User Guide

Intrinsically Safe Humidity and Temperature
Transmitter Series

HMT370EX

VAISALA

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1. About this document

1.1 Version information

Table 1   Document versions (English)

Document code	Date	Description
M212305EN-A	March 2021	This manual. First version of the document.

1.2 Related manuals

Table 2   Related manuals

Document code	Description
M212306EN	HMT370EX Multilingual Installation and Safety Guide (languages: English, German, French, Dutch, Spanish, Portuguese, Italian, Hungarian, Czech, Polish, Finnish, Estonian, Swedish, Norwegian, Danish)

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.

All other product or company names that may be mentioned in this publication are trade names, trademarks, or registered trademarks of their respective owners.

2. Product overview

2.1 Introduction to HMT370EX series

Vaisala HUMICAP® Humidity and Temperature Transmitter Series HMT370EX is the ideal solution for measuring humidity in hazardous areas. Intrinsically safe and robust, HMT370EX operates safely and reliably even in the most hazardous areas, such as Zone 0. The next-generation HMT370EX transmitter can be used as a replacement for the long-running HMT360 transmitter series in all HMT360 applications.

HMT370EX can be installed directly in explosive areas. It can withstand continuous exposure to potentially explosive environments that contain flammable gases or dust, and requires no additional protective enclosures for operation in either gas or dust environments.

HMT370EX offers several probe options for different applications. Thanks to the detachable probe module, probes can be easily replaced and removed for calibration outside the hazardous area without removing the entire transmitter.

The transmitter has 2 analog current output channels (4 – 20 mA) for connection via safety barriers. For easy-to-use access to configuration, diagnostics, and calibration and adjustment functionalities, the probe and transmitter body can be connected to Vaisala Insight PC software for configuration either together as one unit or separately.

2.2 Basic features and options

- Available measurement parameters: relative humidity (RH) and temperature (T)
    - For a list of calculated measurement parameters, see Available measurement parameters (page 10).
- Ex classification: IECEx and ATEX certified for use in Zone 0 and Zone 20 environments: for full Ex classifications, see Table 7 (page 16).
- 2 analog outputs (4 – 20 mA, scalable, isolated)
- Display options: graphical LCD display or non-display model
- Power supply input: 12 – 28 V
- Compatible with Vaisala Insight PC software

2.3 Hazardous area safety

> ⚠ **CAUTION!** Do not install or use HMT370EX in a hazardous area before reviewing the safety information in Using HTM370EX Series transmitters in hazardous locations (page 16).

2.4 Available measurement parameters

Table 3 (page 10) lists the available HMT370EX measurement parameter options and their abbreviations and units for the standard probe options HMP371, HMP373, HMP374, HMP375, HMP377, and HMP378.

Table 3   Available measurement parameters for HMP371, HMP373, HMP374, HMP375, HMP377, and HMP378

Parameter	Abbreviation	Unit
Relative humidity	RH	%RH
Temperature	T	°C (°F)
Dew point temperature	T_d	°C (°F)
Dew point / frost point temperature	$T_{d/f}$	°C (°F)
Absolute humidity	a	g/m^3 (gr/ft^3)
Mixing ratio	x	g/kg (gr/lb)
Wet-bulb temperature	T_w	°C (°F)
Water concentration	H_2O	ppm_v
Water vapor pressure	pw	hPa (psi)
Water vapor saturation pressure	pws	hPa (psi)
Enthalpy	h	kJ/kg (Btu/lb)
Dew point temperature difference	ΔT	°C (°F)
Absolute humidity at NTP	aNTP	g/m^3 (gr/ft^3)
Water mass fraction	H_2O_w	ppm_w

Table 4 (page 10) lists the measurement parameter options available for the oil and fuel probe variants HMP378F and HMP378H.

Table 4   Available measurement parameters for HMP378F and HMP378H

Parameter	Abbreviation	Unit
Available for both HMP378F and HMP378H		
Temperature	T	°C (°F)
Relative saturation	RS	%RS
Water activity	a_w	

Parameter	Abbreviation	Unit
Only available for HMP378F		
Water concentration in oil	H_2O (oil)	ppm_w
Only available for HMP378H		
Water concentration in fuel	H_2O (fuel)	ppm_w
Saturation temperature	T_s	°C (°F)

2.5 Display options

The HMT370EX transmitter can be ordered either with a graphical LCD display, or alternatively without a display. The display options are shown in Figure 1 (page 11).
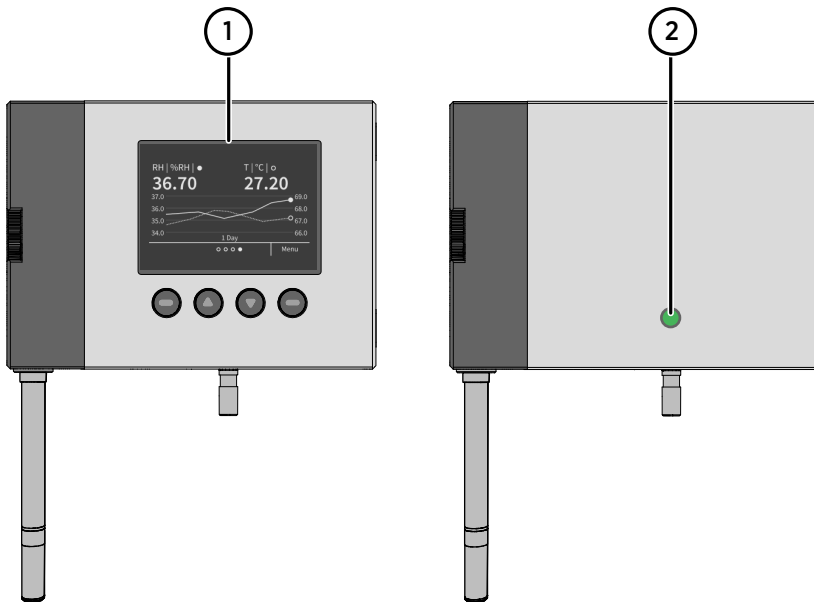
Figure 1   HMT370EX transmitter display options

1   Transmitter with display: LCD display with 4-button interface
2   Transmitter without display: LED status indicator

In the display model, probe and transmitter configuration can be carried out either using the 4-button interface of the display, or by connecting the probe or transmitter to Vaisala Insight PC software. In the model without display, all configuration must be carried out with Vaisala Insight PC software.

For information on Vaisala Insight PC software, see Vaisala Insight PC software (page 55).

For information on the display interface, see Local display overview (page 46).

2.5.1 LED states in transmitter with no display

In the transmitter model with no display, the status LED indicator on the front of the transmitter provides a visual indication of the transmitter's status. If the transmitter LED status indicates that notifications or error messages exist, connect to Vaisala Insight PC software to view status information and carry out any required configuration.

For instructions on connecting to Insight, see Connecting to Insight PC software (page 55).

For an overview of the Insight software, see Vaisala Insight PC software (page 55).

Table 5   LED status indicator states

LED color	Meaning
Not lit	Power off.
Green, fast blinking	Starting up.
Green, not blinking	Power on, normal measurement.
Green, slow blinking	Notification or warning, normal measurement. Connect to Insight to view status information and configure.
Red	Error. Connect to Insight to view status information and configure.
Red and blinking	Critical error. Connect to Insight to view status information and configure.

2.6 Connectivity to Vaisala Insight software

The HMT370EX transmitter and HMT370EX series probes can be connected to Vaisala Insight software either together as one unit or separately with a Vaisala USB cable (see Spare parts and accessories (page 93)). With the Insight software, you can:

- Calibrate and adjust the measurement.
- Test and adjust the analog outputs.
- Configure analog output parameter selection, scaling, error, and clipping settings.
- Configure environmental compensations, measurement settings, and local display settings.
- View real-time measurements and device and status information.

More information

‣ Connecting to Insight PC software (page 55)

2.7 Transmitter parts

The external parts of the transmitter are shown in Figure 2 (page 13), and the internal parts of the transmitter are shown in Figure 3 (page 14).
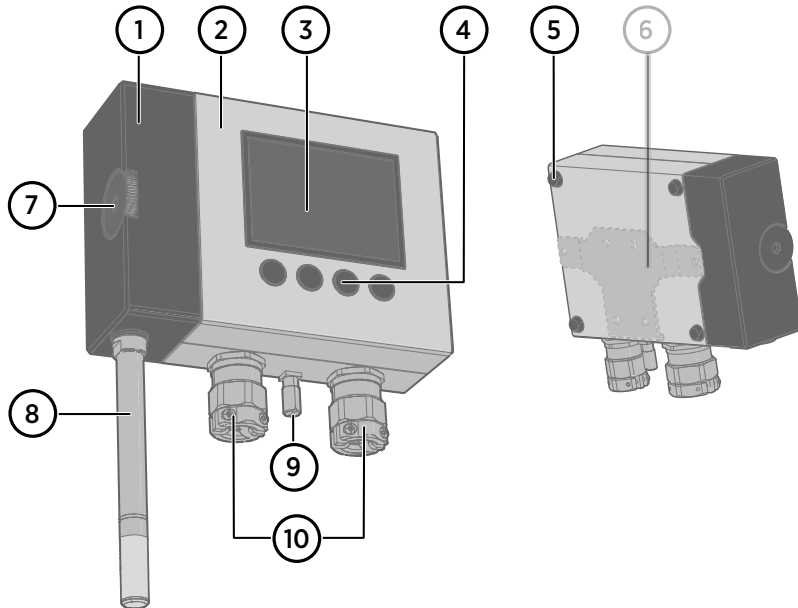
Figure 2   HMT370EX transmitter external parts

1   Detachable probe body
2   Transmitter body (for internal parts, see Figure 3 (page 14))
3   Graphical LCD display (see Display options (page 11))
4   Display interface buttons (see Local display overview (page 46))
5   Wall pads (4 pcs)
6   Retrofit mounting plate for replacing HMT360 installations (optional)
7   Probe body locking wheel
8   Probe head (for information on different probe options, see HMT370EX probe options overview (page 21))
9   Grounding terminal
10   Lead-throughs for wiring (for lead-through accessory options, see Cable gland and conduit options (page 14))
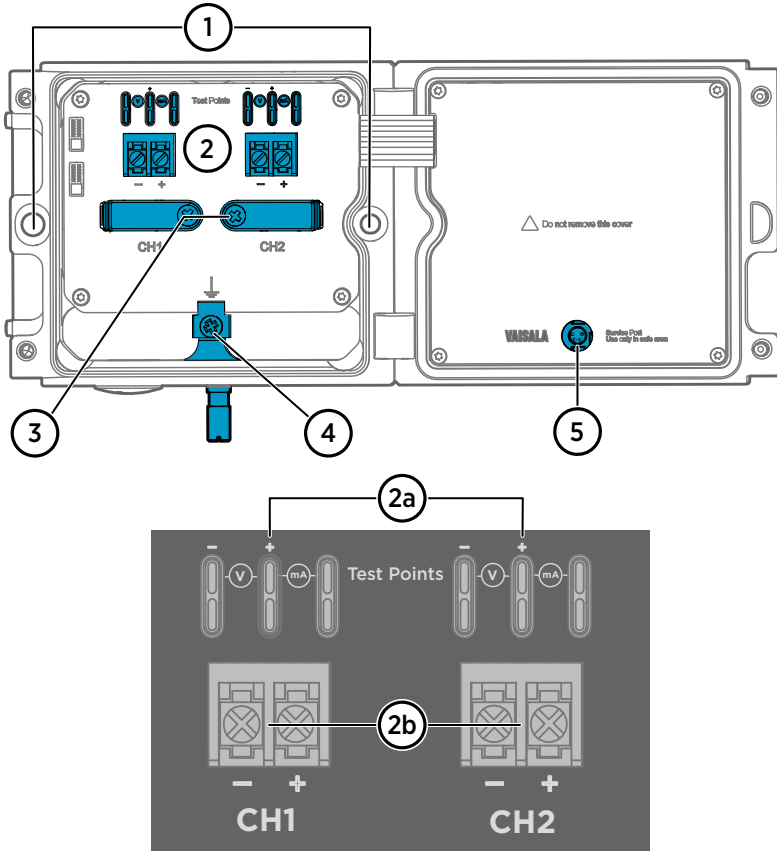
Figure 3   HMT370EX transmitter internal parts

1   Holes for mounting screws
2   Screw terminals and output test points: see **2a** and **2b**
2a   Analog output channel 1 and 2 multimeter test points for current and voltage
2b   Screw terminals for wiring analog output channels 1 and 2
3   Cable fastening clamps
4   Transmitter grounding terminal
5   Transmitter service port (M8, requires Vaisala USB cable accessory)

2.7.1 Cable gland and conduit options

The HMT370EX transmitter body has two M20x1.5 lead-throughs that can be fitted with cable glands, conduit fittings, and plugs, as required by your application. By default, the transmitter comes delivered with 2 different plug types on the transmitter lead-throughs as shown in Figure 4 (page 15).
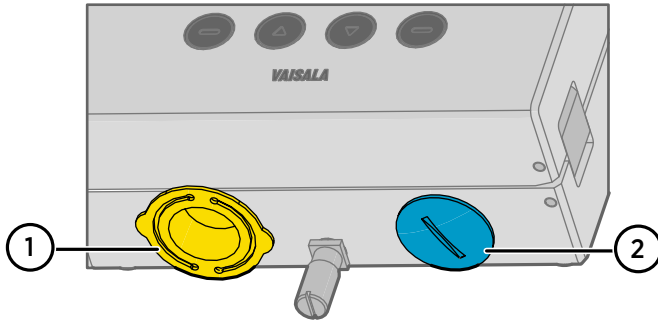
Figure 4   Default plugs in HMT370EX lead-throughs

1   Removable plastic transport cover: must be replaced (fold sides of transport cover together and pull out)
2   Metal sealing plug: can be used in final installation

The plastic transport cover (**1**) must always be replaced with an Ex compliant cable gland, conduit, or seal when wiring HTM370EX. The metal sealing plug (**2**) can be left in place and used in the final installation, if the right-hand lead-through is not used.

Cable glands, conduits, and plugs are available from Vaisala as accessories (listed in Table 6 (page 15)).

Table 6   Cable lead-through accessories

Accessory	Vaisala item code
Cable gland M20 x 1.5 for Ø 5 ... 11 mm cable	265207SP
Cable gland M20 x 1.5 for Ø 10 ... 14 mm cable	265208SP
Conduit fitting M16	265243SP
Conduit fitting NPT1/2″	265240SP
Dummy plug (Ex, 2 pcs)	254931SP

⚠ **CAUTION!** If you use lead-through accessories not ordered from Vaisala, note the following requirements:

- The cable glands and cables used for wiring the device must not impair the Ex protection.
- Unused lead-throughs must be sealed using Ex compliant plugs.
- The glands and plugs must be water and dust tight (minimum IP rating: IP54).

2.8 Using HTM370EX Series transmitters in hazardous locations

> ⚠ **WARNING!** Protected installation using galvanic isolators or Zener barriers is mandatory in a hazardous environment.

In hazardous environments, always connect the transmitters via galvanic isolators or Zener barriers. A galvanic isolator or Zener barrier must also be used when the transmitter and probe body are in a safe area, but the probe head is installed in a hazardous environment. For wiring information, see the galvanic isolator and Zener barrier wiring diagrams included in this document.

HMT370EX does not include a galvanic isolator or a Zener barrier. They can be ordered as optional accessories from Vaisala.

> ⚠ **WARNING!** HMT370EX series transmitters have been designed for use in hazardous locations as specified by the product classification. The personnel installing, using, or maintaining HMT370EX transmitters are responsible for determining the appropriate protection concept for the specific application HMT370EX is used in, and that the hazardous area classification of the device meets the requirements of the application.

> ⚠ **WARNING!** If the equipment is used in a manner not specified by Vaisala, the protection provided by the equipment may be impaired.

HMT370EX series transmitters are certified for use in hazardous areas as defined by the following classifications:

Table 7   HMT370EX series hazardous area classifications

Certification	HMT370EX classification
IECEx [1] / ATEX [2]	II 1 G Ex ia IIC T4 Ga II 1 D Ex ia IIIC T_{200} 85 °C Da -40 °C $\leq$ T_{amb} $\leq$ +60 °C

1)   *International certification*
2)   *EU certification*

> ⚠️ **CAUTION!** The personnel installing, operating, and maintaining HMT370EX transmitters must have the required competencies for working in the hazardous location, as defined by the applicable standards.

For information on the standards that apply to using HMT370EX based on the classification of the device, see HMT370EX certification documentation and the declarations of conformity related to HMT370EX at www.vaisala.com/declarationofconformity.

2.8.1 Guidelines for safe use in hazardous conditions

HMT370EX Series parts overview
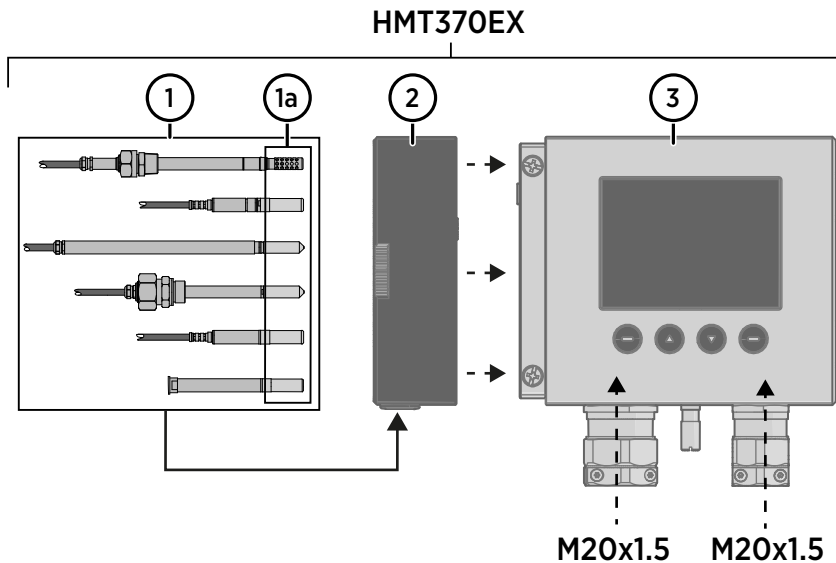
Figure 5   HMT370EX parts overview

HMT370EX Series transmitters consist of 3 main parts: the transmitter body, a detachable probe body, and a probe head attached to the probe body, either directly or using a cable. Figure 5 (page 17) shows the main parts.

