

## CERTIFICATE OF CALIBRATION no K008-SAMPLE

**Customer** NAME  
ADDR1  
ADDR2  
COUNTRY

**Item** Humidity and Temperature Transmitter  
Temperature calibrated from + 14,9 to + 29,9 °C  
Humidity calibrated from 10 to 79,9 %rh from + 14,9 to + 29,9 °C  
  
Read via serial port and analog outputs

**Manufacturer** Vaisala Oyj

**Model** HMT120 / HMP110

**Serial number** Mxxxxxxx / Mxxxxxxx

**Calibration performed** On June 7 and 8, 2016

**Date** June 14, 2016

**Signature**   
Heli Järvinen  
Senior Calibration Engineer

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**Documents attached**

**NOTES** This is a new transmitter without before adjustment data.

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This Certificate may only be reproduced in full, except with the prior written permission by the issuing Laboratory. The measurements carried out and the Certificates of Calibration issued by an Accredited Calibration Laboratory comply with the measurement ranges and uncertainties approved by FINAS Finnish Accreditation Service. The measurement results issued by the Laboratory are traceable to national or international measurement standards. Measurement Standards Laboratory of Vaisala Oyj is a calibration laboratory K008 accredited by FINAS Finnish Accreditation Service, accreditation requirement ISO/IEC 17025. The accreditation is included in the Multilateral Agreement (EA MLA) of the European co-operation for Accreditation (EA).

## CONFIGURATION

The transmitter's configuration, settings and coefficients were read from the transmitter's memory.

Before measurements the transmitter was allowed to stabilize to the conditions of the laboratory for at least 1 hour with + 24,0 VDC  $\pm$  0,3 VDC power supply switched on.

The calibration is valid only with configuration and settings:

Software 1.0.6.569                      Pressure 1,013 hPa  
Filter 1

## REFERENCES USED DURING TEMPERATURE CALIBRATION

Hart 1502A Thermometer, serial number A09200

Agilent 34970A Digital Multimeter, serial number MY44069474

## REFERENCES USED DURING HUMIDITY CALIBRATION

Hart 1502A Thermometer, serial number A09200

Thunder 2500 Humidity generator, serial number 1209916

Vaisala PTB220 Pressure Transmitter, serial number T2410011

Agilent 34970A Digital Multimeter, serial number MY44069474

## TRACEABILITY

The measurement results are traceable to the international system of units (SI) through national metrology institutes (NIST in USA or equivalent) or accredited calibration laboratories.

## UNCERTAINTY

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 standard uncertainty of measurement has been determined in accordance with EA Publication EA-4/02.

The measurement uncertainty represents the situation at the time and conditions of calibration. When using the UUC at different conditions and at different time the effect of the conditions and stability of the UUC shall be evaluated separately.

The measurement results and uncertainty are representing the measurement points only.

## TEMPERATURE CALIBRATION

The temperature calibration was done in the Measurement Standards Laboratory (MSL) of Vaisala Oyj on June 7 and 8, 2016.

The temperature readings of the transmitter were compared to the values of the reference thermometer from + 14,9 to + 29,9 °C in a climate chamber.

Temperature values were read via serial port with resolution of 0,01 °C.

Temperature values are given according to the International Temperature Scale of 1990, ITS-90.

### Measurement results

The reference and the reading values are averages of ten independent observations.

Table 1. Final results, temperature, T

Reference [ °C ]	Reading T [ °C ]	Correction [ °C ]	Uncertainty [ °C ]
+ 22,90	+ 22,90	0,00	± 0,07
+ 22,90	+ 22,91	- 0,01	± 0,07
+ 22,90	+ 22,90	0,00	± 0,07
+ 22,91	+ 22,92	- 0,01	± 0,07
+ 14,90	+ 14,85	+ 0,05	± 0,07
+ 29,91	+ 29,92	- 0,01	± 0,07

The correction shall be added algebraically to the reading.

