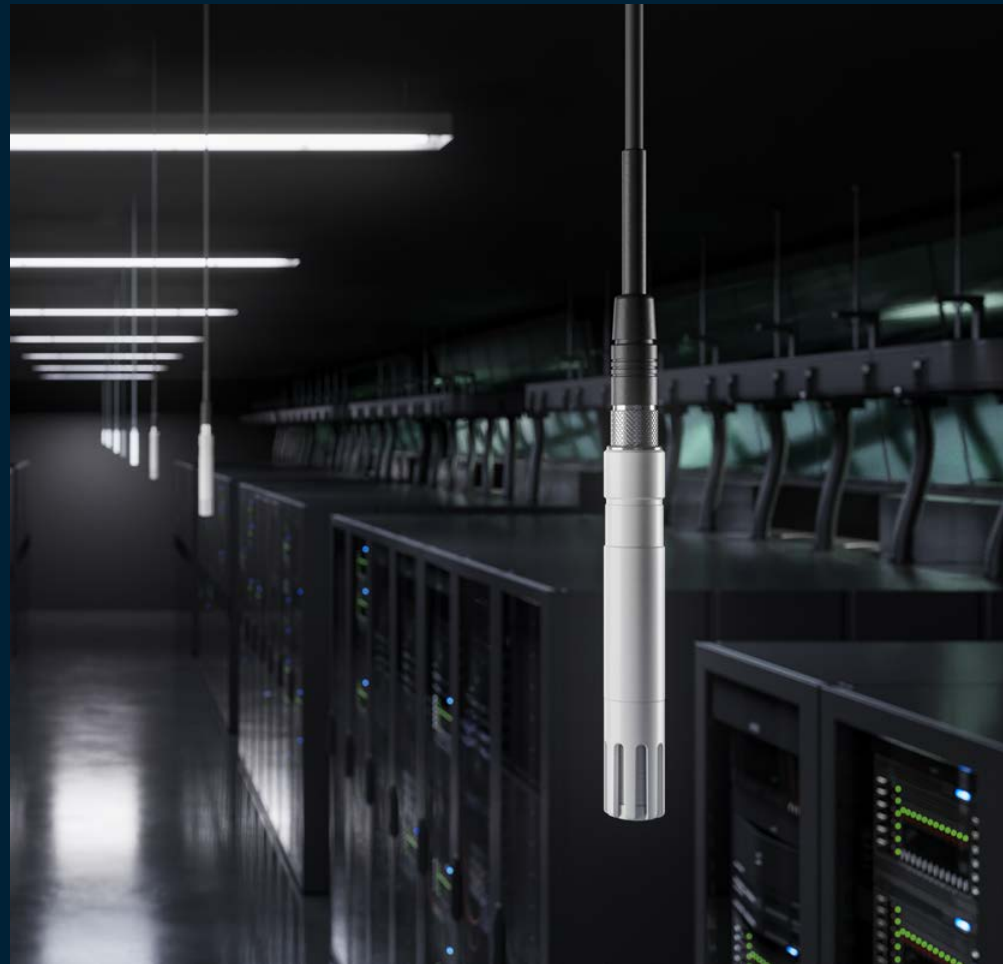


**VAISALA**

# Sensors and transmitters for data centers

Catalogue





# Excellence in measurements

When reliability matters, the measurements matter. Creation of as-designed indoor conditions with minimized consumption of energy is not an easy task. It requires precision and reliability in every piece in the chain. Although influenced by many variables, eventually the control of your HVAC processes can be only as precise as your measurements are. Measurements of humidity, temperature, and other crucial parameters both indoors and outdoors, are among the key contributors to precisely controlled indoor environment.

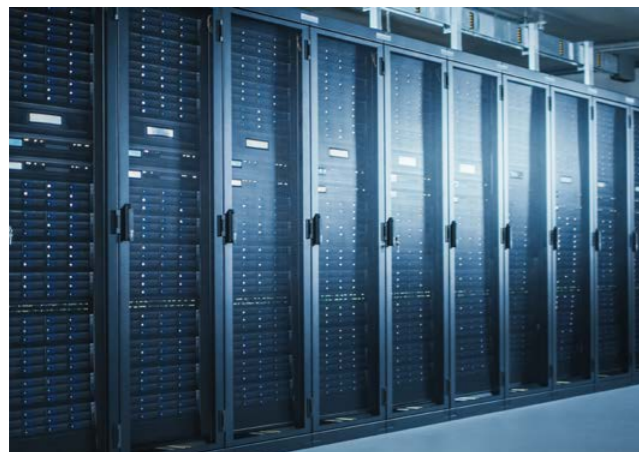
Vaisala is a global leader in environmental and industrial measurements. As the trusted provider of measurement instruments, we offer you peace of mind. You can rest assured

that our measurement devices will enable the highest precision and reliability for your controlled processes.

Let us introduce our signature collections of high-quality instruments for data centers, for your convenience.

» [How much can measurement accuracy impact on cooling energy consumption? Download our free insider's guide to know more!](#)

# Selection for data centers



The unique, cutting edge Vaisala sensor technologies are manifested throughout our versatile range of products. Humidity measurement with Vaisala HUMICAP technology is known for superior performance even in challenging environments. All our transmitters have an exceptionally high reliability and excellent measurement stability. The products are easy to maintain throughout their long lifetime.

Vaisala's offering is a unique combination of outstanding outdoor and indoor measurement instruments. Our selection brings together world-renowned weather and outdoor transmitters and the top-quality measurement instruments used in monitoring and control of indoor environments.

Measurements in data centers must not fail. Sensors and transmitters of Vaisala are prestigious for their unrivalled performance and reliability, enabling precise and trustworthy controls of HVAC systems.

» How continuity is enabled in data centers with Vaisala sensors? [Read the blog post to learn more.](#)



## Outdoor

- Outdoor temperature
- Outdoor humidity
- Barometric pressure
- Weather parameters



## Indoor

- Indoor temperature & humidity
- Duct temperature & humidity
- Immersion temperature
- Differential pressure

# For the premium performance



When the highest possible quality and reliability is required, we have the perfect solution for you. This is the new "de facto" selection for data centers applying the highest standards.

The selection brings together the most essential high-precision measurement instruments designed for critical environments. The products come with uniquely excellent accuracy, reliability and long-term stability of measurement.



**INDIGO500**  
Configurable Transmitter

Versatile transmitter for Indigo Probes  
Outputs: 4-20 mA, 0-10 V, Modbus TCP/IP  
Robust metal appearance  
User friendly interface



**INDIGO300**  
Pre-configured Transmitter

Common transmitter for single Indigo probe use  
Outputs: 4-20 mA, 0-10 V  
Robust metal appearance  
User friendly interface



**INDIGO PROBES**  
Industrial Grade Measurement Probes

Compatible with INDIGO transmitter  
Wide selection for professional use  
HMP1: Wall-mounted RH + T probe  
HMP3: General purpose RH + T probe  
HMP7: RH + T probe



**HMT120/130**  
Humidity and Temperature Transmitter, Multipurpose

Accuracy  $\pm 1.5\%$  RH,  $\pm 0.1$  °C ( $\pm 0.18$  °F)  
Outputs: 4-20 mA, 0-10 V  
Exchangeable measurement probes  
IP65 enclosure, optional display  
Ideal for demanding conditions and processes



**TMT120/130**  
Temperature Transmitter, Multipurpose

Accuracy  $\pm 0.1$  °C ( $\pm 0.18$  °F)  
Outputs: 4-20 mA, 0-10 V  
Exchangeable measurement probes  
IP65 enclosure, optional display  
Ideal for demanding conditions and processes



**PDT101**  
Differential Pressure Transmitter

Accuracy: 0.4% / 1% of span  
Outputs: 4-20 mA, 0-5 V, 0-10 V  
Unidirectional/bidirectional options  
Optional pressure ranges  
Easy mounting



**TMI110**  
Immersion Temperature Transmitter

Accuracy  $\pm 0.1$  °C ( $\pm 0.18$  °F)  
Outputs: 4-20 mA, Modbus RTU  
Installed in a thermowell  
Precise measurement of liquids  
Very fast response time



**HMD60**  
Duct Humidity and Temperature Transmitter

Accuracy  $\pm 1.5\%$  RH,  $\pm 0.1$  °C ( $\pm 0.18$  °F)  
Outputs: 4-20 mA, 0-10 V, Modbus RTU, BACnet MS/TP  
Full metal body, IP66 enclosure  
Proven accuracy even in harsh conditions



**TMD60**  
Duct Temperature Transmitter

Accuracy  $\pm 0.1$  °C ( $\pm 0.18$  °F)  
Output: 4-20 mA  
Full metal body, IP66 enclosure  
Proven accuracy even in harsh conditions



**WXT530**  
Weather Transmitter

Weather parameters: air pressure, temperature, humidity, rainfall, wind speed, wind direction  
Output: Modbus RTU  
Integrated radiation shield



**WMT700**  
Ultrasonic Wind Sensor

Accuracy (speed):  $\pm 0.1$  m/s or 2% of reading  
Accuracy (direction):  $\pm 2$  degrees  
Outputs: current, voltage  
Designed for professional use



**PTB210 + SPH20**  
Digital Barometer + Static Pressure Heads

Total accuracy up to  $\pm 0.25$  hPa  
Outputs: 0-2.5 V, 0-5 V  
Designed for harsh outdoor conditions  
Minimized wind effects



# Precision with streamlined features



We are pleased to introduce our world-class repertoire of high-accuracy transmitters, complementing the building automation system even in the most demanding indoor environments and their control needs.

Vaisala's measurement instruments are the perfect fit for data centers with reliability as a priority, and within a reasonable budget.

The products come with excellent long-term stability of measurement, which ensures accuracy of measurement and precise controls also in the long term.



**HMT120/130**  
Humidity and Temperature Transmitter, Multipurpose  
Accuracy  $\pm 1.5\%$  RH,  $\pm 0.1$  °C ( $\pm 0.18$  °F)  
Outputs: 4-20 mA, 0-10 V  
Exchangeable measurement probes  
IP65 enclosure, optional display  
Ideal for demanding conditions and processes



**TMT120/130**  
Temperature Transmitter, Multipurpose  
Accuracy  $\pm 0.1$  °C ( $\pm 0.18$  °F)  
Outputs: 4-20 mA, 0-10 V  
Exchangeable measurement probes  
IP65 enclosure, optional display  
Ideal for demanding conditions and processes



**HMW90**  
Room Humidity and Temperature Transmitter  
Accuracy  $\pm 1.7\%$  RH,  $\pm 0.2$  °C ( $\pm 0.36$  °F)  
Outputs: 4-20 mA, 0-10 V, Modbus RTU  
Exchangeable measurement modules  
Display with sliding cover



**HMD110**  
Duct Humidity and Temperature Transmitter  
Accuracy  $\pm 2\%$  RH,  $\pm 0.2$  °C ( $\pm 0.36$  °F)  
Outputs: 4-20 mA, Modbus RTU  
IP65 enclosure, optional display  
Durable design, easy to install



**TMD110**  
Duct Temperature Transmitter  
Accuracy  $\pm 0.2$  °C ( $\pm 0.36$  °F)  
Outputs: 4-20 mA, Modbus RTU  
IP65 enclosure, optional display  
Durable design, easy to install



**TMI110**  
Immersion Temperature Transmitter  
Accuracy  $\pm 0.1$  °C ( $\pm 0.18$  °F)  
Outputs: 4-20 mA, Modbus RTU  
Installed in a thermowell  
Precise measurement of liquids  
Very fast response time



**HMW110**  
Humidity and Temperature Transmitter, Wall-mounted  
Accuracy  $\pm 2\%$  RH,  $\pm 0.2$  °C ( $\pm 0.36$  °F)  
Outputs: 4-20 mA, Modbus RTU  
IP65 enclosure, optional display  
Durable design, minimized maintenance needs



**TMW110**  
Temperature Transmitter, Wall-mounted  
Accuracy  $\pm 0.2$  °C ( $\pm 0.36$  °F)  
Outputs: 4-20 mA, Modbus RTU  
IP65 enclosure, optional display  
Durable design, minimized maintenance needs



**HMS110**  
Outdoor Humidity and Temperature Transmitter  
Accuracy  $\pm 2\%$  RH,  $\pm 0.2$  °C ( $\pm 0.36$  °F)  
Outputs: 4-20 mA, Modbus RTU  
Integrated rain / solar radiation shield  
Tolerant of high winds and icing conditions



**TMW90**  
Room Temperature Transmitter  
Accuracy  $\pm 0.2$  °C ( $\pm 0.36$  °F)  
Outputs: 4-20 mA, 0-10 V  
Exchangeable measurement modules  
Display with sliding cover



**PDT101**  
Differential Pressure Transmitter  
Accuracy: 0.4 % / 1 % of span  
Outputs: 4-20 mA, 0-5 V, 0-10 V  
Unidirectional/bidirectional options  
Optional pressure ranges  
Easy mounting



**WXT530**  
Weather Transmitter  
Weather parameters: air pressure, temperature, humidity, rainfall, wind speed, wind direction  
Output: Modbus RTU  
Integrated radiation shield

# Compact options for rack installations



When the space is limited, the miniature-size measurement probes form a compact solution for critical sites. Probes are connected through Modbus RTU and can be daisy-chained for easy installation.

Optional accessories are also available for convenience, including magnetic probe

attachment units and plug & play cables of various lengths, with standard M8 quick connectors.

» [Miniature-size measurement probes area compact solution for critical sites. Read more about Vaisala's humidity sensors.](#)



**HMP110 | HMP110T**  
Humidity and Temperature Probe

Accuracy  $\pm 1.5\%$  RH,  $\pm 0.1$  °C ( $\pm 0.18$  °F)  
Ideal for rough conditions  
IP65 metal housing  
High chemical tolerance  
Excellent measurement stability  
Length 71 mm (2.8 in), diameter 12 mm (0.47 in)

1:1 (71 mm)



**HMP113**  
Humidity and Temperature Probe

Accuracy  $\pm 1.5\%$  RH,  $\pm 0.1$  °C ( $\pm 0.18$  °F)  
Fast thermal response time  
IP54 plastic enclosure  
High chemical tolerance  
Excellent measurement stability  
Length 71 mm (2.8 in), diameter 12 mm (0.47 in)

1:1 (71 mm)



## Sustainability in the heart of our business

Vaisala's premium measurement solutions enhance safety, efficiency, and decisionmaking – for a sustainable future on our planet.

The heart of Vaisala's sustainability lies in the positive impact of our products, as they help our customers, for example, to increase energy efficiency and reduce emissions.

» [Learn more about our sustainability.](#)



## Global coverage with local presence

As a global leader in industrial, weather and environmental measurements, we provide reliable, accurate and innovative products and solutions that enabling better decision-making, increased productivity, and improved safety and quality.

Customers all over the world and in a multitude of industries use our measurement solutions. Everywhere from forecasting weather and making sure it is safe for your flight to take off, to staying ahead of power outages or monitoring incubators for premature children in hospitals, you can find Vaisala's premium measurement solutions in action all over the world.

» [Find your local contact.](#)

# VAISALA

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[vaisala.com](https://vaisala.com)



VAISALA

# HVAC transmitters

Catalogue





# Excellence in measurements

## Unrivaled performance

Vaisala is a global leader in environmental and industrial measurements. Our sensors and transmitters are renowned for their unrivaled performance, reliable results, and low total cost of ownership. You can rest assured that our products will ensure the highest precision and reliability for your controlled processes.

## For cutting-edge solutions

When reliability matters, sensors matter. Control of your HVAC systems and processes, and consequently, your building's performance, can only be as precise and reliable as your measurements. The more critical your building, the more important your sensors become. Precision and reliability are required in every link of the chain, starting with sensors.



## Sustainable buildings

Sustainability in buildings means taking every measure to improve energy efficiency and reduce emissions of the facility. Accurate sensors with reliable measurement capabilities are essential for optimizing building performance and improving the energy efficiency of the facility. Additionally, precise measurements also support achieving optimal indoor conditions for various types of spaces and creating more efficient and comfortable indoor environments.



## Peace of mind throughout the life cycle



As the trusted provider of measurement instruments, we offer you peace of mind. Our top-of-the-line products offer an exceptionally long lifetime, require minimal maintenance, and provide excellent measurement stability. Our transmitters for building automation are covered by a 5-year warranty. Although sensors represent a small investment, it is a strategic one with the potential to unlock huge long-term value.

# Room transmitters

## Accuracy that lasts.

Future-proof design combined with unbeatable measurement stability – the secret of low total cost of ownership of our products.

	HMW90 SERIES Humidity and Temperature Transmitters	TMW90 SERIES Temperature Transmitters	GMW90 SERIES Carbon Dioxide, Humidity and Temperature Transmitters
			
INSTALLATION	Wall-mount	Wall-mount	Wall-mount
OUTPUT PARAMETERS	Relative humidity Temperature Dew point / frost point temperature Wet bulb temperature Enthalpy Mixing ratio Absolute humidity Dew point depression	Temperature	Carbon dioxide Relative humidity Temperature Dew point/frost point temperature Wet bulb temperature Enthalpy Mixing ratio Absolute humidity Dew point depression
OUTPUT OPTIONS	4...20 mA loop powered 0...5/0...10 V, optional relay Modbus RTU	4...20 mA loop powered 0...5/0...10 V, optional relay	4...20 mA 0...5/0...10 V Modbus RTU
DETAILS	Accuracy $\pm 1.7\%$ Rh, $\pm 0.2^\circ\text{C}$ ( $\pm 0.36^\circ\text{F}$ ) Display option IP30 enclosure Calibration certificate included	Accuracy $\pm 0.2^\circ\text{C}$ ( $\pm 0.36^\circ\text{F}$ ) Display option IP30 enclosure Calibration certificate included	Accuracy $\pm 2.5\%$ Rh, $\pm 0.5^\circ\text{C}$ ( $\pm 0.9^\circ\text{F}$ ) $\pm 50$ ppm at 1000 ppm CO <sub>2</sub> CO <sub>2</sub> range 0...5 000 ppm Display option LED CO <sub>2</sub> indication option IP30 enclosure Calibration certificate included
READ MORE	<a href="#">» DATASHEET</a>	<a href="#">» DATASHEET</a>	<a href="#">» DATASHEET</a>

	HMW82/83 Humidity and Temperature Transmitters	TMW82 Temperature Transmitters	GMW83/84/86 Carbon Dioxide, Humidity and Temperature Transmitters
			
INSTALLATION	Wall-mount	Wall-mount	Wall-mount
OUTPUT PARAMETERS	Relative humidity Temperature	Temperature	Carbon dioxide Relative humidity Temperature
OUTPUT OPTIONS	4...20 mA loop powered 0...10 V	4...20 mA loop powered	4...20 mA 0...10 V
DETAILS	Accuracy $\pm 3\%$ Rh, $\pm 0.5^\circ\text{C}$ ( $\pm 0.9^\circ\text{F}$ ) IP30 enclosure	Accuracy $\pm 0.5^\circ\text{C}$ ( $\pm 0.9^\circ\text{F}$ ) IP30 enclosure	Accuracy $\pm 60$ ppm at 1000 ppm CO <sub>2</sub> , $\pm 3\%$ Rh, $\pm 0.5^\circ\text{C}$ ( $\pm 0.9^\circ\text{F}$ ) CO <sub>2</sub> range 0...2000 ppm Display option (GMW83) LED CO <sub>2</sub> indication option (GMW83A) IP30 enclosure
READ MORE	<a href="#">» DATASHEET</a>	<a href="#">» DATASHEET</a>	<a href="#">» DATASHEET</a>

# Wall transmitters

When reliability is a priority.

Transmitters designed for demanding environments  
- prestigious for reliability and unrivaled measurement performance.





	HMT120/130 SERIES Humidity and Temperature Transmitters	TMT120/130 SERIES Temperature Transmitters	HMW110 SERIES Humidity and Temperature Transmitters
			
INSTALLATION	Wall-mount, duct-mount, outdoor	Wall-mount, duct-mount, outdoor	Wall-mount
OUTPUT PARAMETERS	Relative humidity Temperature Dew point / frost point temperature Wet bulb temperature Enthalpy Mixing ratio	Temperature	Relative humidity Temperature Dew point temperature Wet bulb temperature Enthalpy
OUTPUT OPTIONS	4...20 mA loop powered 0...1/0...5/0...10 V	4...20 mA loop powered 0...1/0...5/0...10 V	4...20 mA loop powered Modbus RTU
DETAILS	Accuracy $\pm 1.5\%$ Rh, $\pm 0.1$ °C ( $\pm 0.18$ °F) Display option IP65 enclosure Interchangeable probes Cable probe option Duct mounting kit option Calibration certificate	Accuracy $\pm 0.1$ °C ( $\pm 0.18$ °F) Display option IP65 enclosure Interchangeable probes Cable probe option Duct mounting kit option Calibration certificate	Accuracy $\pm 2\%$ Rh, $\pm 0.2$ °C ( $\pm 0.36$ °F) Display option IP65 enclosure M12 connector option Calibration certificate
READ MORE	<a href="#">» DATASHEET</a>	<a href="#">» DATASHEET</a>	<a href="#">» DATASHEET</a>





	TMW110 SERIES Temperature Transmitters	HMW88/89 Humidity and Temperature Transmitters	TMW88 Temperature Transmitters	GMW87/88 Carbon Dioxide Transmitters
				
INSTALLATION	Wall-mount	Wall-mount	Wall-mount	Wall-mount
OUTPUT PARAMETERS	Temperature	Relative humidity Temperature Dew point temperature Wet bulb temperature Enthalpy	Temperature	Carbon dioxide
OUTPUT OPTIONS	4...20 mA loop powered Modbus RTU	4...20 mA loop powered 0...10 V	4...20 mA loop powered	4...20 mA, 0...10 V Modbus RTU (GMW87)
DETAILS	Accuracy $\pm 0.2$ °C ( $\pm 0.36$ °F) Display option IP65 enclosure M12 connector option Calibration certificate	Accuracy $\pm 3\%$ Rh, $\pm 0.3$ °C ( $\pm 0.54$ °F) Display option IP65 enclosure	Accuracy $\pm 0.3$ °C ( $\pm 0.54$ °F) IP65 enclosure	Accuracy $\pm 60$ ppm at 1000 ppm CO <sub>2</sub> CO <sub>2</sub> range 0...5000 ppm IP64 enclosure
READ MORE	<a href="#">» DATASHEET</a>	<a href="#">» DATASHEET</a>	<a href="#">» DATASHEET</a>	<a href="#">» DATASHEET</a>

# Duct/immersion transmitters

For the premium performance.





With our top-of-the-line sensors you can always trust the measurement. It is the best possible input to your control loop.

	HMD60 SERIES Humidity and Temperature Transmitters	TMD60 SERIES Temperature Transmitters	HMD110 SERIES Humidity and Temperature Transmitters	TMD110 SERIES Temperature Transmitters
				
INSTALLATION	Duct-mount	Duct-mount	Duct-mount	Duct-mount
OUTPUT PARAMETERS	Relative humidity Temperature Dew point temperature Wet bulb temperature Enthalpy Absolute humidity Mixing ratio	Temperature	Relative humidity Temperature Dew point temperature Wet bulb temperature Enthalpy	Temperature
OUTPUT OPTIONS	4...20 mA loop powered 0...10 V Modbus RTU BACnet MS/TP	4...20 mA loop powered	4...20 mA loop powered Modbus RTU	4...20 mA loop powered Modbus RTU
DETAILS	Accuracy $\pm 1.5\%$ Rh, $\pm 0.1$ °C ( $\pm 0.18$ °F) Metal enclosure & probe IP66 (NEMA4X) enclosure Optional probe lengths 25 cm / 10 cm (10" / 4") Calibration certificate	Accuracy $\pm 0.1$ °C ( $\pm 0.18$ °F) Metal enclosure & probe IP66 (NEMA4X) enclosure Optional probe lengths 25 cm / 10 cm (10" / 4") Calibration certificate	Accuracy $\pm 2\%$ Rh, $\pm 0.2$ °C ( $\pm 0.36$ °F) Display option IP65 enclosure Calibration certificate	Accuracy $\pm 0.2$ °C ( $\pm 0.36$ °F) Display option IP65 enclosure Calibration certificate
READ MORE	<a href="#">» DATASHEET</a>	<a href="#">» DATASHEET</a>	<a href="#">» DATASHEET</a>	<a href="#">» DATASHEET</a>

	GMD110 SERIES Carbon Dioxide Transmitters	TMI110 SERIES Temperature Transmitters	HMD82/83, TMD82 Humidity and Temperature Transmitters	PDT101 Differential Pressure Transmitters
				
INSTALLATION	Duct-mount	Immersion type (in thermowell), or duct-mount	Duct-mount	Wall-mount / DIN-rail
OUTPUT PARAMETERS	Carbon dioxide	Temperature	Relative humidity Temperature Dew point temperature Wet bulb temperature Enthalpy	Differential pressure (air)
OUTPUT OPTIONS	4...20 mA 0...10 V Modbus RTU	4...20 mA loop powered Modbus RTU	4...20 mA loop powered 0...10 V	4...20 mA 0...5/10 V
DETAILS	Accuracy $\pm 40$ ppm CO <sub>2</sub> CO <sub>2</sub> ranges 2000/5000/10000 ppm IP65 enclosure Calibration certificate	Accuracy $\pm 0.1$ °C Probe lengths 100/150/200 mm Thermowells available IP65 enclosure Calibration certificate	Accuracy $\pm 3\%$ Rh, $\pm 0.3$ °C ( $\pm 0.54$ °F) Display option IP65 enclosure	Accuracy 0.4% / 1% of span Unidirectional / bidirectional models Optional pressure ranges IP40 enclosure
READ MORE	<a href="#">» DATASHEET</a>	<a href="#">» DATASHEET</a>	<a href="#">» DATASHEET</a>	<a href="#">» DATASHEET</a>

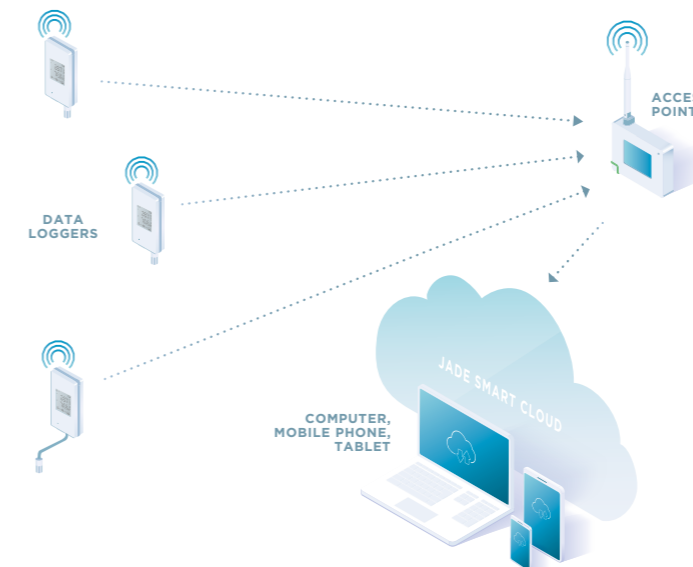
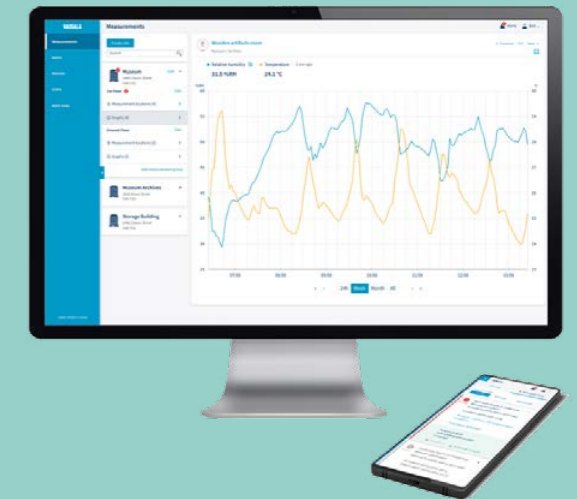
# Outdoor and weather transmitters

# Wireless monitoring system

	HMS110 SERIES Humidity and Temperature Transmitters	HMS82/83 & TMS82 Humidity and Temperature Transmitters	GMP252 Carbon Dioxide Probe with DTR250 Radiation Shield	WXT530 SERIES Weather Transmitters
				
INSTALLATION	Outdoor model with integrated radiation shield	Outdoor model with integrated radiation shield	Outdoor model with radiation shield	Outdoor model with integrated radiation shield
OUTPUT PARAMETERS	Relative humidity Temperature Dew point temperature Wet bulb temperature Enthalpy	Relative humidity Temperature Dew point temperature Wet bulb temperature Enthalpy	Carbon dioxide	Air pressure Temperature Humidity Rainfall Wind speed Wind direction
OUTPUT OPTIONS	4...20 mA loop powered Modbus RTU	4...20 mA loop powered 0...10 V	4...20 mA 0...10 V Modbus RTU	Modbus RTU
DETAILS	Accuracy ±2% Rh, ±0.2 °C (±0.36 °F) IP65 rating Calibration certificate	Accuracy ±3% Rh, ±0.3 °C (±0.54 °F) IP65 rating	Accuracy ±40 ppm at 400 ppm CO <sub>2</sub> CO <sub>2</sub> ranges 0...3000/3000/5000 ppm	Accuracy ±0.5 hPa, ±0.3 °C (±0.54 °F), ±3% Rh, ±3% at 10 m/s
READ MORE	» <a href="#">DATASHEET</a>	» <a href="#">DATASHEET</a>	» <a href="#">DATASHEET</a>	» <a href="#">DATASHEET</a>

## Jade Smart Cloud

Vaisala Jade Smart Cloud combines high-class industrial measurements with easy-to-use cloud-based remote monitoring to enable new levels of competence and flexibility for professionals.



### System hardware

The Jade Smart Cloud hardware selection contains data loggers, access points, and measurement probes. Simply choose the number of measurement points you want, add the probes to match, and start measuring. The system is always delivered ready to use.

### Jade Smart Cloud application

Get insights easily in real-time. You can choose to see an overview of readings from all your connected loggers or drill down to view data from a specific site or measurement group. Accessing the system couldn't be easier – all you need is a laptop, tablet, or smartphone with an internet connection.

» [Vaisala.com/jade](https://www.vaisala.com/jade)

# Measurement solutions where it truly matters

## Data Centers & Mission-Critical Buildings

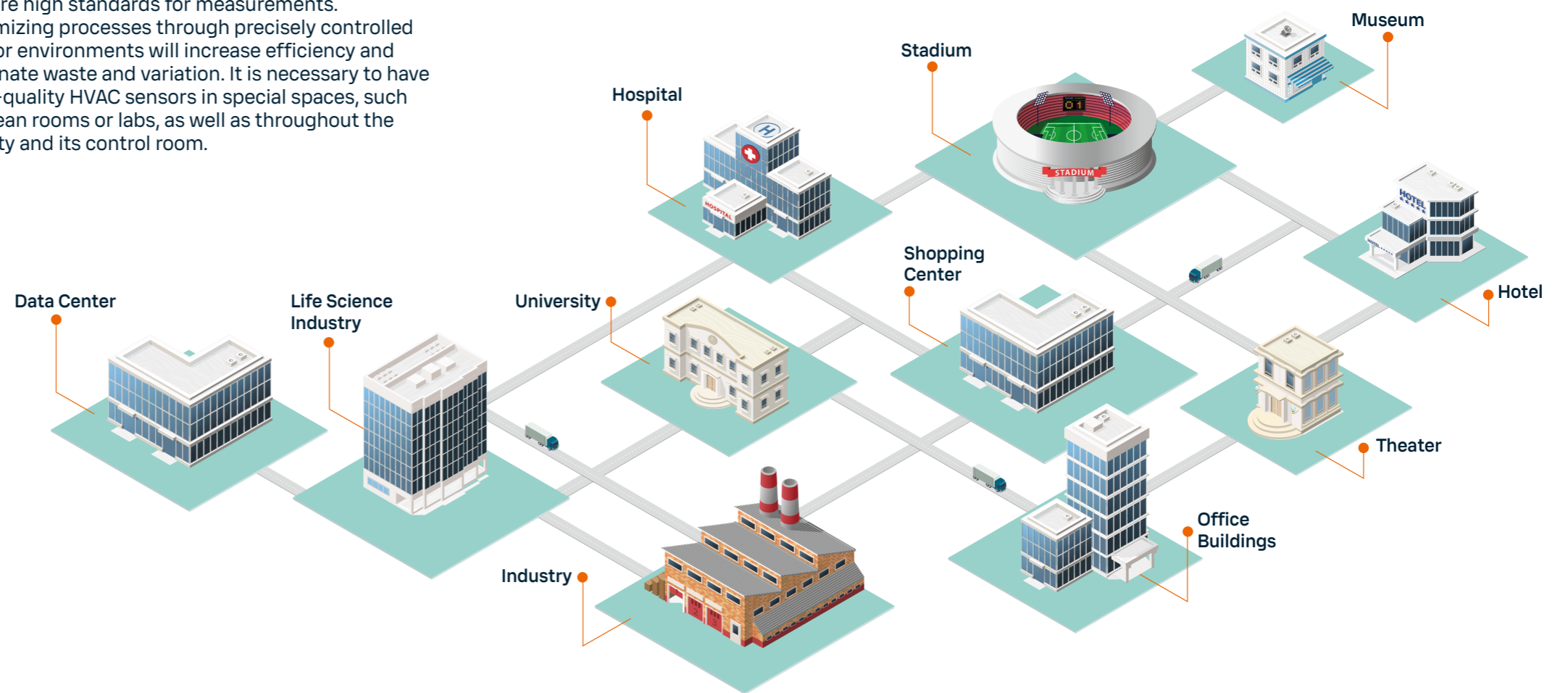
HVAC sensors constitute an integral component in the management of building systems. In mission-critical facilities, such as data centers, the importance of these sensors becomes even more pronounced, given their potential to impact energy consumption and efficiency. The reliability of these sensors is critical to ensuring optimal control of building systems, be it in data halls or control rooms.

## Commercial Buildings

In the realm of commercial buildings, reliable measurements play a critical role in ensuring optimal operations. Of paramount importance in these structures are energy efficiency, sustainability, as well as comfortable and healthy indoor conditions. This necessitates the use of high-reliability instruments with minimal drifting, as they serve to mitigate maintenance requirements and ensure smooth operation of all building systems. It is crucial to prioritize reliable measurements and invest in high-quality instruments to achieve optimal efficiency and minimize operational costs.

## Manufacturing & Industrial Facilities

Manufacturing facilities and industrial facilities require high standards for measurements. Optimizing processes through precisely controlled indoor environments will increase efficiency and eliminate waste and variation. It is necessary to have high-quality HVAC sensors in special spaces, such as clean rooms or labs, as well as throughout the facility and its control room.





## Sustainability in the heart of our business

Vaisala's premium measurement solutions enhance safety, efficiency, and decisionmaking – for a sustainable future on our planet.

The heart of Vaisala's sustainability lies in the positive impact of our products, as they help our customers, for example, to increase energy efficiency and reduce emissions.

» [Learn more about our sustainability.](#)



## Global coverage with local presence

As a global leader in industrial, weather and environmental measurements, we provide reliable, accurate and innovative products and solutions that enabling better decision-making, increased productivity, and improved safety and quality.

Customers all over the world and in a multitude of industries use our measurement solutions. Everywhere from forecasting weather and making sure it is safe for your flight to take off, to staying ahead of power outages or monitoring incubators for premature children in hospitals, you can find Vaisala's premium measurement solutions in action all over the world.

» [Find your local contact.](#)

# Available online 24/7



Our products are easily available, any time, through the Vaisala Online Store. We have fast deliveries on all new instrument as well as spare part online orders. All instruments are made to order and calibrated just before shipment.

» [store.vaisala.com](https://store.vaisala.com)



### Free shipping

Fast, free deliveries on all new instrument & spare part online orders



### Safe Payment

Easy and secure payments options



### Calibration

All instruments are made to order and calibrated just before shipment

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# Product Catalog

Probes · Transmitters · Software · Applications

**VAISALA INDIGO FAMILY**



**VAISALA**

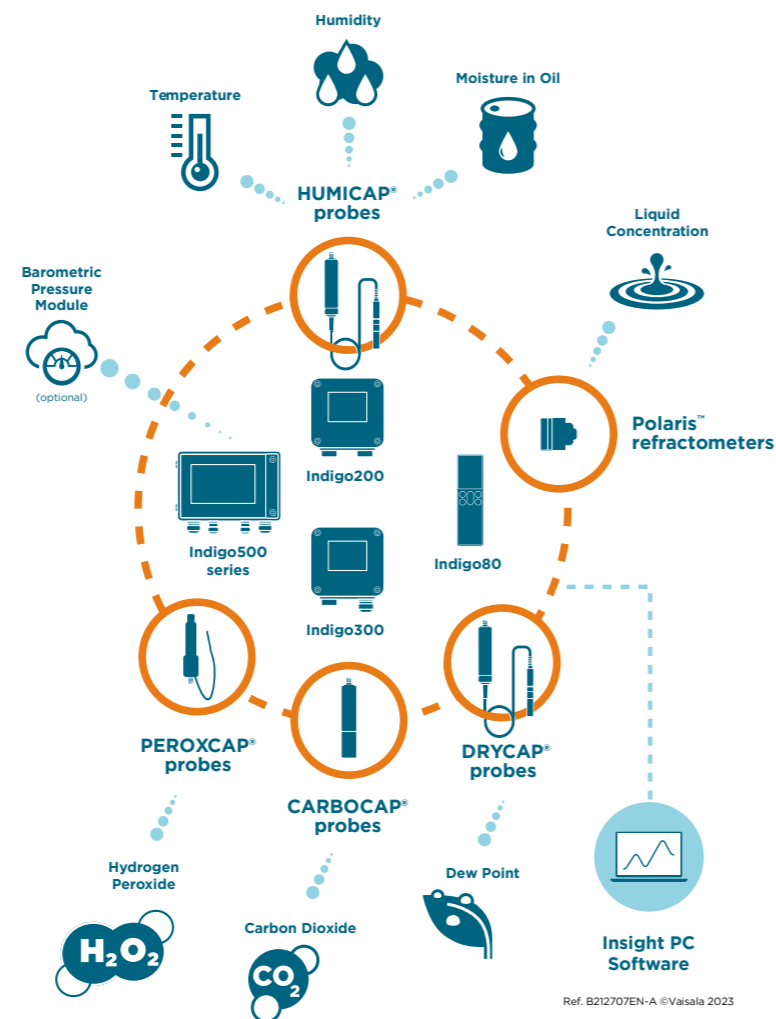


# Modular measurement system to fit every need

## The Vaisala Indigo Family in brief

- **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.

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



## Probes with high 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

- Plug-and-play probe connection
- Dual-probe model enables multi-parameter measurement
- 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

### What combination is the best for you?





» [Try our Indigo selector tool](#), where you can define your measurement need, and we'll give an instant recommendation!





# Indigo compatible probes

## 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. All probes are supplied with RS-485 non-isolated Modbus RTU output.

	HMP1 ambient measurement in indoor spaces and wall-mounting	HMP3 general-purpose use and duct-mounting	HMP4 high-pressure or vacuum environments	HMP5 high temperature environments
				
MEASUREMENT RANGE	0 ... 100 %RH -40 ... +60 °C (-40 ... +140 °F)	0 ... 100 %RH -40 ... +120 °C (-40 ... +248 °F)	0 ... 100 %RH -70 ... +180 °C (-94 ... +356 °F)	0 ... 100 %RH -70 ... +180 °C (-94 ... +356 °F)
ACCURACY AT +23 °C (+73.4 °F)	±1.0 %RH (0 ... 90 %RH) ±0.2 °C (±0.36 °F)	±0.8 %RH (0 ... 90 %RH) ±0.1 °C (±0.18 °F)	±0.8 %RH (0 ... 90 %RH) ±0.1 °C (±0.18 °F)	±0.8 %RH (0 ... 90 %RH) ±0.1 °C (±0.18 °F)
OPERATING ENVIRONMENT TEMPERATURE	-40 ... +60 °C (-40 ... +140 °F)	probe head -40 ... +120 °C (-40 ... +248 °F) probe body -40 ... +80 °C (-40 ... +176 °F)	probe head -70 ... +180 °C (-94 ... +356 °F) probe body -40 ... +80 °C (-40 ... +176 °F)	probe head -70 ... +180 °C (-94 ... +356 °F) probe body -40 ... +80 °C (-40 ... +176 °F)
OPERATIONAL PRESSURE			< 100 bar	
OUTPUT PARAMETERS	Absolute humidity Relative humidity Temperature Wet-bulb temperature Dew/frost point temperature Water concentration Water mass fraction Water vapor pressure Water vapor saturation pressure Enthalpy Mixing ratio	Absolute humidity Relative humidity Temperature Wet-bulb temperature Dew/frost point temperature Water concentration Water mass fraction Water vapor pressure Water vapor saturation pressure Enthalpy Mixing ratio	Absolute humidity Relative humidity Temperature Wet-bulb temperature Dew/frost point temperature Water concentration Water mass fraction Water vapor pressure Water vapor saturation pressure Enthalpy Mixing ratio	Absolute humidity Relative humidity Temperature Wet-bulb temperature Dew/frost point temperature Water concentration Water mass fraction Water vapor pressure Water vapor saturation pressure Enthalpy Mixing ratio
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	HMP7 high-temperature and/or condensing environments	HMP8 high-pressure or leak-tight installation	HMP9 rapidly changing environments	TMP1 demanding temperature measurements
				
MEASUREMENT RANGE	0 ... 100 %RH -70 ... +180 °C (-94 ... +356 °F)	0 ... 100 %RH -70 ... +180 °C (-94 ... +356 °F)	0 ... 100 %RH -40 ... +120 °C (-40 ... +248 °F)	-70 ... +180 °C (-94 ... +356 °F)
ACCURACY AT +23 °C (+73.4 °F)	±0.8 %RH (0 ... 90 %RH) ±0.1 °C (±0.18 °F)	±0.8 %RH (0 ... 90 %RH) ±0.1 °C (±0.18 °F)	±0.8 %RH (0 ... 90 %RH) ±0.1 °C (±0.18 °F)	±0.06 °C (±0.108 °F) *
OPERATING ENVIRONMENT TEMPERATURE	probe head -70 ... +180 °C (-94 ... +356 °F) probe body -40 ... +80 °C (-40 ... +176 °F)	probe head -70 ... +180 °C (-94 ... +356 °F) probe body -40 ... +80 °C (-40 ... +176 °F)	probe head -40 ... +120 °C (-40 ... +248 °F) probe body -40 ... +60 °C (-40 ... +140 °F)	probe head -70 ... +180 °C (-94 ... +356 °F) probe body -40 ... +80 °C (-40 ... +176 °F)
OPERATIONAL PRESSURE	< 10 bar	< 40 bar		
OUTPUT PARAMETERS	Absolute humidity Relative humidity Temperature Wet-bulb temperature Dew/frost point temperature Water concentration Water mass fraction Water vapor pressure Water vapor saturation pressure Enthalpy Mixing ratio	Absolute humidity Relative humidity Temperature Wet-bulb temperature Dew/frost point temperature Water concentration Water mass fraction Water vapor pressure Water vapor saturation pressure Enthalpy Mixing ratio	Absolute humidity Relative humidity Temperature Wet-bulb temperature Dew/frost point temperature Water concentration Water mass fraction Water vapor pressure Water vapor saturation pressure Enthalpy Mixing ratio	Temperature Water vapor saturation pressure
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\*) when including the ISO17025 accredited calibration

[» Watch a video about Vaisala Indigo humidity and temperature probes and how to use them in different applications](#)

# 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. All probes are supplied with RS-485 non-isolated Modbus RTU output.

	DMP5 high temperatures	DMP6 very high temperatures	DMP7 leak-tight installation	DMP8 high-pressure or leak-tight installation
				
MEASUREMENT RANGE	Dew point -40 ... +100 °C (-40 ... +212 °F) Td/f Temperature 0 ... +180 °C (+32 ... +356 °F) Mixing ratio 0 ... 1000 g/kg (0 ... 7000 gr/lbs) Absolute humidity 0 ... 600 g/m <sup>3</sup>	Dew point -25 ... +100 °C (-13 ... +212 °F) Td/f Mixing ratio 0 ... 1000 g/kg (0 ... 7000 gr/lbs)	Dew point -70 ... +80 °C (-94 ... +176 °F) Td/f Temperature 0 ... +80 °C (+32 ... +176 °F) Relative humidity 0 ... 70 %RH Concentration by volume 10 ... 2500 ppm	Dew point -70 ... +80 °C (-94 ... +176 °F) Td/f Temperature 0 ... +80 °C (+32 ... +176 °F) Relative humidity 0 ... 70 %RH Concentration by volume 10 ... 2500 ppm
ACCURACY	Dew point ±2 °C (±3.6 °F) Td/f Temperature ±0.4 °C (±0.72 °F) at +100 °C (+212 °F) Mixing ratio ±12 % of reading Absolute humidity ±10 % of reading (typical)	Dew point ±2 °C (±3.6 °F) Td/f Mixing ratio ±12 % of reading	Dew point Up to ±2 °C (±3.6 °F) Td/f Temperature ±0.2 °C at room temperature Relative humidity ±0.004 %RH + 20% of reading (RH <10 %RH, at + 20 °C) Concentration by volume 1 ppm + 20% of reading (at + 20 °C, 1 bar)	Dew point ±2 °C (±3.6 °F) Td/f Temperature ±0.2 °C at room temperature Relative humidity ±0.004 %RH + 20% of reading (RH <10 %RH, at + 20 °C) Concentration by volume 1 ppm + 20% of reading (at + 20 °C, 1 bar)
OPERATING ENVIRONMENT TEMPERATURE	probe head -40 ... +180 °C (-40 ... +356 °F) probe body -40 ... +80 °C (-40 ... +176 °F)	probe head +100 ... +350 °C (+212 ... +662 °F) probe body -40 ... +80 °C (-40 ... +176 °F)	probe head -40 ... +80 °C (-40 ... +176 °F) probe body -40 ... +80 °C (-40 ... +176 °F)	probe head -40 ... +80 °C (-40 ... +176 °F) probe body -40 ... +80 °C (-40 ... +176 °F)
OPERATIONAL PRESSURE			0 ... 10 bar (0 ... 145 psia)	0 ... 40 bar (0 ... 580 psia)
OUTPUT PARAMETERS	Absolute humidity Relative humidity Dew point temperature Temperature Dew/frost point temperature Water concentration Water mass fraction Water vapor pressure Enthalpy Water vapor saturation pressure Mixing ratio	Dew point temperature Water concentration Dew/frost point temperature Water mass fraction Water vapor pressure Mixing ratio	Absolute humidity Relative humidity Dew point temperature Temperature Dew/frost point temperature Water concentration Water mass fraction Water vapor pressure Enthalpy Water vapor saturation pressure Mixing ratio	Absolute humidity Relative humidity Dew point temperature Temperature Dew/frost point temperature Water concentration Water mass fraction Water vapor pressure Enthalpy Water vapor saturation pressure Mixing ratio
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# Carbon dioxide (CO<sub>2</sub>) probes

Indigo-compatible carbon dioxide (CO<sub>2</sub>) 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.

	GMP251 %-level measurements	GMP252 ppm-level measurements
		
MEASUREMENT RANGE	0 ... 20 % CO <sub>2</sub>	0 ... 10,000 ppm CO <sub>2</sub> (up to 30 000 ppm CO <sub>2</sub> with reduced accuracy)
ACCURACY	At 5 %CO <sub>2</sub> ±0.1 %CO <sub>2</sub> At 0 ... 8 %CO <sub>2</sub> ±0.2 %CO <sub>2</sub> At 8 ... 20 %CO <sub>2</sub> ±0.4 %CO <sub>2</sub>	0 ... 3000 ppm CO <sub>2</sub> ±40 ppm CO <sub>2</sub> 3000 ... 10 000 ppm CO <sub>2</sub> ±2 % of reading Up to 30 000 ppm CO <sub>2</sub> ±3.5 % of reading
LONG-TERM STABILITY	At 0 ... 8 %CO <sub>2</sub> ±0.3 %CO <sub>2</sub> /year At 8 ... 12 %CO <sub>2</sub> ±0.5 %CO <sub>2</sub> /year at 12 ... 20 %CO <sub>2</sub> ±1.0 %CO <sub>2</sub> /year	0 ... 3000 ppm CO <sub>2</sub> ±60 ppm CO <sub>2</sub> /year 3000 ... 6000 ppm CO <sub>2</sub> ±150 ppm CO <sub>2</sub> /year 6000 ... 10 000 ppm CO <sub>2</sub> ±300 ppm CO <sub>2</sub> /year
OPERATING ENVIRONMENT TEMPERATURE	-40 ... +60 °C (-40 ... +140 °F)	-40 ... +60 °C (-40 ... +140 °F)
OUTPUT OPTIONS	0 ... 5/10 V (scalable), min. load 10 kΩ 0/4 ... 20 mA (scalable), max. load 500 Ω RS-485: Modbus, Vaisala Industrial Protocol	0 ... 5/10 V (scalable), min. load 10 kΩ 0/4 ... 20 mA (scalable), max. load 500 Ω RS-485: Modbus, Vaisala Industrial Protocol
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» [Watch a video on Vaisala CARBOCAP series GMP250 probes and how to use them in carbon dioxide measurements](#)

# 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.

# 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.

	HPP271 H2O2 vapor concentration	HPP272 H2O2 vapor concentration, relative saturation, humidity, and temperature
		
MEASUREMENT RANGE	0 ... 2000 ppm +5 ... +50 °C (+41 ... +122 °F)	10...2000 ppm +5 ... +50 °C (+41 ... +122 °F) 0 ... 100 %RS 0 ... 100 %RH
ACCURACY	At +10 ... +25 °C (+50 ... +77 °F), 10 ... 2000 ppm H2O2 : ±10 ppm or 5 % of reading (whichever is greater)	At +10 ... +25 °C (+50 ... +77 °F), 10 ... 2000 ppm H2O2 : ±10 ppm or 5 % of reading (whichever is greater) ±4 %RS At +25 °C (77 °F), 0 ppm H2O2 0 ... 90 %RH ±1 %RH
OPERATING ENVIRONMENT TEMPERATURE	+0 ... +70 °C (+32 ... +158 °F)	+0 ... +70 °C (+32 ... +158 °F)
OUTPUT PARAMETERS	Vaporized hydrogen peroxide concentration by volume  Water concentration by volume	Absolute H2O2 and H2O H2O ppm by volume, water vapor saturation pressure (H2O and H2O+H2O2) dew point temperature vapor pressure (H2O and H2O2)
OUTPUT OPTIONS	RS-485, not isolated; do not use termination on the RS-485 line	RS-485, not isolated; do not use termination on the RS-485 line
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» [Watch a video on how to connect a vaporized hydrogen peroxide probe to a Vaisala Indigo transmitter](#)

	MMP8
	
MEASUREMENT RANGE	Water activity 0 ... 1 aw Temperature -40 ... +180 °C (-40 ... +356 °F)
T90 RESPONSE TIME	10 min
ACCURACY	Water activity ±0.01 aw (±1 %RS) Water concentration in oil 10 % of the reading Temperature ±0.2 °C (0.36 °F) at +20 °C (+68 °F)
OPERATING ENVIRONMENT TEMPERATURE	probe head -40 ... +180 °C (-40 ... +356 °F) probe body -40 ... +80 °C (-40 ... +176 °F)
OPERATING PRESSURE RANGE	0 ... 40 bar (0 ... 580 psia)
OUTPUT PARAMETERS	Relative saturation (%RS) Temperature (°C) Water activity Water concentration in oil (ppmv)
OUTPUT OPTIONS	RS-485, not isolated
READ MORE	» <a href="#">DATASHEET</a> » <a href="#">VAISALA.COM</a>

» [Watch an unboxing video on Vaisala Indigo520 Transmitter & MMP8 Probe](#)





# Indigo Transmitters

Host devices for indigo smart probes

Vaisala Indigo transmitters offer many features that complement Indigo-compatible 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.

# Software

Vaisala insight PC software

	INDIGO500 TRANSMITTER SERIES		INDIGO300 TRANSMITTER	INDIGO200 TRANSMITTER SERIES	
	Indigo520	Indigo510	Indigo300	Indigo202	Indigo201
					
DISPLAY	Touchscreen color LCD display or non-display with LED indicator	Touchscreen color LCD display or non-display with LED indicator	Color LCD display with LED indicator	Color LCD display	Color LCD display or non-display with LED indicator
COMMUNICATION	Modbus TPC/IP	Modbus TPC/IP	Analog output	RS-485, Modbus RTU	Analog output
ANALOG OUTPUTS	4 pcs	2 pcs	3 pcs (pre-configured)	No	3 pcs
RELAYS	2 pcs	No	No	2 pcs	2 pcs
ANALOG INPUTS	1 pc	No	No	No	No
POWERING	15 ... 35 VDC 24 VAC 100 ... 240 VAC PoE+	11 ... 35 VDC 24 VAC	15 ... 30 VDC 24 VAC	15 ... 30 VDC 24 VAC	15 ... 30 VDC 24 VAC
GALVANIC ISOLATION	Yes	Yes	No	No	No
DATA LOGGING	10 years' storage with 24 h interval logging	10 years' storage with 24 h interval logging	No	No	No
REMOTE ACCESS VIA INSIGHT PC SOFTWARE	Yes	Yes	Yes	Yes	Yes
ENCLOSURE	Metal, IP66, NEMA4	Metal, IP66, NEMA4	Metal, IP66	Plastics, IP65	Plastics, IP65
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## 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.

[» Read more](#)



Vaisala Insight PC Software provides quick access to the configuration options and calibration data of Indigo-compatible 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.

- Configure devices to fit perfectly to your needs
- Calibrate and adjust probes on-site
- Run tests and analyze results with 48h data logging functionality

[» Download Insight PC software for free.](#)


# Indigo80 handheld indicator

For portable diagnostics





Vaisala Indigo80 Handheld Indicator is an industrial-grade portable diagnostics tool. Accommodating up to two Vaisala measurement probes, Indigo80 is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting Vaisala Indigo-compatible probes and transmitters.

## Features

- Dual-probe, high-accuracy portable diagnostics and data logging tool. Log up to a month's worth of measurement data.
- Industry standard USB-C interface for data uploads and battery charging. Lithium-ion battery provides a typical operation time of 10 hours.
- Robust, durable aluminum body is resistant to chemicals and dust.
- Multilingual, menu-based user interface available in 10 languages. View live measurement data as numbers or graphs.
- Intuitive user interface that guides the user if needed. Designed to be easy to use.

INDIGO80 Handheld Indicator	
	
OPERATING ENVIRONMENT	Temperature -20 ... +50 °C [-4 ... +122 °F] Humidity 20 ... 85 %RH, when Ta ≤ +40 °C [+104 °F]
MAX. NUMBER OF CONNECTED PROBES	2
DATA LOGGING CAPACITY	Up to 5.5 million real-time data values
LOGGING INTERVAL	1 s ... 12 h
LOGGING DURATION	1 min ... memory full
ALARM	Audible alarm function
SUPPORTE LANGUAGES	English, Chinese, Finnish, French, German, Italian, Japanese, Portuguese, Spanish, Swedish
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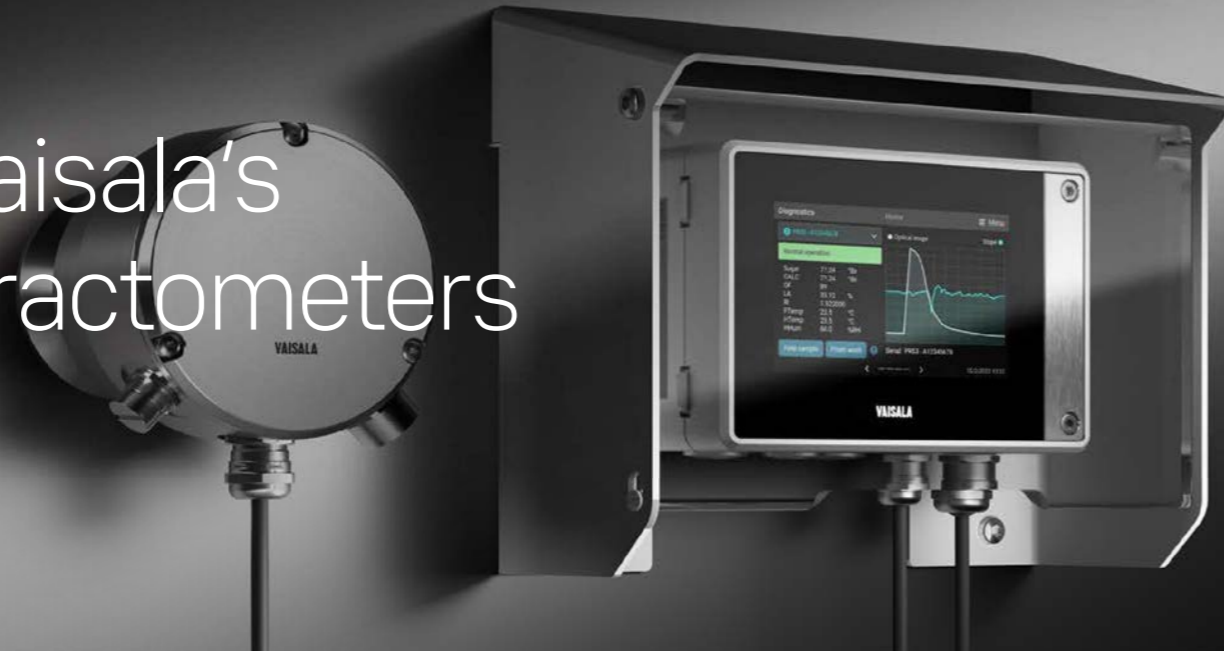
# Indigo80 handheld probes

	HMP80N Humidity and temperature handheld probe	HMP80L Humidity and temperature handheld probe	DMP80A Dew point and temperature handheld probe	DMP80B Dew point and temperature handheld probe
				
MEASUREMENT RANGE	0 ... 100 %RH -20 ... +60 °C [-4 ... +140 °F]	0 ... 100 %RH -50 ... +120 °C [-58 ... +248 °F], shorttime measurement range -50 ... +180 °C [-58 ... +356 °F]	Dew point -40 ... +60 °C [-40 ... +140 °F] Td/f Temperature 0 ... +60 °C [+32 ... +140 °F] Mixing ratio 0 ... 150 g/kg (0 ... 1050 gr/lbs) Absolute humidity 0 ... 130 g/m3	Dew point -70 ... +60 °C [-94 ... +140 °F] Td/f Temperature -10 ... +60 °C [+14 ... +140 °F] Relative humidity 0...70 %RH Concentration by volume 10 ... 2500 ppm
ACCURACY AT +23 °C [+73.4 °F]	±0.8 %RH (0 ... 90 %RH) 0.1 °C (0.18 °F)	±0.8 %RH (0 ... 90 %RH) 0.1 °C (0.18 °F)	Dew point Up to ±2 °C [±3.6 °F] Td/f Temperature ±0.2 °C [±0.36 °F] at room temperature Mixing ratio ±12 % of reading Absolute humidity 0 ... 130 g/m3	Dew point Up to ±2 °C [±3.6 °F] Td/f Temperature ±0.2 °C [±0.36 °F] at room temperature Relative humidity (RH <10 %RH, at +20 °C): ±0.004 %RH + 20 % of reading Concentration by volume (at + 20 °C, 1 bar) 1 ppm + 20 % of reading
OPERATING ENVIRONMENT TEMPERATURE	probe head -20 ... +60 °C [-4 ... +140 °F] probe body -10 ... +60 °C [-14 ... +140 °F]	probe head -50 ... +120 °C [-58 ... +248 °F] probe body -10 ... +60 °C [-14 ... +140 °F]	-10 ... +60 °C [+14 ... +140 °F]	-10 ... +60 °C [+14 ... +140 °F]
OPERATING PRESSURE OF PROBE HEAD			0 ... 20 bar (absolute) (0 ... 290 psi (absolute))	0 ... 20 bar (absolute) (0 ... 290 psi (absolute))
OUTPUT PARAMETERS	Absolute humidity Relative humidity Temperature Wet-bulb temperature Dew/frost point temperature Water concentration Water mass fraction Water vapor pressure Water vapor saturation pressure Enthalpy Mixing ratio	Absolute humidity Relative humidity Temperature Wet-bulb temperature Dew/frost point temperature Water concentration Water mass fraction Water vapor pressure Water vapor saturation pressure Enthalpy Mixing ratio	Absolute humidity Relative humidity Dew point temperature Temperature Dew/frost point temperature Water concentration Water mass fraction Water vapor pressure Enthalpy Water vapor saturation pressure Mixing ratio	Absolute humidity Relative humidity Dew point temperature Temperature Dew/frost point temperature Water concentration Water mass fraction Water vapor pressure Enthalpy Water vapor saturation pressure Mixing ratio
IP RATING	Cable attached IP67 Without cable IP55	Cable attached IP67 Without cable IP55	Cable attached IP67 Without cable IP55	Cable attached IP67 Without cable IP55
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» [Watch the video on how to use Indigo80 and handheld probes.](#)









# Indigo for Vaisala's process refractometers



## Accurate liquid concentration measurements

Vaisala Polaris® process refractometers are now Indigo compatible. Expand features with Indigo and get the most out of your measurement, including data logging, wash control, settings, measurement parameters and service updates. Select two analog or digital inputs for process refractometers and other Indigo compatible probes, and four configurable analog outputs to alarm relays, and ModBus TCP/IP digital protocol.

