

G. LUFFT Mess- und Regeltechnik GmbH

akkreditiert durch die / accredited by the

Deutsche Akkreditierungsstelle GmbH

als Kalibrierlaboratorium im / as calibration laboratory in the

Deutschen Kalibrierdienst



Kalibrierschein
Calibration certificate



Deutsche
Akkreditierungsstelle
D-K-15202-01-00

Kalibrierzeichen
Calibration mark

| |
|---------------------|
| 9469 |
| D-K- 15202-01-00 |
| 2018-02 |

| | |
|---|---|
| Gegenstand Object | temperature transmitter |
| Hersteller Manufacturer | NRG Systems |
| Typ Type | 110 S |
| Fabrikat/Serien-Nr. Serial number | --- |
| Auftraggeber Customer | HydroWind BVBA Veldkantstraat 119 B-1850 Grimbergen (Brussels) |
| Auftragsnummer Order No. | REP 6526A |
| Anzahl der Seiten des Kalibrierscheines Number of pages of the certificate | 3 |
| Datum der Kalibrierung Date of calibration | 13.02.2018 |



Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI). Die DAkkS ist Unterzeichner des multilateralen Übereinkommens 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.

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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This calibration certificate may not be reproduced other than in full except with the permission of both the Deutsche Akkreditierungsstelle GmbH and the issuing laboratory. Calibration certificates without signature are not valid.

| | | |
|---------------|---|--|
| Datum Date | Leiter des Kalibrierlaboratoriums Head of the calibration laboratory | Bearbeiter Person in charge |
| 15.02.2018 |  Helmut Hager |  Frank Bidmann |

Dieser Kalibrierschein ist elektronisch signiert und liegt als Original als PDF-Datei vor.
This calibration certificate is electronic signed and exists as original as PDF-file.

G. LUFFT Mess- und Regeltechnik GmbH
Gutenbergstraße 20
DE-70736 Fellbach
Germany

Tel: ++49(0)711/51822-0
Fax: ++49(0)711/51822-41
E-Mail: info@lufft.de
www.lufft.de

Geschäftsführer/Managing directors:
Dr. Anton Felder
Jörg Mayer
Dr. Martin Nicklas
Axel Schmitz-Hübsch

Amtsgericht Stuttgart
HRB 721373
Ust.ID: DE 250580689
Steuernummer 90490/28336

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calibration item

The calibration object is a temperature transmitter.
The calibration object is unscathed.

absolute pressure

| | | | |
|-------------------|--|-----------------------------------|--|
| measuring range | -40 °C ... 52.5 °C | | |
| accuracy | +/- 1,24 K | | |
| transfer function | temperature = (Voltage x 55,55) – 86,38 °C | Correlation 0,999999975 | Slope[C/V] 55,491 Offset[C] -86,392 |

reference standard

Temperature

| | |
|----------------------------|--|
| reference standards | PT100 resistance thermometer |
| reference numbers | 006197, 006400, 006401, 006404, 006405 |
| calibration marks | 7764-, 7770-, 7771-, 7772-, 7773-D-K-15202-01-00 2017-06 |
| uncertainty of measurement | 5 mK...15 mK |

Temperature

| | |
|----------------------------|--|
| reference standard | precision temperature measuring instrument |
| reference number | 801062 |
| calibration mark | 01-1090-D-K-15186-01-00 2016-10 |
| uncertainty of measurement | 3,3 mK...8,3 mK |

Other measuring instruments

| | |
|----------------------------|--------------------------------|
| reference standard | digital multimeter |
| reference number | 801058 |
| calibration mark | 2122-D-K-15042-01-00-2017-08 |
| uncertainty of measurement | 0,00015 % ... 0,028 % of value |

calibration procedure

Temperature:

The temperature calibration was accomplished after the DAkkS-DKD guideline "Calibration of resistance thermometers" DAkkS-DKD-R 5-1 from December 2010.

The temperature values (t_{90}) refer to the International Temperature Scale of 1990 (ITS-90).

measurement conditions

temperature:

climate chamber, medium: air

description:

The calibration unit was placed in the center of the climate chamber and was completely exposed to the climate conditions. The output signal of the calibration unit was recorded with a multimeter and the software „BenchLink Datalogger 3, Ver. 3.10.00“. The measuring interval was 10 seconds and over 10 minutes the arithmetic mean value was build. The supply voltage was 5 VDC.

ambient conditions

temperature in °C: 21,0 ± 1 K
rel. humidity in %: 30 ± 10 %
air pressure in mbar: 979 ± 10 mbar

calibration results

Temperature calibration

| Reference standard | Calibration unit | | | |
|-------------------------------|-------------------------|---|--|---|
| temperature t_{90} in °C | output signal U in V | temperature calculated t_{90} in °C | measurement deviation ΔT_{90} in K | uncertainty of measurement U in K |
| 0,01 | 1,557 | 0,11 | +0,10 | 0,17 |
| 20,09 | 1,919 | 20,22 | +0,13 | 0,18 |
| 40,13 | 2,280 | 40,27 | +0,14 | 0,21 |

measurement uncertainty

The uncertainty stated is the expanded uncertainty U 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%.