

EH

2001-11-14

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**HUMIDITY&TEMPERATURE TRANSMITTER HMP233****Tested device**

| type   | serial number | manufacturer |
|--------|---------------|--------------|
| HMP233 | W4450038      | Vaisala Oyj  |

Date: 2001-11-14

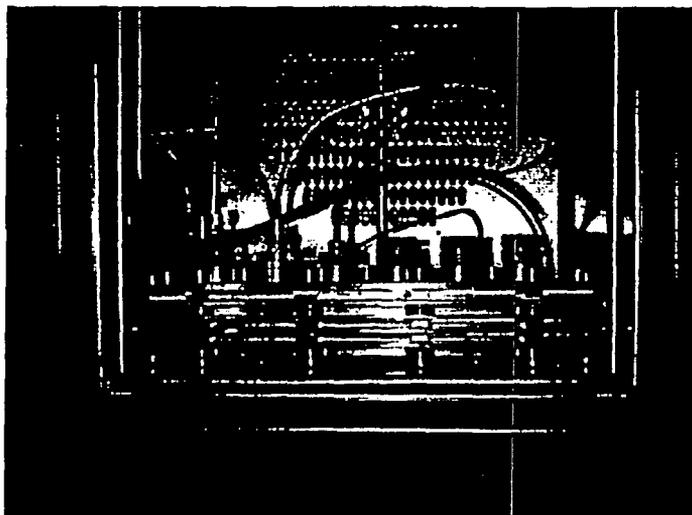
The temperature&humidity transmitter, HMP233, were tested at +22...+90 'C.

**Test station**

The test station is based on humidity generators and a temperature test chamber. The gas from the humidity generators, Thunder Scientific model 2500 or model 3900, is led into the measurement chamber. The temperature of the measurement chamber is changed by the temperature test chamber, Vötsch VT7004. The reference humidity value is calculated from Thunders dew point value and the temperature of the measurement chamber.



1. Test station



2. Humidity probes in the measurement chamber.

The controlling of the test station and data collection are fully automated using a computer based system. The readings of the HMP233 were read via RS-232.

The measurement equipments of the has been calibrated at the Measurement Standard Laboratory of Vaisala. Calibration dates and certificate numbers are listed below.

CERTIFICATES

Humidity generator model 2500:

|                           | date       | number |
|---------------------------|------------|--------|
| 'saturator temperature    | 2000-05-16 | H05164 |
| 'saturator pressure, low  | 2001-06-11 | J06012 |
| 'saturator pressure, high | 2001-06-11 | J06013 |

Temperature transmitter PTU200 (Vaisala):

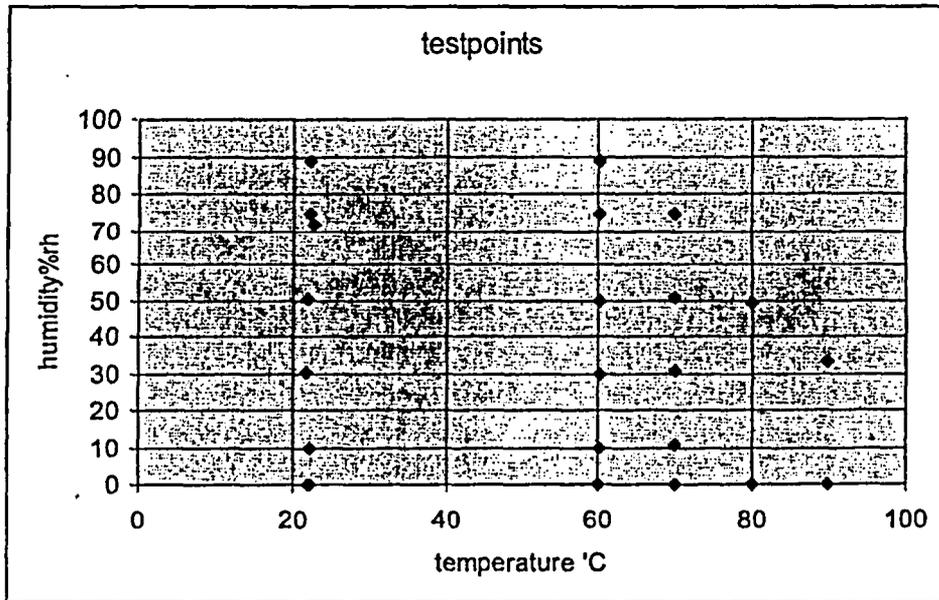
|   |            |        |
|---|------------|--------|
| 'measurement chamber temperature and ambient pressure | 2001-02-28 | J02281 |
|---|------------|--------|

