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USER GUIDE

HMP80

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M212903EN-A

User Guide

Vaisala Handheld Humidity and Temperature Probes

HMP80 Series



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Vaisala Oyj
Vanha Nurmijärventie 21, FI-01670 Vantaa, Finland
P.O. Box 26, FI-00421 Helsinki, Finland
+358 9 8949 1
www.vaisala.com
docs.vaisala.com

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1. About this document

1.1 Version information

This document provides instructions for using and maintaining Vaisala HMP80 HUMICAP® Handheld Humidity and Temperature Probes.

Table 1 Document versions (English)

Document code	Date	Description
M212903EN-A	June 2023	First version.

1.2 Related manuals



For the latest versions of these documents, see docs.vaisala.com.

Table 2 Related manuals

Document code	Name
M212722EN	Vaisala Indigo80 Handheld Indicator User Guide
M212904EN	Vaisala DMP80 Series Handheld Probes User Guide
M212804EN	Vaisala DMP80 Series Handheld Probes Quick Guide
M212803EN	Vaisala HMP80 Series Handheld Probes Quick Guide
M210185EN	Vaisala HMK15 Humidity Calibrator User 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.

1.4 Trademarks

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

Microsoft® and Windows® are either registered trademarks or trademarks of Microsoft Corporation in the United States and other countries.

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2. Product overview

Vaisala HUMICAP® Handheld Humidity and Temperature Probes HMP80 Series have been designed for portable spot-checking, field calibration, and data logging use with the Indigo80 handheld indicator. For easy access to device analytics and configuration, HMP80 probes can be connected to Vaisala Insight software for Windows®.

The HMP80 series probes are available in two lengths offering similar measurement performance. The longer model (HMP80L) is designed for measurements in more extreme temperatures.

The IP66-classified probe handle offers protection against moisture and dust with the probe connection cable attached. Also the cable connection is protected against mechanical stress by the robust design of the handle.

For more information on the Indigo product family, see www.vaisala.com/indigo.

The free Insight PC software is available for download at www.vaisala.com/insight.

2.1 Basic features and options

- Portable design optimized for industrial spot-checking and field calibration
- Wide temperature measurement range
- Condensation-tolerant
- Sensor purge improves long-term stability and chemical resistance
- Compatible with Indigo80 handheld indicator and Insight PC software

More information

- Indigo80 handheld indicator (page 18)
- Vaisala Insight PC software (page 26)

2.2 HMP80N and HMP80L probe models

Both HMP80 series probe models have the same type of sensor, Vaisala HUMICAP® R2C, with sensor purge and sensor warming functionality.

Table 3 HMP80N and HMP80L temperature ranges

Property	HMP80N	HMP80L
Relative humidity measurement range	0 … 100 %RH	
Temperature measurement range	−20 … +60 °C (−4 … +140 °F)	−50 … +120 °C (−58 … +248 °F), short-time measurement range −50 … +180 °C (−58 … +356 °F)

Property	HMP80N	HMP80L
Operating temperature of probe head	−20 ... +60 °C (−4 ... +140 °F)	−50 ... +120 °C (−58 ... +248 °F)
Operating temperature of probe body	−10 ... +60 °C (−14 ... +140 °F)	

The identifying letter of each probe model is included in the configuration code of the probe, shown on the side of the device. Example codes: **N**1A1S0 for an HMP80N probe, and **L**1A1S0 for an HMP80L probe.

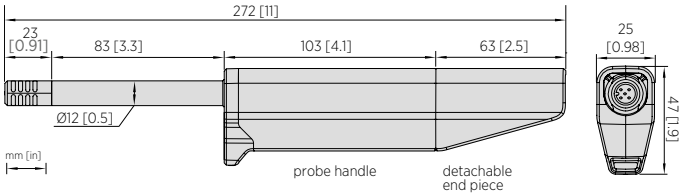


Figure 1 HMP80N dimensions, side and bottom view

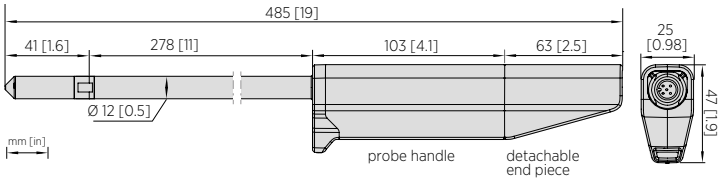


Figure 2 HMP80L dimensions, side and bottom view

2.3 Output parameters

Values of all available output parameters are locked (showing the latest valid value) when sensor purge or condensation prevention functions are active.

Table 4 HMP80 series output parameters

Output parameter name and unit	
Absolute humidity (g/m^3)	Relative humidity (%RH)
Absolute humidity at NTP (g/m^3)	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)

Output parameter name and unit	
Dew/frost point temperature (°C)	Water concentration (ppm_v)
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm_w)
Dew point temperature difference (°C)	Water vapor pressure (hPa)
Enthalpy (kJ/kg)	Water vapor saturation pressure (hPa)
Mixing ratio (g/kg)	Wet-bulb temperature (°C)

More information

- HMP80 specifications (page 42)

2.4 Probe structure

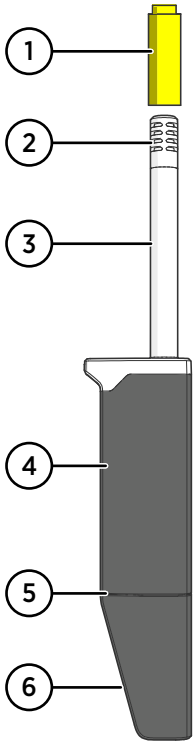


Figure 3 Probe parts (model HMP80N shown)

1 Protection cap (remove before use)
2 Location of sensors on the probe head, inside a removable filter [1)]
3 Probe shaft
4 Probe handle with type label. Contains component board and electronics housing.
5 M12-5M A-coded connector (inside the probe handle)
6 Detachable end piece of the probe handle, protecting the cable connector inside the handle

1) The HUMICAP® R2C sensor used in HMP80 series probes is not user-replaceable. To have the sensor replaced, contact a Vaisala Service Center.

More information

- Recycling instructions (page 48)
- Maintenance and calibration services (page 51)

2.5 Safety

WARNING! When returning a product for calibration or repair, make sure it has not been exposed to dangerous contamination, and is safe to handle without special precautions.

CAUTION! Do not attempt to open the solid part of the probe handle. There are no user serviceable parts inside the probe handle.

CAUTION! Do not touch the probe head with your bare hands. Touching will deposit impurities on the probe head.

CAUTION! Be aware that the probe head may become hot to touch when condensation prevention warming or sensor purge functions are active.

2.6 ESD protection

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

To avoid delivering high static voltages to the product:

- Handle ESD-sensitive components on a properly grounded and protected ESD workbench or by grounding yourself to the equipment chassis with a wrist strap and a resistive connection cord.
- If you are unable to take either precaution, touch a conductive part of the equipment chassis with your other hand before touching ESD-sensitive components.
- Hold component boards by the edges and avoid touching component contacts.

3. Functional description

3.1 HUMICAP technology

Vaisala HUMICAP® is a capacitive thin-film polymer sensor consisting of a substrate on which a thin film of polymer is deposited between two conductive electrodes. The sensing surface is coated with a porous metal electrode to protect it from contamination and exposure to condensation. The substrate is typically glass or ceramic.

The thin-film polymer either absorbs or releases water vapor as the relative humidity of the measurement environment rises or falls. The dielectric properties of the polymer film depend on the amount of absorbed water. As the relative humidity around the sensor changes, the dielectric properties of the polymer film change, and so does the capacitance of the sensor. Capacitance is converted into a humidity reading. The HUMICAP sensor is complemented by a temperature sensor, which is bonded together with the capacitive polymer on some of the sensor variants. Additional output parameters such as dew point are calculated from the readings measured by the sensors.

