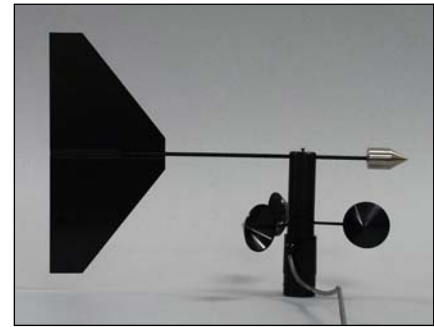# Wind Speed/Direction Smart Sensor (Part # S-WCA-M003)

The Wind Speed/Direction smart sensor is designed to work with the HOBO® Weather Station logger. The smart sensor has a plug-in modular connector that allows it to be added easily to a HOBO Weather Station. All sensor parameters are stored inside the smart sensor, which automatically communicates configuration information to the logger without the need for any programming or extensive setup.

Specifications	Wind Speed/Gust	Wind Direction
Measurement Range	0 to 44 m/s (0 to 99 mph)	0 to 358 degrees, 2 degree dead band
Accuracy	± 0.5 m/s (± 1.1 mph) ± 3% 17 to 30 m/s (38 to 67 mph) ± 4% 30 to 44 m/s (67 to 99 mph)	± 5 degrees
Resolution	0.19 m/s (0.42 mph)	1.4 degrees
Starting Threshold	0.5 m/s (1.1 mph)	0.5 m/s (1.1 mph)
Damping Ratio	NA	0.4
Distance Constant	Approximately 3 m (9.8 ft)	0.8 m (2.6 ft)
Maximum Wind Speed Survival	54 m/sec (120 mph)	
Measurement Definition	Cup revolutions are accumulated every three seconds for the duration of the logging interval. Wind speed is the average speed for the entire logging interval. Gust speed is the highest three-second wind recorded during the logging interval.	Vector components of wind direction are accumulated every three seconds for duration of logging interval. Average direction is calculated from the sum of the vector components every logging interval.
Operating Temperature Range	-40°C to +75°C (-40°F to +167°F)	
Environmental Rating	Weatherproof	
Service Life	2 to 5 years typical depending upon environmental conditions	
Housing	Anodized aluminum housing, injection-molded fiberglass-reinforced plastic cups, stainless steel fasteners, Acetal base, and powder-coated steel mounting rod	
Bearing Type	Stainless steel shielded ball bearing	Bushing
Turning Radius	108 mm (4.25 in.)	Approximately 305 mm (12.5 in.)
Dimensions	317 mm (12.5 in.) H x 419 mm (16.5 in.) W, 12.7 mm (0.5 in.) diameter mounting pole	
Weight	Approximately 700 g (1.5 lbs)	
Bits per Sample	8 for each channel, 24 total	
Number of Data Channels *	3	
Measurement Averaging Option	Automatic averaging (see Measurement Definition)	
Cable Length Available	3.0 m (9.8 ft)	
Length of Smart Sensor Network Cable *	3.0 m (9.8 ft)	
Part Number	S-WCA-M003	
(€ Specification	This product meets CE specification EN61326 criterion C for ESD, criterion C for Radiated Immunity, criterion B for Fast Transient, criterion A for Conducted Immunity, and criterion A for Power Frequency Magnetic Fields. 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.	

*   A single HOBO Weather Station logger can accommodate 15 data channels and up to 100 m (325 ft) of smart sensor cable (the digital communications portion of the sensor cables).

Inside this Package
- Wind Speed/Direction smart sensor
- Mounting Pole ½ inch (12.7 mm) diameter x 14 inch (356 mm) length

Mounting

Accessories
- Full Cross Arm (Part # M-CAA)
- Half Cross Arm (Part # M-CAB)