1   Probe heads (for variant descriptions, see *HMT370EX User Guide*)
1a   Probe head filters
2   Probe body
3   Transmitter body

The different probe head variants are designed for a range of applications, and have their own specifications. Ensure that the transmitter body, probe body, and probe head are each placed in an environment that matches the specification of the part. For allowed ambient temperature ranges, see Table 8 (page 18).

Table 8   Allowed ambient temperature ranges

Equipment part	Allowed ambient temperature range
Transmitter body	-40 °C ... +60 °C (-40 ... +140 °F)
Probe body	-40 °C ... +60 °C (-40 ... +140 °F)
Probe heads HMP374, HMP375, HMP377, and HMP378	Temperature class T4: -70 °C ... +120 °C (-94 ... +248 °F)
	Temperature class T3: -70 °C ... +180 °C (-94 ... +356 °F)
Probe head HMP371	Temperature class T4: -40 °C ... +60 °C (-40 ... +140 °F)
Probe head HMP373	Temperature class T4: Rubber cable version: -40 °C ... +80 °C (-40 ... +176 °F) FEP cable version: -40 °C ... +120 °C (-40 ... +248 °F)

2.8.1.1 Specific conditions of use

CAUTION! With the installation of the equipment in Zone 0 Group II area it has to be ensured that sparks due to impact or friction do not occur.

Wiring requirements

- The cable glands and cables used for wiring the device must not impair the Ex protection.
  - Unused lead-throughs must be sealed using Ex compliant plugs.
- Select a strain relief option that suits the application (either use cable glands that include strain relief or install separate clamps: see IEC 60079-14).

CAUTION! Connect only de-energized wires. Never switch on the power supply input before completing the wiring and closing the transmitter body.

Intrinsic safety

The overvoltage category of HMT370EX transmitters is **I** (non-mains equipment), and ambient pollution degree is 4, as specified in IEC 60664-1. For intrinsically safe input parameters, see Table 9 (page 19) .

Table 9   Intrinsically safe input parameters

Parameter	Value	Associated apparatus entity parameters
U_i	28 VDC	$U_o \leq U_i$
I_i	100 mA	$I_o \leq I_i$
P_i	700 mW	$P_o \leq P_i$
C_i	12.1 nF	$C_o \geq C_i + C_{cable}$
L_i	16 µH	$L_o \geq L_i + L_{cable}$

Using analog output test points

There are test points for measuring the voltages and currents of the analog outputs, located above each screw terminal block as shown in Figure 6 (page 19). Accessing the test points on the component board requires opening the transmitter enclosure.
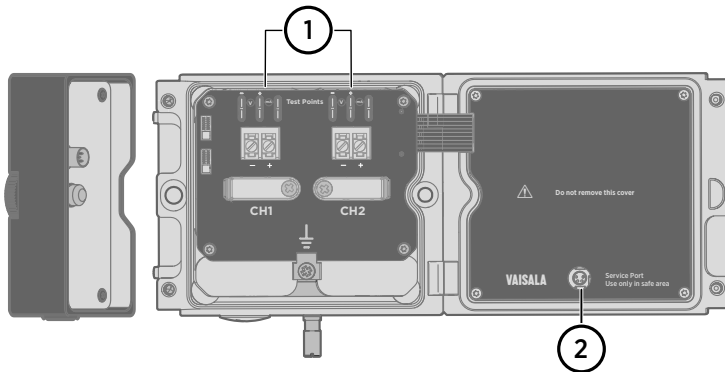
Figure 6   Location of test points and service port

1   Multimeter test points for analog output channels 1 and 2
2   Service port for PC connection

> ⚠️ **CAUTION!** The transmitter body enclosure must not be opened in an explosion hazardous area, unless a safe work permit has been issued in accordance with the standard IEC 60079-14. Either remove the transmitter from the hazardous area before opening the enclosure, or ensure that an IEC 60079-14 compliant safe work procedure has been implemented in the hazardous area.

Use an intrinsically safe multimeter that won't cause the intrinsically safe input parameters listed in Table 9 (page 19) to be exceeded when it is connected in series (current measurement) or parallel (voltage measurement) to the associated apparatus.

Using the service port

The service port (see Figure 6 (page 19)) must only be used in a safe area. Either remove the transmitter from the hazardous area or ensure that a safe work procedure has been implemented in the hazardous area. Only use the Vaisala accessory PC connection cable with the service port.

Maintenance

The probe (includes probe body and head) can be detached and replaced by the user. The probe head filter (see Figure 5 (page 17)) is also user-replaceable. For other maintenance requirements, contact Vaisala.

> ⚠️ **CAUTION!** The probe can be detached and changed when HMT370EX is powered. Any other live maintenance, including changing the probe head filter, is not allowed.

The content in this chapter is maintained in the following separately tracked document:	
Document ID: M212506EN	Revision: A (25 Feb 2021)

3. Probe options

3.1 HMT370EX probe options overview

Figure 7 (page 21) shows the different probe options available for HMT370EX series transmitters. The HMP371 fixed probe option uses a probe head that attaches directly to the probe body. In the other probe options (HMP373, HMP374, HMP375, HMP377, and HMP378), the probe head is attached to the probe body with a cable.
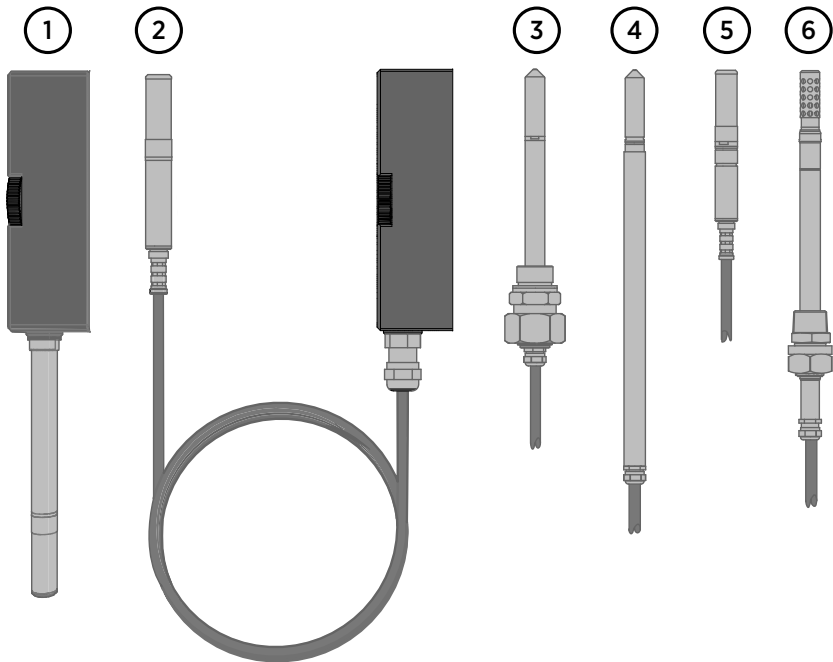
Figure 7   HMT370EX probe options

1   HMP371 fixed probe (page 23)
2   HMP373 probe for confined spaces (page 23)
3   HMP374 probe for high pressure applications (page 25)
4   HMP377 probe for high humidity applications (page 27)
5   HMP375 probe for high temperature applications (page 26)
6   HMP378 probe for pressurized pipelines (page 28)
6a   HMP378 variant: HMP378F probe option for measuring oil moisture and temperature (page 31)
6b   HMP378 variant: HMP378H probe option for measuring fuel moisture and temperature (page 31)

More information

‣ Probe installation overview (page 35)

3.1.1 HMT370EX probe accessories

Table 10 (page 22) lists the available accessories for each probe option.

Table 10   HMT370EX probe accessories

Accessory	Vaisala item code	Models
M12 Indigo USB Adapter cable accessory for connecting HMT370EX probes to Insight	USB2	All models
Ball valve ISO 1/2 with welding joint • Pressure range at +20 °C (+68 °F) 0 … 20 bar (0 … 290 psia) (during installation max. 10 bar (145 psia)	BALLVALVE-1	HMP378
Duct installation kit	210697	HMP373, HMP377
Mounting flange	210696	HMP375
Cable gland M20 x 1.5 with split seal	HMP247CG	HMP373, HMP375, HMP377
Fitting body M22 x 1.5	17223SP	HMP374
Fitting body NPT1/2	17225SP	HMP374
Fitting body ISO1/2 solid structure	DRW212076SP	HMP378
Fitting body NPT1/2 solid structure	212810SP	HMP378
Swagelok fitting for 12 mm probe, 1/2" NPT thread	SWG12NPT12	HMP377
Swagelok fitting for 12 mm probe, 3/8" ISO thread	SWG12ISO38	HMP377
Swagelok fitting for 12 mm probe, 1/2" ISO thread	SWG12ISO12	HMP377
Thread adapter ISO 1/2" to NPT 1/2"	210662SP	All models
Manual press	HM36854SP	HMP378/F/H

3.2 HMP371 fixed probe

Dimensions

The HMP371 fixed probe option has a probe head that attaches directly on the probe body, making it suitable for wall mounting applications.
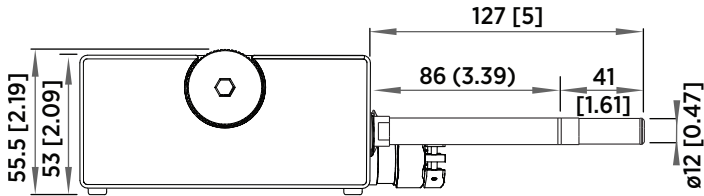
Figure 8   Dimensions in mm (inches)

Specifications

Table 11   HMP371 for wall mounting

Property	Description/value
Temperature range	-40 ... +60 °C (-40 ... +140 °F)
Probe diameter	12 mm (0.47 in)

3.3 HMP373 probe for confined spaces

Dimensions

HMP373 is a small size (ø = 12 mm) general-purpose probe that is suitable for installation into confined spaces such as ducts and channels using the duct installation kit available from Vaisala (item code 210697: see Figure 10 (page 24)).
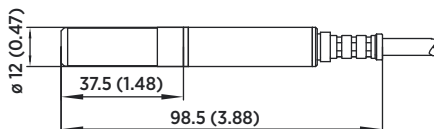
Figure 9   Dimensions in mm (inches)

Specifications

The HMP373 probe option has 2 operating temperature range options depending on the cable selected for the probe. The rubber cable option has a temperature range of -40 ... +80 °C (-40 ... +176 °F). With the Teflon cable option, the temperature range is -40 ... +120 °C (-40 ... +248 °F).

Table 12   HMP373 for confined spaces

Property	Description/value
Temperature range with teflon cable	-40 ... +120 °C (-40 ... +248 °F)
Temperature range with rubber cable	-40 ... +80 °C (-40 ... +176 °F)
Probe cable length	2, 5 or 10 meters (6 ft 7 in, 16 ft 5 in, 32 ft 10 in)
Probe diameter	12 mm (0.47 in)
Installation	
Duct installation kit	210697
Cable gland M20x1.5 with splitting seal	HMP247CG
Swagelok for 12mm probe, 1/2" NPT thread	SWG12NPT12

Duct installation kit 210697
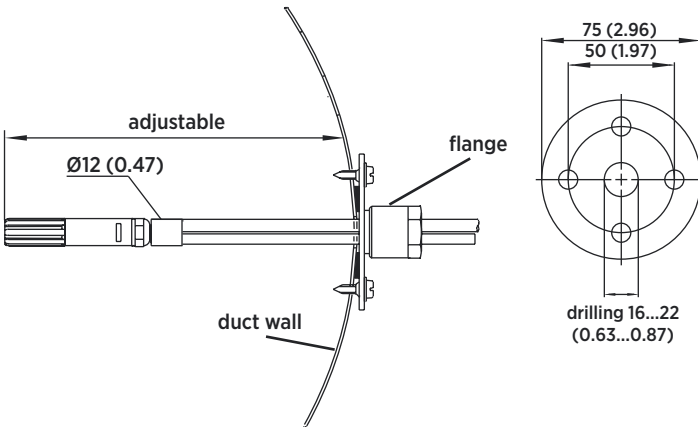
Figure 10   Left: Installation kit for duct mounting. Right: Installation flange. Aluminum or stainless steel.

3.4 HMP374 probe for high pressure applications

Dimensions

The HMP374 probe option is designed for measurement in pressurized spaces or vacuum chambers.
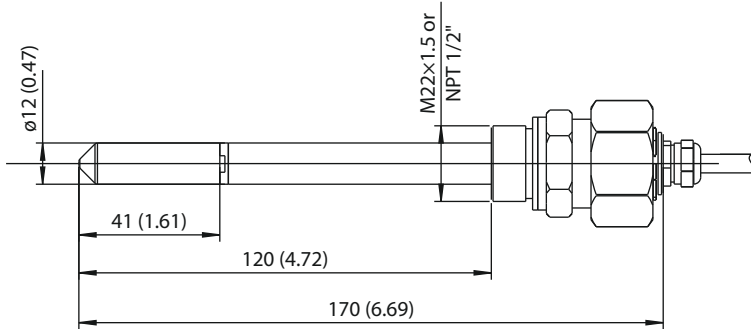
Specifications

Table 13   HMP374 for high pressure

Property	Description/value
Temperature range	-70 ... +180 °C (-94 ... +356 °F)
Pressure range	0 ... 10 MPa
Probe cable length	2, 5 or 10 meters (6 ft 7 in, 16 ft 5 in, 32 ft 10 in)
Probe diameter	12 mm (0.47 in)
Fitting body M22x1.5	17223
Fitting body NPT1/2	17225

> **CAUTION!** In pressurized processes it is essential to tighten the probe very carefully when installing to prevent the loosening of the probe by the action of pressure.

> ⚠️ **CAUTION!** When HMP374 is installed in a process with a pressure differing from normal atmospheric pressure, you must enter the pressure value of the process as an environmental compensation in order to receive accurate measurement results. For information on entering environmental compensations with the transmitter display interface or Vaisala Insight PC software, see Environmental compensation and measurement settings overview (page 66).

3.5 HMP375 probe for high temperature applications

The HMP375 probe option is designed for measurement in high temperature environments.

Dimensions
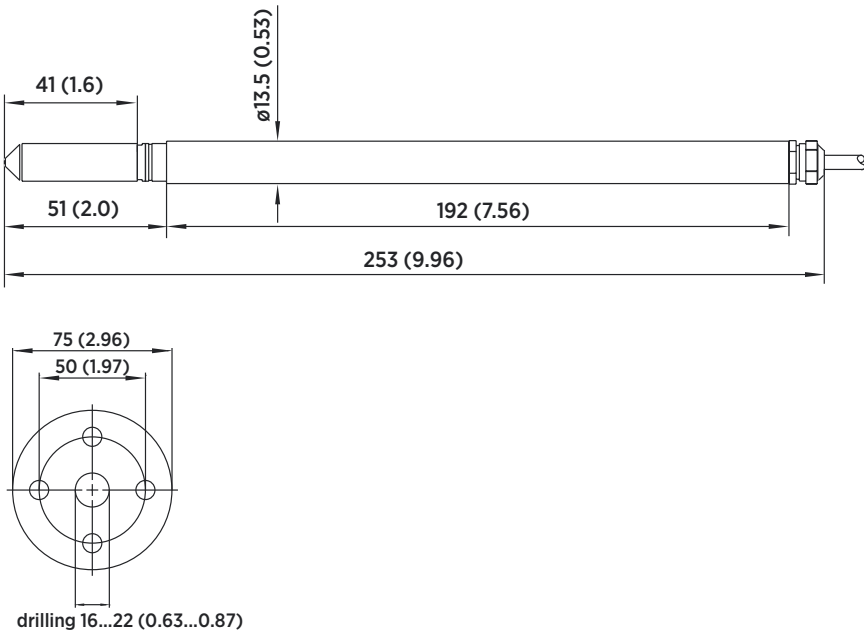
Figure 12   HMP375 probe and stainless steel installation flange. Dimensions in mm (inches).

Specifications

Table 14   HMP375 for high temperature

Property	Description/value
Temperature range	-70 ... +180 °C (-94 ... +356 °F)
Probe cable length	2, 5 or 10 meters (6 ft 7 in, 16 ft 5 in, 32 ft 10 in)
Probe diameter	13.5 mm (0.53 in)
Installation	
Mounting flange	210696
Cable gland M20x1.5 with splitting seal	HMP247CG

3.6 HMP377 probe for high humidity applications

The HMP377 probe option is constructed to be installed in environments with high humidities. The same duct installation kit that is used with HMP373 can be used with HMP377: see Figure 10 (page 24).