HUMICAP sensors with bonded temperature sensors are also known as **composite sensors**. Probes with composite sensors can use the **sensor purge** function to maintain sensor performance. They also implement **condensation prevention** functions that are a key element in achieving an excellent stability and good condensation resistance in high humidity applications.

3.2 Sensor purge

Sensor purge heats the sensor to a high temperature, which evaporates excess molecules out of the sensor polymer. This minimizes the drift at the wet end of humidity readings, and removes contaminants from the sensor element. The heating phase is followed by a cooling phase where the sensor cools down to ambient temperature.

During sensor purge the values of the output parameters stay frozen at their last measured values. Sensor purge takes a few minutes to complete, after which measurement continues normally and updated values of output parameters are again available.

HMP80 series probes perform the purge at one day intervals (known as **interval purge**). If desired, sensor purge can also be performed when the probe is powered on (known as **startup purge**). Purge settings can be configured with the Insight PC software or the Indigo80 handheld indicator.



To allow the sensor purge to be completed in a reasonable time, it will not be started if the ambient temperature is below 0 °C (+32 °F).

3.3 Condensation prevention functions

Condensation prevention prevents water from condensing on the sensor and interfering with humidity measurement. Use of condensation prevention is controlled by a single setting that can be changed with the Insight software or the Indigo80 handheld indicator.

By default, condensation prevention is off.

When condensation prevention is enabled, the probe will automatically use its available condensation prevention functions. When warming is active, values of output parameters that depend on temperature measurement (for example, relative humidity) are unavailable, unless the temperature compensation setting is set to read the temperature from an external source. Output parameters that can be measured or calculated without this external temperature information, such as dew point temperature, are available even without the temperature input.

Sensor warming

The sensor warming feature of the condensation prevention function is intended for improving the condensation tolerance of HMP80 probes. It warms the humidity sensor when necessary to keep its temperature above the dew point of the measurement environment. When sensor warming is activated, all temperature-dependent output parameters become unavailable, unless the temperature compensation setting is set to read the temperature from an external source. The output parameters become available again 4 minutes after the warming is stopped.

Sensor warming is intended for improving the condensation tolerance of the probe in measurement environments that may occasionally cause condensation to form. It is not intended for environments where continuous warming is needed.

3.4 Environmental compensation

Environmental compensations improve the measurement accuracy of the probe. You can configure the settings with the Insight software or the Indigo80 handheld indicator.

Pressure compensation

The pressure of the measured environment affects the accuracy of humidity calculations, especially calculations that are dependent on pressure (for example, mixing ratio). To achieve accurate output of all humidity parameters, you are recommended to update the value of the pressure compensation setpoint to match the environmental pressure when installing the probe.

For example, when you install the probe in a process with a pressure differing from normal atmospheric pressure, update the correct pressure into the pressure compensation setpoint parameter or register of the probe using the Insight software or the Indigo80 handheld indicator.

The entered value is persistent and remains unchanged at device restart.

Temperature compensation

You need to set an external source for the temperature compensation setpoint if the sensor warming feature of the condensation prevention function prevents the probe's own temperature measurement, and the output parameters that require temperature information to be known are required.

When warming is active, values of output parameters that depend on temperature measurement (for example, relative humidity) are unavailable, unless temperature information is read from an external source. Output parameters that can be measured or calculated without this external temperature information, such as dew point temperature, are available even without the temperature input.

The external temperature source can be another probe that is connected to the same Indigo80 handheld indicator as your probe.

To get the most accurate measurement values, the external source needs to be able to provide the temperature compensation setpoint value constantly in real time, and the value needs to correspond to the temperature of the probe's measurement environment as accurately as possible. A suitable measurement point is as close to the probe as possible, but yet far enough so that ongoing condensation prevention warming of the probe does not have an effect on the measured value.

At device restart, the value is cleared.

More information

‣ Configuring environment settings with Indigo80 handheld indicator (page 24)

3.5 Filtering factor

The filtering factor determines how quickly the results of measurement cycles are reflected in values of output parameters. You can use the filtering factor to slow down the response time of the measurement, filtering out rapid changes and measurement noise.

- Maximum value (1) = No filtering, fastest measurement. Output shows 100 % of the most recent measured value.
- Less than maximum value = Filtering is applied and measurement response time is reduced. For example, defining a value that is 90 % of the maximum value means that the filtered output reading = 90 % of the most recent measured value + 10 % of the previous reading.

Filtering factor settings can be configured with the Insight software or the Indigo80 handheld indicator.

More information

‣ Example of configuring filtering factor with Indigo80 handheld indicator (page 23)

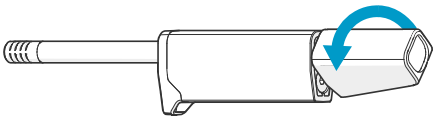
4. Attaching cable to probe

- Probe connection cable (Vaisala item code 272075SP)

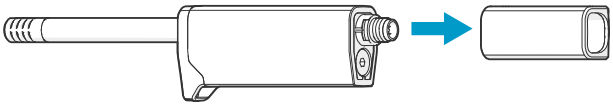
The handle of HMP80 probes has a detachable end piece that protects the probe's cable connector from mechanical stress, such as physical shocks.

To detach the end piece of the handle and expose the cable connector:

1. Hold the probe firmly in your hands.
2. Grip the end piece of the handle and twist it counterclockwise to detach it.



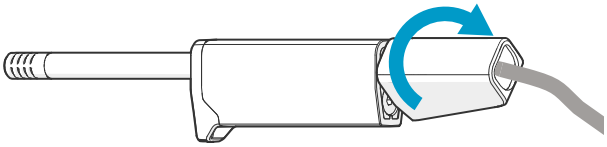
3. Pull out the end piece.



4. You can now attach a probe connection cable in the HMP80 probe's cable connector.

Before attaching the cable, make sure to insert the cable through the end piece first.

5. Position the end piece against the probe and twist it clockwise to secure it into place.





The probe is delivered with a yellow cap protecting the filter. Leave the protection cap on during storage, but remove it before taking the probe into use.

5. Using probe with Indigo80 handheld indicator

5.1 Indigo80 handheld indicator

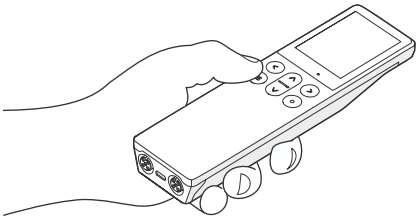


Figure 4 Indigo80 handheld indicator

Vaisala Indigo80 Handheld Indicator is a portable diagnostics tool that accommodates up to two Vaisala Indigo-compatible probes or transmitters for measuring a wide range of parameters.

With the indicator, you can:

- See real-time measurements and device and status information
- Log measurement data
- Calibrate and adjust the probe
- Configure probe features and settings such as condensation prevention, compensation setpoints, sensor purge, and filtering factor. The available features and settings depend on the probe model and firmware version.

Accessing certain configuration options for your probe requires using the free Insight PC software, downloadable at www.vaisala.com/insight.

The help tours in the indicator's user interface guide you through the key features of the indicator. You can access the tours in the **Help** menu by pressing the ☰ button.

For more information on using the indicator, for example, editing the measurement views and performing data logging, see Indigo80 User Guide (M212722EN).

5.1.1 Indigo80 keypad

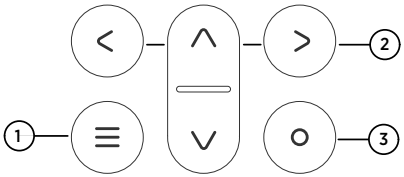


Figure 5 Indigo80 keypad

1 Power on/off and main menu button
2 Arrow buttons for navigating menus and scrolling views
3 Select button for selecting items in the user interface

5.1.2 Indigo80 main menu

Pressing the ☰ button while navigating the Indigo80 menus and views opens the main menu.

