User Guide

Vaisala DRYCAP® Handheld Dew Point Meter
DM70

VAISALA

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1. **About this document**

1.1 Version information

This document provides detailed instructions for using and maintaining Vaisala DRYCAP® Handheld Dew Point Meter DM70.

Document code	Date	Description

M010091EN-G	October 2020	This document.
		
		• The following sections added:
		  • MI70 battery status information (page 13)
		  • MI70 status icons (page 22)
		  • Setting calibration reminder (page 39)
		• The following sections updated:
		  • Sections introducing the MI70 indicator
		  • Measuring multiple parameters simultaneously (page 17)
		  • Connecting to pressurized processes using DSC74 sampling cell (page 48)
		  • Calibration (page 61)
		  • DM70 and DMP74 specifications (page 73)
		  • Spare parts and accessories (page 80)
		• References to DMP248 removed
		• Document format and layout update, quality improvements, and content reorganization.

M010091EN-F	September 2007	Previous version.

1.2 Related manuals

Document code	Name
M210704EN	*Vaisala DRYCAP® Dewpoint and Temperature Transmitter Series DMT340 User's Guide*

1.3 Documentation conventions

WARNING! Warning alerts you to a serious hazard. If you do not read and follow instructions 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 highlights important information on using the product.

Tip gives information for using the product more efficiently.

Lists tools needed to perform the task.

Indicates that you need to take some notes during the task.

1.4 Trademarks

Vaisala® and DRYCAP® are registered trademarks of Vaisala Oyj.

Windows® is either a registered trademark or trademark of Microsoft Corporation in the United States and other countries.

2. Product overview

2.1 Introduction to DM70

Vaisala DRYCAP® Handheld Dew Point Meter DM70 measures dew point temperature accurately in a measurement range from −60 °C up to +60 °C (−76 ... +140 °F) depending on the probe model. DM70 incorporates the advanced DRYCAP® technology, which enables reliable and high-performance dew point measurement. DM70 measures the following parameters:

Table 3   Display parameters

Parameter	Abbreviation	Metric unit	Non-metric unit
Relative humidity	RH	%RH	%RH
Temperature	T	°C	°F
Dew point/frost point temperature [1]	$T_{d/f}$	°C	°F
Dew point temperature [2]	T_d	°C	°F
Dew point in the atmospheric pressure	T_d	°C atm	°F atm
Dew point/frost point in the atmospheric pressure	$T_{d/f}$	°C atm	°F atm
Absolute humidity	a	g/m^3	gr/ft^3
Mixing ratio	x	g/kg	gr/lb
Water concentration / Water mass fraction	H_2O	ppm_v / ppm_w	ppm_v / ppm_w

[1] $T_{d/f}$ shows dew point temperature above the freezing point (0 °C/32 °F) and frost point temperature T_f (dew point over ice) below the freezing point. This is considered as the industry standard.

[2] T_d shows dew point over water throughout the entire measurement range.

DM70 consists of 2 main units: the MI70 indicator and DMP74 probe, models A, B, or C. DM70 can be used with the optional sampling cell to measure process dew point. With DSS70A, DM70 forms a part of a complete portable sampling system for measuring process dew point.

More information

‣ DM70 and DMP74 specifications (page 73)
‣ Parts description (page 11)
‣ Sampling cells (page 44)

2.2 Basic features and options

DM70 has the following basic features and options:

- Numerical and graphical multilingual displays
- Data recording possibility
- Three probe models, temperature measurement range −60 ... +60 °C (−76 ... +140 °F), depending on the model
- A tool for checking the reading of fixed transmitters DMT340, DMT242, and DMT143
- A possibility for an analog output (voltage signal 0 ... 1 V)
- Multiprobe operation; any combination of 2 Vaisala DM70, GM70, HM70, and MM70 series probes can be used, for example, for simultaneous dew point and relative humidity measurements
- The optional, ready-to-use MI70 Link Microsoft Windows® software, which allows an easy way to handle measurement data using a serial line or a USB instrument cable
- The optional sampling system DSS70A

More information

‣ DSS70A sampling system (page 51)
‣ Transferring recorded data to PC with MI70 Link (page 35)

2.3 Parts description
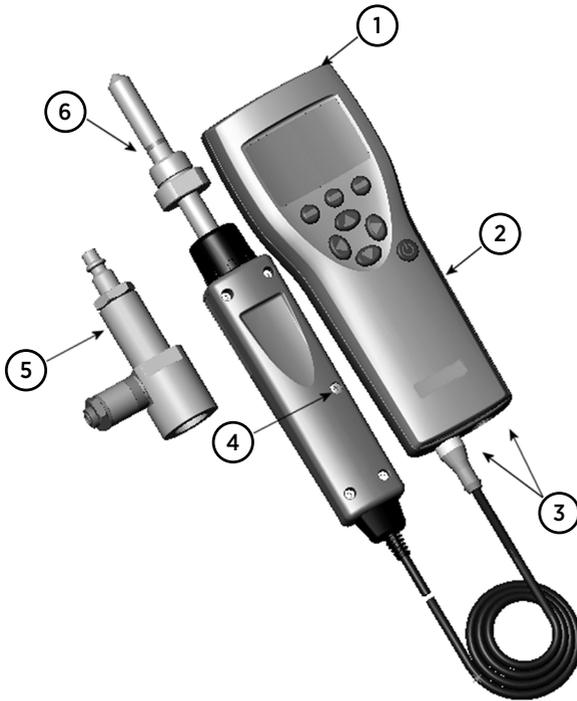
Figure 1   DM70 parts

1   Charger socket
2   MI70 indicator
3   Connector ports for probes and cables
4   Calibration button
5   Sampling cell DSC74 (optional)
6   DMP74 probe

3. MI70 indicator

3.1 MI70 indicator parts
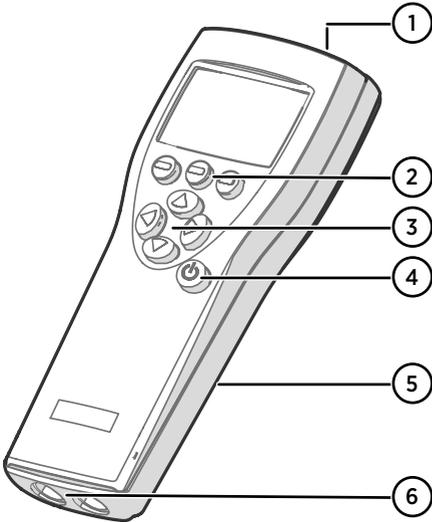
Figure 2   MI70 indicator parts

1   Charger socket
2   Function key shortcut buttons ⊖. The functions change according to what you are doing with the indicator.
3   Arrow buttons:

    ▲   Move up in a menu
    ▼   Move down in a menu
    ▶   Enter a sub-menu
    ◀   Return to previous menu level

4   Power On/Off button
5   Battery compartment at the back of the indicator
6   2 ports (labeled I and II) for connecting probes and instruments.

To open menus, press an arrow button and then press the shortcut buttons. To activate a function shown above the shortcut button, press the shortcut button. To navigate in the menus, press the arrow buttons.

3.2 Installing and recharging MI70 batteries

If you are using **alkaline** batteries, unscrew the back plate of the indicator and insert the batteries. Do not attempt to recharge standard alkaline batteries.

If you ordered MI70 with a **rechargeable** battery, it is already in place as shipped from the factory. The delivered batteries have been pre-charged.

To recharge the battery:

▶   1. Plug in the charger connector to the indicator. The socket is located at the top of the indicator, covered by a rubber seal.

2. Connect the charger to a wall socket. An animated battery icon in the left corner of the display indicates that the battery is charging. The recharge duration (typically 4 ... 5 h) depends on the charge level of the battery.

> **i** A new battery takes approximately 3 charging cycles to reach its maximum battery life.

> **i** Do not store the batteries empty. Empty batteries may not charge after an extended storage period.

3.2.1 MI70 battery status information

The status of the MI70 battery is shown by the battery icon in the upper left corner of the display. Possible statuses are listed in the following table.

Table 4   MI70 battery status indicator

Battery status indicator graphic	Description

■■■▯+ ▮▮▮▯+	Battery status icon. The icon can show the following info:
	
	• 0 ... 8 bars, no animation:
	  • batteries are in use, a charger is not connected
	  • if a charger is connected: non-rechargeable batteries installed
	  • if a charger is connected: waiting for the battery temperature to settle between 0 ... +40 °C (+32 ... +104 °F)
	  • if a charger is connected and the icon remains at 8/8 bars: the battery is full
	• Animated battery status icon: battery is charging (or recovering after emptying out completely). The charging animation is shown also when the indicator is powered off.
	• Battery icon not present: batteries are not installed

[.X.]+	An empty battery icon with an X over it means that the battery cannot be recharged and must be replaced. If the indicator is powered on, a notification about not being able to charge the battery is shown on the MI70 screen. You can order replacement batteries from Vaisala (item code 26755).

> **💡** To keep the rechargeable MI70 battery in good working condition, recharge MI70 monthly if the indicator is not in use.

More information

‣ Spare parts and accessories (page 80)

3.3 MI70 first start-up settings

When you switch on MI70 for the first time, configure the basic settings (time, date, language) as instructed below.

1. Connect the probe to either one of the base connectors in the indicator. To ensure a durable connection, screw the metal ring clockwise until it tightens up. (Respectively, when disconnecting the cable, first screw the metal ring counterclockwise until it loosens and then pull out the plug.)

2. Press the **Power On/Off** button.

3. Press any of the arrow buttons and open the menu by pressing ⊖ **Open**.

4. Select **Settings** using the ⊙ ⊙ buttons and press ⊙.

5. Select **User interface** and press ⊙.

6. Select **Language** and press ⊖ **Set**.

7. Select the language using the ⊙ ⊙ buttons. Confirm the selection by pressing ⊖ **Select**.

8. If you want to set the date at this point, return to the **Settings** menu by pressing ⊙.

> ℹ The language can be selected also later. For instructions, see Selecting language (page 36).

9. To change the date, select **Date** and press ⊖ **Set**. Then change the date using the ⊙ ⊙ buttons. To confirm the selection, press ⊖ **Select**. As a default, the date format is year-month-day. You can select from 2 other alternative formats.

10. To change the time, select **Time** and press ⊖ **Set**. Then change the time by using the arrow buttons. Confirm the selection by pressing ⊖ **OK**. As a default, the time format is based on the 24-hour clock. If you want to use the 12-hour clock, select **12-hour clock** and then press ⊖ **On**.

11. To return to the basic display, press ⊖ **Exit**.

3.4 Changing the rechargeable battery pack

> ⚒ • New rechargeable battery pack
> • Medium-sized flathead screwdriver

In case you are installing a battery pack and you have a device with alkaline batteries, remove the metal contact from the probe port end of the battery compartment before installing the battery pack.

▶ 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 carefully pulling it up from the wires.

3. Connect the black connector of the new battery pack. Make sure the position of the connector is as shown in the following figure (red and black wires are on the upper edge of the connector). Do not push the connector with conducting material.
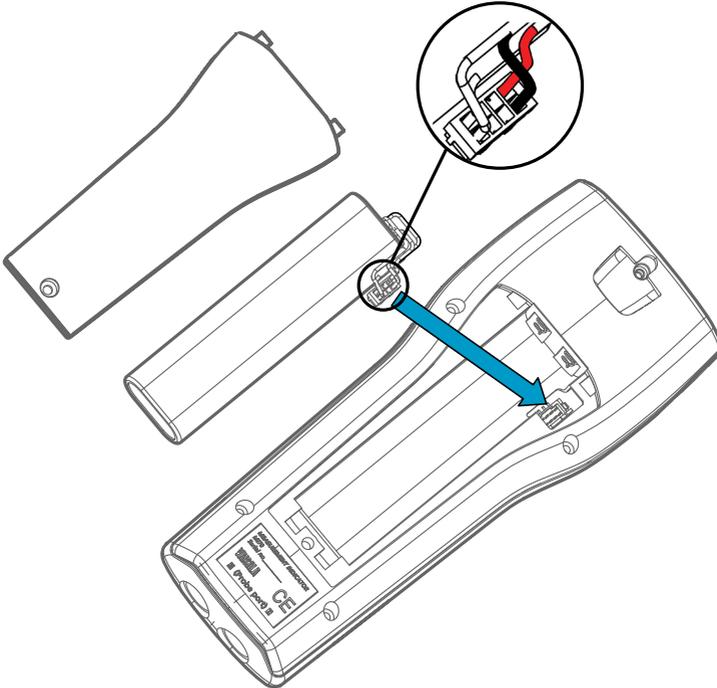
4. Place the battery pack in the compartment.

5. Close the back plate and tighten the screw.

6. Recharge the indicator before use.

4. Dew point measurement

4.1 Measurement in dry environments

The following recommendations should be taken into account when measuring in very dry environments:

- A clean environment is always best for humidity measurements.
- The number of connections should be minimized to avoid leaks.
- The flow rate must be adequate.
- Dead ends must be avoided as they cannot be flushed easily.
- The tube temperature must never lie under the dew point of the sample gas. This may lead to condensation and false results.
- The sample tubing should be of as short length as possible. The surface area should be minimized using the narrowest tubing that the flow conditions allow.
- The surface finish of the pipework is important. Polished or electro-polished steel is recommended for best results.
- Hygroscopic materials should be avoided in the sampling lines. Use stainless steel membranes instead of rubber membranes.
- Impermeable materials should be selected to avoid inward diffusion of moisture through the sampling tubes and enclosures. Such impermeable materials are, for example, high-quality stainless steel and metals. Avoid PVC or nylon tubes.

