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Deutsche
Akkreditierungsstelle
D-K-15140-01-00

Calibration certificate
Kalibrierschein

Calibration mark
Kalibrierzeichen

| |
|-------------|
| 1922657 |
| D-K- |
| 15140-01-00 |
| 08/2019 |

| | |
|---|-----------------------------------|
| Object <i>Gegenstand</i> | Combined Wind Sensor |
| Manufacturer <i>Hersteller</i> | BARANI DESIGN, s.r.o. Slovakia |
| Type <i>Typ</i> | METEOWIND COMPACT |
| Serial number <i>Fabrikat/Serien-Nr.</i> | BW190811001 |
| Customer <i>Auftraggeber</i> | BARANI DESIGN, s.r.o. Slovakia |
| Order No. <i>Auftragsnummer</i> | Email 2019-07-30, Barani |
| Project No. <i>Projektnummer</i> | VT190709 |
| Number of pages <i>Anzahl der Seiten</i> | 5 |
| Date of Calibration <i>Datum der Kalibrierung</i> | 26.08.2019 |

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.

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Date
Datum

02.09.2019

Head of the calibration laboratory
Leiter des Kalibrierlaboratoriums

Dipl. Phys. Dieter Westermann

Person in charge
Bearbeiter

Alina Roß, M. Sc.

Calibration object
Kalibriergegenstand

Combined Wind Sensor

Calibration procedure
Kalibrierverfahren

VA Calibration of wind sensors at non horizontal air flow (D5832 Version 2)

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 | 20.0 mm |
| blockage ratio ¹⁾ | 0.020 [-] |
| software version | P_8.0.03 |

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

Ambient conditions
Umgebungsbedingungen

| | |
|-----------------------|----------------------|
| air temperature | 26.7 °C ± 0.1 °C |
| air pressure | 1018.1 hPa ± 0.3 hPa |
| relative air humidity | 62.0 % ± 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: 180°
Mount is unstable under wind load

Revision
Revision

0

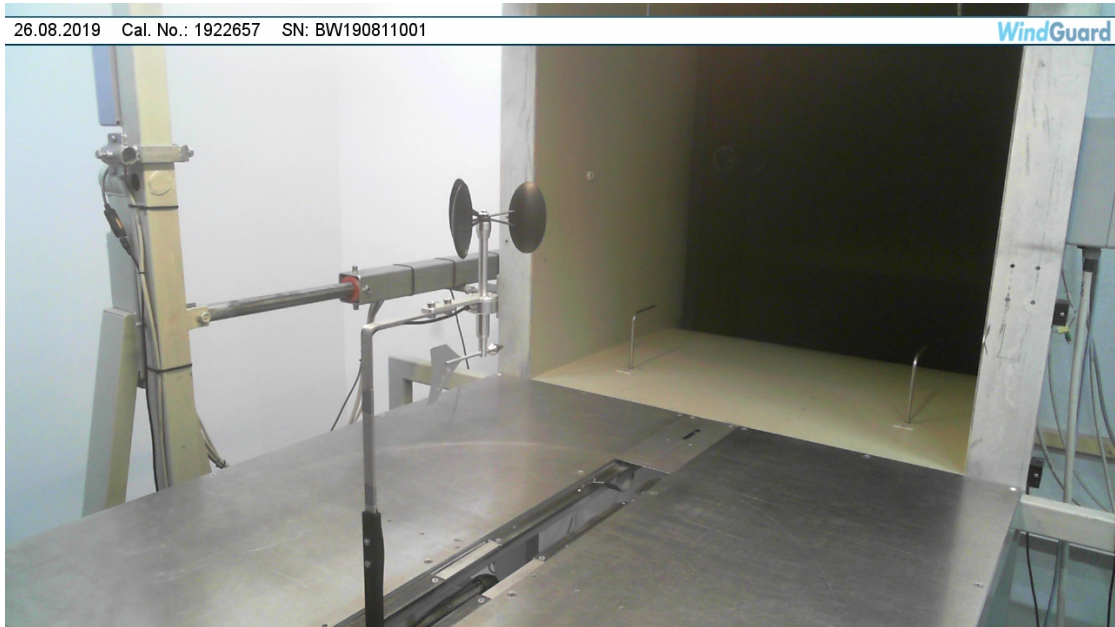
Calibration result (1/2)
Kalibrierergebnis (1/2)