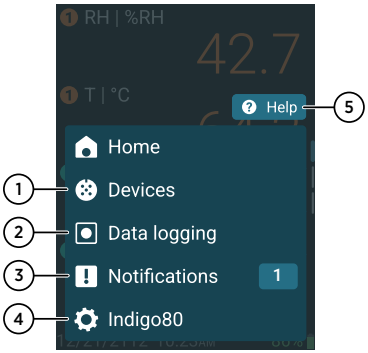


Figure 6 Indigo80 main menu

1 **Devices** menu contains, for example, options related to sensor purge, calibration, and environment settings (depending on the connected device).
2 **Data logging** menu for setting logging interval and duration, and browsing data files.
3 **Notifications** menu displays notifications related to Indigo80 and the connected devices.
4 **Indigo80** menu for changing the settings of Indigo80 (for example, date, time, and language) and viewing device information.
5 **Help** menu contains a **Getting started** tour showing the key features of Indigo80, as well as instructions for sending devices to Vaisala for calibration and maintenance.

5.2 Connecting probes to Indigo80

- Probe connection cable

Up to two Vaisala Indigo-compatible probes or transmitters can be connected to the ports located on the bottom of Indigo80. You can connect and disconnect devices both when the indicator is powered on and when it is off.

Vaisala recommends using cables provided by Vaisala when connecting devices to the indicator. Cables and other accessories are available to order at store.vaisala.com.

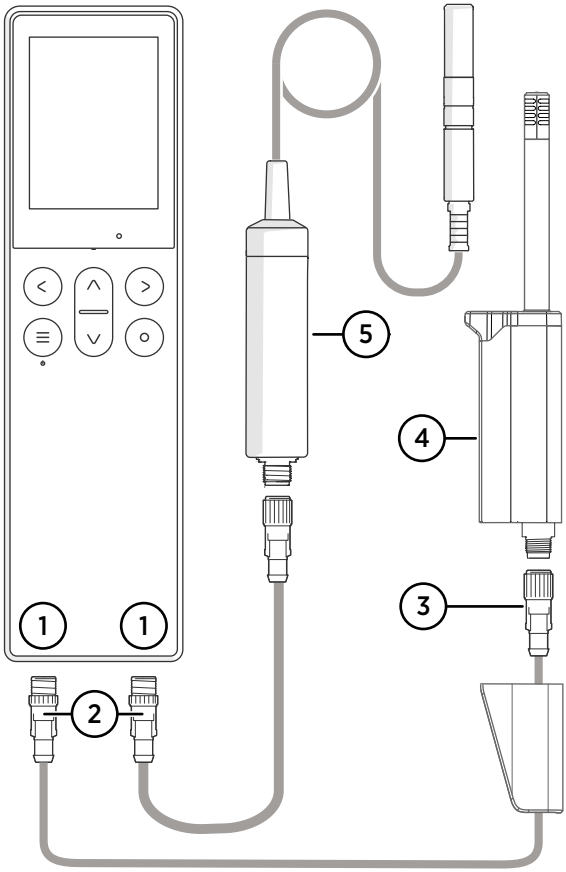


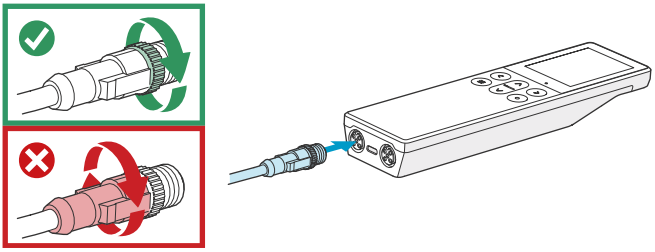
Figure 7 Connecting probes to Indigo80

1 M12-5F ports on the bottom of Indigo80 for connecting compatible Vaisala devices. Ports are labeled ❶ and ❷.
2 M12-5M A-coded cable connector
3 M12-5F A-coded cable connector
4 HMP80 probe, displayed as ❶ by Indigo80
5 HMP7 probe, displayed as ❷ by Indigo80

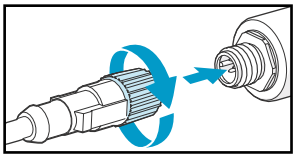
1. If the indicator is powered and no devices are connected to it, the text **Please connect a probe** will be shown on the display.

2. Insert the probe connection cable in one of the ports on the bottom of the indicator.

   - **Note the orientation of the cable connector when inserting it**
   - **Hold the connector in place while turning its locking ring clockwise – never twist the connector body!**



3. Connect the probe to the M12-5F end of the probe connection cable.



   When the indicator recognizes the connected probe, it shows a notification on the display (for example, **HMP80 connected**). A probe connected to the leftmost port in the indicator is labeled ❶ on the indicator's display, while the probe in the rightmost port is labeled ❷.

4. To change probes, simply detach the cable from the probe and connect a new probe.

5.3 Measurement location

When taking measurements with the probe, consider the following:

- Verify the operating environment specification of the probe model. The probe head typically has a much wider operating temperature range than the probe handle.

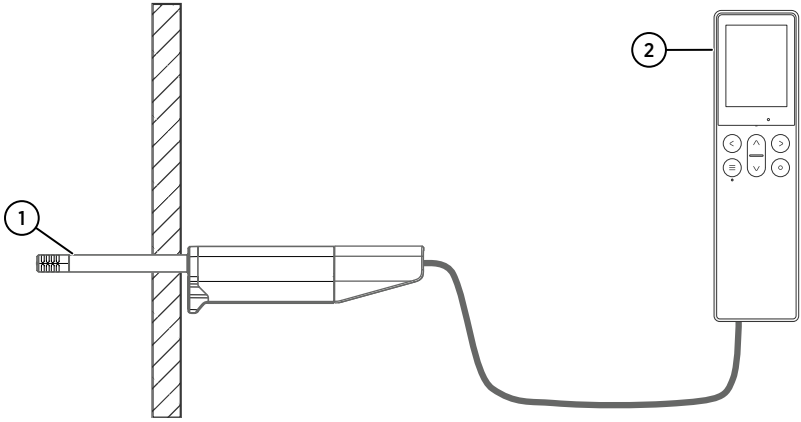


Figure 8 Example installation

1 Mount the probe head horizontally to prevent any water condensing on the probe head from running to the sensors
2 Attach Indigo80 to a metallic surface using the optional magnetic hanger accessory (Vaisala item code ASM214318SP).

5.3.1 Configuring environmental compensations

After installation, configure the pressure compensation setting, if relevant to your probe and its measurement environment.

For example, when you have installed the probe in a process with a pressure differing from normal atmospheric pressure, update the correct pressure into the pressure compensation setpoint parameter or register of the probe. This allows the probe to apply the appropriate pressure compensation into its measurement results.

You can configure the setting with the Insight software or the Indigo80 handheld indicator.

5.4 Configuring probe features with Indigo80 handheld indicator

- Probe connection cable

You can use the Indigo80 handheld indicator to configure probe features such as compensation setpoints, sensor purge settings, and filtering factor. The available features depend on the probe model and firmware version.

Accessing certain configuration options for your probe requires using the free Insight PC software, downloadable at www.vaisala.com/insight.

1. Connect the probe(s) to the indicator.
2. Open the main menu by pressing ☰.
3. Select **Devices**. If you have more than one device connected to the indicator, make a further selection between the devices.
4. Select **Settings** to access and change the features available for your probe.
5. Exit the menu by pressing ⟲ or return to the main menu by pressing ☰.

