TABLE OF CONTENTS

1. INTRODUCTION

Thank you for choosing the ATMOS 22 Ultrasonic Anemometer from METER Group.

The ATMOS 22 Ultrasonic Anemometer is designed for continuous monitoring of wind speed and direction (Section 3). A robust, no moving parts design that prevents errors because of wear or fouling make the ATMOS 22 ideal for long-term, remote installations.

Applications of the ATMOS 22 are listed below:
• Weather monitoring

• Microenvironment monitoring

• In-canopy wind measurement

• Spatially-distributed environmental monitoring

• Wind profiling

• Crop weather monitoring

• Weather networks

Additional advantages include its low-power design that supports battery-operated data loggers, and the SDI-12 three-wire interface. A tilt sensor warns the user of out-of-level condition, and no configurations are necessary.

Prior to use, verify all ATMOS 22 system components are included and appear in good condition.

2. OPERATION

Please read all instructions before operating the ATMOS 22 to ensure it performs to its full potential.

⚠ PRECAUTIONS

METER instruments are built to the highest standards, but misuse or neglect may damage the device and possibly void the manufacturer's warranty. Before using the ATMOS 22, follow the recommended user instructions and arrange proper protections to safeguard the instrument from damage.

2.1 INSTALLATION

Follow the steps listed in Table 1 to set up the ATMOS 22 and start collecting data.

Table 1   Installation

Tools Needed	**Wrench** 13 mm (1/2 in)
	Mounting pole 31.8 to 50.8 mm (1.25 to 2.0 in) diameter
	NOTE: Smaller mounts are compatible if washers are added to the V-bolt (not included). United States standard pipe sizes that are compatible are 1.00-, 1.25-, and 1.50-in. Square tubing with a width of 1.25 to 2.00 in or T-posts can also work as mounting options.
Preparation	**Consider the Surroundings** Ensure that site selection is far from wind obstruction.
	Conduct System Check Plug the weather station into the logger (Section 2.2).
	Verify all sensors are functional and read within expected ranges.
	Adjust Pole Height Prepare the mounting pole to the appropriate height. Many installations require the ATMOS 22 to be mounted 2 m above ground, but mounting height can be adjusted based on the specific application.
Mounting	**Install on Mounting Pole** Use the V-bolt to mount the unit at the desired height. The V-bolt is compatible with most meterological stands, poles, tripods, and other mounts.
	Mount Toward True North Orient the **N** engraved on the side of the instrument should be oriented to point true north (not magnetic north). The ATMOS 22 must be oriented correctly by hand for accurate wind direction measurements.
	Level the System Use the bubble level underneath the ATMOS 22 or a PROCHECK display to level the weather station. The angle of the mounting pole may need to be adjusted or shims added to the ATMOS 22–pole interface to achieve level.

Table 1   Installation (continued)

Mounting (continued)	**Secure the System** Tighten the V-bolt nuts by hand until hand-tight, and then tighten with a wrench, securing the ATMOS 22 flat and tight against the top of the stand. **CAUTION: Do not overtighten V-bolt.** **Secure and Protect Cables** **NOTE: Improperly protected cables can lead to severed cables or disconnected sensors. Cabling issues can be caused by many factors such as rodent damage, driving over sensor cables, tripping over cables, not leaving enough cable slack during installation, or poor sensor wiring connections.** Install cables in conduit or plastic cladding when near the ground to avoid rodent damage. Gather and secure cables between the ATMOS 22 and the data logger to the mounting mast in one or more places. **Connect to Data Logger** Plug the sensor into a data logger. Use the data logger to make sure the sensor is reading properly. Verify these readings are within expected ranges. For more instructions on connecting to data loggers, refer to Section 2.2.

2.2 CONNECTING

The ATMOS 22 works seamlessly with METER data loggers. The ATMOS 22 can also be used with other data loggers, such as those from Campbell Scientific, Inc. For extensive directions on how to integrate the sensor into third-party loggers, refer to the ATMOS 22 Integrator Guide.

ATMOS 22 sensors require excitation voltages in the range of 3.6 to 15.0 VDC and operates at 2.8- to 5.5-VDC level for data communication. The ATMOS 22 can be integrated using SDI-12 protocol. See the ATMOS 22 Integrator Guide for details on interfacing with data acquisition systems.

