

## Frequently Asked Questions (FAQs) Casella Wind Anemometers and Windvanes

**Casella Wind Speed  
And  
Direction sensors**



### **OPERATION**

- What is principle of operation of the sensors?
- What are the main benefits of using GMR in the new direction sensor?
- What standards do the sensors meet?

### **CONFIGURATION**

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- What are transmission path lengths of the sensors?
- Can I connect the sensors directly to a PC?
- Where do I site the sensors?

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## OPERATION

### What is principle of operation of the sensors?

#### Wind Speed sensor:

This sensor works on the principle of an optical encoder, where a light source is interrupted and pulses converted into voltage 0-5v pulse trains. The frequency of these voltage pulses is proportional to wind speed.

#### Wind Direction sensor:

The new sensor uses a solid state Giant Magneto Resistor (GMR) sensor. These magnetic sensors were developed for many contact-less positioning applications. The main spindle of the sensor has a small round magnet at its base, which is positioned above the solid-state detector. Because the detector measures only the direction of an applied field irrespective of strength, a large gap can be left between detector and the magnet. This means that there is no contact between the two, which gives the main benefit of minimizing zero wear.

### What are the main benefits of using GMR in the new direction sensor?

- **Size-** new GMR sensor chip is extremely small and the associated electronic printed circuit board (PCB) enables Casella to manufacture a much smaller housing and sensor. (see figure 1)
- **Zero dead band-** traditional potentiometers (see figure 2) had a physical gap at North direction which gives rise to an electrical dead band on the output signal and could only cover 0-355 degrees direction. The Casella GMR has no dead band so gives continuous output and 0-360 degrees

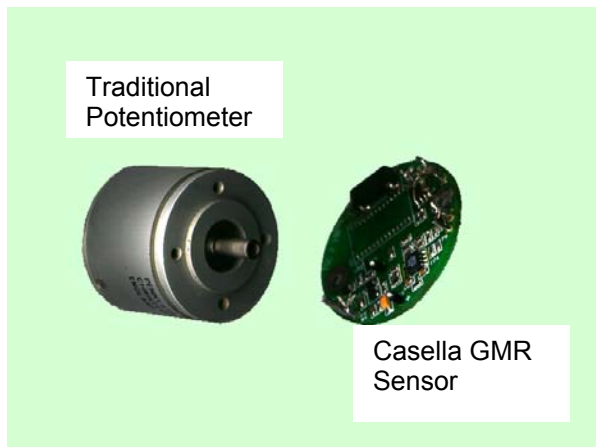


Figure 1

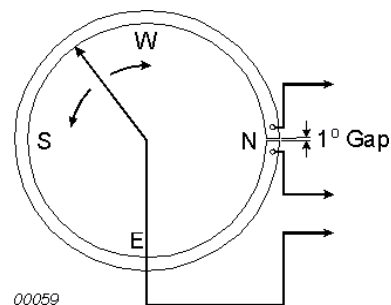


Figure 2

- **Frictionless sensing-** traditional potentiometers had wire wound assemblies with a wiper in the center, which actually makes contact with this wiring. This connection can be subject to wear with time. GMR uses a magnet over the detector and there is no contact between the two.
- **Low power consumption-** the sensor only require typically 3mA

- **Takes speed input for combined serial outputs**
- **Digital output**
- **Greater accuracy and resolution**

### **What standards do the sensors meet?**

The new Casella sensors meet or exceed the following national and international standards;

- EN50081-1 & EN50082-2 for Electromagnetic emission testing.
- WMO N272 / CIMO Meteorological Office specifications for sensor type.

## **CONFIGURATIONS**

### **Can the sensors be used with weather station / Nemesys?**

The new sensors can be installed on the AWS and Nemesys and we suggest fit the standard sensors without conduit to reduce price. A cross arm is required but conduit is only required for sensors at ground level. Please quote the versions with heaters for use in cold climates.

