WINDCOM MESSTECHNIK

Wind Transmitter First Class

Instruction for Use

1. Range of Application

The wind transmitter is designed for the measurement of the horizontal component of the wind speed in the field of meteorology and environmental measuring technology, evaluation of on-site wind potential, and measurement of capacity characteristics of wind power systems. The device features optimized characteristics, dynamic behaviour at high turbulence intensities, minimal over-speeding, and low starting values.

The measuring value is available as a digital output signal at the output. It can be transmitted to data loggers as well. For winter operation the instrument is equipped with an electronically regulated heating, which guarantees a smooth running of the ball bearings, and prevents the shaft and slot from icing.

2. Construction and Mode of Operation

A low-inertia cup star with 3 cups, made of carbon-fibre-reinforced plastic, is set into rotation by the wind. The rotation is scanned opto - electronically, and is converted into a square wave signal. The frequency of this signal is proportional to the number or rotations. Depending on the supply voltage, the output signal ranges between maximal output voltage and ground or a potential (life-zero), lifted by approx. 1, 2 V. The supply of the electronics can be done by DC-voltage of 3, 3 V up to 42 V at a very low current consumption. An AC- or DC-voltage of 24 V is intended for the separate supply of the optional heating. In all probability, the heating guarantees a trouble-free function of the Wind Transmitter First Class even under extreme meteorological icing-conditions.

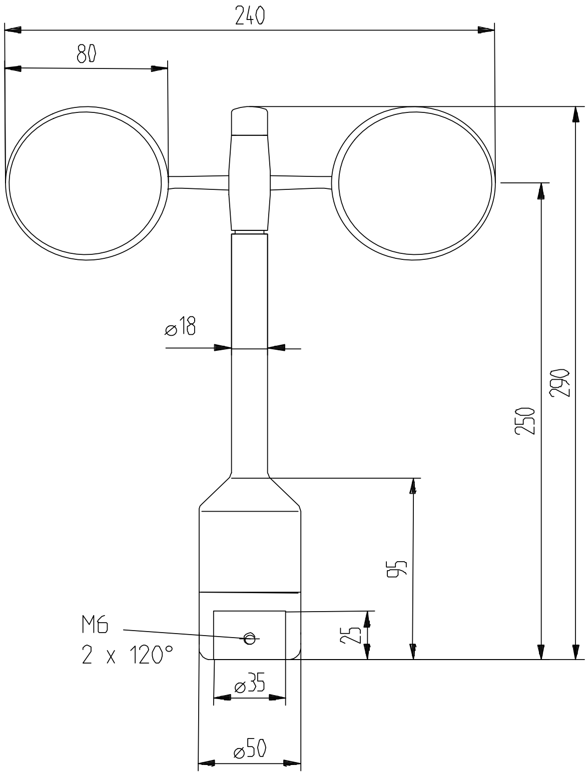
The outer parts of the instrument are made of corrosion-resistant anodised aluminium. Highly effective labyrinth gaskets and O-rings protect the sensitive parts inside the instrument against humidity and dust. The instrument is mounted onto a mast tube; the electrical plug-connection is located in the transmitter shaft.