4.2 Taking dew point measurements

When you start to use DM70 for the first time, see MI70 first start-up settings (page 14). Otherwise follow the instructions below.

1. Connect the probe to the MI70 indicator.

2. Press the **Power On/Off** button.

3. Install the probe to the measuring position. If you are measuring in pressurized processes, see Connecting to pressurized processes using DSC74 sampling cell (page 48). When using other sampling cells than DSC74, make sure that the threads are compatible with the probe threads (G ½″ ISO228/1). Be careful not to damage the sintered filter when installing the probe.

4. Before measuring, make sure that the air pressure settings of DM70 are correct and that autocalibration has taken place (see Automatic autocalibration (page 28)).

5. The basic display opens. Let the reading stabilize.

> ⚠️ **CAUTION!** If you need to disconnect the probe from the indicator, first press the **Power On/Off** button to turn the indicator off. This ensures that all the settings and data are saved properly

> ℹ️ When measuring low dew points, the stabilization times can be long, for example, 1 ... 2 hours. Therefore, turn off the automatic power-off function, turn on the automatic autocalibration, and turn on the automatic sensor purge.
> This allows monitoring the stabilization, the autocalibration ensures an accurate measurement, and the purge ensures the shortest possible response times.

More information

‣ Configuring automatic power off (page 37)
‣ Turning automatic autocalibration on and off (page 28)
‣ Turning automatic sensor purge on and off (page 31)

4.3 Measuring multiple parameters simultaneously

MI70 is a generic indicator that can be used with Vaisala interchangeable dew point (DM70 series), humidity (HM70 series), carbon dioxide (GM70 series), and moisture in oil (MM70 series) probes. Two different types of probes can be connected to MI70 simultaneously.

▶ 1. Switch off the MI70 indicator.

2. Connect the 2 probes to the connector ports (port I and II) on the bottom of the indicator.

3. Switch on MI70.

4. Check that the environment settings of the probes (port I and II) are the same if you are taking measurements from the same condition. In this case, select ⊖ **Yes** when MI70 prompts you to check the environment settings.

5. The reading of the probe in port I is now displayed on the upper row(s) and the reading of the probe in port II on the lower row(s) of the MI70 display.

Figure 3   Display example with carbon dioxide and temperature and humidity probes connected simultaneously

5. User interface

5.1 Basic display
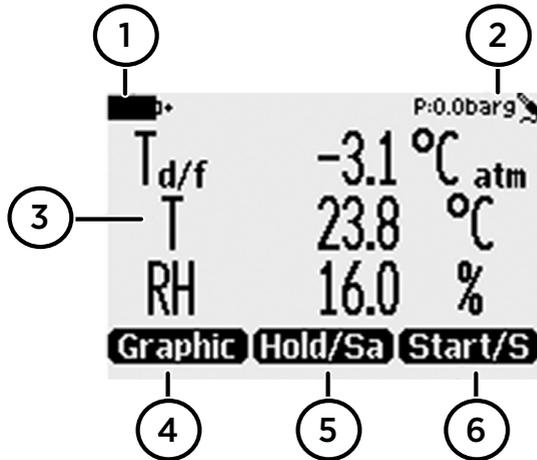
Figure 4   DM70 basic display

1   Battery indicator. Shows the current status (charge) of the battery.
2   Pressure setting.
3   Measured parameter (up to 3 items on display simultaneously). You can change the shown items in **Main menu > Display > Quantities and units**.
4   Function key **Graphic** shows the readings as a curve.
5   Function key **Hold/Save** freezes the display and you can save the reading in the MI70 memory.
6   Function key **Record** is a quick access to the **Recording/Viewing** menu. (This is the default shortcut button. In the figure it has been changed to **Start/S**).

You can change the default function key shortcuts (**Graphic**, **Hold/Save**, **Record**) to other menus or functions in **Main menu > Settings > User interface > Program shortcut keys**.

5.2 Main menu

In the main menu, you can configure the MI70 settings and basic display options, view information about the probe, access recordings and clear the memory, set alarms, start adjustments, and use the analog output option of the MI70 indicator.

To open the main menu and navigate in the menus:

▶   1. Go to the basic display.

2. Press any arrow button, then select ⊖ **Open** (must be pressed within 5 seconds or the indicator returns to the basic display).

3. Move in the menus using the ▲ ▼ buttons.

4. Select an item with the ▶ button.

5. To return to the previous level, press ◀.

6. To return to normal operation, press ⊖ **Exit**.
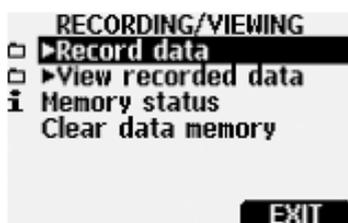
Figure 5   DM70 menus

5.3 MI70 status icons

Icons that inform you about the status of MI70 (for example, battery status and alarm notification) are shown on the upper left corner of the display. Multiple icons can be shown simultaneously.

Table 5   MI70 status icons

Icon	Description
	Battery status icon. The icon can show the following info: • 0 ... 8 bars, no animation: • batteries are in use, a charger is not connected • if a charger is connected: non-rechargeable batteries installed • if a charger is connected: waiting for the battery temperature to settle between 0 ... +40 °C (+32 ... +104 °F) • if a charger is connected and the icon remains at 8/8 bars: the battery is full • Animated battery status icon: battery is charging (or recovering after emptying out completely). The charging animation is shown also when the indicator is powered off. • Battery icon not present: batteries are not installed
	The battery can no longer be charged and must be replaced.
	Recording icon. Shows that the measurements are being recorded. The bar shows for how long the recording will continue (a set time limit or until the memory runs out). The recording icon and bar are shown also when the indicator is powered off.
	Calibration reminder icon. Appears when a calibration reminder has been set to inform that a user-defined interval has passed and calibration is due.
	Analog output icon. Shown when the analog output mode is in use.
	PC connection icon. Shown when the indicator is connected to a PC with a cable.
	Alarm icon. Shown when the measurement has reached a user-defined alarm limit.

More information

5.4 Display menu

5.4.1 Selecting parameters and units

> ℹ️ In the MI70 user interface, measurement parameters are referred to as quantities.
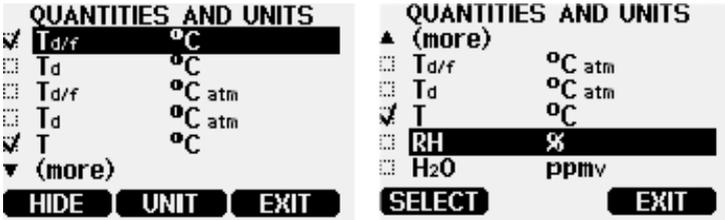
Figure 6   Quantities and units menu

The unit of parameters ($T_{d/f}$, T_d, or T) can be selected between °C or °F. The default is °C.

▶ 1. Open the menu by pressing ▶ ⊖ **Open**.

2. Select **Display** and press ▶.

3. Select **Quantities and units** and then press ▶.

4. To select a parameter, move on the desired parameter using the arrow buttons and then press ⊖ **Select**.

5. To change the unit, move on the desired parameter using the arrow buttons and then press ⊖ **Unit**.

6. To hide a parameter, move on the desired parameter using the arrow buttons and then press ⊖ **Hide**.

7. To return to the basic display, press ⊖ **Exit**.

8. If you want to check the environment settings, press ⊖ **Yes**. Otherwise press ⊖ **No**.

> ℹ️ Units **°C atm** and **°F atm** indicate that the dew point or frost point is converted from process pressure to atmospheric pressure.

5.4.2 Rounding

▶ 1. Open the menu by pressing ▶ ⊖ **Open**.

2. Select **Display** and then press ▶.

3. Select **Rounding**.

4. To return to the basic display, press ⊖ **Exit**.

> ℹ️ Rounding does not affect the measurement accuracy defined in the device specifications.

5.4.3 Holding and saving the display

With the **Hold/Save** function, you can freeze a certain display reading. This reading can be saved in the MI70 memory and it will be available even after MI70 is disconnected from the transmitter.

▶ 1. In the basic display, select **Hold/Save**. Alternatively, select **Main menu > Display > Hold/ Save display > Hold**.

2. Press **Save**.

3. To view the saved display, go to basic display and select **Record > View recorded data**. Alternatively, select **Main menu > Recording/Viewing > View recorded data**.
   A list of saved displays and data recordings appears. The icons on the left of the date and time indicate whether the file is a saved display or a longer recording of data:

   Saved display

   Data recording

4. Select the saved display based on date and time by pressing the right arrow button.

5.4.4 Graphical display

The graphical display shows you the measurements as a curve (the curve of the uppermost parameter shown in the basic display). From the curve you can examine the data trend and history of the last minutes.

To open the graphical display, select **Graphic** in the basic display or select **Main menu > Display > Graphic history > Show**.

To get the statistical info on the graph area (minimum, maximum, and average values), press **Info**.

To get the curve of the other selected parameters, press **Next**. To get the curves of all the parameters, press **Next** until the text **All** appears, and then select **All**.

To zoom in and out, press the up/down arrow buttons.

To move back and forward in the timeline, use the left/right arrow buttons.

5.5 Functions menu

5.5.1 Setting an alarm

> In the MI70 user interface, measurement parameters are referred to as quantities.

When an alarm is triggered, the indicator beeps and the display backlight blinks. The alarm is triggered when the measured value is not between the alarm limits, that is, the permitted area. The alarm level(s) can be set for only 1 parameter at a time.
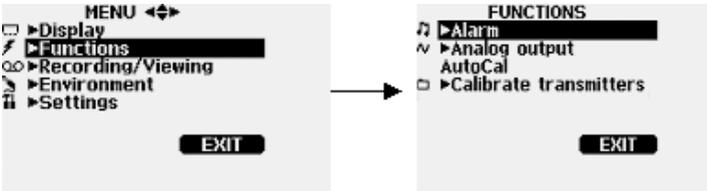
1. Open the menus by pressing ▶ ⊖ **Open**.

2. Select **Functions** and press ▶.

3. Select **Alarm** and press ▶.

4. Select **Quantity** and press ⊖ **Set** to select the parameter.

5. Select the parameter and press ⊖ **Select**. Only 1 active parameter can be selected at a time. To change which parameters are active, go to **Menu > Display > Quantities and units**.

6. Select the first limit and and press ⊖ **Set** (if the alarm function is on, turn it off). Use the arrow buttons to set the alarm level. To select the sign for the alarm level, press the ⊖ +/- button. To save the settings, press ⊖ **OK**.

7. Select the second limit and follow the instructions in step 6. The alarm is triggered when either the upper or lower limit is exceeded.

> If you want to use only 1 limit, for example, if you want to detect if the dew point rises above −40 °C, do the following:
> Set the upper limit to −40 °C and the value of the lower limit so low that it is never reached, for example, to −80 °C. With this configuration, DM70 alerts when T_d rises above −40 °C.

8. To activate the alarm and to return to the basic display, select **Alarm On/Off** and press ⊖ **On**. The note icon ♫ appears in the upper left corner of the display.

9. When the alarm level is reached, you can stop the alarm by pressing ⊖ **OK**. To reactivate the alarm, press ⊖ **Yes**. To discard the alarm, press ⊖ **No**.

> The alarm does not work when the device is powered off.

5.5.2 Selecting and scaling analog output

To get analog measurement data, an analog signal cable is needed (Vaisala item code 27168ZZ).
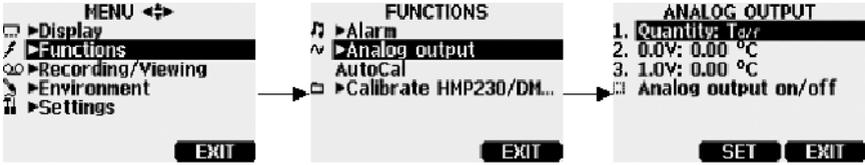
Figure 7   Analog output menu

▶ 1. Connect the signal cable connector of the analog output to the base connector of the MI70 indicator. Connect the screw terminal block as follows:

Wire	Connect to
Brown wire	Common wire (−)
Yellow-green wire	Signal (+)

2. Open the menu by pressing ▶ ⊖ **Open**.

3. Select **Functions** and press ▶.

4. Select **Analog output** and press ▶.

5. To set the value for the 0.0 V output signal, select **0.0 V** and press ⊖ **Set**. If the analog output is on, turn it off. Set the low value using the arrow buttons. To select the sign for the value, press ⊖ +-. To confirm the setting, press ⊖ **OK**.

6. To set the value for the 1.0 V output signal, select **1.0 V** and press ⊖ **Set**. Set the high value using the arrow buttons. To select the sign for the value, press ⊖ +-. To confirm the setting, press ⊖ **OK**.

7. To activate the analog output and to return to the basic display, select **Analog output on/off** and ⊖ **On**. The wave icon ∿ appears in the upper left corner of the basic display.

8. To deactivate analog output, go to **Menu > Functions > Analog output - Analog output on/off** and press ⊖ **Off**.

5.5.3 Autocalibration

To obtain the best possible accuracy in measurements taken in dry environments, DM70 has built-in automatic calibration. During the autocalibration, DM70 adjusts the dry-end reading to correspond to the calibrated values. This is a unique and patented method to avoid errors in accuracy when monitoring low dew points.