5.4.1 Example of configuring filtering factor with Indigo80 handheld indicator

- Probe connection cable

The filtering factor allows averaging the output if the measuring environment produces occasional exceptionally high or low readings.

This example shows how to configure the filtering factor as **0.9** using the Indigo80 handheld indicator.

This means that the new measurement output is a combination of the latest measurement (90 %) and the previous measurement (10 %).

1. Connect the probe(s) to the indicator.
2. Open the main menu by pressing ☰.
3. Select **Devices**. If you have more than one device connected to the indicator, make a further selection between the devices.
4. Select **Settings > Filtering**.
5. Select **Filtering factor**.
   a. Use the arrow buttons to set the value as **0.9**.
   b. Select **Set**.
6. Select **Extended filtering on/off > On** to enable measurement filtering using the filtering factor defined in the previous step.
7. Exit the menu by pressing ⟲ or return to the main menu by pressing ☰.

More information

- Filtering factor (page 15)

5.5 Configuring environment settings with Indigo80 handheld indicator

- Probe connection cable

For optimal measurement accuracy, you can use the Indigo80 handheld indicator to give additional information about the connected probe's measurement environment.

The environment settings available via Indigo80 correspond to the environmental compensation settings of the probe. Therefore, **Environment settings** and **Settings > Compensation setpoints** are interconnected: the configuration set in either menu is applied to both.

1. Connect the probe(s) to the indicator.
2. Open the main menu by pressing ☰.
3. Select **Devices**. If you have more than one device connected to the indicator, make a further selection between the devices.
4. Select **Environment settings** to access the settings for your probe.

   The available environment settings depend on the probe and probe firmware version.

   Pressure
   Value for pressure compensation. The entered value is persistent and remains unchanged at device restart.

   Temperature
   If any value is entered in this field, the device will use it as its temperature measurement value instead of its own sensor reading. This is needed when sensor warming is used, as it will also heat the temperature sensor of the device.
   At device restart, the value is cleared.

   The temperature value needs an external source, for example, another probe that is able to provide the value constantly in real time, and the value needs to correspond to the temperature of the measurement environment as accurately as possible. Thus, set the temperature value only if you have another probe connected to the indicator from which you can read the value. Do not set the temperature value manually.

5. Select a setting from the list, for example, **Pressure**.
   a. Select the unit, if prompted.
   b. Use the arrow buttons to set the desired value, and then select **OK** or **Set**.

      You can also select to read the value from another probe connected to the indicator, provided that the probe can output the required compensation parameter. Press ⟲ to highlight the **Read value from** field, and then press ⊙ to select the other probe as the source of the value.

      For **Temperature**, always set the temperature value to be read from another probe. Do not set the temperature value manually. Make sure that both probes are in the same environment to get the most accurate measurement values.

6. Exit the menu by pressing ⟲ or return to the main menu by pressing ☰.

More information

- Environmental compensation (page 14)

6. Configuration with Insight software

6.1 Vaisala Insight PC software

Vaisala Insight PC software is a configuration software for Indigo-compatible probes and other supported devices. Insight is available for Microsoft Windows® operating systems (64-bit only).

With the Insight software, you can:

- See probe information and status
- See real-time measurement data
- Record data for up to 48 hours and export in CSV format
- Configure probe features such as measurement filtering, sensor purge, and condensation prevention
- Calibrate and adjust the probe

Download Vaisala Insight software at www.vaisala.com/insight.

6.2 Connecting to Insight software

- Computer with a Microsoft Windows® operating system (64-bit version) and Vaisala Insight PC software installed
- Indigo USB adapter (item code USB2) or USB connection cable (item code 242659)

CAUTION! When connecting several devices at the same time, note that your computer may not be able to supply enough power through its USB ports. Use an externally powered USB hub that can supply >2 W for each port.

1. Open the Insight software on your PC.
2. Verify the operating mode of Insight from the **Settings** menu and change it if appropriate.
   - **Basic mode** is suitable for most use cases
   - **Advanced mode** provides access to additional configuration options. Use **Advanced mode** only when instructed to do so by product documentation or Vaisala technical support.
3. Connect the USB adapter to a free USB port on the PC or USB hub.
4. Connect the probe to the USB adapter.
5. Wait for the Insight software to detect the probe.

6.3 Configuration options

The complete probe configuration is accessible via the Insight software. After connecting the probe, select ⚙ **> Configure device** to access the configuration options.

If Insight has been set to **Advanced mode**, additional configuration options may be available. Use **Advanced mode** only when instructed to do so by product documentation or Vaisala technical support.

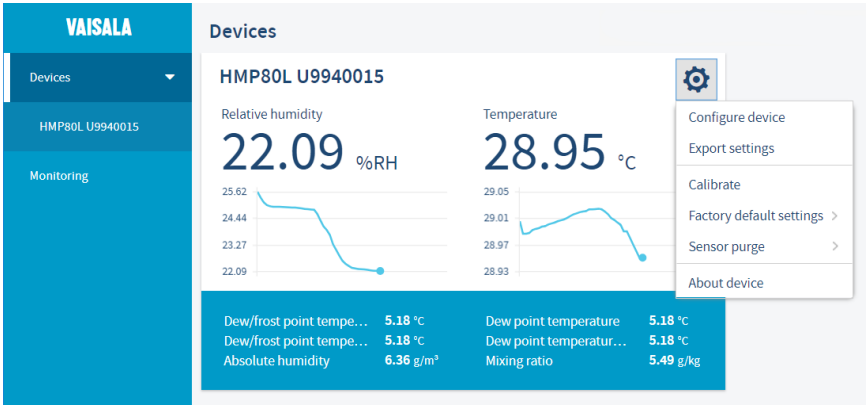


Figure 9 HMP80L in Insight software

More information

- Restoring factory default settings with Insight software (page 40)

6.4 Diagnostics in Insight

Messages sent by the connected devices are shown automatically in Insight. Additional diagnostic data is available on the **Diagnostics** page. The data available depends on the probe model and Insight operating mode (basic or advanced). The data can be very useful when diagnosing issues together with Vaisala support, particularly the diagnostic files.

Diagnostic files

If Insight is in **Advanced mode**, you can retrieve the following diagnostic files from the connected probe:

- **SSR/T_s histogram**: Table of humidity and temperature conditions measured by the probe
- **Error log**: Cumulative total of the error and status events tracked by the probe

Both files contain data from since the probe was manufactured, or since the files were last cleared. Clearing the files is not recommended unless instructed by Vaisala support. The buttons to clear the files are located at the bottom of the **Diagnostics** page.

The files are in comma separated value (CSV) format. They can be opened for viewing in spreadsheet programs such as Microsoft Excel or in text editors.