Cross Arm Mounting
1. Insert the Wind Speed/Direction smart sensor into the mounting pole and secure it at the base of the sensor using the two Phillips head locking screws (see Figure 1).
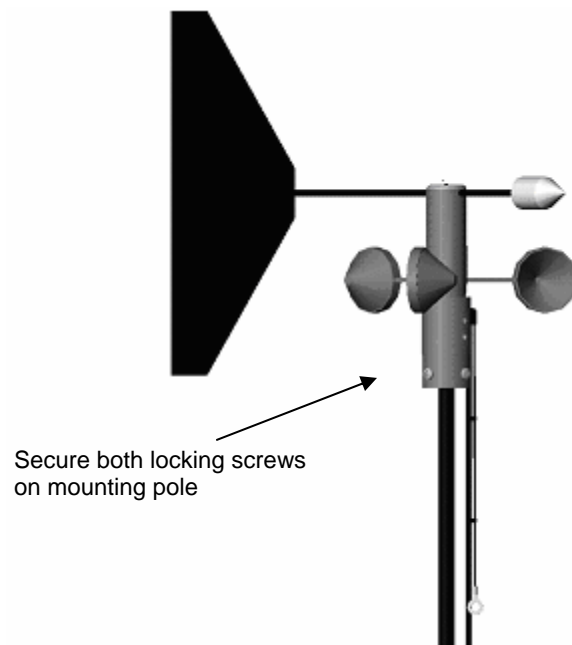
Secure both locking screws
on mounting pole

Figure 1: Sensor Secured on Mounting Pole

2. Insert the Wind Speed/Direction smart sensor with mounting pole into the cross arm as shown in Figure 2. Secure the ground wire to the lug nut on the cross arm.
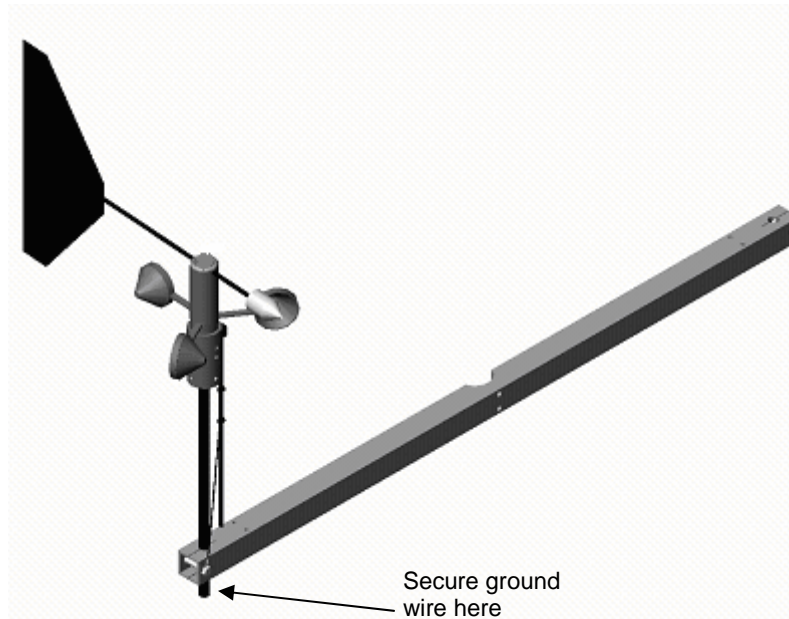

Secure ground
wire here

Figure 2: Sensor Mounted on Cross Arm

3. Install the nut and bolt provided with the cross arm kit. Tighten with a 7/16 inch wrench until snug. Adjust the height of the Wind Speed/Direction smart sensor in the cross arm as necessary.

4. Secure the sensor cable to the bottom of the cross arm with cable ties. The gray tube in the middle of the sensor cable (not shown) is weatherproof and should be securely mounted to the cross arm with cable ties.

5. Follow the steps in the *North Alignment* section on page 4.

Pole Mounting

1. Insert the Wind Speed/Direction smart sensor into the mounting pole and secure it at the base of the sensor using the two Phillips head locking screws (see Figure 1).

2. Secure the Wind Speed/Direction smart sensor with two hose clamps (not included), as shown in Figure 3. Adjust the height as necessary, but make sure the hose clamps are separated by at least 4 inches (10 cm).
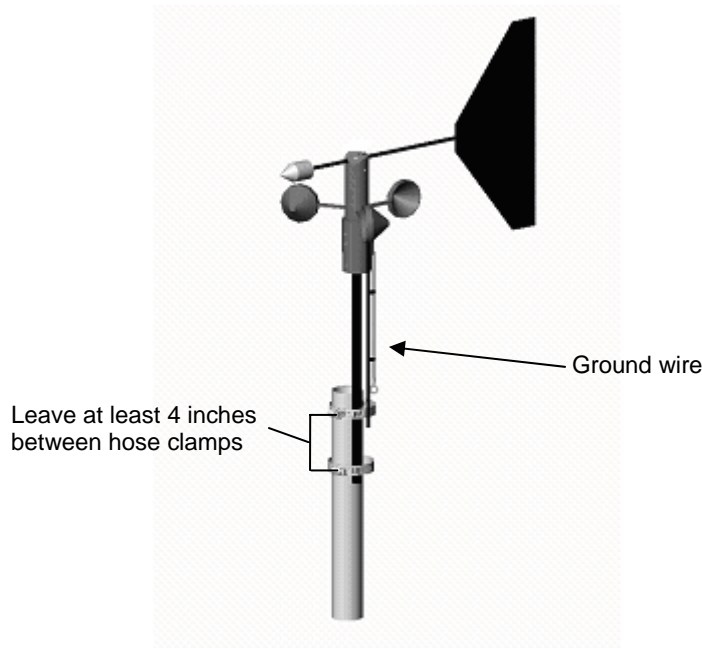