The autocalibration is carried out if the following criteria for the measurement environment are fulfilled:

- Relative humidity must be
  - < 5 % (DMP74A)
  - < 2 % (DMP74B/DMP74C)
- Temperature must be 0 < T < 60 °C

- Humidity environment must be stable. The maximum change in the dew point can be 1 °C within 30 seconds.

> **ℹ** Autocalibration cannot operate if the above criteria are not met.

If the adjustment in the autocalibration reaches a preset, maximum value or if the autocalibration correction fails, for example, because of unstable conditions, a new autocalibration may take place later (if the automatic autocalibration is turned on). Autocalibration can be either automatic or manual.

5.5.3.1 Automatic autocalibration

As a default, the automatic autocalibration in DM70 is turned on. In this mode, the calibration takes place automatically if the dew point or temperature changes significantly, typically more than 10 °C. However, if there are no changes in the conditions, the calibration will take place at an interval of 1 hour (or maximum 1 hour after the previous autocalibration).

5.5.3.2 Turning automatic autocalibration on and off

> **ℹ** If the automatic autocalibration is turned off, the autocalibration should be started when starting measuring after the probe has not been used for a while and always at least once every hour.

To turn off automatic autocalibration:

1. Open the menu by pressing (▶) (⊖) **Open**.
2. Select **Settings** and press (▶).
3. Select **Measurement settings** and press (▶).
4. To turn off automatic autocalibration, press (⊖) **Off**. To reactivate automatic autocalibration, press (⊖) **On**.
5. To return to the basic display, press (⊖) **Exit**.

5.5.3.3 Performing manual autocalibration

To check that autocalibration has taken place for obtaining the most accurate measurement in a very dry environment, you can autocalibrate manually before measuring as follows:

1. Open the menu by pressing (▶) (⊖) **Open**.
2. Select **Functions** and press (▶).
3. Select **AutoCal** and press (⊖) **Start**.

4. If you want to start autocalibration, press **Yes**. If the autocalibration conditions are not fulfilled, a note appears on the display informing that the calibration cannot be made or that a new attempt will be made later.

5. When the autocalibration is completed, the display returns to the basic display automatically.

> ℹ️ If it is too humid, autocalibration will not start.

a. Display during the adjustment period (< 15 seconds).

b. Adjustment period is completed and stabilization period will start.
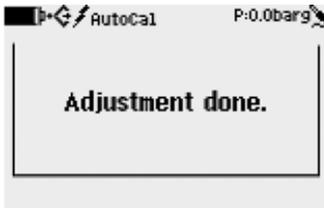
c. After successful autocalibration, the corrected readings are shown during the stabilization period. If the autocalibration fails, no readings are shown, only lines are displayed.
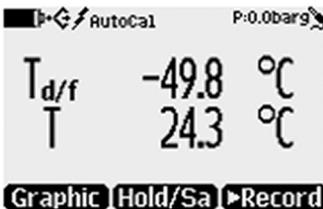
d. Display during the stabilization period (1 ... 2 minutes).

e. Autocalibration is completed.

5.5.4 Sensor purge

Sensor purge feature is only available in the DMP74B/DMP74C probe. The purge should be carried out to achieve the shortest response times and the best long-term stability.

Sensor purge is an automatic procedure, in which the sensor is dried. Thus, the sensor will response very fast when installing the probe from an ambient to a dry gas. This will also ensure together with autocalibration the best measurement accuracy and long-term stability.

The purge is performed automatically if humidity changes significantly or quickly and if the dew point is low enough.

As a default, the automatic sensor purge is turned on automatically in DM70. It is recommended not to turn it off. The automatic sensor purge can also be started manually, which is necessary if the purge has not been performed during the last 24 hours. If the power is continuously turned on in DM70, or if DM70 has been left in logging mode (display on or off), the automatic sensor purge will be performed at set interval (default = 24 hours).

5.5.4.1 Turning automatic sensor purge on and off

Performing the sensor purge on a regular basis provides the best measurement accuracy and fastest response time. Perform the sensor purge when starting to take measurements after the probe has been in storage, and always at least once every 24 hours.

To turn off automatic sensor purge:

▶ 1. Open the menu by pressing ⊳ ⊖ **Open**.

   2. Select **Settings** and press ⊳.

   3. Select **Measurement settings** and press ⊳.

   4. Select **Autom. Purge** and press ⊳.

   5. To turn the automatic sensor purge off, press ⊖ **Off**. To reactivate the automatic sensor purge, press ⊖ **Off**.

   6. To return to the basic display, press ⊖ **Exit**.

5.5.4.2 Changing automatic sensor purge interval

If there are high chemical concentrations present in the measurement environment, some sensor drift can occur. If you experience this kind of drift, it can be necessary to perform the sensor purge more often. The purge interval can be varied between 1 ... 48 hours. However, note that frequent sensor purges reduce battery operation time.

To change the automatic sensor purge interval:

▶ 1. Open the menu by pressing ⊳ ⊖ **Open**.

   2. Select **Settings** and press ⊳.

   3. Select **Measurement settings** and press ⊳.

   4. Select **Purge interval** and press ⊖ **Set**.

   5. Set the desired purge interval with the arrow buttons. Press ⊖ **Ok** to confirm.

   6. To return to the basic display, press ⊖ **Exit**.

5.5.4.3 Performing manual sensor purge

ℹ Although the sensor purge is in the automatic mode, it can also be performed manually.

To check that the sensor purge has been performed to ensure the best possible response times or before calibration, start the purge manually as follows:

▶ 1. Open the menu by pressing ⊳ ⊖ **Open**.

   2. Select **Functions** and press ⊳.

   3. Select **Purge** and press ⊖ **Start**. Confirm the selection by pressing ⊖ **Yes**.

4. When the sensor purge is completed, the display returns to the basic display automatically. The stabilization of the temperature reading can take a few minutes.

> **i** If the dew point is low, automatic autocalibration will take place immediately after the sensor purge.

The purge takes up to 5 minutes to complete. During the purge, there are no readings on the display. A message appears on the display every 15 seconds to inform of the time required to complete the purge. The purge icon also appears in the upper left corner of the display.

Figure 8   Sensor purge displays

> You can also change one of the shortcut keys to point to the sensor purge: for instructions, see Programming shortcut keys (page 37).

5.6 Recording/Viewing menu

5.6.1 Recording data

With MI70, you can record transmitter measurement data over a certain period at chosen intervals. These recordings are saved in the MI70 memory and are available even after MI70 is disconnected from the transmitter. To start recording, select the **Record** function key in the basic display, or navigate to the recording menu: **Main menu > Recording/Viewing > Record data**.
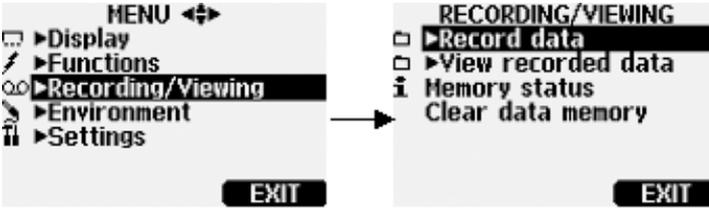
Figure 9   Recording/Viewing menu

5.6.2 Viewing recorded data

1. Open the menu by pressing ▶ ⊖ **Open**.

2. Select **Recording/Viewing** and press ⊖.

3. Select **View recorded data** and press ▶.

4. Select the file you want to view and press ▶. The files are identified according to the starting date and time of recording.

5. To go to the graphical view, press ⊖ **Graph**. To view the recording time stamps, press ⊖ **Times**. To return to the recording values, press ⊖ **Values**.

6. To return to the basic display, press ⊖ **Exit**.

5.6.3 Checking MI70 memory status

1. Open the menu by pressing ▶ ⊖ **Open**.

2. Select **Recording/Viewing** and press ▶.

3. To view the amount of memory that is in use and the estimated free space left, select **Memory status** and press ⊖ **Show**.

4. To return to the basic display, press ⊖ **OK** and ⊖ **Exit**.

> ℹ️ The estimate of available free space is calculated for the current number of active parameters. If you change the displayed parameters, the estimate will change accordingly.

5.6.4 Clearing data memory

1. Open the menu by pressing ▶ ⊖ **Open**.

2. Select **Recording/Viewing** and press ▶.

3. Select **Clear data memory** and press ⊖ **Clear**. To confirm the deletion, press ⊖ **Yes**.

4. To return to the basic display, press ⊖ **Exit**.

5.6.5 Transferring recorded data to PC with MI70 Link

PC data transfer requires the MI70 Link Windows® software and a Vaisala USB cable (item code 219687). The serial connection cable can also be used for MI70 Link data transfer. The MI70 Link software is available from the Vaisala website: www.vaisala.com/mi70link.

Recorded data can be transferred to a PC using the MI70 Link program that allows examining the recorded data easily in the Microsoft Windows® environment and processing it further on a spreadsheet program such as Microsoft Excel®. Both logged and real-time measurement data can be transferred.

To set up an MI70 Link connection:

▶ 1. Install the MI70 Link software according to the instructions on the installation wizard. Do not connect the USB cable before the installation has completed.

2. After the installation completes, connect the MI70 indicator to the PC with the USB/serial cable. Windows detects the new device automatically.

3. You can now access the readings from the PC with MI70 Link. If MI70 Link cannot discover the instrument, check the following:
   - the device is powered on
   - the cable is properly connected
   - another application has not reserved the connection

5.7 Environment menu

5.7.1 Configuring pressure settings

In pressurized environments, the actual process pressure value must be set for DM70. The pressure can be given in the following units:

P_{barg} Gauge pressure is given in the unit of bar. It indicates the pressure difference between the normal atmospheric pressure and the actual process pressure.

P_{bara} Absolute process pressure is given in the unit of bar.

P_{psig} Gauge pressure is given in the unit of psi. It indicates the pressure difference between the normal atmospheric pressure and the actual process pressure.

P_{psia} Absolute pressure is given in the unit of psi.

To set the pressure values:

▶ 1. Open the menu by pressing ▶ ⊖ **Open**.

2. Select **Environment** with ⊙ ⊙ and press ▶.

3. To change the pressure unit, press ⊖ **Unit**. The default unit is barg.

4. To change the ambient pressure value, press ⊖ **Set**.

5. Set the value using the arrow buttons. To change the sign of the pressure value, press ⊖ +/-. To save the value, press ⊖ **OK**.

6. To return to the basic display, press ⊖ **Exit**.

5.8 Settings menu

5.8.1 User interface settings

Figure 10   User interface settings menu

5.8.1.1 Selecting language

You can select any of the following languages for the user interface: English, Finnish, Chinese, Russian, Japanese, Swedish, French, German, or Spanish.

1. Open the menu by pressing ▶ ⊖ **Open**.

2. Select **Settings** and then press ▶.

3. Select **User interface** and then press ▶.

4. Select **Language** and press ⊖ **Set**.

5. Choose the correct language and press ⊖ **Select**.

6. To return to the basic display, press ⊖ **Exit**.

5.8.1.2 Correcting language selection

▶ 1. Return to the basic display by pressing the rightmost ⊖ button until the basic display appears.

2. Go to the **Language selection menu** by pressing first ▶ and then the ⊖ button in the middle.

3. Then press ▲, then ▶, then ▶ again, and finally press the ⊖ button in the middle.

4. Reselect the language.

5.8.1.3 Configuring automatic power off

As a default, MI70 powers off after 15 minutes of inactivity. This also saves battery. The inactivity setting can be changed to 60 minutes or completely turned off.

▶ 1. Open the menu by pressing ▶ ⊖ **Open**.

2. Select **Settings** and press ▶.

3. Select **User interface** and press ▶.

4. Select **Auto power off** and press ⊖ **Set**.

5. Choose an inactivity time option and press ⊖ **Select**.

6. To return to the basic display, press ⊖ **Exit**.

5.8.1.4 Programming shortcut keys

▶ 1. Open the menu by pressing ▶ ⊖ **Open**.

2. Select **Settings** and press ▶.

3. Select **User interface** and press ▶.

4. Select **Program shortcut keys** and press ⊖ **Start**.

5. Press the shortcut key you want to change, for example, **Hold/Save**.

6. If you want to replace **Hold/Save** with the autocalibration function, select **AutoCal** with the arrow buttons and then press ⊖ **Select**. To confirm your selection, press **Yes**. Otherwise press **No** and continue from step 4.

7. To return to the basic display, press ⊖ **Exit**.
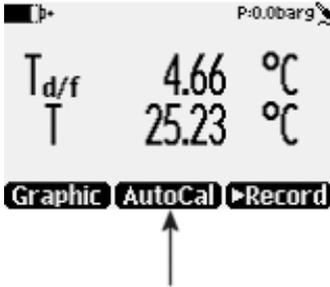
Figure 11   Hold/Save replaced by AutoCal

5.8.1.5 Configuring button tones and backlight

To turn on or off the backlight or the sound effects for the buttons:

▶ 1. Open the menu by pressing ▶ ⊖ **Open**.

2. Select **Settings** and press ▶.

3. Select **User interface** and press ▶.

4. To turn the sound effect on or off, select **Key Click** and press ⊖ **On/Off**.

5. To turn the backlight on or off, select **Backlight on key press** and press ⊖ **On/Off**.

6. To return to the basic display, press ⊖ **Exit**.

5.9 Date and time

As a default, the time format is based on the 24-hour clock. Also a 12-hour clock can be used.