The following parts are included in delivery: 1 Instrument
1 Connection plug

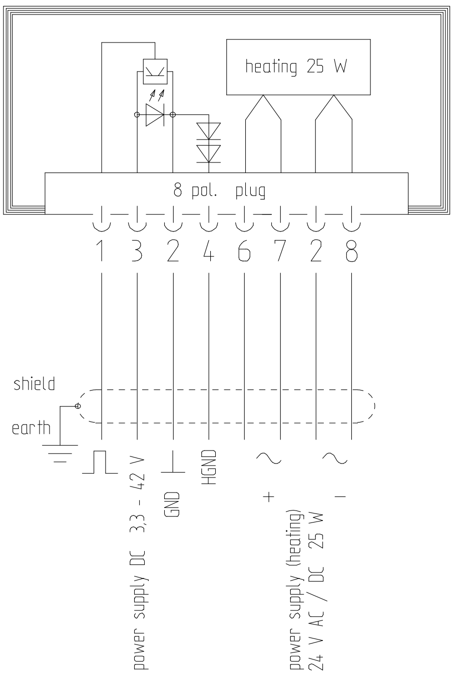
3. Technical Data

Characteristic	Description
Measuring range	0,3...75 m/s
Measuring instability (w/o calibration)	0,3...50 m/s < 3% of meas. value or < 0,3 m/s 50...75 m/s < 6% of meas. value
Survival speed	85 m/s (max. 30 min.)
Permissible Ambient conditions	- 50...+ 80°C, all occurring situations of relative humidity (incl. dew moistening)
Output signal	Form rectangle Frequency 1000 Hz @ 50 m/s Amplitude is supply voltage, max. 15 V Load R > 1 kΩ (Push-pull output with 220 Ω in series) C < 200 nF (corresp. to length typical cable < 1km)
Linearity	Correlation factor r between frequency and wind speed r > 0.999 95 (4…20 m/s)
Starting velocity	< 0,3 m/s
Resolution	0,05 m wind run
Distance constant	< 3 m (acc. to ASTM D 5096 – 96)
Inclined flow	Measuring value deviation Δv compared with stationary horizontal flow: Δv < 1 % conditions: Wind speed: v = 8 m/s Horizontal turbulence intensity: t ≤ 20 % Turbulence structure (rough country): r ≤ 0,8 Average deviation from the horizontal flow: δ [2° Standard spreading of the inclined flow angle
Turbulent flow	deviation Δv turbulent compared with stationary horizontal flow -0,5% < Δv < +2% frequency < 2 Hz
Wind load at 75 m/s	approx. 100 N
Heating	Surface temperature of housing neck > 0 °C at 20 m/s up to –10 °C air temperature, at 10 m/s up to –20 °C using the THIES icing standard 012002 on the housing neck. Heating regulated by temperature sensor
Electrical supply for optoelectronic scanning	Voltage: 3,3...42 V DC (galvanic isolation from housing) current: 0,3 ma @ 3,3 V typical (w/o external load) < 0,5 ma @ 5 V (w/o external load)
Electrical supply for Heating	Voltage: 24 V AC/DC (galvanic isolation from housing) Idling voltage: max. 30 V AC, max. 42 V DC Capacity: 25 W
Connection	8-pole plug-connection for shielded cable in the shaft (see connecting diagram below)
Mounting	Mounting on mast R 1", for ex. DIN 2441 1½ " with separate adaptor (option)
Dimensions	See dimension diagram
Weight	approx. 0,5 kg
Protection	IP 55 (DIN 40050)
EMV	EN 61000-6-2:2001 (immunity) EN 55022:2001, class B (interfering transmission)

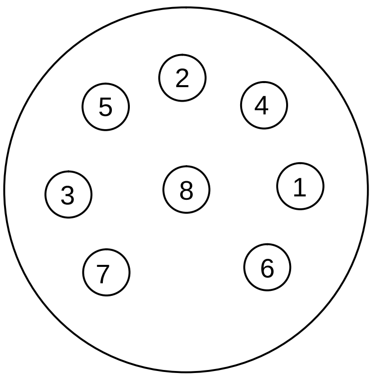
Dimension



Connecting Diagram



Pole figure of the 8-pole plug connector (DIN 45326) with view on the soldered connection side of the socket insert



Contact	Name	Function
1	SIG	Signal (rectangle)
2	GND	Ground
3	+Us	Supply 3,3 V...42 V DC
4	HGND	Ground at life-zero signal
6	HZG~	Heating supply:
7		Voltage: 24 V AC/DC
5	HZG	Capacity: 25 W
8		

4. Preparation for Use

4.1 Selecting the measuring location

In general, wind measuring instruments are supposed to record wind conditions over a large area. According to international regulations, the surface wind should be measured at a height of 10 m above even open terrain, in order to achieve comparable values. An open terrain is defined as terrain where the distance between the wind-measuring instrument and the next obstacle is at least ten times the height of this obstacle (Guide to Meteorological Instruments and Methods of Observation, Sixth Edition, WMO-No. 8). If this regulation cannot be fulfilled, the measuring instrument should be installed at a height at where the measurement values are not influenced by any local obstacles. In any case, the measuring instruments should be installed at a height of 6 to 10 m above the mean height of the buildings or trees in the vicinity. If it is necessary to install the instrument on a roof, it should be installed in the centre of the roof in order to avoid any preferential directions.

4.2 Mounting of the Wind Transmitter

Mount the transmitter onto a pipe socket of R 1" (Ø 33,5 mm) and a length of 25 mm. The pipe socket must have an internal diameter of at least 25 mm as the wind transmitter must be connected electrically with a plug from below. Solder a shielded cable with a diameter of 6-8 mm and a core cross-section of max. 0, 75 mm² to the enclosed plug. For the bi-directional -line of the heating 2 wires can be connected each, in order to keep the line losses low, which are caused by the heating current of approx. 1 A. For the wind transmitter model without heating 3 cores of small cross-section are sufficient. After connection the wind transmitter is put onto the pipe socket, and is fixed at the mast or hanger by means of 2 threaded pins (female hexagon 3 mm).

5. Accessories

For the current supply of the heating you can use for example our power supply. In areas with considerable lightning activity it is advisable to mount a lightning rod. For the electrical connection we would recommend a data line 7x 0, 34 mm² with copper shielded network and weatherproof cover.

6. Maintenance

If properly installed, the instrument requires no maintenance. Heavy pollution can lead to blockage of the slot between the rotating and the stable parts of the transmitter. Thus it is advisable to remove the accumulated dirt from the instrument.
Certain symptoms of wear and tear can appear on the ball bearings after years of use. These symptoms are expressed in a lowered sensitivity of response, standstill or run-noises of the ball bearings. In case that such disturbance might occur we recommend to return the instrument - in original package – to the factory for maintenance work.

