

## Ultrasonic Anemometer Thies 2D S82100H / S82200H / S82300H / S82800H

- S82100H: Heating of sensor arms
- S82200H: Heating of sensor arms and ultrasonic converters
- S82300H: Extra strong heating for the whole sensor incl. housing
- S82800H: Upside down installation for winter operation with heating of sensor arms and ultrasonic converters

- Measurement of wind direction, wind velocity and virtual temperature
- Highest precision, maintenance-free
- Different heating options
- Digital & Analog outputs



### Description

The Ultrasonic Anemometer 2D is designed to acquire the horizontal components of wind velocity and wind direction as well as the virtual temperature in two dimensions. Due to the measuring principle the instrument is ideal for inertia-free measurement of gusts and peak values.

#### Wind velocity and direction

The speed of propagation of the sound in calm air is superposed by the velocity components of an air flow in the direction of the wind. A wind velocity component in the propagation direction of the sound supports the speed of propagation; i.e. it increases if while a wind velocity component against the propagation direction reduces the speed of propagation.

The propagation speed resulting from superposition leads to different propagation times of the sound at different wind velocities and directions over a fixed measurement path. As the speed of sound greatly depends on the temperature of the air, the propagation time of the sound is measured on each of the two measurement paths in both directions. This rules out the influence of temperature on the measurement result. By combining the two measuring paths which are at right angles to each other, the measurement results of the sum and the angle of the wind velocity vector are obtained in the form of rectangular components. After the rectangular velocity components have been measured, they are converted to polar coordinates by the digital-signal-processor of the anemometer and output as a sum and angle of wind velocity.

#### Acoustic virtual temperature

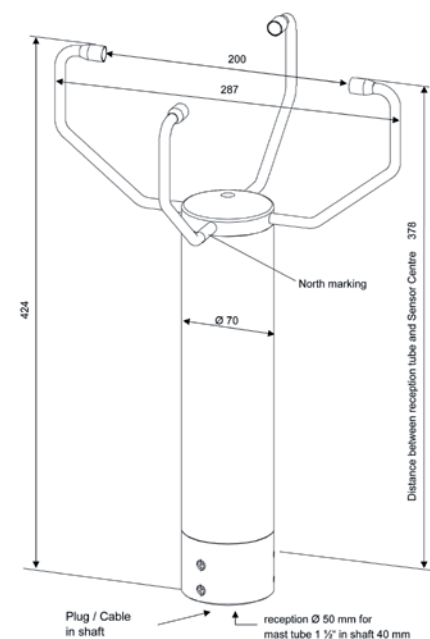
The thermodynamic interrelationship between the propagation velocity of sound and the absolute temperature of the air is defined by a root function. The physical interrelationship between sound velocity and temperature is ideal when measuring the air temperature as long as the chemical composition is known and constant.

#### Heating

The Ultrasonic is equipped with a sophisticated heating system, which keeps all outer surfaces that might disturb the data acquisition in case of ice formation, efficiently on a temperature above +5°C. The converters carrying arms belong to the heated outer surfaces, as well as the ultrasonic converters itself and the housing – depending on the model.

The Ultrasonic is able to acquire measuring data with high accuracy even in unheated state at temperatures down -40 °C. There is no temperature-depending quality of the measuring data. The heating is necessary only for avoiding ice formation on the instrument construction and the associated blockage of the run time data acquisition.

### Dimensional drawing

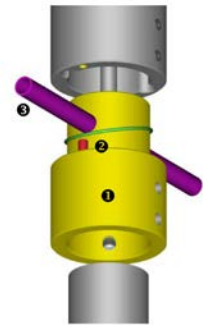


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### Alignment to north with North ring adapter (S83010)

We recommend installing a North ring adapter (1; yellow), which assists aligning the sensor correctly and avoids re-alignment after sensor replacement.

The North ring adapter is installed between sensor and boom. It is equipped with a north pin (2; red) and a direction bearing tube (3; violet). By selecting a fixed point in north direction, the adapter can easily be aligned and fixed with screws on the boom. Remove the tube and place the sensor on the adapter. The sensor is mounted with its north drilling on the north pin of the adapter and screwed in place.

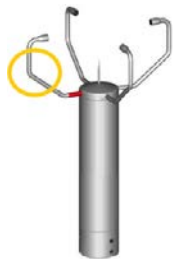
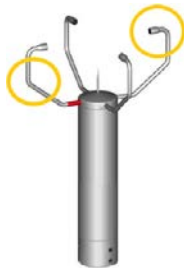
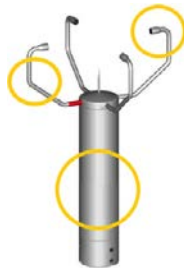


### Using Ultrasonic anemometers for wind energy assessments in cold climates

Ultrasonic anemometers have proven to be ideally suited for harsh winter conditions in comparison to traditional cup anemometers. Advantages of ultrasonic anemometers are:

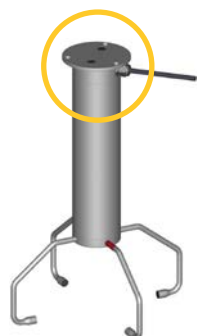
- Very effective heating system including all relevant parts of the sensor
- Distinct failure notice in cases of icing
- No "slowing down"-effects due to icing
- No influence of the heating on mechanical and aerodynamic features of the sensor

The Ultrasonic anemometer Thies 2D is available with different heating options:

Order No.	S82100H	S82200H + S82800H	S82300H
Heating options	<ul style="list-style-type: none"> <li>• Sensor arms</li> </ul>	<ul style="list-style-type: none"> <li>• Sensor arms</li> <li>• Ultrasonic converters</li> </ul>	<ul style="list-style-type: none"> <li>• Sensor arms</li> <li>• Ultrasonic converters</li> <li>• Housing</li> </ul>
			

In order to reduce snow and ice formation on top of the sensor, you can install the sensor upside down (S82800H). Thus snow or ice is falling down and does not pile up on the sensor.

Note: Take care of the cable connection. It must be ensured that no water gets into the shaft and connector or cable gland of the sensor. Ask for a special configuration of the sensor with cable gland at the side (see picture below).



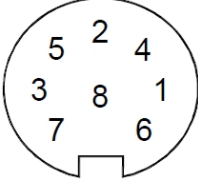
## Ultrasonic Anemometer Thies 2D S82100H / S82200H / S82300H S82800H

Wind Speed	
Measuring range	0 ... 75 m/s, scaling of the analog output is free selectable (Starting threshold: 0.01 m/s)
Accuracy	± 0.1 m/s @ ≤ 5 m/s ± 2% of meas. value @ > 5 m/s
Resolution	0.1 m/s (standard) < 0.01 m/s (user-defined)
Wind Direction	
Measuring range	0 ... 360°
Accuracy	± 1°
Resolution	1° (standard), < 1°(user-defined)
Virtual Temperature	
Measuring range	-50 ... +70°C
Accuracy	± 0.5 K to 35 m/s
Resolution	0.1 K (standard)
Data Output Digital	
Interface	RS485 / RS422
Baud rate	1200 to 230400 selectable
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
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, wind velocity & direction, virtual temp.
Output	Instantaneous values, sliding mean values 0.5 sec to 100 min freely selectable
Output rate	Updating rate 1 to 100 msec
Resolution	16 bit
Analog Inputs	
Input number	Up to 3 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	± 1% of meas. value in the range -40 ... +70°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: -50 ... +80°C (heated), -30 ... +80 °C (unheated) Storage: -50 ... +80°C (Measuring operation possible with heating down to -75°C)
Internal measuring rate	Up to 400 measurements per second at 20°C
Operating voltage	Power supply electronics: 8 ... 78 V DC, 1.5 VA, max. 2.5 VA S82100H Power supply electronics + heating: 24 V AC/DC ± 15%: typ. 80 VA, max. 90 VA @ 24V S82200H Power supply electronics + heating: 24 V AC/DC ± 15%: typ. 85 VA, max. 90 VA @ 24V S83200H Power supply electronics + heating: 48 V AC/DC ± 15%: typ. 280 VA, max. 310 VA @ 48V S82800H Power supply electronics + heating: 24 V AC/DC ± 15%: typ. 85 VA, max. 90 VA @ 24V

## Ultrasonic Anemometer Thies 2D S82100H / S82200H / S82300H / S82800H

General (continued)	
Electr. connection	8-pole plug
Mounting	Mast tube 1 ½", e.g., DIN 2441
Protection	IP 67
Weight	2.5 kg
Manufacturer	Thies
Ammonit Meteo-40	RS485-M (Half duplex, 2-wire, baudrate: 38400 bps)
Accessory	Module set M83575 (incl. isolated repeater)

### Connector Pin Assignment (Serial interface, half-duplex and analog outputs)

Plug Pin No.	Ammonit Wire Color	Allocation	Function	Solder terminal of coupling socket
1		WG*	Analog output wind speed	
2	brown	TXD- / RXD-	Serial interface	
3	green	ADIO (Analog Digital Input Output)**	Function configurable	
4		WR*	Analog output wind direction	
5	white	TXD+ / RXD+	Serial interface	
6	yellow	AGND	Analog ground	
7	red/pink	AC/DC	Supply, reverse-polarity protected	
8	blue/grey	AC/DC	Supply, reverse-polarity protected	

\* If configured by Ammonit, Pin not used.

\*\* Pin configured for analog output of wind speed. OR If heating is managed by the Meteo-40 data logger, Pin 3 is configured to switch the sensor heating.

Cable type (without heating): LiYCY 4 x 2 x 0.25 mm<sup>2</sup>

### Sensor Connection to Ammonit Meteo-40 Data Loggers

In order to connect the Ultrasonic sensor to the Ammonit Meteo-40 data logger, an additional module set (M83555 or M83575) has to be installed between sensor and data logger.

