Introduction to DM70

Vaisala DRYCAP® Handheld Dew Point Meter DM70 measures dew point temperature accurately in measurement range −60 °C … +60 °C (−76 … +140 °F), depending on the probe model. DM70 consists of 2 main units: the MI70 indicator and DMP74 probe, models A, B, or C.

DM70 can be used with an optional sampling cell to measure process dew point. It can also be used as a tool for reading the output of fixed Vaisala dew point transmitters, such as DMT242, DMT132, DMT143, DMT152, and DMT340.

DM70 measures the following parameters:

Table 1. 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

This Quick Guide introduces the features of the MI70 indicator and the basic measurement procedure with the DM70 meter.

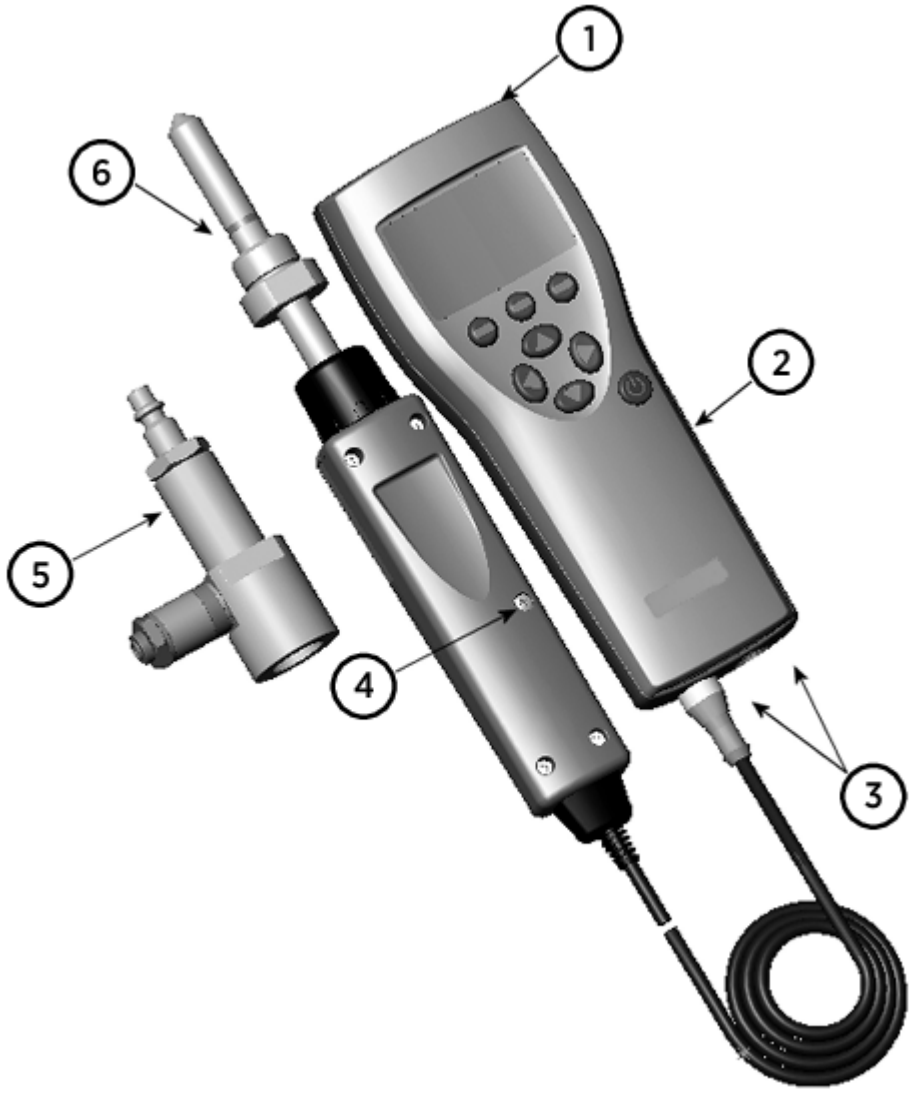
For the full DM70 operating instructions, specifications, and more information on sampling cells, download *DM70 User Guide* (M010091EN) from www.vaisala.com/dm70.

