Turbine control wind sensors

FT TECHNOLOGIES

Critical signals in turbine control ....page 2
What makes Acu-Res® Technology ideal for turbine control?........page 3
Tested to the extreme ....page 4
Which model should I use for my turbine? ....page 5
Should I use one or two sensors on my turbine?..page 6
APQP4Wind ....page 7
Case studies
Turbine retrofit..page 8
Replacement of mechanical anemometers..page 9
Community scale wind turbines ....page 10
Datasheets..page 11

THE WORLD'S TOUGHEST WIND SENSORS

www.fttechnologies.com

Wind speed and wind direction – critical signals in turbine control

The two most important signals that a wind turbine needs for optimal performance are the wind speed and wind direction measurements. The wind sensors that provide this critical data must be able to operate continuously, for years on end, in the harshest of weather conditions, whilst providing consistent, reliable wind measurement.

FT Technologies' ultrasonic wind sensors have been designed specifically for wind turbine control and are used by the world's leading turbine manufacturers – both on and offshore. FT7 Series wind sensors have been operating continuously on turbines around the globe for many years and are often used to upgrade and retrofit older turbines. Over 70% of all offshore wind turbines use FT sensors.

Reliable wind speed measurement is critical for a turbine for a combination of reasons. At low wind speeds, there is not enough energy to justify running the turbine and it is more cost effective to shut it down. At high wind speeds, however, the turbine must stop for safety reasons. In between these two speeds, the turbine needs to receive constant wind speed data in order to continue operating – generating power and revenue for the wind park operator. Any loss of data and the wind turbine must immediately shut down. The wind speed measurement is also used for defining the blade pitch angles and provide a reference power curve estimation.

Wind direction data enables the turbine to face the optimal upwind position for maximum energy production. Even when the turbine is not operating, the wind direction is needed so that the turbine can continuously track and yaw into the optimal position to resume operation as soon as the cut in wind speed is reached.

Wind sensors are installed on the turbine's nacelle, behind the rotor, and are therefore subjected to a turbulent airflow. This can affect the sensor's measurements, as the airflow will vary dependent on nacelle shape, blade shape, rotational speed, sensor location, topology of the geographical location, and several other factors. For this reason, each turbine OEM develops a correction factor known as the 'Nacelle Transfer Function'. This is applied in the Turbine Control System and Strategy, enabling the turbine to derive an approximate free field airflow, and continuously track the best wind conditions for optimal power production.

Wind turbines must continue to operate 24/7 in all weather conditions. The wind sensor, therefore, must also be able to withstand the harshest environments. As turbines are often installed in cold climate regions, where the air density delivers more kinetic energy to the turbine, FT sensors have built-in heaters to prevent them icing up.

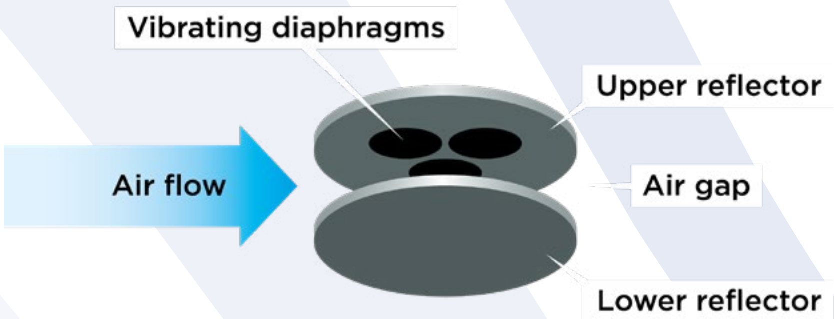
Furthermore, where turbines are located in extremely remote locations, they can be difficult to access for months at a time. FT wind sensors are designed and tested to survive on the top of a turbine, for years on end, with no maintenance and no need for re-calibration. Probably the most tested wind sensors in the world, they have passed over 30 independent tests including sand, dust, ice, vibration, corrosion, hail, water ingress, altitude, extreme temperature, humidity, solar radiation, EMC, lightning protection and bird attack.

What makes Acu-Res® Technology ideal for turbine control use?

FT Technologies has been supplying wind sensors to wind turbines since 2002. We are now the industry's largest supplier, with over 70% of all offshore turbines using FT sensors. FT sensors are unique, in that we use acoustic resonance to measure wind speed, direction and acoustic air temperature.

