

Anemometer Thies First Class Advanced

S11100 / S11100H

سنسور اندازه گیری سرعت باد (کاسه ای) مدل تیس فرست کلاس ادونس

کد سفارش: دارای گرمکن / معمولی

Accredited according to: IEC 61400-12-1 (2005-12), **CLASS A 0.9, B 3.0 & S 0.5**
MEASNET, ISO 17713-1, CLASSCUP



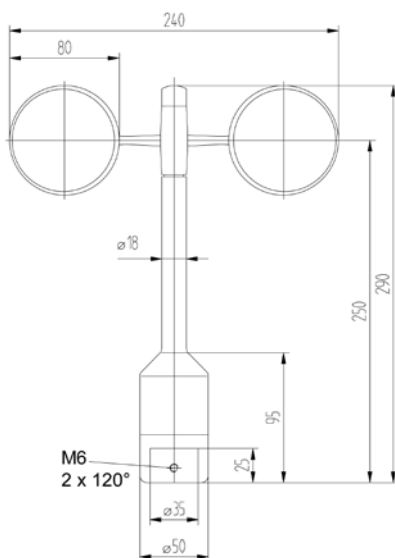
Classification:

IEC 61400-12-1 (2005-12)
Class A Classification Index A 0.9
Class B Classification Index B 3.0
Class S Classification Index S 0.5

Linearity (MEASNET):

$r > 0.99999$ (4 ... 20 m/s)

Dimensional drawing



Optically-scanned cup anemometer

The anemometer Thies First Class Advanced gives outstanding performance. It is the only anemometer on the market that complies with all the requirements of IEC 61400-12-1 (2005-12), Class S 0.5. Its performance ratings have even been improved on the previous Thies First Class anemometer, which was rated the best of its kind according to the CLASSCUP / ACCUWIND Study, (Risø-R-1563-EN, Table 4-4).

It gives optimal dynamic performance with the following characteristics:

- High accuracy
- Minimal deviation from cosine line
- Excellent behaviour to turbulences
- Minimum overspeeding
- Small distance constant
- Low start up value
- Low power consumption
- Digital output

Measurement of power curves and site assessment reports are the main tasks for this instrument. The patented design is the result of long testing in the wind tunnel. The anemometer requires only low maintenance thanks to its low-inertia and ball-bearing cup star.

The sensor is designed for measuring the horizontal wind velocity in the fields of meteorology, climate research, site assessment, and the measurement of capacity characteristics of wind power systems (power curves).

For winter operation the anemometer is equipped with electronically regulated heating to guarantee smooth running of the ball bearings and prevent icing of shaft and slot.

Calibration

Wind speed is determined by the linear function of the frequency output f:

$$\text{wind speed [m/s]} = \text{slope [m]} \times f \text{ [Hz]} + \text{offset [m/s]}$$

Manufacturers instructions: Slope = 0.046 m, Offset = 0.21 m/s

For wind site assessment, anemometers have to be calibrated according to MEASNET in a wind tunnel to achieve highest accuracy. After calibration, use slope and offset values according to the calibration protocol.

Comparison of performance of anemometers

Cup anemometer	Class A	Class B	Information as stated acc. to CLASSCUP & ACCUWIND Study (Table 4-4 horizontal wsp definition Risø R-1563-EN)
NRG Class 1*	1.01	8.44	
Risø P2546**	1.31	6.18	
Vaisala WAA151	1.7	11.1	
Vector L100	1.8	4.5	
Thies First Class	1.5	2.9	
Thies First Class Advanced	0.9	3.0	IEC 61400-12-1 (2005-12) according to Deutsche WindGuard

* NRG Class 1 is a ball bearing version of NRG #40C. In 2012 DTU Wind Energy Department classified the anemometer acc. to ACCUWIND and IEC 61400-12-1.

