



SOH Wind Engineering LLC

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CERTIFICATE FOR CALIBRATION OF CUP ANEMOMETER

Certificate number: 15.US2.06501

Date of issue: August 12, 2015

Type: Thies 4.3351.10.000

Serial number: 05156209

Manufacturer: ADOLF THIES GmbH & Co.KG, Hauptstrasse 76, 37083 Göttingen, Germany

Client: Renewable NRG Systems Inc, 110 Riggs Road, Hinesburg, VT 05461, USA

Anemometer received: August 10, 2015

Anemometer calibrated: 23:02 August 12, 2015

Calibrated by: laj

Procedure: MEASNET, IEC 61400-12-1:2005(E) Annex F

Certificate prepared by: Software Revision 6

Approved by: Calibration engineer, rds

Calibration equation obtained: $v \text{ [m/s]} = 0.04661 \cdot f \text{ [Hz]} + 0.20621$

Standard uncertainty, slope: 0.00169

Standard uncertainty, offset: 0.08465

Covariance: -0.0000013 (m/s)²/Hz

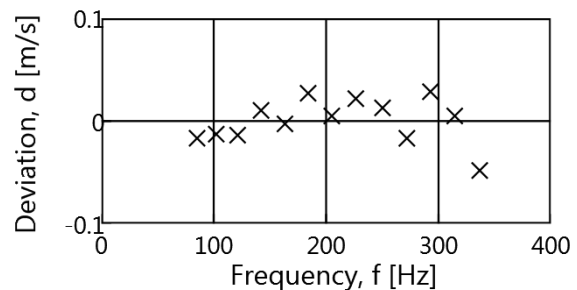
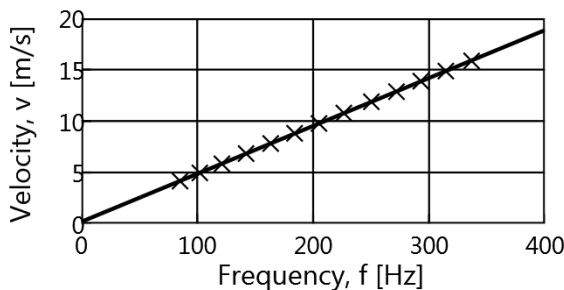
Coefficient of correlation: $\rho = 0.999984$

Absolute maximum deviation: 0.048 m/s at 15.847 m/s

Barometric pressure: 1000.3 hPa

Relative humidity: 56.2%

Succession	Velocity pressure, q, [Pa]	Temperature in wind tunnel [°C]	Temperature in d.p. box [°C]	Wind velocity, v, [m/s]	Frequency, f, [Hz]	Deviation, d, [m/s]	Uncertainty u_c (k=2) [m/s]
2	10.01	26.4	28.0	4.162	85.2281	-0.017	0.028
4	14.20	26.4	28.0	4.959	102.2516	-0.013	0.027
6	19.74	26.5	28.0	5.847	121.3081	-0.014	0.027
8	27.03	26.5	28.0	6.842	142.1385	0.010	0.029
10	35.30	26.5	27.9	7.819	163.3817	-0.003	0.032
12	44.81	26.5	27.9	8.810	184.0042	0.027	0.035
13-last	55.09	26.5	27.9	9.768	205.0316	0.005	0.038
11	67.11	26.5	27.9	10.782	226.4302	0.022	0.042
9	81.47	26.5	28.0	11.880	250.1782	0.013	0.046
7	95.47	26.5	28.0	12.860	271.8464	-0.017	0.049
5	111.24	26.4	28.0	13.881	292.7850	0.029	0.053
3	127.55	26.4	28.0	14.864	314.3739	0.005	0.056
1-first	144.99	26.3	28.0	15.847	336.5989	-0.048	0.060



EQUIPMENT USED

Serial Number	Description
Njord 2	Wind tunnel, blockage factor = 1.003
13924	Control cup anemometer
-	Mounting tube, D = 33.5 mm
TT002	Summit RT-AUI, wind tunnel
TP001	Summit RT-AUI, differential pressure box
DP008	Setra Model 239 pressure transducer
HY001	Dwyer Instruments RHP-2D20 humidity transmitter
BP002	Setra Model 278 barometer
PL3	Pitot tube
XB001	Computer Board. 16 bit A/D data acquisition board
66GSPS1	PC dedicated to data acquisition

Traceable calibrations of the equipment are carried out by external accredited institutions: Atlantic Scale, & Furness Controls. A real-time analysis module within the data acquisition software detects pulse frequency.

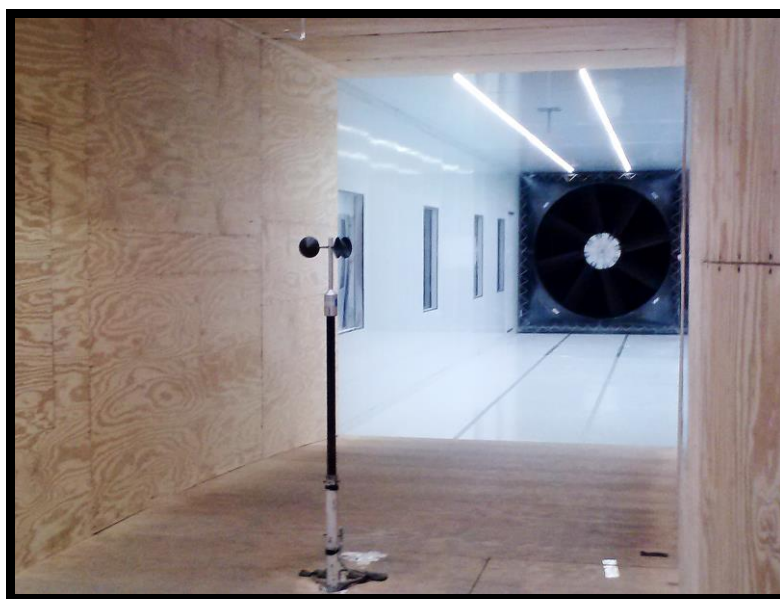


Photo of the wind tunnel setup. The cross-sectional area is 2.5 x 2.5 m.

UNCERTAINTIES

The documented uncertainty is the total combined uncertainty at 95% confidence level ($k=2$) in accordance with EA-4/02. The uncertainty at 10 m/s comply with the requirements in the IEC 61400-12-1:2005 procedure. See Document US.12.01.004 for further details.

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