The default date format is day.month.year, for example, 25.4.2020. The date format can be changed to month.day.year. or year.month.day.

▶ 1. Open the menu by pressing ▶ ⊖ **Open**.

2. Select **Settings** and press ▶.

3. Select **Date and time** and press ▶.

4. For the desired date, select **Date** and then press ⊖ **Set**. Use the arrow buttons to change the date. Confirm the selection by pressing ⊖ **Select**. To change the date format, select an option and press ⊖ **Select**.

5. For the desired time, select **Time** and press ⊖ **Set**. Use the arrow buttons to change the time. To confirm the selection, press ⊖ **OK**. To change the time format, select **12-hour clock** and press ⊖ **On/Off**.

6. To return to the basic display, press ⊖ **Exit**.

5.10 Measurement settings
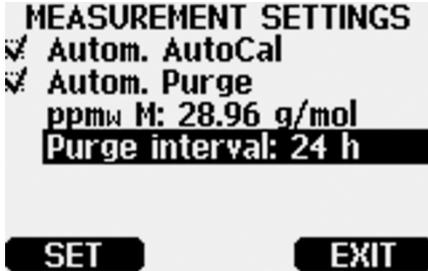
Figure 12   Measurement settings menu

Menu	Description
Automatic autocalibration	To turn the feature on, press ⊖ **On**. To turn the feature off, press ⊖ **Off**.
Automatic purge	To turn the feature on, press ⊖ **On**. To turn the feature off, press ⊖ **Off**.
Molecular weight	The **ppmw M** setting is used to give the molecular weight of the measured gas. This value is required in ppm_w (weight) calculation. The default values are 28.96 for DMP74A/B (air) and 146.06 for DMP74C (SF6).
Purge interval	The time interval at which the automatic sensor purge is performed: can be selected between 1 ... 48 hours. For instructions, see Changing automatic sensor purge interval (page 32).

5.11 Setting calibration reminder

You can set a calibration reminder to notify when calibration is due. Choose an interval of 3, 6, 12, or 24 months. By default, the reminder is off.
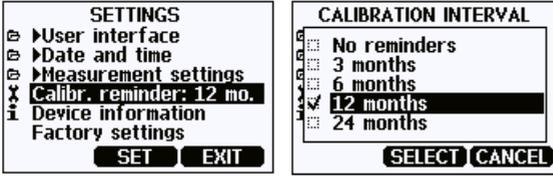
Figure 13   Calibration reminder menu

> **i** Make sure the MI70 date and time settings are correct when using the calibration reminder.

▶ 1. Open the menu by pressing ▶ ⊖ **Open**.

2. Select **Settings** and press ▶.

3. Select **Calibr. reminder** and press ⊖ **Set**.

4. Choose a reminder interval option and press ⊖ **Select**.

5. To return to the basic display, press ⊖ **Exit**.

5.12 Device information
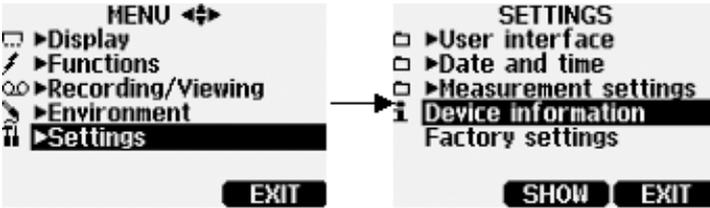
Figure 14   Device information menu

To view basic information about the indicator and probe:

▶ 1. Open the menu by pressing ▶ ⊖ **Open**.

2. Select **Settings** and press ▶.

3. Select **Device information** and press ⊖ **Show**.

4. The first display gives information on the MI70 indicator. For details on the probe, press ⊖ **More**.

5. To return to the basic display, press ⊖ **Exit**.
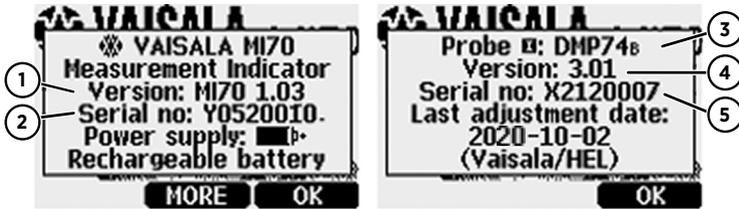
Figure 15   Indicator and probe information

1   Software version of the MI70 indicator
2   Serial number of the MI70 indicator
3   Probe type
4   Software version of the probe
5   Serial number of the probe

5.13 Factory settings

Factory settings can be restored to clear all the changed settings and data memory of the indicator. Restoring factory settings does not affect the probe calibration.

▶ 1. Open the menu by pressing ▶ ⊖ **Open**.

2. Select **Settings** and press ▶.

3. Select **Factory Settings** and press ⊖ **Revert**. To confirm the selection, press ⊖ **Yes**. MI70 powers off automatically.

> **i** When MI70 is switched on after a factory reset, the language, date, and time settings must be set again.

6. Field calibration check of fixed transmitters

To compare measurement readings or to read the output of a fixed transmitter directly on the DM70 display, connect DM70 to a fixed Vaisala transmitter using the connection cable accessories.

Vaisala DRYCAP® Dew Point and Temperature Transmitter Series DMT340 can be adjusted in laboratory conditions using DM70 as a reference. For more information on calibration and adjustment, see Calibration (page 61).

6.1 Field calibration check of DMT340/DMT242/DMT143

You can use DM70 to display the reading of DMT340, DMT242, or DMT143 transmitter, and to compare the readings of DM70 and the transmitter.

Use the following cables to connect DM70 to the transmitter:

- Connection cable 211339 with DMT340
- Connection cable 27160ZZ with DMT242
- Connection cable 219980SP with DMT143

To carry out a field calibration check:

▶ 1. Turn off DM70.

2. Connect the cable between DMT340 (service port) or DMT242/DMT143 (serial port) and DM70 (connector I or II). Turn on both devices.

3. If you are requested to check the environment settings, press ⊖ **Yes**. Then check the pressure settings. For instructions on setting the ambient pressure, see Configuring pressure settings (page 35).

4. Check that the pressure units of DM70 and DMT340/DMT242/DMT143 are the same. If not, and you are checking DMT242/DMT143, change the DM70 pressure unit to **bara** by pressing ⊖ **Unit** on the corresponding row. You cannot change the pressure unit for DMT242/DMT143. Adjust the values as instructed in Configuring pressure settings (page 35).
When using DM70 to check DMT340, you can change the pressure unit of DMT340 by pressing ⊖ **Unit** on the corresponding row. It is also possible to change the pressure unit of DMT340 through the transmitters local display/keypad interface (for instructions, see *DMT340 User's Guide*). Then adjust the values as instructed in Configuring pressure settings (page 35).

5. When the pressure settings are correct, press ⊖ **Exit**. Now the display shows the dew point readings $T_{d/f}$ of DM70, DMT340/DMT242/DMT143, and the difference between the readings $\Delta T_{d/f}$. Roman numerals (I and II) after the parameter abbreviations indicate from which port the readings are coming. You can follow the measurement trend from the graphical display.

6. Wait until the readings are stabilized. This can take up to 1 hour in very low dew points. If the difference between the dew point readings is less than 3 ˚C, there is no immediate need for adjustment. However, in applications where optimum accuracy is essential, it is recommended to send the DMT340/DMT242/DMT143 transmitter to Vaisala if the difference is considered significant.

7. Press the **Power On/Off** button.

8. Disconnect the connection cable.

More information

‣ Spare parts and accessories (page 80)
‣ Maintenance and calibration services (page 83)

7. Sampling from processes

7.1 Sampling cells

When the dew point of a process needs to be measured using DM70, the process can be sampled using one of the following devices:

- DSC74
- DSC74B
- DSC74C
- DSS70A
- DMT242SC
- DMT242SC2

Use the DSC74 sampling cell when the sample is taken from the pressurized process, where the process pressure forces the sample gas into the sample cell.

Use the DSC74B sampling cell as DSC74. DSC74B is enhanced version of DSC74. With version B, harmful gases can be recovered.

DSC74C complements DSC74B with a diffusion coil, which allows measuring in the atmospheric pressure.

Use the DSS70A sampling system when the process is not pressurized, that is, the sample must be pumped from the process and when the process is dirty or too hot for direct measurements.

Use the DMT242SC sampling cell when only the body (thread 3/8″G and 1/4″G) of the main sampling cell is needed.

Use the DMT242SC2 sampling cell with the welded Swagelok connectors. This is ideal for sampling in a 1/4″ pipeline.

7.1.1 DSC74

- Sampling cell with a leakage screw, thread 3/8″G
- Quick coupling, type NIP08, type D
- Thread adapter, type 3/8″ - 1/4″G
- Thread adapter, type 3/8″ - 1/2″G (for DMT242 fittings)
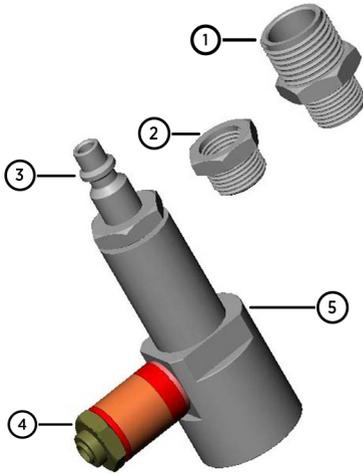
Figure 16   DSC74 sampling cell with adapters

1   Thread adapter type 3/8″ - 1/2″G
2   Thread adapter type 3/8″ - 1/4″G
3   NIP08, type D
4   Leakage screw
5   Sampling cell DSC74

7.1.2 DSC74B

- Sampling cell, thread 3/8″G
- Connection part with a needle valve and an integrated leakage screw
- Reducing nipple (thread adapter), 3/8″G - 1/2″G
- Reducing adapter (thread adapter), 3/8″G - 1/4″G
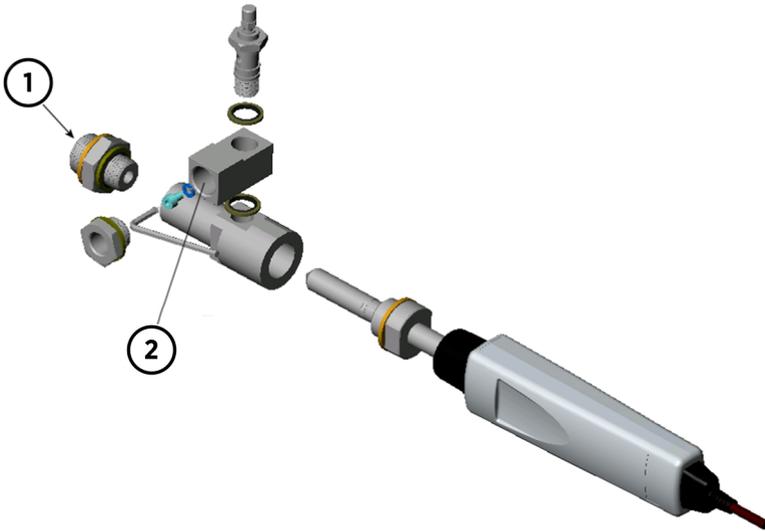
Figure 17   DSC74B

1   Gas goes in
2   Gas comes out

7.1.3 DSC74C

- Sampling cell, thread 3/8"G
- Connection part with a needle valve and an integrated leakage screw
- Reducing nipple (thread adapter), 3/8"G - 1/2"G
- Reducing adapter (thread adapter), 3/8"G - 1/4"G
- Diffusion coil (for measurements in atmospheric pressure)
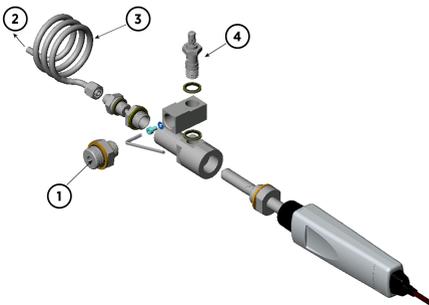
Figure 18   Default assembly of DSC74C

1   Gas goes in. Also the coil can be used
     here.
2   Gas comes out
3   Coil
4   Valve

Figure 19   Alternative assembly of DSC74C for tight spaces
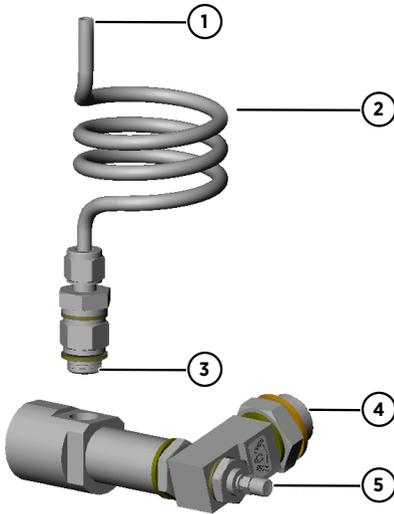
1   Gas comes out
2   Coil
3   Thread, max. size 7 mm
4   Gas goes in
5   Valve

7.1.4 DMT242SC and DMT242SC2

- DMT242SC is a sampling cell with threads 3/8″G and 1/4″G.
- DMT242SC2 is a sampling cell with 1/4″ welded Swagelok connectors.

Figure 20   DMT242SC and DMT242SC2 sampling cells

7.2 Connecting to pressurized processes using DSC74 sampling cell

DSC74 is a Vaisala sampling cell for connecting DM70 to pressurized processes (optional accessory). With DSC74B and DSC74C, measuring can be done in overpressure or atmospheric pressure. This depends on whether the sample gas is let into the sample cell before the needle valve or after that. See Figure 17 (page 46) and Figure 18 (page 46).