Dimensions
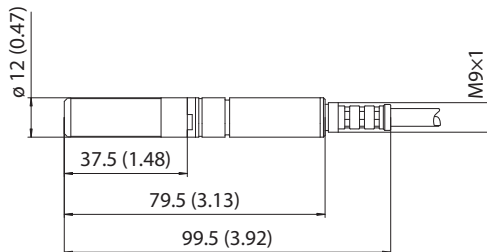
Figure 13   Dimensions in mm (inches)

Specifications

Table 15   **HMP377 for high humidities**

Property	Description/value
Temperature range	-70 ... +180 °C (-94 ... +356 °F)
Probe cable length	2, 5 or 10 meters (6 ft 7 in, 16 ft 5 in, 32 ft 10 in)
Probe diameter	12 mm (0.47 in)

Property	Description/value
Installation	
Duct installation kit	210697
Cable gland M20x1.5 with splitting seal	HMP247CG
Swagelok for 12 mm probe, 3/8" ISO thread	SWG12ISO38
Swagelok for 12 mm probe, 1/2" NPT thread	SWG12NPT12

3.7 HMP378 probe for pressurized pipelines

The HMP378 probe option is especially suitable for measurements inside pipelines. Due to its sliding fit (available probe lengths: 226 mm and 448 mm (8.90 in/17.6 in)), HMP378 is easy to install into and remove from a pressurized process. A ball valve kit (Vaisala item code: BALLVALVE-1) is available for connecting the probe to a pressurized process or pipeline: see Attaching ball valve kit to process (page 30).

HMP378F and HMP378H probe variants for measuring oil and fuel moisture

The HMP378F and HMP378H probe options are variants of the standard HMP378, designed for measurements in oil (HMP378F) and fuel (HMP378H). They provide a specialized selection of measurement parameters (see Table 4 (page 10)) intended specifically for oil and fuel measurements. With HMP378F, oil-specific calculation coefficients can be configured into use to customize the measurement for a specific oil type: see Configuring calculation coefficients (page 69).

For more information on HMP378F, see HMP378F probe option for measuring oil moisture and temperature (page 31).

For more information on HMP378H, see HMP378H probe option for measuring fuel moisture and temperature (page 31).

Dimensions
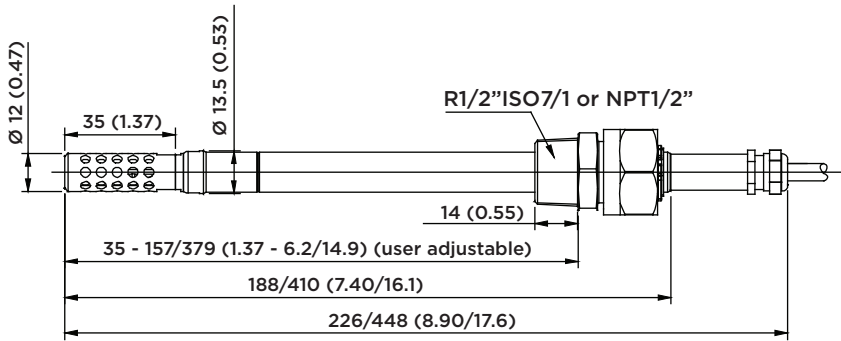
Length for standard/optional probes

Specifications

Table 16   **HMP378 for pressurized pipelines**

Property	Description/value
Temperature range	-70 ... +180 °C (-94 ... +356 °F)
Pressure range	0 ... 4 MPa
Probe cable length	2, 5 or 10 meters (6 ft 7 in, 16 ft 5 in, 32 ft 10 in)
Probe diameter	13.5 mm/12 mm (0.53 in/0.47 in)
Available probe lengths	226 mm/448 mm (8.90 in/17.6 in)
Installation	
Fitting body ISO1/2 solid structure	DRW212076SP
Fitting body NPT1/2 solid structure	NPTFITBODASP
Ball valve ISO 1/2 with welding joint	BALLVALVE-1

3.7.1 Attaching ball valve kit to process
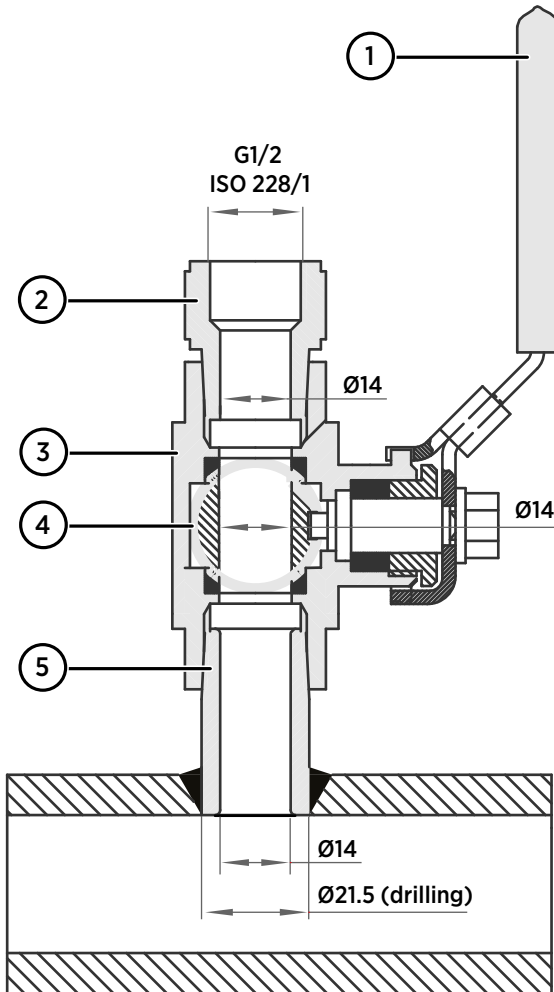
1   Ball valve handle: must point to the same direction as the ball valve body when installing.
2   Extension nipple, threads G1/2 ISO228/1 and R1/2 ISO7/1.
3   Ball valve body. When tightening the assembly, turn only from the ball valve body.
4   Ball of the ball valve.
5   Welding joint, threads R1/2 ISO7/1.

▶ 1. Attach the welding joint to the process pipe or chamber.

2. Apply a sealant (MEGA-PIPE EXTRA No. 7188 or LOCTITE® No. 542 with activator No. 7649) on the threads of the welding joint and screw the bottom of the ball valve onto the welding joint.

3. Tighten the ball valve assembly by turning from the ball valve body.

> ⚠️ **CAUTION!** Tightening the ball valve kit by turning the extension nipple can break the sealing. Tighten the ball valve assembly only from the ball valve body.

4. If you need to cap the ball valve assembly before installing or after removing the probe, attach a blanking nut to close the top of the valve.

3.7.2 HMP378F probe option for measuring oil moisture and temperature

The HMP378F probe option is a variant of the standard HMP378, designed for measurements in oil. The mechanics of the probe are the same as in the standard HMP378 probe option (see HMP378 probe for pressurized pipelines (page 28)).

HMP378F uses the HUMICAP® L2 sensor designed specifically for oil and fuel measurements. For L2 sensor specifications, see Table 20 (page 85).

If required, oil-specific calculation coefficients can be configured into use to customize HMP378F measurements. For instructions, see Configuring calculation coefficients (page 69).

The following measurement parameters are available for HMP378F:

Table 17   HMP378F measurement parameters

Parameter	Abbreviation	Unit
Temperature	T	°C (°F)
Relative saturation	RS	%RS
Water activity	a_w	
Water concentration in oil	H_2O (oil)	ppm_w

3.7.3 HMP378H probe option for measuring fuel moisture and temperature

The HMP378H probe option is a variant of the standard HMP378, designed for measurements in fuel. The mechanics of the probe are the same as in the standard HMP378 probe option (see HMP378 probe for pressurized pipelines (page 28)).

HMP378H uses the HUMICAP® L2 sensor designed specifically for oil and fuel measurements. For HUMICAP L2 sensor specifications, see Table 20 (page 85).

The following measurement parameters are available for HMP378H:

Table 18   HMP378H measurement parameters

Parameter	Abbreviation	Unit
Temperature	T	°C (°F)
Relative saturation	RS	%RS
Water activity	a_w	
Water concentration in fuel	H_2O (fuel)	ppm_w
Saturation temperature	T_s	°C (°F)

4. Installation

4.1 HMT370EX installation overview

Figure 15 (page 33) shows an example HMT370EX installation using the HMP373 probe with the probe head mounted with a bracket, and with both lead-throughs fitted with cable glands.
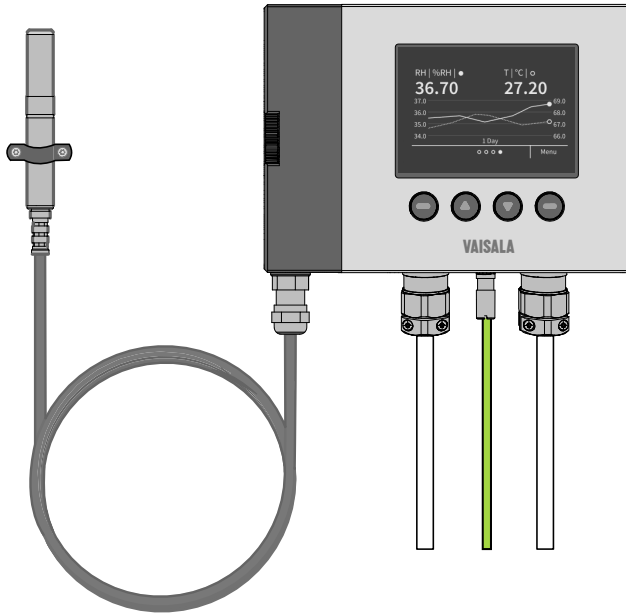
Figure 15   Example wall installation with HMP373 probe

> ⚠️ **CAUTION!** Before starting the installation, review the equipment and safety requirements in this installation overview and the hazardous area safety section Guidelines for safe use in hazardous conditions (page 17).

> ✋ **WARNING!** The installation must be carried out in a safe area, or you must ensure that an IEC 60079-14 compliant safe work procedure has been implemented in the hazardous area.

> **WARNING!** When HMT370EX is powered, the transmitter enclosure must not be opened in a hazardous area. The probe can be detached and changed when HMT370EX is powered. Any other live maintenance, including changing the probe head filter, is not allowed.

- Screws for mounting the transmitter:
    - Installation directly through the transmitter body: 2 pcs Ø 5.5 mm screws
    - Installation with optional mounting plate: 4 pcs Ø 5.5 mm screws and 2 pcs M6 Allen screws
- Crosshead screwdriver for transmitter cover captive screws and wiring screw terminals
- Flathead screwdriver for the grounding terminal
- Cable glands, conduits, and plugs as required in your application, and suitable tools for attaching and tightening them
- Wire-cutting pliers

Optional:

- Crimping tool and wire ferrules
- Allen key (5 mm) for probe body locking wheel
- Ex-compliant multimeter for testing analog outputs

4.1.1 Installation preparations

Before starting the installation, check the following:

- Make sure that your installation site suits the Ex classification of the transmitter: see Table 7 (page 16).
- Review the hazardous area information in Guidelines for safe use in hazardous conditions (page 17) for further information on Ex safety requirements related to HMT370EX and specific conditions of use.
- When selecting the cable glands and plugs for your application, review the information in Cable gland and conduit options (page 14).
- Review the wiring diagrams included in this document for information on wiring using either a galvanic isolator or a Zener barrier.
    - Wiring with galvanic isolators (page 40)
    - Wiring with Zener barriers (page 41)

> **WARNING!** Protected installation using galvanic isolators or Zener barriers is mandatory in a hazardous environment.

> **CAUTION!** When planning the wiring of your application, note that Channel 1 (CH1) must always be wired. The transmitter receives power through the Channel 1 screw terminals, and does not power on if only Channel 2 (CH2) is wired.

4.1.2 Probe installation overview
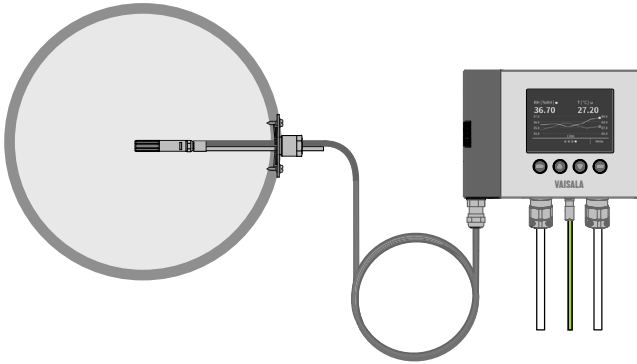
Figure 16   Duct installation example with HMP373 probe and duct installation kit

HMT370EX transmitters can be used with 6 different probe options that are designed for a variety of applications. The installation options vary from wall mounting (fixed HMP371 probe option) to, for example, duct installations (as shown in the HMP373 example in Figure 16 (page 35)) and ball valve installations (HMP378 probe option for pressurized pipelines).

The different probe options have varying operating environment specifications, installation methods, and installation accessories depending on their intended applications. For more information on each option, see HMT370EX probe options overview (page 21). Also review the safety information related to allowed ambient temperature ranges for probes before installation: see Table 8 (page 18).

4.1.3 HMT370EX transmitter dimensions
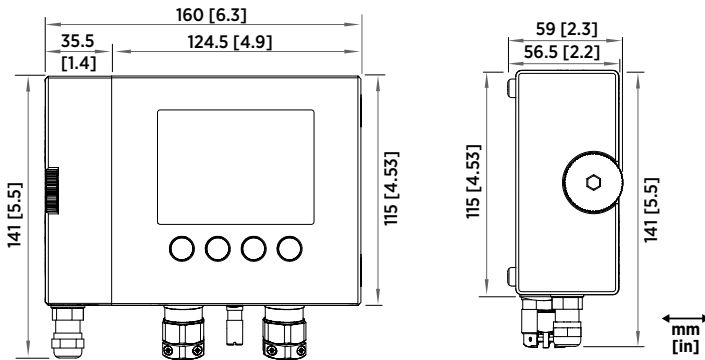
Figure 17   HMT370EX transmitter dimensions

4.2 Mounting

2 ×
Ø 5 mm
[0.2 in]
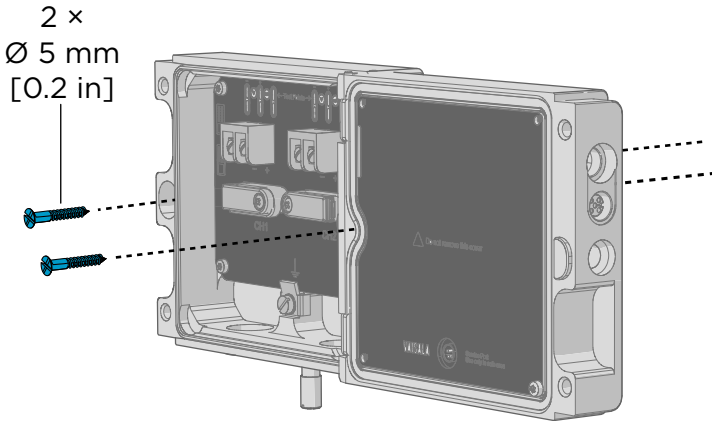
Figure 18   Mounting HMT370EX directly through the transmitter body

Select a surface (for example, a wall) for installing the transmitter. You can mount the transmitter directly to the installation surface with 2 screws, or use an optional mounting plate that attaches to the back of the transmitter.

▶ 1. Detach the probe body from the transmitter body, loosen the captive screws on the transmitter cover, and open the cover.
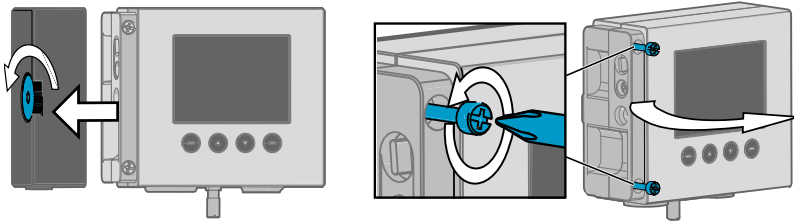
2. Mount the transmitter body on the installation surface either directly through the transmitter body, or using the optional HMT360 retrofit mounting plate:

   a. Installation without mounting plate: attach the transmitter body directly to the installation surface with 2 Ø 5.5 mm screws as shown in Figure 18 (page 36). The left-hand screw hole has extra vertical space for adjusting the position of the transmitter after you have attached the right-hand screw.

   b. Installation with mounting plate: attach the mounting plate to the installation surface with 4 Ø 5.5 mm screws, and then attach the transmitter to the mounting plate with 2 M6 Allen screws.
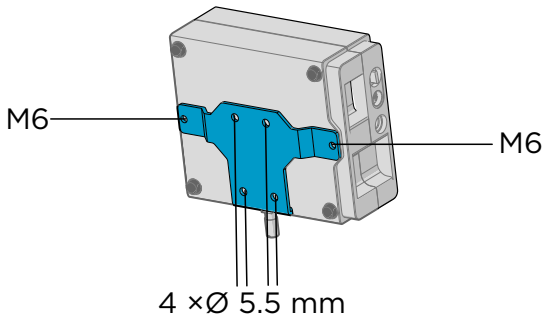
4.3 Attaching cable glands and conduit fittings

The HMT370EX transmitter body has 2 lead-throughs (M20x1.5) for wiring. The combination of cable glands, conduit fittings, and plugs used in the lead-throughs is application-specific, and must be determined by the customer. For information on lead-through accessories available from Vaisala and lead-through accessory requirements, see Cable gland and conduit options (page 14).

> ⚠️ **CAUTION!** If you use lead-through accessories not ordered from Vaisala, note the following requirements:
>
> • The cable glands and cables used for wiring the device must not impair the Ex protection.
> • Unused lead-throughs must be sealed using Ex compliant plugs.
> • The glands and plugs must be water and dust tight.

