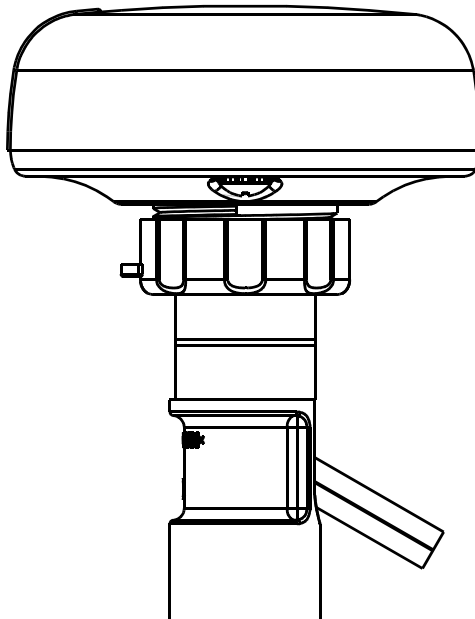




## Owner's Guide & Installation Instructions

*Smart™ Sensor*  
**Solid-State Compass**  
with *GPS Receiver*

Model **GH2183**



Patent <http://www.airmar.com/patent.html>

Record the serial number found on the underside of the sensor.

Serial No. \_\_\_\_\_ Date of Purchase \_\_\_\_\_

17-489-01 rev.10 04/26/22

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**IMPORTANT: Please read the Owner's Guide completely before proceeding.**

## **Introduction**

Thank you for purchasing the Airmar's solid-state Compass with GPS Receiver. This exciting product is actually four sensors in a single unit—a three-axis magnetic compass, a three-axis accelerometer, a three-axis rate gyro, and a GPS receiver. The compact housing is waterproof with a single removable cable. Data is output in digital NMEA 0183 and NMEA 2000® formats.

## **Functions & Outputs**

- Magnetic compass heading
- Angle of vessel pitch (attitude)
- Angle of vessel roll (attitude)
- Rate of Turn
- GPS using WAAS and EGNOS
- NMEA 0183: RS-232 **or** RS-422 standard

## **Features**

- Fast response time
- GPS position updates every second
- Stable and accurate data in dynamic conditions
- Can be programmed to compensate for an installation that is NOT aligned to the front of the boat/vehicle and/or level
- Can be calibrated to compensate for magnetic deviation caused by ferrous metals and other electro-magnetic fields
- Simultaneously outputs data in NMEA 0183 and NMEA 2000® formats
- Waterproof housing
- Waterproof cable system
- Pole, rail, or flush mount

## **WARNING**

**Navigation Aid Only:** The sensor is only an aid to navigation and should never be solely relied upon. It is not a replacement for traditional navigation aids and techniques. Only official government charts contain all the information needed for safe navigation.

**Follow the safety precautions below to reduce the risk of poor product performance, property damage, personal injury, and/or death.**

**WARNING: GPS Accuracy**

The GPS position and velocity accuracies are controlled by the U.S. Department of Defence. Therefore the position accuracy described in the specifications cannot be guaranteed.

**WARNING: Correct Installation Important**

The sensor must be installed and operated according to the instructions in this owner's guide.

**WARNING: Installation Safety**

Always wear safety glasses, a dust mask, and ear protection when installing.

**WARNING: Compass Safe Distance**

The sensor must be a minimum of 0.3m (1') from other standard and steering compasses.

**WARNING: Do Not Install Near Artificial Magnetic Fields**

Observe a safe distance from ferrous metals and anything that can create a magnetic field to prevent interference to the magnetic compass.

**WARNING: Electrical Safety**

The power supply must be OFF before making electrical connections.

**WARNING: Voltage**

The power supply voltage must be 9 - 40 VDC.

**WARNING: Battery**

Make power connections to a power source that is isolated from the engine start battery(s). Voltage drops may cause the compass to lose information and/or change operating mode.

**WARNING: Fuse or Circuit Breaker**

A safe installation requires a 0.5 amp fast-blow fuse or circuit breaker.

**WARNING: Calibrating the Compass**

The internal compass may need to be calibrated after the sensor is installed. Perform the pretest to determine if calibration is necessary.



