

# Vaisala HUMICAP<sup>®</sup> Humidity and Temperature Transmitter Series HMT330 *USER'S GUIDE*

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# CHAPTER 1

## GENERAL INFORMATION

### Safety

Throughout the manual, important safety considerations are highlighted as follows:

**WARNING**

Warning alerts you to a serious hazard. If you do not read and follow instructions very carefully at this point, there is a risk of injury or even death.

**CAUTION**

Caution warns you of a potential hazard. If you do not read and follow instructions carefully at this point, the product could be damaged or important data could be lost.

**NOTE**

Note highlights important information on using the product.

### ESD Protection

Electrostatic Discharge (ESD) can cause immediate or latent damage to electronic circuits. Vaisala products are adequately protected against ESD for their intended use. However, it is possible to damage the product by delivering electrostatic discharges when touching, removing, or inserting any objects inside the equipment housing.

To make sure you are not delivering high static voltages yourself:

- Handle ESD sensitive components on a properly grounded and protected ESD workbench. When this is not possible, ground

yourself to the equipment chassis before touching the boards. Ground yourself with a wrist strap and a resistive connection cord. When neither of the above is possible, touch a conductive part of the equipment chassis with your other hand before touching the boards.

- Always hold the boards by the edges and avoid touching the component contacts.

## Recycling



Recycle all applicable material.



Dispose of batteries and the unit according to statutory regulations. Do not dispose of with regular household refuse.

## Trademarks

HUMICAP® is a registered trademark of Vaisala. Microsoft®, and Windows® are registered trademarks of Microsoft Corporation in the United States and/or other countries.

## Getting Help

Contact Vaisala technical support:

E-mail            [helpdesk@vaisala.com](mailto:helpdesk@vaisala.com)

Telephone        +358 9 8949 789

Fax                +358 9 8949 790



## Warranty

Vaisala hereby represents and warrants all Products manufactured by Vaisala and sold hereunder to be free from defects in workmanship or material during a period of twelve (12) months from the date of delivery save for products for which a special warranty is given. If any Product proves however to be defective in workmanship or material within the period herein provided Vaisala undertakes to the exclusion of any other remedy to repair or at its own option replace the defective Product or part thereof free of charge and otherwise on the same conditions as for the original Product or part without extension to original warranty time. Defective parts replaced in accordance with this clause shall be placed at the disposal of Vaisala.

Vaisala also warrants the quality of all repair and service works performed by its employees to products sold by it. In case the repair or service works should appear inadequate or faulty and should this cause malfunction or nonfunction of the product to which the service was performed Vaisala shall at its free option either repair or have repaired or replace the product in question. The working hours used by employees of Vaisala for such repair or replacement shall be free of charge to the client. This service warranty shall be valid for a period of six (6) months from the date the service measures were completed.

This warranty is however subject to following conditions:

- a) A substantiated written claim as to any alleged defects shall have been received by Vaisala within thirty (30) days after the defect or fault became known or occurred, and
- b) The allegedly defective Product or part shall, should Vaisala so require, be sent to the works of Vaisala or to such other place as Vaisala may indicate in writing, freight and insurance prepaid and properly packed and labelled, unless Vaisala agrees to inspect and repair the Product or replace it on site.

This warranty does not however apply when the defect has been caused through

- a) normal wear and tear or accident;
- b) misuse or other unsuitable or unauthorized use of the Product or negligence or error in storing, maintaining or in handling the Product or any equipment thereof;
- c) wrong installation or assembly or failure to service the Product or otherwise follow Vaisala's service instructions including any repairs or installation or assembly or service made by unauthorized personnel not approved by Vaisala or replacements with parts not manufactured or supplied by Vaisala;
- d) modifications or changes of the Product as well as any adding to it without Vaisala's prior authorization;
- e) other factors depending on the Customer or a third party.

Notwithstanding the aforesaid Vaisala's liability under this clause shall not apply to any defects arising out of materials, designs or instructions provided by the Customer.

This warranty is expressly in lieu of and excludes all other conditions, warranties and liabilities, express or implied, whether under law, statute or otherwise, including without limitation any implied warranties or merchantability or of fitness for a particular purpose and all other obligations and liabilities of Vaisala or its representatives with respect to any defect or deficiency applicable to or resulting directly or indirectly from the Products supplied hereunder, which obligations and liabilities are hereby expressly cancelled and waived. Vaisala's liability shall under no circumstances exceed the invoice price of any Product for which a warranty claim is made, nor shall Vaisala in any circumstances be liable for lost profits or other consequential loss whether direct or indirect or for special damages.

## CHAPTER 2

# PRODUCT DESCRIPTION

Vaisala HUMICAP® Humidity and Temperature Transmitter Series HMT330 provides reliable humidity measurement in wide range of applications. Analog outputs can be chosen between current and voltage signals. Alternatively the following digital outputs can be selected: RS-232 (standard) or RS-422/485 (optional). The transmitter measures and calculates the following quantities:

| Quantity          | Metric Unit | Non Metric Unit |
|-------------------|-------------|-----------------|
| Relative humidity | %RH         | %RH             |
| Temperature       | °C          | °F              |

Optionally available the following quantities:

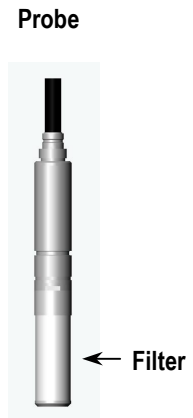
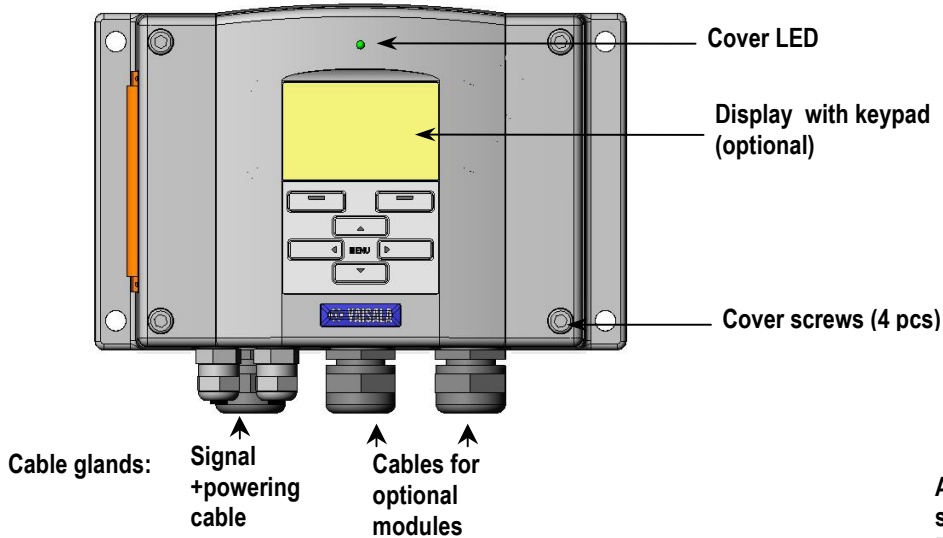
| Quantity                             | Metric Unit      | Non Metric Unit    |
|--------------------------------------|------------------|--------------------|
| Dewpoint /Frostpoint                 | °C               | °F                 |
| Dewpoint                             | °C               | °F                 |
| Absolute humidity                    | g/m <sup>3</sup> | gr/ft <sup>3</sup> |
| Mixing ratio                         | g/kg             | gr/lb              |
| Wetbulb temperature                  | °C               | °F                 |
| Humid air volume/ dry air volume     | ppm              | ppm                |
| Water vapour pressure                | hPa              | lb/in <sup>2</sup> |
| Saturation water vapour pressure     | hPa              | lb/in <sup>2</sup> |
| Enthalpy                             | kJ/kg            | Btu/lb             |
| Difference of T and T <sub>d/f</sub> | °C               | °F                 |

## Options

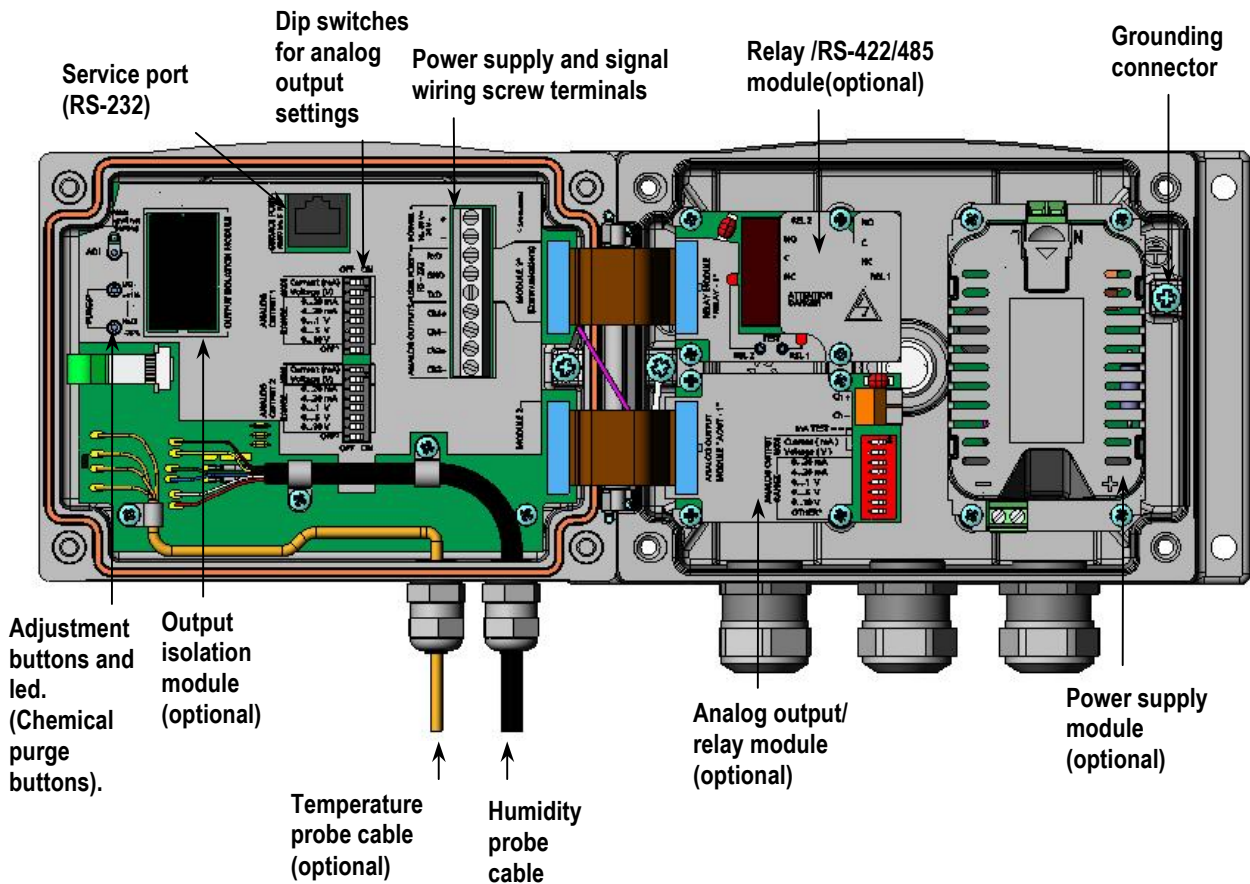
- several probes for different applications
- user friendly display
- calculated output quantities available
- different probe mounting kits, sensor protection options and probe cable lengths
- different transmitter mounting kits
- chemical purge for applications where there is a risk of interfering chemicals in the measuring environment
- warmed probe and sensor heating for high humidity conditions (HMT337)
- optional modules: isolated power supply, power supply module, RS-422/485-module, additional analog output module, relay module
- additional temperature sensor (HMT337)

# Parts

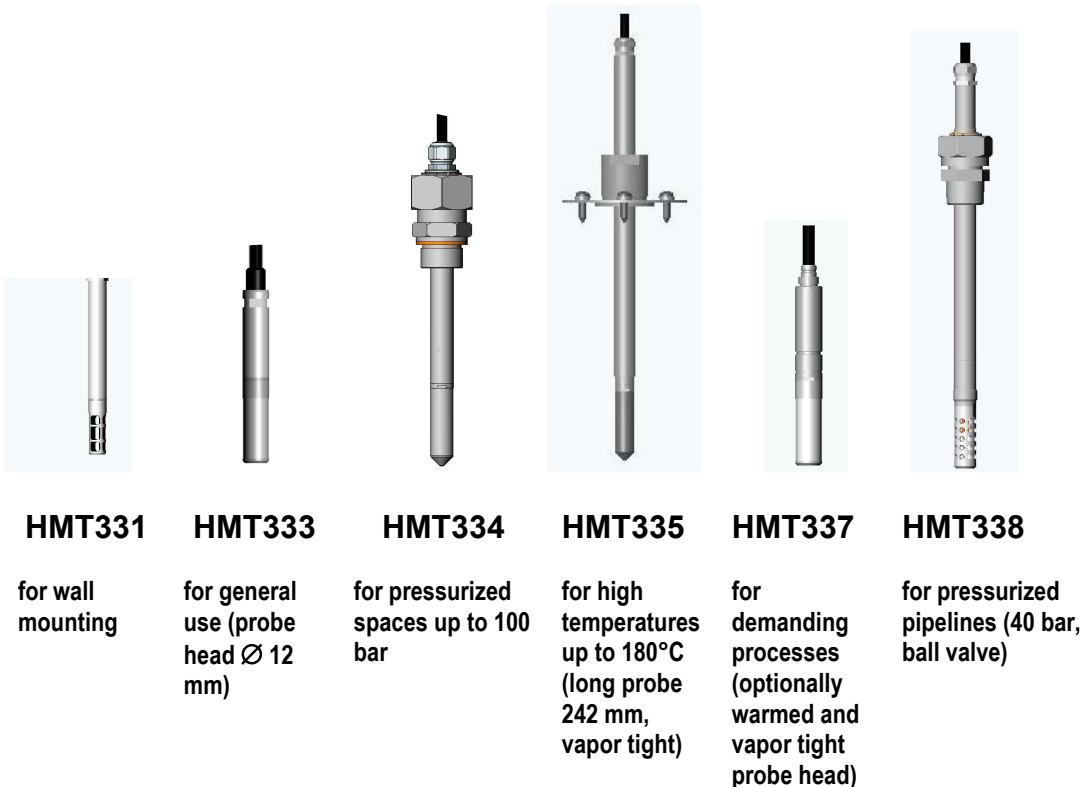
## HMT330 Transmitter body



A yellow plastic probe cover is protecting the sensor head during the transportation. Remove the cover when measuring.



## Probe options



Probe cable lengths: 2, 5 and 10 m.

## Warmed probe HMT337

Temperature difference between the probe head and external environment can cause a risk of condensation on the sensor. A wet probe cannot observe the actual humidity in the ambient air. If the condensed water is contaminated, the life span of the probe may shorten and calibration may change.

HMT337 probe shall be used in applications where condensation can occur due to high humidity and rapid humidity changes. The warmed probe head is heated continuously so that its temperature is always higher than in environment. This prevents condensation on the probe. The power consumption of the warmed probe is slightly higher than other probes.

## CHAPTER 3

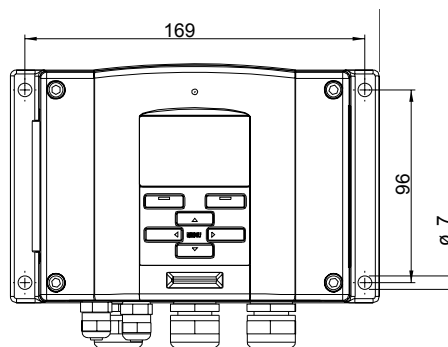
# INSTALLATION

## Mounting of the housing

### Wall mounting

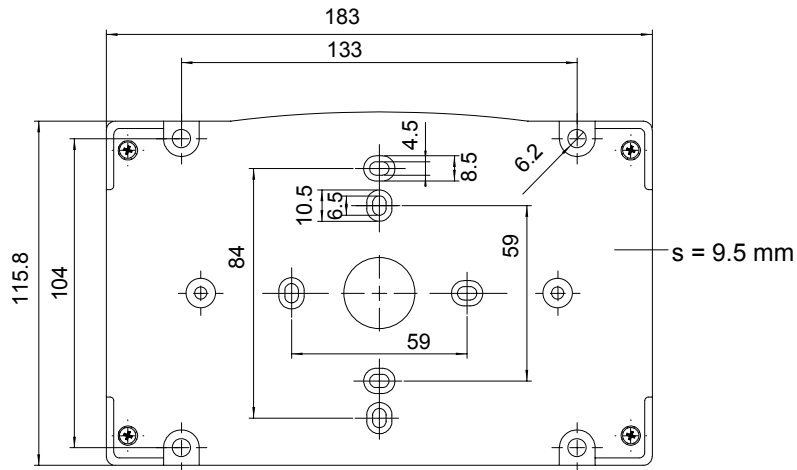
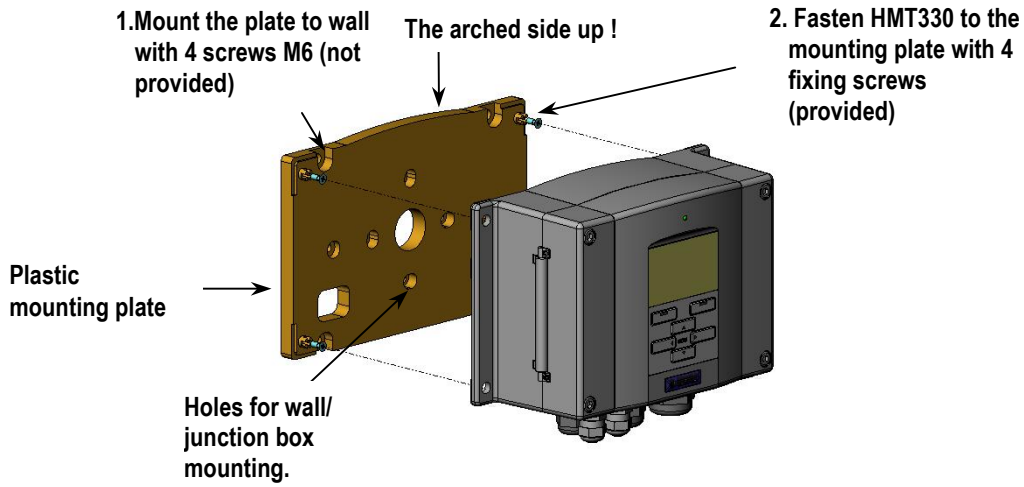
#### Without mounting plate

Fasten the transmitter to the wall with 4 screws M6 (not provided).



#### With plastic wall mounting plate (optional)

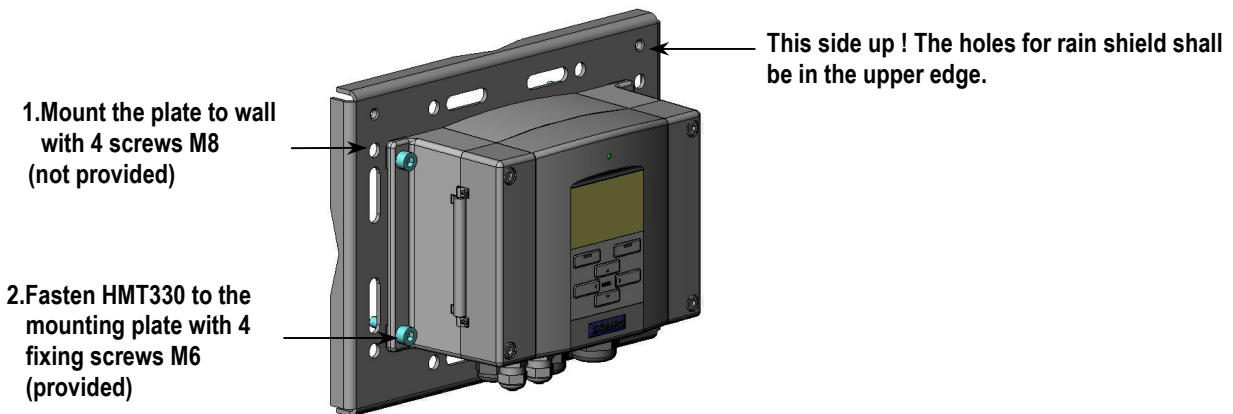
The mounting plate (Vaisala order code 214829) can be installed directly on wall or onto a standard wall box (also US junction box). When wiring through back wall, remove the plastic plug from the wiring hole before mounting.

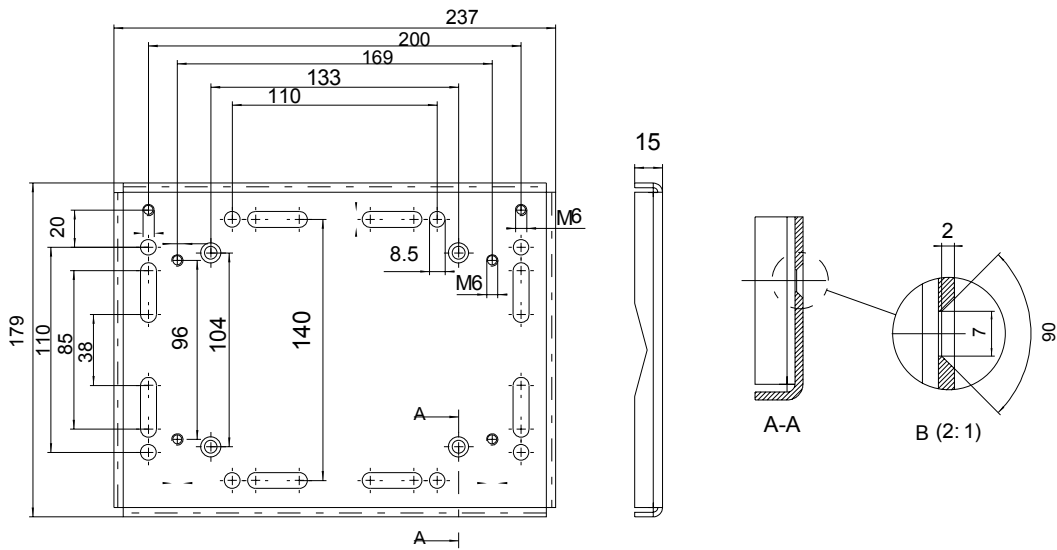


**Plastic mounting plate, dimensions (mm)**

**With metal wall mounting plate (optional)**

Metal mounting plate is included in Rain shield kit and pole installation kit.



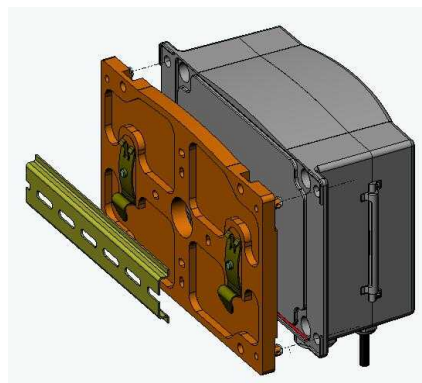


**Metal mounting plate, dimensions (mm)**

### **DIN rail kit mounting (optional)**

Din rail kit includes a plastic wall mounting plate, 2 spring holders and 2 screws M4 x 10 DIN 7985 (Vaisala order code 215094).

1. Attach two spring holders to the plastic mounting plate by using the screws provided with an installation kit.
2. Fasten HMT330 to the plastic mounting plate with 4 screws provided.
3. Press the transmitter onto the DIN rail so that the spring holders snap into the rail.

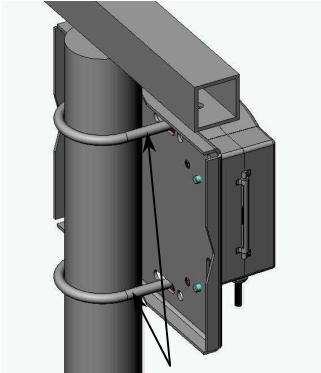


**Din rail kit mounting**

## Pole installation with mounting plate

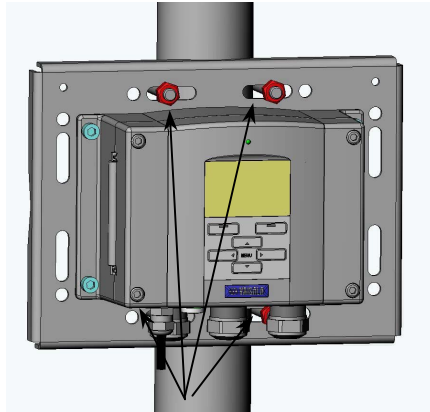
Pole installation kit (Vaisala order code 215108) includes the metal mounting plate and 2 mounting nuts for pole mounting.

**Vertical pole**



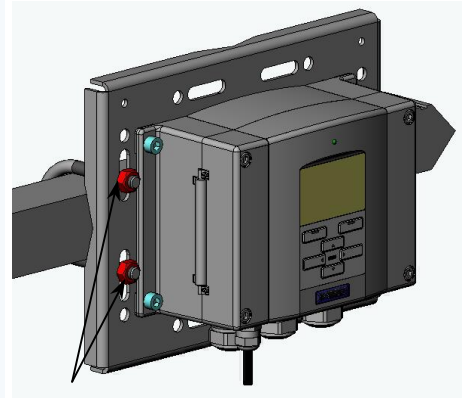
Fixing brackets (2 pcs)  
M8 (provided)  
for Ø 30...102 mm poles.

**Vertical pole**



Mounting nuts M8 (4 pcs)

**Horizontal pole**



Mounting nuts M8 (4 pcs)

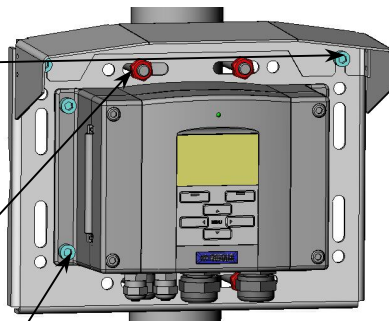
## Mounting the rain shield

Vaisala order code: 215109.

