



SOH Wind Engineering LLC

141 Leroy Road · Williston, VT 05495 · USA

Tel 802.316.4368 · Fax 802.735.9106 · www.sohwind.com

CERTIFICATE FOR CALIBRATION OF CUP ANEMOMETER

Certificate number: 19.US2.08727

Date of issue: September 27, 2019

Type: NRG S1

Serial number: 94120000143

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

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

Anemometer received: September 26, 2019

Anemometer calibrated: September 26, 2019

Calibrated by: SMR

Procedure: MEASNET, IEC 61400-12-1:2017 Annex F

Certificate prepared by: RDS

Approved by: Calibration engineer, RDS

Calibration equation obtained: $v \text{ [m/s]} = 0.09369 \cdot f \text{ [Hz]} + 0.11031$

Standard uncertainty, slope: 0.00172

Standard uncertainty, offset: 0.16469

Covariance: -0.0000027 (m/s)²/Hz

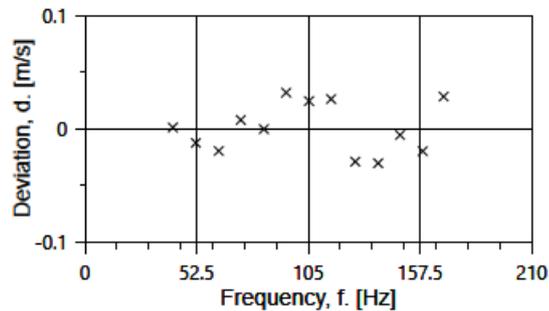
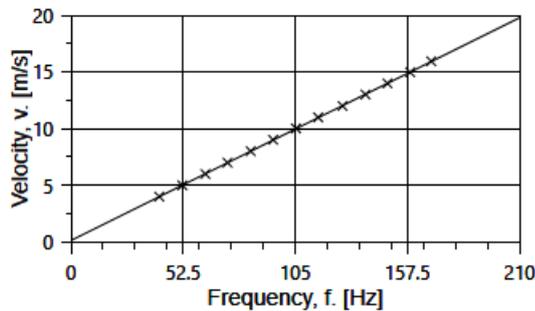
Coefficient of correlation: $\rho = 0.999984$

Absolute maximum deviation: 0.032 m/s at 9.009 m/s

Barometric pressure: 993.8 hPa

Relative humidity: 42.7%

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 $u_c \text{ (k=2)}$ [m/s]
2	9.08	27.5	30.2	3.982	41.3162	0.001	0.023
4	14.21	27.5	30.2	4.981	52.1228	-0.013	0.026
6	20.51	27.4	30.2	5.985	62.9136	-0.020	0.030
8	27.93	27.4	30.2	6.984	73.2804	0.008	0.034
10	36.59	27.3	30.2	7.993	84.1368	-0.001	0.038
12	46.49	27.3	30.2	9.009	94.6450	0.032	0.043
13-last	57.34	27.3	30.2	10.006	105.3584	0.024	0.047
11	69.08	27.3	30.2	10.983	115.7652	0.026	0.051
9	82.36	27.4	30.2	11.992	127.1313	-0.029	0.056
7	96.74	27.4	30.2	12.999	137.8908	-0.031	0.060
5	112.00	27.4	30.2	13.988	148.1864	-0.006	0.064
3	128.27	27.5	30.2	14.971	158.8322	-0.020	0.068
1-first	145.41	27.5	30.2	15.941	168.6685	0.028	0.072



EQUIPMENT USED

Serial Number	Description
Njord2	Wind tunnel, blockage factor = 1.002
13924	Control cup anemometer
-	Mounting tube, D = 25 mm
TT003	Summit Electronics, 1XPT100, 0-10V Output, wind tunnel temp.
TP001	PR Electronics 5102, 0-10V Output, differential pressure box temp.
DP008	Setra Model 239, 0-1inWC, differential pressure transducer
HY003	Dwyer RHP-2D20, 0-10V Output, humidity transmitter
BP003	Setra M278, 0-5VDC Output, barometer
PL3	Pitot tube
XB001	Computer Board. 16 bit A/D data acquisition board
Njord2-PC	PC dedicated to data acquisition

The accuracies of all measurements were traceable to the SI through NIST or CIPM recognized NMI's. A real-time analysis module within the data acquisition software detects pulse frequency.



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

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.

COMMENTS

(none)

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The results on this certificate relate only to the serial number listed.
All calibrations are done in the "As Left" condition unless otherwise noted.

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