## Choosing the Mounting Location

For accurate compass readings and a reliable GPS signal, selecting the best location for the sensor is very important. It can be mounted on a pole, rail, or flat surface. Choose a location that balances the requirements below.

- The sensor must have a clear view of the sky to the horizon in all directions. However, the lower it can be mounted, the more stable it will be. It will better track satellites low on the horizon and give more accurate compass readings by minimizing pitch and roll.
- Do not mount on top of a sailboat mast. The sway will cause jitter in the data.
- To prevent interference to the magnetic compass, mount the sensor:
  - A minimum of 0.3m (1') from other standard and steering compasses.
  - Above a metal hull/deck.
  - Away from any structures or equipment that contain ferrous metals.
  - Away from anything that may create a magnetic field such as: magnetized material, electric motors and equipment, power/ignition cables, and batteries. For distances, follow the respective manufacturer's recommendations.
- To prevent interference to the GPS (Figure 1):
  - It must have a clear view of the sky to receive satellite signals. Check for any obstructions such as buildings or boats.
  - Mount it as far as possible from high-powered transmitting antennas to avoid mutual interference.
  - Mount it lower than any on-board INMARSAT communications antenna.
  - Mount above or below any radar beam. *Do not mount within a radar beam.*
- Mount reasonably level with the earth's surface—*not tilted to one side.*
- Do not mount where the sensor could be a tripping hazard or be tread upon. Note that frozen water spray on the unit may degrade reception.
- Be sure there is access to the underside of the mounting surface.
- Be sure the cable(s) can be routed to reduce electrical interference from other electrical wiring and any on-board equipment with a strong magnetic field such as radar equipment, radio transmitters, engines, generators, etc. Separate the cables by at least 1 m (3').

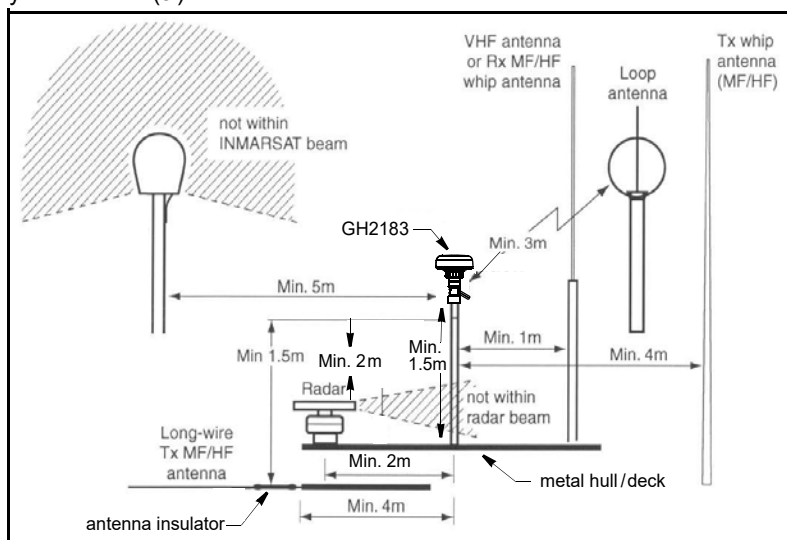


Figure 1. Minimum distance from sensor

Courtesy of Northstar, Acton, MA

## Installing

**CAUTION:** The alignment tab on the sensor must be facing forward and parallel to the centerline of the boat/vehicle for accurate compass readings.

**CAUTION:** Be sure to use the correct parts for your installation. Do not use the flush mount parts (gasket, part B) to mount the receiver on a pole. Using the wrong parts may allow water to leak into the unit.

**CAUTION:** If you use a thread locker, use teflon pipe thread tape. Do not use a liquid thread locker as it may weaken the plastic, causing it to swell and crack.

**IMPORTANT:** Plan the cable route between the sensor and the display and/or network before beginning the installation.

### *Pole or Rail Mount*

The nut assembly supplied has standard marine 1"-14 threads that can be screwed to a standard marine antenna mount, extension pole, or rail-mount bracket. Before beginning the installation, plan for securing the pole/rail bracket to the selected mounting surface and purchase all the necessary hardware. It may be helpful to fasten the pole/rail bracket in place before proceeding.

