

Sense the success

With the Vaisala Indigo family





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Step into the future with a revolutionary new way to measure your most critical industrial processes. The Vaisala Indigo Family takes your industrial measurements to a completely new level with world-leading measurement sensor technology and modular design.



Interchangeable smart probes, robust transmitters, and Vaisala Insight software create a strong ecosystem to ensure energy efficiency, safety, and end-product quality in your operations. The modular plug-and-play design makes Indigo family probes and transmitters easy to install, use, and maintain.

The accuracy and long-term stability of Indigo probes are in a class of their own, giving you a sixth sense you can rely on with the ability to detect even the weakest signals and make better and more timely decisions.

Comprehensive range of measurement parameters

- humidity and temperature
- dew point
- moisture in oil
- carbon dioxide (CO₂)
- vaporized hydrogen peroxide (H₂O₂)
- barometric pressure

Modular design – a system that makes sense

Smart probes with extreme accuracy and stability

- Comprehensive probe selection for measuring various parameters
- Based on premium Vaisala sensor technologies
- Use stand-alone or with Indigo transmitters
- Modern, compact design

Robust transmitters with value-adding functionalities

- Dual-probe model enables multi-parameter measurement
- Plug-and-play probe connection
- Easy data evaluation and visualization
- Additional connectivity, power, and wiring options

Insight software for easy self-service and data visualization

- User-friendly graphical interface
- Quick access to probe data
- Smooth field calibration
- Easy probe configuration
- Connect up to six devices simultaneously
- Data logging functionality

Humidity and temperature probes

Indigo compatible humidity and temperature probes are based on the space-proof Vaisala HUMICAP® technology, the world's first thin-film capacitive humidity sensor. Vaisala HUMICAP sensors guarantee quality and reliability, with a reputation for accuracy, excellent long-term stability, and negligible hysteresis. Indigo compatible humidity probes are suitable for a wide range of applications from industrial processes to life science and building automation. They provide a comprehensive list of output parameters, including relative humidity, temperature, dew point temperature, wet bulb temperature, absolute humidity, mixing ratio, water vapor pressure, and enthalpy.

You can choose from the following probes:

- HMP1 for ambient measurement in indoor spaces and wall-mounting
- HMP3 for general-purpose use and duct mounting
- HMP4 for high-pressure or vacuum environments
- HMP5 for high temperature environments
- HMP7 for high-temperature and/or condensing environments
- HMP8 for high-pressure or leak-tight installation
- HMP9 for rapidly changing environments
- TMP1 for demanding temperature measurements



Indigo compatible humidity and temperature probes.

Dew point probes

Indigo compatible dew point probes feature Vaisala's trusted DRYCAP® technology, specifically designed for humidity measurement in dry environments. The DRYCAP sensor is particularly renowned for its reliable performance in hot and very dry environments. These probes excel in a range of applications, from drying processes to compressed air, dry chambers, and industrial ovens.

Choose from the following probes:

- DMP5 for high temperatures <180 °C (356 °F)
- DMP6 for very high temperatures <350 °C (660 °F)
- DMP7 for leak-tight installation <10 bar
- DMP8 for high-pressure or leak-tight installation <40 bar



Indigo compatible dew point probes.

Moisture in oil probe

Indigo compatible probe MMP8 incorporates the Vaisala HUMICAP 180L2 sensor, which is optimized for moisture in oil applications. The probe is suitable for demanding moisture measurement in a range of oils such as transformer, hydraulic, and lubrication oils and includes a CIGRE-recommended traceable calibration certificate.



MMP8 probe

Carbon dioxide (CO₂) probes

Indigo compatible carbon dioxide (CO₂) probes are based on Vaisala's unique CARBOCAP® technology that provides exceptional stability. They are ideal for applications such as incubators, greenhouses, food storage and transport, animal shelters, and demand-controlled ventilation. They can even be installed outdoors.

Choose from the following probes:

- GMP251 for %-level measurements (0-20 %CO₂)
- GMP252 for ppm-level measurements (0-10,000 ppmCO₂)



GMP251 & GMP252 probe

Vaporized hydrogen peroxide (H₂O₂) probes

Indigo compatible vaporized hydrogen peroxide (H₂O₂) probes feature Vaisala's unique PEROXCAP® technology, which enables accurate and repeatable measurement of vaporized H₂O₂, relative humidity / saturation (%RH / %RS), and temperature during bio-decontamination with a single probe.

Choose from the following probes:

- HPP271 for measuring H₂O₂ vapor concentration
- HPP272 for measuring H₂O₂ vapor concentration, relative saturation, humidity, and temperature



HPP271 & HPP272 probe

Barometric pressure measurement

The Indigo520 transmitter with the barometric pressure measurement module combined with one or two of the Indigo compatible humidity and temperature measurement probes is a unique combination of a meteorological-grade barometer in a single industrial device. Measure three parameters simultaneously: barometric pressure, humidity and temperature. The device incorporates Vaisala's proprietary, space-proof HUMICAP® and BAROCAP® technologies.

- Attach one or two probes to the transmitter.
- Choose the humidity measurement probe that best suits your needs:
 - HMP1 for laboratories
 - HMP3 with a field replaceable sensor for general use
 - HMP7 for demanding, high-humidity industrial and meteorology applications
 - HMP9 for confined spaces
 - TMP1 for temperature measurement only



Indigo520 transmitter with Indigo compatible humidity probes.

Vaisala Insight PC Software

Vaisala Insight PC Software provides quick access to the configuration options and calibration data of Indigo compatible smart probes. Probes can be detached from the process and connected to a PC with a USB cable to access Insight PC software.

The software, which features an intuitive graphical user interface, also allows probe field calibration and adjustments. It also enables easy testing and evaluation – the 48-hour data logging functionality allows data to be recorded from up to six devices simultaneously, with easy export to an Excel-readable format.



Vaisala Insight PC Software

Indigo transmitters

Vaisala Indigo transmitters offer many features that complement Indigo-compatible smart probes. They enable real-time data visualization and access to probe configurations. They also offer additional connectivity, supply voltage, and wiring options compared to using a stand-alone smart probe.

Choose from the following transmitters:

- Indigo500 series – a robust transmitter with features including dual probe support, power over Ethernet, a robust metal enclosure, and touchscreen display.
- Indigo200 series – a transmitter with single probe support, analog, digital, and relay outputs, a modern graphical or numeric display, and wireless access via a nearby smartphone or PC.



Vaisala Indigo500 Series Transmitter



Vaisala Indigo200 Series Transmitter

The Vaisala Indigo Family in a nutshell

- **Fits your needs.** The modular design allows you to choose the elements that are a perfect fit for your measurement needs.
- **Reliable.** Ensures accurate and stable measurements with world-leading measurement sensor technology and robust transmitter design.
- **Simple to install, use, and maintain.** The plug-and-play design ensures smooth installation, calibration, and maintenance of measurement devices.
- **Easy access to data.** Access measurement data visualization, and probe configuration with the Indigo transmitter or Vaisala Insight software.
- **Future-proof measurements.** All probes feature Modbus RTU over RS-485 for flexible connectivity. Indigo transmitters provide additional connectivity options with analog and relay outputs.

The ideal solution for multi-parameter measurement and flexible connectivity

Combined with Indigo compatible probes, Indigo500-series transmitters provide the flexibility you need. They can be used to measure multiple parameters, connected to different system interfaces, or integrated with the Vaisala viewLinc Continuous Monitoring System. Below are some real-life applications with examples of how the Indigo family products work together and with external systems.

Application example	Recommended solution	Benefits
Humidity and dew point process measurement	Indigo520 transmitter + Indigo-compatible humidity probe + dew point probe	Wide measurement range from -70 °C (-94 °F) dew point all the way up to 100% relative humidity in a single device
Humidity measurement in a critical measurement environment or between two measurement points	Indigo520 transmitter + two identical Indigo compatible humidity and temperature probes	Redundant measurement or calculating the difference between two measurement points at instrument level
Laboratory requiring humidity, temperature, carbon dioxide (CO ₂), and barometric pressure measurement	Indigo520 transmitter + two Indigo compatible probes + barometer	All relevant parameters can be combined in one system
Relative humidity measurement in condensing environments such as fuel cells, humidified streams, or drying applications	Indigo520 transmitter + HMP7 probe + TMP1 probe	Enables relative humidity measurement in condensing environment by combining warmed HMP7 probe with temperature measurement
Compatibility with Vaisala viewLinc Continuous Monitoring System	Indigo500 transmitter + one or two Indigo compatible probes + viewLinc 5.1	Compatible with viewLinc Continuous Monitoring System; Modbus TCP/IP connection to Vaisala viewLinc 5.1 Continuous Monitoring System
Multiple system interfaces	Indigo500 transmitter + one or two Indigo compatible probes	Indigo500 suitability with multiple system interfaces; simultaneous Modbus TCP/IP connection to continuous monitoring system or other monitoring system; simultaneous analog output connection to building automation or other control system
Power over Ethernet (PoE) setup	Indigo520 transmitter (PoE model) + one or two Indigo compatible probes	Indigo520 single-wire connectivity with Power over Ethernet (PoE)



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www.vaisala.com/contactus



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 more information

www.vaisala.com



HUMICAP in brief

- A capacitive thin-film polymer sensor
- Full measurement range 0 ... 100 %RH
- Accurate to ± 0.8 %RH
- Traceable humidity measurement
- On the market since 1973

In 1973, Vaisala introduced HUMICAP, the world's first thin-film capacitive humidity sensor. Since then, Vaisala has become the market leader in relative humidity measurements, and thin-film capacitive humidity sensors have developed from one company's innovation into a global industry standard.

Vaisala HUMICAP sensors guarantee quality and reliability, with their reputation for accuracy, excellent long-term stability, and negligible hysteresis.

How it works

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

The thin-film polymer either absorbs or releases water vapor as the relative humidity of the ambient air rises or falls. The dielectric properties of the polymer film depend on the amount of absorbed water. As the relative humidity around the sensor changes, the dielectric properties of the polymer film change, and so does the capacitance of the sensor. The instrument's electronics measure the capacitance of the sensor and convert it into a humidity reading.

Typical applications for humidity measurement

Vaisala's humidity instruments with HUMICAP sensors are suitable for a wide range of applications. From power and steel to life sciences and building automation, many industries need to measure humidity – here are just a few:

Humidity must be measured and controlled in many drying processes, such as those in construction material and paper manufacturing, and fluid bed dryers. The humidity of the process air is a good indicator of the progression of the drying process.

Cleanrooms and other critical environments also require high-performance environmental measurements in order to operate consistently and within specifications. In addition, glove boxes and isolators – used for handling moisture or gas-sensitive materials – benefit from accurate and reliable humidity measurements. Measuring humidity in a critical environment can be especially challenging.

In the food industry the dryers and ovens used in bread baking and cereal manufacture require a carefully controlled humidity level to maintain consistent quality and high yield, and to give distinctive characteristics to the finished product.

In building automation, optimizing both the temperature and relative humidity of the indoor environment enables a greater level of comfort for occupants than optimizing temperature alone. Careful humidity control is a must in museums, archives, warehouses, and other environments where humidity-sensitive materials are stored.

HUMICAP's unique benefits

- Excellent long-term stability
- Insensitive to dust and most chemicals
- Chemical purge option for stable measurements in environments with high concentrations of chemicals
- Sensor heating for measurements even in condensing environments
- Full recovery from condensation

Vaisala HUMICAP humidity products

Vaisala has everything you need for measuring humidity, with a wide range of humidity instruments covering applications from HVAC to the most demanding industrial applications, both indoors and out. Vaisala's humidity instrument offering includes transmitters, modules for volume applications, portable and handheld humidity meters, and humidity calibrators. The full range of humidity products can be found at www.vaisala.com/humidity.



Family of HUMICAP sensors

HUMICAP – the story of innovation

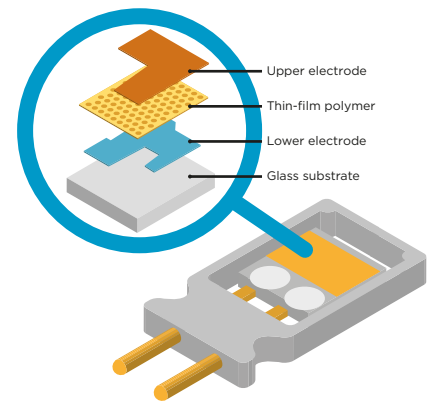
Until the early 1970s, hair hygrometers were commonly used in radiosondes. At that time, reliable humidity measurement was an unresolved challenge and to solve

this, Vaisala began developing a new type of humidity sensor using semiconductors and thin-film materials. The revolutionary HUMICAP humidity sensor was introduced two years later, in 1973, at CIMO VI congress.

HUMICAP was a radical innovation that changed humidity measurements for good. The new technology was groundbreaking: the sensor had no moving parts, and due to the advanced use of semiconductor and thin-film technologies, it was amazingly small. The sensor had a fast response time, good linearity, low hysteresis, and small temperature coefficient.

Despite the fact that the innovation was designed for a new type of a radiosonde, the greatest interest came from elsewhere: people working in environments as diverse as greenhouses, bakeries, warehouses, construction sites, brick and timber kilns, and museums. The need for reliable humidity measurement was common to all, and instruments that could do this accurately were few and far between.

By 1980, a variety of products based on HUMICAP technology – from hand-held meters to industrial transmitters, calibrators, and other accessories – were being sold in over 60 countries. Since its birth, HUMICAP has been part of Vaisala's core business, propelling the company to industry leadership in the field of humidity measurement.



Structure of the HUMICAP sensor

Vaisala INTERCAP® sensor

- Same measurement principle as in the HUMICAP sensor
- Factory pre-calibrated - no additional calibration or adjustment needed
- Fully interchangeable
- Used in humidity instruments with ± 3 %RH accuracy

HMP1 Wall-Mounted Humidity and Temperature Probe



Features

- Compact size
- RH accuracy up to ± 1.0 %RH
- Temperature accuracy up to ± 0.2 °C (0.36 °F)
- Temperature measurement range $-40 \dots +60$ °C ($-40 \dots +140$ °F)
- Chemical purge provides superior chemical resistance
- Modbus® RTU over RS-485
- Compatible with Indigo series transmitters and Insight PC software
- Traceable calibration certificate: 6 points for humidity, 1 point for temperature

Vaisala HUMICAP® Humidity and Temperature Probe HMP1 is designed for ambient measurement in indoor spaces. Its probe head and body are integrated into a single unit with no cable between them. HMP1 can be directly connected to Indigo200 series transmitters to form a single wall-mounted unit.

Flexible connectivity

The probe is compatible with Vaisala Indigo series transmitters, and it can be used as a standalone digital Modbus RTU transmitter over RS-485 serial bus. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight.

Chemical purge minimizes effects of contaminants

In environments with high concentrations of chemicals and cleaning agents, the chemical purge option helps to maintain measurement accuracy between calibration intervals.

The chemical purge involves heating the sensor to remove harmful chemicals. The function can be initiated manually or programmed to occur at set intervals.

Mounting with probe holder

HMP1 probe is delivered with probe holder for wall mounting. The probe holder provides a secure attachment that allows the probe to be removed without removing the base of the holder.



Probe holder

Use with Indigo200

With an Indigo200 series transmitter, HMP1 forms a single wall mounted unit with no probe cable or probe holder needed. Just push the probe directly into the connector on the Indigo200 transmitter and turn the locking wheel to hold the probe in place. Probe settings can be configured through the transmitter.



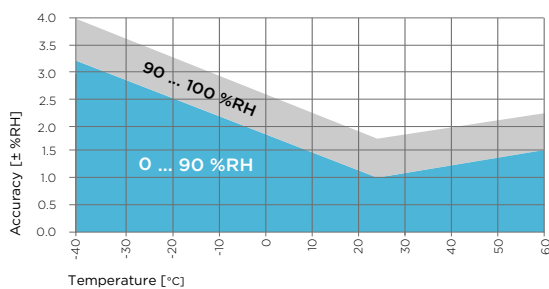
HMP1 with Indigo200 series

Technical data

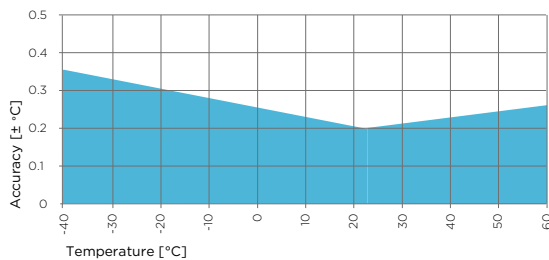
Measurement performance

Relative humidity	
Measurement range	0 ... 100 %RH
Accuracy at +23 °C (+73.4 °F) ^{1) 2)}	±1.0 %RH (0 ... 90 %RH)
Factory calibration uncertainty ³⁾	±0.7 %RH (0 ... 40 %RH) ±1 %RH (40 ... 95 %RH)
Sensor	HUMICAP® I
Temperature	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy at +23 °C (+73.4 °F) ^{1) 2)}	±0.2 °C (±0.36 °F)
Factory calibration uncertainty ³⁾	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)

- 1) Defined against calibration reference. Including non-linearity, hysteresis, and repeatability.
2) In typical room conditions.
3) Defined as ±2 standard deviation limits. Small variations possible; see calibration certificate.



HMP1 humidity measurement accuracy as a function of temperature



HMP1 temperature measurement accuracy over full range

Operating environment

Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
Measurement environment	For air, nitrogen, hydrogen, argon, helium, and oxygen ¹⁾
IP rating	IP50

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

Inputs and outputs

Operating voltage	15 ... 30 V DC
Current consumption	2 mA typical, 200 mA max.
Digital output	RS-485, non-isolated
Protocol	Modbus RTU

Output parameters

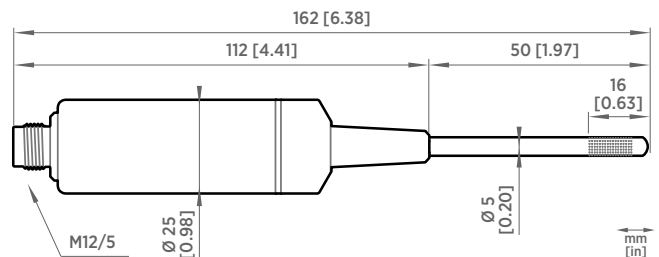
Absolute humidity (g/m ³)	Relative humidity (%RH)
Absolute humidity at NTP (g/m ³)	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm _v)
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)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

Compliance

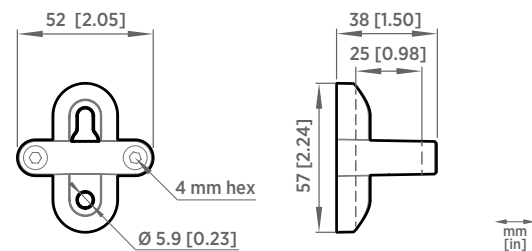
EU directives	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC compatibility	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, RCM

Mechanical specifications

Connector	M12 5-pin A-coded male
Weight	38 g (1.34 oz)
Materials	
Probe	AISI 316L
Probe body	PBT



HMP1 probe dimensions



Probe holder ASM213582 dimensions

Accessories

Indigo USB adapter ¹⁾	USB2
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- 1) Vaisala Insight software for Windows available at www.vaisala.com/insight.



Features

- Available with field replaceable HUMICAP® R2 sensor
- RH accuracy up to 0.8 %RH
- Temperature accuracy up to 0.1 °C (0.18 °F)
- Temperature measurement range –40 ... +120 °C (–40 ... +248 °F)
- Modbus® RTU over RS-485
- Compatible with Indigo series transmitters and Insight PC software

Vaisala HUMICAP® Humidity and Temperature Probe HMP3 is a general purpose probe designed for various industrial processes. The probe structure allows for replacing the sensor without tools, making it suitable for applications such as paint booths and other industrial applications where periodic recalibration alone is not sufficient for maintaining the probe performance. Other suitable applications include, for example, industrial HVAC systems, cleanrooms, and environmental chambers.

Designed for field maintenance

Probe design allows for several operating environments and flexible field maintenance. Filter and HUMICAP® R2 sensor element are field replaceable for applications that require frequent replacements. Calibration and adjustment of humidity measurement is also needed if the HUMICAP® R2 sensor is replaced. The following filter types are recommended for HMP3:

- Stainless steel mesh filter (12 µm mesh size) for typical applications such as air handling units
- Sintered stainless steel filter for applications where maximal protection from dust ingress is essential
- PPS plastic grid filter for best humidity response time

Chemical purge available with composite sensors

If purchased with a composite sensor instead of the field replaceable HUMICAP® R2 sensor, HMP3 can use the chemical purge feature. In environments with high concentrations of chemicals and cleaning agents, the chemical purge option helps to maintain measurement accuracy between calibration intervals. The chemical purge involves heating the sensor to remove harmful chemicals. The function can be initiated manually or programmed to occur at set intervals.

Flexible connectivity

The probe is compatible with Vaisala Indigo series transmitters, and it can be used as a standalone digital Modbus RTU transmitter over RS-485 serial bus. For

easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight.



DNV GL type approval certificate no. TAA00002YT

Technical data

Measurement performance

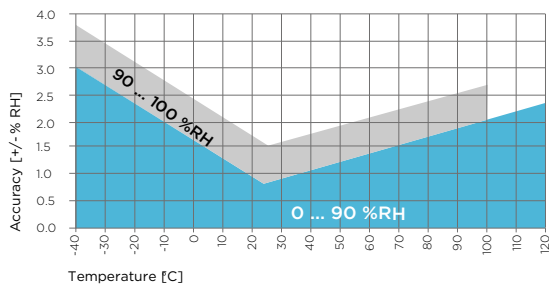
Relative humidity	
Measurement range	0 ... 100 %RH
Accuracy at +23 °C (+73.4 °F) ¹⁾	±0.8 %RH (0 ... 90 %RH)
Factory calibration uncertainty ²⁾	±0.5 %RH (0 ... 40 %RH) ±0.8 %RH (40 ... 95 %RH)
T ₆₃ response time	15 s
Sensor options	HUMICAP® R2 HUMICAP® R2C ³⁾ HUMICAP® 180VC ^{3) 4)}
Temperature	
Sensor	Pt100 RTD Class F0.1 IEC 60751
Measurement range	-40 ... +120 °C (-40 ... +248 °F)
Accuracy ¹⁾	±0.1 °C (±0.18 °F)
Factory calibration uncertainty ²⁾	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)

¹⁾ Defined against calibration reference. Including non-linearity, hysteresis, and repeatability.

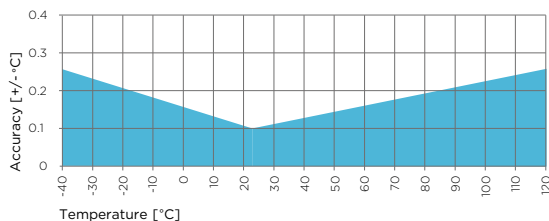
²⁾ Defined as ±2 standard deviation limits. Small variations possible; see calibration certificate.

³⁾ Chemical purge feature available with this sensor.

⁴⁾ H₂O₂ resistant. With HUMICAP® 180VC sensor, accuracy is not specified below -20 °C (-4 °F) operating temperature.



HMP3 humidity measurement accuracy as a function of temperature



HMP3 temperature measurement accuracy over full range

Operating environment

Operating temperature of probe head	-40 ... +120 °C (-40 ... +248 °F)
Operating temperature of probe body	-40 ... +80 °C (-40 ... +176 °F)
Storage temperature	-40 ... +80 °C (-40 ... +176 °F)
Operating environment	Suitable for outdoor use
Measurement environment	For air, nitrogen, hydrogen, argon, helium, and oxygen ¹⁾
IP rating of probe body	IP66

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

Inputs and outputs

Operating voltage	15 ... 30 V DC
Current consumption	10 mA typical, 500 mA max.
Digital output	RS-485, non-isolated
Protocols	Modbus RTU

Output parameters

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

Compliance

EU directives	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC compatibility	EN 61326-1, industrial environment
Type approvals	DNV GL certificate no. TAA00002YT
Compliance marks	CE, China RoHS, RCM

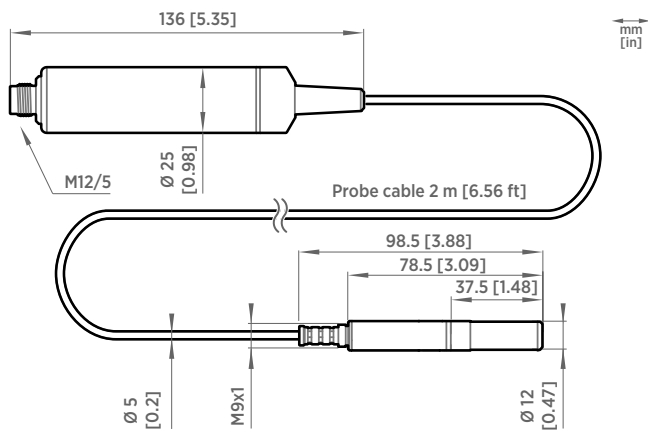
Mechanical specifications

Connector	M12 5-pin A-coded male
Weight	302 g (10.65 oz)
Materials	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP

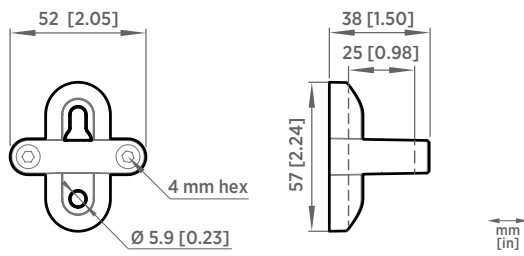
Accessories

Duct installation kit	210697
Solar radiation shield DTR502B	DTR502B
Indigo USB adapter ¹⁾	USB2

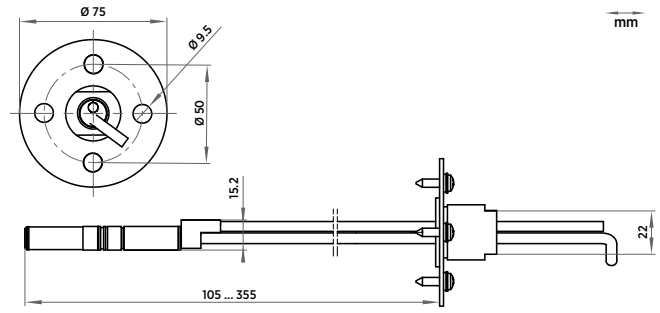
¹⁾ Vaisala Insight software for Windows available at www.vaisala.com/insight.