	PR53AC	PR53AP	PR53GC
			
MEASUREMENT	Measure Brix and other liquid concentrations	Measure Brix and other liquid concentrations	Measure concentrations of acids, alkaline solutions, alcohols, hydrocarbons, solvents, and various other solutions
BENEFIT	Inline measurement with instant productivity and material gains, and simplified process operation	Inline measurement with instant productivity and material gains, and simplified process operation	Inline measurement directly in pipeline, in production transport, and quality control
INDUSTRY	Food, beverage, dairy, and brewery	Food, beverage, dairy and brewery, including OEMs	Chemical, and other industries
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PR53GP	PR53SD	PR53W	PR53M
			
Measure concentrations of sugars/ Brix, acids, alkaline solutions, alcohols, hydrocarbons, solvents, and various other solutions	Measure TDS and other concentrations	Measure concentrations of aggressive chemicals: sulphuric acid (H <sub>2</sub> SO <sub>4</sub> ), hydrochloric acid (HCl), sodium hydroxide (NaOH), and hydrofluoric acid (HF)	Measure concentrations of aggressive chemicals, including hydrochloric acid (HCl), sodium hydroxide (NaOH), sodium chloride (NaCl), sulphuric acid (H <sub>2</sub> SO <sub>4</sub> ), and hydrofluoric acid (HF)
Inline measurement directly in pipelines and tanks, in production transport and perform quality control	Process optimization, black liquor, green liquor, brown stock washing, and other liquid concentrations in fiber and chemical recovery lines	Durability in the harshest conditions. Measure safely and accurately in large pipelines and tanks, The PR53W process refractometer is mounted in a membrane-lined valve body, with no metallic wetted parts included. This allows convenient flange mounting to 1 and 2 inch ANSI and DN50 and DN25 flanges.	Durability in the harshest conditions. Measure safely and accurately, the integrated ultra-pure PTFE flow cell has no metallic wetted parts, making it fully suitable to be in contact with aggressive chemicals. The PR53M mounts into ½ inch process line with a standard NTP-threaded connection.
Sugar, chemical, petrochemical, and other industries	Pulp, paper	Chemical, biochemical, mining and metal refining	Chemical, semiconductor
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# Indigo for power transformers

# Indigo for outdoor measurement



## Real-time moisture measurement for power transformers

Get robust and reliable always-on data about your power transformer's condition. Make smarter decisions on maintenance need and the next steps to take. Simply connect Vaisala's MHT410 and MMP8 probes to your Indigo transmitter.

» [Read more](#)

- Monitor the moisture gradient between top and bottom oil in ONAN(F) cooled transformers
- Ensure you don't compromise your oil's dielectric strength
- Monitor the operational efficiency of an online oil dryer

## Outdoor weather kit for accurate measurement data

Protect your measurements from weather without compromising the data. Indigo500MIK brings you a unique combination of a meteorological grade barometer in a single industrial device, combined with high-class humidity and temperature measurements. Get your professional grade measurements in robust, weatherproof enclosure.

» [Read more](#)

### All the measurement devices are well protected from the outdoor elements

- the probes are installed inside solar radiation shields
- the probe wires are located inside an aluminum enclosure
- the transmitter is covered by a rain shield



## Sustainability in the heart of our business

Vaisala's premium measurement solutions enhance safety, efficiency, and decisionmaking – for a sustainable future on our planet.

The heart of Vaisala's sustainability lies in the positive impact of our products, as they help our customers, for example, to increase energy efficiency and reduce emissions.

» [Learn more about our sustainability.](#)

## Global coverage with local presence

As a global leader in industrial, weather and environmental measurements, we provide reliable, accurate and innovative products and solutions that enabling better decision-making, increased productivity, and improved safety and quality.

Customers all over the world and in a multitude of industries use our measurement solutions. Everywhere from forecasting weather and making sure it is safe for your flight to take off, to staying ahead of power outages or monitoring incubators for premature children in hospitals, you can find Vaisala's premium measurement solutions in action all over the world.

» [Find your local contact.](#)



### HUMICAP sensor's unique benefits

- Excellent long-term stability and repeatability
- Insensitive to dust and most chemicals
- Fast response time
- Sensor heating
- Full recovery from condensation
- The most reliable and accurate humidity measurement

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.

Today, Vaisala is a leading provider of humidity measurement probes to multiple industries and in many applications. Relative humidity sensors are now an industry standard. Here is how it started.

### We need to fix this

Up until the early 1970s, hair hygrometers were widely used despite the unreliable humidity measurements they provided. To address this, Vaisala embarked on the development of a novel humidity sensor employing semiconductors and thin-film materials.

### HUMICAP is born

At the CIMO VI congress in 1973, Vaisala introduced the HUMICAP, the world's first thin-film capacitive humidity sensor. This groundbreaking innovation revolutionized humidity measurements. The HUMICAP sensor had no moving parts and thanks to the advanced utilization of semiconductor and thin-film technologies, it was amazingly small in size.

### From one company's invention to a global standard

Since then, Vaisala has emerged as the market leader in relative humidity measurements, and thin-film capacitive humidity sensors have transcended being one company's invention to a global industry standard.

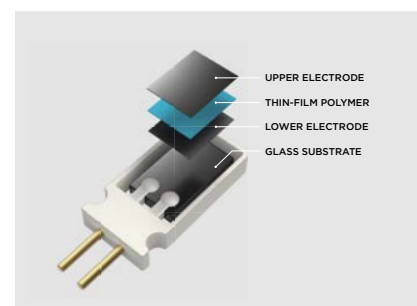
### How it works

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 electrode facing ambient air is made of porous metal to protect the sensor 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.



Structure of the HUMICAP sensor

### Constantly evolving

HUMICAP is not only a sensor, it is a solution to many challenging measurement positions and conditions. HUMICAP is in Vaisala's core and we develop it constantly.



Family of HUMICAP sensors

### Condensation prevention technology with warmed probe

One of Vaisala's innovations in the humidity measurement field includes warmed probe technology for the toughest high humidity environments.

Saturation in the environment causes condensation to form on all surfaces including measurement sensors, which can be fatal for some technologies. A warmed probe keeps the sensor continuously above the ambient temperature, ensuring condensation never forms. With Vaisala's solution, relative humidity measurement is possible in these conditions with an additional Indigo520 transmitter.

### HUMICAP applications

Even though the HUMICAP innovation was originally designed for a new type of a radiosonde, the word got around about reliable humidity measurements, and created a growing demand in many industries and applications. Today we offer 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 outdoors.

### If it works on Mars, it works anywhere

The unforgiving conditions in space pose strict demands on technology, requiring the most reliable sensors that can be trusted to endure without repair. You simply cannot venture out into these conditions with just any instrumentation. Therefore, the HUMICAP products were a natural selection to measure conditions on the planet Mars since 1990s.

## HMP1 Wall-Mounted Humidity and Temperature Probe

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 Indigo300 and Indigo200 series transmitters to form a single wall-mounted unit.



### Features

- Compact size
- RH accuracy up to  $\pm 1.0$  %RH
- Temperature accuracy up to  $\pm 0.2$  °C (0.36 °F)
- Temperature measurement range -40 ... +60 °C (-40 ... +140 °F)
- Sensor purge improves long-term stability and chemical resistance
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products and Insight PC software
- Traceable calibration certificate: 6 points for humidity, 1 point for temperature

### Flexible connectivity

The probe can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://www.vaisala.com/insight).

For more information on the Indigo product family, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

### Sensor purge minimizes effects of contaminants

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

Sensor 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 a 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 Indigo transmitters

With an Indigo300 or 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 transmitter and turn the locking wheel to hold the probe in place. Probe settings can be configured through the transmitter.



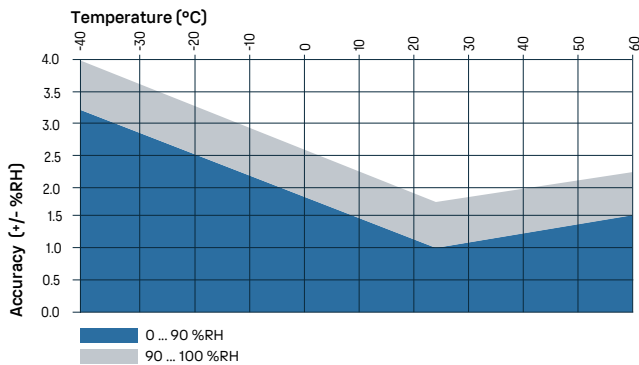
HMP1 with Indigo200 series

# Technical data

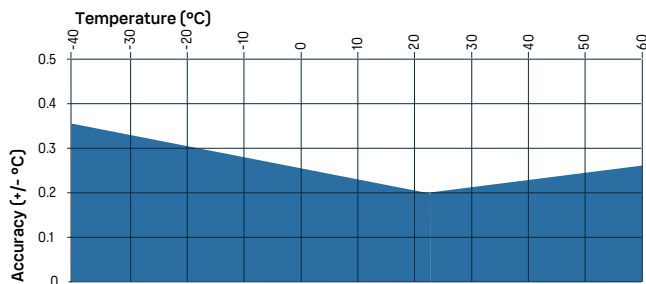
## Measurement performance

Relative humidity	
Measurement range	0-100 %RH
Accuracy at +23 °C (+73.4 °F) <sup>1) 2)</sup>	±1.0 %RH (0-90 %RH)
Factory calibration uncertainty <sup>3)</sup>	±0.7 %RH (0-40 %RH) ±1 %RH (40-95 %RH)
T <sub>63</sub> response time <sup>4)</sup>	21 s
Sensor	HUMICAP® I
Temperature	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy at +23 °C (+73.4 °F) <sup>1) 2)</sup>	±0.2 °C (±0.36 °F)
Factory calibration uncertainty <sup>3)</sup>	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)
T <sub>63</sub> response time <sup>4)</sup>	70 s

- 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.  
 4) In still air.



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 <sup>1)</sup>
IP rating	IP50

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

## Accessories

Indigo USB adapter <sup>1)</sup>	USB2
----------------------------------	------

- 1) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).

## 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

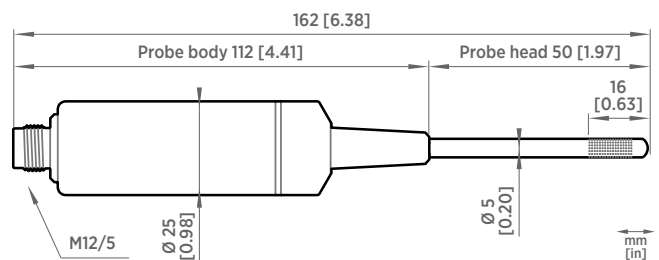
Absolute humidity (g/m <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>v</sub> )
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
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

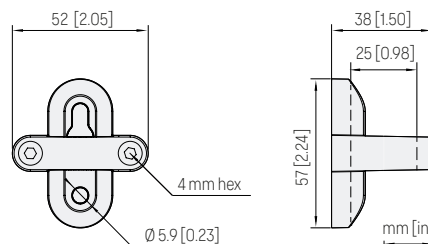
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, RCM

## Mechanical specifications

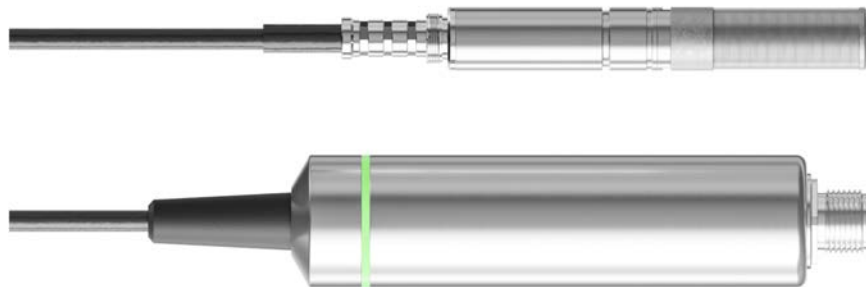
Connector	M12 5-pin A-coded male
Weight	38 g (1.34 oz)
Materials	
Probe	AISI 316L
Probe body	PBT



## HMP1 probe dimensions



## Probe holder ASM213582 dimensions



### 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)
- Sensor purge improves long-term stability and chemical resistance
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products 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 the probe suitable for applications such as paint booths and other industrial applications where periodic recalibration alone is not sufficient for maintaining the probe performance. Other 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

### Sensor purge available with composite sensors

If purchased with a composite sensor instead of the field-replaceable HUMICAP® R2 sensor, HMP3 can use the sensor purge feature. In environments

with high concentrations of chemicals and cleaning agents, sensor purge helps to maintain measurement accuracy between calibration intervals.

Sensor 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).



# Technical data

## Measurement performance

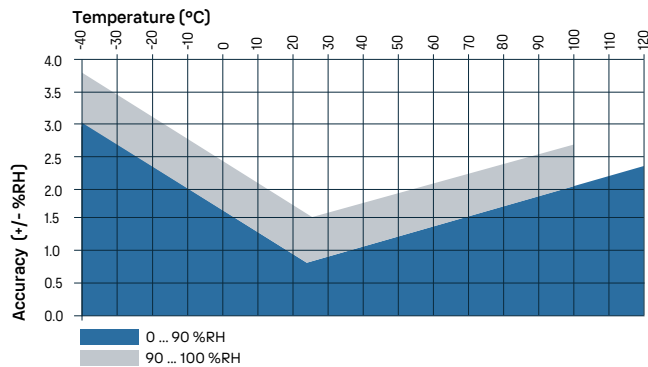
### Relative humidity

Measurement range	0–100 %RH, at max. +95 °C (203 °F) T <sub>d</sub>
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.8 %RH (0–90 %RH)
Factory calibration uncertainty <sup>2)</sup>	±0.5 %RH (0–40 %RH) ±0.8 %RH (40–95 %RH)
T <sub>63</sub> response time	15 s
Sensor options	HUMICAP® R2 HUMICAP® R2C <sup>3)</sup> HUMICAP® 180VC <sup>3) 4)</sup>

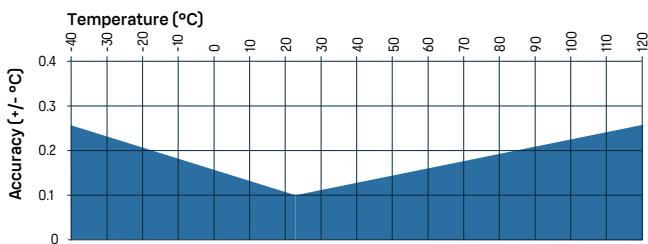
### Temperature

Sensor	Pt100 RTD Class F0.1 IEC 60751
Measurement range	–40 ... +120 °C (–40 ... +248 °F)
Accuracy <sup>1)</sup>	±0.1 °C (±0.18 °F)
Factory calibration uncertainty <sup>2)</sup>	±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) Sensor purge feature available with this sensor.
- 4) H<sub>2</sub>O<sub>2</sub> 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 body	–40 ... +80 °C (–40 ... +176 °F)
Operating temperature of probe head	–40 ... +120 °C (–40 ... +248 °F)
Operating humidity of probe head	Max. +100 °C (212 °F) T <sub>d</sub>
Storage temperature	–40 ... +80 °C (–40 ... +176 °F)
Operating environment	Suitable for outdoor use
Measurement environment	For air, nitrogen, hydrogen, argon, helium, and oxygen <sup>1)</sup>
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 <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>v</sub> )
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
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 and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	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 (with a 2-m cable)	302 g (10.65 oz)
Probe cable length	0.15 m (0.49 ft), 2 m (6.56 ft), 5 m (16.40 ft) or 10 m (32.80 ft)

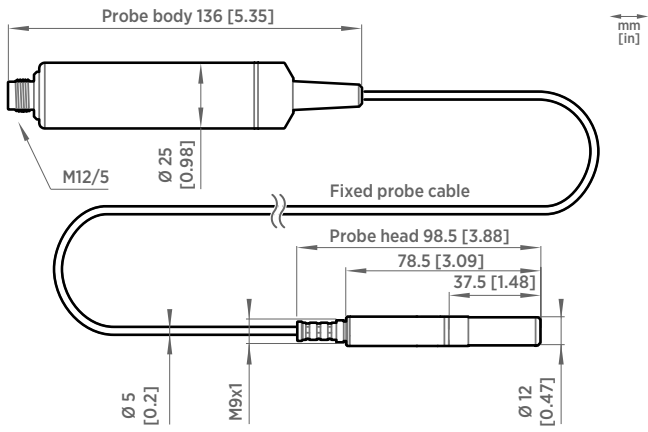
### Materials

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

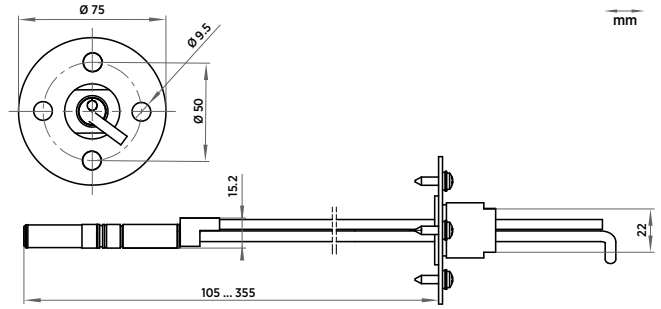
## Accessories

Duct installation kit for humidity probe	210697
Solar radiation shield DTR502B	DTR502B
Cable gland M20×1.5 with split seal	HMP247CG
Magnetic probe holder for Ø 12 mm probe heads <sup>1)</sup>	ASM213382SP
Indigo USB adapter <sup>2)</sup>	USB2

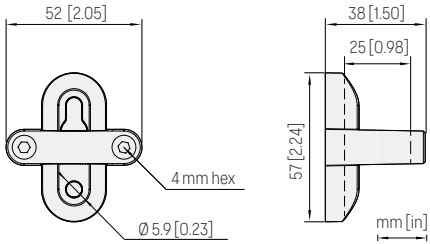
- 1) Not suitable for use at extreme temperatures.
- 2) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).



HMP3 probe dimensions



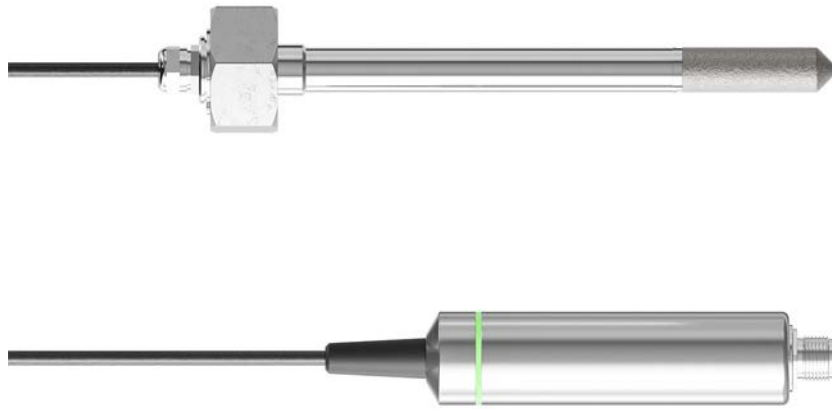
Duct installation kit 210697 dimensions with probe



Probe holder ASM213582 dimensions

## HMP4 Relative Humidity and Temperature Probe

For pressurized and vacuum processes



### Features

- RH accuracy up to  $\pm 0.8$  %RH
- Temperature accuracy up to  $\pm 0.1$  °C ( $\pm 0.18$  °F)
- Temperature measurement range  $-70 \dots +180$  °C ( $-94 \dots +356$  °F)
- Operating pressure 0–100 bar
- Sensor purge improves long-term stability and chemical resistance
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products 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.

### Sensor purge minimizes effects of contaminants

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

The sensor 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

### Relative humidity

Measurement range 0–100 %RH, at max. +95 °C (203 °F)  $T_d$

Accuracy at +23 °C (+73.4 °F) <sup>1)</sup> ±0.8 %RH (0–90 %RH)

Factory calibration uncertainty <sup>2)</sup> ±0.5 %RH (0–40 %RH)  
±0.8 %RH (40–95 %RH)

$T_{63}$  response time 15 s

Sensor options HUMICAP® R2  
HUMICAP® R2C <sup>3)</sup>

### Temperature

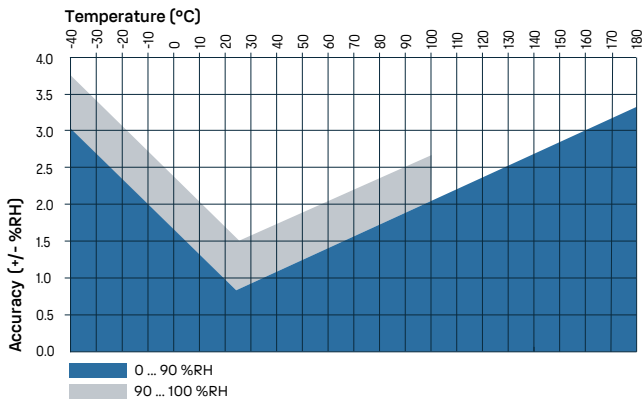
Measurement range –70 ... +180 °C (–94 ... +356 °F)

Accuracy <sup>1)</sup> ±0.1 °C (±0.18 °F)

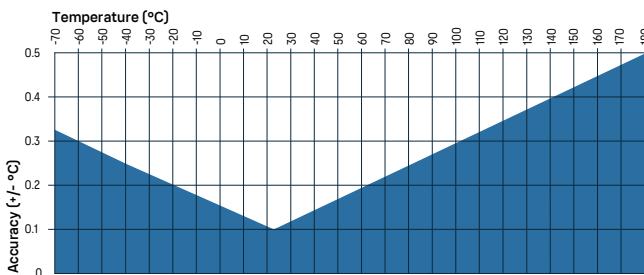
Factory calibration uncertainty <sup>2)</sup> ±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)

Sensor Pt100 RTD Class FO.1 IEC 60751

- <sup>1)</sup> Defined against calibration reference. Including non-linearity, hysteresis, and repeatability.  
<sup>2)</sup> Defined as ±2 standard deviation limits. Small variations possible; see calibration certificate.  
<sup>3)</sup> Sensor 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)

Operating humidity of probe head Max. +100 °C (212 °F)  $T_d$

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

Operational pressure < 100 bar

Operating environment Suitable for outdoor use

Measurement environment For air, nitrogen, hydrogen, argon, helium, oxygen, and vacuum <sup>1)</sup>

IP rating of probe body IP66

<sup>1)</sup> 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<sup>3</sup>) Relative humidity (%RH)

Absolute humidity at NTP (g/m<sup>3</sup>) Relative humidity (dew/frost) (%RH)

Dew point temperature (°C) Temperature (°C)

Dew/frost point temperature (°C) Water concentration (ppm<sub>v</sub>)

Dew/frost point temperature at 1 atm (°C) Water concentration (wet basis) (vol-%)

Dew point temperature at 1 atm (°C) Water mass fraction (ppm<sub>w</sub>)

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 and regulations EMC Directive (2014/30/EU)

RoHS Directive (2011/65/EU) as amended by 2015/863

Electromagnetic compatibility (EMC) 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 (with a 2-m cable) 530 g (18.7 oz)

Probe cable length 2 m (6.56 ft)

### Materials

Probe AISI 316

Probe body AISI 316

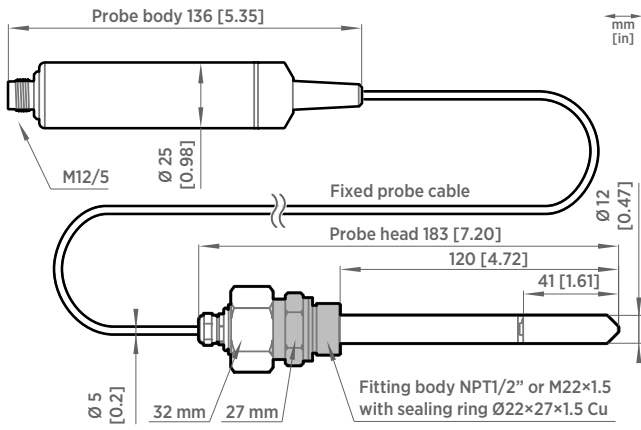
Cable jacket FEP

## Accessories

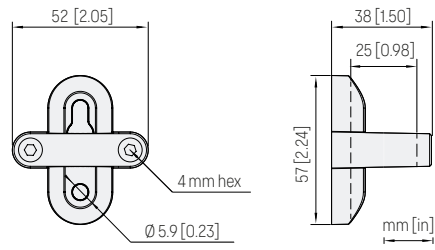
Indigo USB adapter <sup>1)</sup> USB2

Calibration adapter for HMK15 211302SP

<sup>1)</sup> Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).



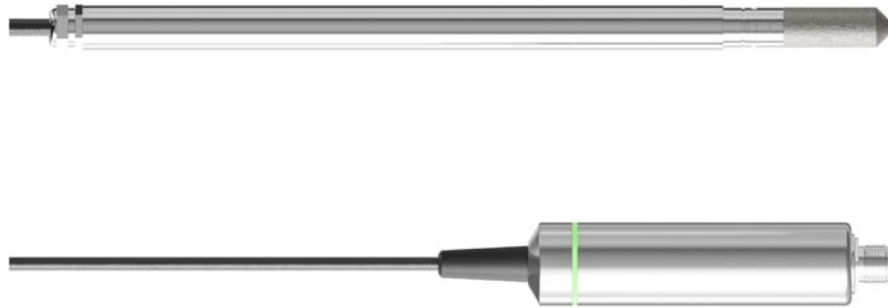
HMP4 probe dimensions



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  $\pm 0.1$  °C ( $\pm 0.18$  °F)
- Temperature measurement range  $-70 \dots +180$  °C ( $-94 \dots +356$  °F)
- Operating temperature of probe body  $-40 \dots +80$  °C ( $-40 \dots +176$  °F)
- Sensor purge improves long-term stability and chemical resistance
- Modbus® RTU over RS-485
- 250-mm (9.84 in) probe allows easy process installation through insulation
- Compatible with Vaisala Indigo products 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.

### Sensor purge minimizes effects of contaminants

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

Sensor 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

### Relative humidity

Measurement range 0–100 %RH, at max. +95 °C (203 °F)  $T_d$

Accuracy at +23 °C (+73.4 °F) <sup>1)</sup> ±0.8 %RH (0–90 %RH)

Factory calibration uncertainty <sup>2)</sup> ±0.5 %RH (0–40 %RH)  
±0.8 %RH (40–95 %RH)

$T_{63}$  response time 15 s

Sensor options HUMICAP® R2  
HUMICAP® R2C <sup>3)</sup>

### Temperature

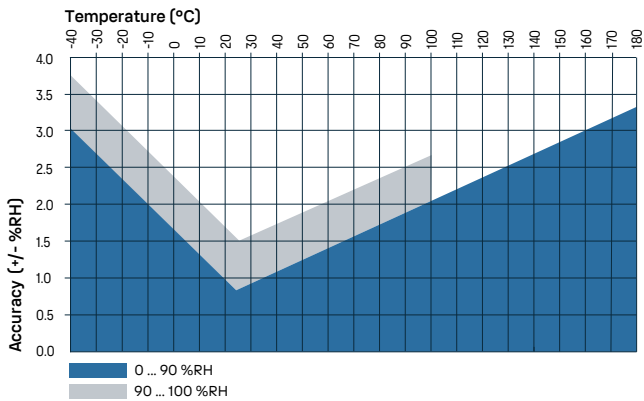
Measurement range –70 ... +180 °C (–94 ... +356 °F)

Accuracy at +23 °C (+73.4 °F) <sup>1)</sup> ±0.1 °C (±0.18 °F)

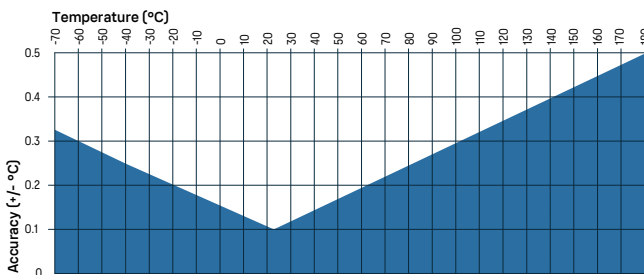
Factory calibration uncertainty <sup>2)</sup> ±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)

Sensor Pt100 RTD Class FO.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) Sensor 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 humidity of probe head Max. +100 °C (212 °F)  $T_d$

Storage temperature –40 ... +80 °C (–40 ... +176 °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<sup>3</sup>) Relative humidity (%RH)

Absolute humidity at NTP (g/m<sup>3</sup>) Relative humidity (dew/frost) (%RH)

Dew point temperature (°C) Temperature (°C)

Dew/frost point temperature (°C) Water concentration (ppm<sub>w</sub>)

Dew/frost point temperature at 1 atm (°C) Water concentration (wet basis) (vol-%)

Dew point temperature at 1 atm (°C) Water mass fraction (ppm<sub>w</sub>)

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 and regulations EMC Directive (2014/30/EU)

RoHS Directive (2011/65/EU) as amended by 2015/863

Electromagnetic compatibility (EMC) 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 (with a 2-m cable) 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

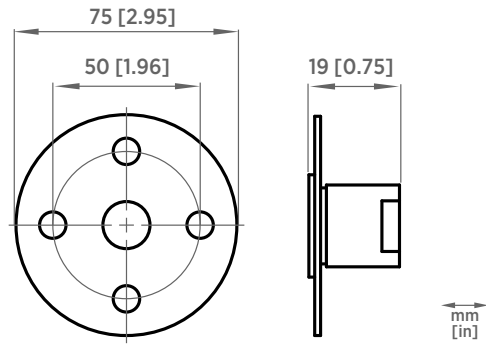
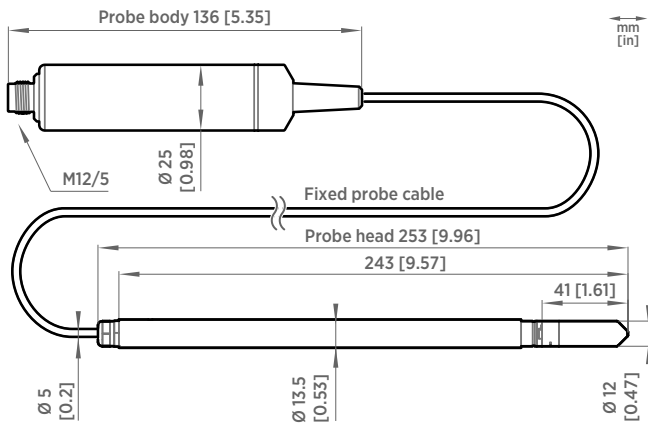
## Accessories

Mounting flange 210696

Indigo USB adapter <sup>1)</sup> USB2

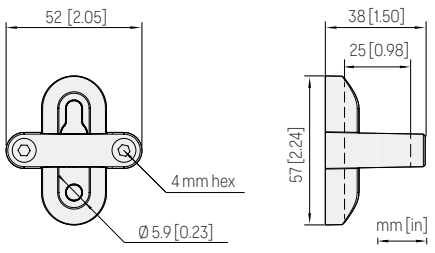
Calibration adapter for HMK15 211302SP

<sup>1)</sup> Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).



Mounting flange 210696 dimensions

HMP5 probe dimensions

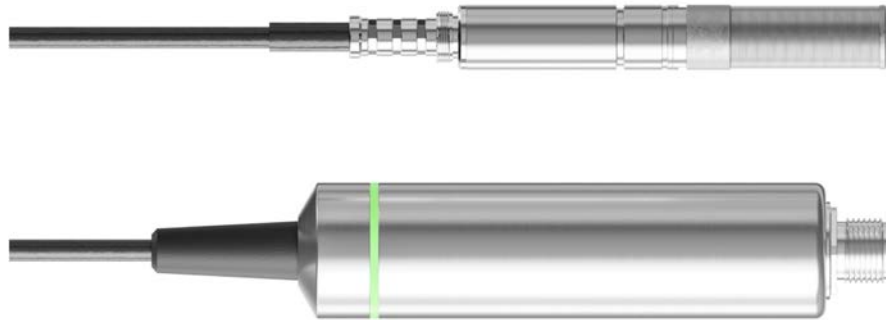


Probe holder ASM213582 dimensions



## HMP7 Relative Humidity and Temperature Probe

For high humidities



### Features

- RH accuracy up to  $\pm 0.8$  %RH
- Temperature accuracy up to  $\pm 0.1$  °C ( $\pm 0.18$  °F)
- Temperature measurement range  $-70 \dots +180$  °C ( $-94 \dots +356$  °F)
- Vapor and pressure proof construction
- Condensation prevention with probe heating
- Sensor purge improves long-term stability and chemical resistance
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products 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.

### Flexible connectivity

The probe can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

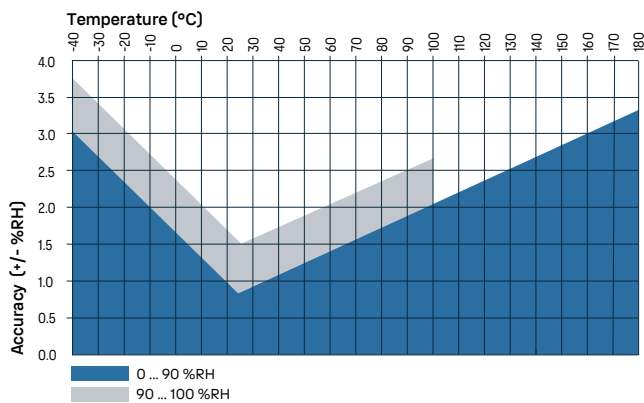
### Relative humidity

Measurement range	0–100 %RH, at max. +95 °C (203 °F) T <sub>d</sub>
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.8 %RH (0–90 %RH)
Factory calibration uncertainty <sup>2)</sup>	±0.5 %RH (0–40 %RH) ±0.8 %RH (40–95 %RH)
T <sub>63</sub> response time	15 s
Sensor options	HUMICAP® R2 HUMICAP® R2C <sup>3)</sup> HUMICAP® 180VC <sup>3) 4)</sup>

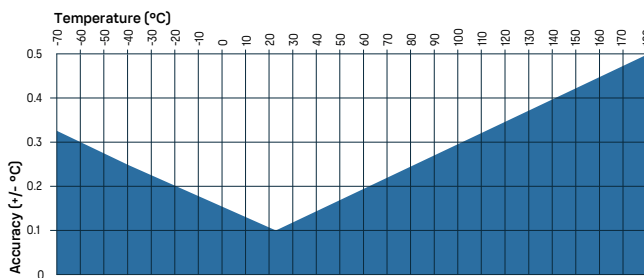
### Temperature

Measurement range	–70 ... +180 °C (–94 ... +356 °F)
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.1 °C (±0.18 °F)
Factory calibration uncertainty <sup>2)</sup>	±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) Sensor purge feature available with this sensor.  
 4) H<sub>2</sub>O<sub>2</sub> 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)
Operating humidity of probe head	Max. +100 °C (212 °F) T <sub>d</sub>
Storage temperature	–40 ... +80 °C (–40 ... +176 °F)
Operational pressure	< 10 bar
Operating environment	Suitable for outdoor use
Measurement environment	For air, nitrogen, hydrogen, argon, helium, oxygen, and vacuum <sup>1)</sup>
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 <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>v</sub> )
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
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 and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	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 (with a 2-m cable)	310 g (10.9 oz)
Probe cable length	0.15 m (0.49 ft), 2 m (6.56 ft) or 10 m (32.80 ft)

### Materials

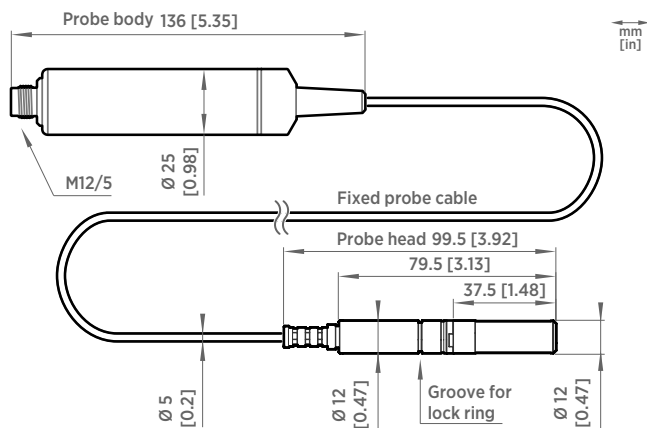
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP

## Accessories

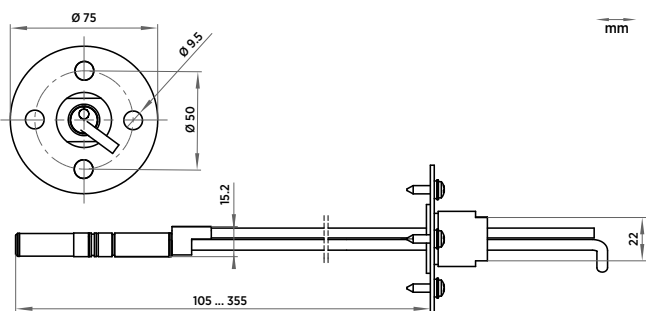
Duct installation kit for humidity probe	210697
Solar radiation shield DTR502B	DTR502B
Warmed probe accessory	HMT330WPA
Cable gland M20×1.5 with split seal	HMP247CG
Swagelok® for 12 mm probe, 1/2" ISO thread	SWG12ISO12
Swagelok® for 12 mm probe, 3/8" ISO thread	SWG12ISO38
Swagelok® for 12 mm probe, 1/2" NPT thread	SWG12NPT12
Magnetic probe holder for Ø 12 mm probe heads <sup>1)</sup>	ASM213382SP
Indigo USB adapter <sup>2)</sup>	USB2
Calibration adapter for HMK15	211302SP

1) Not suitable for use at extreme temperatures.

2) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).



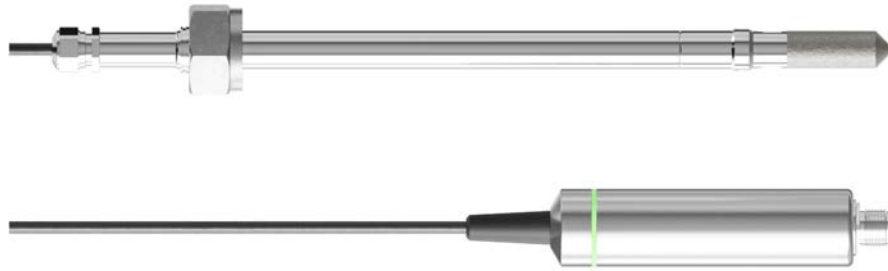
HMP7 probe dimensions



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  $\pm 0.1$  °C ( $\pm 0.18$  °F)
- Operating pressure 0–40 bar
- Temperature measurement range  $-70$  ...  $+180$  °C ( $-94$  ...  $+356$  °F)
- Sensor purge improves long-term stability and chemical resistance
- Probe installation depth can be freely adjusted and probe can be hot-swapped from pressurized pipelines with an optional ball valve kit
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products 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.

### Sensor purge minimizes effects of contaminants

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

Sensor 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

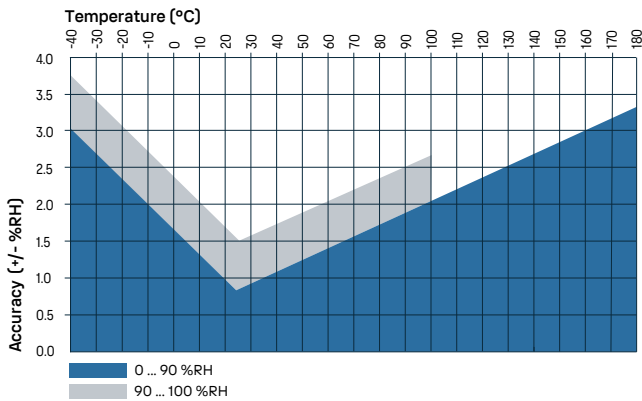
### Relative humidity

Measurement range	0-100 %RH, at max. +95 °C (203 °F) T <sub>d</sub>
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.8 %RH (0-90 %RH)
Factory calibration uncertainty <sup>2)</sup>	±0.5 %RH (0-40 %RH) ±0.8 %RH (40-95 %RH)
T <sub>63</sub> response time	15 s
Sensor options	HUMICAP® R2 HUMICAP® R2C <sup>3)</sup>

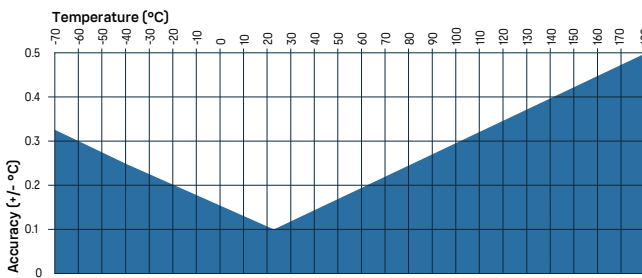
### Temperature

Measurement range	-70 ... +180 °C (-94 ... +356 °F)
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.1 °C (±0.18 °F)
Factory calibration uncertainty <sup>2)</sup>	±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) Sensor 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)
Operating humidity of probe head	Max. +100 °C (212 °F) T <sub>d</sub>
Storage temperature	-40 ... +80 °C (-40 ... +176 °F)
Operational pressure	< 40 bar
Operating environment	Suitable for outdoor use
Measurement environment	For air, nitrogen, hydrogen, argon, helium, oxygen, and vacuum <sup>1)</sup>
IP rating of probe body	IP66
<b>Ball valve</b>	
Operating temperature	Up to +100 °C (+212 °F)
Operating pressure	Up to 40 bar (580 psi), absolute

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 <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>v</sub> )
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
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 and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Type approvals	DNV GL certificate no. TAA00002YT
Compliance marks	CE, China RoHS, RCM



## Mechanical specifications

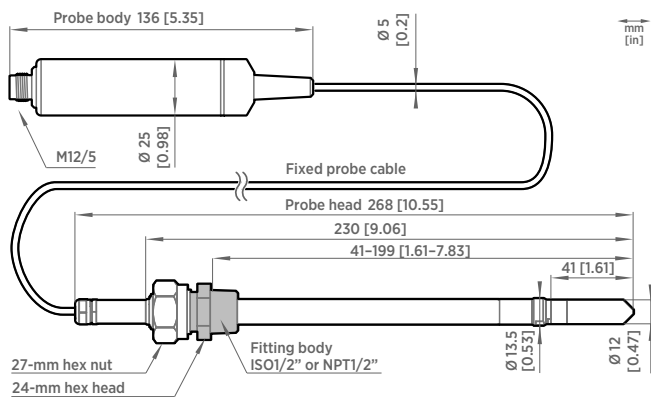
Connector	M12 5-pin A-coded male
Probe fitting	ISO1/2" and NPT1/2" fittings included
Weight (with a 2-m cable)	512 g (18.1 oz)
Probe cable length	2 m (6.56 ft) or 10 m (32.80 ft)
<b>Materials</b>	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP

## Accessories

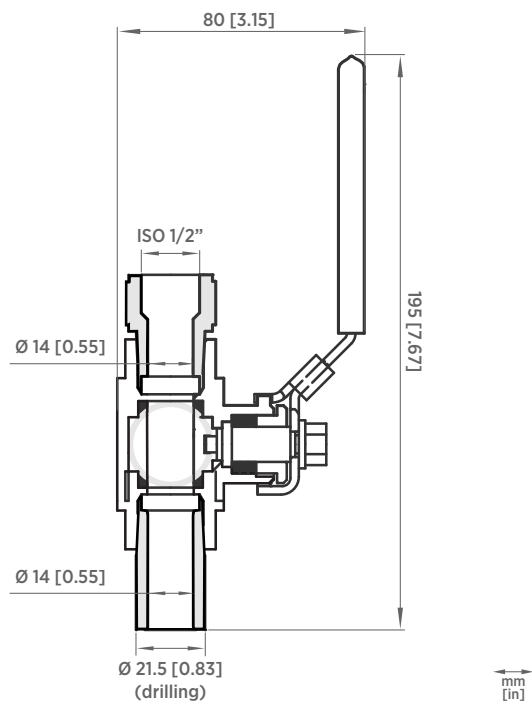
Ball valve kit ISO 1/2" with welding joint	BALLVALVE-1
Indigo USB adapter <sup>1)</sup>	USB2
Calibration adapter for HMK15	211302SP
Weatherproof carrying case for Indigo80 and a series 8 probe <sup>2)</sup>	ASM215318

1) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).

2) For example, MMP8, HMP8, or DMP8 with a max. 2-m (6.6-ft) probe connection cable.



HMP8 probe dimensions



Ball valve kit dimensions

## HMP9 Compact Humidity and Temperature Probe



### 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 improves long-term stability and chemical resistance
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products 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

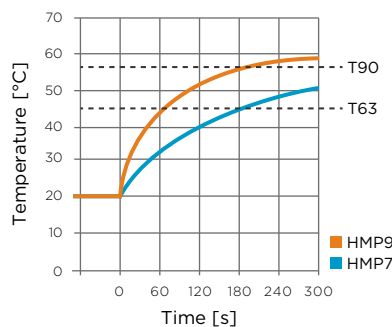
Vaisala HUMICAP® Humidity and Temperature Probe HMP9 is designed for easy installation into rapidly changing environments where fast response time, measurement performance, and chemical tolerance are essential.

### 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 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

### Sensor purge minimizes effects of contaminants

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

Sensor 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://www.vaisala.com/insight).

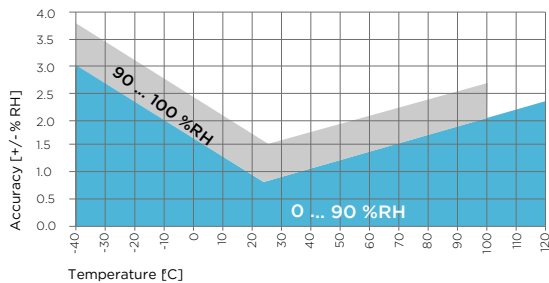
For more information on the Indigo product family, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

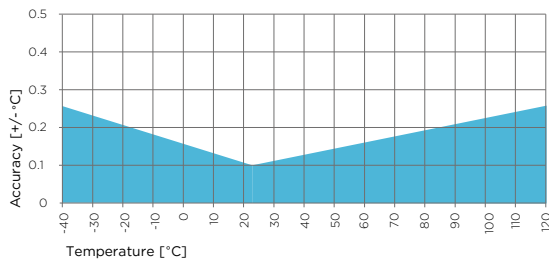
## Measurement performance

Relative humidity	
Measurement range	0–100 %RH, at max. +95 °C (203 °F) T <sub>d</sub>
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.8 %RH (0–90 %RH)
Factory calibration uncertainty <sup>2)</sup>	±0.7 %RH (0–40 %RH) ±1 %RH (40–95 %RH)
T <sub>63</sub> response time <sup>3)</sup>	15 s
Sensor	HUMICAP® I
Temperature	
Measurement range	–40 ... +120 °C (–40 ... +248 °F)
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.1 °C (±0.18 °F)
Factory calibration uncertainty <sup>2)</sup>	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)
T <sub>63</sub> response time <sup>3)</sup>	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)
Operating humidity of probe head	Max. +100 °C (212 °F) T <sub>d</sub>
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 <sup>1)</sup>
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 <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>w</sub> )
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
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 and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, RCM

## Mechanical specifications

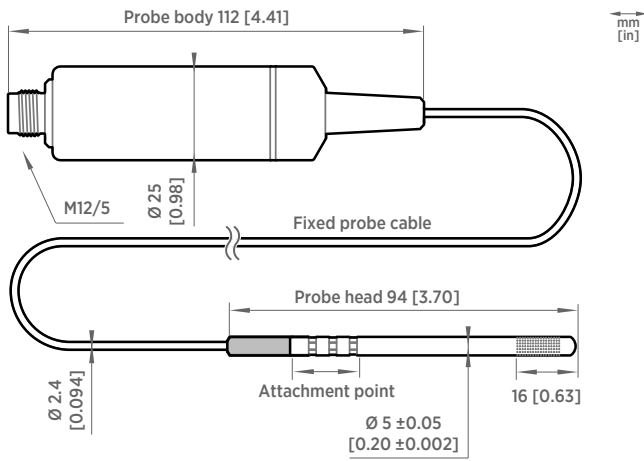
Connector	M12 5-pin A-coded male
Weight (with a 2-m cable)	68 g (2.40 oz)
Probe cable length	2 m (6.56 ft)
Materials	
Probe	AISI 316L
Probe body	PBT
Cable overmolds	FEP

## Accessories

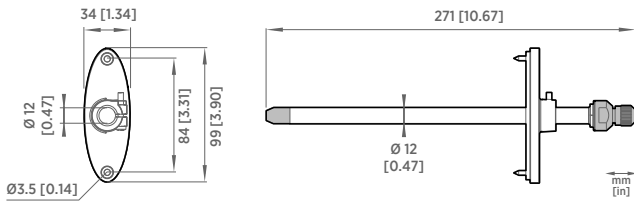
HMP9 calibration adapter for HMK15	ASM213801
HMP9 duct installation kit	ASM214055
Solar radiation shield DTR502B with sensor head support 215130	DTR502B and 215130
Indigo USB adapter <sup>1)</sup>	USB2

- 1) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).

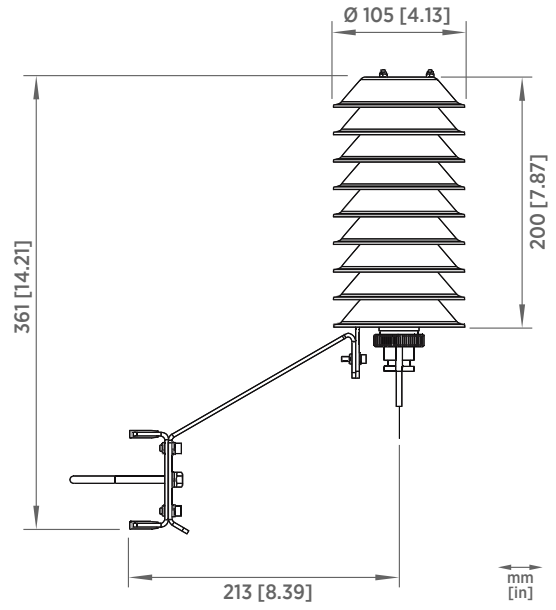




HMP9 probe dimensions



HMP9 Duct Installation Kit ASM214055 dimensions



Solar Radiation Shield DTR502B dimensions



### Features

- Temperature accuracy up to  $\pm 0.1$  °C ( $\pm 0.18$  °F)
- Temperature measurement range  $-70 \dots +180$  °C ( $-94 \dots +356$  °F)
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see [www.vaisala.com/indigo](http://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.

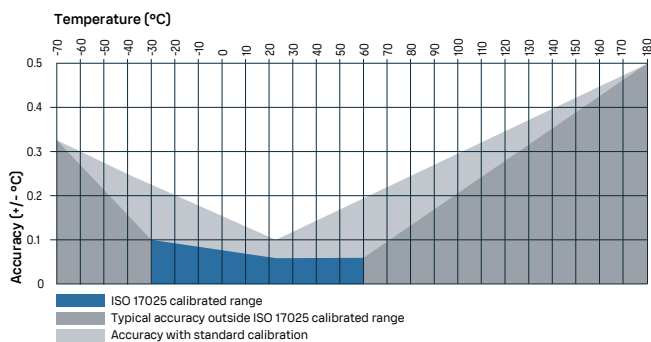
When the humidity probe is heated above dew point temperature, condensation can be avoided and the relative humidity in the actual process temperature can be back-calculated based on the true process temperature measurement received from TMP1.

# Technical data

## Measurement performance

Measurement range	-70 ... +180 °C (-94 ... +356 °F)
Sensor	Pt100 RTD Class F0.1 IEC 60751
<b>Standard calibration <sup>1)</sup></b>	
Accuracy at +23 °C (+73.4 °F)	±0.1 °C (±0.18 °F)
Factory calibration uncertainty <sup>2)</sup>	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)
<b>Optional ISO 17025 calibration <sup>3)</sup></b>	
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.06 °C (±0.108 °F)
Calibration uncertainty <sup>2)</sup>	±0.03 °C (±0.054 °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) Accuracy depends on selected calibration points. Accuracy with ISO 17025 calibration is defined here using a 5-point calibration in the following points: -30, -10, 0, +30, and +60 °C. For more information on calibration services offered by Vaisala, see [vaisala.com/calibration](http://vaisala.com/calibration).



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)
Storage temperature	-40 ... +80 °C (-40 ... +176 °F)
Operating environment	Suitable for outdoor use
<b>IP rating</b>	
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)

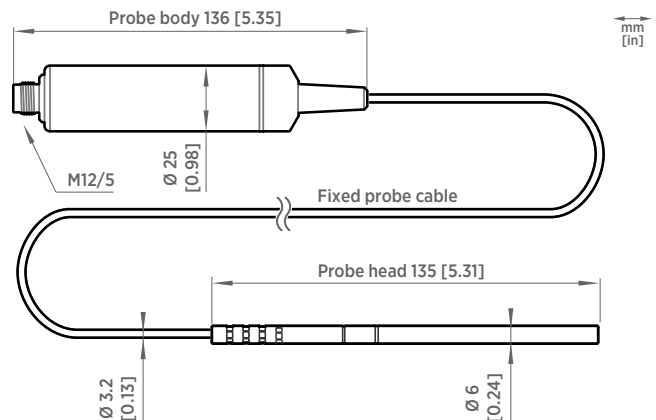
## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	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 (with a 2-m cable)	224 g (7.9 oz)
Probe cable length	2 m (6.56 ft) or 10 m (32.8 ft)
<b>Materials</b>	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP

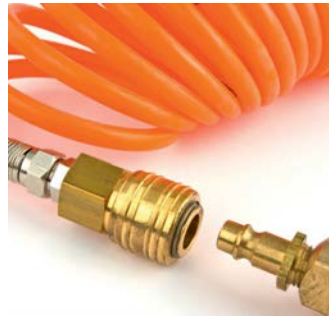
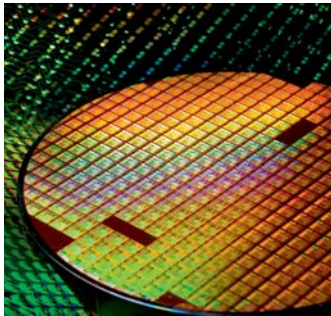


TMP1 probe dimensions

## Accessories

Duct installation kit for temperature 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 <sup>1)</sup>	USB2

<sup>1)</sup> Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).



### DRYCAP sensor's key benefits and features

- High chemical tolerance
- Withstands saturation
- Fast response time
- Sensor purge and warming
- Excellent accuracy and stability
- Vaisala quality

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

As the leading developer and provider of humidity measurement instruments, Vaisala knows also the very dry measurement conditions.

### Reliable data needed

The demand for reliable moisture measurement instruments grew in the 90s, and it was noticed that the traditional humidity probes were not accurate enough at very low humidity levels. The commonly used aluminum oxide sensors were prone to drift and required frequent calibration. A new type of a moisture sensor was needed.

### Taking every measure for the planet

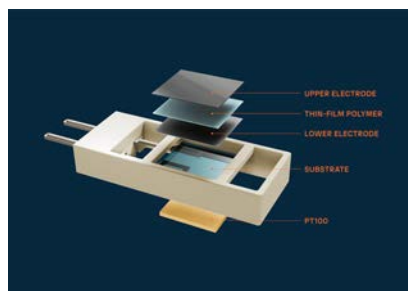
We took on the challenge by combining the highest quality polymer technology with a patented key feature – autocalibration – that would eliminate sensor drift in very dry conditions.

### The era of DRYCAP begins

In 1997, we introduced a new type of dew point sensor based on thin-film polymer technology, the DRYCAP sensor, that could be used in various Vaisala probes for dry measurement conditions.

### How Vaisala DRYCAP works

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



Structure of the DRYCAP sensor

### Autocalibration

Vaisala's patented autocalibration function optimizes the measurement stability in dry environments. The sensor is heated at regular intervals during the automated autocalibration 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.

### Sensor purge

Sensor purge is also an automatic procedure that minimizes the drift at the wet end readings of the dew point measurement. Sensor purge is performed regularly and when the power is switched on. The sensor is heated for several minutes, which will then evaporate all excess molecules out of the sensor polymer. This, together with the autocalibration, results in a very small drift. The measurement output of the transmitter is frozen to the last measured value for the duration of the sensor purge.

### **The parameter of high demand**

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 and this highly successful innovation is continuously growing its demand.

### **When process measurement truly matters**

An example of the several demanding industrial applications where Vaisala DRYCAP technology is used today is battery manufacturing. Due to the ultra-

low humidity requirement and highly controlled atmospheric conditions, reliable dew point measurement is a must. The accurate and stable data the instruments provide, enable controlling the moisture levels along any critical locations of the process, such as the electrode production.

### **DRYCAP application examples**

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.

## 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  $\pm 2$  °C ( $\pm 3.6$  °F)  $T_{d/f}$
- Sensor purge improves long-term stability and chemical resistance
- Condensation-tolerant
- Modbus RTU over RS-485
- Compatible with Vaisala Indigo products 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 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 autocalibrates to ensure accurate measurement.

### Sensor purge minimizes effects of contaminants

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

Sensor 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

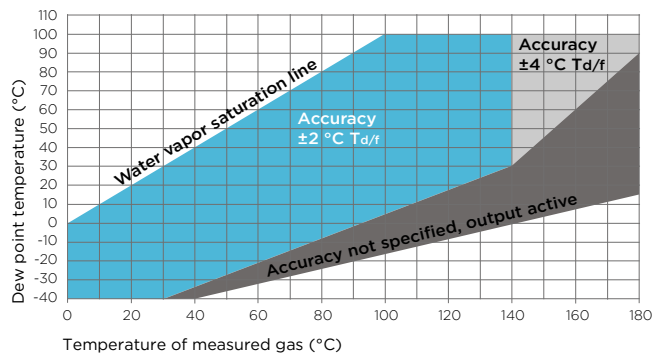
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring and troubleshooting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

Dew point	
Sensor	DRYCAP® 180S
Measurement range	-40 ... +100 °C (-40 ... +212 °F) T <sub>d/f</sub>
Accuracy	±2 °C (±3.6 °F) T <sub>d/f</sub> See accuracy graph
Response time 63 % [90 %] <sup>1)</sup>	
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)
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 <sup>3</sup>
Accuracy	±10 % of reading (typical)

1) Tested with sintered filter.



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

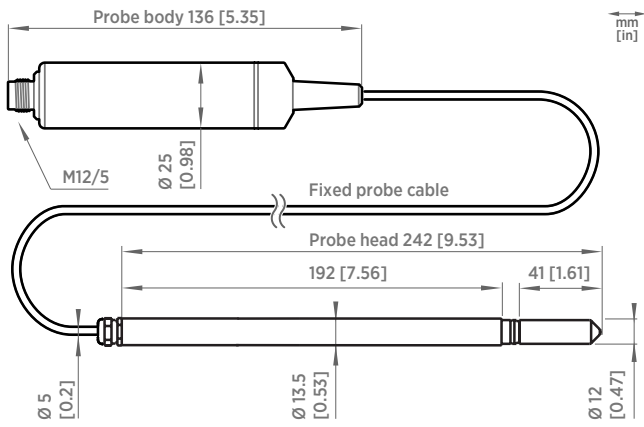
## Compliance

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

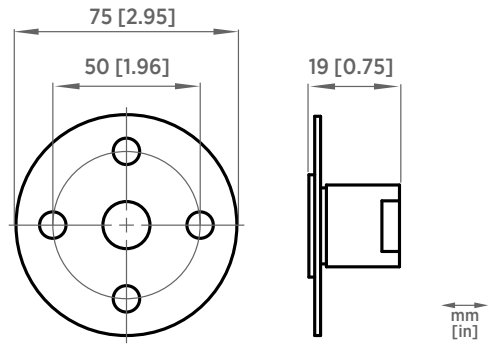


## Mechanical specifications

Connector	M12 5-pin A-coded male
Weight (with a 2-m cable)	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 <sup>1)</sup>	USB2

<sup>1)</sup> Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://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  $\pm 2$  °C ( $\pm 3.6$  °F)  $T_{d/f}$
- Sensor purge improves long-term stability and chemical resistance
- Condensation-tolerant
- Modbus RTU over RS-485
- Compatible with Vaisala Indigo products 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 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.