1. Remove the label from the sensor unit's socket (Figure 2). Fasten the mount base (part C) to the sensor unit (part A) with the two machine screws and lock washers supplied. The torque for the screws is 1.35Nm.

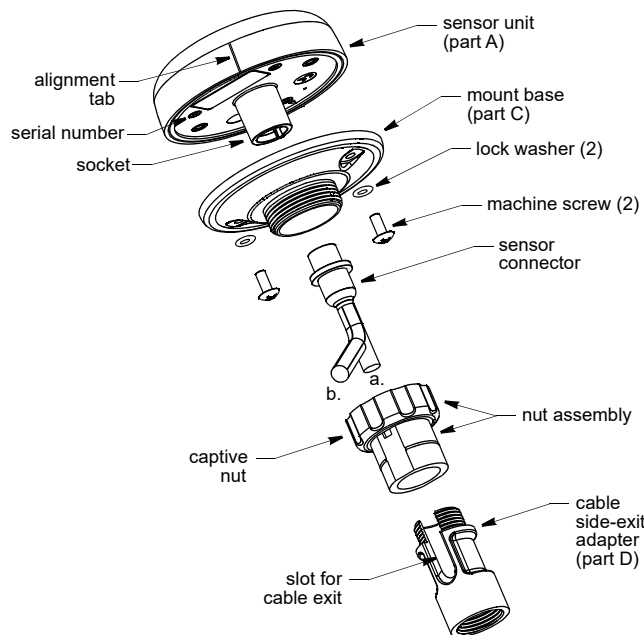


Figure 2. Pole/Rail mount

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2. Decide if you want the cable to exit through the center or along the side of the pole/rail bracket. Slide the nut assembly onto the end of the cable at the sensor connector. *Do not connect the sensor at this time.*
  - a. **Center exit**—Pass the *sensor* connector end of the cable through the center of the pole. *Be sure to leave several inches of cable extending beyond the nut assembly.*
  - b. **Side exit**—Place the cable side-exit adapter (part D) over the cable. *Being sure the cable is passing through the slot in the side,* screw the nut assembly onto the adapter. **Hand tighten** only. Do not over tighten.  
**NOTE:** *Use the adaptor supplied as it has smooth edges that will not chafe the cable. Do not use a purchased part.*
3. Screw the extension pole/rail bracket onto the nut assembly / side-exit adaptor. **Hand tighten** only. Do not over tighten.
4. Remove the protective cap from the *sensor* connector on the cable. (Save the cap to protect the connector when the receiver is removed.) Plug the cable firmly into the sensor.
5. With the alignment tab on the sensor facing forward and parallel to the centerline of the boat / vehicle, slide the captive nut upward and screw it onto the mount base. **Hand tighten** only. Do not over tighten.

### **Flush Mount**

1. Remove the label from over the sensor unit's socket (Figure 3). Apply *removable* thread locker to the two studs supplied. Screw the studs into the underside of the sensor unit (part A).
2. Using the gasket (part B) as a template, position it at the selected mounting location *upside down* with the arrow facing forward and parallel to the centerline of the vehicle/boat. Mark the position of the two mounting holes and the center hole for the cable.
3. Using a 3mm or 1/8" bit, drill the pilot holes. Using a 6mm or 1/4" bit, drill the two mounting holes for the studs. Drill the cable hole with a 38mm or 1-1/2" hole saw.  
**Fiberglass**—Minimize surface cracking by running the drill in reverse until the gelcoat is penetrated.
4. Pass the *sensor* connector-end of the cable through the center of the gasket and through the center mounting hole in the boat/vehicle.
5. Plug the cable firmly into the sensor unit.
6. Orient the gasket with the arrow facing in the same direction as the alignment tab on the sensor unit. Push the gasket onto the studs and slide it over the connector.
- NOTE:** *The gasket fits one way only. A groove in the gasket fits over the alignment tab on the connector.*
7. With the sensor's alignment tab pointing forward and parallel to the centerline of the boat/vehicle, push the studs through the mounting surface. *Check to be sure the gasket is tucked under the lip of the unit.* From underneath the mounting surface, slide a flat washer and lock washer onto each stud. Fasten them with the thumb nuts. **Hand tighten** only. Do not over tighten.

