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# CALIBRATION CERTIFICATE



**Certificate Number:** HEL204750078

| | |
|---|---|
| **Case Number:** | 163069 |
| **Manufacturer:** | Vaisala Oyj |
| **Instrument:** | Humidity and Temperature Transmitter HMT333 |
| **Serial Number:** | A4650017 |
| **Issue Date:** | 2020-11-20 |
| **Calibration Date:** | 2020-11-19 |
| **Recalibration Date:** | 2022-11-19 |

**Approved by:**

Petri Salmi
Technician

**Note(s):**
Service report as an attachment.

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2, which for a normal distribution corresponds to a coverage probability of approximately 95 %. The measurement results are traceable to the international system of units (SI) through national metrology institutes (NIST USA, MIKES Finland, or equivalent) or via ISO/IEC 17025 accredited calibration laboratories.

Procedure instructions: PI217623

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## As Found Results

### Humidity calibration results

| Reference Humidity [ %rh ] | Reference Temperature [ °C ] | Observed Humidity [ %rh ] | Observed Temperature [ °C ] | Humidity Error [ %rh ] | Specification [ %rh ] | Note(s): |
|---|---|---|---|---|---|---|
| 15.0 | 22.51 | 13.5 | 22.53 | -1.5 | ±1.0 | * |
| 33.0 | 22.51 | 30.2 | 22.53 | -2.8 | ±1.0 | * |
| 54.1 | 22.51 | 49.6 | 22.53 | -4.5 | ±1.0 | * |
| 75.0 | 22.52 | 69.4 | 22.53 | -5.6 | ±1.0 | * |
| 94.7 | 22.52 | 88.5 | 22.54 | -6.2 | ±1.7 | * |

### Temperature calibration results

| Reference Temperature [ °C ] | Observed Temperature [ °C ] | Error [ °C ] | Specification [ °C ] | Note(s): |
|---|---|---|---|---|
| 22.52 | 22.53 | 0.01 | ±0.20 | - |

### Reference equipment used in calibration

| Type | Instrument Number | Certificate Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| GE Drück DPS 823B | 17123 | K008-D01628 | 2020-05-06 | 2020-11-30 |
| Pt-100 sensor | 18048 | K008-D01651 | 2020-05-07 | 2021-05-31 |
| PTU307 | 16862 | K008-D00717 | 2020-02-25 | 2021-02-28 |
| Pt-100 sensor | 16670 | K008-D01650 | 2020-05-07 | 2021-05-31 |
| PXI-4070 | 16897 | D01648 | 2020-05-08 | 2021-05-31 |

### Calibration uncertainty (k=2, ~95 % confidence level):

Humidity ±0.5 %rh @ 0...30 %rh, ±0.6 %rh @ 30...45 %rh, ±0.7 %rh @ 45...60 %rh, ±0.8 %rh @ 60...80 %rh, ±0.9 %rh @ 80...95 %rh
Temperature ±0.09 °C

### Ambient conditions:

| Humidity [ %rh ] | Temperature [ °C ] | Pressure [ hPa ] |
|---|---|---|
| 40 ± 4 | 23 ± 2 | 984 ± 20 |

Any error greater than the specification is noted with *

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# CALIBRATION CERTIFICATE



**Certificate Number:** HEL204750078

## As Left Results

### Humidity calibration results

| Reference Humidity [ %rh ] | Reference Temperature [ °C ] | Observed Humidity [ %rh ] | Observed Temperature [ °C ] | Humidity Error [ %rh ] | Acceptance Limit [ %rh ] | Pass/Fail |
|---|---|---|---|---|---|---|
| 15.0 | 22.51 | 15.3 | 22.52 | 0.3 | ±1.0 | Pass |
| 33.0 | 22.51 | 33.3 | 22.52 | 0.3 | ±1.0 | Pass |
| 54.1 | 22.51 | 54.0 | 22.51 | -0.1 | ±1.0 | Pass |
| 75.0 | 22.52 | 75.0 | 22.52 | 0.0 | ±1.0 | Pass |
| 94.7 | 22.52 | 94.9 | 22.52 | 0.2 | ±1.7 | Pass |

### Temperature calibration results

| Reference Temperature [ °C ] | Observed Temperature [ °C ] | Error [ °C ] | Acceptance Limit [ °C ] | Pass/Fail |
|---|---|---|---|---|
| 22.52 | 22.52 | 0.00 | ±0.20 | Pass |

### Reference equipment used in calibration

| Type | Instrument Number | Certificate Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| GE Drück DPS 823B | 17123 | K008-D01628 | 2020-05-06 | 2020-11-30 |
| Pt-100 sensor | 18048 | K008-D01651 | 2020-05-07 | 2021-05-31 |
| PTU307 | 16862 | K008-D00717 | 2020-02-25 | 2021-02-28 |
| Pt-100 sensor | 16670 | K008-D01650 | 2020-05-07 | 2021-05-31 |
| PXI-4070 | 16897 | D01648 | 2020-05-08 | 2021-05-31 |