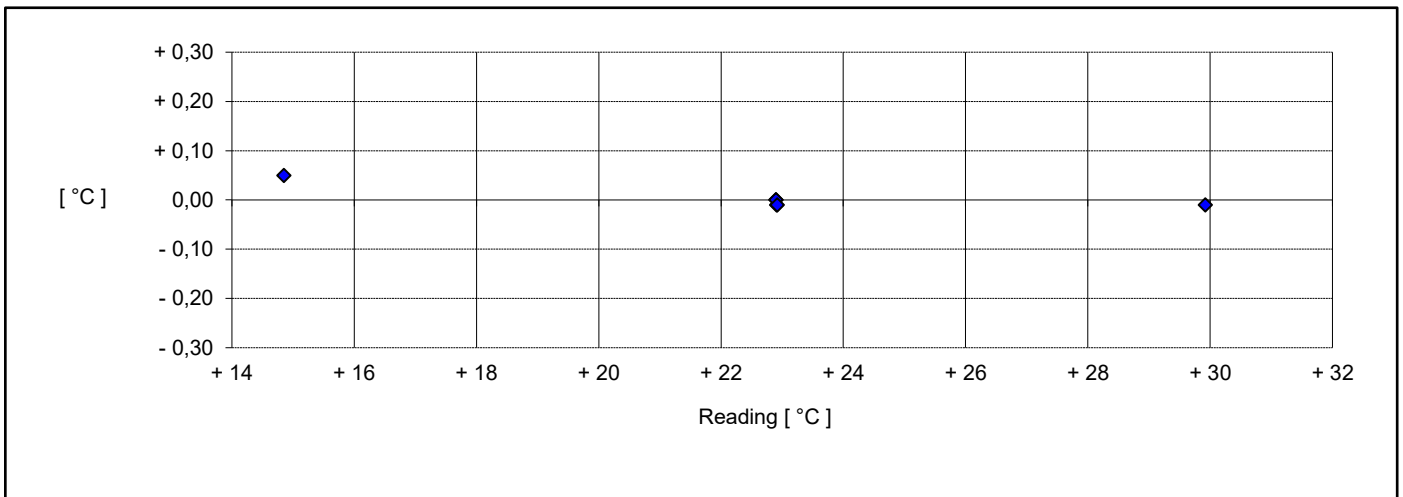


Figure 1. Final results, T

Conditions

Temperature  
Humidity

+ 23,3 °C ± 0,3 °C  
35 %rh ± 3 %rh

## HUMIDITY CALIBRATION

The humidity calibration was done in the Measurement Standards Laboratory (MSL) of Vaisala Oyj on June 7 and 8, 2016.

The humidity readings of the transmitter were compared to the reference humidity values at climate chamber in the range from 10 to 79,9 %rh. The humidity readings were read via serial port with resolution of 0,01 %rh.

### Measurement results

The probe was allowed to stabilize to each humidity for at least 60 minutes before the readings were read. The reference and the reading values are averages of ten independent observations.

Table 2. Final results, humidity

Temperature [ °C ]	Reference [ %rh ]	Reading RHout [ %rh ]	Correction [ %rh ]	Uncertainty [ %rh ]
+ 22,9	10,0	9,8	+ 0,2	± 0,4
+ 22,9	30,0	29,8	+ 0,2	± 0,6
+ 22,9	49,9	49,8	+ 0,1	± 0,8
+ 22,9	79,9	79,8	+ 0,1	± 0,9
+ 14,9	30,2	30,6	- 0,4	± 0,6
+ 29,9	29,8	29,8	0,0	± 0,6

The correction shall be added algebraically to the reading.