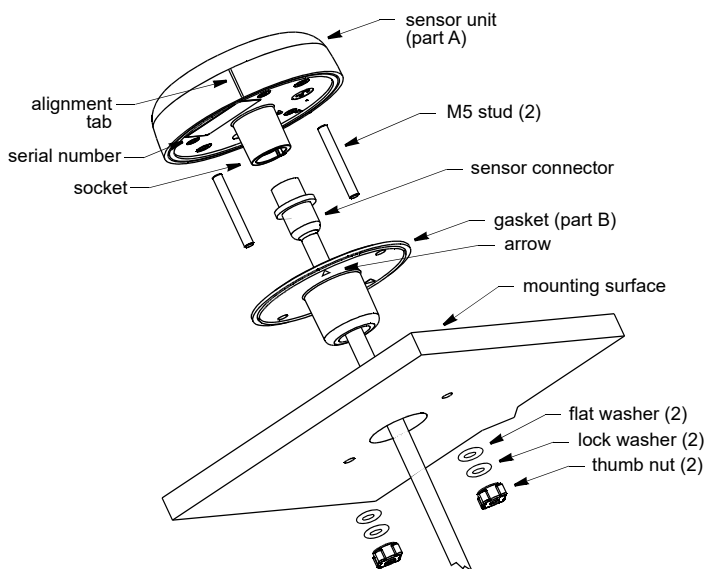


Figure 3. Flush mount

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## **Cable Routing & Connecting**

Depending on the equipment you will be using, route the sensor cable to an Airmar Data Converter, Combiner, an NMEA 0183 display, an NMEA 2000 network, a laptop, or other device. After reading the cautions below, go to the appropriate instructions.

**CAUTION:** Do not remove the waterproof connector(s) to ease cable routing. Buy a cable without a connector. Instructions for wiring are supplied.

**CAUTION:** To reduce electrical interference from other electrical wiring and any on-board equipment with a strong magnetic field such as radar equipment, radio transmitters, engines, generators, etc., separate the cables by at least 1m (3'). Ensure that all the cables shields are appropriately grounded.

**CAUTION:** Be careful not to tear the cable jackets when passing them through compartments, bulkheads, or walls. Use grommets to prevent chaffing.

**CAUTION:** Use a multimeter to check the polarity and the connections to the power supply before applying power to the sensor.

**CAUTION:** Coil any excess cable(s) and secure with cable ties to prevent damage.

### ***Connecting to a Data Converter, Combiner, or Splitter***

Follow the installation instructions that are supplied with the unit.

### ***Connecting to an NMEA 0183 Display***

Route the sensor cable to the display. *Do not fasten the cable in place at this time.*

#### **Connector on Display End**

If your sensor cable has a connector on the display end, and it can be plugged into the port on your NMEA 0183 display; do so now. Coil any excess cable and secure it with cable ties to prevent damage. Fasten the cable in place.

### No Connector on Display End: Wiring

If your sensor cable does not have a connector on the display end, it must be hard wired. Referring to the owner's manual that came with your display, connect the colored wires as shown in Figure 4.

**CAUTION:** Your sensor has either an RS-422 or RS-232 standard. You must follow the wiring diagram in Figure 4 that matches your sensor. If it is wired for the wrong standard, it will not transmit and receive data properly.

**NOTE:** If your display does not have NMEA 0183 output connections, the yellow and orange wires are not needed. Apply heat-shrink tubing to each unused wire. (Alternatively, the yellow and orange wires can be connected to an external sensor.)

**NOTE:** The display power may be wired directly to the sensor cable, or it may be wired separately.

1. Allowing an extra 25 cm (10") for wiring ease, cut the cable to length.
2. Strip 60 mm (2-1/2") of the outer jacket and foil shielding from the cut end of the cable (Figure 4).
3. Strip 10 mm (3/8") of conductor insulation from the end of each colored wire.
4. Protect the cable's foil shielding from causing a short by using heat-shrink tubing around the jacket where the wires emerge from the cable. The tubing must overlap the wires a minimum of 6 mm (1/4"). Shrink the tubing using a heat gun.
5. Being sure the power supply is OFF, connect the wires to the display.
6. Fasten the cable in place.
7. Your installation is complete. To begin receiving data, refer to the owner's manual that came with your display.