Humidity generator model 3900:

|                           |            |        |
|---------------------------|------------|--------|
| 'saturator temperature    | 2000-11-22 | H11221 |
| 'saturator pressure, low  | 2000-11-28 | H11284 |
| 'saturator pressure, high | 2000-11-30 | H11305 |

The uncertainty of the test station is 0.42%RH (k=1).

Testpoints:



EH

2001-11-14

**Results:**

| References | Readings |        | Errors   |        |
|------------|----------|--------|----------|--------|
|            | Temp. 'C | Hum%rh | Temp. 'C | Hum%rh |
| 0          | 22.08    | 0.3    | 22.1     | -0.3   |
| 9.82       | 22.29    | 10.4   | 22.3     | 0.6    |
| 30.31      | 21.82    | 31.1   | 21.8     | 0.8    |
| 50.13      | 21.94    | 51.1   | 21.9     | 1.0    |
| 71.9       | 22.68    | 72.4   | 22.7     | 0.5    |
| 88.69      | 22.22    | 88.1   | 22.2     | -0.6   |
| 0          | 60.02    | 0      | 60       | 0.0    |
| 9.97       | 60.03    | 10.8   | 60       | 0.8    |
| 29.91      | 60.03    | 30.8   | 60       | 0.9    |
| 49.79      | 60.05    | 51     | 60.1     | 1.2    |
| 74.68      | 60.06    | 75.9   | 60.1     | 1.2    |
| 88.99      | 60.06    | 89.8   | 60.1     | 0.8    |
| 0          | 69.99    | 0.2    | 70       | 0.2    |
| 10.51      | 69.99    | 11.6   | 70       | 1.1    |
| 30.57      | 70.02    | 31.9   | 70       | 1.3    |
| 50.63      | 70.02    | 52.6   | 70       | 2.0    |
| 74.43      | 70.04    | 76.6   | 70       | 2.2    |
| 0          | 79.9     | 0.4    | 79.9     | 0.4    |
| 49.07      | 79.96    | 51.6   | 80       | 2.5    |
| 0          | 89.7     | 0.5    | 89.7     | 0.5    |
| 33.33      | 89.77    | 35.2   | 89.7     | 1.9    |
| 0          | 21.99    | -0.3   | 22       | -0.3   |
| 74.46      | 22.1     | 75.3   | 22.1     | 0.8    |

EH

2003-02-19

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**HUMIDITY TRANSMITTER HMP233****Tested device**

| type   | serial number | manufacturer |
|--------|---------------|--------------|
| HMP233 | 623074        | Vaisala Oyj  |