HMP3 probe dimensions



Probe holder ASM213582 dimensions



Duct installation kit 210697 dimensions with probe

HMP4 Relative Humidity and Temperature Probe

For pressurized and vacuum processes



Features

- RH accuracy up to $\pm 0.8\%$ RH
- Temperature accuracy up to $\pm 0.1\text{ }^{\circ}\text{C}$ ($\pm 0.18\text{ }^{\circ}\text{F}$)
- Temperature measurement range $-70 \dots +180\text{ }^{\circ}\text{C}$ ($-94 \dots +356\text{ }^{\circ}\text{F}$)
- Operating pressure $0 \dots 10\text{ MPa}$ ($0 \dots 100\text{ bar}$)
- Sensor purge provides superior chemical resistance
- Modbus® RTU over RS-485
- Compatible with Indigo transmitters and Insight PC software
- Traceable calibration certificate: 6 points for humidity, 1 point for temperature

Vaisala HUMICAP® Humidity and Temperature Probe HMP4 is designed for high-pressure applications such as compressed air systems in maritime, breathing air, and industrial applications, where measurement performance and chemical tolerance are essential.

Proven Vaisala HUMICAP® performance

Vaisala is the original innovator of the thin-film capacitive humidity measurement technology, which has now become the industry standard in humidity measurement.

HUMICAP® technology results from Vaisala's 40-year experience in industrial humidity measurement, providing the best stability, fast response time, and low hysteresis in a wide range of applications.

Chemical purge minimizes effects of contaminants

In environments with high concentrations of chemicals and cleaning agents, the chemical purge option helps to maintain measurement accuracy between calibration intervals.

The chemical purge involves heating the sensor to remove harmful chemicals. The function can be initiated manually or programmed to occur at set intervals.

Flexible connectivity

The probe is compatible with Vaisala Indigo series transmitters, and it can be used as a standalone digital Modbus RTU transmitter over RS-485 serial bus. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight.

Vaisala Indigo product family

Indigo transmitters extend the capabilities of Indigo compatible measurement probes. The transmitters can display measurements on the spot as

well as transmit them to automation systems through analog signals, digital outputs, and relays. Cable length between probe and transmitter can be extended to up to 30 meters. For more information, see www.vaisala.com/indigo.



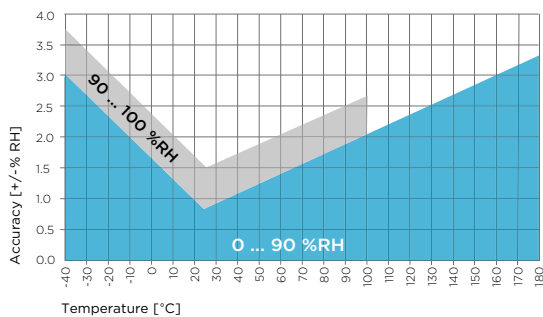
DNV GL type approval certificate no. TAA00002YT

Technical data

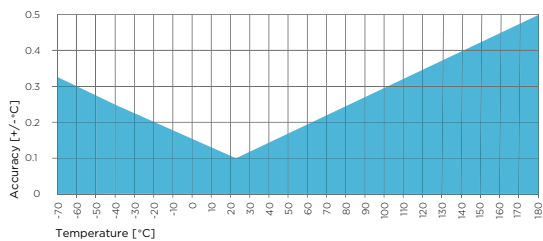
Measurement performance

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® R2C ³⁾
Temperature	
Measurement range	-70 ... +180 °C (-94 ... +356 °F)
Accuracy ¹⁾	±0.1 °C (±0.18 °F)
Factory calibration uncertainty ²⁾	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)
Sensor	Pt100 RTD Class F0.1 IEC 60751

- 1) Defined against calibration reference. Including non-linearity, hysteresis, and repeatability.
 2) Defined as ±2 standard deviation limits. Small variations possible; see calibration certificate.
 3) Chemical purge feature available with this sensor.



HMP4 humidity measurement accuracy as a function of temperature



HMP4 temperature measurement accuracy over full range

Operating environment

Operating temperature of probe body	-40 ... +80 °C (-40 ... +176 °F)
Operating temperature of probe head	-70 ... +180 °C (-94 ... +356 °F)
Operational pressure	< 100 bar
Operating environment	Suitable for outdoor use
Measurement environment	For air, nitrogen, hydrogen, argon, helium, oxygen, and vacuum ¹⁾
IP rating of probe body	IP66

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

Inputs and outputs

Operating voltage	15 ... 30 V DC
Current consumption	10 mA typical, 500 mA max.
Digital output	RS-485, non-isolated
Protocols	Modbus RTU

Output parameters

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

Compliance

EU directives	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC compatibility	EN 61326-1, industrial environment
Type approvals	DNV GL certificate no. TAA00002YT
Compliance marks	CE, China RoHS, RCM

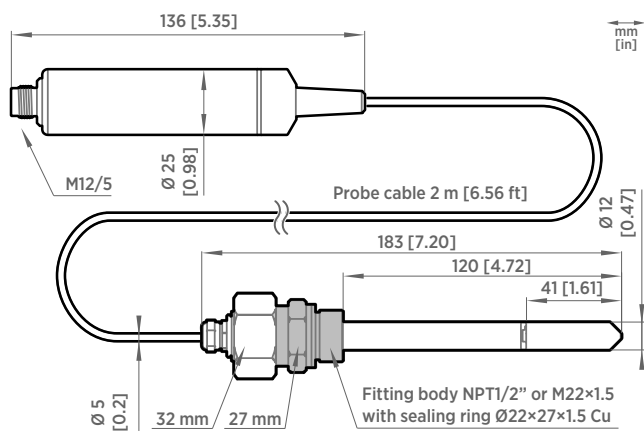
Mechanical specifications

Connector	M12 5-pin A-coded male
Fitting body	M22×1.5 or NPT1/2"
Weight	530 g (18.7 oz)
Materials	
Probe	AISI 316
Probe body	AISI 316
Cable jacket	FEP

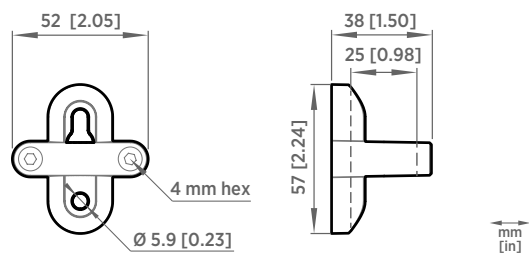
Accessories

Indigo USB adapter ¹⁾	USB2
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- 1) Vaisala Insight software for Windows available at www.vaisala.com/insight.



HMP4 probe dimensions



Probe holder ASM213582 dimensions



HMP5 Relative Humidity and Temperature Probe

For high temperatures



Features

- RH accuracy up to $\pm 0.8\%$ RH
- Temperature accuracy up to $\pm 0.1\text{ }^{\circ}\text{C}$ ($\pm 0.18\text{ }^{\circ}\text{F}$)
- Temperature measurement range $-70 \dots +180\text{ }^{\circ}\text{C}$ ($-94 \dots +356\text{ }^{\circ}\text{F}$)
- Operating temperature of probe body $-40 \dots +80\text{ }^{\circ}\text{C}$ ($-40 \dots +176\text{ }^{\circ}\text{F}$)
- Sensor purge provides superior chemical resistance
- Modbus® RTU over RS-485
- 250-mm (9.84 in) probe allows easy process installation through insulation
- Compatible with Indigo series transmitters and Insight PC software
- Traceable calibration certificate: 6 points for humidity, 1 point for temperature

Vaisala HUMICAP® Humidity and Temperature Probe HMP5 is designed for high-temperature applications such as baking ovens, pasta dryers, and industrial drying kilns, where measurement performance and chemical tolerance are essential.

Proven Vaisala HUMICAP® performance

Vaisala is the original innovator of the thin-film capacitive humidity measurement technology, which has now become the industry standard in humidity measurement.

HUMICAP® technology results from Vaisala's 40-year experience in industrial humidity measurement, providing the best stability, fast response time, and low hysteresis in a wide range of applications.

Chemical purge minimizes effects of contaminants

In environments with high concentrations of chemicals and cleaning agents, the chemical purge option helps to maintain measurement accuracy between calibration intervals.

The chemical purge involves heating the sensor to remove harmful chemicals. The function can be initiated manually or programmed to occur at set intervals.

Flexible connectivity

The probe is compatible with Vaisala Indigo series transmitters, and it can be used as a standalone digital Modbus RTU transmitter over RS-485 serial bus. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight.

Vaisala Indigo product family

Indigo transmitters extend the capabilities of Indigo compatible measurement probes. The transmitters can display measurements on the spot as

well as transmit them to automation systems through analog signals, digital outputs, and relays. Cable length between probe and transmitter can be extended to up to 30 meters. For more information, see www.vaisala.com/indigo.



DNV GL type approval certificate no. TAA00002YT

Technical data

Measurement performance

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

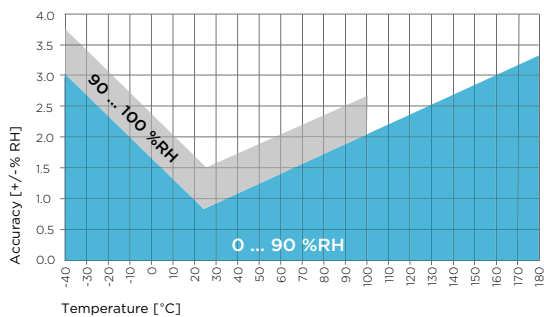
Sensor options

HUMICAP® R2
HUMICAP® R2C ³⁾

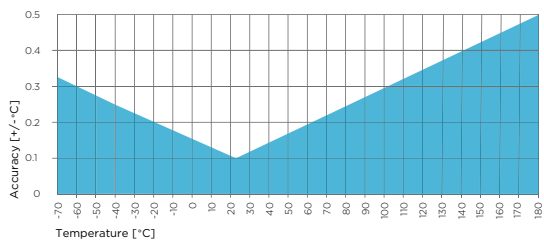
Temperature

Measurement range	−70 ... +180 °C (−94 ... +356 °F)
Accuracy at +23 °C (+73.4 °F) ¹⁾	±0.1 °C (±0.18 °F)
Factory calibration uncertainty ²⁾	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)
Sensor	Pt100 RTD Class F0.1 IEC 60751

- 1) Defined against calibration reference. Including non-linearity, hysteresis, and repeatability.
2) Defined as ±2 standard deviation limits. Small variations possible; see calibration certificate.
3) Chemical purge feature available with this sensor.



HMP5 humidity measurement accuracy as a function of temperature



HMP5 temperature measurement accuracy over full range

Operating environment

Operating temperature of probe body	−40 ... +80 °C (−40 ... +176 °F)
Operating temperature of probe head	−70 ... +180 °C (−94 ... +356 °F)
Operating environment	Suitable for outdoor use
IP rating of probe body	IP66

Inputs and outputs

Operating voltage	15 ... 30 V DC
Current consumption	10 mA typical, 500 mA max.
Digital output	RS-485, non-isolated
Protocols	Modbus RTU

Output parameters

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

Compliance

EU directives	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC compatibility	EN 61326-1, industrial environment
Type approvals	DNV GL certificate no. TAA00002YT
Compliance marks	CE, China RoHS, RCM

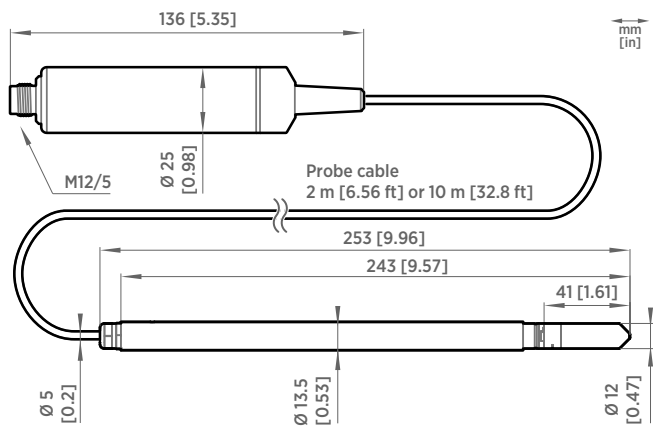
Mechanical specifications

Connector	M12 5-pin A-coded male
Weight	436 g (15.37 oz)
Materials	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP

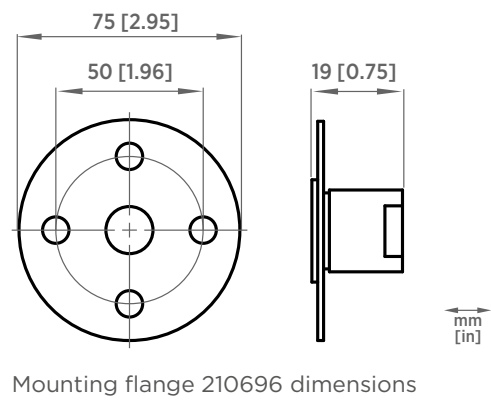
Accessories

Mounting flange	210696
Indigo USB adapter ¹⁾	USB2

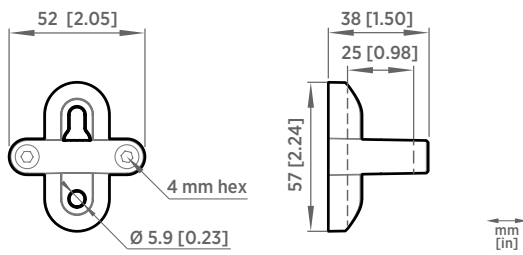
¹⁾ Vaisala Insight software for Windows available at www.vaisala.com/insight.



HMP5 probe dimensions



Mounting flange 210696 dimensions



Probe holder ASM213582 dimensions



HMP7 Relative Humidity and Temperature Probe

For high humidities

Features

- RH accuracy up to $\pm 0.8\%$ RH
- Temperature accuracy up to $\pm 0.1\text{ }^{\circ}\text{C}$ ($\pm 0.18\text{ }^{\circ}\text{F}$)
- Temperature measurement range $-70 \dots +180\text{ }^{\circ}\text{C}$ ($-94 \dots +356\text{ }^{\circ}\text{F}$)
- Vapor and pressure proof construction
- Condensation prevention with probe heating
- Sensor purge provides superior chemical resistance
- Modbus® RTU over RS-485
- Compatible with Indigo transmitters and Insight PC software
- Traceable calibration certificate: 6 points for humidity, 1 point for temperature



Vaisala HUMICAP® Humidity and Temperature Probe HMP7 is designed for applications that involve constant high humidity or rapid changes in humidity, such as drying and test chambers, combustion air, and other humidifiers and meteorological measurements, where measurement performance and chemical tolerance are essential.

Proven Vaisala HUMICAP® performance

Vaisala is the original innovator of the thin-film capacitive humidity measurement technology, which has now become the industry standard in humidity measurement.

HUMICAP® technology results from Vaisala's 40-year experience in industrial humidity measurement, providing the best stability, fast response time, and low hysteresis in a wide range of applications.

Avoiding condensation at extreme humidity

Probe heating functionality heats up not only the sensor, but the whole probe head. When probe temperature is heated above dew point temperature, condensation on the probe can be avoided while measuring the dew point

temperature of the process. By setting the temperature compensation value obtained, for example, with the TMP1 temperature probe, true relative humidity at process temperature can be measured while avoiding condensation by elevated probe temperature.

Vaisala Indigo product family

Indigo transmitters extend the capabilities of Indigo compatible measurement probes. The transmitters can display measurements on the spot as well as transmit them to automation systems through analog signals, digital outputs, and relays. Cable length between probe and transmitter can be extended to up to 30 meters. For more information, see www.vaisala.com/indigo.

Flexible connectivity

The probe is compatible with Vaisala Indigo series transmitters, and it can be used as a standalone digital Modbus RTU transmitter over RS-485 serial bus. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight.



DNV GL type approval
certificate no. TAA00002YT

Technical data

Measurement performance

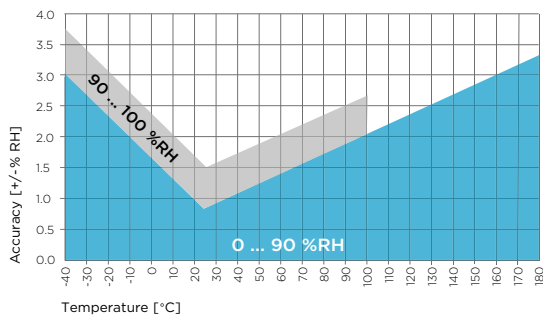
Relative humidity	
Measurement range	0 ... 100 %RH
Accuracy at +23 °C (+73.4 °F) ¹⁾	±0.8 %RH (0 ... 90 %RH)
Factory calibration uncertainty ²⁾	±0.5 %RH (0 ... 40 %RH) ±0.8 %RH (40 ... 95 %RH)
T ₆₃ response time	15 s
Sensor options	HUMICAP® R2 HUMICAP® R2C ³⁾ HUMICAP® 180VC ^{3) 4)}
Temperature	
Measurement range	-70 ... +180 °C (-94 ... +356 °F)
Accuracy at +23 °C (+73.4 °F) ¹⁾	±0.1 °C (±0.18 °F)
Factory calibration uncertainty ²⁾	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)
Sensor	Pt100 RTD Class F0.1 IEC 60751

¹⁾ Defined against calibration reference. Including non-linearity, hysteresis, and repeatability.

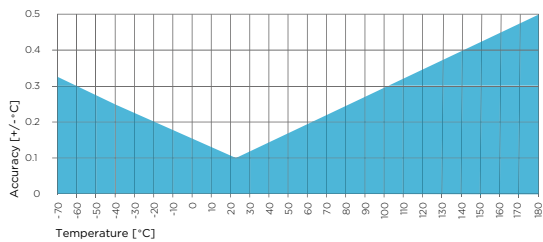
²⁾ Defined as ±2 standard deviation limits. Small variations possible; see calibration certificate.

³⁾ Chemical purge feature available with this sensor.

⁴⁾ H₂O₂ resistant. With HUMICAP® 180VC sensor, accuracy is not specified below -20 °C (-4 °F) operating temperature.



HMP7 humidity measurement accuracy as a function of temperature



HMP7 temperature measurement accuracy over full range

Operating environment

Operating temperature of probe body	-40 ... +80 °C (-40 ... +176 °F)
Operating temperature of probe head	-70 ... +180 °C (-94 ... +356 °F)
Operational pressure	< 10 bar
Operating environment	Suitable for outdoor use
Measurement environment	For air, nitrogen, hydrogen, argon, helium, oxygen, and vacuum ¹⁾
IP rating of probe body	IP66

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

Inputs and outputs

Operating voltage	18 ... 30 V DC
Current consumption	10 mA typical, 500 mA max.
Digital output	RS-485, non-isolated
Protocols	Modbus RTU

Output parameters

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

Compliance

EU directives	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC compatibility	EN 61326-1, industrial environment
Type approvals	DNV GL certificate no. TAA00002YT
Compliance marks	CE, China RoHS, RCM

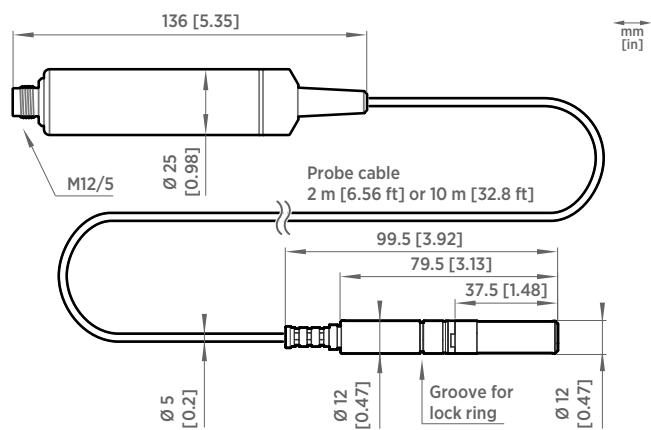
Mechanical specifications

Connector	M12 5-pin A-coded male
Weight	310 g (10.9 oz)
Materials	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP

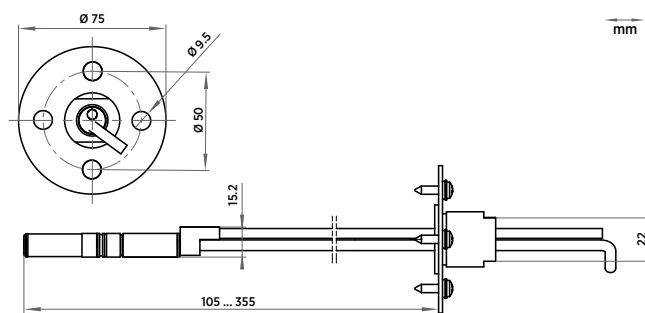
Accessories

Duct installation kit for RH probe	210697
Solar radiation shield DTR502B	DTR502B
Cable gland M20×1.5 with split seal	HMP247CG
Swagelok® for 12 mm probe, 1/2" ISO thread	SWG12ISO12
Swagelok® for 12 mm probe, 3/8" ISO thread	SWG12ISO38
Swagelok® for 12 mm probe, 1/2" NPT thread	SWG12NPT12
Indigo USB adapter ¹⁾	USB2

¹⁾ Vaisala Insight software for Windows available at www.vaisala.com/insight.



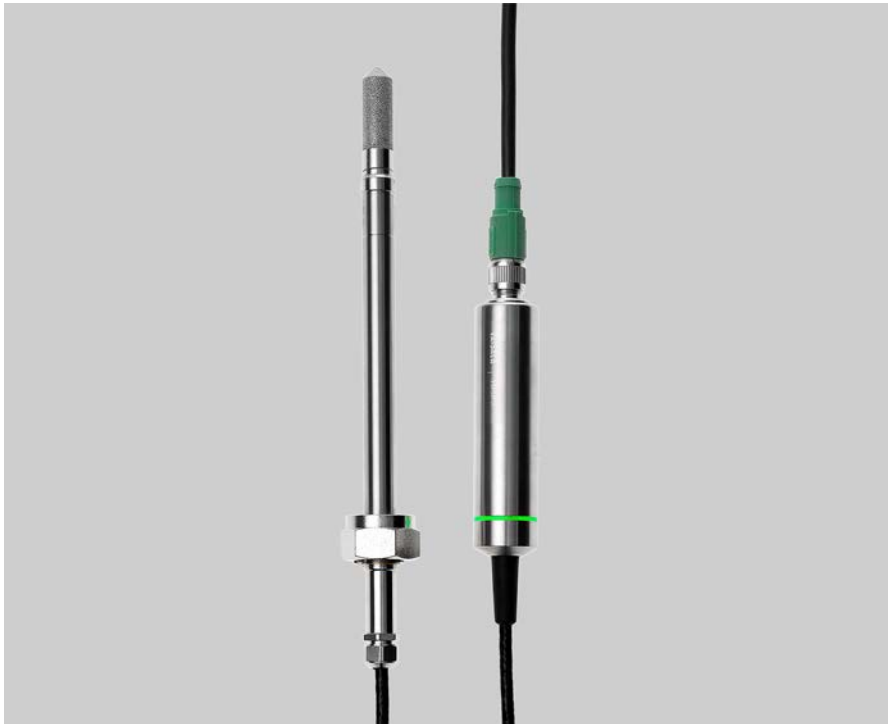
HMP7 probe dimensions



Duct installation kit 210697 dimensions with probe

HMP8 Relative Humidity and Temperature Probe

For pressurized and vacuum processes



Features

- RH accuracy up to $\pm 0.8\%$ RH
- Temperature accuracy up to $\pm 0.1\text{ }^{\circ}\text{C}$ ($\pm 0.18\text{ }^{\circ}\text{F}$)
- Operating pressure 0 ... 4 MPa (0 ... 40 bar)
- Temperature measurement range $-70\text{ }^{\circ}\text{C}$... $+180\text{ }^{\circ}\text{C}$ ($-94\text{ }^{\circ}\text{F}$... $+356\text{ }^{\circ}\text{F}$)
- Sensor purge provides superior chemical resistance
- Probe installation depth can be freely adjusted and probe can be hot-swapped from pressurized pipelines with an installation valve
- Modbus® RTU over RS-485
- Compatible with Indigo transmitters and Insight PC software
- Traceable calibration certificate: 6 points for humidity, 1 point for temperature

Vaisala HUMICAP® Humidity and Temperature Probe HMP8 is designed for pressurized applications in compressed air systems, refrigerant dryers, and other pressurized industrial applications, where easy insertion and removal of the probe and adjustable installation depth into the pipeline are needed.