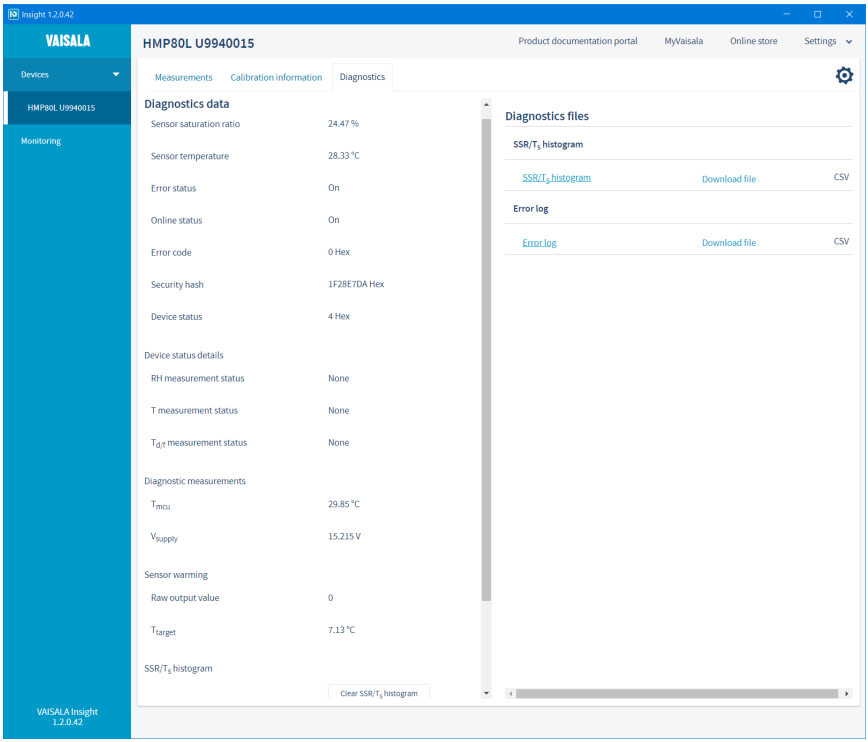


Figure 10 HMP80L diagnostics in Insight (advanced mode)

7. Calibration and adjustment

7.1 Calibration and adjustment overview

Calibration means comparing the measurement output of the device to a known reference, such as a known environment in a calibration chamber or the output of a reference instrument. Correcting the reading of the device so that it measures accurately is referred to as **adjustment**.

The probe is fully calibrated and adjusted as shipped from the factory. To maintain the accuracy of the measurement, calibrate and adjust the probe as needed. Typical calibration interval is one year, but depending on the application it may be necessary to check the accuracy more frequently.

Vaisala recommends sending the probe regularly to Vaisala for factory calibration. The probe is calibrated and adjusted at multiple points along its measurement range. Factory calibration always includes a traceable calibration certificate and adjustment, if needed.

Factory calibration leads to highest accuracy and lowest uncertainty. After factory calibration the instrument performs as new. For up-to-date information about calibration points and offering, visit store.vaisala.com.

WARNING! When returning a product for calibration or repair, make sure it has not been exposed to dangerous contamination, and is safe to handle without special precautions.

It is also possible to calibrate and adjust the probe on the field using the Insight PC software or the Indigo80 handheld indicator.

If you think the device is not measuring correctly, calibration and adjustment is not the first thing to do. Check the following first:

- Make sure nothing is interfering with the measurement: heat sources, temperature differences, or condensation.
- Check that there is no moisture on the probe. If the sensor has become wet, wait for it to dry.
- Always wait for the measurement to stabilize.

7.2 Adjustment points and requirements

You can adjust the humidity measurement in 1 ... 5 points and temperature measurement in 1...2 points, depending on the device that you use for the adjustment. Note the following:

- Humidity adjustment in more than 2 points is only available when you use the Insight software in **Advanced Mode**.

- If you are adjusting in more than one humidity point, make sure the first two points are at least 10 %RH apart.
- The probe will reject adjustments that are too large, that is, greater than 10 %RH for humidity and 0.5 °C for temperature. If the probe appears to need such a large correction, perform a sensor purge and repeat the adjustment procedure. Make sure that the measurement has stabilized and the reference environment is reliable. If the required adjustment is still too large, the probe needs to be serviced by Vaisala.

When adjustment of humidity measurement is necessary, Vaisala recommends adjusting in two points, 11 %RH and 75 %RH. These humidities can be produced using Vaisala HMK15 Humidity Calibrator.
Adjustment of temperature measurement is typically not necessary.

More information

- Calibration and adjustment with Indigo80 handheld indicator (page 30)
- Adjusting measurement with Insight software (page 34)
- HMK15 Humidity Calibrator with HMP80 series probes (page 35)

7.3 Calibration and adjustment with Indigo80 handheld indicator

The Indigo80 handheld indicator provides two ways to calibrate and adjust measurements for probes: **Guided calibration** and **Manual adjustment**.

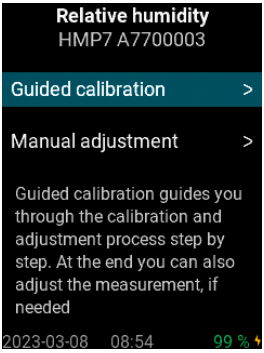


Figure 11 Indigo80 calibration methods for probes

- Choose **Guided calibration** when you want the indicator to guide you through the calibration process step by step. At the end you can also adjust the measurement, if needed.
- Choose **Manual adjustment** when you want to freely set the reference and measured values to adjust the measurement.

Calibrating a measurement with the indicator, including purge and adjustment, typically takes 1 ... 2 hours depending on the number of calibration points.

7.3.1 Performing guided calibration with Indigo80 handheld indicator

- Probe connection cable
- Reference environment(s) for producing the desired reference values

In guided calibration, the indicator guides you through the calibration process step by step. At the end, you can also adjust the measurement, if needed.

You can choose to do either 1-point or 2-point calibration, and choose to use the reference environment or instrument of your choice, for example, another probe connected to your indicator.

For relative humidity, you can choose to use Vaisala HMK15 Humidity Calibrator. For more information on HMK15, see HMK15 User Guide (M210185EN).

1. Connect the probe(s) to the indicator.
2. If your probe supports the sensor purge feature, wait for the start-up purge to finish.
3. Open the main menu by pressing ☰.
4. Select **Devices**. If you have more than one device connected to the indicator, make a further selection between the devices.
5. Select **Calibrate / Adjust**.
6. Select the parameter, for example, **Relative humidity**.
7. Select **Guided calibration**.
8. In **Calibration points**, select the number of the calibration points: **1 point** or **2 points**.
9. In **Reference**, select the desired reference environment(s) or reference instrument(s).

   Selection **Other reference** allows you to use any reference environment(s) of your choice. For 2-point calibration of relative humidity, you can select two salts from the list, one for each calibration point.
   When you have selected the reference environments for 2-point calibration, press ⟨ to get back to the previous view.
10. Select **Start calibration**.

    The indicator guides you through the calibration process from this point onwards. Press ⟩ to proceed from one view to another.

7.3.2 Performing manual adjustment with Indigo80 handheld indicator

- Probe connection cable
- Reference environment(s) for producing the desired reference values

This procedure tells you how to use the indicator to adjust the probe's measurement in 1 ... 2 points.

1. Connect the probe(s) to the indicator.
2. Open the main menu by pressing ☰.
3. Select **Devices**. If you have more than one device connected to the indicator, make a further selection between the devices.
4. If your probe supports the sensor purge feature, wait for the start-up purge to finish or start the purge manually by selecting **Devices > <your device> > Sensor purge**.

   After the purge has been completed, continue to the next step.
5. Select **Calibrate / Adjust**.
6. Select the parameter, for example, **Relative humidity**.
7. Select **Manual adjustment**.
8. Place the probe to the first reference point and select **Reference value, point 1** to open the stabilizing graph view. Wait for the measurement to stabilize fully.

   The stabilization typically takes at least 10 ... 15 minutes.

   a. When the reading has stabilized, press ▷.

   b. Use the arrow buttons to set the value of the reference, and then select **OK** or **Set**.

   If you already have the reference and measured values available for your calibration point(s), you can just skip the stabilizing graph view with the ▷ button to get to the view where you can set the reference value. Then replace the automatically filled **Measured value, point 1** and **Measured temperature, point 1** with your actual values.

9. If you want to adjust the measurement in 2 points, place the probe to the second reference point. Then scroll down the **<parameter> adjustment** view and select **Reference value, point 2** to open the stabilizing graph view. Wait for the measurement to stabilize fully.

   a. When the reading has stabilized, press ▷.

   b. Use the arrow buttons to set the value of the second reference, and then select **OK** or **Set**.