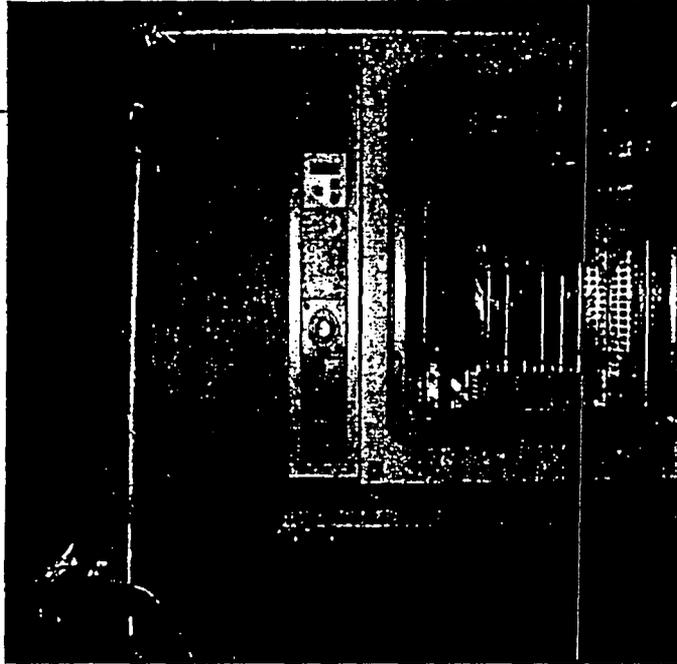
Date: 2003-02-19

The transmitter HMP233 was tested at temperatures +120...+180'C.

**Test station 2.**

A test station for high dew point values: The test station is based on a saturator unit and a measurement chamber placed in oven. The temperature of the saturator (dew point) is controlled by a liquid thermostat (Lauda RC 25 CP). The saturated gas from the saturator is led into the measurement chamber via heat exchanger. The temperature of the measurement chamber is changed by the oven (Heraeus UT 6120). The reference dew point value is calculated from the temperature and pressure readings of the saturator and the pressure of the measurement chamber. The reference humidity is then calculated using the dew point temperature and the measurement chamber temperature.

EH



1. Saturator unit and measurement chamber

Calibration dates and certificate numbers are listed below.

CERTIFICATES

Saturator, PTU200 (Vaisala):

|                          | date       | number |
|--------------------------|------------|--------|
| ' temperature & pressure | 2003-01-23 | L00122 |

Measurement chamber, PTU200 (Vaisala):

|                          | date       | number |
|--------------------------|------------|--------|
| ' temperature & pressure | 2003-01-23 | L00122 |

EH

2003-02-19

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**RESULTS**

| Reference | HMP233<br>623074  |           |                |
|-----------|-------------------|-----------|----------------|
| Temp[°C]  | Humidity<br>[%RH] | read[%RH] | error<br>[%RH] |
| 119.4     | 30.6              | 31.1      | 0.5            |
| 132.0     | 20.8              | 21.2      | 0.4            |
| 143.4     | 15.0              | 15.7      | 0.7            |
| 148.0     | 13.2              | 14.0      | 0.8            |
| 166.0     | 8.2               | 9.8       | 1.5            |
| 177.9     | 6.2               | 8.3       | 2.1            |
| 178.5     | 0                 | 0.6       | 0.6            |
| 143.8     | 0                 | 0.2       | 0.2            |
| 124.5     | 0                 | 0.2       | 0.2            |

EH

2003-06-06

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**HUMIDITY TRANSMITTER HMP233 AT -40...+120°C****Tested device**

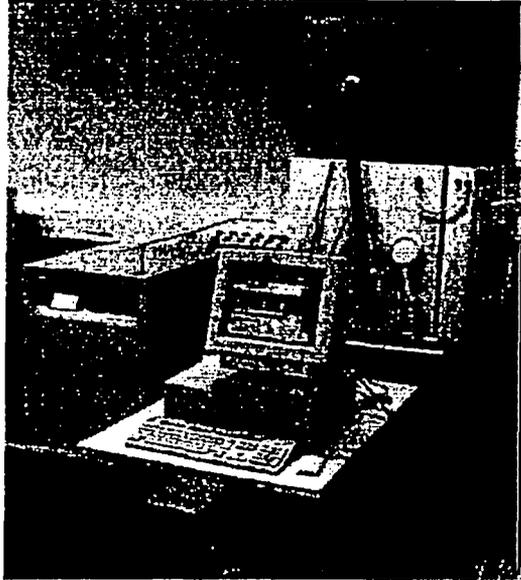
| type   | serial number | manufacturer |
|--------|---------------|--------------|
| HMP233 | 623074        | Vaisala Oyj  |