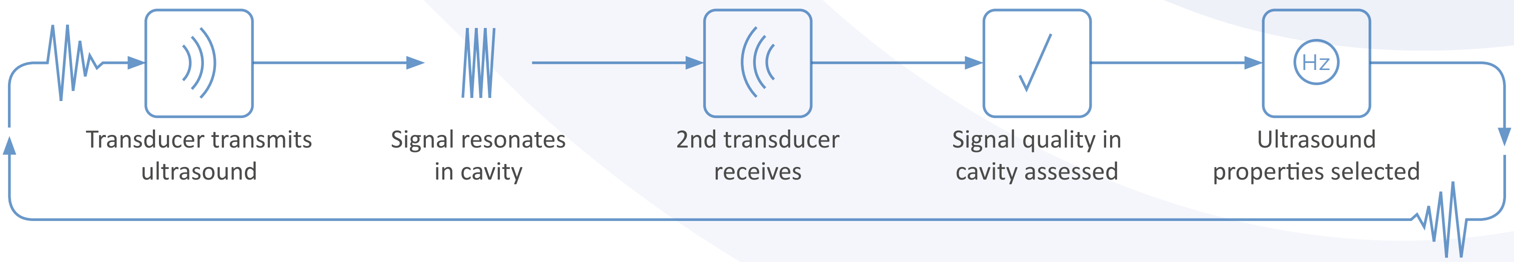
Acu-Res® Technology provides a signal-to-noise ratio superior to conventional ultrasonic sensors using time of flight technology. It enables high levels of data availability and accuracy in acoustically and vibrationally noisy environments, commonly experienced in wind turbine application where noise emitted by the blade rotation can cause traditional sensors to fail. FT sensors are also immune to Radio Frequency Interference, and have a minimal sound emission, preventing cross talk to other nearby sensors, and leaving bats and birds undisturbed.

Acu-Res® Technology enables us to design a compact, rugged sensor. With low weight and mass, the power requirement is minimised when heating the sensor in cold climates. The smaller size of our sensor also means that we have a lower carbon footprint when it comes to packaging and shipping it worldwide.



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.



Tested to the extreme

FT wind sensors undergo rigorous testing before, during and after development. New designs and design modifications are put through Highly Accelerated Life Testing (HALT). HALT uses extreme thermal and vibration stresses to identify product design weakness. Repeatedly subjecting sensors to stresses outside of their specified range enables weak points to be identified and designed out. During the FT HALT, the sensor is heated to 125°C and then cooled to -90°C whilst being vibrated at 30G RMS.

FT7 Series sensors have been externally certified to the following standards:

Drop and Topple Test Ec: EN 60068-2-31 (2008). Dropped 9 times at different angles from at least one metre onto concrete.

Anti-Icing Test: MIL-STD-810G. With the heater switched on, the sensor was exposed to freezing rain in an airflow of 15m/s at -15°C. Even when 37mm of ice had built up on the test bar the sensor itself remained ice-free.
De-Icing Test: MIL-STD-810G. The sensor was ice-free in under 5 minutes.

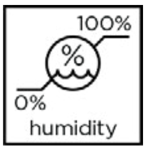
Corrosion: ISO 9227 (2006) & IEC12944 (1998). Tested to category C5-M High of BS EN ISO 12944 (1998) in a neutral salt spray atmosphere for 1440 hours.

Altitude: EN 60068-2-13 (1999). 4 hours at a constant low pressure typical to 3000 metres above sea level. Additional tests in a dedicated altitude wind tunnel have shown that the sensor measures accurately up to 4000m.

Solar Radiation: EN 60068-2-5 (2011). 24 hours of UV radiation with an ambient temperature of 55°C, irradiance of 1120 W/m².

Sinusoidal Vibration Test Fc: EN 60068-2-6 (2008). 5Hz to 500Hz, 1 octave/minute sweep rate, 5 sweep cycles, 3 axes
Random Vibration Test Fh: EN 60068-2-64 (2008). 5Hz to 500Hz, 90 minutes per axis, 0.0075g²/Hz severity over 3 axes.

Mist, Fog and Low Cloud Test CL26: DEF STAN 00-35 Test CL26. Fog intensity of 1.66ml/80cm² for one hour.
Driving Rain Test CL27: DEF STAN 00-35 Test CL27. Rain intensity of 200mm for one hour.

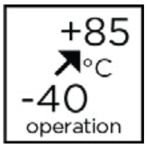


Stationary Temperature & Humidity Test Cab: EN 60068-2-78 (2013). Relative humidity +93% at +40°C for 240 hours.
Combined Temperature & Humidity Test Z/AD: EN 60068-2-38 (2009). Ten 24 hour cycles, upper temperature +65°C. Cold sub cycle: -10°C.
Cyclic humidity test: EN 60068-2-30 (2005). Six 24 hour cycles, upper temperature 55°C.