### **What are transmission path lengths of the sensors?**

The standard sensors give voltage and pulse outputs and these will limit the distance to logger/ unit to approximately 200m. If longer distances are required the sensors can be connected to the sensor interface module and then the following outputs can be generated:

- RS232- for transmission over 50m
- RS 458/422 for up to 12km
- 4-20mA can also be used for long transmission paths

### **Can I connect straight to a pc?**

Yes. By using the interfaces as described above the RS232 output can be input direct into a serial port on a laptop or PC and this can communicate with the Casella Online Pro software package for real-time data analysis and wind rose generation if required. The PC can also log this data to the hard disk for historical recording.

### **Where do I site the sensors?**

In order to obtain the best measurement of wind speed and direction, the anemometer and vane should be supported in such a way that neither the supporting poles or the other sensors will obstruct the airflow to the sensor. Casella can provide suitable cross-arms for these mountings. But sometimes compromises may have to be made.

The increase in wind speed with height above the ground and the increase in turbulence close to the ground have caused meteorologists to set a standard height of 30 ft (10m).

The most important question is where to locate the sensors? There are two most likely scenarios:

The measurements will be used by a meteorologist for historical or forecasting purposes or by industry for pollution or incident monitoring purposes.

For meteorological measurements:

Sensors are typically mounted at 30 ft (10 meters) height and the ideal terrain should be flat with no obstructions for 1000 ft (300 meters) around.

For a site with evenly distributed small obstructions the height should be 30 ft (10m +h).

For roof mounting, the sensors should be half the height of the building again, i.e. for a 36 ft (12 metre) building the roof mast should be 18 ft (6 meters) high = 54 ft (18 meters) total height.

For industrial/safety measurements:

The measurements should be made at the point of interest

If this is shrouded by trees, buildings etc it does not matter!

But site security is always an issue and this may also govern where the equipment is sited.

Other measurement requirements are also possible.

For aviation applications the wind is used for take-off and landing.

Measure close to these runway locations. The ICAO recommends 18 to 30 ft (6m-10m) at the runway threshold.

For emission monitoring.

The mounting point will have to be down wind of the source.

General considerations.

Wind varies in all locations so may have to consider multi point installations to completely map a whole site.

There will always be some compromise in measurement locations. Bear in mind cable lengths, power supplies, ease of access for maintenance, and suitability of ground for a mast.

**Other Information**

**Useful Windspeed - Related Information**

| <b>WIND SPEED CONVERSION FACTORS</b> |   |              |
|--------------------------------------|---|--------------|
| 1 m/s                                | = | 2.237 mph    |
| 1 m/s                                | = | 1.9426 knots |
| 1 m/s                                | = | 3.6 km/hr    |
| 1 knot                               | = | 0.515 m/s    |
| 1 knot                               | = | 1.152 mph    |
| 1 knot                               | = | 1.85 km/hr   |
| 1 mph                                | = | 0.447 m/s    |
| 1 mph                                | = | 0.868 knots  |
| 1 mph                                | = | 1.61 km/hr   |

| <b>Beaufort Wind Scale</b> |          |             |
|----------------------------|----------|-------------|
| Calm                       | Force 0  | < 1 knot    |
| Light Air                  | Force 1  | 1-3 knots   |
| Light breeze               | Force 2  | 4-6 knots   |
| Gentle breeze              | Force 3  | 7-10 knots  |
| Moderate breeze            | Force 4  | 11-16 knots |
| Fresh Breeze               | Force 5  | 17-21 knots |
| Strong breeze              | Force 6  | 22-27 knots |
| Near gale                  | Force 7  | 28-33 knots |
| Gale                       | Force 8  | 34-40 knots |
| Strong gale                | Force 9  | 41-47 knots |
| Storm                      | Force 10 | 48-55 knots |
| Violent storm              | Force 11 | 56-63 knots |
| Hurricane                  | Force 12 | > 64 knots  |