The DSC74 sampling cell comes with a quick connector that fits to industry standard compressed air line connectors (suitable for type D, Quick08, NIP08). This allows for easy installation and detachment of the probe without having to shut down the process. Alternative ways to connect are through the 2 different thread adapters (G3/8″ to G1/2″ and G3/8″ to G1/4″ ISO) that are supplied with each DSC74 unit.

> ⚠ **CAUTION!** If you use the thread adapters, the process pressure must be shut down for the installation or removal of the probe. If you use the quick connector, the process pressure can be maintained during the installation or removal of the sampling cell. Take a firm hold of the device to keep it in your hands while removing it.

Measurement in the process pressure

Measurement in the atmospheric pressure
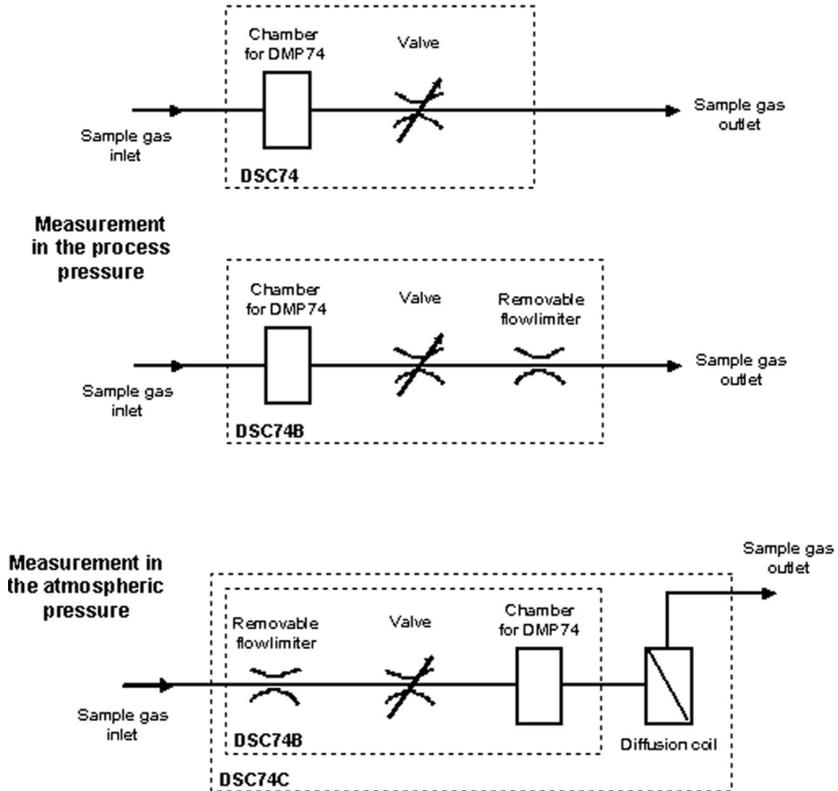
To connect to a pressurized process using DSC74:

1. Check that the HM70 pressure setting is correct (same as the process pressure). For instructions, see Configuring pressure settings (page 35).

2. Select the quick connector or thread adapter that matches your process fitting.

3. Carefully seal the threads of the quick connector or thread adapter with PTFE thread seal tape.

4. Attach the quick connector or thread adapter onto the sample cell threads. Tighten the fitting with a fork wrench.

5. Connect the sample cell to the process fittings. Seal the fitting with PTFE thread seal tape.

6. Install the gasket (delivered with the probe) to the nut of probe thread.

7. Set the probe into the sample cell. Tighten the probe by turning it from the thread nut. Do not tighten the probe from the handle.

8. Make sure that the valve of the sampling cell is open. First close the valve, then turn it halfway open again. You can also first open the valve more to ventilate the parts, then readjust it to allow only a small leakage.

Figure 21   Turning sampling cell valve screw with flathead screwdriver

> 💡 To verify that the leak screw is open, close the screw and then listen for a barely audible hiss when reopening the screw (1/2 turn). A light air flow can be felt when placing a hand over the opened valve.

9. If the sample cell is installed correctly, there is no leakage in the connections. You can test this by closing the valve temporarily.

> ⚠️ **CAUTION!** Do not open the leak screw more than 1/2 turn to limit the pressure drop in the sampling cell. If the pressure drops too much, measurement accuracy can be affected significantly.

More information

‣ Spare parts and accessories (page 80)

7.3 DSS70A sampling system

DSS70A is a portable sampling system for taking gas samples from hot, dirty, or pressurized processes. The gas collecting system is built in the briefcase including the DM70 meter. The system consists of a sample pump that draws out the sample gas, a filter to clean the sample from particles (> 7µm), and a sample valve and flowmeter to adjust the flow rate.
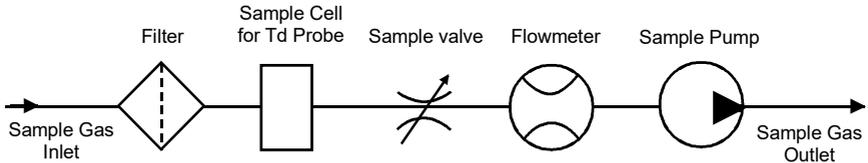
The sample gas going into the system must meet the following requirements:

- The temperature must be < 40 ˚C (104 ˚F). Thus, when using the PTFE tube of 2 meters (provided), the temperature of the process gas should be less than 200 ˚C (392 ˚F). When the temperature of the sample gas is over 200 ˚C, a stainless steel tube (not provided) should be used.
- The sample gases must be: Air, N_2, non-toxic gases, inert, non-flammable gases.
- If the sample is taken from a pressurized process (1.2 ... 20 bar), the sample pump must be turned off and the tube from the flowmeter to the pump must be detached.

The DSS70A sampling system can be ordered from Vaisala separately or in connection with the DM70 meter.

Figure 22   DSSA70A portable sampling system

1   Fuses
2   Inline filter (7 μm)
3   MI70 recharger adapter
4   Pump on/off
5   MI70 indicator
6   Sample valve
7   Sampling tube
8   Sample gas inlet and outlet
9   Flowmeter
10   Detach this tube when sampling from pressurized processes

7.3.1 DSS70A sampling procedure

To take a sample from a process using DSS70A:

▶   1. Before you start, make sure the pump is switched off. Lift the flowmeter to a vertical
        position.

    2. Close the sample valve by turning it clockwise as far as it goes.

    3. If the process is not pressurized (600 ... 1200 mbar), continue from step 3. If the process is
        pressurized (1.2 ... 20 bar), detach the flexible tube from the flowmeter. See Figure 22
        (page 52).

4. Remove the inlet/outlet plugs.

5. Insert the 1/4″ tubing into the **IN** fitting. Tighten the nut 11/4 turns with an open-ended, 14-mm spanner to make a gas-tight fitting. In future, only slight tightening with an open-ended spanner is needed to make a gas-tight fitting. Insert the tubing into the **OUT** fitting, if needed.

6. If the process is not pressurized, turn on the pump. If the process is pressurized, do not turn the pump on.

7. Adjust the sample flow using the sample valve, for example, 150 l/h = 2.5 l/min.

8. Turn on the MI70 indicator.

9. Set the pressure to represent the sample pressure. For instructions, see Configuring pressure settings (page 35).

10. Wait until the reading has stabilized.

11. After the measurements, turn off the pump, remove the tubes, and put the inlet/outlet plugs back into their places.

> ⚠ **CAUTION!** Be careful when taking samples from hot processes. Do not touch the hot sampling lines without suitable protective clothing.

> ℹ The measured dew points must always be lower than the ambient temperature or DSS70A probe temperature to avoid condensation in the system. If condensation occurs, stop sampling and dry the system by circulating ambient air in the system.
> Prevent liquids from entering the DSS70A sampling line as this may damage the product.

7.3.2 Recharging DSS70A battery

The battery must be recharged when the charger meter shows 10.5 V or less. DSS70A is powered by a battery, fitted underneath the system. MI70 uses its own battery when it is connected to DSS70A.

To recharge the DSS70A battery:

1. Detach the MI70 recharger adapter from the socket of the sampling system and plug in the recharger provided with DM70.

2. Disconnect the recharger when the battery is full and put the MI70 recharger back into the case.
   If you want to recharge the sampling system and MI70 at the same time, connect the MI70 recharger adapter to the recharger socket on top of MI70 and recharge DSS70A as described above.

7.3.3 Changing DSS70A battery

Replacement batteries can be ordered from Vaisala (see Spare parts and accessories (page 80)).

To change the battery:

▶ 1. The battery is fitted underneath the sampling system. To change the battery, lift the sampling system from the briefcase. To lift the system, use 2 screwdrivers as lever arms and lift the system from 2 corners (see Figure 23 (page 54)).

Figure 23   Lifting the system

2. Turn the sampling system upside down (see Figure 24 (page 55)).
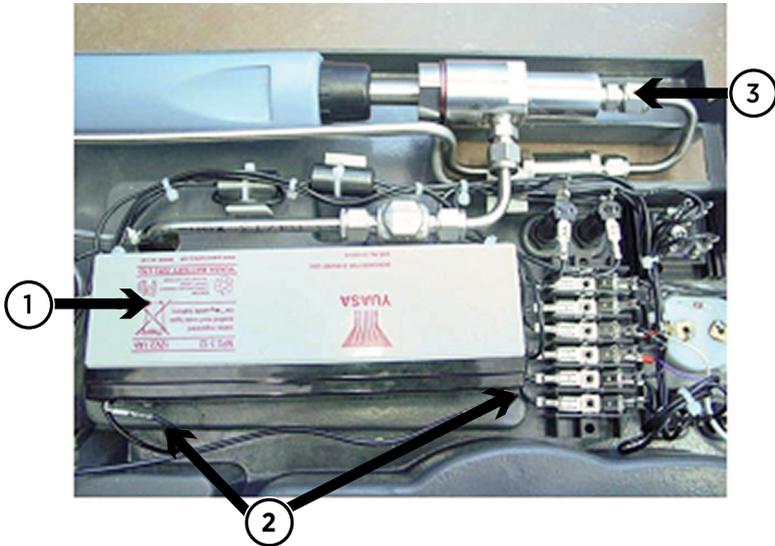
Figure 24   Sampling system upside down

1   Battery
2   Battery wires
3   Nut of the sample oil

3. Detach the battery wires. Remove the old battery by pulling it up. The battery is attached to its place with double-sided tape.

> The used battery must be disposed of according to the local laws and regulations.

4. Attach the double-sided tapes provided with the battery to the new battery enclosure. Place them onto the side without text. For reference, see the old battery.

> **WARNING!** Batteries are electrochemically live at all times. Do not short-circuit them.

5. Reconnect the wires as follows:
   • Red pole: BA + wire
   • Black pole: BA - wire

6. Press the new battery onto the tapes.

7. Put the system back into the briefcase.

More information

‣ Spare parts and accessories (page 80)

7.3.4 Changing DSS70A filter

The filter should be changed regularly as a part of maintenance. However, the need for changing the filter depends on how dirty the process is. The filter may need to be changed after several hundreds of hours or after years. A dry filter may cause increased response times. A new filter can be ordered from Vaisala (see Spare parts and accessories (page 80)).

1. To change the filter, lift the sampling system out of the briefcase. See Figure 23 (page 54).

2. Unscrew the nut of sample cell. See Figure 25 (page 56).

3. Turn the sampling cell right side up again and undo the nut of the filter cell.

4. Replace the filter and tighten the nuts. The direction of the arrow on the filter must match the direction of the arrow on DSS70A. See Figure 25 (page 56).

5. Put the sampling system back into the briefcase.
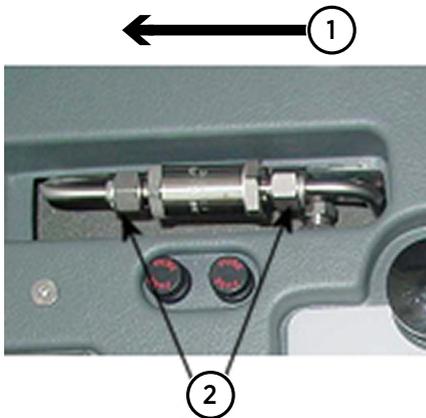
Figure 25   Changing the filter

1   Filter direction
2   Nuts of the filter

More information

‣ Spare parts and accessories (page 80)

7.3.5 Changing DSS70A fuses

To change the DSS70A fuses:

1. Press down the fuse button and simultaneously turn it.
2. Replace the old fuse with a new one of same type and rating (glass tube fuse 5 × 20 mm T 2 A / 250 VAC).
3. Put the fuse button back into place by pressing and turning it.

8. Measuring moisture in SF$_6$ gas-insulated equipment

8.1 Overview

Sulfur hexafluoride (SF$_6$) is an inert, insulating gas of high dielectric strength and thermal stability. SF$_6$ is used to insulate high voltage lines, circuit breakers, and other equipment used in transmission and distribution of electricity. Measuring moisture is crucial for the maintenance of SF$_6$ equipment.

The DMP74C probe has been optimized for measurements in SF$_6$ gas. The measurement is recommended to be made in pressurized gas for better dew point accuracy. The sensor purge feature of the DRYCAP® 180M sensor allows a fast response in low dew points, and only a small amount of SF$_6$ needs to be drained from the GIE (gas-insulated equipment).