### Sensor purge minimizes effects of contaminants

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

Sensor 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring and troubleshooting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

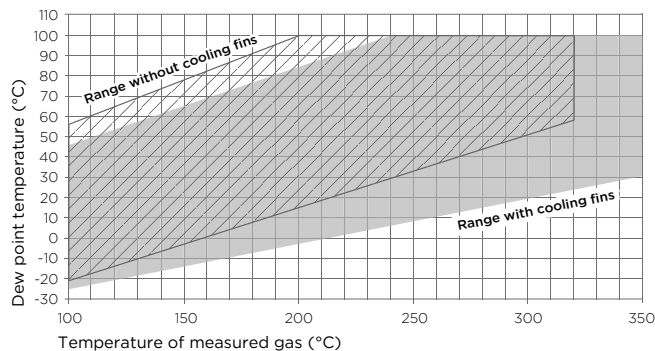
## Measurement performance

Dew point	
Sensor	DRYCAP® 180S
Measurement range	-25 ... +100 °C (-13 ... +212 °F) T <sub>d/f</sub>
Accuracy	±2 °C (±3.6 °F) T <sub>d/f</sub>
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 <sup>1) 2)</sup>	+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 <sup>3)</sup>
IP rating	IP66

- 1) Installation of cooling fins on the cooling set affects the operating temperature range. See the operating range graph.
- 2) The operating range specifications apply in stand-still air. High flow rates in the process may reduce the probe performance and cause damage to the equipment.
- 3) 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 and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Type approvals	DNV GL certificate no. TAA00002YT
Compliance marks	CE, China RoHS, RCM

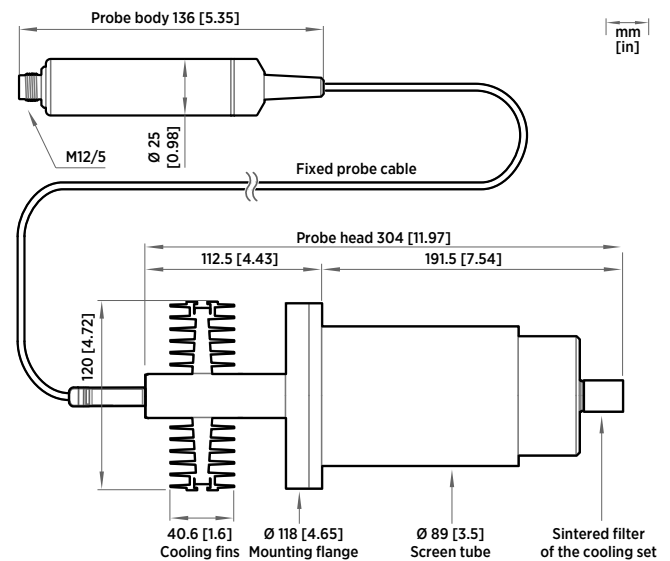


## Output parameters

Dew point temperature (°C)	Water concentration (ppm <sub>v</sub> )
Dew/frost point temperature (°C)	Water concentration (wet basis) (vol-%)
Dew/frost point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
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 (with a 2-m cable)	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

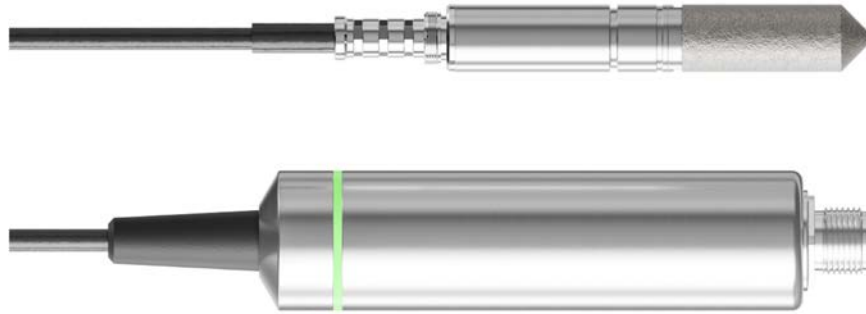
## Accessories

Cooling set	DMP246CS
Indigo USB adapter <sup>1)</sup>	USB2

- 1) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://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 improves long-term stability and chemical resistance
- Tolerates condensation, oils, dust, and most chemicals
- Modbus RTU over RS-485
- Compatible with Vaisala Indigo products 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.

### Sensor purge minimizes effects of contaminants

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

Sensor 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

An 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

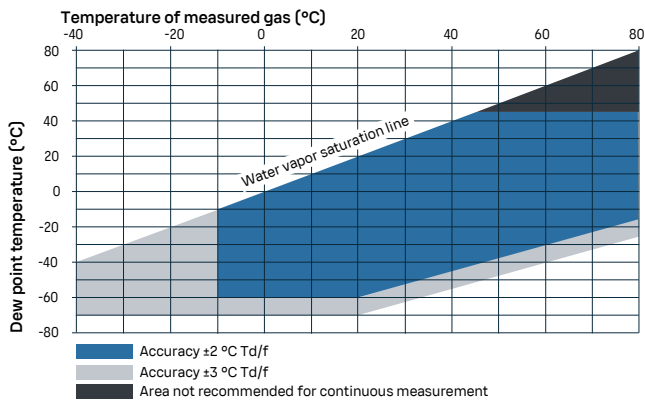
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring and troubleshooting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

Dew point	
Sensor	DRYCAP® 180M
Measurement range	-70 ... +80 °C (-94 ... +176 °F) T <sub>d/f</sub>
Measurement range for continuous use	-70 ... +45 °C (-94 ... +113 °F) T <sub>d/f</sub>
Accuracy	Up to ±2 °C (±3.6 °F) T <sub>d/f</sub> See accuracy graph
Response time 63 % [90 %] <sup>1)</sup>	
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 FO.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 psi), absolute
Measurement environment	For air, nitrogen, hydrogen, argon, helium, oxygen <sup>1)</sup> , 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

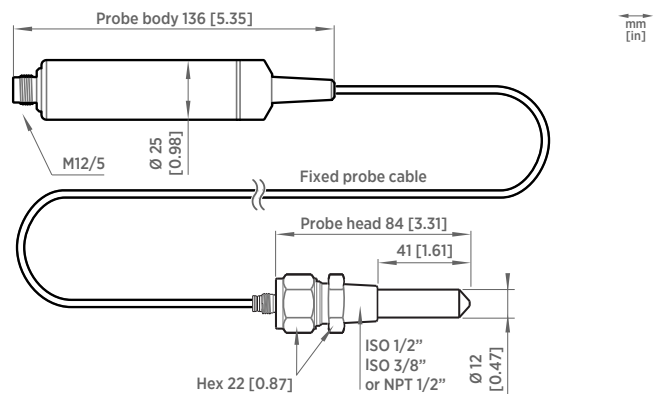
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, RCM

## Output parameters

Absolute humidity (g/m <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>v</sub> )
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
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
Probe cable length	0.15 m (0.49 ft), 2 m (6.56 ft) or 10 m (32.80 ft)
Materials	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP



## DMP7 dimensions

## Accessories

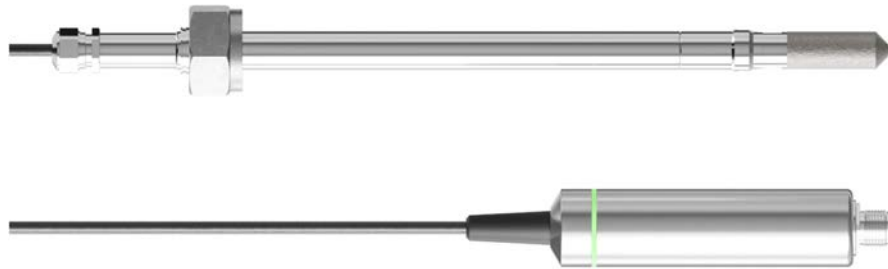
Swagelok ISO 3/8"	SWG12ISO38
Swagelok ISO 1/2"	SWG12ISO12
Swagelok NPT 1/2"	SWG12NPT12
Magnetic probe holder for Ø 12 mm probe heads <sup>1)</sup>	ASM213382SP
Indigo USB adapter <sup>2)</sup>	USB2

1) Not suitable for use at extreme temperatures.

2) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://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 0–40 bar (0–580 psi), absolute
- Adjustable installation depth
- Tolerates condensation, oils, dust, and most chemicals
- Sensor purge improves long-term stability and chemical resistance
- Modbus RTU over RS-485
- Compatible with Vaisala Indigo products 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.

### Sensor purge minimizes effects of contaminants

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

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

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

### Flexible connectivity

The probe can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

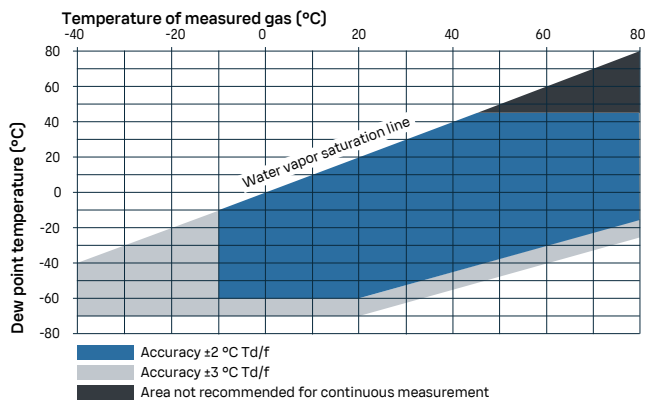
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring and troubleshooting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

<b>Dew point</b>	
Sensor	DRYCAP® 180M
Measurement range	-70 ... +80 °C (-94 ... +176 °F) T <sub>d/f</sub>
Measurement range for continuous use	-70 ... +45 °C (-94 ... +113 °F) T <sub>d/f</sub>
Accuracy up to 20 bar/290 psia	±2 °C/±3.6 °F T <sub>d/f</sub> See accuracy graph
Accuracy, 20 ... 40 bar/290 ... 580 psia	Additional inaccuracy +1 °C T <sub>d/f</sub>
Response time 63 % [90 %] <sup>1)</sup> :	
From dry to wet	5 s [15 s]
From wet to dry	45 s [8 min]
<b>Temperature</b>	
Measurement range	0 ... +80 °C (+32 ... +176 °F)
Accuracy	±0.2 °C at room temperature
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751
<b>Relative humidity</b>	
Measurement range	0-70 %RH
Accuracy (RH <10 %RH, at +20 °C)	±0.004 %RH + 20% of reading
<b>Concentration by volume (ppm)</b>	
Measurement range (typical)	10-2500 ppm
Accuracy (at +20 °C, 1 bar)	1 ppm + 20% of reading

<sup>1)</sup> 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 psi), absolute
Measurement environment	For air, nitrogen, hydrogen, argon, helium, oxygen <sup>1)</sup> , and vacuum
IP rating for probe body	IP66
Mechanical durability of probe head	Up to +180 °C (+356 °F) Up to 70 bar/1015 psi, absolute
<b>Ball valve</b>	
Operating temperature	Up to +100 °C (+212 °F)
Operating pressure	Up to 40 bar (580 psi), absolute

<sup>1)</sup> 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

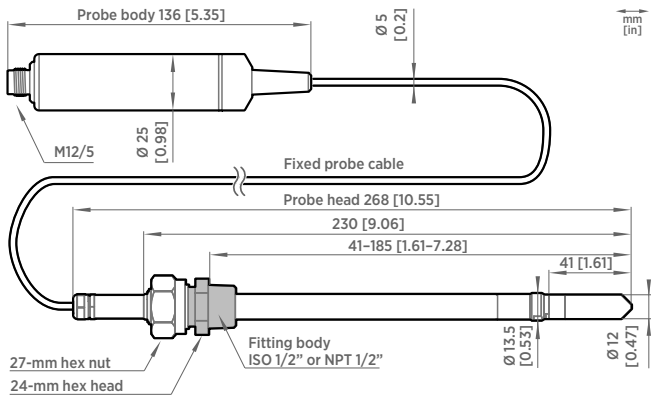
Absolute humidity (g/m <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>w</sub> )
Dew/frost point temperature at 1 atm (°C)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

## Compliance

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

## Mechanical specifications

Connector	M12 5-pin A-coded male
Weight (with a 2-m cable)	512 g (18.1 oz)
Probe cable length	2 m (6.56 ft)
<b>Materials</b>	
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 kit ISO 1/2" with welding joint	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 <sup>1)</sup>	242659
Weatherproof carrying case for Indigo80 and a series 8 probe <sup>2)</sup>	ASM215318

<sup>1)</sup> Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).

<sup>2)</sup> For example, MMP8, HMP8, or DMP8 with a max. 2-m (6.6-ft) probe connection cable.



### CARBOCAP's unique benefits

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

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.

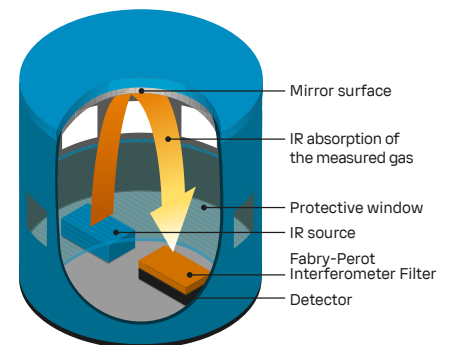
Instruments measuring at several absorption and reference wavelengths with a single light source are known as single-beam multi-wavelength instruments. The technology is widely applied in costly analyzers. The unique feature of the CARBOCAP® sensor is its micromachined FPI filter, which performs a multiwavelength 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.

First launched in 1997, the Vaisala CARBOCAP 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.

Vaisala uses a single-beam and dual-wavelength NDIR (Non-dispersive infrared) technology for measuring CO<sub>2</sub>. The patented CARBOCAP technology is used in all our CO<sub>2</sub> sensors. This technology incorporates a unique tunable band pass filter that was developed by Vaisala and is manufactured in our own state-of-the-art cleanroom. Learn more on our [carbon dioxide page](#).



Structure of the CARBOCAP sensor. Both reference and gas absorption are measured in the same optical path.

### Typical applications for carbon dioxide measurement

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 CO<sub>2</sub> replaces oxygen, it can be harmful to people in very high concentrations. CO<sub>2</sub> 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 CO<sub>2</sub> incubators.

Normal atmospheric air includes CO<sub>2</sub> at ppm levels. Typical CARBOCAP applications include ventilation control in buildings occupied by people, animal shelters, and greenhouses. In areas where large volumes of CO<sub>2</sub> are handled,

reliable CO<sub>2</sub> 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 handheld meters, measurement modules, and industrial transmitters for CO<sub>2</sub> measurements to multigas measurement solutions.

## GMP251 Carbon Dioxide Probe For %-level measurements



### Features

- Measurement range 0 ... 20 %CO<sub>2</sub>
- Intelligent, standalone probe with analog and digital outputs
- Compatible with Vaisala Indigo products, Insight PC software, and RFL100 data logger
- Wide operating temperature range (-40 ... +60 °C) (-40 ... +140 °F)
- IP65-classified housing
- Integrated temperature measurement for CO<sub>2</sub> compensation purposes
- Compensations also for pressure, oxygen, and humidity
- Sensor head heated to prevent condensation

Vaisala CARBOCAP® Carbon Dioxide Probe GMP251 is an 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

- Excellent 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 CO<sub>2</sub> measurement according to ambient temperature. The effects of pressure and background gas can also be compensated for. The measurement range is 0 ... 20 %CO<sub>2</sub> and the sensor performance is optimized at 5 %CO<sub>2</sub> 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 H<sub>2</sub>O<sub>2</sub> 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 and the Indigo80 handheld indicator for an extended range of output and configuration options. See [www.vaisala.com/indigo](http://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 software for Windows®. See [www.vaisala.com/insight](http://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 CO<sub>2</sub> 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. <sup>1)</sup>

<sup>1)</sup> Third-party pump and multiplexer not provided by Vaisala.

# Technical data

## Measurement performance

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

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

## Compliance

EU directives and regulations	EMC, RoHS
Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, China RoHS, RCM

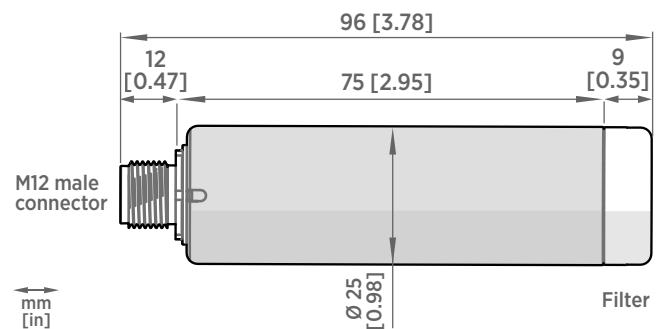
## Operating environment

Operating temperature of CO <sub>2</sub> measurement	-40 ... +60 °C (-40 ... +140 °F) <sup>1)</sup>
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)	<ul style="list-style-type: none"> <li>• H<sub>2</sub>O<sub>2</sub> (2000 ppm, non-condensing)</li> <li>• Alcohol-based cleaning agents (for example ethanol and IPA)</li> <li>• Acetone</li> <li>• Acetic acid</li> </ul>
<b>Pressure</b>	
Compensated	500-1100 hPa
Operating	< 1.5 bar
<b>Gas flow (for flow-through option)</b>	
Operating range	< 10 l/min
Recommended range	0.1-0.8 l/min

<sup>1)</sup> 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
<b>Materials</b>	
Probe housing	PBT polymer
Filter	PTFE membrane, PBT polymer grid
Connector	Nickel plated brass
<b>Dimensions</b>	
Probe diameter	25 mm (0.98 in)
Probe length	96 mm (3.78 in)



GMP251 dimensions

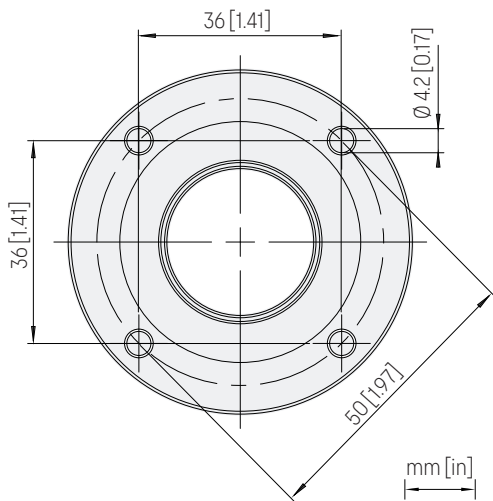
## Inputs and outputs

Analog outputs	<ul style="list-style-type: none"> <li>0–5/10 V (scalable), min. load 10 kΩ</li> <li>0/4–20 mA (scalable), max. load 500 Ω</li> </ul>
Digital output	Over RS-485: <ul style="list-style-type: none"> <li>Modbus</li> <li>Vaisala Industrial Protocol</li> </ul>
<b>Operating voltage</b>	
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
<b>Power consumption</b>	
Typical (continuous operation)	0.4 W
Maximum	0.5 W

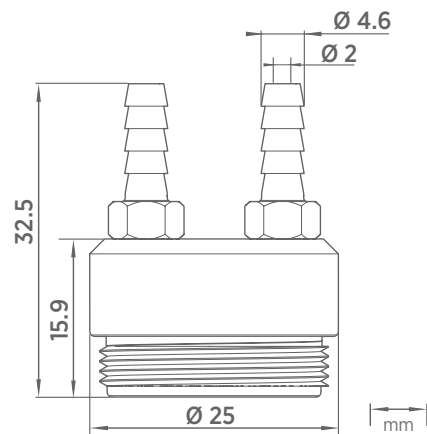
## Spare parts and accessories

Standard membrane filter	ASM211650SP
Porous sintered PTFE filter	DRW243649SP
Probe connection cable with open wires (1.5 m), shielded	223263SP
Probe connection cable with open wires (1.5 m), shielded	254294SP
Probe connection cable with open wires (3 m), shielded	26719SP
Probe connection cable with open wires (10 m), shielded	216546SP
Probe connection cable with open wires and 90° plug (0.6 m), shielded	244669SP
Probe connection cable with open wires and 90° plug (1.5 m), shielded	255102
MI70 connection cable, M12 5-pin	CBL210472
Connection cable for Indigo80, M12-5F - M12-5M, 1.5 m	272075SP
Flat cable for GMP250 probes, M12 5-pin	CBL210493SP
Indigo USB adapter <sup>1)</sup>	USB2
Probe mounting clips (2 pcs)	243257SP
Probe mounting flange	243261SP
Probe holder assembly	ASM213582
Flow-through adapter with gas ports	ASM211697SP
Calibration adapter	DRW244827SP
Spray shield	ASM212017SP

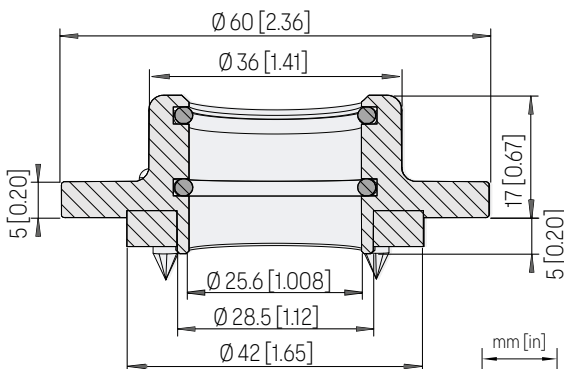
<sup>1)</sup> Vaisala Insight software for Windows available at [vaisala.com/insight](http://vaisala.com/insight)



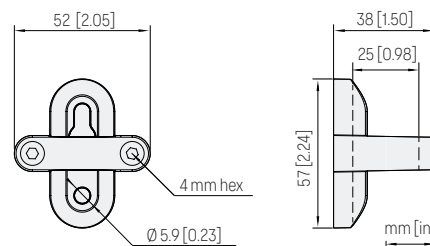
Probe mounting flange 243261SP dimensions



Flow-through adapter with gas ports ASM211697SP. Suitable for tubes with 4 mm inner diameter.



Probe mounting flange 243261SP dimensions, cross section



Probe holder ASM213582 dimensions

## GMP252 Carbon Dioxide Probe For ppm-level measurements



### Features

- Measurement range  
0 ... 10 000 ppm CO<sub>2</sub>
- Intelligent, standalone probe with analog and digital outputs
- Compatible with Vaisala Indigo products and Insight PC software
- Wide operating temperature range, -40 ... +60 °C (-40 ... +140 °F)
- IP65-classified housing
- Integrated temperature measurement for CO<sub>2</sub> compensation purposes
- Compensations also for pressure, oxygen, and humidity
- Sensor head heated to prevent condensation

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

### Benefits

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

GMP252 is suitable for harsh and humid CO<sub>2</sub> measurement environments where stable and accurate ppm-level CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> (measurements up to 30 000 ppm CO<sub>2</sub> 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 H<sub>2</sub>O<sub>2</sub> 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 and the Indigo80 handheld indicator for an extended range of outputs and configuration options. See [www.vaisala.com/indigo](http://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 software for Windows®. See [www.vaisala.com/insight](http://www.vaisala.com/insight).

### Applications

GMP252 is ideal for agriculture, refrigeration, greenhouses, and demanding HVAC applications where stable and accurate ppm-level CO<sub>2</sub> 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. <sup>1)</sup>

<sup>1)</sup> Third-party pump and multiplexer not provided by Vaisala.

# Technical data

## Measurement performance

Measurement range	0–10 000 ppm CO <sub>2</sub> (up to 30 000 ppm CO <sub>2</sub> with reduced accuracy)
<b>Accuracy</b> <sup>1)</sup>	
0–3000 ppm CO <sub>2</sub>	±40 ppm CO <sub>2</sub>
3000–10 000 ppm CO <sub>2</sub>	±2 % of reading
Up to 30 000 ppm CO <sub>2</sub>	±3.5 % of reading
<b>Calibration uncertainty</b>	
at 2000 ppm CO <sub>2</sub>	±31 ppm CO <sub>2</sub>
at 10 000 ppm CO <sub>2</sub>	±105 ppm CO <sub>2</sub>
<b>Long-term stability</b>	
0–3000 ppm CO <sub>2</sub>	±60 ppm CO <sub>2</sub> /year
3000–6000 ppm CO <sub>2</sub>	±150 ppm CO <sub>2</sub> /year
6000–10 000 ppm CO <sub>2</sub>	±300 ppm CO <sub>2</sub> /year
<b>Temperature dependence 0–10 000 ppm CO<sub>2</sub></b>	
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 <sub>2</sub> (typical)	–0.5 % of reading/°C
<b>Pressure dependence</b>	
With compensation at 0–10 000 ppm CO <sub>2</sub> , 500–1100 hPa	±0.015 % of reading/hPa
Without compensation (typical)	+0.15 % of reading/hPa
<b>Humidity dependence</b>	
With compensation, 0–10 000 ppm CO <sub>2</sub> , 0–100 %RH	±0.7 % of reading (at +25 °C (+77 °F))
Without compensation (typical)	+0.05 % of reading/%RH
<b>O<sub>2</sub> dependence</b>	
With compensation, 0–10 000 ppm %CO <sub>2</sub> , 0–90 %O <sub>2</sub>	±0.6 % of reading (at +25 °C (+77 °F))
Without compensation (typical)	–0.08 % of reading/%O <sub>2</sub>
<b>Start-up, warm-up, and response time</b>	
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
<b>Flow rate dependence (for flow-through option)</b>	
< 1 l/min flow	No effect
1–10 l/min flow	< 0.6 % of reading l/min

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

## Inputs and outputs

Analog outputs	<ul style="list-style-type: none"> <li>0–5/10 V (scalable), min. load 10 kΩ</li> <li>0/4–20 mA (scalable), max. load 500 Ω</li> </ul>
Digital output	Over RS-485: <ul style="list-style-type: none"> <li>Modbus</li> <li>Vaisala Industrial Protocol</li> </ul>
<b>Operating voltage</b>	
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
<b>Power consumption</b>	
Typical (continuous operation)	0.4 W
Maximum	0.5 W

## Operating environment

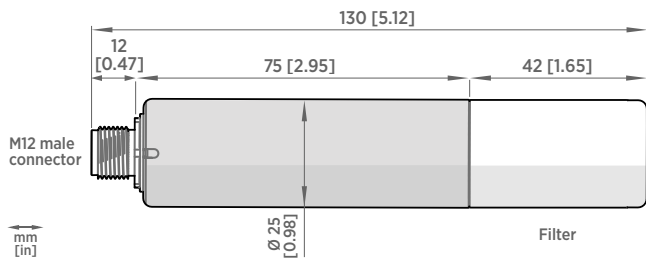
Operating temperature of CO <sub>2</sub> measurement	–40 ... +60 °C (–40 ... +140 °F)
Storage temperature	–40 ... +70 °C (–40 ... +158 °F)
Operating humidity	0–100 %RH, non-condensing
Condensation prevention	Sensor head heating when power on
IP rating, probe body	IP65
Chemical tolerance (temporary exposure during cleaning)	<ul style="list-style-type: none"> <li>H<sub>2</sub>O<sub>2</sub> (2000 ppm, non-condensing)</li> <li>Alcohol-based cleaning agents (for example ethanol and IPA)</li> <li>Acetone</li> <li>Acetic acid</li> </ul>
<b>Pressure</b>	
Compensated	500–1100 hPa
Operating	< 1.5 bar
<b>Gas flow (for flow-through option)</b>	
Operating range	< 10 l/min
Recommended range	0.1–0.8 l/min

## Compliance

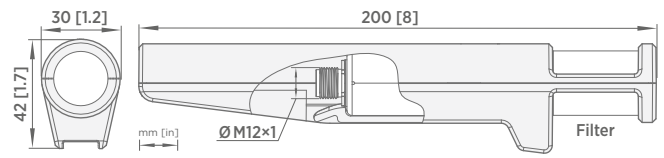
EU directives and regulations	EMC, RoHS
Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, RCM

## Mechanical specifications

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



GMP252 probe dimensions

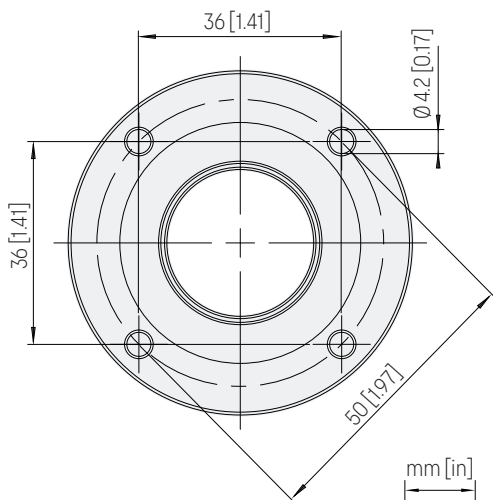


GMP252 probe handle dimensions

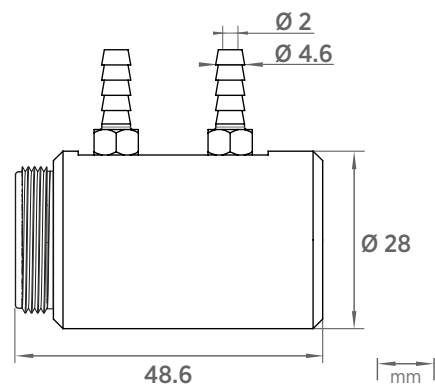
## Spare parts and accessories

Porous sintered PTFE filter for GMP252	DRW244221SP
Probe connection cable with open wires (1.5 m), shielded	223263SP
Probe connection cable with open wires (1.5 m), shielded	254294SP
Probe connection cable with open wires (3 m), shielded	26719SP
Probe connection cable with open wires (10 m), shielded	216546SP
Probe connection cable with open wires and 90° plug (0.6 m), shielded	244669SP
Probe connection cable with open wires and 90° plug (1.5 m), shielded	255102
M170 connection cable, M12 5-pin	CBL210472
Connection cable for Indigo80, M12-5F - M12-5M, 1.5 m	272075SP
Flat cable for GMP250 probes, M12 5-pin	CBL210493SP
Indigo USB adapter <sup>1)</sup>	USB2
Probe mounting clips (2 pcs)	243257SP
Probe mounting flange	243261SP
Probe holder assembly	ASM213582
Probe handle with magnetic hanger	GMP252HANDLESP
Probe handle	ASM214342SP
Flow-through adapter with gas ports	ASM212011SP
Calibration adapter	DRW244827SP
Spray shield	ASM212017SP
Radiation shield DTR250	DTR250
Radiation shield DTR250 with pole mounting kit	DTR250A

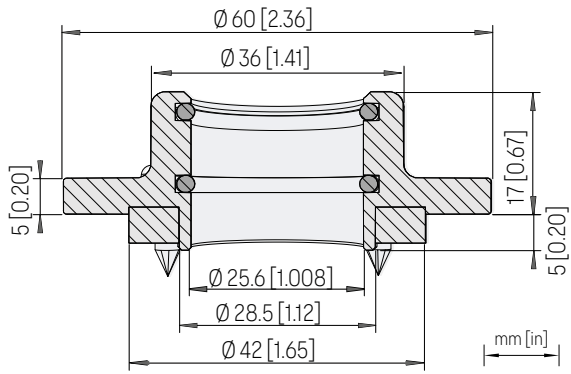
<sup>1)</sup> Vaisala Insight software for Windows is available at [www.vaisala.com/insight](http://www.vaisala.com/insight).



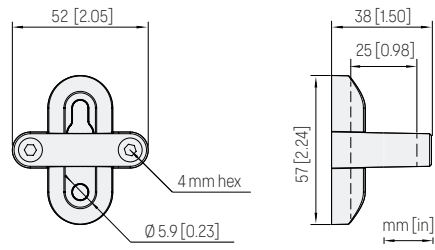
Probe mounting flange 243261SP dimensions



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



Probe mounting flange 243261SP dimensions, cross section

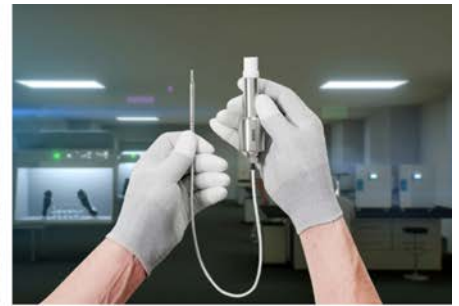


Probe holder ASM213582 dimensions



## PEROXCAP® technology

Innovative technology designed for bio-decontamination applications



### PEROXCAP's unique benefits

- **Chemical purge:** The probe heats up at intervals to maintain measurement performance and lengthen the sensors' lifespan. Rapid heating of the sensor also removes impurities.
- **Sensor vitality:** Sensor performance can be evaluated using the "Sensor Vitality" value, accessible through [Vaisala Insight software](#) and displayed as a percentage.

The unique PEROXCAP technology enables accurate measurement of multiple parameters in vaporized hydrogen peroxide bio-decontamination. Probes use two capacitive thin-film polymer [HUMICAP® sensors](#) to provide high accuracy, excellent long-term stability, and negligible hysteresis in demanding high-concentration  $vH_2O_2$  applications in atmospheric pressure.

The HUMICAP sensor, used in PEROXCAP technology, is a capacitive thin-film polymer sensor consisting of a substrate on which a thin polymer film is deposited 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, as does the capacitance of the sensor. The probe's electronics measure the capacitance of the sensor and convert it to a humidity reading.

PEROXCAP uses two HUMICAP sensors, one with and one without a catalytic layer. The thin-film polymer absorbs water and  $H_2O_2$  vapor. The amount is proportional to the ambient relative humidity (sensor with catalytic layer) or relative saturation (sensor without catalytic layer) depending on the sensor. Learn more about [HPP270 series probes](#).

### Intelligent PEROXCAP measurement technology

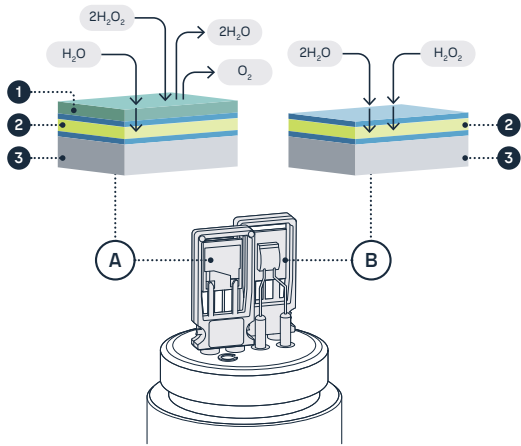
One unique feature of PEROXCAP is that it provides the critical **relative saturation** value. Water ( $H_2O$ ) and hydrogen peroxide ( $H_2O_2$ ) have similar molecular structures, however, while relative humidity (RH) indicates the level of water vapor in the air at a given temperature, relative saturation is the level of water *and* hydrogen peroxide vapor. Air that contains hydrogen peroxide vapor will condense before 100 % relative humidity, which is why relative saturation allows you to predict condensation.

### Multiple measurements for comprehensive bio-decontamination monitoring

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

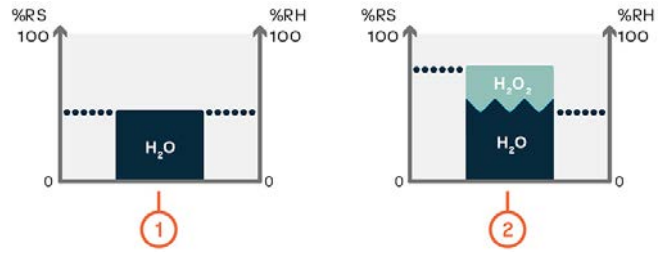
- HPP271 probes measure  $H_2O_2$  vapor concentration (ppm) and temperature dew point.
- HPP272 probes measure  $H_2O_2$  vapor concentration (ppm), temperature, dew point, vapor pressure, and humidity as both relative saturation and relative humidity.

### 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 layer over the thin-film polymer decomposes hydrogen peroxide into water and oxygen and prevents it from entering the sensing polymer.
- 2** Thin-film polymer between two electrodes.
- 3** Alumina substrate.

### PEROXCAP'S critical difference: relative saturation



- 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.

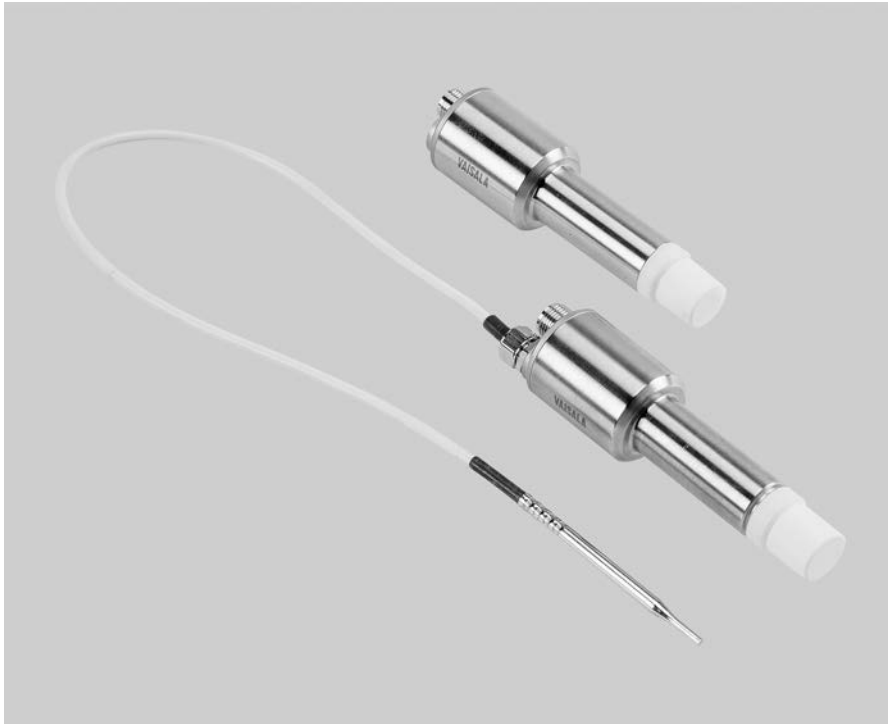
For example, at 20 °C with an  $H_2O_2$  concentration of 500 ppm, the humidity level 25 %RH is equivalent to 60 %RS. When this gas mixture starts to condense, i.e. when RS is 100 %, RH is 45 %.

### Traceable $H_2O_2$ factory calibration

Every PEROXCAP sensor is manufactured in [Vaisala's own cleanrooms](#) 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. You can also [calibrate your own](#) HPP270 series probes.

## HPP270 Series Probes

For hydrogen peroxide, humidity,  
and temperature measurement



### Features

- Basic probe option HPP271 for H<sub>2</sub>O<sub>2</sub> vapor concentration measurement
- Advanced probe option HPP272: compact 3-in-1 probe with real-time measurement of H<sub>2</sub>O<sub>2</sub> 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 Indigo products and Insight PC software

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.

### Relative saturation for comprehensive humidity monitoring

Similar to water, H<sub>2</sub>O<sub>2</sub> 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<sub>2</sub>O<sub>2</sub> vapor together. This tells you reliably when the bio-decontaminated air starts to condense.

### Repeatable measurement for highly condensing environments

Intelligent measurement technology including the sensor purge function helps to maintain accuracy between calibrations in challenging H<sub>2</sub>O<sub>2</sub> 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.

### Indigo and Insight compatible

The probe can be connected to Vaisala Indigo transmitters and the Indigo80 handheld indicator to extend the selection of available features.

Indigo products provide a range of additional display, output, and relay options, as well as convenient interfaces for monitoring, configuration, and calibration and adjustment. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

For easy-to-use access to configuration, calibration, and adjustment, the probe can be connected to Vaisala Insight PC software. See [www.vaisala.com/insight](http://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<sub>2</sub>O<sub>2</sub>, 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 <sub>2</sub> O <sub>2</sub>	±10 ppm
Accuracy at +10 ... +25 °C (+50 ... +77 °F), 10 ... 2000 ppm H <sub>2</sub> O <sub>2</sub> <sup>1)</sup>	±10 ppm or 5 % of reading (whichever is greater)
Factory calibration uncertainty at +25 °C (+77 °F), 500 ppm H <sub>2</sub> O <sub>2</sub> <sup>2)</sup>	±10 ppm
Response time (T <sub>63</sub> )	70 s
Other parameters	
H <sub>2</sub> O ppm by volume, dew point temperature	

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 V DC Analog output: 15 ... 25 V DC
Current consumption at +25 °C (+77 °F)	
In digital mode	Max. 10 mA
In analog mode	Max. 50 mA
During sensor 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 dependence

## Operating environment

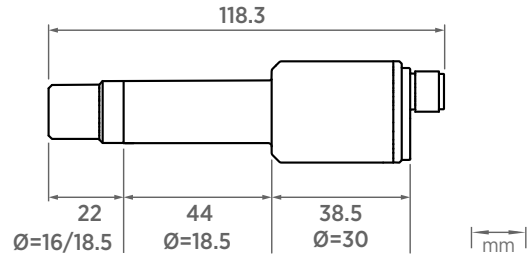
Operating temperature	+0 ... +70 °C (+32 ... +158 °F)
Storage temperature	-20 ... +70 °C (-4 ... +158 °F)
Ambient pressure	Normal atmospheric pressure
IP rating	IP65

## Compliance

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

## Mechanical specifications

Connector	M12-5M
Materials	
Probe body	AISI316L stainless steel
Filter cap	Porous PTFE



## HPP271 dimensions

## Spare parts and accessories

Indigo USB adapter <sup>1)</sup>	USB2
Probe connection cable with open wires, 1.5 m (4.9 ft)	254294SP
Probe connection cable with open wires, 3 m (9.8 ft)	254295SP
Probe connection cable with open wires, 5 m (16 ft)	254296SP
Probe connection 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
Indigo transmitters	See <a href="http://www.vaisala.com/indigo">www.vaisala.com/indigo</a>
Indigo80 handheld indicator	See <a href="http://www.vaisala.com/indigo80">www.vaisala.com/indigo80</a>

1) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://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 <sub>2</sub> O <sub>2</sub>	±10 ppm
Accuracy at +10 ... +25 °C (+50 ... +77 °F), 10 ... 2000 ppm H <sub>2</sub> O <sub>2</sub> <sup>1)</sup>	±10 ppm or 5 % of reading (whichever is greater)
Factory calibration uncertainty at +25 °C (+77 °F), 500 ppm H <sub>2</sub> O <sub>2</sub> <sup>2)</sup>	±10 ppm
Response time (T <sub>63</sub> )	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 <sub>2</sub> O <sub>2</sub>	±0.5 %RS
Accuracy at +25 °C (+77 °F) <sup>1)</sup>	±4 %RS
Factory calibration uncertainty at +25 °C (+77 °F), 500 ppm H <sub>2</sub> O <sub>2</sub> <sup>2)</sup>	±2 %RS
Relative humidity	
Measurement range	0 ... 100 %RH
Measurement temperature range	+5 ... +70 °C (+41 ... +158 °F)
Accuracy: <sup>1)</sup>	
at +25 °C (77 °F), 0 ppm H <sub>2</sub> O <sub>2</sub> , 0 ... 90 %RH	±1 %RH
over full temperature measurement and H <sub>2</sub> O <sub>2</sub> range	±2 %RH
Response time (T <sub>63</sub> )	20 s
Factory calibration uncertainty at +25 °C (77 °F), 0 ppm H <sub>2</sub> O <sub>2</sub> , 0 ... 95 %RH <sup>2)</sup>	±1 %RH
Temperature	
Sensor	Pt1000 RTD Class F0.1
Accuracy over temperature range	±0.2 °C (±0.36 °F)
Other parameters	
Absolute H <sub>2</sub> O <sub>2</sub> and H <sub>2</sub> O, H <sub>2</sub> O ppm by volume, water vapor saturation pressure (H <sub>2</sub> O and H <sub>2</sub> O+H <sub>2</sub> O <sub>2</sub> ), dew point temperature, vapor pressure (H <sub>2</sub> O and H <sub>2</sub> O <sub>2</sub> )	

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 V DC Analog output: 15 ... 25 V DC
Current consumption at +25 °C (+77 °F)	
In digital mode	Max. 10 mA
In analog mode	Max. 50 mA
During sensor purge	Max. 250 mA
Digital output	
Interface	RS-485, not isolated; do not use termination on the RS-485 line
Communication protocol	Modbus RTU v.1.02
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

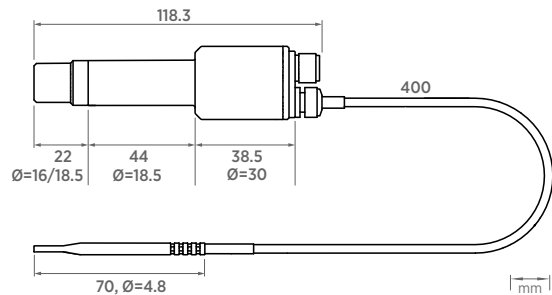
Operating temperature	+0 ... +70 °C (+32 ... +158 °F)
Storage temperature	-20 ... +70 °C (-4 ... +158 °F)
Ambient pressure	Normal atmospheric pressure
IP rating	IP65

## Compliance

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

## Mechanical specifications

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



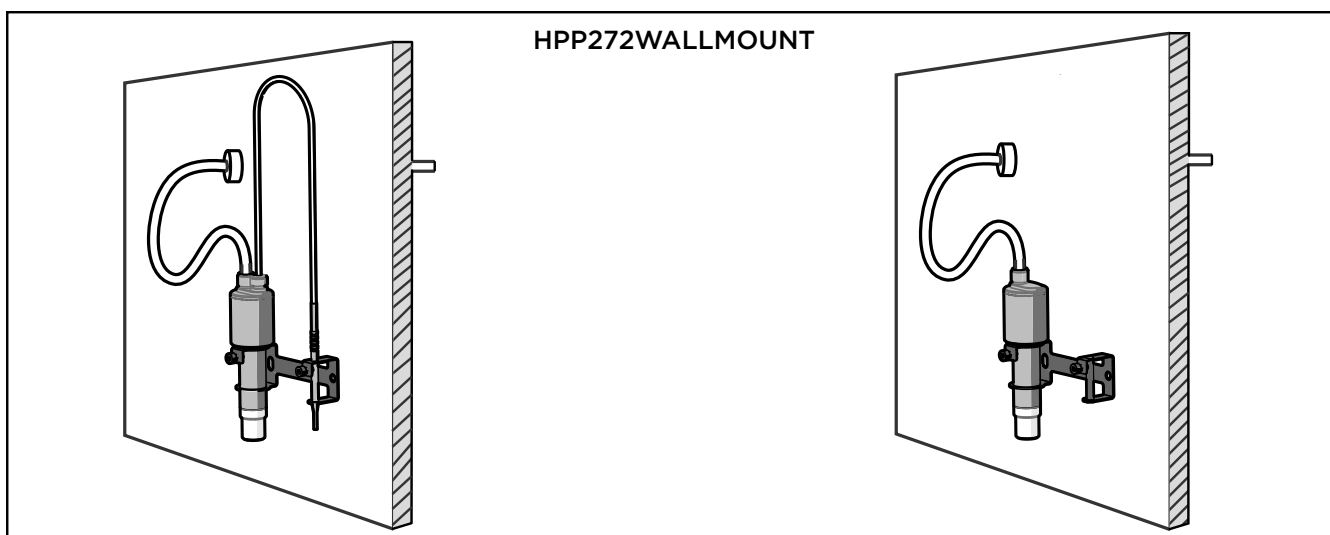
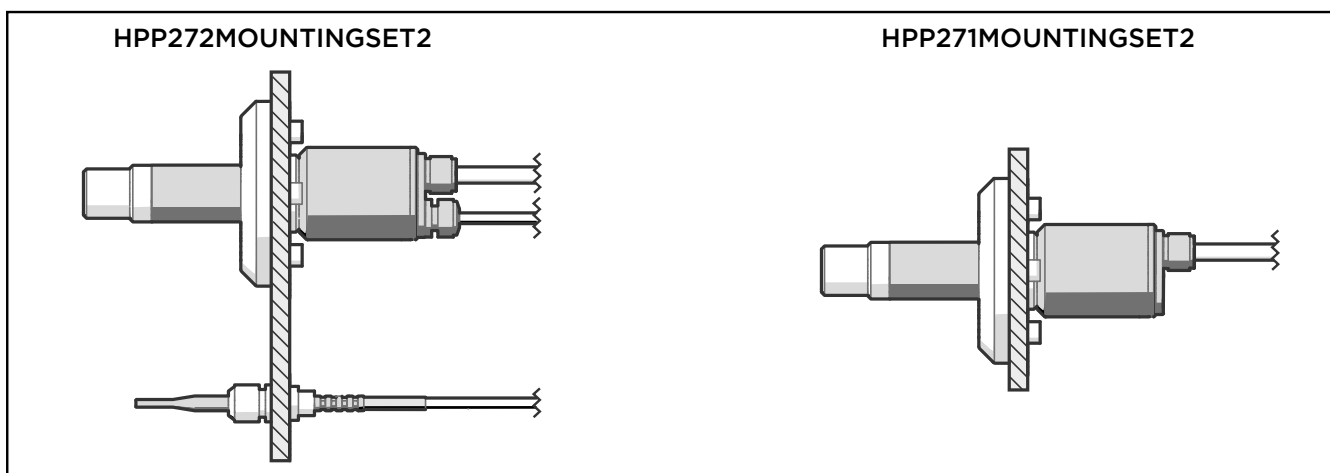
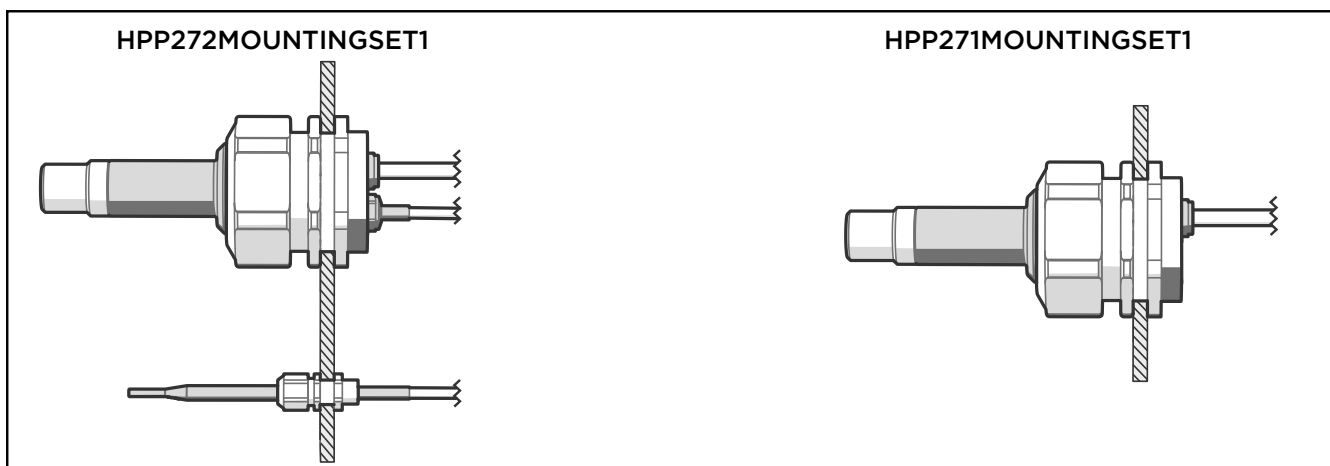
## HPP272 dimensions

## Spare parts and accessories

Indigo USB adapter <sup>1)</sup>	USB2
Probe connection cable with open wires, 1.5 m (4.9 ft)	254294SP
Probe connection cable with open wires, 3 m (9.8 ft)	254295SP
Probe connection cable with open wires, 5 m (16 ft)	254296SP
Probe connection 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 <a href="http://www.vaisala.com/indigo">www.vaisala.com/indigo</a>
Indigo80 handheld indicator	See <a href="http://www.vaisala.com/indigo80">www.vaisala.com/indigo80</a>

1) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).

# HPP271 and HPP272 installation accessories





### 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

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.

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.

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.
- Our sensor technology tells the true margin to water saturation point in all changing conditions, taking into account, for example, temperature changes and aging of oil.
- Highly stable pressure and temperature tolerances.
- Easy to install through ball valve – no need to shut down the process.
- Enables predictive maintenance work and quick identification of damaging trends.

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.

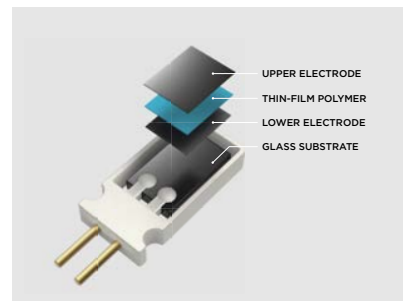
Oil molecules or additives do not penetrate the electrode. Thus the sensor output is independent of the oil type.

### Online measurement

Online 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 online 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  $\pm 0.01 a_w$  ( $\pm 1 \text{ } \% \text{RS}$ )
- Incorporates the proven Vaisala HUMICAP<sup>®</sup> sensor
- Modbus<sup>®</sup> RTU over RS-485
- Two lengths available for the probe head: 262 mm and 448 mm
- Traceable calibration certificate
- Compatible with Vaisala Indigo products and Insight PC software

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

### Reliable Vaisala HUMICAP<sup>®</sup> technology

MMP8 incorporates the latest-generation Vaisala HUMICAP<sup>®</sup> 180L2 sensor, which is the result of over 20 years of field experience.

The 180L2 sensor's excellent chemical tolerance provides accurate and reliable measurement over a wide measurement range. The 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 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 an optional ball valve kit, MMP8 is ideal for installation into processes where the probe needs to be installed or removed while the process is running. MMP8 is available in two different lengths, and the installation depth of the probe 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.

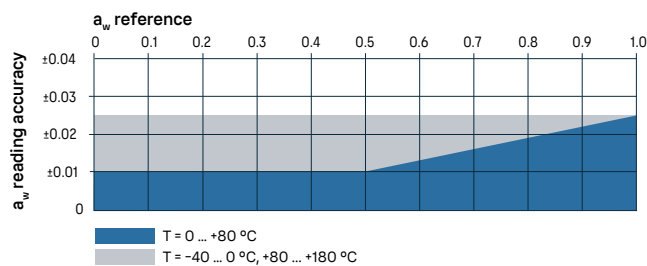
For more information on Indigo family products and Insight PC software that can be used with the probe, see [www.vaisala.com/insight](http://www.vaisala.com/insight) and [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

Water activity	
Measurement range	0–1 $a_w$
$T_{90}$ response time <sup>1)</sup>	10 min
Sensor	HUMICAP® 180L2
Accuracy <sup>2)</sup>	±0.01 $a_w$ (±1 %RS)
Water concentration in oil	
Typical accuracy	10 % of the reading
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 psi), absolute
Installation pressure	Up to 10 bar (145 psi), absolute
IP rating of probe body	IP66
Ball valve	
Operating temperature	Up to +100 °C (+212 °F)
Operating pressure	Up to 40 bar (580 psi), absolute

## 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 concentration in oil (ppm <sub>w</sub> )

## Mechanical specifications

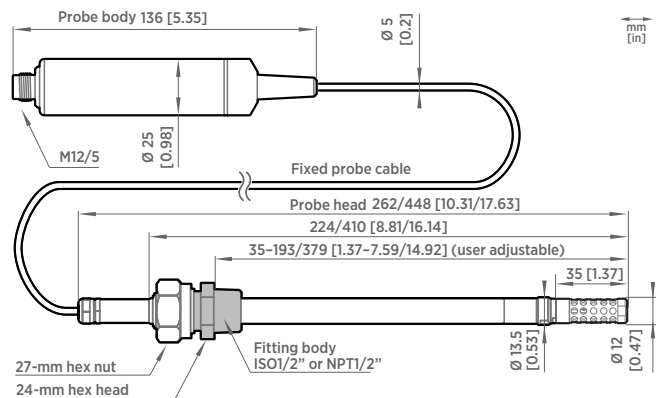
Connector	M12 5-pin A-coded male
Weight (with a 2-m cable)	262-mm-long MMP8: 510 g (18.0 oz) 448-mm-long MMP8: 610 g (21.5 oz)
Filter options	Stainless steel grid standard filter Stainless steel grid filter for high flow rates (> 1 m/s)
Probe cable length	2 m (6.56 ft)
Adjustable installation depth	262-mm-long MMP8: 35–193 mm (1.37–7.59 in) 448-mm-long MMP8: 35–379 mm (1.37–14.92 in)
Materials	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP

## Compliance

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



- 1) DNV GL certificate applies to the 262-mm-long MMP8 model only, not to the 448-mm-long model.



## MMP8 dimensions

## Accessories

Ball valve kit ISO 1/2" with welding joint	BALLVALVE-1
Ball valve kit ISO 1/2" – ISO 3/4" with thread joint	BALLVALVE-2
Indigo USB adapter <sup>1)</sup>	USB2
Calibration adapter for HMK15	211302SP
Weatherproof carrying case for Indigo80 and a series 8 probe <sup>2)</sup>	ASM215318

- 1) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).  
 2) For example, MMP8, HMP8, or DMP8 with a max. 2-m (6.6-ft) probe connection cable.

## Indigo520 Transmitter For Vaisala Indigo-compatible probes



### Features

- Supports 2 detachable measurement devices simultaneously
- Data logging of all measurement parameters
- IP66 rated metal enclosure
- 4 configurable galvanically isolated analog outputs
- 2-wire current loop analog input
- 2 relays
- Ethernet connection with web interface for remote access
- Displays measurements on the spot and 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
- Optional non-display model with LED indicator

### Variety of probe options

Indigo500 Series transmitters are the most versatile option for use with Indigo-compatible probes.

- HMP Series humidity and temperature probes
- DMP Series dew point probes
- GMP250 Series carbon dioxide probes
- HPP270 Series vaporized hydrogen peroxide probes

- 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.

Indigo500 Series transmitters can be connected to the MHT410 transmitter for display of measurement data and automation system connectivity.

Indigo500 Series transmitters can also be connected to the portable diagnostics tool Indigo80 handheld indicator.

Indigo520 transmitter can be connected to Polaris™ PR53 process refractometers for measuring liquid concentrations.

For more information on the Indigo product family, see [vaisala.com/indigo](https://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. The Ethernet connection also 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 H<sub>2</sub>O<sub>2</sub> (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
Carbon dioxide	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
Polaris™ Process Refractometers <sup>1)</sup>	PR53AC, PR53AP, PR53GC, PR53GP, PR53M, PR53SD, PR53W
Indigo80 Handheld Indicator	Indigo80
MGP260 Series Multigas Probes	MGP261, MGP262
Differential Pressure Transmitters	PDT101, PDT102

<sup>1)</sup> Compatible with transmitters ordered with software configuration "L" for process refractometers.

## Transmitter options

Display	<ul style="list-style-type: none"> <li>Capacitive touchscreen display</li> <li>No display (indicator LED) <sup>1)</sup></li> </ul>
Powering	<ul style="list-style-type: none"> <li>Protective extra-low voltage (15–35 V DC, 24 V AC ± 20%)</li> <li>AC (mains) power (100–240 V AC 50/60 Hz)</li> <li>Power over Ethernet (no analog outputs, analog input, or relays)</li> </ul>

<sup>1)</sup> Recommended when the transmitter is exposed to direct UV light, and for outdoor installations and high-humidity environments.

## 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

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	5.0–9.0 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)

## Operating environment

Operating environment	Outdoor use
Use in wet location	Yes
Operating humidity	0–100 %RH
Maximum operating altitude, AC (mains) power	3000 m (approx. 9800 ft)
Maximum operating altitude, protective extra-low voltage (PELV) and Power over Ethernet (PoE)	4000 m (approx. 13 100 ft)
IP rating	IP66 <sup>1)</sup>
UL 50E rating	Type 4

### Operating temperature

With display	-25 ... +55 °C (-13 ... +131 °F)
Without display	-40 ... +60 °C (-40 ... +140 °F)
Without display with barometer module	-40 ... +55 °C (-40 ... +131 °F)

### Storage temperature

With display	-30 ... +60 °C (-22 ... +140 °F)
Without display	-40 ... +60 °C (-40 ... +140 °F)

<sup>1)</sup> Evaluated by Eurofins, not by UL.

## Powering

Property	Description/Value
<b>Operating power <sup>1)</sup></b>	
Protective extra-low voltage (PELV) version	15–35 V DC, 24 V AC $\pm 20\%$ 50/60 Hz, max. current 2 A (power supply is galvanically isolated) Fuse size for power supply: 3 A Isolation voltage: 500 V AC, 1000 V DC
PELV power cable temp. rating	$\geq +80\text{ }^{\circ}\text{C}$ (+176 $^{\circ}\text{F}$ )
AC (mains) power version	100–240 V AC 50/60 Hz, max. current 1 A (power supply is galvanically isolated) Fuse size for power supply: 10 A Isolation voltage: 1500 V AC
AC (mains) power cable length	2.5 m (approx. 8 ft 2 in)
Power over Ethernet version	Power over Ethernet (PoE) IEEE 802.3at Type 2 Class 4 Max. current 600 mA, max. power consumption 25.5 W Isolation voltage: 500 V AC, 1000 V DC

### Typical current consumption at +20 °C (+68 °F) ( $U_{in}$ 24 V DC) <sup>2)</sup>

Base consumption (no display, analog outputs, or communication)	50 mA
With display	+ 60 mA
With voltage analog output	< 2 mA per channel
With current analog output	+ 21 mA per channel
With relays	+ 9 mA per relay
With Ethernet cable connected	+ 15 mA
With barometer module	+ 5 mA

<sup>1)</sup> The power supply option is selected when ordering the transmitter.

<sup>2)</sup> For the current consumption of the connected measurement device, see the device's documentation, available at [docs.vaisala.com](http://docs.vaisala.com).