ATMOS 22 sensors come with a 3.5-mm stereo plug connector (Figure 1) to facilitate easy connection with METER loggers. ATMOS 22 sensors may be ordered with stripped and tinned wires to facilitate connecting to some third-party loggers (Section 2.2.2).

Ground
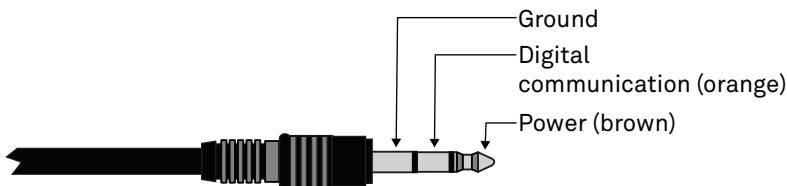Digital communication (orange)
Power (brown)

Figure 1   3.5-mm stereo plug connector wiring

The ATMOS 41 comes standard with a 5-m cable. It may be purchased with custom cable lengths for an additional fee (on a per-meter basis). In some instances, the cable can be extended beyond 75 m by the user, but this is discouraged for a variety of reasons. Please contact Customer Support for more details before extending or splicing cables.

2.2.1 CONNECT TO METER DATA LOGGER

The ATMOS 22 works most efficiently with ZENTRA series data loggers. Check the METER downloads webpage for the most recent data logger firmware. Logger configuration may be done using either ZENTRA Utility (desktop and mobile application) or ZENTRA Cloud (web-based application for cell-enabled data loggers).

NOTE: This system will not work with legacy data loggers (Decagon Em5 or Em5B).

1. Plug the stereo plug connector into one of the sensor ports on the logger.

2. Use the appropriate software application to configure the chosen logger port for the ATMOS 22. METER data loggers will automatically recognize ATMOS 22 sensors.

3. Set the measurement interval.

    METER data loggers measure the ATMOS 22 every minute and return the average of the 1-min data across the chosen measurement interval. For example, the interval can be set to 5 min, 10 min, 15 min. See Table 2 for additional information.

ATMOS 22 data can be downloaded from METER data loggers using either ZENTRA Utility or ZENTRA Cloud. Refer to the logger user manual for more information about these programs.

2.2.2 CONNECT TO NON-METER LOGGER

The ATMOS 22 can be purchased for use with non-METER (third party) data loggers. Refer to the third-party logger manual for details on logger communications, power supply, and ground ports. The ATMOS 22 Integrator Guide also provides detailed instructions on connecting sensors to non-METER loggers.

ATMOS 22 sensors can be ordered with stripped and tinned (pigtail) wires for use with screw terminals. Refer to the third-party logger manual for details on wiring.

Connect the ATMOS 22 wires to the data logger as illustrated in Figure 2 and Figure 3, with the power supply wire (brown) connected to the excitation, the digital out wire (orange) to a digital input, and the bare ground wire to ground.

Power (brown)
Ground (bare)
Digital communication (orange)
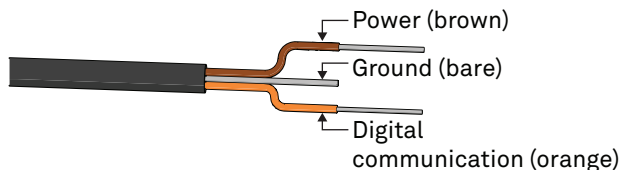
Figure 2 Pigtail wiring

NOTE: Some early ATMOS 22 may have the older Decagon wiring scheme where the power supply is white, the digital out is red, and the bare wire is ground.
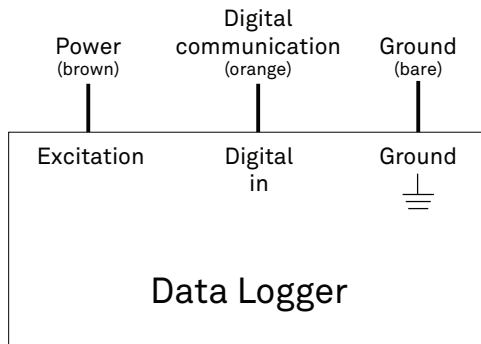
Figure 3   Wiring diagram

NOTE: The acceptable range of excitation voltages is from 3.6 to 15.0 VDC. To read the ATMOS 22 with Campbell Scientific data loggers, power the sensors off a 12-V port (or any port that continuously powers from 3.6–15.0 VDC).

If the ATMOS 22 cable has a standard stereo plug connector and needs to be connected to a non-METER data logger, use one of the following two options.