▶   1. Install the application-specific lead-through accessories and lead the wiring cables
       through them into the transmitter body: an example is shown below.
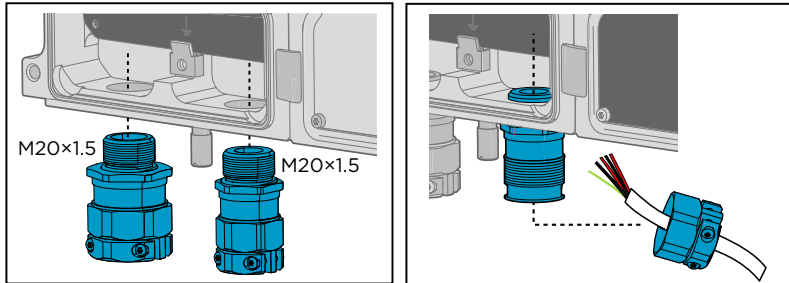
4.4 Wiring

> **WARNING!** Protected installation using galvanic isolators or Zener barriers is
> mandatory in a hazardous environment.

> Galvanic isolators and Zener barriers are available from Vaisala as accessories. See
> Spare parts and accessories (page 93).

> **CAUTION!** Ensure that the transmitter is powered correctly. 12 V DC is the
> minimum voltage in all conditions, measured at the transmitter screw terminals.
> If the supply voltage is less than 12 V DC, the analog output current can be
> erroneous.

> It is recommended to use ferrules on the stripped wires to help ensure a secure
> connection with the screw terminals.
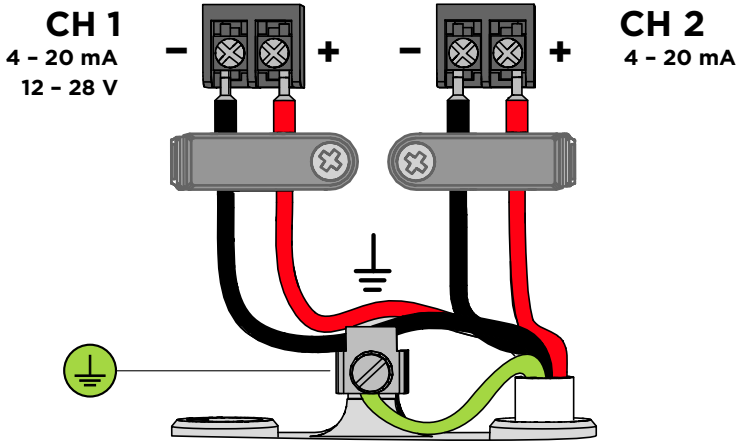
Figure 19   Wiring example using one cable

▶ 1. Prepare the cabling wires as required in your application (cabling either through 1 or 2 lead-throughs).

    a. Strip the cable wires: it is recommended to attach ferrules to the contact ends of the wires.

    b. Open the cable gland and insert a suitable length of the cable inside the transmitter through the cable gland.

    c. Tighten the cable gland: refer to the instructions of the glands used in your application for maximum tightness.

    d. If your installation does not require using both lead-throughs, plug the unused lead-through with an Ex compliant seal.

2. Connect the screw terminal wiring as required in your application. For protected installation wiring diagrams, see Wiring with galvanic isolators (page 40) and Wiring with Zener barriers (page 41).

    a. Open the cable fastening clamps below the screw terminals and lead the cables to the terminals through the clamps.

    b. Connect the wires to the screw terminals: for an example, see Figure 19 (page 39).

> **ℹ** Note that Channel 1 (CH1) must always be wired. The transmitter receives power through the CH1 screw terminals, and does not power on if only Channel 2 (CH2) is wired.

    c. Adjust the length of the wires and close the cable fastening clamps so that they hold the cables in place.

4.4.1 Wiring with galvanic isolators
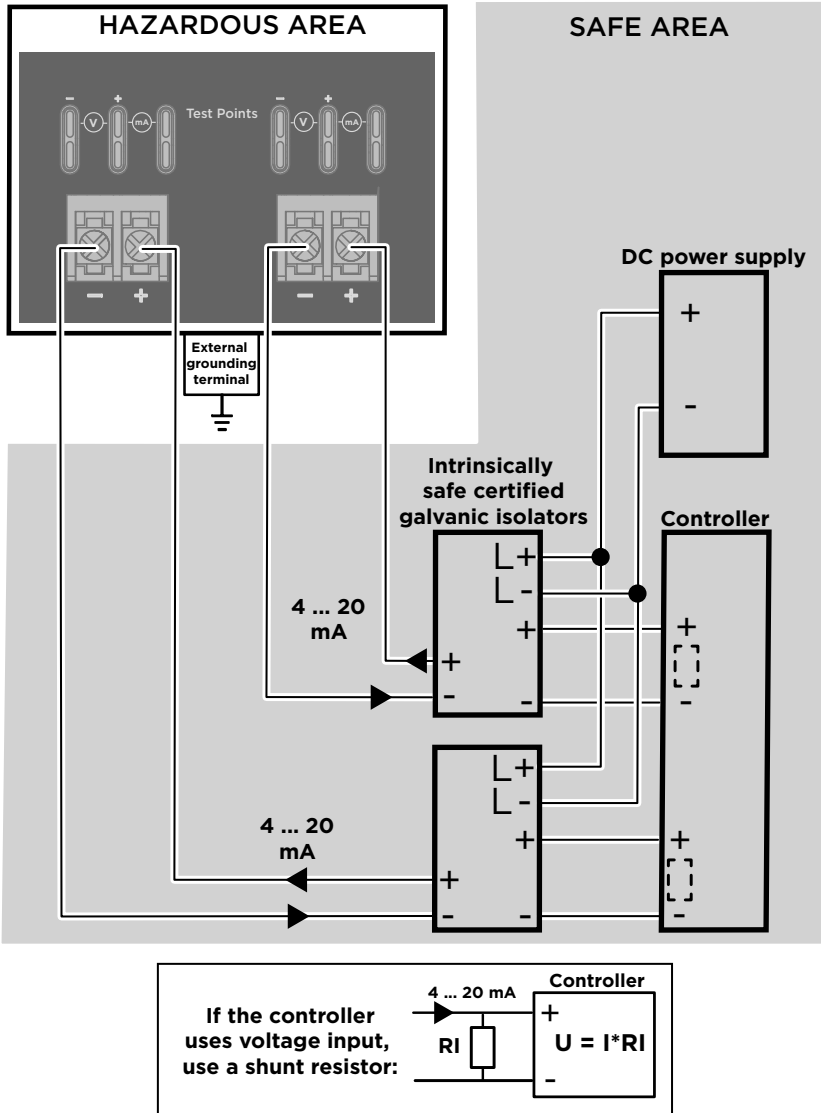
Figure 20   Wiring diagram with galvanic isolators

4.4.2 Wiring with Zener barriers
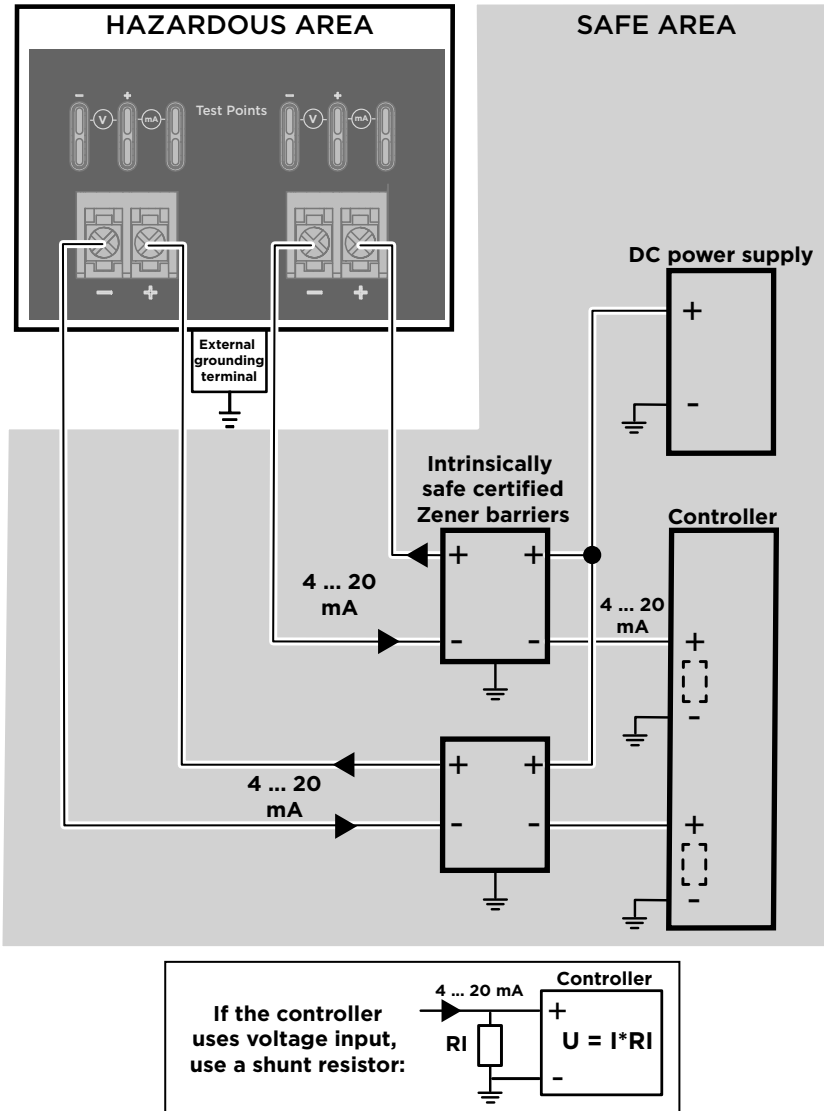
Figure 21   Wiring diagram with Zener barriers

4.5 Finalizing installation: closing transmitter and attaching grounding

▶ 1. Close the transmitter body cover and tighten the captive screws. Tighten the screws to approximately 3.5 Nm: ensure that there is no gap between the covers.

3.5 Nm
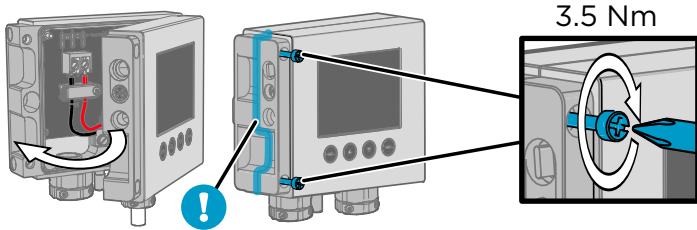
> ℹ Ensure that the cover has been tightened sufficiently so that there is no gap between the covers in the area highlighted in the illustration.

   2. Attach the probe body to the transmitter.
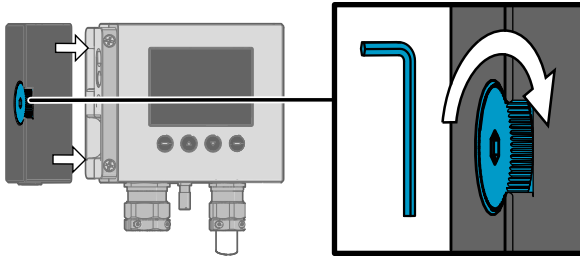
> ℹ It is sufficient to tighten the probe body to finger tightness with the locking wheel. To prevent detaching the probe body without tools, you can tighten the locking wheel further with an Allen key (5 mm).

3. Connect the grounding terminal on the bottom of the transmitter to the grounding element of the installation site with a 4 mm^2 grounding wire.
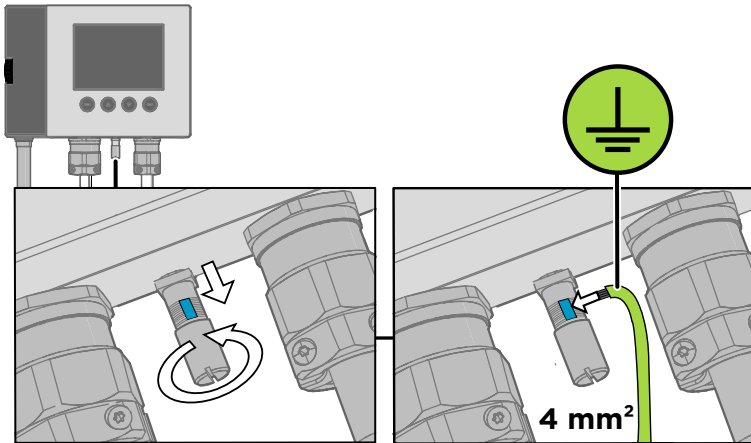
4. After grounding the transmitter, switch on the power supply input.

4.6 Optional: testing analog output level with a multimeter

CAUTION! The transmitter body enclosure must not be opened in an explosion hazardous area, unless a safe work permit has been issued in accordance with the standard IEC 60079-14. Either remove the transmitter from the hazardous area before opening the enclosure, or ensure that an IEC 60079-14 compliant safe work procedure has been implemented in the hazardous area.

Always use an Ex compliant multimeter. The output parameters of the multimeter must be compatible with the input parameters of the transmitter.
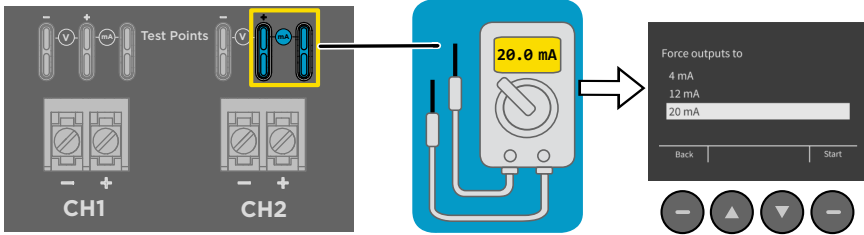
Figure 22   Multimeter test point overview

If you you want to verify the output level of the analog output channels, test the connection as follows:

1. Detach the probe body and open the transmitter cover.

2. Connect a multimeter to the mA testing points located above the output screw terminals on the transmitter component board.

3. Start the output test mode either by using the transmitter display interface, or, if using a transmitter without a display, by connecting the transmitter to Insight PC software.

    a. For instructions on using the output test mode with Insight PC software, see Testing analog output level with Insight (page 64).

    b. To start the output test mode with the display interface, open the **Settings > Analog outputs > Test outputs** menu.
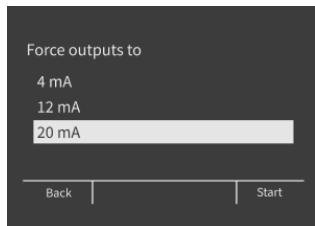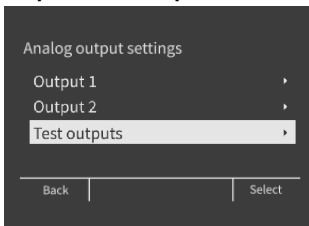
    c. Select an output level to force the output to (4, 12, or 20 mA) and select **Start**. Verify the output with the multimeter.

4. After verifying the output, remove the multimeter, close the transmitter cover, and reattach the probe body.

5. If the output is incorrect and requires adjustment, see Analog output adjustment overview (page 74).

> **CAUTION!** The service port (see Figure 3 (page 14)) must only be used in a safe area. Either remove the transmitter from the hazardous area or ensure that a safe work procedure has been implemented in the hazardous area. Only use the Vaisala accessory PC connection cable with the service port.

5. HMT370 local display interface

5.1 Local display overview

Figure 23   HMT370EX local display examples: measurement graph view and main menu screen

The display version of the HMT370EX transmitter has graphical LCD display with a 4-button interface. The local display can be used to view measurement information, configure settings, and calibrate and adjust measurements and outputs.

Using local display interface buttons

The display interface has 4 buttons for operating the display menus.
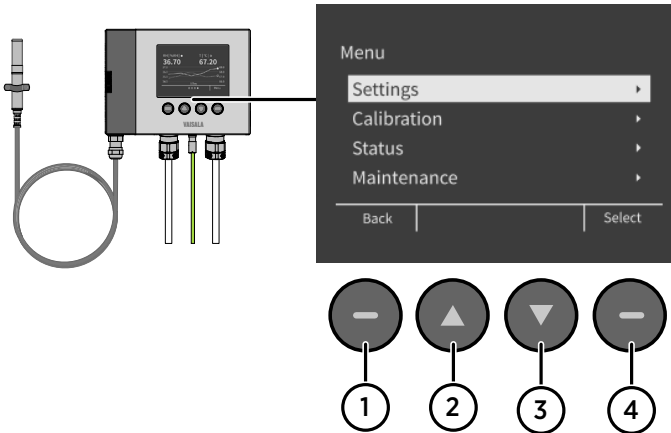
Figure 24   HMT370EX display interface buttons

1   **Back**: press to move back in the menu tree or cancel a selection.
2   **Up**: move up in the menu tree or increase a value.
3   **Down**: move down in the menu tree or decrease a value.
4   **Select**: press to open a menu or confirm a selection.

Press and hold **Back** to return directly to the main menu.

Press and hold the **Up** or **Down** button to increase or decrease a value faster.