## User interfaces

User interfaces	Web interface for remote use, optional touchscreen display
Supported languages	English, Chinese, French, German, Japanese, Spanish
Optional display	5" capacitive touchscreen
Integrated data logging capabilities	Non-volatile memory, at least 10 years' storage with 24 h interval logging

## Inputs and outputs

Transmitter service port connection	Connection to Indigo80 with cable 262195SP
<b>Analog input <sup>1)</sup></b>	
Available ranges	4–20 mA
Resolution	6 $\mu\text{A}$
Display resolution	0.01 mA
Accuracy	$\pm 0.05\text{ mA}$
Input impedances	200 $\Omega$
Isolation	Isolated from power supply
Overload protection	40 mA max. (reverse polarity protected)

<b>Analog outputs <sup>1)</sup></b>	
Number of analog outputs	4
Isolation	Isolated from power supply
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 <sup>2</sup> (14 AWG)
Accuracy of analog outputs at +20 °C (+68 °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	$R_L > 10\ \text{k}\Omega$

<b>Relay outputs <sup>1)</sup></b>	
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 <sup>2</sup> (14 AWG)
Max. wire size in AC (mains) version	1.5 mm <sup>2</sup> (16 AWG)

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

<sup>1)</sup> Not available in transmitters that are powered with Power over Ethernet (PoE).

## Compliance

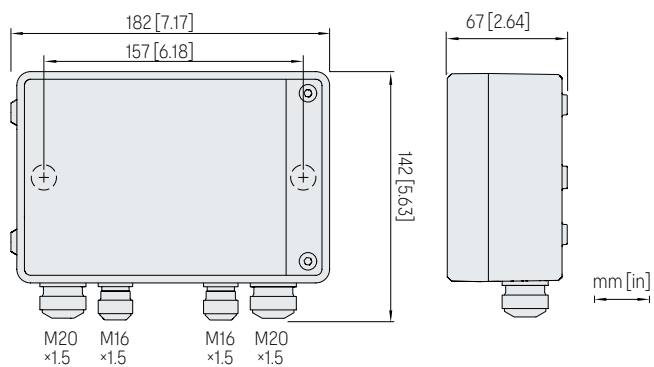
EU directives and regulations	EMC Directive (2014/30/EU) Low Voltage Directive (2014/35/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B
Electrical safety	IEC/EN 61010-1
Type approvals	DNV GL certificate no. TAA000032M EU RO Mutual Recognition certificate no. MRA000004F
Compliance marks	CE, China RoHS, FCC, RCM, UKCA
Listing marks	UL Listed (USA and Canada)
FCC compliance	FCC Part 15, Class B



## Accessories

Adapter plate	DRW252186SP
Installation kit for pole or pipeline	215108
Installation kit with weather shield	215109
Indigo500 spatter guard	ASM214526
M12 - M8 service cable 1.5 m (4.9 ft), for connecting to Indigo80	262195SP
<b>Probe connection cables</b>	
Probe connection cable, 0.3 m (approx. 12 in), open end <sup>1)</sup>	CBL210896-03MSP
Probe connection cable, 1 m (approx. 3 ft 3 in), open end <sup>1)</sup>	CBL210896-1MSP
Probe connection cable, 3 m (approx. 9 ft 10 in), open end <sup>1)</sup>	CBL210896-3MSP
Probe connection cable, 5 m (approx. 16 ft 5 in), open end <sup>1)</sup>	CBL210896-5MSP
Probe connection cable, 10 m (approx. 32 ft 10 in), open end <sup>1)</sup>	CBL210896-10MSP

<sup>1)</sup> The usable length outside of the transmitter enclosure is approx. 0.1 m (4 in) shorter than the total length of the cable.

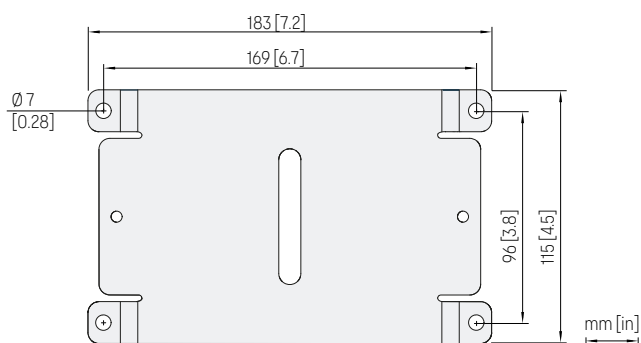


Indigo520 dimensions and lead-through sizes

## Spare parts

Cable gland, M20×1.5, 5.0–9.0 mm (0.20–0.35 in)	ASM213670SP
Cable gland with split bushing, M20×1.5 <sup>1)</sup>	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
Sintered filter (for barometer module)	DRW010335SP

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



Indigo500 adapter plate dimensions

## Indigo510 Transmitter

For Vaisala Indigo-compatible probes



### Features

- Touchscreen display (optional non-display model with LED indicator also available)
- Data logging of all measurement parameters
- IP66 rated metal enclosure
- 2 configurable galvanically isolated analog outputs
- Ethernet connection with web interface for remote access
- Modbus<sup>®</sup> TCP/IP protocol
- Protective extra-low voltage powering
- UL Listed in USA and Canada

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

Indigo500 Series transmitters are the most versatile option for use with Indigo-compatible probes.

- HMP Series humidity and temperature probes
- DMP Series dew point probes
- GMP250 Series carbon dioxide probes
- HPP270 Series vaporized hydrogen peroxide probes
- 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.

Indigo500 Series transmitters can be connected to the MHT410 transmitter for display of measurement data and automation system connectivity. Indigo500 Series transmitters can also be connected to the portable diagnostics tool Indigo80 handheld indicator.

For more information on the Indigo product family, see [vaisala.com/indigo](https://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. The Ethernet connection also 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 H<sub>2</sub>O<sub>2</sub> (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
Carbon dioxide	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
Indigo80 Handheld Indicator	Indigo80

## Transmitter options

Display	<ul style="list-style-type: none"> <li>Capacitive touchscreen display</li> <li>No display (indicator LED)<sup>1)</sup></li> </ul>
Powering	Protective extra-low voltage (11–35 V DC, 24 V AC ± 15% 50/60 Hz)

<sup>1)</sup> Recommended when the transmitter is exposed to direct UV light, and for outdoor installations and high-humidity environments.

## User interfaces

User interfaces	Web interface for remote use, optional touchscreen display
Supported languages	English, Chinese, French, German, Japanese, Spanish
Optional display	5" capacitive touchscreen
Integrated data logging capabilities	Non-volatile memory, at least 10 years' storage with 24 h interval logging

## Mechanical specifications

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)
<b>Cable diameters for cable glands</b>	
M20×1.5 glands	5.0–9.0 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)

## Operating environment

Operating environment	Outdoor use
Use in wet location	Yes
Operating humidity	0–100 %RH
Maximum operating altitude	4000 m (approx. 13 100 ft)
IP rating	IP66 <sup>1)</sup>
UL 50E rating	Type 4

Operating temperature	
With display	–20 ... +60 °C (–4 ... +140 °F)
Without display	–40 ... +60 °C (–40 ... +140 °F)

Storage temperature	
With display	–30 ... +60 °C (–22 ... +140 °F)
Without display	–40 ... +60 °C (–40 ... +140 °F)

<sup>1)</sup> Evaluated by Eurofins, not by UL.

## Powering

Property	Description/Value
<b>Operating power</b>	
Protective extra-low voltage (PELV)	11–35 V DC, 24 V AC ± 15% 50/60 Hz, max. current 2 A (power supply 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)

Typical current consumption at +20 °C (+68 °F) (U <sub>in</sub> 24 V DC) <sup>1)</sup>	
Base consumption (no display, analog outputs, or communication)	50 mA
With display	+ 60 mA
With voltage analog output	< 2 mA per channel
With current analog output	+ 21 mA per channel
With Ethernet cable connected	+ 15 mA

<sup>1)</sup> For the current consumption of the connected measurement device, see the device's documentation, available at docs.vaisala.com.

## Inputs and outputs

Transmitter service port connection	Connection to Indigo80 with cable 262195SP
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Analog outputs	
Number of analog outputs	2
Isolation	Isolated from power supply
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 <sup>2</sup> (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 <sub>L</sub> < 500 Ω
0–1 V output	R <sub>L</sub> > 2 kΩ
0–5 V and 0–10 V outputs	R <sub>L</sub> > 10 kΩ

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



## Compliance

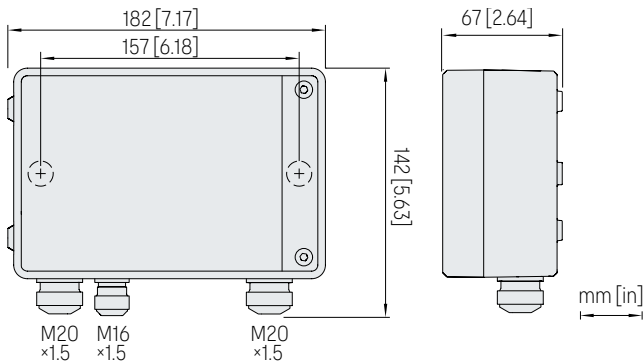
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## Accessories

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Installation kit for pole or pipeline	215108
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M12 - M8 service cable 1.5 m (4.9 ft), for connecting to Indigo80	262195SP
<b>Probe connection cables</b>	
Probe connection cable, 0.3 m (approx. 12 in), open end <sup>1)</sup>	CBL210896-03MSP
Probe connection cable, 1 m (approx. 3 ft 3 in), open end <sup>1)</sup>	CBL210896-1MSP
Probe connection cable, 3 m (approx. 9 ft 10 in), open end <sup>1)</sup>	CBL210896-3MSP
Probe connection cable, 5 m (approx. 16 ft 5 in), open end <sup>1)</sup>	CBL210896-5MSP
Probe connection cable, 10 m (approx. 32 ft 10 in), open end <sup>1)</sup>	CBL210896-10MSP

<sup>1)</sup> The usable length outside of the transmitter enclosure is approx. 0.1 m (4 in) shorter than the total length of the cable.

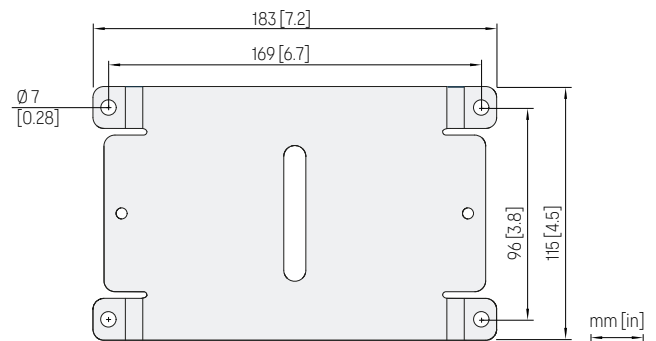


Indigo510 dimensions and lead-through sizes

## Spare parts

Cable gland, M20×1.5, 5.0–9.0 mm (0.20–0.35 in)	ASM213670SP
Cable gland with split bushing, M20×1.5 <sup>1)</sup>	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

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



Indigo500 adapter plate dimensions

## Indigo300 Transmitter For Vaisala Indigo-compatible probes



### Features

- Numerical and graphical color display for up to 3 parameters
- Non-display version with an LED status indicator also available
- IP66-rated metal housing
- Support for one Indigo-compatible probe
- Tool-free locking wheel for the probe
- 24 V AC/DC power supply input
- 3 preconfigured analog outputs (mA or V)
- Service port on the front for connecting to Vaisala Insight PC software or Indigo80 handheld indicator

Vaisala Indigo300 Transmitter is a host device for displaying measurement values from Vaisala Indigo-compatible probes and/or transmitting them to automation systems through analog signals.

### Transmitter for Vaisala Indigo-compatible probes

- HMP series humidity and temperature probes
- TMP1 temperature probe
- DMP series dew point probes
- GMP250 series carbon dioxide probes
- HPP270 series vaporized hydrogen peroxide probes
- MMP8 moisture in oil probe

The Indigo300 transmitter is a plug-and-play host device for current and future Vaisala Indigo-compatible probes. The transmitter has a numerical and graphical color display showing up to 3 measurement parameters simultaneously.

A non-display transmitter version with an LED status indicator is also available.

### Simple to connect and service

Probes can be connected to the transmitter tool-free using the locking wheel of the probe connector. You can connect a probe directly or by using a cable. Instead of the locking wheel and a detachable cable, it is also possible to use a cable gland with a fixed cable.

The service port on the front can be opened with a 4-mm Allen key for access to the free Vaisala Insight PC software or Indigo80 handheld indicator.

With Insight and Indigo80, you can view live measurement data from the probe connected to the transmitter, configure both the transmitter and the probe, as well as calibrate and adjust the probe without having to detach it from the transmitter.

### Robust design

The IP66-rated, corrosion-resistant metal housing of the transmitter is suitable for harsh conditions.

### Versatile installation options

The mounting options include mounting through the transmitter body and mounting on a DIN rail. With an adapter plate, the transmitter can be installed to replace an HMT330, DMT340, or MMT330 series transmitter.

The transmitter can either be wired from the back, which leaves no trailing cables, or through the bottom lead-throughs.

For more information on the Indigo300 transmitter and the Indigo product family, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# 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
Carbon dioxide	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	With display: -30 ... +70 °C (-22 ... +158 °F) Without display: -40 ... +70 °C (-40 ... +158 °F)
Operating humidity	0-100 %RH
Maximum operating altitude	5000 m (approx. 16 400 ft)
IP rating	IP66 <sup>1)</sup>

1) IP40 for transmitters equipped with a locking wheel and a probe connection cable attached to it. This combination is recommended only for indoor conditions.

## Inputs and outputs

Power supply input	15-30 V DC <sup>1)</sup> 24 V AC ±10 % 50/60 Hz
Fuse size for power supply	2.5 A
Transmitter service port connection	<ul style="list-style-type: none"> <li>Connection to Insight with USB2 and cable 262195SP <sup>2)</sup></li> <li>Connection to Indigo80 with cable 262195SP</li> </ul>
<b>Analog outputs</b>	Current or voltage
Number of analog outputs	3
Selectable voltage output types	0-1 V, 0-5 V, 0-10 V, 1- 5 V, scalable, $R_L \geq 10 \text{ k}\Omega$
Selectable current output types	4-20 mA, 0-20 mA, scalable, $R_L \leq 500 \Omega$
Accuracy of analog outputs at 20 °C (+68 °F)	±0.1 % full scale <sup>3)</sup>
Temperature dependence	±0.005 % / °C full scale

### Current consumption at 20 °C (+68 °F) ( $U_{in}$ 24 V DC)

Minimum consumption with display off, no analog outputs active, no probe connected <sup>4)</sup>	13 mA
Minimum consumption with display on, brightness normal mode, no analog outputs active, no probe connected	18 mA
$U_{out}$ 0-1 V, 0-5 V, 0-10 V, 1-5 V	+ 1.8 mA per connected channel at maximum load
$I_{out}$ 4-20 mA, 0-20 mA	+ 12.3 mA max. per connected channel

1) When used with the HMP7 probe, the minimum required power supply input is 18 V DC.

2) Vaisala Insight software for Windows™ available at <http://www.vaisala.com/insight>.

3) For the voltage outputs, small variation is possible around true zero.

4) For the current consumption of the connected probe, see the probe's user documentation.

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN IEC 61326-1, industrial environment
EMC emissions	CISPR 32 / EN 55032, Class A FCC part 15 B, Class A ICES-3 / NMB-3 (Class A)
Compliance marks	CE, China RoHS, FCC, RCM, UKCA

## Mechanical specifications

Housing material	EN AW-6082
Connection screw terminals	Max. 1.5 mm <sup>2</sup> wire (16 AWG)
Cable lead-throughs for output and power cables	<ul style="list-style-type: none"> <li>M20×1.5 cable gland / conduit fitting NPT 1/2"</li> <li>M16×1.5 cable gland / conduit fitting NPT 1/2"</li> </ul>
Cable diameter for M20×1.5 gland	7-13 mm (0.26-0.51 in)
Cable diameter for M16×1.5 gland	2-6 mm (0.08-0.24 in)
Dimensions	161 × 134 × 43.5 mm (6.34 × 5.26 × 1.71 in)
Weight	1200 g (2.65 lb)

## Probe connection cables

Detachable cables for use with locking wheel <sup>1)</sup>	
Probe connection cable, 1 m (3 ft 3 in)	INDIGOCABLE1M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 1 m (3 ft 3 in)	INDIGOCABLEHDM5
Probe connection cable, 3 m (9 ft 11 in)	INDIGOCABLE3M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 3 m (9 ft 11 in)	INDIGOCABLEHDM3M
Probe connection cable, 5 m (16 ft 5 in)	INDIGOCABLE5M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 5 m (16 ft 5 in)	INDIGOCABLEHDM5M
Probe connection cable, 10 m (32 ft 10 in)	INDIGOCABLE10M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 10 m (32 ft 10 in)	INDIGOCABLEHDM10M
Fixed cables for use with cable gland <sup>2)</sup>	
Probe connection cable, 0.3 m (12 in), open end <sup>3)</sup>	CBL210896-03MSP
Probe connection cable, 1 m (3 ft 3 in), open end	CBL210896-1MSP
Probe connection cable, 3 m (9 ft 11 in), open end	CBL210896-3MSP
Probe connection cable, 5 m (16 ft 5 in), open end	CBL210896-5MSP
Probe connection cable, 10 m (32 ft 10 in), open end	CBL210896-10MSP

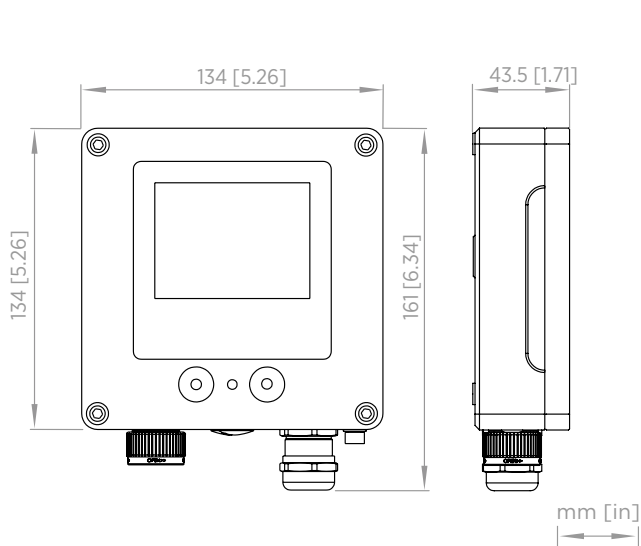
1) The IP rating of transmitters that use detachable probe connection cables with the locking wheel is IP40.

2) The IP rating of transmitters that use fixed probe connection cables with the cable gland is IP66.

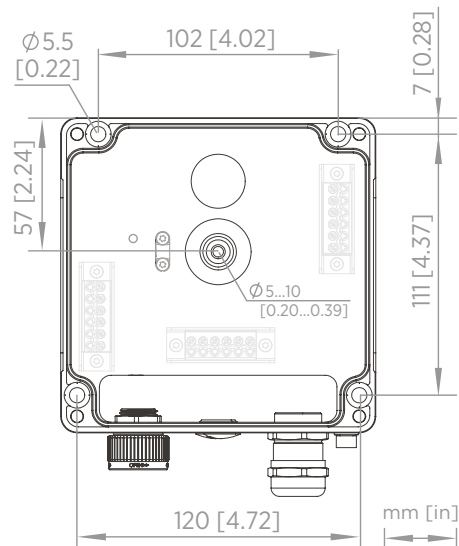
3) The usable length outside of the transmitter enclosure is approx. 0.1 m (4 in) shorter than the total length of the cable.

## Spare parts and accessories

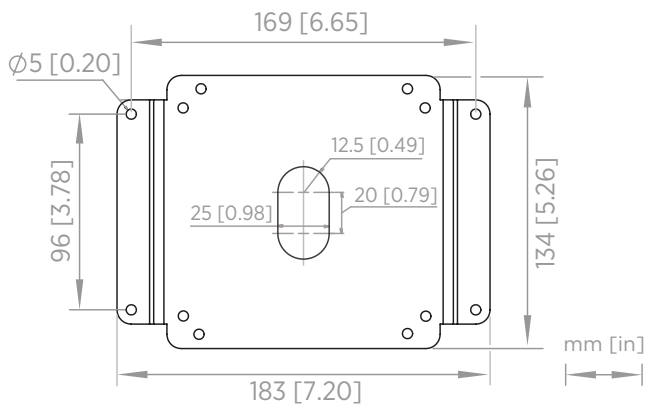
Adapter plate for replacing a Vaisala 330 series transmitter	DRW257715SP
DIN rail installation kit	ASM215071SP
Vaisala Indigo USB adapter and M12 - M8 service cable, for connecting to Insight	USB2 and 262195SP
M12 - M8 service cable 1.5 m (4.9 ft), for connecting to Indigo80	262195SP
Cable gland M20×1.5 for 7.0–13.0 mm (0.26–0.51 in) cable	253993SP
Conduit fitting M20×1.5 for NPT1/2" conduit	214780SP
Cable gland M16×1.5 for 2.0–6.0 mm (0.08–0.24 in) cable	ASM213671SP
Conduit fitting M16×1.5 for NPT1/2" conduit	210675SP
Plug for M20 lead-through	ASM213672SP
Plug for M16 lead-through	210369SP
Service port plug	DRW257660SP



Indigo300 transmitter dimensions



Indigo300 transmitter body mounting dimensions



Indigo300 adapter plate (DRW257715SP) mounting dimensions

## Indigo200 Series Transmitters For Vaisala Indigo-compatible probes



### Features

- Transmitter USB-C port allows connecting to Vaisala Insight PC software with a generic USB cable
- 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 transmitting measurements 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 CO<sub>2</sub> 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 color display with numeric and graph measurement viewing options; 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.

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 H<sub>2</sub>O<sub>2</sub> and alcohol-based cleaning agents.

For easy access to configuration and monitoring options, Indigo200 can be connected to Vaisala Insight PC software using the USB-C port on the transmitter with any generic USB cable that has a USB-C connector.

With Insight PC software, you can configure both the host device and the probes connected to it. Insight PC software also provides options for temporary viewing of the measurement data and diagnostics.

For more information on Indigo transmitters and the Indigo product family, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## General

- Color display (Indigo201: optional non-display version)
- USB connection to Vaisala Insight PC software for easy access to configuration and monitoring options.

## 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
Carbon dioxide	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: <ul style="list-style-type: none"> <li>• H<sub>2</sub>O<sub>2</sub> (6000 ppm, non-condensing)</li> <li>• Alcohol-based cleaning agents such as ethanol and IPA (max. 70 % concentrate)</li> </ul>
IP rating	IP65 <sup>1)</sup>
Indoor/outdoor use	Indoor use

<sup>1)</sup> Note that the IP65 rating only applies when the cable gland wiring option is used, and the lead-through with the pierceable seal at the back of the transmitter is left intact. See user documentation for more information on Indigo200 wiring options.

## Inputs and outputs

Insight PC software configuration access <sup>1)</sup>	USB-C port on transmitter (compatible with generic USB cables)
Power supply input	15–30 V DC <sup>2)</sup> 24 V AC ±10 % 50/60 Hz
Relay contacts x 2	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
------------------------	--------------------

<sup>1)</sup> Vaisala Insight software for Windows\* available at [www.vaisala.com/insight](http://www.vaisala.com/insight).

<sup>2)</sup> When used with the HMP7 probe, the minimum required power supply input is 18 V DC.

## Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, RCM

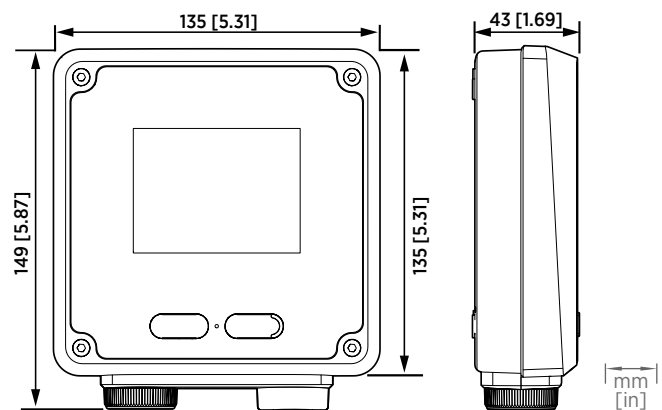
## Mechanical specifications

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

## Spare parts and accessories

USB-C connection cable (2 m, type C to A, for Insight PC software access) <sup>1)</sup>	273956
Probe connection cable, 1 m (3 ft 3 in)	INDIGOCABLE1M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 1 m (3 ft 3 in)	INDIGOCABLEHDM5
Probe connection cable, 3 m (9 ft 11 in)	INDIGOCABLE3M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 3 m (9 ft 11 in)	INDIGOCABLEHDM3M
Probe connection cable, 5 m (16 ft 5 in)	INDIGOCABLE5M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 5 m (16 ft 5 in)	INDIGOCABLEHDM5M
Probe connection cable, 10 m (32 ft 10 in)	INDIGOCABLE10M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 10 m (32 ft 10 in)	INDIGOCABLEHDM10M
Universal mains power supply with EU/US/UK/AUS plugs	INDIGOPOWER24VSP

<sup>1)</sup> Note that a USB-C cable is not included in Indigo200 deliveries by default. A generic USB-C cable (type C to A) can also be used.



Indigo200 series dimensions



### Features

- Easy access to configuration settings and measurement data of supported devices
- Simple setup, diagnostics, and field calibration and adjustment
- Supports Indigo-compatible measurement 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 measurement probes and other supported devices.

### Indigo product family

Vaisala Indigo-compatible probes are self-contained, interchangeable measurement probes. The probes can be used as standalone digital Modbus® RTU devices, or together with Indigo series transmitters or the Indigo80 indicator, which 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 local display of an Indigo transmitter or the Indigo80 indicator. Alternatively, 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 Windows 10 operating systems or newer. One product specific USB cable (type A connector) per connected probe is needed.

Vaisala Insight software is available for download at [vaisala.com/insight](https://vaisala.com/insight).

# Devices supported by Insight software

## 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
Carbon dioxide	GMP251, GMP252
Vaporized hydrogen peroxide	HPP271, HPP272
Moisture in oil	MMP8

## Indigo transmitters and handheld devices

Device or series	Models
Indigo200 Transmitter <sup>1)</sup>	INDIGO201, INDIGO202
Indigo300 Transmitter	INDIGO300
Indigo80 Handheld Indicator	INDIGO80
DMP80 Series Handheld Dew Point Probes	DMP80A, DMP80B
HMP80 Series Handheld Humidity and Temperature Probes	HMP80L, HMP80N
GMP80P Portable Carbon Dioxide Probe with Pump Sampling	GMP80P

<sup>1)</sup> Requires model with USB-C connection, introduced in 2022. Models with WLAN connection are not supported by Insight software.

## Other supported devices

Device or series	Models
DMT143 Miniature Dew Point Transmitters	DMT143, DMT143L
GMD110 Duct Carbon Dioxide Transmitter	GMD110
HMD60 Series Humidity and Temperature Transmitters	HMD62, HMD65, TMD62
HMDW110 Series Humidity and Temperature Transmitters	HMW110, HMW112, HMD110, HMD112, HMS110, HMS112, TMI110
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
HMT370EX Series Intrinsically Safe Humidity and Temperature Transmitters	HMT370EX, HMP371, HMP373, HMP374, HMP375, HMP377, HMP378
MGP260 Series Multigas Probes	MGP261, MGP262
Polaris™ Refractometers	PR53AC, PR53AP, PR53GC, PR53GP, PR53M, PR53W, PR53SD
VDL200 Data Logger	VDL200



## Indigo80 Handheld Indicator For portable diagnostics








### Features

- Flexible operation with Vaisala Indigo-compatible probes and transmitters, including HMP80 and DMP80 handheld probes and GMP80P probe with pump sampling
- Intuitive user interface available in 10 languages
- Rechargeable battery
- Robust design and modern appearance
- Logged measurement data can be transferred to PC via Vaisala Insight software

Vaisala Indigo80 Handheld Indicator is an industrial-grade portable diagnostics tool. Accommodating up to two Vaisala measurement probes, Indigo80 is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting Vaisala Indigo-compatible probes and transmitters.

### Variety of probe options

The Indigo80 indicator has two cable ports by which a combination of two probes or transmitters can be simultaneously connected to the indicator. Indigo80 can communicate with most current and future Vaisala probes and transmitters for measuring a wide range of parameters.

-  Humidity and temperature
-  Dew point
-  Carbon dioxide
-  Hydrogen peroxide vapor
-  Moisture in oil

For the full set of probes and transmitters currently compatible with Indigo80, see the following page. For more information on the Indigo product family, see [vaisala.com/indigo](https://vaisala.com/indigo).

### Robust and reliable

The sturdy aluminum body of Indigo80 is resistant to chemicals and dust. Indigo80 is powered by a rechargeable lithium-ion battery with a typical operation time of 10 h. During long-term logging Indigo80 can be powered by using an AC adapter.

### Easy to use

Indigo80 has an intuitive user interface that guides the user if needed. The indicator is designed to be easy to use in numerous use cases and measurement environments.

To access logged data and configuration functionality, Indigo80 can be connected to Vaisala Insight PC software for Windows®. For more information, see [vaisala.com/insight](https://vaisala.com/insight).

### Multilingual user interface

Indigo80 has a multilingual, menu-based user interface that shows live measurement data both numerically and graphically. The Indigo80 user interface is available in 10 languages.



View live measurement data as numbers or graphs

# Vaisala devices compatible with Indigo80

## Vaisala Indigo-compatible probes

HMP1, HMP3, HMP4, HMP5, HMP7, HMP8, HMP9, HMP80L, HMP80N	Humidity and temperature
TMP1	Temperature
DMP5, DMP6, DMP7, DMP8, DMP80A, DMP80B	Dew point
GMP251, GMP252	Carbon dioxide
HPP271, HPP272	Vaporized hydrogen peroxide
MMP8	Moisture in oil

## Other Vaisala devices

HMP60, HMP63, HMP110, HMP113, HMP115, HMM170	Humidity and temperature
HMP110T, HMP115T, TMP115	Temperature
DMT143, DMT143L	Dew point

## Vaisala Indigo transmitters (host devices)

Indigo300, Indigo510, Indigo520
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# Technical data

## Operating environment

Operating temperature	-20 ... +50 °C (-4 ... +122 °F)
Storage temperature	-20 ... +60 °C (-4 ... +140 °F), recommended +20 °C (+68 °F)
Operating and storage humidity	20–85 %RH, when Ta ≤ +40 °C (+104 °F)
Charging temperature	0 ... +45 °C (+32 ... +113 °F) <sup>1)</sup>
IP rating	IP40
Use in wet location	No
Operating environment	Indoor use
Pollution degree	3
Maximum operating altitude	2000 m (approx. 6500 ft)

1) The battery will not charge at temperatures below 0 °C (+32 °F).

## Data logging and user interface specifications

Data logging capacity	Up to 5.5 million real-time data values
Logging interval	1 s - 12 h
Logging duration	1 min - memory full <sup>1)</sup>
Alarm	Audible alarm function
Supported languages	English, Chinese, Finnish, French, German, Italian, Japanese, Portuguese, Spanish, Swedish
Display	2.7" sunlight readable transfective TFT LCD color display with backlight and automatic brightness control

1) For example, data logging duration for one measurement parameter with a logging interval of one second is over eight weeks. Use an AC adapter to power Indigo80 during long-term logging.

## Battery operation time

Operation time (continuous use)	10 h at +20 °C (+68 °F) <sup>1)</sup>
Charging time	2 hours <sup>1)</sup>

1) Typical value. Actual performance depends on, for example, the number and type of devices connected to Indigo80 and the data logging interval.


## Mechanical specifications

Weight	385 g (14 oz)
Dimensions (H × W × D)	213 × 58 × 27 mm (8.4 × 2.3 × 1.1 in)
<b>Materials</b>	
Main body and rear piece	Aluminum EN AW-6082 T6
Back cover	Rubber (TPE) and polycarbonate (PC), reinforced with fiberglass Flammability rating UL94 V-1
Display	Strengthened glass with anti-fingerprint (AF) and anti-reflection (AR) coatings

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B FCC part 15 B, Class B ICES-3 / NMB-3 (Class B)
Electrical safety	IEC/EN 61010-1
Compliance marks	CE, China RoHS, FCC, RCM, UKCA

## Inputs and outputs

Max. number of connected probes	2
Connector type	M12 5-pin female (2 pcs)
<b>Battery</b> <sup>1)</sup>	
Type	Rechargeable lithium-ion battery
Nominal voltage	7.2 V
Rated capacity	2900 mAh / 20.88 Wh
Charge limit voltage	8.4 V
<b>AC adapter</b> <sup>2)</sup>	
Type	45 W USB-C AC adapter <sup>3)</sup>
Connector type	USB-C
AC input	100-240 V AC, 1.2 A, 50-60 Hz
DC output	5.0 V/9.0 V/12.0 V/15.0 V DC, 3.0 A 20.0 V DC, 2.25 A 45 W
Insulation	Double or reinforced, indicated with the following symbol: 
PC interface	Vaisala Insight PC software with USB-C cable (Windows OS). <sup>4)</sup> Data can be logged and transferred also without Insight.

1) The battery is not user-replaceable. Contact Vaisala Service Center for any battery-related maintenance needs.

2) The AC adapter is an optional accessory. If using an AC adapter not provided by Vaisala, make sure it fulfills the specifications given in this table and the safety requirements listed in Indigo80 Safety Guide (M212872EN), available at docs.vaisala.com.

3) 45 W AC adapter recommended for optimal performance of Indigo80. An AC adapter with a lower power rating can also be used.

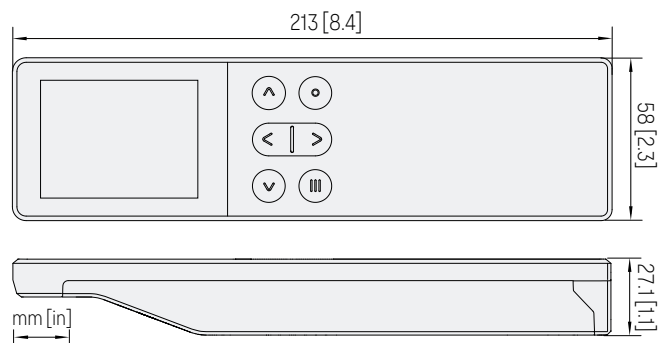
4) Insight software is available for download at [vaisala.com/insight](https://vaisala.com/insight).

## Spare parts and accessories

<b>Cables</b>	
Cable for transmitters (M12-M8), 1.5 m (4 ft 11 in)	262195SP
Cable for probes (M12-M12), 1.5 m (4 ft 11 in)	272075SP
Flat cable for probes (M12-M12), 1 m (3 ft 3 in)	CBL210493SP
Probe connection cable (M12-M12), 10 m (32 ft 10 in)	INDIGOCABLE10M
<b>Other</b>	
Magnetic hanger for indicator	ASM214318SP
Weatherproof carrying case for Indigo80 and HMP80 and DMP80 series probes	ASM214759
Weatherproof carrying case for Indigo80 and a series 8 probe <sup>1)</sup>	ASM215318
Light carrying case for HM40S or Indigo80 indicator and a compatible probe <sup>2)</sup>	230245SP

1) For example, MMP8, HMP8, or DMP8 with a max. 2-m (6 ft 7 in) probe connection cable.

2) For example, DMP80, HMP80N, or GMP252 probe with handle accessory and a max. 1.5-m (4 ft 11 in) probe connection cable.



Indigo80 dimensions (front and side view)

## HMP80 Series Handheld Humidity and Temperature Probes

For spot-checking applications



### Features

- Portable design optimized for industrial spot-checking and field calibration
- RH accuracy up to  $\pm 0.8\%$  RH
- Temperature accuracy up to  $0.1\text{ }^{\circ}\text{C}$  ( $0.18\text{ }^{\circ}\text{F}$ )
- Wide temperature measurement range
- Condensation-tolerant
- Sensor purge improves long-term stability and chemical resistance
- Compatible with Indigo80 handheld indicator and Insight PC software
- Calibration certificate included

Vaisala HUMICAP® Handheld Humidity and Temperature Probes HMP80 Series have been designed for portable use, especially with the Indigo80 handheld indicator. The combination of HMP80 probe and Indigo80 is ideal for spot-checking and field calibration of installed Vaisala humidity instruments.

### 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.

The 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.

HMP80 series probes are delivered with standard factory calibration certificates, with accredited calibration as an option. The probes can therefore be used as a working standard in field calibration.

### Robust design for handheld measurements

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

The design of the probe handle has been optimized for manual operation in versatile measurement environments. The IP66-classified probe handle offers excellent protection against moisture and dust with the probe connection cable attached. Also the cable connection is protected against mechanical stress by the robust design of the handle.

### Flexible connectivity

HMP80 probes are optimized for portable spot-checking, field calibration, and data logging use with the Indigo80 handheld indicator. For easy-to-use access to device analytics and configuration, HMP80 probes can be connected to Vaisala Insight software for Windows®.

For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo) and [www.vaisala.com/insight](http://www.vaisala.com/insight).

# Technical data

## HMP80 series measurement performance

### Relative humidity

Measurement range	0-100 %RH
Accuracy at +23 °C (73.4 °F) <sup>1)</sup>	±0.8 %RH (0-90 %RH)
Factory calibration uncertainty <sup>2)</sup>	±0.5 %RH (0-40 %RH) ±0.8 %RH (40-95 %RH)

T<sub>63</sub> response time 15 s

Sensor HUMICAP® R2C

### Temperature

Measurement range	HMP80N: -20 ... +60 °C (-4 ... +140 °F) HMP80L: -50 ... +120 °C (-58 ... +248 °F), short-time measurement range -50 ... +180 °C (-58 ... +356 °F)
-------------------	--

Accuracy at +23 °C (+73.4 °F) <sup>1) 3)</sup> ±0.1 °C (±0.18 °F)

Factory calibration uncertainty <sup>2)</sup> ±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)

Sensor Pt100 RTD Class FO.1 IEC 60751

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

## HMP80 series operating environment

Operating temperature of probe handle -10 ... +60 °C (-14 ... +140 °F)

Operating temperature of probe head  
HMP80N: -20 ... +60 °C (-4 ... +140 °F)  
HMP80L: -50 ... +120 °C (-58 ... +248 °F)

Storage temperature -20 ... +60 °C (-4 ... +140 °F)

Measurement environment For air, nitrogen, hydrogen, argon, helium, oxygen, and vacuum <sup>1)</sup>

IP rating of probe handle:

with probe connection cable connected to the probe IP66

without cable IP55

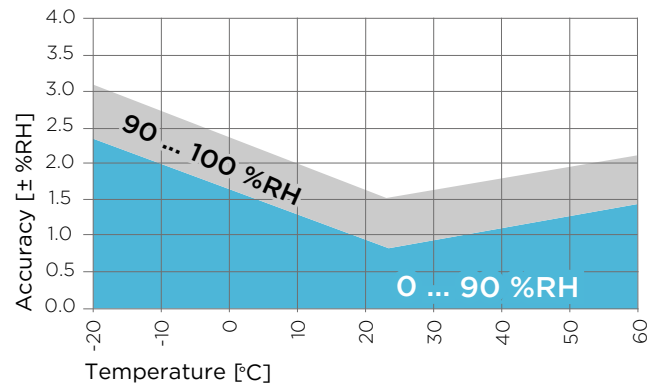
<sup>1)</sup> Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases.

## HMP80 series inputs and outputs

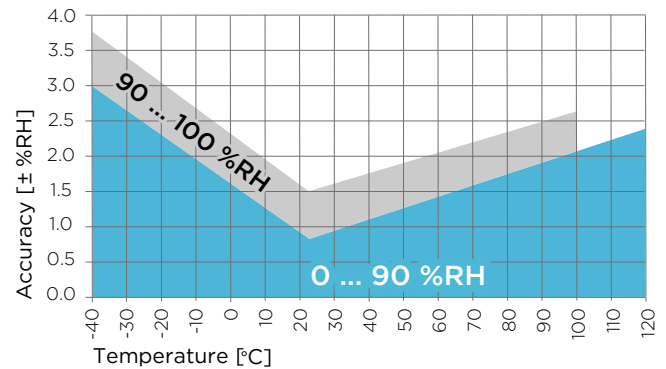
Operating voltage	15-30 V DC
Current consumption	10 mA typical, 500 mA max.
Digital output	RS-485, non-isolated

## HMP80 series compliance

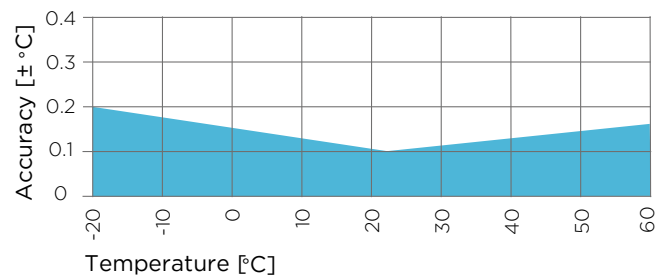
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Rough handling (excluding sensor inside probe head)	IEC 60068-2-31
Compliance marks	CE, China RoHS, RCM, UKCA



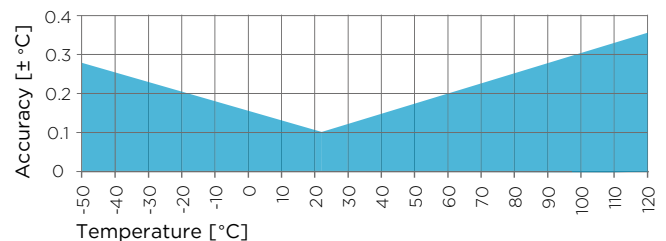
HMP80N humidity measurement accuracy as a function of temperature



HMP80L humidity measurement accuracy as a function of temperature



HMP80N temperature measurement accuracy over full range



HMP80L temperature measurement accuracy over full range

## HMP80 series output parameters

Absolute humidity (g/m <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>w</sub> )
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
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)

## HMP80 series mechanical specifications

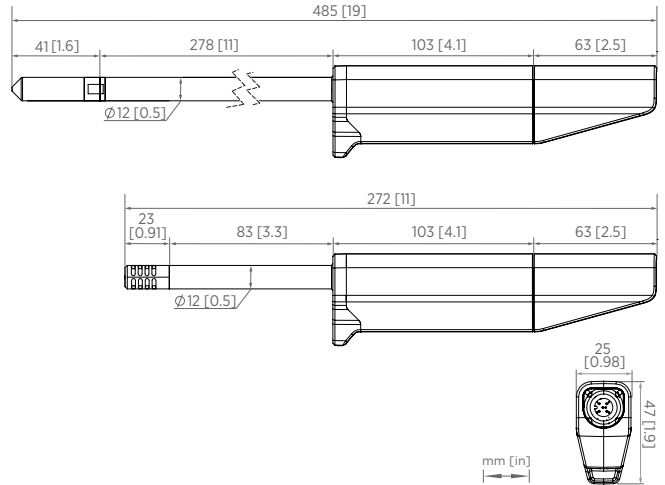
Connector type	M12 5-pin A-coded male
Weight	HMP80N: 200 g (7 oz) HMP80L: 300 g (10 oz)

Materials	
Probe handle	Polyamide (PA) and thermoplastic elastomer (TPE)
Probe shaft	Stainless steel (AISI 316L)
Filters	HMP80N: Stainless steel (AISI 316L) <sup>1)</sup> HMP80L: Porous stainless steel (AISI 316L) <sup>2)</sup>

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

## HMP80 series spare parts and accessories

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



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

## DMP80 Series Handheld Dew Point and Temperature Probes

For spot-checking applications



### Features

- Portable design optimized for industrial spot-checking and field calibration
- Dew point measurement accuracy up to  $\pm 2$  °C ( $\pm 3.6$  °F)  $T_{d/f}$
- Wide dew point measurement range
- Sensor purge improves long-term stability and chemical resistance
- Condensation-tolerant
- Compatible with Indigo80 handheld indicator and Insight PC software
- Calibration certificate included

Vaisala DRYCAP® Handheld Dew Point and Temperature Probes DMP80 Series have been designed for portable use, especially with the Indigo80 handheld indicator. The combination of DMP80 probe and Indigo80 is ideal for spot-checking and field calibration of installed Vaisala humidity instruments.

### Reliable measurements with the Vaisala DRYCAP sensor

Vaisala DRYCAP sensor is robust against particulate contamination, water condensation, oil vapor, and most chemicals. The sensor tolerates condensation and recovers perfectly if exposed to liquid water. The sensor's performance is excellent also in dynamic and low dew point applications, thanks to its fast reaction time and stability.

The probes can be inserted directly into pressurized processes, and respond rapidly from ambient to process conditions. The DMP80 probes are suitable for direct process dew point measurement in a wide temperature and pressure range.

DMP80 series probes are delivered with standard factory calibration certificates, with accredited calibration as an option. The probes can therefore be used as a working standard in field calibration.

### Sensor purge minimizes effects of contaminants

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

Sensor purge involves heating the sensor briefly to remove chemicals that could lower measurement performance and cause drifting.

### Robust design for handheld measurements

The design of the probe handle has been optimized for manual operation in versatile measurement environments. The IP66-classified probe handle offers excellent protection against moisture and dust with the probe connection

cable attached. Also the cable connection is protected against mechanical stress by the robust design of the handle.

### Flexible connectivity

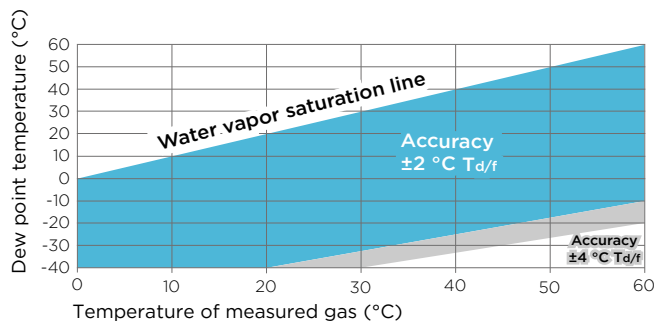
DMP80 probes are optimized for portable spot-checking, field calibration, and data logging use with the Indigo80 handheld indicator. For easy-to-use access to device analytics and configuration, DMP80 probes can be connected to Vaisala Insight software for Windows®.

For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo) and [www.vaisala.com/insight](http://www.vaisala.com/insight).

# Technical data

## DMP80A measurement performance

Dew point	
Sensor	DRYCAP® 180S
Measurement range	-40 ... +60 °C (-40 ... +140 °F) T <sub>d/f</sub>
Accuracy	Up to ±2 °C (±3.6 °F) T <sub>d/f</sub>
Response time 63 % [90 %]:	
From dry to wet	5 s [10 s]
From wet to dry	45 s [5 min]
Temperature	
Measurement range	0 ... +60 °C (+32 ... +140 °F)
Accuracy	±0.2 °C (±0.36 °F) at room temperature
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751
Mixing ratio	
Measurement range (typical)	0-150 g/kg (0-1050 gr/lbs)
Accuracy (typical)	±12 % of reading
Absolute humidity	
Measurement range	0-130 g/m <sup>3</sup>
Accuracy (typical)	±10 % of reading



Dew point accuracy vs. measurement conditions (DMP80A)

## DMP80 series operating environment

Operating temperature range	-10 ... +60 °C (+14 ... +140 °F)
Storage temperature	-20 ... +60 °C (-4 ... +140 °F)
Operating pressure of probe head	0-20 bar (0-290 psi), absolute
Measurement environment	For air, nitrogen, hydrogen, argon, helium, and oxygen <sup>1)</sup>
IP rating of probe handle:	
With probe connection cable connected to the probe	IP66
Without cable	IP55

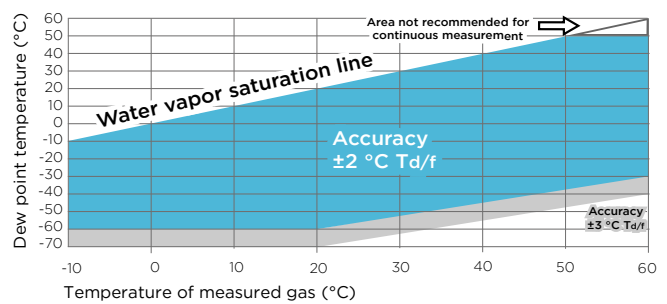
<sup>1)</sup> Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases.

## DMP80 series inputs and outputs

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

## DMP80B measurement performance

Dew point	
Sensor	DRYCAP® 180M
Measurement range	-70 ... +60 °C (-94 ... +140 °F) T <sub>d/f</sub>
Accuracy	Up to ±2 °C (±3.6 °F) T <sub>d/f</sub>
Response time 63 % [90 %]:	
From dry to wet	5 s [15 s]
From wet to dry	45 s [8 min]
Temperature	
Measurement range	0 ... +60 °C (+32 ... +140 °F)
Accuracy	±0.2 °C (±0.36 °F) 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



Dew point accuracy vs. measurement conditions (DMP80B)

## DMP80 series mechanical specifications

Connector type	M12 5-pin A-coded male
Weight	250 g (9 oz)
Mechanical connection options	G1/2" ISO 228/1 NPT1/2"
Materials	
Probe handle	Polyamide (PA) and thermoplastic elastomer (TPE)
Probe shaft	Stainless steel (AISI 316L)
Filter	Porous stainless steel (AISI 316L) <sup>1)</sup>

<sup>1)</sup> Vaisala item code: HM47280SP

## DMP80 series output parameters

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

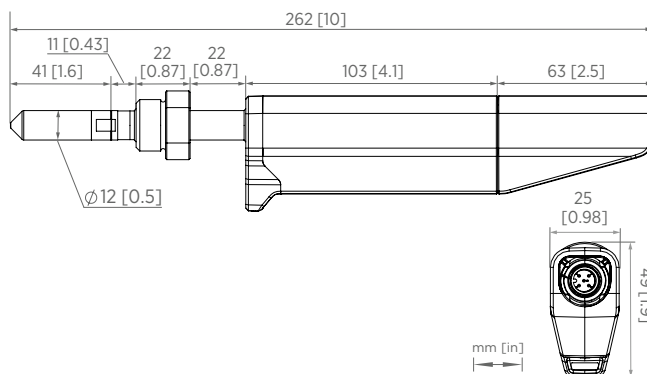


## DMP80 series compliance

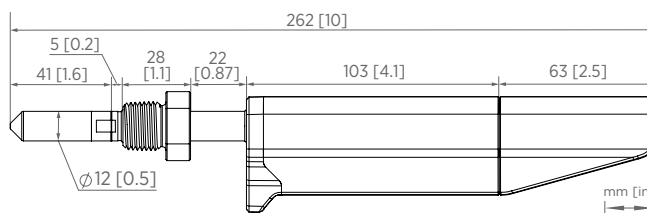
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Rough handling (excluding sensor inside probe head)	IEC 60068-2-31
Compliance marks	CE, China RoHS, RCM, UKCA

## DMP80 series spare parts and accessories

Cables	
Probe connection cable (M12-M12), 1.5 m (4.11 ft)	272075SP
Flat cable for probes (M12-M12), 1.0 m (3.4 ft)	CBL210493SP
Accessories for ISO G1/2" thread option	
Sampling cell with quick connector and leak screw	DSC74
Sampling cell with female connectors, inlet G3/8", outlet G1/4" ISO	DMT242SC
Sampling cell with Swagelok connectors for 1/4" tubing	DMT242SC2
Two-pressure sampling cell	DSC74B
Two-pressure sampling cell with coil	DSC74C
Other items	
Indigo USB adapter	USB2
Sintered stainless steel filter	HM47280SP



Dimensions of DMP80 series probes with G1/2" thread, side and bottom view



Dimensions of DMP80 series probes with NPT1/2" thread

# More information

Visit [docs.vaisala.com](https://docs.vaisala.com) for product documentation, including datasheets, order forms, and user guides.

<b>Humidity measurement</b>	<b>Product documentation</b>
HMP1 Humidity and Temperature Probe	<a href="https://docs.vaisala.com">HMP1 at docs.vaisala.com</a>
HMP3 Humidity and Temperature Probe	<a href="https://docs.vaisala.com">HMP3 at docs.vaisala.com</a>
HMP4 Relative Humidity and Temperature Probe	<a href="https://docs.vaisala.com">HMP4 at docs.vaisala.com</a>
HMP5 Relative Humidity and Temperature Probe	<a href="https://docs.vaisala.com">HMP5 at docs.vaisala.com</a>
HMP7 Relative Humidity and Temperature Probe	<a href="https://docs.vaisala.com">HMP7 at docs.vaisala.com</a>
HMP8 Relative Humidity and Temperature Probe	<a href="https://docs.vaisala.com">HMP8 at docs.vaisala.com</a>
HMP9 Compact Humidity and Temperature Probe	<a href="https://docs.vaisala.com">HMP9 at docs.vaisala.com</a>
TMP1 Temperature Probe	<a href="https://docs.vaisala.com">TMP1 at docs.vaisala.com</a>

<b>Dew point measurement</b>	<b>Product documentation</b>
DMP5 Dew Point and Temperature Probe	<a href="https://docs.vaisala.com">DMP5 at docs.vaisala.com</a>
DMP6 Dew Point Probe	<a href="https://docs.vaisala.com">DMP6 at docs.vaisala.com</a>
DMP7 Dew Point and Temperature Probe	<a href="https://docs.vaisala.com">DMP7 at docs.vaisala.com</a>
DMP8 Dew Point and Temperature Probe	<a href="https://docs.vaisala.com">DMP8 at docs.vaisala.com</a>

<b>Carbon dioxide measurement</b>	<b>Product documentation</b>
GMP251 Carbon Dioxide Probe	<a href="https://docs.vaisala.com">GMP251 at docs.vaisala.com</a>
GMP252 Carbon Dioxide Probe	<a href="https://docs.vaisala.com">GMP252 at docs.vaisala.com</a>

<b>Hydrogen peroxide measurement</b>	<b>Product documentation</b>
HPP270 Series Probes	<a href="https://docs.vaisala.com">HPP270 Series at docs.vaisala.com</a>

<b>Moisture in oil measurement</b>	<b>Product documentation</b>
MMP8 Moisture in Oil Probe	<a href="https://docs.vaisala.com">MMP8 at docs.vaisala.com</a>

<b>Portable diagnostics</b>	<b>Product documentation</b>	<b>Software download</b>
Indigo80 Handheld Indicator	<a href="https://docs.vaisala.com">Indigo80 at docs.vaisala.com</a>	<a href="https://vaisala.com/indigo80">vaisala.com/indigo80</a>
HMP80 Series Humidity and Temperature Probes	<a href="https://docs.vaisala.com">HMP80 Series at docs.vaisala.com</a>	
DMP80 Series Dew Point and Temperature Probes	<a href="https://docs.vaisala.com">DMP80 Series at docs.vaisala.com</a>	

<b>Indigo transmitters and Insight software</b>	<b>Product documentation</b>	<b>Software download</b>
Indigo500 Series Transmitters	<a href="https://docs.vaisala.com">Indigo500 Series at docs.vaisala.com</a>	<a href="https://vaisala.com/indigo500">vaisala.com/indigo500</a>
Indigo300 Transmitters	<a href="https://docs.vaisala.com">Indigo300 Series at docs.vaisala.com</a>	
Indigo200 Series Transmitters	<a href="https://docs.vaisala.com">Indigo200 Series at docs.vaisala.com</a>	
Insight PC software	<a href="https://docs.vaisala.com">Insight software at docs.vaisala.com</a>	<a href="https://vaisala.com/insight">vaisala.com/insight</a>



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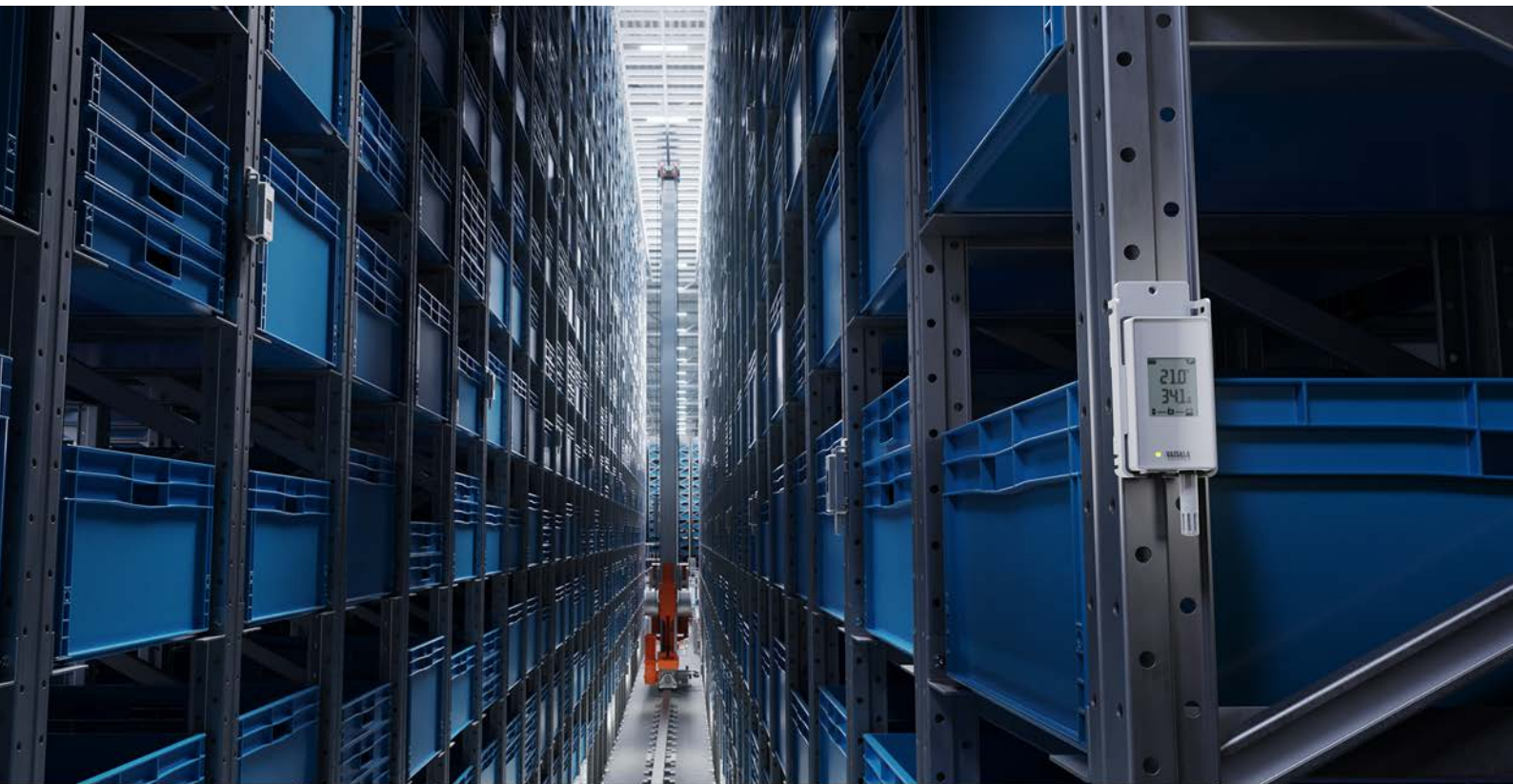
**VAISALA**

Please contact us at  
[vaisala.com/requestinfo](https://vaisala.com/requestinfo)

# Product Catalog

Industrial applications · GxP-regulated applications

**INDOOR ENVIRONMENTAL MONITORING SYSTEMS**



**VAISALA**



# About Vaisala

## **Vaisala Industrial Measurements**

Vaisala's Industrial Measurements business area provides customers with visibility into their own processes. Our products provide them with accurate and reliable measurement data which enables them to make decisions for optimized industrial processes.

With the reliable data from our instruments, customers can increase process efficiency, product quality, productivity, and yield but decrease energy consumption, waste, and emissions. Our monitoring systems also help our customers operating in the regulated environments to fulfill their regulatory compliance.

Industrial Measurements' customers operate in different types of environments from semiconductor factories and high-rise buildings to power plants and health technology laboratories where reliable measuring and monitoring of the ambient conditions are a prerequisite for successful operations.

## **Life science and pharmaceutical industry**

For over 50 of the world's top life science companies, Vaisala provides measurement devices and monitoring systems for continuous records, reports and alarms. These solutions are used to monitor temperature and humidity conditions in research and development, production, and storage environments. With our solutions and services, life science companies ensure the quality and safety of their products, and maintain compliance with global regulations.

This product catalog provides an overview of our products to help you select what best suits your needs. For more information, visit us at [vaisala.com](https://vaisala.com) or contact us at [vaisala.com/requestinfo](https://vaisala.com/requestinfo). Product user documentation is available at [docs.vaisala.com](https://docs.vaisala.com).