Option 1

1. Clip off the stereo plug connector on the sensor cable.
2. Strip and tin the wires.
3. Wire it directly into the data logger.

This option has the advantage of creating a direct connection and minimizes the chance of the sensor becoming unplugged. However, it then cannot be easily used in the future with a METER readout unit or data logger.

Option 2
Obtain an adapter cable from METER.

The adapter cable has a connector for the stereo plug connector on one end and three wires (or pigtail adapter) for connection to a data logger on the other end. The stripped and tinned adapter cable wires have the same termination as in Figure 3: the brown wire is excitation, the orange is output, and the bare wire is ground.

NOTE: Secure the stereo plug connector to the pigtail adapter connections using adhesive-lined heat shrink to ensure the sensor does not become disconnected during use.

2.3 COMMUNICATION

The SDI-12 protocol requires that all sensors have a unique address. ATMOS 22 sensor factory default is an SDI-12 address of 0. To add more than one SDI-12 sensor to a bus, the sensor address can be changed using a ZSC Bluetooth® sensor interface and the ZENTRA Utility Mobile app as described below:

NOTE: The sensor SDI-12 address must be returned to 0 to work with ZENTRA loggers.

1.   Using a mobile device, open the ZENTRA Utility Mobile app.

2.   Connect the sensor to the ZSC.

3.   Under Sensor Information, select the SDI Address dropdown.

4.   Scroll through the options and select the desired SDI-12 address.

> NOTE: Address options include 0-9, A-Z, and a-z.

The sensor address can also be changed using the PROCHECK handheld device.

1.   Using a PROCHECK connected to the sensor, press the **Menu** button to bring up the `CONFIG` menu.

> NOTE: If the PROCHECK does not have this option, please upgrade its firmware to the latest version from the METER Legacy Handheld Devices webpage.

2.   Scroll down to `SDI-12 Address`. Press **Enter**.

3.   Press the **UP** or **DOWN** arrows until the desired address is highlighted.

Address options include 0...9, A...Z, and a...z.

4.   Press **Enter**.

Detailed information can also be found in the application note Setting SDI-12 addresses on METER digital sensors using Campbell Scientific data loggers and LoggerNet.

When using the sensor as part of an SDI-12 bus, excite the sensors continuously to avoid issues with initial sensor startup interfering with the SDI-12 communications.

3. SYSTEM

This section describes the ATMOS 22 Ultrasonic Anemometer.

3.1 SPECIFICATIONS

MEASUREMENT SPECIFICATIONS

Horizontal Wind Speed	
Range	0–30 m/s
Resolution	0.01 m/s
Accuracy	The greater of 0.3 m/s or 3% of measurement
Wind Gust	
Range	0–30 m/s
Resolution	0.01 m/s
Accuracy	The greater of 0.3 m/s or 3% of measurement
Wind Direction	
Range	0°–359°
Resolution	1°
Accuracy	±5°
Tilt	
Range	−90° to 90°
Resolution	0.1°
Accuracy	±1°

COMMUNICATION SPECIFICATIONS

Output
SDI-12 communication
Data Logger Compatibility
METER ZL6, Em50, and EM60 data loggers or any data acquisition systems capable of 3.6- to 15.0-VDC excitation and SDI-12 communication

PHYSICAL CHARACTERISTICS

Dimensions

Diameter	10 cm (3.94 in)
Height	16 cm (6.30 in)

Operating Temperature Range

Minimum	−50 °C
Typical	NA
Maximum	60 °C

Cable Length

5 m (standard)

75 m (maximum custom cable length)

NOTE: Contact Customer Support if a nonstandard cable length is needed.

Connector Types

Stereo plug connector or stripped and tinned wires

Stereo Plug Connector Diameter

3.5-mm

ELECTRICAL AND TIMING CHARACTERISTICS

Supply Voltage (VCC to GND)

Minimum	3.6 VDC continuous
Typical	NA
Maximum	15.0 VDC continuous

NOTE: The ATMOS 22 must be continuously powered to work properly.

NOTE: For the ATMOS 22 to meet digital logic levels specified by SDI-12, it must be excited at 3.9 VDC or greater.

Digital Input Voltage (logic high)

Minimum	2.8 V
Typical	3.6 V
Maximum	5.0 V

Digital Input Voltage (logic low)	
Minimum	−0.3 V
Typical	0.0 V
Maximum	0.8 V

Digital Output Voltage (logic high)	
Minimum	NA
Typical	3.6 V
Maximum	NA

NOTE: For the ATMOS 22 to meet digital logic levels specified by SDI-12, it must be excited at 3.9 VDC or greater.

