

Hand-held Humidity and Temperature Meter HM70

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 potential 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.

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 malfunction 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 of 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's Hand-held HM70

HM70 consists of two main units: MI70 indicator and HMP75/HMP76/HMP77 probe. HM70 Hand-held humidity meter incorporates Vaisala's advanced HUMICAP[®] technology which enables reliable and high performance humidity measurement.

Vaisala HM70 is delivered with a factory calibration certificate.

Display parameters

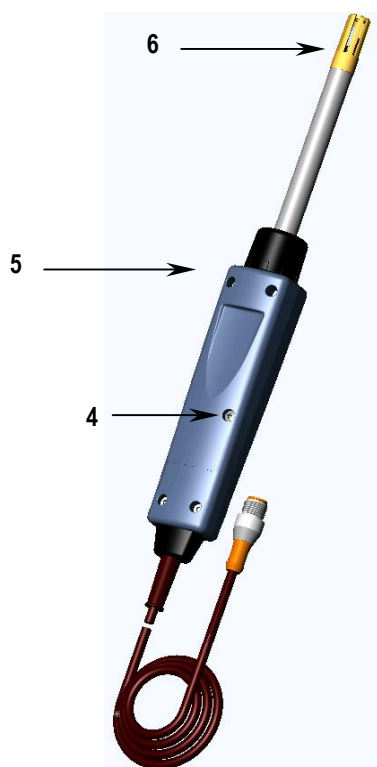
- **RH** relative humidity (% RH)
- **T** temperature (°C/°F)
- **T_{d/f}** : dewpoint/frostpoint¹⁾ temperature (°C/°F)
- **T_d** : dewpoint temperature²⁾ (°C/°F)
- **a** : absolute humidity (g/m³/ gr/ft³)
- **x** : mixing ratio (g/kg / gr/lb)
- **T_w**: wetbulb temperature (°C/°F)
- **H₂O**: humid air volume/ dry air volume (ppm)
- **pw**: water vapour pressure (hPa/ lb/in²)
- **pws**: saturation water vapour pressure(hPa/ lb/in²)
- **h** : enthalpy (kJ/kg / Btu/lb)
- **a_w** : water activity

¹⁾ T_{d/f} shows dewpoint temperature above the freezing point (0°C/32 °F) and frostpoint temperature T_f(dewpoint over ice) below the freezing point.

²⁾ T_d shows dewpoint over water throughout the entire measurement range.

MI70 INDICATOR

- 1 MI70 indicator
- 2 Recharger connector
- 3 Connector ports for probes and cables
- 4 Calibration button under the screw
- 5 Probe HMP75/76/77
- 6 Probe filter



HMP75 PROBE

Basic probe for relative humidity and temperature measurement



HMP76 PROBE

Rugged probe with a long stainless steel shaft. Preheat and chemical purge options available (HMP76B).



HMP77 PROBE

Cable probe for industrial processes up to 180 °C. Preheat and chemical purge options available (HMP77B).

CHAPTER 3

PREPARATIONS BEFORE USE

Installing and recharging of batteries

1. If you are using alkaline batteries, unscrew the back plate of the indicator and insert the alkalines. If HM70 is ordered with rechargeable battery pack, it is already in place as shipped from the factory.
2. Recharge the battery pack as follows: Plug in recharger connector to the base of the indicator and connect the recharger to wall socket. A battery symbol in corner of display starts to roll.
 - It is not recommended to use HM70 during the first recharging. Later on HM70 can be used while recharging.
 - Duration of recharging depends on the charge level of the battery pack being 4 hours typical. The recommended first recharging time is 6 hours.
3. The battery pack is full when the battery symbol stops rolling.
4. Disconnect the recharger.

Turning on the device

1. Connect the probe to the either of the base connectors of the indicator.
2. Press  button.
3. Select the language by using   buttons. Confirm by pressing  **SELECT**. You can select the language later as well, see page 18.

4. To change the date, select **Date** and press $\ominus$ **SET**. Change the date by using any of the $\triangle$ ∇ $\triangleright$ $\triangleleft$ buttons. To confirm the date, press $\ominus$ **OK**. The default date presentation format is: **year-month-date**. If you want to change the format, see page 20.
5. To change the time, select **Time** and press $\ominus$ **SET**. Change the time by using arrow buttons. To confirm the time, press $\ominus$ **OK**. The default time presentation format is 24-hour clock. If you want to use 12-hour clock, select **12-hour clock**, press $\ominus$ **ON**.
6. Press $\ominus$ **EXIT**. To check and change the pressure setting, select **YES**. Otherwise select **NO**, basic display appears.

CHAPTER 4

TAKING MEASUREMENTS

See Chapter 3 *Preparations before use* if you start the HM70 first time, otherwise follow instructions below.

1. Connect the probe to MI70-indicator.
2. Press  **POWER ON/OFF** button.
3. If you have a chemical purge option in your probe (HMP76B, HMP77B), remember to carry out chemical purge regularly, see page 27.
4. In case there is a risk for condensation, use the optional preheat (HMP76B/HMP77B) when installing the probe, see page 28.
5. Install the probe to the measuring position. If measuring in pressurized processes, see the instructions on page 15.
6. Before measurements, ensure that the air pressure setting of HM70 is correct (see page 15).
7. The basic display opens, let the reading stabilize.

CAUTION

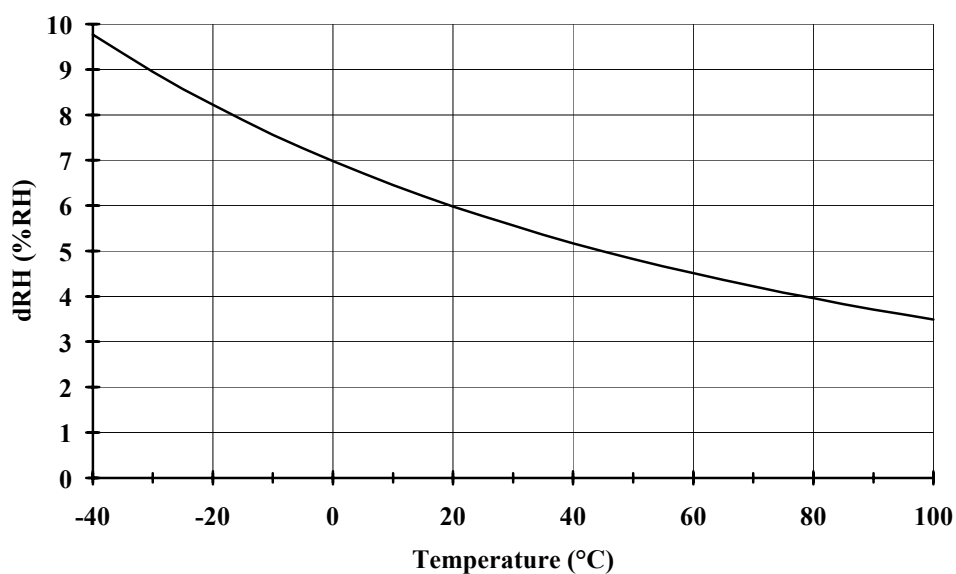
If you need to disconnect the probe from the indicator, first press  **POWER ON/OFF** button to turn the indicator OFF. This ensures that all settings and data are saved properly.

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 ± 1 °C between the environment and the probe causes an error of ± 6 %RH. When the humidity is 90 %RH, the corresponding error is ± 5.4 %RH.

A temperature difference of a few degrees can also cause water to condense on the sensor surface. HUMICAP[®] sensor starts to function normally as soon as the water has evaporated. If the condensed water is contaminated, the life span of the probe may shorten and calibration may change. See also information about sensor preheat, page 28



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

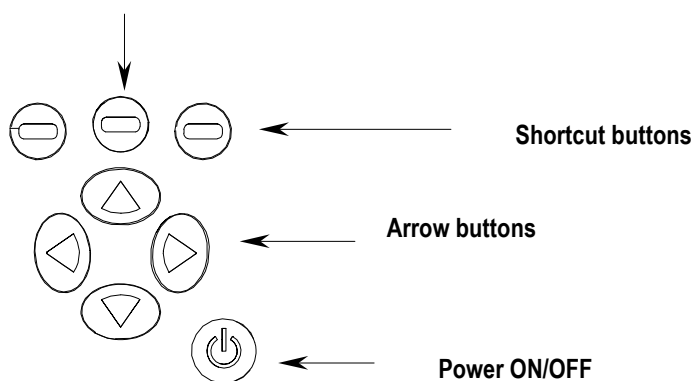
CHAPTER 5

BUTTONS, DISPLAYS AND MENUS

Buttons and navigation

To open a menu view

1. Press an arrow button
2. Press this shortcut button



Press down the **POWER ON/OFF** button until the indicator turns on/off.

