



AirData Vector Analysis Firmware (AD40)

- Track true wind movement
- Calculate Sigma Theta
- Satisfy EPA requirements
- Model dispersion with accurate data
- Identify the source of odour or dust issues

Summary

Recording a constant wind speed and direction can be done accurately by almost any data logging system. However, accurate recording while the wind is varying in speed or direction, or both, within the reporting period of the system, is far more difficult. It can also be vital, in cases of airborne pollution.

As an example, using the standard scalar values, half a minute of wind from the East and half a minute from the North would be reported as a wind direction of North-East.

However, if the Easterly wind blows at a speed of 10 knots, the effect of Northerly gusts at 30 knots would be to blow airborne particles more North than East.

Envirodata's AirData firmware resolves the difficulty of accurate measurement by vector analysis, or calculating the net effect of wind speed and direction.

The AirData firmware also records peak wind gust and in conjunction with the ST30 Sigma Theta firmware, can also determine particle dispersion.

Vector Analysis

The location of an air particle [or pollutant] can be accurately and reliably traced, because the system continuously monitors wind speed and direction and analyses them in a vector form.



The Images above show two examples of Envirodata Weather Maestro weather stations with AD40 AirData firmware and ST30 Sigma Theta firmware loaded to simplify environmental reporting required at these mine sites. Both systems use our IS37 mast to meet Australian standards

In detail, the AirData software:

1. Continuously averages wind speed each second.
2. Continuously averages wind direction each second and detects and corrects for a transition through the NORTH point during the second.
3. Calculates NORTH/SOUTH component.
4. Calculates EAST/WEST component.

(see Figure 1)

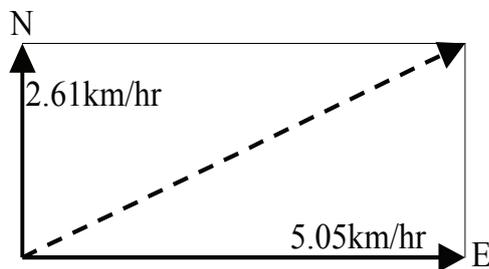


Figure 1 – N/S and E/W Components

The AirData firmware reports the net air movement values as:

- EAST/WEST component
- NORTH/SOUTH component
- Vector angle
- Vector magnitude

In all of the above, the wind movement is normally treated as a wind speed, but can be treated as a wind run.

For example, if the period of time for the scenario illustrated in Figure 1 and 2 was one hour, then the particles would have actually travelled 5.68 kilometres at an angle of 63°.

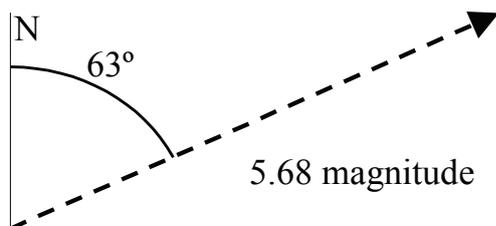


Figure 2 – Vector Angle and Wind Speed (or Wind Run)

Dispersion of Particles

Once the net movement of the centre of the airborne particles has been determined, the spread of the particles might be required.

This is normally calculated from Sigma Theta, the standard deviation of the wind direction.

The Sigma Theta calculation has been developed by Maritimo, Williams et al. It uses the sum of sines and sum of cosines collected over the period.

The Envirodata Weather Maestro series data loggers can provide this Sigma Theta calculation as a standard firmware output (option ST30)

Wind Gust

The AirData software can measure the highest wind gust for any given period.

The “gust” can be averaged over from 1 to 20 seconds as required for any whole number which divides into 60 exactly.

Naturally, increased resolution in proportion is available for the longer periods.

A 3 second period - the default period - has, typically, a 1 kilometre per hour resolution.

In detail, the AirData software:

- Continuously averages wind speed over each second
- Accumulates speed over the wind gust period
- Retains the highest wind gust selected from all the wind gust periods during each minute, and reports the highest value as the “peak wind gust” for that minute
- Selects the highest current value over the customer’s specified reporting period.

A default set of reporting periods would be 10 minute summaries, hourly summaries and daily summaries, concurrently.