Power Line Slew Rate	
Minimum	1.0 V/ms
Typical	NA
Maximum	NA

Current Drain (during measurement)	
Minimum	0.2 mA
Typical	8.0 mA
Maximum	33.0 mA

Current Drain (while asleep)	
Minimum	0.2 mA
Typical	0.3 mA
Maximum	0.4 mA

Power Up Time (SDI ready)—aRx! Commands	
Minimum	NA
Typical	10 s
Maximum	NA

Power Up Time (SDI ready)—Other Commands	
Minimum	NA
Typical	130 ms
Maximum	NA

| Power Up Time (SDI–12, DDI disabled)	
Minimum	NA
Typical	200 ms
Maximum	NA
Measurement Duration	
Minimum	NA
Typical	110 ms
Maximum	3,000 ms

COMPLIANCE

EM ISO/IEC 17050:2010 (CE Mark)

3.2 ANEMOMETER

The open space in the center of the anemometer is where the ATMOS 22 measures wind speed. Ultrasonic signals emitted from transducers at right angles to each other bounce off the porous acoustic plate (Figure 4) and back up to the opposite sensor. The speed of sound is affected by the wind, and the wind speed is calculated by measuring differences in the time it takes for sound to travel back and forth between sensors (Section 3.5).

When powered on, the ATMOS 22 measures the wind speed and direction once every 10 s and records the instantaneous wind vector components. When queried, the ATMOS 22 outputs the average of the instantaneous measurements since the last query for wind speed and direction and the maximum instantaneous wind speed value for wind gust.
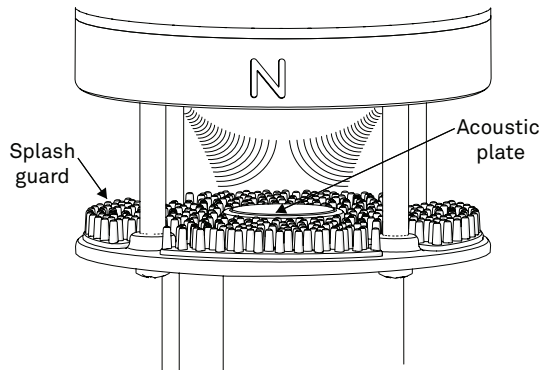
Figure 4   Anemometer

The ATMOS 22 measures wind speed every 10 s and keeps a running average of the last 10 measurements. If an instantaneous measurement is more than eight times the running average, the instantaneous measurement is rejected. It is not reported as the maximum gust or included in the data that are averaged over the output interval.

For normal ATMOS 22 use cases, this is an effective method for eliminating inaccuracy resulting from spurious spikes in wind speed (e.g., bumblebee checking out the ultrasonic path). In special use cases where data are output frequently and large step changes in wind speed are present (e.g., turning on a wind tunnel), this spike rejection algorithm may result in an error code being output.

3.3 TEMPERATURE SENSOR

The ATMOS 22 temperature measurement (Figure 5) is made in the small stainless steel needle containing a tiny temperature sensor (thermistor) that extends from the middle of the four ultrasonic transducers in the center of the anemometer. The speed of sound is temperature dependent, so the ATMOS 22 temperature measurement is important for the wind speed and direction calculations. The ATMOS 22 temperature measurement should not be used as an accurate measurement of air temperature. Testing has shown errors of as much as 2 °C between the ATMOS 22 temperature sensor and the true air temperature under sunny conditions.

When powered on, the ATMOS 22 measures the air temperature once every 10 s and records the instantaneous values. When queried, the ATMOS 22 outputs the average of the instantaneous measurements since the last query.