1. Fasten the rain shield to the metal mounting plate with 2 (M6) mounting screws (provided)

2. Fasten the mounting plate with rain shield to the wall or to the pole (see pole installation).

3. Fasten the HMT330 to the mounting plate 4 fixing screws (provided)

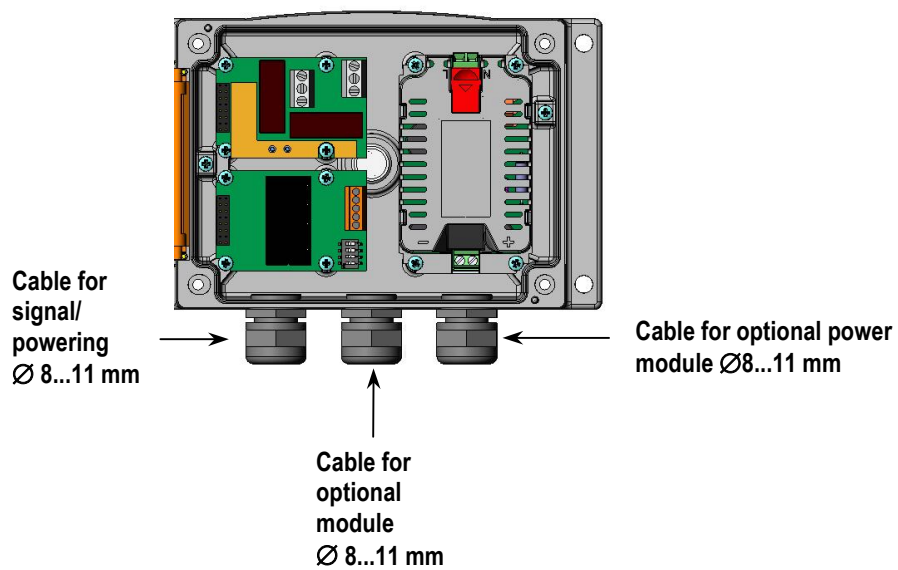




# Wiring

## Cable bushings

A single electrical cable with a screen and three to ten wires is recommended for power and analog/serial connections. The cable diameter should be 8...11 mm. The number of cable bushings depends on the transmitter options. See the following recommendations for the cable bushings:

**NOTE**

When there is high electric noise level (e.g. near powerful electric motor) in the operating environment it is recommended to use shielded cable or take care that the signal cables are separated from other cables.

## Grounding the cables

The screen of the electrical cable must be grounded properly to achieve the best possible EMC performance.

Fig. 1

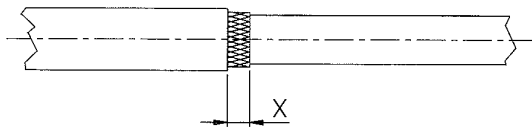


Fig. 2

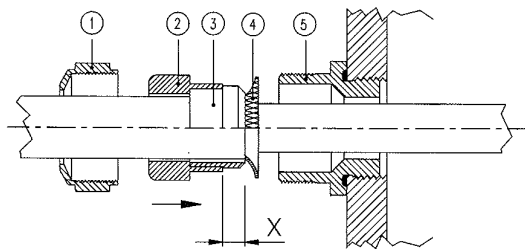
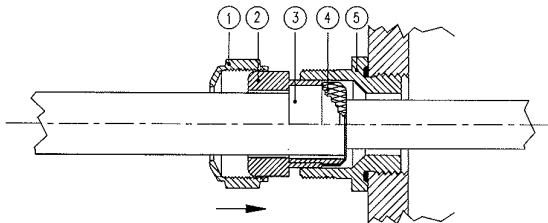


Fig. 3



1. Cut back outer sheath to desired length.
2. Cut back screen braiding or screen foil to dimension X (see figure 3).
3. Push the domed cap nut (item 1) and the seal insert with contact socket of the gland (item 2+3) onto the cable as shown in the diagram.
4. Bend over the screen braiding or screen foil by about 90° (item 4).
5. Push the seal insert with the contact socket of the gland (item 2+3) up to the screen braiding or screen foil.
6. Mount lower part (item 5) on the housing.
7. Push the seal with the contact socket of the gland and (item 2+3) flush into the lower part (item 5).
8. Screw the domed cap nut (item 1) onto the lower part (item 5).

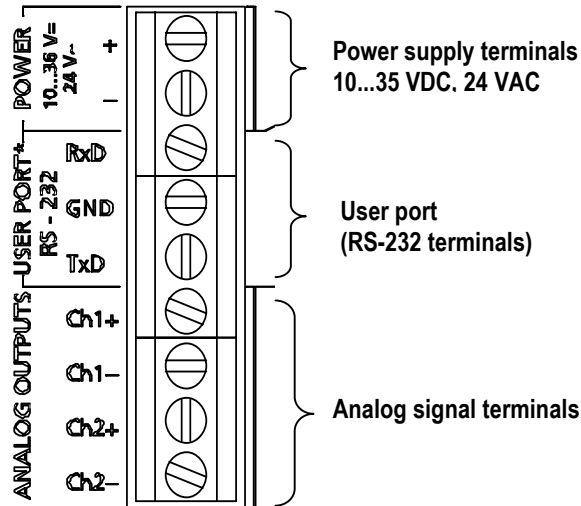
## Transmitter housing grounding

In case you need to ground the transmitter housing, the grounding connector is found inside the housing (see picture on page 11). Note anyhow that the probe head is connected to the same potential as the housing. Make sure that different groundings are made to the same potential. Otherwise harmful ground currents may be generated.

If it is needed to have galvanic isolation of the power supply line from the output signals, HMT330 can be ordered with optional output isolation module, see Appendix 3. This module prevents harmful grounding loops.

## Signal and power supply wiring

When connecting transmitter with 8-pole connector, see Appendix 7.



### Screw terminal block on the motherboard

#### WARNING

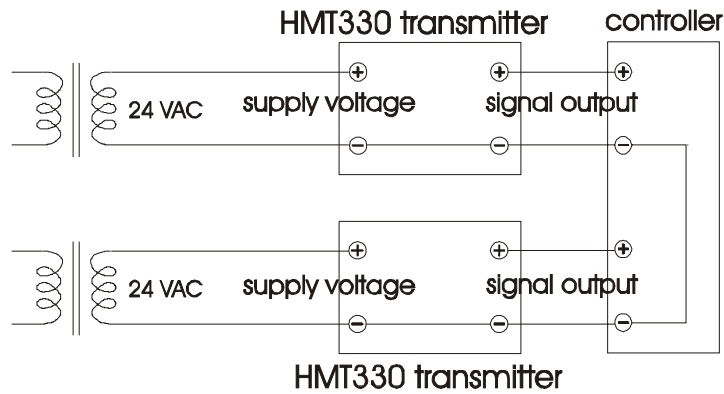
Make sure that you connect only de-energized wires.

1. Open the transmitter cover by taking out the four cover screws.
2. Insert the power supply wires and signal wires through the cable bushing in the bottom of the transmitter; see the grounding instructions in the previous sections.
3. Connect the analog output cables to terminals: **Ch1 +, Ch1-, Ch2+, Ch2-**. Connect the RS-232 user port cables to terminals **RxD, GND and TxD**, more about the RS-232 connection on page 33.
4. When wiring RS-485 module, relay module or additional analog output module, see Appendices 4, 5 and 6.
5. Connect the power supply wires to the connectors: **POWER 10...35V+ 24V~ (+) and (-)** terminals. (If using AC voltage, connect **always** phase to power supply **(+)** and 0 to power supply **(-)**). When wiring the power supply module, see Appendix 2.
6. Turn on the power. The indicator led on the cover lit continuously during normal operation.
7. Close the cover and replace the cover screws. The transmitter is ready for use.

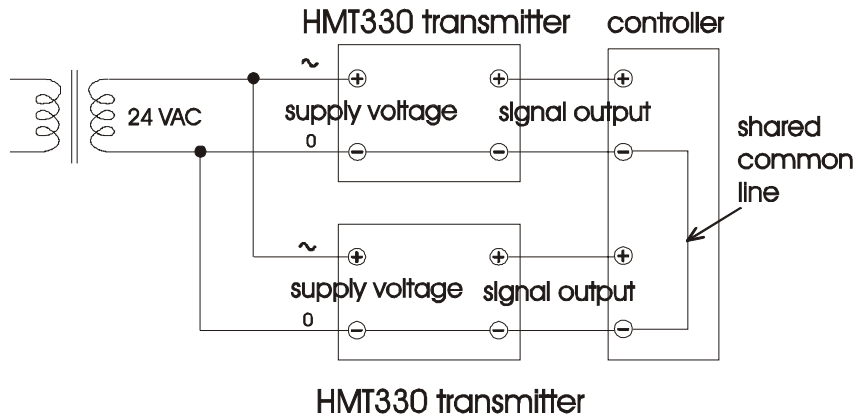
## Connections to a 24 VAC power supply

Separate floating supply for each transmitter is recommended (see figure A). If you have to connect several transmitters to one AC supply, the phase (~) must always be connected to (+) connector of each transmitter (see figure B).

A) No common loop - RECOMMENDED!



B) Common loop formed



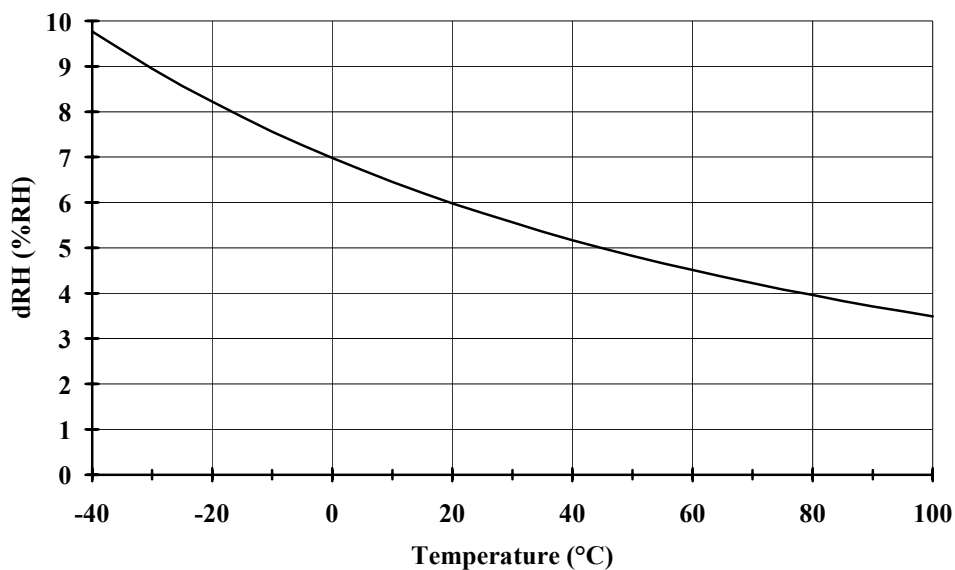
### CAUTION

In case you have only one AC supply, never connect same wire to the + connector of a transmitter and to the - connector of another one. This will short-circuit the transformer.

## Probe mounting

### Beware of temperature differences

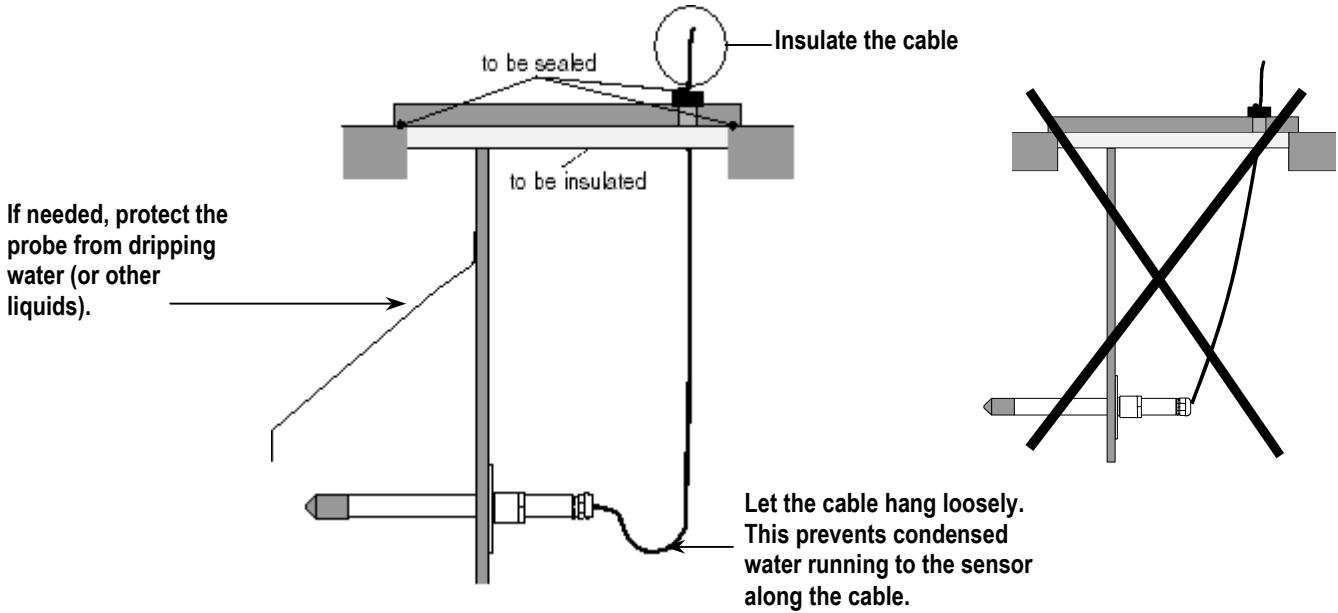
In humidity measurement and especially in calibration it is essential that temperature of the probe and measuring environment is the same. Even a small difference in temperature between the environment and the probe causes an error. As the curve below shows, if the temperature is +20 °C and the relative humidity 100 %RH, a difference of  $\pm 1$  °C between the environment and the probe causes an error of  $\pm 6$  %RH.



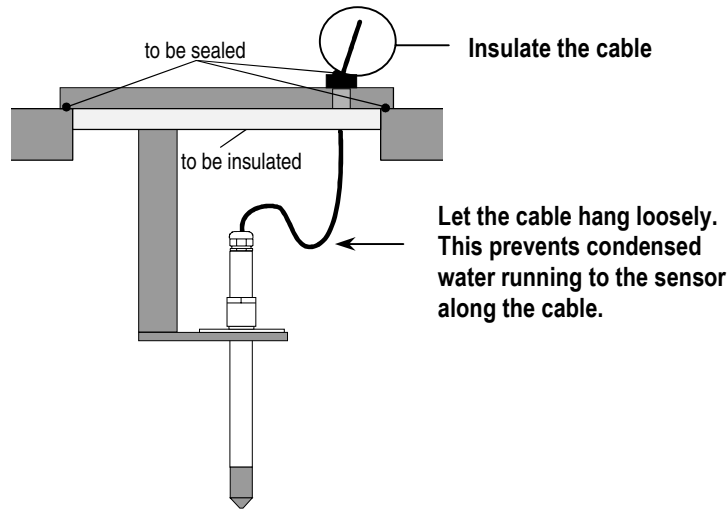
Measurement error at 100 %RH when the difference between the ambient and sensor temperature is 1 °C.

### General instructions for the probes with a cable

Mount the probes with a cable with the sensor head **horizontally**; this way, any water condensing on the tube cannot flow onto the sensor.



When there is no alternative but to install the sensor head in the process **vertically**, the point of entry must be carefully insulated. The cable must also be allowed to hang loosely as this prevents any condensed water from running onto the sensor head along the cable.



**NOTE**

Please do not attach a heated probe (HMT337) to a metal structures to avoid condensation problems caused by heat conduction along the metal.

If the process temperature is much higher than that of the environment, the whole sensor head and preferably plenty of cable must be inside the process. This prevents measuring inaccuracy caused by heat conduction along the cable.

When mounted on the side of a duct or channel, the sensor head must be inserted from the side of the duct. If this is not possible and the sensor head must be inserted from the top, the point of entry must be carefully insulated.

Vaisala probe installation kits and some installation examples are presented in Appendix 11.

## HMT333 for general use

The HMT333 is a small size (d=12mm) general-purpose probe suitable for ducts and channels with the installation kit available from Vaisala.

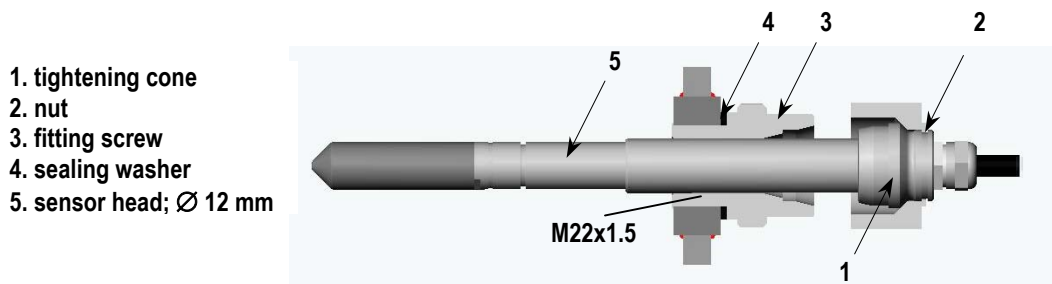
The following probe installation kits for HMT333 and installation examples are presented in Appendix 11:

- Duct mounting kit
- Cable gland.

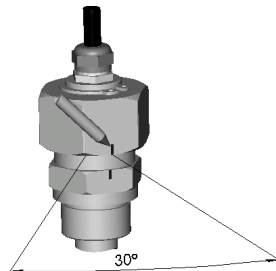
## HMT334 for pressurized spaces

The HMT334 probe is for the humidity measurements in pressurized rooms and industrial processes. The probe is provided with a nut, a fitting screw and a sealing washer. Keep the fitting screw and the nut in place on the body of the sensor head during handling to prevent damage to the highly polished surface of the probe. Follow the instructions below to achieve a leak-tight assembly:

1. Unscrew the fitting screw from the nut and the sensor head.
2. Fasten the fitting screw to the chamber wall with a sealing washer. Tighten the fitting screw into the threaded sleeve with a torque spanner. The tightening torque is  $150 \pm 10$  Nm ( $110 \pm 7$  ft-lbs)
3. Insert the body of the sensor head into the fitting screw and screw the nut manually to the fitting screw until the connection feels tight.
4. Mark both the fitting screw and the nut hex.



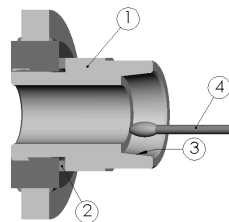
5. Tighten the nut a further  $30^\circ$  (1/12 turn) or if you have a torque spanner tighten it with a torque of  $80 \pm 10$  Nm ( $60 \pm 7$  ft-lbs).



**NOTE** After detachment the nut must be tightened without increased effort.

6. Clean and grease the tightening cone of the fitting screw after every tenth detachment. Change the sealing washer every time the fitting screw is detached. Use high-vacuum grease (e.g. Down Corning, Europe) or a similar grease.

1. fitting screw
2. sealing washer
3. tightening cone
4. clean cotton stick



**CAUTION** In pressurized processes it is essential to tighten the supporting nuts and screws very carefully to prevent loosening of the probe by the action of pressure.

**NOTE** When the HMT330 is installed in a process with a pressure differing from normal atmospheric pressure, please enter the pressure value of the process (in hPa or mbar) into the transmitter memory, see command **PRES** or use display/keypad.

## HMT335 for high temperatures

HMT335 is installed similarly than the probe HMT333 but without the supporting bar. The duct installation kit for HMT335 is presented in Appendix 11.

To avoid incorrect humidity readings, the temperature differences between inside and outside of the duct shall not be remarkable.



## HMT337 for demanding processes

The HMT337 is for environment where relative humidity is very high, near saturation. The warmed probe head prevents the saturation of the sensor. An additional temperature probe is also available.

The following probe installation kits for HMT337 and installation examples are presented in Appendix 11:

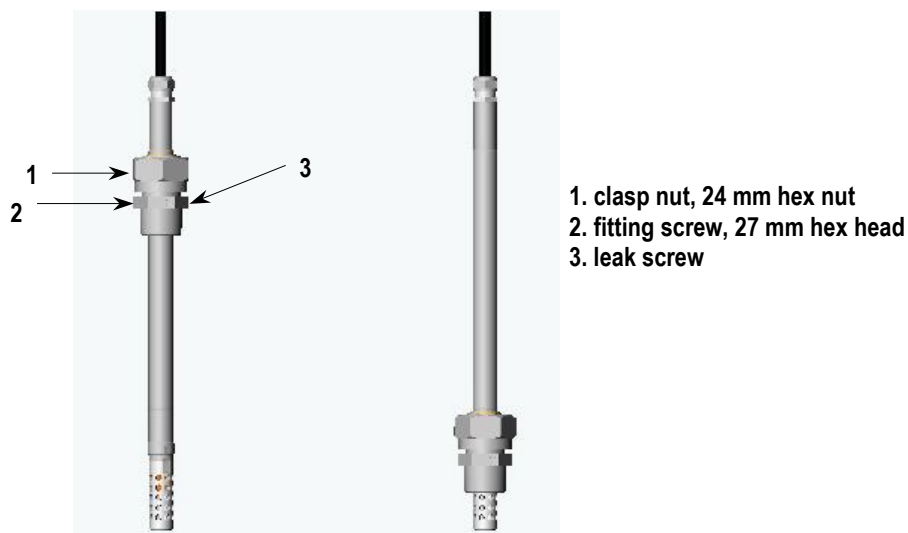
- Duct mounting kit
- Cable gland
- Pressure tight Swagelok connector
- Vaisala's Meteorological Installation kit

The installation kits are available both for humidity probe and temperature probe.

## HMT338 for pressurized pipelines/oils

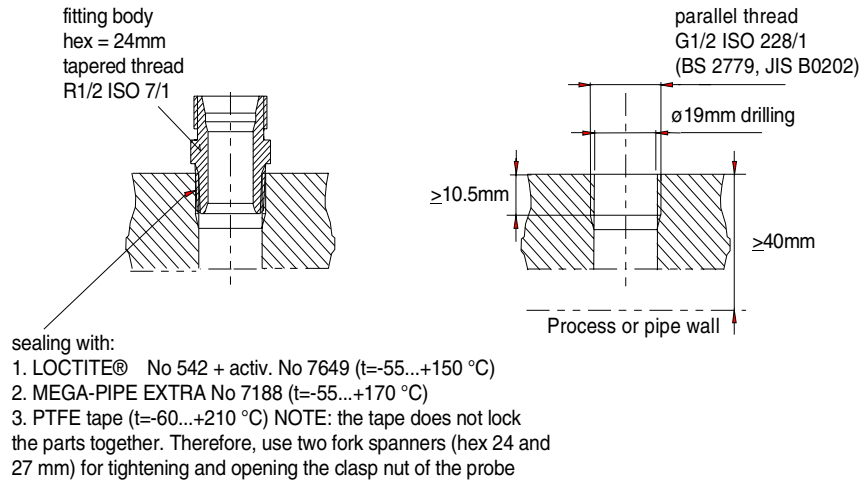
Due to the sliding fit, the HMT338 is easy to install into and remove from the pressurized process. The probe is especially suitable for the measurements in pipelines.

The ball valve installation kit for HMT338 is presented in Appendix 11:



**HMT338 probe dimensions (in mm); standard 178 (adjustment range 120 mm) and optional 400 mm (adjustment range 340 mm).**

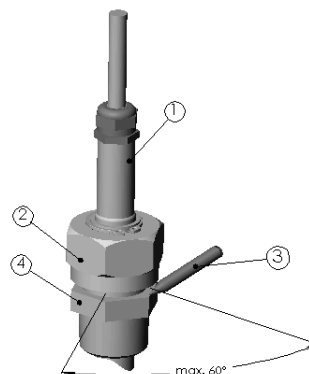
### Sealing thread cutting for the fitting body.



### Tightening the clasp nut

1. Adjust the probe to a suitable depth according to the type of installation and tighten the clasp nut first manually.
2. Tighten the clasp nut first manually.
3. Mark the fitting screw and the clasp nut.
4. Tighten the nut a further 50 - 60° (ca.1/6" turn) with a plastic wrench. If you have a suitable torque spanner, tighten the nut to max 45±5 Nm (33±4 ft-lbs).

1. probe
2. clasp nut
3. pen
4. fitting screw



#### NOTE

Take care not to over tighten the clasp nut to avoid difficulties when opening it.

**CAUTION** Take care not to damage the probe body. A damaged body makes the probe head less tight and may prevent it from going through the clasp nut.

**CAUTION** In pressurized processes it is essential to tighten the supporting nuts and screws very carefully to prevent loosening of the probe by the action of pressure.

**NOTE** When installed in a process with a pressure differing from normal atmospheric pressure, please enter the pressure value of the process (in hPa or mbar) into the transmitter memory via the serial line (see command **PRES**) or by using display/keypad.

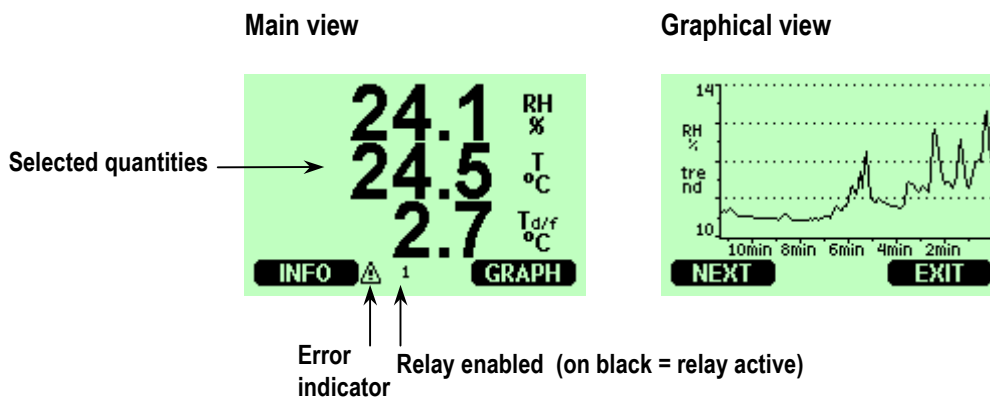
## CHAPTER 4

# OPERATION

Within a few seconds after power-up the led on the cover of the transmitter is lit continuously indicating normal operation.

## Display/keypad (optional)

When the transmitter is turned on the first time, the language selection window opens: Select the language with ▲▼ keys and press = SELECT key. Display shows you the measurement values of the selected quantities in the selected units. You can select 1...3 quantities for the numerical main view (see Chapter 4 section *Changing the quantities and units*). In the graphical view the measurements are presented in a form of curve showing the data trend and history of the measurements.



## Main view

Press the **INFO** key (in the main view) to see the device information views, see section *Device information*.

The error indicator is lit as long as the error state is on. The sign disappears when the error state is over and you have checked the error message (press the **INFO** key in the main view).

### NOTE

From any view, a long press on the right-hand function key takes you directly to the main view.

## Graphical view

The graphical view shows the data trend of the selected quantities, one at a time. The graph is updated automatically while measuring. Use the following functions in graphical view:

- Press the **NEXT** key to have the trend graph and max/min graph in turns.
- Press the **EXIT** key to get back the main view.

**Trend graph:** Shows you a curve of average values. Each value is calculated average over a time period. See table below.

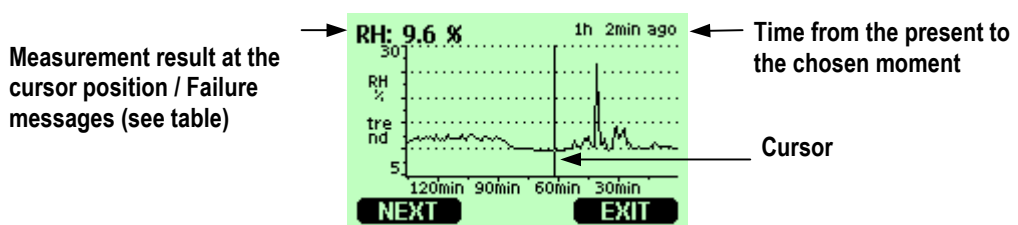
**Max/min graph:** Shows you the minimum and maximum values in a form of curve. Each value is max/min over a time period. See table below.