[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.

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

Measurement in dry environments

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

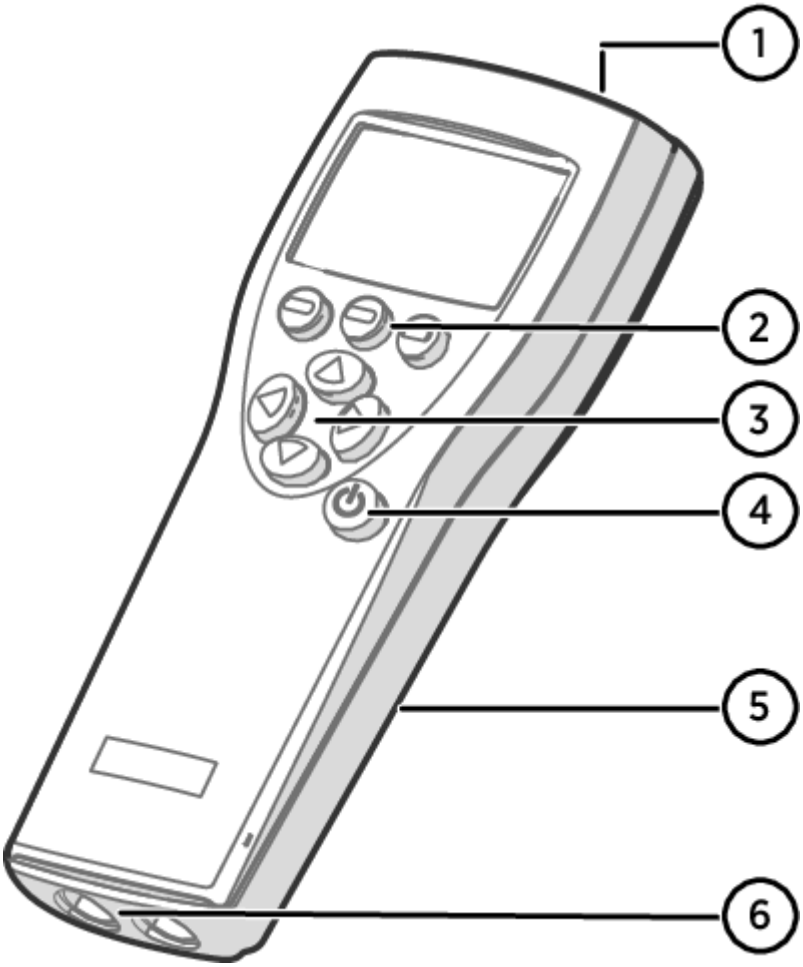
- A clean environment is always best for humidity measurements.
- The number of connections should be minimized to avoid leaks.
- The flow rate must be adequate.
- Dead ends must be avoided as they cannot be flushed easily.
- The tube temperature must never lie under the dew point of the sample gas. 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.

MI70 indicator

Vaisala MI70 handheld indicator is a portable tool for viewing the measurements, recording the data, and configuring the settings of connected Vaisala instruments. MI70 indicators can be used with a wide range of Vaisala instruments, and are also delivered as part of the probe and indicator product packages DM70, GM70, HM70, and MM70.

MI70 indicator parts

Figure 1. MI70 indicator parts



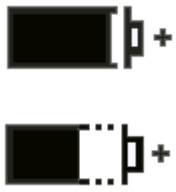
1 Charger socket
2 Function key shortcut buttons. The functions change according to what you are doing with the indicator.
3 Arrow buttons:
   - Move up in a menu
   - Move down in a menu
   - Enter a sub-menu
   - Return to previous menu level
4 Power On/Off button
5 Battery compartment at the back 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.