NOTE: Temperature data will not be collected by legacy Em50 series data loggers.
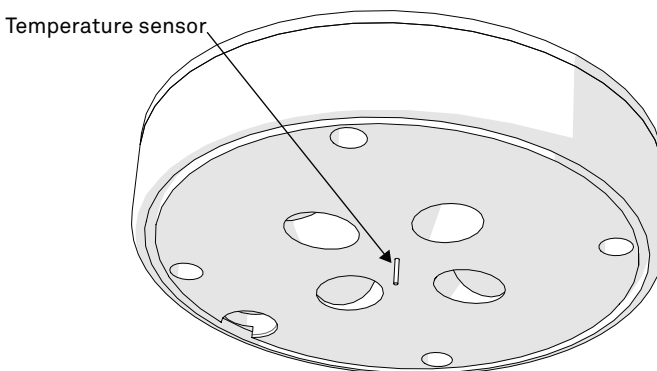

Temperature sensor

Figure 5   Temperature sensor

3.4 TILT SENSOR

The ATMOS 22 is also equipped with a tilt sensor similar to those found in smartphones. The primary use of the tilt sensor data is to ensure the ATMOS 22 remains level at all times. Regularly check X and Y tilt data to ensure the ATMOS 22 is level; if it has tilted, return to the site and level again. Although this sensor may also be used to level the instrument

during installation, it is much easier to use the small bubble level on the bottom of the anemometer plate. For reference, a positive X tilt indicates that the ATMOS 22 is leaning north, and a positive Y tilt indicates that the ATMOS 22 is leaning west.

NOTE: Tilt data will not be collected by legacy Em50 series data loggers.

3.5 WIND SPEED AND DIRECTION THEORY

The theory behind the anemometer comes from Campbell and Unsworth (1979). The speed c (m/s) of sound in still air depends on air temperature T (K), vapor pressure e (kPa), and atmospheric pressure, p (kPa), as shown in Equation 1.

$$c = 20.067\sqrt{T\left(1+\frac{0.32e}{p}\right)}$$ **Equation 1**

For a given sound path length, d (m), the number of wavelengths, n, in still air is determined with Equation 2.

$$n = \frac{vd}{c}$$ **Equation 2**

Here v is the frequency of the sound (Hz). When the air is moving, the speed of sound is the sum of the wind speed and the speed of sound in still air. The anemometer transmits a sound pulse in a forward direction, then a similar pulse in the reverse direction. The difference in n between the two points is computed. If the vector magnitude of the wind in the direction of the sound is u (m/s), then

$$n - \Delta n_+ = \frac{vd}{c+u}$$ **Equation 3**

$$n + \Delta n_- = \frac{vd}{c-u}$$ **Equation 4**

for sound traveling with and against the wind. Subtracting the result of Equation 3 from the result of Equation 4 creates Equation 5.

$$\Delta n = \Delta n_- + \Delta n_+ = \frac{2vdu}{c^2 - u^2}$$ **Equation 5**

Even at the maximum wind speeds for the anemometer, u^2 is only about 1% of c^2, so the equation can be simplified as shown in Equation 6.

$$u \cong \frac{c^2}{2vd}\Delta n$$ **Equation 6**

This is the basic equation for the anemometer. Delta (Δ) n is proportional to the phase difference between the forward and reverse sound pulses. The sound comes from a 40 kHz ultrasonic transducer in the head of the anemometer. A sound pulse is transmitted diagonally across the anemometer, bouncing off an acoustic plate in the center. The sound pulse is then received by another transducer in the anemometer head that is opposite the first. Once the sound pulse is received, the receiver becomes the transmitter and the

process is repeated. Two more sensors, mounted at 90 degrees from the first two, give the other horizontal component of the wind. The sound travels a total distance of about 72 mm from transmitter to receiver, but d in the equations is just the horizontal distance, which is 40 mm.

If u is the magnitude of the wind vector in the east-west direction (east +) and v is the magnitude in the north-south direction (north +), then wind speed is computed with Equation 7.

$$S = \sqrt{\bar{u}^2 + \bar{v}^2}$$

Equation 7

Where the overbar indicates an average of the values sampled every 10 s, wind direction is computed with Equation 8.

$$\theta = tan^{-1}\left(\bar{v}/\bar{u}\right)$$

Equation 8

WARNING: The wind measurement through more frequent SDI-12 commands **requires 42 ms to complete. An additional 60 ms are required for the computations to determine phase differences. The anemometer samples every 10 s (or more often if requested** through more frequent SDI-12 commands**). The gust speed reported is the highest instantaneous wind speed measured during the selected averaging interval (must be >20 s or gusts will equal speed).** Wind speeds above 30 m/s are not measured reliably with the phase shift method, so wind speeds measured above 30 m/s will be reported as 30 m/s.

The ATMOS 22 uses a wind speed spike rejection scheme to protect against the inclusion of spurious wind speed spikes in the averaged wind speed data. The ATMOS 22 measures wind speed every 10 s and keeps a running average of the last 10 measurements. If an instantaneous measurement is more than eight times the running average, then the instantaneous measurement is rejected and not reported as the maximum gust or included in the data that are averaged over the output interval.