Measurement information views

The home view of the display has several options for showing the measurement information of the connected probe. You can switch between the different views (for example, numerical parameters or graph view) using the **Up** and **Down** buttons. The parameter display settings can be configured in the **Settings > Display** menu.
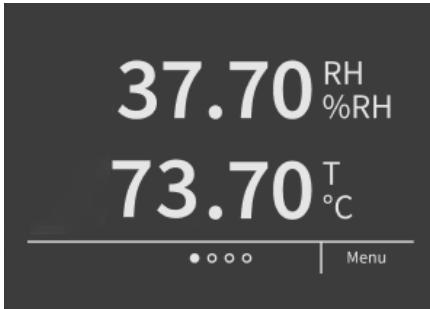
Figure 25   2 parameter view example
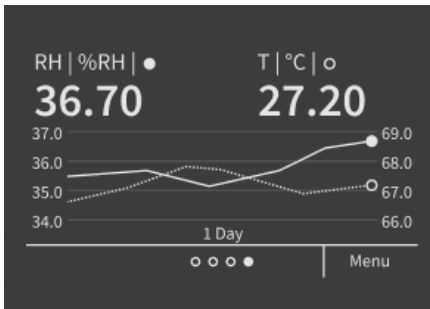
Figure 26   Graph view example

Figure 27   Parameter list view example

Configuration options

You can configure the following settings with the local display:

- Analog output settings (parameters, scaling, fault indication, output test and adjustment)
- Measurement settings (environmental compensation and filtering factor)
- Display settings (displayed parameters, units, graph visualization options, general display settings such as timeout and PIN code)

In addition to configuration, you can also calibrate and adjust the measurement of the connected probe with different references (1-point or 2-point adjustment), view device and measurement status information, and reset the transmitter back to factory settings.

5.1.1 Local display PIN code

You can enable a (non-configurable) PIN code in the **Settings > Display** menu to prevent using the display menus without entering the code.

The PIN code is the following 4 button presses: **Up > Select > Back > Back**
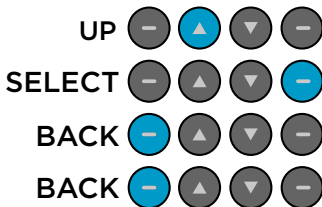
Figure 28   Display PIN code button presses

5.1.2 Light and dark display themes
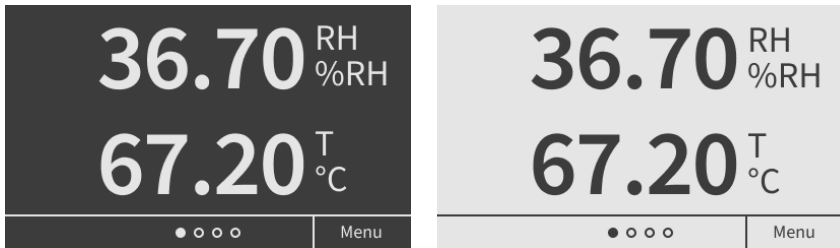
Figure 29   Dark (left) and light (right) display theme examples

You can select either a **Light** or **Dark** display theme to match the lighting conditions of your environment.

The **Light** theme has a light background and dark text and graphics, and the **Dark** theme has a dark background and light text and graphics.

5.1.3 Sleep mode
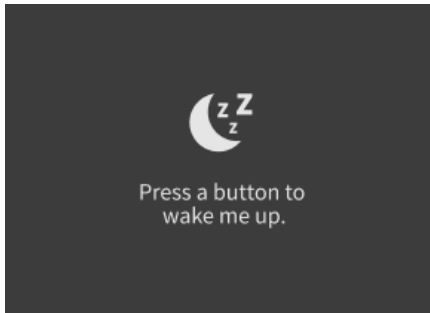
Figure 30   Transmitter display in sleep mode

You can define a timeout after which the display goes to sleep mode when not used with the **Settings > Display > Timeout** selection (1, 5, 15, 30, 60 minutes or disabled). Pressing any button returns the display back to normal operation from the sleep mode.

5.2 HMT370EX display main menu
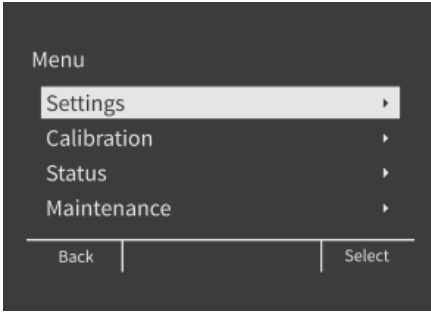
The first view of the display interface menu contains 4 submenus for different configuration options. See the following sections for more information on each submenu:

- Settings menu (page 50)
- Calibration menu (page 53)
- Status menu (page 53)
- Maintenance menu (page 54)
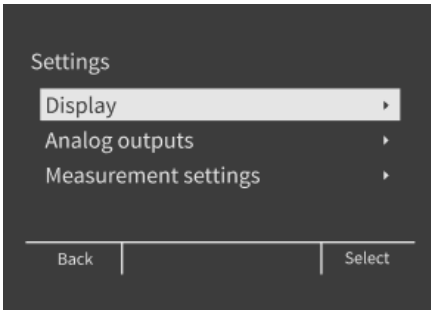
5.3 Settings menu

The **Settings** menu contains the following configuration options:

Display	Selections for which parameters are displayed, display interface language, graph settings, display PIN code protection, timeout (sleep mode), and theme.
Analog outputs	Analog output 1 and 2 parameter selection, scaling, error output selection, and output test mode.
Measurement settings	Environmental compensation and filtering factor configuration.
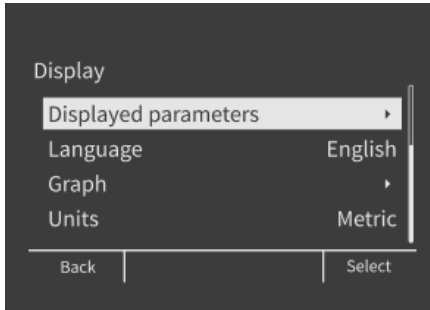
5.3.1 Display menu

In the **Display** menu, you can select which parameters are shown on the display, change the local display interface language, and configure graph, unit, display timeout, menu access PIN code, and color theme options.

Displayed parameters	Select which measurement parameters are shown on the display. Up to 4 parameters can be shown simultaneously.
Language	Set the local display interface language. The available options are **English**, **German**, **French**, **Japanese**, and **Chinese**.
Graph	Set the measurement parameters shown as graphs and the time period visualized in the graph.
Units	Set the display interface to show units either as metric or non-metric.
Menu PIN code	Enable or disable using the fixed PIN code to restrict access to configuration menus.
Timeout	Define the time after which the screen enters power saving mode (sleep mode) if not used.
Theme	Set the display interface to use either a **Light** or **Dark** color theme.

If you have selected a wrong language and need to change the display language, see the instructions in Problems and their possible solutions (page 80). You can also change the display language by connecting the transmitter to the Insight PC software.

5.3.2 Analog outputs menu
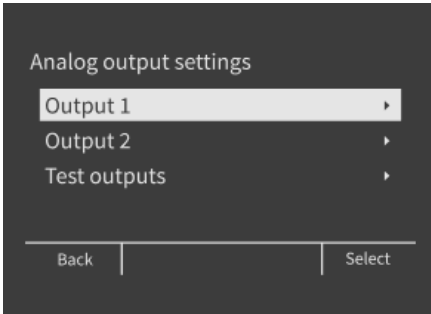
Figure 34   Analog output settings

In the **Analog outputs** menu, you can select the measurement parameters that are sent on analog output channels 1 and 2, select the output scaling and error indication level, and test the accuracy of the outputs.

Output 1   Select which measurement is sent on analog output channel 1 and how the measurement value is scaled on the 4 – 20 mA output range. You can also set the current level that is output to indicate an error state (either 3.6 mA or 21 mA).

Output 2   The same configuration options as for **Output 1**.

Test outputs   You can force the analog output to a fixed value (options: 4, 12, and 20 mA) and read the fixed output to verify that the transmitter outputs are working correctly.

For more information on analog output configuration using the local display or Vaisala Insight PC software, see Analog output configuration overview (page 61).

5.3.3 Measurement settings menu

In the **Measurement settings** menu, you can set environmental compensations and configure the filtering factor.

> ⚠️ **CAUTION!** You must enter the pressure compensation value in order to accurately measure calculated parameters that require pressure data. By default, the pressure compensation value is set as 1013.25 hPa.

Pressure   Enter the pressure of the current measurement environment (in hPa).

Filtering on/off   Enable or disable measurement output filtering using the default filtering factor.

Extended filtering on/off   Enable or disable measurement output filtering using a custom filtering factor value (entered in the **Filtering factor** selection).

Filtering factor   Enter a custom filtering factor value (requires enabling the **Extended filtering factor** selection).

5.4 Calibration menu
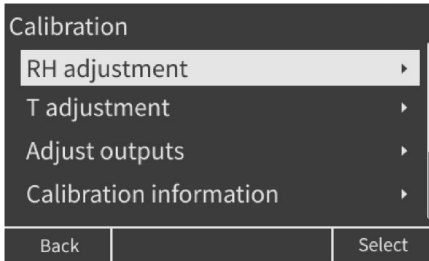
In the calibration menu, you can adjust the RH or T measurement of the connected probe using 1 or 2 reference points. You can also view information about the currently existing adjustments and reset the adjustment of the connected probe back to default.

RH adjustment — Relative humidity calibration and adjustment using 1 or 2 reference points.

T adjustment — Temperature calibration and adjustment using 1 or 2 reference points.

Calibration information — Shows information on the adjustments made to the measurement.

Reset probe — Selections for resetting probe measurement adjustments to factory default settings.
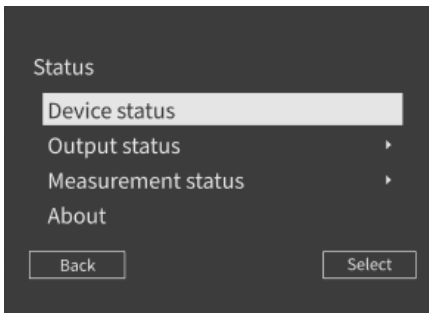
5.5 Status menu

The **Status** menu contains options for viewing information about the operation of the device: transmitter and probe status messages, output and measurement status, and general information on the device.

Device status	Device operation information such as notifications and errors.
Output status	Shows the current statuses of analog output 1 and 2 (output level and measurement).
Measurement status	Shows the current status or statuses of each measurement parameter (for example, **OK** or **Measurement not ready**).
About	Device information (software version and manufacturing date).

5.6 Maintenance menu
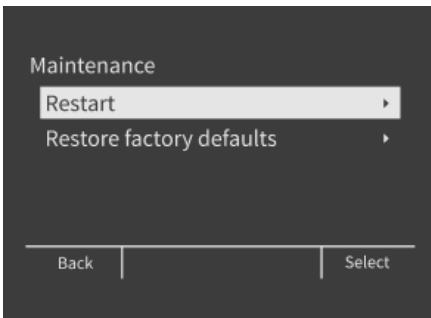
Figure 37   Maintenance menu

In the maintenance menu, you can restart the transmitter and restore transmitter settings back to factory defaults.

> ℹ️ Adjustments made to probe measurement will remain in place also after a transmitter factory reset, as probe adjustments are stored in probe memory.

6. Operating with Insight PC software

6.1 Vaisala Insight PC software

Vaisala Insight PC software is a configuration software for Indigo compatible devices. The supported operating systems are Windows 7 (64-bit), Windows 8.1 (64-bit), and Windows 10 (64-bit).

With the Insight software, you can:

- See device information and status.
- See real-time measurement data.
- Calibrate and adjust device measurement.
- Configure analog output settings such as parameters, scaling and error level, and test and adjust analog output level.
- Configure environmental compensations and measurement settings such as filtering factor and calculation coefficients.

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

The probe body can be detached from the transmitter and connected to Insight separately using the probe body service port. You can also connect the transmitter and probe body to Insight together as one unit by using the transmitter service port.

Connecting the probe body separately to Insight software requires the M12 Indigo USB Adapter accessory (Vaisala item USB2). Connecting the transmitter service port to Vaisala Insight software requires the M8-4F USB cable accessory (Vaisala item 219690).

6.1.1 Basic and Advanced user modes

You can switch between the **Basic Mode** and **Advanced Mode** user modes with the selections in the **Settings** menu.

Certain functionalities are only available in **Advanced Mode**. The options enabled by switching to **Advanced Mode** are often intended for administrative users: set the user mode according to the requirements of the personnel that use the device.

6.2 Connecting to Insight PC software

- Computer with Vaisala Insight PC software installed
- M12 Indigo USB Adapter accessory (Vaisala item USB2) for connecting the probe body to Insight, or the USB connection cable for transmitter service port (M8-4F, Vaisala item 219690).

> ⚠ **CAUTION!** The transmitter body enclosure must not be opened in an explosion hazardous area, unless a safe work permit has been issued in accordance with the standard IEC 60079-14. Either remove the transmitter from the hazardous area before opening the enclosure, or ensure that an IEC 60079-14 compliant safe work procedure has been implemented in the hazardous area.

> ⚠ **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.
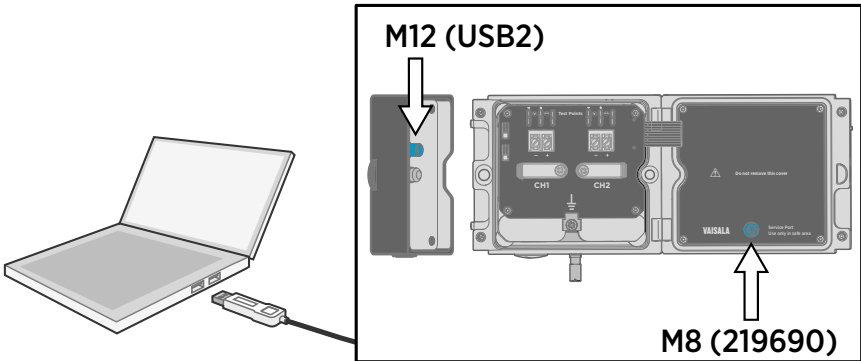
Figure 38   Connecting to Insight: probe body and transmitter service port locations

▶ 1. If you want to configure the probe by itself:

    a. Open the Insight PC software.

    b. Connect the M12 USB cable (Vaisala item USB2) to a free USB port on the PC.

    c. Detach the probe body from the transmitter: see Mounting (page 36) for an example.

> ⚠ **CAUTION!** The probe can be detached and changed when HMT370EX is powered. Any other live maintenance, including changing the probe head filter, is not allowed.

    d. Move the probe body to the space you are using to connect the probe to a computer.

    e. Connect the M12 USB cable (Vaisala item USB2) to the service port of the probe.

    f. Wait for Insight to detect the probe.

2. If you want to configure the transmitter and probe together as one unit:

   a. Open the Insight PC software.

   b. Connect the the M8 USB cable (Vaisala item 219690) to a free USB port on the PC.

   c. Open the transmitter cover: see Mounting (page 36) for an example.

   d. Reconnect the probe body to the transmitter cover.

   e. Connect the M8 USB cable (Vaisala item 219690) to the service port on inside of the the transmitter cover.

   f. Wait for Insight to detect the probe.

6.2.1 Installing driver for the USB service cable

> Only Windows® operating systems are supported by the driver of the USB service cable.

1. Connect the USB service cable to a USB port on your computer. Windows® detects the new device and installs the appropriate driver.

2. Open **Devices and Printers** from the Windows® Start menu. Use search to find it if necessary (search for "devices").

3. Locate the cable in the list of devices:
   - If the device is listed as **Vaisala USB Device** with a COM port number in brackets, the cable is ready for use. **Note the COM port number, you will need it later.**
   - If the device is listed as **Vaisala USB Instrument Cable** without a COM port number listed, you must install the driver manually.
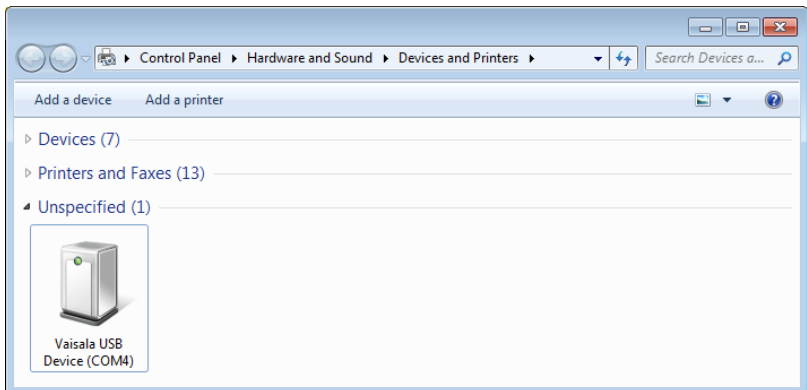
4. To install the driver manually:

   a. Disconnect the USB service cable from the computer.

   b. Download the Vaisala USB driver at http://www.vaisala.com/software (select the appropriate USB Instrument Driver Setup for your cable).

   c. Run the USB driver installation program *Vaisala USB Device Driver Setup.exe*. Accept the installation defaults.

   d. Go back to step 1 and verify that the driver installation works as expected.

6.3 Insight main view with transmitter

Figure 39   Insight main menu and settings: transmitter view

1   Select ⚙ to access Insight main menu.

- **Configure Device**: environmental compensation settings, analog output settings, display and graph settings, measurement coefficients, filtering factor, and general settings.
- **Export Settings**: creates a text file export of the device settings.
- **Calibrate**: options for calibrating and adjusting RH and T measurement, adjusting analog outputs, viewing adjustment data, and restoring factory adjustments.
- **Restart device**: quick access selection for restarting the device.
- **Restore factory settings**: restores default settings, clears any user adjustments, and restores the latest factory calibration.
- **Probe**: selections for restarting the connected probe and restoring factory settings to the probe.
- **About Device**: general device information such as serial number and software version.

2   Select **Settings** to switch between the **Basic Mode** and **Advanced Mode** user modes, change the units of parameters (metric/non-metric), enter a factory code to access restricted functionalities, or view information about the Insight software.

3   **Monitoring** provides options for monitoring and recording selected parameters, and exporting the monitoring data as a CSV (comma-separated values) file.

4   Device information menu with the following tabs:

- **Measurements**: measurement graph view with parameter drop-down selection.
- **Calibration information**: read-only information about the latest stored calibration.