The time period for the trend and max/min calculations depends on the selected graph window as follows:

### Time periods for calculations.

| Observation time | Time period for trend/max/min calculations |
|------------------|--|
| 10 minutes       | 5 seconds                                  |
| 2 hours          | 1 minute                                   |
| 1 day            | 12 minutes                                 |
| 10 days          | 2 hours                                    |
| 2 months         | 12 hours                                   |
| 1 year           | 3 days                                     |

- Press the ▲▼ keys to zoom in and out the time in the graph window.
- Press the ◀▶ keys to have a cursor mode where you can observe an individual measuring point. Press an arrow key to move a cursor (vertical bar) along the time axis. The numerical value at the cursor position is shown at the left upper corner. Time from the present to the chosen moment is shown at the right upper corner.



## Messages

| Message          | Interpretation  |
|------------------|---|
| Power outage     | Power failure (marked also with dashed vertical line).        |
| No data          | Quantity has not been selected for the display.               |
| RH meas. failure | Humidity measurement/sensor failure.                          |
| T meas. failure  | Temperature measurement/sensor failure.                       |
| Device failure   | General device failure.                                       |
| Adj.mode active  | Adjustment mode active (data visible only in adjustment mode) |

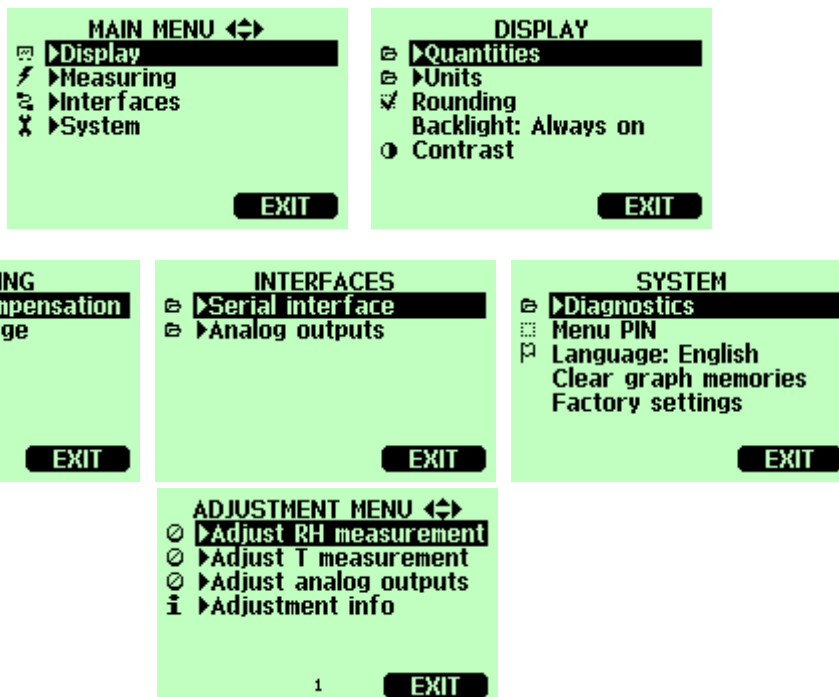
A question mark after time tells you that at least one power failure (dashed vertical line) has occurred after the chosen moment. In this case, the actual time difference between the present and the cursor position is not exactly known.

## Menus and navigation

In the menus you can change settings and select functions.

1. Open the **MAIN MENU** by pressing any of the ▲▼◀▶ arrow keys.
2. Move in the menus by using the arrow keys.
3. Open a submenu with ► key.
4. Press ◀ to return to the previous level.
5. Function key = **EXIT** returns you back to the main view.

Adjustment menu opens only when **ADJ** button (on the motherboard) is pressed.



Display menus (the contents of the menu depends on the transmitter model and options)

## Changing the language setting

1. Go back to the main view by keeping the right-hand **—** key pressed.
2. Open the **MAIN MENU** by pressing any of the **▲▼◀▶** keys
3. Select **►System** (the lowest row) press **►**key.
4. Select **Language: ...** (the third row marked with a flag icon), press **— SELECT** key (left-hand **—** key).
5. Select the language with **▲▼** keys and press **— SELECT** key (left-hand **—** key).
6. Press **— EXIT** to return to the main view.

## Rounding setting

You can round off one decimal by using the Rounding function (rounding ON). The default setting is rounding on. The rounding has no effect on quantities without decimals.

1. Open the **MAIN MENU** by pressing any of the **▲▼◀▶** arrow keys.
2. Select **►Display**, press **►**key.
3. Select **Rounding**, press **— ON/OFF** key.
4. Press **— EXIT** to return to the main view.

## Display backlight setting

By the default the display backlight is always on. In the automatic mode the backlight stays on for 30 seconds from the last keypress. When pressing any key, the light turns on again.

1. Open the **MAIN MENU** by pressing any of the **▲▼◀▶** arrow keys.
2. Select **►Display**, press **►**key.
3. Select **Backlight**, press **— CHANGE** key.
4. Select **On/Off/ Automatic**, press **— SELECT** key.
5. Press **— EXIT** to return to the main view.

## Display contrast setting


1. Open the **MAIN MENU** by pressing any of the ▲▼◀▶ arrow keys.
2. Select ►**Display**, press ► key.
3. Select **Contrast**, press ─ **ADJUST** key.
4. Adjust the contrast by pressing the ◀▶ arrow keys.
5. Press ─ **OK** and ─ **EXIT** to return to the main view.

## Keypad lock (keyguard)

This function locks the keypad and prevents unintentional key presses.

1. Keep pressing the left-hand function key for 4 seconds to lock the keypad (at any display).
2. To unlock the keypad, press the ─ **OPEN** key for 4 seconds.

## Menu PIN lock

You can prevent access to the device settings by activating the menu PIN lock. When this function is activated, the main view and graphical view are available but access to the menus is locked. The key symbol  indicates the activation of this feature.

1. Open the **MAIN MENU** by pressing any of the ▲▼◀▶ arrow keys
2. Select ►**System**, press ► key.
3. Select **Menu PIN**, press ─ **ON** key.
4. Give a PIN code by using ▲▼ keys. Press ─ **OK** to confirm the setting. Now the PIN lock is on and the key symbol is shown in a display. When you exit from the menu, returning is possible only by giving the PIN code.
5. Press ─ **EXIT** to return to the main view.

When you want to turn off the PIN lock, go to the menu by giving the PIN code and select ►**System**, **Menu PIN**, press ─ **OFF** key.

In case you have forgotten the PIN code, open the transmitter cover and press the **ADJ** button once. Wait for a few seconds and the adjustment menu opens. Select **Clear menu PIN**, press ─ **CLEAR**.

|             |   |
|-------------|---|
| <b>NOTE</b> | You can also disable the keypad and or lock the menus with serial command <b>LOCK</b> . |
|-------------|---|



---

# Serial interface connections

Connect the serial interface by using either the user port or the service port.

For fixed RS-232 connection, use the user port. You can change the serial settings and operate in RUN, STOP and POLL modes.

For temporary RS-232 connections and with MI70 Link software, use the service port. Service port allows you to operate only in STOP mode with fixed serial settings.

## Connections

### 1. User port connection:

Use suitable serial cable between the user port RxD, GND and TxD screw terminals and the PC serial port.

#### NOTE

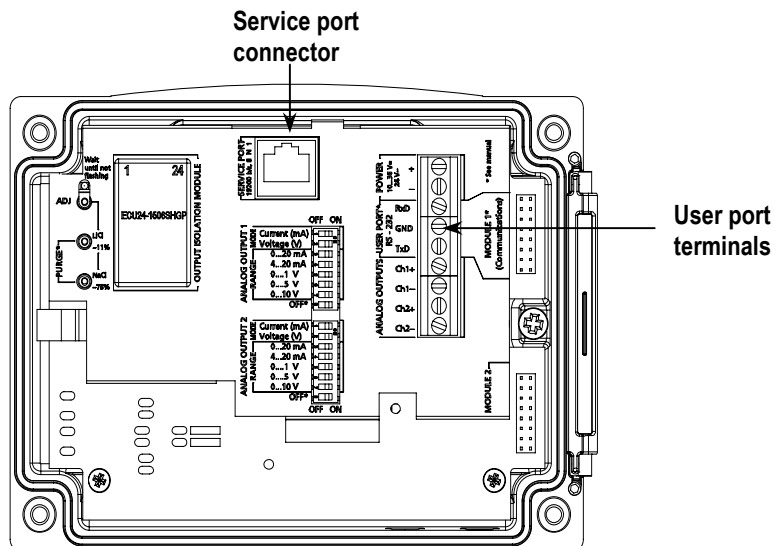
User port cannot be used when RS-485 module is connected.

### Service port connection (Vaisala interface cable):

Connect the serial interface cable (optional accessory, order code: 19446ZZ) between the serial port of your PC and the service port connector on the motherboard, see picture.

### 2. Power-up the HMT330.

### 3. Open a terminal program and set the communication settings (see the following section for more detailed instructions).



**Default serial communication settings for the user port**

| Parameter    | Value |
|--------------|-------|
| bauds        | 4800  |
| parity       | no    |
| data bits    | 7     |
| stop bits    | 1     |
| flow control | none  |

**Fixed communication settings for the service port.**

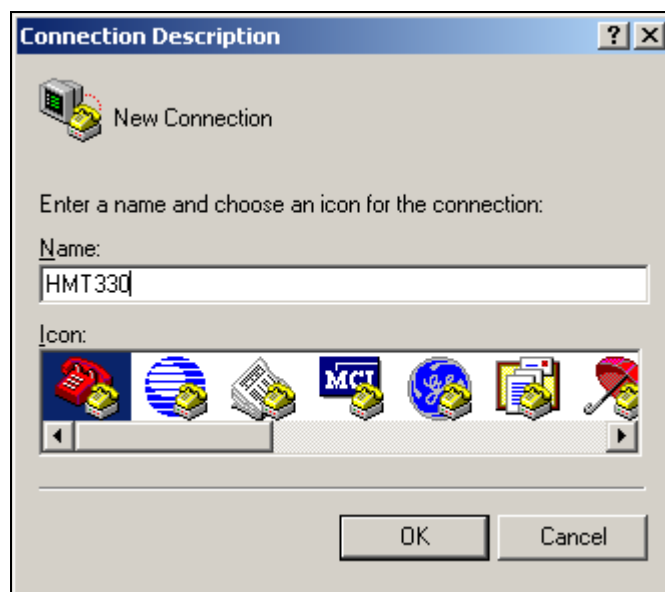
| Parameter    | Value |
|--------------|-------|
| bauds        | 19200 |
| parity       | no    |
| data bits    | 8     |
| stop bits    | 1     |
| flow control | none  |

## Terminal program connection

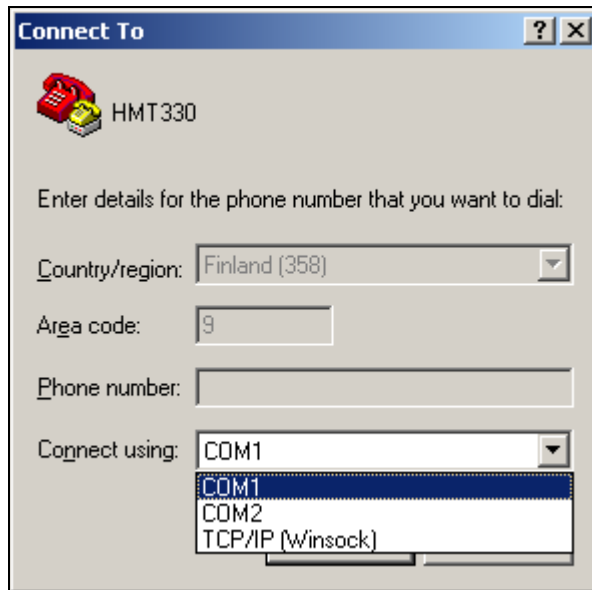
The following instructions show a connection example with HyperTerminal program (included in the Microsoft® Windows®).

Follow the instructions below to open a HyperTerminal program:

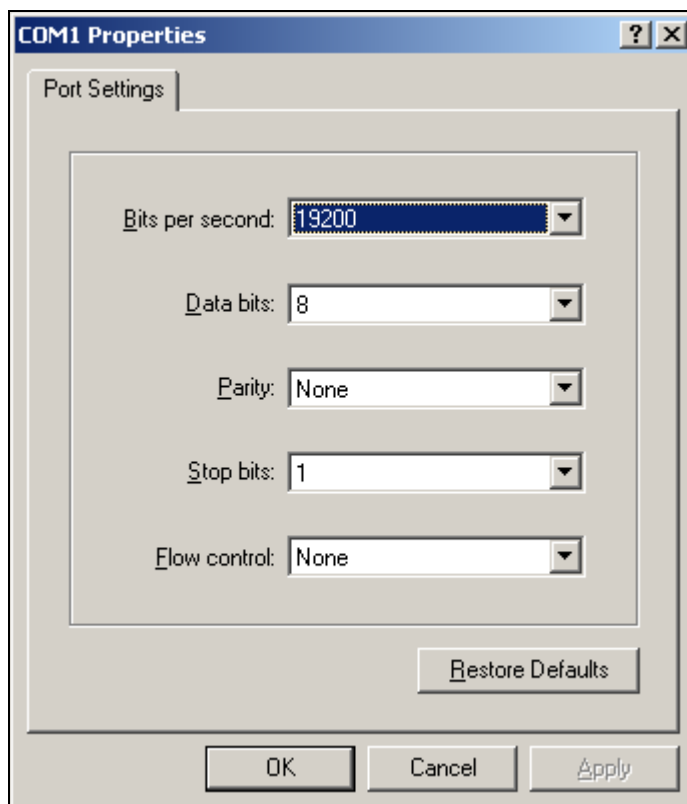
1. Start HyperTerminal. To get help for starting HyperTerminal, click "Start", select "Help" to open Windows® help, and search for "HyperTerminal".
2. In the HyperTerminal's "New Connection" window, define a name for HMT330 serial connection, e.g. "HMT330". Click OK.



3. In "Connect using" box, select the PC communications port where the serial cable is connected. (If your computer has only one COM port, it is called "COM1".) Click OK.



4. Set the port settings in the "Properties" window to match the current settings of your HMT330 *user port*. (Use the fixed settings shown in the picture below if you are using the HMT330 *service port*.) For HMT330, "Flow control" must always be set to "None". Finally click OK to start using the serial connection.



Select "File" → "Save" in the HyperTerminal main window to save the serial port settings. To use the saved settings later, start HyperTerminal, click cancel in the "New Connection" window, and select "File" → "Open".

# List of serial commands

The bold text in the brackets is a default setting.

## Measurement commands

|                               |   |
|-------------------------------|---|
| <b>R</b>                      | Start the continuous outputting                             |
| <b>S</b>                      | Stop the continuous outputting                              |
| <b>INTV</b> [0...255 S/MIN/H] | Set the continuous output interval (for RUN mode)           |
| <b>SEND</b> [0...99]          | Output the reading once                                     |
| <b>SEND D</b>                 | Outputting the reading with the raw data                    |
| <b>SMODE</b> [STOP/RUN/POLL]  | Set the serial interface                                    |
| <b>SERI</b> [baud p d s]      | User port settings (default: 4800 E 7 1) baud: 300...115200 |
| <b>ADDR</b> [0...99]          | Set the transmitter address (for POLL mode)                 |
| <b>OPEN</b> [0...99]          | Open temporarily connection to the POLL-mode device         |
| <b>CLOSE</b>                  | Close the connection (back to POLL mode)                    |

## Formatting commands

|                       |  |
|-----------------------|--|
| <b>FORM</b>           | Set the output format of SEND and R commands   |
| <b>TIME</b>           | Set the time   |
| <b>DATE</b>           | Set the date   |
| <b>FTIME</b> [ON/OFF] | Add time to output to SEND and R outputs   |
| <b>FDATE</b> [ON/OFF] | Add date to R and SEND outputs   |
| <b>FST</b> [ON/OFF]   | Add the state of probe heating and chemical purge in connection with SEND and R commands |
| <b>UNIT</b>           | Select the metric or non-metric output units   |

## Data recording commands

|                      |   |
|----------------------|---|
| <b>DSEL</b>          | Select data recording and display quantities. |
| <b>PLAY</b> [0...17] | Output recorded data file                     |
| <b>DIR</b>           | Display recorded files                        |
| <b>DELETE</b>        | Delete the graph files                        |
| <b>UNDELETE</b>      | Recovers the deleted files                    |

## Chemical purge commands

|              |                                  |
|--------------|----------------------------------|
| <b>PUR</b>   | Set the automatic chemical purge |
| <b>PURGE</b> | Start the manual chemical purge  |

## Calibration and adjustment commands

|              |   |
|--------------|---|
| <b>CRH</b>   | Relative humidity calibration                     |
| <b>CT</b>    | Temperature calibration                           |
| <b>CTA</b>   | Additional temperature probe calibration          |
| <b>FCRH</b>  | Relative humidity calibration after sensor change |
| <b>LI</b>    | Revert the factory calibration                    |
| <b>CTEXT</b> | Give the text to calibration information field    |
| <b>CDATE</b> | Set the calibration date                          |
| <b>ACAL</b>  | Analog output calibration                         |

## Setting and testing the analog outputs

|              |   |
|--------------|---|
| <b>AMODE</b> | View the analog outputs                     |
| <b>ASEL</b>  | Select the parameter for the analog outputs |
| <b>ITEST</b> | Test the analog outputs                     |
| <b>AERR</b>  | Change the analog error output value        |

## Setting and testing the relays

|              |                         |
|--------------|-------------------------|
| <b>RSEL</b>  | Set and view the relays |
| <b>RTEST</b> | Test the relays         |

## Other commands

|                      |   |
|----------------------|---|
| <b>?</b>             | Output the information about the device               |
| <b>??</b>            | Output the information about the device in POLL-state |
| <b>ECHO</b> [ON/OFF] | Turn the serial interface echo ON/OFF                 |
| <b>FIND</b>          | All devices in POLL mode are send their addresses     |
| <b>HELP</b>          | List the most common commands                         |
| <b>PRES</b> [hPa]    | Set the value for pressure compensations              |
| <b>XPRES</b>         | Set the value for pressure compensations, temporarily |
| <b>ERRS</b>          | List present transmitter errors                       |
| <b>FILT</b>          | Set the result filtering                              |
| <b>VERS</b>          | Display the software version information              |
| <b>XHEAT</b>         | Sensor heating  |
| <b>LOCK</b>          | Lock the menu/disable keypad                          |

---

# Operation and settings

After power-up transmitter (in STOP-mode) outputs a prompt mark:

```
HMT330 / 1.01  
>
```

In RUN mode a measurement output starts after power-up. Give commands by typing them on your computer. ↵ stands for pressing ENTER.

## Getting the measurement message from serial line

### Starting the continuous outputting

**R ↵**

Starts output of measurements. You can stop outputting by giving a command **S** or by pressing the Esc-button or by resetting the transmitter. See command **SMODE** to change the start-up operation mode.

Format the output by using the following commands:

- resulting interval can be changed with a command **INTV**.
- output string format can be changed with a command **FORM**.
- status of chemical purge and probe heating can be added with a command **FST**.
- date and time information can be added with commands **FDATE** and **FTIME**

### Examples:

```
>r  
RH= 11.3 %RH T= 28.8 'C  
>
```

```
>r  
RH= 11.3 %RH T= 28.8 'C Tdf= -3.7 'C Td= -4.2 'C a= 3.2 g/m3  
x= 2.8 g/kg T  
w= 13.0 'C ppm= 4440 pw= 4.48 hPa pws= 39.53 hPa h= 36.1  
kJ/kg dT= 32.5 'C  
>
```

## Stopping the continuous outputting

S ↵

Ends the RUN mode; after this command all other commands can be used.

## Outputting the reading once

In STOP mode:

SEND ↵

In POLL mode:

SEND aa ↵

aa = address of the transmitter

The output format depends on which parameters the transmitter can output.

### Examples:

```
RH= 98.4 %RH T= 31.1 'C
```

```
RH= 98.4 %RH T= 31.1 'C Td= 36.0 'C Tdf= 36.0 'C a= 42.4
g/m3      x= 38.8 g/kg Tw= 30.8 'C ppm= 62414 pw= 59.53
hPa pws= 60.52 hPa h= 130.7 kJ/kg
```

If value is too long to fit to the allocated space or if there is an error in outputting the quantity, value is displayed with stars '\*’.

### Example:

```
RH=***.* %RH T= 31.0 'C
```

The output mode can be changed with the commands: **FORM**, **FST**, **FDATE**, **TIME**.

## Outputting the reading with raw data

SEND D ↵

### Example:

```
>send d
24.1720 15.0399 -3.5743 189.2324 15.0709 15.0399 23.9765
> 1 2 3 4 5 6 7
```

where the readings (from the left) are:

1. Temperature (°C)
2. RH (%RH)

- 
3. Tdf (°C)
  4. Capacitance (pF)
  5. RH raw: calculated from scaled capacitance (%RH)
  6. Enhancement factor corrected RH (%RH)
  7. Additional temperature (°C)

## Formatting the serial line message

### Setting time and date

TIME ↵

DATE ↵

These time and date settings are shown on the timestamps of **PLAY** command. When you want to include time and date in the **R** and **SEND** commands, use the **FTIME** and **FDATE** commands.

#### Example:

```
TIME↵  
Current time is 04:12:39  
Enter new time (hh:mm:ss) ? 12:24:00↵  
>DATE↵  
Current date is 2000-01-01  
Enter new date (yyyy-mm-dd) ? 2004-07-05↵  
>
```

|  |
|--|
| <b>NOTE</b> Time and date are cleared to 2000-01-01 00:00:00 at reset or at power failure. |
|--|

### Adding time and date to R and SEND outputs

FTIME x ↵

FDATE x ↵

x = ON or OFF

Command will enable/disable output of time and date to the serial line.

**Example:**

```

>send
RH= 98.4 %RH T= 31.0 'C
>ftime on
Form. time      : ON
>send
03:47:59 RH= 98.4 %RH T= 31.0 'C
>fdate on
Form. date      : ON
>send
2004-07-05 03:48:03 RH= 98.4 %RH T= 31.0 'C
>

```

**Outputting the state of optional probe heating and chemical purge with SEND and R commands**

|                |
|----------------|
| <b>FST x ↵</b> |
|----------------|

x = ON or OFF (default)

**Example:**

```

>fst on
Form. status    : ON
>send
1 N 0 RH= 40.1 %RH T= 24.0 'C Td= 9.7 'C Tdf= 9.7 'C a=
8.7 g/m3 x= 7.5
g/kg Tw= 15.6 'C ppm= 11980 pw= 12.00 hPa pws= 29.91 hPa
h= 43.2 kJ/kg
>purge
Purge started, press any key to abort.
>send
1 S 134 RH= 40.2 %RH T= 24.1 'C Td= 9.8 'C Tdf= 9.8 'C a=
8.8 g/m3 x= 7.5
g/kg Tw= 15.7 'C ppm= 12084 pw= 12.10 hPa pws= 30.11 hPa
h= 43.5 kJ/kg
>

```

More about chemical purge in Appendix 9.

<sup>1</sup>Letters and values indicating the state of the probe

|                                      |                              |
|--------------------------------------|------------------------------|
| N...xxx →normal operation            | xxx= probe heat power        |
| X...xxx →sensor heating              | xxx= sensor temperature (°C) |
| H...xxx →chemical purge              | xxx= sensor temperature (°C) |
| S... xxx →sensor cooling after purge | xxx= sensor temperature (°C) |



---

## Changing the quantities and units

Quantities and units are changed by using serial commands or by using the optional display/keypad.

| Quantity          | Abbreviation | Metric Unit | Non Metric Unit |
|-------------------|--------------|-------------|-----------------|
| Relative humidity | <b>RH</b>    | %RH         | %RH             |
| Temperature       | <b>T</b>     | °C          | °F              |

Optionally available the following quantities:

| Quantity                             | Abbreviation | Metric Unit      | Non Metric Unit    |
|--------------------------------------|--------------|------------------|--------------------|
| Dewpoint/Frostpoint                  | <b>TDF</b>   | °C               | °F                 |
| Dewpoint                             | <b>TD</b>    | °C               | °F                 |
| Absolute humidity                    | <b>A</b>     | g/m <sup>3</sup> | gr/ft <sup>3</sup> |
| Mixing ratio                         | <b>X</b>     | g/kg             | gr/lb              |
| Wetbulb temperature                  | <b>TW</b>    | °C               | °F                 |
| Humid air volume/ dry air volume     | <b>PPM</b>   | ppm              | ppm                |
| Water vapour pressure                | <b>PW</b>    | hPa              | lb/in <sup>2</sup> |
| Saturation water vapour pressure     | <b>PWS</b>   | hPa              | lb/in <sup>2</sup> |
| Enthalpy                             | <b>H</b>     | kJ/kg            | Btu/lb             |
| Difference of T and T <sub>d/f</sub> | <b>DT</b>    | °C               | °F                 |

### NOTE

Only the quantities selected when ordering the device can be selected for a output quantity.

## By using display/keypad

### Selecting the display output quantity

1. Open the **MAIN MENU** by pressing any of the ▲▼◀▶ arrow keys.
2. Select ► **Display**, press ► key.
3. Select ► **Quantities**, press ► key.
4. Select the quantity by using the ▲▼ keys, press = **SELECT**. Note, 1...3 quantities can be selected at the time.
5. Press = **EXIT** to return to the main view.

## Selecting metric or non-metric output units for the display

1. Open the **MAIN MENU** by pressing any of the ▲▼◀▶ arrow keys.
2. Select ► **Display**, press ► key.
3. Select ► **Units**, press ► key.
4. Select the unit by using the ▲▼ keys, press = **CHANGE**. The unit changes from metric to non-metric or other way round.
5. Press = **EXIT** to return to the main view.

### NOTE

Changing the units by using the display/keypad has no effect on the serial output units.

## By using serial line

### Selecting the quantity and format for the serial output

Use this **FORM**-command when you want to change the format or select a certain quantities for the output commands **SEND** and **R**.

