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D-K-15140-01-00

Calibration certificate
Kalibrierschein

Calibration mark
Kalibrierzeichen

1820663
D-K-
15140-01-00
02/2018

Object <i>Gegenstand</i>	Combined Wind Sensor
Manufacturer <i>Hersteller</i>	BARANI DESIGN, s.r.o. Slovakia
Type <i>Typ</i>	MeteoWind 2
Serial number <i>Fabrikat/Serien-Nr.</i>	1063059739
Customer <i>Auftraggeber</i>	BARANI DESIGN, s.r.o. Slovakia
Order No. <i>Auftragsnummer</i>	Email 2018-02-26, Barani
Project No. <i>Projektnummer</i>	VT180310
Number of pages <i>Anzahl der Seiten</i>	4
Date of Calibration <i>Datum der Kalibrierung</i>	28.02.2018

This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).

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Date
Datum
28.02.2018

Head of the calibration laboratory
Leiter des Kalibrierlaboratoriums

Dipl. Phys. Dieter Westermann

Person in charge
Bearbeiter

Heiko Westermann, B. Sc.

Calibration object
Kalibriergegenstand

Combined Wind Sensor

Calibration procedure
Kalibrierverfahren

• Deutsche WindGuard Wind Tunnel Services: VA Anemometerkalibrierung - D5831 Version 13

Based on following standards:

- MEASNET ANEMOMETER CALIBRATION PROCEDURE Version 2 / 2009
- IEC 61400-12-1:2017 Power performance measurements of electricity producing wind turbines
- IEC 61400-12-2:2013 Power performance of electricity producing wind turbines based on nacelle anemometry
- ISO 3966:2008 Measurement of fluid in closed conduits
- ISO 16622:2002 Meteorology - Sonic anemometers/thermometers

Place of calibration
Ort der Kalibrierung

Wind tunnel of Deutsche WindGuard WindTunnel Services GmbH, Varel

Test conditions
Messbedingungen

wind tunnel area	10000 cm ²
anemometer frontal area	200 cm ²
diameter of mounting pipe	34 mm EN 10217
blockage ratio ¹⁾	0.020 [-]
software version	7.7

¹⁾ Due to the special construction of the test section no blockage correction is necessary.

Ambient conditions
Umgebungsbedingungen

air temperature	19.6 °C ± 0.1 °C
air pressure	1027.7 hPa ± 0.3 hPa
relative air humidity	24.9 % ± 2.0 %

Measurement uncertainty
Messunsicherheit

The expanded uncertainty assigned to the measurement results is obtained by multiplying the standard uncertainty by the coverage factor $k=2$. It has been determined in accordance with DAkkS-DKD-3. The value of the measurand lies within the assigned range of values with a probability of 95%.

The reference flow speed measurement is traceable to the German NMI (Physikalisch-Technische Bundesanstalt) standard for flow speed. It is realized by using a PTB owned and calibrated Laser Doppler Anemometer (Standard Uncertainty 0.2 %, $k=2$)

Additional remarks
Zusätzliche Anmerkungen

Orientation: 0°

Calibration result
Kalibrierergebnis

Sensor m/s	Tunnel Speed m/s	Uncertainty m/s
4.006	3.951	0.050
6.037	6.021	0.050
7.967	7.976	0.051
9.920	9.945	0.051
12.067	12.018	0.052
13.988	13.998	0.052
16.039	16.034	0.050
15.027	14.999	0.053
12.984	12.986	0.051
10.956	10.973	0.051
8.950	8.972	0.051
7.063	7.054	0.051
5.044	5.031	0.050

Statistical analysis

Slope 1.00129 (m/s)/(m/s) ±0.00192 (m/s)/(m/s)
 Offset -0.0199 m/s ±0.021 m/s
 Standard error (Y) 0.028 m/s
 Correlation coefficient 0.99998

Remarks

The calibrated sensor complies with the demanded linearity of MEASNET



Graphical representation of the result
Grafische Darstellung des Ergebnisses

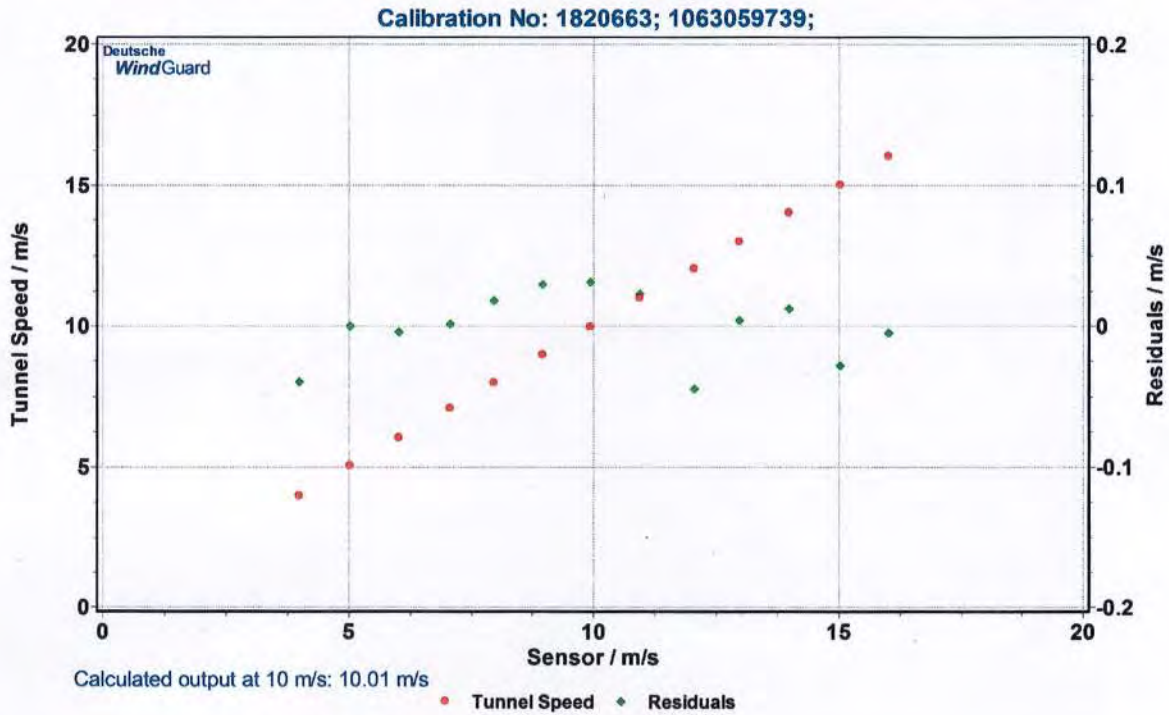


Photo of the measurement setup
Foto des Messaufbaus



Remark: The proportions of the set-up may not be true to scale due to imaging geometry.