SF$_6$ is a greenhouse gas, with a global warming potential 24900 times that of CO$_2$. For this reason, the gas should be recycled according to the local laws and regulations. The DSC74B sampling cell allows the gas to be collected after the measurement (see Figure 26 (page 58)). When measurement is done in the GIE pressure, the structure of DSC74B eliminates the adverse effect of pressure fluctuation caused by the collection system.
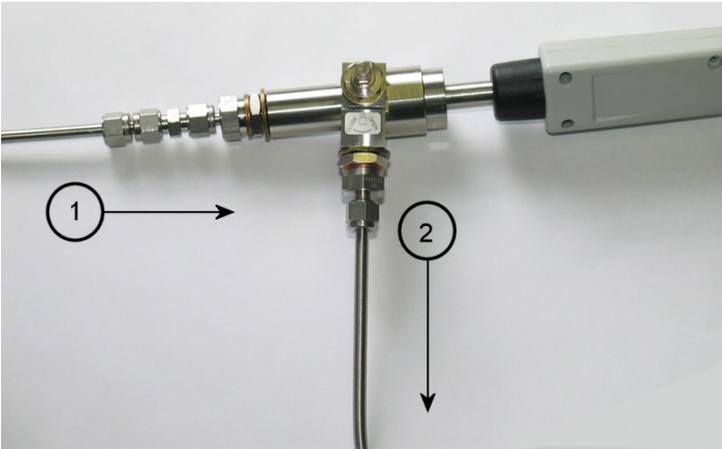
Figure 26   Gas collection option

1   Gas from GIE
2   Gas to the collecting system

8.2 Operating environment

A typical dew point of pure SF_6 is usually around −60 °C. The recommendations for the moisture limit of the equipment insulated with gas (GIE) vary between 70 ... 810 ppm_v, which corresponds to −45 ... −22 °C $T_{d/f}$ in the atmospheric pressure, or −29 ... −3 °C $T_{d/f}$ in 5 bar_g pressure.

DM70 is able to measure the dew point directly in the GIE pressure (usually 3 ... 8 bar_g), or the gas can be sampled and measured in the atmospheric pressure. If there is a need to measure high-pressure gas (>10 bar), for example in the recycling bottle, a regulator should be used to drop the pressure before the measurement.

High-voltage equipment can locate either indoors or outdoors. The operational temperature range of DM70 is between −10 ... +60 °C.

8.3 Measuring

> ⚠️ **CAUTION!** Before measuring moisture, make sure that hydrofluoric (HF) acid is not present in the GIE.

With DSC74B, the dew point can be measured at the GIE pressure. If the measurement is done in the GIE pressure, DM70 is able to show the corresponding dew point in the atmospheric pressure.

DSC74B limits the flow rate with a leakage screw. The flow rate is optimized for GIE pressures between 3 ... 10 bar_g, and no external flow meter is needed. The maximum flow can also be increased by removing the leak screw and adjusting the flow manually with the valve.

Remove the leak screw as shown in Figure 27 (page 59).

Figure 27   Removing the leak screw

Parts per million by volume (ppm_v) and parts per million by weight (ppm_w) are frequently used to indicate humidity. The latter depends on the molecular weight of the gas. For SF_6, the molecular weight is 146.06, and the conversion between ppm_v and ppm_w is the following:

$ppm_w = ppm_v / 8.1$

DM70 is able to show the ppm_v and ppm_w values for moisture.

9. Calibration and adjustment

9.1 Calibration

DM70 is fully calibrated and adjusted as shipped from the factory. The typical calibration interval is 1 year. Calibration must always be done when there is reason to believe that the device is not within the accuracy specifications.

The device can be sent to Vaisala for calibration and adjustment.

If DM70 is producing incorrect measurements, the recommended first step is to carry out a few (2 ... 4) sensor purges (available in the DMP74B/DMP74C probes) to heat and dry the sensor and check if this solves the issue. For instructions on starting a sensor purge manually, see Performing manual sensor purge (page 32). If sensor purges fail to correct the issue, move on to calibration and adjustment.

9.2 User calibration and adjustment

In this document, the term "calibration" refers to comparing the device's reading against a reference value. "Adjustment" refers to changing the device's reading to correspond to the reference value. After the adjustment, the original calibration certificate shipped with the product is no longer valid. Read the instructions through carefully before making any adjustments.

Dew point calibration should be carried out in Vaisala or in other laboratory conditions.

9.3 Adjusting DM70

The reference condition of the dew point must be traceable to the appropriate standards. The user adjustment requires a stable humidity generator capable of producing the required humidities and a calibrated reference dew point meter. For adjustment, the probe and the reference dew point meter are connected to the humidity generator output, the reference condition is adjusted and let to stabilize. After the probe and the reference dew point meter are stabilized, the DM70 reading is adjusted to correspond the reference value.

For the adjustment of the DMP74A probe, the dew point reference temperature should be between –40 °C and –60 °C (–40 °F ... –76 °F), and for the DMP74B and DMP74C probes, the dew point reference temperature should be between –57 °C and –67 °C (–70.6 °F ... –88.6 °F). The optional sampling cell DSC74 (see Figure 16 (page 45)) can be used as a calibration chamber to be connected with a humidity generator.

To ensure the correctness of the adjustment, the reference dew point meter must be calibrated at a recognized laboratory with a known uncertainty and traceability to national or international standards.

The T_d and H_2O parameters can be viewed in the adjustment mode to see the effect of the adjustment.

To see when the adjustment was made last, select **Last adjustment date** or check the date from the **Device information** view (see Device information (page 40)).

9.4 Adjusting DMT340 series transmitters using DM70 as reference or terminal

Vaisala DRYCAP® Dew Point and Temperature Transmitter Series DMT340 can be adjusted using a correctly adjusted DM70 as a reference dew point meter. Note that dew point adjustment should be carried out in laboratory conditions and not in the field. The adjustment procedure for DMT340 using DM70 as a reference is very similar to the adjustment of the DMP74B/DMP74C probes.

You can also use the MI70 indicator without the reference probe as a terminal to display the measurement readings and to control the adjustment functions when making adjustment of DMT340. This is especially useful with transmitters without display. For instructions, see Td/f adjustment of DMT340 series transmitters using DM70 (page 66).

9.5 Adjusting dew point

Before adjusting dew point, first carry out the 2-point relative humidity calibration, which ensures the basic adjustment level. When adjusting the DMP74B or DMP74C probe or DMT340 series transmitters with the M-sensor, do the sensor purge before calibration and adjustment. For instructions, see Sensor purge (page 31).

9.5.1 Making a 2-point relative humidity adjustment

> ℹ️ For the DMP74A probe, the wet point humidity reference must be > 20 %RH. For the DMP74B and DMP74C probes , the wet point humidity reference must be < 20 %RH.

For DMP74A, humidity references of 0 % (for example nitrogen) and 30 … 75 % are recommended. Make sure that the difference between the humidity references is more than 30 %.

For DMP74B and DMP74C, humidity references of 0 % (for example nitrogen) and 11 % are recommended.

To make a 2-point %RH adjustment:

▶ 1. Check that DM70 is turned on.

2. When using the DMP74B probe, do the manual sensor purge. For instructions, see Performing manual sensor purge (page 32) .

3. Remove the screw from the probe handle to expose the calibration button (see Figure 1 (page 11)) and press the button, for example, with a small screwdriver. When pressing the button, the indicator switches into adjustment mode.

4. To start adjusting, press ⊖ **OK**.

5. Select **RH** and press ⊖ **Select**.

6. To check the environmental settings, press ⊖ **Yes**. To continue without checking the settings, press ⊖ **No**.

7. To select the adjustment method, press ⊖ **Adjust**.

8. Select **2-point adjustment** and press ⊖ **Select**. Press ⊖ **OK** to continue.

9. Set the probe to a lower reference value of relative humidity [1]. You can follow the stabilization from the graph display by pressing ⊖ **Graph**. When the reading has stabilized, press ⊖ **Ready**.

10. Use the arrow buttons to give the lower reference value of relative humidity. Then press ⊖ **OK**.

11. Set the probe to a higher reference value of relative humidity [1]. You can follow the stabilization from the graph display by pressing ⊖ **Graph**. When the reading has stabilized, press ⊖ **Ready**.

12. Use the arrow buttons to give the higher reference value of relative humidity. Then press ⊖ **OK**.

13. Confirm the adjustment by pressing ⊖ **Yes**. If you press ⊖ **No**, you return to the adjustment display and no changes are made.

> **i** DMP74A: If the difference between the 2 references is less than 30 %, the adjustment cannot be done.

14. The adjustment is complete. To exit the adjustment mode, press ⊖ **Back**.

15. To return to the basic display, press ⊖ **Exit**.

16. Place the screw back onto the calibration button after finishing dew point adjustments.

---

1) *If there is a temperature difference between the generated reference and the probe temperature, relative humidity must be calculated to correspond to the temperature of the probe.*

9.5.2 Making a 2-point %RH adjustment of DMT340 series transmitters using DM70

DM70 can be used for making a 2-point relative humidity adjustment of DMT340 series transmitters.

For DMT340 M-sensor, humidity references of 0 % (for example nitrogen) and 10 ... 20 % are required.

> ℹ️ For the DMT340 M-sensor, both reference humidities must be below 20 %RH.

To make a 2-point %RH adjustment of DMT340 using DM70:

▶ 1. Turn off DM70.

2. Connect cable 211339 between DMT340 (service port) and DM70 (connector I or II). Turn on both devices.

3. With DMT340 series transmitters with the M-sensor, perform the manual purge (for instructions, see Performing manual sensor purge (page 32)). Also, if you are using a DMP74B probe as reference, perform the manual purge on the reference probe as well.

4. Press the **ADJ** button on the DMT340 component board to enable the adjustment mode.

5. From the list of parameters, select **RH$_{I/II}$**

6. When you are prompted to check the settings, make sure that the pressure units of DM70 and DMT340 are the same. If not, change the unit by pressing ⊖ **Unit** on the corresponding row.

7. Continue with the adjustment by pressing ⊖ **Adjust**. Select **2-point adjustment**. A note is displayed on the screen reminding you to follow the adjustment procedure described in *DMT340 User's Guide*. Press ⊖ **OK** to proceed with the adjustment.

8. Set the probe to a lower reference value of relative humidity [1]. You can follow the stabilization from the graph display by pressing ⊖ **Graph**. When the reading has stabilized, press ⊖ **Ready**.

9. Use the arrow buttons to give the lower reference value of relative humidity. Then press ⊖ **OK**.

10. Set the probe to a higher reference value of relative humidity [1]. You can follow the stabilization from the graph display by pressing ⊖ **Graph**. When the reading has stabilized, press ⊖ **Ready**.

11. Use the arrow buttons to give the higher reference value of relative humidity. Then press ⊖ **OK**.

12. Confirm the adjustment by pressing ⊖ **Yes**. If you press ⊖ **No**, you return to the adjustment display and no changes are made.

13. The adjustment is complete. To exit the adjustment mode, press ⊖ **Back**.

14. To return to the basic display, press ⊖ **Exit**.

[1] *If there is a temperature difference between the generated reference and the probe temperature, relative humidity must be calculated to correspond to the temperature of the probe.*

9.5.3 Td/f adjustment of DM70

> ℹ️ For DMP74B/DMP74C, the sensor purge must be performed manually 1 hour before adjusting the dew point.

For DMP74A, the reference temperature of the dew point should be −40 ˚C … −60 ˚C (−40 ˚F … −76 ˚F).

For DMP74B/DMP74C, the reference temperature of the dew point should be −57 ˚C … −67 ˚C (−70.6 ˚F … −88.6 ˚F).

To adjust the dew point:

▶ 1. Set the probe to the reference condition. Follow the stabilization from the graphic display by pressing ⊖ **Graph**. The minimum recommended stabilization time for this critical adjustment is 5 hours.

2. Perform the manual purge if necessary.

3. Press the **Calibration** button on the probe handle (see Figure 1 (page 11)) using, for example, a small screwdriver. The indicator will switch into adjustment mode. To confirm calibration, press ⊖ **OK**.

4. Select $T_{d/f}$ and press ⊖ **Select**.

5. To check the environmental settings, press ⊖ **Yes**. To go to calibration directly, press ⊖ **No**.

6. To select **1-point adjustment**, press ⊖ **Adjust** and then ⊖ **Select**.

7. When the reading has stabilized at the reference level, press ⊖ **Ready**.

8. Use the arrow buttons to give the reference value. Then press ⊖ **OK**.

9. Confirm the adjustment by pressing ⊖ **Yes**. If you press ⊖ **No**, you return to the adjustment mode display and no changes are made.

10. Wait until the automatic autocalibration has taken place.

11. When the calibration completes, press ⊖ **Back** to exit the adjustment mode.

12. To return to the basic display, press ⊖ **Exit**.

13. Place the screw back onto the calibration button.

14. To seal the calibration, attach a sticker on the calibration button.

> ℹ️ Several autocalibrations may be necessary after this adjustment has been performed until the transmitter reaches full accuracy.

9.5.4 Td/f adjustment of DMT340 series transmitters using DM70

> ℹ️ For DMT340 series transmitters with the M-sensor, the sensor purge must be performed manually 1 hour before adjusting the dew point.

For DMT340 series transmitters, the reference temperature of the dew point should be −57 … −67 ˚C (−70.6 … −88.6 ˚F).