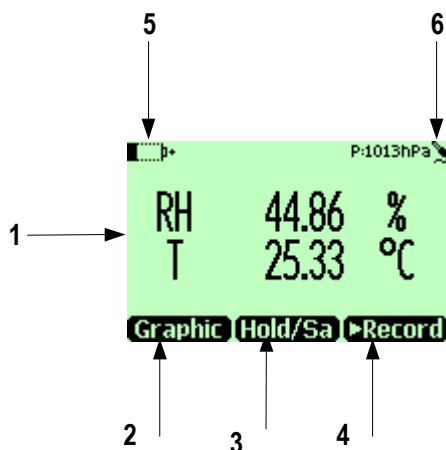


Press the **SHORTCUT** buttons to activate the function shown above the button.



Press any of the **ARROW** buttons to open the **MENUS**. In the **MENUS** you can navigate with **ARROW** buttons.

Basic display



1. Selected quantities. Up to three of the quantities can be selected at a time.

- **RH** relative humidity (% RH)
- **T** temperature (°C/°F)
- **T_{d/f}** : dewpoint/frostpoint¹⁾ temperature (°C/°F)
- **T_d** : dewpoint temperature²⁾ (°C/°F)
- **a** : absolute humidity (g/m³ / gr/ft³)
- **x** : mixing ratio (g/kg / gr/lb)
- **T_w**: wetbulb temperature (°C/°F)
- **H₂O**: humid air volume/ dry air volume (ppm)
- **pw**: water vapour pressure (hPa/ lb/in²)
- **pws**: saturation water vapour pressure(hPa/ lb/in²)
- **h** : enthalpy (kJ/kg / Btu/lb)
- **a_w** : water activity

2. Shortcut button **Graphic**¹ changes display into curve mode

3. Shortcut button **Hold/Sa**¹ freezes display and you may save the reading into the memory.

4. Shortcut button **▶Record**¹ takes you to the **Recording/Viewing** menu.

5. State of battery.

6. Pressure setting.

¹**Graphic**, **Hold/Sa** and **Record** -functions above the shortcut buttons are set in the factory. You can change them to refer other functions (see page 19).

Graphical display

Graphical display shows you the measurements in a form of curve. From the curve you can examine the data trend and history of the last minutes. Graphical display shows firstly the curve of the uppermost quantity shown in a basic display.

1. In basic display, press $\ominus$ **Graphic** or (alternatively open the **MENU**, select **►Recording/Viewing**.
2. Graphical display opens. More information on page 17 **Graphic history**.
3. Press $\ominus$ **BACK** to return to the basic display.

Menus

In the menus you can change settings and select the functions.

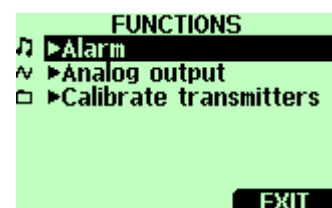
1. Open the main menu by pressing any of the $\triangle$ ∇ $\rightarrow$ $\leftarrow$ buttons.
2. Press $\ominus$ **OPEN** within 5 seconds. The basic display returns if you do not open the **MENU** shortly. If this happens, begin with the item 1 again.
3. Move in the menus by using $\triangle$ ∇ buttons.
4. Select the item with $\rightarrow$ button.
5. Press $\leftarrow$ to return to the earlier level.
6. **EXIT** returns back to normal operation.



Main menu



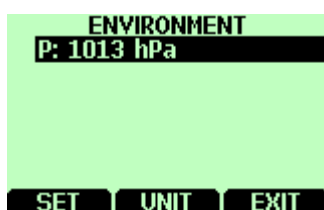
Display menu



Functions menu



Recording/Viewing menu



Environment menu



Settings menu

CHAPTER 6

SETTINGS

Pressure setting

In pressurized environments, the actual process pressure value shall be set to HM70. The pressure can be given in the following units:

hPa: Absolute pressure given in the unit of hPa.

barg: Gauge pressure given in the unit of bar. Indicates the pressure difference between normal atmospheric pressure and the actual process pressure.

bara: Absolute process pressure given in the unit of bar.

psia: Absolute pressure given in the unit of psi.

Follow the instructions below:



1. Open the **MENU**; press **OPEN**
2. Select **ENVIRONMENT** with and press .
3. Press **UNIT** to change the pressure unit. Default unit is hPa.
4. Press **SET** to set the ambient pressure value.
5. Set the pressure value by using buttons. Press **+/-** to change the sign of the pressure value. Press **OK** to save the value.
6. Press **EXIT** to return to the basic display.

Display settings



Quantities and units

All the quantities and units are shown in page 6.

1. Open the **MENU**; press $\triangleright \ominus$ **OPEN**.
2. Select **►Display**, press $\triangleright$.
3. Select **►Quantities and units**, press $\triangleright$.
4. To select a quantity, move on the quantity you want by using the arrow buttons, press $\ominus$ **SELECT**.
5. To change the unit, move on the quantity you want by using the arrow buttons, then press $\ominus$ **UNIT**.
6. To hide a quantity, move on the quantity you want to hide by using the arrow buttons, then press $\ominus$ **HIDE**.
7. Press $\ominus$ **EXIT** to return to the basic display.
8. If asked, press $\ominus$ **YES**, if you want to check environment settings, otherwise press $\ominus$ **NO**.

Rounding

You can select one or two decimal display by using the **Rounding** function. The default setting is rounding off (= two decimal display).

1. Open the **MENU**; press $\triangleright \ominus$ **OPEN**
2. Select the **►Display**, press $\triangleright$
3. Select **Rounding**.
4. Press $\ominus$ **ON** to have rounding on (one decimal display). Press $\ominus$ **OFF** to deactivate rounding (two decimal display).
5. Press $\ominus$ **EXIT** to return to the basic display.

Hold/Save display

Hold/Save function enables you to freeze a certain display reading. This reading can be saved into the memory.

1. Open **MENU**: press   **OPEN**.
2. Select **►Display**, press .
3. Select **Hold/Save display**.
4. Press  **HOLD** to freeze the display. The frozen measurement data is displayed.
5. Press  **SAVE** to save the reading and  **CANCEL** to return to the basic display.
6. You can save several readings with **HOLD-SAVE** function. The data points are identified on the basis of the saving date and time. All the individual readings (data points) are stored in a same file marked with . The file remains in the indicator memory even if the indicator is switched OFF.
7. To view the saved readings, press  **►Record**, select **►View recorded data**, press .
8. Select the file marked with , press . Now you can see the saved data readings. Press  **TIMES** to see the recording timestamps.
9. Press  **EXIT** to return to the basic display.

Graphic history

Graphic history shows the data curve of the last hour. To see longer graphs, use the data recording function to save the data and then view it as a graph.

1. Open the **MENU**: press   **OPEN**.
2. Select **►Display**, press .
3. Select **Graphic history**, press  **SHOW** to have a graphical history display.
4. To get the statistical info on the graph area (minimum, maximum and mean values), press  **INFO**.

5. To get the curve of the other selected quantities, press $\ominus$ **NEXT**. To get the curves of the all quantities, press $\ominus$ **NEXT** until text **ALL** is shown instead of **NEXT**. Then press $\ominus$ **ALL**.
6. To zoom in the curve, press the arrow button $\triangle$. To zoom out, press the button ∇ . To move the curve in horizontal directions, press the buttons $\triangleleft$ $\triangleright$.
7. Press $\ominus$ **BACK** and **EXIT** to return to the basic display.

User interface



Selecting language

You can select any of the following languages as an user interface language: English, German, French, Finnish, Spanish or Swedish.

1. Open the **MENU**: press $\triangleright$ $\ominus$ **OPEN**.
2. Select **▶Settings**, press $\triangleright$.
3. Select **▶User interface**, press $\triangleright$.
4. Select **Language**, press $\ominus$ **SET**.
5. Select the language you want, press $\ominus$ **SELECT**.
6. Press $\ominus$ **EXIT** to return to the basic display.

If you accidentally select a wrong language, first go back to the basic display by pressing rightmost $\ominus$ key as many times as required, then go to the language selection menu by pressing: $\triangleright$, middle $\ominus$ key $\triangle$, $\triangleright$, $\triangleright$, middle $\ominus$ key.