| Reference Tilt Angle deg | Reference UNC deg | Test item Speed Hz | Reference Air velocity m/s | Reference Unc m/s | Test item Direction V |
|--------------------------------|-------------------------|--------------------------|----------------------------------|-------------------------|-----------------------------|
| -30.29 | 0.2 | 10.392 | 7.832 | 0.05 | 1.232 |
| -27.99 | 0.2 | 10.562 | 7.832 | 0.05 | 1.233 |
| -25.98 | 0.2 | 10.670 | 7.831 | 0.05 | 1.233 |
| -23.99 | 0.2 | 10.795 | 7.833 | 0.05 | 1.234 |
| -22.00 | 0.2 | 10.930 | 7.829 | 0.05 | 1.233 |
| -20.00 | 0.2 | 11.041 | 7.829 | 0.05 | 1.233 |
| -18.00 | 0.2 | 11.162 | 7.829 | 0.05 | 1.232 |
| -16.00 | 0.2 | 11.287 | 7.831 | 0.05 | 1.232 |
| -14.01 | 0.2 | 11.430 | 7.828 | 0.05 | 1.231 |
| -12.01 | 0.2 | 11.538 | 7.828 | 0.05 | 1.230 |
| -10.00 | 0.2 | 11.574 | 7.828 | 0.05 | 1.231 |
| -8.00 | 0.2 | 11.570 | 7.828 | 0.05 | 1.230 |
| -6.00 | 0.2 | 11.580 | 7.829 | 0.05 | 1.229 |
| -4.26 | 0.2 | 11.589 | 7.827 | 0.05 | 1.229 |
| -3.01 | 0.2 | 11.572 | 7.828 | 0.05 | 1.228 |
| -2.00 | 0.2 | 11.596 | 7.828 | 0.05 | 1.229 |
| -1.00 | 0.2 | 11.642 | 7.827 | 0.05 | 1.229 |
| -0.01 | 0.2 | 11.648 | 7.826 | 0.05 | 1.230 |
| 1.01 | 0.2 | 11.646 | 7.827 | 0.05 | 1.226 |
| 2.01 | 0.2 | 11.708 | 7.828 | 0.05 | 1.226 |
| 3.01 | 0.2 | 11.761 | 7.829 | 0.05 | 1.226 |
| 4.24 | 0.2 | 11.733 | 7.825 | 0.05 | 1.226 |
| 5.98 | 0.2 | 11.821 | 7.825 | 0.05 | 1.226 |
| 7.99 | 0.2 | 11.807 | 7.823 | 0.05 | 1.226 |
| 10.00 | 0.2 | 11.794 | 7.825 | 0.05 | 1.226 |
| 12.00 | 0.2 | 11.724 | 7.822 | 0.05 | 1.226 |
| 14.00 | 0.2 | 11.653 | 7.825 | 0.05 | 1.226 |
| 16.01 | 0.2 | 11.592 | 7.827 | 0.05 | 1.226 |
| 18.00 | 0.2 | 11.511 | 7.827 | 0.05 | 1.226 |
| 19.98 | 0.2 | 11.389 | 7.824 | 0.05 | 1.226 |
| 22.00 | 0.2 | 11.245 | 7.828 | 0.05 | 1.226 |

Calibration result (2/2)
Kalibrierergebnis (2/2)

| Reference | Reference | Test item | Reference | Reference | Test item |
|------------|-----------|-----------|--------------|-----------|-----------|
| Tilt Angle | UNC | Speed | Air velocity | Unc | Direction |
| deg | deg | Hz | m/s | m/s | V |
| 23.98 | 0.2 | 11.102 | 7.827 | 0.05 | 1.226 |
| 25.97 | 0.2 | 11.000 | 7.828 | 0.05 | 1.226 |
| 27.98 | 0.2 | 10.867 | 7.831 | 0.05 | 1.225 |
| 30.05 | 0.2 | 10.683 | 7.832 | 0.05 | 1.225 |

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.

- End of document / Ende des Dokuments -