#### FORM x ↵

x = formatter string

Formatter string consists of quantities and modifiers. When you select the quantity, use the abbreviations of the quantities (see previous tables) when typing the command. The modifiers are as follows:

|     |   |
|-----|---|
| x.y | length modifier (number of digits and decimal places) |
| #t  | tabulator   |
| #r  | carridge-return                                       |
| #n  | line feed   |
| “”  | string constant                                       |
| U5  | unit field and length                                 |

#### Example:

```
>form "RH=" 4.2 rh U5 #t "T=" t U3 #r #n
RH= 14.98%RH T= 74.68'F
```

```
>send
RH= 16.03%RH T= 74.66'F
```

```
>form "Tfrost=" tdf U3 #t "Temp=" t U3 #r#n
Tfrost= 36.0'C Temp= 31.0'C
>
```

---

Command 'FORM /' will return the default output form.

```
form /  
>send  
RH= 98.4 %RH T= 31.1 'C  
>
```

## Selecting metric or non-metric output units

UNIT x ↵

x = M or N  
M = metric units  
N = non-metric units

### NOTE

This command changes all the serial output and display units to either metric or non-metric units. When you want to have at the same time both metric and non-metric units on the display, select the unit by using the display/keypad.

## Pressure compensation setting

The pressure has an effect on humidity calculations and accuracy. Therefore, accurate calculations can be achieved only when the ambient pressure is taken into consideration.

### Multiplication factors

NOTE: conversions from mmHg and inHg are defined at 0°C and for mmH<sub>2</sub>O and inH<sub>2</sub>O at 4°C.

| FROM:              | TO: hPa    |
|--------------------|------------|
| mbar               | 1          |
| PaN/m <sup>2</sup> | 0.01       |
| mmHg torr          | 1.333224   |
| inHg               | 33.86388   |
| mmH <sub>2</sub> O | 0.09806650 |
| inH <sub>2</sub> O | 2.490889   |
| atm                | 1013.25    |
| at                 | 980.665    |
| bar                | 1000       |
| psia               | 68.94757   |

psia = psi absolute

**Example:** 29.9213 inHg = 29.9213 x 33.86388 = 1013.25 hPa/mbar

**NOTE**

Pressure compensation is intended to be used in normal air only. When measuring in other gases, please contact Vaisala for further information.

## By using display/keypad

For the pressure unit selection, see *Selection of quantities and units by using display/keypad*.

1. Open the **MAIN MENU** by pressing any of the ▲▼◀▶ arrow keys.
2. Select ► **Measuring**, press ► key.
3. Select ► **Pressure compensation**, press ► key.
4. Press = **SET**, give the pressure value by using the arrow keys.
5. Press = **OK** and = **EXIT** to return to the main view.

## By using serial line

```
PRES aaaa.a ↵
```

```
XPRES aaaa.a ↵
```

where: aaaa.a = absolute pressure (hPa)

Command **XPRES** should be used if the value is changed frequently. Its value is not retained at reset, and when set to 0, last value set with **PRES** is used instead.

### Example:

```
>pres
Pressure      : 1013.00 hPa ?
>pres 1010
Pressure      : 1010.00 hPa
>
```

## User port serial settings

The communication settings for the user port can be changed via the serial line or by using the optional display/keypad. The communication settings for the service port are fixed and not changeable.

---

## By using display/keypad

1. Open the **MAIN MENU** by pressing any of the **▲▼◀▶** arrow keys.
2. Select **►Interfaces**, press **►**key.
3. Select **►Serial interface**, press **►**key.
4. Select **Baud rate/ Serial format/ Comm mode** press **►SELECT** key.
5. For RUN communication mode, select **RUN interval**, press **— SET**.
6. Set the measuring interval and the unit by using the arrow keys, press **— SELECT**.
7. For POLL communication mode, select **POLL address**, press **— SET**.
8. Set the transmitter address by using the arrow keys. Press **— OK** to confirm the setting.
9. Select **Echo**, press **— ON/OFF**.
10. Press **— EXIT** to return to the main view.

## By using serial line

### Communication settings for user port

**SERI b p d s ↵**

b = bauds (110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200)

p = parity (n = none, e = even, o = odd)

d = data bits (7 or 8)

s = stop bits (1 or 2)

The settings can be changed one parameter at a time or all parameters at once:

```
>SERI 0 ↵          changing parity only
4800 0 7 1
>SERI 600 N 8 1 ↵  changing all parameters
600 N 8 1
```

You can use the SERI command to change/view the user port settings even if you are currently connected to the service port.

## Setting the user port start-up operating mode

```
SMODE xxxx ↵
```

xxxx = STOP, RUN or POLL

In STOP mode: output only by command, all commands can be used (default mode)

In RUN mode: automatic output, only command **S** can be used

In POLL mode: output only with command **SEND** [addr] Use with RS-485 buses, see App 6.

Selected output mode will be activated after power outages.

## Setting the outputting interval for the RUN mode

```
INTV xxx yy ↵
```

xxx = output interval (0...255)  
0: the fastest possible output rate  
yy= unit (s, min or h)

### Example:

```
>INTV 10 min ↵  
Output intrv. : 10 min
```

## Setting the user port echo

```
ECHO x ↵
```

x = ON or OFF (default=ON)

Enables/disables echo of characters received.

---

## Data Filtering

The averaging data filter calculates a moving average over a certain period of time. The lowest measurement noise is achieved with the extended filtering. The three following filtering levels are available:

OFF = No filtering (default)

ON =Standard= Short filtering (about 15 s moving average).

EXT = Extended filtering (about 1 min moving average)

### By using display/keypad

1. Open the **MAIN MENU** by pressing any of the ▲▼◀▶ arrow keys.
2. Select ► **Measuring**, press ► key.
3. Select **Filtering**, press = **CHANGE**.
4. Select **Off/ Standard/ Extended** press = **SELECT**.
5. Press = **EXIT** to return to the main view.

### By using serial line

Sets the filtering level.

FILT xxx ↵

xxx= OFF, ON or EXT ( default =OFF)

## Device information

### By using display/keypad

Pressing the **INFO** key (in the main view) shows you the

- present or past unacknowledged errors
- device information
- adjustment information fed by the user
- measuring settings
- interface settings (serial line, analog outputs and relays)

Proceed in the information views by pressing = **MORE** as many times as you get the desired information. You may proceed in the information views also with arrow buttons. Press = **OK** to return to the main view.

## By using serial line

### Checking transmitter settings

Use command '?' to check the current transmitter configuration. Command '??' is similar but can also be used if the transmitter is in POLL mode.

```
? ↵
```

```
?? ↵
```

#### Example:

```
>?
HMT330 / 1.01
Serial number : Z2720001
Batch number  : Z2250003
Adjust. date   : 2004-06-29
Adjust. info   : Vaisala/HEL
Date          : 2000-01-01
Time          : 18:48:06
Serial mode    : STOP
Baud P D S    : 4800 E 7 1
Output interval: 0 s
Address       : 0
Echo          : ON
Pressure      : 1013.25 hPa
Filter        : OFF
Ch1 output    : 4...20mA
Ch2 output    : 4...20mA
Ch1 RH low   : 0.00 %RH
Ch1 RH high  : 100.00 %RH
Ch2 T low    : -40.00 'C
Ch2 T high   : 180.00 'C
Module 1     : not installed
Module 2     : not installed
>
```

#### Help

Listing the commands.

```
HELP ↵
```

```
>help
?          ACAL      ADDR      AERR      ASCL
ASEL      CDATE     CLOSE     CODE      CRH
CT        CTA       CTEXT     DATE      DELETE
DIR       DSEL      DSEND     ECHO      ERRS
FCRH      FDATE     FILT      FORM      FST
FTIME     HEAT     HELP      INTV      ITEST
MODS      OPEN     PLAY      PRES      PUR
PURGE     R        RESET     RSEL      RTEST
SEND      SERI     SMODE     TEST      TIME
UNDELETE  UNIT     VERS     XPRES
>
```



---

## Error messages

### ERRS ↵

Display transmitter error messages. See the errors/action table on page 60.

#### Example:

```
>ERRS  
NO ERRORS  
>
```

#### Example:

```
>ERRS  
FAIL  
Error: Temperature measurement malfunction  
Error: Humidity sensor open circuit  
>
```

## Software version information

### VERS ↵

#### Example:

```
>vers  
HMT330 / 1.01
```

## Reverting the factory settings by using the display/keypad

This operation does not affect the adjustments. Only settings available in the menus are reverted.

1. Open the **MAIN MENU** by pressing any of the ▲▼◀▶ arrow keys.
2. Select ►**System**, press ►key.
3. Select ►**Serial interface**, press ►key.
4. Select **Factory settings**, press ─**REVERT** key. Press ─**YES** to confirm the setting.

## Resetting the transmitter by using serial line

**RESET ↵**

Resets the device. The user port switches to start-up output mode selected with command SMODE.

## Locking the menu/keypad by using serial line

**LOCK x ↵**

x = 0 / 1 / 1 xxxx / 2

0= keypad enabled  
1= menu locked  
1 xxxx= menu locked with 4-digit PIN code  
2= keypad disabled

### Example, turning on the menu lock:

```
>lock 1
Keyboard lock : 1
>
```

### Example, turning on the menu lock with PIN code 1234:

```
>lock 1 1234
Keyboard lock : 1 [1234]
>
```

### Example, disabling the keypad completely:

```
>lock 2
Keyboard lock : 2
>
```

#### **NOTE**

Open the locks with the serial command **LOCK 0**. You can open the menu lock also by using the keypad, if a PIN code has been set.

---

# Data Recording

Data recording function is always on and collects data automatically into the device's memory. Recorded data do not disappear from the memory when the power is switched off. Collected data can be observed in a form of a graph in display's graphical view or it can be listed out by using the serial line or MI70 Link program.

## Selecting the data recording quantities

If the device is provided with the optional display, the recorded quantities are always those selected for the display. Up to three quantities can be recorded at a time. See section *Changing the quantities and units* to select the display quantities.

By using the serial line, use the following command to select the quantities:

```
DSEL xxx ↵
```

xxx = data recording quantity (rh/ t / tdf....)

Give the command without parameters and press ENTER to display current recording parameters.

### Example:

```
>dsel rh t tdf
RH T Tdf
```

## Getting the recorded data

If the device is provided with the optional display, the graphical view shows the data of the selected quantities, one at a time. More instructions in section *Graphical view*.

By using the serial line, give a command **DIR** to check the available files:

```
DIR↵
```

The device records six files (six observation times) for each selected quantity. Thus, total amount of the files depends on the amount of the selected quantities being at minimum 6 and at maximum 18.

| Observation time | Time period for trend/max/min calculations |
|------------------|--|
| 10 minutes       | 5 seconds                                  |
| 2 hours          | 1 minute                                   |
| 1 day            | 12 minutes                                 |
| 10 days          | 2 hours                                    |
| 2 months         | 12 hours                                   |
| 1 year           | 3 days                                     |

**Example, three quantities (RH,T and Tdf) selected:**

|      |    |     |                   |                   |     |   |
|------|----|-----|-------------------|-------------------|-----|---|
|      |    |     |                   |                   |     | <b>software information,<br/>not essential for a user</b> |
|      |    |     |                   |                   |     | ┌──────────┐  |
| >dir | 0  | RH  | latest 10 minutes | 04-08-19 09:42:30 | 135 | 0205  |
|      | 1  | RH  | latest 2 hours    | 04-08-19 07:38:45 | 135 | 0401  |
|      | 2  | RH  | latest 1 day      | 04-08-18 06:53:45 | 135 | 0412  |
|      | 3  | RH  | latest 10 days    | 04-08-10 23:23:45 | 135 | 0490  |
|      | 4  | RH  | latest 2 months   | 04-06-12 21:53:45 | 135 | 0812  |
|      | 5  | RH  | latest 1 year     | 03-07-11 09:53:45 | 135 | 1003  |
|      | 6  | T   | latest 10 minutes | 04-08-19 09:42:30 | 135 | 0205  |
|      | 7  | T   | latest 2 hours    | 04-08-19 07:38:45 | 135 | 0401  |
|      | 8  | T   | latest 1 day      | 04-08-18 06:53:45 | 135 | 0412  |
|      | 9  | T   | latest 10 days    | 04-08-10 23:23:45 | 135 | 0490  |
|      | 10 | T   | latest 2 months   | 04-06-12 21:53:45 | 135 | 0812  |
|      | 11 | T   | latest 1 year     | 03-07-11 09:53:45 | 135 | 1003  |
|      | 12 | Tdf | latest 10 minutes | 04-08-19 09:42:30 | 135 | 0205  |
|      | 13 | Tdf | latest 2 hours    | 04-08-19 07:38:45 | 135 | 0401  |
|      | 14 | Tdf | latest 1 day      | 04-08-18 06:53:45 | 135 | 0412  |
|      | 15 | Tdf | latest 10 days    | 04-08-10 23:23:45 | 135 | 0490  |
|      | 16 | Tdf | latest 2 months   | 04-06-12 21:53:45 | 135 | 0812  |
|      | 17 | Tdf | latest 1 year     | 03-07-11 09:53:45 | 135 | 1003  |
|      | >  |     |                   |                   |     |   |

**PLAY X**

x = 0...17

The PLAY command outputs the selected file to the serial line. Before giving the command, set the actual date and time stamps with TIME and DATE commands, if needed.

Select the desired data file, see the numbering system from the previous program listing example.

|         |          |              |       |                   |       |   |
|---------|----------|--------------|-------|-------------------|-------|---|
|         |          |              |       |                   |       | <b>software information,<br/>not essential for a user</b> |
|         |          |              |       |                   |       | ┌──────────┐  |
| >play 2 | RH       | latest 1 day |       | 99-12-30 22:33:13 | 135   | 0412  |
|         | Date     | Time         | trend | min               | max   |   |
|         | yy-mm-dd | hh:mm:ss     | %RH   | %RH               | %RH   |   |
|         | 99-12-30 | 22:33:13     | 19.16 | 18.99             | 19.33 |   |
|         | 99-12-30 | 22:45:13     | 19.30 | 19.09             | 19.55 |   |
|         | 99-12-30 | 22:57:13     | 20.01 | 19.28             | 21.17 |   |
|         | 99-12-30 | 23:09:13     | 21.21 | 20.98             | 21.44 | Power failure   |
|         | 99-12-30 | 23:21:13     | 19.57 | 17.72             | 21.11 |   |
|         | 99-12-30 | 23:33:13     | 19.09 | 18.62             | 19.84 |   |

Key <ESC> can be used to interrupt the output listing.

**NOTE** Data in the output is <TAB> limited. This is compatible with most spreadsheet programs.

**NOTE** Output of large amounts of recorded data can take long time. If you are using the user port, select the highest serial baud supported to reduce the time required for output.

---

## Deleting the recorded files

### By using the display/keypad

1. Open the **MAIN MENU** by pressing any of the ▲▼◀▶ arrow keys.
2. Select ►**System**, press ►key.
3. Select **Clear graph memories**, press = **CLEAR** key. Confirm by pressing = **YES**.

#### **CAUTION**

This function clears all the data history from the memory, including all graphs.

### By using the serial line

**DELETE** command deletes all data files.

**DELETE**↵

**UNDELETE** command recovers the deleted files.

**DELETE**↵

## **Windows® based MI70 Link program for data handling and real-time monitoring with PC**

The recorded data can be transferred to a PC by using MI70 Link program. You can examine the recorded data easily in Windows® environment and transfer it further to a spreadsheet program (such as Microsoft® Excel). MI70 Link program allows you also to monitor transmitter readings directly with a PC (real-time window function).

MI70 Link program is available from Vaisala, see list of accessories on page 78.

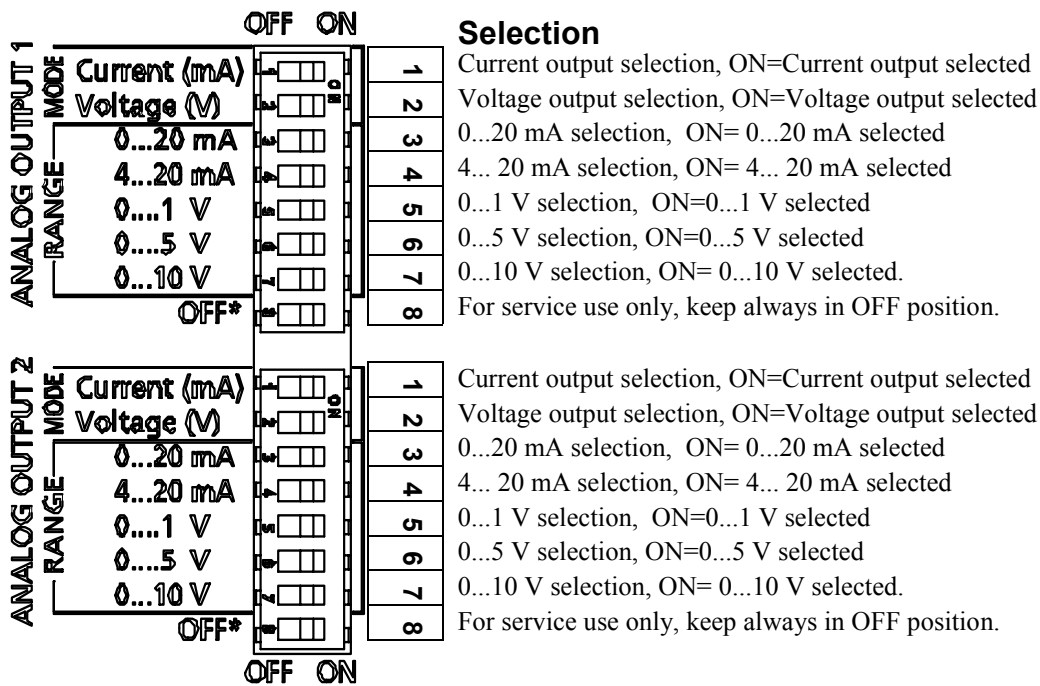
# Analog output settings

The analog outputs are set in a factory according to the order form. In case you want to change the settings, follow these instructions. (Optional third analog output, see Appendix 4).

## Changing the output mode and range

Both output channels have an own dip switch module with 8 switches, see the position from picture on page 11 (Dip switches for analog output settings).

1. Select the current/voltage output by setting ON either of the switches 1 or 2.
2. Select the range by setting ON one of the switches 3...7.



**NOTE** Only one of the switches 1 and 2 can be ON at a time.  
 Only one of the switches 3-7 can be ON at a time.

**Example:** 0...5 V voltage output selected for channel 1 and 4...20 mA selected for channel 2.

|   | OFF | ON | Selection               |
|---|-----|----|-------------------------|
| 1 | █   |    | Voltage output selected |
| 2 |     | █  |                         |
| 3 | █   |    |                         |
| 4 | █   |    |                         |
| 5 | █   |    | 0...5 V selected        |
| 6 |     | █  |                         |
| 7 | █   |    |                         |
| 8 | █   |    |                         |

|   |   |   |                         |
|---|---|---|-------------------------|
| 1 |   | █ | Current output selected |
| 2 | █ |   | 4... 20 mA selected     |
| 3 | █ |   |                         |
| 4 |   | █ |                         |
| 5 | █ |   |                         |
| 6 | █ |   |                         |
| 7 | █ |   |                         |
| 8 | █ |   |                         |

#### NOTE

If you have customized the error output setting (AERR), check that the set error values are still valid, see section *Analog output fault indication setting*.

## Changing and scaling the analog output quantities

### By using display/keypad

1. Open the **MAIN MENU** by pressing any of the ▲▼◀▶ arrow keys.
2. Select ► **Interfaces**, press ► key.
3. Select ► **Analog outputs**, press ► key.
4. Select ► **Output 1/2/3**, press ► key.
5. Select ► **Quantity**, press = **SELECT**.
6. Select the quantity by using the arrow keys, press = **SELECT**.
7. Select ► **Scale**, lower limit, press = **SET**. Give the lower limit value by using the arrow keys. Press = **OK** to confirm the setting.

8. Select the upper limit, press **SET**. Give the upper limit value by using the arrow keys. Press **OK** to confirm the setting.
9. Press **EXIT** to return to the main view.

## By using serial line

Connect the transmitter to the PC. Open the terminal connection between your PC and the transmitter.

1. Check the analog outputs with the following command.

**AMODE**↵

```
>amode
Ch1 output      : 0...1V
Ch2 output      : 0...1V
>
```

2. Select and scale the quantities for the analog outputs with the following command. Note that the optional quantities can be selected only if they have been selected when ordering the device.

**ASEL xxx yyy zzz**↵

where: **xxx** = quantity of channel 1 and **yyy** = quantity of channel 2. **zzz**= quantity of the optional analog output.

Give always all the quantities for all outputs. Use abbreviations shown in the next table.

| Quantity                            | abbreviation |
|-------------------------------------|--------------|
| Relative humidity                   | RH           |
| Temperature                         | T            |
| <b>Optional quantities</b>          |              |
| Dewpoint/Frostpoint                 | TDF          |
| Dewpoint                            | TD           |
| Absolute humidity                   | A            |
| Mixing ratio                        | X            |
| Wetbulb temperature                 | TW           |
| Humid air volume/ dry air volume    | PPM          |
| Water vapour pressure               | PW           |
| Saturation water vapour pressure    | PWS          |
| Enthalpy                            | H            |
| Difference of T and T <sub>df</sub> | DT           |

**Example** (device with two analog outputs):

```
>asel rh t
Ch1 (RH ) low   : 0.00 %RH ? 0
Ch1 (RH ) high  : 100.00 %RH ? 100
Ch2 (T ) low    : -40.00 'C ? -50
Ch2 (T ) high   : 60.00 'C ? 80
>
```



---

## Analog output tests

Test the operation of the analog by forcing the outputs to given values. Measure then the values with a current/voltage meter.

### By using display/keypad

1. Open the **MAIN MENU** by pressing any of the ▲▼◀▶ arrow keys.
2. Select ►**System**, press ►key.
3. Select ►**Diagnostics**, press ►key.
4. Select ►**Analog output tests**, press ►key.
5. Select one of the testing options **Force 0 % /50 %/ 100 % of scale**, press = **TEST**. All outputs are tested simultaneously. The actual output value depends on the selected range.
6. Press = **OK** to stop testing = **EXIT** to return to the main view.

### By using serial line

This command forces the analog outputs to given values. The set values remain valid until you give the command **ITEST** without parameters or **RESET** the transmitter.

```
ITEST aa.aaa bb.bbb ↵
```

aa.aaa = current or voltage value to be set for channel 1 (mA or V)  
bb.bbb = current or voltage value to be set for channel 2 (mA or V)

#### Example:

```
>itest 20 5
Ch1 (RH )      :      *      20.000 mA   H'CCB5
Ch2 (T )       :      *      5.000 V    H'5F9B
>itest
Ch1 (RH )      :      21.017 %RH   12.203 mA   H'7DC3
Ch2 (T )       :      27.407 'C    3.370 V    H'41C9
>
```

## Analog output fault indication setting

Factory default state for analog outputs during error condition is 0 V/ 0mA. Please be careful when selecting the new error value. The error state of the transmitter should not cause unexpected problems in process monitoring.

## By using display/keypad

1. Open the **MAIN MENU** by pressing any of the **▲▼◀▶** arrow keys.
2. Select **►Interfaces**, press **►**key.
3. Select **►Analog outputs**, press **►**key.
4. Select **►Output 1/2/3**, press **►**key.
5. Select the **Fault indication**, give the fault indication value by using the arrow keys, Press **= SET**. Give the value by using the arrow keys. Press **= OK** to confirm the setting. This value is shown if a transmitter error occurs.
6. Press **= EXIT** to return to the main view.

## By using serial line

Error output can be changed with **AERR** command.

**AERR** ↵

### Example:

```
>aerr↵  
Ch1 error out : 0.000V ? 5.0↵  
Ch2 error out : 0.000V ? 5.0↵  
>
```

**NOTE** Error output value shall be within a valid range for output type.

**NOTE** The error output value is shown only when there are minor electrical faults such as a humidity sensor damage. When there is a severe device malfunction, the error output value is not necessarily shown.

## CHAPTER 5

# MAINTENANCE

### Cleaning

Clean the transmitter enclosure with a soft, lint-free cloth moistened with mild detergent.

### Changing the probe filter

1. Unscrew the filter from the probe head.
2. Screw a new filter on the probe head. When using the stainless steel filter, take care to tighten the filter properly (recommended force 130 Ncm).

New filters can be ordered from Vaisala, see list of accessories on page 78.

### Calibration and adjustment

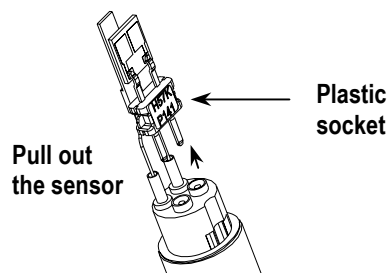
The HMT330 is fully calibrated and adjusted as shipped from factory. Typical calibration interval is one year. Depending on the application it may be good to make more frequent checks. Calibration shall be done always when there is a reason to believe that device is not within the accuracy specifications.

Calibration and adjustment can be carried out in Vaisala Service Centers or by the user, see chapter 6.

## Changing the sensor

The user can change sensors HUMICAP180 and HUMICAP180L.

1. Unscrew the filter from the probe head. See the instructions on page 59.
2. Remove the damaged sensor and insert a new one. Handle the new sensor by the plastic socket. **DO NOT TOUCH THE SENSOR PLATE.**
3. After sensor change the humidity calibration must be made according to the instructions, see command **FCRH**.
4. Screw a new filter on the probe head. When using the stainless steel filter, take care to tighten the filter properly (recommended force 130 Ncm).



## Error states

In error state the quantity is not measured and the output is shown as follows:

- analog channel outputs 0 mA or 0 V (you may change this fault indication value by using the serial command **AERR** or by display/keypad, see page 57.
- the serial port outputs stars \*\*\*
- the cover LED is blinking
- optional display: error indicator is lit. The indicator disappears when the error state is over and you have checked the error message (press the **INFO** key in the main view).

| Error message                            | Action   |
|--|--|
| Humidity sensor measurement malfunction. | Check the integrity of the humidity probe and the probe cable. Clean the probe from dirt water, ice or other contaminants. |
| Humidity sensor short circuit.           | Check the integrity of the humidity probe and the probe cable. Clean the probe from dirt water, ice or other contaminants. |
| Humidity sensor open circuit..           | Check the integrity of the humidity probe and the probe cable.   |
| Temperature sensor open circuit.         | Check the integrity of the humidity probe and the probe cable.   |
| Temperature sensor short circuit.        | Check the integrity of the humidity probe and the probe cable. Clean the probe from dirt water, ice or other contaminants. |
| Temperature measurement                  | Check the integrity of the humidity probe and the  |

|   |   |
|---|---|
| malfunction.  | probe cable. Clean the probe from dirt water, ice or other contaminants.  |
| Temperature sensor current leak.                                    | Check the integrity of the humidity probe and the additional T-probe and the probe cables. Clean the probes from dirt water, ice or other contaminants. |
| Internal ADC read error.  | Internal transmitter failure. Remove the transmitter and return the faulty unit to Vaisala Service.   |
| Additional temperature sensor short circuit.                        | Check the integrity of the additional T-probe and the probe cable. Clean the probe from dirt water, ice or other contaminants.                          |
| Additional temperature sensor open circuit.                         | Check the integrity of the additional T-probe and the probe cable.  |
| Additional temperature sensor measurement malfunction.              | Check the integrity of the additional T- probe and the probe cable. Clean the probe from dirt water, ice or other contaminants.                         |
| Internal EEPROM read error.   | Internal transmitter failure. Remove the transmitter and return the faulty unit to Vaisala Service.   |
| Internal EEPROM write error.  | Internal transmitter failure. Remove the transmitter and return the faulty unit to Vaisala Service.   |
| Add-on module (1/2) connection failure.                             | Turn off the power and check the module connection. Turn on the power.  |
| Device internal temperature out of range.                           | Ensure that the operating temperature is within the valid range.  |
| Operating voltage out of range.                                     | Ensure that the operating voltage is within the valid range.  |
| Internal analog voltage out of range.                               | Internal transmitter failure. Remove the transmitter and return the faulty unit to Vaisala Service.   |
| Internal system voltage out of range.                               | Internal transmitter failure. Remove the transmitter and return the faulty unit to Vaisala Service.   |
| Internal ADC reference voltage out of range.                        | Internal transmitter failure. Remove the transmitter and return the faulty unit to Vaisala Service.   |
| Internal analog output reference voltage out of range.              | Internal transmitter failure. Remove the transmitter and return the faulty unit to Vaisala Service.   |
| Configuration switches for analog output 1/2/3 set incorrectly.     | Check and re-set the switches, see page 54.   |
| EEPROM failure on add-on module 1 or 2.                             | Check the analog output module connection.  |
| Communication module installed in incorrect add-on module slot.     | Change the module to another module slot.   |
| Unknown/incompatible module installed in add-on module slot 1(or2). | Ensure that the module is compatible with the HMT330.   |

To check the error message via the serial interface, use command ERRS. In case of constant error, please contact the Vaisala Service Centers.