Excerpt of report *Deutsche WindGuard Wind Tunnel Services GmbH, AK 03 002*

Investigation and Classification of the Anemometer Thies First Class

Description

Manufacturer: Adolf Thies GmbH&Co.KG
Hauptstrasse 76
37083 Göttingen

Identification: First Class 4.3350; Ser. No. 0203020

Measuring period: 02.01.2003 – 04.04.2003

Test site: Varel, Germany

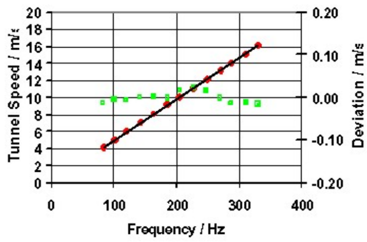
Wind Tunnel: University of Oldenburg

Linearity

According to:
MEASNET
Cup Anemometer
Calibration Procedure
09/97

Result:

Calibration average of 20 different anemometers Thies First Class.
Slope: 0.0481 m
Offset: 0.19 m/s
Correlation: 0.999984
Uncertainty: 0.05 m/s
Remark:
The results do not replace an individual calibration.

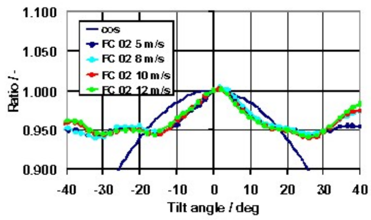


Off Axis Response

According to:
IEC 61400-121- CD
Wind Turbine Power
Performance Testing
06/02

Result:

Figure showing the tilt response of Thies First Class for tunnel speed of 5 m/s, 8 m/s, 10 m/s and 12 m/s.
Average deviation to cosine response 0.7 percent in the range of ± 20 degree.
Uncertainty: 0.25 %

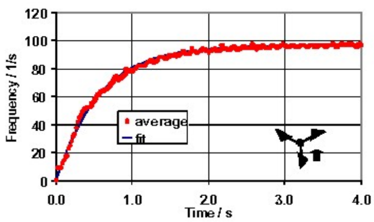


Distance Constant

According to:
ASTM D 5096
Determining the
Performance of a Cup or
Propeller Anemometer

Result:

Figure showing the time constant of Thies First Class 0103003 for tunnel speed of 5 m/s. The calculated distance constant was 2.7 m to 3.7 m depending on starting angle.
Uncertainty: 0.06 m



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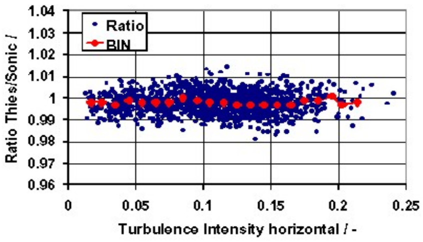
Deutsche WindGuard Wind Tunnel Services GmbH

Outdoor Test

According to:
IEC 61400-121 - CD Wind Turbine Power Performance Testing 06/02

Result:

Figure showing the field comparison of Thies First Class with a calibrated ultra sonic anemometer. No turbulence depending influence was found.
Averaged ratio:0.998
Uncertainty: 0.7 %

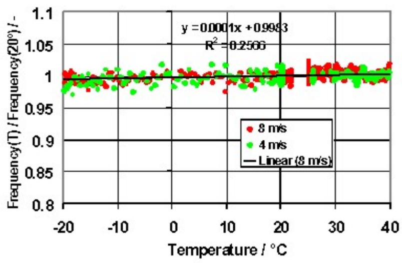


Temperature Dependency

According to:
CLASSCUP 02/01 Development of a Standardised Cup Anemometer Suited to Wind Energy Applications

Result:

Figure showing the influence of temperature on the friction of bearings at tunnel speed of 4 m/s and 8 m/s.
Thies First Class 0103003
Uncertainty: 0.04 %

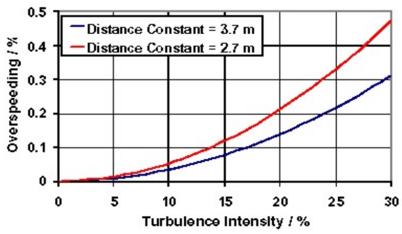


Overspeeding

According to:
CLASSCUP 02/01 Development of a Standardised Cup Anemometer Suited to Wind Energy Applications

Result:

Figure showing the computed overspeeding depending on the measured distance constant and the turbulence intensity.



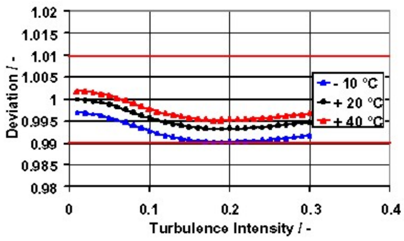
Classification

According to:
IEC 61400-121 - CD Wind Turbine Power Performance Testing06/02

Result:

Figure showing the calculated total deviation including angular, dynamic and friction effects for the Thies First Class Anemometer.
Uncertainty: 0.25 %

The anemometer meets in flat terrain all aspects of the requirements for a *Class 1* Anemometer.



Results presented in this report are valid for the items to be tested only.

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