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## Differential pressure

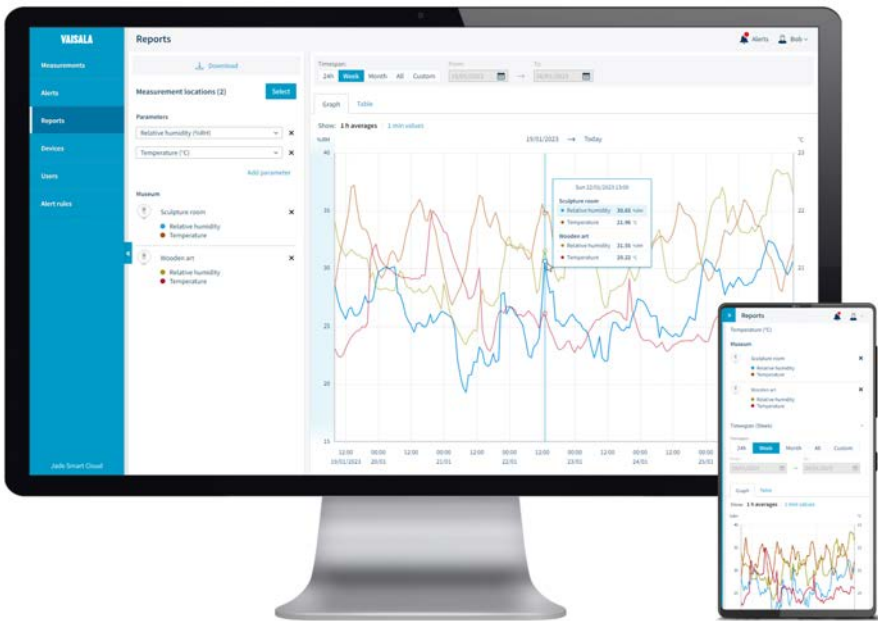
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## System introduction: Jade Smart Cloud Monitoring System for industrial applications



### Choose Jade when you need:

- Access to your measurement data anywhere & anytime
- Fast and easy installation
- Easy access via web browser on any device
- Mobile optimized remote monitoring and alarming
- Secure data storage on the cloud
- Adaptable and scalable configurations for changing applications
- Simple to use system for any industrial monitoring need

Vaisala Jade Smart Cloud combines high-class industrial measurements with easy-to-use cloud-based remote monitoring to enable new levels of competence and flexibility for professionals.

### Flexible and reliable

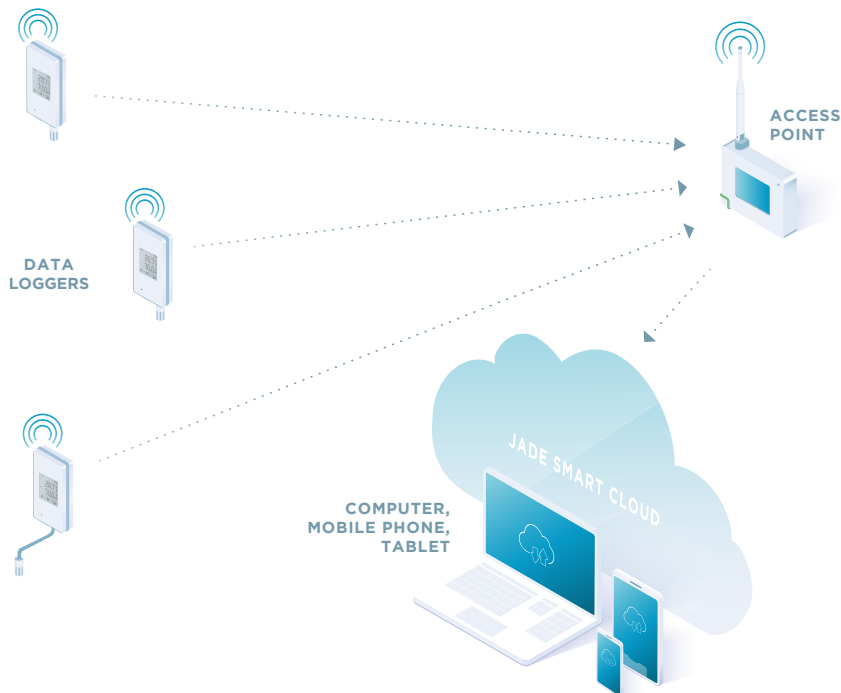
Jade Smart Cloud provides a flexible, reliable, and effective way to monitor humidity, temperature and other parameters online in your applications. This provides actionable insights into long-term conditions, site analytics, optimization, maintenance and process improvements.

### Modularity for demanding applications

Jade Smart Cloud is a modular monitoring solution. The compatible devices and gateways come with built-in connectivity and they are delivered ready-to-use. Various Vaisala measurement probes are supported to fulfill even the highest standards required for measurements.

The system is ideal for demanding environments, like museums and archives, food and beverage, warehouses, R&D and university laboratories, construction, and other industrial monitoring applications.





### Features

- Online service for monitoring of measurement parameters such as humidity and temperature
- Secure cloud storage of data
- Management of measurement locations using an intuitive system of sites and locations
- Connect using a web browser on your mobile phone, tablet or computer
- Add devices and users based on your needs
- No device pairing needed, as devices are associated with a specific cloud account when they are purchased

Vaisala Jade Smart Cloud is a convenient cloud-based data service for managing measurement data. The application can be accessed through a web browser on your mobile phone, tablet, or computer, making it ideal for professionals who want access to quality measurement data anywhere and at any time.

### Easy setup

The system is very easy to get started with. No device pairing is needed, as the devices are associated with a Jade Smart Cloud account when they are purchased. New devices become automatically available in the system. With the intuitive user interface, users can assign devices to measurement locations. Measurement locations can then be organized into measurement groups and sites for easy navigation.

### Licensing

Access to the user interface, as well as features that are enabled, are based on license tiers. Basic tier provides the essential management features. Additional tiers will be made available later.

The number of active devices that can send their data to the cloud is controlled using device connection subscriptions. All data is safely stored in the cloud.

### Web application

The web application user interface is built on modern web technologies and supported by all major desktop and mobile browsers. There is no app to install and maintain. The user interface is always available online at: <https://jade.vaisala.com>



Graph on mobile screen

# Technical data

## Web application

Web address	<a href="https://jade.vaisala.com">https://jade.vaisala.com</a>
Web interface protocol	TLS 1.2
Supported Internet browsers	All modern and up-to-date browsers, including, but not limited to: Google Chrome™ Apple Safari® Microsoft Edge® Mozilla Firefox®
User interface languages	English, Finnish, French, German, Portuguese, Spanish, Swedish

## License tiers

Feature	Basic tier
Live measurement data	✓
Viewing historical measurement data using graph or table view	✓
Exporting measurement data reports in PDF and CSV format	✓
Organizing measurement locations under groups and sites	✓
Device and probe details, including calibration date	✓
Alerts for measurement locations and devices	✓
User configurable alert rules	✓
Alert notifications by email	✓
Inviting new users to access your account	✓
User rights and site access control using Administrator, Operator, and Viewer roles	✓

## Supported devices

Device model	Connection requirements
CWL100 Cloud Wireless Data Logger	Connects wirelessly through CA10 Cloud Access Point. The access point must be associated with the same customer account. See <a href="#">CWL100 Data Logger Datasheet (B211912EN)</a> .
CA10 Cloud Access Point	Ethernet network with Internet connection. See <a href="#">CA10 Access Point Datasheet (B211911EN)</a> .



### Features

- Connects up to 32 CWL100 wireless data loggers to Vaisala Jade Smart Cloud
- Display shows connection status of data loggers and cloud service
- Long range LoRa™ radio with over 100 m (328 ft) typical indoor range
- End-to-end encryption ensures secure data transmission and storage
- Powered by Power over Ethernet (PoE) or DC adapter
- Requires Internet connection through cabled Ethernet network or cellular modem

Cloud Access Point CA10 is a wireless networking hardware device for connecting CWL100 data loggers to Vaisala Jade Smart Cloud service.

### CA10 and Jade Smart Cloud

CA10 access point transfers measurement data from wireless CWL100 data loggers to Jade Smart Cloud service, and enables management of the data loggers from the cloud interface. Data is encrypted during transfers to protect against eavesdropping, data tampering, and transfer errors.

CA10 access points and CWL100 data loggers are associated with a specific cloud account when they are purchased, so there is no need for the user to do any device pairing. CA10 always requires power and Internet connection for operation.

### Redundancy

Redundancy of the wireless connection is achieved through use of multiple access points and free connection capacity in the system. If a data logger has a connection problem, it will automatically connect to another available nearby access point in the system. At least two access points with free capacity are needed for failover to function.

In case of temporary network disruptions, the CWL100 data loggers can record up to 30 days of measurements. Recorded data can be downloaded directly from the data logger through the USB port.

### Time synchronization

CA10 requires accurate time to operate its LoRa wireless connection, and to maintain correct time on the connected data loggers. To achieve the accurate time, CA10 automatically synchronizes with Network Time Protocol (NTP) servers over the Internet.

# Technical data

## Wireless

Networking standards	LoRa™
Wireless connection capacity	Up to 32 supported devices
Modulation	LoRa chirp spread spectrum modulation
Output power	13 dBm (20 mW)
Antenna	Non-removable external antenna
Typical range (indoors)	At least 100 m (approx. 330 ft)
Maximum number of access points in an area	8
<b>Frequency bands</b>	
Model CA10E	868 MHz
Model CA10A	915 MHz

## General

Compatible host systems	Vaisala Jade Smart Cloud
Supported devices	CWL100 data logger
Display language	English
Internal clock	Synchronizes with Network Time Protocol (NTP) servers over the Internet

### Requirements for connectivity

Cabled Ethernet network with Internet connection (can be provided using a cellular modem)

Network provides IP address through DHCP

CA10 must be able to access TCP port 443 and UDP port 123

## Inputs and outputs

Operating voltage using dedicated power supply connector	10 ... 30 V DC
PoE power class	Class 0
Power consumption	Max. 13 W
<b>Ethernet interface</b>	
Supported standards	10BASE-T, 100BASE-TX
IPv4 address assignment	DHCP (automatic)
<b>Connectors</b>	
Power supply connector	2.0 mm center pin locking type DC power jack
Service port	Micro-USB (2.0)
Expansion port	USB type A (2.0)
Ethernet	8P8C (RJ-45)

## Operating environment

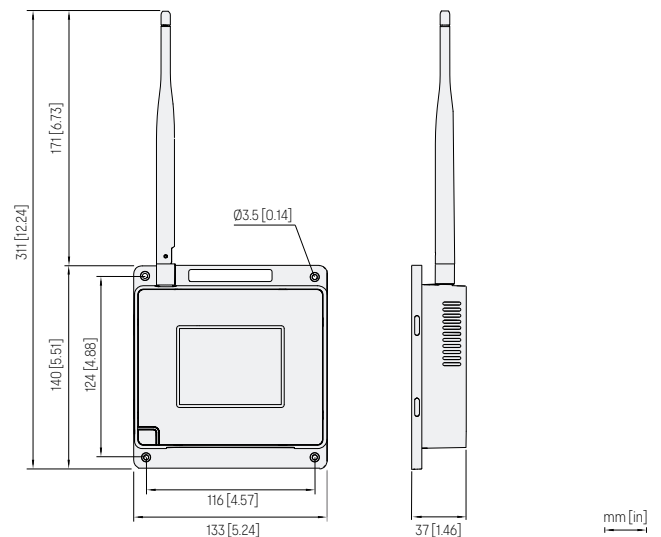
Operating environment	Indoor use
IP rating	IP30
Operating temperature	-20 ... +60 °C (-4 ... +140 °F)
Operating humidity	0 ... 90 %RH, non-condensing
Storage temperature	-20 ... +60 °C (-4 ... +140 °F)

## Compliance

Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment
Electrical safety	IEC/EN 61010-1
<b>CA10E model</b>	
EU directives and regulations	RoHS Directive (2011/65/EU) as amended by 2015/863 Radio Equipment Directive, RED (2014/53/EU)
Radio standards and approvals	ETSI EN 300 220-2 ETSI EN 301 489-1 ICASA No: TA-2022/0596 IMDA No: DB105576 Serbia: V005 21
Compliance marks	AAA, CE, ICASA, UKCA
<b>CA10A model</b>	
Radio standards and approvals	Anatel ID: 04763-19-12322 AS/NZS 4268 FCC ID: 2AO39-AP10A IC ID: 23830-AP10A
Compliance marks	ANATEL, RCM

## Mechanical specifications

Housing color	White
Mounting methods	Screws, tie wrap
Weight	386 g (13.6 oz)
Dimensions (H × W × D)	311 × 133 × 37 mm (12.24 × 5.24 × 1.46 in)
<b>Materials</b>	
Housing	PC/ABS blend
Display window	Chemically strengthened glass
Antenna	ABS



CA10 access point dimensions



### Features

- Reliable >100 m (approx. 330 ft) wireless range utilizing LoRa™ radio technology
- Detachable high-accuracy relative humidity and temperature probes
- Typical battery life of 18 months
- Uses standard alkaline batteries
- Optional magnetic mounting bracket available

CWL100 Cloud Wireless Data Logger uses long range LoRa wireless technology. It can be used to monitor temperature and humidity in a wide range of environments such as warehouses, production areas, cleanrooms, and laboratories. CWL100 is also suitable for construction moisture measurement.

### LoRa wireless

CWL100 connects wirelessly to Vaisala Jade Smart Cloud service, which provides real-time data, trend graphs, and alerts. The LoRa modulation technique provides a robust wireless signal that is extremely reliable over long distances and in complex, obstructed conditions. This wireless technology allows the data logger's signal to travel over 100 m (approx. 330 ft) indoors without the aid of signal amplifiers or repeaters. Wireless communications are encrypted to ensure data integrity and security.

Measurements are updated on the local display and stored on the data logger's local memory every 60 seconds, and sent through the wireless connection every 4 minutes. Jade Smart Cloud service stores the data in the original 1-minute resolution.

In case of a temporary network disruption the data logger can record up to 30 days of measurements. Recorded data can be downloaded directly from CWL100 through the USB port.

### Versatility and convenience

CWL100 requires no startup configuration, and the included mounting bracket supports several installation methods. Detailed custom display shows the latest measurement results, battery status, and signal strength of the current access point connection. The housing is classified IP54 to protect the device from dust and cleaning.

CWL100 is powered by 2 standard AA size 1.5 V batteries (LR6 alkaline or FR6 lithium) for 18 months of operation at approximately 20 °C (68 °F). When fresh batteries are inserted during yearly calibration, battery replacement between calibrations is not needed.

### Detachable probe

CWL100 supports several probe types for humidity and temperature measurement. Models with plastic housing are suitable for ambient measurements and provide a fast temperature response time. Stainless

steel probes are robust and suitable for demanding applications such as construction moisture measurement using the borehole method.

The probes use Vaisala HUMICAP® humidity sensors and platinum temperature sensors for superior stability. Probes can be integrated with the CWL100 housing or connected using a cable.

The probe is detachable, and easy to switch out for calibration. Jade Smart Cloud service detects the changed probe information automatically and maintains accurate and complete historical records.

# Probe options

Probe model	Measurement	Application <sup>1)</sup>	Measurement temperature	Mounting	Calibration certificate
HMP63	RH + T	General purpose humidity and temperature probe. Ideal for ambient measurement.	-40 ... +60 °C (-40 ... +140 °F)	Integrated or cable probe	No
HMP63T	T	General purpose temperature probe. Ideal for ambient measurement.	-40 ... +60 °C (-40 ... +140 °F)	Integrated or cable probe	No
HMP110	RH + T	Robust probe for demanding conditions. Suitable for structural humidity measurement using the borehole method.	-40 ... +80 °C (-40 ... +176 °F)	Cable probe only	Yes
HMP115	RH + T	Calibrated probe for high accuracy general purpose humidity and temperature measurement.	-40 ... +60 °C (-40 ... +140 °F)	Integrated or cable probe	Yes
HMP115T	T	Calibrated probe for high accuracy general purpose temperature measurement.	-40 ... +60 °C (-40 ... +140 °F)	Integrated or cable probe	Yes
TMP115	T	Wide-range temperature probe. Suitable for measurement in extremely cold temperatures. Available as 50 cm (1 ft 7.7 in) and 3 m (9.8 ft) long versions.	-196 ... +90 °C (-320 ... +194 °F)	Integrated or cable probe	Yes

1) See probe datasheets for detailed probe specifications and probe-specific accessories.

## Accessories

Accessory	Item code	HMP63	HMP110	HMP115/T	TMP115
Probe cable 1.5 m	CBL210555-1M5SP	✓	✓	✓	✓
Probe cable 3 m	CBL210555-3MSP	✓	✓	✓	✓
Probe cable 10 m	CBL210555-10MSP	✓	✓	✓	✓
Flat cable 3 m	CBL210647SP	✓	✓	✓	✓

## Accessories for concrete moisture measurement

Accessory	Item code	HMP63	HMP110	HMP115/T	TMP115
Plastic tube set (12 pcs)	19266HM		✓		
Long (200 mm) plastic tube set (12 pcs)	245789		✓		
Rubber plugs (12 pcs)	233976		✓		
Plastic flange set (12 pcs)	26529HM		✓		
Long rubber plug for wet concrete (12 pcs)	26530HM		✓		



HMP63/T and HMP115/T probes



HMP110 probe



TMP115 probe

# Technical data

## Wireless

Networking standards	LoRa™
Modulation	LoRa chirp spread spectrum modulation
Output power	13 dBm (20 mW)
Antenna	Internal
Typical range (indoors)	At least 100 m (approx. 330 ft)
Range with line-of-sight	Over 500 m (1640 ft)
Frequency bands	868 MHz and 915 MHz

## Memory

Sample capacity	30 days (43200 samples per channel)
Memory type	Non-volatile EEPROM
Memory mode	Ring buffer (FIFO)
Sampling rate	One sample / channel / minute (non-changeable)

## General

Compatible probes	HMP63, HMP63T, HMP110, HMP115, HMP115T, TMP115
Batteries	2 × AA sized, 1.5 V (LR6 or FR6)
Operation time at 20 °C (68 °F) without external power supply	18 months
Internal clock accuracy	±30 s/month Synchronizes time from CA10 access point

## Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Electrical safety	EN 61010-1
<b>868 MHz model</b>	
EU directives and regulations	RoHS Directive (2011/65/EU) as amended by 2015/863 Radio Equipment Directive, RED (2014/53/EU)
Radio standards and approvals	ETSI EN 300 220-2 ETSI EN 301 489-1 ICASA No: TA-2022-0748 IMDA No: DB105576 Serbia: M005 21
Compliance marks	AAA, CE, ICASA, UKCA
<b>915 MHz model</b>	
Radio standards and approvals	Anatel ID: 04761-19-12322 AS/NZS 4268 FCC ID: 2A039-RFL100A IC ID: 23830-RFL100A
Compliance marks	ANATEL, RCM

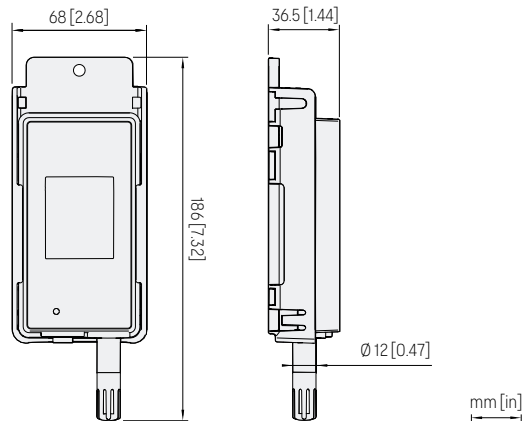
## Operating environment

Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity	0-100 %RH, non-condensing
IP rating	IP54
<b>Operating temperature <sup>1)</sup></b>	
with alkaline batteries	+2 ... +60 °C (+35.6 ... +140 °F)
with lithium batteries	-20 ... +60 °C (-4 ... +140 °F)

<sup>1)</sup> For both alkaline and lithium, battery temperature operating specifications apply.

## Mechanical specifications

Housing color	White
Mounting methods	Screws, tie-wrap, hook, or magnetic mounting bracket (optional accessory)
Probe interface	4-pin female M8 connector
Service port	USB 2.0 with micro-USB connector
<b>Dimensions (H × W × D) with HMP115 probe</b>	
Without mounting bracket	158 × 62 × 31 mm (6.22 × 2.4 × 1.22 in)
With mounting bracket	186 × 68 × 36.5 mm (7.32 × 2.68 × 1.44 in)
<b>Weight</b>	
With batteries (2 pcs alkaline), HMP115 probe, and magnetic mounting bracket	254 g (8.96 oz)
<b>Materials</b>	
Housing	PC/ABS blend
Display window	PMMA (acrylic)
Sealings	TPE



CWL100 dimensions with HMP115 probe



## System introduction: viewLinc Continuous Monitoring System for GxP-regulated environments



### Choose viewLinc when you need:

- Unlimited parameters and gap-free data for compliance
- Easy-to-use IQOQ protocols, GxP documentation
- A full suite of service options, including: installation, validation, and global calibration
- Validated data that can be shared with external control and automation systems

Designed for life science and GxP-regulated environments, Vaisala's viewLinc Continuous Monitoring System (CMS) ensures gap-free data, reliable alarming, and records that comply global regulatory requirements such as 21 CFR Part 11 and Annex 11.

### Versatile and reliable

Ideal for cleanrooms, laboratories, GDP warehouses, and hospitals, the viewLinc Enterprise Server-based system provides a web-based interface for remote monitoring, secure audit trail, customizable reporting, and reliable alarming through email, text, phone, or signal tower and annunciator.

### Flexible connectivity

The system scales easily, includes nine language versions, and offers flexible connectivity options, including: Ethernet, PoE, Wi-Fi, and Vaisala's powerful wireless technology, VaiNet.





### Features

- Cloud service for monitoring measurement parameters such as temperature, humidity, and CO<sub>2</sub>
- Secure cloud storage of data
- Support for ten languages
- Configurable alarm notifications by email
- Continual, automated validation of the system
- Connect using a web browser
- Add devices and users based on your needs
- Automatic device pairing

Vaisala viewLinc Cloud is a powerful cloud-based environmental monitoring system designed specifically for GxP applications, providing automated alarming and reporting capabilities to ensure the safety and efficacy of your products. The system is accessed through a web browser from anywhere with an Internet connection, making it ideal for professionals who want access to quality measurement data anywhere and at any time. viewLinc Cloud is instantly scalable to suit your monitoring requirements, allowing your system to range from one to thousands of measurements and multiple users with different roles and responsibilities.

viewLinc Cloud helps ensure that enterprises in GxP-regulated industries achieve and demonstrate compliance with stringent quality guidelines and processes. From its data integrity, access controls, and encryption to its continuous validation system, viewLinc Cloud provides a faster and simpler path to a compliant monitoring system.

### Easy setup

As a cloud service, there is no software to install or servers to manage. No device pairing is needed. New devices connect to the cloud service automatically and become available in the system within minutes. With the intuitive user interface, administrators can easily configure alarms to notify staff before conditions go out of specification. And users can see current conditions and report on historical conditions instantly.

### Cloud-based service

viewLinc Cloud is offered as Software-as-a-Service (SaaS). Vaisala takes care of most of the typical IT functions for you, such as server management, security and backup. With reduced load on your IT department and a convenient subscription model that eliminates significant upfront costs, viewLinc Cloud is very easy to adopt.

### Security

In viewLinc Cloud, data is always encrypted, both in transit and at rest. Access to the application is controlled via multi-factor authentication and within the application access is further restricted by role-based user rights, allowing for a high degree of control over who can see and do what.

### Data integrity

The software maintains your data in a complete, consistent, and accurate state, adhering to the principles of ALCOA++. Modification or deletion of data is prevented, and modification of configurations is restricted and recorded in the secure audit trail.

### Validation

viewLinc Cloud simplifies the process of validating your monitoring system. An initial qualification report is provided with your subscription. Additionally, the Continuous Validation System performs regular, automated tests on system status and functionality, and provides documented evidence of compliance.

### Scalable

You can quickly expand or reduce your viewLinc Cloud installation. Our system accommodates installations ranging from a few measurements to several thousand, and can be localized at one site or spread across the globe.

# Technical data

## License tiers

The license tier defines which set of features is available in the user interface. The Standard tier provides all of the essential management and user features. Additional tiers with more complex functionality will be made available later.

## Web application

The user interface is built on modern web technologies and supports most major browsers. There is no app to install and maintain.

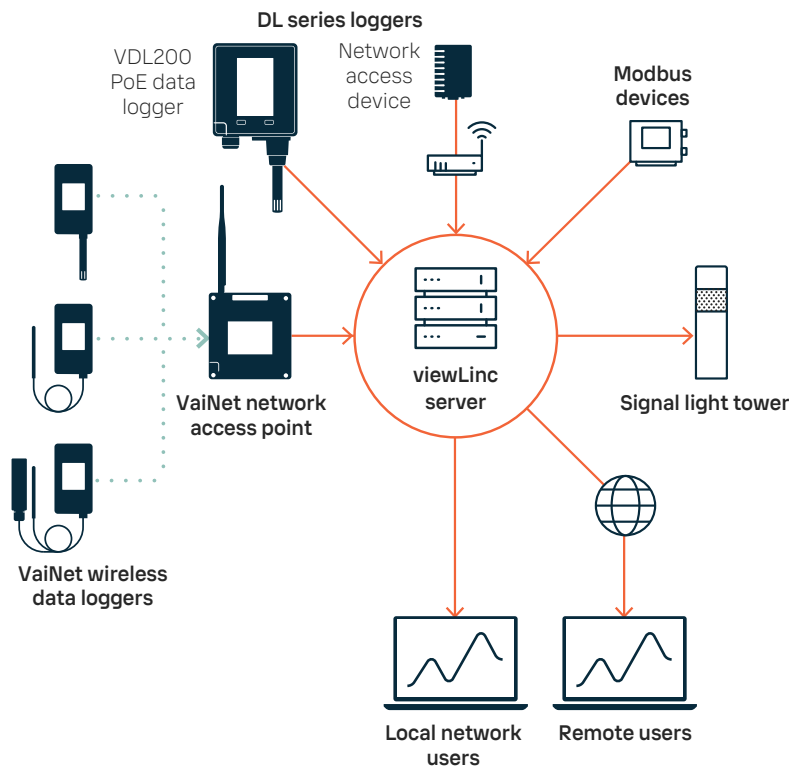
## Supported devices

viewLinc Cloud supports the RFL100 family of data loggers. Support for other measurement devices will be added in an on-going basis. Service subscriptions can be easily updated as your monitoring needs grow.

Feature	Standard tier
Configurable interface to match your facility or organizational structure	✓
Live measurement data	✓
Trend graph	✓
Alarms for measurement locations and devices	✓
Alarm notifications by email	✓
User configurable alarm rules	✓
Device and probe details, including calibration date and battery status	✓
Reports available in XLSX, CSV, and PDF	✓
Rights-based access defines what users can do and see within the system	✓

Web address	<a href="https://viewlinc.com">https://viewlinc.com</a>
Web interface protocol	TLS 1.3
Supported Internet browsers	All modern and up-to-date browsers, including, but not limited to: Google Chrome™ Microsoft Edge®
User interface languages	English, Finnish, French, German, Portuguese, Spanish, Swedish, Italian, Chinese, Japanese

Device type	Connection requirements
RFL100 Wireless Data Logger	Connects wirelessly through AP10 access point. The access point must be associated with the same customer account.
AP10 VaiNet Wireless Access Point	Ethernet network with Internet connection



### Features

- Software for continuous monitoring of temperature, humidity, and other parameters
- Eleven language versions for enterprise-wide, multi-site use
- Preconfigured and custom reports
- Windows Active Directory for easy user management
- Configurable alarm notifications: email, SMS, voice calls, signal towers, browser alerts
- Scheduled threshold alarming and alarm notification delivery times to accommodate maintenance periods or work shifts
- Interactive tours for novice users
- Licensed features: Voice/SMS web service, 3rd-party Modbus devices, Vaisala OPC UA Server, REST API

Vaisala viewLinc Enterprise Server software lets you network Vaisala data loggers or Modbus devices using a combination of wired and wireless connections. It supports installations from one or two measurement points to large systems with thousands of locations. Through user engagement and agile development, Vaisala delivers an always-improving product with new features and better performance. From its data integrity, access controls, and encryption to its validation protocols, viewLinc provides a faster and simpler implementation of your compliant monitoring system, particularly for enterprises in GxP-regulated industries seeking stringent quality guidelines and processes.

### Upgrading

- Only viewLinc 4.3.6 and higher can upgrade to 5.2 directly. Lower versions must first upgrade to 4.3.6.
- During upgrade, confirm list of previously provided hostnames/aliases so users can connect to viewLinc.
- Starting in 5.2, viewLinc uses Transport Layer Security (TLS) 1.3, so all Vaisala VaiNet AP10 Access Points in the installation need firmware version 4.5 or newer. AP10s version F and older must be replaced.

### System requirements

- A dedicated server (virtual server is recommended) continuously available 24/7 to run viewLinc software
- At least one Vaisala data logger or transmitter
- Vaisala cables to connect data loggers and set up wireless transmitters

### Continuous reliability

- Accessible via browser on any network computer or mobile device

- Runs as a Microsoft® Windows® service
- Supports UTF-8 compliant multi-byte character sets

### Licensing

- License key required for each installation and determines the number of devices
- Additional licenses enable voice or SMS web notifications, Vaisala OPC UA Server integration, the viewLinc REST API, or third-party Modbus devices

# Technical data

## Requirements based on system size

System size in measurement points	1 ... 20	21 ... 400	400+
Dedicated or shared server	Either	Either	Dedicated
CPU	1.6 GHz dual core	1.6 GHz dual core	3.2 GHz quad core
RAM	8 GB	12 GB	16 GB
Disk space increase/year	1.5 GB/year for 20 data points	15 GB/year for 200 data points	75 GB/year for 1000 data points
Continuous free disk space for reports <sup>1)</sup>	2 GB	4 GB	10 GB

<sup>1)</sup> 1 month duration with 1 minute scan/sample

## Server requirements

Availability	Dedicated server (a virtual server is recommended) available 24 hours a day, 7 days a week
Server management	Connected to an uninterruptible power supply (UPS) A tested backup solution with support for open file backup Synchronizes time with a Network Time Protocol (NTP) server
Operating system	Windows Server® 2022 Windows Server® 2022 Datacenter Edition Windows Server® 2019 Windows Server® 2019 Datacenter Edition Windows Server® 2016 Windows Server® 2016 Datacenter Edition Windows® 10 Enterprise (64-bit) Windows® 11 Pro
Application disk space	350 MB
Database disk space <sup>1)</sup>	200 KB/data point <sup>2)</sup> /day
Network traffic <sup>3)</sup>	Approx. 100 KB/minute/device
Web interface protocol <sup>4)</sup>	TLS 1.3
Security certificate for web interface	Authorized TLS certificate and key <sup>5)</sup>
Email encoding	RFC 2047
Secure email protocol	TLS 1.3
Active Directory server	2048-bit RSA certificate

<sup>1)</sup> Not applicable to Device Host installation.

<sup>2)</sup> Data points are device channels monitoring and recording data.

<sup>3)</sup> Depends on number of devices, system configuration and type of communication devices used.

<sup>4)</sup> viewLinc 5.2 includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit. <http://www.openssl.org/>

<sup>5)</sup> viewLinc-signed certificate and key can be generated during installation.

## Client requirements

Internet browser	Google Chrome™ Microsoft® Edge™
Computer clients	Any network computer with a supported Internet browser, a minimum 2.4 GHz CPU, and 4 GB of RAM.
Display and tablet clients	Touchscreen or mouse-operated panel with a supported Internet browser. Must be connected to the same network as viewLinc Enterprise Server.

## Wireless device connectivity

RFL100 series <sup>1)</sup>	Connects using Vaisala VaiNet protocol. Requires installation of an AP10 access point.
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<sup>1)</sup> VaiNet devices not available in all regions.

## Wired device connectivity

VDL200	Connects to a viewLinc Device host via Ethernet after its network settings have been configured through a USB-A – USB-C cable.
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DL series using vNet device	vNet Power-over-Ethernet devices are 802.3af compliant and work with both end-point and mid-span systems. viewLinc Aware automatically detects and configures vNet devices. <sup>1)</sup> Requires vNet device drivers (provided).
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DL series using single or multi-port Ethernet device	Ethernet connectivity devices must be configured with static or reserved IP addresses. If the devices are being installed on different subnets, they need to be configured before being installed. Ethernet device drivers must be installed on each server used to connect Vaisala devices.
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DL series using USB cable	Connect devices directly to viewLinc Device Hosts using a USB-to-logger cable. Requires USB ports.
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Modbus devices (RTU or TCP)	<ul style="list-style-type: none"> <li>Connect Modbus RTU devices directly to viewLinc Device Hosts using a USB-to-serial cable</li> <li>Connect Modbus RTU devices to viewLinc over the Ethernet network using a Serial to Ethernet adapter (like a Digi PortServer)</li> <li>Connect Modbus TCP devices to viewLinc over the Ethernet network</li> </ul> RTU devices require serial COM ports. TCP devices require a static IP address.
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Signal tower (light and/or buzzer)	Connect devices according to manufacturer directions. Preconfigured device settings are selectable in viewLinc. Note that you must assign a static or reserved IP address for signal towers.
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<sup>1)</sup> vNet devices maintain a low power rating by operating at a network speed of 10 Mbps. To ensure your network devices can operate at different speeds, set the network speed for the connected vNet port (see vNet User Guide).

## Network ports

Default	Type	Used by
80	TCP	Signal towers
389	TCP	Active Directory (less secure)
443	TCP	viewLinc web interface
502	TCP	Modbus TCP-enabled devices
636	TCP	Active Directory (secure connection)
771	TCP	vNet and multi-port Ethernet devices
950	TCP	Moxa serial-to-Wi-Fi devices
9065	UDP	viewLinc Aware service for vNet discovery
12500	TCP	Twilio web services
12600	TCP/UDP	AP10 and viewLinc device host
55000	TCP	Vaisala OPC UA Server



### Features

- Connects up to 32 RFL100 data loggers to a Vaisala monitoring system
- Powered by Power over Ethernet (PoE) or DC adapter
- Minimal infrastructure and no signal amplifiers needed
- Chirp spread spectrum wireless modulation is resistant to multi-path fading
- Secure data transmission
- Secure firewall and tamper-proof data backup

VaiNet Access Point AP10 is a wireless networking hardware device for Vaisala's proprietary wireless technology: VaiNet. AP10 transfers measurement data from wireless VaiNet data loggers to the monitoring system, and enables the remote configuration and management of VaiNet data loggers by the system's administrator. A wired Ethernet network connection is required.

### AP10 with a cloud-based monitoring system

AP10 supports viewLinc Cloud, a cloud-based data service for managing measurement data. When used with viewLinc Cloud, the installation is very simple. No device pairing is needed, as the devices are associated with the cloud account when they are purchased. New devices become automatically available in the system.

viewLinc Cloud systems can utilize 8 access points and up to 256 wireless data loggers on a single site.

### AP10 with an on-premise monitoring system

On-premise monitoring systems utilize Vaisala viewLinc Enterprise Server software. Instead of device pairing being preconfigured at the factory, the administrator of the viewLinc Enterprise Server has control over pairing. Whenever a new data logger is added to the system, AP10 automatically identifies

it and forwards its information to viewLinc. The administrator of the viewLinc Enterprise Server makes the decision to accept the new device.

With viewLinc Enterprise Server, the access points and data loggers can be deployed as a large VaiNet system by using the VaiNet segmentation feature. Systems with up to 32 access points and up to 1024 data loggers can be deployed on a single site, as long as the large system installation guidelines are followed.

AP10 synchronizes with default NTP servers over the Internet. When used with the viewLinc Enterprise Server, AP10 can be configured to use your local NTP server, which allows operation without an Internet connection.

### Data integrity

Data is encrypted during VaiNet transfers to protect against eavesdropping, data tampering, and transfer errors. Both the access point and the monitoring system

verify that the data has been received correctly. Once the data is verified, it is stored to the monitoring system's secure database and protected from tampering and loss.

### Redundancy

Redundancy of the wireless connection is achieved through use of multiple VaiNet access points and free connection capacity in the system. If a VaiNet data logger has a connection problem, it will automatically connect to another available access point in the system. At least 2 access points with free capacity are needed for failover to function.

### Time synchronization

AP10 requires accurate time to operate its VaiNet wireless connection, and to maintain correct time on the connected data loggers. To achieve the accurate time, AP10 synchronizes with Network Time Protocol (NTP) servers.

# Technical data

## Wireless

Networking standards	Vaisala VaiNet
Wireless connection capacity	Up to 32 supported devices
Modulation	Chirp spread spectrum modulation
Output power	13 dBm (20 mW)
Antenna	Non-removable external antenna
Typical range (indoors)	At least 100 m (approx. 330 ft)
<b>Maximum number of access points in an area</b>	
Standard system	8
Large system <sup>1)</sup>	32
<b>Frequency bands</b>	
Model API0C	500 MHz
Model API0E	868 MHz
Model API0A	915 MHz
Model API0J	920 MHz
Model API0T	922 MHz

<sup>1)</sup> Requires viewLinc Enterprise Server. Subject to additional installation requirements. See *Guidelines for Large VaiNet Systems (M212596EN)*.

## General

Compatible Vaisala monitoring systems	viewLinc Enterprise Server 5.0 and newer viewLinc Cloud
Supported wireless devices	RFL100 data logger
User interfaces	Touchscreen interface Web browser interface <sup>1)</sup>
User interface languages <sup>2)</sup>	English, German, French, Portuguese, Spanish, Swedish, Chinese, Japanese
Internal clock	Synchronizes with Network Time Protocol (NTP) server on UDP port 123. NTP server connection required for operation.

<sup>1)</sup> Not available on cloud-connected variant.

<sup>2)</sup> Only English language is available on the cloud-connected variant.

## Inputs and outputs

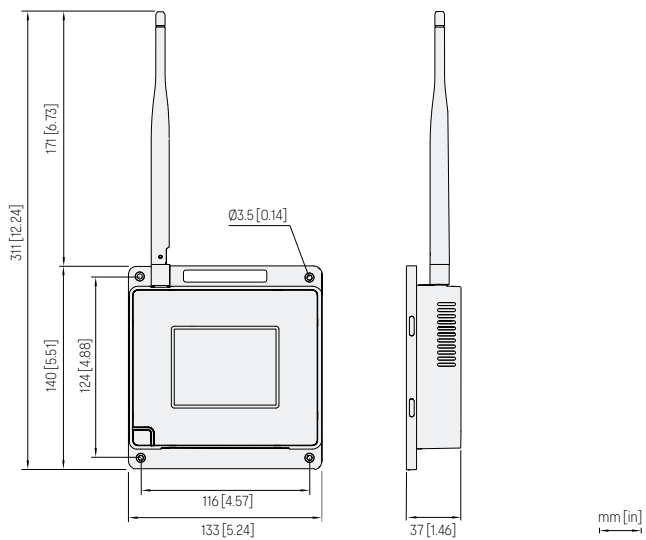
Supply voltage using dedicated power supply connector	10–30 V DC
PoE power class	Class 0
Power consumption	Max. 13 W
<b>Ethernet interface</b>	
Supported standards	10BASE-T, 100BASE-TX
IPv4 address assignment	DHCP (automatic), static
<b>Connectors</b>	
Power supply connector	2.0 mm center pin locking type DC power jack
Service port	Micro-USB (2.0)
Expansion port	USB type A (2.0)
Ethernet	8P8C (RJ-45)

## Operating environment

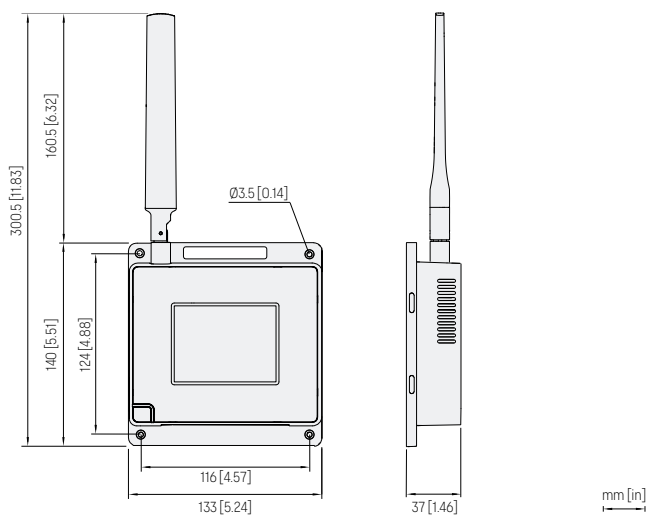
Operating environment	Indoor use
IP rating	IP30
Operating temperature	–20 ... +60 °C (–4 ... +140 °F)
Operating humidity	0–90 %RH, non-condensing
Storage temperature	–20 ... +60 °C (–4 ... +140 °F)

## Compliance

Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment
Electrical safety	IEC/EN 61010-1
<b>API0E model</b>	
EU directives and regulations	RoHS Directive (2011/65/EU) as amended by 2015/863 Radio Equipment Directive, RED (2014/53/EU)
Radio standards and approvals	ETSI EN 300 220-2 ETSI EN 301 489-1 ICASA No: TA 2020-7918 IMDA No: DB105576 TRA No: ER67585/18 Serbia: M005 21
Compliance marks	AAA, CE, ICASA, UKCA
<b>API0A model</b>	
Radio standards and approvals	Anatel ID: 04763-19-12322 AS/NZS 4268 FCC ID: 2AO39-AP10A IC ID: 23830-AP10A NOM ID: 1901C00393
Compliance marks	ANATEL, NOM, NYCE, RCM
<b>API0J model</b>	
Radio standards and approvals	MIC ID: 012-200006
Compliance marks	GITEKI
<b>API0C model</b>	
Radio standards and approvals	China MIIT 工业和信息化部公告 2019 年第 52号
Compliance marks	China RoHS
<b>API0T model</b>	
Radio standards and approvals	NCC ID: CCAP21LP1250T6
Compliance marks	NCC



AP10 access point dimensions



AP10C model dimensions

## Mechanical specifications

Housing color	White
Mounting methods	Screws, tie wrap
Weight	386 g (13.62 oz)

### Dimensions (H × W × D)

AP10C model	300.5 × 133 × 37 mm (11.83 × 5.24 × 1.46 in)
Other models	311 × 133 × 37 mm (12.24 × 5.24 × 1.46 in)

### Materials

Housing	PC/ABS blend
Display window	Chemically strengthened glass
Antenna	ABS





### Features

- Industry-leading measurement precision
- Interchangeable high-accuracy probes for T, RH, and CO<sub>2</sub>
- 30-day memory buffer
- Typical battery life of 18 months in RH and T measurement
- Uses standard AA batteries
- Probe calibrations are traceable to SI units through national metrology institutes or accredited calibration laboratories
- Cost-effective alternative to chart recorders

RFL100 Data Logger uses Vaisala’s proprietary VaiNet wireless technology. It can be used to monitor temperature (T), relative humidity (RH), and carbon dioxide level (CO<sub>2</sub>) in a wide range of environments. Suitable applications include warehouses, production areas, cleanrooms, laboratories, incubators, fridges, cold storage areas, and freezers down to -196 °C (approx. -320 °F).

### VaiNet wireless

RFL100 connects wirelessly through the AP10 VaiNet Wireless Access Point to Vaisala monitoring systems for real-time trends, alarms, and historical reporting. VaiNet wireless technology provides a robust wireless signal that is extremely reliable over long distances and in complex, obstructed conditions. This wireless technology allows the data logger’s signal to travel over 100 m (approx. 330 ft) indoors without the aid of signal amplifiers or repeaters. Wireless communications are encrypted to ensure data integrity and security.

Measurements are updated and stored every 60 seconds, and sent from the data logger every 4 minutes. In case of temporary network disruptions, the data logger can record up to 30 days of measurements that are automatically transmitted to the monitoring system when communications are restored. Recorded data can also be downloaded directly from RFL100 through the USB port.

### Versatility and convenience

RFL100 requires no startup configuration, and the included mounting bracket supports several installation methods. Detailed custom display shows the latest measurement results, alarm and battery status, and signal strength of the current access point connection. The housing is classified IP54 to protect the device from dust and cleaning.




RFL100 is powered by two standard AA size 1.5 V batteries (LR6 alkaline or FR6 lithium) for 18 months of operation at approximately 20 °C (68 °F) in RH and T measurement. When fresh batteries are inserted during yearly calibration, battery replacement between calibrations is not needed. External power is required for CO<sub>2</sub> measurement, with the batteries serving as backup in case the external power becomes unavailable.

### Interchangeable probes

The probes are detachable and easy to switch out for calibration. The monitoring system detects the changed probe information automatically and maintains accurate and complete historical records. RH and T probes use Vaisala HUMICAP® humidity sensors and platinum temperature sensors (Pt100 and Pt1000 type) for superior stability. Probes can be integrated with the RFL100 housing or connected using a cable.

CO<sub>2</sub> measurement is provided by the GMP251 probe that uses Vaisala’s patented, latest-generation CARBOCAP® technology with exceptional stability. The probe automatically compensates the CO<sub>2</sub> measurement according to ambient temperature.

# Probe options

Probe	Description <sup>1)</sup>	Installation notes
<b>HMP110, HMP110T, and HMP110REF</b> 	<p><b>Humidity and temperature</b> probe for measurement in demanding conditions. Robust stainless steel construction. Temperature-only version HMP110T available.</p> <p>Plastic grid filter provides the fastest response time. For added protection, select the membrane filter, the PTFE filter, or the stainless steel sintered filter.</p> <p>Measurement temperature range <math>-40 \dots +80 \text{ }^{\circ}\text{C}</math> (<math>-40 \dots +176 \text{ }^{\circ}\text{F}</math>).</p>	<p>Suitable for measurement inside chambers, incubators, fridges, and freezers.</p> <p>Versatile mounting options using accessories.</p> <p>Must be connected to RFL100 using a cable.</p> <p>A constant output probe version HMP110REF is also available for validating installations. The constant output version does not measure - instead, it outputs unchanging humidity and temperature values.</p>
<b>HMP115 and HMP115T</b> 	<p><b>Humidity and temperature</b> probe for general purpose measurement. Temperature-only version HMP115T available.</p> <p>Plastic grid filter provides the fastest response time. For added protection, select the membrane filter or the PTFE filter.</p> <p>Measurement temperature range <math>-40 \dots +60 \text{ }^{\circ}\text{C}</math> (<math>-40 \dots +140 \text{ }^{\circ}\text{F}</math>).</p>	<p>Ideal choice for ambient measurement.</p> <p>Can be integrated with the RFL100 housing or connected using a cable.</p>
<b>TMP115</b> 	<p><b>Temperature</b> probe for measurement in a wide range of conditions.</p> <p>Available as 50 cm (1 ft 7.7 in) and 3 m (9.8 ft) long versions. Length includes the probe body and sensor tip.</p> <p>Measurement temperature range <math>-196 \dots +150 \text{ }^{\circ}\text{C}</math> (<math>-320 \dots +302 \text{ }^{\circ}\text{F}</math>).</p> <p>Operating temperature range of the probe body is <math>-40 \dots +60 \text{ }^{\circ}\text{C}</math> (<math>-40 \dots +140 \text{ }^{\circ}\text{F}</math>).</p>	<p>Suitable for measurement inside chambers, fridges, and freezers.</p> <p>Can be integrated with the RFL100 housing or connected using a cable.</p> <p>Sensor tip withstands immersion in glycol and liquid nitrogen.</p> <p>Use the thermal dampener block accessory (item code 236310SP) to add thermal mass to the sensor tip.</p>
<b>GMP251</b> 	<p><b>Carbon dioxide</b> probe for %-level measurements. Designed for use in demanding applications such as life science incubators.</p> <p>Operating temperature range <math>-40 \dots +60 \text{ }^{\circ}\text{C}</math> (<math>-40 \dots +140 \text{ }^{\circ}\text{F}</math>).</p> <p>When ordered with the RFL100 data logger, the probe is delivered with a mounting kit that includes a probe holder designed for use with GMP251 and the other supported probes. The kit also includes a magnetic holder for the Probe Splitter M8/M12 accessory.</p>	<p>Must be connected using the Probe Splitter M8/M12 accessory. Any one of the other supported probes can be connected at the same time in the M8 connector of the probe splitter.</p> <p>Requires use of external power supply due to power consumption. Data logger batteries provide a backup in case the external power is not available.</p> <p>Note that the logged temperature data of all probes is limited to range <math>-40 \dots +60 \text{ }^{\circ}\text{C}</math> (<math>-40 \dots +140 \text{ }^{\circ}\text{F}</math>) when GMP251 is connected.</p>

<sup>1)</sup> See [probe datasheets at docs.vaisala.com](https://docs.vaisala.com) for detailed probe specifications.

# Accessories

## Accessories

Accessory <sup>1)</sup>	Item code
Probe cable for RFL100, 1.5 m	CBL210555-1M5SP
Probe cable for RFL100, 3 m	CBL210555-3MSP
Probe cable for RFL100, 10 m	CBL210555-10MSP
Flat cable for RFL100, 3 m	CBL210647SP
Probe holder (5 pcs) for Ø 12 mm probes	ASM213382SP
CO <sub>2</sub> probe mounting kit	ASM214253SP
Probe splitter M8 (for connecting two T probes)	CBL210834SP
Probe splitter M8/M12 (for connecting a CO <sub>2</sub> probe)	CBL211050SP
1 m high-temperature cable M12 (for CO <sub>2</sub> probe) <sup>2)</sup>	271038SP
1 m high-temperature cable M8 (for RH/T probe in CO <sub>2</sub> applications) <sup>2)</sup>	271039SP
Universal power supply (100–240 V AC / 5 V DC) with micro-USB connector	ASM214178SP

1) See [probe datasheets at docs.vaisala.com](https://docs.vaisala.com) for probe-specific accessories.

2) High-temperature cables are extensions for the probe splitter M8/M12 in CO<sub>2</sub> applications. They tolerate –20 ... +180 °C (–4 ... +356 °F) temperatures and can remain inside an incubator during a typical heat sterilization cycle. Due to heat conduction, leave half of the cable in ambient temperature when installed.



RFL100 with two TMP115 probes (left) and with HMP110 and GMP251 probes (right)

# Technical data

## Wireless

Networking standards	Vaisala VaiNet
Modulation	Chirp spread spectrum modulation
Output power	≤ 13 dBm (≤ 20 mW)
Antenna	Internal
Typical range (indoors) <sup>1)</sup>	At least 100 m (approx. 330 ft)
Range with line-of-sight	Over 500 m (1640 ft)
Frequency bands	500 MHz, 868 MHz, 915 MHz, 920 MHz, and 922 MHz

<sup>1)</sup> Attaching the data logger directly to an interfering barrier, for example a metal surface, will reduce the range of the radio signal and typical range may not be achieved.

## Memory

Sample capacity	30 days (43200 samples per channel)
Memory type	Non-volatile EEPROM
Memory mode	Ring buffer (FIFO)
Sampling rate	One sample / channel / minute (non-changeable)

## General

Compatible probes	GMP251, HMP110, HMP110T, HMP115, HMP115T, TMP115
Batteries	2 × AA sized, 1.5 V (LR6 or FR6)
<b>Operation time on battery power at 20 °C (68 °F)</b>	
RH and T measurement in any probe combination	18 months
CO <sub>2</sub> measurement	Typically 12 hours with lithium batteries

## Compatibility requirements

Item	Required minimum version(s)
Vaisala monitoring system	<ul style="list-style-type: none"> <li>viewLinc Enterprise Server 5.0</li> <li>viewLinc Cloud (all versions)</li> </ul>
Dual T probe support using Probe Splitter M8 accessory	<ul style="list-style-type: none"> <li>RFL100 firmware 1.2.0</li> <li>AP10 firmware 3.0</li> <li>viewLinc Enterprise Server 5.0.2</li> </ul>
CO <sub>2</sub> measurement using Probe Splitter M8/M12 accessory and external power	<ul style="list-style-type: none"> <li>RFL100 firmware 1.4.0</li> <li>RFL100 hardware manufactured after July 2021</li> <li>AP10 firmware 4.0 and hardware revision G</li> <li>viewLinc Enterprise Server 5.1</li> </ul>

## Operating environment

Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity	0-100 %RH, non-condensing
IP rating	IP54
IP rating with external power supply	IP20
<b>Operating temperature<sup>1)</sup></b>	
with alkaline batteries	+2 ... +60 °C (+35.6 ... +140 °F)
with lithium batteries	-20 ... +60 °C (-4 ... +140 °F)
with external power supply	+0 ... +60 °C (+32 ... +140 °F)

<sup>1)</sup> Verify operating temperature specification when using third party batteries and power supplies.

## Compliance

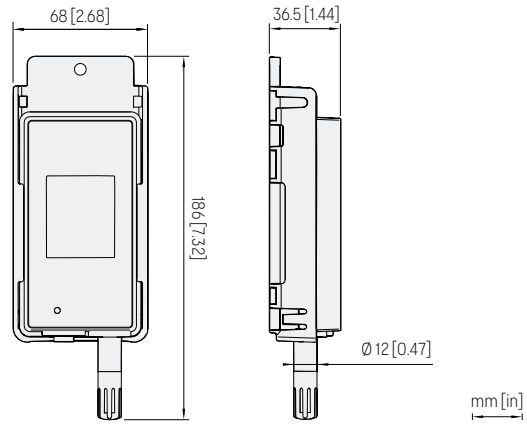
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment
Electrical safety	IEC/EN 61010-1
<b>500 MHz model</b>	
Radio standards and approvals	China MIIT 工业和信息化部公告 2019 年第 52 号
Compliance marks	China RoHS
<b>868 MHz model</b>	
EU directives and regulations	RoHS Directive (2011/65/EU) as amended by 2015/863 Radio Equipment Directive, RED (2014/53/EU)
Radio standards and approvals	ETSI EN 300 220-2 ETSI EN 301 489-1 ICASA No: TA 2020-7761 IMDA No: DB105576 TRA No: 67584/18 Serbia: M005 21
Compliance marks	AAA, CE, ICASA, UKCA
<b>915 MHz model</b>	
Radio standards and approvals	Anatel ID: 04761-19-12322 AS/NZS 4268 FCC ID: 2AO39-RFL100A IC ID: 23830-RFL100A NOM ID: 1901C00493
Compliance marks	ANATEL, NOM, NYCE, RCM
<b>920 MHz model</b>	
Radio standards and approvals	MIC ID: 012-200007
Compliance marks	GITEKI
<b>922 MHz model</b>	
Radio standards and approvals	NCC ID: CCAP21LP1240T3
Compliance marks	NCC

## Mechanical specifications

Housing color	White
Mounting methods	Screws, cable ties, hook, or magnetic mounting bracket (optional accessory)
Probe interface	4-pin female M8 connector
Service port	USB 2.0 with micro-USB connector
<b>Dimensions (H × W × D) with HMP115 probe</b>	
Without mounting bracket	158 × 62 × 31 mm (6.22 × 2.4 × 1.22 in)
With mounting bracket	186 × 68 × 36.5 mm (7.32 × 2.68 × 1.44 in)
<b>Weight</b>	
With batteries (2 pcs alkaline) and HMP115 probe	190 g (6.7 oz)
With batteries (2 pcs alkaline), HMP115 probe, and magnetic mounting bracket	254 g (8.96 oz)
<b>Materials</b>	
Housing	PC/ABS blend
Display window	PMMA (acrylic)
Sealings	TPE

## Requirements for external power supply

Output voltage	5 V DC
Output power	Min. 1 W
Output connector	Micro-USB
Certifications and approvals	<ul style="list-style-type: none"> <li>• Certified to IEC 62368-1</li> <li>• Approved for use in your country</li> </ul>



RFL100 dimensions with HMP115 probe



### Features

- Optimized for fast transfer of measurement and alarm data
- 2 probe ports
- Records and displays up to 4 parameters
- PoE (Power over Ethernet) and battery backup
- Local memory buffer for a minimum of 30 days of data
- Ethernet connection to Vaisala viewLinc Enterprise Server software
- Easy configuration with Insight PC software using USB-C connection

VDL200 is an Ethernet-connected data logger for continuous monitoring systems. It provides high-accuracy measurements from up to 2 detachable humidity, temperature, and carbon dioxide probes. Suitable applications include real-time measurements in environments where wired connections are preferred. VDL200 is compatible with the Vaisala viewLinc Enterprise Server software.

### Ease of deployment

VDL200 has a versatile mounting bracket that supports installation using screws, cable ties, or the included magnet. Connected probes are detected at startup, and measurement parameters are automatically selected for display and data logging.

VDL200 is powered by PoE (Power over Ethernet), and secured with a battery backup. VDL200 uses commonly available AA size 1.5 V alkaline (LR6) and lithium (FR6) batteries.

Only minimal configuration is needed to connect the VDL200 to its host system. Typically only the address of the host system must be set, and possibly the network settings must be configured according to the local network requirements. When the data logger is accepted to the host system, it automatically identifies the connected devices and the available parameters – manual configuration is not needed.

VDL200 has a USB-C service port for on-site access to configuration settings. To connect, you need a USB-C cable and the Insight PC software for Windows®. For more information, see [vaisala.com/insight](https://vaisala.com/insight).

### Ease of use

The display and status LED on the data logger show the measurement and connectivity status of the data logger at a glance. All 4 measurement parameters and their units fit on the display at the same time.

Connected VDL200 data loggers can be remotely managed from the host system.

### Gap-free data

If the VDL200 loses connection with its host system, it continues to measure and display data, and store the data in its local memory. When the connection is restored, the locally stored data is quickly uploaded to the host system.

In case of a power outage, the data logger continues to record data to its local memory using the battery backup. The battery type and measurement probe combination determine how long the battery backup lasts.

### Interchangeable probes

VDL200 utilizes external, interchangeable Vaisala measurement probes. Probes can be replaced with factory calibrated ones as part of an applicable service, or they can be calibrated on the spot. Probe calibration information is automatically updated to the host system, and can be used to remind the system administrator to take action when calibration is due.

# Probe options

Probe	Description <sup>1)</sup>	Installation notes
<b>HMP110 and HMP110T</b> 	<p><b>Humidity and temperature</b> probe for measurement in demanding conditions. Robust stainless steel construction. Temperature-only version HMP110T available.</p> <p>Plastic grid filter provides the fastest response time. For added protection, select the membrane filter, the PTFE filter, or the stainless steel sintered filter.</p> <p>Measurement temperature range -40 ... +80 °C (-40 ... +176 °F).</p>	<p>Suitable for measurement inside chambers, incubators, fridges, and freezers.</p> <p>Versatile mounting options using accessories.</p> <p>Must be connected to VDL200 using an M8/M8 probe cable (for example, CBL211293-3MSP).</p>
<b>HMP115 and HMP115T</b> 	<p><b>Humidity and temperature</b> probe for general purpose measurement. Temperature-only version HMP115T available.</p> <p>Plastic grid filter provides the fastest response time. For added protection, select the membrane filter or the PTFE filter.</p> <p>Measurement temperature range -40 ... +60 °C (-40 ... +140 °F).</p>	<p>Ideal choice for ambient measurement.</p> <p>Can be connected to VDL200 directly or using an M8/M8 probe cable (for example, CBL211293-3MSP).</p>
<b>TMP115</b> 	<p><b>Temperature</b> probe for measurement in a wide range of conditions.</p> <p>Available as 50 cm (1 ft 7.7 in) and 3 m (9.8 ft) long versions. Length includes the probe body and sensor tip.</p> <p>Measurement temperature range -196 ... +150 °C (-320 ... +302 °F).</p> <p>Operating temperature range of the probe body is -40 ... +60 °C (-40 ... +140 °F).</p>	<p>Suitable for measurement inside chambers, fridges, and freezers. Sensor tip withstands immersion in glycol and liquid nitrogen.</p> <p>Can be connected to VDL200 directly or using an M8/M8 probe cable (for example, CBL211293-3MSP).</p> <p>Use the thermal dampener block accessory (item code 236310SP) to add thermal mass to the sensor tip.</p>
<b>GMP251</b> 	<p><b>Carbon dioxide</b> probe for %-level measurements. Designed for use in demanding applications such as life science incubators.</p> <p>Measurement temperature range -40 ... +60 °C (-40 ... +140 °F).</p> <p>When ordered with the VDL200 data logger, the probe is delivered with an M8-M12 adapter cable (item code CBL211291SP) and the CO<sub>2</sub> probe mounting kit (item code ASM214253SP). The kit includes a probe holder that has attachments for the GMP251 probe, a Ø 12 mm probe (for example, HMP110) and the sensor tip of the TMP115 probe.</p>	<p>Must be connected to VDL200 using the M8/M12 flat cable (item code CBL211291SP).</p>

<sup>1)</sup> See probe *datasheets* for detailed probe specifications.

# Cables and accessories

## Cables

Cable	Item code
Probe cable for VDL200, M8-4M – M8-4F, 3 m	CBL211293-3MSP
Probe cable for VDL200, M8-4M – M8-4F, 10 m	CBL211293-10MSP
Flat probe cable for VDL200, M8-4M – M8-4F, 3 m	CBL211292SP
Flat probe cable for VDL200, M8-4M – M12-5F, 3 m	CBL211291SP
USB-A – USB-C cable for service port connection, 2 m	273956
High-temperature cable, M12-5M – M12-5F, 1 m <sup>1) 2)</sup>	271038SP
High-temperature cable, M8-4M – M8-4F, 1 m <sup>2)</sup>	271039SP

1) For CO<sub>2</sub> probe. Connect to VDL200 using M8-M12 adapter cable CBL211291SP.

2) High-temperature cables tolerate –20 ... +180 °C (–4 ... +356 °F) temperatures and can remain inside an incubator during a typical heat sterilization cycle. Due to heat conduction, leave half of the cable in ambient temperature when installed.