10. In **<parameter> adjustment** view, check the difference between each reference and measured value. Very large differences may be due to insufficient stabilization time or unsuitable calibration setup.
    - To store the adjustments to the probe, scroll down and select **Activate adjustment > OK**. Confirm by selecting **OK**.
    - To exit without taking the adjustment in use, press ☰ to end calibration.
11. Update the calibration information in **Calibrate / Adjust > Calibration information**. Navigate to the **Calibration information** menu by pressing ☇.
12. Press ☰ to end calibration.

7.3.3 Restoring factory adjustment with Indigo80 handheld indicator



- Probe connection cable

If needed, you can restore the factory adjustment for your probe using the Indigo80 handheld indicator.

Note that restoring the factory adjustment is not necessary before a new adjustment: you can just perform the new adjustment on top of the old adjustment. However, you can select to do the restore procedure if your adjustment fails for some reason, or if you want to return to the original factory adjustment.

1. Connect the probe(s) to the indicator.
2. Open the main menu by pressing ☰.
3. Select **Devices**. If you have more than one device connected to the indicator, make a further selection between the devices.
4. Select **Calibrate / Adjust**.
5. Select any of the available parameters to access the view where you can restore the factory adjustment.
6. Scroll down and select **Restore factory adjustment > OK**.
7. Confirm by selecting **OK**.
8. Press ☰ to end calibration.

7.4 Adjusting measurement with Insight software

- Computer with a Microsoft Windows® operating system (64-bit version) and Vaisala Insight PC software installed
- Indigo USB adapter (item code USB2) or USB connection cable (item code 242659)
- Reference environment(s) for producing the desired humidity and/or temperature

This procedure can be used to adjust the probe's humidity or temperature measurement. If you want to adjust both, repeat the procedure.

Because stabilization of temperature and humidity takes time, you should expect the adjustment procedure to take at least 30 minutes for each adjustment point.

1. Connect the probe to the Insight software.
2. If you intend to adjust humidity measurement, first select **> Sensor purge** to perform sensor purge to condition the sensor. Wait a few minutes for purge to complete.
3. Select **> Calibrate > Yes** to switch the probe to calibration mode.

   In calibration mode, the device will not use functions that may interfere with calibration and adjustment.
4. Select the type of adjustment to perform: **RH adjustment** or **T adjustment**.
5. Define the needed adjustment for the first measurement point:
   a. Insert the probe head in the reference environment for the first calibration point.
   b. Wait for the measurement to stabilize fully. This may take more than 30 minutes. Monitor the readings to see when both the RH and temperature measurements have stabilized.
   c. Click the **Reference value, point 1** text box and enter the reference value of the calibration point. Press **ENTER** or click outside the text box when done.
   d. The probe automatically enters the measured values for the calibration point.
6. If you want to adjust in more than one point, repeat the previous step for all desired calibration points.

   You can adjust humidity measurement in up to five points when Insight is set to **Advanced mode**.

7. Check the difference between each reference and measured value. Very large differences may be due to insufficient stabilization time or unsuitable calibration setup.
   - To save the adjustment into the device, select **Activate adjustment**.
   - To exit without taking the adjustment in use, select **Close**.

8. Check the message that appears at the top of the screen. If the message indicates that the adjustment is activated successfully, your adjustment is stored in the probe.
9. Select the **Calibration information** tab and update the **Calibration date** and **Calibration text**.
10. Select **Close** to exit the calibration mode.

7.5 HMK15 Humidity Calibrator with HMP80 series probes

CAUTION! Sensors on the probe head are vulnerable to damage when the filter is removed. Handle the probe carefully and avoid touching the sensors.

Vaisala HMK15 Humidity Calibrator is a suitable humidity reference for HMP80 series probes. When preparing the salt solutions and using the calibrator, follow the general instructions in the HMK15 User Guide (M210185EN) to avoid common sources of calibration error.

HMP80 series specific considerations:

HMP80L probe model

- Use calibration adapter 211302 to prevent the sensor from being submerged in the salt solution. Adapter 211302 is delivered with the HMK15 calibrator.
- With the filter removed and the adapter attached, place the probe in one of the Ø13.5 mm holes in the HMK15 universal lid.
- Make sure the probe is well supported when using it with the HMK15 calibrator.

HMP80N probe model

- The sensor in the HMP80N is short, so a calibration adapter is not needed.
- With the filter removed, place the probe in the Ø12 mm hole in the HMK15 universal lid.



Figure 12 Calibrating a humidity probe with HMK15 using 211302 adapter

8. Maintenance

8.1 Cleaning the probe

CAUTION! Do not attempt to clean the sensors under the filter.

Do not spray anything directly on the probe head, since that may deposit impurities on the sensors.

You can clean the probe, probe handle, and cable by wiping them with a soft, lint-free cloth moistened with water or a suitable cleaning agent, such as isopropyl alcohol. Do not wipe the filter: wiping the filter may block its pores and/or deposit residue on the filter. If the filter is heavily contaminated, replace it.

When cleaning, follow these precautions:

- Avoid touching the filter. If you need to touch the filter, always wear clean gloves (cotton, rubber or similar material). Keep the filter free of any grease or oil.
- Do not scrape the probe or the probe handle, and avoid abrasive cloths when wiping the surface.
- Do not immerse the probe or the probe handle in liquid to clean them.
- Wipe cleaning agents off the probe, probe handle, and the cable after cleaning.

After cleaning the probe, it is recommended to perform sensor purge.

8.1.1 Chemical tolerance

Avoid exposing the probe to cleaning agents for unnecessarily long periods of time.

The following chemicals can be used to clean the probe:

- Deionized water
- Isopropyl alcohol (70 %).

More information

‣ HMP80 specifications (page 42)

8.2 Changing the probe filter



- New compatible filter
- Clean lint-free gloves



CAUTION! Sensors are easily damaged when the filter is not in place. Handle the probe head carefully.

1. Put on clean gloves before touching the filter.
2. Turn the filter counter-clockwise to loosen it.
3. Remove the filter from the probe head. Be careful not to touch the sensors with the filter.
4. Install a new filter on the probe head. Tighten the filter properly.

9. Troubleshooting

9.1 Problem situations

Table 5 Troubleshooting table

Problem	Possible cause	Solution
Measurement output seems incorrect	Installation location is not representative of actual conditions you want to measure	Verify the installation location and relocate the probe if necessary.
	Heat conduction along probe shaft is interfering with measurement accuracy	Follow the installation recommendations for cases when temperature of measured environment differs greatly from ambient. See Measurement location (page 21).
	Probe is in need of adjustment	Calibrate and adjust the probe.
Values of measurement parameters stop changing for a few minutes	Probe is performing a sensor heating function such as sensor purge or waiting for the sensor to cool down	Wait for the function to complete and measurement parameters to be available again.

9.2 Error messages

Probes can communicate with error messages when they are connected to Indigo80 indicator or Insight software. The messages are categorized according to the severity of the status:

- **Critical errors** are fatal to the operation of the device. It may not be able to respond to communication at all, and will not measure correctly.
- **Errors** prevent normal operation of the device. Depending on the problem, errors may resolve themselves. For example, a completely wet humidity sensor may cause a humidity measurement error.
- **Warnings** do not prevent normal operation but may indicate possible problems.
- **Status** indicates a known state of the device.