Hail: EN 61215-2 (2016). 50mm diameter ice balls, weighing 57g each, shot at the sensor at 31m/s. Hail withstand class HW 5.

Ingress Protection: ISO 20653:2013 IPX6K
EN 60529 (1992+A2:2103). Sealed to IPX6K, IP66 and IP67. Protected against high velocity water jets with increased pressure, access to hazardous parts and against solid foreign objects. Submerged in one metre depth of water for 30 minutes, and exposed to a dust chamber for 8 hours.

Wind Blown Sand & Dust Test: DEF STAN 00-35 CL25. Sand particles for three hours and then dust particles for three hours, at 29m/s air velocity, concentration 1.1g/m³.



Cold Temperature Test Ad: EN 60068-2-1 (2007). 16 hours of cold air at -40°C.
Dry Heat Test Bd: EN 60068-2-2 (2007). 16 hours dry heat at +85°C.
Thermal Cycling Test Nb: EN 60068-2-14 (2009). 16 temperature cycles from -40°C to +85°C.

Mechanical Shock Test Ea and CAF2656: EN 60068-2-27 (2009). Peak acceleration: 50G, duration: 11ms, pulse shape: half-sine.

EMC & RFI
EN 61000-6-2: Industrial environments
EN 61000-6-3: Residential, commercial and light-industrial environments
EN 61000-4-2: Electrostatic discharge
EN 61000-4-3: Radiated, radio-frequency, electromagnetic field
EN 61000-4-4: Electrical fast transient/burst
EN 61000-4-5: Surge
EN 61000-4-6: Conducted disturbances induced by RF fields
EN 61000-4-8: Power frequency magnetic field
EN 61000-4-9: Pulse magnetic field
EN 61000-4-10: Damped oscillatory magnetic field
EN 61000-4-29: Voltage dips, short interruptions and voltage variations on d.c. input power port

Which model should I use on my turbine?

FT wind sensors are available with different mechanical and communication interfaces. With no moving parts to wear out or degrade, turbine downtime and yaw misalignments are minimized, while the turbine availability and AEP is improved.

FT702 - 50m/s measurement range

The most widely used models are the FT702LT and the FT702LTD – V22 -FF. Launched in 2011 these models have a flat front mounting, and measure up to 50m/s. They are available with either RS485HD serial communication or 4-20mA analogue communication

In 2014, the PM “Pipe Mount” version was introduced, enabling the sensor to be installed on a 50mm mast pipe by using the FT090 adaptor or a sensor-specific adaptor created by the OEM. Please note that although the PM sensor is still available, we now recommend our newer FT742-DM50 model which fits directly to a mast pipe of 48-50mm without the use of an adaptor.

See datasheet on page 11.

FT722-FF - 50m/s measurement range

In 2016 we launched the FT722 as an upgrade to the FT702. With improved wind speed accuracy and our patented turbulator design, it offers superior performance. With serial communication, it also has the option to output acoustic temperature.

See datasheet on page 12.

FT742-FF - 75m/s measurement range

This Flat Front wind sensor is designed for a quick and easy installation against a metal bar. Highly resistant to electromagnetic and acoustic interference, it is also an ideal choice for smaller-scale wind turbines. For retrofit, it provides a single, compact solution to replacing an existing mechanical wind vane and anemometer wind measurement system.

See datasheet on page 13.

FT742-DM50 - 75m/s measurement range

The DM50 wind sensor fits directly onto a 47.9 to 51mm pipe. With superior corrosion resistance and lightning protection, it reads wind speeds up to 75m/s. For ease of alignment to the turbine centerline, the sensor can be fitted using our special alignment collar and alignment tools.

See datasheet on page 14.

Should I use one or two sensors on my turbine?

A turbine control wind sensor is a **crucial active component** of a wind turbine, which continuously helps to reduce Levelised Cost of Energy (LCoE). Operating continuously, even in extreme environments, FT wind sensors provide maximum data availability. This enables the wind turbine generator to maximise its energy capture and capacity factor. When there is no wind speed or direction data the turbine is forced to shut down, generating no power and no revenue.

Using only one sensor means accepting the risk of having a 'single point of failure'. If the sensor fails, power cannot be generated due to the lack of wind speed and direction data. Installing a 'redundant' back up sensor would minimise this risk. If one sensor fails, then the back up sensor takes over and the turbine can generate power continuously.