## Vaisala Service Centers

Vaisala Service Centers perform calibrations and adjustments as well as repair and spare part services, see contact information below.

Vaisala Service Centers offer also extended services e.g. accredited calibrations, maintenance contracts and calibration reminder program. Do not hesitate to contact them to get further information.

### **NORTH AMERICAN SERVICE CENTER**

**Vaisala Inc.**, 10-D Gill Street, Woburn, MA 01801-1068, USA.

Phone: +1 781 933 4500, Fax +1 781 933 8029

Email: [us-customersupport@vaisala.com](mailto:us-customersupport@vaisala.com)

### **EUROPEAN SERVICE CENTER**

**Vaisala Instruments Service**, Vanha Nurmijärventie 21 FIN-01670

Vantaa, FINLAND. Phone: +358 9 8949 2758, Fax +358 9 8949 2295

E-mail: [instruments.service@vaisala.com](mailto:instruments.service@vaisala.com)

### **ASIAN SERVICE CENTER**

**Vaisala KK**, 42 Kagurazaka 6-Chome, Shinjuku-Ku, Tokyo 162-0825,

JAPAN. Phone: +81 3 3266 9611, Fax +81 3 3266 9610

E-mail: [aftersales.asia@vaisala.com](mailto:aftersales.asia@vaisala.com)

**[www.vaisala.com](http://www.vaisala.com)**

## CHAPTER 6

# CALIBRATION AND ADJUSTMENT

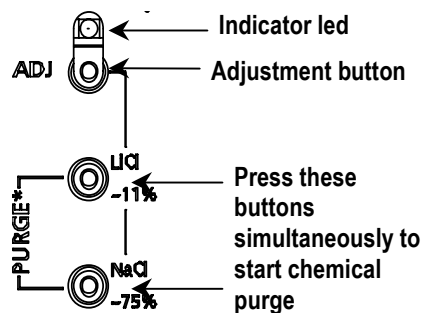
Calibration and adjustment is carried out either by using the push-keys on the motherboard, through the serial port or with the optional display/keypad. (Vaisala portable instruments HM70 and HMI41 can also be used).

## Opening and closing the adjustment mode

1. Open the transmitter cover. The buttons needed in adjustment are on the left-hand side of the motherboard.
2. If the chemical purge option is available, it should be carried out always before calibration. To start chemical purge press simultaneously two **PURGE** push-keys (on the motherboard) for a few seconds. Red indicator led flashes with short pulses until purge is complete (up to 6 minutes).
3. Press the **ADJ** key to open an adjustment mode.

### Indicator LED states:

LED off: adjustment locked  
 LED on: adjustment available  
 LED blinking evenly: measurement not stabilized  
 LED blinking with short pulses: chemical purge is going on



**NOTE** If using a warmed probe (**HMT337 option**), probe heating will be interrupted when **ADJ** key is pressed. Allow sufficient time for the probe to reach ambient temperature before starting the adjustment procedure.

4. Press the **ADJ** key second time to close the adjustment mode.

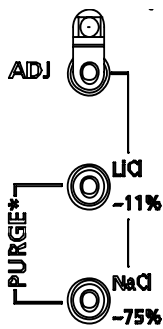
# Relative humidity adjustment

## By using push-buttons

A simple push-button adjustment is carried out by using two relative humidity references: 11 % RH (LiCl) and 75 % RH (NaCl).

1. Carry out the chemical purge (optional).

### LiCl reference



2. Press the **ADJ** button on the motherboard to open the adjustment mode. The indicator led starts flashing.
3. Remove the filter from the probe and insert the probe head into a measurement hole of the 11 % RH (LiCl) in the humidity calibrator HMK15 (please use the adapter fitting for the probes of HMT334, HMT335, HMT337 and HMT338).
4. Wait at least 30 minutes for the sensor to stabilize (the indicator led is lit continuously). Adjustment cannot be done if the conditions are not stabilized (indicator led is flashing).
5. When the indicator led is lit continuously press the button **LiCl~11 %** to adjust the 11 % RH condition. After adjustment transmitter returns to normal operation mode (indicator led is unlit).

### NaCl reference

6. When adjusting in the second reference 75 % RH, press the **ADJ** button to open the adjustment mode. The indicator led starts flashing.
7. Insert the probe head into a measurement hole of the 75 % RH (NaCl) reference chamber of the humidity calibrator HMK15 (please use the adapter fitting for the probes of HMT334, HMT335, HMT337 and HMT338).
8. Wait at least 30 minutes for the sensor to stabilize (the indicator led is lit continuously). Adjustment cannot be done if the conditions are not stabilized (indicator led is flashing).
9. Press the button **NaCl~75 %** to adjust the 75 % RH condition. After adjustment transmitter returns to normal operation mode (indicator led is unlit)



## By using display/keypad

Please, note that the difference between the two humidity references must be at least 50% RH.

1. Carry out the chemical purge (optional).
2. Press the **ADJ** button (opens the **ADJUSTMENT MENU**).
3. Select **► Adjust RH measurement**, press **►** key.
4. Select **1-point/ 2-point adjustment**, press. Press **— START**.
5. Select the reference: **Manual (enter value)/N<sub>2</sub> chamber (~0%) / LiCl chamber (~11%) / NaCl chamber (~75%) / KSO<sub>4</sub> chamber (~97%)**, press **— SELECT**.
6. Remove the filter from the probe and insert the probe head into a measurement hole of the dry end reference chamber (e.g. LiCl: 11 % RH in the humidity calibrator HMK15, please use the adapter fitting for the probes of HMT334, HMT335, HMT337 and HMT338).
7. Wait at least 30 minutes for the sensor to stabilize. Follow the stabilization from the **—GRAPH** display. Press **—READY** when stabilized. If the **MANUAL** reference value chosen, enter now the reference value by using the arrow keys.

When carrying out the 2-point adjustment proceed to the next adjustment point and carry out the procedure as described in the previous item.

8. Answer **— YES** to confirm the adjustment. Press **— OK** to return to the adjustment menu
9. Press **— EXIT** to close the adjustment mode and return to the main view. Before closing the adjustment mode, feed the adjustment information to the device, see section *Feeding the adjustment information*.

## By using serial line

Please, note that the difference between the two humidity references must be at least 50% RH.

1. Carry out the chemical purge (optional).
2. Press the **ADJ** button.
3. Connect the HMT330 to a PC, please see instructions from the page 33. Open a terminal program.

4. Remove the filter from the probe and insert the probe head into a measurement hole of the dry end reference chamber (e.g. LiCl: 11 % RH in the humidity calibrator HMK15, please use the adapter fitting for the probes of HMT334, HMT335, HMT337 and HMT338).
5. Give command **CRH** and press **ENTER**.

```
CRH ↵
```

6. Wait at least 30 minutes for the sensor to stabilize.
7. Type **C** and press **ENTER** a few times to check if the reading is stabilized.
8. When the reading is stabilized, give the reference humidity after the question mark and press **ENTER**.

```
>crh
```

```
RH : 11.25 Ref1 ? c
RH : 11.25 Ref1 ? c
RH : 11.25 Ref1 ? c
RH : 11.24 Ref1 ? c
RH : 11.24 Ref1 ? 11.3
Press any key when ready ...
```

Now the device is waiting for the high end reference.

9. Insert the probe head into a measurement hole of the high end reference chamber (e.g. NaCl: 75 % RH chamber in the humidity calibrator HMK15, please use the adapter fitting for the probes of HMT334, HMT335, HMT337 and HMT338).
10. Let the probe stabilize for about 30 minutes. You can follow the stabilization by pressing any key, typing **C** and pressing **ENTER**.
11. When stabilized, type the high end reference value after a question mark and press **ENTER**.

```
>crh
```

```
RH : 11.25 Ref1 ? c
RH : 11.24 Ref1 ? c
RH : 11.24 Ref1 ? 11.3
Press any key when ready ...
```

```
RH : 75.45 Ref2 ? c
RH : 75.57 Ref2 ? c
RH : 75.55 Ref2 ? c
RH : 75.59 Ref2 ? 75.5
OK
>
```

OK indicates that the adjustment has succeeded and the new calibration coefficients are calculated and stored.

12. Give the adjustment information (date and text) to the transmitter's memory, see the commands **CTEXT** and **CDATE**.
13. Press the **ADJ** button on the motherboard to close the adjustment mode.
14. Take the probe out of the reference conditions and replace the filter.

## Relative humidity adjustment after sensor change

### By using display/keypad

When using the optional display/keypad, follow the instructions on page 65 but select **Adj. for new RH sensor** (instead of **1-point/ 2-point adjustment**).

### By using serial line

After sensor change, carry out the procedure as described in previous sections. Just replace the **CRH** command with the **FCRH** command when using the serial line.

```
FCRH ↵
```

#### Example:

```
>FCRH ↵
RH : 1.82 1. ref ? 0 ↵
Press any key when ready... ↵
RH : 74.22 2. ref ? 75 ↵
OK
>
```

The OK indicates that the calibration has succeeded.

## Temperature adjustment

### By using display/keypad

1. Press the **ADJ** button on the motherboard to open the **ADJUSTMENT MENU**. If using a warmed probe for measuring, probe heating will be interrupted when **ADJ** key is pressed. Wait some time for the probe to reach ambient temperature.
2. Select **► Adjust T measurement**, press **►** key.
3. Select **1-point/ 2-point adjustment**, press. Press **— START**.
4. Remove the filter from the probe and insert the probe head into a reference temperature.
5. Wait at least 30 minutes for the sensor to stabilize. Follow the stabilization from the **—GRAPH** display.
6. Press **—READY** when stabilized. Give the reference temperature by using the arrow keys.

When carrying out the 2-point adjustment proceed to the next adjustment point and carry out the procedure as described in the previous item. Please, note that the difference between the two temperature references must be at least 30 °C.

7. Press **OK**. Press **YES** to confirm the adjustment.
8. Press **OK** to return to the adjustment menu.
9. Press **EXIT** to close the adjustment mode and return to the main view.

## By using serial line

1. Press the **ADJ** key on the motherboard to open the adjustment mode. If using a warmed probe for measuring, probe heating will be interrupted when **ADJ** key is pressed. Wait some time for the probe to reach ambient temperature.
2. Remove the probe filter and insert the probe head into the reference temperature.
3. Type command **CT** or (**CTA** for additional T probe) and press **ENTER**.

```
CT ↵
```

or for additional T probe

```
CTA ↵
```

Type **C** and press **ENTER** a few times to check if the reading is stabilized.

4. Let the reading stabilize, give the reference temperature after the question mark and press **ENTER** three times.

When having another reference temperature (2-point calibration) press **ENTER** twice and insert the probe to the second reference. When the reading is stabilized, give the second reference temperature after the question mark and press **ENTER**. Please, note that the difference between the two temperature references must be at least 30 °C.

### Example (1-point adjustment):

```
>ct
T   :   16.06  Ref1 ? c
T   :   16.06  Ref1 ? c
T   :   16.06  Ref1 ? c
T   :   16.06  Ref1 ? c
T   :   16.06  Ref1 ? c
T   :   16.06  Ref1 ? 16.0
Press any key when ready ...
```

```
T      :    16.06  Ref2 ?  
OK  
>
```

OK indicates that the calibration has succeeded.

5. Give the calibration information (date and text) to the transmitter's memory, see the serial commands **CTEXT** and **CDATE**.
6. Press the **ADJ** button on the motherboard to close the adjustment mode.
7. Take the probe out of the reference conditions and replace the filter.

## Analog output adjustment

In the analog output calibration the analog output is forced to the following values:

- current output: 2 mA and 18 mA
- voltage output: 10 % and 90 % of the range

Connect HMT330 to a calibrated current/voltage meter in order to measure either current or voltage depending on the selected output type.

## By using display/keypad

1. Press the **ADJ** button to open the **ADJUSTMENT MENU**.
2. Select **► Adjust analog outputs**, press **►** key.
3. Select the output to be adjusted **Adjust analog output...**, press **— START**.
4. Measure the first analog output value with a multimeter. Give the measured value by using the arrow keys. Press **— OK**.
5. Measure the second analog output value with a multimeter. Give the measured value by using the arrow keys. Press **— OK**.
6. Press **— OK** to return to the adjustment menu.
7. Press **— EXIT** to close the adjustment mode and to return to the main view.

## By using serial line

Give the following command and type the multimeter reading, press ↵.

```
ACAL ↵
```

### Example (current outputs):

```
>ACAL ↵  
Ch1 I1 (mA) ? 2.046 ↵  
Ch1 I2 (mA) ? 18.087 ↵  
Ch2 I1 (mA) ? 2.036 ↵  
Ch2 I2 (mA) ? 18.071 ↵
```

## Feeding the adjustment information

This information is shown on the device information fields (see Chapter 4, section *Device information*).

## By using display/keypad

1. If you are not in the adjustment menu, press the **ADJ** button on the motherboard (opens the **ADJUSTMENT MENU**).
2. Select ► **Adjustment info**, press ► key.
3. Select **Date**, press = **SET**. Give the date by using the arrow keys. Press = **OK**.
4. Select **i**, press = **CHANGE**. Enter information text including 17 characters at maximum by using the arrow keys. Press = **OK**.
5. Press = **EXIT** to return to the main view.

## By using serial line

### Giving text to adjustment information field

**CTEXT** ↵

Set adjustment info text.

**Example:**

```
>ctext
Adjust. info   : (not set) ? HMK15
>
```

### Giving date to adjustment information field

**CDATE** ↵

Set adjustment date in formatYYYY-MM-DD.

**Example.**

```
>cdate
Adjust. date   : (not set) ? 2004-05-21
>
```



## CHAPTER 7

# SPECIFICATIONS

## Performance

### Relative humidity

|  |  |
|--|--|
| Measurement range  | 0...100 %RH  |
| Accuracy (including non-linearity, hysteresis and repeatability) |  |
| at +20 °C  | ± 1 % RH (0...90 % RH)<br>± 1.7 % RH (90...100 % RH)     |
| at -20...+40 °C  | ± (1.0 + 0.008 x reading) % RH (*)                       |
| at -40...-20 °C, +40...+ 180 °C                                  | ± (1.5 + 0.015 x reading) % RH (*)                       |
| Factory calibration uncertainty (**) (+20 °C)                    | ± 0.6 % RH (0...40 % RH)<br>± 1.0 % RH (40...97 % RH)    |
| Humidity sensors   |  |
| HUMICAP® 180   | for typical applications                                 |
| HUMICAP® 180C  | for applications with chemical purge and/or warmed probe |
| HUMICAP® 180L2   | for applications with demanding chemical environment (*) |
| (*) Note ! For HUMICAP® 180L2                                    |  |
| at -10...+40 °C  | ± (1.0 + 0.01 x reading) % RH                            |
| at -40...-10 °C, +40...+180 °C                                   | ± (1.5 + 0.02 x reading) % RH                            |

(\*\*) Defined as ± 2 standard deviation limits. Small variations possible, see also calibration certificate.

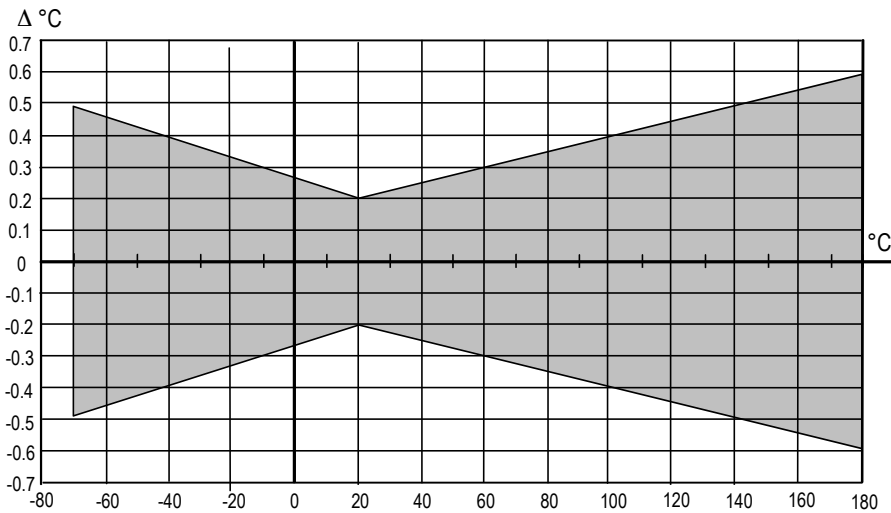
Response time (90 %) at 20 °C in still air

8 s with grid filter  
20 s with grid + steel netting filter  
40 s with sintered filter

### Temperature (+ operating pressure ranges)

|                      |   |
|----------------------|---|
| HMT331               | -40...+60 °C (-40...+140 °F)                            |
| HMT333 (vapor tight) | -40...+80 °C (-40...+176 °F)                            |
| HMT334               | -70...+180 °C (-94...+356 °F), 0...10 MPa (0...100 bar) |
| HMT335 (vapor tight) | -70...+180 °C (-94...+356 °F)                           |
| HMT337 (vapor tight) | -70...+180 °C (-94...+356 °F)                           |
| HMT338               | -70...+180 °C (-94...+356 °F), 0...4 MPa (0...40 bar)   |

Accuracy at +20 °C (+68 °F) ± 0.2 °C  
 Accuracy over temperature range (see graph):



Temperature sensor

Pt 100 RTD 1/3 Class B IEC 751

### Calculated variables

|                             | HMT331 probe             | HMT333 probe             | HMT334/335/337/338 probes |
|-----------------------------|--------------------------|--------------------------|---------------------------|
| <b>Dewpoint temperature</b> | -20...+60 °C             | -20...+80 °C             | -20...+100 °C             |
| <b>Mixing ratio</b>         | 0...160 g/kg dry air     | 0...500 g/kg dry air     | 0...500 g/kg dry air      |
| <b>Absolute humidity</b>    | 0...160 g/m <sup>3</sup> | 0...500 g/m <sup>3</sup> | 0...500 g/m <sup>3</sup>  |
| <b>Wet bulb temperature</b> | 0...60 °C                | 0...+100 °C              | 0...+100 °C               |
| <b>Enthalpy</b>             | -40...+1500 kJ/kg        | -40...+1500 kJ/kg        | -40...+1500 kJ/kg         |
| <b>Water vapor pressure</b> | 0... 1000 hPa            | 0... 1000 hPa            | 0... 1000 hPa             |

### Accuracies of the calculated variables

Accuracies of the calculated variables depend on the calibration accuracy of the humidity and temperature sensors; here the accuracies are given for ±2 %RH and ±0.2 °C.

#### Accuracy of dewpoint temperature °C

| Temp. | Relative humidity |      |      |      |      |      |      |      |      |      |
|-------|-------------------|------|------|------|------|------|------|------|------|------|
|       | 10                | 20   | 30   | 40   | 50   | 60   | 70   | 80   | 90   | 100  |
| -40   | 1.86              | 1.03 | 0.76 | 0.63 | 0.55 | 0.50 | 0.46 | 0.43 | —    | —    |
| -20   | 2.18              | 1.19 | 0.88 | 0.72 | 0.62 | 0.56 | 0.51 | 0.48 | —    | —    |
| 0     | 2.51              | 1.37 | 1.00 | 0.81 | 0.70 | 0.63 | 0.57 | 0.53 | 0.50 | 0.48 |
| 20    | 2.87              | 1.56 | 1.13 | 0.92 | 0.79 | 0.70 | 0.64 | 0.59 | 0.55 | 0.53 |
| 40    | 3.24              | 1.76 | 1.27 | 1.03 | 0.88 | 0.78 | 0.71 | 0.65 | 0.61 | 0.58 |
| 60    | 3.60              | 1.96 | 1.42 | 1.14 | 0.97 | 0.86 | 0.78 | 0.72 | 0.67 | 0.64 |
| 80    | 4.01              | 2.18 | 1.58 | 1.27 | 1.08 | 0.95 | 0.86 | 0.79 | 0.74 | 0.70 |
| 100   | 4.42              | 2.41 | 1.74 | 1.40 | 1.19 | 1.05 | 0.95 | 0.87 | 0.81 | 0.76 |
| 120   | 4.86              | 2.66 | 1.92 | 1.54 | 1.31 | 1.16 | 1.04 | 0.96 | 0.89 | 0.84 |
| 140   | 5.31              | 2.91 | 2.10 | 1.69 | 1.44 | 1.26 | 1.14 | 1.05 | 0.97 | 0.91 |
| 160   | 5.80              | 3.18 | 2.30 | 1.85 | 1.57 | 1.38 | 1.24 | 1.14 | 1.06 | 0.99 |

## Accuracy of mixing ratio g/kg

(ambient pressure 1013 mbar)

| Temp. | Relative humidity |       |        |       |       |       |        |        |       |       |
|-------|-------------------|-------|--------|-------|-------|-------|--------|--------|-------|-------|
|       | 10                | 20    | 30     | 40    | 50    | 60    | 70     | 80     | 90    | 100   |
| -40   | 0.003             | 0.003 | 0.003  | 0.003 | 0.003 | 0.004 | 0.004  | 0.004  | —     | —     |
| -20   | 0.017             | 0.018 | 0.019  | 0.021 | 0.022 | 0.023 | 0.025  | 0.026  | —     | —     |
| 0     | 0.08              | 0.09  | 0.09   | 0.10  | 0.10  | 0.11  | 0.11   | 0.12   | 0.13  | 0.13  |
| 20    | 0.31              | 0.33  | 0.35   | 0.37  | 0.39  | 0.41  | 0.43   | 0.45   | 0.47  | 0.49  |
| 40    | 0.97              | 1.03  | 1.10   | 1.17  | 1.24  | 1.31  | 1.38   | 1.46   | 1.54  | 1.62  |
| 60    | 2.68              | 2.91  | 3.16   | 3.43  | 3.72  | 4.04  | 4.38   | 4.75   | 5.15  | 5.58  |
| 80    | 6.73              | 7.73  | 8.92   | 10.34 | 12.05 | 14.14 | 16.71  | 19.92  | 24.01 | 29.29 |
| 100   | 16.26             | 21.34 | 28.89  | 40.75 | 60.86 | 98.85 | 183.66 | 438.56 | —     | —     |
| 120   | 40.83             | 74.66 | 172.36 | —     | —     | —     | —      | —      | —     | —     |

## Accuracy of wet bulb temperature °C

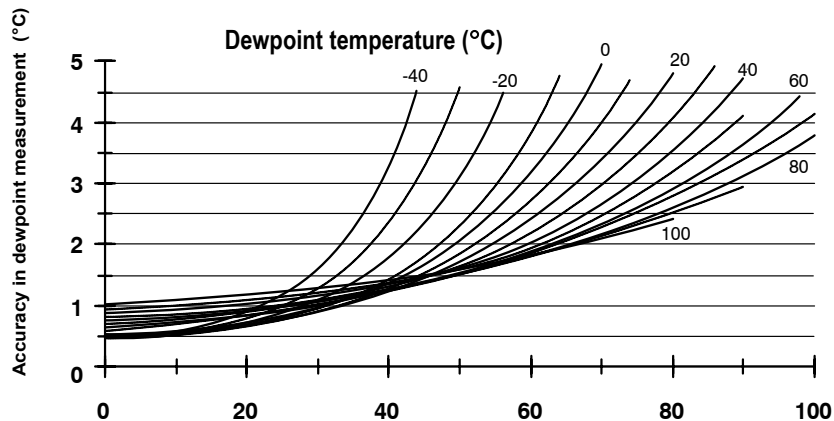
| Temp. | Relative humidity |      |      |      |      |      |      |      |      |      |
|-------|-------------------|------|------|------|------|------|------|------|------|------|
|       | 10                | 20   | 30   | 40   | 50   | 60   | 70   | 80   | 90   | 100  |
| -40   | 0.20              | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | —    | —    |
| -20   | 0.21              | 0.21 | 0.22 | 0.22 | 0.22 | 0.22 | 0.23 | 0.23 | —    | —    |
| 0     | 0.27              | 0.28 | 0.28 | 0.29 | 0.29 | 0.29 | 0.30 | 0.30 | 0.31 | 0.31 |
| 20    | 0.45              | 0.45 | 0.45 | 0.44 | 0.44 | 0.44 | 0.43 | 0.43 | 0.42 | 0.42 |
| 40    | 0.84              | 0.77 | 0.72 | 0.67 | 0.64 | 0.61 | 0.58 | 0.56 | 0.54 | 0.52 |
| 60    | 1.45              | 1.20 | 1.03 | 0.91 | 0.83 | 0.76 | 0.71 | 0.67 | 0.63 | 0.60 |
| 80    | 2.23              | 1.64 | 1.32 | 1.13 | 0.99 | 0.89 | 0.82 | 0.76 | 0.72 | 0.68 |
| 100   | 3.06              | 2.04 | 1.58 | 1.31 | 1.14 | 1.01 | 0.92 | 0.85 | 0.80 | 0.75 |
| 120   | 3.85              | 2.40 | 1.81 | 1.48 | 1.28 | 1.13 | 1.03 | 0.95 | 0.88 | 0.83 |
| 140   | 4.57              | 2.73 | 2.03 | 1.65 | 1.41 | 1.25 | 1.13 | 1.04 | 0.97 | 0.91 |
| 160   | 5.25              | 3.06 | 2.25 | 1.82 | 1.55 | 1.37 | 1.24 | 1.13 | 1.05 | 0.99 |

## Accuracy of absolute humidity g/m<sup>3</sup>

| Temp. | Relative humidity |       |       |       |       |       |       |       |      |      |
|-------|-------------------|-------|-------|-------|-------|-------|-------|-------|------|------|
|       | 10                | 20    | 30    | 40    | 50    | 60    | 70    | 80    | 90   | 100  |
| -40   | 0.004             | 0.004 | 0.005 | 0.005 | 0.005 | 0.006 | 0.006 | 0.006 | —    | —    |
| -20   | 0.023             | 0.025 | 0.027 | 0.029 | 0.031 | 0.032 | 0.034 | 0.036 | —    | —    |
| 0     | 0.10              | 0.11  | 0.12  | 0.13  | 0.13  | 0.14  | 0.15  | 0.15  | 0.16 | 0.17 |
| 20    | 0.37              | 0.39  | 0.41  | 0.43  | 0.45  | 0.47  | 0.49  | 0.51  | 0.53 | 0.55 |
| 40    | 1.08              | 1.13  | 1.18  | 1.24  | 1.29  | 1.34  | 1.39  | 1.44  | 1.49 | 1.54 |
| 60    | 2.73              | 2.84  | 2.95  | 3.07  | 3.18  | 3.29  | 3.40  | 3.52  | 3.63 | 3.74 |
| 80    | 6.08              | 6.30  | 6.51  | 6.73  | 6.95  | 7.17  | 7.39  | 7.61  | 7.83 | 8.05 |
| 100   | 12.2              | 12.6  | 13.0  | 13.4  | 13.8  | 14.2  | 14.6  | 15.0  | 15.3 | 15.7 |
| 120   | 22.6              | 23.3  | 23.9  | 24.6  | 25.2  | 25.8  | 26.5  | 27.1  | 27.8 | 28.4 |
| 140   | 39.1              | 40.0  | 41.0  | 42.0  | 43.0  | 44.0  | 45.0  | 45.9  | 46.9 | 47.9 |
| 160   | 63.5              | 64.9  | 66.4  | 67.8  | 69.2  | 70.7  | 72.1  | 73.5  | 74.9 | 76.4 |

## Dewpoint temperature (HMT337 warmed probe option)

Find the intersection of the dewpoint temperature curve and the dewpoint difference reading (process temperature-dewpoint temperature) on the x-axis and read the accuracy in dewpoint measurement on the y-axis.