Error message	Description	Recommended action
Critical errors		
Firmware checksum mismatch [49]	The installed firmware is corrupted.	Contact Vaisala technical support.
Device settings corrupted [50]	Parameter memory is corrupted.	
Additional configuration settings corrupted [51]		
Sensor coefficients corrupted [52]		
Main configuration settings corrupted [53]		
Factory default settings corrupted [54]		
Non-volatile memory read write failure [57]	Hardware fault.	
Errors		
Temperature measurement error [44]	Readings from sensor(s) are missing or out of range.	Inspect probe head and sensors visually. If the probe is completely wet, allow it to dry out. If the sensors are damaged or missing and the error message(s) stay active, contact Vaisala to have the probe repaired.
Humidity measurement error [45]		
Humidity sensor failure [46]		
Capacitance reference error [47]	Hardware fault.	Contact Vaisala technical support.
Sensor heater error [212]		
General device failure [994]	High number of measurement errors, capacitance reference errors, or sensor heater errors written in the error log.	
Ambient temperature out of range [48]	Probe handle is too hot or cold.	Relocate the probe handle so that its ambient temperature is within the specified operating range.
Supply voltage out of range [55]	Probe supply voltage is too high or low.	Check and correct the supply voltage.

Warnings		
Calibration has expired [353]	This warning is displayed by the calibration reminder functionality if the calibration interval has been exceeded.	Calibrate the probe and update the calibration date information.
Software restart [679] Unexpected device restart [216]	The probe has automatically restarted itself.	Check that supply voltage is stable and operating environment is within specification.
Status messages		
Calibration is about to expire [352]	This message is displayed by the calibration reminder functionality.	Calibrate the probe and update the calibration date information.
Purge in progress [287]	Sensor purge of the humidity sensor is ongoing.	Wait for sensor purge to complete.
The readings stay frozen until the sensor cools down [288]	Probe is waiting for its sensors to cool down.	Wait for measurement readings to become available.

More information

- Technical support (page 51)

9.3 Restoring factory default settings with Insight software

If needed, you can restore the probe back to its factory default settings using the Insight software. Doing this will also clear any user adjustment and restore the latest adjustment performed by Vaisala.

1. Connect the probe to the Insight software.
2. Select > **Factory default settings > Restore settings**.
3. Wait for the probe to be re-detected.

More information

- Configuration options (page 27)

9.4 Restoring factory default settings with Indigo80 handheld indicator



- Probe connection cable

If needed, you can restore the probe back to its factory default settings using the Indigo80 handheld indicator. The user adjustment of the probe and the settings or log files of the indicator itself are not affected.

1. Connect the probe(s) to the indicator.
2. Open the main menu by pressing ☰.
3. Select **Devices**. If you have more than one device connected to the indicator, make a further selection between the devices.
4. Select **Factory default settings > Restore settings > OK**.
5. Confirm by selecting **OK**.
6. Exit the menu by pressing ⟲ or return to the main menu by pressing ☰.

9.5 Writing a problem report

When troubleshooting the product, write a problem report including:

- What failed (what worked / did not work)?
- Where did it fail (location and environment)?
- When did it fail (date, immediately / after a while / periodically / randomly)?
- How many failed (only one defect / other same or similar defects / several failures in one unit)?
- What was done when the failure was noticed?
- What was connected to the product and to which connectors?
- Input power source type, voltage, and list of other items (such as lighting, heaters, and motors) that were connected to the same power output.
- Are all parts connected and grounded properly? Take a photo to help the troubleshooting.

10. Technical data

10.1 HMP80 specifications

Table 6 HMP80 series measurement performance

Property	Description/Value
Relative humidity	
Measurement range	0 ... 100 %RH
Accuracy at +23 °C (73.4 °F) [1]	±0.8 %RH (0 ... 90 %RH)
Factory calibration uncertainty [2]	±0.5 %RH (0 ... 40 %RH) ±0.8 %RH (40 ... 95 %RH)
T_{63} response time	15 s
Sensor	HUMICAP® R2C
Temperature	
Measurement range	HMP80N: −20 ... +60 °C (−4 ... +140 °F) HMP80L: −50 ... +120 °C (−58 ... +248 °F), short-time measurement range −50 ... +180 °C (−58 ... +356 °F)
Accuracy at +23 °C (+73.4 °F) [1] [3]	±0.1 °C (±0.18 °F)
Factory calibration uncertainty [2]	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)
Sensor	Pt100 RTD Class F0.1 IEC 60751

1) *Defined against calibration reference. Including non-linearity, hysteresis, and repeatability.*
2) *Defined as ±2 standard deviation limits. Small variations possible; see calibration certificate.*
3) *Exposing temperature sensor to temperatures below −20 °C (−4 °F) may cause permanent additional deviation of ±0.1 °C (0.18 °F).*

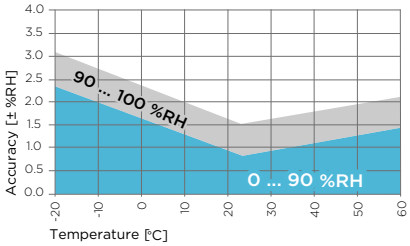


Figure 13 HMP80N humidity measurement accuracy as a function of temperature

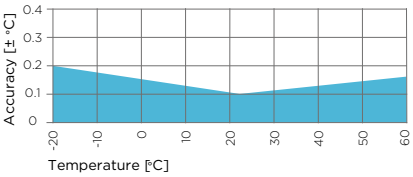


Figure 14 HMP80N temperature measurement accuracy over full range

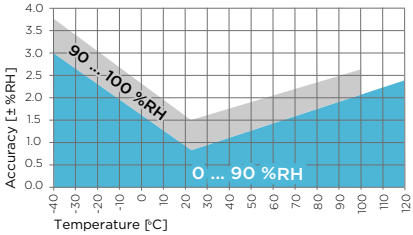


Figure 15 HMP80L humidity measurement accuracy as a function of temperature

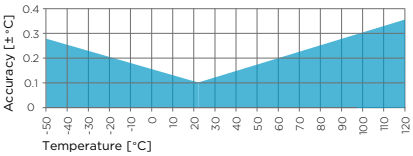


Figure 16 HMP80L temperature measurement accuracy over full range

Table 7 HMP80 series operating environment

Property	Description/Value
Operating temperature of probe body	−10 ... +60 °C (−14 ... +140 °F)
Operating temperature of probe head	HMP80N: −20 ... +60 °C (−4 ... +140 °F) HMP80L: −50 ... +120 °C (−58 ... +248 °F)
Storage temperature	−20 ... +60 °C (−4 ... +140 °F)
Measurement environment	For air, nitrogen, hydrogen, argon, helium, oxygen, and vacuum [1)]
Chemical tolerance	Temporary exposure during cleaning: • Deionized water • Isopropyl alcohol (70 %)
IP rating of probe handle:	
with probe connection cable connected to the probe	IP66: Dust-tight. Protected from powerful water jets from any direction.

Property	Description/Value
without cable	IP55: Limited protection against dust. Protected from water jets from any direction.

1) *Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases.*

Table 8 HMP80 series inputs and outputs

Property	Description/Value
Operating voltage	15 ... 30 V DC
Current consumption	10 mA typical, 500 mA max.
Digital output	RS-485, non-isolated

Table 9 HMP80 series output parameters

Output parameter name and unit	
Absolute humidity (g/m^3)	Relative humidity (%RH)
Absolute humidity at NTP (g/m^3)	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm$_v$)
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm$_w$)
Dew point temperature difference (°C)	Water vapor pressure (hPa)
Enthalpy (kJ/kg)	Water vapor saturation pressure (hPa)
Mixing ratio (g/kg)	Wet-bulb temperature (°C)

Table 10 HMP80 series mechanical specifications

Property	Description/Value
Connector type	M12 5-pin A-coded male
Weight	HMP80N: 200 g (7 oz) HMP80L: 300 g (10 oz)
Materials	
Probe handle	Polyamide (PA) and thermoplastic elastomer (TPE)
Probe shaft	Stainless steel (AISI 316L)

Property	Description/Value
Filters	HMP80N: Stainless steel (AISI 316L) [1] HMP80L: Porous stainless steel (AISI 316L) [2]

1) *With holes and without an additional filter membrane. Vaisala item code of filter: DRW255306SP.*
2) *Vaisala item code: HM47280SP*