Date: 2003-06-06

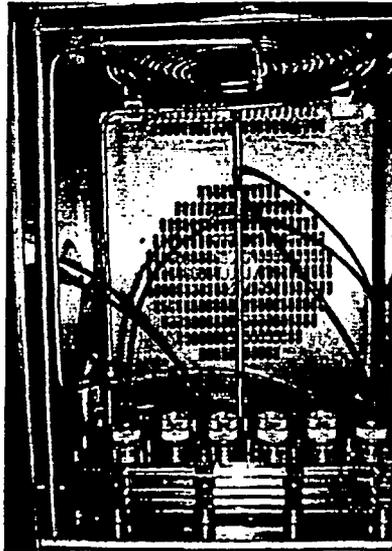
The humidity transmitter HMP233 were tested at temperatures -40...+120°C.

**Test station 1.**

The test station is based on humidity generators and a temperature test chamber. The gas from the humidity generators, Thunder Scientific model 2500 or model 3900, is led into the measurement chamber. Nitrogen gas is used as dry point (0%rh) at temperature above 0°C. The temperature of the measurement chamber is changed by the temperature test chamber, Vötsch VT7004. The reference humidity value is calculated from Thunders dew point value and the temperature of the measurement chamber.



1. Test station



2. Probe at measurement chamber.

The controlling of the test station and data recording are fully automated using a computer based system. The readings of the HMP233 were read via RS-232

The test station measurement equipment has been calibrated by the Measurement Standard Laboratory at Vaisala. Calibration dates and certificate numbers are listed below.

CERTIFICATES

Humidity generator model 2500:

|                           | date       | number |
|---------------------------|------------|--------|
| 'saturator temperature    | 2002-10-23 | K3022A |
| 'saturator pressure, low  | 2002-10-23 | K10231 |
| 'saturator pressure, high | 2002-10-22 | K1022D |

Temperature transmitter PTU200 (Vaisala):

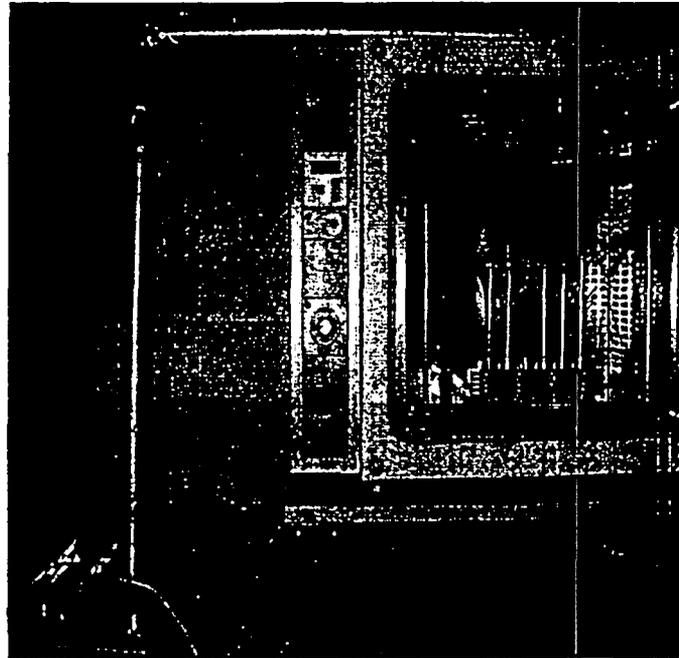
|                                  |            |        |
|----------------------------------|------------|--------|
| 'measurement chamber temperature | 2002-04-11 | K04112 |
|----------------------------------|------------|--------|

Humidity generator model 3900:

|                           |            |        |
|---------------------------|------------|--------|
| 'saturator temperature    | 2002-10-23 | K10230 |
| 'saturator pressure, low  | 2002-10-23 | K10232 |
| 'saturator pressure, high | 2002-10-25 | K10252 |
| 'test pressure            | 2002-10-25 | K10233 |

**Test station 2.**

A test station for high dew point values: The test station is based on a saturator unit and a measurement chamber placed in oven. The temperature of the saturator (dew point) is controlled by a liquid thermostat (Lauda RC 25 CP). The saturated gas from the saturator is led into the measurement chamber via heat exchanger. The temperature of the measurement chamber is changed by the oven (Heraeus UT 6120). The reference



temperature and the pressure of humidity is then measured and the

3. Saturator unit and measurement chamber

EH

2003-06-06

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Calibration dates and certificate numbers are listed below.