## Inputs and outputs

|   |   |
|---|---|
| Operation voltage                                     | 10...35 VDC, 24 VAC                                     |
| with optional power supply module                     | 100...240 VAC 50/60 Hz                                  |
| Start-up time after power-up                          | 3 s   |
| Power consumption @ 20 °C, V <sub>supply</sub> =24VDC |   |
| RS-232  | max 25 mA   |
| U <sub>out</sub> 2x 0...1V/ 0...5V/0...10V            | max 25 mA   |
| I <sub>out</sub> 2x 0...20 mA                         | max 60 mA   |
| display and backlight                                 | + 20 mA   |
| during chemical purge                                 | + 110 mA max  |
| during probe heating (HMT337)                         | + 120 mA  |
| Analog outputs  |   |
| current output  | 0...20 mA, 4...20 mA                                    |
| voltage output  | 0...1 V, 0...5 V, 0...10 V                              |
| Accuracy of analog outputs at 20 °C                   | ± 0.05 % full scale                                     |
| Temperature dependence of the analog outputs          | ± 0.005 % full scale                                    |
| External loads  |   |
| current outputs                                       | R <sub>L</sub> < 500Ω                                   |
| 0... 1 V output                                       | R <sub>L</sub> > 2kΩ                                    |
| 0... 5 V and 0... 10 V outputs                        | R <sub>L</sub> > 10kΩ                                   |
| Digital outputs                                       | RS-232, RS-485 (optional)                               |
| Relay outputs (optional)                              | 0.5 A, 250 VAC  |
| Max wire size   | 0.5 mm <sup>2</sup> (AWG 20) stranded wires recommended |
| Cable bushing   | M20*1.5 (cable diameter 8...11 mm)                      |

## Specifications

---

|  |                  |
|--|------------------|
| Conduit fitting                          | M20*1.5/NPT 1/2" |
| 8-pole connector (male)                  | RSFM5/0.5        |
| 8-pole connector with 5 m cable (female) | RKT5-24/3M       |
| Probe cable diameter                     |                  |
| HMT333                                   | 6.0 mm           |
| other probes                             | 5.5 mm           |

## Operating conditions

|                                  |   |
|----------------------------------|---|
| Operating temperature range      |   |
| for humidity measurement         | -70...+180 °C (-94...+356 °F) see probe specifications        |
| for transmitter body electronics | -40...+60 °C (-40...+140 °F)                                  |
| with display                     | 0...+60 °C (+32...+140 °F)                                    |
| Electromagnetic compatibility    | EN61326-1:1997+ Am1:1998 + Am2:2001<br>Industrial environment |

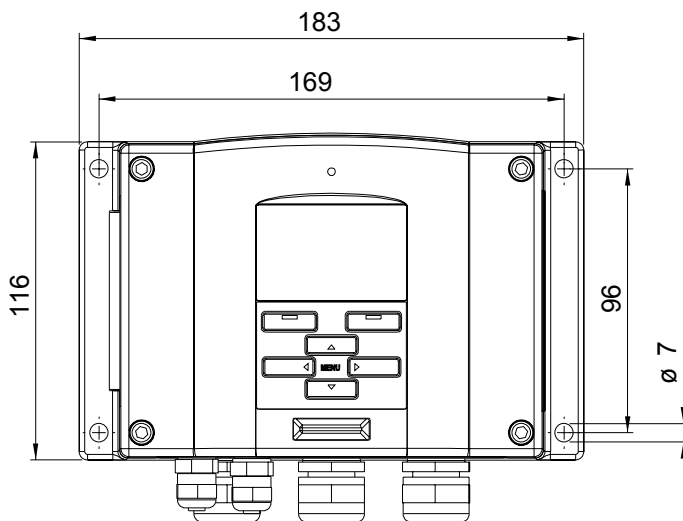
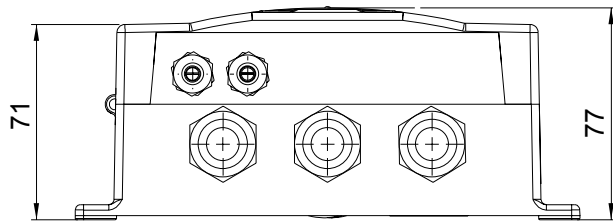
## Materials

|                        |                         |
|------------------------|-------------------------|
| Housing material       | G-A1Si 10 Mg (DIN 1725) |
| Housing classification | IP 65 (NEMA 4)          |
| Housing weight         | 1.2 kg                  |

## Options and accessories

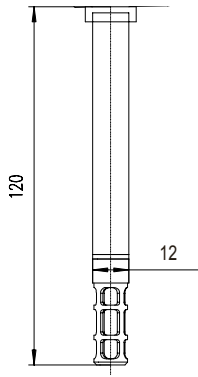
| Description  | Order code   |
|--|--------------|
| <b>Probe accessories</b>   |              |
| PPS plastic grid with stainless steel netting                    | DRW010281SP  |
| PPS plastic grid filter  | DRW010276SP  |
| Stainless steel sintered filter                                  | HM47280SP    |
| Stainless steel grid (for oil measurement)                       | HM47453SP    |
| <b>Sensors</b>   |              |
| HUMICAP180 (general purpose)                                     | HUMICAP180   |
| HUMICAP180L2 (for high chemical concentrations)                  | HUMICAP180L2 |
| PT100 sensor   | 10429SP      |
| <b>Probe Mounting</b>  |              |
| Duct installation kit for HMT333                                 | 210697       |
| Installation flange for HMT335                                   | 210696       |
| Duct installation kit for HMT337                                 | 210710       |
| Ball valve set for HMT338 (0...40 bar)                           | DMP248BVS    |
| Duct installation kit for T-probe                                | 215003       |
| <b>Transmitter mounting</b>                                      |              |
| Wall mounting plate (plastic)                                    | 214829       |
| DIN rail installation set  | 215094       |
| Pole installation kit  | 215108       |
| Rain shield  | 215109       |
| Meteorological installation kit                                  | HMT330MIK    |
| <b>Connectors and fittings</b>                                   |              |
| Sealed cable gland M20*1.5 for 8...11 mm cable                   | 214728SP     |
| Sealed cable gland M20*1.5 for 11...14 mm cable                  | 214729SP     |
| Conduit Fitting  | 214672SP     |
| Male Swagelok connector for 12mm probe with 3/8" ISO (RT) Thread | SWG12ISO38   |
| Male Swagelok connector for 12mm probe with 1/2" NPT Thread      | SWG12NPT12   |
| Swagelok connector for T-probe with 1/8" ISO (RT) Thread         | SWG6ISO18    |
| Swagelok connector for T-probe with 1/8" NPT (RT) Thread         | SWG6NPT18    |
| Fitting body for HMT334  | 17223        |
| NPT fitting body for HMT334                                      | 17225        |
| Cable gland AGRO for HMT333/337                                  | HMP247CG     |
| Fitting body NPT 1/2" for HMT338                                 | 212810SP     |
| Fitting body ISO 1/2" for HMT338                                 | DRW212076SP  |
| Calibration adapter for HMK15                                    | 211302       |
| <b>Connection cables</b>   |              |
| PC connection cable  | 19446ZZ      |
| HMI41 connection cable   | 25917ZZ      |
| HM70 connection cable  | 211339       |
| MI70 Link software interface kit                                 | 215005       |
| <b>Cable connectors</b>  |              |
| 8-pole connector with 5 m  | 212142       |
| 8-pole connector equipped with screw terminals                   | 212416       |
| <b>Modules</b>   |              |
| Relay module   | RELAY-1      |
| Analog output module   | AOUT-1       |
| Isolated RS-485 module   | RS-485-1     |
| Universal AC-power   | POWER-1      |
| Galvanic isolation module  | DCDC-1       |

# DIMENSIONS (IN MM)

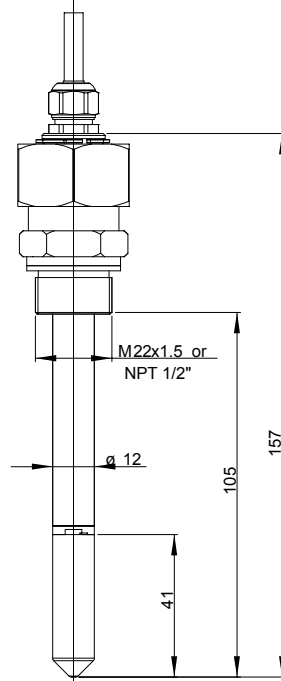


# Probes

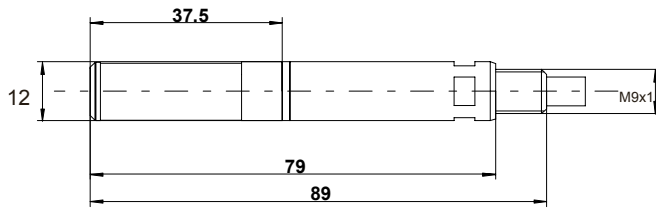
## HMT331



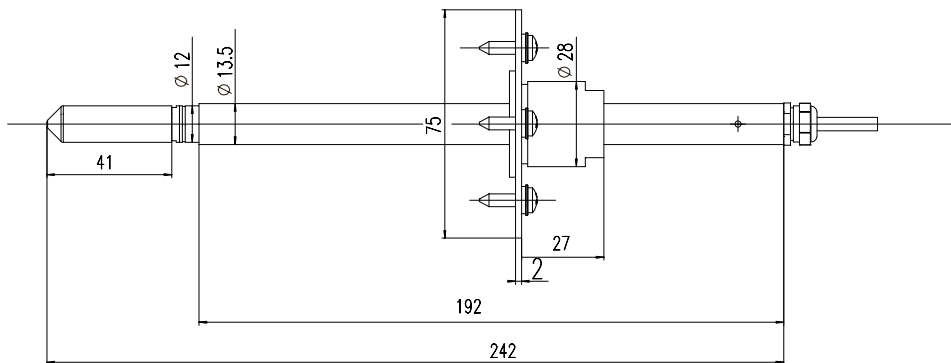
## HMT334



## HMT333



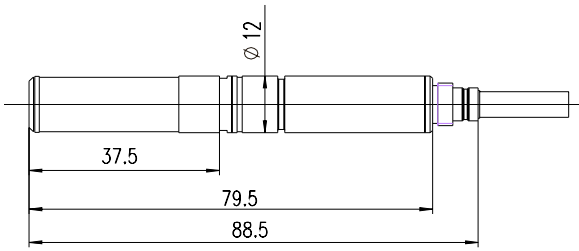
## HMT335



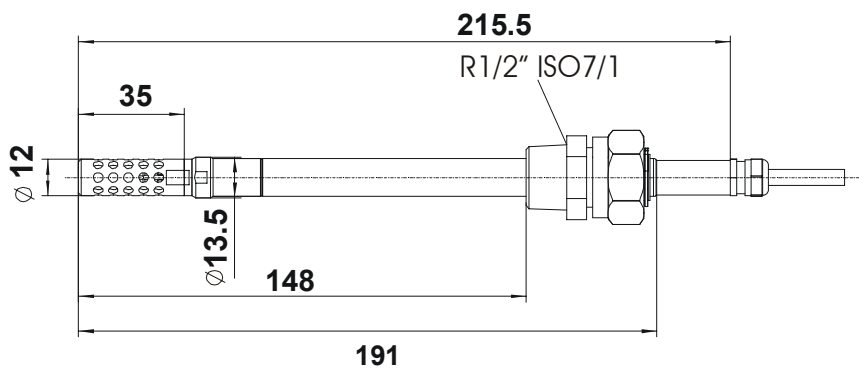


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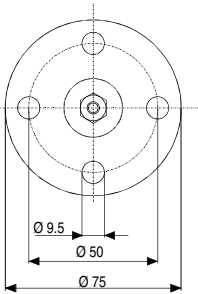
## HMT337



## HMT338



Duct installation flange mounting plate (HMT333, HMT337, HMT335 and additional T-probe.)



## APPENDIX 1

## CALCULATION FORMULAS

The HMT330 series transmitters measure relative humidity and temperature. From these values dewpoint, mixing ratio, absolute humidity and enthalpy in normal pressure are calculated using the following equations

dewpoint:

$$T_d = \frac{T_n}{\frac{m}{\log\left(\frac{P_w}{A}\right)} - 1} \quad (1)$$

The parameters  $A$ ,  $m$ , and  $T_n$  depend on temperature according to the following table (\* used for frostpoint calculation if the dewpoint is negative):

| t              | A      | m      | $T_n$  |
|----------------|--------|--------|--------|
| <0 °C *        | 6.1134 | 9.7911 | 273.47 |
| 0 ... 50 °C    | 6.1078 | 7.5000 | 237.3  |
| 50 ... 100 °C  | 5.9987 | 7.3313 | 229.1  |
| 100 ... 150 °C | 5.8493 | 7.2756 | 225.0  |
| 150 ... 180 °C | 6.2301 | 7.3033 | 230.0  |

mixing ratio:

$$x = 621.99 \cdot RH \cdot \frac{P_w}{(p - P_w)} \quad (2)$$

absolute humidity:

$$a = 216.68 \cdot \frac{P_w}{T} \quad (3)$$

enthalpy:

$$h = (T - 273.15) \cdot (1.01 + 0.00189 \cdot x) + 2.5 \cdot x \quad (4)$$

The water vapour saturation pressure  $P_{ws}$  is calculated by using two equations (5 and 6):

$$\Theta = T - \sum_{i=0}^3 C_i T^i \quad (5)$$

|        |       |                           |
|--------|-------|---------------------------|
| where: | $T$   | = temperature in K        |
|        | $C_i$ | = coefficients            |
|        | $C_0$ | = 0.4931358               |
|        | $C_1$ | = $-0.46094296 * 10^{-2}$ |
|        | $C_2$ | = $0.13746454 * 10^{-4}$  |
|        | $C_3$ | = $-0.12743214 * 10^{-7}$ |

$$\ln P_{ws} = \sum_{i=1}^3 b_i \Theta^i + b_4 \ln \Theta \quad (6)$$

|        |          |                           |
|--------|----------|---------------------------|
| where: | $b_i$    | = coefficients            |
|        | $b_{-1}$ | = $-0.58002206 * 10^4$    |
|        | $b_0$    | = $0.13914993 * 10^1$     |
|        | $b_1$    | = $-0.48640239 * 10^{-1}$ |
|        | $b_2$    | = $0.41764768 * 10^{-4}$  |
|        | $b_3$    | = $-0.14452093 * 10^{-7}$ |
|        | $b_4$    | = 6.5459673               |

The water vapor pressure is calculated using:

$$P_w = RH \cdot \frac{P_{ws}}{100} \quad (7)$$

Parts per million by volume is calculated using:

$$ppm_v = 10^6 \cdot \frac{P_w}{(p - P_w)} \quad (8)$$

Symbols:

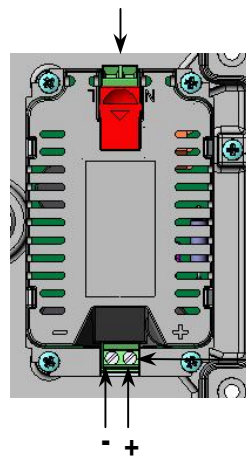
|          |   |
|----------|---|
| $T_d$    | = dewpoint temperature (°C)             |
| $P_w$    | = water vapour pressure(hPa)            |
| $P_{ws}$ | = water vapour saturation pressure(hPa) |
| $RH$     | = relative humidity (%)                 |
| $x$      | = mixing ratio (g/kg)                   |
| $p$      | = atmospheric pressure (hPa)            |
| $a$      | = absolute humidity (g/m <sup>3</sup> ) |
| $T$      | = temperature (K)                       |
| $h$      | = enthalpy (kJ/kg)                      |

## APPENDIX 2

# POWER SUPPLY MODULE (OPTIONAL)

The mains power connection may be connected to the power supply module only by an authorized electrician. A readily accessible disconnect device shall be incorporated in the fixed wiring.

Connect AC mains voltage wires to these terminals



Grounding terminal

In case the module is not installed in factory:

Connect wires from these terminals to the POWER 10...36 V 24 V terminals of the mother board.

Power supply module

## Installation

1. Disconnect the power.
2. Remove the protective plug from the cable gland and thread the wires.
3. In case the power supply module is installed in the factory, continue with the step 5. To attach the module, open the transmitter cover and fasten the power module to the bottom of the housing with four screws. See the position from page 11.

## Wiring

4. In case the power supply module is not installed in a factory: Connect the wires from the power supply module's terminals marked with + and - to the terminals **POWER 10...35 V 24V** on the motherboard of the transmitter.
5. Connect the AC mains voltage wires to the power supply module terminals marked with **N** and **L**.
6. Attach the grounding wire to the grounding terminal on the right-hand side of the transmitter.
7. Connect the power. The LED on the cover of the transmitter is lit continuously during normal operation.

**WARNING** Do not detach the power supply module from the transmitter when the power is on.

**WARNING** Do not connect the mains power to power supply module when it is not installed in the transmitter.

**WARNING** Always connect protective ground terminal !

## Technical Specifications of the power supply module

|                       |  |
|-----------------------|--|
| Operating voltage     | 100...240 VAC 50/60 Hz   |
| Connections           | screw terminals for 0.5...2.5 mm <sup>2</sup> wire (AWG 20...14) |
| Bushing               | for 8...11 mm diameter cable                                     |
| Operating temperature | -40...+60 °C (-40...+140 °F)                                     |
| Storage temperature   | -40...+70 °C (-40...+158 °F)                                     |

## Warnings

### **Questo prodotto é conforme alla Direttiva sul basso voltaggio (73/23 CEE).**

- La conduttura elettrica puó essere collegata al modulo di alimentazione elettrica soltanto da un elettricista autorizzato.
- Non staccare l'alimentazione elettrica dal trasmettitore quando é acceso.
- Non collegare la corrente elettrica al modulo di alimentazione elettrica se non é installato nel trasmettitore HMT330.
- Collegare sempre il morsetto protettivo a terra!

### **Dette produkt er i overensstemmelse med direktivet om lavspænding (73/23 EØS).**

- Netstrømskoblingen til må kun tilsluttes strømforsyningsmodulet af en autoriseret elinstallatør
- Strømforsyningsmodulet må ikke løsghøres fra senderen, mens spændingen er sluttet til.
- Slut ikke netspændingen til strømforsyningsmodulet, når det ikke er installeret i HMT330- senderen
- Forbind altid den beskyttende jordklemme!

### **Dit product voldoet aan de eisen van de richtlijn 73/23 EEG (Laagspanningsrichtlijn).**

- De stroom kan aan de stroomtoevoer module aangesloten worden alleen door een bevoegde monteur.
- Het is niet toegestaan de stroomtoevoer module van de transmitter los te koppelen wanneer de stroom aan is.
- Het is niet toegestaan de stroom aan de stroomtoevoer module aan te sluiten als deze niet in een HMT330-transmitter is gemonteerd.
- Altijd beschermend aardcontact aansluiten!

### **Este producto cumple con la directiva de bajo voltaje (72/23 EEC).**

- La conexión de la alimentación principal al módulo de alimentación sólo puede realizarla un electricista autorizado.
- No desenchufe el módulo de alimentación del transmisor cuando esté encendido.
- No conecte la alimentación principal al módulo de alimentación cuando no esté instalado en el transmisor HMT330.
- Conecte siempre el terminal de protección de conexión a tierra.

### **See toode vastab madalpinge direktiivile(73/23 EEC).**

- Voolukaabli vóib vooluallika mooduli külge ühendada ainult volitatud elektrik.
- Árge ühendage vooluallika moodulit saatja küljest lahti, kui vool on sisse lülitatud.
- Árge ühendage voolukaablit vooluallika mooduli külge, kui seda pole HMT330-tüüpi saatjasse paigaldatud.
- Ühendage alati kaitsev maandusklemm!

### **Ez a termék megfelel a Kisfeszültségű villamos termékek irányelvnek (73/23/EGK).**

- A hálózati feszültséget csak feljogosított elektrotechnikus csatlakoztathatja a tápegységmodulra.
- A bekapcsolt távadóról ne csatlakoztassa le a tápegységmodult.
- Ne csatlakoztassa a hálózati feszültséget a tápegységmodulhoz, ha az nincs beépítve a HMT330 távadóba.
- Feltétlenül csatlakoztasson földelő védőkapcsot!

### **Šis produktas atitinka direktyvą dėl žemos įtampos prietaisų (73/23/EB).**

- Elektros tinklą su energijos tiekimo modulių sujungti gali tik įgaliotas elektrikas.
- Niekada neišimkite energijos tiekimo modulio iš siūstuvo, kai maitinimas yra įjungtas.
- Jei energijos tiekimo modulis nėra įmontuotas HMT330 siūstuve, nejunkite jo į elektros tinklą.
- Visada prijunkite prie apsauginės žeminimo jungties!

**Šis produkts atbilst Zemsprieguma direktīvai (73/23 EEC).**

- Strāvas pieslēgumu var pieslēgt pie barošanas avota moduļa tikai autorizēts elektriķis.
- Neatvienot barošanas avota moduli no raidītāja, kad pieslēgta strāva.
- Nepievienot strāvu barošanas avota modulim, ja tas nav uzstādēts HMT330 raidītājā
- Vienmēr pievienot aizsargājošu iezemētu terminālu !

**Ten produkt spełnia wymogi Dyrektywy niskonapięciowej (73/23 EEC).**

- Napięcie zasilające powinno zostać podłączone do modułu zasilacza tylko przez wykwalifikowanego elektryka.
- Nie wolno odłączać modułu zasilacza od nadajnika, kiedy zasilanie jest włączone.
- Nie wolno podłączać napięcia zasilającego do modułu zasilacza, kiedy nie jest on zamontowany w nadajniku HMT330.
- Zawsze należy podłączać zabezpieczający zacisk uziemiający!

**Tento výrobek vyhovuje Směrnici pro nízké napětí (73/23 EEC).**

- Připojení síťového napájení k napájecímu modulu smí provádět pouze oprávněný elektrikář.
- Neodpojujte napájecí modul od snímače při zapnutém napájení.
- Nepřipojujte síťové napájení k napájecímu modulu, pokud není instalován ve snímači HMT330.
- Vždy zapojte ochrannou zemnicí svorku!

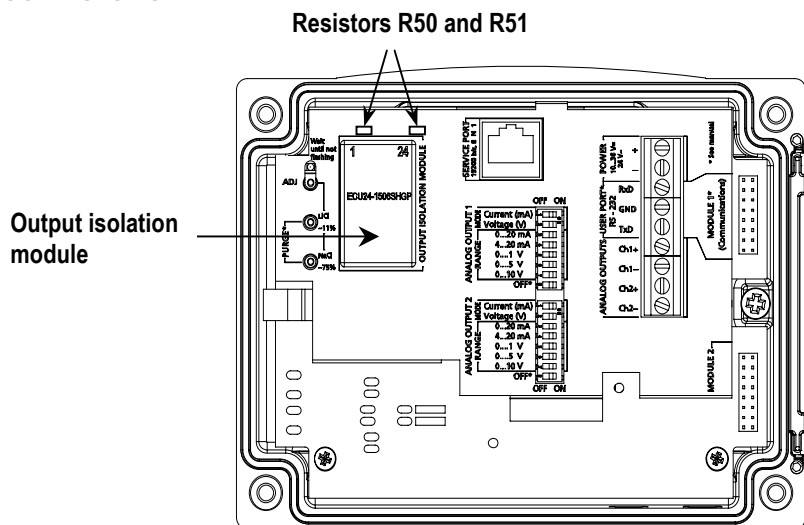
## APPENDIX 3

# GALVANIC ISOLATION FOR OUTPUTS

If galvanic isolation of the power supply line from the output signals is needed, HMT330 can be ordered with optional output isolation module. This module prevents harmful grounding loops.

**NOTE** Output isolation module is not needed when using the power supply module.

## Installation

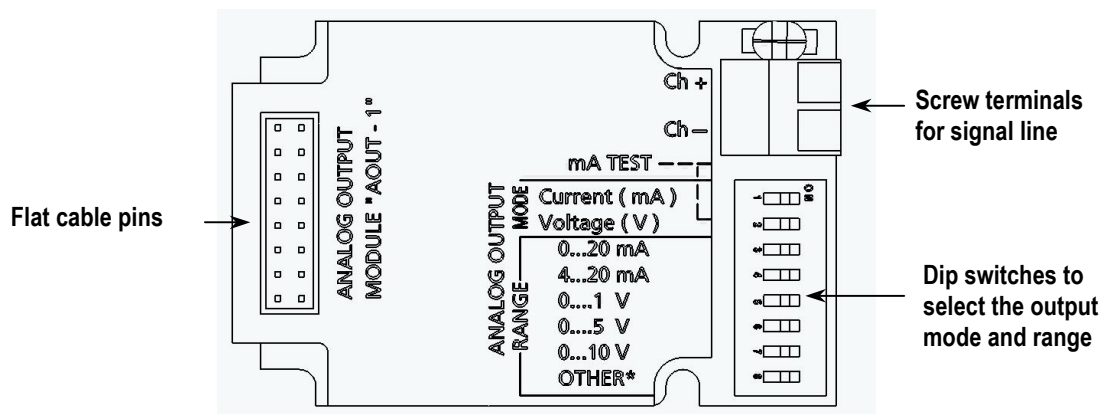


To install the output isolation module, follow the instructions below:

1. Disconnect the power.
2. Open the transmitter cover and fasten the DC/DC converter module onto the motherboard into position shown in a picture.
3. Solder out the resistors R50 and R51 (see picture).
4. Thread the cable tie around the module to lock the fastening.
5. Connect the power.