Particularly where wind turbines are installed in remote locations, including offshore, FT Technologies recommends installing two sensors, as this will ultimately contribute to maximisation of AEP and capacity factors. With the increasing size of turbines, this is even more important.

No sensor offers 100% data availability in all weather conditions. It is not uncommon to see wind sensors damaged by either lightning or ice throw, or by typhoon conditions. It is important, therefore, to have mitigation strategies ensuring that the turbine is able to operate safely when a sensor fails to provide data to the controller. Redundant sensors increase the CAPEX LCoE, but help to improve the turbine availability and power generation, which reduces the OPEX LCoE.

Factors increasing LCoE

- No sensor redundancy to back up if one sensor does not output data
- Inadequate maintenance: the system can degrade over time, reducing the AEP
- Inadequate data availability caused by sensors not operating well during certain weather conditions
- Low Turbine Capacity Factor
- Poor sensor integration leading to unexpected shutdowns
- Suboptimal controller strategies
- Leasing the system instead of owning it: LCoE is higher because a third party is making a profit from the lease
- Financing: Interest paid to the financial institution providing the loan increases ownership costs
- No wind speed and direction data means no power generation

Factors reducing LCoE

- Lower component costs, turbine costs, larger turbines (CAPEX)
- Durability and longevity: components with long life without maintenance reduce the LCoE
- Better Capacity Factor: dependent on turbine availability and data availability, and /or better siting and turbine model, turbine rating and control strategies
- Longer warranties reduce risk for component replacement under OEM's warranty
- Redundant and well aligned sensors helps to maximize AEP, which reduces the risk for underperformance
- Keep stock of local spare sensors for replacements to minimize downtime

APQP4Wind

In 2018 FT Technologies implemented a policy to introduce APQP4Wind quality standards throughout their entire management system, product design processes and component supply chain. The policy is aimed at increasing product reliability for the end customer and removing costs of poor quality through the product life.

APQP4Wind is a non-profit association founded by world-leading wind turbine manufacturers and suppliers including Vestas, SGRE, GE, Goldwind, Nordex Acciona and LM Wind Power. It's aim is to achieve continuous quality improvement within the wind industry in order to decrease the Levelized Cost of Energy making wind more competitive with other forms of energy. Advanced Product Quality Planning (APQP) is a well-known concept within the automotive industry. APQP4Wind has adapted the concept of APQP to formulate quality standards that are intended to be the quality assurance methodology used by the entire global wind industry supply chain from design to end-user.

FT Technologies is the first manufacturer of Turbine Control Wind Sensors to implement APQP4Wind processes into its design and quality processes.

FT wind sensors are manufactured and certified according to CE, UKCA, and North American Standards. Our UK-based manufacturing facility holds ETL certification, ISO9001 and ISO14000 certified by DNV.

Individual, traceable calibration

Every sensor leaving our facility has undergone individual calibration in our own fully automated wind tunnel up to 75m/s. The calibration results are traceable according to the sensor's serial number and engraved body number. FT calibration reports are available on request.

Our CWT2 high-speed calibration wind tunnel is referenced to the Measnet Accredited Wind Tunnels at Deutsche Windguard at wind speeds of 4-38m/s.

Customers who require their sensors to emulate the result of another specific calibration facility, can use our in-built FT UCT function (User Calibration Table). Full details are available in the User Manual.

FT sensors can, upon request, be supplied with a Measnet accredited calibration as per IEC61400-12-1, conducted and applied by Deutsche Windguard with speed range 2-38m/s. There are two options available, both including a Windguard certificate and traceable Windguard calibration ID:

- Verification of the FT calibration, performed by Windguard 2-38m/s
- New calibration, performed and applied by Windguard 2-38m/s.

Case Study

Turbine Retrofit: Minnesota, USA

Replacement of inferior ultrasonic sensors unable to withstand the freezing conditions

Project

The client had bought its turbines overseas and then re-wired them to the 60Hz grid in the USA. Unfortunately, the ultrasonic wind sensors that were on the turbines originally, kept on breaking, causing significant downtime, even during the summer. In the winter they were becoming iced-up and the moisture was seeping inside the sensors causing them to break down even more frequently.

After replacing the original ultrasonic sensors with like for like products, the turbines were still breaking down and the consultancy firm was asked to find a solution.