Proven Vaisala HUMICAP® performance

Vaisala is the original innovator of the thin-film capacitive humidity measurement technology, which has now become the industry standard in humidity measurement.

HUMICAP® technology results from Vaisala's 40-year experience in industrial humidity measurement, providing the best stability, fast response time, and low hysteresis in a wide range of applications.

Chemical purge minimizes effects of contaminants

In environments with high concentrations of chemicals and cleaning agents, the chemical purge option helps to maintain measurement accuracy between calibration intervals.

The chemical purge involves heating the sensor to remove harmful chemicals. The function can be initiated manually or programmed to occur at set intervals.

Flexible connectivity

The probe is compatible with Vaisala Indigo series transmitters, and it can be used as a standalone digital Modbus RTU transmitter over RS-485 serial bus. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight.

Vaisala Indigo product family

Indigo transmitters extend the capabilities of Indigo compatible measurement probes. The transmitters can display measurements on the spot as

well as transmit them to automation systems through analog signals, digital outputs, and relays. Cable length between probe and transmitter can be extended to up to 30 meters. For more information, see www.vaisala.com/indigo.



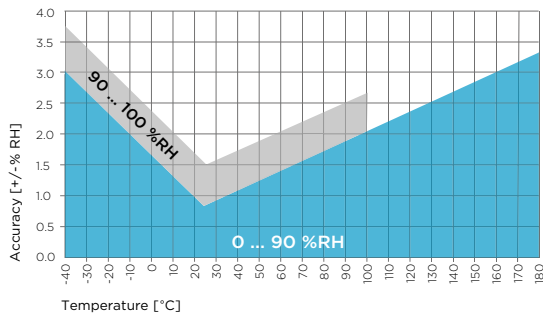
DNV GL type approval certificate no. TAA00002YT

Technical data

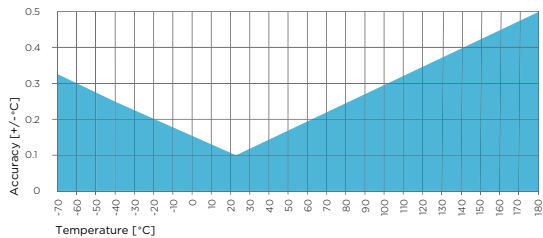
Measurement performance

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® R2C ³⁾
Temperature	
Measurement range	-70 ... +180 °C (-94 ... +356 °F)
Accuracy at +23 °C (+73.4 °F) ¹⁾	±0.1 °C (±0.18 °F)
Factory calibration uncertainty ²⁾	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)
Sensor	Pt100 RTD Class F0.1 IEC 60751

- 1) Defined against calibration reference. Including non-linearity, hysteresis, and repeatability.
 2) Defined as ±2 standard deviation limits. Small variations possible; see calibration certificate.
 3) Chemical purge feature available with this sensor.



HMP8 humidity measurement accuracy as a function of temperature



HMP8 temperature measurement accuracy over full range

Operating environment

Operating temperature of probe body	-40 ... +80 °C (-40 ... +176 °F)
Operating temperature of probe head	-70 ... +180 °C (-94 ... +356 °F)
Operational pressure	< 40 bar
Operating environment	Suitable for outdoor use
Measurement environment	For air, nitrogen, hydrogen, argon, helium, oxygen, and vacuum ¹⁾
IP rating of probe body	IP66

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

Inputs and outputs

Operating voltage	15 ... 30 V DC
Current consumption	10 mA typical, 500 mA max.
Digital output	RS-485, non-isolated
Protocols	Modbus RTU

Output parameters

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

Compliance

EU directives	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC compatibility	EN 61326-1, industrial environment
Type approvals	DNV GL certificate no. TAA00002YT
Compliance marks	CE, China RoHS, RCM

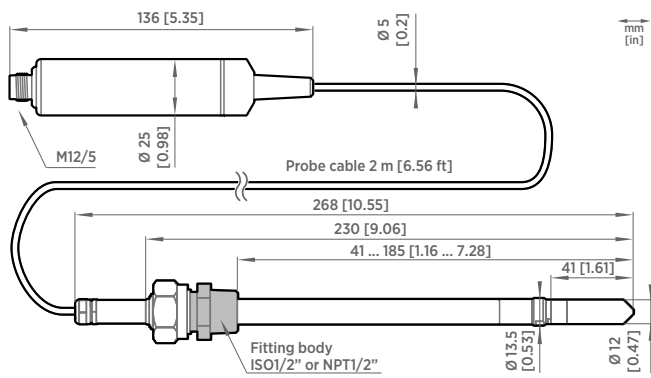
Mechanical specifications

Connector	M12 5-pin A-coded male
Probe fitting	ISO1/2" and NPT1/2" fittings included
Weight	512 g (18.1 oz)
Materials	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP

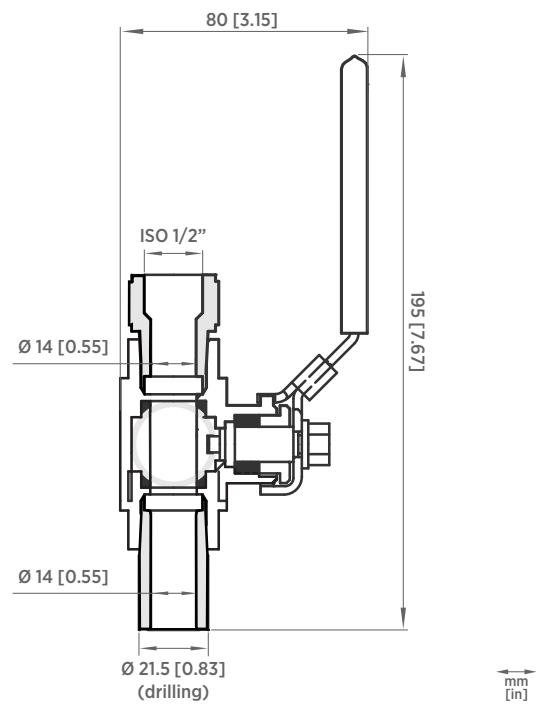
Accessories

Ball valve ISO 1/2" with welding joint	BALLVALVE-1
Indigo USB adapter ¹⁾	USB2

- 1) Vaisala Insight software for Windows available at www.vaisala.com/insight.



HMP8 probe dimensions



Ball valve kit dimensions



Features

- Miniature probe head with low thermal mass for superior response time
- RH accuracy up to 0.8 %RH
- Temperature accuracy up to 0.1 °C (0.18 °F)
- Temperature measurement range -40 ... +120 °C (-40 ... +248 °F)
- Sensor purge provides superior chemical resistance
- Modbus® RTU over RS-485
- Compatible with Indigo transmitters and Insight PC software
- Traceable calibration certificate: 6 points for humidity, 1 point for temperature
- M10×1.5 cable gland included for mounting the probe head

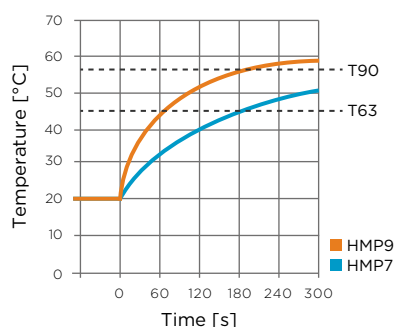
Vaisala HUMICAP® Humidity and Temperature Probe HMP9 is designed for easy installation into rapidly changing environments where fast response time, measurement performance, and chemical tolerance are essential.

Miniature probe head with HUMICAP® performance

The main feature of HMP9 is its 5 mm (0.2 in) diameter miniature probe head. Despite the small footprint, the probe head contains a HUMICAP® sensor that provides its industry standard humidity measurement performance.

HMP9 has great stability, fast response time, and low hysteresis in a wide range of applications. This makes it the superior choice in applications where the mechanical properties or replaceable filters of the heavier probes are not needed.

Measurement environments where occasional condensation is present are not a problem as long as the probe is protected from exposure to liquid water. For continuously condensing environments, use HMP7 with probe heating instead.



HMP9 T response time compared to HMP7

Chemical purge minimizes effects of contaminants

In environments with high concentrations of chemicals and cleaning agents, the chemical purge option helps to maintain measurement accuracy between calibration intervals.

The chemical purge involves heating the sensor to remove harmful chemicals. The function can be initiated manually or programmed to occur at set intervals.

Flexible connectivity

The probe is compatible with Vaisala Indigo series transmitters, and it can be used as a standalone digital Modbus RTU transmitter over RS-485 serial bus. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight.

Technical data

Measurement performance

Relative humidity

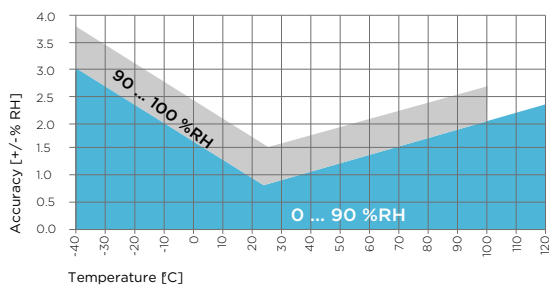
Measurement range	0 ... 100 %RH
Accuracy at +23 °C (+73.4 °F) ¹⁾	±0.8 %RH (0 ... 90 %RH)
Factory calibration uncertainty ²⁾	±0.7 %RH (0 ... 40 %RH) ±1 %RH (40 ... 95 %RH)
T ₆₃ response time ³⁾	15 s

Sensor HUMICAP® I

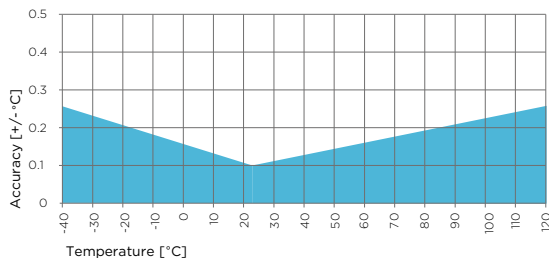
Temperature

Measurement range	-40 ... +120 °C (-40 ... +248 °F)
Accuracy at +23 °C (+73.4 °F) ¹⁾	±0.1 °C (±0.18 °F)
Factory calibration uncertainty ²⁾	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)
T ₆₃ response time ³⁾	70 s

- 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⁾ In still air.



HMP9 humidity measurement accuracy as a function of temperature



HMP9 temperature measurement accuracy over full range

Operating environment

Operating temperature of probe body	-40 ... +60 °C (-40 ... +140 °F)
Operating temperature of probe head	-40 ... +120 °C (-40 ... +248 °F)
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
Operating environment	Suitable for outdoor use when protected from rain
Measurement environment	For air, nitrogen, hydrogen, argon, helium, and oxygen ¹⁾
IP rating of probe body	IP65

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

Inputs and outputs

Operating voltage	15 ... 30 V DC
Current consumption	5 mA typical, 400 mA max.
Digital output	RS-485, non-isolated
Default serial settings	19200 bps N 8 2
Protocol	Modbus RTU

Output parameters

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

Compliance

EU directives	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC compatibility	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, RCM

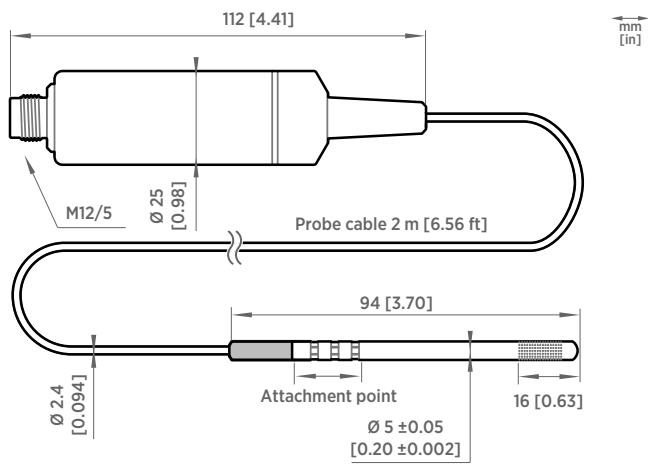
Mechanical specifications

Connector	M12 5-pin A-coded male
Weight	68 g (2.40 oz)
Materials	
Probe	AISI 316L
Probe body	PBT
Cable overmolds	FEP

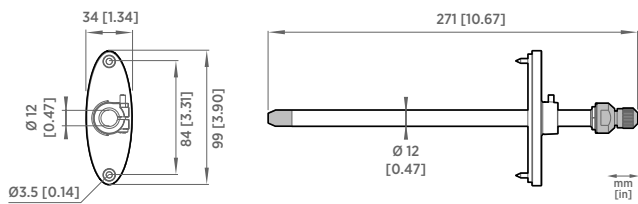
Accessories

HMP9 calibration adapter for HMK15	ASM213801
HMP9 duct installation kit	ASM214055
Solar radiation shield DTR502B with sensor head support 215130	DTR502B and 215130
Indigo USB adapter ¹⁾	USB2

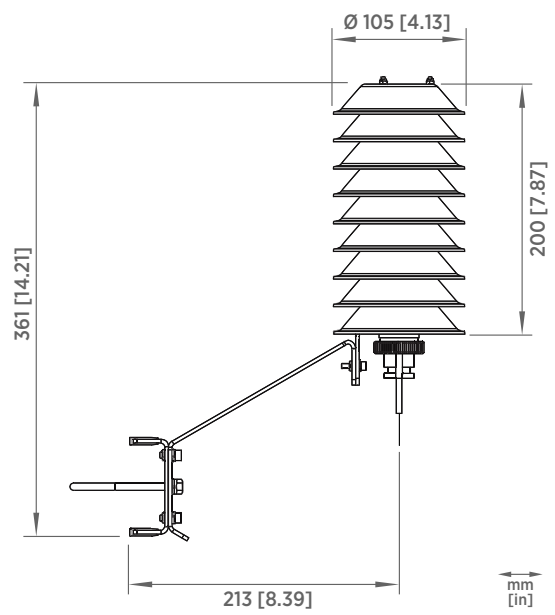
- ¹⁾ Vaisala Insight software for Windows available at www.vaisala.com/insight.



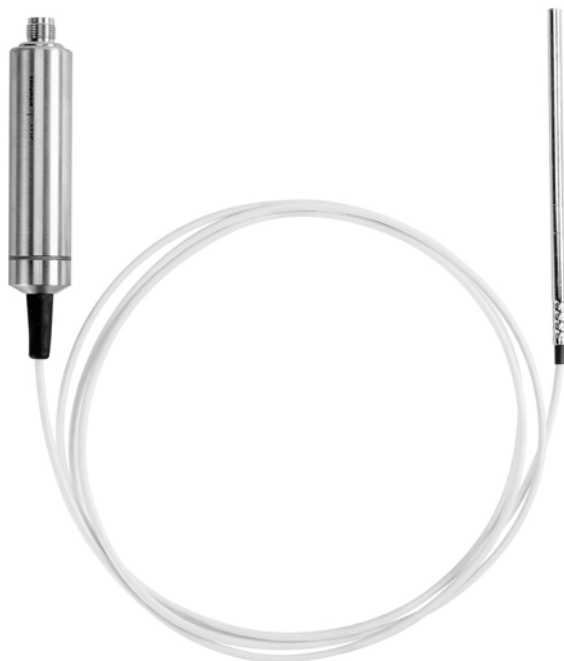
HMP9 probe dimensions



HMP9 Duct Installation Kit ASM214055 dimensions



Solar Radiation Shield DTR502B dimensions



Features

- Temperature accuracy up to ± 0.1 °C (± 0.18 °F)
- Temperature measurement range $-70 \dots +180$ °C ($-94 \dots +356$ °F)
- Modbus® RTU over RS-485
- Compatible with Indigo series transmitters and Insight PC software
- Traceable 2-point calibration certificate with calibration points at $+20$ and $+70$ °C ($+68$ and $+158$ °F)

Vaisala Temperature Probe TMP1 is designed for demanding temperature measurements in industrial applications such as pharmaceutical industry and calibration laboratories, where accuracy and robustness are essential.

Flexible connectivity

The probe is compatible with Vaisala Indigo series transmitters, and it can be used as a standalone digital Modbus RTU transmitter over RS-485 serial bus. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight.

Vaisala Indigo product family

Indigo transmitters extend the capabilities of Indigo compatible measurement probes. The transmitters can display measurements on the spot as well as transmit them to automation systems through analog signals, digital

outputs, and relays. Cable length between probe and transmitter can be extended to up to 30 meters. For more information, see www.vaisala.com/indigo.

Relative humidity measurements in high humidities

When the TMP1 probe is connected to a control system in parallel with HMP7 Relative Humidity and Temperature Probe, it is possible to have relative humidity measurement in actual process temperature while using probe heating in the relative humidity probe. Probe heating helps to avoid condensation in situations where the dew point temperature of the process is close to the ambient temperature.

When the humidity probe is heated above dew point temperature, condensation can be avoided and the relative humidity in the actual process temperature can be back-calculated based on the true process temperature measurement received from TMP1.



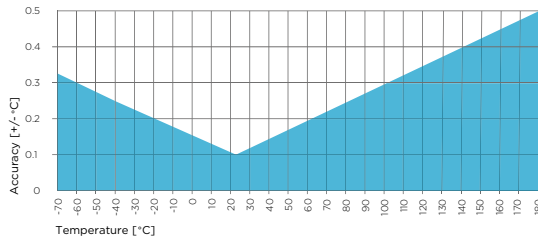
DNV GL type approval certificate no. TAA00002YT

Technical data

Measurement performance

Measurement range	-70 ... +180 °C (-94 ... +356 °F)
Accuracy at +23 °C (+73.4 °F) ¹⁾	±0.1 °C (±0.18 °F)
Factory calibration uncertainty ²⁾	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)
Sensor	Pt100 RTD Class F0.1 IEC 60751

1) Defined against calibration reference. Including non-linearity, hysteresis, and repeatability.
2) Defined as ±2 standard deviation limits. Small variations possible; see calibration certificate.



TMP1 temperature measurement accuracy over full range

Operating environment

Operating temperature of probe body	-40 ... +80 °C (-40 ... +176 °F)
Operating temperature of probe head	-70 ... +180 °C (-94 ... +356 °F)
Operating environment	Suitable for outdoor use

IP rating

Probe body	IP66
Probe head and cable	IPX8/IPX9

Inputs and outputs

Operating voltage	15 ... 30 V DC
Current consumption	10 mA typical
Digital output	RS-485, non-isolated
Protocols	Modbus RTU
Output parameters	Temperature (°C) Water vapor saturation pressure (hPa)

Compliance

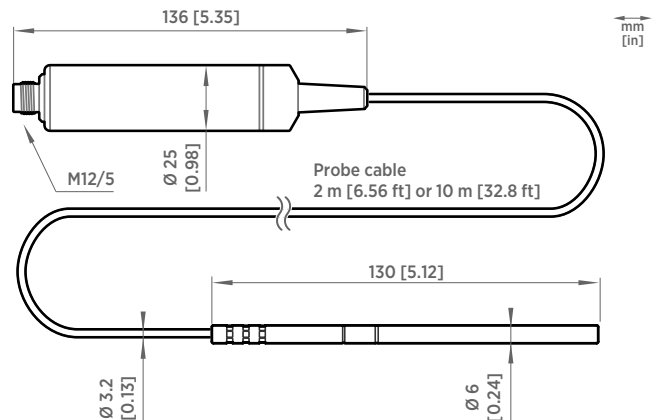
EU directives	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC compatibility	EN 61326-1, industrial environment
Type approvals	DNV GL certificate no. TAA00002YT
Compliance marks	CE, China RoHS, RCM

Mechanical specifications

Connector	M12 5-pin A-coded male
Weight	224 g (7.9 oz)

Materials

Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP

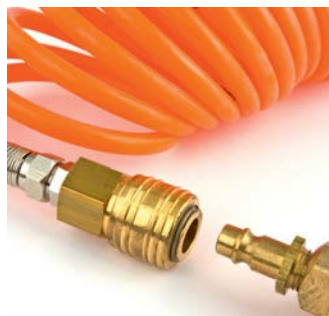
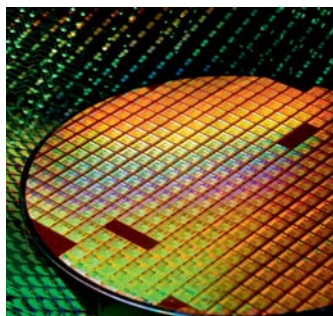


TMP1 probe dimensions

Accessories

Duct installation kit for T probe	215003
Swagelok® for 6 mm probe, 1/8" ISO thread	SWG6ISO18
Swagelok® for 6 mm probe, 1/8" NPT thread	SWG6NPT18
Indigo USB adapter ¹⁾	USB2

¹⁾ Vaisala Insight software for Windows available at www.vaisala.com/insight.



DRYCAP in brief

- Thin-film polymer sensor with unique auto-calibration function
- Wide measurement range, dew point measurement down to -80°C (-112°F)
- Accuracy $\pm 2^{\circ}\text{C}$ ($\pm 3.6^{\circ}\text{F}$)
- SI-traceable dew point measurement

In 1997 Vaisala introduced DRYCAP, a new type of dew point sensor based on thin-film polymer technology. Since its launch, the DRYCAP product family has grown to encompass a huge range of applications, from drying processes to compressed air and dry chambers. The DRYCAP sensor is particularly renowned for its reliable performance in hot and very dry environments

How it works

DRYCAP's unrivalled performance is based on two innovations: the proven capacitive thin-film polymer sensor and the auto-calibration function.

The sensor's thin-film polymer absorbs or releases water vapor as the surrounding humidity increases or decreases. The dielectric properties of the polymer change as the humidity around the sensor changes, as does the capacitance of the sensor. Capacitance is converted into a humidity reading. The capacitive polymer sensor is bonded together with a temperature sensor, and dew point is calculated from the humidity and temperature readings.

Vaisala's patented auto-calibration function optimizes the measurement stability in dry environments. The sensor is heated at regular intervals during the automated auto-calibration procedure. The humidity and temperature readings

are monitored as the sensor cools to ambient temperature, with offset correction compensating for any potential drift. This enables the DRYCAP sensor to deliver accurate measurements in the long term, dramatically reducing the need for maintenance.

Typical applications for dew point measurement

Vaisala DRYCAP dew point instruments measure dew point in industrial applications, where gas humidity is typically very low. Dew point is often a critical parameter, with inadequate control resulting in problems such as process downtime, damaged process equipment, and deterioration in end-product quality.

Dew point is measured in various drying and heat-treatment processes such as plastic drying, baking ovens, and food drying. It is also controlled in compressed air, where excess moisture can result in poor end-product quality, ice formation, and equipment corrosion.

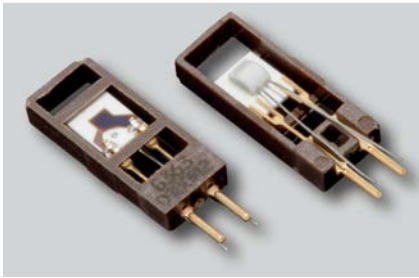
Other typical applications include medical gas, dry environments in lithium battery manufacturing, and gas-insulated high-voltage equipment used in the power industry.

DRYCAP's unique benefits

- Excellent long-term stability, with recommended 2-year calibration interval
- Rapid response time
- Withstands condensation and recovers rapidly
- Resistant to particulate contamination, oil vapor, and most chemicals

Vaisala DRYCAP humidity products

Vaisala's dew point instruments are suitable for accurate and stable monitoring of dry conditions in a variety of applications from -80 to $+100$ °C T_d . Vaisala's product range includes transmitters for demanding industrial applications, compact instruments for installation in dryers, and handheld meters for spot checking. Portable sampling systems are also available. View the complete range of dew point products at www.vaisala.com/dewpoint.



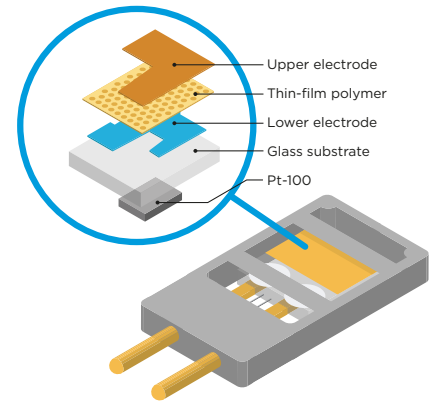
DRYCAP sensor

The DRYCAP story

The DRYCAP story began in the mid-1990s following an unresolved measurement challenge. Traditional humidity instruments were not accurate enough at very low humidities, while commonly used aluminum oxide sensors were prone to drift and required frequent calibration. There was strong demand for accurate, easy-to-use, cost-effective, and low-maintenance dew point instruments. Vaisala's solution was to combine the highest quality polymer technology with a patented key feature – auto-calibration – that would eliminate sensor drift in very dry conditions. The result was the stable, reliable, and accurate DRYCAP sensor.