## APPENDIX 4

**THIRD ANALOG OUTPUT (OPTIONAL)****Installation and wiring**

1. Disconnect the power.
2. In case the analog output module is installed in the factory, continue with the step 4. To attach the module, open the transmitter cover and fasten the analog output module to the bottom of the housing with four screws. See the position from the picture on page 11.
3. Connect the flat cable between the analog output module and the motherboard's pins **MODULE 2**.
4. Take out the protective plug from the cable gland and thread the wires.
5. Connect the wires to the screw terminals marked with **Ch+** and **Ch-**.
6. Select the current/voltage output by setting ON either of the switches 1 or 2.
7. Select the range by setting ON one of the switches 3...7.

**NOTE** Only one of the switches 1 and 2 can be ON at a time.

Only one of the switches 3...7 can be ON at a time.

|           |   | OFF | ON | Selection  |
|-----------|---|-----|----|--|
| Channel 3 | 1 |     |    | Current output selection, ON=Current output selected |
|           | 2 |     |    | Voltage output selection, ON=Voltage output selected |
|           | 3 |     |    | 0...20 mA selection, ON= 0...20 mA selected          |
|           | 4 |     |    | 4... 20 mA selection, ON= 4... 20 mA selected        |
|           | 5 |     |    | 0...1 V selection, ON=0...1 V selected               |
|           | 6 |     |    | 0...5 V selection, ON=0...5 V selected               |
|           | 7 |     |    | 0...10 V selection, ON= 0...10 V selected.           |
|           | 8 |     |    | For service use only, keep always in OFF position.   |

8. Connect the power.
9. Select the quantity and scale the channel via the serial line or display/keypad, see page 55. For testing the analog output, see page 57. For fault indication setting, see page 57.

Third analog output is shown the serial line as **CH3** and in the optional display menu as Output 3.

## Technical specifications for analog output module

|                                  |  |
|----------------------------------|--|
| Outputs                          | 0...20 mA, 4...20 mA, 0...1 V, 0...5 V, 0...10 V |
| Operating temperature range      | -40...+60 °C (-40...+140 °F)                     |
| Power consumption                |  |
| U <sub>out</sub> 0...1 V         | max 30 mA  |
| U <sub>out</sub> 0...5V/0...10V  | max 30 mA  |
| I <sub>out</sub> 0... 20 mA      | max 60 mA  |
| External loads                   |  |
| current outputs                  | R <sub>L</sub> < 500 ohms                        |
| Max load + cable loop resistance | 540 ohms   |
| 0...1 V                          | R <sub>L</sub> > 2000 ohms                       |
| 0...5 V and 0... 10 V            | R <sub>L</sub> > 10 000 ohms                     |
| Storage temperature range        | -55...+80 °C (-67...+176 °F)                     |
| 3-pole screw terminal            |  |
| Max wire size                    | 1.5 mm <sup>2</sup> (AWG16)                      |

## APPENDIX 5

# RELAYS (OPTIONAL)

HMT330 can be equipped with one or two configurable relay modules. Each module contains two configurable relays. See the contact ratings from the Technical Specifications, page 97.

## Installation and wiring

1. Disconnect the power.
2. In case the relay-module is installed in the factory, continue with the step 4. To attach the module, open the transmitter cover and fasten the relay module to the bottom of the housing with four screws. See the position from the picture on page 11.
3. Connect the flat cable between the relay module and the motherboard's pins **MODULE 2** or **MODULE 1**.
4. Take out the protective plug from the cable gland and thread the relay wires.
5. Connect the wires to the screw terminals: NO,C, NC.
6. When the mains power is in use attach the grounding wire to the grounding terminal.

### Selecting the activation state of the relay

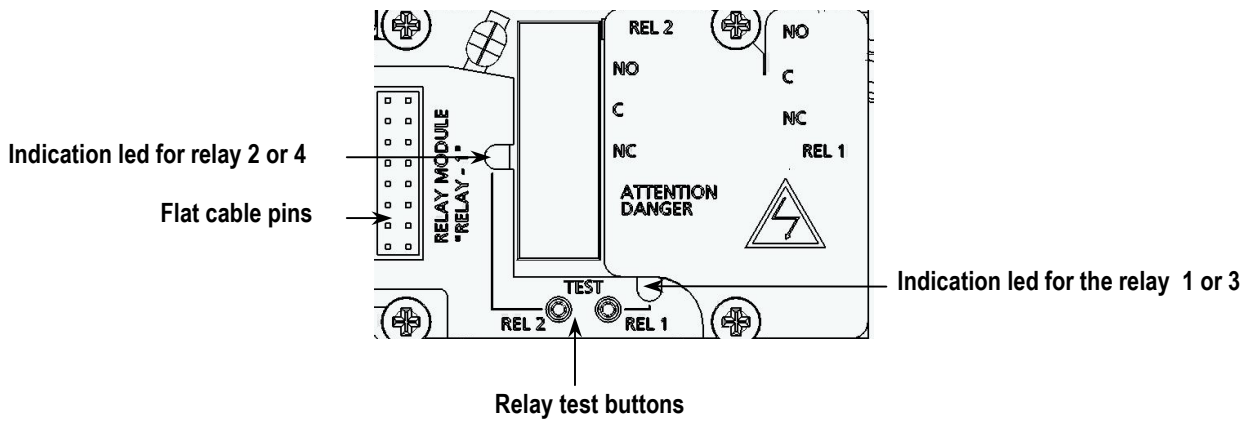
The middlemost C terminal and either one of the terminals NO/NC shall be connected. The polarity can be freely selected.

|    |                 |  |
|----|-----------------|--|
| NO | Normally open   |  |
| C  | Common relay    |  |
| NC | Normally closed |  |

Relay NOT activated: C and NC outputs are closed, NO is open  
 Relay IS activated: C and NO outputs are closed, NC is open.

7. Connect the power and close the cover.

### Relay module



**WARNING** Do not detach the relay module from the transmitter when the power is on.

**WARNING** Do not connect the mains power to relay unit without grounding the transmitter.

## Operation of the relays

### Quantity for the relay output

A relay monitors the quantity chosen for the relay output. Any of the quantities available can be chosen.

### Relay setpoints

When the measured value is in between the *above* and *below* values, the relay is passive. When choosing lower value as *above* value and higher value as *below* value, the relay is passive when the measured value is not between the setpoints.

You can also set only one setpoint.

### Hysteresis

Hysteresis function is to prevent the relay switching back and forth when measured value is near to the setpoint values.

Relay is activated when the measured value passes the exact value of the setpoint. When returning and passing the setpoint again relay is released only until the value reaches the setpoint increased/decreased by the hysteresis value.

Hysteresis should be smaller than difference of the setpoints.

Example: When the 'active above' value is 60 %RH and the hysteresis value is 5 %RH, relay activates when the relative humidity reaches 60 %RH. As the humidity decreases, relay releases at 55 %RH.

### Relay indicating transmitter error status

You can set a relay to follow the operation status of the device. By selecting STATUS for output quantity a relay changes state on the basis of the operation status as follows:

Normal operation: relay active (C and NO outputs are closed)  
Not measuring state (error state or power off): relay released

### Enabling/disabling the relays

You can deactivate the relay outputs e.g. for service purposes of your system.

### Operation of the indication leds

Relay is activated: led is lit.  
Relay is not activated: led is not lit.

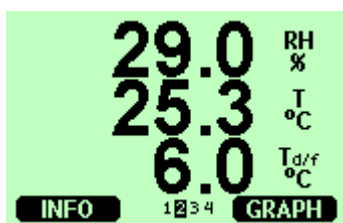
## Setting the relay outputs

### NOTE

When having only one relay module installed, its relays are called 'relay 1' and 'relay 2'.

When having two relay modules, the relays of the the module connected to slot **MODULE 1** (communications) are called 'relay 1' and relay 2' and relays connected to slot **MODULE 2** are called 'relay 3' and 'relay 4'.

### By using display/keypad



↑  
Relays available.  
Activation state  
shown in black.  
Disabled relays  
are not shown.

1. Open the **MAIN MENU** by pressing any of the ▲▼◀▶ arrow keys.
2. Select ► **Interfaces**, press ► key.
3. Select ► **Relay outputs**, press ► key.
4. Select ► **Relay 1/2/3/4**, press ► key.
5. Select the **Quantity**, press = **SELECT**. Select which quantity the relay follows (or **STATUS** when the relay follows the transmitter error). Press = **SELECT**.
6. Select **Act. above / Act. below**. Press = **SET**. If asked, select = **MODIFY** if you want to set the setpoint by using the arrow keys. Select = **REMOVE** if you want to remove the setpoint.
7. Select **Hysteresis** Press = **SET**. Set the hysteresis by using the arrow keys. Press = **OK**.
8. Select **Relay enable**, press = **ON/OFF** to enable/disable the relay.

### By using serial line

Use command **RSEL** to select the quantity, setpoints and hysteresis or enable/disable the relay outputs.

**RSEL [q1 q2 q3 q4] ↵**

where    q1 = quantity for the relay 1 or **STATUS**

q2 = quantity for the relay 2 or STATUS  
 q3 = quantity for the relay 3 or STATUS  
 q4 = quantity for the relay 4 or STATUS

Factory setting: relays disabled.

Use the following quantity abbreviations:

| Quantity                            | Abbreviation |
|-------------------------------------|--------------|
| Relative humidity                   | RH           |
| Temperature                         | T            |
| Dewpoint/Frostpoint                 | TDF          |
| Dewpoint                            | TD           |
| Absolute humidity                   | A            |
| Mixing ratio                        | X            |
| Wetbulb temperature                 | TW           |
| Humid air volume/ dry air volume    | PPM          |
| Water vapour pressure               | PW           |
| Saturation water vapour pressure    | PWS          |
| Enthalpy                            | H            |
| Difference of T and T <sub>df</sub> | DT           |

**Example of window limit switch:** Selecting relay 1 to follow relative humidity measurement and relay 2 to follow temperature measurement. Two relay setpoints are set for both relays.

```
>rsel rh t
Rel1 RH  above: 0.00 %RH ? 30
Rel1 RH  below: 0.00 %RH ? 40
Rel1 RH  hyst : 0.00 %RH ? 2
Rel1 RH  enabl: OFF ? ON
Rel2 T   above: 0.00 'C ? 30
Rel2 T   below: 0.00 'C ? 40
Rel2 T   hyst : 0.00 'C ? 3
Rel2 T   enabl: OFF ? ON
>
```

**Example of normal limit switch:** Selecting relay 1 to follow relative humidity, relay 2 to follow temperature, relay 3 to follow dewpoint and relay 4 to follow dewpoint. One setpoint is chosen for all the outputs.

```
>rsel rh t td td
Rel1 RH  above: 60.00 %RH ? 70
Rel1 RH  below: 70.00 %RH ? -
Rel1 RH  hyst : 2.00 %RH ? 2
Rel1 RH  enabl: ON ? on
Rel2 T   above: 50.00 'C ? 60
Rel2 T   below: 40.00 'C ? -
Rel2 T   hyst : 2.00 'C ? 2
```

```
Rel2 T    enabl: ON ? on
Rel3 Td   above: 5.00 'C ? 10
Rel3 Td   below: 0.00 'C ? -
Rel3 Td   hyst  : 1.00 'C ? 1
Rel3 Td   enabl: OFF ? on
Rel4 Td   above: 0.00 'C ? 20
Rel4 Td   below: 0.00 'C ? -
Rel4 Td   hyst  : 0.00 'C ? 2
Rel4 Td   enabl: OFF ? on
>
```

**Example of using relay 1 as alarm status:** Selecting relay 1 to follow the operation status and relay 2 to follow the temperature measurement.

```
>rsel status t
Rel1 STAT above: -
Rel1 STAT below: -
Rel1 STAT hyst  : -
Rel1 STAT enabl: ON ?
Rel2 T    above: 0.00 'C ? 30
Rel2 T    below: 0.00 'C ? -
Rel2 T    hyst  : 0.00 'C ? 2
Rel2 T    enabl: OFF ? ON
```

## Testing the operation of relays

Testing activates relays even if they are disabled.

### By using module push keys

Press the REL 1 or REL 2 button to activate the corresponding relay.

### By using display/keypad

1. Open the **MAIN MENU** by pressing any of the ▲▼◀▶ arrow keys.
2. Select ►**System**, press ►key.
3. Select ►**Diagnostics**, press ►key.
4. Select ►**Relay tests**, press ►key.
5. Select **Invert relay 1...**, press = **TEST**. Now the selected relay output is forced to opposite state. Press = **OK** to return to normal operation.



6. Press **EXIT** to return to the main view.

## By using serial line

RTEST [ON/OFF ON/OFF ] ↵

**Example:** Testing all four relays.

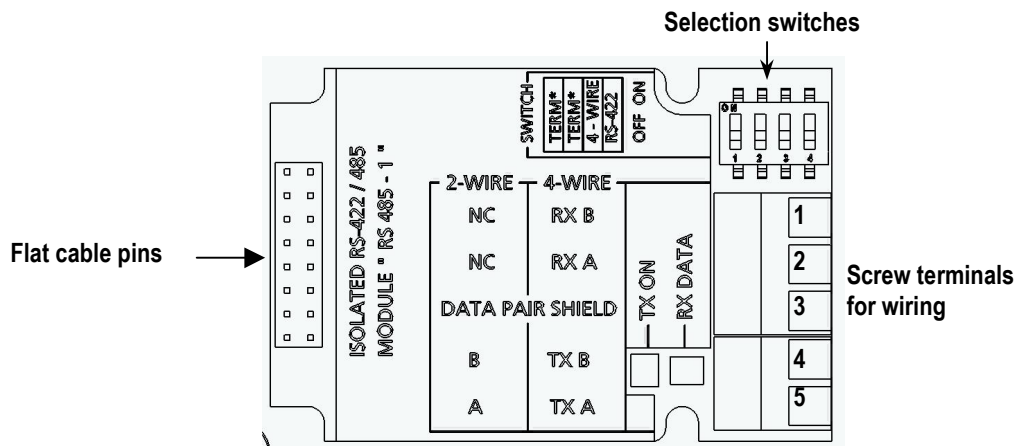
```
>rtest on on on on
  ON ON ON ON
>
>rtest off off off off
  OFF OFF OFF OFF
>
```

## Technical specifications for relay modules

|  |                              |
|--|------------------------------|
| Operating temperature range                                    | -40...+60 °C (-40...+140 °F) |
| Operating pressure range                                       | 500...1300 mHg               |
| Power consumption @24 V  | max 30 mA                    |
| Contacts SPDT (change over) e.g.<br>Contact arrangement Form C |                              |
| I <sub>max</sub>   | 0.5 A 250 VAC                |
| I <sub>max</sub>   | 0.5 A 30 VDC                 |
| Safety standard for the<br>relay component                     | IEC60950 UL1950              |
| Storage temperature range                                      | -55...+80 °C (-67...+176 °F) |
| 3-pole screw terminal / relay                                  |                              |
| Max wire size  | 2.5 mm <sup>2</sup> (AWG14)  |

## APPENDIX 6

# RS-422/485 INTERFACE (OPTIONAL)



RS-485-module.

## Installation and wiring

1. Disconnect the power.
2. In case the RS-485-module is installed in the factory, continue with the item 4. To attach the module, open the transmitter cover and fasten the RS-485 module to the bottom of the housing with four screws.
3. Connect the flat cable between the RS-485 module and the motherboard's pins **MODULE1 (Communications)**.
4. Pull the network wirings through the cable gland.
5. Connect the twisted pair wires (1 or 2 pairs) to the screw terminals as follows:

| Screw terminal | Data line (2-wire RS-485) | Data line (4-wire RS-485/422) |
|----------------|---------------------------|-------------------------------|
| 1              | (not connected)           | RxB                           |
| 2              | (not connected)           | RxA                           |
| 3              | Data pair shield          | Data pair shield              |
| 4              | B                         | TxB                           |
| 5              | A                         | TxA                           |

6. If you use RS-485 (or RS-422) to connect just one HMT330 to a master computer, you may enable the internal termination of HMT330 by switching switches 1 and 2 ON. Make sure that the master's end of the line is also terminated (by using master's internal termination or with a separate terminator).

If you are connecting many transmitters to the same RS-485 bus, make sure that switches 1 and 2 are OFF and terminate the bus with separate terminators at both ends. This allows removing the transmitter without blocking the bus operation.

**NOTE**

If you use the internal termination of the transmitter at the end of the bus (instead of using separate terminators) removing that transmitter will block the bus operation.

7. Select the bus type (4-wire/2-wire) by using the selection switch 3.

In 4-wire mode RS-485 master sends data to the HMT330 through terminals RxA and RxB and receives data from HMT330 through terminals TxA and TxB.

**4-wire (switch 3:ON)**

| RS-485 master | Data | HMT330 |
|---------------|------|--------|
| TxA           | →    | RxA    |
| TxB           | →    | RxB    |
| RxA           | ←    | TxA    |
| RxB           | ←    | TxB    |

**2-wire (switch 3:OFF)**

| Rs-485 master | Data | HMT330 |
|---------------|------|--------|
| A             | ↔    | A      |
| B             | ↔    | B      |

8. When operating in communication mode RS-422, set the switches 3 and 4 to ON position (4-wire wiring is required for RS-422 mode).
9. Connect the power and close the cover.

## Operation

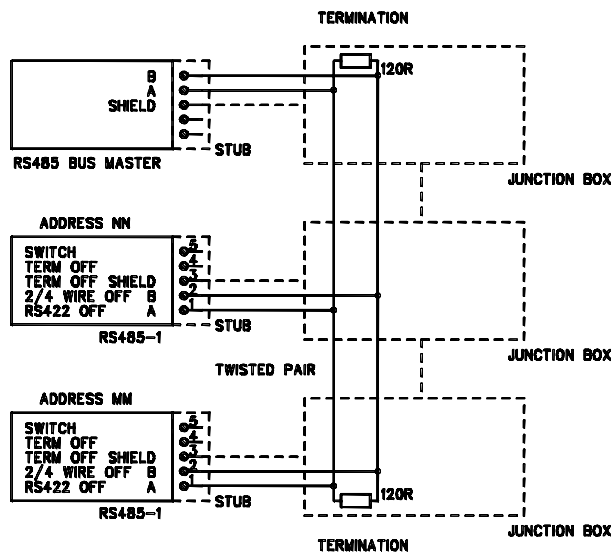
RS-485 interface enables communication between RS-485 network and HMT330 transmitter. The RS-485 interface is isolated and offers a maximum communications rate of 115 200 bits/s. For maximum bus length of 1km, use bit rate 19200 b/s or less.

When selecting an RS-232-RS-485 converters for the network, avoid self powered converters as they don't necessarily support the needed power consumption.

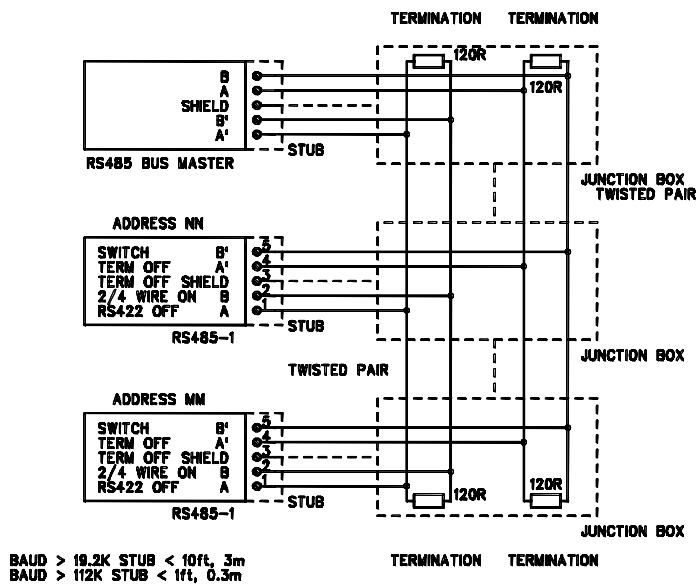
Echo function shall be always disabled (OFF) when using the 2-wire connection. When using the 4-wire connection you can disable/enable the echo setting.

**NOTE** User port on HMT330 main board cannot be used and connected when RS-485 module is connected. Service port is operating normally.

2-wire RS-485 bus



4-wire RS-485 bus



## Networking commands

Set the RS-422/485 interface by using the following commands. The other serial line commands are given in a Chapter 4 section *List of serial commands*.

RS-485 configuration commands may be typed by using the service port or RS-422/485 port. Also the optional display/keypad can be used, see page 44.

### RS-485 bus settings

**SERI b p d s ↵**

b = baud rate (300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200)  
 p = parity (n = none, e = even, o = odd)  
 d = data bits (7 or 8)  
 s = stop bits (1 or 2)

The new baud rate setting is valid after reset.

### RS-485 bus echo

Use this command to enable/disable echo of characters received over the serial line.

**ECHO x ↵**

x = ON or OFF (default= OFF)

When using 2-wire connection, echo must be always disabled.

### RS-485 transmitter address

No address is needed when only one transmitter is used. When several transmitters are connected to the same line, each transmitter must be given an own address in the initial configuration, and POLL mode shall be used.

**ADDR aa ↵**

aa = address (0 ...99) (default = 0)

Example: transmitter is given address 99

```
>ADDR <cr>
Address : 2 ? 99 ↵
```

## RS-485 serial interface mode

**SMODE xxxx ↵**

xxxx = STOP, RUN or POLL

In STOP mode: measurements output only by command, all commands can be used

In RUN mode: outputting automatically, only command S can be used to stop

In POLL mode: measurements output only with command SEND.

## RS-485 output interval

**INTV n xxx ↵**

where: n = 0 - 255      xxx = S, MIN or H

Sets the RUN mode output interval. The time interval is used only when the RUN mode is active. For example, the output interval is set to 10 minutes:

```
>INTV 10 min ↵  
Output intrv. : 10 min  
>
```

Setting RUN output interval to zero enables the fastest possible output rate.

## OPEN & CLOSE

**OPEN nn ↵**

nn = address of the transmitter (0...99)

When all transmitters are in the POLL mode the OPEN command sets the single transmitter temporarily to STOP mode so that commands can be given.

**CLOSE ↵**

Switches the transmitter back to the POLL mode.

**Example:**

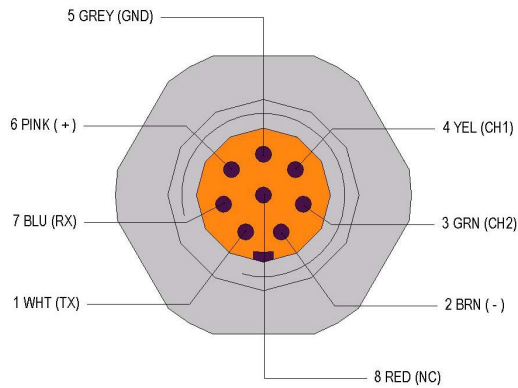
```
>OPEN 2 ↵      opens the line to transmitter 2
>CRH ↵        calibration started
...
>CLOSE ↵      line closed
>
```

## Technical specifications of the RS-485 module

|                                  |  |
|----------------------------------|--|
| Operating temperature range      | -40...+60 °C (-40...+140 °F)                               |
| Operating modes                  | 2-wire (1-pair) half duplex<br>4-wire (2-pair) full duplex |
| Operating speed max              | 115.2 kbaud  |
| Bus isolation                    | 300VDC   |
| Power consumption<br>@ 24V       | max 50 mA  |
| External loads<br>standard loads | 32 RL > 10kohm   |
| Storage temperature range        | -55...+80 °C (-67...+176 °F)                               |
| Max wire size                    | 1.5 mm <sup>2</sup> (AWG16)                                |

## APPENDIX 7

# WIRING OF THE OPTIONAL 8-POLE CONNECTOR



| PIN/<br>TERMINAL | WIRE       | SERIAL SIGNAL    |                  | ANALOG<br>SIGNAL                  |
|------------------|------------|------------------|------------------|-----------------------------------|
|                  |            | RS-232 (EIA-232) | RS-485 (EIA-485) |                                   |
| 1                | White      | Data out TX      | A+               | -                                 |
| 2                | Brown      | serial GND       | (serial GND)     | signal GND<br>(for both channels) |
| 3                | Green      | -                | -                | Ch 2 +                            |
| 4                | Yellow     | -                | -                | Ch 1 +                            |
| 5                | Grey       | 24 V-            | 24 V-            | 24 V-                             |
| 6                | Pink       | 24 V+            | 24 V+            | 24 V+                             |
| 7                | Blue       | Data in RX       | B-               | -                                 |
| 8                | Shield/Red | Cable shield     | Cable shield     | Cable shield                      |



## APPENDIX 8

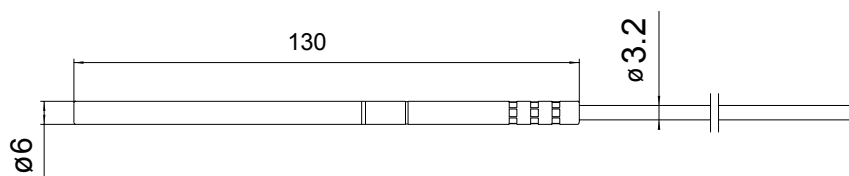
**TEMPERATURE PROBE (OPTIONAL)**

An external temperature probe for HMT337 is needed for the measurement of the ambient temperature in case you have a transmitter with a warmed probe. This allows you to get other humidity quantities than dewpoint and mixing ratio.

T-sensor is connected always in factory.