- **Diagnostics**: troubleshooting and administrative information about the device status. Also includes options for exporting the device error log and other diagnostics information as files (CSV/ZIP). When contacting Vaisala support, it is recommended to include an up-to-date export of the error log with the support request.

6.4 Insight main view with probe
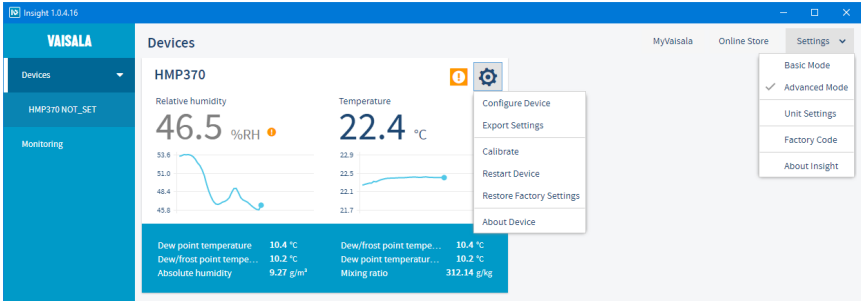
Figure 40   Insight main menu and settings: probe view

When you detach a probe from the transmitter and connect it separately to Insight, the configuration view is otherwise similar as when connecting a transmitter and a probe together (see Insight main view with transmitter (page 59)), but the configuration options are limited to probe functionalities.

7. Analog output configuration

7.1 Analog output configuration overview

HMT370EX has 2 scalable 4 – 20 mA analog output channels. Each output has the following configuration options:

- Output parameter selection
- Output scale low end and high end
- Error output level and clipping limits
- Output testing (force output to a specified level for multimeter testing)

> **i** Note that the clipping and error limit configuration can only be carried out with Insight PC software.

The configuration of the outputs can be changed with the transmitter display interface or by connecting the transmitter to Vaisala Insight PC software.

Figure 41   Analog output configuration options in Insight PC software

7.2 Configuring analog outputs with Insight

Using the Insight PC software, you can configure the measurement parameter sent on each analog output, the scaling of the parameter, clipping and error limits, and the error output level. In addition to configuration, you can also carry out an output test where the output is forced to a fixed level so it can be verified with a multimeter. Both output channels have the same configuration options.

The analog output configuration view in Insight also shows the status and output mode of the analog output channel: see Figure 41 (page 61).

▶ 1. Connect to Insight (see Connecting to Insight PC software (page 55)).

   2. Select ⚙ > **Configure Device**, and then one of the 2 analog outputs.

   3. Select the measurement parameter that is sent on the output channel you are configuring, set the scaling for the output, and define the output level that indicates an error.

   4. Define the clipping and error limits.

   5. Store the selections with **Save** and exit with **Close**.

   6. Repeat the configuration for each output (analog outputs 1, 2, and 3) as required.

   7. If you want to test the output, see the instructions in Analog output level test (page 63).

7.3 Configuring analog outputs with local display interface

Using the local display interface of the transmitter, you can configure the measurement parameter sent on each analog output, the scaling of the parameter, and the error output level. In addition to configuration, you can also carry out an output test where the output is forced to a fixed level so it can be verified with a multimeter. Both output channels have the same configuration options.

To view the status of the outputs, select **Menu > Status > Output status**.

> ℹ Note that clipping and error limit configuration for the analog outputs can only be carried out with Insight PC software.

▶ 1. Select **Menu > Settings > Analog outputs**.

   2. Select the measurement parameter that is sent on the output channel you are configuring, set the scaling for the output, and define the output level that indicates an error.

   3. Repeat the configuration for each output as required.

   4. If you want to test the output, see the instructions in Analog output level test (page 63).

7.4 Analog output level test

If you need to verify that the signal from the HMT370EX transmitter's analog output channel is correct, you can force the output of the channel to a specific value and measure the output level with a multimeter.

The analog output level tested can be carried out either with the local display interface or using Vaisala Insight PC software.
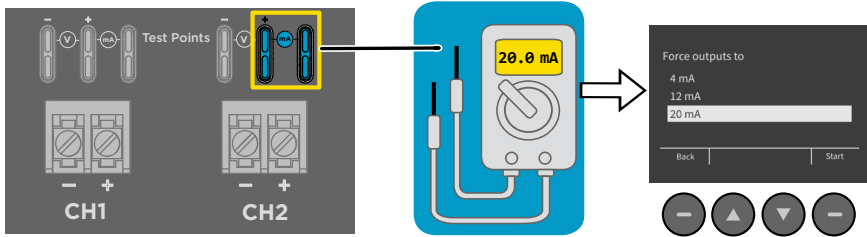
Figure 42   Multimeter test point overview

> ⚠️ **CAUTION!** The transmitter body enclosure must not be opened in an explosion hazardous area, unless a safe work permit has been issued in accordance with the standard IEC 60079-14. Either remove the transmitter from the hazardous area before opening the enclosure, or ensure that an IEC 60079-14 compliant safe work procedure has been implemented in the hazardous area.

> ℹ️ Always use an Ex compliant multimeter. The output parameters of the multimeter must be compatible with the input parameters of the transmitter.

7.4.1 Testing analog output level with local display interface

If you you want to verify the output level of an analog output channel, test the connection as follows:

▶ 1. Detach the probe body and open the transmitter cover.
   2. Connect a multimeter to the mA testing points located above the output screw terminals on the transmitter component board (see Figure 42 (page 63)).

3. To start the output test mode with the local display interface, open the **Settings > Analog outputs > Test outputs** menu.

Analog output settings		Force outputs to	
Output 1	▸	4 mA	
Output 2	▸	12 mA	
Test outputs	▸	20 mA	
Back	Select	Back	Start
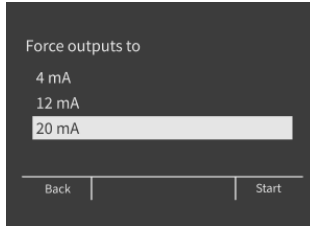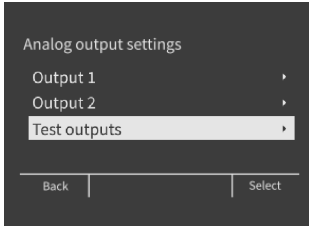
4. Select an output level to force the output to (4, 12, or 20 mA) and select **Start**. Verify the output with the multimeter and select **Finish** when done.

5. If the output is incorrect and requires adjustment, see Analog output adjustment overview (page 74).

6. Remove the multimeter, close the transmitter cover, and reattach the probe body.

7.4.2 Testing analog output level with Insight

▶ 1. Detach the probe body and open the transmitter cover.

2. Connect a multimeter to the mA testing points located above the output screw terminals on the transmitter component board (see Figure 42 (page 63)).

3. Connect to Insight (see Connecting to Insight PC software (page 55)).

4. Select ⚙ **> Configure Device**, and then the analog output channel you want to test.

5. Enter a test output value in the **Test output level** and select **Save**.

Test output level	①	4	
Output value			%RH
Output level		4	

Save	Close
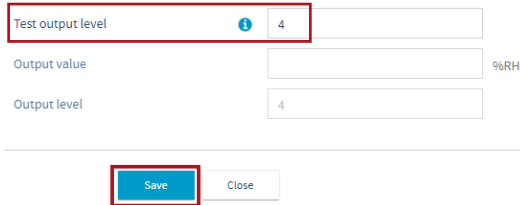
6. The **Output mode** field will show that the **Test mode** is now active.

Output status	Test mode
Output mode	4...20 mA

7. Verify that the multimeter reading matches the **Test output level** value.

8. If the output is incorrect and requires adjustment, see Analog output adjustment overview (page 74).

9. After verifying the output, clear the value from the **Test output level** field and select **Save**. This switches the **Test mode** off.

> ⚠️ **CAUTION!** The **Test mode** must always be switched off after verifying the output level to return to normal measurement mode.

10. Remove the multimeter, close the transmitter cover, and reattach the probe body.

8. Environmental compensation and measurement settings

8.1 Environmental compensation and measurement settings overview

Pressure compensation

You can configure a pressure compensation value to HMT370EX using either the local display interface or Vaisala Insight PC software.

> ⚠️ **CAUTION!** You must enter the pressure compensation value in order to accurately measure calculated parameters that require pressure data. By default, the pressure compensation value is set as 1013.25 hPa.

Filtering factor

If the measuring environment produces occasional exceptionally high or low readings that need to be averaged out in the output, you can apply a filtering factor to the measurement output. The filtering factor defines the speed at which the latest measurement is integrated into the transmitter's output. For example, setting the filtering factor to 0.500 means that the displayed output is a 50%+50% combination of the previous measurement and the most recent measurement. To show the latest measurement directly in the output, set the filtering factor to 1.000 (no filtering).

HMT370EX has 2 alternative filtering factor options: either a default filtering factor that uses a 13 second moving average (T90), or a custom filtering factor defined by the user.

The filtering factor can be configured using the local display interface or Vaisala Insight PC software.

Calculation coefficients

When required, you can define the molar mass of the ambient gas (default value: 28.965 g/mol) and oil-specific calculation coefficients. The oil-specific calculation coefficients (selections **Oil A** and **Oil B**) are applicable only for the HMP378F oil probe model.

> ⚠️ **CAUTION!** The molar mass of the ambient gas must be defined when calculating gas dependent humidity parameters.

> ℹ️ Note that calculation coefficients (molar mass of the ambient gas and oil-specific calculation coefficients) can only be entered with Vaisala Insight PC software.

For more information on the oil calculation coefficients for HMP378F, see HMP378F calculation model with average oil coefficients (page 69) and HMP378F calculation model with oil-specific coefficients (page 70).

8.2 Configuring pressure compensation

You can configure a pressure compensation value to HMT370EX using either the local display interface or Vaisala Insight PC software.

> ℹ️ Note that configuring these settings requires using Insight in **Advanced Mode**.

To set a pressure compensation value:

1. If you are using the local display interface:

    a. Select **Menu > Settings > Measurement settings > Pressure**.

    b. Use the **Up** and **Down** buttons to enter a value for each digit of the pressure value. Move to the next digit with **Select**.

    c. After the final digit, pressing **Select** saves the pressure value.

2. If you are using Insight PC software:

    a. Connect to Insight PC software: see Connecting to Insight PC software (page 55).

    b. Select ⚙ **> Configure Device > Compensation setpoints**.

    c. Enter the pressure compensation value into the **Pressure** field and select **Save**.

8.3 Configuring filtering factor
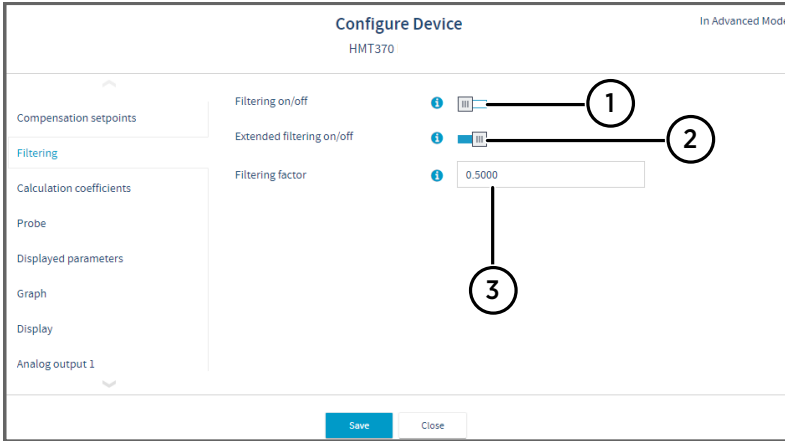
Figure 43   Filtering factor configuration in Insight PC software

1   Enable **Filtering on/off** to use the default filtering factor.
2   Enable **Extended filtering on/off** if you want to enter a custom filtering factor value.
3   After enabling the **Extended filtering on/off** selection, enter the custom value into the
    Filtering factor field.

You can apply a filtering factor to the measurement output to average out measurement
output over time (for more information, see Environmental compensation and measurement
settings overview (page 66)). A default or custom filtering factor can be set using either the
local display interface or Vaisala Insight PC software.

To set a filtering factor:

1. If you are using the local display interface:

    a. Select **Menu > Settings > Measurement settings > Filtering**.

    b. To enable the default filtering factor (13 second moving average (T90)), set the
        Filtering on/off selection to **ON**.

    c. If you want to enter a custom filtering factor, set the **Extended filtering on/off**
        selection to **ON**, select **Filtering factor** and enter the custom value with the **Up** and
        Down buttons.

    d. After the final digit, pressing **Select** saves the pressure value.

2. If you are using Insight PC software:

    a. Connect to Insight PC software: see Connecting to Insight PC software (page 55).

    > **i** Note that configuring these settings requires using Insight in **Advanced Mode**.

    b. Select ⚙ **> Configure Device > Filtering**.

    c. To enable the default filtering factor (13 second moving average (T90)), set the **Filtering on/off** selection to **ON** and select **Save**.

    d. If you want to enter a custom filtering factor, set the **Extended filtering on/off** selection to **ON**, enter the custom value into the **Filtering factor** field, and select **Save**.

8.4 Configuring calculation coefficients

You can configure a compensation value for the molar mass of the ambient gas and oil-specific coefficients to HMT370EX with Vaisala Insight PC software. The oil-specific coefficients (**Oil A** and **Oil B**) are only applicable for the HMP378F oil measurement probe option.

> **i** Note that configuring these settings requires using Insight in **Advanced Mode**.

> **i** Note that calculation coefficients can only be configured with Insight PC software.

To enter calculation coefficient values with Insight:

▶ 1. Connect to Insight PC software: see Connecting to Insight PC software (page 55).

2. Select ⚙ **> Configure Device > Calculation coefficients**.

3. Enter the calculation coefficients (**Molar mass of gas**, **Oil A**, or **Oil B**) as applicable in their respective fields and select **Save**.

8.4.1 HMP378F calculation model with average oil coefficients

The oil moisture calculation model in HMP378F probes is based on average water solubility behavior in oils. The ppm_w output is calculated as follows:

$$ppm_w = a_w \times 10^{(A/(T+273.15)+B)}$$

a_w water activity
A, B   coefficients (average or oil specific)
T   temperature (°C)

Generally, moisture in oil measurement with HMP378F has an accuracy of ±2 … 3 % of the reading. If additional accuracy is needed, see HMP378F calculation model with oil-specific coefficients (page 70).

8.4.2 HMP378F calculation model with oil-specific coefficients

For additional accuracy, an oil-specific calculation model can be used in HMP378F. An oil sample has to be sent to Vaisala for modeling. As a result, the specific coefficients (A and B: see formula in HMP378F calculation model with average oil coefficients (page 69)) for the oil are determined by Vaisala. Using these coefficients increases measurement accuracy.

You can configure the determined coefficients of the oil into use with Insight PC software, or contact Vaisala about setting the coefficients. For configuration instructions, see Configuring calculation coefficients (page 69).

9. Calibration and adjustment

9.1 Calibration and adjustment overview
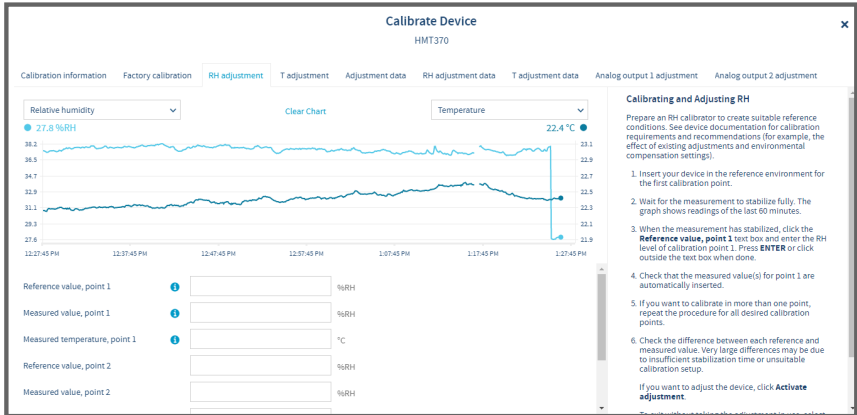
Figure 44   Insight PC software calibration view example
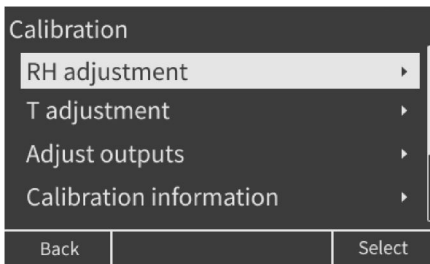
Figure 45   Local display calibration menu

The RH and T measurement of the probe used in the HMT370EX transmitter can be calibrated and adjusted (1-point or 2-point adjustments) using one of the following alternative configuration options:

- Detaching the probe body from the transmitter and connecting the probe to Insight PC software (requires M12 Indigo USB Adapter cable accessory (Vaisala item USB2)).
- Calibrating and adjusting the probe with Insight PC software when the probe is attached to the transmitter (requires M8 USB cable accessory 219690).
- Calibrating and adjusting the probe with the local display interface of the transmitter when the probe is attached to the transmitter.

9.2 Adjusting measurements with Insight

You can carry out RH and T adjustments with Insight PC software in 2 ways:

- Detach the probe body from the transmitter and connect the probe body to Insight.
- Connect the probe body and transmitter to Insight together as one unit using the transmitter service port.

For instructions on connecting to Insight using either option, see Connecting to Insight PC software (page 55).

> ⚠ **CAUTION!** Using the transmitter service port requires opening the transmitter enclosure. Do not open the transmitter enclosure without reviewing the information in Connecting to Insight PC software (page 55).