The consultant, Guy Le Blanc, inspected the existing sensors and declared they were not capable of withstanding the incredibly cold Minnesota weather. Investigating possible solutions, Guy visited a nearby large megawatt wind farm and asked what sensors they were using. They recommended the FT702 pipe mount sensor explaining that they worked reliably through the Minnesota winters.

Comparing the cost of the FT702 sensor with the loss of revenue incurred by shutdowns and long downtimes waiting for a technician to service the existing sensors, Guy recommended that the client invest in the FT702 sensors.

Results

Since installing FT Technologies sensors, the wind farm operator has seen a significant reduction in turbine downtime, particularly in the winter as the internal heating system in the FT702 prevents icing and therefore communications interruption.

"After hearing about the reliable performance of the FT702 and then holding it in my hand and feeling the difference in weight and size, I was sold!

"Discussing the project with Gordon Bease, Director – North American Operations at FT Technologies, I came to understand that not all wind sensors are the same or equal. It was an eyeopener!

"We went from the one on the left to the FT702LT. We were not able to get any information on the one from the other supplier and the winter mist made it an ice block. The weather can throw anything at us now; this sensor and FT Technologies has made it possible to keep these turbines running.

"Thank you very much for your support and product."

Guy Le Blanc
Owner of Le Blanc Consulting

Case Study

Replacement of mechanical anemometers

Turbine retrofit in Quebec, Canada, to replace cup and vane anemometers that were breaking in cold, moist conditions

Background

A wind energy company had several wind parks located in the mountains, close to the coast. Due to the location there was high humidity and, in the winter, very cold conditions. Their 600 MW of turbines all had mechanical cup and vane anemometers which were continually failing and then having to be re-built. In addition, heavy icing was stopping the mechanical sensors from working, causing turbine downtime and lost revenue. Even when re-built, the anemometers would break again after 6-18 months with bearings failure.

To halt this costly cycle of replacement the company decided to invest in better wind sensors. The customer approached us and we installed a small number of our FT702 wind sensors as a test.

Results

The test was hugely successful with the FT702 ultrasonic wind sensors perfectly able to cope with the harsh conditions. Due to the lack of icing the customer experienced extended uptime with no replacement cycle needed. The FT sensors will not need replacing for years. The reduced costs meant that the customer was able to recoup the costs of the new FT wind sensors in a short period of time.

“Thank you for your extra effort throughout the past weeks supporting the accelerated delivery of the ultrasonic anemometers to us. We especially appreciate your “customer centricity”, clear communication, and accommodation of our director during his visit to your factory.

“The efforts of your team have been critical to the retrofit of more than 200 wind turbines that were experiencing technical difficulties due to severe icing. With the support of the FT team we have been able to complete the retrofits on schedule and minimize the impact to our customers.

“Please extend our personal gratitude to all members on your team that supported this effort and we look forward to future cooperation between FT Technologies and ourselves.“

Executive Sourcing Leader, Renewables
Executive Product Service Leader, Renewables

Case Study

Community scale wind turbines

Eliminating electromagnetic noise interference to improve turbine performance

Project

FT was approached by a consultancy firm who wanted to help its wind farm client find reliable wind sensors capable of operating in cold climate conditions. In smaller 30, 50, and 100kW turbines the nacelle is physically more compact than on utility scale turbines. This means that the wind sensor is located closer to the generator and gear box within the nacelle. Even though they were using ultrasonic sensors, customers were finding that electromagnetic noise emanating from the nacelle was interfering with the sensor's performance. This caused the sensor to stop communicating with the turbine and the turbines stopped working altogether. They approached us to see if FT wind sensors could get around this issue.

Results

Customers found that since FT ultrasonic wind sensors are specifically designed for turbine control, they are highly resistant to electromagnetic interference and therefore had zero noise-related issues. In addition, the FT7 Series sensors produce a strong, resonating sound wave in a small space, providing a large signal that is easy to measure and so they did not suffer from acoustic interference either.

FT702

Flat Front wind sensor

FT TECHNOLOGIES

The FT702 ultrasonic anemometer is the result of FT Technologies long years of experience in designing durable turbine control wind sensors for the demanding environment outside a wind turbine. Users typically experience data availability of more than 99.9% as the ultrasonic anemometer keeps on working in many adverse environments where traditional sensors fail.

The FT702 incorporates robust protection circuitry to shield it against these effects. The sensor will survive undamaged lightning induced surges in excess of 4kA 8/20µs.

