Deutsche WindGuard
Wind Tunnel Services GmbH, Varel

DEUTSCHE WINDGUARD

accredited by the / *akkreditiert durch die*

Deutsche Akkreditierungsstelle GmbH

as calibration laboratory in the / *als Kalibrierlaboratorium im*

Deutschen Kalibrierdienst

DKD

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-K-15140-01-00

1522485
D-K-15140-01-00
07/2015

Calibration certificate
Kalibrierschein

Calibration mark
Kalibrierzeichen

Object *Gegenstand*	3D Sonic Anemometer
Manufacturer *Hersteller*	Gill Instruments UK-Hampshire S041 9EG
Type *Typ*	1590-PK-020
Serial number *Fabrikat/Serien-Nr.*	Y152201
Customer *Auftraggeber*	Gill Instruments UK-Hampshire S041 9EG
Order No. *Auftragsnummer*	M42664
Project No. *Projektnummer*	VT150742
Number of pages *Anzahl der Seiten*	5
Date of Calibration *Datum der Kalibrierung*	31.07.2015

This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).
The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.
The user is obliged to have the object recalibrated at appropriate intervals.
Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).
Die DAkkS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

Date *Datum*	Head of the calibration laboratory *Leiter des Kalibrierlaboratoriums*	Person in charge *Bearbeiter*
17.08.2015	Dipl. Phys. Dieter Westermann	Dipl.-Ing. (FH) Catharina Herold

Calibration object *Kalibriergegenstand*	3D Sonic Anemometer
Calibration procedure *Kalibrierverfahren*	• Deutsche WindGuard Wind Tunnel Services: Calibration of anemometers; Version 1.0 (2014) Based on following standards: • MEASNET: Anemometer calibration procedure • IEC 61400-12-1: Power performance measurements of electricity producing wind turbines • IEC 61400-12-2: Power performance of electricity producing wind turbines based on nacelle anemometry • ISO 3966: Measurement of fluid in closed conduits • ISO 16622: Meteorology - Sonic anemometers/thermometers
Place of calibration *Ort der Kalibrierung*	Windtunnel of Deutsche WindGuard WindTunnel Servies GmbH, Varel

Test conditions
Messbedingungen

wind tunnel area	10000 cm²
anemometer frontal area	220 cm²
diameter of mounting pipe	50 mm
blockage ratio [1)]	0.022 [-]
software version	7.64

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

Ambient conditions
Umgebungsbedingungen

air temperature	23.2 °C ± 0.1 °C
air pressure	1019.4 hPa ± 0.3 hPa
relative air humidity	57.6 % ± 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)
Latest accreditation *Letzte Akkreditierung*	04/2014
Additional remarks *Zusätzliche Anmerkungen*	Orientation: 180°

Calibration result
Kalibrierergebnis

Sensor v_hor	Sensor dir	Sensor v_vert	Tunnel speed	Uncertainty (k=2)
m/s	deg	m/s	m/s	m/s
3.948	180.787	-0.010	3.953	0.050
5.876	180.169	-0.022	5.893	0.050
7.869	180.363	-0.026	7.890	0.050
9.809	180.506	-0.025	9.842	0.050
11.796	180.825	-0.023	11.848	0.050
13.701	180.831	-0.015	13.769	0.050
15.650	181.000	-0.002	15.739	0.050
14.714	180.963	-0.006	14.803	0.050
12.749	180.975	-0.022	12.817	0.050
10.761	180.688	-0.026	10.813	0.050
8.840	180.525	-0.025	8.878	0.050
6.889	180.131	-0.024	6.919	0.050
4.880	180.381	-0.017	4.903	0.050

File: 1522485

Linear regression analysis	Slope	1.00687 (m/s)/(m/s) ±0.00056 (m/s)/(m/s)
	Offset	-0.0224 m/s ±0.006 m/s
	Standard error (Y)	0.008 m/s
	Correlation coefficient	0.999998

Remarks The calibrated sensor complies with the demanded linearity of MEASNET

Graphical representation of the result
Grafische Darstellung des Ergebnises

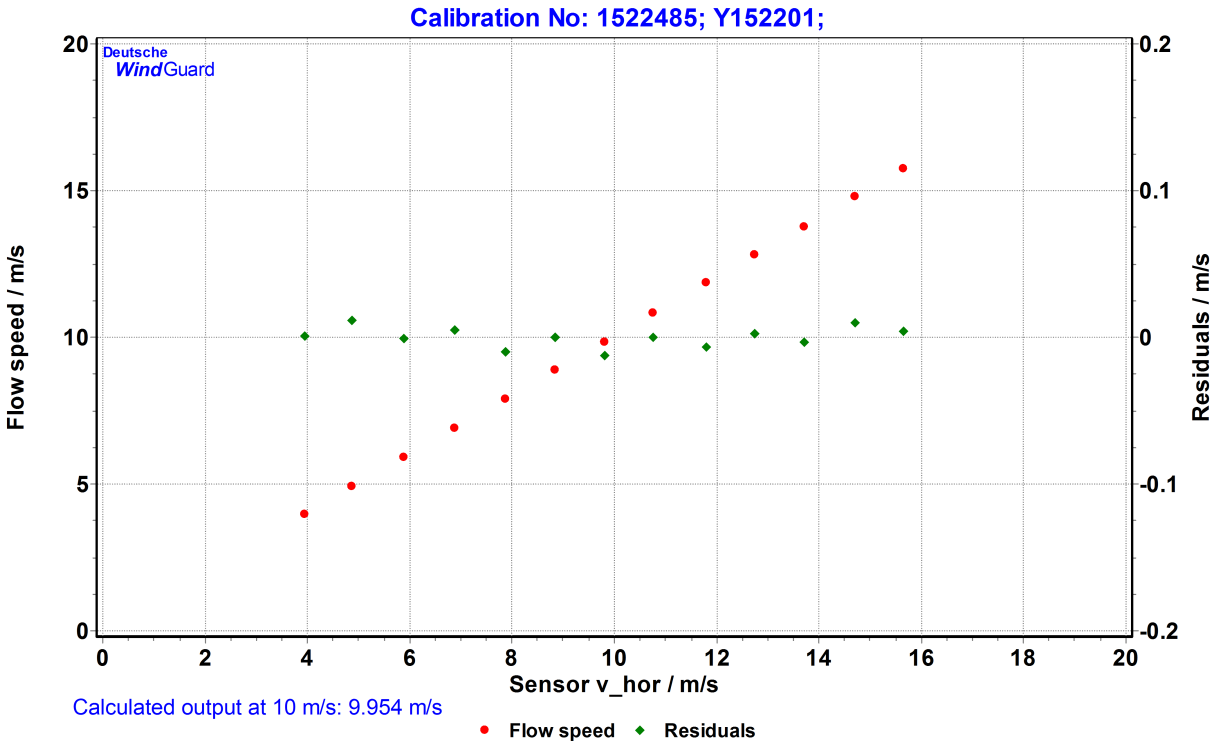

Photo of the measurement setup
Foto des Messaufbaus

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

Sensor config during calibration
Sensorkonfiguration während der Kalibrierung

D1

D1

Y152201

D2

D2

2329-601-03

D3

D3

M2,U1,O1,L1,P5,B4,H1,NQ,E1,T1,S1,C2,A1,I1,J1,V1,X1,G0,K50,

D7

D7

NO DAC AVAILABLE