The first DRYCAP products were launched in 1997, and this highly successful innovation is still going strong today. DRYCAP also led the way for the next great innovation: the world's first

transmitter that monitors both dew point and process pressure simultaneously, aimed at compressed air customers worldwide. The story continues.



Structure of the DRYCAP sensor

DMP5 Dew Point and Temperature Probe

For high temperature applications



Features

- Measures humidity at temperatures up to +180 °C (+356 °F)
- Dew point measurement range –40 ... +100 °C (–40 ... +212 °F) $T_{d/f}$
- Dew point measurement accuracy up to ± 2 °C (± 3.6 °F) $T_{d/f}$
- Sensor purge provides superior chemical resistance
- Condensation-tolerant
- Modbus RTU over RS-485
- Compatible with Indigo transmitters and Insight PC software
- Traceable calibration certificate

Vaisala DRYCAP® Dew Point and Temperature Probe DMP5 is designed for humidity measurement in applications with high temperatures. The long and robust steel probe and an optional installation flange allow easy installation with adjustable depth through insulation, for example, in ovens.

Measure humidity directly in hot processes

DMP5 is built for direct measurement in hot and dry processes, up to +180 °C (+356 °F). As the probe can be directly placed in the process, there is no need for a sampling system or trace heating. As a result, high measurement accuracy and constancy are maintained. DMP5 provides unmatched dry-end measurement accuracy at temperatures up to 140 °C; however, it can operate safely at temperatures up to 180 °C. DMP5 incorporates the Vaisala DRYCAP® sensor, which is accurate, reliable, and stable. The sensor is condensation-tolerant and is immune to particulate contamination, oil vapor, and most chemicals. Sensor warming minimizes the risk of condensation accumulating on the sensor. If the DRYCAP® sensor does

get wet, it will rapidly dry and recover its swift response time. In low humidity conditions the sensor will auto-calibrate to ensure accurate measurement.

Chemical purge minimizes effects of contaminants

In environments with high concentrations of chemicals and cleaning agents, the chemical purge option helps to maintain measurement accuracy between calibration intervals.

The chemical purge involves heating the sensor to remove harmful chemicals. The function can be initiated manually or programmed to occur at set intervals.

Services you can count on

Each probe is manufactured and individually calibrated in Vaisala's world-class facility in Finland. The traceable factory calibration certificate is included also in electronic format in the probe.

The interchangeable probes minimize the downtime associated with maintenance. Validate and maintain the accuracy by calibrating the instrument on the field or use the easy and thorough calibration service in Vaisala's service facilities in Helsinki, Boston, Beijing and Tokyo.



DNV GL type approval certificate no. TAA00002YT

Technical data

Measurement performance

Dew point

Sensor	DRYCAP® 180S
Measurement range	-40 ... +100 °C (-40 ... +212 °F) $T_{d/f}$
Accuracy	± 2 °C (± 3.6 °F) $T_{d/f}$ See accuracy graph

Response time 63 % [90 %] ¹⁾

From dry to wet	5 s [10 s]
From wet to dry	45 s [5 min]

Temperature

Measurement range	0 ... +180 °C (+32 ... +356 °F) ²⁾
Accuracy at +100 °C (+212 °F)	± 0.4 °C (± 0.72 °F)
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751

Mixing ratio

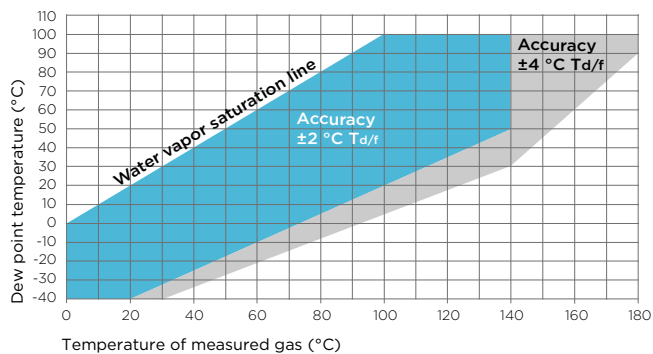
Measurement range (typical)	0 ... 1000 g/kg (0 ... 7000 gr/lbs)
Accuracy (typical)	± 12 % of reading

Absolute humidity

Measurement range	0 ... 600 g/m ³
Accuracy	± 10 % of reading (typical)

1) Tested with sintered filter.

2) If sensor warming is enabled, temperature measurement is locked when humidity rises above 80 %RH and warming is switched on.



Dew point accuracy vs. measurement conditions

Operating environment

Operating temperature range for probe head -40 ... +180 °C (-40 ... +356 °F)

Operating temperature range for probe body -40 ... +80 °C (-40 ... +176 °F)

Storage temperature -40 ... +80 °C (-40 ... +176 °F)

Measurement environment For air, nitrogen, hydrogen, argon, helium, and oxygen ¹⁾

IP rating for probe body IP66

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

Inputs and outputs

Operating voltage	15 ... 30 V DC
Current consumption	10 mA typical, 500 mA max.
Digital output	RS-485, non-isolated
Protocols	Modbus RTU

Output parameters

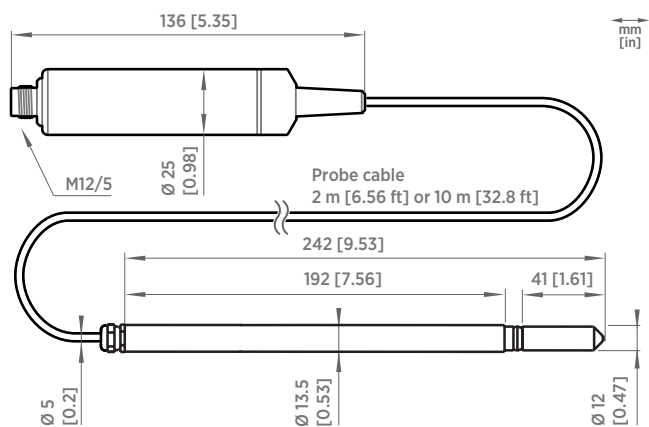
Absolute humidity (g/m ³)	Relative humidity (%RH)
Absolute humidity at NTP (g/m ³)	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm _v)
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)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

Compliance

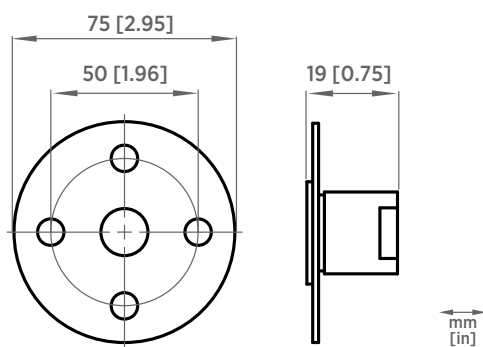
EU directives	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC compatibility	EN 61326-1, industrial environment
Type approvals	DNV GL certificate no. TAA00002YT
Compliance marks	CE, China RoHS, RCM

Mechanical specifications

Connector	M12 5-pin A-coded male
Weight	436 g (15.37 oz)
Probe cable length	2 m (6.56 ft) or 10 m (32.8 ft)
Materials	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP



DMP5 dimensions



Optional mounting flange 210696 dimensions

Accessories

Mounting flange	210696
Indigo USB adapter ¹⁾	USB2

¹⁾ Vaisala Insight software for Windows available at www.vaisala.com/insight.

DMP6 Dew Point Probe

For very high temperature applications



Features

- Measures humidity at high temperatures up to +350 °C (+662 °F)
- Dew point measurement range -25 ... +100 °C (-13 ... +212 °F) $T_{d/f}$
- Dew point measurement accuracy up to ± 2 °C (± 3.6 °F) $T_{d/f}$
- Sensor purge provides superior chemical resistance
- Condensation-tolerant
- Modbus RTU over RS-485
- Compatible with Indigo transmitters and Insight PC software
- Traceable calibration certificate

Vaisala DRYCAP® Dew Point Probe DMP6 is designed for humidity measurement in industrial applications with very high temperatures. High temperature tolerance is achieved using a passive cooling set that conducts heat away from the probe and reduces temperature to optimal range for the sensor.

Measure humidity directly in very hot processes

DMP6 is built for direct measurement in temperature range +100 ... +350 °C (+212 ... +662 °F). There is no need for a sampling system or trace heating. To tolerate these high temperatures the probe head is inserted inside a cooling set that provides passive cooling. The cooling set has removable cooling fins that allow the operating temperature profile of the probe to be adjusted so that adequate cooling is provided for each application. The cooling system has no moving parts, and requires no additional power or cooling utilities, so there is no risk of sensor damage due to mechanical cooling failure.

DMP6 incorporates the Vaisala DRYCAP® sensor, which is accurate, reliable, and stable. The sensor is condensation-tolerant and is immune to particulate

contamination, oil vapor, and most chemicals. Sensor warming minimizes the risk of condensation accumulating on the sensor. If the DRYCAP® sensor does get wet, it will rapidly dry and recover its swift response time.

Chemical purge minimizes effects of contaminants

In environments with high concentrations of chemicals and cleaning agents, the chemical purge option helps to maintain measurement accuracy between calibration intervals.

The chemical purge involves heating the sensor to remove harmful chemicals. The function can be initiated manually or programmed to occur at set intervals.

Services you can count on

Each probe is manufactured and individually calibrated in Vaisala's world-class facility in Finland. The traceable factory calibration certificate is included also in electronic format in the probe.

The interchangeable probes minimize the downtime associated with maintenance. Validate and maintain the accuracy by calibrating the instrument on the field or use the easy and thorough calibration service in Vaisala's service facilities in Helsinki, Boston, Beijing and Tokyo.



DNV GL type approval certificate no. TAA00002YT

Technical data

Measurement performance

Dew point

Sensor	DRYCAP® 180S
Measurement range	-25 ... +100 °C (-13 ... +212 °F) T _{d/f}
Accuracy	±2 °C (±3.6 °F) T _{d/f}
Response time 63 % [90 %]:	
From dry to wet	5 s [10 s]
From wet to dry	45 s [5 min]

Mixing ratio

Measurement range (typical)	0 ... 1000 g/kg (0 ... 7000 gr/lbs)
Accuracy (typical)	±12 % of reading

Operating environment

Operating temperature range of probe head ¹⁾ +100 ... +350 °C (+212 ... +662 °F)

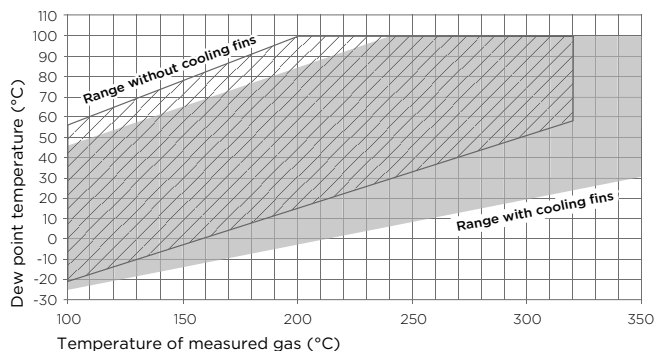
Operating temperature range of probe body -40 ... +80 °C (-40 ... +176 °F)

Storage temperature -40 ... +80 °C (-40 ... +176 °F)

Measurement environment For air, nitrogen, hydrogen, argon, helium, and oxygen ²⁾

IP rating IP66

- ¹⁾ Installation of cooling fins on the cooling set affects the operating temperature range. See the operating range graph.
²⁾ Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases.



Operating range of DMP6 probe head

Inputs and outputs

Operating voltage	15 ... 30 V DC
Current consumption	10 mA typical, 500 mA max.
Digital output	RS-485, non-isolated
Protocols	Modbus RTU

Compliance

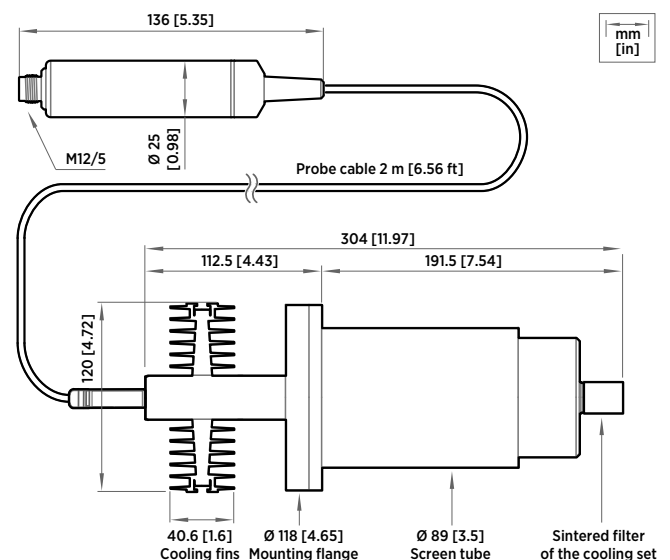
EU directives	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC compatibility	EN 61326-1, industrial environment
Type approvals	DNV GL certificate no. TAA00002YT
Compliance marks	CE, China RoHS, RCM

Output parameters

Dew point temperature (°C)	Water concentration (ppm _v)
Dew/frost point temperature (°C)	Water concentration (wet basis) (vol-%)
Dew/frost point temperature at 1 atm (°C)	Water mass fraction (ppm _w)
Dew point temperature at 1 atm (°C)	Water vapor pressure (hPa)
Mixing ratio (g/kg)	

Mechanical specifications

Connector	M12 5-pin A-coded male
Probe weight	500 g (1.10 lb)
Cooling set weight	3.50 kg (7.72 lb)
Probe cable length	2 m (6.56 ft)
Materials	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP
Cooling set	Stainless steel and aluminum



DMP6 dimensions with Cooling Set DMP246CS

Accessories

Cooling set	DMP246CS
Indigo USB adapter ¹⁾	USB2

- ¹⁾ Vaisala Insight software for Windows available at www.vaisala.com/insight.



DMP7 Dew Point and Temperature Probe

For installations in tight spaces



Features

- Dew point measurement range $-70 \dots +80 \text{ }^{\circ}\text{C}$ ($-94 \dots +176 \text{ }^{\circ}\text{F}$) $T_{d/f}$
- Dew point measurement accuracy up to $\pm 2 \text{ }^{\circ}\text{C}$ ($\pm 3.6 \text{ }^{\circ}\text{F}$) $T_{d/f}$
- Sensor purge provides superior chemical resistance
- Tolerates condensation, oils, dust, and most chemicals
- Modbus RTU over RS-485
- Compatible with Indigo transmitters and Insight PC software
- Traceable calibration certificate

Vaisala DRYCAP® Dew Point and Temperature Probe DMP7 is designed for low-humidity applications. Thanks to its short probe length, it fits in installations with limited space such as semiconductor manufacturing equipment. Other applications include industrial drying, compressed air systems, dry rooms, and blanket gases in metal heat treatment.

Stability at low dew points

Vaisala DRYCAP® sensor is immune to particulate contamination, water condensation, oil vapor, and most chemicals. The sensor tolerates condensation and recovers perfectly if exposed to liquid water. Fast reaction time and stability make its performance unmatched also in dynamic and low dew point applications.

Chemical purge minimizes effects of contaminants

In environments with high concentrations of chemicals and cleaning agents, the chemical purge option helps to maintain measurement accuracy between calibration intervals.

The chemical purge involves heating the sensor to remove harmful chemicals. The function can be initiated manually or programmed to occur at set intervals.

Pressure-tight installation

Optional pressure-tight Swagelok fitting is available for DMP7. When installed using the fitting DMP7 is suitable for installations with pressure in range $0 \dots 10 \text{ bar}$ ($0 \dots 145 \text{ psia}$).

Flexible connectivity

The probe is compatible with Vaisala Indigo series transmitters, and it can be used as a standalone digital Modbus RTU transmitter over RS-485 serial bus. For easy-to-use access to field calibration,

device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight.

Technical data

Measurement performance

Dew point

Sensor	DRYCAP® 180M
Measurement range	-70 ... +80 °C (-94 ... +176 °F) $T_{d/f}$
Measurement range for continuous use	-70 ... +45 °C (-94 ... +113 °F) $T_{d/f}$
Accuracy	Up to ± 2 °C (± 3.6 °F) $T_{d/f}$ See accuracy graph

Response time 63 % [90 %] ¹⁾

From dry to wet 5 s [15 s]

From wet to dry 45 s [8 min]

Temperature

Measurement range	0 ... +80 °C (+32 ... +176 °F)
Accuracy	± 0.2 °C at room temperature
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751

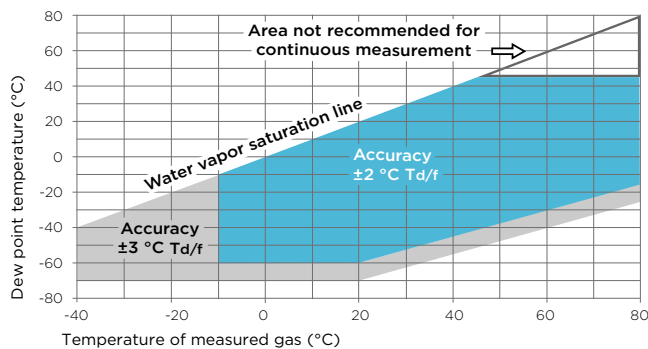
Relative humidity

Measurement range	0 ... 70 %RH
Accuracy (RH <10 %RH, at +20 °C)	± 0.004 %RH + 20% of reading

Concentration by volume (ppm)

Measurement range (typical)	10 ... 2500 ppm
Accuracy (at +20 °C, 1 bar)	1 ppm + 20% of reading

¹⁾ Tested with sintered filter.



Dew point accuracy vs. measurement conditions

Operating environment

Operating temperature for probe head	-40 ... +80 °C (-40 ... +176 °F)
Operating temperature for probe body	-40 ... +80 °C (-40 ... +176 °F)
Storage temperature	-40 ... +80 °C (-40 ... +176 °F)
Operating pressure for probe head	0 ... 10 bar (0 ... 145 psia)
Measurement environment	For air, nitrogen, hydrogen, argon, helium, oxygen ¹⁾ , and vacuum
IP rating for probe body	IP66

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

Inputs and outputs

Operating voltage	15 ... 30 V DC
Current consumption	10 mA typical, 500 mA max.
Digital output	RS-485, non-isolated
Protocols	Modbus RTU

Compliance

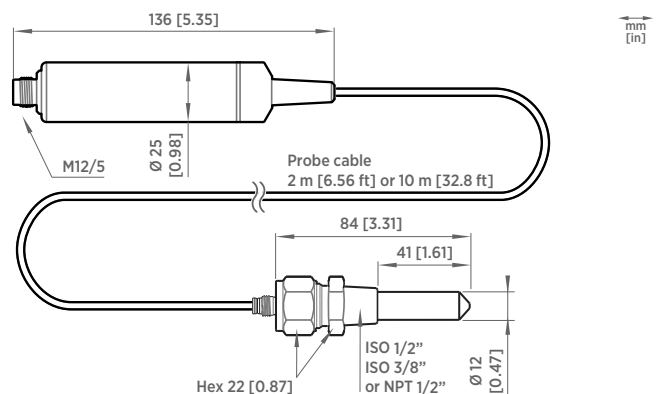
EU directives	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC compatibility	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, RCM

Output parameters

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

Mechanical specifications

Connector	M12 5-pin A-coded male
Weight	310 g (10.9 oz) with 2 m (6.56 ft) cable
Materials	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP



DMP7 dimensions

Accessories

Swagelok ISO 3/8"	SWG12ISO38
Swagelok ISO 1/2"	SWG12ISO12
Swagelok NPT 1/2"	SWG12NPT12
Indigo USB adapter ¹⁾	USB2

¹⁾ Vaisala Insight software for Windows available at www.vaisala.com/insight.



DMP8 Dew Point and Temperature Probe

For pressurized pipelines



Features

- Dew point measurement range $-70 \dots +80 \text{ }^{\circ}\text{C}$ ($-94 \dots +176 \text{ }^{\circ}\text{F}$) $T_{d/f}$
- Dew point measurement accuracy up to $\pm 2 \text{ }^{\circ}\text{C}$ ($\pm 3.6 \text{ }^{\circ}\text{F}$) $T_{d/f}$
- Operating pressure of probe head $0 \dots 4 \text{ MPa}$ ($0 \dots 40 \text{ bar}$)
- Adjustable installation depth
- Tolerates condensation, oils, dust, and most chemicals
- Sensor purge provides superior chemical resistance
- Modbus RTU over RS-485
- Compatible with Indigo transmitters and Insight PC software
- Traceable calibration certificate

Vaisala DRYCAP® Dew Point and Temperature Probe DMP8 is designed for industrial low-humidity applications such as industrial drying, compressed air systems, and semiconductor industry. It can be installed in a 1/2" NPT or ISO thread with adjustable insertion depth.

Stability at low dew points

The Vaisala DRYCAP® sensor is immune to particulate contamination, water condensation, oil vapor, and most chemicals. The sensor tolerates condensation and recovers perfectly if exposed to liquid water. Fast reaction time and stability make its performance unmatched also in dynamic and low dew point applications. Outstanding stability provides a long calibration interval.

Chemical purge minimizes effects of contaminants

In environments with high concentrations of chemicals and cleaning agents, the chemical purge option helps to maintain measurement accuracy between calibration intervals.

The chemical purge involves heating the sensor to remove harmful chemicals. The function can be initiated manually or programmed to occur at set intervals.

Easy installation

Thanks to its sliding sealing, it is easy to adjust the installation depth of the DMP8 probe head.

An optional ball-valve installation kit allows for inserting or detaching the probe from a pressurized line.

Flexible connectivity

The probe is compatible with Vaisala Indigo series transmitters, and it can be used as a standalone digital Modbus RTU transmitter over RS-485 serial bus. For

easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight.

Technical data

Measurement performance

Dew point

Sensor	DRYCAP® 180M
Measurement range	-70 ... +80 °C (-94 ... +176 °F) T _{d/f}
Measurement range for continuous use	-70 ... +45 °C (-94 ... +113 °F) T _{d/f}
Accuracy up to 20 bar/290 psia	±2 °C/±3.6 °F T _{d/f} See accuracy graph
Accuracy, 20 ... 40 bar/290 ... 580 psia	Additional inaccuracy +1 °C T _{d/f}
Response time 63 % [90 %] ¹⁾ :	
From dry to wet	5 s [15 s]
From wet to dry	45 s [8 min]

Temperature

Measurement range	0 ... +80 °C (+32 ... +176 °F)
Accuracy	±0.2 °C at room temperature
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751

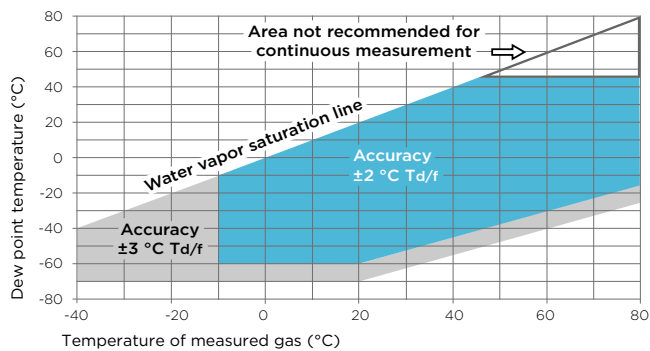
Relative humidity

Measurement range	0 ... 70 %RH
Accuracy (RH <10 %RH, at +20 °C)	±0.004 %RH + 20% of reading

Concentration by volume (ppm)

Measurement range (typical)	10 ... 2500 ppm
Accuracy (at +20 °C, 1 bar)	1 ppm + 20% of reading

¹⁾ Tested with sintered filter.