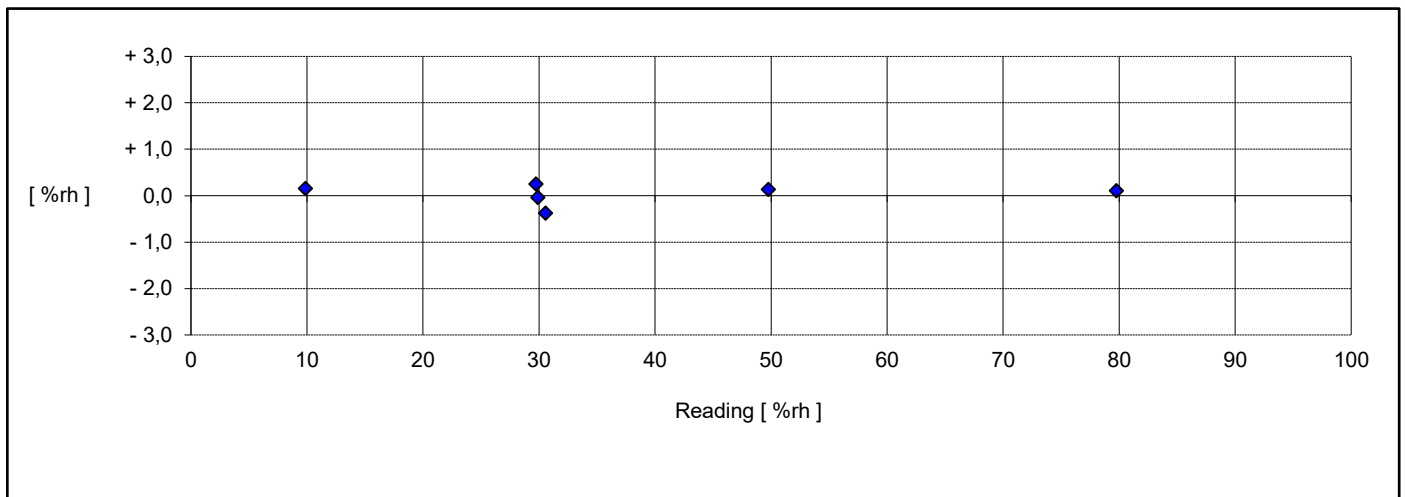


Figure 2. Final results

Conditions	Pressure	1006,4 hPa ± 4,7 hPa
	Temperature	+ 23,3 °C ± 0,3 °C
	Humidity	35 %rh ± 3 %rh

## Analog calibration

### Calculations

Analog values were calculated from the measured analog output values using equation 1.

$$x_{\text{analog}} = \frac{x_{hi} - x_{lo}}{\text{Output}_{hi} - \text{Output}_{lo}} \cdot (\text{Output} - \text{Output}_{lo}) + x_{lo}, \text{ where} \quad (1)$$

$x_{hi}$  is the maximum and  $x_{lo}$  is the minimum value of the range of the measured quantity and  $\text{Output}_{hi}$  is the maximum and  $\text{Output}_{lo}$  is the minimum output value of the output range.

### Analog temperature calibration

The analog output of the transmitter was calibrated in the Measurement Standards Laboratory (MSL) of Vaisala Oyj on June 7 and 8, 2016.

The analog output values of the transmitter were measured and compared to the reference temperature values in range from + 14,9 to + 29,9 °C.

The current measurement method was voltage measurement over calibrated 100 ohm current shunt connected to the output of the transmitter.

### Measurement results

The reference and the reading values are averages of ten independent observations.

Table 3. Measurement results, temperature, T

Reference [ °C ]	Output [ mA ]	T <sub>analog</sub> [ °C ]	Correction [ °C ]	Uncertainty [ °C ]
+ 22,90	11,3308	+ 22,91	- 0,01	± 0,07
+ 22,90	11,3323	+ 22,91	- 0,01	± 0,07
+ 22,90	11,3329	+ 22,91	- 0,01	± 0,07
+ 22,91	11,3372	+ 22,93	- 0,02	± 0,07
+ 14,90	8,7531	+ 14,86	+ 0,04	± 0,07
+ 29,91	13,5799	+ 29,94	- 0,03	± 0,07

The correction shall be added algebraically to the reading.

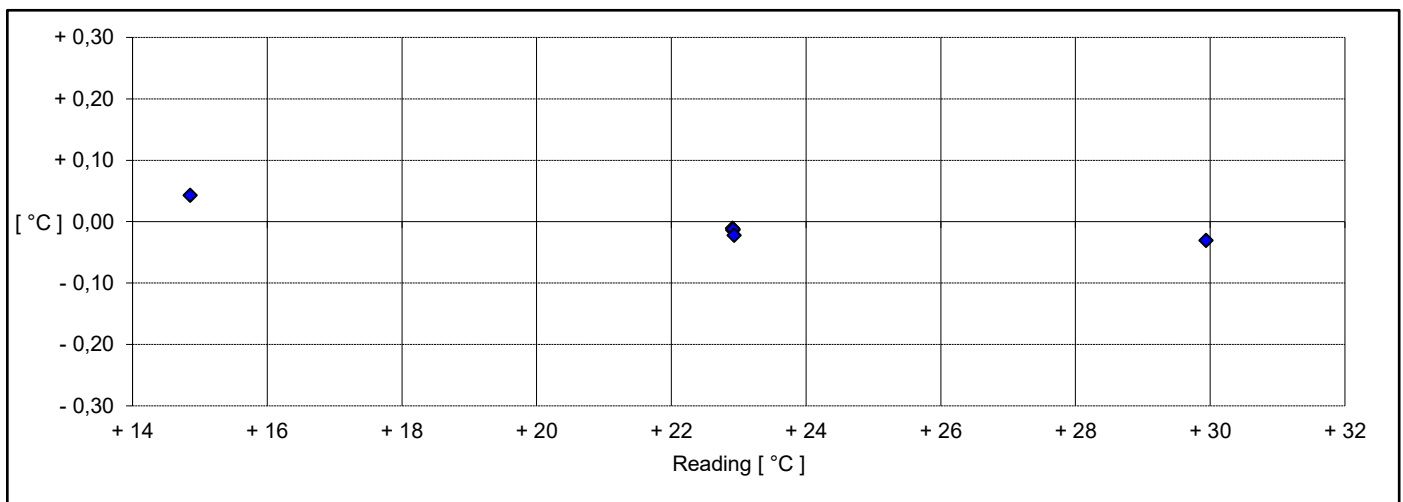


Figure 3. Final results, T

Conditions                      Temperature                      + 23,3 °C ± 0,3 °C  
    Humidity                              35 %rh ± 3 %rh