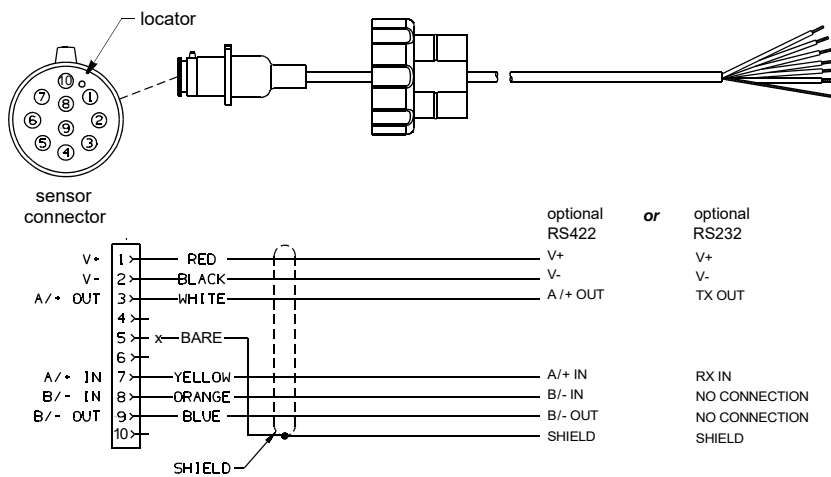


Figure 4. NMEA 0183 sensor cable  
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## Connecting to an NMEA 2000® Network

**CAUTION:** Only two termination resistors are required on an NMEA 2000 network. More than two will degrade the bus performance.

Route the sensor cable to the NMEA 2000 network. Plug the NMEA 2000 connector into the network node (Figure 5). Coil any excess cable and secure with cable ties to prevent damage.

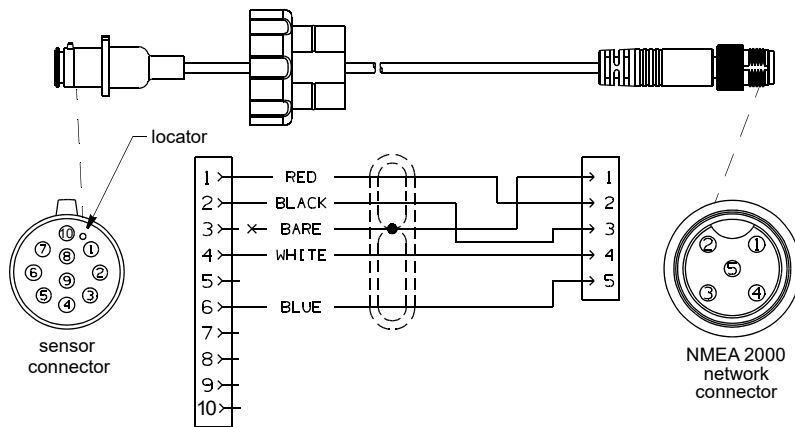


Figure 5. NMEA 2000 sensor cable [6m (20') shown]

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**NOTE:** Sensor cables longer than 6m (20') have a termination resistor built into the sensor connector (Figure 6).

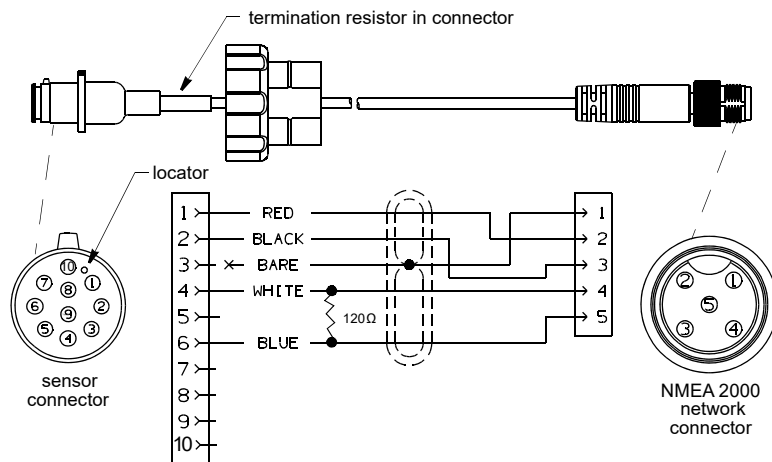


Figure 6. NMEA 2000 sensor cable [10m (33') shown]

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## Calibrating the Compass

**WARNING:** The internal compass may need to be calibrated after the sensor is installed for maximum accuracy. Perform the pretest below to determine if calibration is necessary.