Figure 3: Sensor Mounted on Pole

3. Secure the sensor cable with cable ties. The gray tube in the middle of the sensor cable (not shown) is weatherproof and should be securely mounted on the cross arm with cable ties.

4. Follow the steps in the *North Alignment* section on page 4.

Placement and Mounting Considerations

- The Wind Speed/Direction smart sensor should be mounted vertically in a location free of wind shadows.

- For accurate wind speed/direction measurements, mount the sensor at a distance of at least five times the height of the nearest tree, building, or other obstruction.

- Be sure to secure the sensor cable with cable ties to protect it from damage.

- Refer to the *HOBO Weather Station User's Guide* for more information about setting up complete weather stations.

- Ground wire must be used. Attach it to the mounting pole or tripod.

North Alignment

The wind speed/direction sensor must be oriented properly to obtain meaningful data. This involves aligning the north sticker on the base of the sensor with true north. There are two methods to align the sensor: compass alignment and Global Positioning Satellite (GPS) alignment.

Note: The magnetic declination must be known to align the direction sensor to true north using a magnetic compass. Worldwide declination information is available from the National Space Science Data Center at: http://nssdc.gsfc.nasa.gov/space/cgm/cgm.html.

Compass Alignment

Tools required:

- Compass

- Binoculars

- Tape (such as electrical, packing, or duct tape)

Two people are required to complete this procedure.

1. Align the stainless steel point of the wind vane with the north sticker on the base.

2. Secure the base and vane shaft with a piece of tape so that the vane cannot rotate (see Figure 4).
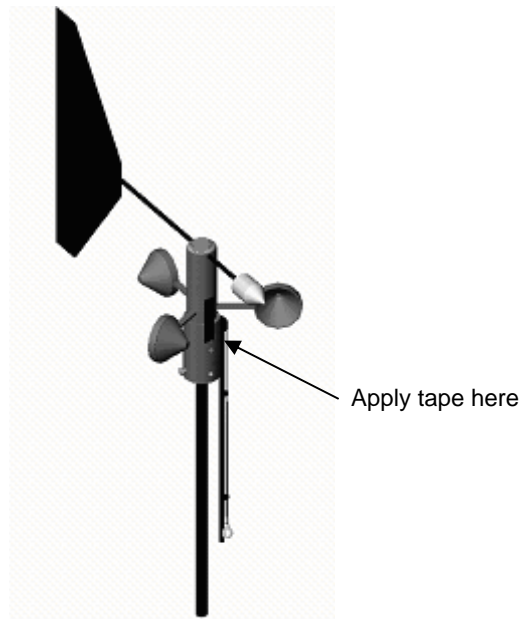

Apply tape here

Figure 4: Aligning Wind Vane

3. While standing 150 to 200 feet south of the sensor, use the compass to determine magnetic north. Align yourself so the compass points north and directly at the sensor.

4. While viewing the sensor through binoculars, instruct another person to rotate the sensor mounting post to point the vane north. The vane should seem to disappear from sight when properly aligned.

5. Once you've obtained the correct position, secure the sensor by tightening the two Phillips head screws at the base of the sensor until it is firmly attached to the ½ inch diameter black mounting pole (see Figure 1).

6. Finally, do not forget to remove the tape!

GPS Alignment

Tools required:

- Handheld GPS with WAAS-enabled receiver or any similar high accuracy GPS device

- Flag, orange cone, or other temporary marker

- Laptop computer with logger software installed

This procedure requires only one person, but is easier to complete with two people. In this procedure, you will be using the GPS receiver first to create an arbitrary waypoint and then to determine the bearing from the sensor to that waypoint. You will then align the sensor so that when the vane is pointed at the waypoint, the direction reported by the logger software matches the GPS receiver's bearing to the waypoint.