MI70 status icons

Table 1. MI70 status iconsIcons 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.

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. 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).
	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.

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.

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 Table 1.

To recharge the rechargeable battery:

1. Plug in the charger connector to the MI70 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.

A new battery takes approximately 3 charging cycles to reach its maximum capacity.

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

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

Taking measurements

MI70 first start-up settings

When taking MI70 into use for the first time, configure the basic settings (language, date, and time) as instructed below.

1. Press the **Power On/Off** button in MI70 to switch the indicator on.
2. Press any of the arrow buttons and open the menu by pressing Open.
3. Select Settings using the buttons and press .
4. Select User interface and press .
5. Select Language and press Set.
6. Select the language using the buttons. Confirm the selection by pressing Select.
7. To set the date, return to the Settings menu by pressing .
8. Select Date and press Set. Change the date using the buttons. To confirm the selection, press Select.

   To select an alternative date format, select Date format and press Set. You can select from 3 alternative formats. Press Select to confirm the selection.

9. To set the time, return to the Settings menu by pressing
10. Select Time and press Set. 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 press On.
11. To return to the basic display, press Exit.

Basic measuring steps with DM70

If measuring in a pressurized process, see Sampling cells.

Before taking measurements, make sure that the air pressure settings of DM70 are correct and that autocalibration has taken place. See Configuring pressure settings and Autocalibration.

1. Remove the yellow transport protection cap from the probe head.
2. With the MI70 indicator **power switched off**, connect the probe cable to either of the connector ports of MI70.

   Rotate the metal ring around the cable connector clockwise until it tightens up.

3. Switch MI70 on by pressing the **Power On/Off** button.
4. Install the probe in the measurement environment.
5. The basic display opens. Let the measurement reading stabilize.
6. For options on recording measurement data or examining the data as a graph, see User interface.

CAUTION! Handle the probe carefully. Strong impact or falling can damage the probe.

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

When disconnecting the cable, first loosen the metal ring by turning it counterclockwise and then pull out the connector.

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.

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.

Autocalibration

To obtain the best possible accuracy in measurements taken in dry environments, DM70 has built-in automatic calibration. During autocalibration, DM70 adjusts the dry end reading to correspond to the calibrated values.

By 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).

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. You can start autocalibration manually in the Functions menu of the MI70 indicator.

For more information on autocalibration, see *DM70 User Guide* (M010091EN).

Sensor purge

The sensor purge feature is available in the DMP74B and DMP74C probes. Sensor purge is an automatic procedure in which the sensor is dried. This improves sensor response time when installing the probe from an ambient to dry gas. Together with autocalibration it will also ensure the best measurement accuracy and long-term stability.

By default, sensor purge is turned on automatically in DM70, and it is recommended not to turn it off. The purge is performed if humidity changes significantly or quickly and if the dew point is low enough. 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 a set interval (the default is 24 hours).

If automatic sensor purge has been turned off, the purge should be started manually if it has not been performed during the last 24 hours. You can start sensor purge manually in the Functions menu of the MI70 indicator.

For more information on sensor purge, see *DM70 User Guide* (M010091EN).

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 sampling cells:

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

The principle of using a sampling cell in process measurements is described in Connecting to pressurized processes using DSC74 sampling cell. Detailed information about the features of different sampling cell models is available in the *DM70 User Guide* (M010091EN).

Connecting to pressurized processes using DSC74 sampling cell

- PTFE tape
- Adjustable wrench
- Flat head screwdriver

DSC74 is a Vaisala sampling cell for connecting DM70 to pressurized processes (optional accessory).

DSC74 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.

To connect to a pressurized process using DSC74:

1. Check that the DM70 pressure setting is correct (same as the process pressure). For instructions, see Configuring pressure settings.
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 sampling cell threads. Tighten the fitting with a wrench.
5. Connect the sampling 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 sampling 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 1. Turning sampling cell valve screw with flat head 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 sampling cell is installed correctly, there is no leakage in the connections. You can test this by closing the valve temporarily.