## Selected probe-specific accessories

Accessory <sup>1)</sup>	Compatible probes	Item code
Thermal dampener block for 3/16" probes (4.8 mm)	TMP115	236310SP
Probe holder (5 pcs) for Ø 12 mm probes	HMP110/T, HMP115/T, TMP115	ASM213382SP
CO <sub>2</sub> probe mounting kit	GMP251	ASM214253SP
Sintered PTFE filter	HMP115/T	219452SP

1) See probe datasheets in [docs.vaisala.com](https://docs.vaisala.com) for more accessories.



# Technical data

## Compatible probes

Measurement	Compatible measurement probes
Humidity and temperature (RH+T)	HMP110, HMP115
Temperature (T)	HMP110T, HMP115T, TMP115
Carbon dioxide (CO <sub>2</sub> )	GMP251

## Compatible systems and software

System or software	Version	Connection
viewLinc Enterprise Server	Version 5.2.1 or above	TCP port 8883 (default)
Insight PC software	Version 1.3.0 or above	USB-C
Time server <sup>1)</sup>	Any	UDP port 123

<sup>1)</sup> Connection to Network Time Protocol (NTP) server is required for operation.

## Inputs and outputs

Ethernet connector	8P8C (RJ-45)
Probe connector (2 pcs)	4-pin female M8 connector
Service port	USB-C
<b>Ethernet interface</b>	
Supported standards	10BASE-T, 100BASE-TX
IPv4 address assignment	DHCP (automatic), static IP

## Operating environment

Operating environment	Indoor use
Use in wet location	No
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
Operating temperature	-20 ... +60 °C (-4 ... +140 °F)
Operating humidity	0-100 %RH, non-condensing
IP rating	IP30
Do not place the VDL200 unit in an environment that can exceed this specification, for example inside a climate chamber. Insert only the measurement probe(s) in the chamber and leave the VDL200 unit outside it.	

## Powering

Powering options	Power over Ethernet (PoE) Battery backup <sup>1)</sup> USB-C for temporary service use
PoE supply voltage	48 V DC
USB-C supply voltage	5 V DC
Power consumption	Max. 2 W
Battery type	AA size, 1.5 V, LR6 (alkaline) or FR6 (lithium)
Number of batteries	4
<b>Typical operating time on battery power at 20 °C (68 °F)</b>	
RH and T measurement combinations	2 weeks with alkaline batteries
CO <sub>2</sub> measurement	24 hours with lithium batteries

<sup>1)</sup> Network connection is not available when VDL200 is operating on battery power.

## Data logging and user interface specifications

Number of samples <sup>1)</sup>	50 000
Sampling rate	1 min
Minimum recording span	30 days
Memory type	Flash
Memory mode	Ring buffer (FIFO)
Display	3.16" reflective matrix display
Display languages	English
Interaction	2 capacitive buttons

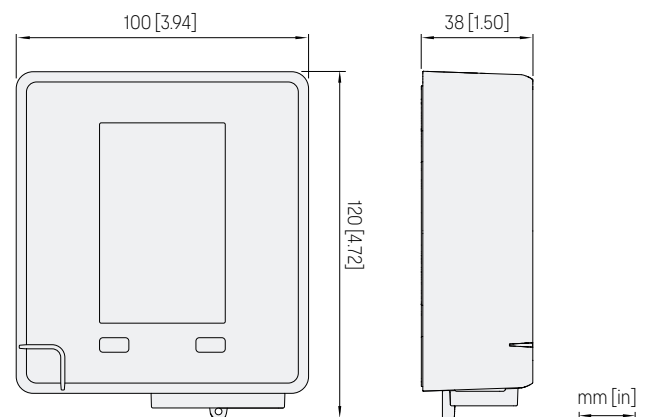
<sup>1)</sup> 1 sample can include up to 4 measurement values.

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment EN 61000-6-2 EN 61000-6-4 FCC part 15 B, Class A ICES-3 / NMB-3 (Class A)
Compliance marks	CE, China RoHS

## Mechanical specifications

Housing color	RAL 9003 (white)
Mounting methods	Screws, cable ties, or magnet
Dimensions without probes (H × W × D)	120 × 100 × 38 mm (4.72 × 3.94 × 1.50 in)
Display size (H × W)	68 × 42 mm (2.68 × 1.65 in)
Weight without batteries and probes	260 g (9.17 oz)
<b>Materials</b>	
Housing	PBT plastic
Display window	PMMA (acrylic)
Mounting bracket	PC/ABS plastic blend



VDL200 dimensions

## HMP115 Humidity and Temperature Probe



### Features

- Humidity and temperature probe designed for use with RFL100, CWL100, and VDL200 data loggers
- Measurement temperature range: -40 ... +60 °C (-40 ... +140 °F)
- Proven Vaisala HUMICAP® 180R sensor for excellent stability
- Fast thermal response time
- Low power consumption
- Temperature-only model HMP115T available
- Compatible with Vaisala Insight PC software and Vaisala Indigo80 Handheld Indicator
- Comes with calibration certificate: ±1.5 %RH measurement accuracy (0-90 %RH)

Vaisala HUMICAP® Humidity and Temperature Probe HMP115 is a highly accurate and cost-effective humidity probe with plastic enclosure. It is designed for indoor measurements with compatible Vaisala data loggers.

### Designed for use with Vaisala data loggers

HMP115 provides an ideal solution for ambient measurement as it can be directly connected to the housing of Vaisala RFL100, CWL100, and VDL200 data loggers. It can also be connected using a cable for remote probe use.

### High performance

HMP115 has a PC/ABS plastic enclosure and is suitable for non-condensing environments with fast temperature changes and a need for high-accuracy

measurements with traceability. HMP115 also has excellent chemical tolerance thanks to the proven Vaisala HUMICAP® 180R sensor.

Plastic grid filter provides the fastest response time. For added protection, select the membrane filter or the PTFE filter.

### Low power consumption

HMP115 is suitable for battery-powered applications due to its very low power consumption. It also has an extremely fast start-up time.

### Variety of calibration options

A quick field calibration can easily be carried out using a handheld device, for example, Vaisala Indigo80 Handheld Indicator or Vaisala Handheld Meter HM40. Alternatively, the probe can be calibrated using a PC with Vaisala Insight PC software and a compatible USB connection cable, or sent to Vaisala for calibration. Vaisala Service Centers offer both ISO 9001 and ISO 17025 calibrations.

# Technical data

## Measurement performance

Relative humidity	
Measurement range	0-100 %RH
Accuracy <sup>1)</sup>	
at 0 ... +40 °C (+32 ... +104 °F)	±1.5 %RH (0-90 %RH) ±2.5 %RH (90-100 %RH)
at -40 ... 0 °C (-40 ... +32 °F) and +40 ... +60 °C (+104 ... +140 °F)	±3.0 %RH (0-90 %RH) ±4.0 %RH (90-100 %RH)
Typical factory calibration uncertainty	±0.8 %RH
Humidity sensor	HUMICAP® 180R
Stability	±2 %RH over 2 years
Temperature	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy	
at +15 ... +25 °C (+59 ... +77 °F)	±0.1 °C (±0.18 °F)
at 0 ... +40 °C (+32 ... +104 °F)	±0.2 °C (±0.36 °F)
at -40 ... 0 °C (-40 ... +32 °F) and +40 ... +60 °C (+104 ... +140 °F)	±0.4 °C (±0.72 °F)
Typical factory calibration uncertainty	±0.12 °C (±0.22 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751

<sup>1)</sup> Including non-linearity, hysteresis, and repeatability.

## Operating environment

Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity	0-100 %RH, non-condensing
IP rating <sup>1)</sup>	IP54

<sup>1)</sup> Not applicable with the plastic grid filter.

## Compliance

EU directives and regulations	RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, RCM

## Inputs and outputs

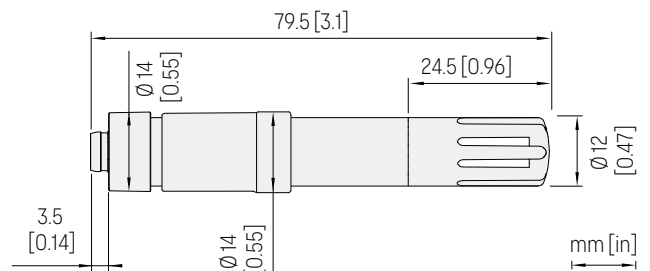
Power consumption	1 mA average, max. peak 5 mA
Operating voltage	5-28 V DC
Start-up time	1 s
Digital output	RS-485 2-wire half duplex, supports Modbus RTU

## Output parameters

Output parameter	HMP115	HMP115T
Temperature (°C)	✓	✓
Relative humidity (%RH)	✓	

## Mechanical specifications

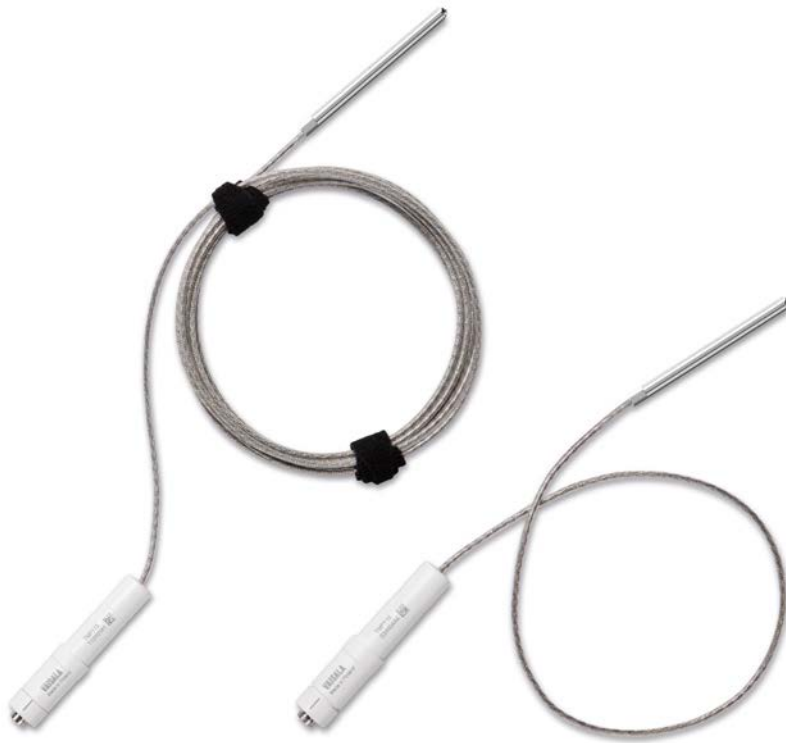
Cable connector	4-pin M8 (IEC 60947-5-2)
Weight	9 g (0.3 oz)
Materials	
Body	PC/ABS blend
Grid filter	PC (glass reinforced)



HMP115 dimensions

## Accessories

Probe holder, 5 pcs	ASM213382SP
USB cable for PC connection	219690
Connection cable for Indigo80 handheld indicator	262195SP
Connection cable for MI70 indicator	219980SP
Connection cable for HM40 handheld meter	HMT120Z300



### Features

- Temperature probe designed for use with RFL100, CWL100, and VDL200 data loggers
- Measurement range  $-196 \dots +150 \text{ }^{\circ}\text{C}$  ( $-320 \dots +302 \text{ }^{\circ}\text{F}$ )
- Platinum RTD temperature sensor for superior measurement stability
- Available as 0.5 m (1 ft 7.7 in) and 3 m (9.8 ft) long versions
- Compatible with Vaisala Insight PC software and Vaisala Indigo80 Handheld Indicator
- Traceable calibration certificate

Wide-Range Temperature Probe TMP115 is ideal for use in temperature-controlled chambers, cryogenic applications, incubators,  $\text{LN}_2$  tanks, and blood/tissue banks. TMP115 uses a platinum RTD temperature sensor for superior measurement stability.

### Designed for use with Vaisala data loggers

TMP115 can be directly connected to Vaisala RFL100, CWL100, and VDL200 data loggers. It can also be connected using a cable for remote probe use. The probe is available in two lengths: 0.5 m (1 ft 7.7 in) and 3 m (9.8 ft). The length includes probe body and sensor tip.

The operating temperature range of the probe body is  $-40 \dots +60 \text{ }^{\circ}\text{C}$  ( $-40 \dots +140 \text{ }^{\circ}\text{F}$ ). It is usually best to leave the probe body outside the measured environment, and just insert the probe tip and some cable.

### Low power consumption

TMP115 is suitable for battery-powered applications due to its very low power consumption. It also has an extremely fast start-up time.

### Features for cold storage applications

Some cold storage applications may require slowing down the naturally fast response time of the probe. You can easily accomplish this by adding more thermal mass to the sensor tip. The thermal dampener block accessory (item code 236310SP) is designed for this purpose. The damping effect of the block is equivalent to that of 40 ml of glycol.

The 4.8 mm (0.19 in) diameter sensor tip withstands immersion in glycol and liquid nitrogen.

Flat cables are available as accessories for the compatible data loggers in case door seal insertion to chambers and freezers is required.

### Variety of calibration options

A quick field calibration can easily be carried out using a handheld device, for example, Vaisala Indigo80 Handheld Indicator or Vaisala Handheld Meter HM40. Alternatively, the probe can be calibrated using a PC with Vaisala Insight PC software and a compatible USB connection cable, or sent to Vaisala for calibration. Vaisala Service Centers offer both ISO 9001 and ISO 17025 calibrations.

# Technical data

## Measurement performance

Temperature	
Measurement range	-196 ... +150 °C (-320 ... +302 °F)
Accuracy over temperature range <sup>1)</sup>	
at -196 ... -90 °C (-320 ... -130 °F)	±2.5 °C (±4.5 °F)
at -90 ... -30 °C (-130 ... -22 °F)	±0.75 °C (±1.35 °F)
at -30 ... 0 °C (-22 ... +32 °F)	±0.5 °C (±0.9 °F)
at 0 ... +50 °C (+32 ... +122 °F)	±0.25 °C (±0.45 °F)
at +50 ... +90 °C (+122 ... +194 °F)	±0.75 °C (±1.35 °F)
at +90 ... +150 °C (+194 ... +302 °F)	±2.5 °C (±4.5 °F)
Temperature sensor	Pt100 RTD Class A IEC 751
Typical factory calibration uncertainty	
at -90 °C (-130 °F)	±0.13 °C (±0.234 °F)
at -45 °C (-49 °F)	±0.07 °C (±0.149 °F)
at 0 °C (32 °F) and warmer	±0.06 °C (±0.128 °F)

<sup>1)</sup> Includes non-linearity, hysteresis, and repeatability.

## Operating environment

Operating temperature of sensor tip	-196 ... +150 °C (-320 ... +302 °F)
Operating temperature of probe body <sup>1)</sup>	-40 ... +60 °C (-40 ... +140 °F)
IP rating of sensor tip	IP67
IP rating of probe body	IP65

<sup>1)</sup> Heat conduction along the probe cable may affect the temperature of the probe body. Model with 3 m (9.8 ft) probe cable is recommended for continuous measurement of very hot and cold temperatures.

## Compliance

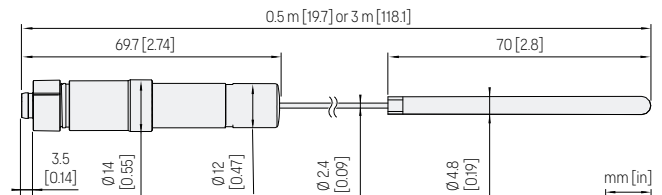
EU directives and regulations	RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, RCM

## Inputs and outputs

Operating voltage	5-28 V DC
Start-up time	1 s
Digital output	RS-485 2-wire half duplex, supports Modbus RTU
Output parameters	Temperature (°C)

## Mechanical specifications

Cable connector	4-pin male M8 (IEC 60947-5-2)
<b>Materials</b>	
Probe body	PC/ABS blend
Cable	FEP
Sensor tip	Stainless steel (AISI 316)
<b>Dimensions</b>	
Probe length including cable and sensor tip	0.5 m (1 ft 7.7 in) or 3 m (9 ft 10.1 in)
Probe body diameter	14 mm (0.55 in)
Sensor tip length	70 mm (2.76 in)
Sensor tip diameter	4.76 mm (0.19 in)



## TMP115 dimensions

## Accessories

Thermal dampener block for 3/16" probes (4.8 mm)	236310SP
Probe holder (5 pcs)	ASM213382SP
USB cable for PC connection	219690
Connection cable for Indigo80 handheld indicator	262195SP
Connection cable for MI70 indicator	219980SP
Connection cable for HM40 handheld meter	HMT120Z300



### Features

- Miniature-size humidity transmitter
- Low power consumption and fast start-up for battery-powered applications
- Measurement range: 0–100 %RH; –40 ... +80 °C (–40 ... +176 °F)
- Cable detachable with standard M8 quick connector
- IP65 metal housing
- Compatible with Vaisala Insight PC software and Vaisala Indigo80 handheld indicator
- Optional RS-485 digital output supports Modbus® RTU
- ±1.5 %RH measurement accuracy (0–90 %RH)
- Temperature-only model HMP110T also available

Vaisala HUMICAP® Humidity and Temperature Probe HMP110 is a trouble-free and cost-effective humidity transmitter with high accuracy and good stability. It is suitable for volume applications or integration into other manufacturers' equipment. HMP110 is also suitable for glove boxes, greenhouses, fermentation and stability chambers, data loggers, and incubators.

### Benefits

- Latest generation Vaisala HUMICAP® 180R sensor for best stability and high chemical tolerance
- Comes with calibration certificate
- Optional dew/frost point, wet bulb temperature, absolute humidity, mixing ratio, and enthalpy calculation

### Easy installation

The probe cable has a screw-on quick connector for easy installation. Different cable lengths and accessories are available.

### Low current consumption

HMP110 is suitable for battery-powered applications because of its very low current consumption. It also has a fast start-up time.

### Several outputs

Temperature measurement is a standard feature in the HMP110, with dew/frost point temperature, wet bulb temperature, absolute humidity, mixing ratio, and enthalpy as optional calculated parameters. Three standard voltage outputs are available. An optional RS-485 output with Modbus support is also available.

### Flexible connectivity

In addition to analog and digital (Modbus) output options, the probe can also be used with the Vaisala Indigo80 handheld indicator. For easy-to-use

access to configuration and device analytics functionalities, the probe can be connected to Vaisala Insight software for Windows®. For more information, see [www.vaisala.com/insight](http://www.vaisala.com/insight) and [www.vaisala.com/indigo80](http://www.vaisala.com/indigo80).

### Robust design

The stainless steel body of HMP110 is classified as IP65, making it ideal for rough conditions. HMP110 has high chemical tolerance thanks to the HUMICAP® 180R sensor.

# Technical data

## Models

Model	Output	Special features
HMP110	RH+T	-
HMP110T	T	-
HMP110REF	-	Fixed output probe for validation of HMT120 and HMT130 transmitters

## Measurement performance

Relative humidity	
Measurement range	0-100 %RH
Accuracy: <sup>1) 2)</sup>	
at 0 ... +40 °C (+32 ... +104 °F)	±1.5 %RH (0-90 %RH) ±2.5 %RH (90-100 %RH)
at -40 ... 0 °C (-40 ... +32 °F) and +40 ... +80 °C (+104 ... +176 °F)	±3.0 %RH (0-90 %RH) ±4.0 %RH (90-100 %RH)
Factory calibration uncertainty at +20 °C (+68 °F)	±1.1 %RH (0-90 %RH) ±1.8 %RH (90-100 %RH)
Humidity sensor types	HUMICAP® 180R HUMICAP® 180V
Stability	±2 %RH over 2 years
T <sub>90</sub> response time	With plastic grid filter: approx. 17 s With membrane filter: approx. 20s With stainless steel sintered filter: approx. 60 s
Temperature	
Measurement range	-40 ... +80 °C (-40 ... +176 °F)
Accuracy (probes with analog output):	
at 0 ... +40 °C (+32 ... +104 °F)	±0.2 °C (±0.36 °F)
at -40 ... 0 °C (-40 ... +32 °F) and +40 ... +80 °C (+104 ... +176 °F)	±0.4 °C (±0.72 °F)
Accuracy (probes with digital output):	
at +15 ... +25 °C (+59 ... +77 °F)	±0.1 °C (±0.18 °F)
at 0 ... +15 °C (+ 32 ... +59 °F) and +25 ... +40 °C (+77 ... +104 °F)	±0.15 °C (±0.27 °F)
at -40 ... 0 °C (-40 ... +32 °F) and +40 ... +80 °C (+104 ... +176 °F)	±0.4 °C (±0.72 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Analog outputs	
Accuracy at +20 °C (+68 °F)	±0.2 % of FS
Temperature dependence	±0.01 % of FS/°C (±0.006 % of FS/°F)

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

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

## Operating environment

Operating temperature	-40 ... +80 °C (-40 ... +176 °F)
IP rating <sup>1)</sup>	IP65

1) Not applicable with the plastic grid filter.

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, RCM, UKCA

## Inputs and outputs

Power consumption	1 mA average, max. peak 5 mA
Operating voltage <sup>1)</sup>	
With 1 V / 2.5 V output	5-28 V DC
With 5 V output	8-28 V DC
With loop power converter	8-28 V DC
With digital output	5-28 V DC
Start-up time	
HMP110 probes with analog output	4 s at operating voltage 13.5-16.5 V DC 2 s at other valid operating voltages
HMP110 probes with digital output	1 s
Outputs	
2 channels	0-1 V DC / 0-2.5 V DC / 0-5 V DC / 1-5 V DC
1-channel loop-power converter (separate module, compatible with humidity accuracy only)	4-20 mA
Digital output (HMP110 probes with digital output)	RS-485 2-wire half duplex, supports Modbus RTU
External loads	
0-1 V	R <sub>L</sub> min. 10 kΩ
Other voltage outputs	R <sub>L</sub> min. 50 kΩ

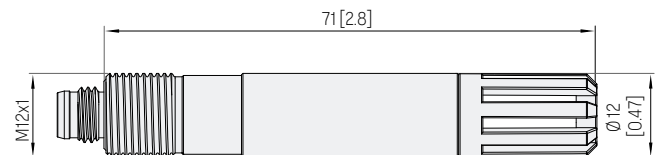
### Output parameters

Relative humidity, temperature, dew/frost point temperature, wet bulb temperature, absolute humidity, mixing ratio, enthalpy

<sup>1)</sup> Use lowest available operating voltage to minimize heating.

## Mechanical specifications

Body thread	M12x1 / 10 mm (0.4 in)
Cable connector	M8 4-pin female (IEC 60947-5-2)
Materials	
Body	Stainless steel (AISI 316)
Grid filter	Chrome coated ABS plastic
Cable	Polyurethane or FEP
Weight	
Probe	17 g (0.6 oz)
Probe with 0.3 m (1 ft) cable	28 g (1 oz)



HMP110 and HMP110T probe dimensions

## Spare parts and accessories

### Sensors

Vaisala HUMICAP® 180R HUMICAP180R

Vaisala HUMICAP® 180V HUMICAP180V

### Sensor protection

Plastic grid filter DRW010522SP

Membrane filter DRW010525SP

Stainless steel sintered filter HM46670SP

PTFE membrane filter with stainless steel grid ASM212652SP

PTFE sintered filter DRW244938SP

### Probe installation

Duct installation kit 215619

Probe mounting clamp set, 10-pcs 226067

Probe mounting flange 226061

Probe holder, 5 pcs ASM213382SP

Plastic M12 installation nuts, pair 18350SP

Flat extension cable 1 m (3 ft) <sup>1)</sup> CBL210649SP

### Connection adapters

4-20-mA loop power converter UI-CONVERTER-1CB

Mounting bracket for converter 225979

USB cable for PC connection 219690

Connection cable for Indigo80 handheld indicator 262195SP

Connection cable for MI70 indicator 219980SP

### Connection cables with open wires

+60-°C 0.3-m (+140-°F 1-ft) HMP5OZ032SP

+60-°C 1.2-m (+140-°F 4-ft) HMP5OZ120

+60-°C 3-m (+140-°F 9.8-ft) HMP5OZ300SP

+80-°C 1.5-m (+176-°F 5-ft) 225777SP

+80-°C 3-m (+176-°F 10-ft) 225229SP

+180-°C 1.5-m (+356-°F 5-ft) FEP 238025

+180-°C 3-m (+356-°F 10-ft) FEP 226902SP

<sup>1)</sup> Connection cable 219980SP is also needed if this cable is used with MI70 indicator.





### Features

- Measurement range 0 ... 20 %CO<sub>2</sub>
- Intelligent, standalone probe with analog and digital outputs
- Compatible with Vaisala Indigo products, Insight PC software, and RFL100 data logger
- Wide operating temperature range (-40 ... +60 °C) (-40 ... +140 °F)
- IP65-classified housing
- Integrated temperature measurement for CO<sub>2</sub> compensation purposes
- Compensations also for pressure, oxygen, and humidity
- Sensor head heated to prevent condensation

Vaisala CARBOCAP® Carbon Dioxide Probe GMP251 is an 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

- Excellent 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 CO<sub>2</sub> measurement according to ambient temperature. The effects of pressure and background gas can also be compensated for. The measurement range is 0 ... 20 %CO<sub>2</sub> and the sensor performance is optimized at 5 %CO<sub>2</sub> 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 H<sub>2</sub>O<sub>2</sub> 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 and the Indigo80 handheld indicator for an extended range of output and configuration options. See [www.vaisala.com/indigo](http://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 software for Windows®. See [www.vaisala.com/insight](http://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 CO<sub>2</sub> 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. <sup>1)</sup>

<sup>1)</sup> Third-party pump and multiplexer not provided by Vaisala.

# Technical data

## Measurement performance

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

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

## Compliance

EU directives and regulations	EMC, RoHS
Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, China RoHS, RCM

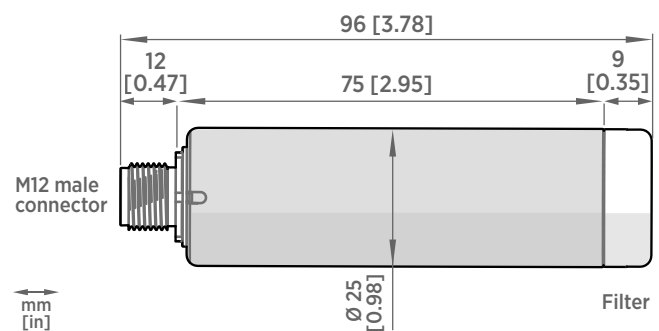
## Operating environment

Operating temperature of CO <sub>2</sub> measurement	-40 ... +60 °C (-40 ... +140 °F) <sup>1)</sup>
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)	<ul style="list-style-type: none"> <li>• H<sub>2</sub>O<sub>2</sub> (2000 ppm, non-condensing)</li> <li>• Alcohol-based cleaning agents (for example ethanol and IPA)</li> <li>• Acetone</li> <li>• Acetic acid</li> </ul>
<b>Pressure</b>	
Compensated	500-1100 hPa
Operating	< 1.5 bar
<b>Gas flow (for flow-through option)</b>	
Operating range	< 10 l/min
Recommended range	0.1-0.8 l/min

<sup>1)</sup> 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
<b>Materials</b>	
Probe housing	PBT polymer
Filter	PTFE membrane, PBT polymer grid
Connector	Nickel plated brass
<b>Dimensions</b>	
Probe diameter	25 mm (0.98 in)
Probe length	96 mm (3.78 in)



GMP251 dimensions

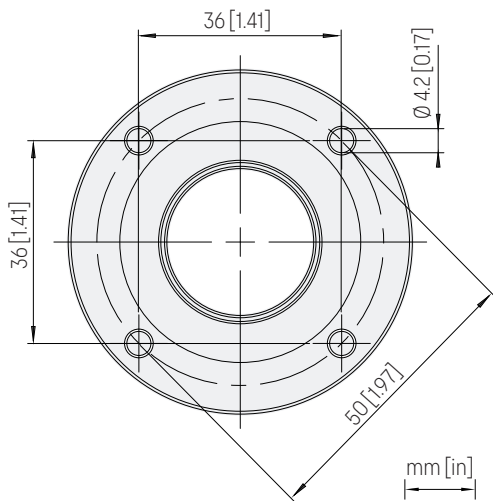
## Inputs and outputs

Analog outputs	<ul style="list-style-type: none"> <li>0–5/10 V (scalable), min. load 10 kΩ</li> <li>0/4–20 mA (scalable), max. load 500 Ω</li> </ul>
Digital output	Over RS-485: <ul style="list-style-type: none"> <li>Modbus</li> <li>Vaisala Industrial Protocol</li> </ul>
<b>Operating voltage</b>	
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
<b>Power consumption</b>	
Typical (continuous operation)	0.4 W
Maximum	0.5 W

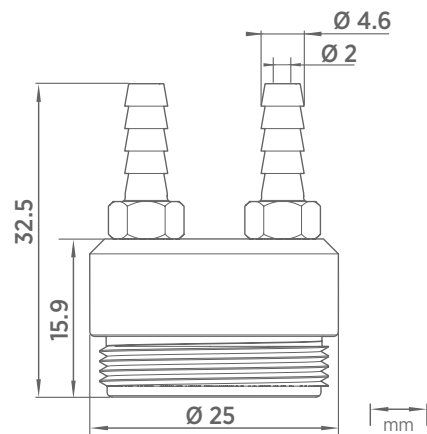
## Spare parts and accessories

Standard membrane filter	ASM211650SP
Porous sintered PTFE filter	DRW243649SP
Probe connection cable with open wires (1.5 m), shielded	223263SP
Probe connection cable with open wires (1.5 m), shielded	254294SP
Probe connection cable with open wires (3 m), shielded	26719SP
Probe connection cable with open wires (10 m), shielded	216546SP
Probe connection cable with open wires and 90° plug (0.6 m), shielded	244669SP
Probe connection cable with open wires and 90° plug (1.5 m), shielded	255102
MI70 connection cable, M12 5-pin	CBL210472
Connection cable for Indigo80, M12-5F - M12-5M, 1.5 m	272075SP
Flat cable for GMP250 probes, M12 5-pin	CBL210493SP
Indigo USB adapter <sup>1)</sup>	USB2
Probe mounting clips (2 pcs)	243257SP
Probe mounting flange	243261SP
Probe holder assembly	ASM213582
Flow-through adapter with gas ports	ASM211697SP
Calibration adapter	DRW244827SP
Spray shield	ASM212017SP

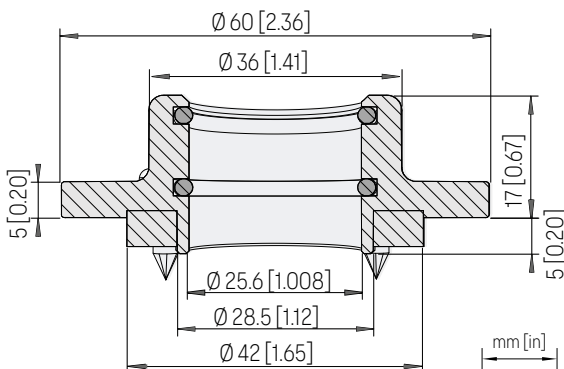
<sup>1)</sup> Vaisala Insight software for Windows available at [vaisala.com/insight](http://vaisala.com/insight)



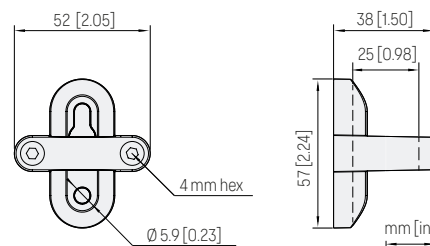
Probe mounting flange 243261SP dimensions



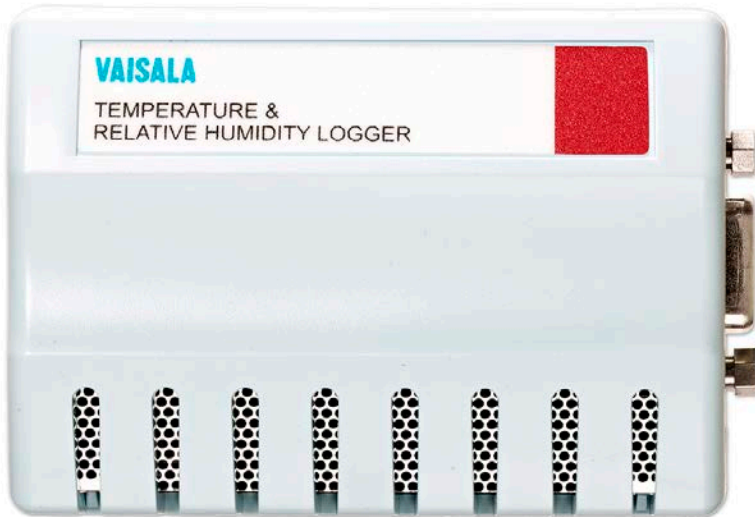
Flow-through adapter with gas ports ASM211697SP. Suitable for tubes with 4 mm inner diameter.



Probe mounting flange 243261SP dimensions, cross section



Probe holder ASM213582 dimensions



### Features

- Industry-leading temperature and relative humidity measurement precision
- High accuracy, adjustable timebased digital recording
- Printed reports for any time period
- 10-year battery
- Ability to perform validation and continuous monitoring with the same model
- Traceable to SI units through national metrology institutes
- Superior alternative to chart recorders and hard-wired systems
- Integrated high-accuracy RH sensor

Vaisala's 2000 series of data loggers are designed to provide high accuracy measurements for temperature, relative humidity and an analog sensor of your choice.

The 2000 logger combines internal temperature and RH sensors with optional external channels for either current or voltage inputs for recording parameters such as differential pressure, CO<sub>2</sub>, level, particles, or conductivity. The 2000 logger can also include a Boolean channel for door switches or alarm contacts. The 2000 logger includes calibrations traceable to SI units through national metrology institutes.<sup>1)</sup>

Ideal for use in standalone or networked applications, the 2000 data logger connects directly to a PC with USB, or installs to an existing network via

Ethernet, Power over Ethernet, or WiFi. Each data logger contains a 10-year battery and onboard memory for recording at the point of measurement. With autonomous power and recording capacity, data is immune to network and power interruptions.

The DL2000 data loggers can be used with Vaisala software, either viewLinc or vLog, to download, display, and analyze environmental data. The viewLinc monitoring system provides 24/7

multi-stage alarm notification, remote, real-time monitoring and gap-free data. The vLog software is a simple solution for validation/ mapping applications. The measurement results are traceable to the international system of units (SI) through national metrology institutes (NIST USA, MIKES Finland, or equivalent) or ISO/IEC 17025 accredited calibration laboratories.

All reports are customizable and can be exported to spreadsheets and PDF to provide records that meet the requirements of 21 CFR Part 11 and Annex 11.

<sup>1)</sup> The measurement results are traceable to the international system of units (SI) through national metrology institutes (NIST USA, MIKES Finland, or equivalent) or ISO/IEC 17025 accredited calibration laboratories.

# Technical Data

## General

Size	85 × 59 × 26 mm (3.4 × 2.3 × 1 in)
Weight	76 g (2.7 oz.)
Interfaces	RS-232 serial, USB, WiFi, Ethernet and Power over Ethernet (vNet)
Mounting	3M Dual Lock™ fasteners
Power source	Internal 10-year lithium battery (Battery life specified at +23 °C with sample interval of 1 min or longer)
Internal clock	Accuracy ±1 min/month at -25 °C ... +70 °C (-13 ... +158 °F)
Electromagnetic compatibility	FCC Part 15 and CE EN 50581:2012 EN 55032:2012/AC:2013 Class B EN 61326-1:2013
RoHS compliance	2011/65/EU
<b>PC Software</b>	
Monitoring, alarming and reporting	viewLinc
Validation/mapping GxP environments	vLog VL for validated vLog SP for non validated
Adding loggers to an existing OPC-compatible monitoring system	OPC Server

## Channel Configuration and Recording Span

Model	Channel Types			
	CH 1	CH 2	CH 3	CH 4
2000-20R	T	RH		
2000-3CR	T	RH	4 ... 20 mA	
2000-35R	T	RH	0 ... 5 VDC	
2000-3AR	T	RH	0 ... 10 VDC	
2000-4BR	T	RH	Boolean	Boolean
<b>Number of Channels Enabled<sup>1)</sup></b>				
Sample Interval	1	2	3	4
10 seconds	14.1 days	7.1 days	4.7 days	3.5 days
1 minute	2.8 months	1.4 months	23.8 days	21.2 days
5 minutes	1.2 years	7.1 months	4.7 months	3.5 months
15 minutes	3.5 years	1.7 years	1.2 years	10.6 months
1 hour	13.9 years	7.0 years	4.6 years	3.5 years

1) Temperature channel must be enabled when the RH channel is enabled.

## Memory

Sample capacity	122 197 12-bit samples
Memory type	Non-volatile EEPROM
Memory modes	User-selectable wrap (FIFO) or stop when memory is full. User-selectable start and stop times.
Sampling rates	User-selectable from once every 10 seconds to once a day.

## Current Loop and Voltage Inputs

Input Type	Current Loop	Analog Voltage
Available ranges	0 ... 22 mA	0 ... 5 VDC, 0 ... 10 VDC
Resolution	5.5 µA	0.025 % F.S.
Accuracy	±0.15 % F.S. at +25 °C (+77 °F)	±0.15 % F.S. at +25 °C (+77 °F)
Input impedances	75 Ω <sup>1)</sup>	>1 MΩ
Isolation	One common per logger	One common per logger
Overload protection	40 mA max. (reverse-polarity protected)	±24 VDC max. (reverse-polarity protected)

1) Termination resistance plus approximately 0.4 volt drop through a protection diode.

## Internal Sensors

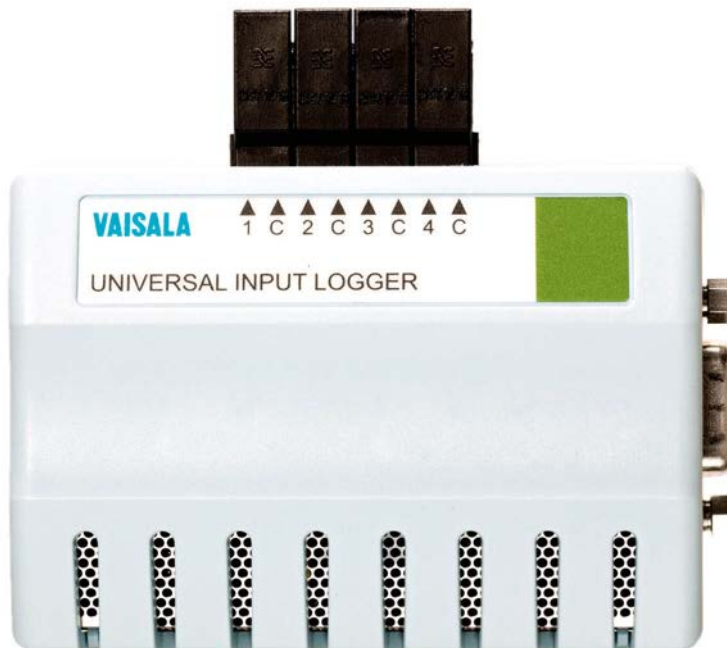
Internal Temperature Sensor	
Calibrated measurement range <sup>1)</sup>	-25 ... +70 °C (-13 ... +158 °F)
Operating range	-35 ... +85 °C (-31 ... +185 °F)
Initial accuracy <sup>2)</sup>	
± 0.10 °C over +20 °C ... +30 °C (± 0.18 °F over +68 °F ... +86 °F)	
± 0.20 °C over -25 °C ... +70 °C (± 0.36 °F over -13 °F ... +158 °F)	
One Year Accuracy <sup>3)</sup>	
± 0.15 °C over +20 °C ... +30 °C (± 0.27 °F over +68 °F ... +86 °F)	
± 0.25 °C over -25 °C ... +70 °C (± 0.45 °F over -13 °F ... +158 °F)	
Resolution	0.02 °C at +25 °C (0.04 °F at +77 °F)
Internal RH Sensor	
Calibrated measurement range <sup>1)</sup>	45 %RH at +10 °C (+50 °F) 10 ... 80 %RH at +25 °C (+77 °F) 45 %RH at +45 °C (+113 °F)
Operating range	0 ... 100 %RH (non-condensing)
Initial accuracy <sup>2)</sup>	
± 1 %RH over 10 ... 80 %RH at +20 ... +30 °C (+68 ... +86 °F)	
± 1.5 %RH over 80 ... 90 %RH at +20 ... +30 °C (+68 ... +86 °F)	
± 2 %RH over 10 ... 90 %RH at -20 ... +70 °C (-4 ... +158 °F)	
One year accuracy <sup>3)</sup>	
± 2 %RH over 10 ... 90 %RH at +20 ... +30 °C (+68 ... +86 °F)	
± 3 %RH over 10 ... 90 %RH at -20 ... +70 °C (-4 ... +158 °F)	
Resolution	0.05 %RH

1) Custom calibration points available upon request including full ICH coverage.

2) Initial accuracy includes all known influence quantities present at the time of calibration including calibration uncertainty, mathematical fit, data logger resolution, hysteresis and reproducibility.

3) One Year Accuracy includes all known influence quantities present during the operation of a data logger over the course of one year including Initial Accuracy and Long Term Drift. Not included is any drift related to atypical contamination or misuse.





### Features

- 10-year battery and large onboard memory
- Single and multi-channel models with up to four input channels
- Easily set scaling and measurement units for recording
- Time-based digital recording in a range of sample intervals
- Multiple connectivity options - USB, Ethernet, WiFi
- Optional vNet cradle for Ethernet or Power over Ethernet connectivity
- Traceable to SI units through national metrology institutes.
- Two year limited warranty

DL4000 series of data loggers are designed to interface with a wide range of transducers, transmitters, and sensors with a DC voltage or 0 - 20 mA current loop output.

DL4000 is a simple solution for recording and monitoring pressure, flow, fluid level, PH, electrical properties, moisture and gas concentrations.

Ideal for use in standalone or networked applications, the DL4000 Universal Input logger connects directly to a PC with USB or installs to an existing network via Ethernet, Power over Ethernet or WiFi. Each logger contains a 10-year battery and onboard memory for recording a wide range of variables at the point of measurement. With autonomous power and recording capacity, data is immune to network and power interruptions.

The DL4000 data loggers can be used with Vaisala software, either viewLinc or vLog, to download, display, and analyze environmental data. The viewLinc monitoring system provides 24/7 multi-stage alarm notification, remote, real-time monitoring and gap-free data. The vLog software is a simple solution for validation/mapping applications. The DL4000 data loggers include calibrations traceable to SI units through national metrology institutes.<sup>1)</sup>

All reports are customizable and can be exported to spreadsheets and PDF to provide records that meet the requirements of 21 CFR Part 11 and Annex 11.

Choose the DL4000 VL series data logger for GxP-compliant environments and the DL4000 SP series for non-GxP applications.

<sup>1)</sup> Measurement results are traceable to the international system of units (SI) through national metrology institutes (NIST USA, MIKES Finland, or equivalent) or ISO/IEC 17025 accredited calibration laboratories.

# Technical Data

## General specifications

Operating range	-40 ... +85 °C (-40 ... +185 °F) and 0 ... 100 %RH (non-condensing)
Interfaces	RS-232 serial USB Wifi module Ethernet and Power over Ethernet (vNet)
Weight	76 g (2.7 oz)
Size	85 × 59 × 26 mm (3.4 × 2.3 × 1 in)
Mounting	3M Dual Lock™ fasteners
PC software	Graphing & Reporting Software vLog SP for SP-series vLog VL for VL-series viewLinc for continuous monitoring & alarming OPC Server to add on to existing OPC compatible monitoring systems
Internal clock	Accuracy ±1 min/month at -25 ... +70 °C (-13 ... +158 °F)
Electromagnetic compatibility	FCC Part 15 and CE EN 50581:2012 EN 55032:2012/AC:2013 Class B EN 61326-1:2013
RoHS compliance	2011/65/EU
Power source	Internal 10-year lithium battery (Battery life specified with sample interval of 1 min or longer)

## Memory specifications

Memory type	Non-volatile EEPROM
Data sample capacity	120 000 12-bit samples
Memory modes	User-selectable wrap (FIFO) or stop when memory is full. User-selectable start and stop times.
Sampling rates	User-selectable from once every 10 seconds to once a day. (Battery life specified with sample interval of 1 min or longer)
Recording span	Recording span depends upon sample interval selected and number of channels enabled. Please see table above.

## Recording span

	1	2	3	4
10 seconds	13.8 days	6.9 days	4.6 days	3.4 days
1 minute	2.7 months	1.3 months	27.7 days	20.8 days
5 minutes	1.1 years	6.9 months	4.6 months	3.4 months
15 minutes	3.4 years	1.7 years	1.1 years	10.4 months
1 hour	13.6 years	6.8 years	4.5 years	3.4 years

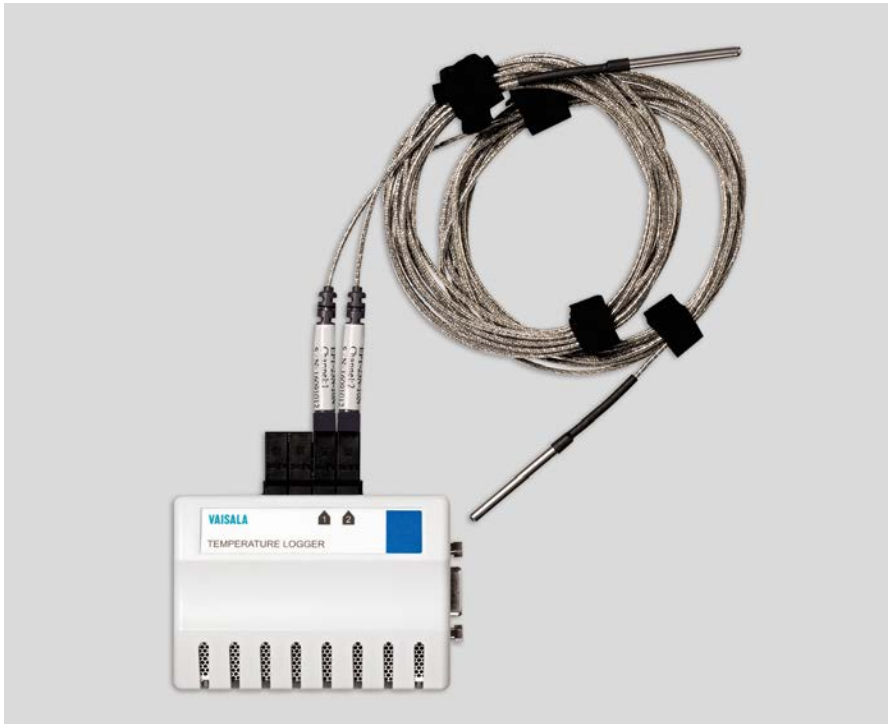
## Current loop and voltage inputs

Available ranges	0 ... 20mA	0 ... 5 V DC, 0 ... 10 V DC
Resolution	5.5 µA	0.025 % F.S.
Accuracy	±0.15 % F.S. at +25 °C (+77 °F)	±0.15 % F.S. at +25 °C (+77 °F)
Input impedances	75 Ω	> 1 MΩ
Isolation	One common per logger	One common per logger
Overload protection	40 mA max. (reverse-polarity protected)	±24 V DC max. (reverse-polarity protected)

## Channel configurations

4000-405	0 ... 5 V DC
4000-40A	0 ... 10 V DC
4000-40C	0 ... 20 mA





### Features

- Industry-leading precision and accuracy
- Printed reports for any time period
- Internal battery with up to 10 years' lifetime
- Validation and continuous monitoring with the same model
- 2-year limited warranty
- Superior alternative to chart recorders and hard-wired systems
- Timebase calibrated over the operating temperature range
- Adjustable time-based recording
- Snap-in logger cradle for easy network connectivity
- Two probe options give high accuracy – from  $-90\text{ }^{\circ}\text{C}$  to  $+70\text{ }^{\circ}\text{C}$  ( $-130\text{ }^{\circ}\text{F}$  to  $+158\text{ }^{\circ}\text{F}$ )
- Traceable to SI units through national metrology institutes

The DL1000-1400 temperature data loggers include the VL series for regulated environments and the SP series for non FDA/GxP regulated industries.

### Suitable for validated and standard precision monitoring

Validatable data loggers, together with Vaisala software solutions, provide a superior, high accuracy solution for use in FDA/GxP regulated environments by ensuring tamperproof files and electronic records that meet 21 CFR Part 11 requirements.

The DL1000-1400 temperature data loggers include calibrations traceable to SI units through national metrology institutes.<sup>1)</sup>

DL data loggers are compatible with the browser-based Vaisala viewLinc continuous monitoring software. viewLinc provides 24/7 multi-stage alarm notification and remote monitoring, and is suitable for regulated environments.

Additional software options include vLog VL for regulated environments and vLog SP for standard precision monitoring. vLog software solutions allow downloading, displaying, analyzing, and reporting of recorded environmental data.

### Applications

The DL1000-1400 temperature data loggers are ideal for monitoring and validation of:

- Refrigerators and freezers (to  $-90\text{ }^{\circ}\text{C}$  ( $-130\text{ }^{\circ}\text{F}$ ))
- Incubators
- Stability chambers
- Warehouses
- Ambient conditions

### Autonomous power and recording capacity

Each data logger contains a battery<sup>2)</sup> and onboard memory for recording at the point of measurement. With autonomous power and recording capacity, data is immune to network and power interruptions.

1) Measurement results are traceable to the international system of units (SI) through national metrology institutes (NIST USA, MIKES Finland, or equivalent) or ISO/IEC 17025 accredited calibration laboratories.

2) Expected battery lifetime up to 10 years in typical use.



# Technical data

## General specifications

Interfaces	<ul style="list-style-type: none"> <li>Internal: RS-232 serial</li> <li>With additional connectors/devices: USB, Ethernet, Wi-Fi, PoE</li> </ul>
PC software	<ul style="list-style-type: none"> <li>vLog software for graphing and reporting (vLog SP for SP series and vLog VL for VL series)</li> <li>viewLinc Enterprise Server software for continuous monitoring and alarming</li> <li>OPC DA Server to add Vaisala recorders to any OPC-compatible monitoring system</li> </ul>
Internal clock	Accuracy ±1 min/month -25 °C ... +70 °C (-13 °F ... +158 °F)
Logger operating/ Storage range	-40 °C ... +85 °C (-40 °F ... +185 °F) 0 ... 100 %RH non-condensing
Power source	Internal lithium battery with typical lifetime of 10 years <sup>1)</sup>

1) Typical battery lifetime specified with sample interval of 1 min or longer.

## Mechanical specifications

Size	85 × 59 × 26 mm (3.4 × 2.3 × 1 in)
Weight	76 g (2.7 oz)
Mounting	3M Dual Lock™ fasteners Snap-in connector locks provide secure probe connections

## Internal temperature sensor

1000-21x series	Precision-tolerance epoxy-encapsulated NTC thermistor
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## Memory

1000-2XX series	48 100 12-bit samples
1400-44X series	85 300 12-bit samples
Memory type	Non-volatile EEPROM
Memory modes	User selectable: wrap (FIFO) or stop when memory is full. User selectable start time. User selectable stop time (VL series only).
Sampling rates	User-selectable (in 10-second intervals) from once every 10 seconds to once a day.

## Compliance

EU directives and regulations	EMC Directive (2014/35/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment
EMC emissions	CISPR 32 / EN 55032, Class B FCC part 15 B, Class B
Compliance marks	CE, China RoHS, RCM

## Recording span: 1000-2xx

Sample interval	Number of channels enabled	
	1	2
10 seconds	5.5 days	2.7 days
1 minute	1.1 months	16.7 days
5 minutes	5.5 months	2.7 months
15 minutes	1.3 years	8.3 months
1 hour	5.4 years	2.7 years



Data logger model VL-1000-21x



Data logger model VL-1000-22x

# Technical data

## Recording span: 1400-44x

Sample interval	Number of channels enabled			
	1	2	3	4
10 seconds	9.8 days	4.9 days	3.2 days	2.4 days
1 minute	1.9 months	29.6 days	19.7 days	14.8 days
5 minutes	9.8 months	4.9 months	3.2 months	2.4 months
15 minutes	2.4 years	1.2 years	9.8 months	7.4 months
1 hour	9.7 years	4.8 years	3.2 years	2.4 years



Data logger model VL-1400-44x

## EPT series temperature probes

### Sensor models

"N" range external probes EPT-23N-XXN and EPT-22W-XXN

Operating/storage range -40 °C ... +95 °C (-40 ... +203 °F)

Connector color code Black

"V" range external probes EPT-23N-XXV and EPT-22W-XXV

Operating/storage range -95 °C ... +95 °C (-139 ... +203 °F)

Connector color code Blue

### Sensor tips

EPT-23N-XXX  
Stainless steel  
Diameter 3.2 mm (0.13 in)  
Length 38 mm (1.5 in)

EPT-22W-XXX (liquid submersible)  
Sealed Teflon® tip  
Diameter 3 mm (0.12 in)  
Length 28 mm (1.1 in)

Probe lengths 3 m (10 ft) and 7.6 m (25 ft)

Cable construction 2 mm (0.08 in) diameter  
Teflon® coated cable

## Temperature probe accessories

Thermal dampening block, for use in refrigerators and freezers, simulates a glycol bottle to reduce viewLinc alarms generated by opening and closing a door.



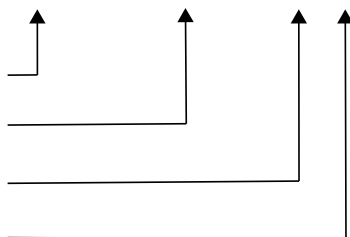
## EPT - XXX - XXX

External probe - temperature

23N or 22W

Probe length - 10 or 25 ft

Probe range - V or N



# Technical data

## Temperature range and accuracy

### Internal sensor

Calibrated measurement range -25 ... +70 °C (-13 ... +158 °F)

Operating/storage range -40 ... +85 °C (-40 ... +185 °F)

0 ... 100 %RH non-condensing

Initial accuracy <sup>1)</sup> ±0.10 °C over +20 ... +30 °C  
(±0.18 °F over +68 ... +86 °F)  
±0.20 °C over -25 ... +70 °C  
(±0.36 °F over -13 ... +158 °F)

1-year accuracy <sup>2)</sup> ±0.15 °C over +20 ... +30 °C  
(±0.27 °F over +68 ... +86 °F)  
±0.25 °C over -25 ... +70 °C  
(±0.45 °F over -13 ... +158 °F)

### External probes - all models

#### "N" range external probe

Calibrated measurement range -25 ... +70 °C (-13 ... +158 °F)

Operating/storage range -40 ... +95 °C (-40 ... +203 °F)

Initial accuracy <sup>1) 3)</sup> ±0.10 °C over +20 ... +30 °C  
(±0.18 °F over +68 ... +86 °F)  
±0.20 °C over -25 ... +70 °C  
(±0.36 °F over -13 ... +158 °F)

1-year accuracy <sup>2) 3)</sup> ±0.20 °C over +20 ... +30 °C  
(±0.36 °F over +68 ... +86 °F)  
±0.25 °C over -25 ... +70 °C  
(±0.45 °F over -13 ... +158 °F)

Resolution 0.02 °C at +25 °C (0.04 °F at +77 °F)

#### "V" range external probe

Operating/storage range -95 ... +95 °C (-139 ... +203 °F)

Initial accuracy <sup>1) 3)</sup> ±0.20 °C over -90 ... -40 °C  
(±0.36 °F over -130 ... -40 °F)

1-year accuracy <sup>2) 3)</sup> ±0.25 °C over -90 ... -40 °C  
(±0.45 °F over -130 ... -40 °F)

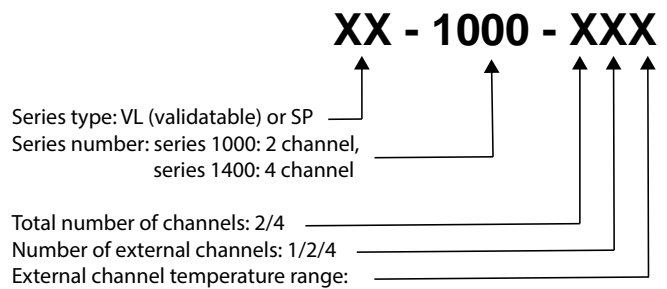
Resolution 0.02 °C at -80 °C (0.04 °F at -112 °F)

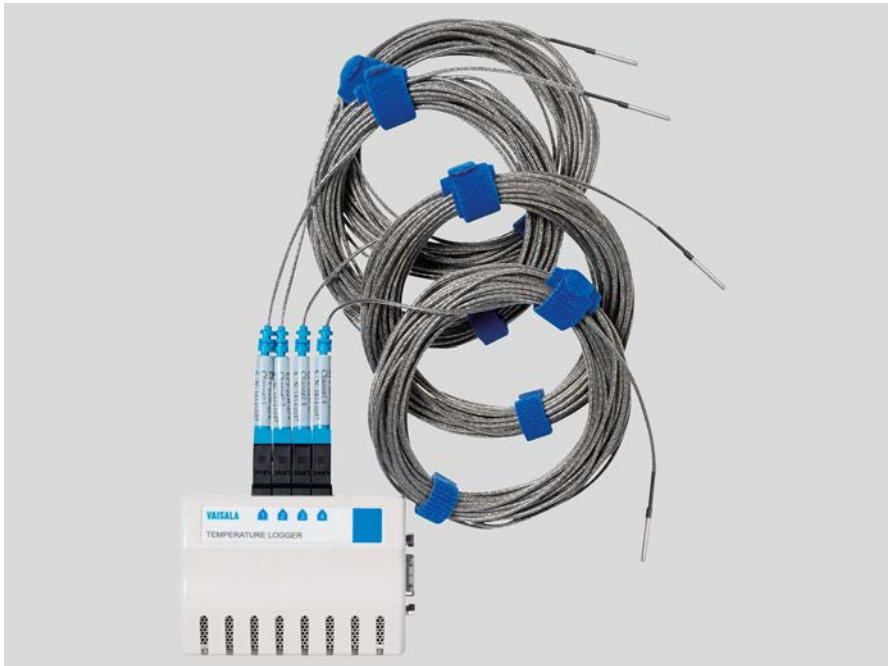
Calibrated measurement range -90 ... -40 °C (-130 ... -40 °F)

- <sup>1)</sup> Initial accuracy includes all known influence quantities present at the time of calibration including calibration uncertainty, mathematical fit, data logger resolution, hysteresis, and reproducibility.  
<sup>2)</sup> 1-year accuracy includes all known influence quantities present during the operation of a data logger over the course of 1 year including initial accuracy and long term drift. Not included is any drift related to atypical contamination or misuse.  
<sup>3)</sup> Specification for external channels is for a probe calibrated to the specific channel of the data logger and with the data logger at -25 °C ... +70 °C (-13 °F ... +158 °F).

## Product part number legend

Guide for reading the product tables and selecting the most appropriate model for your application.

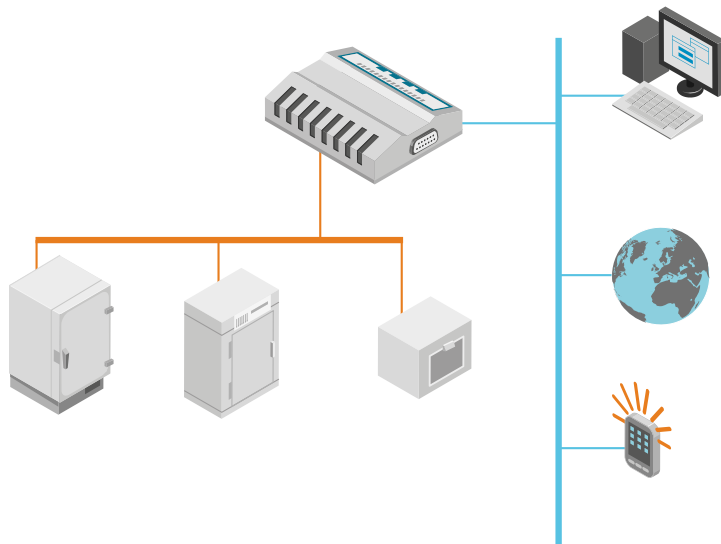




### Features

- Industry-leading precision and accuracy
- Real-time monitoring & alarming with viewLinc software
- Reliable validation/mapping with vLog software
- Easy connectivity to your existing network – wired or wireless
- Validation and continuous monitoring with the same data logger
- Superior alternative to chart recorders and hard-wired systems
- Traceable to SI units through national metrology institutes

Vaisala's multi-application temperature data loggers monitor temperatures in up to four applications with one logger – ultra-low temperature freezers, freezer/refrigerators and incubators.



DL1016-1416 data loggers include calibrations traceable to SI units through national metrology institutes.<sup>1)</sup>

Choose the DL1016-1416 VL series data logger for GxP-compliant environments and the DL1016-1416 SP series for non-GxP applications.

### Model numbers and channels

- VL-1016-22V: Two external channels for validatable applications
- VL-1416-44V: Four external channels for validatable applications
- SP-1016-22V: Two external channels
- SP-1416-44V: Four external channels

DL1016-1416 data loggers can be used with Vaisala software, either viewLinc or vLog, to download, display, and analyze environmental data.

