



FT702LT Turbine Control Wind Sensor

Featuring Acoustic Resonance Sensing Technology



FT Technologies
www.fttech.co.uk

Product Features

- ▶ *Developed for turbine control applications*
- ▶ *Patented Acoustic Resonance technology*
- ▶ *Solid-state design with no moving parts*
- ▶ *Combined speed and direction sensing*
- ▶ *Durable and rugged design*
- ▶ *Powerful heater for ice-prone areas*
- ▶ *Suitable for land and offshore installation*
- ▶ *Easy mounting on turbine*
- ▶ *RS485 and 4-20mA interface options*
- ▶ *ISO9001 designed and manufactured*

Description

Measurement Principle

The FT702LT incorporates FT Technologies' patented *Acoustic Resonance* sensing technology. This proven award-winning technology uses an acoustic (ultrasonic) signal which is resonated inside a small cavity to measure both wind speed and wind direction. Advantages of *Acoustic Resonance* include;

- ▶ *resonance effect boosts signal-to-noise ratio*
- ▶ *inherent compensation against fluctuations in atmospheric temperature, pressure and humidity*
- ▶ *linear response vs speed*
- ▶ *close transducer spacing results in very compact and rugged sensor configurations*
- ▶ *monolithic construction results in improved accuracy*

Designed for Wind Turbine Applications

Accurate measurement of incident wind direction at the turbine is essential for optimum generating performance. The FT702LT provides measurement data for both turbine yaw control (wind direction) and start-up and shut-down (wind speed) of the turbine.

With no moving parts to degrade or wear out, the FT702LT helps reduce costly unscheduled maintenance visits and shortens turbine down-time.

High Reliability

Each aspect of the FT702LT design has been optimised for the demanding environment in which modern megawatt scale turbines are installed. Rigorous testing at the design stage, including advanced highly accelerated testing techniques such as HALT, means that the FT702LT can be trusted in the most demanding conditions. All production sensors are 100% wind tunnel tested and undergo powered burn-in testing to ensure that the highest levels of reliability are achieved in the field.

Anti-Icing Heater

For operation in ice-prone areas, the FT702LT is fitted with a highly effective thermostatically controlled 'all-body' heating system. A three element heater (one element located in the top of the sensor and two in the bottom) is used to ensure that the heating is evenly distributed over the entire surface area. The heat flux exceeds the Finnish Met. Institute guidelines of 0.4W/sq. cm.

Enhanced EMC and Lightning Protection

Located outside the protection of the turbine nacelle, wind sensors are exposed to high levels of electromagnetic interference from atmospheric disturbances such as static discharges and nearby lightning strikes. The FT702LT incorporates robust protection circuitry to protect it against these effects. (See Technical Specification for details of test levels). The sensor will survive undamaged after lightning induced surges in excess of 8kV 1.2/50µs. A detailed EMC test report is also available on request.

Easy Alignment

Mounting and aligning the sensor on the turbine is very straightforward. A machined flat on the sensor body defines the 0deg wind datum so that the sensor automatically aligns with the turbine axis.

Flexible Interfacing

The FT702LT is available with either RS485 serial or 4-20mA current loop interface, allowing it to be used with virtually any turbine controller. A range of wind speed scaling factors is available for the 4-20mA option (See Ordering Information) so that the sensor can be used in retrofit applications without having to make any changes to the turbine controller.

Technical Specification

SENSOR PERFORMANCE

MEASUREMENT PRINCIPLE	Acoustic Resonance (compensated against variations in temperature, pressure and humidity)
WIND SPEED MEASUREMENT	
RANGE	0-50m/s
ACCURACY	±0.5m/s (0-15m/s), ±4% (>15m/s)
RESOLUTION	0.1m/s
WIND DIRECTION MEASUREMENT	
RANGE	0 to 360°
ACCURACY	±2° (within ±10° of 0° datum), ±4° (over remainder)
RESOLUTION	1°

DATA I/O

RS485 OPTION

INTERFACE FORMAT	Digital RS485, galvanically isolated from power supply lines and case
DATA UPDATE RATE	ASCII data, polled or continuous output modes 5 measurements per second

4-20mA OPTION

INTERFACE TYPE	4-20mA, galvanically isolated from power supply lines and case
FORMAT	One 4-20mA current loop for wind speed (see Ordering Information for scaling factors available) One 4-20mA current loop for wind direction (4-20mA = 0-360deg)
READING UPDATE RATE	5 per second
CONFIGURATION PORT²	RS485 half duplex, non-isolated relative to power ground

POWER REQUIREMENTS

SUPPLY VOLTAGE	20V to 30V dc
SUPPLY CURRENT (HEATER OFF)	25mA
SUPPLY CURRENT (HEATER ON)	4A (max) - heater is thermostatically controlled. Heater current will depend on prevailing environmental conditions. Heater power limited to 99W (max).

