Rugged wind sensors for use in defense

FT TECHNOLOGIES

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THE WORLD'S TOUGHEST WIND SENSORS

www.fttechnologies.com

Is accurate wind speed measurement crucial to your operations?

If wind speed and direction information out in the field is important to you, then you need a rugged wind sensor that can deliver reliable readings even in the harshest of environments.

From the Sahara to the South Pole, FT wind sensors are used on armoured vehicles, in CBRN detection equipment and in ballistic meteorology systems. Tough but lightweight, they are even used on board sUAS and at UAV ground launch and recovery stations.

Battlefield Meteorology

THALES

Thales integrates an FT wind sensor into their METSMAN High Accuracy Meteorological System.

CBRN Detection Equipment

LOCKHEED MARTIN

Lockheed Martin integrates an FT sensor into their Chemical, Biological, Radiological Early Warning Systems.

Hostile Artillery Locating System

LEONARDO

HALO (Hostile Artillery Locating System) is an acoustic weapon locating system produced by Leonardo, integrating an FT wind sensor.

Fire Monitoring by Drone

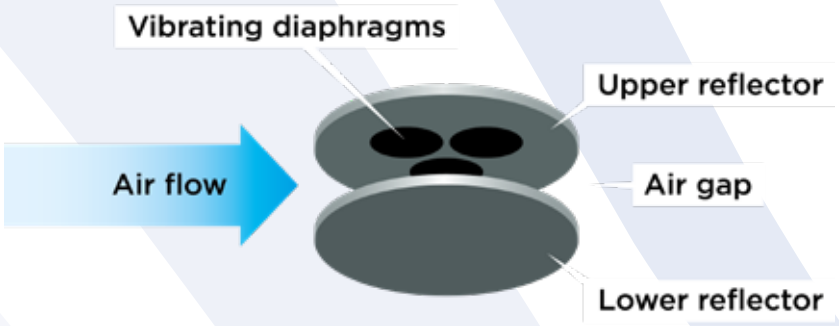
Agencia de Medio Ambiente y Agua
CONSEJERÍA DE MEDIO AMBIENTE

Monitoring the progress of forest fires at night using a drone equipped with an FT205 sensor.

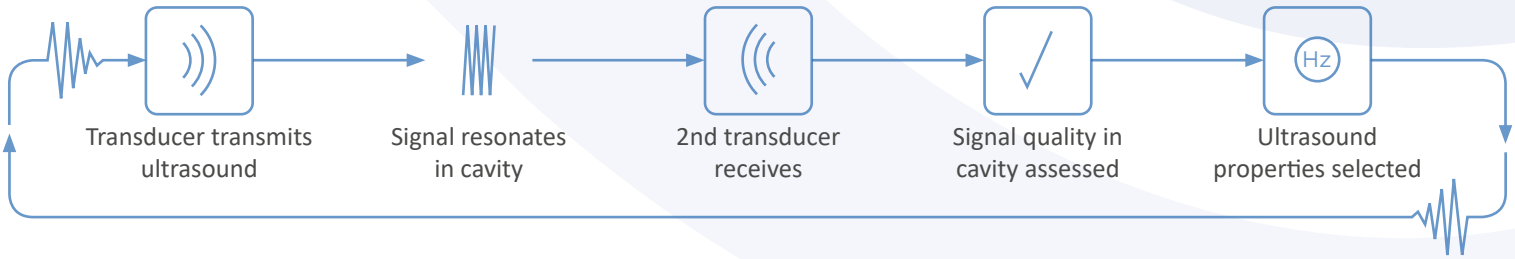
What makes Acu-Res® Technology ideal for defense sensors?

FT Technologies has developed, manufactured and delivered combat-rugged ultrasonic wind sensors for defense and military use for over 20 years. We offer a range of ultrasonic sensors for airflow measurement in extreme environments where reliability, robustness and high performance are crucial.

FT sensors are unique in the marketplace in that we use acoustic resonance to measure wind speed, direction and acoustic air temperature. Acu-Res® Technology provides a superior signal/noise ratio, which enables high levels of data availability and accuracy in acoustically and vibrationally noisy environments. FT sensors are designed to withstand shock and vibration and have passed all our HALT tests at 60G. In addition, FT sensors are designed to be immune to Radio Frequency Interference, and to have low enough emissions that they will not affect any neighbouring sensors - on a vehicle or drone, for instance.