The viewLinc monitoring system provides 24/7 multi-stage alarm notification, remote, real-time monitoring and gap-free data.

The vLog software is a simple solution for validation/mapping applications. All reports are customizable and can be exported to spreadsheets and PDF to provide records that meet the requirements of 21 CFR Part 11 and Annex 11.

<sup>1)</sup> Measurement results are traceable to the international system of units (SI) through national metrology institutes (NIST USA, MIKES Finland, or equivalent) or ISO/IEC 17025 accredited calibration laboratories.

# Technical data

## General specifications

Interfaces	<ul style="list-style-type: none"> <li>Internal: RS-232 serial</li> <li>With additional connectors/devices: USB, Ethernet, Wi-Fi, PoE</li> </ul>
Software	<ul style="list-style-type: none"> <li>vLog software for graphing and reporting</li> <li>viewLinc Enterprise Server software for continuous monitoring and alarming</li> <li>OPC Server to add Vaisala recorders to any OPC-compatible monitoring system</li> </ul>
Internal clock accuracy	±1 min/month 0 ... +50 °C (+32 ... +122 °F)
Power source	Lithium battery with typical lifetime of 10 years <sup>1)</sup>

<sup>1)</sup> Typical battery life specified with sample interval of 1 min or longer.

## Measurement performance

Sensor	"V" Range External Probe
Calibrated measurement range	-90 ... +50 °C (-130 ... +122 °F)
Operating range	-95 ... +70 °C (-139 ... +158 °F)
Initial accuracy <sup>1)</sup>	±0.25 °C over -90 ... +50 °C (±0.45 °F over -130 ... +122 °F)
One year accuracy <sup>1)</sup>	±0.35 °C over -90 ... +50 °C (±0.63 °F over -130 ... +122 °F)
Resolution	0.01 °C at +25 °C (0.02 °F at +77 °F)

<sup>1)</sup> Specification for external channels is for a probe calibrated to the specified channel of the data logger, with the logger at 0 °C to +50 °C (+32 °F to +77 °F).

## Memory

1016 Series	68 600 16-bit samples
1416 Series	101 375 16-bit samples
Memory type	Non-volatile EEPROM
Memory modes and sampling rates	User-selectable rates from once every 10 seconds to once per day (with sample interval of ≥1 min)

## Operating environment

Operating temperature	0 ... +50 °C (+32 ... +122 °F)
Operating humidity	0 ... 100 %RH non-condensing
Storage temperature	-40 ... +85 °C (-40 ... +185 °F)
Storage humidity	0 ... 100 %RH non-condensing

## Recording span: 1016-22V

Sample interval	Number of channels enabled	
	1	2
1 minute	1.5 months	23.8 days
5 minutes	7.6 months	3.8 months
15 minutes	1.9 years	11.5 months
1 hour	7.8 years	3.9 years

## Recording span: 1416-44V

Sample interval	Number of channels enabled			
	1	2	3	4
1 minute	2.3 months	1.1 months	23.5 days	17.6 days
5 minutes	11.3 months	5.6 months	3.7 months	2.8 months
15 minutes	2.8 years	1.4 years	11.3 months	8.5 months
1 hour	11.5 years	5.7 years	3.8 years	2.8 years

## Thermistor probes

Sensor	"V" range external probe
Operating temperature	-95 ... +70 °C (-139 ... +158 °F)
Connector color code	Blue
Probe length	3 m (10 ft) and 7.6 m (25 ft) lengths available
Cable construction	2 mm (0.07 in) diameter, Teflon coated cable

### Stainless steel sensor tip

Diameter	3.2 mm (1/8 in)
Length	38 mm (1.5 in)

### Sealed Teflon sensor tip

Diameter	3 mm (0.12 in)
Length	28 mm (1.1 in)

## Mechanical specifications

Dimensions	85 × 59 × 26 mm (3.4 × 2.3 × 1 in)
Weight	76 g (2.7 oz)
Mounting	3M Dual Lock™ fasteners Snap-in connector locks provide secure probe connections

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
EMC emissions	EN 55032:2012/AC:2013 Class B
Compliance marks	CE, FCC Part 15

## Spare parts and accessories

### Immersion/Dry probes

Thermistor V range probe 25 ft	235139SP
Thermistor V range probe 10 ft	235218SP
Thermistor immersion V range probe 25 ft	235140SP
Thermistor immersion V range probe 10 ft	235217SP

### Temperature probe accessories

Thermal dampening block, for use in refrigerators and freezers. The block simulates a glycol bottle to reduce alarms generated by opening and closing a door.	EPT-TDB-2
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### Designed for Controlled Environments

- Extreme temperatures
- Liquid nitrogen (LN<sub>2</sub>)
- Ovens
- Sterilization chambers

The Vaisala DL1700 series data loggers provide highly accurate temperature data acquisition and are ideal for demanding environments. The DL1700 data loggers can be used with Vaisala software, either viewLinc or vLog, to download, display, and analyze environmental data.

### Applications

- Ideal for extreme temperatures from -240 °C to +1760 °C
- Accepts type J, K, T, E, R and S thermocouples
- No programming or complicated equations required
- Highly accurate replacement for bulky data acquisition systems
- Traceable to SI units through national metrology institutes

The viewLinc monitoring system provides 24/7 multi-stage alarm notification, remote, real-time monitoring and gap-free data. The vLog software is a simple solution for validation/ mapping applications. All reports are customizable and can be exported to spreadsheets and PDF to provide records that meet the requirements of 21 CFR Part 11 and Annex 11.

Easy to use with standard thermocouples, these compact data loggers can offer up to five channels of data in temperatures ranging from -240 °C to +1760 °C.

We offer models for both validated and non-validated applications. Choose the DL1700 VL series for GxP-compliant environments and the DL1700 SP series for non-validated applications. DL1700 series data loggers include calibrations traceable to SI units through national metrology institutes.<sup>1)</sup>

<sup>1)</sup> Measurement results are traceable to the international system of units (SI) through national metrology institutes (NIST USA, MIKES Finland, or equivalent) or ISO/IEC 17025 accredited calibration laboratories.

# Technical Data

## General

Interfaces	RS-232 serial, USB, Ethernet, WiFi network interface available
Internal clock	Accuracy: $\pm 1$ min./month at $-25 \dots +70$ °C
Software	viewLinc for Monitoring, Alarming and Reporting vLogVL for Validation/ Mapping GxP environments vLogSP for graphing and reporting non-GxP environments OPC Server to add Vaisala loggers to any OPC- compatible monitoring system

## Temperature Accuracy

	Temperature Measurement Range	Accuracy at Mid-range	Resolution at Mid-range
Type K	$-220 \dots +1370$ °C ( $-364 \dots +2498$ °F)	$\pm 1.3$ °C ( $\pm 2.3$ °F)	0.37 °C (0.67 °F)
Type J	$-130 \dots +900$ °C ( $-202 \dots +1652$ °F)	$\pm 1.0$ °C ( $\pm 1.8$ °F)	0.29 °C (0.52 °F)
Type T	$-240 \dots +350$ °C ( $-400 \dots +662$ °F)	$\pm 1.2$ °C ( $\pm 2.2$ °F)	0.34 °C (0.61 °F)
Type E	$-110 \dots +740$ °C ( $-166 \dots +1364$ °F)	$\pm 0.70$ °C ( $\pm 1.3$ °F)	0.20 °C (0.36 °F)
Type R	$-50 \dots +1760$ °C ( $-58 \dots +3200$ °F)	$\pm 4.4$ °C ( $\pm 7.9$ °F)	1.3 °C (2.3 °F)
Type S	$-50 \dots +1700$ °C ( $-58 \dots +3092$ °F)	$\pm 5.1$ °C ( $\pm 9.2$ °F)	1.5 °C (2.7 °F)

## Operating Environment

Operating temperature	$-40 \dots +85$ °C ( $-40 \dots +185$ °F)
Operating humidity	0 ... 100 %RH (non-condensing)
EMC compliance	FCC Part 15 and CE EN 50581:2012 EN 55032:2012/AC:2013 Class B EN 61326-1:2013
RoHS compliance	2011/65/EU

## Mechanical Specifications

Dimensions	85 × 59 × 26 mm (3.4 × 2.1 × 1 in)
Weight	60 g (2.7 oz)
Mounting	3M Dual Lock™ fasteners
Power source	Internal 10-year lithium battery (Battery life specified with sample interval of 1 min. or longer)

## Cold Junction Temperature Channel

Measurement range	$-40 \dots +85$ °C ( $-40 \dots +185$ °F)
Accuracy	$\pm 0.25$ °C over $+20 \dots +30$ °C ( $\pm 0.45$ °F over $+68 \dots +86$ °F) $\pm 0.35$ °C over $-25 \dots +70$ °C ( $\pm 0.63$ °F over $-13 \dots +158$ °F)

## Data Logger Inputs

1700 Model	Number of Channels Enabled		
	Thermocouple	CJT	Total
170-54T	4	1	5

**Note:** One channel is designated for Cold Junction Temperature (CJT) reference using an on-board precision-tolerance thermistor.

## Thermocouple Input Channels

<b>Compatible Thermocouple Types: J, K, T, E, R, S</b>	
<b>Initial Accuracy</b>	
Input range	$-7.2 \dots +55.4$ mV
Resolution	0.016 mV
Initial Accuracy	$\pm 0.042$ mV at $+25$ °C ( $+77$ °F)
<b>Input Impedance: 10M <math>\Omega</math></b>	
Input range	$-7.2 \dots +55.4$ mV
Resolution	0.016 mV
1-Year Accuracy	$\pm 0.055$ mV at $+25$ °C ( $+77$ °F)
<b>Additional Error</b>	
At 3 V/m RF field from 450 MHz ... 580 MHz	$\pm 0.350$ mV
At 3 V conducted RF from 3 MHz ... 80 MHz	$\pm 1.0$ mV

## Memory

Memory type	Non-volatile EEPROM
Data sample capacity	135,165 12-bit samples
Memory modes	User-selectable wrap (FIFO) or stop when memory is full. User-selectable start time.
Sampling rates	User-selectable from once every 10 seconds to once a day. (Battery life specified with sample interval of 1 min. or longer)
Recording span	Recording span depends upon sample interval selected and number of channels enabled.

## Spare Parts and Accessories

<b>Thermocouple probe</b>	EPT-22T-20T
Type	T
Conductors	Copper/Constantan
Operating range	$-200 \dots +200$ °C ( $-328 \dots +392$ °F)
Length	6.096 m (20 ft)
Error	$\pm 1$ °C ... $\pm 1.5$ %



## Mid-range Data Loggers

For temperature, humidity, and contact channel measurement



### Designed for controlled environments

- Drug discovery, R&D
- Early phase clinical trials
- Blood and tissue banks
- Hospitals and pharmacies
- Nutraceutical manufacturing
- Food and dietary supplement applications
- Aerospace
- Semiconductors
- Museums and archives

Vaisala Mid-range Data Loggers are designed for early phase drug and device development applications where speed and economy are critical. The MR loggers can be used with Vaisala software to monitor and analyze environmental data and provide presentation-quality records that are easily exported to PDF and spreadsheets.

### Simplified calibration

Easy to install and configure, the MR loggers are calibrated with an abbreviated process that provides reliable accuracy in operating environments between  $-55$  to  $+50$  °C ( $-67$  to  $122$  °F).

The MR loggers include calibrations traceable to SI units through national metrology institutes to ensure cGMP, ISO 9000, and HACCP quality standards.<sup>1)</sup> Optional services are available, including extended warranties and onsite calibration.

### Easy configuration

Additional connectivity devices enable data transfer with several options, including USB, wireless, and Power over Ethernet with the vNet PoE network interface. When MR loggers are used with the vNet PoE device, installation takes minutes. With the vNet device, loggers are automatically identified on your network by the software.

### Lean validation

For applications that require validation, we offer efficient and practical protocols that allow for quick verification of data logger functions. For information on IQOQ documents, see [www.vaisala.com/gamp-gxp-validation](http://www.vaisala.com/gamp-gxp-validation).

### Software options

Whether you need multistage alarming sent via text, email, PC display, or dial-out, or to perform a comprehensive mapping study, Vaisala has user-friendly software designed for use in regulated environments, including:

- viewLinc Continuous Monitoring and Alarming
- vLogSP for Validation/Mapping applications

### Data logger options

Six versions of the MR loggers are available with up to four channels of temperature-only, temperature + humidity, or Boolean contact channel for door switches/alarm contact recording:

- DL1000MR - 1 internal temperature channel
- DL1016MR - 2 channel temperature with probes
- DL1016MRB - 2 channel with 1 temperature probe, and 1 contact input
- DL1416MR - 4 channel temperature with probes
- DL1416MRB - 2 channel temperature with probes, and 2 contact inputs
- DL2000MR - 2 internal channels temperature and RH

<sup>1)</sup> Measurement results are traceable to the International System of units (SI) through national metrology institutes (NIST USA, MIKES Finland, or an equivalent) or ISO/IEC 17025 accredited calibration laboratories.



# Technical data

## General

Interfaces	RS-232 serial, Ethernet, USB, Wi-Fi, vNet PoE network interface
Software	<ul style="list-style-type: none"><li>• vLog Validation/Mapping</li><li>• viewLinc Continuous Monitoring &amp; Alarming</li><li>• OPC DA Server to add Vaisala loggers to any OPC compatible monitoring system</li></ul>
Internal clock accuracy	±1 min/month 0 to +50 °C (+32 to +122 °F)
Power source	Lithium battery with typical lifetime of 10 years <sup>1)</sup>

<sup>1)</sup> Typical battery life specified with sample interval of 1 min or longer.

## Memory

Memory type	Non-volatile EEPROM
Memory mode	User-selectable wrap (FIFO) or stop when memory is full
Sampling rates	User-selectable rates from once every 10 seconds to once per day (Typical battery life specified with sample interval of 1 min or longer)
<b>Data sample capacity</b>	
DL1000MR	48 100 12-bit samples
DL1016MR/MRB	68 600 16-bit samples
DL1416MR/MRB	101 375 16-bit samples
DL2000MR	122 197 12-bit samples

## Mechanical specifications

Dimensions	85 × 59 × 26 mm (3.4 × 2.3 × 1 in)
Weight	76 g (2.7 oz)
Mounting	3M Dual Lock™ Fasteners Snap-in connector for secure probe connections

## Temperature sensors

Internal sensor type	Precision-tolerance epoxy encapsulated NTC thermistor
Cable construction	2 mm (0.07 in) diameter, Teflon coated cable

### External temperature probes

Sensor tip	Stainless steel
Diameter	3.2 mm (1/8 in)
Length	38 mm (1.5 in)

### Probe cable lengths

DL1016MR/MRB	3 m (10 ft)
DL1416MR/MRB	7.6 m (25 ft)

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
EMC emissions	EN 55032:2012/AC:2013 Class B
Compliance marks	CE, FCC Part 15

# Technical data

## DL1000MR internal temperature sensor

### Range and accuracy

Logger operating range	-35 ... +85 °C (-31 ... +185 °F)
Calibrated measurement range	-25 ... +70 °C (-13 ... +158 °F)
Resolution	0.02 at +25 °C (0.04 at +77 °F)
Accuracy over temperature range at -25 ... +70 °C (-13 ... +122 °F) <sup>1)</sup>	±0.5 °C (±0.9 °F)

<sup>1)</sup> Initial accuracy includes all known influence quantities present at the time of calibration including calibration uncertainty, mathematical fit, data logger resolution, hysteresis and reproducibility. Not included is any drift related to atypical contamination or misuse.

## DL2000MR internal temperature/RH sensor

### Temperature range and accuracy

Operating range	-35 ... +85 °C (-31 ... +185 °F)
Calibrated measurement range	-25 ... +70 °C (-13 ... +158 °F)
Accuracy over temperature range at -25 ... +70 °C (-13 ... +122 °F) <sup>1)</sup>	±0.5 °C (±0.9 °F)
Resolution	0.02 °C at +25 °C (0.04 °F at +77 °F)

### Relative humidity range and accuracy

Calibrated measurement points	<ul style="list-style-type: none"> <li>• 45 %RH at +10 °C (+50 °F)</li> <li>• 10 %RH and 80 %RH at +25 °C (+77 °F)</li> <li>• 45 %RH at +25 °C (+77 °F)</li> <li>• 45 %RH at +45 °C (+113 °F)</li> </ul>
Operating range	0 ... 100 %RH (non-condensing)
Temperature range +20 ... +30 °C (68 ... 86 °F)	10 ... 90 %RH ±2.0 %RH
Temperature range -20 ... +20 °C, +30 ... +70 °C (-4 ... 68 °F, 86 ... 158 °F)	10 ... 90 %RH ±3.0 %RH
Resolution	0.05 %RH
Humidity sensor	HUMICAP <sup>®</sup> 180R
Stability	±2 %RH over 2 years

<sup>1)</sup> Initial accuracy includes all known influence quantities present at the time of calibration including calibration uncertainty, mathematical fit, data logger resolution, hysteresis and reproducibility. Not included is any drift related to atypical contamination or misuse.

## DL1016/1416MR external temperature sensors

### Range and accuracy

Logger operating range	0 ... +50 °C (32 ... +122 °F)
Probe operating range	-95 ... +70 °C (-139 ... +158 °F)
Calibrated measurement range	-55 ... +50 °C (-130 ... +122 °F)
Resolution	0.01 °C at +25 °C (0.02 °F at +77 °F)
Accuracy over temperature range at -55 ... +50 °C (-67 ... +122 °F) <sup>1)</sup>	±0.5 °C (±0.9 °F)

<sup>1)</sup> Specification for external channels is for a probe calibrated to the specified channel of the data logger, with the logger at 0 °C to +50 °C (32 °F to +122 °F).

## Accessories

Thermal dampening block, for use in refrigerators and freezers. The block simulates a glycol bottle to reduce alarms generated by opening and closing doors.	EPT-TDB
Cable with magnetic contact switch (7.6 m (25 in)) for use with MRB loggers	EPT-DS-25



### Features

- Eliminates the cost of wiring AC power to each monitored point
- Data loggers can be installed wherever a LAN cable can be run
- Increased data communication protection from power outage because the server room's UPS can provide backup power
- Plug and Play connectivity when using viewLinc Aware function

Wherever reliable network communications and cost are important, more companies are using Power over Ethernet (PoE) devices. Vaisala vNet PoE network interface brings easy connectivity with Vaisala DL series data loggers at a lower cost than alternative networking devices.

The snap-in design streamlines data logger connectivity into a small footprint, eliminating wires between normally separate data loggers and PoE devices. When power and data are carried over the same cable, you can also eliminate the cost of installing an AC power source.

vNet PoE integrates VL and SP data loggers without compromising their high accuracy. It brings greater flexibility and simplicity to the deployment of Vaisala Continuous Monitoring system.

The viewLinc Aware function in viewLinc monitoring software allows you to quickly configure data loggers, alone or in batches. Simply place data loggers in a vNet cradle, connect to a Local Area Network, and viewLinc discovers and configures the data loggers.

vNet PoE interface comes in four models:

- CDL-VNET-P with a fan inside the cradle for data loggers with an internal temperature channel
- CDL-VNET-LP without a fan for data loggers without an internal temperature channel
- CDL-VNET-PC with 15 V output to power external sensors and transmitters; includes internal fan
- CDL-VNET-LPC with 15 V output to power external sensors and transmitters; without internal fan

There is also an option to power the interface with AC. Select the model that fits your application to monitor and record temperature, humidity, CO<sub>2</sub>, differential pressure, door switches, and many other parameters.

# Technical Data

## Measurement performance

### Heating effect on measurements

CDL-VNET-P and CDL-VNET-PC	Temperature rise from electronics (important only for data loggers with internal sensors): < 0.05 °C as seen by the data logger sensor
CDL-VNET-LP and CDL-VNET-LPC	Not to be used for data loggers with internal sensors

## Operating environment

Operating temperature	-25 ... +70 °C (-13 ... +158 °F)
Storage temperature	-40 ... +85 °C (-40 ... +185 °F)
Operating humidity	0 ... 90 %RH (non-condensing and not to exceed a mixing ratio of 38.5 g/kg)

## Inputs and outputs

Ethernet connectivity	IEEE 802.3af (Class 1) <sup>1)</sup> , bandwidth 10Base-T
Connectivity cable	Category 5/5e RJ-45 connector 1.83 m (6 ft)
Operating voltage <sup>2)</sup>	12 ... 30 V DC Plugs into vNet jack labeled 12 V

### Output voltage

CDL-VNET-P and CDL-VNET-LP	Not available
CDL-VNET-PC and CDL-VNET-LPC	Nominal: 15 V DC Maximum: 350 mW

### Power consumption

CDL-VNET-P and CDL-VNET-LP	Typical: 625 mW Maximum: 700 mW
CDL-VNET-PC and CDL-VNET-LPC	Typical: 900 mW Maximum: 1.35 W

### Power supply <sup>3)</sup>

North America	12 V DC / 0.5 A max. out 120 V AC in
International	12 V DC / 1.66 A max. out 100 ... 240 V AC in

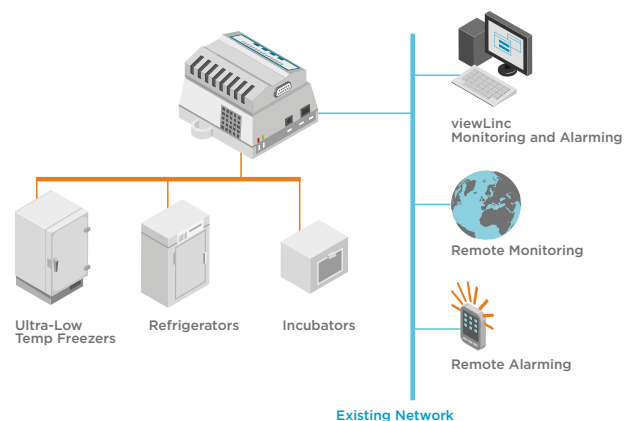
1) Max. PSE power reservation is 4.00 W.  
2) Optional for use without PoE.  
3) Included but not required when using PoE.

## Mechanical specifications

Dimensions (H × W × L)	43 × 102 × 102 mm (1.7 × 4.0 × 4.0 in)
Weight	180 g (6.3 oz)

## General specifications

Data logger compatibility	v6.00 hardware and higher Includes models VL and SP 1000, 1700, 1200, 1016, 1416, 1400, 2000, 4000
LED indicators	Link, activity, power, data logger communications
Device configuration	HTTP Web Interface PC-based configuration wizard
viewLinc Aware	Requires one vNet to be programmed with the viewLinc server IP address. Other vNets on the subnet will automatically self-configure.
Addressing	DHCP/RARP ARP-Ping Static IP for IP address assignment Net BIOS name
Firmware	Field upgradable firmware
<b>Compliance</b>	
Emissions/Immunity	FCC Part 15 and CE EN 50581:2012 EN 55032:2012/AC:2013 Class B EN 61326-1:2013
Conformity	RoHs, 2011/65/EU WEEE





### Features

- Accurate and reliable measurement with Vaisala HUMICAP® humidity sensor technology
- Interchangeable probe (easy field calibration)
- Resistant to dust and most chemicals
- Enclosure IP65
- Traceable calibration certificate: 3 points for humidity, 1 point for temperature
- Temperature-only models TMT120 and TMT130 also available
- Suitable for cleanrooms and demanding HVAC and light industrial applications

Vaisala HUMICAP® Humidity and Temperature Transmitters HMT120 and HMT130 are designed for humidity and temperature monitoring in cleanrooms and are also suitable for demanding HVAC and light industrial applications.

### Options

- Humidity parameter options: relative humidity, dew point/frost point, wet bulb temperature, enthalpy, absolute humidity, mixing ratio, vapor pressure, and saturation vapor pressure
- 2-wire loop-powered or 3-wire voltage output configurations
- Optional LCD display
- USB cable available for a PC connection for maintenance
- Wall-mounted or with a remote probe
- Constant output probe available
- Can be mounted outdoors using a Vaisala installation kit and Vaisala Radiation Shield DTR504A

### Performance

The HMT120 and HMT130 transmitters incorporate Vaisala HUMICAP® humidity sensor technology that measures relative humidity accurately and reliably. Vaisala HUMICAP® sensors are resistant to dust and most chemicals.

The HMT120 and HMT130 transmitter enclosure is optimized for use in cleanrooms. The smooth surface of the enclosure makes it easy to clean and the enclosure material is chosen to tolerate purifying agents. Furthermore, cabling can be done through the back wall of the transmitter.

### Interchangeable probe

The HMT120 and HMT130 transmitters use a fully interchangeable relative humidity probe. The probe can be easily removed and replaced with a new one

without having to adjust the transmitter, which allows for easy and quick recalibration of the transmitter. The probe can be adjusted using one of Vaisala's handheld meters as a reference. Also available is a constant output probe with fixed RH and T output for convenient inspection of the monitoring system and signal transfer line.

### Available options

The HMT120 and HMT130 transmitters are available as wall mounted or with a remote probe. For high temperature applications or where space is limited, the remote probe is ideal.

The optional LCD display shows the measurement results of selected parameters in selected units. The parameters are displayed simultaneously on two separate rows on the display.

# Technical data

## Models

Model	Measured parameters	Output
HMT120	RH + T	2 analog outputs, 4 ... 20 mA (loop-powered)
HMT130	RH + T	2 analog outputs, 0 ... 1 V, 0 ... 5 V, 0 ... 10 V, or user-defined between 0 ... 10 V
TMT120	T	1 analog output, 4 ... 20 mA (loop-powered)
TMT130	T	1 analog output, 0 ... 1 V, 0 ... 5 V, 0 ... 10 V, or user-defined between 0 ... 10 V

## Measurement performance

Relative humidity <sup>1)</sup>	
Measurement range	0 ... 100 %RH
Accuracy <sup>2) 3)</sup>	
At 0 ... +40 °C (+32 ... +104 °F)	±1.5 %RH (0 ... 90 %RH) ±2.5 %RH (90 ... 100 %RH)
With HMP110 probe: At -40 ... 0 °C and +40 ... +80 °C (-40 ... +32 °F and +104 ... +176 °F)	±3.0 %RH (0 ... 90 %RH) ±4.0 %RH (90 ... 100 %RH)
With HMP113 probe: At -40 ... 0 °C and +40 ... +60 °C (-40 ... +32 °F and +104 ... +140 °F)	
Factory calibration uncertainty at +20 °C (+68 °F)	±1.1 %RH (0 ... 90 %RH) ±1.8 %RH (90 ... 100 %RH)
Humidity sensor types	HUMICAP® 180R HUMICAP® 180V <sup>4)</sup>
Stability	±2 %RH over 2 years
Stability in typical HVAC applications	±0.5 %RH per year
Temperature	
Measurement range	HMP110: -40 ... +80 °C (-40 ... +176 °F) HMP113: -40 ... +60 °C (-40 ... +140 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Accuracy over temperature range:	
HMP110:	
At +15 ... +25 °C (+59 ... +77 °F)	±0.1 °C (±0.18 °F)
At 0 ... +15 °C and +25 ... +40 °C (+32 ... +59 °F and +77 ... +104 °F)	±0.15 °C (±0.27 °F)
At -40 ... +0 °C and +40 ... +80 °C (-40 ... +32 °F and +104 ... +176 °F)	±0.4 °C (±0.72 °F)
HMP113:	
At 0 ... +40 °C (+32 ... +104 °F)	±0.2 °C (±0.36 °F)
At -40 ... 0 °C and +40 ... +60 °C (-40 ... +32 °F and +104 ... +140 °F)	±0.4 °C (±0.72 °F)
Other output parameters (optional)	
Dew point/frost point, wet bulb temperature, enthalpy, absolute humidity, mixing ratio, vapor pressure, saturation vapor pressure	

1) Relative humidity specifications excluding TMT120 and TMT130, which are temperature-only models.  
2) Including non-linearity, hysteresis, and repeatability.  
3) With HUMICAP® 180V sensor, accuracy is specified only in operating temperature -20 ... +80 °C (-4 ... +176 °F).  
4) Not available with HMP113.

## Operating environment

IP rating (transmitter body)	IP65 <sup>1)</sup>
Operating temperature of transmitter body, no display	-40 ... +60 °C (-40 ... +140 °F)
Operating temperature of transmitter body with display	-20 ... +60 °C (-4 ... +140 °F)
Operating temperature, probe	HMP110: -40 ... +80 °C (-40 ... +176 °F) HMP113: -40 ... +60 °C (-40 ... +140 °F)
Storage temperature	-50 ... +70 °C (-58 ... +158 °F)

1) IP65 for the HMP110 probe only when using stainless steel sintered filter (HM46670SP) or PTFE sintered filter (item code DRW244938SP).

## Inputs and outputs

HMT120 and TMT120 2-wire transmitter (loop-powered)	
Current output signals	4 ... 20 mA
External loop voltage	10 ... 30 V DC (R <sub>L</sub> = 0 Ω) 20 ... 30 V DC (R <sub>L</sub> < 500 Ω)
HMT130 and TMT130 3-wire transmitter	
Voltage output signals	0 ... 1 V, 0 ... 5 V, 0 ... 10 V or user-defined between 0 ... 10 V
Min. output resistance	1 kΩ
Serial output	RS-485, non-isolated
Relay output	1 relay (max. 50 V DC, 200 mA)
Supply voltage	10 ... 35 V DC 15 ... 35 V DC (when output 0 ... 10 V) 24 V AC (±20 %)
Current consumption at 24 V DC	8 mA, if relay closed 15 mA
Max. additional error caused by the analog outputs after calibration at +20 °C (+68 °F) ambient temperature	±0.1 % of FS output signal
Temperature dependence of the analog outputs	±0.005 % of FS output signal

## Mechanical specifications

Weight	270 g (9.5 oz)
Probe cable lengths	3 m, 5 m, 10 m - up to 50 m (9.8 ft, 16 ft, 33 ft - up to 164 ft)
Display (optional)	128 x 64 resolution full graphics B&W display without backlight
Material	
Transmitter housing	PBT plastic
Display window	PC plastic
Probe body	HMP110: Stainless steel (AISI 316) HMP113: PC/ABS blend
Probe grid filter	HMP110: Chrome coated ABS plastic HMP113: PC (glass reinforced)
Connections	
Inputs and outputs	Screw terminals 0.5 ... 1.5 mm <sup>2</sup> (AWG 20 ... AWG 15)
Probe interface	4-pin M8 female panel connector

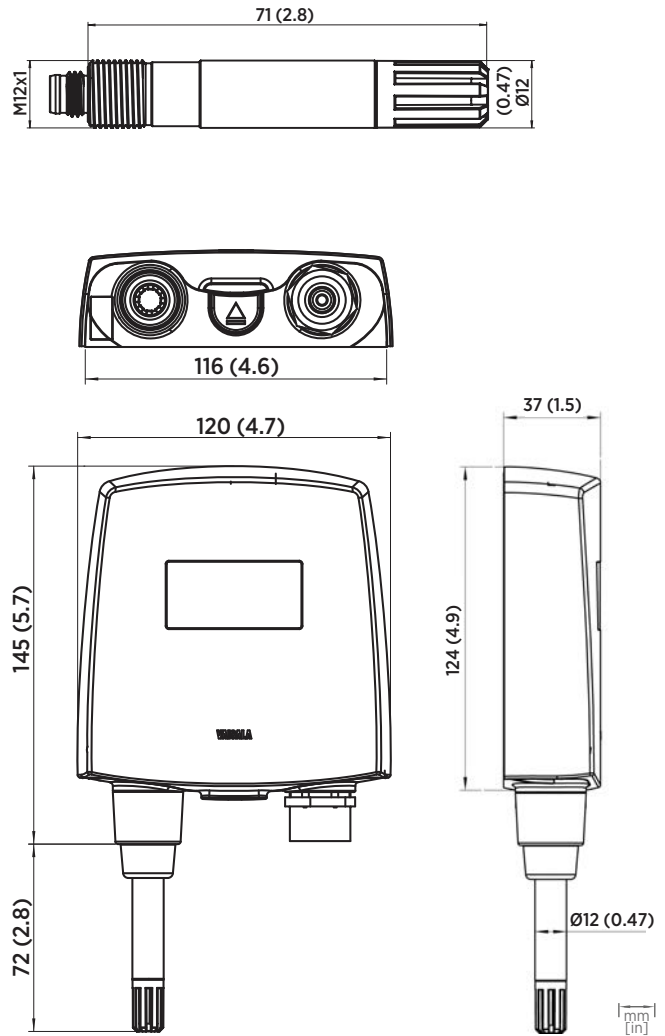
## Compliance

EU directives and regulations	EMC, RoHS
Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment CISPR 32 / EN 55032, Class B
Compliance marks	CE, RCM

## Spare parts and accessories

<b>Probes <sup>1)</sup></b>	
Humidity and temperature probe	HMP110
Humidity and temperature replacement probe	HMP110R
Temperature-only probe	HMP110T
Constant output probe	HMP110REF
Humidity and temperature probe	HMP113
<b>Sensors</b>	
Standard humidity sensor	HUMICAP180R
Catalytic humidity sensor for H <sub>2</sub> O <sub>2</sub>	HUMICAP180V <sup>2)</sup>
<b>Sensor protection</b>	
HMP110 probes:	
Plastic grid filter	DRW010522SP
Plastic grid with membrane filter	DRW010525SP
Stainless steel sintered filter	HM46670SP
PTFE membrane filter with stainless steel grid	ASM212652SP
PTFE sintered filter	DRW244938SP
HMP113 probe:	
Plastic grid filter	DRW240185SP
Plastic grid with membrane filter	ASM210856SP
Stainless steel sintered filter	HM47280SP
Porous PTFE filter	219452SP
<b>Probe installation</b>	
Probe mounting clamp, 1 pc	225501
Probe mounting clamps, 10 pcs	226067
Probe mounting flange	226061
Probe holder, 5 pcs	ASM213382SP
<b>Cables</b>	
Probe cable 3 m (9.8 ft)	HMT120Z300
Probe cable 5 m (16 ft)	HMT120Z500
Probe cable 10 m (33 ft)	HMT120Z1000
Probe cable 20 m (66 ft)	HMT120Z2000
HM70 connection cable	211339
USB serial interface cable	219685
<b>Transmitter protection and installation</b>	
Radiation shield	DTR504A
Rain shield with installation kit	215109
Duct installation kit	215619

1) See the separate HMP110 and HMP113 order forms.  
2) Not available with HMP113.



Dimensions of HMP110 remote probe (top image) and HMT120, HMT130, TMT120, and TMT130 transmitters

## CAB100 CMS Industrial Cabinet

For data collection in cleanrooms and industrial settings



### Features

- Measurement options include differential pressure and analog inputs for a variety of parameters
- Analog inputs can be made intrinsically safe with a safety barrier or galvanic isolator
- Reporting via viewLinc is compliant with FDA, Annex 11, GxP, and GAMP
- Networking options include PoE and/or a multiport Ethernet adapter
- Large cabinets (CAB100B) feature an integrated 24 V DC / 2.5 A power supply
- Small cabinets (CAB100A) have the option of integrated power supply, or Power over Ethernet

Vaisala CMS Industrial Cabinet CAB100 integrates Vaisala's world-class instruments for monitoring differential pressure and other parameters into a simple, pre-configured instrument panel. In combination with the Vaisala viewLinc Enterprise Server software, the cabinet provides pre-installed real-time monitoring of your critical environments.

### Easy data collection with quality and compliance

Cabinets are configurable to your application requirements, with options for differential pressure transmitters, analog inputs for the connection of remote transmitters, and safety barriers or galvanic isolators for hazardous areas that require intrinsically safe devices. CAB100 enables you to combine differential pressure and other transmitters with data loggers in a single enclosure for centralized monitoring and reliable alarming.

### Configured for your cleanroom

CAB100 is designed to ensure regulatory compliance in multiple cleanroom applications, including: pharmaceutical, healthcare, biotechnology, medical

device, aerospace, automotive, and semiconductor manufacturing. Select from two cabinet sizes: small and large. Small cabinets can contain up to four analog inputs which can also be intrinsically safe, or four differential pressure transmitters. Large cabinets can accommodate up to 12 differential pressure transmitters and up to 32 analog input channels with intrinsically safe options.

Communication is achieved over Ethernet to the viewLinc server database. CAB100 is an ideal solution for many monitoring applications, providing device protection, economy and serviceability.

The lockable metal enclosure protects the measurement instruments from tampering and accidental damage.

### The benefits of centralization

It is often impossible or impractical to run power or network cables to each desired point of measurement. With CAB100 you can centralize and economize by running a single power and network cable to the cabinet to support numerous transmitters, while also reducing the number of network adapters needed.

Centralization of measurement devices also simplifies serviceability. With multiple transmitters and data loggers located together, regular maintenance activities like calibration are easy and efficient.



## CAB100 configuration options

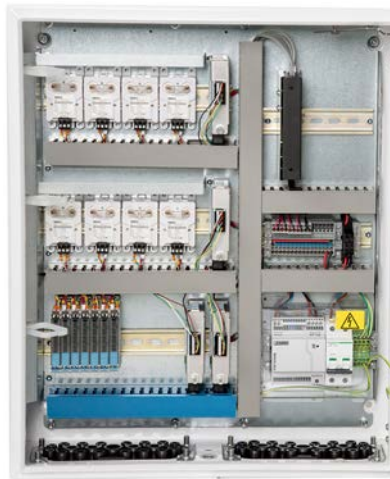
<b>Cabinet size and material (H × W × L)</b>	Model CAB100A (small cabinet)	200 × 300 × 400 mm (7.87 × 11.81 × 15.75 in) Aluminum, painted white
	Model CAB100B (large cabinet)	200 × 500 × 600 mm (7.87 × 19.69 × 23.62 in) Stainless steel AISI 316, painted white
<b>Powering</b>	AC (mains) power	110–240 V AC, 50–60 Hz 0.5 A maximum (120 V AC)
	Power supply module within cabinet	24 V DC / 2.5 A / Fused 2 A
	Power over Ethernet <sup>1)</sup>	Power over Ethernet, with loop power, without fan
	Maximum power consumption	CAB100A: 20 W CAB100B: 40 W
<b>IP rating</b>	CAB100A (small cabinet)	IP54
	CAB100B (large cabinet)	IP66/NEMA 4
<b>Analog channels</b>	4–32 channels	4–20 mA
<b>Safety barrier</b>	1–16 pieces	1 barrier per channel
<b>Galvanic isolator</b>	1–12 pieces	1 isolator per channel
<b>Differential pressure</b>	1–12 pieces	±60 Pa or ±0.25 in H <sub>2</sub> O
<b>Ethernet communication</b>	Model CAB100B (large cabinet)	Up to 2 serial-to-Ethernet devices via RJ45 (DIGI PortServer TS4)
	Model CAB100A (small cabinet)	Vaisala vNet Ethernet interface for DL series data loggers with PoE option via RJ45 connector
<b>Ethernet</b>	Ethernet switch	+4 PoE IEEE 802.3af/at
<b>Compliance</b>	Model CAB100A (small cabinet)	EN/IEC 61326-1 (Basic electromagnetic environment) <sup>2)</sup>
	Model CAB100B (large cabinet)	CISPR 32 / EN 55032, Class A FCC part 15 B, Class A IEC/UL/EN 61010-1 SGS safety listed in USA and Canada CE, UKCA, China RoHS, and RCM compliant Conducted immunity: Output may deviate in 1–40 MHz environment, measured deviation ≤0.25 mA Radiated immunity: Output may deviate in 80–250 MHz environment, measured deviation ≤0.3 mA.

1) Only with PDTs and small CAB100.

2) Excluding CAB100 analog input channels, which are not surge protected.



CAB100 supports internal differential pressure transmitters, analog inputs, and safety barriers or galvanic isolators.



**For accuracy specifications, see devices on [www.vaisala.com](http://www.vaisala.com)**

- DL4000 data loggers for multiple parameters
- PDT101 differential pressure transmitter
- HMT370EX series transmitters for intrinsically safe temperature and humidity measurement
- HMT120 and HMT130 series transmitters for analog inputs



### Our service offering

- Maintenance Agreement
- Installation and configuration
- Validation
- Calibration services
- Training
- Validation mapping

Vaisala provides comprehensive customer care for the entire life cycle of the Vaisala viewLinc Continuous Monitoring System (CMS). These expert services will ensure that your CMS provides reliable monitoring throughout its operational lifespan.

### Worldwide experts at your service

Vaisala's service and support teams provide you with an in-depth understanding of critical environments, network technologies, and measurement devices. We help ensure that your CMS is efficiently and effectively deployed so that it meets or exceeds the most stringent compliance requirements for installation in GxP-regulated environments.



*"The Vaisala team is well qualified, easy to work with, and became a part of our team. This relationship was a major reason that our original goal of project completion [for a 2000 point, 60 site system] within two years was met."*

Joe Cwiertniewicz,  
Facilities Manager, McKesson

**Choose the optimal combination of life cycle services for your viewLinc CMS:**



MAINTENANCE AGREEMENT



INSTALLATION & CONFIGURATION



IQ/OQ VALIDATION



CALIBRATION SERVICES



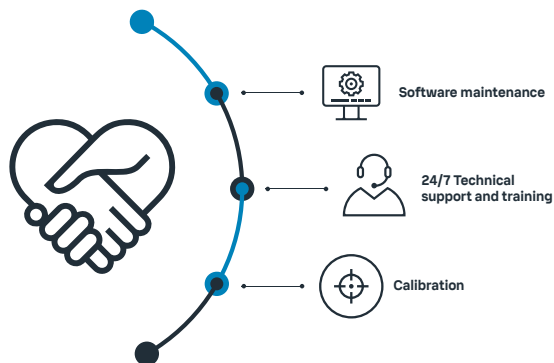
TRAINING



VALIDATION MAPPING

# viewLinc Life Cycle Maintenance Agreement

Our life cycle services provide you with expert support throughout the lifetime of your CMS to ensure reliable monitoring. Choose the services that suit your needs best, or consult our experts to help you decide.



## viewLinc Life Cycle Maintenance Agreement

The viewLinc Life Cycle Maintenance Agreement (LCMA) is an agreement designed to ensure that your viewLinc CMS is always up to date in terms of performance and regulatory compliance. It also helps ensure you get maximum benefit from your viewLinc CMS with support from our experts. The agreement comprises software updates, enhanced support and training for your staff, and remote emergency support.

### Software updates

Software updates ensure that your viewLinc CMS is updated regularly to address technological advances and changes in regulations. Updates are provided free of charge and include supporting documentation.

### Enhanced support and training for your staff

Enhanced support means that Vaisala technical experts will help you to solve any technical challenge you might face when using Vaisala hardware and software. All queries are answered by a Vaisala expert on the next working day at the latest. The service also includes a fixed amount of pre-planned training and/or consultation on topics of your choosing. Training is recommended when you first start using viewLinc and when you are onboarding new staff.

For technical support, contact us via [MyVaisala portal](#) or the Vaisala helpdesk at [helpdesk@vaisala.com](mailto:helpdesk@vaisala.com).

### Remote emergency support

Remote emergency support is available to help troubleshoot the root cause of critical issues with Vaisala hardware and software that inhibit core system functions. Support is available 24/7 via Vaisala's dedicated emergency support number.



*"Over the years, Vaisala's field support has assisted us for complex system integrations, supporting all our needs effectively. Vaisala has enabled us to reduce the time it takes to create a fully GMP-monitored environment. That provides us with a competitive edge."*

David Teer, Senior Engineering Manager, Viral-based Therapeutics, Lonza Houston.

# Installation and configuration

Vaisala’s experienced technicians are available to manage and perform the installation and configuration of your viewLinc CMS. Our installation service ensures flawless system deployment and efficient start-up without burdening your resources. We also offer update and expansion services for existing viewLinc systems.

## Installation service includes:

- Collaborative planning
- Installation of all measurement devices and network hardware
- Software installation and configuration
- User and administrator training
- System handover



## Efficient and worry-free installation

With our comprehensive installation service you can be certain that the system deployment meets all your operational and regulatory requirements.

## Comprehensive training

Our installation service includes hands-on user and administrator training to ensure staff can make effective use of the CMS from day one.

## Expert support

Vaisala’s service technicians have expert knowledge of our hardware, software, and associated technologies. They are experienced in setting up systems for critical and GxP-regulated environments.

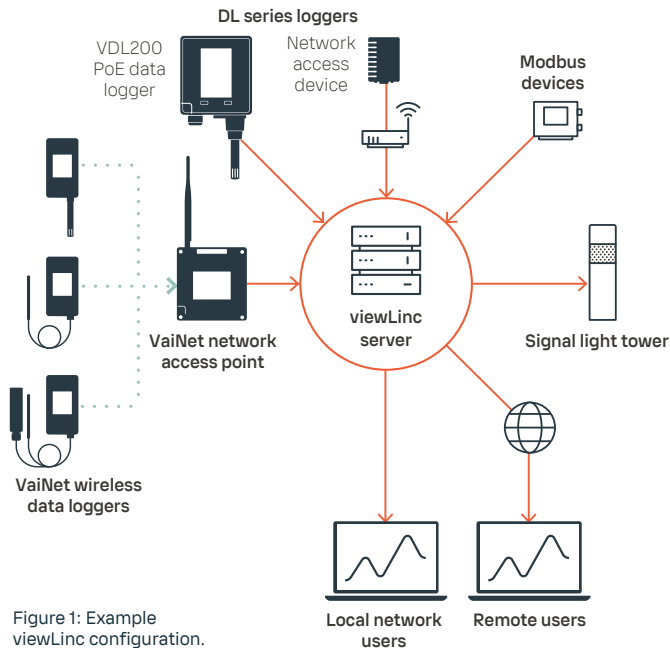


Figure 1: Example viewLinc configuration.

*“The system was installed with the help of Vaisala Field Service. When a Joint Commission surveyor returned, we presented him with printouts of viewLinc records for the dates and times of his choosing. He was impressed.”*

Frank Gee, Director of Facilities,  
Hazel Hawkins Memorial Hospital, California

# Validation

Ensure a high quality validation of your monitoring system and reduce system implementation time by using our expertise and understanding of GxP quality systems.



## **IQ/OQ validation**

Ensure high-quality validation of your monitoring system and reduce system implementation time by using our expertise and understanding of GxP quality systems.

Vaisala offers on-site Installation Qualification (IQ) and Operational Qualification (OQ) services for the Vaisala viewLinc CMS.

IQ captures the baseline configuration of your system and provides evidence of control that aligns with GxP guidelines. OQ provides evidence that your monitoring system is operating as designed, encompassing all GxP functions of the system including audit trails, tamper-proof data, and the relevant requirements of 21 CFR Part 11, EU GMP Annex 11, and PSFB 040122.

## **Economical and efficient**

Monitoring system validation performed by a skilled and experienced Vaisala technician is an economical choice, providing significant savings in time and resources. Let us take care of IQ/OQ system validation so that you can concentrate on your core business.

## **The quickest way to audit-ready monitoring**

Our understanding of GxP regulations and quality system standards in life science industries ensures that your viewLinc CMS is validated, documented, and ready for regulatory scrutiny.

## **Comprehensive validation documents**

Our validation service includes full documentation to demonstrate that the system is operating according to specifications and that it meets quality standards and regulatory requirements.

*“The viewLinc system is not only easy to validate to GMP compliance, but it’s also more efficient than all the hard wiring typically required by automation and control systems.”*

David Teer, Senior Engineering Manager, Viral-based Therapeutics, Lonza Houston

# Calibration services

Vaisala offers several calibration options for CMS data loggers and instruments to verify and ensure their measurement accuracy.

Simply choose from Service Center Calibration, On-site Calibration, or our Probe-Swapping Service and leave the rest to our experts. All calibration options include official calibration certificates for both internal and external audit purposes.

We also offer cost-efficient Calibration Care agreements which include priority processing. You can learn more about the benefits of a Calibration Care agreement [here](#).



## Service Center Calibration

Traceable ISO 9001 or accredited ISO/IEC 17025 calibration performed at a Vaisala calibration laboratory:

- Wide calibration ranges and extensive options
- Adjustment included and repair services available as an option
- Includes calibration certificate with as-found and as-left results

## On-site Calibration

Single or multi-point calibration, accredited if required, performed at your site by Vaisala experts:

- No system downtime or lost data
- Carefree and convenient – saves in-house resources
- Includes calibration certificate

## Probe-Swapping Service

Avoid calibration-related downtime with our Probe-Swapping Service, which provides you with a replacement probe with an as-found calibration certificate.

- Factory calibration accuracy with minimal downtime
- Probe replacement can be performed in seconds

## Vaisala service centers providing ISO and Accredited calibration services

Boston	Helsinki	Beijing	Tokyo
  <p>ACCREDITED CALIBRATION LABORATORY CERTIFICATE # 2083.01</p>	  <p>FINAS Finnish Accreditation Service K008 (EN ISO/IEC 17025)</p>	  <p>中国认可 国际互认 校准 CALIBRATION CNAS L10243</p>	  <p>JCSS JCSS 0123</p>
<p><b>ALL PARAMETERS CALIBRATED:</b> Relative Humidity, Temperature, Dew Point, Pressure, Carbon dioxide and Hydrogen peroxide</p>			
<p>Please visit <a href="http://store.vaisala.com">store.vaisala.com</a> to see services availability and terms in your area.</p>			

# Training

Vaisala offers comprehensive training services for viewLinc customers to ensure staff are properly trained on the system's functions and capabilities. Whether you are deploying a new monitoring system, expanding an existing one, or adapting to staff changes, our comprehensive training ensures proper use of the system and compliance with regulations such as FDA 21 CFR 211.25.



### Choose the training option that serves your needs best:

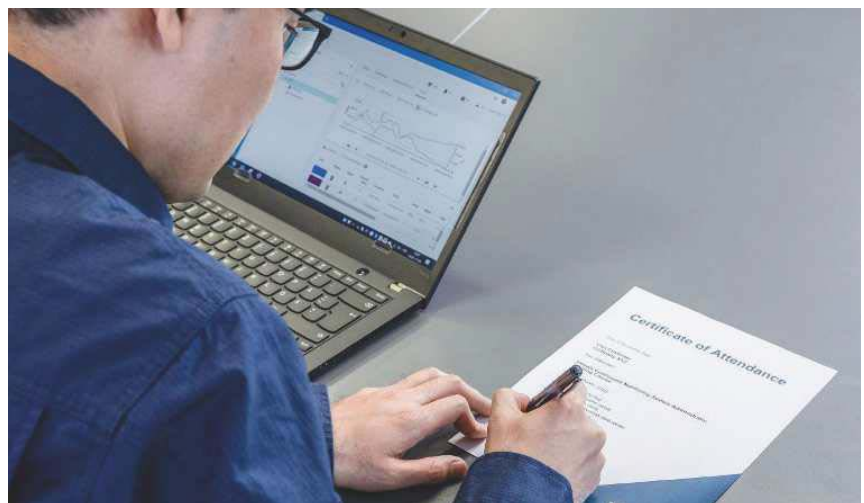
- Remote training with Vaisala technical support experts via Teams
- On-site training with hands-on exercises; typically delivered with our [Installation Service](#).

# Validation mapping

Understanding the critical process parameters of a controlled environment is crucial to the safe and effective use of that space for manufacturing, storing, processing, and distributing pharmaceuticals, biological materials, and medical devices. The Vaisala Validation Mapping Service ensures that you fully understand the variability of conditions and qualify controlled environments.

### The Validation Mapping Service includes:

- Thermal mapping and analysis of environments
- Mapping equipment used during the service
- Mapping study documents



Inquire about availability of the Validation Mapping Service in your region [here](#).

*"As our research has evolved, viewLinc has met our needs. We are extremely pleased with the viewLinc system and the services Vaisala provides."*

Dr. Leonardo Motta, Medical Laboratory Supervisor, Health Research Institute, University of Caxias do Sul, Brazil





### Features

- Achieve time and cost savings by preventing production downtime
- Ensure highly accurate measurements
- Provide certification and mandatory documentation for instrument calibration standards
- Free up staff to focus on primary work assignments
- Enjoy peace of mind with Vaisala-certified calibration expertise and components
- Take advantage of a wide array of available calibrations

Calibrating Vaisala Continuous Monitoring Systems (CMS) on-site helps to maximize reliability and profitability by minimizing costly equipment downtime, removing the need for in-house or factory calibration, and allowing your staff to focus on what is truly important: your business.

### Reliable On-site Calibration for Life Science Applications

On-site Calibration Service offers a range of benefits over the conventional options of either shipping equipment back to the manufacturer or calibrating in-house. Reliable on-site calibration minimizes downtime by keeping your monitoring system in place and operational.

Certain calibrations require removal of the device from process. For these situations Vaisala offers rental devices and device swap services to ensure continuity of monitoring and gap-free

data. By outsourcing calibration to Vaisala, you remove the need to invest in specialized calibration equipment and training – allowing staff to focus on their primary tasks.

We provide you with a range of single- and multi-point calibration options using application-specific reference instruments, complete with a certificate of NIST traceability. To maintain the high levels of accuracy and optimal performance of your CMS, the system sends a reminder when calibration is due.

### Complete Documentation

On-site Calibration Service provides a thorough analysis with comprehensive paper and digital documentation, including a calibration certificate to ensure verification and standards compliance. Calibration reports, data sheets, and calibration labels can be supplied on-site, with digital backup files saved to disk. Our highly accurate calibrations fulfill international standards and make it easy to comply with regulatory requirements.

# Technical Data

## Single-point Calibration

Temperature	
Range	-90 ... +70 °C
Unit Under Test acceptance limits	±1 °C
Calibration points	One point at point of use
Adjustment	Not available
Certificate	Includes as-found/as-left data
Traceability	NIST
Available for the following devices	Vaisala Temperature Data Loggers <ul style="list-style-type: none"> <li>• DL1000</li> <li>• DL1016</li> <li>• DL1400</li> <li>• DL1416</li> <li>• DL2000</li> <li>• HMT140</li> </ul>
Reference instrument	Vaisala Temperature Data Logger
Temperature for Liquid Nitrogen Applications	
Range	-196 °C
Unit Under Test acceptance limits	±3 °C
Calibration points	One point at point of use
Adjustment	Not available
Certificate	Includes as-found/as-left data
Traceability	NIST
Available for the following devices	Vaisala Temperature Data Loggers DL1700
Reference instrument	Vaisala Temperature Data Logger, Fluke 52 Series II
Relative Humidity	
Range	Ambient RH (within range of 10 ... 90 %RH) at any temperature within range of +10 ... +45 °C
Unit Under Test acceptance limits	±5 %RH
Calibration points	One point at point of use
Adjustment	Not available
Traceability	NIST
Applicable loggers and transmitters	Vaisala Humidity Data Logger DL2000, HMT140
Reference instrument	Vaisala Humidity Data Logger
Carbon Dioxide	
Range	0 ... 20 % at point of use
Unit Under Test acceptance limits	Application dependent
Calibration points	One point at point of use
Adjustment	Not available
Certificate	Includes as-found/as-left data
Traceability	NIST
Available for the following devices	Vaisala Carbon Dioxide Transmitter Series GMT220
Reference instrument	Vaisala GM70

## Multi-point Calibration

Temperature	
Range	-90 ... +90 °C
Unit Under Test acceptance limits	±0.5 °C
Calibration points	Application-dependent
Adjustment	Available on 3+ point calibrations
Certificate	Includes as-found/as-left data and uncertainties
Traceability	NIST
Available for the following devices	Vaisala Temperature Data Loggers with Probes <ul style="list-style-type: none"> <li>• DL1000</li> <li>• DL1016</li> <li>• DL1400</li> <li>• DL1416</li> <li>• HMT143</li> <li>• HMT148</li> </ul>
Reference instrument	Ametek ETC159
Relative Humidity	
Range	10 ... 90 %RH at ambient temperature
Unit Under Test acceptance limits	Loggers ±3 %RH
Calibration points	Application-dependent
Adjustment	Available on 3+ point calibrations
Certificate	Includes as-found/as-left data and uncertainties
Traceability	NIST
Available for the following devices	Vaisala Relative Humidity Data Loggers HMT141, DL2000
Reference instrument	Vaisala HMT330
Differential Pressure	
Range	-15 ... 200 psi
Unit Under Test acceptance limits	Range-dependent
Calibration points	Application-dependent
Adjustment	Available on 3+ point calibrations
Certificate	Includes as-found/as-left data
Traceability	NIST
Available for the following devices	Vaisala Differential Pressure Transmitter Series PDT100
Reference instrument	Fluke Process Calibrator / Pressure Modules
Current and Voltage	
Range	0 ... 5 VDC 0 ... 10 VDC 0 ... 20 mA
Unit Under Test acceptance limits	±0.15 %FS at +25 °C
Calibration points	Match Factory Calibration
Adjustment	Yes
Certificate	Includes as-found/as-left data and uncertainties
Traceability	NIST
Available for the following devices	Vaisala Relative Data Loggers HMT140, DL4000, DL2000
Reference instrument	National Instruments PHLe-4141



## GxP Documentation Package for Vaisala viewLinc Continuous Monitoring System



**User Requirements Specification (URS)**  
**Functional Specification (FS)**  
**Design Qualification (DQ)**  
**Traceability Matrix (TM)**  
**Risk Assessment (RA)**

### Features

- System validation documentation package designed to provide ISPE Good Automated Manufacturing Practice (GAMP) methodology for viewLinc system validation.
- Available in English, Portuguese, Japanese, and Chinese.
- Specify the required attributes of your viewLinc system using the viewLinc-specific GxP documentation:
  - User Requirements Specification
  - Functional Specification
  - Design Qualification
  - Traceability Matrix
  - Risk Assessment

Vaisala viewLinc Continuous Monitoring System is ideal for GxP-regulated applications and environments that contain high-value products. If you are required to maintain compliant environmental monitoring methods and documentation, Vaisala can provide a GxP System Documentation package for the viewLinc monitoring system to help ensure your system implementation fulfills the recommendations of ISPE Good Automated Manufacturing Practice (GAMP).

### Specify, then verify

The goal of the GAMP approach is to ensure, through specification and testing, that the monitoring system is fit for its intended use and implemented in a controlled manner. The required attributes of the system are described in specifications, and then verified in testing. The GxP Documentation Package provides the required specifications, which can then be verified using the Vaisala IQOQ (Installation Qualification/Operation Qualification) Documentation Package.

### User Requirements Specification (URS)

The User Requirements Specification defines the capabilities you have deemed necessary for the Vaisala Continuous Monitoring System to fulfil its intended role in your process. This document provides a clear and concise list of requirements for a typical continuous monitoring application, while providing the option to add new requirements according to your unique business processes.

### Functional Specification (FS)

The Functional Specification outlines all functions of the Vaisala Continuous Monitoring System. This document can be used by stakeholders to evaluate the CMS as a candidate system by comparison to a User Requirements Specification.

### Design Qualification (DQ)

The Design Qualification ensures that the Vaisala Continuous Monitoring System is appropriately designed and capable of meeting the requirements of the system user. The DQ compares individual User Requirements in the URS against the system functions, and provides traceable verification that each User Requirement is fulfilled by a function listed in the FS.

### **Traceability Matrix (TM)**

The Traceability Matrix ensures traceability of the requirements through the assessment and testing processes. The Traceability Matrix is used to verify that each requirement from the URS is fulfilled by a corresponding function in the CMS. It verifies that each requirement and corresponding function has been fully evaluated through Risk Assessment, IQ Testing, and OQ Testing.

### **Risk Assessment (RA)**

The Risk Assessment outlines the CMS functions that are critical to preserving the safety and efficacy of GxP products. This Risk Assessment provides justification for the items in the Vaisala CMS that will be tested (or not tested). This analysis serves as a guide for your testing efforts.

A central tenet of GAMP philosophy is to leverage supplier involvement. Items identified as not requiring testing in the CMS IQOQ have either been tested thoroughly by Vaisala during system development, or are tested elsewhere during the implementation process.

### **More information**

For more information on the GxP Documentation Package for viewLinc, see [www.vaisala.com/gamp-gxp-validation](http://www.vaisala.com/gamp-gxp-validation).

## Indigo80 Handheld Indicator For portable diagnostics








### Features

- Flexible operation with Vaisala Indigo-compatible probes and transmitters, including HMP80 and DMP80 handheld probes and GMP80P probe with pump sampling
- Intuitive user interface available in 10 languages
- Rechargeable battery
- Robust design and modern appearance
- Logged measurement data can be transferred to PC via Vaisala Insight software

Vaisala Indigo80 Handheld Indicator is an industrial-grade portable diagnostics tool. Accommodating up to two Vaisala measurement probes, Indigo80 is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting Vaisala Indigo-compatible probes and transmitters.

### Variety of probe options

The Indigo80 indicator has two cable ports by which a combination of two probes or transmitters can be simultaneously connected to the indicator. Indigo80 can communicate with most current and future Vaisala probes and transmitters for measuring a wide range of parameters.

-  Humidity and temperature
-  Dew point
-  Carbon dioxide
-  Hydrogen peroxide vapor
-  Moisture in oil

For the full set of probes and transmitters currently compatible with Indigo80, see the following page. For more information on the Indigo product family, see [vaisala.com/indigo](https://vaisala.com/indigo).

### Robust and reliable

The sturdy aluminum body of Indigo80 is resistant to chemicals and dust. Indigo80 is powered by a rechargeable lithium-ion battery with a typical operation time of 10 h. During long-term logging Indigo80 can be powered by using an AC adapter.