For normal ATMOS 22 use cases, this is an effective method for eliminating inaccuracy resulting from spurious spikes in wind speed (e.g., bumblebee investigating the ultrasonic path). In special use cases where data are output frequently and large step changes in wind speed are present (e.g., turning on a wind tunnel), this spike rejection algorithm may result in an error code being output.

NOTE: Cup anemometers average over a much longer interval than 42 ms, so the gusts measured with a sonic anemometer will have a larger peak-to-mean ratio than a cup anemometer.

3.6 LIMITATIONS
The ATMOS 22 is engineered to be a robust device with minimal downtime. However, it does have limitations that will affect its measurements under some conditions.

3.6.1 SNOW AND ICE ACCUMULATION
Accumulation of snow, ice, or frost can compromise the wind measurements if accumulation occurs in the anemometer acoustic pathway or on the acoustic plate (Section 4.2).

3.6.2 HEAVY RAIN AND STRONG WIND

During strong storm events, water can splash off of the horizontal bottom plate of the anemometer envelope and interrupt the signal passing between the sonic transducers. The spikes on the bottom plate help dissipate the energy of rainwater to minimize splashing and reduce the likelihood that the wind measurements are interrupted. Additionally, specially treated hydrophobic porous polyethylene membranes protect the ultrasonic transducers from direct splashing and the sintered (porous) glass construction draws water from the upper surface of the acoustic plate to keep a constant sound path length. Despite these features, heavy rain and strong wind can still cause water to reach the membranes and also cause temporary water buildup on the acoustic plate. The hydrophobic nature of the transducer protective membranes and the quick-draining ability of the acoustic plate should limit wind measurement interruptions to heavy rain events and should bring wind measurement back online soon after extreme conditions abate.

3.7 MEASUREMENTS WITH METER DATA LOGGERS

METER EM60 series and ZENTRA series data loggers query the ATMOS 22 once every minute and record the appropriate averages and maximums from the ATMOS 22 in memory. When the measurement interval is reached, the 1-min measurements are processed into the appropriate averages and maximums and output to final storage (see the METER logger manual for more information). Table 2 describes the quantities output from the ATMOS 22 and how they are processed in the logger for each ATMOS 22 measurement.

NOTE: The Em50 series data loggers only record and output wind speed, wind direction, and wind gust. They do not record or output anemometer temperature or tilt information.

Table 2   ATMOS 22 output quantities processed in METER data logger

Measurement	Data Output Every Minute	Data Saved by Logger Each Measurement Interval (m = number of minutes)
Wind speed	Average of six 10-s wind speed measurements in both horizontal wind vectors	Wind run is calculated from each 1-min average of both horizontal wind vectors. METER logger saves average wind run from m 1-min averages.
Wind direction	Average of six 10-s wind direction measurements in both horizontal wind vectors	Weighted direction calculated from horizontal wind vectors
Wind gust	Maximum of six 10-s wind speed measurements	Maximum wind speed recorded over measurement interval
Anemometer temperature	Average of six 10-s anemometer temperature measurements	Average of m 1-min averages of anemometer temperature

| Tilt | Instantaneous measurements of tilt in X and Y orientation | Average of m instantaneous measurements of tilt in X and Y orientation |

4. SERVICE

This section contains calibration frequencies, cleaning and maintenance, troubleshooting guidelines, and contact information.

4.1 CALIBRATION

The relationship between wind speed and phase is determined by geometry and the laws of physics. Since the geometry is tightly controlled in manufacturing, no individual anemometer calibration is needed. The phase of each ATMOS 22 anemometer is initially set to zero in a zero wind-speed condition. Extensive wind-tunnel and field testing has shown this to result in accurate wind-speed measurements. A subsample of anemometers is checked monthly for accuracy as part of routine quality assurance (QA) procedures. Routine recalibration of the ATMOS 22 is not necessary.

4.2 CLEANING AND MAINTENANCE

Below are instructions to clean and maintain the ATMOS 22. Cleaning and maintenance should be performed as needed.

1. Make sure nothing is obscuring the temperature sensor or the sonic transducers shown in Figure 6 (cobwebs, leaves, wasp nests, etc.).