## Analog humidity calibration

The analog output of the transmitter was calibrated in the Measurement Standards Laboratory (MSL) of Vaisala Oyj on June 7 and 8, 2016.

The analog readings of the transmitter were compared to the reference humidity values at climate chamber in the range from 10 to 79,9 %rh. The analog humidity readings were read with digital multimeter.

The measurement method was voltage measurement over calibrated 100 ohm current shunt connected to the output of the transmitter.

### Measurement results

The probe was allowed to stabilize to each humidity for at least 60 minutes before the readings were read.

The reference and the reading values are averages of ten independent observations.

Table 4. Final results, humidity

Temperature [ °C ]	Reference [ %rh ]	Output [ mA ]	RH <sub>analog</sub> [ %rh ]	Correction [ %rh ]	Uncertainty [ %rh ]
+ 22,9	10,0	5,5762	9,8	+ 0,2	± 0,4
+ 22,9	30,0	8,7560	29,8	+ 0,2	± 0,6
+ 22,9	49,9	11,9637	49,8	+ 0,1	± 0,8
+ 22,9	79,9	16,7651	79,8	+ 0,1	± 0,9
+ 14,9	30,2	8,8872	30,6	- 0,4	± 0,6
+ 29,9	29,8	8,7829	29,8	0,0	± 0,6

The correction shall be added algebraically to the reading.

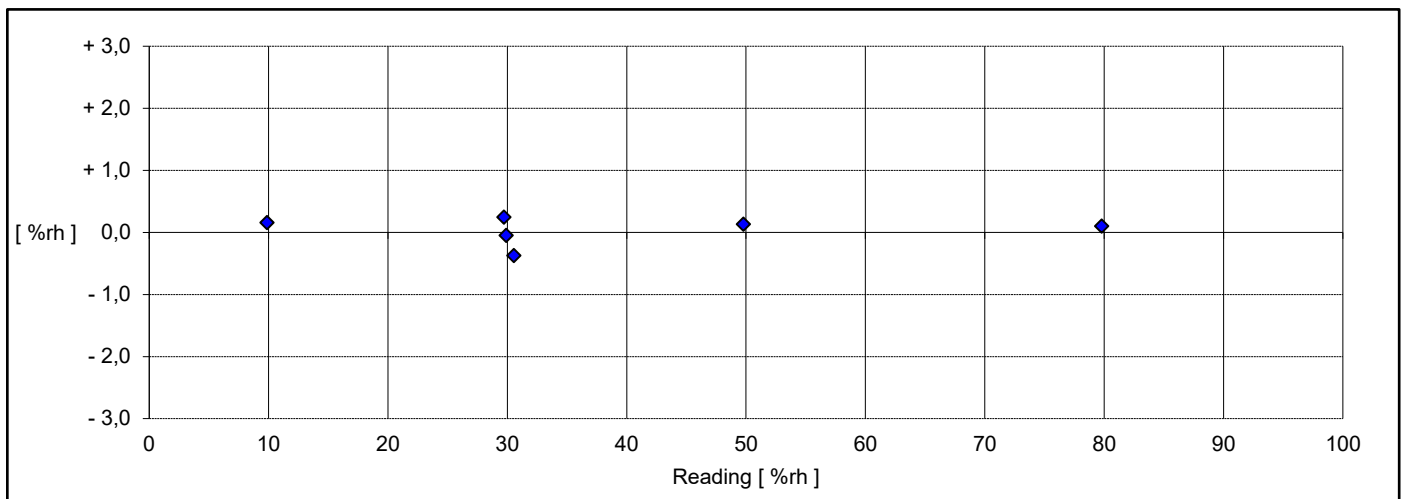


Figure 4. Final results

Conditions	Pressure	1006,4 hPa ± 4,7 hPa
	Temperature	+ 23,3 °C ± 0,3 °C
	Humidity	35 %rh ± 3 %rh