

# G. LUFFT Mess- und Regeltechnik GmbH

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## 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

|                     |
|---------------------|
| 9477                |
| D-K-<br>15202-01-00 |
| 2018-02             |

|   |   |
|---|---|
| Gegenstand<br>Object  | <b>temperature transmitter</b>  |
| Hersteller<br>Manufacturer  | <b>NRG Systems</b>  |
| Typ<br>Type   | <b>110 S</b>  |
| Fabrikat/Serien-Nr.<br>Serial number  | <b>---</b>  |
| Auftraggeber<br>Customer  | <b>HydroWind BVBA<br/>Veldkantstraat 119<br/>B-1850 Grimbergen (Brussels)</b> |
| Auftragsnummer<br>Order No.   | <b>REP 6526A</b>  |
| Anzahl der Seiten des Kalibrierscheines<br>Number of pages of the certificate | <b>3</b>  |
| Datum der Kalibrierung<br>Date of calibration                                 | <b>15.02.2018</b>   |



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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|               |   |  |
|---------------|---|--|
| Datum<br>Date | Leiter des Kalibrierlaboratoriums<br>Head of the calibration laboratory                             | Bearbeiter<br>Person in charge   |
| 15.02.2018    | <br>Helmut Hager | <br>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.*

|  |  |  |   |
|--|--|--|---|
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|--|--|--|---|

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| 2018-02             |

### 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 | <b>Correlation</b> | <b>Slope[C/V]</b> | <b>Offset[C]</b> |
|                   |  | <b>0,999999387</b> | <b>55,631</b>     | <b>-86,382</b>   |

### 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<br>$t_{90}$ in °C | output signal<br>U in V | temperature<br>calculated<br>$t_{90}$ in °C | measurement<br>deviation<br>$\Delta T_{90}$ in K | uncertainty of<br>measurement<br>U in K |
| -0,03                         | 1,552                   | -0,17                                       | -0,14  | 0,21                                    |
| 20,07                         | 1,914                   | 19,94                                       | -0,13  | 0,15                                    |
| 40,08                         | 2,273                   | 39,89                                       | -0,19  | 0,13                                    |

#### 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%.