**CAUTION: Boat**—The Pretest and AutoCalibration Procedure must be done in calm seas in a 0.8 km (0.5 mile) open area away from other boats and ferrous objects such as structures and aids to navigation. Avoid congested areas and waters with strong currents as calibration will be difficult and possibly hazardous.

### *Pretest*

Go to an appropriate site.

- **Vehicle**—Drive to an open parking lot or field, away from other vehicles and ferrous objects.
- **Boat**—In calm seas, navigate to an open area of water, 0.8 km (0.5 mile) of open space away from other boats and ferrous objects.

While making a full circle, compare the heading data to another compass. Check all headings. If the data agrees, there is no magnetic influence on the sensor. The compass does NOT need to be calibrated.

*If the data does not agree, continue with the calibration instructions below.*

### *How to Calibrate*

Calibration can be done in one of two ways.

- Calibrate the compass using the WeatherCaster™ software and a PC.
- Follow the AutoCalibration Procedure below.

### *AutoCalibration Procedure*

**IMPORTANT:** Calibration requires the vehicle/boat to complete 2 to 3 circles.

**IMPORTANT:** In the event of a calibration failure, repeat the procedure.

1. At the site where the pretest was performed, select the display page on the NMEA Instrument that shows Heading.
2. Shut OFF and then turn ON the DC power that is connected to the sensor.
3. Within 2 minutes of cycling power to the sensor, start the vehicle/boat in a slow [4.5 to 7 MPH (4 to 6 knots)] circular turn that takes about 2 to 3 minutes to complete.\*

If the vehicle/boat completes 1.5 circles within 3 to 4.5 minutes, AutoCalibration will begin. Heading will stop being reported on any NMEA 0183 or NMEA 2000 display until the calibration is finished.

4. Keep turning in the same circle for 1 to 2 more complete circles.  
*Do not change the speed or rate of turn through the circle.*
5. When calibration is completed successfully, Heading will return to the display. If calibration fails, the display will flash Heading ON and OFF in 10 second intervals for 60 seconds. (Display times may vary by manufacturer.)

\* The optimum rate of turn is 180°/minute: 3°/second, 30°/10 seconds, 45°/15 seconds, and 90°/30 seconds.

## Maintenance

**CAUTION:** Do not disassemble the sensor. Removing the screws from the sensor unit (part A) will damage the waterproof seal, thus voiding the warranty.

**CAUTION:** Do not immerse in water or pressure wash. Doing so may allow water to infiltrate the sensor, voiding the warranty.

Since the sensor has no moving parts, it requires minimal maintenance. Clean with a soft damp cloth and mild household detergent.

## Troubleshooting

- Is there power to the sensor?
- Are all the connections tight?
- Is the cable-run free of kinks or damage?
- Is there interference from other antennas or instruments?
- Is there damage to the sensor?
- Is there ice on the sensor?

### *No GPS Fix*

- Does the sensor have a clear view of the sky?

### *Inaccurate Compass Readings*

- Is the sensor installed facing forward and parallel to the centerline of the boat/vehicle?
- Is the compass calibrated?
- Is the sensor mounted near the boat/vehicle's center of gravity?
- Is there interference from ferrous metals, electronic equipment, electric motors, batteries, or cables that are creating a magnetic field?

## Firmware Revisions

Airmar may release updated versions of the sensor's firmware. Periodically, check Airmar's website at [www.airmar.com](http://www.airmar.com) to down-load the latest revision, or contact Technical Support for a CD.

## NMEA 2000: Load Equivalency Number

LEN is the amount of current a device draws from an NMEA 2000 network.  
(1 LEN = 50 mA)

LEN.....2

## Where to Purchase Parts

### Gemeco

### USA

Tel: 803-693-0777

email: [sales@gemeco.com](mailto:sales@gemeco.com)

### Airmar EMEA

### Europe, Middle East, Africa

Tel: +33.(0)2.23.52.06.48

email: [sales@airmar-emea.com](mailto:sales@airmar-emea.com)

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