PHYSICAL

DIMENSIONS	See Outline Dimensions
WEIGHT	300g
MATERIAL	Aluminium alloy, hard anodised & impregnated with PTFE
I/O CONNECTOR	5 way (RS485 option), 8 way (4-20mA option) multipole connector
MOUNTING METHOD	Self aligning, single screw fixing

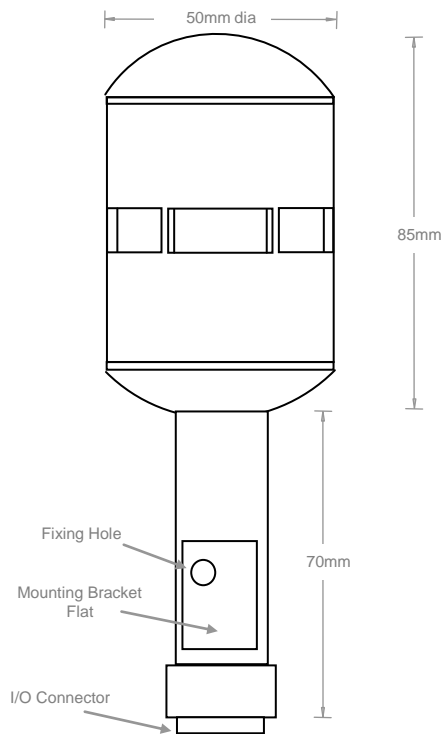
ENVIRONMENTAL

TEMPERATURE RANGE	-40° to +85°C (operating), -40° to +85°C (storage)
HUMIDITY	0-100%
INGRESS PROTECTION	IP67 rated
EMC (Full Test Report available on request)	
EMISSIONS:	EN 61000-6-4:2001 CISPR 22:1997 CLASS B
IMMUNITY:	EN61000-6-2:2001 & EN 61000-6-2:2005
ELECTROSTATIC DISCHARGE	EN 61000-4-2:1995, ±8kV (Contact Discharge), ±15kV (Air Discharge)
RADIATED RF INTERFERENCE	EN 61000-4-3:2002, 80-1000MHz swept frequency: 10V/m, 80%AM, 1% increment 3s dwell time 1-2.7GHz swept frequency: 3V/m, 80%AM, 1% increment 3s dwell time
FAST TRANSIENT BURSTS	EN 61000-4-4:1995, ±2kV Shielded cable, 20m. ±2kV 24V DC power ports 5/50ns Tr/Td 5kHz Repetition Rate
SURGE	EN 61000-4-5:1995, +/-8kV Shielded cable, 20m. 24V DC power supply ±0.5kV line to line ±0.5kV line to earth. Phase angles: Async 1.2/50µs Tr/Td, 60s event intervals
CONDUCTED RF FIELD	EN 61000-4-6:1996, 30V RMS, 80% amplitude modulation 0.15 to 80MHz
PULSE MAGNETIC FIELD	EN 61000-4-9:1994, 10kA/m 1.2/50µs
DAMPED OSCILLATORY WAVES MAG. FIELD	EN 61000-4-10:1994, 500A/m 100kHz, 1MHz

NOTES:

- All specifications subject to change without notice
- The Configuration Port is provided to allow the user to change the internal settings of the FT702LT/D and to perform diagnostic testing. This interface should only be used for configuration and test purposes. This interface is not intended for permanent connection to the turbine controller.

Outline Dimensions



FT702LT Outline Drawing

Ordering Information

Order code for RS485 interface:

FT702LT

Order code for 4-20mA Interface:

FT702LT/D Append 2 digit wind speed scaling

- 30 m/s = 20mA
- 35 m/s = 20mA
- 40 m/s = 20mA
- 45 m/s = 20mA
- 50 m/s = 20mA
- 55 m/s = 20mA
- 60 m/s = 20mA
- 65 m/s = 20mA
- 70 m/s = 20mA

See Note

NOTE:

The models available with scaling factors above 50m/s are intended for applications where the turbine controller wind speed scaling is preset and cannot easily be changed (this is often the case for retrofit applications). Because the maximum wind speed range of the FT702LT/D is 50m/s, for models with speed scaling above 50m/s the maximum output current is limited to a value equivalent to 50m/s



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