Dew point accuracy vs. measurement conditions

Operating environment

Operating temperature for probe head	-40 ... +80 °C (-40 ... +176 °F)
Operating temperature for probe body	-40 ... +80 °C (-40 ... +176 °F)
Storage temperature	-40 ... +80 °C (-40 ... +176 °F)
Operating pressure for probe head	0 ... 40 bar (0 ... 580 psia)
Measurement environment	For air, nitrogen, hydrogen, argon, helium, oxygen ¹⁾ , and vacuum
IP rating for probe body	IP66
Mechanical durability of probe head	Up to +180 °C (+356 °F) Up to 70 bar/1015 psia

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

Inputs and outputs

Operating voltage	15 ... 30 V DC
Current consumption	10 mA typical, 500 mA max.
Digital output	RS-485, non-isolated
Protocols	Modbus RTU

Output parameters

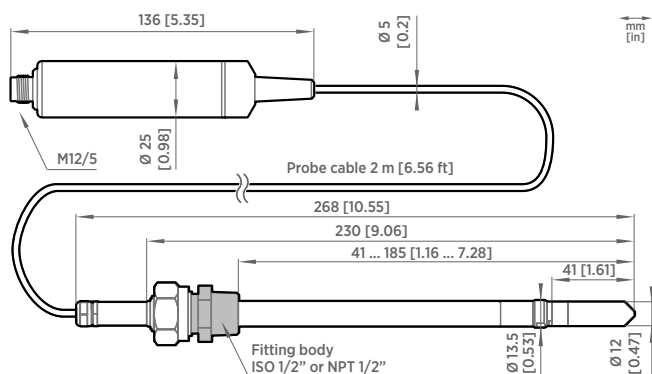
Absolute humidity (g/m ³)	Relative humidity (%RH)
Absolute humidity at NTP (g/m ³)	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm _v)
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)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

Compliance

EU directives	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC compatibility	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, RCM

Mechanical specifications

Connector	M12 5-pin A-coded male
Weight	512 g (18.1 oz)
Probe cable length	2 m (6.56 ft)
Materials	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP

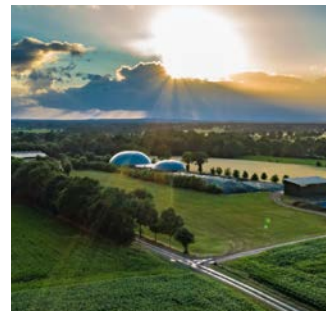
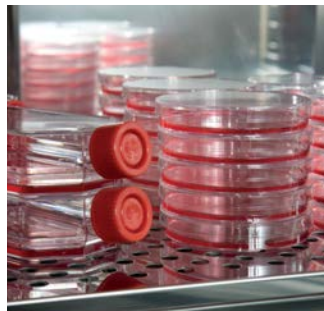


DMP8 dimensions

Accessories

Fitting body ISO R 1/2" with leak screw	ISOFITBODASP
Fitting body ISO R 1/2" (no leak screw)	DRW212076SP
Fitting body NPT 1/2" (no leak screw)	NPTFITBODASP
Sampling cell	DMT242SC
Sampling cell with Swagelok connectors	DMT242SC2
Ball valve set for pressurized pipelines	BALLVALVE-1
Duct installation flange for ISO R 1/2" thread	DM240FASP
Thread adapter ISO 1/2" to NPT 1/2"	210662SP
Blind plug ISO 1/2"	218773
Indigo USB adapter ¹⁾	242659

¹⁾ Vaisala Insight software for Windows available at www.vaisala.com/insight.



CARBOCAP in brief

- A silicon-based infrared (IR) absorption sensor
- Enables continuous internal reference measurement & multiband absorption measurement
- Depending on the product, enables both ppm and percentage level measurement
- Providing accurate measurements since the late 1990s

First launched in 1997, the Vaisala CARBOCAP carbon dioxide (CO₂) sensor features a groundbreaking innovation – the micromachined, electrically tunable Fabry-Pérot Interferometer (FPI) filter for built-in reference measurement. This reliable and stable sensor has been delivering accurate measurements since the late 1990s across a wide range of industries and applications, from building automation and safety to life sciences and ecological research.

How it works

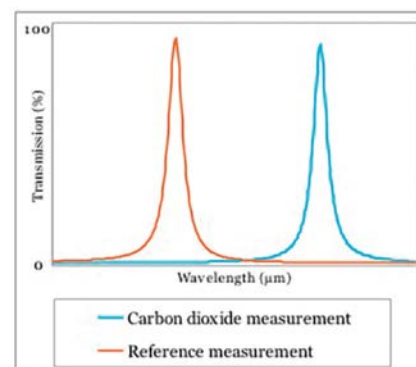
Gases have a characteristic absorbance band in the infrared (IR) region, each at a unique wavelength. When IR radiation is passed through a gas containing another gas we are measuring, part of the radiation is absorbed. Therefore, the amount of radiation passing through the gas depends on the amount of the measured gas present, and this can be detected with an IR detector.

The Vaisala CARBOCAP sensor features an electrically tunable FPI filter. In addition to measuring gas absorption, the micromechanical FPI filter enables a reference measurement at a wavelength where no absorption occurs. When taking the reference measurement, the FPI filter is electrically adjusted to switch the bypass band from the absorption wavelength to a non-absorption wavelength. The reference measurement compensates for any potential changes in the light source intensity, as well as for contamination and dirt accumulation in the optical path. This feature means that CARBOCAP sensor operation is highly stable over time.

Instruments measuring at several absorption and reference wavelengths with a single light source are known as single-beam multi-wavelength instruments. The technology is widely applied in costly analyzers. The unique feature of the CARBOCAP sensor is its micromachined FPI filter, which performs a multi-wavelength measurement using a single detector. The compact size of the sensor means that this advanced technology can be incorporated into small probes, modules, and transmitters.

CARBOCAP's unique benefits

- Superior stability enabled by autocalibration
- Insensitive to harsh conditions
- Minimal maintenance and calibration requirements



Example of carbon dioxide measurement. Both reference and CO₂ absorption are measured in the same optical path

Typical applications

Vaisala CARBOCAP sensor technology is well suited to a wide range of applications, but since the final customer value for each industrial application is unique, it depends on the product line how the CARBOCAP sensor technology is implemented.

In carbon dioxide measurement products, the technology is utilized for both ppm (parts per million) and percentage level measurements. Since CO₂ replaces oxygen, it can be harmful to people in very high concentrations. CO₂ is present at percentage levels only within closed processes such as fermentation and controlled-atmosphere storage environments. Percentage-level measurements are also typical in life-science applications such as CO₂ incubators.

Normal atmospheric air includes CO₂ at ppm levels. Typical CARBOCAP applications include ventilation control in buildings occupied by people, animal shelters, and greenhouses. In areas where large volumes of CO₂ are handled, reliable CO₂ measurement with alarm control is an important safety precaution. The CARBOCAP sensor is also a popular choice in ecological measurement applications such as biogas process lines, where excellent long-term stability and tolerance to harsh conditions are important requirements. For biogas applications, the technology is applied for multigas measurements, as it also helps improve the methane quality in the process.

Product examples

Vaisala's instruments including the CARBOCAP sensor technology range from hand-held meters, measurement modules, and industrial transmitters for

CO₂ measurements to multigas measurement solutions. View the complete range at www.vaisala.com/carbondioxide.

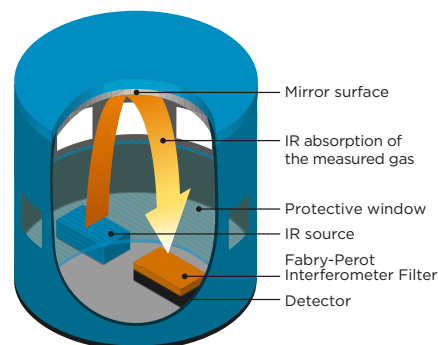
The CARBOCAP story

The CARBOCAP story began in 1992, when micromechanical sensors were being intensively researched at Vaisala. The groundbreaking idea of miniaturizing the Fabry-Pérot Interferometer (FPI) was born, leading to collaborative development work with VTT Technical Research Center of Finland. Later, a patent application was submitted for a single-channel gas concentration measurement method using the FPI.

The driving force behind the innovation of the CARBOCAP sensor was Vaisala's commitment to developing superior technologies for environmental measurements. And indeed, Vaisala's pioneering work in the field of silicon-based NDIR technology and electrically tunable filters resulted in the compact, simple and highperformance CARBOCAP sensor. To this day, the long-term stability and reliability of the measurement provided by the FPI is unrivaled.

The first commercial CARBOCAP products, launched in 1997, were developed for measuring ppm-level CO₂ in ventilation applications. They were soon followed by percentage-level

measurement products. Since 2011, Vaisala has developed its 2nd generation CARBOCAP sensor technology with improved features. The new sensor technology is incorporated in several product lines that are targeted for demanding applications. Typical examples are greenhouses, air control units, biogas lines and life science incubators.



Structure of the CARBOCAP sensor



Features

- Measurement range 0 ... 20 %CO₂
- Intelligent, standalone probe with analog and digital outputs
- Compatible with Indigo transmitters and Insight PC software
- Wide operating temperature range (-40 ... +60 °C)
- IP65-classified housing
- Integrated temperature measurement for CO₂ compensation purposes
- Compensations also for pressure, oxygen, and humidity
- Sensor head heated to prevent condensation
- Compatible with Indigo transmitters, RFL100 data logger, and Insight PC software

Vaisala CARBOCAP® Carbon Dioxide Probe GMP251 is a new intelligent probe for measuring carbon dioxide. This robust, standalone measurement device is designed for use in demanding applications, such as life science incubators, where stable, reliable, and accurate performance is required.

Benefits

- Superior long-term stability
- Reliable and accurate
- Calibration certificate included

GMP251 is based on Vaisala's patented, latest-generation CARBOCAP technology that enables exceptional stability. A new type of infrared (IR) light source is used instead of the traditional incandescent light bulb, which extends the lifetime of GMP251.

GMP251 incorporates an internal temperature sensor for compensation of the CO₂ measurement according to ambient temperature. The effects of pressure and background gas can also be compensated for. The measurement range is 0 ... 20 %CO₂ and the sensor performance is optimized at 5 %CO₂ measurement.

The operating temperature range of the probe is wide (-40 ... +60 °C (-40 ... +140 °F)), and the probe housing is classified as IP65. Condensation is prevented as the internal sensor head is heated. GMP251 is resistant to dust and most chemicals, such as H₂O₂ and alcohol-based cleaning agents.

Ease of use

GMP251 is a compact probe with easy and fast plug-in, plug-out installation. The surface of the probe is smooth, which makes it easy to clean. The probe provides several output options, including analog current and voltage outputs and digital RS-485 output with Modbus® protocol.

GMP251 can be connected to Indigo series transmitters for an extended range of output and configuration options. See www.vaisala.com/indigo.

For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight PC software. See www.vaisala.com/insight.

Applications

GMP251 is ideal for life science incubators, cold storages, fruit and vegetable transportation, and for all demanding applications where stable and accurate %-level CO₂ measurements are needed.

A flow-through adapter with gas ports is available as an accessory, enabling tubing for easy and flexible remote measurement with a separate pump. A multiplexer can also be added for sampling gas from several locations.¹⁾

1) Third-party pump and multiplexer not provided by Vaisala.

Technical data

Measurement performance

Measurement range	0 ... 20 %CO ₂
Accuracy ¹⁾	
At 5 %CO ₂	±0.1 %CO ₂
At 0 ... 8 %CO ₂	±0.2 %CO ₂
At 8 ... 20 %CO ₂	±0.4 %CO ₂
Calibration uncertainty	
At 5 %CO ₂	±0.07 %CO ₂
At 20 %CO ₂	±0.27 %CO ₂
Long-term stability	
At 0 ... 8 %CO ₂	±0.3 %CO ₂ /year
At 8 ... 12 %CO ₂	±0.5 %CO ₂ /year
at 12 ... 20 %CO ₂	±1.0 %CO ₂ /year
Temperature dependence	
With compensation at 5 %CO ₂ , 0 ... +50 °C (+32 ... +122 °F)	< ±0.05 %CO ₂
With compensation, 0 ... 20 %CO ₂ , -40 ... +60 °C (-40 ... +140 °F)	±0.045 % of reading/°C
without temperature compensation at 5 %CO ₂ (typical)	-0.25 % of reading/°C
Pressure dependence	
With compensation at 5 %CO ₂ 700 ... 1100 hPa	±0.05 %CO ₂
With compensation, 0 ... 20 %CO ₂ 500 ... 1200 hPa	±0.015 % of reading/hPa
Without compensation (typical)	+0.15 % of reading/hPa
Humidity dependence	
With compensation, 0 ... 20 %CO ₂ , 0 ... 100 %RH	±0.7 % of reading (at +25 °C (+77 °F))
Without compensation (typical)	+0.05 % of reading / %RH
O₂ dependence	
With compensation, 0 ... 20 %CO ₂ , 0 ... 90 %O ₂	±0.6 % of reading (at +25 °C (+77 °F))
Without compensation (typical)	-0.08 % of reading / %O ₂
Start-up, warm-up, and response time	
Start-up time at +25 °C (+77 °F)	< 10 s
Warm-up time for full spec.	< 4 min
Response time (T90):	
With standard filter	< 1 min
Flow-through option with > 0.1 l/min	< 1 min
With spray shield	< 2 min
Flow rate dependence (for flow-through option)	
Flow rate dependence:	
< 1 l/min flow	No effect
1 ... 10 l/min flow	< 0.6 % of reading/ l/min

¹⁾ At 25 °C (77 °F) and 1013 hPa (incl. repeatability and non-linearity).

Compliance

EU directives	EMC, RoHS
EMC compatibility	EN 61326-1, basic electromagnetic environment
Compliance marks	CE, RCM

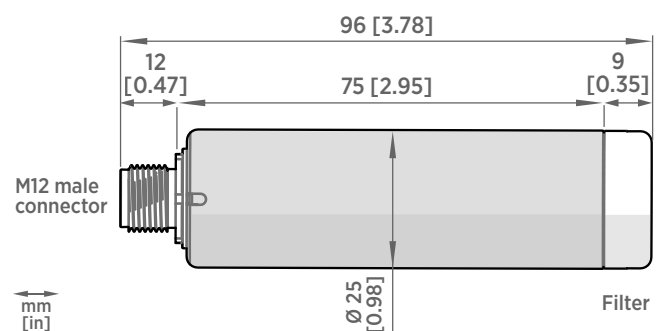
Operating environment

Operating temperature of CO ₂ measurement	-40 ... +60 °C (-40 ... +140 °F) ¹⁾
Storage temperature	-40 ... +70 °C (-40 ... +158 °F)
Humidity	0 ... 100 %RH, non-condensing
Condensation prevention	Sensor head heating, when power on
IP rating, probe body	IP65
Chemical tolerance (temporary exposure during cleaning)	- H₂O₂ (2000 ppm, non-condensing) - Alcohol-based cleaning agents (for example ethanol and IPA) - Acetone - Acetic acid
Pressure	
Compensated	500 ... 1100 hPa
Operating	< 1.5 bar
Gas flow (for flow-through option)	
Operating range	< 10 l/min
Recommended range	0.1 ... 0.8 l/min

¹⁾ Occasional short-term exposure to up to +90 °C (+194 °F) allowed, provided that the probe is fully installed inside the measured condition and power is switched on. Accuracy specification not applicable if used in temperatures above +60 °C (+140 °F).

Mechanical specifications

Weight, probe	45 g (1.59 oz)
Connector type	M12 5-pin male
Materials	
Probe housing	PBT polymer
Filter	PTFE membrane, PBT polymer grid
Connector	Nickel plated brass
Dimensions	
Probe diameter	25 mm (0.98 in)
Probe length	96 mm (3.78 in)



GMP251 dimensions

Inputs and outputs

Analog outputs

- 0 ... 5/10 V (scalable), min. load 10 k Ω
- 0/4 ... 20 mA (scalable), max. load 500 Ω

Digital output

- Over RS-485:
- Modbus
 - Vaisala Industrial Protocol

Operating voltage

With digital output in use 12 ... 30 VDC

With voltage output in use 12 ... 30 VDC

With current output in use 20 ... 30 VDC

Power consumption

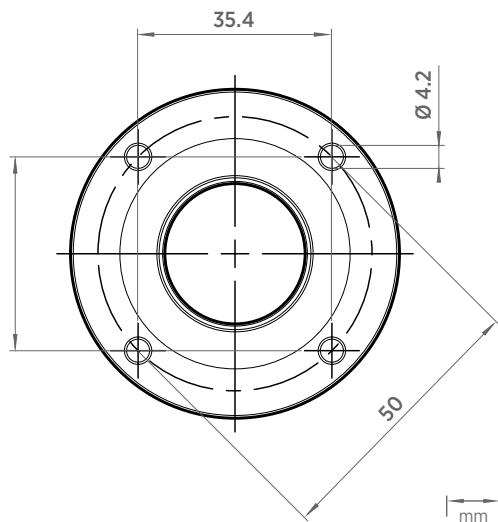
Typical (continuous operation) 0.4 W

Maximum 0.5 W

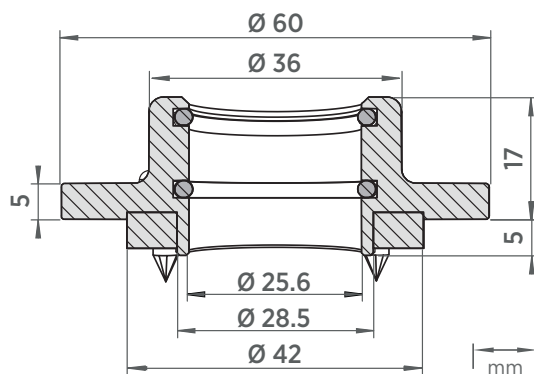
Spare parts and accessories

Standard membrane filter	ASM211650SP
Porous sintered PTFE filter	DRW243649SP
Probe cable with open wires (1.5 m)	223263SP
Probe cable with open wires (1.5 m), shielded	254294SP
Probe cable with open wires (3 m)	26719SP
Probe cable with open wires (10 m)	216546SP
Probe cable with open wires and 90° plug (0.6 m)	244669SP
Probe cable with open wires and 90° plug (1.5 m)	255102
Flow-through adapter with gas ports	ASM211697SP
Indigo USB adapter ¹⁾	USB2
MI70 connection cable for probe	CBL210472
Flat cable for GMP250 probes, M12 5-pin	CBL210493SP
Probe mounting clips (2 pcs)	243257SP
Probe mounting flange	243261SP
Calibration adapter	DRW244827SP
Spray shield	ASM212017SP

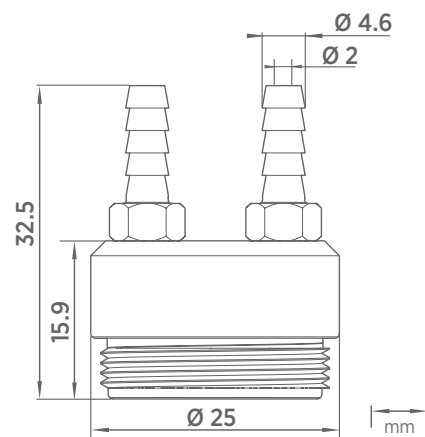
¹⁾ Vaisala Insight software for Windows available at www.vaisala.com/insight



Probe mounting flange dimensions



Probe mounting flange dimensions, cross section



Flow-through adapter with gas ports. Suitable for tubes with 4 mm inner diameter.



Features

- Measurement range 0 ... 10 000 ppm CO₂
- Intelligent, stand-alone probe with analog and digital outputs
- Compatible with Indigo transmitters and Insight PC software
- Wide operating temperature range, -40 ... +60 °C (-40 ... +140 °F)
- IP65-classified housing
- Integrated temperature measurement for CO₂ compensation purposes
- Compensations also for pressure, oxygen, and humidity
- Sensor head heated to prevent condensation

Vaisala CARBOCAP® Carbon Dioxide Probe GMP252 is a new intelligent probe for measuring carbon dioxide. This robust, standalone measurement device is designed for use in agriculture, refrigeration, greenhouses, and demanding HVAC applications.

Benefits

- Superior long-term stability
- Reliable and accurate
- Calibration certificate included

GMP252 is suitable for harsh and humid CO₂ measurement environments where stable and accurate ppm-level CO₂ measurements are needed. GMP252 is based on Vaisala's patented, latest-generation CARBOCAP technology that enables exceptional stability. A new type of infrared (IR) light source is used instead of the traditional incandescent light bulb, which extends the lifetime of GMP252.

GMP252 incorporates an internal temperature sensor for compensation of the CO₂ measurement according to ambient temperature. The effects of pressure and background gas can also be compensated for. The measurement

range is 0 ... 10 000 ppm CO₂ (measurements up to 30 000 ppm CO₂ are available with reduced accuracy). The operating temperature range of the probe is wide (-40 ... +60 °C (-40 ... +140 °F)), and the probe housing is classified as IP65. Condensation is prevented as the internal sensor head is heated.

GMP252 is resistant to dust and most chemicals, such as, H₂O₂ and alcohol-based cleaning agents.

Ease of use

GMP252 is a compact probe with easy and fast plug-in, plug-out installation. The surface of the probe is smooth, which makes it easy to clean. The probe provides several output options, including analog current and voltage outputs and digital RS-485 output with Modbus® protocol.

GMP252 can be connected to Indigo series transmitters for an extended selection of outputs and configuration options. See www.vaisala.com/indigo.

For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight PC software. See www.vaisala.com/insight.

Applications

GMP252 is ideal for agriculture, refrigeration, greenhouses, and demanding HVAC applications where stable and accurate ppm-level CO₂ measurements are needed.

A flow-through adapter with gas ports is available as an accessory, enabling tubing for easy and flexible remote measurement with a separate pump. A multiplexer can also be added for sampling gas from several locations. ¹⁾

¹⁾ Third-party pump and multiplexer not provided by Vaisala.

Technical data

Measurement performance

Measurement range	0 ... 10 000 ppm CO ₂ (up to 30 000 ppm CO ₂ with reduced accuracy)
Accuracy ¹⁾	
0 ... 3000 ppm CO ₂	±40 ppm CO ₂
3000 ... 10 000 ppm CO ₂	±2 % of reading
Up to 30 000 ppm CO ₂	±3.5 % of reading
Calibration uncertainty	
at 2000 ppm CO ₂	±31 ppm CO ₂
at 10 000 ppm CO ₂	±105 ppm CO ₂
Long-term stability	
0 ... 3000 ppm CO ₂	±60 ppm CO ₂ /year
3000 ... 6000 ppm CO ₂	±150 ppm CO ₂ /year
6000 ... 10 000 ppm CO ₂	±300 ppm CO ₂ /year
Temperature dependence 0 ... 10 000 ppm CO₂	
With compensation, -10 ... +50 °C	±0.05 % of reading/°C
With compensation, -40 ... +60 °C	< ±0.1 % of reading/°C
Without temperature compensation at 2000 ppm CO ₂ (typical)	-0.5 % of reading/°C
Pressure dependence	
With compensation at 0 ... 10 000 ppm CO ₂ , 500 ... 1100 hPa	±0.015 % of reading/hPa
Without compensation (typical)	+0.15 % of reading/hPa
Humidity dependence	
With compensation, 0 ... 10 000 ppm CO ₂ , 0 ... 100 %RH	±0.7 % of reading (at +25 °C (+77 °F))
Without compensation (typical)	+0.05 % of reading/%RH
O₂ dependence	
With compensation, 0 ... 10 000 ppm %CO ₂ , 0 ... 90 %O ₂	±0.6 % of reading (at +25 °C (+77 °F))
Without compensation (typical)	-0.08 % of reading/%O ₂
Start-up, warm-up, and response time	
Start-up time at +25 °C	< 12 s
Warm-up time for full spec.	< 2 min
Response time (T90):	
With standard filter	< 1 min
Flow-through option with > 0.1 l/min	30 s
With spray shield	< 3 min
Flow rate dependence (for flow-through option)	
< 1 l/min flow	no effect
1 ... 10 l/min flow	< 0.6 % of reading l/min

¹⁾ At 25 °C and 1013 hPa (incl. repeatability and non-linearity).

Inputs and outputs

Analog outputs	0 ... 5/10 V (scalable), min. load 10 kΩ 0/4 ... 20 mA (scalable), max. load 500 Ω
Digital output	Over RS-485: - Modbus - Vaisala Industrial Protocol

Operating voltage

With digital output in use	12 ... 30 V DC
With voltage output in use	12 ... 30 V DC
With current output in use	20 ... 30 V DC

Power consumption

Typical (continuous operation)	0.4 W
Maximum	0.5 W

Operating environment

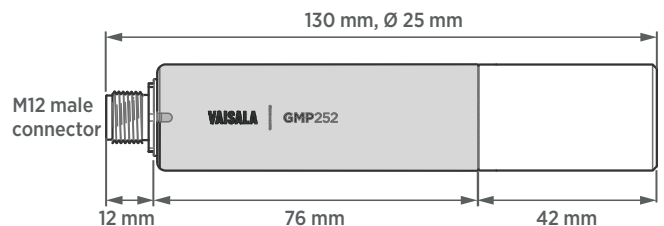
Operating temperature of CO ₂ measurement	-40 ... +60 °C (-40 ... +140 °F)
Storage temperature	-40 ... +70 °C (-40 ... +158 °F)
Humidity	0 ... 100 %RH, non-condensing
Condensation prevention	Sensor head heating when power on
IP rating, probe body	IP65
Chemical tolerance (temporary exposure during cleaning)	- H₂O₂ (2000 ppm, non-condensing) - Alcohol-based cleaning agents (for example ethanol and IPA) - Acetone - Acetic acid
Pressure	
Compensated	500 ... 1100 hPa
Operating	< 1.5 bar
Gas flow (for flow-through option)	
Operating range	< 10 l/min
Recommended range	0.1 ... 0.8 l/min

Compliance

EU directives	EMC, RoHS
EMC compatibility	EN 61326-1, basic electromagnetic environment
Compliance marks	CE, RCM

Mechanical specifications

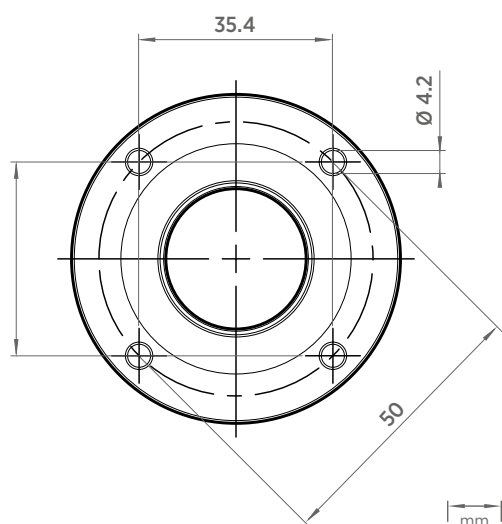
Weight, probe	58 g (2.05 oz)
Connector type	M12 5-pin male
Materials	
Probe housing	PBT polymer
Filter	PTFE
Connector	Nickel plated brass
Dimensions	
Probe diameter	25 mm (0.98 in)
Probe length	130 mm (5.12 in)



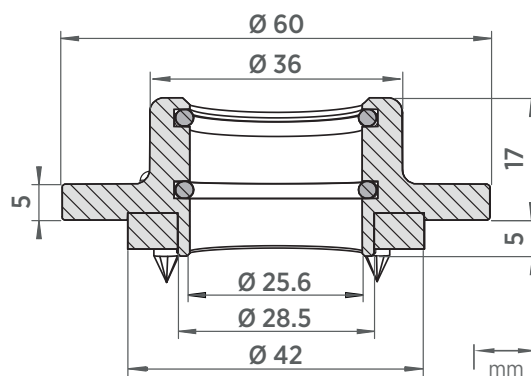
Spare parts and accessories

Porous sintered PTFE filter for GMP252	DRW244221SP
Probe cable with open wires (1.5 m)	223263SP
Probe cable with open wires (1.5 m), shielded	254294SP
Probe cable with open wires (3 m)	26719SP
Probe cable with open wires (10 m)	216546SP
Probe cable with open wires and 90° plug (0.6 m)	244669SP
Probe cable with open wires and 90° plug (1.5 m)	255102
Flow-through adapter with gas ports	ASM212011SP
Indigo USB adapter ¹⁾	USB2
M170 connection cable for probe	CBL210472
Flat cable for GMP250 probes, M12 5-pin	CBL210493SP
Probe mounting clips (2 pcs)	243257SP
Probe mounting flange	243261SP
Calibration adapter	DRW244827SP
Spray shield	ASM212017SP
Radiation shield DTR250	DTR250
Radiation shield DTR250 with pole mounting kit	DTR250A

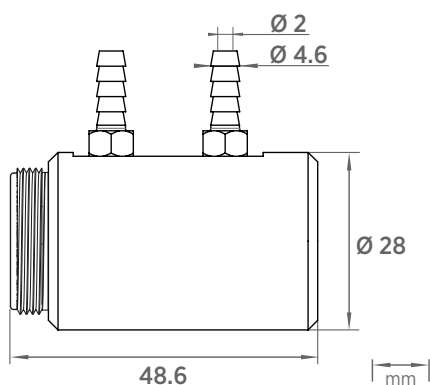
¹⁾ Vaisala Insight software for Windows is available at www.vaisala.com/insight.