▶
  1. Connect the probe body or transmitter to Insight (see Connecting to Insight PC software (page 55)).

  2. Select ⚙ **> Calibrate > Yes**.

  3. Select either **RH adjustment** or **T adjustment**

  4. Follow the instructions in the Insight interface.

  5. After completing the adjustment:

      a. If you configured the probe body separately, reattach the probe body to the transmitter.

      b. If you connected to the transmitter service port, remove the cable and see the instructions in Finalizing installation: closing transmitter and attaching grounding (page 42).

9.3 Adjusting measurements with HMT370EX local display interface

The probe connected to HMT370EX can be calibrated and adjusted using the local display interface and a reference device or a calibrator with a known reference concentration. Both RH and T adjustments can be carried out either as 1-point or 2-point adjustments.

To carry out a 1-point or 2-point adjustment with the local display interface:

▶
  1. Prepare a reference source that you can compare to the measurement of the probe.

  2. Select **Menu > Calibration** and either **RH adjustment** or **T adjustment**.

3. Select the number of points you want to adjust and press **Select**.
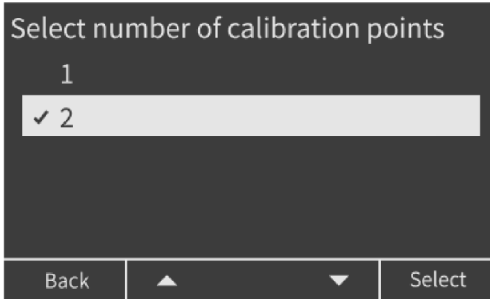
4. When you select either 1 or 2 points, the transmitter shows a notification about starting the adjustment and information about the task. Place the probe near the reference point.
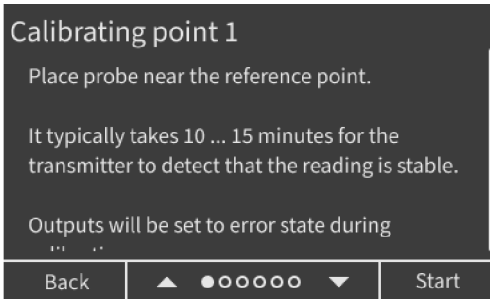
5. When you are ready to begin the adjustment, select **Start**. To cancel the adjustment and return to the previous menu, select **Back**.

The analog outputs are set to error state during calibration and adjustment.

6. After you start the adjustment, the stabilization view is shown. Wait until the display shows a notification about the stabilization being complete.
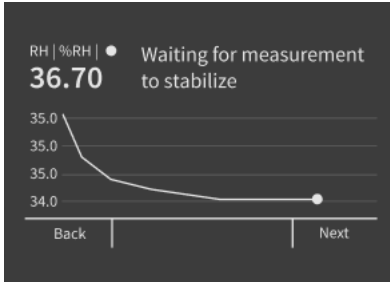
> ℹ️ You can also select **Next** to continue before the notification about stabilization being complete is shown. If the stabilization is not yet ready, a message is shown.

7. After the stabilization has completed, continue with **Next**.

8. The display shows the value measured by the probe. Enter the known value of your reference using the **Up** and **Down** buttons, and then select **Next**.

> 💡 Press and hold the **Up** or **Down** button to change the value faster.

9. If you are calibrating multiple points, repeat the steps for the next point.

10. After the last point has been adjusted, an information view shows the adjustments that were made. Confirm the adjustments by selecting **Apply**. If you do not want to use the adjustments, select **Discard** to return back without taking the adjustments into use.

11. After applying the adjustment, you can view information about the calibration from the **Calibration information** selection in the **Calibration** menu.

12. If you need to restore factory adjustments, select **Reset probe** in the **Calibration** menu.

9.4 Analog output adjustment overview

If the output level of the HMT370EX transmitter's analog channels appears to be incorrect, you can test and adjust the output level using either Insight PC software or the local display interface.

Note that testing and adjusting the analog output requires opening the transmitter enclosure and connecting a multimeter to the test points on the transmitter component board.

⚠️ **CAUTION!** The transmitter body enclosure must not be opened in an explosion hazardous area, unless a safe work permit has been issued in accordance with the standard IEC 60079-14. Either remove the transmitter from the hazardous area before opening the enclosure, or ensure that an IEC 60079-14 compliant safe work procedure has been implemented in the hazardous area.

ℹ️ The output parameters of the multimeter must be compatible with the input parameters of the transmitter.

For instructions on connecting the multimeter to the test points and testing the analog output level, see Analog output level test (page 63).

9.4.1 Adjusting analog output level with Insight

Figure 46   Analog output level adjustment in Insight PC software

1   Enable the adjustment mode with this selection.
2   Start sending a low level test output (4 mA) with this selection. Enter the value measured
    with the multimeter in the **Measured value, low point** field.
3   Start sending a high level test output (20 mA) with this selection. Enter the value
    measured with the multimeter in the **Measured value, high point** field.
4   After adjusting both low and high points, activate the adjustment with this selection.
5   The corrections made to the output level are shown here. Enter information about the
    calibration and the calibration date.

▶   1. Detach the probe body and open the transmitter cover.

    2. Connect a multimeter to the mA testing points located above the output screw terminals
       on the transmitter component board (see Figure 42 (page 63)).

    3. Connect to Insight (see Connecting to Insight PC software (page 55)).

4. Select ⚙ **> Calibrate > Yes** and then either **Analog output 1 adjustment** or **Analog output 2 adjustment**.

5. Follow the instructions in the Insight interface to carry out the adjustment.

6. Remove the multimeter, close the transmitter cover, and reattach the probe body.

9.4.2 Adjusting analog output level with local display interface

To adjust the output level of analog output channel 1 or 2 with the local display interface:

▶ 1. Detach the probe body and open the transmitter cover.

2. Connect a multimeter to the mA testing points located above the output screw terminals on the transmitter component board (see Figure 42 (page 63)).

3. Select **Menu > Calibration > Adjust outputs**, and then select either **Analog output 1** or **Analog output 2**.

4. The display shows information about the analog output level adjustment. Select **Next** to start sending the low level (4 mA) test output from the transmitter analog channel.

5. Verify that the output reading of the multimeter matches 4 mA. If the multimeter reading differs from 4 mA, enter the required change to the transmitter output level with the **Up** and **Down** buttons. Select **Next** after the correction.

6. The transmitter starts to send the high level (20 mA) test output. Verify that the output reading of the multimeter matches 20 mA. If the multimeter reading differs from 20 mA, enter the required change to the transmitter output level. Select **Next** after the correction.

7. In the next view, select **Apply** to take the adjustment into use. If you do not want to save the adjustment, select **Back**.

8. Remove the multimeter, close the transmitter cover, and reattach the probe body.

10. Maintenance

10.1 Overview

Inspect the condition of the transmitter, probe body, and probe head periodically.

The probe (includes probe body and head) can be detached and replaced by the user. The probe head filter (see Figure 5 (page 17)) is also user-replaceable. For other maintenance requirements, contact Vaisala.

> ⚠️ **CAUTION!** The probe can be detached and changed when HMT370EX is powered. Any other live maintenance, including changing the probe head filter, is not allowed.

10.1.1 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.

10.2 Cleaning

You can clean the transmitter, probe, and probe body by wiping with a moist cloth. Standard cleaning agents can be used.

> ℹ️ Avoid exposing the transmitter, probe body, or probe to chemicals for unnecessarily long periods of time. Do not immerse them in liquid when cleaning, and wipe chemicals off the surfaces after cleaning.

10.3 Changing probe filter

Replace the probe filter if it is contaminated. New filters are available from Vaisala.

> ⚠️ **CAUTION!** Be careful when changing the filter, since it is easy to break the sensor when the filter is removed.

When replacing the filter, wear clean gloves to avoid depositing dirt or oil on the filter.

Replace the filter as follows:

▶ 1. Turn the filter counterclockwise until it is loose.

2. Pull the filter straight out carefully.
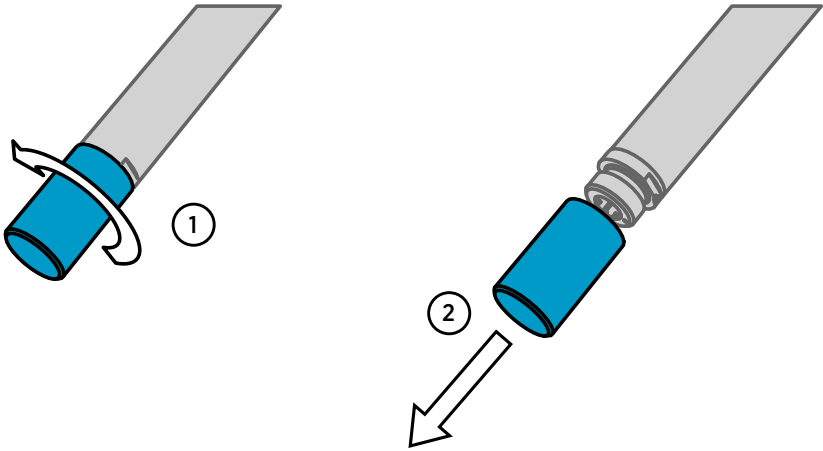
> ⚠ **CAUTION!** Do not damage the sensor.

3. Take the new filter, and insert it to the filter thread.
4. Tighten the new filter firmly by turning it clockwise (recommended force 5 Nm).

11. Troubleshooting

11.1 Problems and their possible solutions

If you have a problem with using HMT370EX, check the following tables before contacting Vaisala. If the problem you have is not listed in the tables, or if the proposed solution does not fix the problem, contact Vaisala technical support.

Problem: Analog output level appears incorrect	
Possible cause:	**Solution:**
Insufficient supply voltage	Ensure that the transmitter is powered correctly. 12 V DC is the minimum voltage in all conditions, measured at the transmitter screw terminals.
	If the supply voltage is less than 12 V DC, the analog output current can be erroneous.
	For information on testing and adjusting analog output level, see Analog output level test (page 63) and Analog output adjustment overview (page 74)

Problem: Transmitter does not power on when power supply is switched on	
Possible cause:	**Solution:**
Analog output channel 1 (CH1) not wired	Analog output channel 1 (CH1) must always be wired. The transmitter receives power through the Channel 1 screw terminals, and does not power on if only Channel 2 (CH2) is wired.
	For wiring instructions, see Wiring (page 38).
Incorrect supply voltage	Ensure that the transmitter is powered correctly using a supply voltage range of 12 – 28 V DC.
	12 V DC is the minimum voltage in all conditions, measured at the transmitter screw terminals.
Incorrect polarity	Check that the screw terminal connections have been made correctly.
	For wiring instructions, see Wiring (page 38).

Problem: PIN code prevents opening transmitter local display menus	
Possible cause:	**Solution:**
PIN code required	Access to transmitter local display menus can be restricted by taking a PIN code into use. For instructions on unlocking the display menus with the PIN code, see Local display PIN code (page 48).

Problem: Transmitter local display interface has wrong language selected	
Possible cause:	**Solution:**
Local display configuration mistake	If the transmitter local display interface has been set to a wrong language, you can access the language selection menu with the following button presses: 1. Press and hold **Back** to return to the home view. 2. Press **Select** 3 times to open the **Display** menu. 3. Press **Down** once to move to the language selection menu item. 4. Press **Select** to open the language selections. 5. Move to the correct language with the **Up** and **Down** buttons, and start using the language by pressing **Select**.

Problem: Cannot locate Insight PC software configuration options	
Possible cause:	**Solution:**
Wrong user mode	Certain functionalities are only available in **Advanced Mode**. Change between the **Basic Mode** and **Advanced Mode** in the **Settings** menu. See Figure 39 (page 59) for the location of the **Settings** menu.

11.2 Error messages

HMT370EX can display error messages either in Vaisala Insight PC software or in the transmitter's local display.

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	Firmware is corrupted	Contact Vaisala technical support
Factory default settings corrupted	Parameter memory is corrupted	
Device settings corrupted		
Errors		
Temperature sensor failure	Readings from sensors missing or out of range	Inspect probe head and sensors visually. If the probe is completely wet, allow it to dry out.
Humidity sensor failure		If the sensors are damaged or missing and the error message(s) stay active, contact Vaisala to have the probe repaired.
Supply voltage out of range	Supply voltage too high or low	Check supply voltage
Warnings		
Calibration has expired	Shown by calibration reminder functionality	Calibrate the probe and update the calibration date information
Unexpected device restart	Device has automatically restarted itself	Check that supply voltage is stable and operating environment is within specification
Status messages		
Calibration is about to expire	Shown by calibration reminder functionality	Calibrate the probe and update the calibration date information

11.3 Restoring factory default settings

You can restore the transmitter and the connected probe back to their factory default settings using Insight software or the local display interface. Doing this will also clear any user adjustment and restore the latest adjustment performed by Vaisala.

> Note that restoring the factory default settings of the probe can only be done using Vaisala Insight PC software. Transmitter factory default settings can be restored also with the local display interface.

▶ 1. To restore **transmitter** factory default settings with the local display interface:

   a. Select **Menu > Maintenance > Restore factory settings** and confirm with **Restore**.

2. To restore **transmitter** factory default settings with Vaisala Insight PC software:

   a. Connect the transmitter to Insight. See Connecting to Insight PC software (page 55).

   b. Select ⚙ **> Restore Factory Settings > Yes**.

3. To restore **probe** factory default settings with Vaisala Insight PC software:

   a. Connect the probe body, or transmitter and probe body together as one unit, to Insight. See Connecting to Insight PC software (page 55).

   b. When the probe body is connected to Insight without the transmitter: select ⚙ **> Restore Factory Settings > Yes**.

   c. When the probe body is connected to the transmitter: select ⚙ **> Probe > Restore Factory Settings > Yes**.

12. Technical data

12.1 Specifications

Table 19   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 options	HUMICAP® R2
	HUMICAP® L2 [3]
Temperature	
Measurement range	−70 ... +180 °C (−94 ... +356 °F)
Accuracy at +23 °C (+73.4 °F)	±0.1 °C (±0.18 °F)
Factory calibration uncertainty	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)
Sensor	Pt1000 RTD Class F0.1 IEC 60751
Other available measurement parameters	
Dew point temperature, wet-bulb temperature, absolute humidity, mixing ratio, water concentration, water mass fraction, water vapor pressure, and enthalpy	

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) *The HUMICAP® L2 sensor is used in the HMP378F and HMP378H probe variants that are intended for oil and fuel measurements. For specifications, see Table 20 (page 85).*
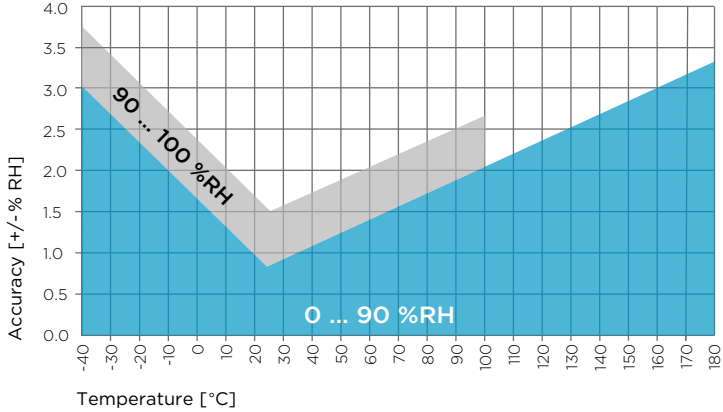
Figure 47   Humidity measurement accuracy as function of temperature

Humidity measurement accuracy specified for dew point temperature of max. 95 °C (203 °F).