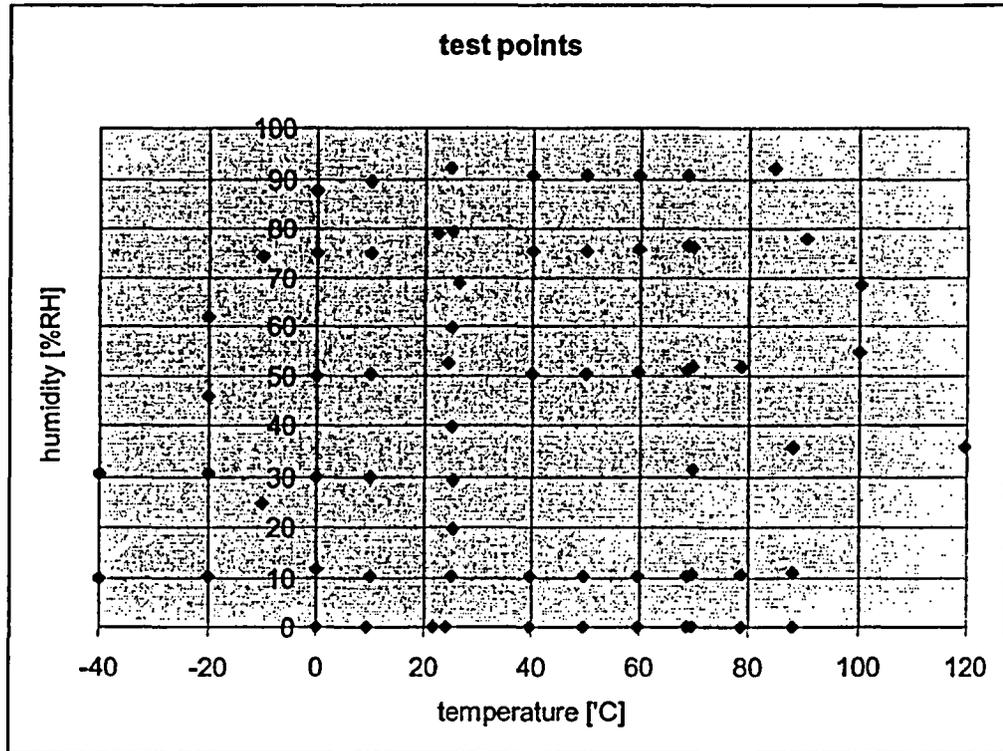
CERTIFICATESSaturator, PTU200 (Vaisala):

|                          | date       | number |
|--------------------------|------------|--------|
| ' temperature & pressure | 2003-01-23 | L00122 |

Measurement chamber, PTU200 (Vaisala):

|                          | date       | number |
|--------------------------|------------|--------|
| ' temperature & pressure | 2003-01-23 | L00122 |