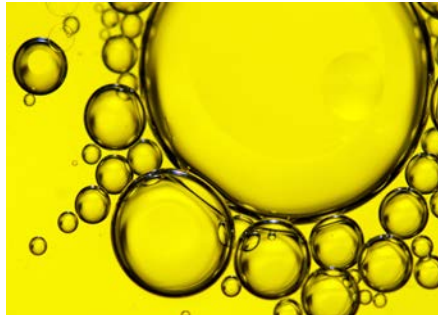
Dimensions of probe mounting flange (243261SP)



Probe mounting flange cross section



Flow-through adapter with gas ports (ASM212011SP). Suitable for tubes with 4 mm inner diameter.



HUMICAP in brief

- A capacitive thin-film polymer sensor
- Water activity (a_w) measurement within range 0 ... 1
- Measurement accuracy up to $\pm 0.01 a_w$ (1 %RS)
- Over 20 years of experience in measuring moisture in oil

Vaisala uses HUMICAP sensor technology for measuring moisture in oil. The HUMICAP sensors are the first ever sensors that can measure moisture in oil online. The sensor materials are specifically developed to measure even very low moisture levels in oils, whether mineral, vegetable or synthetic.

Water is a common contaminant in industrial oils. Water contamination deteriorates the performance of the oil, be it used for lubrication, cooling, insulation or other purposes. High moisture content increases the risk of corrosion, overheating, machine malfunction and other problems and can ultimately lead to costly failure and unscheduled downtime. Monitoring the oil for moisture is a simple way of improving the reliability of industrial machinery and equipment. With time, substantial savings in maintenance costs can be achieved.

Free water formation - the critical point

Water can dissolve in oil. When the water content of the oil increases, it eventually reaches the saturation point of the oil. Once the fluid has reached its saturation point, any additional water introduced will separate out as free water by forming a distinct layer. Alternatively, the

oil can form dispersion with water, which turns the oil cloudy. Since most oils are less dense than water, the water layer will usually settle below the oil with time. Free water formation is critical in terms of problems related to water in oil. When water is no longer dissolved in the oil, corrosion and wearing of equipment increase rapidly. Therefore it is important to keep the moisture content safely below the saturation point.

The ability of oil to hold dissolved water depends on the type and age of the oil as well as its additives. Two major factors have an effect on the saturation point as the oil ages: temperature fluctuations and changes in the chemical make-up due to the formation of new substances as by-products of the chemical reactions.

Water activity (a_w) - a direct measure of oil quality

The conventional measure for water content in oil is ppm (parts per million), which describes the absolute amount of water in the oil. Ppm measurement has, however, a major limitation. It does not account for any variations in the oil's

saturation point. In other words, ppm measurement provides no indication of how close the moisture level is to the saturation point in a dynamic system with fluctuating saturation point. By measuring water activity instead of ppm, the risk of actually exceeding the saturation point can be avoided.

Water activity measurement indicates directly whether there is a risk of free water formation. With a relative scale from 0 (no water present) to 1 (the oil is saturated with water) it gives a reliable indication of how close the saturation point of water is.

Unique benefits of HUMICAP in oil moisture measurements

- Fast. Online, real-time detection of moisture in oil without sampling.
- Reliable. Tells the true margin to water saturation point in all changing conditions, taking into account e.g. temperature changes and aging of oil.
- Highly stable. Excellent pressure and temperature tolerance.
- Easy to install through ball valve – no need to shut down the process.
- Enables predictive maintenance work. Trends can be quickly identified.

In contrast to traditional measurement techniques, water activity measurement is independent of oil type. Regardless of the saturation point of the fluid, water activity measurement always provides a true indication for the risk of free water formation, even when the saturation point is increasing or decreasing. In its simplicity, water activity value is understandable at a glance. Trends can be quickly identified.

Vaisala HUMICAP for measuring water activity

The Vaisala transmitters used for measuring moisture in oil feature the HUMICAP sensor, a capacitive thin-film polymer sensor especially developed for demanding moisture measurements in liquid hydrocarbons.

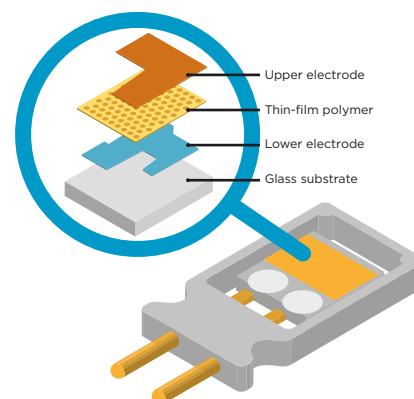
The HUMICAP sensor consists of four functional layers: glass substrate, lower electrode, water-active polymer layer, and porous upper electrode. The thin-film polymer either absorbs or releases water as the surrounding moisture level changes. Water molecules move to/from the polymer layer until there is moisture equilibrium between the polymer and the oil. The dielectric properties of the polymer depend on the moisture level. As the moisture level changes, the dielectric properties of the polymer film change, and so does the capacitance of the sensor. The instrument's electronics measure the capacitance of the sensor and convert it into water activity. Oil molecules or additives do not penetrate the electrode. Thus the sensor output is independent of the oil type.

On-line measurement

On-line water activity measurement ensures reliable performance of equipment at all times. Time-consuming sampling and laboratory analysis are no longer needed. This not only reduces the risk of human induced error but also provides cost savings in equipment and chemicals.

Typical applications for moisture in oil measurement

Moisture is an important factor determining the condition of both lubricating and transformer oils. With on-line information on the quality of the oil, preventive actions can be taken and the maintenance costs cut substantially.



Structure of the HUMICAP sensor



Features

- Continuous online measurement of moisture in oil and temperature
- Temperature measurement range $-40 \dots +180 \text{ }^{\circ}\text{C}$ ($-40 \dots +356 \text{ }^{\circ}\text{F}$)
- Measurement accuracy up to $\pm 0.01 a_w$ ($\pm 1 \% \text{RS}$)
- Incorporates the proven Vaisala HUMICAP[®] sensor, used for over 20 years in oil applications
- Modbus[®] RTU over RS-485
- Traceable calibration certificate: 6 points for humidity, 1 point for temperature
- Compatible with Indigo series transmitters and Insight PC software

Vaisala HUMICAP[®] Moisture in Oil Probe MMP8 enables fast and reliable measurement of moisture in oil. It uses the proven Vaisala HUMICAP[®] sensor, which was developed for demanding dissolved moisture measurements in transformer and lubrication oils, hydraulic fluids, and other liquids.

Reliable Vaisala HUMICAP[®] technology

MMP8 incorporates the latest-generation Vaisala HUMICAP[®] 180L2 sensor, which is the result of over 20 years of field experience. It was developed for demanding moisture measurement in transformer and lubrication oils and other liquids.

The sensor's excellent chemical tolerance provides accurate and reliable measurement over a wide measurement range. The HUMICAP[®] 180L2 sensor has excellent sensitivity in the dry end of the range, which is typically needed in transformer applications.

Measure the margin to water saturation

MMP8 measures dissolved moisture in oil in terms of the water activity (a_w), relative saturation (%RS), and temperature (T). Water activity or

relative saturation indicate directly whether there is a risk of free water formation. This data is relevant in lubrication oil applications where detecting water ingress and preventing free water formation is crucial. The measurement is independent of oil type and age.

MMP8 can also output ppm, the average mass concentration of water in oil. Vaisala has this conversion readily available for specific oils, including mineral transformer oil. This allows continuous measurement of ppm concentration in power transformer condition monitoring.

For other oils, the oil-specific conversion coefficients can be calculated if the water solubility of the oil is known and the solubility characteristic remains constant.

Easy installation

When installed with the ball valve kit, the MMP8 is ideal for installation into processes where the probe needs to be installed or removed while the process is running. Probe installation depth is adjustable. Pressure fitting options are ISO 1/2" and NPT 1/2". MMP8 is delivered with a manual pressing handle that allows the probe to be pushed against process pressure.



DNV GL type approval certificate no. TAA00002YT

Technical data

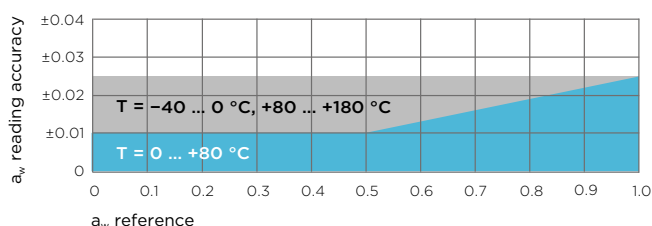
Measurement performance

Water activity

Measurement range	0 ... 1 a _w
T ₉₀ response time ¹⁾	10 min
Sensor	HUMICAP® 180L2
Accuracy ²⁾	±0.01 a _w (±1 %RS)
Temperature	
Measurement range	-40 ... +180 °C (-40 ... +356 °F)
Accuracy at +20 °C (+68 °F)	±0.2 °C (0.36 °F)

¹⁾ At +20 °C (+68 °F) in still oil.

²⁾ In range 0 ... 0.5 a_w including non-linearity, hysteresis, and repeatability. See accuracy graph below.



MMP8 A_w measurement accuracy

Operating environment

Operating temperature of probe head	-40 ... +180 °C (-40 ... +356 °F)
Operating temperature of probe body	-40 ... +80 °C (-40 ... +176 °F)
Storage temperature range	-40 ... +80 °C (-40 ... +176 °F)
Operating pressure range	0 ... 40 bar (0 ... 580 psia)
Installation pressure	Up to 10 bar (145 psia)
IP rating of probe body	IP66
Ball valve	
Operating temperature	Up to +120 °C (+248 °F)
Operating pressure	Up to 40 bar (0 ... 580 psia)

Inputs and outputs

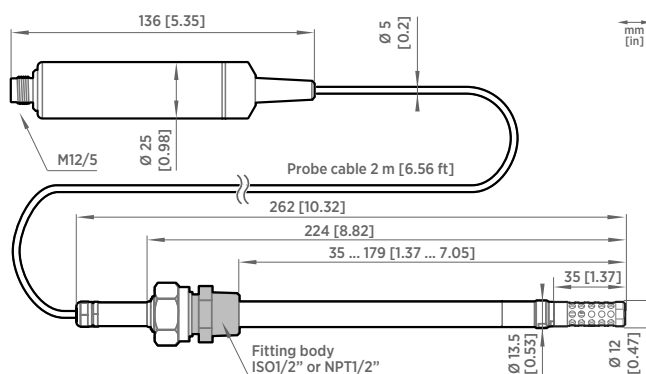
Operating voltage	15 ... 30 V DC
Current consumption	10 mA typical
Digital output	RS-485, non-isolated
Protocols	Modbus RTU
Output parameters	Relative saturation (%RS) Temperature (°C) Water activity Water mass fraction (ppm _w)

Compliance

EU directives	EMC Directive (2014/30/EU)
	RoHS Directive (2011/65/EU) amended by 2015/863
EMC compatibility	EN 61326-1, industrial environment
Type approvals	DNV GL certificate no. TAA00002YT
Compliance marks	CE, China RoHS, RCM

Mechanical specifications

Connector	M12 5-pin A-coded male
Weight	510 g (18.0 oz)
Filter options	Stainless steel grid standard filter Stainless steel grid filter for high flow rates (> 1 m/s)
Probe cable length	2 m (6.56 ft)
Adjustable installation depth	35 ... 179 mm (1.37 ... 7.05 in)
Materials	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP



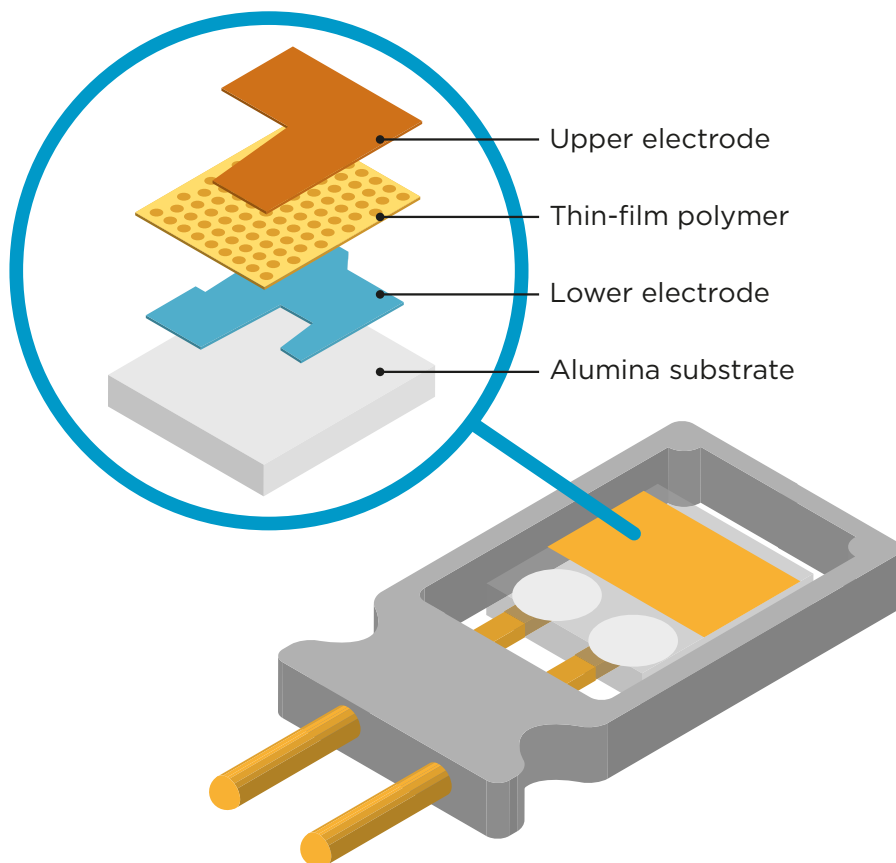
MMP8 dimensions

Accessories

Ball valve ISO 1/2" with welding joint	BALLVALVE-1
Ball valve ISO 1/2" - ISO 3/4" with thread joint	BALLVALVE-2
Indigo USB adapter ¹⁾	USB2

¹⁾ Vaisala Insight software for Windows available at www.vaisala.com/insight.

PEROXCAP® sensor for measuring vaporized hydrogen peroxide, relative saturation and relative humidity



PEROXCAP's unique benefits

- Repeatable measurement
- Excellent long-term stability
- In addition to H_2O_2 ppm measurement, the sensor also measures humidity and temperature when combined with an additional temperature sensor
- Unique Relative Saturation parameter indicates the combined humidity of both H_2O_2 vapor and water vapor
- Tolerates high humidity and measures accurately even in 100% relative saturation
- Accurate measurement with a traceable H_2O_2 factory calibration
- Long product lifetime and annual calibration interval
- Optional on-site calibration

Unique capacitive thin-film polymer sensor for repeatable measurement

PEROXCAP sensor technology works using measurements from two HUMICAP® sensors. Vaisala HUMICAP sensors guarantee quality and reliability, with their reputation for repeatability, accuracy, excellent long-term stability, and negligible hysteresis, even in the most demanding high-concentration H_2O_2 applications in atmospheric pressure.

HUMICAP is a thin-film polymer sensor consisting of an Alumina substrate on which a thin polymer film is sandwiched between two electrodes. The polymer film absorbs or

releases vapor according to humidity changes in the environment. As the humidity changes, the dielectric properties of the polymer film change, and so does the capacitance of the sensor. The instrument's electronics measure the capacitance of the sensor and convert it into a humidity reading.

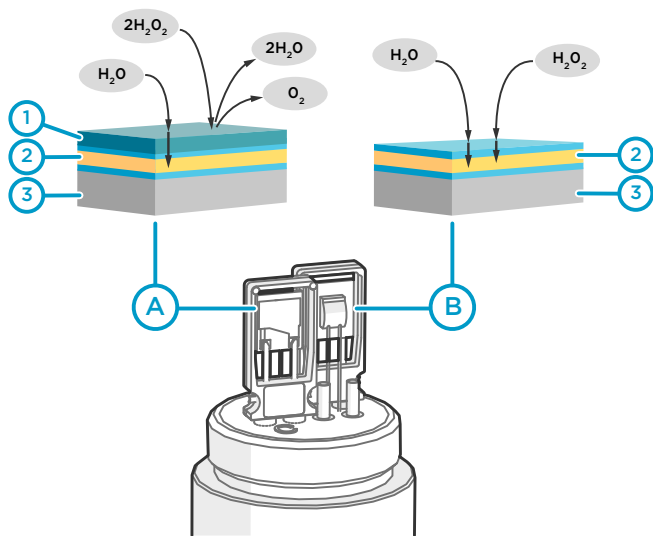
The upper electrode is made of corrosion resistant conductive material and functions as one of the two electrodes in the capacitor. It protects the active material of the sensor from dust, dirt and conductive particles.

The thin film polymer is sandwiched between the two electrodes. This conductive layer absorbs water and H_2O_2 vapor. The advanced upper electrode is one of the secrets behind a cutting-edge humidity sensor. The amount of vapor absorbed is proportional to the ambient relative humidity (sensor with catalytic layer) or relative saturation.

The thin film polymer layer amplifies the amount of water and H_2O_2 in the air. We synthesize our own polymers in order to optimize sensor performance.

The lower electrode is made of corrosion resistant conductive material and functions as one of the two electrodes in the capacitor.

Operating principle of PEROXCAP measurement



- A** HUMICAP sensor with a catalytic layer (under the probe filter). This sensor only senses water vapor.
- B** HUMICAP sensor without a catalytic layer (under the probe filter). This sensor senses the air mixture with both hydrogen peroxide vapor and water vapor.
- 1** Catalytic protection layer over the thin-film polymer. This layer catalyzes hydrogen peroxide into water and oxygen and prevents it from entering the sensing polymer.
- 2** Thin-film polymer between two electrodes.
- 3** Alumina substrate.

Intelligent PEROXCAP measurement technology

PEROXCAP measurement uses two HUMICAP sensors: one HUMICAP sensor with a catalytic layer and the other one without the catalytic layer. The catalytic layer catalyzes hydrogen peroxide from the vapor mixture. Therefore, the HUMICAP sensor with the catalytic layer only senses water vapor, providing a measurement of partial water pressure, i.e. relative humidity (RH). The other HUMICAP sensor without the catalytic layer senses the air mixture with both hydrogen peroxide vapor and water vapor. The difference between the readings from these two sensors indicates the vapor concentration of H_2O_2 .

Repeatable measurement even in high humidity

The PEROXCAP sensor is warmed using a chemical purge function. This purging process involves rapid heating of the sensor to remove possible impurities and condensation. This allows the sensor to provide reliable measurement, even in environments where the humidity is near saturation because the heating prevents condensation on the sensor.

PEROXCAP's intelligent measurement technology, including the chemical purge function, helps maintain measurement accuracy between calibration intervals in challenging environments. The unique PEROXCAP technology was developed to provide stable and repeatable measurements.

Multi-parameter measurement

Combining the PEROXCAP sensor with an additional temperature sensor allows up to three measurement parameters: hydrogen peroxide vapor concentration, temperature, and humidity, referring to both relative humidity and relative saturation.

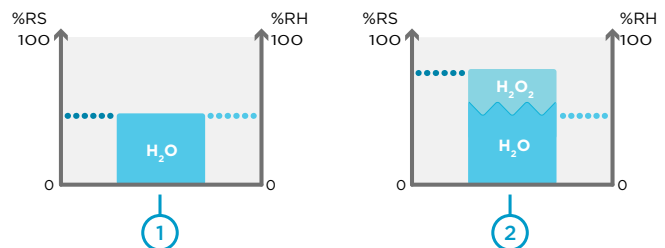
Water and hydrogen peroxide have a very similar molecular structure; both affect the humidity of the air in which they are present

- Relative saturation indicates the humidity of the air caused by both H_2O_2 vapor and water vapor. When relative saturation reaches 100 %RS, the vapor mixture starts to condense.
- Relative humidity is a parameter that indicates the humidity of the air caused only by water vapor.

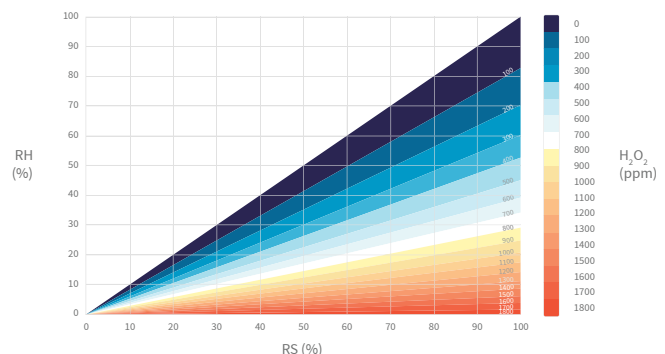
Traceable H_2O_2 factory calibration

Every PEROXCAP sensor is manufactured in Vaisala's own cleanroom and individually calibrated at the Vaisala factory. Both H_2O_2 and RH calibrations are traceable to international SI units, which ensures that the measured values represent the real environment.

The effect of H_2O and H_2O_2 on relative saturation (RS) and relative humidity (RH)



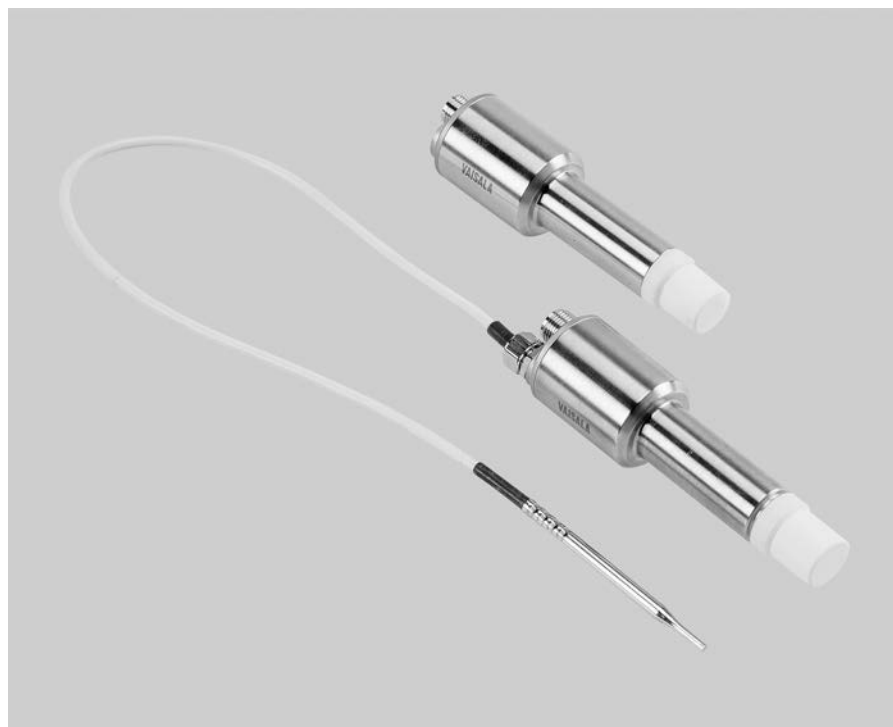
- 1** Space without H_2O_2 vapor. When H_2O_2 vapor is not present, relative saturation equals relative humidity.
- 2** Same space with H_2O_2 vapor introduced. Relative saturation is higher than relative humidity.