Figure 48   Temperature measurement accuracy over full range

HUMICAP® L2 sensor option

The HUMICAP® L2 sensor is used in the HMP378F and HMP378H probe variants that are intended for oil and fuel measurements.
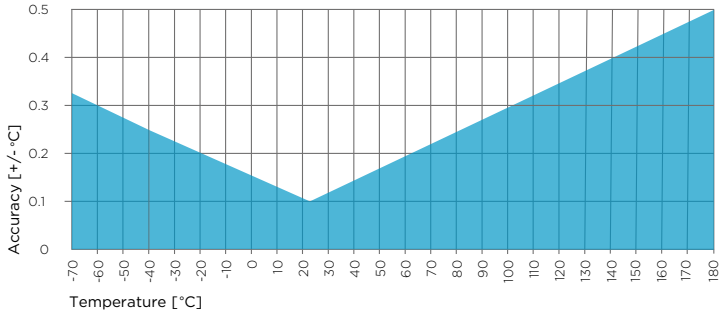
Table 20   HUMICAP® L2 measurement performance

Property	Description/Value
Water activity	
Measurement range	0 ... 1 a_w [1]
T_{90} response time [2]	10 min

Property	Description/Value
Sensor	HUMICAP® L2
Accuracy [3)]	±0.01 a_w (±1 %RS)
Factory calibration uncertainty	±0.6 %RH (0 ... 40 %RH)
	±1.0 %RH (40 ... 95 %RH)
Temperature	
Measurement range	−40 ... +180 °C (−40 ... +356 °F)
Accuracy at +20 °C (+68 °F)	±0.2 °C (0.36 °F)

1) 0 ... 1 a_w corresponds to 0 ... 100 %RH
2) At +20 °C (+68 °F) in still oil.
3) In range 0 ... 0.5 a_w, including non-linearity, hysteresis, and repeatability. See accuracy graph below.
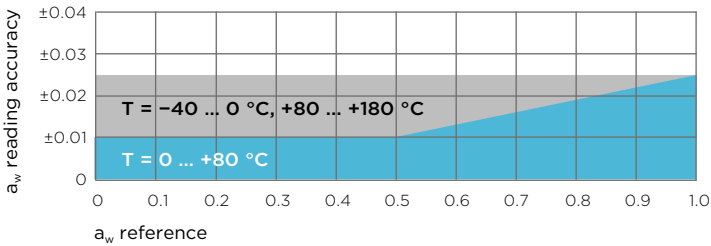
Figure 49 A_w measurement accuracy

Table 21   Operating environment

Property	Description/value
Operating temperature for electronics	-40 ... +60 °C (-40 ... +140 °F)
Operating temperature with display	-20 ... +60 °C (-4 ... +140 °F)
Storage temperature	-40 ... +70 °C (-40 ... +158 °F)
Pressure range	See probe specifications

Table 22   Compliance

Property	Description/value
EMC compatibility	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, RCM, WEEE

Table 23   Inputs and outputs

Property	Description/value
Operating voltage	12 – 28 V
Analog outputs	2 outputs (two-wire, 4 – 20 mA) Connection via safety barriers
Typical accuracy of analog outputs at +20 °C	±0.0625 % full scale
Typical temperature dependence of analog outputs	0.005 % / °C (0.005 % / °F) full scale
Service port connection	USB cable 219690
Display	Graphical LCD display

Table 24   Mechanical specifications

Property	Description/value
Connections	Screw terminals, 0.33 ... 2.0 mm^2 wires (AWG 14-22)
Cable glands	M20 x 1.5
Conduit fitting	NPT 1/2" and M16
Housing material	EN AW-6082
Housing weight	Transmitter: 1500 g (3.3 lb) HMP371 fixed probe: 320 g (0.7 lb)
IP rating	IP66: Dust-tight. Protected from powerful water jets from any direction.
NEMA rating	NEMA 4: Dust-tight. Protected from powerful water jets from any direction.
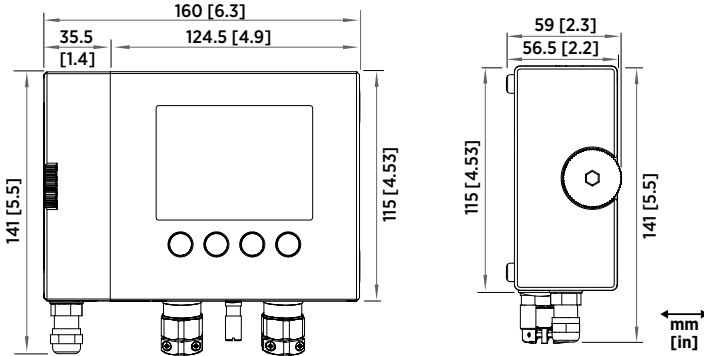
Figure 50   HMT370EX transmitter dimensions

12.2 HMP371 specifications

Table 25   HMP371 for wall mounting

Property	Description/value
Temperature range	-40 ... +60 °C (-40 ... +140 °F)
Probe diameter	12 mm (0.47 in)

The HMP371 fixed probe option has a probe head that attaches directly on the probe body, making it suitable for wall mounting applications.

Figure 51   Dimensions in mm (inches)

12.3 HMP373 specifications

Table 26   HMP373 for confined spaces

Property	Description/value
Temperature range with teflon cable	-40 ... +120 °C (-40 ... +248 °F)

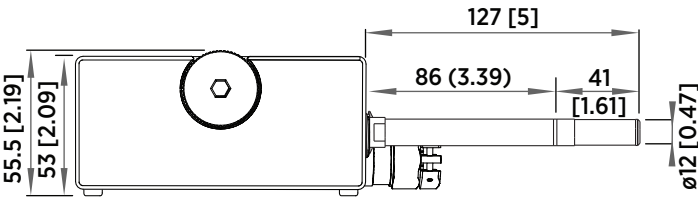| Property	Description/value
Temperature range with rubber cable	-40 ... +80 °C (-40 ... +176 °F)
Probe cable length	2, 5 or 10 meters (6 ft 7 in, 16 ft 5 in, 32 ft 10 in)
Probe diameter	12 mm (0.47 in)
Installation	
Duct installation kit	210697
Cable gland M20x1.5 with splitting seal	HMP247CG
Swagelok for 12mm probe, 1/2″ NPT thread	SWG12NPT12

Figure 52   Dimensions in mm (inches)

12.4 HMP374 specifications

Table 27   HMP374 for high pressure

Property	Description/value
Temperature range	-70 ... +180 °C (-94 ... +356 °F)
Pressure range	0 ... 10 MPa
Probe cable length	2, 5 or 10 meters (6 ft 7 in, 16 ft 5 in, 32 ft 10 in)
Probe diameter	12 mm (0.47 in)
Fitting body M22x1.5	17223
Fitting body NPT1/2	17225
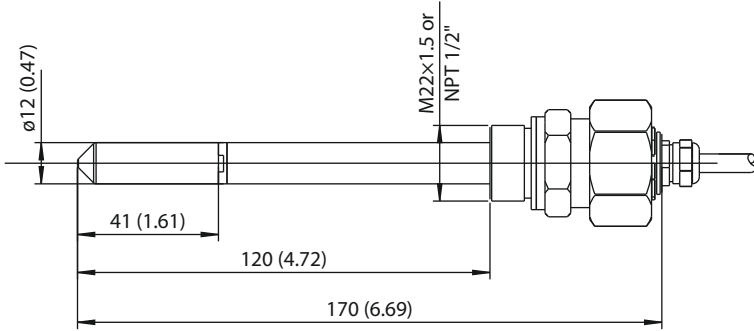
Figure 53   Dimensions in mm (inches)

12.5 HMP375 specifications

Table 28   HMP375 for high temperature

Property	Description/value
Temperature range	-70 ... +180 °C (-94 ... +356 °F)
Probe cable length	2, 5 or 10 meters (6 ft 7 in, 16 ft 5 in, 32 ft 10 in)
Probe diameter	13.5 mm (0.53 in)
Installation	
Mounting flange	210696
Cable gland M20x1.5 with splitting seal	HMP247CG

Figure 54   HMP375 probe and stainless steel installation flange. Dimensions in mm (inches).

12.6 HMP377 specifications

Table 29   **HMP377 for high humidities**

Property	Description/value
Temperature range	-70 ... +180 °C (-94 ... +356 °F)
Probe cable length	2, 5 or 10 meters (6 ft 7 in, 16 ft 5 in, 32 ft 10 in)
Probe diameter	12 mm (0.47 in)
Installation	
Duct installation kit	210697
Cable gland M20x1.5 with splitting seal	HMP247CG
Swagelok for 12 mm probe, 3/8″ ISO thread	SWG12ISO38
Swagelok for 12 mm probe, 1/2″ NPT thread	SWG12NPT12

Figure 55   Dimensions in mm (inches)

12.7 HMP378 specifications

Table 30   **HMP378 for pressurized pipelines**

Property	Description/value
Temperature range	-70 ... +180 °C (-94 ... +356 °F)
Pressure range	0 ... 4 MPa
Probe cable length	2, 5 or 10 meters (6 ft 7 in, 16 ft 5 in, 32 ft 10 in)
Probe diameter	13.5 mm/12 mm (0.53 in/0.47 in)
Available probe lengths	226 mm/448 mm (8.90 in/17.6 in)
Installation	
Fitting body ISO1/2 solid structure	DRW212076SP
Fitting body NPT1/2 solid structure	NPTFITBODASP
Ball valve ISO 1/2 with welding joint	BALLVALVE-1

Length for standard/optional probes

12.8 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 31   Accessory availability

Accessory	Part number	Models
Probe accessories		
M12 Indigo USB Adapter cable accessory for connecting HMT370EX probes to Insight	USB2	All models
Ball valve ISO 1/2 with welding joint • Pressure range at +20 °C (+68 °F) 0 ... 20 bar (0 ... 290 psia) (during installation max. 10 bar (145 psia)	BALLVALVE-1	HMP378
Duct installation kit	210697	HMP373, HMP377
Mounting flange	210696	HMP375
Cable gland M20 x 1.5 with split seal	HMP247CG	HMP373, HMP375, HMP377
Fitting body M22 x 1.5	17223SP	HMP374
Fitting body NPT1/2	17225SP	HMP374
Fitting body ISO1/2 solid structure	DRW212076SP	HMP378
Fitting body NPT1/2 solid structure	212810SP	HMP378

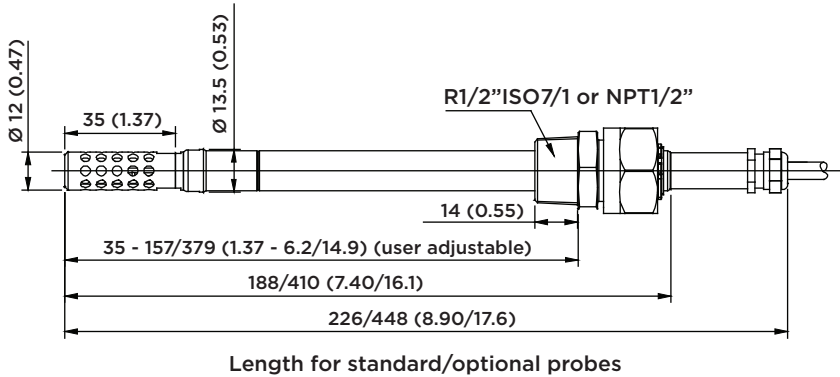| Accessory	Part number	Models
Swagelok fitting for 12 mm probe, 1/2" NPT thread	SWG12NPT12	HMP377
Swagelok fitting for 12 mm probe, 3/8" ISO thread	SWG12ISO38	HMP377
Swagelok fitting for 12 mm probe, 1/2" ISO thread	SWG12ISO12	HMP377
Thread adapter ISO 1/2" to NPT 1/2"	210662SP	All models
Manual press	HM36854SP	HMP378/F/H
Cable lead-through accessories		
Cable gland M20 x 1.5 for Ø 5 … 11 mm cable	265207SP	All models
Cable gland M20 x 1.5 for Ø 10 … 14 mm cable	265208SP	All models
Conduit fitting M16	265243SP	All models
Conduit fitting NPT1/2"	265240SP	All models
Dummy plug (Ex, 2 pcs)	254931SP	All models
Transmitter accessories		
HMT360 retrofit mounting plate	DRW253246SP	All models
USB service cable for transmitter	219690	All models
Zener barrier for 1 channel (for 2 channels, order 2 pcs)	210664	All models
Galvanic isolator for 1 channel	212483	All models
Galvanic barrier for 1 channel	MTL5541	All models
Galvanic barrier for 2 channels (1 pc double channel)	MTL5544	All models
Calibration adapter for HMK15	211302	HMP371, HMP373, HMP374, HMP377

12.9 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.

HMT370EX series transmitters and probes have have metal and plastic parts that can be removed for recycling. The gasket of the transmitter body is made of silicone. With the transmitter model with no display, the transmitter body can be recycled as metal after removing the detachable electronics. With the LCD display model, the transmitter body must be disposed of as electrical and electronic waste.

Recycling instructions for transmitters with no display
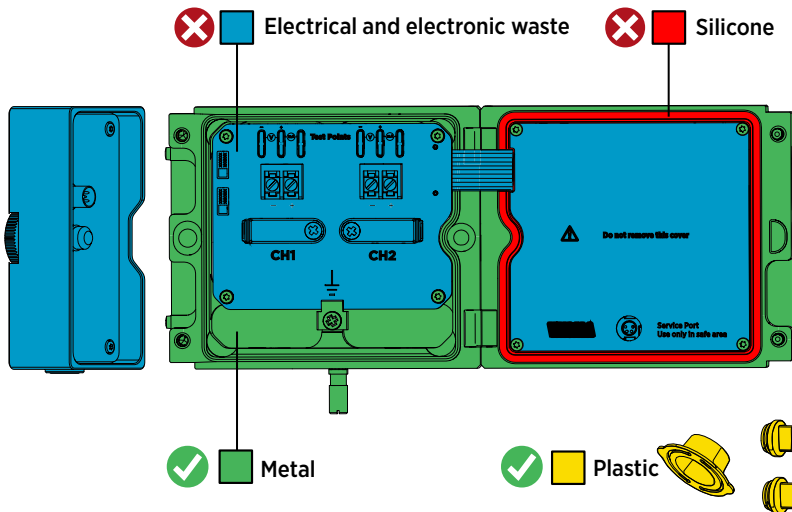

Figure 57   Recyclable and non-recyclable parts in transmitters with no display

- Probe body and probe head: dispose of as electrical and electronic waste.
- Transmitter component board, flat cable, and inside cover: remove metal screws and dispose of as electrical and electronic waste.
- Transmitter body and screws: recycle as metal.
- Service port and lead-through plugs: recycle as plastic.
- Transmitter cover gasket: dispose of or recycle as silicone according to local regulations.
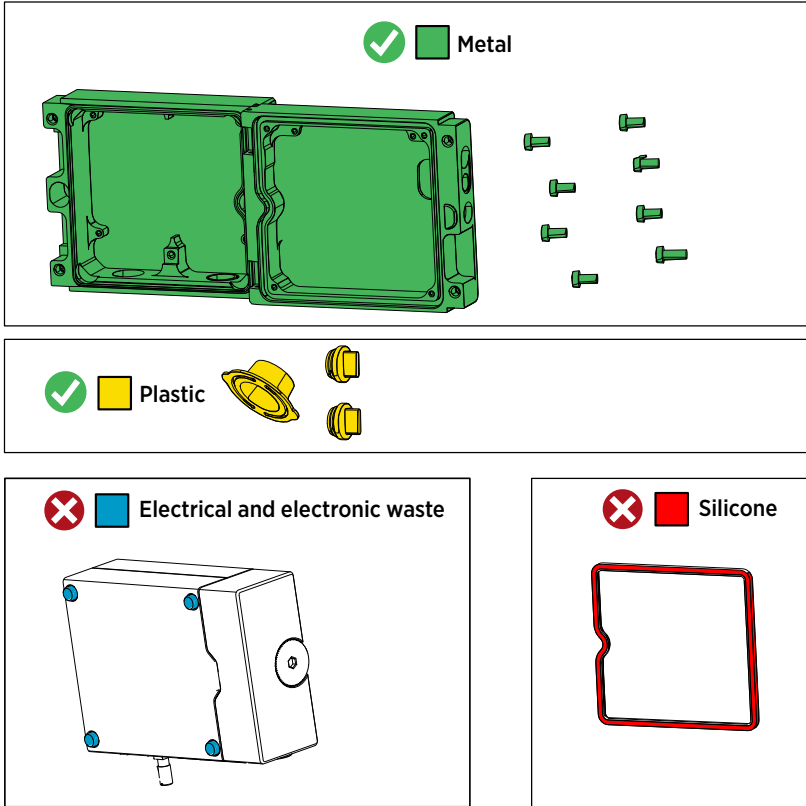
Figure 58   Recyclable and non-recyclable parts in transmitters with no display after disposing of electronics and probe

The transmitter body and screws can be recycled as metal after the electronics have been removed. Remove the wall pads on the bottom of the transmitter before recycling.

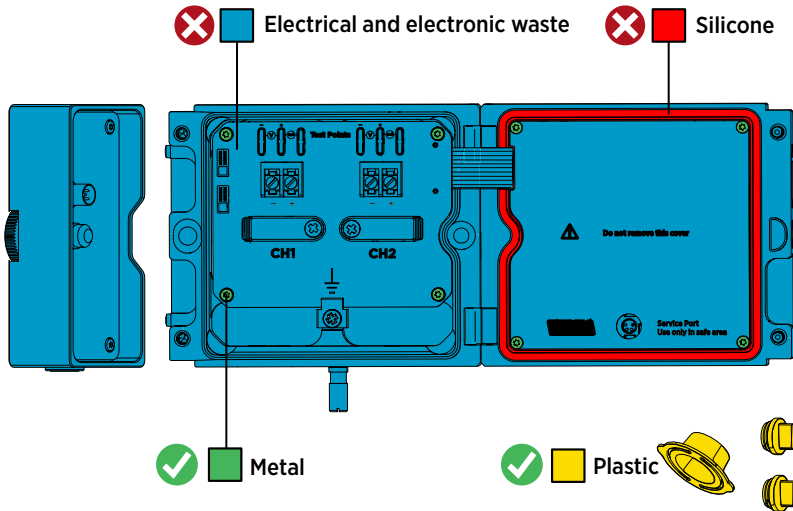## Recycling instructions for transmitters with display

Figure 59   Recyclable and non-recyclable parts in transmitters with display

- Probe body and probe head: dispose of as electrical and electronic waste.
- Transmitter body, component board, flat cable, and inside cover: remove metal screws and dispose of as electrical and electronic waste.
- Service port and lead-through plugs: recycle as plastic.
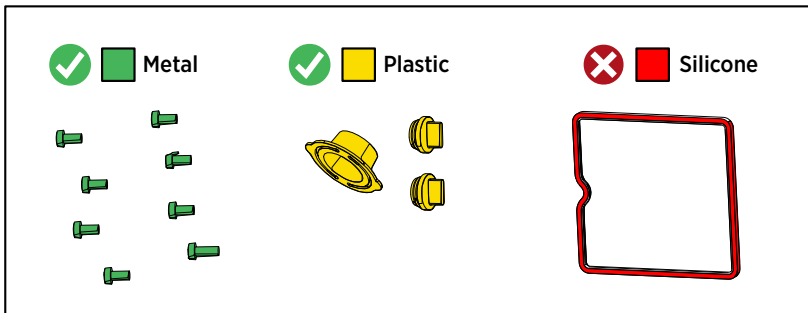- Transmitter cover gasket: dispose of or recycle as silicone according to local regulations.

Figure 60   Recyclable and non-recyclable parts in transmitters with display after disposing of electrical and electronic waste

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.

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

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