**TEST POINTS**



**RESULTS**

| Reference<br>Temp[°C] | Humidity<br>[%RH] | HMP233<br>read[%RH] | HMP233<br>error [%RH] |
|-----------------------|-------------------|---------------------|-----------------------|
| 23.96                 | 0.05              | -0.13               | -0.18                 |
| 24.96                 | 10.05             | 10.22               | 0.17                  |
| 25.27                 | 19.67             | 19.88               | 0.21                  |
| 25.41                 | 29.25             | 29.6                | 0.35                  |
| 25.09                 | 39.74             | 40.33               | 0.59                  |
| 24.24                 | 52.25             | 52.94               | 0.69                  |
| 25.14                 | 59.48             | 59.91               | 0.43                  |
| 26.41                 | 68.78             | 69.04               | 0.26                  |
| 25.14                 | 79.28             | 79.22               | -0.06                 |

|        |       |       |       |
|--------|-------|-------|-------|
| 24.65  | 91.93 | 90.72 | -1.21 |
| 9.3    | 0.07  | -0.04 | -0.11 |
| 9.95   | 10.07 | 10.34 | 0.27  |
| 10.04  | 29.9  | 30.72 | 0.82  |
| 9.91   | 50.26 | 51.68 | 1.42  |
| 10.04  | 74.77 | 75.75 | 0.98  |
| 10.11  | 89.31 | 89.18 | -0.13 |
| 0.04   | 0.1   | 0.2   | 0.1   |
| 0.001  | 11.6  | 11.91 | 0.31  |
| 0.03   | 29.98 | 30.8  | 0.82  |
| 0.03   | 49.84 | 51.26 | 1.42  |
| 0.001  | 75.01 | 76.05 | 1.04  |
| 0.01   | 87.79 | 87.91 | 0.12  |
| -40.09 | 9.75  | 12.03 | 2.28  |
| -40.14 | 30.47 | 30.28 | -0.19 |
| -40.17 | 48.62 | 47.31 | -1.31 |
| -20.07 | 10.29 | 10.92 | 0.63  |
| -20.08 | 30.38 | 30.79 | 0.41  |
| -20.07 | 45.85 | 46.49 | 0.64  |
| -20.05 | 61.69 | 62.22 | 0.53  |
| -10.05 | 24.89 | 25.53 | 0.64  |
| -10.04 | 74.32 | 75.29 | 0.97  |
| 39.5   | 0.05  | -0.25 | -0.3  |
| 39.76  | 10.16 | 10.19 | 0.03  |
| 39.9   | 50.19 | 50.36 | 0.17  |
| 39.91  | 75.37 | 74.98 | -0.39 |
| 39.85  | 90.7  | 89.38 | -1.32 |
| 49.81  | 0     | -0.21 | -0.21 |
| 49.83  | 10.09 | 10.04 | -0.05 |
| 49.88  | 50.27 | 50.23 | -0.04 |
| 49.88  | 75.43 | 75.11 | -0.32 |
| 49.89  | 90.47 | 89.43 | -1.04 |
| 59.81  | 0     | -0.15 | -0.15 |
| 59.81  | 10.09 | 9.99  | -0.1  |
| 59.82  | 50.38 | 50.41 | 0.03  |
| 59.83  | 75.48 | 75.56 | 0.08  |
| 59.83  | 90.68 | 90.3  | -0.38 |
| 68.55  | 0     | -0.07 | -0.07 |
| 68.55  | 10.19 | 10.1  | -0.09 |
| 68.56  | 50.89 | 51.17 | 0.28  |
| 68.57  | 76.36 | 76.99 | 0.63  |
| 68.57  | 90.72 | 91.24 | 0.52  |
| 78.71  | 0     | 0.05  | 0.05  |
| 78.75  | 10.57 | 10.55 | -0.02 |
| 78.78  | 51.46 | 52.26 | 0.8   |
| 87.98  | 0     | 0.13  | 0.13  |
| 88.02  | 10.74 | 10.79 | 0.05  |
| 88.04  | 35.59 | 36.15 | 0.56  |

EH

2003-06-06

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|          |       |       |      |
|----------|-------|-------|------|
| 84.53 *  | 91.95 | 92.09 | 0.14 |
| 90.37 *  | 77.77 | 79.01 | 1.24 |
| 99.94 *  | 54.67 | 55.92 | 1.25 |
| 100.26 * | 68.46 | 70.16 | 1.7  |
| 119.67 * | 35.67 | 37.03 | 1.36 |

\* test station 2.