** Classification from 2004 performed in FOI-LT5 wind tunnel, which is not MEASNET-certified.

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کد سفارش: دارای گرمکن / معمولی

Specification

Characteristics	
Physical functionality	Optically-scanned cup anemometer
Delivered signal	Frequency output (pulse)
Accuracy	
Accuracy	0.3 ... 50 m/s 1% of meas. value or < 0.2 m/s
Linearity	Correlation factor r between frequency f and wind speed y $y = 0.0462 \times f + 0.21$ typical $r > 0.99999$ (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) 3 m acc. to ISO 17713-1
Turbulent flow	Deviation Δv turbulent compared with stationary horizontal flow $-0.5\% < \Delta v < +2\%$ Frequency < 2 Hz
Inclined flow - mean deviation from cosinus line - Turbulence effect	< 0.1 % (in range of $\pm 20^\circ$) < 1 % (in the range up to 30% turbulence intensity)
Wind load	Approx. 100 N @ 75 m/s
Operating range	
Measuring range	0.3 ... 75 m/s
Survival speed	80 m/s (mind. 30 min)
Permissible ambient conditions	-50 ... +80 °C, all occurring situations of relative humidity
Electrical data	
Output signal	Form rectangle, 1082 Hz @ 50 m/s, supply voltage max. 15 V
Electrical supply for optoelec. scanning	Voltage: 3.3 ... 48 VDC (galvanic isolation from housing) Current: 0.3 mA @ 3.3 V (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. 48 VDC Power consumption: 25 W
General	
Connection	8-pole plug-connection for shielded cable in the shaft
Mounting	on mast tube R1"
Dimensions	290 x 240 mm
Fixing boring	35 x 25 mm
Weight	approx. 0.5 kg
Material	Housing: Anodised aluminium Cup star: Carbon-fibre-reinforced plastic
Type of bearings	Metallic ball bearings
Protection	IP 55 (DIN 40050)
Patent	EP 1 398 637 DE 103 27 632 EP 1 489 427
EMC	EN 61000-6-2:2001 (immunity) EN 55022:2001, Class B (interfering transmission)
Manufacturer	Thies

* applies only for S11100H (P6101H)

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کد سفارش: دارای گرمکن / معمولی

Sensor connection to Ammonit Meteo-40 data logger

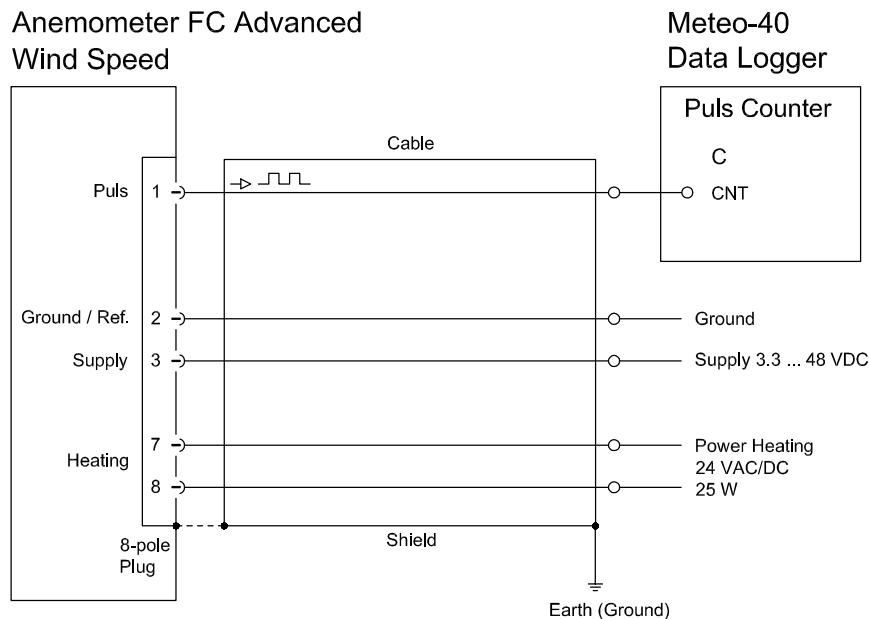
Sensor	Plug Pin No.	Ammonit Cable Wire Colour	Meteo-40 Counter	Supply Sensor
Wind speed Pulse output	1	white	CNT	
Supply	3	red		9 ... 36 V*
Ground	2	black		Main Ground
Heating	7	orange, orange		24 VAC/DC
	8	violet, violet		

* Supply voltage for usage with Meteo-40 data loggers.