### Calibration uncertainty (k=2, ~95 % confidence level):

Humidity ±0.5 %rh @ 0...30 %rh, ±0.6 %rh @ 30...45 %rh, ±0.7 %rh @ 45...60 %rh, ±0.8 %rh @ 60...80 %rh, ±0.9 %rh @ 80...95 %rh
Temperature ±0.09 °C

### Ambient conditions:

| Humidity [ %rh ] | Temperature [ °C ] | Pressure [ hPa ] |
|---|---|---|
| 40 ± 4 | 23 ± 2 | 984 ± 20 |

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**Certificate Number:** HEL204750078

**Calibration note(s):**
The humidity calibration was done by comparing the instrument humidity readings to the reference humidity generator readings in the Vaisala laboratory's permanent facility. The reference humidity readings were calculated based on two-pressure humidity generation principle using the measurement results of saturator pressure and temperature and calibration chamber pressure and temperature.

The temperature(s) of the instrument was calibrated by comparing the instruments's temperature readings to a reference thermometer.

Before measurements the instrument was allowed to stabilize to the conditions of the laboratory with power supply on. The purge function was run before the calibration if the instrument has the chemical purge option.

The measurement results were obtained from the measured values or the results were calculated from the measured values by using adjustment coefficients. The reference and instrument readings are averages of at least five independent observations. All relative humidity readings below freezing are compliant to WMO humidity calculation method. The dew point readings are frost point readings when dew point is below 0 °C if the readings are given as a dew point.

The 0 %rh humidity was measured in dry nitrogen gas or dry gas using the humidity meter as a reference if the 0 %rh humidity point was measured

The calibration uncertainty represents the situation at the time and conditions of calibration. When using the instrument at different conditions and at different time the effect of the conditions and stability of the instrument shall be evaluated separately. The calibration results and the statement of conformity with specification/acceptance limit relate only to the calibrated instrument and the calibration points.

The statement of conformity is based on simple acceptance, whether the calibration result is within or outside the manufacturer's specification/acceptance limits. The calibration uncertainty is not taken into account in the statement of conformity. The probability of accepting a non-conforming result or rejecting a conforming result can be as large as 50 % with this acceptance rule when the calibration result is close to the acceptance limit.

Pass or - = The calibration result is equal or within the manufacturer's acceptance limit.
Fail or * = The calibration result is outside the manufacturer's acceptance limit.
N/A = The calibration result acceptance limit is not specified.

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Certificate report no. H37-20470002

# CALIBRATION CERTIFICATE

| | |
|---|---|
| **Instrument** | Humidity and Temperature Transmitter HMT333 |
| **Order code** | HMT330 3F0A002BCAC100A04AABAA1 |
| **Serial number** | A4650017 |
| **Manufacturer** | Vaisala Oyj, Finland |
| **Calibration date** | 18th November 2020 |

The analog outputs of the above instrument were measured by using working standards of the manufacturer. The outputs were forced by digital input signals to three output values. The observed values were determined by measuring the voltage over a calibrated precision resistor. All results are traceable in terms of voltage and resistance to NIST.

**Analog output channel 1 calibration results**
**Channel 1 scaling: RH 0...100 %RH**

| Output forced to mA | Observed output mA | Difference mA | Permissible difference mA |
|---|---|---|---|
| 2.000 | 1.999 | - 0.001 | ±0.010 |
| 10.000 | 10.003 | + 0.003 | ±0.010 |
| 18.000 | 18.009 | + 0.009 | ±0.010 |

**Analog output channel 2 calibration results**
**Channel 2 scaling: T -40...80 °C**

| Output forced to mA | Observed output mA | Difference mA | Permissible difference mA |
|---|---|---|---|
| 2.000 | 2 | 0 | ±0.010 |
| 10.000 | 10.003 | + 0.003 | ±0.010 |
| 18.000 | 18.008 | + 0.008 | ±0.010 |

**Analog output channel 3 calibration results**
**Channel 3 scaling: No analog 999.999...999.999**

| Output forced to mA | Observed output mA | Difference mA | Permissible difference mA |
|---|---|---|---|
| - | - | - | - |
| - | - | - | - |
| - | - | - | - |

**Equipment used in calibration**

| Type | Serial number | Calibration date | Certificate number |
|---|---|---|---|
| 34970A | MY41007044 | 2020-03-10 | 11-9485435-012 |
| Shunt Cable | ES 13893 | 2020-05-06 | D01605 |

**Uncertainty ( 95 % confidence level, k=2)**
Current ±0.00175mA
**Ambient conditions** / Humidity 38 ± 5%RH, Temperature 23 ± 2 °C, Pressure 1004 ± 20 hPa.

Technician





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