Automatic power OFF

As shipped from factory, HM70 has a default setting which turns the power off automatically after 15 minutes of inactivity. This is to conserve the battery. In case you want to change the inactivity time setting to 60 minutes or turn off the automatic power off function, follow the instructions.

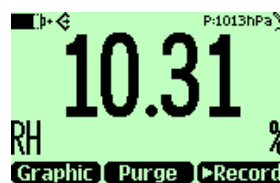
1. Open the **MENU**: press **OPEN**.
2. Select **►Settings**, press .
3. Select **►User interface**, press .
4. Select **Auto power off**, press **SET**.
5. Select the choice you want, press **SELECT**.
6. Press **EXIT** to return to the basic display.

Changing the shortcut keys

As a default, the three shortcut keys refer to the functions **Graphic**, **Hold/Save** and **►Record**. If needed, a shortcut for the functions can be changed to correspond to your needs.

1. Open the **MENU**: press **OPEN**.
2. Select **►Settings**, press .
3. Select **►User Interface**, press .
4. Select **Program shortcut keys**, press **START**.
5. Press the shortcut key you want to change, e.g. **Hold/Save**.
6. If you want to replace **Hold/Save** with **Chemical purge**-function (as an example), select **Chemical Purge** by using arrow buttons (**►Functions**) **Chemical Purge**, press **SELECT**. Answer **YES** to confirm your selection, otherwise answer **NO** and continue from item 4.
7. Press **EXIT** to return to the basic display.

Hold/Save -shortcut key replaced
by Chemical purge -shortcut key



Button click and backlight on button press

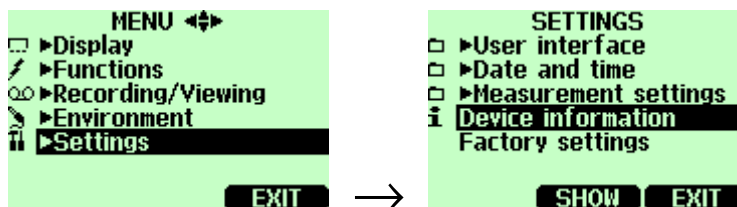
1. Open the **MENU**: press   **OPEN**.
2. Select **►Settings**, press .
3. Select **User interface**, press .
4. To turn OFF or ON sound effect while pressing the buttons, select **Key Click** and press  **ON/OFF**.
5. To turn OFF and ON backlight while pressing the buttons, select **Backlight on key press**  **ON/OFF**.
6. Press  **EXIT** to return to the basic display.

Setting date and time

To have correct date and time in recorded data files, set the date and time according to the following instructions.

1. Open the **MENU**: press   **OPEN**.
2. Select **►Setting**, press .
3. Select **►Date and time**, press .
4. To change the date, select **Date** and press  **SET**. Change the date by using arrow buttons. To confirm the date, press  **OK**. The default date presentation format is *year-month-date*, e.g. 2002-06-05. If you want to change the format, select **Date format: Y-M-D**, press **SET** , select either **D.M.Y** or **M/D/Y**, press **SELECT**.
5. To change the time, select **Time** and press  **SET**. Change the time by using arrow buttons. To confirm the time, press  **OK**. The default time presentation format is 24-hour clock. If you want to change the format, select **12-hour clock**, press  **ON/OFF**.
6. Press  **EXIT**.

Device information



The basic information about the indicator and the probe is found as follows:

1. Open the **MENU**: press **OPEN**
2. Select **►Settings**, press .
3. Select **Device information**, press **SHOW**.
4. The first display gives the information on the MI70 indicator. Press **MORE** to get the information on the probe. Press **OK** and **EXIT** to return to the basic display.

MI70 indicator
information



Probe type information



Reverting factory settings

Factory settings can be reverted to clear all changed settings and data memory of the indicator. Reverting factory settings does not effect on probe calibration.

1. Open the **MENU**: press **OPEN**.
2. Select **►Settings**, press .
3. Select **Factory settings**, press **REVERT**. Press **YES** to confirm the reverting.
4. The power turns off automatically. When switching on again, the factory settings are reverted. You shall set the language, date and time again. See Chapter 3.

CHAPTER 7

RECORDING DATA

Recording



You can record measurement data and view the recorded data on the display.

1. Press the shortcut $\ominus \blacktriangleright$ **Record**, (alternatively open the **MENU**, select $\blacktriangleright$ **Recording/Viewing**).
2. Select $\blacktriangleright$ **Record data**, press $\odot$.
3. To change interval, select **Interval**, press $\ominus$ **SET**.
4. Select the measurement interval with arrow buttons. Measurement intervals and the maximum recording times are shown in the table below.

Recording interval	Maximum recording time (memory full)		
	1 quantity	2 quantities	3 quantities
1 s	45 min	22 min	15 min
5 s	3 h	113 min	75 min
15 s	11 h	5 h	3 h
30 s	22 h	11 h	7 h
1 min	45 h	22 h	15 h
5 min	9 days	4 days	3 days
15 min	28 days	14 days	9 days
30 min	56 days	28 days	18 days
1 h	113 days	56 days	37 days
3 h	339 days	169 days	112 days
12 h	1359 days	678 days	451 days

5. Press $\ominus$ **SELECT**.
6. To set the recording duration, select **Duration**, press $\ominus$ **SET**.
7. Select the recording duration (1 min, 5 min, 15 min, 30 min, 1 h, 3 h, 12 h, 24 h, 7 d, 30 d, memory full) with arrow buttons and press $\ominus$ **SELECT**.
8. Start recording: select **Start/Stop recording**, press $\ominus$ **START**. If you chose 'Memory full', you see the maximum recording time on the display. You can also delete files in order to empty the memory. Press $\ominus$ **START** again to accept maximum recording time.
9. You can switch the HM70 off during recording to save battery. Display message tells you that recording continues undisturbed even when power is off. If the indicator is switched off during recording, the progress bar  is shown on the display every 10 seconds (all the time, if charger is connected). This bar shows the amount of recorded data.

CAUTION

Do not disconnect the probe when the data recording is on, even if the indicator is off. This may cause loss of recorded data.

Stopping recording

1. To stop recording press $\ominus$ **►Record**, select **►Record data** and press $\triangleright$, select **Start/Stop recording** and press $\ominus$ **STOP**.
2. Now you can go and see the recorded file by selecting $\ominus$ **SHOW**.
You can save individual measurement data points with **Hold/Save** function described in page 17.

Viewing recorded data

1. Open the **MENU**: press $\triangleright$ $\ominus$ **OPEN**.
2. Select **►Recording/Viewing**, press $\triangleright$.

3. Select **►View recorded data**, press .
4. Select the file you want to view, press . The files are identified according to the starting date and time of recording.
5. Press  **GRAPH** to get the graphical view, press  **TIMES** to get the recording timestamps (press  **VALUES** to go back the recorded values).
6. Press  **EXIT** to return to the basic display.

Checking the memory status

You can check how much there is free space in the memory.

1. Open the **MENU**: press   **OPEN**.
2. Select **►Recording/Viewing**, press .
3. Select **Memory status**, press  **SHOW** to see the amount of memory in use and the estimated free space.
4. To return to the basic display, press  **OK** and  **EXIT**.

Note that the estimate of the free space is calculated for current number of active quantities. If you change the displayed quantities, the estimate is different.

Deleting all recorded files

The data memory can be cleared as follows:

1. Open the **MENU**: press   **OPEN**.
2. Select **►Recording/Viewing**, press .
3. Select **Clear data memory**, press  **CLEAR**. Press  **YES** to confirm deletion of all recorded data files.
4. To return to the basic display, press  **EXIT**.

MI70 Link program to transfer recorded data to PC

The recorded data can be transferred to a PC by using MI70 Link program. MI70 Link program can be ordered from Vaisala, see list of accessories on page 56. You can examine the recorded data easily in Windows[®] environment and transfer it further to a spreadsheet program (such as Microsoft[®] Excel) to be modified.

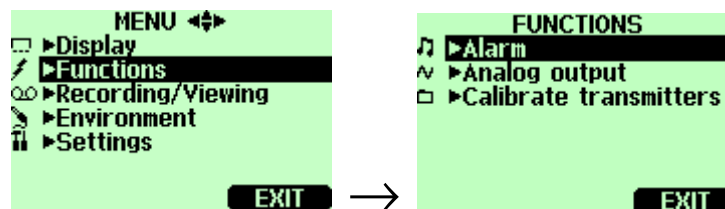
MI70 Link program for real time PC monitoring

You can monitor HM70 readings directly with a PC by using MI70 Link program. MI70 Link program can be ordered from Vaisala, see list of accessories on page 56.

