



AGIMET UWS
Ultrasonic Surface Wind System
Technical Description



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Introduction

The availability of accurate and up-to-date surface wind information is critical to ensure safe airport operations. The International Civil Aviation Organisation (ICAO) recommends:

“Representative surface wind observations should be obtained by the use of sensors appropriately sited. Sensors for surface wind observations for local routine and special reports should be sited to give the best practicable indication of conditions along the runway and touchdown zones.”

Changes in surface wind can trigger requirements for the issuance of SPECI and local special reports and are also a major factor in selecting the runway in use.

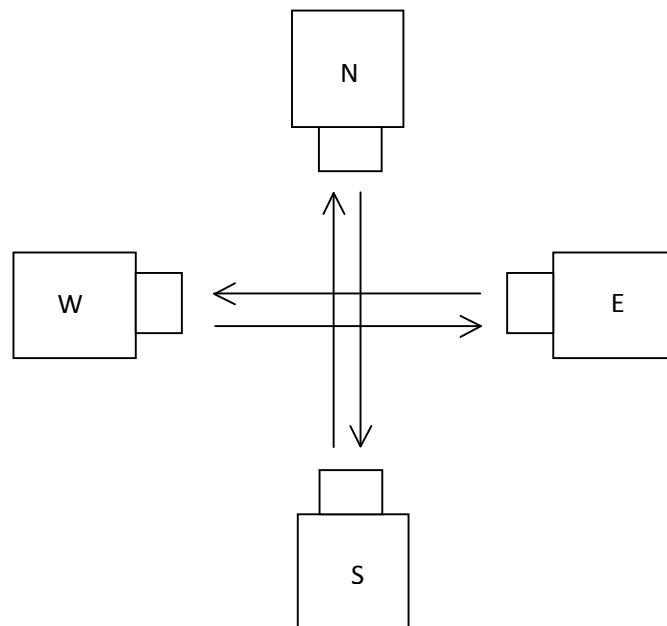
The AGI Ultrasonic Wind System is the third generation airport wind measurement system designed and built by AGI. Being fully solid-state (i.e. it has no moving parts), the system provides reliable, accurate and virtually maintenance-free surface wind data. It complies with all relevant ICAO and World Meteorological Organisation (WMO) standards and regulations and is suitable for any airport up to and including CAT III. The system includes full engineering diagnostics and control, and features extremely robust self-test and monitoring functions.

Systems can be supplied fully installed with comprehensive engineering and operator training, and post-installation support is available worldwide.

Principle of Operation

Although originally developed in the 1970s, ultrasonic anemometers have only relatively recently achieved a sufficient stage of technical maturity to be considered for use in airport meteorological applications. Many countries do now allow their use as direct replacements for cup and vane anemometers, for example in the UK under CAA ATSIN 145.

An ultrasonic anemometer measures the time taken for an ultrasonic pulse of sound to travel between transducers. It has four transducers, one at each major compass point, which operate in pairs.



Simplified Ultrasonic Anemometer



The time taken for a pulse to travel from the North transducer to the South transducer is measured, and compared with the time for a pulse to travel back the other way, from South to North. Likewise times are compared between West and East, and East and West transducers.

If, for example, a North wind is blowing, then the time taken for the pulse to travel from N to S will be faster than from S to N, whereas the W to E and E to W times will be the same. The wind speed and direction can then be calculated from the differences in the times of flight on each axis. This calculation is independent of factors such as temperature.

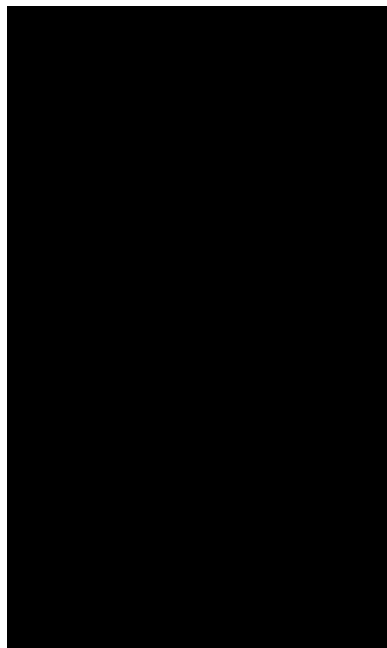
In order to supply all the surface wind information required, the system calculates magnetically compensated true wind measurements as follows:

- 2 and 10 minute mean wind direction
- 2 and 10 minute mean wind speed
- 10 minute maximum gust wind speed
- 10 minute minimum lull wind speed
- 10 minute wind direction variation
- Instantaneous wind speed (3 second filter)
- Instantaneous wind direction (3 second filter)

AGIMET UWS is also capable of recognising what is called a 'marked discontinuity' in surface wind. This is defined by the WMO as:

"...an abrupt and sustained change in wind direction of 30° or more, with a wind speed of 20km/h (10kt) before or after the change, or a change in wind speed of 20km/h (10kt) or more, lasting at least 2 minutes."