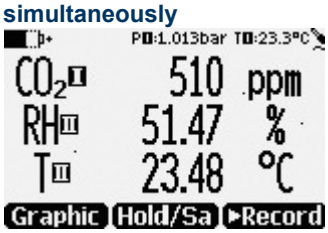
CAUTION! Do not open the leak screw more than 1/2 turn to limit the pressure drop in the sampling cell. If the pressure drops too much, measurement accuracy can be affected significantly.

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 in 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.

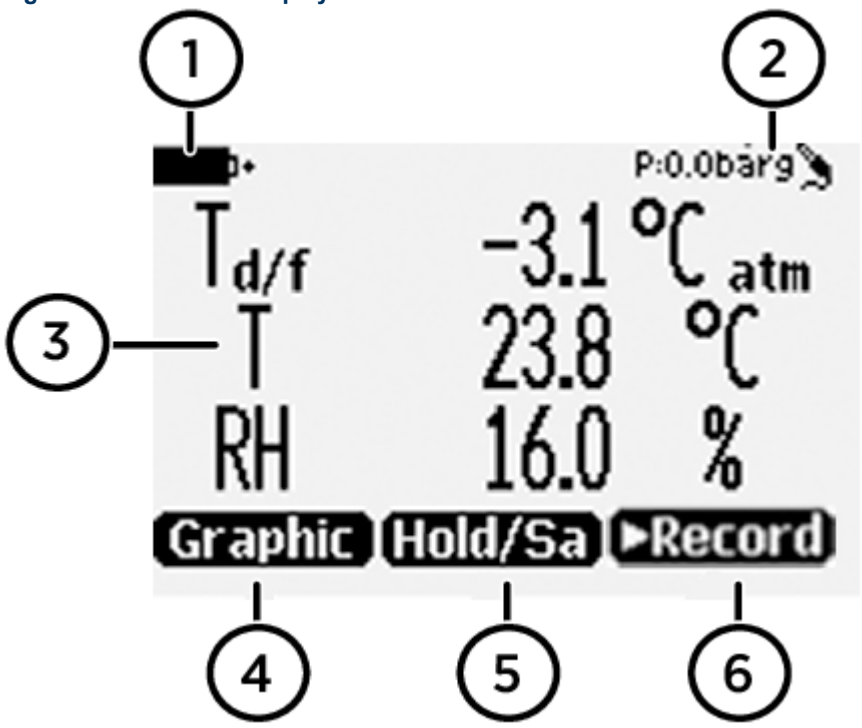
Figure 1. Display example with carbon dioxide and temperature and humidity probes connected simultaneously



User interface

Basic display

Figure 1. 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.

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.

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.

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 1. Main menu and Display menu

Figure 2. Functions menu for DMP74A (left) and DMP74B/C (right)