CHAPTER 8

OTHER FUNCTIONS

Setting the alarm levels



HM70 is alarming by beeping and blinking the backlight. The alarm turns on when the measured value is not between the alarm limits (permissible area). Alarm level(s) can be set for only one quantity at a time. Set the alarm levels as follows:

1. Open the **MENU**: press **OPEN**.
2. Select **►Functions**, press .
3. Select **►Alarm**, press .
4. Select **Quantity** and press **SET** to choose a quantity.
5. Select quantity, press **SELECT**. (Only one quantity can be chosen at a time. Only active quantities can be selected. To change the active quantities, go to **MENU**→**►Display**→**►Quantities and units**).
6. Select the first limit, press **SET** (if the alarm function is ON, take it OFF). Set the alarm level by using arrow buttons. Press **+/-** button to choose the sign of the alarm level. Press **OK** to save the setting.
7. Select the second limit, then follow instructions in item 6. The alarm will go off when the upper limit is exceeded or when lower limit is gone below.

If you have only one limit, e.g. if you want to detect if the humidity is rising above 50 % RH, set the upper limit to 50 % RH and the lower limit so low that it never will be reached (for example 0 % RH). Thus, the HM70 will alert when RH rises above 50 % RH.

8. Select **Alarm ON/OFF**, press $\ominus$ **ON** to activate the alarm and return back to the basic display.
9. A note picture sign ♪ appears on the upper left corner.
10. When the alarm level is reached, you can stop alarming by pressing $\ominus$ **OK**. To reactivate the alarm function, answer $\ominus$ **YES**. To stop the alarm function completely, answer $\ominus$ **NO**.

NOTE

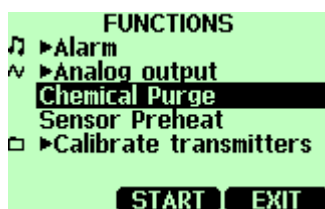
The alarm is not in function when the device is turned off. Remember to turn off the automatic power off, see page 19.

Chemical purge (optional)

Chemical purge is an optional feature for the humidity probes HMP76 and HMP77. 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 sensitivity. In chemical purge the interfering chemical is evaporated by heating the humidity sensor to a temperature of +160 °C for 2 minutes.

For the most applications it will be sufficient to perform chemical purge once a week. For applications where HM70 is subject to high concentrations of chemicals, chemical purge should be performed more frequently, in extreme cases before each measurement.

Turning on the chemical purge



Chemical purge is available only with the probes HMP76B and HMP77B.

1. Open the **MENU**: press $\triangleright$ $\ominus$ **OPEN**.
2. Select **►Functions**, press $\triangleright$.
3. Select **Chemical Purge**, press $\ominus$ **START**.

4. Confirm the starting by pressing **YES**. Chemical purge takes up to 6 minutes. During that time there are no readings on a display. A message display appears once in 15 seconds and it tells you the time required to complete the chemical purge. The chemical purge symbol  is shown on upper left corner.
5. When the chemical purge is done the basic display with readings returns.
6. Stabilization of temperature reading can take a few minutes.

You can make a shortcut to the chemical purge function by setting one shortcut key to refer Chemical Purge function, see page 19.

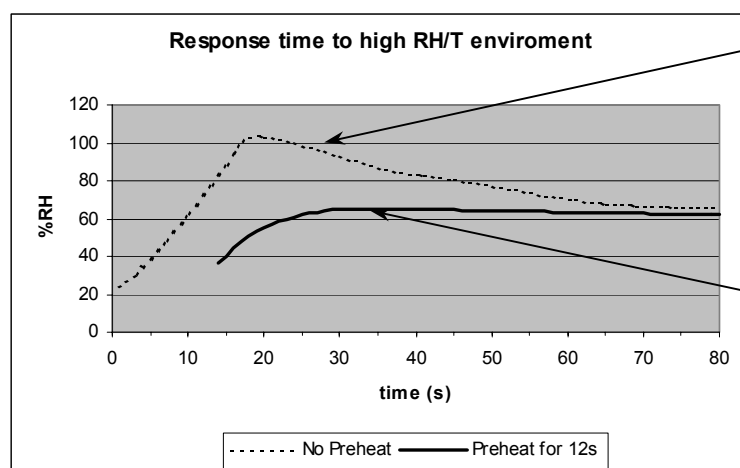
Sensor preheat (optional)

Sensor preheat is an optional feature for the humidity probes HMP76 and HMP77.

In some measurement applications, unwanted dew formation makes humidity measurement difficult or even impossible. High humidity combined with rapidly changing outdoor temperature can condense the water vapour in the air onto the sensor head. Until this dew evaporates or dries, it is impossible to obtain a true reading. In sensor preheat the sensor is heated to a temperature level of approximately +100 °C for up to 4 minutes. This is to prevent possible condensate from the sensor.

When setting the probe from outdoor conditions into warm and humid conditions there can be large temperature difference between the probe head and external environment. In such a conditions turn on the sensor preheat immediately before installing the probe to prevent condensation forming on the probe.

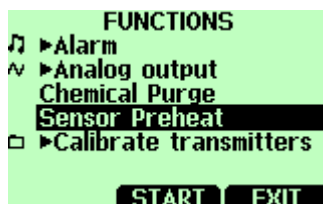
Figure below shows how response time can be dramatically shortened and water condensation on the sensor avoided when using a sensor preheat.



This curve shows how relative humidity increases as a consequence of condensation on the sensor. The correct response is achieved not until the sensor is dried.

When using preheat, response time is shortened.

Turning on/off the sensor preheat



Sensor preheat is available only with the probes HMP76B and HMP77B.

1. Open the **MENU**: press **OPEN**.
2. Select **►Functions**, press .
3. Select **Sensor Preheat**, press **START**. Confirm the starting by pressing **YES**.
4. Insert the probe to the process.
5. When the sensor preheat is done, a display message tells that operation is completed and the basic display with readings returns.

Sensor preheat is taking about 4 minutes at maximum. During that time there are no readings on a display. A message display appears once in 15 seconds and it tells you the time required to complete the sensor preheat. Sensor preheat symbol Preheat is shown on upper left corner. Stabilization of the temperature can take a few minutes.

You can make a shortcut to the sensor preheat function by setting one shortcut key to refer sensor preheat function, see page 19.

CHAPTER 9

CALIBRATION AND ADJUSTMENT OF TRANSMITTERS

HM70 in checking and adjusting

The following transmitters can be calibrated by using HM70: HMDW 60/70, HMW 61/71, HMD/W 20/30, HMP130, HMP230/240 series, HMT320 series, HMM210 series and DMW19 transmitter.

- in the field; check and adjust a fixed transmitter's reading against HM70's calibrated reference probe
- one or two point calibrations can be done to industrial transmitters and modules (HMP230/240 series, HMT320 series, HMM210 modules) by using a MI70 indicator and Vaisala's humidity calibrator HMK15.

Calibration cables

For calibration and adjustment connect HM70 to fixed transmitter by using one of the following connection cables:



- HMA6070-cable for HMD/W 60/70 and HMW 61/71 transmitters
- HMA2030-cable for HMD/W 20/30 and HMP130 transmitters
- 27159ZZ-cable for HMP230/240 series transmitters and HMM210 series modules.
- 211339-cable for HMT320 series transmitters
- 211917ZZ-cable for DMW19 transmitter.



Calibration and adjustment of HMD/W 60/70, HMD/W 20/30 and HMP130 series transmitters

For checking and adjusting HM60/70 series and HM20/30/130 series transmitters you need a MI70 and a HMP70 calibrated reference probe and a connection cable. Only relative humidity channel of these transmitters can be checked.

1. Connect the end of the HMA6070 (connection cable for HM60/70-series) or HMA2030 (connection cable for HM20/30-series) cable to either of the HM70's connector port located on the bottom of the indicator, see figure on page 30.
2. Connect the other end of the HMA6070 or HM20/30/130-cable to the **RH TEST** connector (or **TEST** connector) of the transmitter's motherboard.
3. Turn on MI70 indicator.
4. **This concerns ONLY calibration of HM60/70-series:** If a transmitter has voltage output, select the RH input scale setting 0...20 mA. If a transmitter has current output, set the indicator's default setting to correspond the transmitter's signal (0...20 mA/4...20 mA) as follows:
 - Open the **MENU**: press **OPEN**.
 - Select **►Settings**, press
 - Select **►Measurement settings**, press
 - Select **RH scale: 4...20 mA or 0...20 mA**, press **ON**
 - To return to the basic display, press **EXIT**
5. Now the reading of the transmitter is shown on the first or middle row of the display, depending on the connector port to which the calibration cable is connected. Value of the port I is shown on the upper row of the display and the value of the port II on the lower row of the display. Difference of the readings is shown in the lowest row.