Cable type without heating: LiYCY 3 x 0.25 mm²

Cable type with heating wires: LiYCY 7 x 0.25 mm²

Sensor connection diagram to Ammonit Meteo-40 data logger



Connection recommendations for the cable shield

Sensor carrier	Sensor	Shielding / Ground
Metallic met mast, grounded	Non-isolated mounting on the met mast (e.g. by using metallic brackets, holders, etc.)	Connect cable shield only at the side of the data logger to ground.
Metallic met mast, grounded	Isolated mounting at the met mast (e.g. by using non-metallic brackets, holder etc. or metallic brackets, holders etc. with isolated plastic adapters)	Connect cable shield at sensor plug and at the side of the data logger to ground.
Metallic met mast, non-grounded	Non-isolated mounting on the met mast (e.g. by using metallic brackets, holders etc.)	Connect cable shield at sensor plug and at the side of the data logger to ground.

Anemometer Thies First Class Advanced

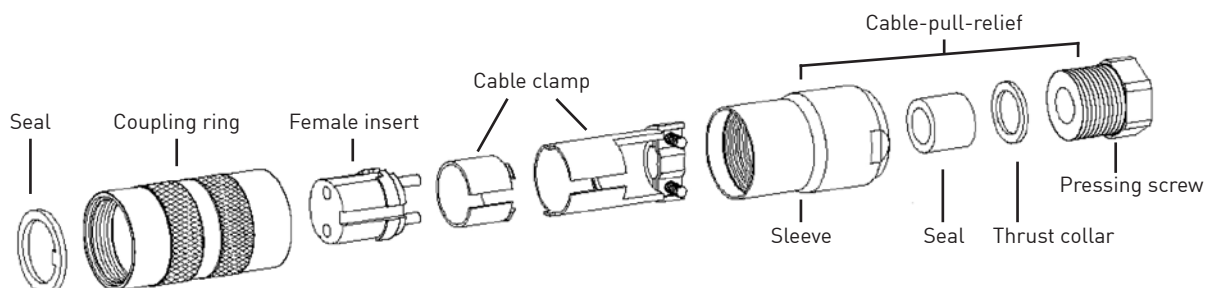
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Plug and cable assembly

Coupling socket, Type: Binder, Serial 423, EMC with cable clamp



Cable connection: WITH cable shield

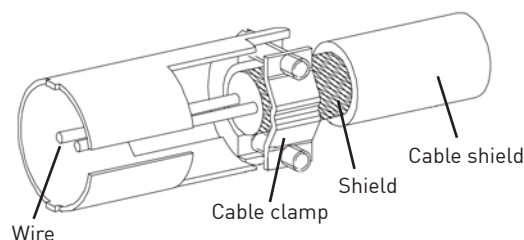
1. Stringing parts on cable acc. to plan given above.
2. Stripping cable sheath 20 mm
Cutting uncovered shield 15 mm
Stripping wire 5 mm

A) Putting shrink hose or insulation tape between wire and shield

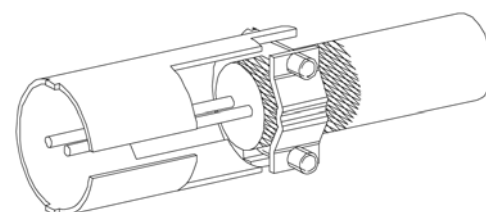
B) If cable diameter permits, put the shield backward on the cable sheath.

3. Soldering wire to the insert, positioning shield in cable clamp.
4. Screwing-on cable clamp.
5. Assembling remaining parts acc. to plan above.
6. Tightening pull-relief of cable by screw-wrench (SW16 and 17).

A)

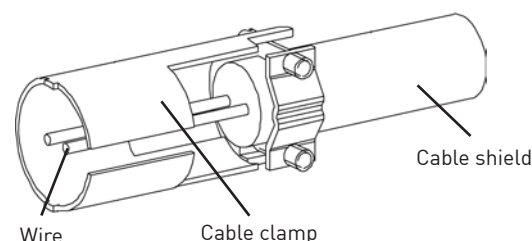


B)



Cable connection: WITHOUT cable shield

1. Stringing parts on cable acc. to plan given above.
2. Stringing cable sheath 20 mm
3. Cutting uncovered shield 20 mm
4. Stripping wire 5 mm
5. Soldering wire to the insert.
6. Positioning shield in cable clamp.
7. Screwing-on cable clamp.
8. Assembling remaining parts acc. to plan above.
9. Tightening pull-relief of cable by screw-wrench (SW 16 and 17).