The sensor works by creating a resonating ultrasonic signal inside the sensor's measurement cavity. The motion of air is sensed by measuring the phase change in the ultrasonic signal caused by the wind as it passes through the cavity. The sensor has three transducers arranged in an equilateral triangle. The net phase difference between a transmitting and receiving transducer pair is indicative of the airflow along the axis of the pair. Therefore by measuring all three pairs the component vectors of the airflow along the sides of the triangle are determined. These vectors are combined to give the overall speed and direction. The sensor uses complex signal processing and data analysis taking a sequence of multiple measurements to calculate regular wind readings. The sensor inherently compensates for changes in the air's temperature, pressure or humidity. A strong resonating sound wave in a small space provides a large signal that is easy to measure. Acu-Res® has a signal to noise ratio more than 40db stronger than other ultrasonic technologies.



Built for use in extreme conditions

FT sensors are combat-proven to withstand severe shocks, function in extreme temperatures and to be completely waterproof. We build them according to MIL-STD-810 and put them through an extensive burn-in program before they leave our facilities to guarantee each unit can take everything that's thrown at it.

WIND SPEED, DIRECTION & TEMPERATURE

Unique acoustic resonance technology delivers a strong signal and reliable data even in the toughest of climates and weather conditions.

RUGGED AND SHOCK-RESISTANT

Extremely small, with no moving parts to degrade or damage, FT sensors are developed to resist drop, shock and vibration. During development they are tested to 60G.

HEATED FOR COLD CLIMATES

The aluminium body ensures that heat is evenly distributed for effecive ice prevention. A thermostatically controlled heating system allows the sensor to maintain its temperature at a user specified heater set point between 0° and 50°C.

MOBILE, COMPACT, LIGHTWEIGHT

Lightweight, with low-power usage, it is ideally suited for portable or temporary deloyments where it may be roughly handled.

MAINTENANCE-FREE

The aluminium hard anodised body is highly resistant to corrosion, sand, dust and electromagnetic interference. Requires no maintenance or re-calibration.

LIGHTWEIGHT SENSOR FOR DRONES

Our lightweight FT205 sensor weighs only 100g and is ideal for use on UAV and as a replacement for a pitot-based system on a fixed wing or multi-rotor UAV.

Case Study

CBRN Detection Equipment

We supply our FT surface mount sensors to Lockheed Martin and they integrate them into their MetroGuard family of chemical, biological and radiological detection information, along with wind speed and direction, and location data.

LOCKHEED MARTIN

Project

Comprised of remote units, and a base station, these systems determine if the characteristics of a biological aerosol cloud are present. The CBREWS base station monitors the status of the units and can command a remote unit to collect samples for forensic analysis. Using the power of sensor networking, the potential for a false alarm is significantly reduced.

Lockheed Martin chose to use FT sensors in their remote unit, due to the small size and light weight of our sensors, thus allowing rapid setup and breakdown of the monitoring units for incident-based application. For use at fixed sites, the high reliability and longevity of our sensors means that the wind speed and direction data supplied is delivered consistently, despite any harsh weather conditions.

Tested to the extreme

FT Technologies' wind sensors have passed over 30 independent tests including ice, corrosion, sand, dust, hail, vibration, drop, and lightning protection. During testing FT sensors are exposed to one month of Amazon rainfall in one hour, repeatedly dropped onto concrete, cycled from the Antarctic to Saharan heat, submerged in water, subjected to 8000 volts and exposed to corrosive salt spray.

Battlefield Meteorology

FT supplies wind sensors to Thales for integration into their METSMAN High Accuracy Meteorological System.

THALES

Background

Thales Land & Joint Division wanted to design meteorological sensors and systems to meet the requirements of real time ground-level meteorological information for NBC Hazard Prediction Systems.

The provision of accurate meteorological information is an essential element in the process of determining the plume direction, width and the threat from chemical and biological agents. The ability to implement vital protective measures can only be achieved when accurate and immediate meteorological information is provided to the hazard prediction and reporting software.

Thales approached FT and asked us to if we could provide a sensor that would measure wind speed reliably even under the most severe climatic and environmental conditions. They also wanted a sensor that they could integrate into their own equipment.

Results

The surface mount wind sensor was found to be the ideal solution. The METSMAN now meets the stringent requirements of military operations giving Mean Time Between Failures of up to 29,000 hours depending on the selected configuration. Other than cursory visual checks of the sensor by the user there are no maintenance tasks at 'first line' during normal operation.

METSMAN fitted to a Type 10 tank

Thanks to the surface mount wind sensor the METSMAN is able to measure wind speed and direction whilst on the move, has no moving parts, an extremely low thermal signature and is ideal for all applications requiring meteorological information. equipment.

