

Ultrasonic Anemometer Thies 3D - Heating for extreme icing conditions

The Ultrasonic Anemometer 3D is designed to measure the horizontal and vertical components of wind velocity, wind direction and acoustic virtual temperature in 3 dimensions.



Description

- Classified acc. to IEC 61400-12-1:2017
- Measurement of wind direction & speed in 3 dimensions X, Y and Z
- Real-time measurement
- Highest precision, maintenance-free and heatable
- Digital / analog outputs and inputs

The Ultrasonic Anemometer 3D is designed to measure the horizontal and vertical components of wind velocity, wind direction and acoustic virtual temperature in 3 dimensions. The Ultrasonic Anemometer 3D consists of 6 ultrasonic transformers, in pairs facing each other at a distance of 200 mm. The three resulting measurement paths are vertical in relation to each other. The transformers function both as acoustic transmitters and receivers.

In comparison to cup anemometers, the measuring principle provides for inertia-free measurement of rapidly changing variables with maximum precision and accuracy. It is particularly suitable for the measurement of gusts and peak values. The level of accuracy achieved when measuring the air temperature (acoustic virtual temperature) surpasses that of classical methods, in which the temperature sensors are used with a weather and radiation shield, following correction of the influence of damp occurring with certain weather situations.

The maintenance-free and wearless anemometer needs no re-calibration, and is equipped with a heating for winter operation even under extreme conditions.

All calculations are carried out by a high-capacity digital-signal-processor (DSP) within the propagation time of the ultrasonic signals with an accuracy basis of 32 bit. The instrument offers comprehensive statistic functions such as gliding averaging, standard deviation, co-variance etc., which can be selected via the digital interface. The gliding averaging can be set optionally in vectorial or scalar form, identically or differently for each parameter.

Heating

For a multitude of applications the continuous output of solid measuring data of the wind velocity and direction is an indispensable requirement to the measuring system, even under meteorological extreme conditions such as icing situations. The Ultrasonic is equipped with a sophisticated heating system. This system keeps all outer surfaces that might disturb the measuring value acquisition in case ice formation, efficiently on a temperature above +5°C.

Also the measuring arms belong to the heated outer surfaces, as well as additionally the ultrasonic transducer and the housing – depending on the model. The Ultrasonic is in a position to generate measuring data with high accuracy even in unheated state at temperatures of up to below –40 °C. There is no temperature-depending quality of the measuring data. The heating is necessary only for avoiding the ice formation on the instrument construction, thus avoiding an involved failure in the measuring value acquisition.

Specifications

Wind Speed	
Measuring range	0 ... 85 m/s (measures up to 99.99 m/s + output); Scaling of analog output selectable Starting threshold: 0.01 m/s
Accuracy	≤ 5 m/s: ± 0.1 m/s rms (root mean square over 360°) > 5 m/s ... ≤ 35 m/s: ± 1% rms of measured value (root mean square over 360°) > 35 m/s ... ≤ 65 m/s: ± 2% rms of measured value (root mean square over 360°) > 65 m/s ... ≤ 85 m/s: ± 3% rms of measured value (root mean square over 360°)
Resolution	0.1 m/s (telegrams No. 1 to 4) 0.01 m/s (telegrams No. 5 to 12 and user-defined)
Wind Direction	
Measuring range	Azimuth: 0 ... 360° Elevation: -90° ... 90°
Accuracy	± 1° with wind velocity > 1 m/s ≤ 35 m/s ± 2° with wind velocity > 35 m/s ≤ 65 m/s ± 4° with wind velocity > 65 m/s ≤ 85 m/s
Resolution	1° (telegrams No. 1 to 4) < 1° (telegrams No. 5 to 12 and user-defined)
Acoustic Virtual Temperature	
Measuring range	-40 ... +70°C (not specified, but useful measuring range: -75 ... +75°C)
Accuracy	± 0.5 K
Resolution	0.1 K (in telegrams No. 1 to 5)

Wind Speed	
Data Output Digital	
Interface	RS485 / RS422
Baud rate	1200 to 921600 adjustable
Output	Instantaneous values, wind speed / direction and acoustic virtual temp. Sliding mean values 0.5 sec to 100 min freely selectable
Output rate	1 per 1 msec to 1 per 60 sec., adjustable in msec steps
Status identification	Heating, measurement path failure, ΔT path temperatures
Data Output Analog	
Electr. output	0 ... 20 mA / 0 ... 10 V or 4 ... 20 mA / 2 ... 10 V for wind vectors X, Y and Z
Output	Wind vectors X, Y and Z, Instantaneous values, sliding mean values 0.5 sec to 100 min freely selectable
Output rate	Updating rate 0.1 ... 100 Hz
Resolution	16 bit
Analog Inputs	
Input number	Up to 5 analog inputs possible. (3x standard, 2x add. configurable acc. to manu.)
Input resolution	16 bit
Sampling rate	0.1 ... 100 Hz per channel
Input range	0 ... 10 V
Data processing	Output of measured values in user-specific telegram
Accuracy	$\pm 1\%$ of meas. value in the range $-40 \dots +70^\circ\text{C}$
Linearity, integral	INL: type < 6LSB
Effective low-noise bits	Type 14 bit (at DC-supply for avoiding of dynamic cross-talk in the connection line)
General	
Temperature range	Oper. temperature: $-40 \dots +70^\circ\text{C}$; Storage: $-50 \dots +80^\circ\text{C}$; with heating up to -75°C
Internal measuring rate	Up to 285 complete measurement sequences per second at 20°C
Operating voltage	Power supply electronics: 8 ... 78 VDC, 1.5 VA, max. 2.5 VA S83100H Power supply electronics + heating: 24 V AC/DC $\pm 15\%$: typ. 150 VA S83300H Power supply electronics + heating: 48 V AC/DC $\pm 15\%$: typ. 360 VA
EMC	EN 55022: 1998 class B; EN 55024: 1998; EN 61326:1997; A3:2003
Electr. connection	8-pole plug
Manufacturer	Thies

Sensor connection diagram

Ultrasonic Anemometer Thies
2D, 3D Half Duplex

Communication RS485

M83575

Meteo-40
Data Logger

