DEUTSCHE WINDGUARD

IECRE and MEASNET approved test laboratory

Calibration Certificate / *Kalibrierschein*

issued by the calibration laboratory / *erstellt durch das Kalibrierlaboratorium*

Deutsche WindGuard Wind Tunnel Services GmbH

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

Member of / *Mitglied im*

Deutschen Kalibrierdienst

DKD

Calibration certificate *Kalibrierschein*	Calibration mark *Kalibrierzeichen*	2121063 D-K-15140-01-00 04/2021

Object *Gegenstand*	3D Sonic Anemometer
Manufacturer *Hersteller*	Gill Instruments UK-Hampshire S041 9EG
Type *Typ*	1590-PK-020/W
Serial number *Fabrikat/Serien-Nr.*	211101
Customer *Auftraggeber*	Gill Instruments UK-Hampshire S041 9EG
Order No. *Auftragsnummer*	M52803
Project No. *Projektnummer*	VT210334
Number of pages *Anzahl der Seiten*	5
Date of Calibration *Datum der Kalibrierung*	06.04.2021

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 presented results relate only to the calibrated object. 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. Die dargestellten Ergebnisse beziehen sich nur auf den kalibrierten Gegenstand. 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*
06.04.2021	Dipl. Phys. Dieter Westermann	Kai Schuster, B. Eng.

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Calibration object
Kalibriergegenstand

3D Sonic Anemometer

Calibration procedure
Kalibrierverfahren

IEC 61400-12-1:2017

Place of calibration
Ort der Kalibrierung

Wind tunnel 2 of Deutsche WindGuard Wind Tunnel Services GmbH, Varel

Test conditions
Messbedingungen

wind tunnel area	10000 cm²
anemometer frontal area	220 cm²
diameter of mounting pipe	0.0 mm no mounting
blockage ratio [1)]	0.022 [-]
software version	9.1.0

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

Ambient conditions
Umgebungsbedingungen

air temperature	(20.7 ± 0.4) °C – (21.0 ± 0.4) °C
air pressure	(1005.9 ± 0.4) hPa – (1006.2 ± 0.4) hPa
relative air humidity	(29.7 ± 5.0) % – (30.0 ± 5.0) %

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 EA-4/02 M: 2013. 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: 180°
North alignment via transducer support arm

Revision
Revision

0

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Calibration result
Kalibrierergebnis

Reference Air velocity m/s	Combined Unc m/s	Test item Speed m/s	Test item Direction deg	Test item Vertical m/s
3.903	0.040	3.847	180.000	-0.032
5.909	0.040	5.824	180.000	-0.051
7.971	0.040	7.865	180.000	-0.071
9.983	0.040	9.852	180.000	-0.080
12.011	0.048	11.848	180.000	-0.081
13.944	0.056	13.741	180.000	-0.085
15.979	0.064	15.741	180.000	-0.087
15.048	0.060	14.823	180.000	-0.085
13.006	0.052	12.813	180.000	-0.086
10.987	0.044	10.831	180.000	-0.082
8.952	0.040	8.823	180.000	-0.071
6.950	0.040	6.844	180.000	-0.059
4.910	0.040	4.821	180.000	-0.047

Statistical analysis		
	Slope	1.01463 (m/s)/(m/s) ±0.00067 (m/s)/(m/s)
	Offset	0.0010 m/s ±0.007 m/s
	Standard error (Y)	0.010 m/s
	Correlation coefficient	0.999998

Remarks The calibrated sensor complies with the demanded linearity of MEASNET

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Graphical representation of the result
Grafische Darstellung des Ergebnisses