Product used

The FT742-SM is tested to DEF STAN 00-35. With an integrated electronic compass, it has a solid state build and is sealed to IP66/67.

Case Study

Hostile Artillery Locating System

HALO, in service with the British Army since 2002, is an acoustic weapon locating system originally developed by BAE Systems, and now supplied to Leonardo.

LEONARDO

Project

The Halomet uses a distributed array of up to twelve sensor posts to detect the pressure wave that is generated when artillery weapons fire or shells explode. Sensor posts are usually deployed some two to four km apart.

Data on the detected passing pressure wave together with the prevailing meteorological conditions at the Sensor Post are relayed back to a Command Post. Here, data associated with the same event that has been detected at the other Sensor Posts is used to compute the location of the source of the sound.

HALO uses the meteorological data to generate a large-area model of the effects of the weather on the propagation of the sound which, together with a digital terrain database, is used to compute the future flight path of the sound. By this means HALO is able to accurately calculate locations.

HALO incorporates a specially designed surface mount sensor. As HALO is used in desert, mountainous and arctic environments they needed a wind speed and direction sensor that would work in all of these environments.

Product used

Halomet is a fully customized product provided by FT Technologies exclusively to Leonardo.

Case Study

Forest Fire Monitoring: Spain

When trying to predict the progress of a forest fire, one of the most important pieces of information to consider is the intensity and direction of the wind. Armed with this knowledge, it is possible to take preemptive action, such as controlled burning in specific areas to prevent the fire from advancing.

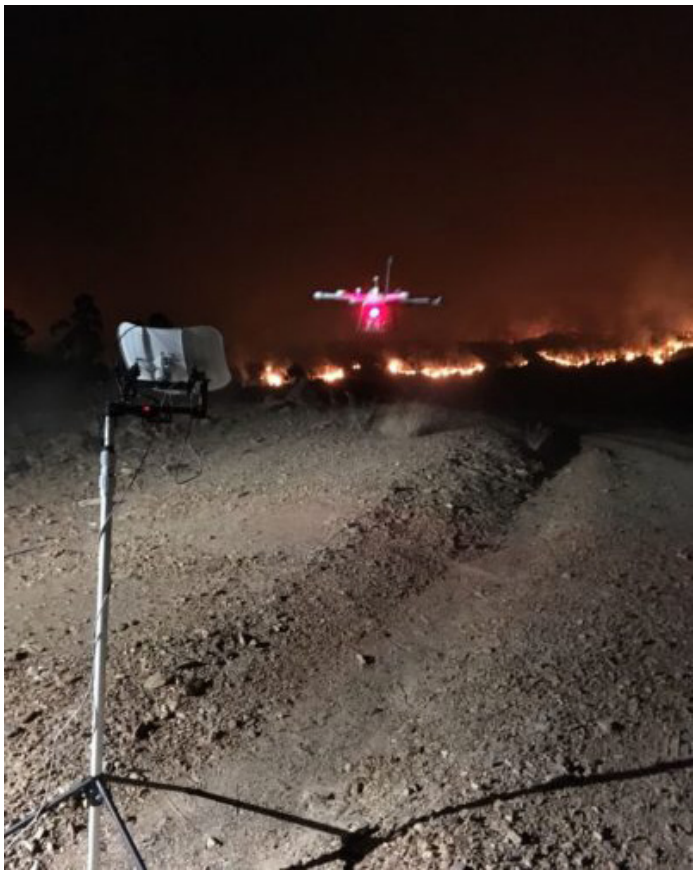
In Andalusia, Spain, forest fires are a regular occurrence during the summer months. Until recently, the only way to predict the wind was by gathering data from low altitude weather stations. Although producing reasonably accurate data, the stations were often located several kilometres from the fire front, usually within the same incident command centres controlling the emergency services.

Background

By day, planes are able to fly above the fire and report its progress. However, at nightfall, all piloted aircraft must stop their operations for safety reasons. The lack of wind data during the night could often have disastrous consequences.

Agencia de Medio Ambiente y Agua
CONSEJERÍA DE MEDIO AMBIENTE

During the summer of 2018, AMAYA and INFOCA (the authority dedicated to the prevention and extinction of forest fires in Andalusia) jointly funded a project to test a new drone specifically designed to fly at night in order to monitor wind speed and direction directly at the fire front. Developed by Dronetools SL, the drone was equipped with an FT205 wind sensor.



Before testing the sensor on real fires, field tests were carried out 15 metres above the ground in order to compare the results with a weather station and confirm that the sensor's data was correct.