To adjust DMT340 dew point using DM70, follow the instructions below.

> 💡 First carry out step 1 … step 7 . In step 8, choose one of the two alternative methods for completing the adjustment.

▶ 1. Turn off DM70.

2. Connect the cable 211339 between DMT340 (service port) and DM70 (connector I or II). Turn on both devices.

3. Set the probe to the reference condition. Follow the stabilization from the graphic display by pressing ⊖ **Graph**. The minimum recommended stabilization time for this critical adjustment is 5 hours.

4. Perform the manual purge if necessary.

5. Press the ADJ button on the DMT340 component board to enable the adjustment mode.

6. From the list of parameters, select **T$_{d/f I/II}$**

7. You are prompted to check the settings: make sure that the pressure units of DM70 and DMT340 are the same. If not, change the unit by pressing ⊖ **Unit** on the corresponding row.

8. At this point you need to select the adjustment method. If the reference probe is connected, 2 options are displayed: **To same as T$_{d/f I/II}$** (see To same as T d/f I/II (page 67)) or **1-point adjustment** (see 1-point adjustment (page 67)). If you are using DM70 as a terminal, only **1-point adjustment** is possible.

9.5.4.1 To same as $T_{d/f\ I/II}$

> This procedure is one of the alternative options for completing the adjustment described in Td/f adjustment of DMT340 series transmitters using DM70 (page 66).

> This adjustment method automatically uses the reading of the reference probe as the reference value for making the adjustment.

▶ 1. Continue with the adjustment by pressing ⊖ **Yes**.

2. A note is displayed on the screen reminding you to follow the adjustment procedure described in the *DMT340 User's Guide*. Press ⊖ **OK** to proceed with the adjustment.

3. Follow the stabilization from the graphic display by pressing ⊖ **Graph**. The minimum recommended stabilization time for this critical adjustment is 5 hours.

4. When the reading has stabilized at the reference level, press ⊖ **Ready**. This adjustment method automatically uses the reading of the reference probe as the reference value.

5. Confirm the adjustment by pressing ⊖ **Yes**. If you press ⊖ **No**, you return to the adjustment mode display and no changes are made.

6. Wait until the automatic autocalibration has taken place.

7. When the calibration completes, press ⊖ **Back** to exit the adjustment mode.

8. To return to the basic display, press ⊖ **Exit**.

9. Place the screw back onto the calibration button.

10. To seal the calibration, attach a sticker on the calibration button.

> Several autocalibrations may be necessary after this adjustment has been performed until the transmitter reaches full accuracy.

9.5.4.2 1-point adjustment

> This procedure is one of the alternative options for completing the adjustment described in Td/f adjustment of DMT340 series transmitters using DM70 (page 66).

> This adjustment method allows entering the reference value manually when making the adjustment.

1. A note is displayed on the screen reminding you to follow the adjustment procedure described in the *DMT340 User's Guide*. Press ⊖ **OK** to proceed with the adjustment.

2. Follow the stabilization from the graphic display by pressing ⊖ **Graph**. The minimum recommended stabilization time for this critical adjustment is 5 hours.

3. When the reading has stabilized at the reference level, press ⊖ **Ready**.

4. Use the arrow buttons to give the reference value and press ⊖ **OK**.

5. Confirm the adjustment by pressing ⊖ **Yes**. If you press ⊖ **No**, you return to the adjustment mode display and no changes are made.

6. Wait until the automatic autocalibration has taken place.

7. When the calibration completes, press ⊖ **Back** to exit the adjustment mode.

8. To return to the basic display, press ⊖ **Exit**.

9. Place the screw back onto the calibration button.

10. To seal the calibration, attach a sticker on the calibration button.

> ℹ️ Several autocalibrations may be necessary after this adjustment has been performed until the transmitter reaches full accuracy.

9.6 Adjusting temperature

9.6.1 Temperature adjustment of DM70

The temperature adjustment can be done using the 1-point or 2-point adjustment. The 1-point adjustment should be done within the temperature range in which the device is most often used.

> 💡 First carry out steps step 1 ... step 4. In step 5, choose one of the two alternative methods for completing the adjustment.

To start the adjustment:

1. Press the **Calibration** button of the probe handle (see number 4 in Figure 1 (page 11)) using a tool with a thin, sharp point, for example, a small screwdriver. The indicator will switch into the adjustment mode. To confirm calibration, press ⊖ **OK**.

2. Select $T_{d/f}$ and press ⊖ **Select**.

3. Select **T** and press ⊖ **Select**.

4. To select the adjustment method, first press ⊖ **Adjust** and then choose the adjustment method, either **1-point adjustment** or **2-point adjustment**.

5. Depending on your selection, continue with the instructions in 1-point adjustment (page 69) or 2-point adjustment (page 69).

9.6.1.1 1-point adjustment

> This procedure is one of the alternative options for completing the adjustment described in Temperature adjustment of DM70 (page 68).

▶   1. After selecting **1-point adjustment**, press ⊖ **Select** to continue.

2. Set the probe to the reference temperature. You can follow the stabilization from the graph display by pressing ⊖ **Graph**. The minimum recommended stabilization time for this critical adjustment is 5 hours. When the reading has stabilized, press ⊖ **Ready**.

3. Use the arrow buttons to give the reference temperature and then press ⊖ **OK**.

4. Confirm the adjustment by pressing ⊖ **Yes**. If you press ⊖ **No**, you return to the adjustment mode display and no changes are made.

5. To exit the adjustment mode, press ⊖ **Back**.

6. To return to the basic display, press ⊖ **Exit**.

9.6.1.2 2-point adjustment

> This procedure is one of the alternative options for completing the adjustment described in Temperature adjustment of DM70 (page 68).

▶   1. After selecting **2-point adjustment**, press ⊖ **Select** to continue.

2. Set the probe to a lower reference temperature. You can follow the stabilization from the graphical display by pressing ⊖ **Graph**. When the reading has stabilized, press ⊖ **Ready**.

3. Use the arrow buttons to give the lower reference temperature value and then press ⊖ **OK**.

4. Set the probe to a higher reference temperature. You can follow the stabilization from the graphical display by pressing ⊖ **Graph**. When the reading has stabilized, press ⊖ **Ready**.

5. Use the arrow buttons to give the higher reference temperature value and then press ⊖ **OK**.

6. Confirm the adjustment by pressing ⊖ **Yes**. If you press ⊖ **No**, you return to the adjustment display and no changes are made.

> ℹ️ If the difference between the 2 references is less than 30 %, the adjustment cannot be done.

7. The adjustment is complete. To exit the adjustment mode, press ⊖ **Back**.

8. To return to the basic display, press ⊖ **Exit**.

9.6.2 Temperature adjustment of DMT340 series using DM70

DM70 can be used for making the temperature adjustment of DMT340 series transmitters.

> 💡 First carry out steps step 1 ... step 6. From step 6 onwards, choose one of the three alternative methods for completing the adjustment.

▶ 1. Turn off DM70.

2. Connect the cable 211339 between DMT340 (service port) and DM70 (connector I or II). Turn on both devices.

3. Press the ADJ button on the DMT340 component board to enable the adjustment mode.

4. From the list of parameters, select **$T_{I/II}$**.

5. At this point you need to select the adjustment method. If the reference probe is connected, three options are displayed: **To same as $T_{I/II}$** (see To same as T I/II (page 70)), **1-point adjustment** (see 1-point adjustment (page 71)) or **2-point adjustment** (see 2-point adjustment (page 71)).

6. You are prompted to check the settings: make sure that the pressure units of DM70 and DMT340 are the same. If not, change the unit by pressing ⊖ **Unit** on the corresponding row.

9.6.2.1 To same as $T_{I/II}$

> 💡 This procedure is one of the alternative options for completing the adjustment described in Temperature adjustment of DMT340 series using DM70 (page 70).

> ℹ️ This adjustment method automatically uses the reading of the reference probe as the reference value for making the adjustment.

▶ 1. After selecting **To same as T$_{I/II}$**, confirm the adjustment by pressing ⊖ **Yes**. If you press ⊖ **No**, a note is displayed on the screen reminding you to follow the adjustment procedure described in the *DMT340 User's Guide*. Press ⊖ **OK** and the adjustment mode display returns and no changes are made.

9.6.2.2 1-point adjustment

> 💡 This procedure is one of the alternative options for completing the adjustment described in Temperature adjustment of DMT340 series using DM70 (page 70).

▶ 1. After selecting **1-point adjustment**, press ⊖ **Select** to continue.

2. Set the probe to the reference temperature. You can follow the stabilization from the graphic display by pressing ⊖ **Graph**. When the reading has stabilized, press ⊖ **Ready**.

3. Use the arrow buttons to give the reference temperature value and press ⊖ **OK**.

4. Confirm the adjustment by pressing ⊖ **Yes**. If you press ⊖ **No**, you return to the adjustment mode display and no changes are made.

5. The adjustment is now complete. Press ⊖ **Back** to exit the adjustment mode.

6. To return to the basic display, press ⊖ **Exit**.

9.6.2.3 2-point adjustment

> 💡 This procedure is 1 of the alternative options for completing the adjustment described in Temperature adjustment of DMT340 series using DM70 (page 70).

▶ 1. After selecting **2-point adjustment**, press ⊖ **Select** to continue.

2. Set the probe to the lower reference temperature. You can follow the stabilization from the graphic display by pressing ⊖ **Graph**. When the reading has stabilized, press ⊖ **Ready**.

3. Use the arrow buttons to give the lower reference temperature value and press ⊖ **OK**.

4. Set the probe to the higher reference temperature. You can follow the stabilization from the graphic display by pressing ⊖ **Graph**. When the reading has stabilized, press ⊖ **Ready**.

5. Use the arrow buttons to give the higher reference temperature value and press ⊖ **OK**.

6. Confirm the adjustment by pressing ⊖ **Yes**. If you press ⊖ **No**, you return to the adjustment mode display and no changes are made.

> ℹ️ If the difference between the two references is less than 30 °C, the adjustment cannot be done.

7. The adjustment is now complete. Press ⊖ **Back** to exit the adjustment mode.

8. To return to the basic display, press ⊖ **Exit**.

10. **Technical data**

10.1 DM70 and DMP74 specifications

Table 6   DM70 handheld meter general specifications

Property	Description/value
Storage temperature	−40 ... +70 ˚C (−40 ... +158 ˚F)
Storage humidity range	0 ... 100 % non-condensing
Housing material	ABS/PC blend
Total weight	750 g (26 oz)
Electromagnetic compatibility	Complies with the following standard: EN 61326-1:1997 +Am 1:1998, Electrical equipment for measurement, control, and laboratory use - EMC requirements: Basic environment.

Table 7   DMP74A, DMP74B, and DMP74C measurement performance

Property	Description/value
Dew point temperature	
Measurement range	DMP74C: −70 ... +30 ˚C (−94 ... +86 ˚F) DMP74A: −50 ... +60 ˚C (−58 ... +140 ˚F) DMP74B: −70 ... +30 ˚C (−94 ... +86 ˚F)
Accuracy	±2 ˚C (±3.6 ˚F), see the accuracy graphs below
Dew point range for ±2 ˚C. Accuracy for pressure converted dew point (dew point measured in pressure, calculated to 1 atm dew point value)	DMP74A: −64 ... +60 ˚C (−83 ... +140 ˚F) DMP74B: −80 ... +20 ˚C (−112 ... +68 ˚F) DMP74C: −72 ... +20 ˚C (−98 ... +68 ˚F)
DMP74A:	
Response time: 63 % (90 %) at flow rate 0.2 m/s, 1 bar absolute pressure, +20 ˚C	
0 ... −40 ˚C T_d (+32 ... +40 ˚F T_d)	20 s (120 s)
−40 ... ˚C T_d (−40 ... +32 ˚F T_d)	10 s (20 s)
DMP74B/DMP74C:	
Response time: 63 % (90 %) at flow rate 0.2 m/s, 1 bar absolute pressure, +20 ˚C	
0 ... −60 ˚C T_d (+32 ... −76 ˚F T_d)	50 s (340 s)