6. Ensure that the probes are located in the same conditions. You can have an optional probe holder for the HMP76 probe to attach the probe next to the probe of HMD60/70 or HMD20/30 (order code for the probe holder: HM36915).
7. Wait until the readings have stabilized (can take up to 20 minutes). If the difference between the humidity readings is less than 2 % RH, there is no immediate need for adjustment.
8. Adjust the transmitters reading to correspond the HM70 reference probe by turning the small screw on the modules on the transmitter's mother board marked with **RH offset/ RH gain**. If the RH reading is < 65 %, turn the **RH offset** screw and if the RH reading is >65 %, turn the **RH gain** screw. Turning to the clockwise direction increases the reading, turning to opposite direction decreases the reading.

Do not breathe towards the transmitter probes when adjusting the reading.
9. When the transmitter reading is equal with the HM70 reference probe's reading, adjustment is done.
10. Switch off HM70 and detach the cable from the transmitter and the HM70 indicator.

Calibration and adjustment of HMP230/240 transmitters and HMM210 modules

You are able to check and adjust only humidity channel, temperature channel can only be checked. Calibrate your transmitter/module against a calibrated reference probe of HM70 or against a calibrator's reference humidity by using MI70 indicator in communication. Follow the first 12 steps and continue according to the chosen calibration method.

1. In case you have a transmitter provided with heated probe, carry out these preparations before calibration.

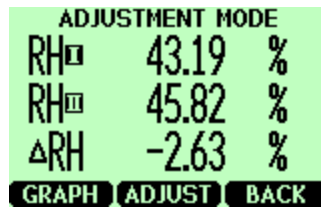
HMP240 transmitter with a probe heating: The heating function is turned off automatically when the calibration cable is connected to the transmitter. Before starting the calibration wait until the sensor head is stabilized to the ambient conditions.

HMM210 module with chemical purge function (re-gain) or with probe heating option: before calibration turn off the probe heating by using HEAT OFF command, after calibration reactivate the heating function by using HEAT ON command. Before calibration,

activate the re-gain function by resetting the device and let stabilize to the ambient conditions.

2. Connect the 27159ZZ-calibration cable to the
 - **X5** connector of the HMP230/HMP240-series transmitter (**X5** connector = 6-pin connector on the left side of the motherboard).
 - **calibration connector** of the HMM210 module.
3. Connect the other end of the calibration cable to either of the HM70's connector port located on the bottom of the indicator, see figure on page 30.
4. Turn on the HM70.
5. Open the **MENU**: press   **OPEN**.
6. Select **►Functions**, press .
7. Select **►Calibrate transmitters**, press .
8. Select **1.Baud rate** and **2.Serial format**. Press  **SET** to change the serial settings. Serial settings of the transmitter/module and HM70 shall be the same. HMP230/240 default serial settings: 4800, 7, even 1. HMM210 module's default settings: 1200, 8, None. Note! HMM213 shall be in RUN/STOP mode.
9. Select **3.Start calibration**, press  **START**. If the serial settings of HM70 are not compatible with the settings of HMP230, or the cable connection is not working check that the serial settings of HMP230 and the settings of HM70 are the same. Check the cable connection. Then retry connection in step 6.
10. After connection has been established start the adjustment by pressing  **OK**.
11. Select the quantity to check RH/T (view only), press  **SELECT**.
12. If RH selected, check the environment settings of HM70 probe, if needed. Press  **YES** or  **NO**.

The first row shows the reading of the probe/transmitter connected to the port I, the second row shows the reading of the probe/transmitter connected to the port II. The third row Δ RH/T is the difference between the readings of the ports. By pressing  **BACK** you return to the selection display.



Example of the RH display

Field checking and adjustment of humidity by using a calibrated reference probe

Follow the steps from 1 to 12 and continue as follows:

13. Ensure that the probes are located in the same conditions.
14. Wait until the readings have stabilized. If the difference between the humidity readings is less than 2 % RH, there is no immediate need for adjustment.
15. Adjust the transmitter reading to correspond a reading of the reference probe by pressing $\ominus$ ADJUST.
16. Select **To same as RH_{II}**. Press $\ominus$ SELECT.
17. Confirm by pressing $\ominus$ YES
18. Press $\ominus$ BACK, $\ominus$ EXIT, $\ominus$ EXIT to return to the basic display.

1-point humidity adjustment by using a calibrator

You can use Vaisala humidity calibrator HMK15 to achieve the reference humidities. MI70 indicator is working as a communicator in the calibration procedure.

Follow the steps from 1 to 12 and continue as follows:

13. Insert the transmitter probe to the reference humidity
14. Press $\ominus$ ADJUST
15. Select **1-point adjustment**. press $\ominus$ SELECT

16. Wait until the reading is stabilized (takes about 30 minutes). You can follow the stabilization from the $\ominus$ **GRAPH** display.
17. Press $\ominus$ **READY** when the value is stabilized in the reference humidity.
18. Enter the correct humidity value by using the arrow buttons. Press $\ominus$ **OK**.
19. Confirm by pressing $\ominus$ **YES**
20. Press $\ominus$ **BACK**, $\ominus$ **EXIT**, $\ominus$ **EXIT** to return to the basic display.

2-point adjustment by using a calibrator

You can use Vaisala humidity calibrator HMK15 in calibration and adjustment. Note that the difference between the two reference humidities shall be at least 50 %. MI70 indicator is working as a communicator in the calibration procedure.

Follow the steps from 1 to 12 and continue as follows:

13. Insert the transmitter probe to the first reference humidity.
14. Press $\ominus$ **ADJUST**
15. Select **2-point adjustment**. press $\ominus$ **SELECT**
16. Wait until the reading is stabilized (takes about 30 minutes). You can follow the stabilization from the $\ominus$ **GRAPH** display.
17. Press $\ominus$ **READY** when the value is stabilized in the first reference humidity.
18. Enter the first reference humidity value by using the arrow buttons. Press $\ominus$ **OK**.
19. Insert the transmitter probe to the second reference humidity.
20. Wait until the reading is stabilized (takes about 30 minutes or more). You can follow the stabilization from the $\ominus$ **GRAPH** display.
21. Press $\ominus$ **READY** when the value is stabilized in the second reference humidity.

22. Enter the second reference humidity value by using the arrow buttons. Press $\ominus$ OK.
23. Confirm by pressing $\ominus$ YES
24. Press $\ominus$ BACK, $\ominus$ EXIT, $\ominus$ EXIT to return to the basic display.

Calibration and adjustment of HMT320 series transmitters

You can check and adjust both humidity and temperature channels. If you adjust both channels, make the temperature adjustment first. You can calibrate your transmitter against a calibrated reference probe of HM70 or against a calibrator's reference humidity by using MI70 indicator in communication. Follow the first 9 steps and continue according to the chosen calibration method.

1. Connect the 211339-calibration cable to the **RS232** connector in the mother board of the HMP300-series transmitter
2. Connect the other end of the calibration cable to either of the HM70's connector port located on the bottom of the indicator, see figure on page 30.
3. Turn on both devices (the HMT300-series transmitter can be on all the time).
4. The reading of the transmitter is shown on the first or middle row of the display, depending on the connector port to which the calibration cable is connected. Value of the port I is shown on the upper row of the display and the value of the port II on the lower row of the display. Difference of the readings is shown in the lowest row.
5. Ensure that the probes are located in the same conditions.
6. Take off the **CAL.DIS** jumper from the motherboard of the HMT300 transmitter. Now MI70 is moved into **Adjustment mode**.
7. Press $\ominus$ OK to start adjustment.
8. Select RH or T, press $\ominus$ SELECT.
9. Check the environment settings, if needed. Otherwise press $\ominus$ NO.

