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WIND
ENGINEERING
FLUID
DYNAMICS

CERTIFICATE FOR CALIBRATION OF CUP ANEMOMETER

Certificate number: 15.02.03124 **Date of issue:** April 27, 2015

Type: WindSensor P2546C-OPR Cup Anemometer **Serial number:** 34525

Manufacturer: WindSensor, Nyvang 6, DK-4000 Roskilde, Denmark

Client: WindSensor, Nyvang 6, DK-4000 Roskilde, Denmark

Anemometer received: April 24, 2015 **Anemometer calibrated:** April 25, 2015

Calibrated by: apo **Procedure:** MEASNET, referring to IEC 61400-12-1

Certificate prepared by: cea **Approved by:** Calibration engineer, aht

Anders Holtze Thomsen

Calibration equation obtained: v [m/s] = 0.62163 · f [Hz] + 0.22495

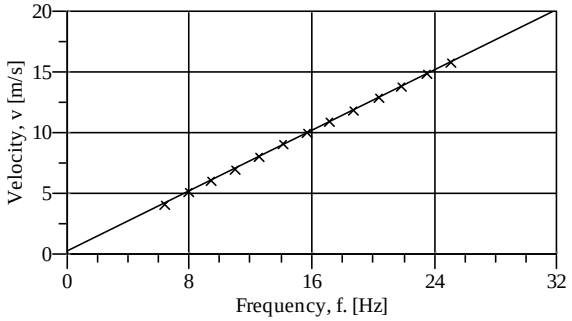
Standard uncertainty, slope: 0.00134 **Standard uncertainty, offset:** 0.06194

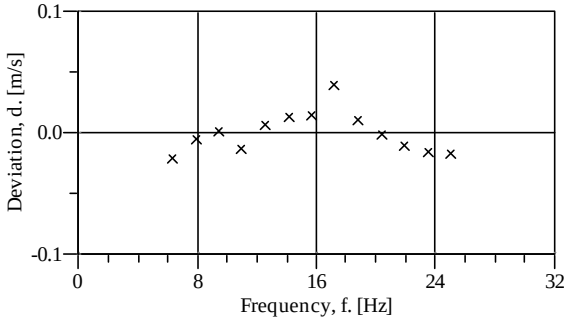
Covariance: -0.0000109 (m/s)²/Hz **Coefficient of correlation:** $\rho = 0.999990$

Absolute maximum deviation: 0.039 m/s at 10.923 m/s

Barometric pressure: 1002.7 hPa **Relative humidity:** 22.0%

Succession	Velocity pressure, q. [Pa]	Temperature in wind tunnel [°C]	control room [°C]	Wind velocity, v. [m/s]	Frequency, f. [Hz]	Deviation, d. [m/s]	Uncertainty u_c (k=2) [m/s]
2	9.68	34.5	24.1	4.139	6.3308	-0.022	0.021
4	14.88	34.4	24.1	5.130	7.8997	-0.006	0.025
6	20.85	34.3	24.1	6.072	9.4035	0.001	0.029
8	27.83	34.2	24.1	7.014	10.9430	-0.014	0.033
10	36.46	34.1	24.1	8.028	12.5422	0.006	0.037
12	46.01	34.0	24.0	9.017	14.1220	0.013	0.042
13-last	56.15	34.0	24.0	9.960	15.6375	0.015	0.046
11	67.52	34.1	24.0	10.923	17.1471	0.039	0.051
9	80.01	34.1	24.1	11.892	18.7519	0.011	0.055
7	94.03	34.2	24.1	12.894	20.3809	-0.001	0.060
5	107.95	34.3	24.1	13.817	21.8822	-0.011	0.064
3	124.08	34.4	24.1	14.815	23.4978	-0.016	0.069
1-first	140.69	34.6	24.1	15.781	25.0512	-0.016	0.073





Accreditation to ISO 17025

CAL Reg.nr. 452

EQUIPMENT USED

Serial number	Description
-	Boundary layer wind tunnel.
1256	Control cup anemometer.
-	Mounting tube, D = 25 mm
t1	PT100 temperature sensor, wind tunnel.
t2	PT100 temperature sensor, control room.
9904031	PPC500 Furness pressure manometer
X4650038	HMW71U Humidity transmitter
X4350042	PTB100AVaisala analogue barometer.
PS1	Pitot tube
HB2835279	Computer Board. 16 bit A/D data acquisition board.
-	PC dedicated to data acquisition.

Traceable calibrations of the equipment are carried out by external accredited institutions: Furness (PPC500) and Exova Metech. A real-time analysis module within the data acquisition software detects pulse frequency.

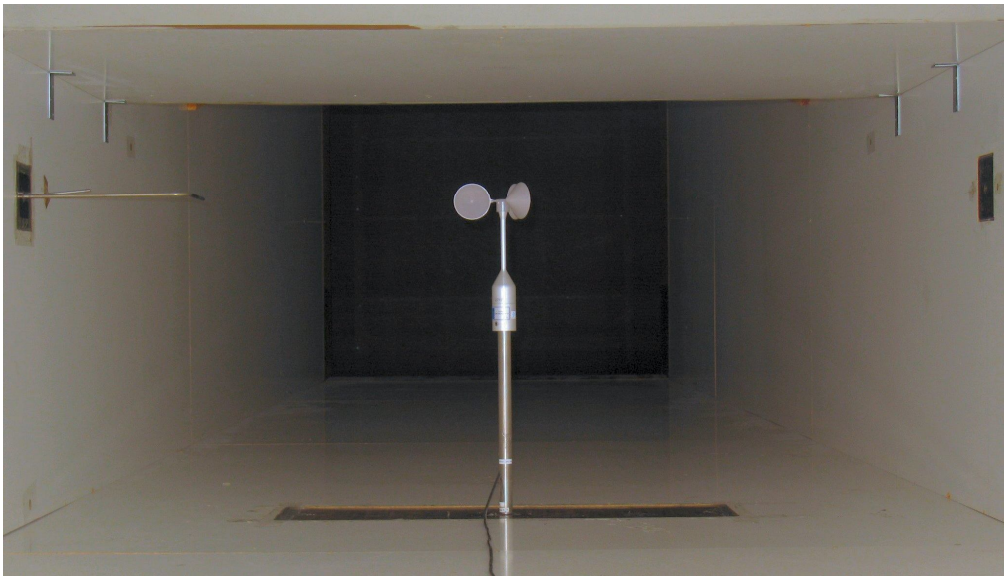


Photo of the wind tunnel setup (hxb = 0.85x1.75 m). The shown anemometer is of the same type as the calibrated one.

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 MEASNET procedure that prescribes an absolute uncertainty less than 0.1 m/s at a mean wind velocity of 10 m/s, that is 1%. See Document 97.00.004 “MEASNET - Test report on the calibration campaign” for further details.

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