**Temperature measurement**

|                   |                                   |
|-------------------|-----------------------------------|
| range:            | -70...+ 180 °C (-94...+356 °F)    |
| Typical accuracy: | ± 0.1 °C (± 0.18 °F)              |
| Sensor:           | Pt100 PRT DIN IEC 751 class 1/4 B |
| Cable length:     | 2/5/10 meters                     |
| Pressure tight:   | up to 7 bar                       |
| Probe material:   | stainless steel                   |

**Mechanical dimensions (in mm) for optional temperature sensor.**

## APPENDIX 9

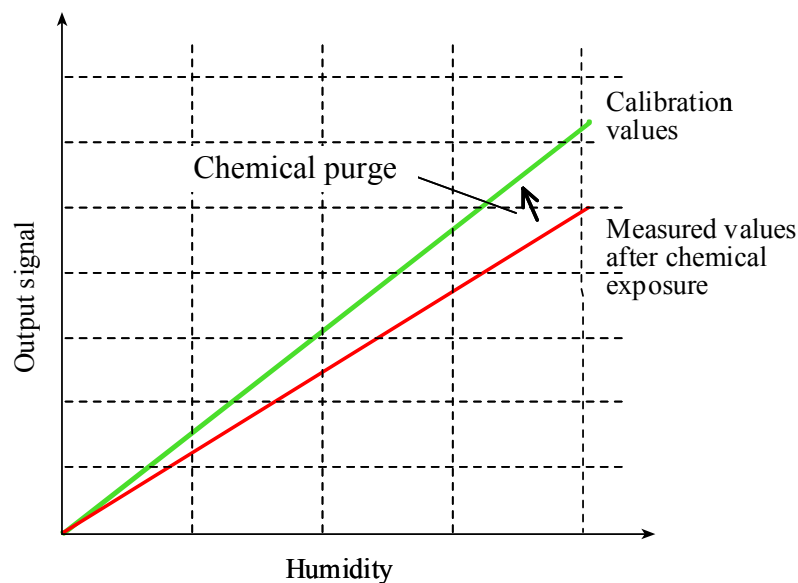
**CHEMICAL PURGE (OPTIONAL)****General**

In some specific applications the sensor gain may decrease gradually due to an interference caused by some particular chemical present in the ambient (see figure). The sensor polymer absorbs the interfering chemical; this reduces the polymer's ability to absorb water molecules and so decreases the sensor gain. In chemical purge heating the humidity sensor to a temperature level of approximately +160 °C for several minutes evaporates the interfering chemical.

The purge function starts with heating stage, continues with settling and when the temperature of the sensor is decreased transmitter returns to normal mode. The whole cycle takes about 6 minutes.

**NOTE**

Chemical purge function locks the output values for about 6 minutes.



**Decrease of the sensor gain due to an interfering chemical and the effect of the chemical purge process.**

Before starting the chemical purge note the following:

- the sensor is protected with a PPS grid with stainless steel netting, a stainless steel sintered filter or with membrane SST filter
- the sensor temperature shall be below 100 °C. At higher temperatures the chemicals evaporate spontaneously from the sensor and the chemical purge is not necessary.

## Automatic chemical purge (Interval purge)

When the HMT330 leaves the factory the automatic chemical purge (if selected) takes place repeatedly with the time intervals set in the factory. User can change the interval in which the purge takes place by using serial commands or with the optional display/keypad. This can be needed if the measuring environment contains high concentrations of interfering chemicals. The automatic chemical purge can be also turned off if necessary.

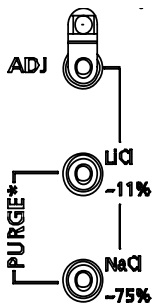
## Manual chemical purge

The chemical purge should be performed always before calibration (see the calibration instructions) or when there is a reason to believe that a sensor has become exposed to an interfering chemical. Make sure that the temperature of the sensor has come down to normal temperature before starting a calibration.

## Chemical Purge in power up

Chemical purge can be set to start within 10 seconds from the power-up of the device. This function can be enabled only by using the serial line.

## Starting the chemical purge




### By using the push-keys

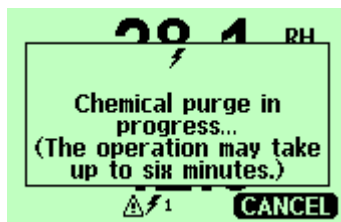
Start manual chemical purge by pressing simultaneously two **PURGE** push-keys (on the motherboard) for a few seconds. Indicator led flashes until purge is complete (up to 6 minutes).

### By using the keypad (optional)

Set the automatic and manual chemical purge by using the display/keypad.

1. Open the **MAIN MENU** by pressing any of the **▲▼◀▶** arrow keys.
2. Select **▶ Measuring**, press **▶** key.
3. Select **▶ Chemical purge**, press **▶** key.
  - Turn on/off the automatic purge by selecting **Automatic purge**, press **▶ ON/OFF** key. Set the purge interval by selecting the **Interval:...**, press **— SET**. Set the purge interval and the unit (hour/day) by using the arrow keys. The interval shall be 1 hour...10 days. Press **— OK**.
  - Start manual purge by selecting **Manual start** and pressing **— START**.
4. Press **— EXIT** to return to the main view.

The symbol  in the display tells that chemical purge is in progress.



The message displayed during the chemical purge. Display returns to the main view after chemical purge.

## By using the serial line

### Setting the automatic and start-up purge

With **PUR** command you can enable or disable automatic and power-up chemical purge and set the interval for automatic purge. If the sensor is exposed to chemicals it is recommended to have the chemical purge done at least once in 720 min (=12 hours). In applications where the chemical exposure is not likely, the interval can be longer.

It is not recommended to change duration, settling, temperature or temp.difference.

**PUR ↵**

Type **PUR** and press ENTER to proceed. The maximum interval is 14400 minutes (=10 days).

```
>pur
Interval Purge : OFF ?
Interval       : 720 min ?
Power-up Purge : OFF ?
Duration       : 120 s ?
Settling       : 240 s ?
Temperature    : 160 'C ?
Temp. diff.    : 0.5 'C ?
>
```

**NOTE**

To activate the new interval setting immediately, reset the transmitter.

**NOTE**

When chemical purge in power-up is enabled, wait about 6 min after power-up before taking measurements. The output channels are locked for the first operation minutes to the initial measured values

### Starting the manual chemical purge

Type **PURGE** to start chemical purge immediately.

**PURGE ↵**

```
>purge  
Purge started, press any key to abort.  
>
```

The prompt '>' appears when the heating period is over. However, the transmitter outputs are locked to values measured before chemical purge until the settling time is over.

## APPENDIX 10

# SENSOR HEATING (OPTIONAL)

## General

This function is optionally available only in transmitters with HUMICAP®180 C sensor.

The sensor heating is recommended for the high humidity environments where even small temperature differences can cause water to condense on the sensor. The sensor heating speeds-up the humidity sensor's recovery from condensation.

Sensor heating starts-up when the relative humidity of the measuring environment reaches the RH-value set by a user (RH-limit). The temperature to where the RH-sensor is heated as well as the duration of the heating can be defined by a user.

**NOTE**

During the sensor heating the outputs are locked to the values measured before the heating cycle.

## Setting the humidity sensor heating

When the HMT330 leaves the factory the sensor heating follows the factory default values. You can enable/disable the function, change the RH-limit and define the heating temperature and duration of this function.

## Sensor heating ON/OFF

Enables/disables the sensor heating.

XHEAT xx ↵

where: xx = ON / OFF

```
>xheat on
Extra heat      : ON
>xheat off
Extra heat      : OFF
>
```

## Setting the heating parameters

Whenever the RH-value seen by the sensor exceeds the predefined RH-limit the humidity sensor is warmed up to the predefined temperature. The duration of the heating can also be defined.

After the heating cycle the humidity conditions are checked and new sensor heating is taken place if the predefined conditions are reached again.

### XHEAT↓

Type the values after question mark. The ranges available:

```
Extra heat RH -limit:      0...100 %RH (default:95 %RH)
(heating function starts-up above the setpoint)
Extra heating temperature: 0...200 °C (default: 100 °C)
Extra heating time:        0...255 s (default: 30 s)
```

#### Example:

```
>xheat
Extra heat      : OFF
Extra heat RH   : 95 ? 90
Extra heat temp: 100 ? 85
Extra heat time: 30 ? 10
>xheat on
Extra heat      : ON
>
```

#### NOTE

During the sensor heating the outputs are locked to the values measured before the cycle.

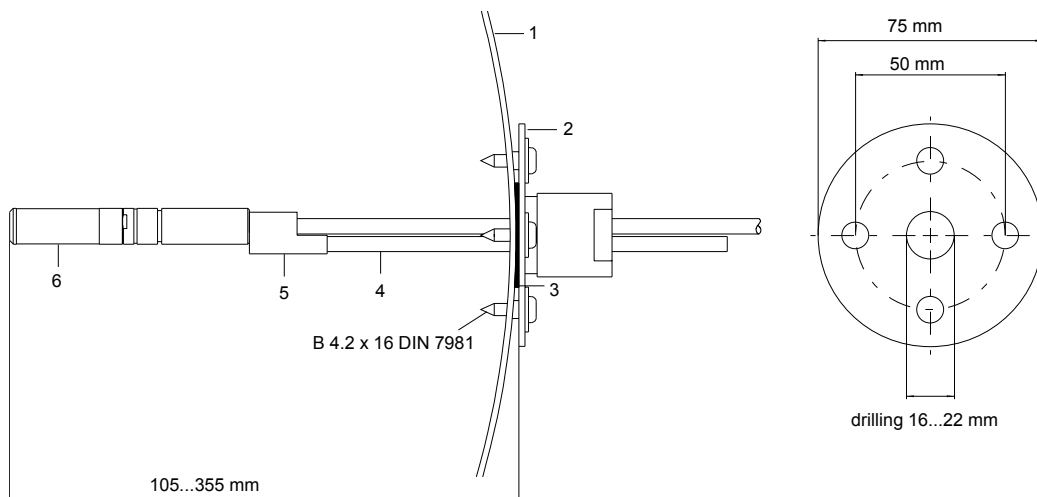


## APPENDIX 11

# PROBE INSTALLATION KITS AND INSTALLATION EXAMPLES

## Duct installation kits (for HMT333/337/335)

Duct installation kit includes a flange, a sealing ring, a supporting bar and probe attaching part for the sensor head and screws for attaching the flange to the duct wall. Vaisala order codes: 210697 (for HMT333), 210710 (for HMT337) and 210696 (for HMT335, no supporting bar )



### Duct mounting installation kit

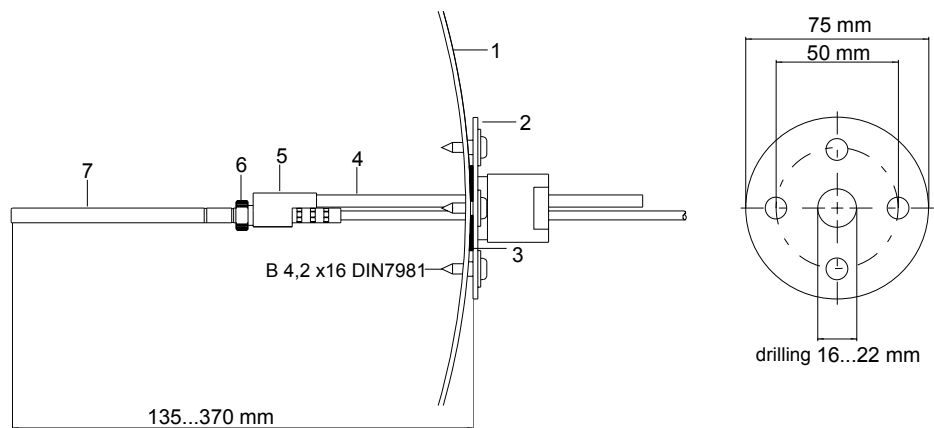
- 1 Duct wall
- 2 Flange
- 3 Sealing ring
- 4 Supporting bar (not included in the kit for HMT335)
- 5 Probe attaching part (to be fixed with the supporting bar)
- 6 Relative humidity probe

### NOTE

When there is remarkable temperature difference between the duct and the air outside the duct, the supporting bar shall be installed as deep in the duct as possible. This prevents errors caused by the heat conduction in the bar and cable.

## Duct installation kit for T-probe (for HMT337)

Vaisala duct installation kit for the T-probe includes flange, supporting bar, probe attaching part, sealing ring and the fixing screws (4 pcs). Vaisala order code: 215003.



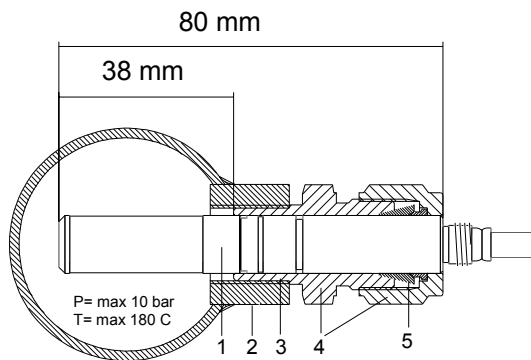
### Duct mounting installation kit

- 1 Duct wall
- 2 Flange
- 3 Sealing ring
- 4 Supporting bar
- 5 Probe support (to be fixed to the supporting bar)
- 6 Retainer bushing (to be fixed to the probe support)
- 7 Temperature probe (to be fixed to the retainer bushing)

## Pressure tight Swagelok installation kits (for HMT337)

### RH probe installation

Swagelok installation kit for the relative humidity probe includes Swagelok connector with ISO3/8" or NPT1/2" thread. Vaisala order codes: SWG12ISO38 or SWG12NPT12.

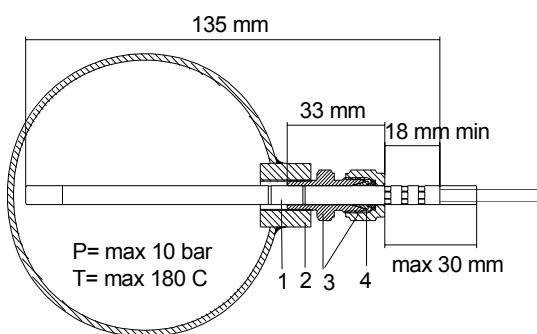


- 1 Relative humidity probe
- 2 Duct connector
- 3 ISO3/8" or NPT1/2" thread
- 4 Swagelok connector
- 5 Ferrules

Swagelok installation kit for RH-probe

### Temperature probe installation

Swagelok installation kit for T-probe includes Swagelok connector with either ISO1/8" or NPT1/8" thread. Vaisala order codes: SWG6ISO18 or SWG6NPT18.

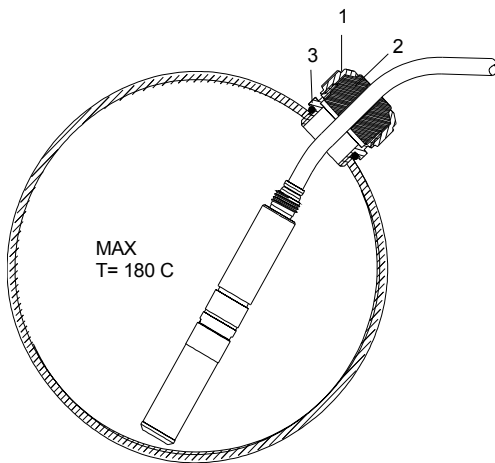


- 1 T-probe
- 2 Duct connector
- 3 Swagelok connector
- 4 Ferrules

Swagelok installation kit for T-probe

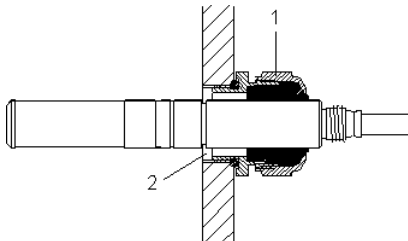
## Examples of vapour tight installations with cable gland

### RH-probe installations (for HMT333/337)



- 1 Nut (to be tightened to the body)
- 2 Seal
- 3 Body and O-ring

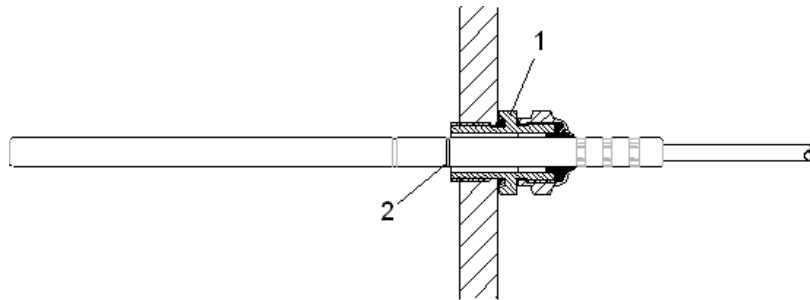
### Cable installation with cable gland AGRO (Vaisala order code: HMP247CG)



- 1 AGRO 1160.20.145 (T= -40...+100 °C)  
Not available from Vaisala
- 2 In pressurized places, use a locking ring  
(example: 11x 1 DIN471).

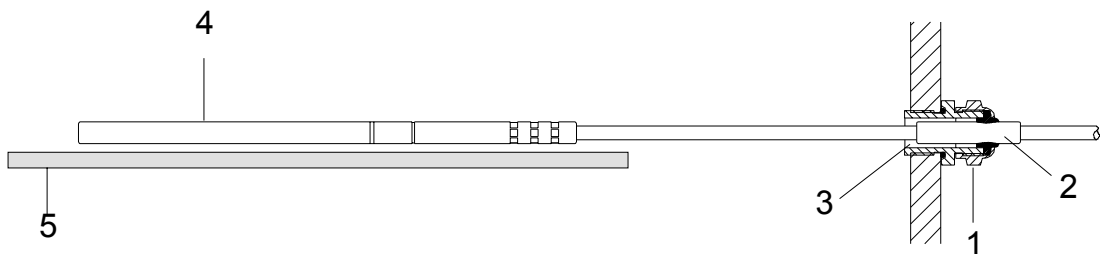
### Probe head installation with cable gland (not available from Vaisala)

## T- probe installations (HMT337)



### Vapour tight installation (not available from Vaisala)

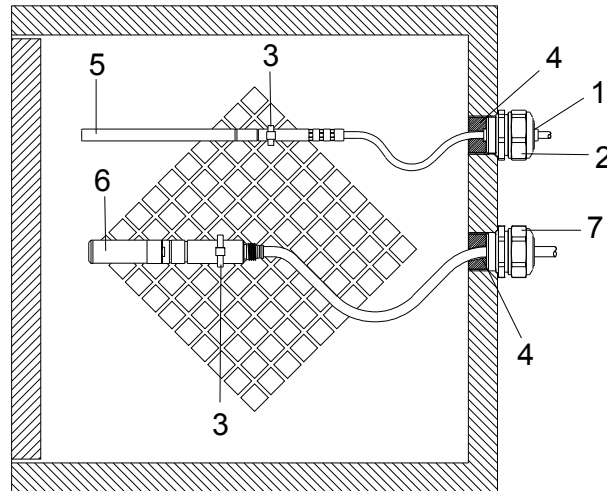
- 1 Cable gland. For example AGRO 1100.12.91.065 (T= -25...+200 °C)
- 2 In pressurized processes, use a locking ring (example: 6x 0.7 DIN471)



### Wall mounting installation (not available from Vaisala)

- 1 Cable gland. For example AGRO 1100.12.91.065
- 2 Compacted PTFE sleeve
- 3 Silicon glue between the PTFE sleeve and the cable
- 4 Temperature probe
- 5 Recommended support to keep the probe in horizontal position

## Example of the climate chamber installation



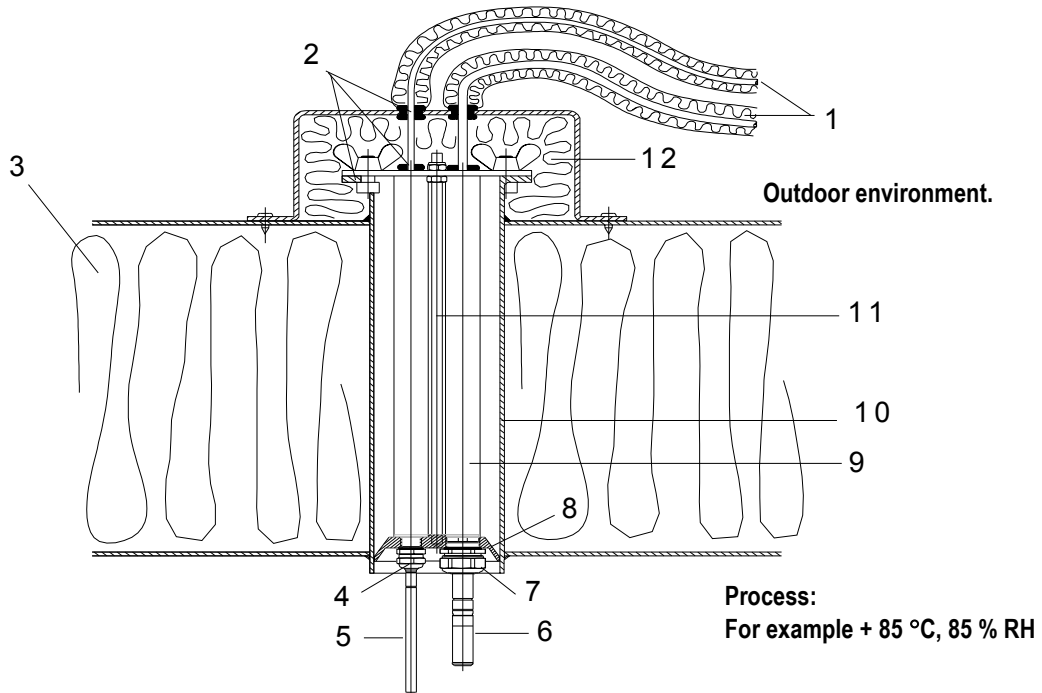
### Climate chamber installation (not available from Vaisala)

- 1 PTFE sleeve
- 2 Cable gland, for example: AGRO 1100.12.91.065
- 3 Stainless steel cable tie or similar fastener
- 4 To be sealed (silicone)
- 5 Temperature probe
- 6 Relative humidity probe
- 7 HMP247CG, Cable gland AGRO

#### NOTE

Let the cables hang loosely to prevent condensed water running to the sensor head.

## Example of the installation through a roof



- 1 Insulated probe cables
- 2 Sealings
- 3 Roof
- 4 Cable gland for temperature probe (for example: AGRO 1100.12.91.065)
- 5 Temperature probe
- 6 Relative humidity probe
- 7 Cable gland for relative humidity probe (for example: AGRO 1160.20.145)
- 8 Plastic adapter to protect probes from condensation water coming from the pipe. Diameter slightly smaller than tube diameter.
- 9 Plastic tube for probe heads (2 pcs)
- 10 Stainless steel tube coming through the roof.
- 11 Two thread bars holding the plastic adapter.
- 12 Insulated pipe ending.

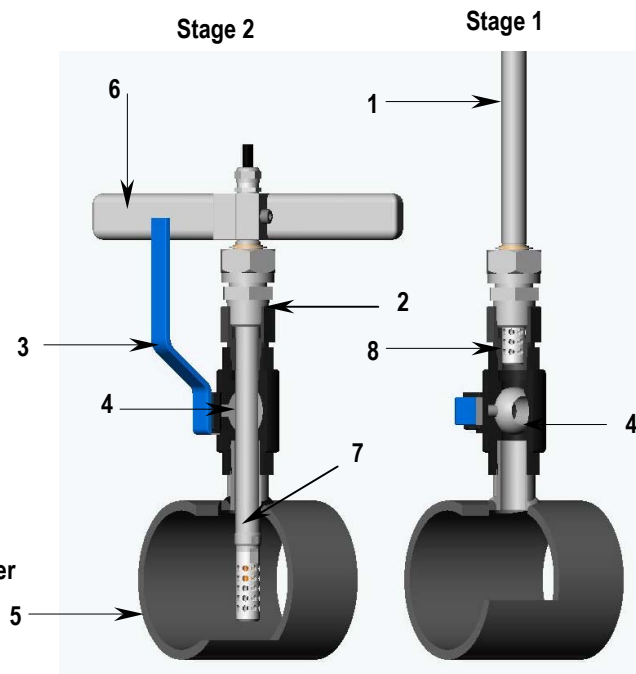
## Ball valve installation kit (for HMT338)

The ball valve installation is preferred when connecting the probe to a pressurized process or pipeline. Use the ball valve set or a 1/2" ball valve assembly with a ball hole of  $\text{Ø}14$  mm or more. If you install the sensor head ( $\text{Ø} 12$  mm) in a process pipe, please note that the nominal size of the pipe must be at least 1 inch (2.54 cm). Use the manual press handle to press the sensor head into the pressurized ( $< 10$  bar) process or pipeline.

1. Shut down the process if the process pressure is more than 10 bars. If the pressure is lower there is no need to shut down the process.
2. Make the installation according to the figure below. Install the sensor head transversely against the direction of the process flow.
3. Make sure that the temperature at the measurement point is equal to that of the process, otherwise the moisture reading may be incorrect.

Vaisala order code: DMP248BVS

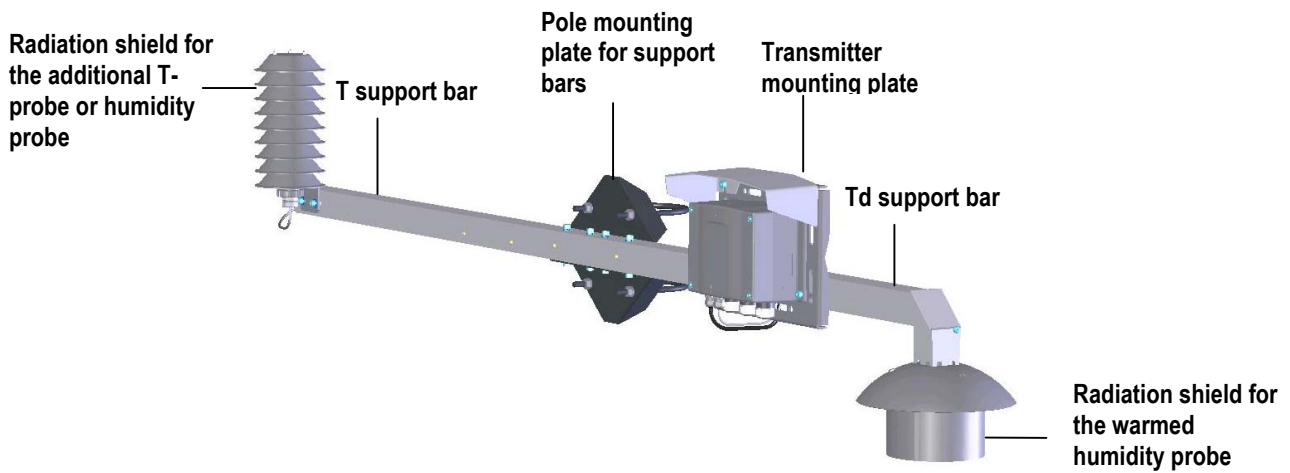
1. probe
2. Tighten clasp nut first manually; probe is then sliding easily. Finally tighten with a fork spanner about  $60^\circ$ , to have a stable installation. Note: do not overtighten this screw!
3. handle of the ball valve
4. ball of the ball valve
5. process chamber / pipeline
6. manual press handle
7. the groove on the sensor head indicates the upper adjustment limit
8. filter





## Meteorological Installation kit (for HMT337)

The Vaisala meteorological Installation Kit HMT330MIK enables the HMT337 to be installed outdoors to obtain reliable measurements for meteorological purposes. For more information, see HMT330MIK brochure and order form.



**Meteorological Installation Kit for outdoor installation (Vaisala order code: HMT330MIK).**