Field checking and adjustment by using a calibrated reference probe

Follow the steps from 1 to 9 and continue as follows:

10. Check that the probes are located in equal conditions and wait until the readings are stabilized (can take 30 minutes or more). If you are near the probes, do not breathe in the direction of them.
11. Press $\ominus$ **ADJUST** to continue adjusting.
12. Press **To same as RH_{int.}**, press $\ominus$ **SELECT**. (MI70 recognizes always the port to which the HMP70-series probe is connected).
13. Confirm by pressing $\ominus$ **YES**.
14. Adjustment is done. Press $\ominus$ **BACK** and $\ominus$ **EXIT** to return to the basic display.
15. Replace the **CAL.DIS** jumper.
16. Switch off the MI70 and detach the calibration cable from MI70 and from the transmitter.

1-point adjustment by using a calibrator

When adjusting a transmitter only in one reference condition, please take care that the reference condition represents well the measuring environment.

If you use humidity calibrator HMK15, please use the adapter fitting (13.5 mm) on the measurement hole if you calibrate probes of HMT324, HMT325, HMT327 and HMT328.

Follow the steps from 1 to 9 and continue as follows:

10. Remove the filter from the transmitter's probe and insert the probe head into the reference condition.
11. Press $\ominus$ **ADJUST** to continue adjusting.
12. Select **1-point adjustment**, press $\ominus$ **SELECT**.
13. Press $\ominus$ **READY** when the reading is stabilized in the reference condition (takes about 30 minutes or more). You can follow the stabilization from the $\ominus$ **GRAPH** display.

14. Enter correct reference value by using the arrow buttons. Press $\ominus$ **OK**.
15. Confirm by pressing $\ominus$ **YES**.
16. Adjustment is done. Press $\ominus$ **BACK** and $\ominus$ **EXIT** to return to the basic display.
17. Replace the jumper to **CAL.RH** pins.
18. Detach the calibration cable from MI70 and from the transmitter.

2-point adjustment by using a calibrator

If you use humidity calibrator HMK15, please use the adapter fitting (13.5 mm) on the measurement hole if you calibrate probes of HMT324, HMT325, HMT327 and HMT328.

Follow the steps from 1 to 9 and continue as follows:

17. Remove the filter from the transmitter's probe and insert the probe head into lower reference humidity.
18. Press $\ominus$ **ADJUST** to continue adjusting.
19. Select **2-point adjustment**, press $\ominus$ **SELECT**.
20. Press $\ominus$ **READY** when the reading is stabilized in the first reference condition (takes about 30 minutes or more).
21. Enter correct reference value by using the arrow buttons. Press $\ominus$ **OK**.
22. Remove the probe and insert the probe head into higher reference humidity. You can follow the stabilization from the $\ominus$ **GRAPH** display (takes about 30 minutes or more).
23. Press $\ominus$ **READY** when the reading is stabilized in the second reference condition.
24. Give the higher reference humidity value by using the arrow buttons. Press $\ominus$ **OK**.
25. Confirm the adjustment, press $\ominus$ **YES** (by pressing $\ominus$ **NO** you return to adjustment mode display and no changes are made). If the difference between two references is less than 50 %, adjustment can not be done.
26. Adjustment is done. Press $\ominus$ **BACK** to exit the adjustment mode press $\ominus$ **EXIT** to return to the basic display.

27. Replace the jumper to **CAL.RH** pins.
28. Switch off MI70 and detach the calibration cable from the MI70 and from the transmitter.

Field checking of DMW19 transmitter

You are able to use MI70 as a display and check your DMW19 transmitter against a calibrated reference probe of HM70.

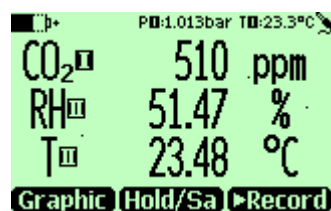
1. Turn on the DMW19.
2. Remove the lid of the DMW19 transmitter.
3. Connect the 211917ZZ- cable to the 6-pins test connector (cable connector position: Vaisala-logo on top) of the DMW19.
4. Connect the other end of the calibration cable to either of the HM70's connector port located on the bottom of the indicator, see figure on page 30.
5. Turn on the HM70.
6. The reading of the DMW19 transmitter is shown on the first or middle row of the HM70 display, depending on the connector port to which the calibration cable is connected. Value of the port I is shown on the upper row of the display and the value of the port II on the lower row of the display. Difference of the readings is shown in the lowest row.
7. Turn off the HM70.
8. Remove the connection cable and replace the lid of the DMW19.

CHAPTER 10

MEASURING OTHER PARAMETERS SIMULTANEOUSLY

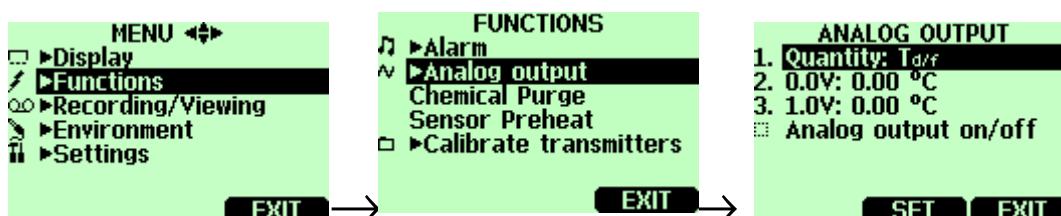
The MI70 indicator is a generic indicator that can be used with Vaisala interchangeable dewpoint (DMP) and carbon dioxide (GMP) probes. Two different probes can be used simultaneously.

1. Turn off the device.
2. Connect the DMP70/GMP70 probe to the other connector port in the bottom of the indicator.
3. Turn on the device.
4. Check that the pressure settings of the probes (port I and II) are the same, if you are taking measurements from the same condition.
5. The display shows now the reading of the port I probe in the upper row(s) and the reading of the port II in the lower row(s).



Example of the display when carbon dioxide and humidity probe connected simultaneously to the MI70 indicator.

CHAPTER 11

ANALOG OUTPUT CONNECTION**Selecting and scaling the analog output**

To get analog measurement data, you need the analog output signal cable, see list of accessories on page 56. One voltage signal channel 0...1.0V can be scaled for the selected quantity.

1. Connect the analog output signal cable connector to the indicator base connector. Connect the screw terminal block as follows:

Brown wire:	common wire (-)
Yellow-green wire:	signal (+)

2. Open the MENU: press OPEN.
3. Select ►Functions, press .
4. Select ►Analog output, press .
5. Select Quantity and press SET to choose a quantity.
6. Select Quantity, press SELECT. (One quantity can be chosen at a time. Only active quantities can be selected. To change the quantities, go to MENU→►Display→►Quantities and units).

7. Select **0.0 V** to set the value for the 0.0V output signal, press $\ominus$ **SET**. (If the analog output is ON, take it OFF) Set the low value by using arrow buttons. Press $\ominus$ **+/-** button to choose the sign of the value. Press $\ominus$ **OK** to make the setting.
8. Select **1.0V** to set the value for the 1.0V output signal, press $\ominus$ **SET**. Set the high value by using arrow buttons. Press $\ominus$ **+/-** button to choose the sign of the value. Press $\ominus$ **OK** to make the setting.
9. Select **Analog output on/off**, press $\ominus$ **ON** to activate the analog output and return back to the basic display.
10. A wave picture sign  appears on the upper left corner of the basic display.
11. To deactivate the analog output function, go to **MENU**→**Functions**→**Analog output**→**Analog output on/off** and press $\ominus$ **OFF**.

CHAPTER 12

CALIBRATION AND ADJUSTMENT OF HM70 SERIES PROBES

General about calibrations

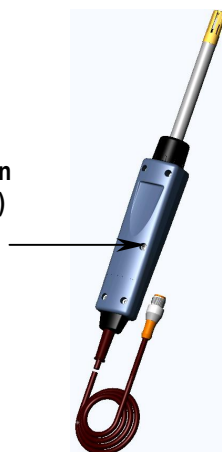
The HM70 is fully calibrated as shipped from factory. Adjustment shall be done if there is a reason to believe that device is not within the accuracy specifications. However, if HM70 is used as a reference instrument in humidity measurements, the humidity recalibration is recommended every year.

It is recommended to send the device to Vaisala Service Centres for calibration, see contact information on page 50. Alternatively user can calibrate and adjust HM70 by following the instructions given in this chapter.

When using Vaisala humidity calibrator HMK15, use the adapter fitting (13.5 mm hole) with the probes HMP76 and HMP77. Probe HMP75 does not need the adapter fitting. If chemical purge option is available, it should always be performed before calibration, see page 27.

Before starting the adjustment mode, take out the screw covering the calibration button.