If a marked continuity is detected the system automatically uses only surface wind values occurring after the discontinuity occurred for calculating 10 minute data.



Ultrasonic Anemometer

Field Site Equipment

The number of field sites depends on the requirements and layout of each particular airfield. Usually either two or three field sites are used. Each field site is installed onto a solid concrete base, and is provide with power and communications services.

AGI recommends the use of the Wind Observer II ultrasonic anemometer, manufactured by Gill Instruments and proven in the most hostile environments, including naval use. These sensors are constructed from stainless steel and are fitted with heaters which prevent icing. They are much more reliable than the older cup and vane types, and require no calibration or maintenance. They operate self-test routines and output alarm codes if faults or possible causes of future faults are detected.

Each sensor is fitted to the top of a 10m composite frangible mast along with a red LED obstruction light. The mast hinges for ease of maintenance.

At the base of the mast, a Field Site Electronics Unit (FSEU) is fitted. This is a stainless steel weatherproof housing that contains all of the electronics and services necessary for the field site. The FSEU includes a heater to ensure operation even during extreme ambient conditions. A modem for communication with rack equipment is also fitted.



AGIMET UWS Mast Base and FSEU

Rack Equipment

Surface wind data from each field site is reported four times a second to other system equipment, usually positioned in the ATC tower. The necessary data links can be wired, fibre optic or wireless. Field site data is fed to the Aviation Wind Processor (AWP), which is a 3U module designed to fit a standard 19" rack. Also provided is a modem panel, similarly rack-mounted, which contains the modems that receive field site data.

The AWP is a real-time packet routing system designed to receive, validate, process, queue and output data packets for dedicated surface wind displays. It can also produce data and alarm outputs suitable for integration to AWOS or other Met and ATC systems. A watchdog feature operates continuously, to reset the system in case of a fault.

The AWP front panel is fitted with LEDs to give a visual indication of system status.



AWP Front Panel

The AWP is capable of interfacing with up to four field sites.
The system can be configured to output wind speed in either knots or m/s.

Surface Wind Displays

Multiple surface wind displays can be driven by the AWP. These are typically 6.5" panel mounted TFT touch screens, which include self-test and data validation routines. The surface wind display enables users to scroll through a number of different screens (each clearly laid out and simple to read), depending on the specific wind data desired.



Surface Wind Display Screens



The display modules can output surface wind information onto a LAN for archiving and can also show METAR information.

Standards

AGIVIS 2000 complies with all relevant international standards, including:

- ICAO Annex 3 (Meteorological Service for International Air Navigation)
- ICAO Manual on Automatic Meteorological Observing Systems at Aerodromes (Doc 9837)
- ICAO Manual of Aeronautical Meteorological Practice (Doc 8896)
- WMO CIMO Guide

The system also complies with a number of national standards issued locally by countries worldwide, including:

- UK CAA CAP 746 (Meteorological Observations at Aerodromes)
- UK CAA CAP 670 (Air Traffic Services Safety Requirements)

Installation and Support

AGI offers a full installation service, which includes comprehensive site acceptance testing to demonstrate full functionality of the system. Factory-based and on-site training is available for both engineers and system users, and post-installation support can be provided worldwide. We can also offer a spares package tailored to the needs of each system.

All AGIMET UWS systems are covered by a full 2 year warranty.

Specifications

AGIMET UWS System	
Measurement Range	0 to 75 m/s
Accuracy: Up to 5 m/s	±0.5 m/s
Accuracy: Over 5 m/s	±10%
Resolution: Speed	0.01 m/s
Accuracy: Direction	±5°
Resolution: Direction	1°
EMC: Emissions	EN 61000-6-3
EMC: Immunity	EN 61000-6-2
Dead Band Wind Direction	None



Field Sites	
Operating Temperature	-40°C to +50°C
Relative Humidity	100%
Power Requirements	230V \pm 10%, 44Hz to 60Hz
Environmental Protection	IP65

Rack Equipment	
Operating Temperature	0°C to +50°C
Relative Humidity	80% non-condensing
Power Requirements	230V \pm 10%, 44Hz to 60Hz

Anemometer Mast	
Height	10m
Frangibility Standard	ICAO Annex 14
Maximum Wind Speed: No Ice	45 m/s
Maximum Wind Speed: 12.5mm Ice	33 m/s
Operating Temperature	-40°C to +50°C
Service Life	12 Years

Surface Wind Displays	
Operating Temperature	-10°C to +40°C
Relative Humidity	95% non-condensing
Power Requirements	12V DC (an in-line 90V to 264V, 50Hz to 60Hz AC PSU can be supplied)
Resolution	640 x 480
Brightness	800 cd/m ²
Contrast Ratio	600:1
EMC: Emissions	EN 55022 and EN 61000
EMC: Immunity	IEC 61000

AGI is dedicated to the continuous improvement of its products. If specific requirements exist that are not covered by this Technical Description, we are always happy to discuss developments that would allow them to be fulfilled.