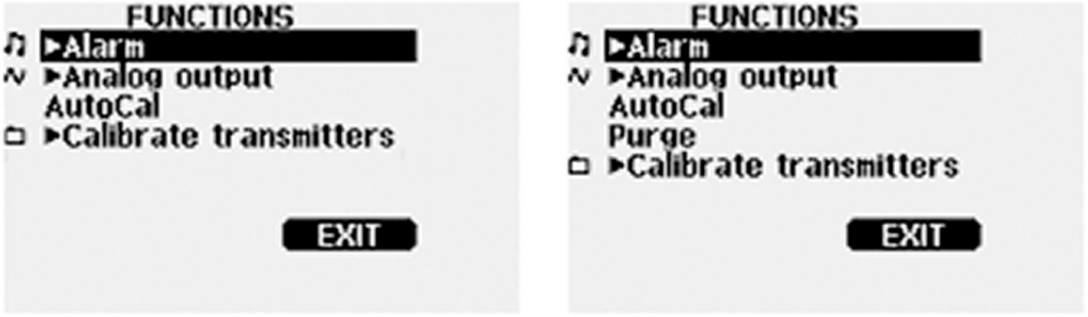


Figure 3. Recording/Viewing menu and Environment menu

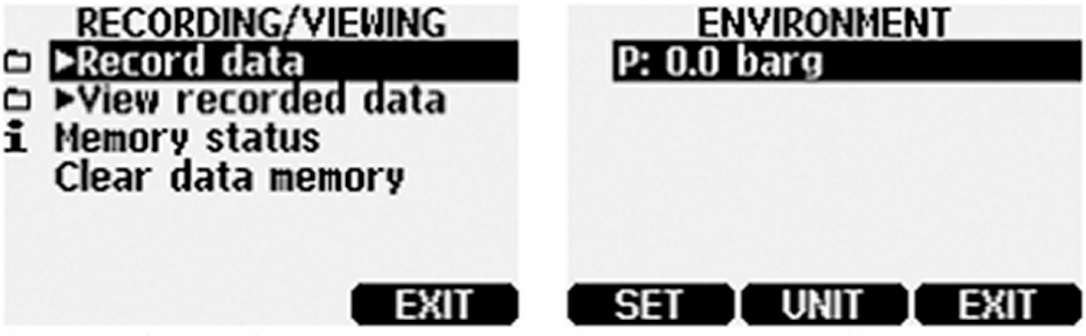


Figure 4. Settings menu


SETTINGS
▶User interface
▶Date and time
▶Measurement settings
Device information
Factory settings
EXIT

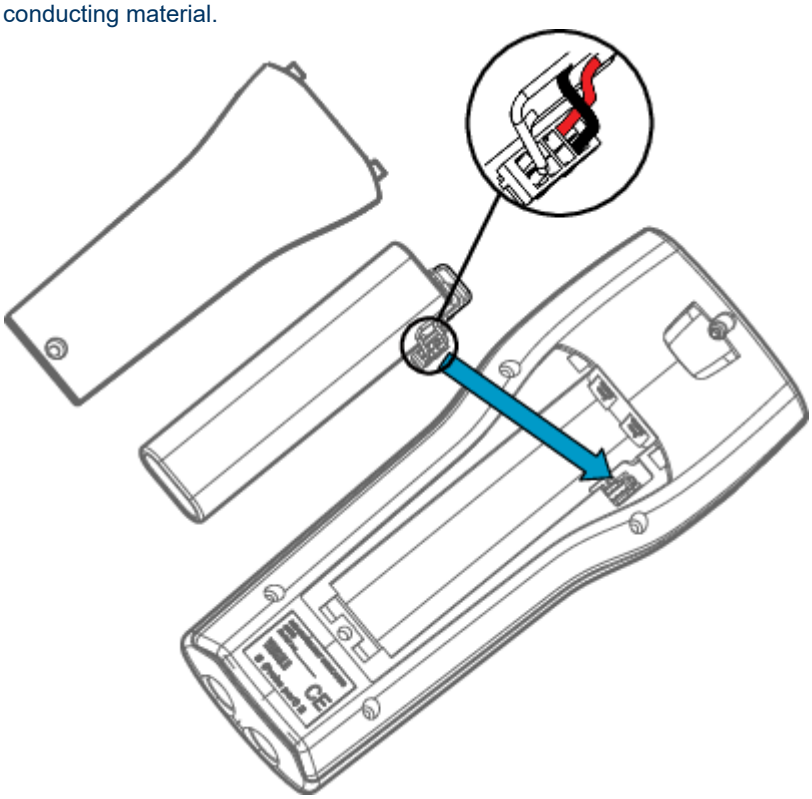
Maintenance

Changing the rechargeable battery pack

- New rechargeable battery pack
- Medium-sized flat head screwdriver

In case you are installing a rechargeable battery pack in the MI70 indicator 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.

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.