Calibration button
(under the screw)



Relative humidity adjustment

LiCl-NaCl automatic adjustment

LiCl-NaCl automatic adjustment is a two-point adjustment in reference humidities of 11.3 % (LiCl) and 75 % (NaCl). You don't have to feed the reference values, the HM70 displays the accurate value based on the measured temperature and the Greenspan table stored into the memory of the HM70. Make the adjustment as instructed in the following section *2-point relative humidity adjustment* (select **LiCl--NaCl autom.** on item 8 and follow the display instructions).

2-point adjustment

Low humidity references 0 % (Nitrogen)/ 11.3 % (LiCl) and higher humidity references 75 % (NaCl)/ 97 % (K₂SO₄) are recommended for two-point adjustment. Ensure that the difference between the humidity references is more than 50 %.

1. When adjusting both relative humidity and temperature, please make the temperature adjustment first.
2. Check that the HM70 is switched on.
3. If chemical purge option is available perform it before adjustment, see page 27.
4. Take out the screw from the probe handle to expose the calibration button. Press the button with a small screwdriver. When pressing the button, indicator turns to adjusting mode.
5. Press $\ominus$ **OK** to start the adjustment mode.
6. Select **RH**, press $\ominus$ **SELECT**.

7. Press $\ominus$ **YES** to check the environmental settings, to continue directly adjustment press $\ominus$ **NO**.
8. Now the adjustment mode is on, press $\ominus$ **ADJUST** to select the adjustment method.
9. Select **2-point adjustment**, press $\ominus$ **SELECT**. Press $\ominus$ **OK** to continue.
10. Set the probe to a lower reference relative humidity. If using HMK15 calibrator, use the adapter fitting (13.5 mm hole) with probes HMP76 and HMP77.
You can follow the stabilization from the $\ominus$ **GRAPH** display. Press $\ominus$ **READY** when the reading is stabilized.
11. Give the lower reference humidity value by using the arrow buttons. Press $\ominus$ **OK**.
12. Set the probe to the higher reference humidity. Press $\ominus$ **READY** when the reading is stabilized. You can follow the stabilization from the $\ominus$ **GRAPH** display.
13. Give the higher reference relative humidity value by using the arrow buttons. Press $\ominus$ **OK**.
14. Confirm the adjustment, press $\ominus$ **YES** (by pressing $\ominus$ **NO** you return to adjustment mode display and no changes are made). If the difference between two references is less than 50 %, adjustment can not be done.
15. Adjustment has been carried out. Press $\ominus$ **BACK** to exit the adjustment mode press $\ominus$ **EXIT** to return to the basic display.
16. Replace the screw onto calibration button.

You can attach a sticker on the calibration button screw to seal the calibration.

1-point adjustment

Usually it is recommended to make an adjustment in two reference humidities. If adjustment is done by using one reference humidity (1-point adjustment), select the reference humidity so that it represents the measuring environment. Make the adjustment in one point as instructed in the previous section *Two-point relative humidity adjustment* (select **1-point adjustment** and follow the display instructions).

Temperature adjustment

Temperature adjustment in one or two points can be done if there is reason to believe that the adjustment is changed. If adjustment is done only in one point, reference condition shall represent the measuring environment.

1. Take out the screw covering the calibration button (in the probe handle).
2. Press the calibration button. For pressing, use tool with thin and sharp point, such as small screwdriver. When pressing the button, indicator turns to adjusting mode.
3. Select **T**, press $\ominus$ **SELECT**.
4. Now the adjustment mode is on, press $\ominus$ **ADJUST** to select the adjustment method: **1-point adjustment** or **2-point adjustment**.

1-point adjustment

Follow the steps from 1 to 4 and continue as follows:

5. Select **1-point adjustment**, press $\ominus$ **SELECT**.
6. Set the probe to a reference temperature. You can follow the stabilization from the $\ominus$ **GRAPH** display. Press $\ominus$ **READY** when the reading is stabilized in the reference.
7. Give the reference temperature value by using the arrow buttons. Press $\ominus$ **OK**.
8. Confirm the adjustment, press $\ominus$ **YES**. (By pressing $\ominus$ **NO** you return to adjustment mode display and no changes are made).
9. Calibration is carried out. Press $\ominus$ **BACK** to exit the adjustment mode and $\ominus$ **EXIT** to return to the basic display.

2-point adjustment

Follow the steps from 1 to 4 and continue as follows:

5. Select **2-point adjustment**. Press $\ominus$ **SELECT** to continue.
6. Set the probe to a lower reference temperature. You can follow the stabilization from the $\ominus$ **GRAPH** display.
7. Press $\ominus$ **READY** when the reading is stabilized. Give the lower reference temperature by using the arrow buttons. Press $\ominus$ **OK**.
8. Set the probe to the higher reference temperature. You can follow the stabilization from the $\ominus$ **GRAPH** display. Press $\ominus$ **READY** when the reading is stabilized.
9. Give the higher reference temperature by using the arrow buttons. Press $\ominus$ **OK**.
10. Confirm the adjustment, press $\ominus$ **YES**. (By pressing $\ominus$ **NO** you return to adjustment mode display and no changes are made). If the difference between two references is less than 30 °C, adjustment can not be done.
11. Calibration is carried out. Press $\ominus$ **BACK** to exit the adjustment mode and $\ominus$ **EXIT** to return to the basic display.

Last adjustment date

To see the last adjustment date, select **Last adjustment date**. You can check this date also from the **Device information**, see page 21.

CHAPTER 13

ERROR MESSAGES

If HM70 displays an error message, check first that the sensor is connected properly and let the probe dry if there is condensed water in the probe.

In case of constant error, please contact Vaisala Service (see page 50).

Error Messages

- Voltage required for **Purge** unavailable
- Voltage required for **Preheat** unavailable
- Eeprom read/write error
- ADC malfunction
- Operating voltage out of range
- Analog voltage out of range
- Temperature/Humidity sensor open/short circuit
- Temperature sensor current leak
- Temperature/humidity measurement malfunction
- Temperature value out of range
- Relative humidity value out of range
- Sensor not found
- Amplifier chain malfunction

CHAPTER 14

MAINTENANCE

Changing the filter

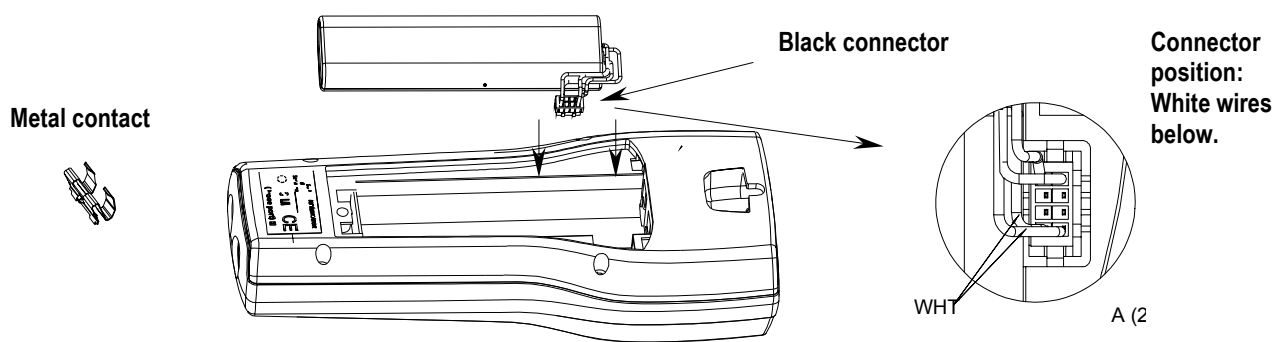
1. Screw out the dirty filter from the probe head (Figure 1 on page 7). Don't try to clean the filter. Avoid touching the sensor.
2. Screw on the new filter.

Changing the battery pack

A new rechargeable battery pack can be ordered from Vaisala. Change the battery pack as follows:

1. Open the back plate of the indicator by opening the screw of the back plate.
2. Remove the old battery pack. Detach the black connector by pulling up carefully from the wires.
3. Connect the black connector of the new battery pack, ensure that the position of the connector is as indicated in figure (red and black wires are on the upper edge of the connector). Do not push the connector with conducting material
4. Place the battery pack, close the back plate and tighten the screw.
5. Charge the battery pack before use, see page 8.

In case you are installing battery pack and you have a device with alkaline batteries, remove the metal contact before installing the battery pack.



Installing the battery

Vaisala Service Centres

NORTH AMERICAN SERVICE CENTER

Vaisala Inc., 100 Commerce Way, Woburn, MA 01801-1068, USA.