For example, at 20 °C and 500 ppm hydrogen peroxide, the humidity level 25 %RH is equivalent to 60 %RS. When this gas mixture starts to condense (relative saturation being 100 %), relative humidity is 45 %.

HPP270 Series Probes

For hydrogen peroxide, humidity, and temperature measurement



Features

- Basic probe option HPP271 for H_2O_2 vapor concentration measurement
- Advanced probe option HPP272: compact 3-in-1 probe with real-time measurement of H_2O_2 vapor concentration, humidity, and temperature
- Superior long-term stability and repeatability with proprietary PEROXCAP® technology
- Corrosion-resistant stainless steel housing (IP65)
- Traceable calibration certificate
- Standalone probe with digital Modbus RTU over RS-485 or 2 analog outputs
- Compatible with Vaisala Insight PC software and Indigo transmitters

The Vaisala PEROXCAP® Hydrogen Peroxide, Humidity, and Temperature Probes HPP271 and HPP272 are designed for demanding hydrogen peroxide bio-decontamination where repeatable, stable, and accurate measurement is essential. The HPP270 series probes are suitable for a variety of applications such as isolator, material transfer hatch, and room bio-decontamination.

Up to three measurements in one compact unit

The advanced HPP272 probe option provides all the parameters you need to measure during bio-decontamination processes: hydrogen peroxide vapor, temperature, and humidity as relative saturation and relative humidity.

Repeatable measurement for highly condensing environments

Intelligent measurement technology including the chemical purge function helps to maintain accuracy between calibrations in challenging H_2O_2 environments. The purging process involves rapid heating of the sensor to remove possible contamination.

The PEROXCAP® sensor used in the HPP270 series probes is warmed, which prevents condensation from forming on the sensor. This provides reliable measurement even in condensing conditions.

Relative saturation for comprehensive humidity monitoring

Similar to water, H_2O_2 vapor affects the humidity level of decontaminated air. The advanced HPP272 probe option enables the measurement of relative saturation, which indicates the total humidity level caused by water vapor and H_2O_2 vapor together. This tells you reliably when the bio-decontaminated air starts to condense.

Indigo and Insight compatible

Vaisala Indigo transmitters provide additional features such as analog and digital outputs, relays, and a smartphone configuration interface. For easy-to-use access to configuration, calibration, and adjustment, the probe can be connected to Vaisala Insight PC software. See www.vaisala.com/indigo and www.vaisala.com/insight.

Traceable calibration at Vaisala

Every probe and sensor is manufactured and individually calibrated at Vaisala world-class facilities.

Available traceable calibration certificates: 2 points for H_2O_2 , 3 points for humidity, 1 point for temperature.

HPP271 technical data

Measurement performance

Hydrogen peroxide

Sensor	PEROXCAP®
Measurement range	0 ... 2000 ppm
Measurement temperature range	+5 ... +50 °C (+41 ... +122 °F)
Repeatability at +25 °C (+77 °F) up to 500 ppm H ₂ O ₂	±10 ppm
Accuracy at +10 ... +25 °C (+50 ... +77 °F), 10 ... 2000 ppm H ₂ O ₂ ¹⁾	±10 ppm or 5 % of reading (whichever is greater)
Factory calibration uncertainty at +25 °C (+77 °F), 500 ppm H ₂ O ₂ ²⁾	±10 ppm
Response time (T ₆₃)	70 s

Other parameters

H₂O ppm by volume

¹⁾ Including non-linearity, hysteresis, and repeatability.

²⁾ Defined as ±2 standard deviation limits. See also calibration certificate.

Inputs and outputs

Operating voltage	Digital output: 15 ... 30 VDC Analog output: 15 ... 25 VDC
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Current consumption at +25 °C (+77 °F)

In digital mode	Max. 10 mA
In analog mode	Max. 50 mA
During purge	Max. 250 mA

Digital output

Interface	RS-485, not isolated; do not use termination on the RS-485 line
Communication protocol	Modbus RTU v1.02

Analog output

Outputs	2 × 4 ... 20 mA 3-wire current outputs
Max. load	500 Ω
Accuracy (typical)	±0.1 % of full scale
Analog output temperature dependence	0.005 %/°C (0.003 %/°F) full scale

Operating environment

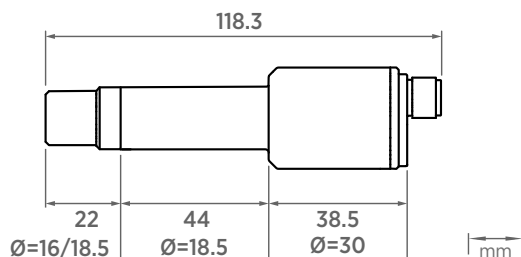
Operating temperature	+0 ... +70 °C (+32 ... +158 °F)
Storage temperature	−20 ... +70 °C (−4 ... +158 °F)
Ambient pressure	Normal atmospheric pressure
IP rating	IP65

Compliance

EU directives	EMC, RoHS
EMC compatibility	EN 61326-1, industrial environment
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, China RoHS, RCM

Mechanical specifications

Connector	M12/5 male
Materials	
Probe body	AISI316L stainless steel
Filter cap	Porous PTFE



HPP271 dimensions

Spare parts and accessories

Indigo USB adapter ¹⁾	USB2
Probe cable with open wires, 1.5 m (4.9 ft)	254294SP
Probe cable with open wires, 3 m (9.8 ft)	254295SP
Probe cable with open wires, 5 m (16 ft)	254296SP
Probe cable with open wires, 10 m (33 ft)	254297SP
Flat cable, M12-5F - M12-5M, 1 m (3.3 ft)	CBL210493SP
Filter	DRW246363SP
Gland set for through-wall installation, HPP271	HPP271MOUNTINGSET1
Flange for through-wall installation, HPP271	HPP271MOUNTINGSET2
Wall mount for HPP271 and HPP272	HPP272WALLMOUNT

Transmitters

Indigo transmitters	See www.vaisala.com/indigo
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¹⁾ Vaisala Insight software for Windows available at www.vaisala.com/insight.

HPP272 technical data

Measurement performance

Hydrogen peroxide

Sensor	PEROXCAP®
Measurement range	0 ... 2000 ppm
Measurement temperature range	+5 ... +50 °C (+41 ... +122 °F)
Repeatability at +25 °C (+77 °F) up to 500 ppm H ₂ O ₂	±10 ppm
Accuracy at +10 ... +25 °C (+50 ... +77 °F), 10 ... 2000 ppm H ₂ O ₂ ¹⁾	±10 ppm or 5 % of reading (whichever is greater)
Factory calibration uncertainty at +25 °C (+77 °F), 500 ppm H ₂ O ₂ ²⁾	±10 ppm
Response time (T ₆₃)	70 s

Relative saturation

Measurement range	0 ... 100 %RS
Measurement temperature range	+5 ... +50 °C (+41 ... +122 °F)
Repeatability at +25 °C (+77 °F), 500 ppm H ₂ O ₂	±0.5 %RS
Accuracy at +25 °C (+77 °F) ¹⁾	±4 %RS
Factory calibration uncertainty at +25 °C (+77 °F), 500 ppm H ₂ O ₂ ²⁾	±2 %RS

Relative humidity

Measurement range	0 ... 100 %RH
Measurement temperature range	+5 ... +70 °C (+41 ... +158 °F)
Accuracy: ¹⁾	
at +25 °C (77 °F), 0 ppm H ₂ O ₂ , 0 ... 90 %RH	±1 %RH
over full temperature measurement and H ₂ O ₂ range	±2 %RH
Response time (T ₆₃)	20 s
Factory calibration uncertainty at +25 °C (77 °F), 0 ppm H ₂ O ₂ , 0 ... 95 %RH ²⁾	±1 %RH

Temperature

Sensor	Pt1000 RTD Class F0.1
Accuracy over temperature range	±0.2 °C (±0.36 °F)

Other parameters

Absolute H₂O₂ and H₂O, H₂O ppm by volume, water vapor saturation pressure (H₂O and H₂O+H₂O₂), dew point temperature, vapor pressure (H₂O and H₂O₂)

¹⁾ Including non-linearity, hysteresis, and repeatability.

²⁾ Defined as ±2 standard deviation limits. See also calibration certificate.

Inputs and outputs

Operating voltage	Digital output: 15 ... 30 VDC Analog output: 15 ... 25 VDC
-------------------	---

Current consumption at +25 °C (+77 °F)

In digital mode	Max. 10 mA
In analog mode	Max. 50 mA
During purge	Max. 250 mA

Digital output

Interface	RS-485, not isolated; do not use termination on the RS-485 line
Communication protocol	Modbus RTU v1.02

Analog output

Outputs	2 × 4 ... 20 mA 3-wire current outputs
Max. load	500 Ω
Accuracy (typical)	±0.1 % of full scale
Analog output temperature dependence	0.005 %/°C (0.003 %/°F) full scale

Operating environment

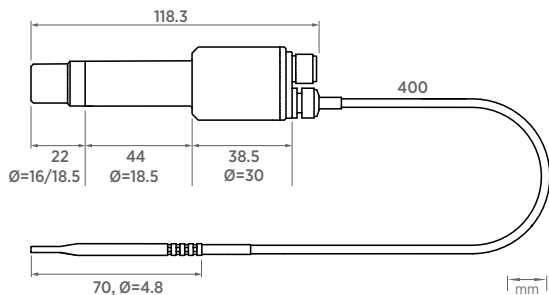
Operating temperature	+0 ... +70 °C (+32 ... +158 °F)
Storage temperature	-20 ... +70 °C (-4 ... +158 °F)
Ambient pressure	Normal atmospheric pressure
IP rating	IP65

Compliance

EU directives	EMC, RoHS
EMC compatibility	EN 61326-1, industrial environment
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, China RoHS, RCM

Mechanical specifications

Connector	M12/5 male
Materials	
Probe body	AISI316L stainless steel
Filter cap	Porous PTFE
Temperature probe	AISI316L stainless steel
Temperature probe cable	PTFE



HPP272 dimensions

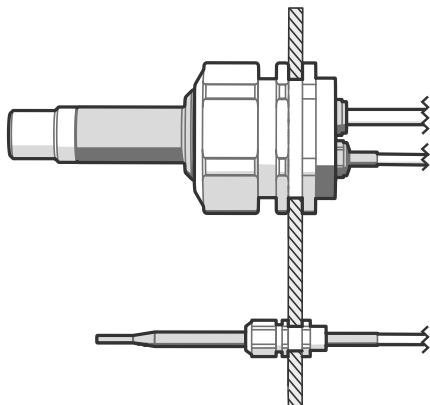
Spare parts and accessories

Indigo USB adapter ¹⁾	USB2
Probe cable with open wires, 1.5 m (4.9 ft)	254294SP
Probe cable with open wires, 3 m (9.8 ft)	254295SP
Probe cable with open wires, 5 m (16 ft)	254296SP
Probe cable with open wires, 10 m (33 ft)	254297SP
Flat cable, M12-5F - M12-5M, 1 m (3.3 ft)	CBL210493SP
Filter	DRW246363SP
Gland set for through-wall installation, HPP272	HPP272MOUNTINGSET1
Flange for through-wall installation, HPP272	HPP272MOUNTINGSET2
Wall mount for HPP271 and HPP272	HPP272WALLMOUNT
Indigo transmitters	See www.vaisala.com/indigo

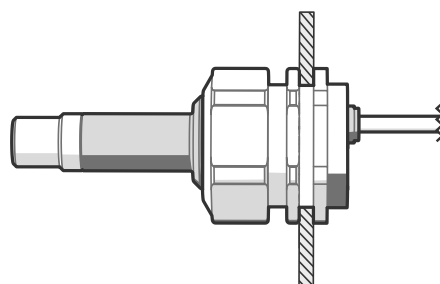
¹⁾ Vaisala Insight software for Windows available at www.vaisala.com/insight.

HPP271 and HPP272 installation accessories

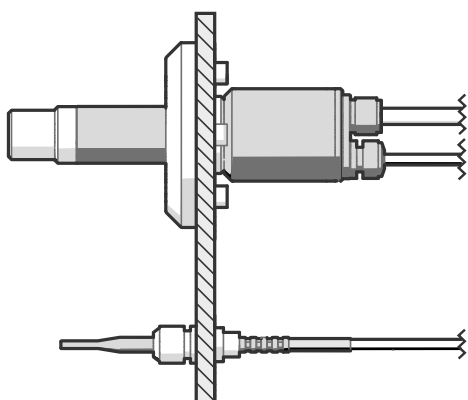
HPP272MOUNTINGSET1



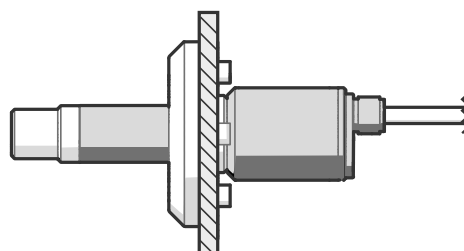
HPP271MOUNTINGSET1



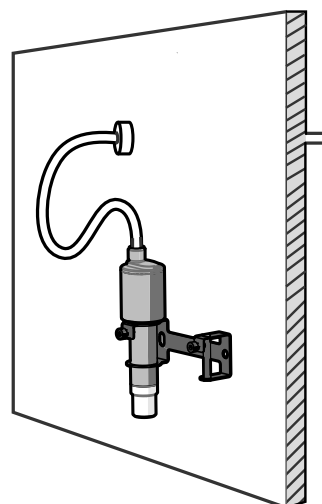
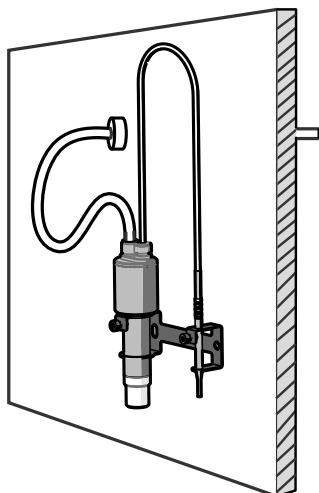
HPP272MOUNTINGSET2



HPP271MOUNTINGSET2



HPP272WALLMOUNT





Features

- Easy access to configuration settings and measurement data of supported devices
- Simple setup, diagnostics, and field calibration and adjustment
- Supports Indigo compatible smart probes and a selection of other Vaisala devices
- Connect up to 6 devices simultaneously

Calibration is needed for verifying and maintaining measurement accuracy over time and ensuring the quality and reliability of the measurement. Vaisala Insight PC software gives quick access to the configuration and calibration of Indigo compatible smart probes and other supported devices.

Indigo product family

Vaisala Indigo compatible smart probes are self-contained, interchangeable measurement probes. The probes can be used as standalone digital Modbus® RTU devices, or together with Indigo series transmitters that provide flexibility in terms of system interface: display, service interface, and powering options. The Indigo product family provides various ways to interact with the device. The probe settings and calibration can be done through the Indigo transmitter, using a Wi-Fi connection or local display, or the probes can be detached from the process and connected to a PC with a USB cable for setup and field calibration using Insight PC software.

High-quality field calibration

Field calibration is a quick way to check and validate the measurement. The simplest form of field calibration is comparison with a portable instrument.

However, when more accuracy is needed or more than one point has to be calibrated, the calibration should be made using a calibrator in the controlled environment of a laboratory or a workshop.

When a high-quality calibration in a controlled environment is needed, just detach the probe from the process, bring it to the laboratory, connect to the USB cable, and launch the Insight PC software. Up to 6 devices can be connected to Insight simultaneously. The software automatically detects the connected devices and makes calibrating easy with an intuitive graphical user interface.

Diagnostics and more

Vaisala Insight PC software provides access to diagnostics data and device specific advanced features, such as event logs, parameter backup copy, and electronic copy of the calibration

certificate. It also allows easy testing and evaluation – the 48-hour data logging functionality allows recording data from up to 6 devices simultaneously, with easy export to Excel readable format.

Technical requirements

Vaisala Insight PC software is available in English and Japanese, and it operates on 64-bit Windows 7, Windows 8.1 and Windows 10 operating systems. One product specific USB cable (type A connector) per connected probe is needed.

Vaisala Insight software is available for download at www.vaisala.com/insight.

Devices supported by Insight software

Indigo compatible smart probes

Measurement type	Probe models
Humidity and temperature	HMP1, HMP3, HMP4, HMP5, HMP7, HMP8, HMP9
Temperature	TMP1
Dew point	DMP5, DMP6, DMP7, DMP8
CO ₂	GMP251, GMP252
Vaporized hydrogen peroxide	HPP271, HPP272
Moisture in oil	MMP8

Other supported devices

Device or series	Models
DMT143 Miniature Dew Point Transmitters	DMT143, DMT143L
HMD60 Series Humidity and Temperature Transmitters	HMD62, HMD65, TMD62
HMDW110 Series Humidity and Temperature Transmitters	HMW110, HMDW112, HMD110, HMD112, HMS110, HMS112
HMM170 Humidity Measurement Module	HMM170
HMP110 Series Humidity and Temperature Probes	HMP110, HMP110T, HMP113, HMP115, HMP115T, TMP115
HMP60 Series Humidity and Temperature Probes	HMP60, HMP63
MGP260 Series Multigas Probes	MGP261, MGP262



Features

- Universal transmitter for Vaisala Indigo compatible probes
- Touchscreen display (optional non-display model with LED indicator also available)
- IP66 and NEMA 4 rated metal enclosure
- 2 configurable galvanically isolated analog outputs
- Ethernet connection with web interface for remote access
- Modbus® TCP/IP protocol
- Protective extra-low voltage powering

Vaisala Indigo510 transmitter is an industrial-grade, robust transmitter that accommodates 1 Vaisala Indigo compatible probe for humidity, temperature, dew point, carbon dioxide, hydrogen peroxide, and moisture in oil measurements. The transmitter can display measurements on the spot as well as transmit them to automation systems through analog signals or Modbus TCP/IP protocol.

Variety of probe options

Indigo510 transmitters can be used with Indigo compatible probes.

- Humidity and temperature probes: HMP1, HMP3, HMP4, HMP5, HMP7, HMP8, HMP9, TMP1
- Dew point probes: DMP5, DMP6, DMP7, DMP8
- CO₂ probes: GMP251, GMP252
- Vaporized hydrogen peroxide probes: HPP271, HPP272
- MMP8 moisture in oil probe

The probes are interchangeable, self-contained measurement instruments that are easily detachable from the transmitter for calibration and maintenance. The probes are connected using a cable that can be extended with a standard instrumentation cable to allow up to 30 m (98 ft) distance between the transmitter and the probe.

The Indigo510 transmitter can also be connected to the MHT410 transmitter for display of measurement data and automation system connectivity.

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

Analog and digital interfaces

The Indigo510 transmitter has 2 analog channels that can be configured to mA or voltage type. Any of the output parameters from the connected probe can be assigned to control the analog channels.

The digital output protocol is Modbus TCP/IP over Ethernet

Besides Modbus TCP/IP, the transmitter's Ethernet connection provides a web interface and cybersecurity that meets modern standards.

Robust design

The transmitter has a wide operating temperature range, an IP66-rated corrosion-resistant metal enclosure and an optional touchscreen display made of strengthened (IK08) glass. The transmitter withstands commonly used cleaning chemicals, such as isopropanol and liquid H₂O₂ (30 %), and performs even in the harshest conditions.

The standard mounting options include mounting on a wall and on a DIN rail. With an adapter plate, the transmitter can be installed to replace an HMT330, DMT340, and MMT330 series transmitter. A pole mounting kit is also available as an accessory.

Technical data

Indigo compatible probes

Measurement type	Probe models
Humidity and temperature	HMP1, HMP3, HMP4, HMP5, HMP7, HMP8, HMP9
Temperature	TMP1
Dew point	DMP5, DMP6, DMP7, DMP8
CO ₂	GMP251, GMP252
Vaporized hydrogen peroxide	HPP271, HPP272
Moisture in oil	MMP8

Other compatible devices

Device or series	Models
MHT410 Moisture, Hydrogen and Temperature Transmitter	MHT410

Inputs and outputs

Operating power	
Protective extra-low voltage (PELV)	11 ... 35 V DC, 24 V AC $\pm 15\%$ 50/60 Hz, max. current 2 A Isolation voltage: 500 V AC, 1000 V DC
PELV power cable temp. rating	$\geq +80\text{ }^{\circ}\text{C}$ (+176 $^{\circ}\text{F}$)
Analog outputs	
Number of analog outputs	2
Selectable voltage output types	0 ... 1 V, 0 ... 5 V, 0 ... 10 V, scalable
Selectable current output types	4 ... 20 mA, 0 ... 20 mA, scalable
Max. wire size	2.5 mm ² (14 AWG)
Accuracy of analog outputs at +20 $^{\circ}\text{C}$ (+68 $^{\circ}\text{F}$)	$\pm 0.05\%$ full scale
Temperature dependence	$\pm 0.005\%$ / $^{\circ}\text{C}$ full scale
External loads:	
Current outputs	$R_L < 500\ \Omega$
0 ... 1 V output	$R_L > 2\ \text{k}\Omega$
0 ... 5 V and 0 ... 10 V outputs	$R_L > 10\ \text{k}\Omega$
Ethernet interface	
Supported standards	10BASE-T, 100BASE-TX
Connector	8P8C (RJ45)
Supported protocols	Modbus TCP/IP (port 502), HTTPS (port 8443)

Operating environment

Operating temperature	With display $-20\text{ }^{\circ}\text{C}$... $+60\text{ }^{\circ}\text{C}$ ($-4\text{ }^{\circ}\text{F}$... $+140\text{ }^{\circ}\text{F}$) Without display $-40\text{ }^{\circ}\text{C}$... $+60\text{ }^{\circ}\text{C}$ ($-40\text{ }^{\circ}\text{F}$... $+140\text{ }^{\circ}\text{F}$)
Storage temperature	With display $-30\text{ }^{\circ}\text{C}$... $+60\text{ }^{\circ}\text{C}$ ($-22\text{ }^{\circ}\text{F}$... $+158\text{ }^{\circ}\text{F}$) Without display $-40\text{ }^{\circ}\text{C}$... $+60\text{ }^{\circ}\text{C}$ ($-40\text{ }^{\circ}\text{F}$... $+140\text{ }^{\circ}\text{F}$)
For use in wet locations	Yes
Operating humidity	0 ... 100 %RH
Maximum operating altitude	3000 m (9843 ft)
IP rating	IP66

Mechanical specifications

NEMA rating	NEMA 4
Housing classification	IK08, DIN EN ISO 11997-1: Cycle B (VDA 621-415)
Housing material	AlSi10Mg (DIN 1725)
Display window material	Strengthened glass (IK08)
Weight	1.5 kg (3.3 lb)
Dimensions (H $\times$ W $\times$ D)	142 $\times$ 182 $\times$ 67 mm (5.63 $\times$ 7.17 $\times$ 2.64 in)
Cable diameters for cable glands	
M20 $\times$ 1.5 glands	5.0 ... 8.0 mm (0.20 ... 0.31 in)
M20 $\times$ 1.5 glands with split bushing	7 mm (0.28 in)
M16 $\times$ 1.5 glands	2.0 ... 6.0 mm (0.08 ... 0.24 in)

Compliance

EU directives	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC compatibility	IEC/EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B
Electrical safety	IEC/EN 61010-1
Compliance marks	CE, China RoHS, FCC, RCM, UKCA
Listing marks	Canada (SGS), US (SGS)
FCC compliance	FCC Part 15, Class B

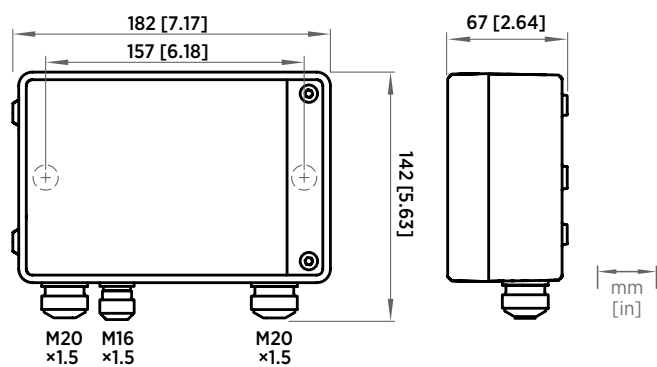
Spare parts

Cable gland, M20 $\times$ 1.5, 5.0 ... 8.0 mm (0.20 ... 0.31 in)	ASM21367OSP
Cable gland with split bushing, M20 $\times$ 1.5 ¹⁾	262632SP
Cable gland, M16 $\times$ 1.5, 2.0 ... 6.0 mm (0.08 ... 0.24 in)	ASM21367ISP
Conduit fitting, M20 $\times$ 1.5 for NPT1/2" conduit	214780SP

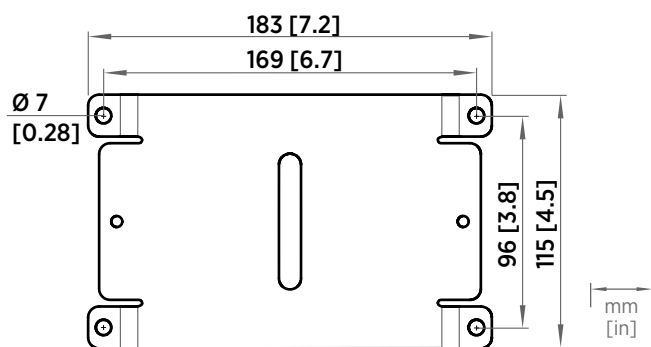
¹⁾ With 7-mm (0.28 in) hole for cable and 14-mm (0.55 in) hole for 8P8C (RJ45) connector to pass through.