Conclusion

Throughout the summer, the drone equipped with the FT205 wind sensor was tested in four real forest fire situations. The data produced from the sensor proved critically important to the emergency services as they were able to monitor the spread of the blaze during the night. Measurements were taken at different altitudes to confirm the wind direction.

The valuable data collected by the drone and its sensor was used to complement the existing system of ground weather stations used by the emergency services.

"In the final analysis, the sensor worked accurately in real fire situations. The drone, equipped with the FT205 sensor, was an indispensable tool for predicting the advance of the fire at night."

Javier Prada Delgado
Integration Engineer
Dronetools SL

FT742-SM

Surface mount wind sensor

FT TECHNOLOGIES

The FT742 Surface Mount wind sensor is designed for OEM integration. It has an electronic compass and a thermostatic heater. The sensor has been integrated into UAVs, drones, military vehicles, autonomous robots and handheld weather stations.

The sensor can be installed to ensure alignment with a standard reference, typically Magnetic North, or the integrated compass can calculate this automatically. Small, low power and extremely rugged, the FT742-SM is extensively tested and certified for vibration and shock resistance, and RF immunity.

WIND SPEED

0-75m/s

OPERATING RANGE

-40 to 85°C

HEIGHT

71.2mm

WEIGHT

252g

WIND SPEED

Range	0-75m/s, 0-270km/h, 0-145.8 knots
Resolution	0.1m/s, 0.1km/h, 0.1knots
Accuracy	±0.3m/s (0-16m/s) ±2% (16-40m/s) ±4% (40-75m/s)

WIND DIRECTION

Range	0 to 360°
Resolution	1°
Accuracy	4° RMS
Compass accuracy	5° RMS

ACOUSTIC TEMPERATURE

Resolution	0.1°C
Accuracy	±2°C
Under the following conditions:	
Speed Range	5m/s - 60m/s
Operating Range	-20°C to +60°C
Difference between air and sensor temperature	<10°C

PHYSICAL

Universal M12 8-pole circular I/O connector.

DIGITAL SENSOR

Interface	RS422 (full-duplex) RS485 (half-duplex)
Format encoding	ASCII

SENSOR PERFORMANCE

Measurement principle	Acoustic Resonance
Units of measure	m/s, km/h or knots
Data update rate	Up to 10Hz
Altitude	0-4000m
Humidity	0-100%
Ingress protection	IP66, IP67 (when correctly installed with supplied O-ring)
Heater settings	0° to 55°C

POWER REQUIREMENTS

Supply voltage	6V to 30V DC (24V DC nominal) Supports battery operation with reduced heater capacity.
Supply current heater off	25mA (29mA with compass enabled)
Supply current (heater on)	Up to 2A

POWER CONSUMPTION

With heater disabled - For battery use

Battery supply	Compass disabled	Compass enabled
24V	600mW	696mW
12V	300mW	348mW
9V	225mW	261mW
6V	150mW	174mW

FT742-DM

Direct mount wind sensor

FT TECHNOLOGIES

The FT742 Direct Mount fits directly onto a 33.7mm pipe and reads wind speeds up to 75m/s. This makes it ideal for a wide range of meteorological applications and for wind resource assessment.

Small yet very rugged, it is easy to heat even at low power. With no moving parts to degrade or damage and resistant to shock and vibration, it is easy to transport and will perform consistently, time and time again. The hard anodised aluminium body is highly resistant to corrosion, sand, dust, ice, solar radiation and bird attack. The sensor is sealed to IP66, IP67 and IPX6K standard.

WIND SPEED

0-75m/s

OPERATING RANGE

-40 to **85**°C

HEIGHT

161mm

WEIGHT

380g

WIND SPEED

Range	0-75m/s
Resolution	0.1m/s
Accuracy	±0.3m/s (0-16m/s) ±2% (16-40m/s) ±4% (40-75m/s)

WIND DIRECTION

Range	0 to 360°
Resolution	1°
Accuracy	4° RMS

ACOUSTIC TEMPERATURE

Resolution	0.1°C
Accuracy	±2°C
Under the following conditions:	
Speed Range	5m/s - 60m/s
Operating Range	-20°C to +60°C
Difference between air and sensor temperature	<10°C

POWER REQUIREMENTS

Supply voltage	12V to 30V DC (24V DC nominal). Supports 12V battery operation with reduced heater capacity
Supply current heater off	31mA
Supply current (heater on)	Limited to 4A (default) 6A (max)