WIND SPEED
0-50m/s

OPERATING RANGE
-40 to **85**°C

HEIGHT
55mm

WEIGHT
320g

WIND SPEED

Range	0-75m/s
Resolution	0.1m/s
Accuracy	±0.5m/s (0-15m/s) ±4% (>15m/s)

WIND DIRECTION

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

SENSOR PERFORMANCE

Measurement principle	Acoustic Resonance
Units of measure	m/s, km/h or knots
Data update rate	Up to 5Hz
Altitude	0-4000m
Humidity	0-100%
Ingress protection	IP67, EN 60529 (2000)
Heater settings	0° to 55°C

POWER REQUIREMENTS

Supply voltage	20V to 30V DC (24V DC nominal) Supports 12V battery operation with reduced heater capacity
Supply current heater off	~30 mA
Supply current (heater on)	Limited to 4A (default) 6A (max)

ANALOGUE SENSOR

Interface	4-20 mA

DIGITAL SENSOR

Interface	RS485 (half-duplex)
Format encoding	ASCII

FT722-FF

Flat Front wind sensor

FT TECHNOLOGIES

The FT722 Flat Front wind sensor is designed for quick and easy installation against a metal bar. The bar allows the sensor to be aligned to the central axis of the turbine without error.

Ideal for retrofit, the sensor provides a single, compact solution to replacing an existing mechanical wind vane and anemometer wind measurement system. With no moving parts to wear out or degrade, turbine downtime is reduced, power output is increased and yaw control is more efficient. With updated software and improved accuracy, it is also a fit and function replacement for the FT702LT-FF sensor.

WIND SPEED	OPERATING RANGE
0-50m/s	-40 to 85°C
HEIGHT	**WEIGHT**
161mm	320g

WIND SPEED

Range	0-50m/s
Resolution	0.1m/s
Accuracy	±0.3m/s (0-16m/s)
	±2% (16-40m/s)
	±4% (40-50m/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

ANALOGUE SENSOR

Interface	4-20 mA

DIGITAL SENSOR

Interface	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, IPX6K
Heater settings	0° to 55°C

POWER REQUIREMENTS

Supply voltage	12V to 30V DC (24V DC nominal)
Supply current heater off	~31 mA
Supply current (heater on)	Limited to 4A (default), 6A (max)

FT742-FF

Flat Front wind sensor

The FT742 Flat Front wind sensor is widely used in the wind turbine business, both on and offshore. It can measure wind speeds up to 75m/s making it suitable for use in the stormiest areas of the world.
Designed for installation against a metal bar, the sensor is easily aligned to the central axis of the turbine without error. The thermostatically controlled heating system prevents ice build-up, not only on the sensor itself, but also on the metal bar. This prevents blockage of the measurement cavity, reducing turbine downtime during heavy icing events. The hard anodised aluminium body is highly resistant to corrosion, sand, dust, ice and solar radiation. The sensor is sealed to IP66, IP67 and IPX6K standard.

WIND SPEED
0-75m/s

OPERATING RANGE
-40 to 85°C

HEIGHT
161mm

WEIGHT
320g

WIND SPEED

Range	up to 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

ANALOGUE SENSOR

Interface	4-20 mA

DIGITAL SENSOR

Interface	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, IPX6K
Heater settings	0° to 55°C

POWER REQUIREMENTS

Supply voltage	12V to 30V DC (24V DC nominal)
Supply current heater off	~31 mA
Supply current (heater on)	Limited to 4A (default) 6A (max)

FT742-DM50

Direct Mount wind sensor

FT TECHNOLOGIES

The FT742-DM50 wind sensor fits directly onto a 47.9 to 51mm OD pipe and reads wind speeds up to 75m/s. With superior corrosion resistance and lightning protection, the DM50 is a great choice for both wind turbines. For ease of alignment, the DM50 can be fitted using our special alignment collar and mounting tool.

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

174mm

WEIGHT

535g

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

DIGITAL SENSOR

- Interface........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, IPX6K
- Heater settings........0° to 55°C

POWER REQUIREMENTS

- Supply voltage........20V to 30V DC
  (24V DC nominal)
  Supports 12V battery operation
  with reduced heater capacity
- Supply current heater off........~31 mA
- Supply current (heater on)........Limited to 4A (default)
  6A (max)

Daniel Reid
Account Manager - Wind Energy
daniel.reid@fttechnologies.com

Aled Lumley
Senior Applications Engineer
aled.lumley@fttechnologies.com

THE WORLD'S TOUGHEST WIND SENSORS
www.fttechnologies.com

FT Technologies
Sunbury House, Brooklands Close
Sunbury on Thames, TW16 7DX, UK
T: +44 (0)20 8943 0801