1. Connect the sensor to the HOBO Weather Station logger (refer to the *Connecting* section below).

2. Connect the laptop to the logger with the PC interface cable.

3. Pick a visible location that is at least 100 meters (110 yards) away from the wind speed/direction sensor and walk to it. Establish a waypoint with the handheld GPS receiver. You may want to use averaging to minimize the waypoint position error if your GPS receiver is so equipped. (For best results, the estimated position error of the waypoint should be less than 10 feet if the distance to the sensor is 100 meters, and less than 20 feet for a distance of 200 meters.) Mark the waypoint with a flag, orange cone, or other suitable marker.

4. Walk back to the sensor and determine the bearing to the waypoint you just created with the GPS receiver. Again you may need to determine the average value of the bearing to keep the errors to a minimum.

5. Start the logger software and open the launch window (refer to the software manual for details about operating the software) to get real time readings or select "Get Status" to get the current reading.

6. Point the sensor vane directly at the waypoint flag or marker and rotate the sensor base until the wind direction sensor value in the logger software matches the angle obtained with the GPS receiver.

7. Once the vane is in position, secure the sensor by tightening the two screws at the base (see Figure 1) until it is firmly attached to the ½ inch diameter black mounting pole.

8. Double check that the reported angle is correct.

Connecting

To start using the Wind Speed/Direction smart sensor, stop the HOBO Weather Station logger and insert the modular jack into an available port. If a port is not available use a 1-to-2 adapter (Part # S-ADAPT). The next time the HOBO Weather Station is launched, it will automatically detect the new smart sensor. Note that the HOBO Weather Station supports a maximum of 15 data channels. This sensor requires three channels. Launch the logger and verify that the sensor is functioning correctly. See the *HOBO Weather Station User's Guide* for more details about connecting smart sensors to the HOBO Weather Station.

Operation

The Wind Speed/Direction sensor measures the wind speed/direction every three seconds. At the conclusion of the logging interval, the three-second values are averaged together and recorded in the data logger.

Direction Averaging

Unit vector averaging is used to determine wind direction because traditional averaging would produce inaccurate results. For example, three measurements of 350, 11, and 12 degrees—which are all winds from the north—averaged together would result in 126 degrees, which incorrectly indicates a southeasterly wind. Instead, the vector components (North/South and East/West) for each wind measurement are calculated every three seconds for the duration of the logging interval. At the conclusion of the logging interval, the North/South and East/West components are averaged and then re-combined to calculate the average wind direction for the logging interval.

Maintenance

The Wind Speed/Direction smart sensor does not normally require any maintenance other than an occasional cleaning and lubrication. In dusty locations, the anemometer bearing should be lubricated with a light oil every 6 to 12 months. Squirt a spray oil (such as WD-40) into the gap above the three-cup assembly. If the cups or vane become dirty, rinse the sensor with mild soap and fresh water. Do not immerse the sensor in water or use any organic solvents to clean the unit. **Note:** If the vane assembly is disassembled, apply a thread-locker (such as Loctite®) to the screws that hold the tail fin assembly together upon reassembly.

Verifying Sensor Accuracy

It is recommended that you check the accuracy of the Wind Speed/Direction smart sensor annually. The Wind Speed/Direction smart sensor cannot be calibrated. Onset uses precision components to obtain accurate measurements. If the smart sensor is not providing accurate data, then it is damaged or possibly worn out if it has been in use for several years. If you are unsure of the accuracy, you can send the smart sensor back to Onset for inspection and possible replacement of the mechanism or bearings if required. Contact Onset or your dealer for a Return Merchandise Authorization (RMA) number before sending the sensor.

Warranty

This product is warranted to be free from defects in material and workmanship for a period of one year from the date of original purchase. During the warranty period, Onset will, at its option, either repair or replace products that prove to be defective. This warranty is void if the Onset products have been damaged by customer error or negligence or if there has been an unauthorized modification.

Tune-up Service

Onset will examine and retest this and any other smart sensor.

(€ The CE Marking identifies this product as complying with all relevant directives in the European Union (EU).

Part #: MAN-S-WCA
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