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

Email: 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

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

www.vaisala.com

CHAPTER 15

TECHNICAL SPECIFICATIONS

Probes HMP75, HMP76 and HMP77

Measured variables

Relative humidity

Measurement range 0... 100 % RH

Maximum achievable accuracy (over temperature range -40...180 °C)

against high quality certified standards ± 1 % RH (0... 90 %)
 ± 2 % RH (90...100 % RH)

against salt solutions ± 2 % RH (0... 90 %)
(ASTM E104-85) ± 3 % RH (90...100 % RH)

The accuracy values include non-linearity, hysteresis and repeatability.

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

HMP75	8 s (plastic grid)
HMP76	40 s (sintered bronze filter)
HMP77	20 s (plastic grid with SS netting)

Long term stability (typical) better than 1 % RH/year

Temperature

Measurement ranges

HMP75	-20...+60 °C
HMP76	-50...+120 °C (to+180 °C temporarily)
HMP77	-70...+180 °C
Accuracy at +20°C	± 0.2 °C

Calculated variables

Typical ranges

Dewpoint temperature	-40...+100 °C, -40...+212 °F
Mixing ratio	0...600 g/kg dry air
Absolute humidity	0...600 g/m ³
Wet bulb temperature	0...+100 °C, 32...+212 °F
Enthalpy	0...160 kJ/g
Water vapor pressure	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/m³

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

General

Humidity sensor	HUMICAP®180
Temperature sensor	Pt100 IEC751 1/3 class B
Operating temperature range for electronics	-40...+60 °C, -40...+140 °F
Standard sensor protection	
HMP75	Plastic grid
HMP76	Sintered bronze filter
HMP77	Grid with SS netting
Housing classification	IP65 (NEMA 4)

Housing material	ABS/ PC blend
Probe material	Stainless steel (AIS316L)
Probe cable length (between indicator and the probe handle)	1.9 m
Probe head cable length of HMP77 (from handle to the root of the probe head)	5.0 m
Probe head diameter	12 mm (0.47 inch)
Weight	
HMP75	250 g
HMP76	350 g
HMP77	500 g

MI70 Indicator

Indicator general

Operating temperature range	-10...+ 40 °C
Operating humidity	0...100 %RH , non-condensing
Menu languages	English, Finnish, French, German, Spanish, Swedish
Display	LCD with backlight Graphic trend display of any quantity Character height up to 16mm
Probe inputs	1 or 2
Power supply	Rechargeable NIMH battery pack with AC-POWER or 4 x AA size alkalines, type IEC LR6
Analog output	0...1 VDC
Output resolution	0.6 mV
Accuracy	0.2 % full scale
Temperature dependence	0.002 %/°C full scale
Minimum load resistor	10 kohm to ground
Data interface	RS232C (EIA-232)
Data logging capacity	900...2700 real time data points,
Logging interval	1 s to 12 h
Logging duration	1 min ... memory full
Alarm	Audible alarm function
Housing classification	IP54
Weight	400 g
Housing material	ABS/PC-blend

Battery pack

Operation times in	
continuous use	48 h typical at +20 °C
data logging use	up to 30 days
Power consumption during charge	10W max
Charging time	4 hour

General about the HM70 Hand held humidity and temperature meter

Storage temperature	-40 ...+70 °C
Storage humidity range	0...100 %Non Condensing

Electromagnetic compatibility

Complies with the following standard:

EN 61326-1:1997 +Am 1:1998, Electrical equipment for measurement, control and laboratory use - EMC requirements: Portable.

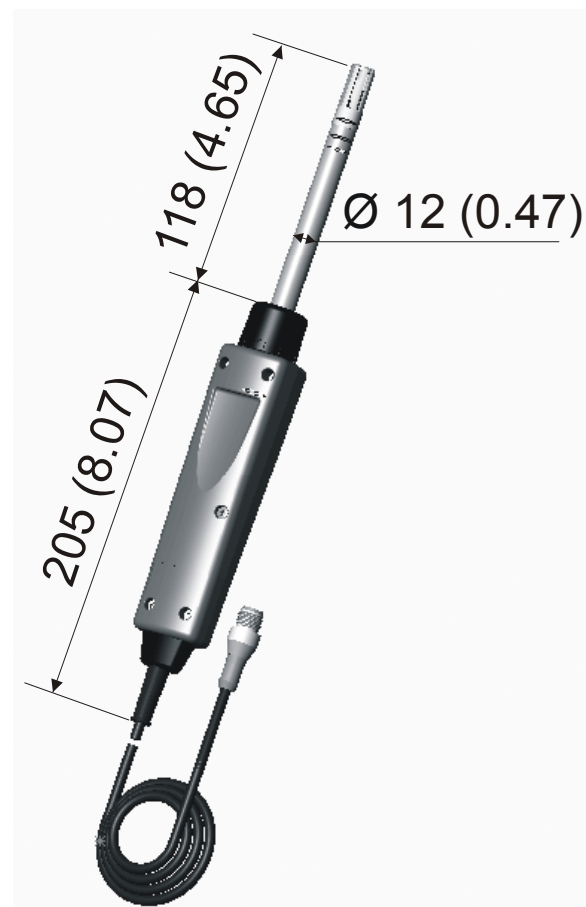
Accessories

Description	Order code
AC-Adapters	
Euro AC-adapter	MI70EUROADAPTER
UK AC-adapter	MI70UKADAPTER
US AC-adapter	MI70USADAPTER
AUS AC-adapter	MI70AUSADAPTER
Connection cables	
Analog output signal cable	27168ZZ
Connection cable for HM60/70/140 series	HMA6070
Connection cable for HM20/30/130 series	HMA2030
Connection cable for HMDM200 series	27159ZZ
Connection cable for HM300-series	211339
Connection cables for DMW19	211917ZZ
Carrying cases	
Carrying case for one probe (HMP75 or HMP77)	MI70CASE
Carrying case for two probes (HMP75 and HMP76 or GMP-probe)	MI70CASE2
Probe accessories	
HMP75 Plastic PC grid filter Membrane filter Sintered bronze filter	6221 10159HM DRW212987SP
HMP76/77 Plastic PPS grid filter Sintered stainless steel filter Sintered bronze filter (HMP76 standard) PPS grid with SS netting (HMP77 standard) Probe holder (only for HMP76)	DRW010276SP HM47280SP DRW212987SP DRW010281SP HM36915
Others	
Measurement indicator	MI70
MI70 Link- software interface kit	MI70LINK

Dimensions in mm (inches)



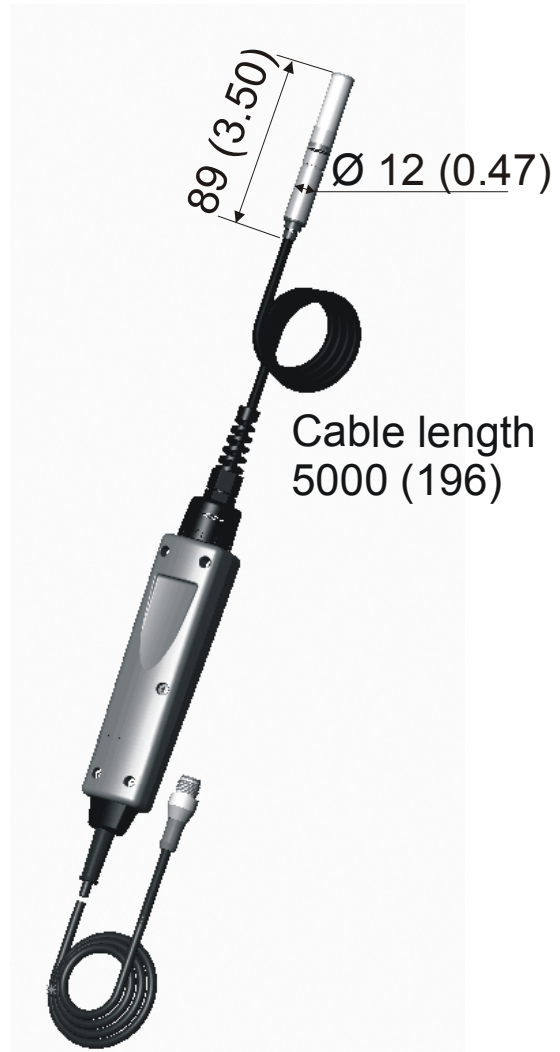
MI70 Indicator



HMP75 probe



HMP76 probe



HMP77 probe