Accessories

Adapter plate	DRW252186SP
Installation kit for pole or pipeline	215108
Installation kit with weather shield	215109
Probe connection cables	
Probe connection cable, 1 m	CBL210896-1MSP
Probe connection cable, 3 m	CBL210896-3MSP
Probe connection cable, 5 m	CBL210896-5MSP
Probe connection cable, 10 m	CBL210896-10MSP



Indigo510 dimensions and lead-through sizes



Indigo500 adapter plate dimensions

Indigo520 Transmitter

For Vaisala Indigo compatible probes



Features

- Universal transmitter for Vaisala Indigo compatible probes
- Supports 2 detachable probes simultaneously
- IP66 and NEMA 4 rated metal enclosure
- 4 configurable galvanically isolated analog outputs
- 2 relays
- Ethernet connection with web interface for remote access
- Displays measurements on the spot as well as transmits them to automation systems through analog signals, relays, or Modbus TCP/IP protocol.

Vaisala Indigo520 transmitter is an industrial-grade, robust transmitter that accommodates 1 or 2 Vaisala Indigo compatible probes for humidity, temperature, dew point, carbon dioxide, hydrogen peroxide, and moisture in oil measurements. The transmitter can measure barometric pressure with an additional module.

Options

- Multiple powering options: Power over Ethernet, protective extra-low voltage, and AC (mains) power
- Available with Vaisala BAROCAP® barometric pressure sensor known for its high accuracy and excellent long-term stability
- Touchscreen display (optional non-display model with LED indicator also available)

Variety of probe options

Indigo520 transmitters are the most versatile option for use with Indigo compatible probes.

- Humidity and temperature probes: HMP1, HMP3, HMP4, HMP5, HMP7, HMP8, HMP9, TMP1
- Dew point probes: DMP5, DMP6, DMP7, DMP8

- CO₂ probes: GMP251, GMP252
- Vaporized hydrogen peroxide probes: HPP271, HPP272
- MMP8 moisture in oil probe

The probes are interchangeable, self-contained measurement instruments that are easily detachable from the transmitter for calibration and maintenance. The probes are connected using a cable that can be extended with a standard instrumentation cable to allow up to 30 m (98 ft) distance between the transmitter and the probe.

The Indigo520 transmitter can also be connected to the MHT410 transmitter for display of measurement data and automation system connectivity.

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

Analog and digital interfaces

The Indigo520 transmitter has 4 analog channels that can be configured to mA or voltage type, and 2 configurable relays. Any of the output parameters from the connected probes can be assigned to control the analog channels and relays.

The digital output protocol is Modbus TCP/IP over Ethernet

Besides Modbus TCP/IP, the transmitter's Ethernet connection provides a web interface and cybersecurity that meets modern standards.

Robust design

The transmitter has a wide operating temperature range, an IP66-rated corrosion-resistant metal enclosure and an optional touchscreen display made of strengthened (IK08) glass. The transmitter withstands commonly used cleaning chemicals, such as isopropanol and liquid H₂O₂ (30 %), and performs even in the harshest conditions.

Technical data

Indigo compatible probes

Measurement type	Probe models
Humidity and temperature	HMP1, HMP3, HMP4, HMP5, HMP7, HMP8, HMP9
Temperature	TMP1
Dew point	DMP5, DMP6, DMP7, DMP8
CO ₂	GMP251, GMP252
Vaporized hydrogen peroxide	HPP271, HPP272
Moisture in oil	MMP8

Other compatible devices

Device or series	Models
MHT410 Moisture, Hydrogen and Temperature Transmitter	MHT410

Measurement performance

Barometric pressure (optional module)	
Pressure range	500 ... 1100 hPa
Class A:	
Linearity	±0.05 hPa
Hysteresis	±0.03 hPa
Repeatability	±0.03 hPa
Calibration uncertainty	±0.07 hPa
Accuracy at +20 °C / +68 °F	±0.10 hPa
Temperature dependence	±0.1 hPa
Total accuracy (-40 ... +60 °C / -40 ... +140 °F)	±0.15 hPa
Long-term stability/year	±0.1 hPa
Response time (100 % response):	
One sensor	2 s
Pressure units	hPa, mbar, kPa, Pa, inHg, mmH2O, mmHg, torr, psia

Mechanical specifications

NEMA rating	NEMA 4
Housing classification	IK08, DIN EN ISO 11997-1: Cycle B (VDA 621-415)
Housing material	AlSi10Mg (DIN 1725)
Display window material	Strengthened glass (IK08)
Weight	1.5 kg (3.3 lb)
Dimensions (H × W × D)	142 × 182 × 67 mm (5.63 × 7.17 × 2.64 in)

Cable diameters for cable glands	
M20×1.5 glands	5.0 ... 8.0 mm (0.20 ... 0.31 in)
M20×1.5 glands with split bushing	7 mm (0.28 in)
M16×1.5 glands	2.0 ... 6.0 mm (0.08 ... 0.24 in)

Inputs and outputs

Operating power	
Protective extra-low voltage (PELV) version ¹⁾	15 ... 35 V DC, 24 V AC ±20 % 50/60 Hz, max. current 2 A (power supply input is galvanically isolated) Fuse size for power supply: 3 A Isolation voltage: 500 V AC, 1000 V DC
PELV power cable temp. rating	≥ +80 °C (+176 °F)
AC (mains) power version ¹⁾	100 ... 240 V AC 50/60 Hz, max. current 1 A (power supply input is galvanically isolated) Fuse size for power supply: 10 A Isolation voltage: 1500 V AC
Power over Ethernet version ¹⁾	50 V DC, 600 mA PoE+, IEEE 802.3 at PD (power supply input is galvanically isolated) Fuse size for power supply: 2 A Isolation voltage: 500 V AC, 1000 V DC

Analog outputs	
Number of analog outputs	4
Selectable voltage output types	0 ... 1 V, 0 ... 5 V, 0 ... 10 V, scalable
Selectable current output types	4 ... 20 mA, 0 ... 20 mA, scalable
Max. wire size	2.5 mm ² (14 AWG)
Accuracy of analog outputs at +20 °C (+68 °F)	±0.05 % full scale
Temperature dependence	±0.005 % / °C full scale
External loads:	
Current outputs	R _L < 500 Ω
0 ... 1 V output	R _L > 2 kΩ
0 ... 5 V and 0 ... 10 V outputs	R _L > 10 kΩ

Relay outputs	
Number and type of relays	2 pcs, SPDT
Max. switching power, current, voltage	30 W, 1 A, 40 V DC / 28 V AC
Max. wire size in PELV version	2.5 mm ² (14 AWG)
Max. wire size in AC (mains) version	1.5 mm ² (16 AWG)

Ethernet interface	
Supported standards	10BASE-T, 100BASE-TX
Connector	8P8C (RJ45)
Supported protocols	Modbus TCP/IP (port 502), HTTPS (port 8443)

¹⁾ The power supply option is selected when ordering the transmitter.

Operating environment

Operating temperature	With display -20 ... +55 °C (-4 ... +131 °F) Without display -40 ... +60 °C (-40 ... +140 °F) ¹⁾
Storage temperature	With display -30 ... +60 °C (-22 ... +158 °F) Without display -40 ... +60 °C (-40 ... +140 °F)
For use in wet locations	Yes
Operating humidity	0 ... 100 %RH
Maximum operating altitude	3000 m (9843 ft)
IP rating	IP66 ²⁾

¹⁾ Operating temperature without display with barometer module -40 ... +55 °C (-40 ... +131 °F).

²⁾ Evaluated by Eurofins, not by UL.

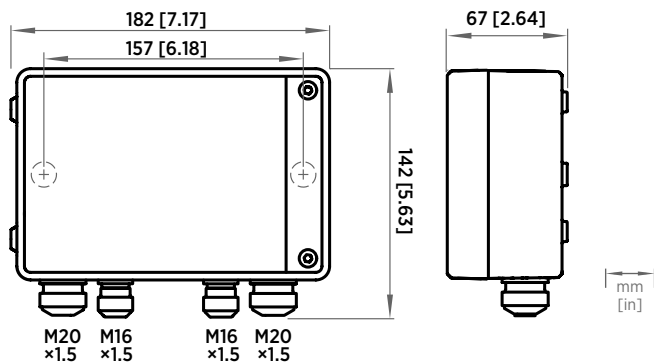
Compliance

EU directives	EMC Directive (2014/30/EU) Low Voltage Directive (2014/35/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC compatibility	IEC/EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B
Electrical safety	IEC/EN 61010-1
Compliance marks	CE, China RoHS, FCC, RCM
Listing marks	Canada (SGS), US (SGS)
FCC compliance	FCC Part 15, Class B

Spare parts

Cable gland, M20×1.5, 5.0 ... 8.0 mm (0.20 ... 0.31 in)	ASM213670SP
Cable gland with split bushing, M20×1.5 ¹⁾	262632SP
Cable gland, M16×1.5, 2.0 ... 6.0 mm (0.08 ... 0.24 in)	ASM213671SP
Conduit fitting, M20×1.5 for NPT1/2" conduit	214780SP

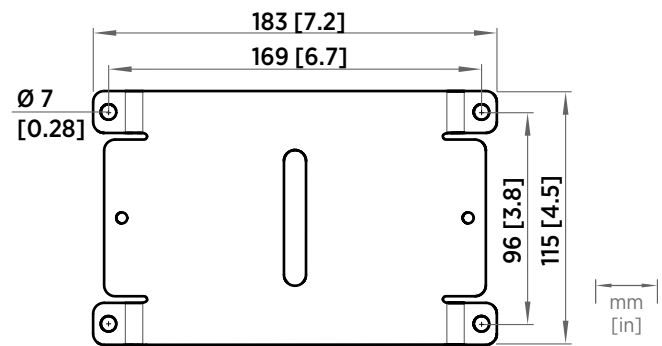
¹⁾ With 7-mm (0.28 in) hole for cable and 14-mm (0.55 in) hole for 8P8C (RJ45) connector to pass through.



Indigo520 dimensions and lead-through sizes

Accessories

Adapter plate	DRW252186SP
Installation kit for pole or pipeline	215108
Installation kit with weather shield	215109
Probe connection cables	
Probe connection cable, 1 m	CBL210896-1MSP
Probe connection cable, 3 m	CBL210896-3MSP
Probe connection cable, 5 m	CBL210896-5MSP
Probe connection cable, 10 m	CBL210896-10MSP



Indigo500 adapter plate dimensions



Features

- Wireless interface for configuration and temporary use
- Numerical and graphical color display (optional non-display version for analog model)
- IP65 enclosure
- 24 V AC/DC power supply input
- Indigo201: 3 analog outputs (mA or V)
- Indigo202: RS-485 with Modbus® RTU
- 2 configurable relays

Vaisala Indigo200 series transmitters are host devices for displaying measurement values from Vaisala Indigo compatible probes and/or transmitting them to automation systems through analog signals, Modbus RTU communication, or relays.

Transmitter for Vaisala Indigo compatible probes

- HMP series humidity and temperature probes HMP1, HMP3, HMP4, HMP5, HMP7, HMP8, HMP9
- TMP1 temperature probe
- DMP series dew point probes DMP5, DMP6, DMP7, DMP8
- GMP250 series CO₂ probes GMP251, GMP252
- HPP270 series vaporized hydrogen peroxide probes HPP271, HPP272
- MMP8 moisture in oil probe

Indigo200 series transmitters are plug-and-play probe host devices for current and future Vaisala Indigo compatible probes. The host device has a numerical

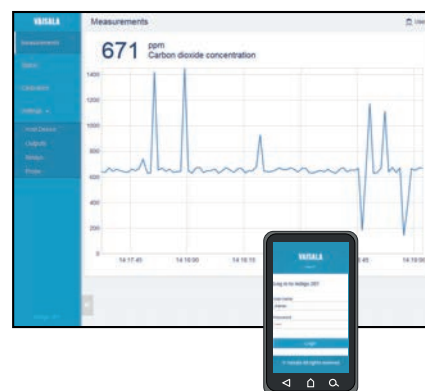
and graphical color display; Indigo201 is also available as a non-display version that uses an LED indicator for notifications.

Vaisala Indigo compatible probes are connected either directly to the host or by using a cable between Indigo200 and the probe.

Indigo200 has a browser-based wireless configuration interface for mobile devices and computers that support a wireless connection (IEEE 802.11 b/g/n WLAN). The host device and the probes connected to it can be configured using the wireless user interface. It also allows for temporary viewing of the measurement data.

The surface of the Indigo200 enclosure is smooth, which makes it easy to clean. It is also resistant to dust and most chemicals, such as H₂O₂ and alcohol-based cleaning agents.

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



Wireless configuration interface example (desktop and mobile views)

Technical data

General

- Color display (Indigo201: optional non-display version)
- Wireless (WLAN) configuration interface: connect to Indigo200 and use the browser-based user interface for device configuration and measurement data viewing

Indigo compatible probes

Measurement type	Probe models
Humidity and temperature	HMP1, HMP3, HMP4, HMP5, HMP7, HMP8, HMP9
Temperature	TMP1
Dew point	DMP5, DMP6, DMP7, DMP8
CO ₂	GMP251, GMP252
Vaporized hydrogen peroxide	HPP271, HPP272
Moisture in oil	MMP8

Operating environment

Operating temperature	With display -20 ... +60 °C (-4 ... +140 °F) Without display -40 ... +60 °C (-40 ... +140 °F)
Storage temperature	-40 ... +70 °C (-40 ... +158 °F)
Chemical tolerance	Temporary exposure during cleaning: • H₂O₂ (6000 ppm, non-condensing) • Alcohol-based cleaning agents such as ethanol and IPA (max. 70 % concentrate)
IP rating	IP65

Inputs and outputs

Power supply input	15 ... 30 V DC ¹⁾ 24 V AC ±10 % 50/60 Hz
Relay contacts x 2	Max. switching power 30 W Max. switching current 1 A Max. switching voltage 40 V DC / 28 V AC

Indigo201 model

Three analog outputs (voltage or current)	Voltage: 0 ... 1 V, 0 ... 5 V, 0 ... 10 V, 1 ... 5 V, scalable, min. load 1 kΩ Current: 4 ... 20 mA, 0 ... 20 mA, scalable, max. load 500 Ω
Accuracy of analog outputs at 20 °C	±0.1 % full scale for 0 ... 10 V and 0 ... 20 mA

Indigo202 model

Digital communications	RS-485, Modbus RTU
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¹⁾ When used with the HMP7 probe, the minimum required power supply input is 18 V DC.

Mechanical specifications

Housing material	PC/ABS plastic
Display window material	PMMA plastic
Connection screw terminals	26 AWG ... 20 AWG
Weight	402 g (14.2 oz)
Dimensions (H×W×D)	149 × 135 × 43 mm (5.87 × 5.31 × 1.7 in)

Compliance

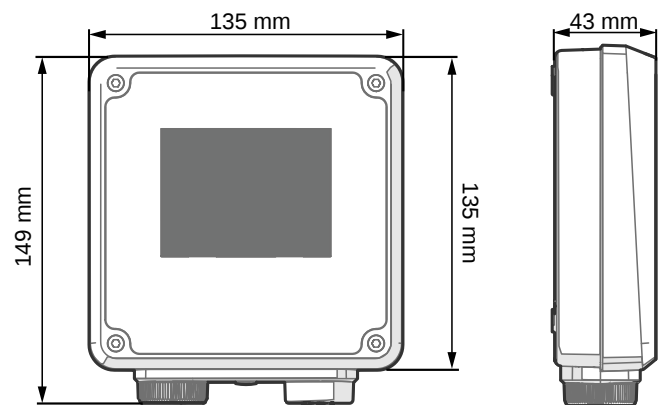
EU directives

Radio Equipment Directive, RED (2014/53/EU)
RoHS Directive (2011/65/EU) amended by 2015/863

Electrical safety	EN 61010-1
Networking standards (wireless configuration interface WLAN access point)	IEEE 802.11 b/g/n compliant
EMC compatibility	EN 61326-1, industrial environment
Compliance marks	CE, RCM
Contains	FCC ID QOQ-WGM110, IC 5123A-WGM110, MIC 209-J00197, MSIP-CRM-BGT-WGM110

Spare parts and accessories

Probe connection cable, 1 m (3 ft 3 in)	INDIGOCABLE1M
Probe connection cable, H ₂ O ₂ compatible, 1 m (3 ft 3 in)	INDIGOCABLEHDM5
Probe connection cable, 3 m (9 ft 11 in)	INDIGOCABLE3M
Probe connection cable, H ₂ O ₂ compatible, 3 m (9 ft 11 in)	INDIGOCABLEHDM3M
Probe connection cable, 5 m (16 ft 5 in)	INDIGOCABLE5M
Probe connection cable, H ₂ O ₂ compatible, 5 m (16 ft 5 in)	INDIGOCABLEHDM5M
Probe connection cable, 10 m (32 ft 10 in)	INDIGOCABLE10M
Probe connection cable, H ₂ O ₂ compatible, 10 m (32 ft 10 in)	INDIGOCABLEHDM10M
Optional line voltage power adapter: AC Power Supply Universal 24 V DC 1.25 A 30 W	244784SP
Universal mains power supply with EU/US/UK/AUS plugs	INDIGOPOWER24V



Indigo200 series dimensions



Depending on the Vaisala product, you may have several filter options to choose from. Typically one of the options is defined as the recommended filter. The recommended filter is suitable for the majority of the applications where the specific product is designed to be used. There are, however, some exceptions where another type of filter may be the best option. This document provides some general guidelines when considering the optimal filter for a specific application.

Particulate protection

Typically the primary task of the filter is to prevent dust from entering the sensor element. Vaisala capacitive sensor technology is not sensitive to particulates as such, but dust accumulating on the sensor surface may still have an impact on the measurement performance. It may weaken the response time and particulates may also carry harmful substances, causing corrosion in certain conditions. This is why keeping the sensor clean with the proper filter is a good idea.

Stainless steel mesh and PTFE membrane are the typical filtering materials. Sintered filters offer the best protection against dust, but there are also use cases where particulate filtering is not a critical requirement, or it is considered undesirable because it slows down the response time. For example, in handheld devices it is common to use a mesh filter without the actual particulate filtering element.

Mechanical protection

Capacitive thin film sensor is a sensitive component and it does not withstand severe mechanical stress, such as physical shocks. For this reason, it needs

a protective element around it. Another cause of mechanical stress is high flow speed in the measurement environment, where a simple grid is not enough to protect the sensor. Sintered filter is a good choice for high wind speeds, because the environment inside the filter stays calm.



Response time

There are two factors in a filter affecting the response time of the sensor. First, the diffusion rate. Steel mesh has much faster diffusion rate than a sintered filter, meaning that the humidity level inside the filter stabilizes faster to the same level with the surrounding environment. Another factor is thermal mass. A heavier

filter will add more mass to the sensor head and thus it takes longer for the sensor to adapt into changes in temperature.

A sintered filter has the slowest response time and an open grid filter made of plastic has the fastest. This can be especially critical in applications with still air of very weak flow. A higher flow rate will balance the difference.

When is it time to replace the filter?

Filters should be visually inspected on a regular basis. Filter replacement is recommended if the filter appears clogged or there are signs of severe corrosion or mechanical damage. Keep in mind that a clogged sintered filter that is otherwise in good condition may still be reused. You may be able to clean the filter with an ultrasonic bath or an appropriate cleaning agent. Remember to dry the filter well before reinstalling it.

GENERAL PURPOSE FILTERS FOR HUMIDITY AND DEW POINT APPLICATIONS ¹⁾

	Plastic grid with steel mesh filter	Plastic grid with PTFE membrane filter	Stainless steel grid with PTFE membrane filter	Sintered stainless steel filter	Stainless steel grid with mesh filter
Example image					
Particulate protection	★★★★☆	★★★★☆	★★★★☆	★★★★★	★★★★☆
Mechanical protection	★★★★☆	★★★★☆	★★★★★	★★★★★	★★★★★
Response time	★★★★☆	★★★★☆	★★★☆☆	★☆☆☆☆	★★★★☆
Typical use / Features	Industrial applications, up to 180 °C (356 °F)	Generic applications, up to 80 °C (176 °F)	Demanding applications, rugged design	Demanding industrial applications	Industrial applications
High end probes					
HMP series, HMT330, HMT310, HMT360, HMT370EX, HMM170	DRW010281SP	—	—	HM47280SP	—
DMP series, DMT340	DRW010281SP	—	—	HM47280SP	—
Miniature humidity probes					
HMP110, HMP60, HMT120, HMT130	—	DRW010525SP	ASM212652SP	HM46670SP	—
HMP113, HMP63, RFL100	—	ASM210856SP	—	HM47280SP	—
Handhelds					
HM40	—	For HM41 and HM45: ASM210856SP For HM46: 10159HM	For HMP42: 19867HM , 19858HM	For HM46: 0195 (brass)	—
HM70	For HMP77: DRW010281SP	10159HM	—	DRW212987SP (brass) HM47280SP	—
DM70	DRW010281SP	—	—	HM47280SP	—
OEM models					
DMT143	—	—	—	DRW010335SP	—
DMT143L	—	—	—	HM47280SP	—
DMT152	—	—	—	—	220957SP
DPT146	—	—	—	—	220957SP

1) Recommended filter marked in bold.

OTHER FILTERS ¹⁾

	Sintered PTFE filter	Plastic grid	Stainless steel grid	Stainless steel grid for high flow rate	Stainless steel grid with membrane and drain hole
Example image					
Particulate protection	★★★★★	☆☆☆☆☆	☆☆☆☆☆	☆☆☆☆☆	★☆☆☆☆
Mechanical protection	★★☆☆☆	★★★★☆	★★★★★	★★★★★	★★★★★
Response time	★★★☆☆	★★★★★	★★★★★	★★★☆☆	★★★★★
Typical use / Features	Fast drying, corrosion resistant	Clean environment, fast response time	Oil measurement or vacuum	Oil measurement, high flow rate	Condensing environment, PEM fuel cells
High end probes					
HMP series, HMT330, HMT310, HMT360, HMT370EX, HMM170	(219452SP)	DRW010276SP	HM47453SP	220752SP	214848SP
DMP series, DMT340	—	—	HM47453SP	—	—
MMP series, MMT330	—	—	HM47453SP	220752SP	—
Miniature humidity probes					
HMP110, HMP60, HMT120, HMT130	DRW244938SP	DRW010522SP	—	—	—
HMP113, HMP63, RFL100	219452SP	DRW240185SP	—	—	—
Handhelds					
HM40	—	For HM41 and HM45: DRW240185SP	—	—	—
HM70	—	For HMP75: 6221	—	—	—
DM70	—	—	HM47453SP	—	—
MM70	—	—	HM47453SP	220752SP	—
OEM models					
DMT143	—	—	HM47453SP	—	—
DMT143L	—	—	HM47453SP	—	—

¹⁾ Recommended filter marked in bold.

More information

For order forms, product specifications, and user guidance on Vaisala Indigo compatible probes, see the product pages at www.vaisala.com.

Humidity measurement

HMP1 Wall-Mounted Humidity and Temperature Probe	www.vaisala.com/hmp1
HMP3 General Purpose Humidity and Temperature Probe	www.vaisala.com/hmp3
HMP4 Relative Humidity and Temperature Probe	www.vaisala.com/hmp4
HMP5 Relative Humidity and Temperature Probe	www.vaisala.com/hmp5
HMP7 Relative Humidity and Temperature Probe	www.vaisala.com/hmp7
HMP8 Relative Humidity and Temperature Probe	www.vaisala.com/hmp8
HMP9 Compact Humidity and Temperature Probe	www.vaisala.com/hmp9
TMP1 Temperature Probe	www.vaisala.com/tmp1

Dew point measurement

DMP5 Dew Point and Temperature Probe	www.vaisala.com/dmp5
DMP6 Dew Point Probe	www.vaisala.com/dmp6
DMP7 Dew Point and Temperature Probe	www.vaisala.com/dmp7
DMP8 Dew Point and Temperature Probe	www.vaisala.com/dmp8

Carbon dioxide measurement

GMP251 Carbon Dioxide Probe	www.vaisala.com/gmp251
GMP252 Carbon Dioxide Probe	www.vaisala.com/gmp252

Moisture in oil measurement

MMP8 Moisture in Oil Probe	www.vaisala.com/mmp8
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Hydrogen peroxide measurement

HPP270 Series Probes	www.vaisala.com/hpp270
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Insight software and Indigo transmitters

Insight PC software	www.vaisala.com/insight
Indigo500 Series Transmitters	www.vaisala.com/indigo500
Indigo200 Series Transmitters	www.vaisala.com/indigo200