2. Check the following areas to make sure they are clear of miscellaneous environmental, animal (specifically bird droppings) and insect debris, or spider webs:

   a. Anemometer opening

   b. Acoustic plate

3. Clean the ATMOS 22

   a. Scrub with light to medium pressure using a warm, damp cloth.

   b. Completely dry the instrument by removing excess water using a dry cloth.

   c. Clean around posts and between crevices using a dry brush.

   d. Be sure the sensor is level after cleaning.

CAUTIONS

• **DO NOT** immerse the sensor in water.

• **DO NOT** touch the temperature sensor needle (Figure 6).

   CAUTION: The wire leads for the temperature sensor needle are very delicate and can be easily damaged.

• Avoid more than light pressure on the sonic transducers (Figure 6).

   NOTE: Do not allow water to enter the sonic transducers (Figure 6). Water may corrode the metal parts inside and ruin the transducers.

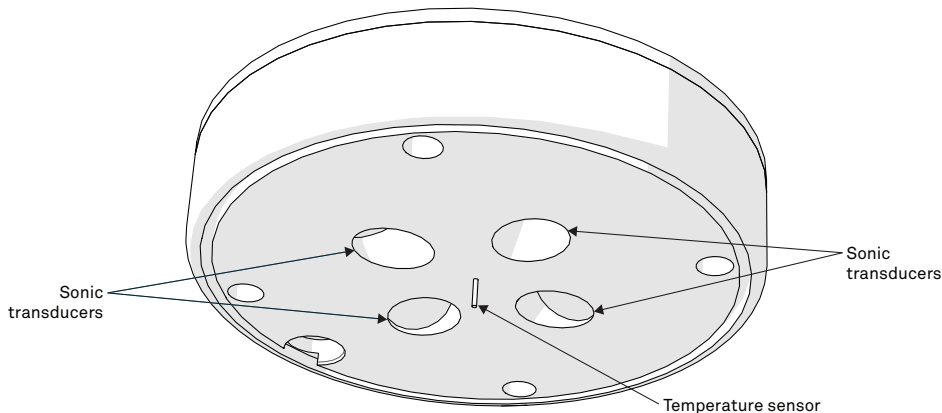**Figure 6   Temperature needle and sonic transducers**

4.3 TROUBLESHOOTING

Table 3   Troubleshooting the ATMOS 22

Problem	Possible Solutions
ATMOS 22 not responding	Check power to the sensor.
	Check sensor cable and 3.5-mm plug integrity.
	Check data logger wiring to ensure the following connections: • Brown—3.6 VDC to 15.0 VDC continuous power supply • Orange—digital data output • Bare—ground
	If sensor does not respond, use the PROCHECK to make sure it is working satisfactorily.
	Check SDI-12 address. It should be zero for METER data loggers.
No wind speed	Check anemometer pathway to make sure there is no debris blocking the path of the sonic transducer measurement (between transducers and acoustic plate).
	Check the sonic transducers to make sure that there is no water buildup; if there is moisture, take a dry cloth and dab it away.
	Check to see if the acoustic plate (Figure 4) is dirty, and clean by flushing with water and dry with a dry cloth (Section 4.2).
	Be sure the ATMOS 22 is level.

4.4 CUSTOMER SUPPORT

NORTH AMERICA

Customer service representatives are available for questions, problems, or feedback Monday through Friday, 7:00 am to 5:00 pm Pacific time.

Email:	support.environment@metergroup.com
	sales.environment@metergroup.com
Phone:	+1.509.332.5600
Fax:	+1.509.332.5158
Website:	metergroup.com

EUROPE

Customer service representatives are available for questions, problems, or feedback Monday through Friday, 8:00 to 17:00 Central European time.

Email:	support.europe@metergroup.com
	sales.europe@metergroup.com
Phone:	+49 89 12 66 52 0
Fax:	+49 89 12 66 52 20
Website:	metergroup.de

If contacting METER by email, please include the following information:

Name	Email address
Address	Instrument serial number
Phone	Description of the problem

NOTE: For products purchased through a distributor, please contact the distributor directly for assistance.

4.5 TERMS AND CONDITIONS

By using METER instruments and documentation, you agree to abide by the METER Group, Terms and Conditions. Please refer to metergroup.com/terms-conditions for details.

REFERENCE

Campbell, Gaylon S. and Michael H. Unsworth. 1979. An Inexpensive Sonic Anemometer for Eddy Correlation. *Journal of Applied Meteorology*. 18 (8):1072–1077.

INDEX