DIGITAL SENSOR

Interface	RS485 (half-duplex)
Format encoding	ASCII

ANALOGUE SENSOR

Interface	4-20 mA, galvanically isolated

SENSOR PERFORMANCE

Measurement principle	Acoustic Resonance
Units of measure	m/s, km/h or knots
Data update rate	Up to 10Hz
Altitude	0-4000m
Humidity	0-100%
Ingress protection	IP66, IP67, IPX6K
Heater settings	0° to 55°C

PHYSICAL

I/O connector	5-way (RS485 option) 8-way (4-20mA option)

FT742-PM

Pipe mount wind sensor

FT TECHNOLOGIES

The FT742 Pipe Mount wind sensor is designed for installation on top of a pipe or post with an FT090 pipe mount adapter. The sensor cable is run inside the pipe giving added lightning and environmental protection. Factory alignment of the pipe mount adapter ensures that the sensor is automatically aligned without error.

Measuring wind speeds up to 75m/s it is suitable for use in the stormiest areas of the world.

WIND SPEED

0-75m/s

OPERATING RANGE

-40 to **85**°C

HEIGHT

161mm

WEIGHT

350g

WIND SPEED

Range	0-75m/s
Resolution	0.1m/s
Accuracy	±0.3m/s (0-16m/s) ±2% (16-40m/s) ±4% (40-75m/s)

WIND DIRECTION

Range	0 to 360°
Resolution	1°
Accuracy (within ±10° datum)	2° RMS
Accuracy (outside ±10° datum)	4° RMS

ACOUSTIC TEMPERATURE

Resolution	0.1°C
Accuracy	±2°C
Under the following conditions:	
Speed Range	5m/s - 60m/s
Operating Range	-20°C to +60°C
Difference between air and sensor temperature	<10°C

DIGITAL SENSOR

Interface	RS485 (half-duplex)
Format encoding	ASCII

ANALOGUE SENSOR

Interface	4-20 mA, galvanically isolated

POWER REQUIREMENTS

Supply voltage	12V to 30V DC (24V DC nominal). Supports 12V battery operation with reduced heater capacity
Supply current heater off	31mA
Supply current (heater on)	Limited to 4A (default) 6A (max)

DIGITAL SENSOR

Interface	RS485 (half-duplex)
Format encoding	ASCII

ANALOGUE SENSOR

Interface	4-20 mA, galvanically isolated

SENSOR PERFORMANCE

Measurement principle	Acoustic Resonance
Units of measure	m/s, km/h or knots
Data update rate	Up to 10Hz
Altitude	0-4000m
Humidity	0-100%
Ingress protection	IP66, IP67, IPX6K
Heater settings	0° to 55°C

FT205

Lightweight wind sensor for drones

FT TECHNOLOGIES

The FT205 lightweight, low power wind sensor has been specifically designed for use on UAV and SWaP-limited applications. An integrated electronic compass makes it ideal for use on a moving platform.

With low power requirements, and reading up to 75m/s, the FT205 Lightweight Wind Sensor is ideal for UAV flight control systems and environmental monitoring from drones.

WIND SPEED

0-75m/s

OPERATING RANGE

-20 to **70**°C

HEIGHT

55.1mm

WEIGHT

100g

WIND SPEED

Range	0-75m/s, 0-270km/h, 0-145.8 knots
Resolution	0.1m/s, 0.1km/h, 0.1knots
Accuracy	±0.3m/s (0-16m/s) ±2% (16-40m/s) ±4% (40-75m/s)

WIND DIRECTION

Range	0 to 360°
Resolution	1°
Accuracy	4° RMS
Compass accuracy	5° RMS

ACOUSTIC TEMPERATURE

Resolution	0.1°C
Accuracy	±2°C
Under the following conditions:	
Speed Range	5m/s - 60m/s
Operating Range	-20°C to +60°C
Difference between air and sensor temperature	<10°C

SENSOR PERFORMANCE

Measurement principle	Acoustic Resonance
Units of measure	m/s, km/h or knots
Data update rate	Up to 10Hz
Altitude	0-4000m
Humidity	0-100%

POWER REQUIREMENTS

Supply voltage	6V to 30V DC
Supply current	30mA

PHYSICAL

Molex CLIK-Mate I/O connector and cable
Sensor made of 3D printed graphite and nylon composite
Surface-Mount with compressed gasket and 3x screw fit. An adaptor is provided for pole-mounting (pole not supplied).

DIGITAL SENSOR

Interface	RS422 (full-duplex) RS485 (half-duplex) UART (full-duplex, 3V & 5V)
Format encoding	ASCII

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