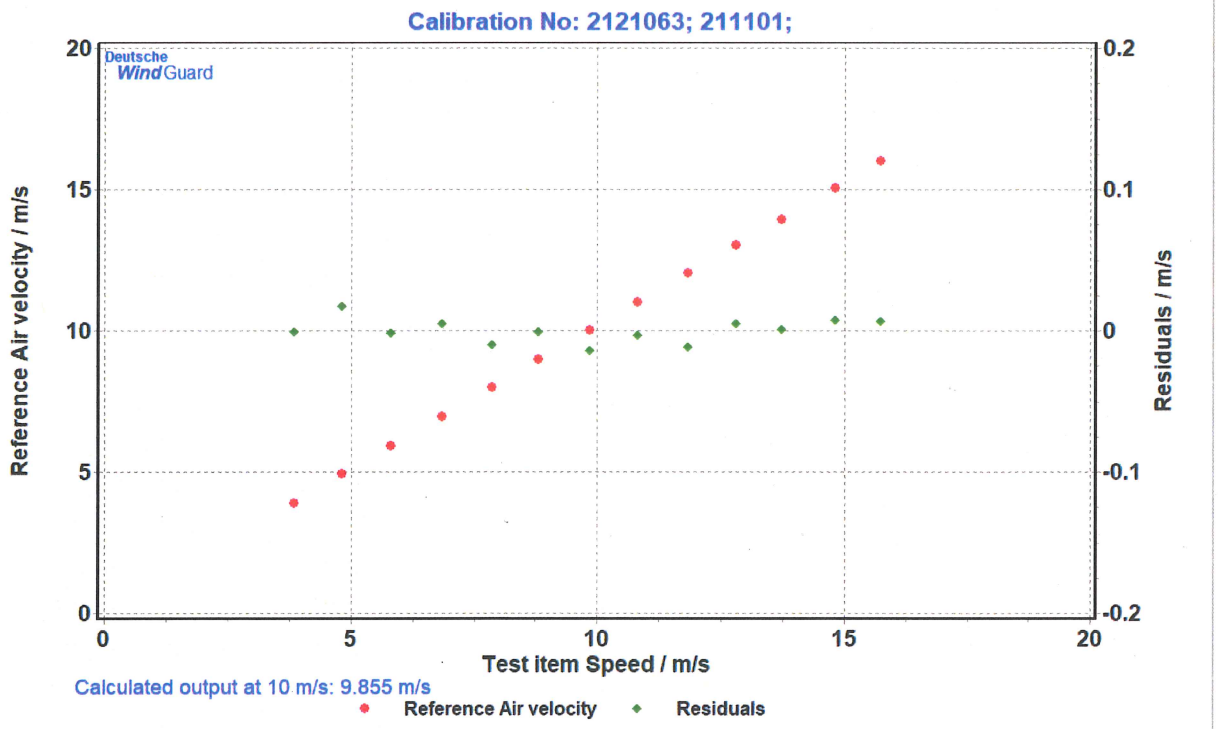
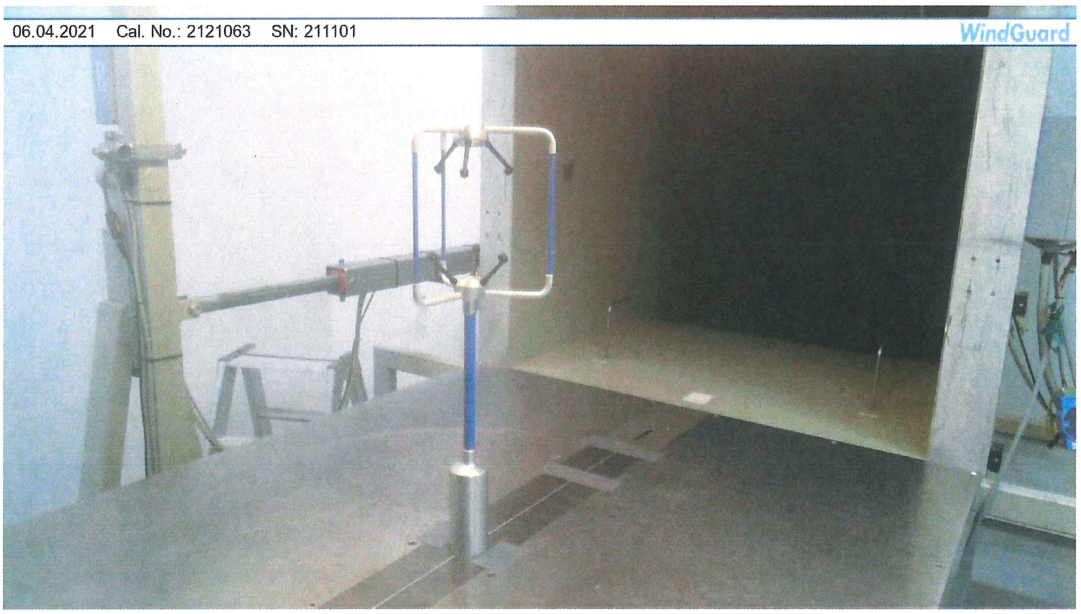


Photo of the measurement setup
Foto des Messaufbaus



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

Sensor config during calibration
Sensorkonfiguration während der Kalibrierung

Serial Number : W211101

---- SW VERSION ----------

Anemometer Firmware Version: 2329-701

---- HW DETAILS OF ANEMOMETER ----------

Detected Anemometer Class : WindMaster 20Mhz

Number of AXIS on this unit : 3

DAC resolution of attached unit : 12

Number of DAC channels : 0

Maximum sampling rate : (8) P8 20 Hz

---- USER CONFIGURATION OF ANEMOMETER ----------

Baud Rate : 19200

Output Message Format : M2 Polar

Output Message Velocity Units : m/s

Output Message Terminator : <cr><lf>

Retries : ON

Instantaneous Sampling : OFF

Factory Calibration : ON

Physical Communications : Auto

Resolution settings : Normal resolution

Alignment settings : North to spar

Averaging settings : Averaging inactive

Output rate : P1 1 Hz

Polar angle minimum magnitude: 0.050 m/s

Power-On Message : Display Power On Message

ASCII Format : Comma Separated (CSV)

SOS and Sonic Temperature display : Neither

Analogue output scaling : 5m/s

Unit Identifier : 'Q'

Synchronised Polling : Off

- End of document / Ende des Dokuments -

Test Report issued under the responsibility of:

DEUTSCHE WINDGUARD

TEST REPORT
IEC 61400-12-1 Annex F
Anemometer Calibration Certificate

IECRE Report Number. ..... :	**IECRE.WE.TR.AC.21-19007-R0**
RETL Calibration Certificate. ..... :	**2121063**
Date of issue ..... :	**06.04.2021**
RE Testing Laboratory..... : (Name & Address)	**Deutsche WindGuard Wind Tunnel Services GmbH** **D-26316 Varel**
Applicant .....: (Name & Address)	**Gill Instruments** **UK-Hampshire S041 9EG**
Test item description .....:	**3D Sonic Anemometer**
Manufacturer.....:	**Gill Instruments**
Model/Type reference .....:	**1590-PK-020/W**
Ratings / Serial number .....:	**211101**
Tested by (name, function, signature) .....:	Printed name/function: **Kai Schuster, B. Eng.** **Operator** Signature: Schuster
Approved by (name, function, signature) .....:	Printed name/function: **Dipl. Phys. Dieter Westermann** **Head of calibration laboratory** Signature: D. Westermann

This report is not valid as a Test Report unless signed by an approved RE Testing Laboratory.

General disclaimer:

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