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Abstract: Summary of cup anemometer classification

According to IEC 61400-12-1 [2005-12] Classification Scheme

Reference:

Deutsche WindGuard Wind Tunnel Services GmbH AK 08 1662.01

Measuring period: 09.2007 - 05.2008

Test site: Varel

Wind Tunnel: Deutsche WindGuard GmbH, Varel

Off Axis Response

According to:

WindGuard Calibration Procedure 04/2008

IEC 61400-12-1

Wind Turbine Power Performance Testing 2005-12

ISO 17713-1

Wind tunnel test methods for rotating anemometer performance 2007-05

Result:

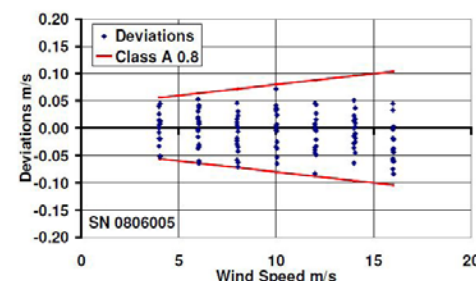
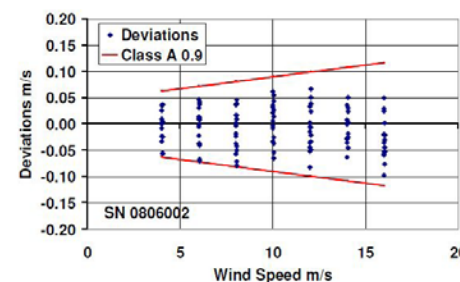
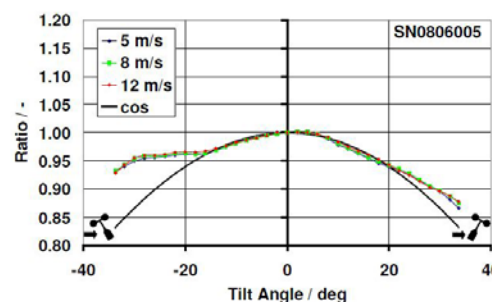
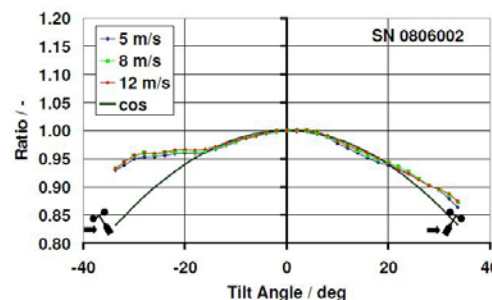
Figures showing the off axis response of Thies First Class for tunnel speed of 5 m/s, 8 m/s and 12 m/s.

Average deviation of cosine response 0.1 percent in the range of ± 16 degree.

Uncertainty in angle measurement: 0.2 deg

Uncertainty in zero tilt angle < 0.1 deg

Uncertainty due to wind tunnel < 0.1 m/s



Class A Classification

According to:

IEC 61400-12-1

Wind Turbine Power Performance Testing 2005-12

ACCUWIND - Method for Classification of Cup Anemometers Risø-P-1555

Influence parameter range:

Wind speed range:	V = 4 ... 16m/s
Turbulence intensity range:	0.003 - 0.12+0.48/V
Turbulence structure:	1.0/0.8/0.5
Air temperature:	0 ... +40°C
Air density:	0.8 ... 1.3kg/m ³
Flow angle:	-3 deg ... 3 deg
Wind simulation:	Kaimal wind spectrum with longitudinal turbulence length scale of 350m

Result:

Figures showing the calculated total measurement error of the Thies First Class Advanced anemometer taking into account all influencing parameters. Negative sign: underestimation of wind speed.

Classification Index: **A 0.9**

Source: Summary of Cup Anemometer Classification, Adolf Thies GmbH & Co.KG, Deutsche WindGuard GmbH, Varel, 2008.