| Property	Description/value
−60 ... 0 ˚C T_d (−76 ... +32 ˚F T_d)	10 s (20 s)
Temperature	
Measurement range	−10 ... 60 ˚C (14 ... 140 ˚F)
Accuracy at +20 ˚C (+68 ˚F)	±0.2 ˚C (±0.36 ˚F)
Typical temperature dependence of electronics	±0.005 ˚C/˚C (±0.005 °F/°F)
Temperature sensor	Pt100 IEC751 1/3 class B
PPM (ppm_v or ppm_w)	
Measurement range (typical)	DMP74A: 40 ... 200000 ppm
	DMP74B/DMP74C: 10 ... 20000 ppm
Accuracy at +20 ˚C (+68 ˚F):	
< 40 ppm	±(0.5 ppm + 25.4 % of reading)
> 40 ppm	±(7.3 ppm + 8.3 % of reading)
Absolute humidity (DMP74A probe recommended)	
Measurement range (typical)	0.5 ... 100 g/m^3 (0.2 ... 40 gr/ft^3)
Accuracy	±(0.2 g/m^3 + 10 % of reading)
	±(0.1 gr/ft^3 + 10 % of reading)
Mixing ratio (DMP74A probe recommended)	
Measurement range (typical)	0.2 ... 100 g/kg (2 ... 700 gr/lbs)
Accuracy	±(0.1 g/kg + 12 % of reading)
	±(0.8 gr/lbs + 12 % of reading)
Relative humidity (DMP74A)	
Measurement range	0 ... 100 %
Accuracy at +20 ˚C (+68 ˚F)	RH < 5 %: ±(0.025 % RH + 17.5 % of reading)
	RH > 5 %: ±(0.8 % RH + 2 % of reading)
Measurement environment	
Temperature	−10 ... +60 ˚C (+14 ... +140 ˚F)
Pressure	DMP74A: 0 ... 20 bar_a (0 ... 290 psi_a)
	DMP74B: 0 ... 20 bar_a (0 ... 290 psi_a)
	DMP74C: 0 ... 10 bar_a (0 ... 150 psi_a)
Sample flow rate	No effect on dew point accuracy
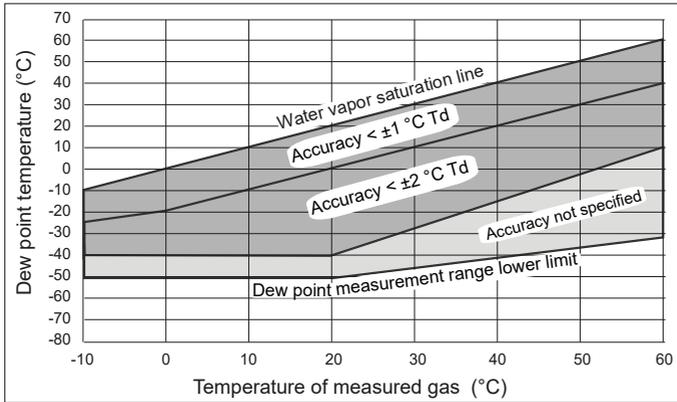
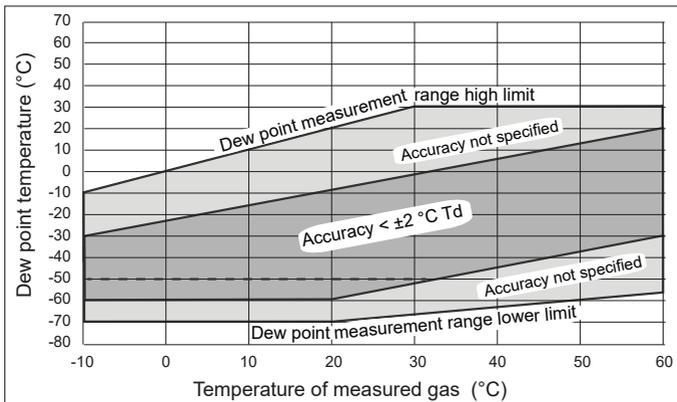Figure 28   DMP74A dew point accuracy vs. measurement conditions

Figure 29   DMP74B and DMP74C dew point accuracy vs. measurement conditions

Dashed line: For DMP74C the ±2 °C accuracy range is limited to −50 °C T_d when used in SF_6 gas.

Table 8   DMP74A, DMP74B, and DMP74C general specifications

Property	Description/value
Sensor	DMP74A: Vaisala DRYCAP® 180S DMP74B/DMP74C: Vaisala DRYCAP® 180M
Probe material (wetted parts)	Stainless steel (AISI 316L)
Sensor protection	Sintered filter, (AISI 316L), item No. HM47280SP

Property	Description/value
Mechanical connection	G1/2″ ISO2281 thread with bonded seal ring (U-seal)
Housing classification	IP65 (NEMA4)
Storage temperature	−40 ... +70 ˚C (−40 ... +158 ˚F)
Storage humidity	0 ... 100 %RH non-condensing
Weight	350 g (12 oz)

Table 9   DMP74A, DMP74B, and DMP74C mechanical specifications

Property	Description/value
Materials	
Probe housing material	PET plastic
Filter	PTFE membrane, PET plastic grid
Connector	Nickel plated brass, M12 5-pin
Housing classification, probe body	IP65
Connector	M12 5-pin male
Weight, probe head	45 g (1.6 oz)
Dimensions	
Probe diameter	25 mm (0.98 in)
Probe length	96 mm (3.8 in)

Table 10   Sampling cell specifications

Property	Description/value
DMT242SC sampling cell	
Inlet/outlet thread	ISO G 3/8″/G 1/4″
Pressure limit	10 MPa, 100 bar_g, 1450 psi_g
Material	Stainless steel AISI316
Weight	220 g (7.8 oz)
DMT242SC sampling cell with Swagelok connectors	
Inlet/outlet thread	1/4″ Swagelok connectors (for 1/4″ tubing)
Pressure limit	4 MPa, 40 bar_g, 580 psi_g
Material	Stainless steel AISI316

Property	Description/value
Weight	285 g (10 oz)
DSC74 sampling cell for pressurized gases	
Quick connector	Type D/NIP08
Leak screw	Screwdriver operated
Inlet/outlet thread	ISO G 3/8″/G 1/4″
Thread adapters included	A) ISO G 3/8″ to G 1/4″ (female)
	B) ISO G 3/8″ to G 1/2″ (male)
Pressure limit	1 MPa, 10 bar$_g$, 145 psi$_g$
Material	Stainless steel AISI316
Weight	300 g (11 oz)
DSC74B 2-pressure sampling cell	
Inlet/outlet thread	ISO G 3/8″/G 3/8″
Flow adjustment	Manually operated
Pressure limit	1 MPa, 10 bar$_g$, 145 psi$_g$
Material	Stainless steel AISI316
Weight	390 g (14 oz)
DSC74C	
DSC74C is a sampling cell that combines DSC74B with DMCOIL cooling/venting coil.	
DMCOIL	
Coil pipe size	6 mm (0.24 in)
Connection to sampling cell	With ISO G 1/4″ and G 3/8″ thread adapter
Weight	130 g (4.6 oz)
DSS70A sampling system	
Measuring range	−60 ˚C (−76 ˚F) T_d ... T_{amb} (max T_{amb} +40 ˚C (+104 ˚F) T_d)
Operating gases	Air, N_2, non-toxic gases, non-flammable, inert gases
Inlet/outlet connection	1/4″ SWAGELOK
Operating temperature	Ambient temperature: 0 ... +40 ˚C (+32 ... +104 ˚F)
	Gas temperature: max 200 ˚C (392 ˚F) with 2 m (6.6 ft) PTFE tube at 20 ˚C (68 ˚F)

Property	Description/value
Operating pressure	With pump: 0.6 ... 1.2 bar$_a$ (8.7 ... 17.4 psi$_a$) Pump disconnected: 0 ... 20 bar$_a$ (0 ... 290 psi$_a$)
Battery operation time for pump	8 h continuous
Filter	7 mm (0.28 in) inline filter, 1/4″ SWAGELOK SS-4F-7
Wetted parts	Stainless steel
Carrying case	ABC plastic
Weight	5.5 kg (12 lbs.)
Fuse ratings	Glass tube fuse 5 × 20 mm T 2A/250 VAC (Manufacturer: Littlefuse 218002)

10.2 MI70 specifications

Table 11   MI70 measurement indicator

Property	Description/Value
Operating environment	
Operating temperature	−10 ... +40 °C (+14 ... +104 °F)
Operating humidity	0 ... 100 %RH, non-condensing
Storage temperature	−40 ... +70 °C (-40 ... +158 °F)
Inputs and outputs	
Max. no of probes	2
PC interface	MI70 Link software with USB or serial port cable
Analog output	0 ... 1 VDC
Power supply	Rechargeable NiMH battery pack with AC adapter or 4 × AA size alkalines, type IEC LR6
Output resolution	0.6 mV
Accuracy	0.2 % full scale
Temperature dependence	0.002 %/˚C (0.01 %/˚F) full scale
Minimum load resistor	10 kΩ to ground
Mechanical specifications	
Housing classification	IP54
Housing materials	ABS/PC blend

Property	Description/Value
Weight	400 g (14 oz)
Compatibility	
EMC compliance	EN 61326-1, portable equipment
Other	
Menu languages	English, Chinese, Spanish, Russian, French, Japanese, German, Swedish, Finnish
Display	• LCD with backlight • Graphic trend display of any parameter • Character height up to 16 mm (0.63 in)
Alarm	Audible alarm function
Data logging capacity	2700 real time data points
Logging interval	1 s to 12 h
Logging duration	1 min ... memory full
Resolution	0.01 %RH, 0.01 °C/°F, 0.01 hPa, 0.01 a_w, 10 ppm / 0.01 %CO_2

Table 12   MI70 battery operation time

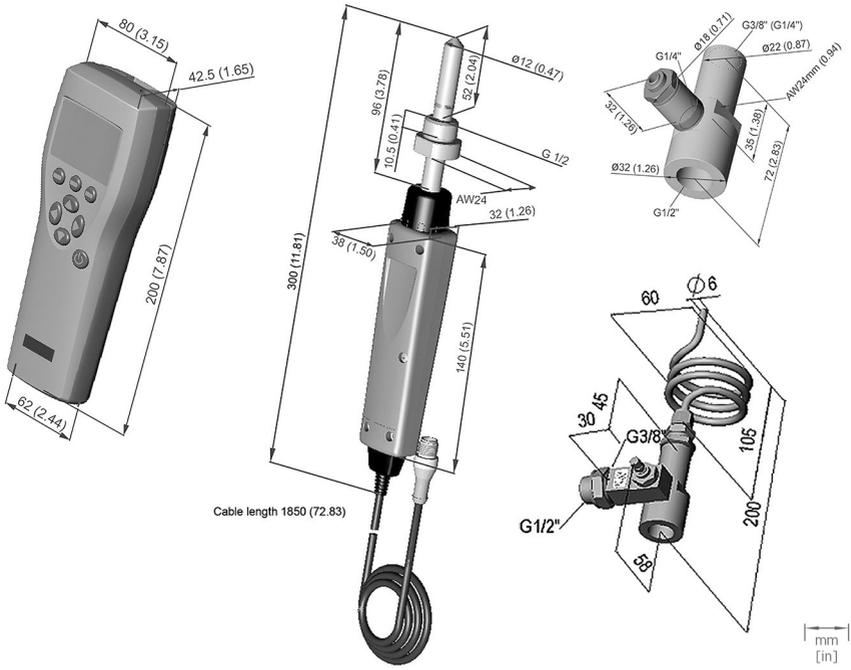| Property	Value/Description
Typical charging time	4 hours
Operation times	
Continuous use	48 h typical at +20 ˚C (+68 °F)
Data logging use	Up to a month

10.3 Dimensions

Figure 30   Dimensions of MI70 indicator, DMP74 probe, DSC74 sampling cell, and DSC74C sampling cell (left to right and top to bottom)

10.4 Spare parts and accessories

ℹ️ Information on spare parts, accessories, and calibration products is available online at www.vaisala.com and store.vaisala.com.

Table 13   DM70 spare parts and accessories

Description	Item code
AC adapters	
Euro AC adapter	MI70EUROADAPTER
UK AC adapter	MI70UKADAPTER

Description	Item code
US AC adapter	MI70USADAPTER
AUS AC adapter	MI70AUSADAPTER
MI70 All adapter	MI70ALLADAPTER
Sampling	
Portable sampling system with case	DSS70A
Sampling cell	DMT242SC
Sampling cell with Swagelok connectors	DMT242SC2
Sampling cell for pressurized gases	DSC74
Two pressure sampling cell	DSC74B
Two pressure sampling cell with venting coil	DSC74C
Cooling/venting coil for sampling cells	DMCOIL
Cables	
Analog output signal cable	27168ZZ
Connection cable for DMT152, DMT132, DMT143, DPT145, and DPT146 transmitters	219980SP
Probe extension cable (10 m (33 ft))	213107SP
Connection cable for DMT242	27160ZZ
Connection cable for DMT340 series	211339
Carrying cases	
Weatherproof hard plastic carrying case	MI70CASE3
Soft carrying case	MI70SOFTCASE
Probe accessories	
Sintered filter for the probe	HM47280SP
Bonded seal ring	26230
Others	
Measurement indicator	MI70
USB PC connection cable (for use with MI70 Link software) [1]	219687
Filter for DSS70A	210801
Rechargeable battery for MI70	26755
Rechargeable battery for DSS70A	DSS70BAT

Description	Item code
Service kit for DSC74 (all versions)	DSC74SERVICEKIT

1) *Vaisala MI70 Link software for Windows is available at www.vaisala.com/mi70link.*

Maintenance and calibration services

Vaisala offers comprehensive customer care throughout the life cycle of our measurement instruments and systems. Our factory services are provided worldwide with fast deliveries. For more information, see www.vaisala.com/calibration.

- Vaisala Online Store at store.vaisala.com is available for most countries. You can browse the offering by product model and order the right accessories, spare parts, or maintenance and calibration services.
- To contact your local maintenance and calibration expert, see www.vaisala.com/contactus.

Technical support

Contact Vaisala technical support at helpdesk@vaisala.com. Provide at least the following supporting information as applicable:

- Product name, model, and serial number
- Software/Firmware version
- Name and location of the installation site
- Name and contact information of a technical person who can provide further information on the problem

For more information, see www.vaisala.com/support.

Warranty

For standard warranty terms and conditions, see www.vaisala.com/warranty.
Please observe that any such warranty may not be valid in case of damage due to normal wear and tear, exceptional operating conditions, negligent handling or installation, or unauthorized modifications. Please see the applicable supply contract or Conditions of Sale for details of the warranty for each product.

Recycling

Recycle all applicable material.

Follow the statutory regulations for disposing of the product and packaging.

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