Table 11 HMP80 series compliance

Property	Description/Value
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Rough handling (excluding sensor inside probe head)	IEC 60068-2-31
Compliance marks	CE, China RoHS, RCM, UKCA

10.2 Dimensions

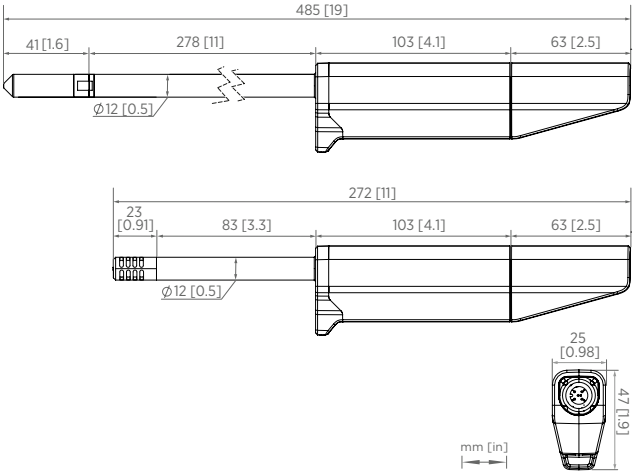


Figure 17 Dimensions of HMP80L (top) and HMP80N (bottom), side and bottom view

10.3 Spare parts and accessories

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

Table 12 HMP80 series spare parts and accessories

Property	Description/value
Probe connection cable (M12-M12), 1.5 m (4.11 ft)	272075SP
Flat cable for probes (M12-M12), 1.0 m (3.4 ft)	CBL210493SP
Indigo USB adapter	USB2
Sintered stainless steel filter (HMP80N, HMP80L)	HM47280SP
Plastic PPS grid filter (HMP80N, HMP80L)	DRW010276SP
PPS grid with SS netting (HMP80N, HMP80L)	DRW010281SP
Slotted MIM filter (HMP80N)	DRW255306SP
Slotted MIM filter with membrane (HMP80N)	ASM214606SP

10.4 Accuracy of calculated output parameters

HMP80 series probes measure relative humidity and temperature, and calculate the other output parameters from those two parameters. Accuracy of the calculated parameters is derived from the accuracy of the original RH and T measurements.

Use the Vaisala Humidity Calculator to convert the accuracy specification of RH measurement for other humidity parameters. You can download it from www.vaisala.com.

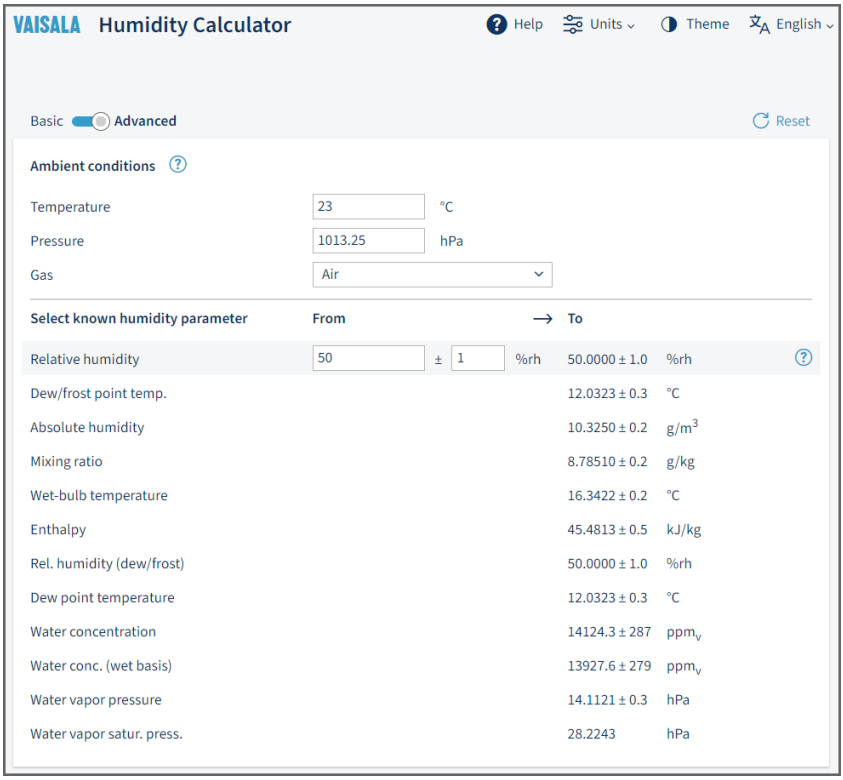


Figure 18 Vaisala Humidity Calculator in Advanced mode

Appendix A. Recycling instructions

These recycling instructions guide you on the end-of-life treatment of this Vaisala product. As waste regulations and infrastructure vary in each country, these instructions only indicate the different components to be separated and common ways to handle them. Always follow local requirements when disposing of the product. Vaisala encourages to use the best available recycling practices to minimize related environmental impacts.

Vaisala is committed to meeting the requirements of the EU Waste Electrical and Electronic Equipment (WEEE) Directive. This directive aims to minimize the impact of electrical and electronic goods on the environment, by increasing reuse and recycling, and reducing the amount of WEEE going to landfill. This symbol indicates that the product should be collected separately from other waste streams and treated appropriately.

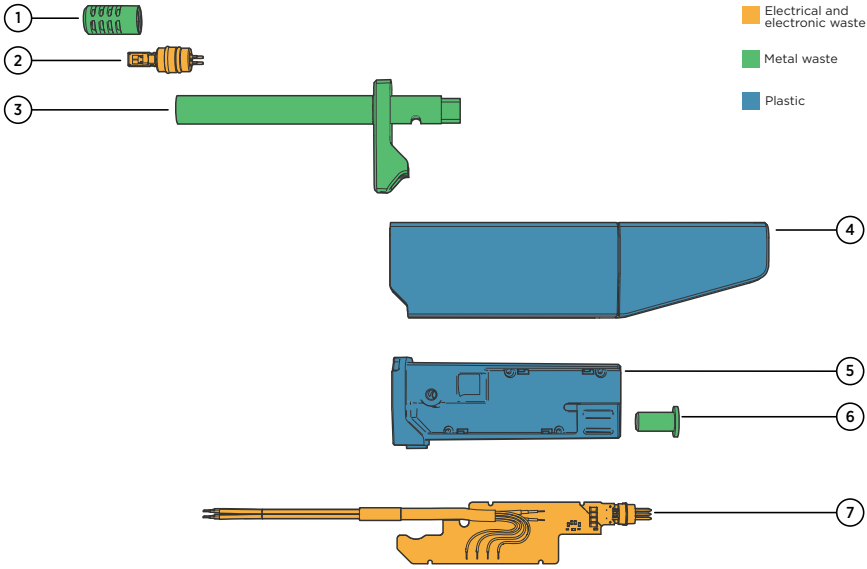


Figure 19 Materials for recycling

Table 13 Materials for recycling

Part		Material	Recycling
1	Filter	Stainless steel (AISI 316L)	Metal waste
2	Sensor	Various materials	Electrical and electronic waste

Part		Material	Recycling
3	Probe shaft	Stainless steel (AISI 316L)	Metal waste
4	Probe handle	Polyamide (PA), glass reinforced and thermoplastic elastomer (TPE)	Dispose of or recycle as plastic according to local waste management practices and regulations
5	Electronics housing	Polyamide (PA), glass reinforced	Dispose of or recycle as plastic according to local waste management practices and regulations
6	Screw	Stainless steel (AISI 316L)	Metal waste
7	Component board and wiring	Various materials	Electrical and electronic waste

More information

- Probe structure (page 11)
- HMP80 specifications (page 42)

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.

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.

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.

Recycling

Recycle all applicable material according to local regulations.

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