### Easy to use

Indigo80 has an intuitive user interface that guides the user if needed. The indicator is designed to be easy to use in numerous use cases and measurement environments.

To access logged data and configuration functionality, Indigo80 can be connected to Vaisala Insight PC software for Windows®. For more information, see [vaisala.com/insight](https://vaisala.com/insight).

### Multilingual user interface

Indigo80 has a multilingual, menu-based user interface that shows live measurement data both numerically and graphically. The Indigo80 user interface is available in 10 languages.



View live measurement data as numbers or graphs

# Vaisala devices compatible with Indigo80

## Vaisala Indigo-compatible probes

HMP1, HMP3, HMP4, HMP5, HMP7, HMP8, HMP9, HMP80L, HMP80N	Humidity and temperature
TMP1	Temperature
DMP5, DMP6, DMP7, DMP8, DMP80A, DMP80B	Dew point
GMP251, GMP252	Carbon dioxide
HPP271, HPP272	Vaporized hydrogen peroxide
MMP8	Moisture in oil

## Other Vaisala devices

HMP60, HMP63, HMP110, HMP113, HMP115, HMM170	Humidity and temperature
HMP110T, HMP115T, TMP115	Temperature
DMT143, DMT143L	Dew point

## Vaisala Indigo transmitters (host devices)

Indigo300, Indigo510, Indigo520
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# Technical data

## Operating environment

Operating temperature	-20 ... +50 °C (-4 ... +122 °F)
Storage temperature	-20 ... +60 °C (-4 ... +140 °F), recommended +20 °C (+68 °F)
Operating and storage humidity	20–85 %RH, when Ta ≤ +40 °C (+104 °F)
Charging temperature	0 ... +45 °C (+32 ... +113 °F) <sup>1)</sup>
IP rating	IP40
Use in wet location	No
Operating environment	Indoor use
Pollution degree	3
Maximum operating altitude	2000 m (approx. 6500 ft)

1) The battery will not charge at temperatures below 0 °C (+32 °F).

## Data logging and user interface specifications

Data logging capacity	Up to 5.5 million real-time data values
Logging interval	1 s - 12 h
Logging duration	1 min - memory full <sup>1)</sup>
Alarm	Audible alarm function
Supported languages	English, Chinese, Finnish, French, German, Italian, Japanese, Portuguese, Spanish, Swedish
Display	2.7" sunlight readable transfective TFT LCD color display with backlight and automatic brightness control

1) For example, data logging duration for one measurement parameter with a logging interval of one second is over eight weeks. Use an AC adapter to power Indigo80 during long-term logging.

## Battery operation time

Operation time (continuous use)	10 h at +20 °C (+68 °F) <sup>1)</sup>
Charging time	2 hours <sup>1)</sup>

1) Typical value. Actual performance depends on, for example, the number and type of devices connected to Indigo80 and the data logging interval.


## Mechanical specifications

Weight	385 g (14 oz)
Dimensions (H × W × D)	213 × 58 × 27 mm (8.4 × 2.3 × 1.1 in)
<b>Materials</b>	
Main body and rear piece	Aluminum EN AW-6082 T6
Back cover	Rubber (TPE) and polycarbonate (PC), reinforced with fiberglass Flammability rating UL94 V-1
Display	Strengthened glass with anti-fingerprint (AF) and anti-reflection (AR) coatings

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B FCC part 15 B, Class B ICES-3 / NMB-3 (Class B)
Electrical safety	IEC/EN 61010-1
Compliance marks	CE, China RoHS, FCC, RCM, UKCA

## Inputs and outputs

Max. number of connected probes	2
Connector type	M12 5-pin female (2 pcs)
<b>Battery</b> <sup>1)</sup>	
Type	Rechargeable lithium-ion battery
Nominal voltage	7.2 V
Rated capacity	2900 mAh / 20.88 Wh
Charge limit voltage	8.4 V
<b>AC adapter</b> <sup>2)</sup>	
Type	45 W USB-C AC adapter <sup>3)</sup>
Connector type	USB-C
AC input	100-240 V AC, 1.2 A, 50-60 Hz
DC output	5.0 V/9.0 V/12.0 V/15.0 V DC, 3.0 A 20.0 V DC, 2.25 A 45 W
Insulation	Double or reinforced, indicated with the following symbol: 
PC interface	Vaisala Insight PC software with USB-C cable (Windows OS). <sup>4)</sup> Data can be logged and transferred also without Insight.

1) The battery is not user-replaceable. Contact Vaisala Service Center for any battery-related maintenance needs.

2) The AC adapter is an optional accessory. If using an AC adapter not provided by Vaisala, make sure it fulfills the specifications given in this table and the safety requirements listed in Indigo80 Safety Guide (M212872EN), available at docs.vaisala.com.

3) 45 W AC adapter recommended for optimal performance of Indigo80. An AC adapter with a lower power rating can also be used.

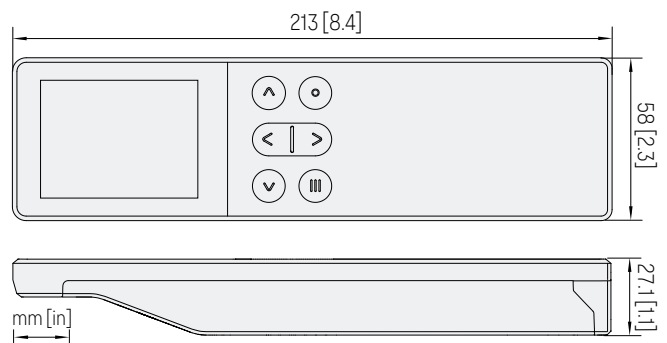
4) Insight software is available for download at [vaisala.com/insight](https://vaisala.com/insight).

## Spare parts and accessories

<b>Cables</b>	
Cable for transmitters (M12-M8), 1.5 m (4 ft 11 in)	262195SP
Cable for probes (M12-M12), 1.5 m (4 ft 11 in)	272075SP
Flat cable for probes (M12-M12), 1 m (3 ft 3 in)	CBL210493SP
Probe connection cable (M12-M12), 10 m (32 ft 10 in)	INDIGOCABLE10M
<b>Other</b>	
Magnetic hanger for indicator	ASM214318SP
Weatherproof carrying case for Indigo80 and HMP80 and DMP80 series probes	ASM214759
Weatherproof carrying case for Indigo80 and a series 8 probe <sup>1)</sup>	ASM215318
Light carrying case for HM40S or Indigo80 indicator and a compatible probe <sup>2)</sup>	230245SP

1) For example, MMP8, HMP8, or DMP8 with a max. 2-m (6 ft 7 in) probe connection cable.

2) For example, DMP80, HMP80N, or GMP252 probe with handle accessory and a max. 1.5-m (4 ft 11 in) probe connection cable.



Indigo80 dimensions (front and side view)

## HMP80 Series Handheld Humidity and Temperature Probes

For spot-checking applications



### Features

- Portable design optimized for industrial spot-checking and field calibration
- RH accuracy up to  $\pm 0.8$  %RH
- Temperature accuracy up to 0.1 °C (0.18 °F)
- Wide temperature measurement range
- Condensation-tolerant
- Sensor purge improves long-term stability and chemical resistance
- Compatible with Indigo80 handheld indicator and Insight PC software
- Calibration certificate included

Vaisala HUMICAP® Handheld Humidity and Temperature Probes HMP80 Series have been designed for portable use, especially with the Indigo80 handheld indicator. The combination of HMP80 probe and Indigo80 is ideal for spot-checking and field calibration of installed Vaisala humidity instruments.

### 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.

The 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.

HMP80 series probes are delivered with standard factory calibration certificates, with accredited calibration as an option. The probes can therefore be used as a working standard in field calibration.

### Robust design for handheld measurements

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

The design of the probe handle has been optimized for manual operation in versatile measurement environments. The IP66-classified probe handle offers excellent protection against moisture and dust with the probe connection cable attached. Also the cable connection is protected against mechanical stress by the robust design of the handle.

### Flexible connectivity

HMP80 probes are optimized for portable spot-checking, field calibration, and data logging use with the Indigo80 handheld indicator. For easy-to-use access to device analytics and configuration, HMP80 probes can be connected to Vaisala Insight software for Windows®.

For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo) and [www.vaisala.com/insight](http://www.vaisala.com/insight).



# Technical data

## HMP80 series measurement performance

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

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

## HMP80 series operating environment

Operating temperature of probe handle	-10 ... +60 °C (-14 ... +140 °F)
Operating temperature of probe head	HMP80N: -20 ... +60 °C (-4 ... +140 °F)
	HMP80L: -50 ... +120 °C (-58 ... +248 °F)
Storage temperature	-20 ... +60 °C (-4 ... +140 °F)
Measurement environment	For air, nitrogen, hydrogen, argon, helium, oxygen, and vacuum <sup>1)</sup>
IP rating of probe handle:	
with probe connection cable connected to the probe	IP66
without cable	IP55

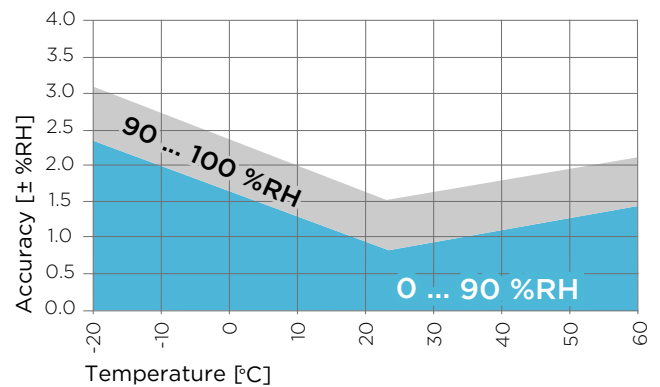
- 1) Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases.

## HMP80 series inputs and outputs

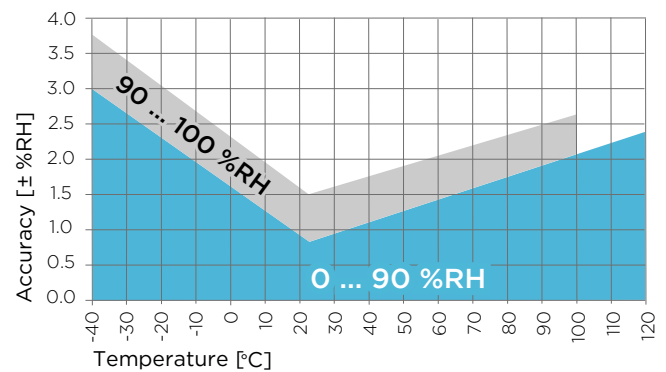
Operating voltage	15-30 V DC
Current consumption	10 mA typical, 500 mA max.
Digital output	RS-485, non-isolated

## HMP80 series compliance

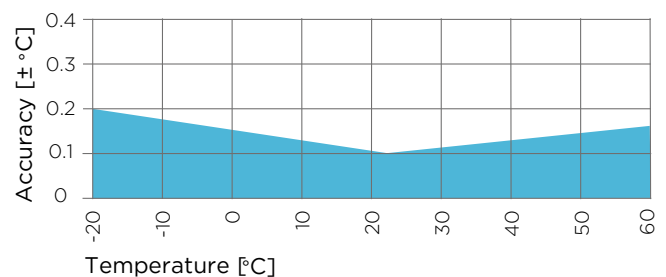
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Rough handling (excluding sensor inside probe head)	IEC 60068-2-31
Compliance marks	CE, China RoHS, RCM, UKCA



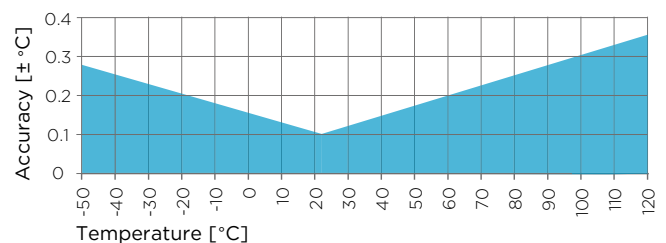
HMP80N humidity measurement accuracy as a function of temperature



HMP80L humidity measurement accuracy as a function of temperature



HMP80N temperature measurement accuracy over full range



HMP80L temperature measurement accuracy over full range

## HMP80 series output parameters

Absolute humidity (g/m <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>w</sub> )
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
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)

## HMP80 series mechanical specifications

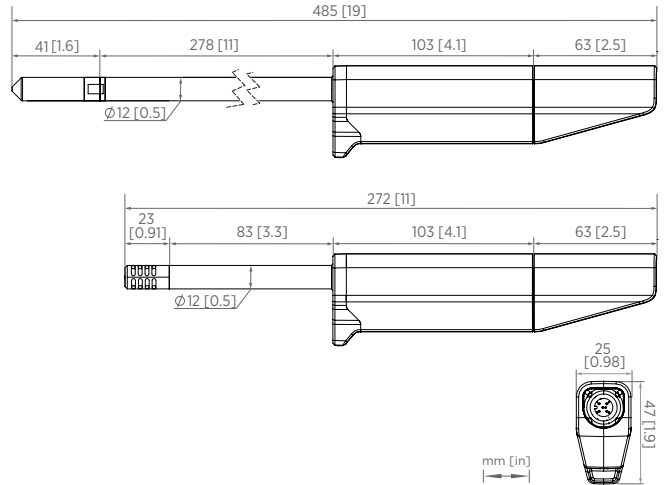
Connector type	M12 5-pin A-coded male
Weight	HMP80N: 200 g (7 oz) HMP80L: 300 g (10 oz)

Materials	
Probe handle	Polyamide (PA) and thermoplastic elastomer (TPE)
Probe shaft	Stainless steel (AISI 316L)
Filters	HMP80N: Stainless steel (AISI 316L) <sup>1)</sup> HMP80L: Porous stainless steel (AISI 316L) <sup>2)</sup>

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

## HMP80 series spare parts and accessories

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



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

## DMP80 Series Handheld Dew Point and Temperature Probes

For spot-checking applications



### Features

- Portable design optimized for industrial spot-checking and field calibration
- Dew point measurement accuracy up to  $\pm 2$  °C ( $\pm 3.6$  °F)  $T_{d/f}$
- Wide dew point measurement range
- Sensor purge improves long-term stability and chemical resistance
- Condensation-tolerant
- Compatible with Indigo80 handheld indicator and Insight PC software
- Calibration certificate included

Vaisala DRYCAP® Handheld Dew Point and Temperature Probes DMP80 Series have been designed for portable use, especially with the Indigo80 handheld indicator. The combination of DMP80 probe and Indigo80 is ideal for spot-checking and field calibration of installed Vaisala humidity instruments.

### Reliable measurements with the Vaisala DRYCAP sensor

Vaisala DRYCAP sensor is robust against particulate contamination, water condensation, oil vapor, and most chemicals. The sensor tolerates condensation and recovers perfectly if exposed to liquid water. The sensor's performance is excellent also in dynamic and low dew point applications, thanks to its fast reaction time and stability.

The probes can be inserted directly into pressurized processes, and respond rapidly from ambient to process conditions. The DMP80 probes are suitable for direct process dew point measurement in a wide temperature and pressure range.

DMP80 series probes are delivered with standard factory calibration certificates, with accredited calibration as an option. The probes can therefore be used as a working standard in field calibration.

### Sensor purge minimizes effects of contaminants

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

Sensor purge involves heating the sensor briefly to remove chemicals that could lower measurement performance and cause drifting.

### Robust design for handheld measurements

The design of the probe handle has been optimized for manual operation in versatile measurement environments. The IP66-classified probe handle offers excellent protection against moisture and dust with the probe connection

cable attached. Also the cable connection is protected against mechanical stress by the robust design of the handle.

### Flexible connectivity

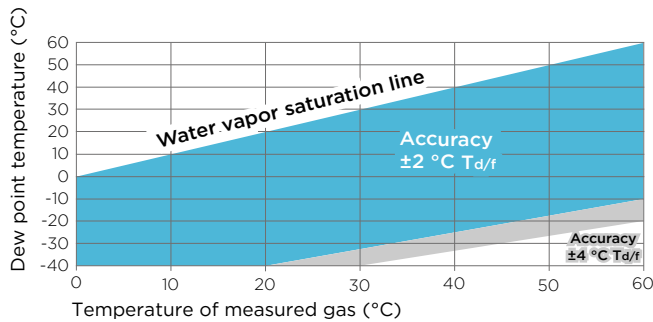
DMP80 probes are optimized for portable spot-checking, field calibration, and data logging use with the Indigo80 handheld indicator. For easy-to-use access to device analytics and configuration, DMP80 probes can be connected to Vaisala Insight software for Windows®.

For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo) and [www.vaisala.com/insight](http://www.vaisala.com/insight).

# Technical data

## DMP80A measurement performance

Dew point	
Sensor	DRYCAP® 180S
Measurement range	-40 ... +60 °C (-40 ... +140 °F) T <sub>d/f</sub>
Accuracy	Up to ±2 °C (±3.6 °F) T <sub>d/f</sub>
Response time 63 % [90 %]:	
From dry to wet	5 s [10 s]
From wet to dry	45 s [5 min]
Temperature	
Measurement range	0 ... +60 °C (+32 ... +140 °F)
Accuracy	±0.2 °C (±0.36 °F) at room temperature
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751
Mixing ratio	
Measurement range (typical)	0-150 g/kg (0-1050 gr/lbs)
Accuracy (typical)	±12 % of reading
Absolute humidity	
Measurement range	0-130 g/m <sup>3</sup>
Accuracy (typical)	±10 % of reading



Dew point accuracy vs. measurement conditions (DMP80A)

## DMP80 series operating environment

Operating temperature range	-10 ... +60 °C (+14 ... +140 °F)
Storage temperature	-20 ... +60 °C (-4 ... +140 °F)
Operating pressure of probe head	0-20 bar (0-290 psi), absolute
Measurement environment	For air, nitrogen, hydrogen, argon, helium, and oxygen <sup>1)</sup>
IP rating of probe handle:	
With probe connection cable connected to the probe	IP66
Without cable	IP55

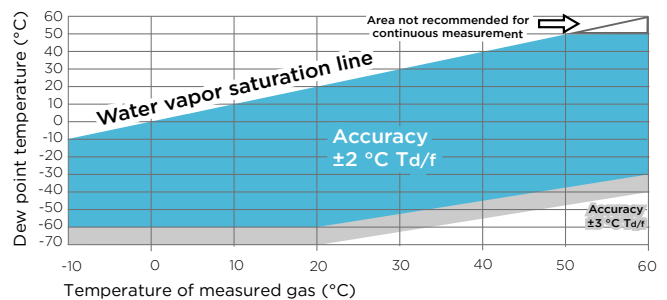
<sup>1)</sup> Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases.

## DMP80 series inputs and outputs

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

## DMP80B measurement performance

Dew point	
Sensor	DRYCAP® 180M
Measurement range	-70 ... +60 °C (-94 ... +140 °F) T <sub>d/f</sub>
Accuracy	Up to ±2 °C (±3.6 °F) T <sub>d/f</sub>
Response time 63 % [90 %]:	
From dry to wet	5 s [15 s]
From wet to dry	45 s [8 min]
Temperature	
Measurement range	0 ... +60 °C (+32 ... +140 °F)
Accuracy	±0.2 °C (±0.36 °F) 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



Dew point accuracy vs. measurement conditions (DMP80B)

## DMP80 series mechanical specifications

Connector type	M12 5-pin A-coded male
Weight	250 g (9 oz)
Mechanical connection options	G1/2" ISO 228/1 NPT1/2"
Materials	
Probe handle	Polyamide (PA) and thermoplastic elastomer (TPE)
Probe shaft	Stainless steel (AISI 316L)
Filter	Porous stainless steel (AISI 316L) <sup>1)</sup>

<sup>1)</sup> Vaisala item code: HM47280SP

## DMP80 series output parameters

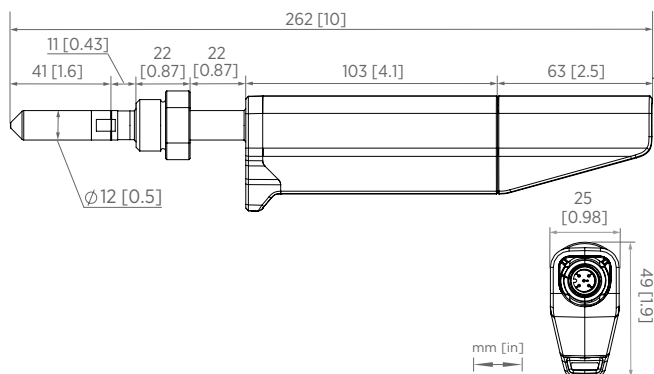
Absolute humidity (g/m <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>v</sub> )
Dew/frost point temperature at 1 atm (°C)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

## DMP80 series compliance

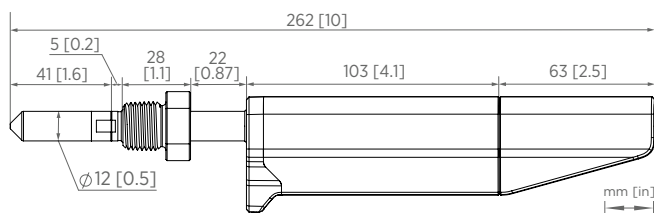
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Rough handling (excluding sensor inside probe head)	IEC 60068-2-31
Compliance marks	CE, China RoHS, RCM, UKCA

## DMP80 series spare parts and accessories

Cables	
Probe connection cable (M12-M12), 1.5 m (4.11 ft)	272075SP
Flat cable for probes (M12-M12), 1.0 m (3.4 ft)	CBL210493SP
Accessories for ISO G1/2" thread option	
Sampling cell with quick connector and leak screw	DSC74
Sampling cell with female connectors, inlet G3/8", outlet G1/4" ISO	DMT242SC
Sampling cell with Swagelok connectors for 1/4" tubing	DMT242SC2
Two-pressure sampling cell	DSC74B
Two-pressure sampling cell with coil	DSC74C
Other items	
Indigo USB adapter	USB2
Sintered stainless steel filter	HM47280SP



Dimensions of DMP80 series probes with G1/2" thread, side and bottom view



Dimensions of DMP80 series probes with NPT1/2" thread



### Features

- Humidity measurement range 0 ... 100 %RH
- Temperature measurement ranges -40 ... +100 °C (-40 ... +212 °F), depending on probe model. The HM46 model can measure up to +180 °C (+356 °F) for a short period of time.
- Incorporates proven Vaisala HUMICAP® sensor technology
- Calibration reminder function
- Probes can be user calibrated using an on-site reference
- Graphical display indicates when measurement has stabilized
- Hold-button to freeze the screen and save the reading
- Multilingual user interface available in 10 languages (EN, DE, FR, JA, ZH, PT, ES, RU, FI, SV)

The easy-to-use HM40 is a compact and portable humidity meter that provides reliable measurements in a wide range of applications. It is the ideal spot-checking tool for everything from structural moisture measurement and air conditioning systems to humidity measurement in industrial production processes and life science applications. There are four different models available: HM41, HM42, HM45, and HM46.

### Benefits

- Compact, portable, and easy to use
- Versatile meter with wide measurement range and multiple calculated parameters
- Ideal for spot-checking in a wide variety of applications

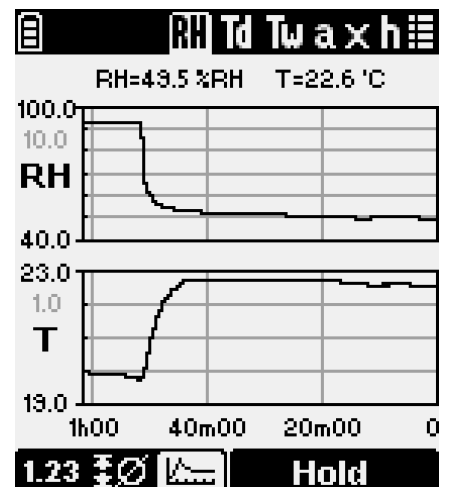
### Simple and Easy to Use

HM40 has a large, user-friendly graphical display and easy-to-use push buttons. The user interface is simple and intuitive, and available in 10 languages. Also, many settings can be modified to meet users' individual needs. In addition to relative humidity and temperature, HM40 provides five calculated humidity

parameters, all of which are available in metric and non-metric units. HM40 is powered by 2 AA batteries. An external USB-charger and rechargeable AA sized NiMH batteries are available as an option. Each model also comes with a handy belt clip and case.

### Easy Recalibration

Calibrating HM40 is easy. The meter or the probe can be sent to a Vaisala Service Center for recalibration. Alternatively, calibration can be completed on site by users with a humidity reference such as another hand-held meter or Vaisala Humidity Calibrator HMK15. The indicator includes a calibration reminder function that can be activated by the user.



The Graph Clearly Indicates When Readings Have Stabilized.

# HM40 Handheld Humidity and Temperature Meter Series

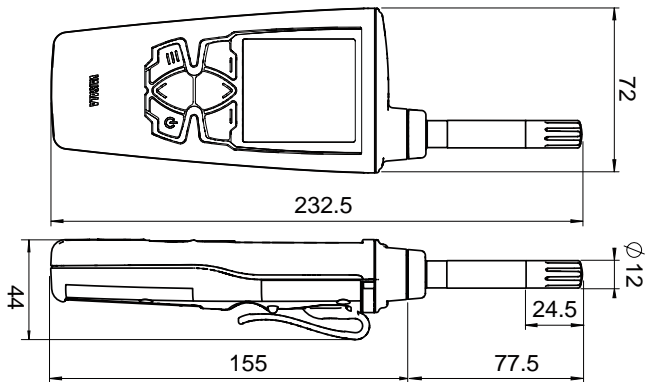


## HM41 Technical Data

Humidity Measurement Accuracy (Including Non-linearity, Hysteresis, and Repeatability):

At 0 ... +40 °C	±1.5 %RH (0 ... 90 %RH)
	±2.5 %RH (90 ... 100 %RH)
At -10 ... 0 °C and +40 ... +60 °C	±3.0 %RH (0 ... 90 %RH)
	±4.0 %RH (90 ... 100 %RH)

Humidity sensor	HUMICAP® 180R
Temperature measurement range	-10 ... +60 °C (+14 ... +140 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Measurement probe	Interchangeable HMP113 probe
Probe material	PC/ABS plastic blend (white)
IP rating	IP54
Weight (with alkaline batteries)	230 g (8.1 oz)
Filter material	PC (glass-reinforced)



HM41 dimensions in mm



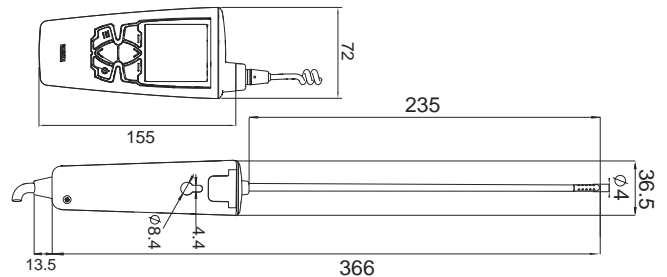
## HM42 Technical Data

Humidity Measurement Accuracy (Including Non-linearity, Hysteresis, and Repeatability):

At 0 ... +40 °C	±1.5 %RH (0 ... 90 %RH)
	±2.5 %RH (90 ... 100 %RH)
At -40 ... 0 °C and +40 ... +80 °C	±3.0 %RH (0 ... 90 %RH)
	±4.0 %RH (90 ... 100 %RH)
At +80 ... +100 °C	±4.0 %RH <sup>1)</sup>

Humidity sensor	HUMICAP® 100R-Mini
Temperature measurement range	-40 ... +100 °C (-40 ... +212 °F)
Temperature sensor	Pt1000 RTD Class F0.3 IEC60751
Measurement probe	HM42PROBE
Probe head material	Stainless steel
IP rating	IP40 (probe), IP54 (indicator)
Weight (with alkaline batteries)	370 g (13.1 oz)
Filter material	Stainless steel and PTFE membrane
Probe cable length	1500 mm (59 in)

<sup>1)</sup> Not recommended for  $T_d > 85 °C$



HM42 dimensions in mm

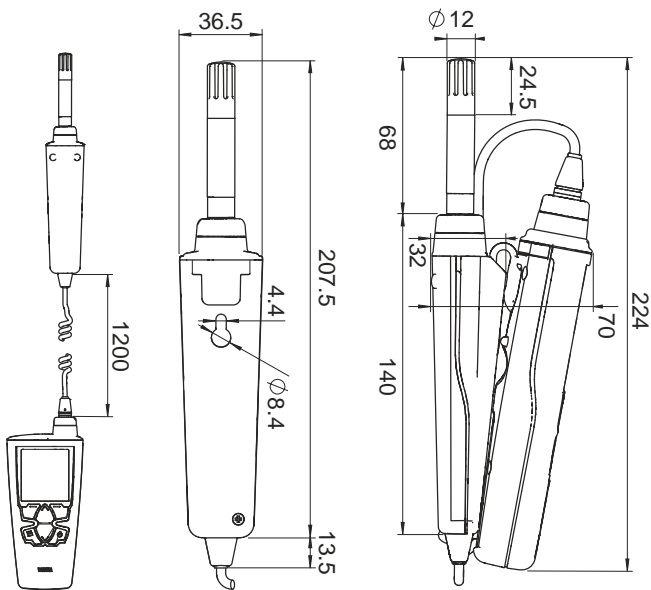


### HM45 Technical Data

Humidity Measurement Accuracy (Including Non-linearity, Hysteresis, and Repeatability):

At 0 ... +40 °C	±1.5 %RH (0 ... 90 %RH)
	±2.5 %RH (90 ... 100 %RH)
At -40 ... 0 °C and +40 ... +60 °C	±3.0 %RH (0 ... 90 %RH)
	±4.0 %RH (90 ... 100 %RH)

Humidity sensor	HUMICAP® 180R
Temperature measurement range	-40 ... +60 °C (-40 ... +140 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Measurement probe	Interchangeable HMP113 with HM40HANDLE
Probe material	PC/ABS plastic blend (white)
IP rating	IP54
Weight (with alkaline batteries)	330 g (11.6 oz)
Filter material	PC (glass-reinforced)
Probe cable length	1200 mm (47 in)



HM45 dimensions in mm

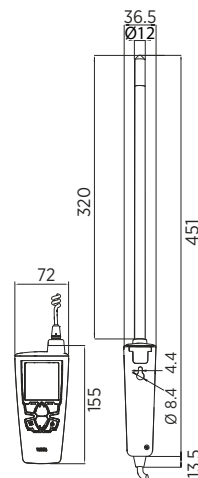
### HM46 Technical Data

Humidity Measurement Accuracy (Including Non-linearity, Hysteresis, and Repeatability):

At 0 ... +40 °C	±1.5 %RH (0 ... 90 %RH)
	±2.5 %RH (90 ... 100 %RH)
At -40 ... 0 °C and +40 ... +80 °C	±3.0 %RH (0 ... 90 %RH)
	±4.0 %RH (90 ... 100 %RH)
At +80 ... +100 °C	±4.0 %RH <sup>1)</sup>

Humidity sensor	HUMICAP® 180R
Temperature measurement range	-40 ... +100 °C (-40 ... +212 °F), short-term up to +180 °C (+356 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Measurement probe	HM46PROBE
Probe head material	Stainless steel, brass filter
IP rating	IP40 (probe), IP54 (indicator)
Weight (with alkaline batteries)	490 g (17.3 oz)
Filter material	Sintered brass
Probe cable length	1500 mm (59 in)

<sup>1)</sup> Not recommended for  $T_g > 85$  °C



HM46 dimensions in mm



# HM40 Series Technical Data

## Measurement Performance

Calculated parameters	Dew point, wet bulb temperature, absolute humidity, mixing ratio, enthalpy
<b>Relative Humidity</b>	
Measurement range	0 ... 100 %RH
Accuracy (including non-linearity, hysteresis, and repeatability) for different models at 0 ... +40 °C (+32 ... +104 °F)	±1.5 %RH (0 ... 90 %RH) ±2.5 %RH (90 ... 100 %RH)
Factory calibration uncertainty at +20 °C (+68 °F):	
HM42 and HM46	±1.5 %RH
HM41 and HM45	±1.1 %RH (0 ... 90 %RH) ±1.8 %RH (90 ... 100 %RH)
Stability	±2 %RH over 2 years
Humidity Measurement Response Time:	
(90 %) with plastic grid filter (HM41 and HM45)	17 s
(90 %) with membrane filter and steel grid (HM42)	26 s
(90 %) with brass sintered filter (HM46)	40 s
<b>Temperature</b>	
Accuracy over temperature range:	
At 0 ... +40 °C (+32 ... +104 °F)	±0.2 °C (0.36 °F)
At -40 ... 0 °C and +40 ... +100 °C (-40 ... +32 °F and +104 ... +212 °F)	±0.4 °C (0.72 °F)

## Operating Environment

<b>Operating temperature</b>	
Indicator	-10 ... +60 °C (+14 ... +140 °F)
Probe handle	-40 ... +60 °C (-40 ... +140 °F)
Probe head	Range -40 ... +180 °C (-40 ... +356 °F) See probe specifications
Storage temperature	-30 ... +70 °C (-22 ... +158 °F)
EMC compliance	EN61326-1, Portable Equipment

## Mechanical Specifications

<b>Materials</b>	
Indicator body	PC/ABS blend, acrylic display lens
Probe holder	PC/ABS blend (gray)
Probe handle	PC/ABS blend (white), PC/ABS blend (gray, HM45) or PBT (gray, HM42/46)
HMP113 probe or probe measurement head	PC/ABS blend (white, HM41/45) or stainless steel (HM42/46)
IP rating, HM40	IP54

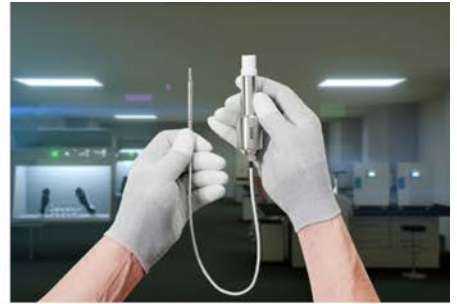
## Indicator

Display	LCD (140 x 160 pixels)
Power-up time	< 3 s
Batteries	2 × AA, 1.5 V
Operation time (typical)	100 hours (without backlight)
Menu languages	English, Chinese (simplified), Finnish, French, German, Japanese, Portuguese, Russian, Spanish, Swedish

## Spare Parts and Accessories

<b>Indicator</b>	
Spare HM40 indicator	HM40INDI
Belt clip (3 pcs)	227710SP
Battery cover (3 pcs)	225688SP
NiMH rechargeable batteries (4 pcs)	229247SP
External battery recharger with USB connection and 4 batteries	229249SP
Case for short HM40 probes	235849SP
Case for long HM40 probes	DRW242351SP
<b>Standard Probe (HM41)</b>	
HMP113 probe for HM40	HMP113 (configuration: V00B2C1A0)
Plastic locking bushing (3 pcs) for attaching HMP113 probe to HM40 indicator	DRW238590SP
Plastic grid filter for HMP113 probe	DRW236214SP
Plastic grid with membrane filter for HMP113 probe	230727SP
<b>HM42 Probe (HM42)</b>	
Thin 4 mm diameter probe for HM40	HM42PROBE
Steel grid filter for HM42PROBE	19867HM
Membrane tube set (5 pcs) for HM42PROBE	19858HM
Rubber sleeve set (10 pcs) for HM42PROBE	19809HM
Calibration adapter for HM42PROBE	HM37067
<b>Remote Probe (HM45)</b>	
HMP113 probe for HM40	HMP113 (configuration: V00B2C1A0)
Plastic locking bushing (3 pcs) for attaching HMP113 probe to HM40 indicator	DRW238590SP
HM40 handle and cable	HM40HANDLE
Plastic grid filter for HMP113 probe	DRW236214SP
Plastic grid with membrane filter for HMP113 probe	230727SP
<b>HM46 Probe (HM46)</b>	
Stainless steel 12 mm diameter probe for HM40	HM46PROBE
Sintered filter for HM46PROBE	0195
Optional membrane filter for HM46PROBE (up to +80 °C)	10159HM
Plastic grid filter for HM46PROBE (up to +80 °C)	6221
Disposable sleeve, 50 pcs set	1558
Probe holder	HM36915

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



### PEROXCAP's unique benefits

- **Chemical purge:** The probe heats up at intervals to maintain measurement performance and lengthen the sensors' lifespan. Rapid heating of the sensor also removes impurities.
- **Sensor vitality:** Sensor performance can be evaluated using the "Sensor Vitality" value, accessible through [Vaisala Insight software](#) and displayed as a percentage.

The unique PEROXCAP technology enables accurate measurement of multiple parameters in vaporized hydrogen peroxide bio-decontamination. Probes use two capacitive thin-film polymer [HUMICAP® sensors](#) to provide high accuracy, excellent long-term stability, and negligible hysteresis in demanding high-concentration  $vH_2O_2$  applications in atmospheric pressure.

The HUMICAP sensor, used in PEROXCAP technology, is a capacitive thin-film polymer sensor consisting of a substrate on which a thin polymer film is deposited 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, as does the capacitance of the sensor. The probe's electronics measure the capacitance of the sensor and convert it to a humidity reading.

PEROXCAP uses two HUMICAP sensors, one with and one without a catalytic layer. The thin-film polymer absorbs water and  $H_2O_2$  vapor. The amount is proportional to the ambient relative humidity (sensor with catalytic layer) or relative saturation (sensor without catalytic layer) depending on the sensor. Learn more about [HPP270 series probes](#).

### Intelligent PEROXCAP measurement technology

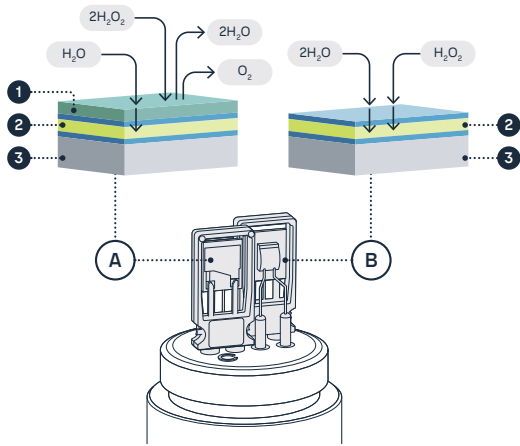
One unique feature of PEROXCAP is that it provides the critical **relative saturation** value. Water ( $H_2O$ ) and hydrogen peroxide ( $H_2O_2$ ) have similar molecular structures, however, while relative humidity (RH) indicates the level of water vapor in the air at a given temperature, relative saturation is the level of water *and* hydrogen peroxide vapor. Air that contains hydrogen peroxide vapor will condense before 100 % relative humidity, which is why relative saturation allows you to predict condensation.

### Multiple measurements for comprehensive bio-decontamination monitoring

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

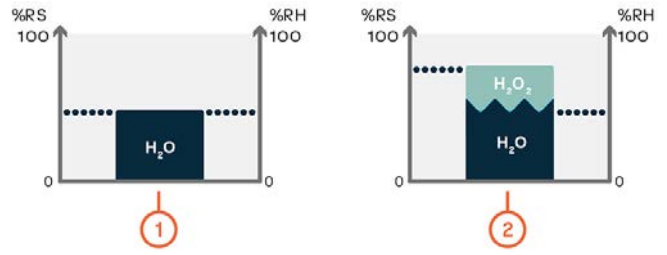
- HPP271 probes measure  $H_2O_2$  vapor concentration (ppm) and temperature dew point.
- HPP272 probes measure  $H_2O_2$  vapor concentration (ppm), temperature, dew point, vapor pressure, and humidity as both relative saturation and relative humidity.

### 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 layer over the thin-film polymer decomposes hydrogen peroxide into water and oxygen and prevents it from entering the sensing polymer.
- 2** Thin-film polymer between two electrodes.
- 3** Alumina substrate.

### PEROXCAP'S critical difference: relative saturation



- 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.

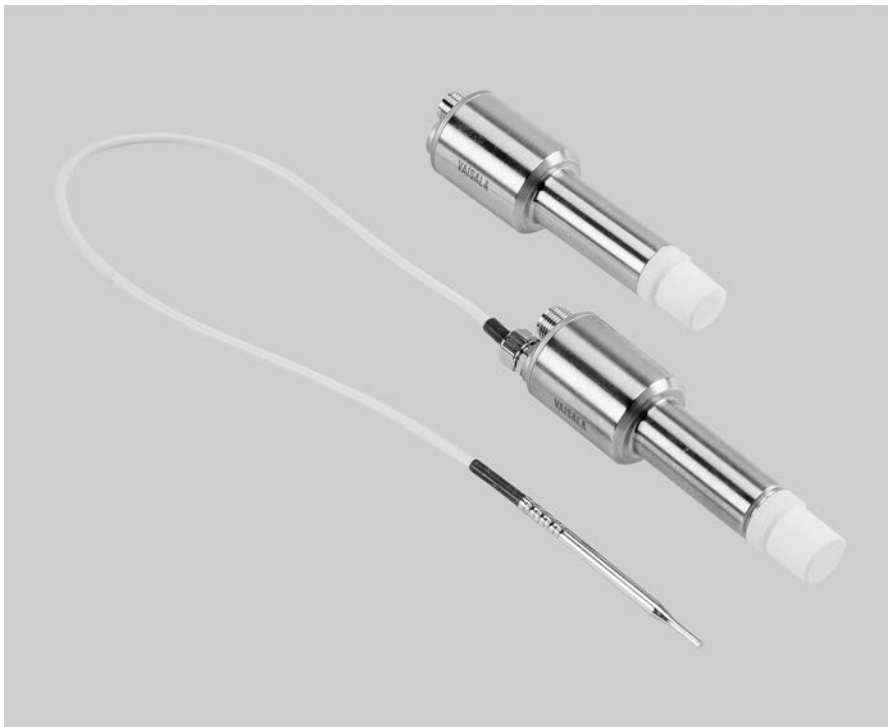
For example, at 20 °C with an  $H_2O_2$  concentration of 500 ppm, the humidity level 25 %RH is equivalent to 60 %RS. When this gas mixture starts to condense, i.e. when RS is 100 %, RH is 45 %.

### Traceable $H_2O_2$ factory calibration

Every PEROXCAP sensor is manufactured in [Vaisala's own cleanrooms](#) 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. You can also [calibrate your own HPP270 series probes](#).

## HPP270 Series Probes

For hydrogen peroxide, humidity, and temperature measurement



### Features

- Basic probe option HPP271 for H<sub>2</sub>O<sub>2</sub> vapor concentration measurement
- Advanced probe option HPP272: compact 3-in-1 probe with real-time measurement of H<sub>2</sub>O<sub>2</sub> 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 Indigo products and Insight PC software

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.

### Relative saturation for comprehensive humidity monitoring

Similar to water, H<sub>2</sub>O<sub>2</sub> 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<sub>2</sub>O<sub>2</sub> vapor together. This tells you reliably when the bio-decontaminated air starts to condense.

### Repeatable measurement for highly condensing environments

Intelligent measurement technology including the sensor purge function helps to maintain accuracy between calibrations in challenging H<sub>2</sub>O<sub>2</sub> 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.

### Indigo and Insight compatible

The probe can be connected to Vaisala Indigo transmitters and the Indigo80 handheld indicator to extend the selection of available features.

Indigo products provide a range of additional display, output, and relay options, as well as convenient interfaces for monitoring, configuration, and calibration and adjustment. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

For easy-to-use access to configuration, calibration, and adjustment, the probe can be connected to Vaisala Insight PC software. See [www.vaisala.com/insight](http://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<sub>2</sub>O<sub>2</sub>, 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 <sub>2</sub> O <sub>2</sub>	±10 ppm
Accuracy at +10 ... +25 °C (+50 ... +77 °F), 10 ... 2000 ppm H <sub>2</sub> O <sub>2</sub> <sup>1)</sup>	±10 ppm or 5 % of reading (whichever is greater)
Factory calibration uncertainty at +25 °C (+77 °F), 500 ppm H <sub>2</sub> O <sub>2</sub> <sup>2)</sup>	±10 ppm
Response time (T <sub>63</sub> )	70 s
Other parameters	
H <sub>2</sub> O ppm by volume, dew point temperature	

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 V DC Analog output: 15 ... 25 V DC
Current consumption at +25 °C (+77 °F)	
In digital mode	Max. 10 mA
In analog mode	Max. 50 mA
During sensor 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 dependence

## Operating environment

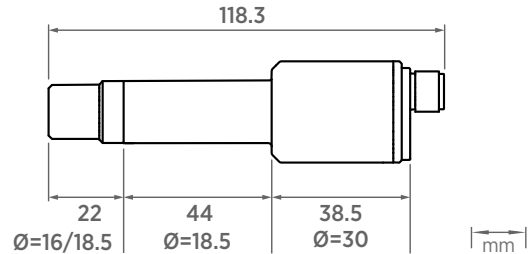
Operating temperature	+0 ... +70 °C (+32 ... +158 °F)
Storage temperature	-20 ... +70 °C (-4 ... +158 °F)
Ambient pressure	Normal atmospheric pressure
IP rating	IP65

## Compliance

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

## Mechanical specifications

Connector	M12-5M
Materials	
Probe body	AISI316L stainless steel
Filter cap	Porous PTFE



## HPP271 dimensions

## Spare parts and accessories

Indigo USB adapter <sup>1)</sup>	USB2
Probe connection cable with open wires, 1.5 m (4.9 ft)	254294SP
Probe connection cable with open wires, 3 m (9.8 ft)	254295SP
Probe connection cable with open wires, 5 m (16 ft)	254296SP
Probe connection 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
Indigo transmitters	See <a href="http://www.vaisala.com/indigo">www.vaisala.com/indigo</a>
Indigo80 handheld indicator	See <a href="http://www.vaisala.com/indigo80">www.vaisala.com/indigo80</a>

1) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://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 <sub>2</sub> O <sub>2</sub>	±10 ppm
Accuracy at +10 ... +25 °C (+50 ... +77 °F), 10 ... 2000 ppm H <sub>2</sub> O <sub>2</sub> <sup>1)</sup>	±10 ppm or 5 % of reading (whichever is greater)
Factory calibration uncertainty at +25 °C (+77 °F), 500 ppm H <sub>2</sub> O <sub>2</sub> <sup>2)</sup>	±10 ppm
Response time (T <sub>63</sub> )	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 <sub>2</sub> O <sub>2</sub>	±0.5 %RS
Accuracy at +25 °C (+77 °F) <sup>1)</sup>	±4 %RS
Factory calibration uncertainty at +25 °C (+77 °F), 500 ppm H <sub>2</sub> O <sub>2</sub> <sup>2)</sup>	±2 %RS
Relative humidity	
Measurement range	0 ... 100 %RH
Measurement temperature range	+5 ... +70 °C (+41 ... +158 °F)
Accuracy: <sup>1)</sup>	
at +25 °C (77 °F), 0 ppm H <sub>2</sub> O <sub>2</sub> , 0 ... 90 %RH	±1 %RH
over full temperature measurement and H <sub>2</sub> O <sub>2</sub> range	±2 %RH
Response time (T <sub>63</sub> )	20 s
Factory calibration uncertainty at +25 °C (77 °F), 0 ppm H <sub>2</sub> O <sub>2</sub> , 0 ... 95 %RH <sup>2)</sup>	±1 %RH
Temperature	
Sensor	Pt1000 RTD Class F0.1
Accuracy over temperature range	±0.2 °C (±0.36 °F)
Other parameters	
Absolute H <sub>2</sub> O <sub>2</sub> and H <sub>2</sub> O, H <sub>2</sub> O ppm by volume, water vapor saturation pressure (H <sub>2</sub> O and H <sub>2</sub> O+H <sub>2</sub> O <sub>2</sub> ), dew point temperature, vapor pressure (H <sub>2</sub> O and H <sub>2</sub> O <sub>2</sub> )	

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 V DC Analog output: 15 ... 25 V DC
Current consumption at +25 °C (+77 °F)	
In digital mode	Max. 10 mA
In analog mode	Max. 50 mA
During sensor purge	Max. 250 mA
Digital output	
Interface	RS-485, not isolated; do not use termination on the RS-485 line
Communication protocol	Modbus RTU v.1.02
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

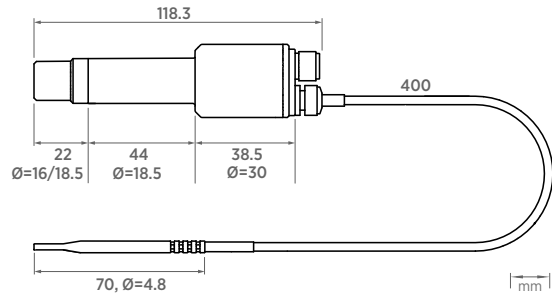
Operating temperature	+0 ... +70 °C (+32 ... +158 °F)
Storage temperature	-20 ... +70 °C (-4 ... +158 °F)
Ambient pressure	Normal atmospheric pressure
IP rating	IP65

## Compliance

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

## Mechanical specifications

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



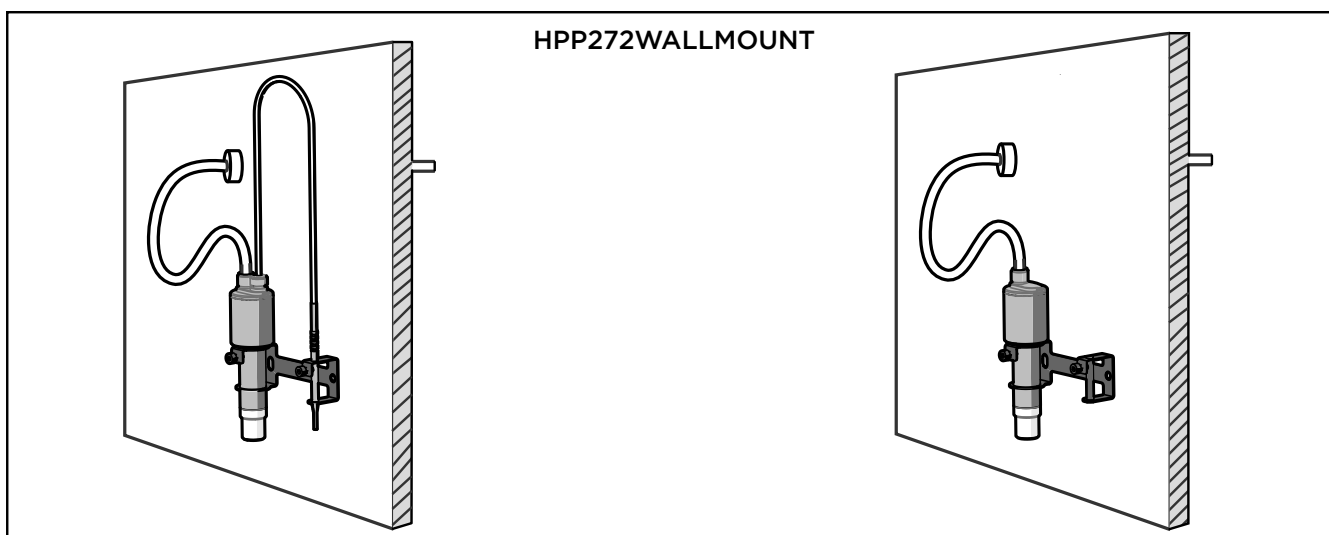
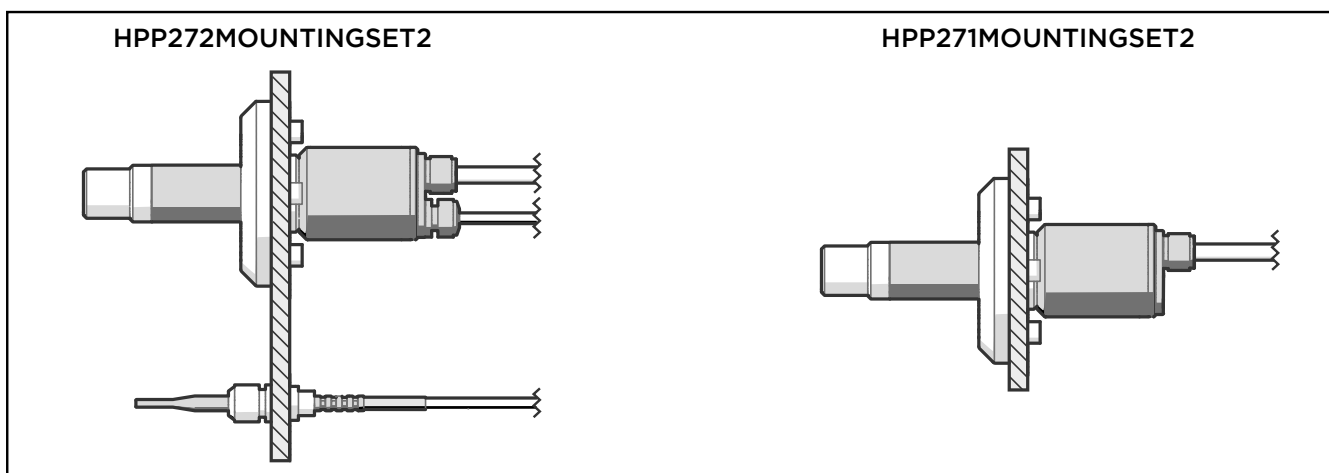
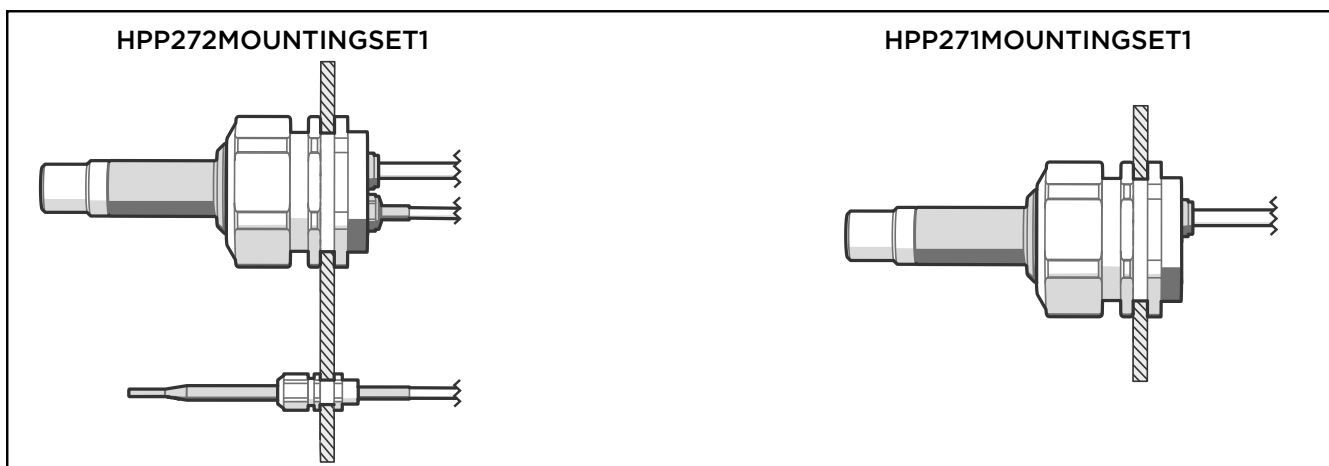
## HPP272 dimensions

## Spare parts and accessories

Indigo USB adapter <sup>1)</sup>	USB2
Probe connection cable with open wires, 1.5 m (4.9 ft)	254294SP
Probe connection cable with open wires, 3 m (9.8 ft)	254295SP
Probe connection cable with open wires, 5 m (16 ft)	254296SP
Probe connection 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 <a href="http://www.vaisala.com/indigo">www.vaisala.com/indigo</a>
Indigo80 handheld indicator	See <a href="http://www.vaisala.com/indigo80">www.vaisala.com/indigo80</a>

1) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).

# HPP271 and HPP272 installation accessories





### Features

- Easy and reliable calibration of humidity probes and transmitters
- Based on saturated salt solutions
- Fast temperature equilibration
- No external power required
- Suitable for laboratory use and on-site checks
- Chambers and transit covers make HMK15 easy to transport
- Pre-measured certified salts available
- Vaisala Service Centers offer accredited calibrations for humidity, temperature, and barometric pressure

No measuring instrument stays accurate by itself. It is essential that the functioning of an instrument is periodically checked against a reference. Vaisala has developed Vaisala Humidity Calibrator HMK15 to make calibration and spot-checking of humidity probes and transmitters easy and reliable.

### Benefits

- Easy to use
- Reliable calibration
- Certified and pre-measured salts available on order form of HMK15

### Reliable calibration method

The operating principle of HMK15 is based on the fact that a saturated salt solution generates a certain relative humidity in the air above it. The reading of the humidity probe or transmitter can then be adjusted accordingly. Many calibration laboratories use this generally accepted and reliable method to

calibrate humidity instruments. Usually two or three different salt solutions are used. Salts are chosen according to the application. Available salts and their reference humidities:

- Lithium chloride LiCl (11 %RH)
- Magnesium chloride  $MgCl_2$  (33 %RH)
- Sodium chloride NaCl (75 %RH)
- Potassium chloride KCl (85 %RH)
- Potassium sulphate  $K_2SO_4$  (97 %RH)

### Certified salts

HMK15 can be ordered with certified and pre-measured salts. A sample calibration is made from each salt batch in Vaisala's Measurement Standards Laboratory (MSL).

### FINAS accredited measurement standards laboratory

Vaisala's Measurement Standards Laboratory is a FINAS accredited calibration laboratory. FINAS is a member of the EA (the European Cooperation for Accreditation).





# Technical data

## Operating environment

Operating temperature range	+0 ... +50 °C (+32 ... +122 °F)
-----------------------------	---------------------------------

## Mechanical specifications

Dimensions (H × W × L)	90 × 230 × 200 mm (3.54 × 9.06 × 7.87 in)
Weight	1 kg (2.20 lb) without salt solutions
Material (metal parts)	Anodized aluminum

## Parts

### Standard contents of HMK15 calibrator

Base plate
Two salt chambers with basic lids and transit covers
Thermometer
Measurement cup and mixing spoon
Calibration adapter (Ø13.5 mm) for Ø12 mm probes with long sensor legs
Calibration adapter (Ø13.5 mm) for Ø12 mm probes with short sensor legs

### Optional items

See table *Spare parts and accessories*

## Spare parts and accessories

Rubber plug set	19746HM
O-ring set	218096
Ion exchanged water	19767HM
Thermometer with red capillary liquid	25130HM
Transit bag	HM27032

### Salt chambers and lids

HMK15 basic lid	271549
HMK15 universal lid	271550
HMK15 custom lid for 4 × HMP110 with filter on	253277SP
HMK15 custom lid for DMT132 and HMP60/HMP110 with filter on	230914
HMK15 salt chamber with basic lid and transit cover	DRW255417SP
HMK15 salt chamber with universal lid and transit cover	19766HM

### Calibration adapters

Calibration adapter for HMP9 probe	ASM213801
Calibration adapter (Ø13.5 mm) for Ø12 mm probes with long sensor legs	211302SP
Calibration adapter (Ø13.5 mm) for Ø12 mm probes with short sensor legs	218377SP
Calibration adapter for HMP42 probe	HM37067

### Certified and ready-dosed salts <sup>1)</sup>

Ready-dosed LiCl salt package (LiCl salt 11 %RH, total uncertainty ±1.3 %RH) <sup>2)</sup>	19729HM
Ready-dosed MgCl <sub>2</sub> salt package (MgCl <sub>2</sub> salt 33 %RH, total uncertainty ±1.2 %RH) <sup>2)</sup>	19730HM
Ready-dosed NaCl salt package (NaCl salt 75 %RH, total uncertainty ±1.5 %RH) <sup>2)</sup>	19731HM
Ready-dosed KCl salt package (KCl salt 85 %RH, total uncertainty ±2.0 %RH) <sup>2)</sup>	251377HM
Ready-dosed K <sub>2</sub> SO <sub>4</sub> salt package (K <sub>2</sub> SO <sub>4</sub> salt 97 %RH, total uncertainty ±2.0 %RH) <sup>2)</sup>	19732HM

<sup>1)</sup> Calibration certificate included with each salt package.  
<sup>2)</sup> Uncertainties given at +20 °C (+68 °F).



### Features

- Easy mounting on wall, DIN rail, or panel
- 3 pressure ranges (Pa and inH<sub>2</sub>O)
- Unidirectional and bidirectional models
- Accessible zero and span adjustment potentiometers
- LED status indicator
- Dedicated models for critical and regulated environments and for air handling systems
- Euro style detachable connector
- Calibrations traceable to SI units through national metrology institutes or accredited calibration laboratories

Vaisala Differential Pressure Transmitter PDT101 offers precise measurement of differential air pressure. PDT101 offers dedicated models for critical and regulated environments with very low differential pressures and unidirectional models for air handling systems.

### Operating environment

The highly accurate bidirectional models of PDT101 are designed especially for demanding life science and cleanroom applications, and are the perfect choice for any application requiring precise pressure differential measurement. The transmitter is ideal for incorporating into the Vaisala viewLinc Continuous Monitoring System to measure and monitor the critical environmental parameters as required in regulated environments.

The unidirectional models of PDT101 are optimal for air handling units to measure differential pressure over fans or filters, for example.

Zero and span adjustment screws are available on every PDT101 model. Both adjustments are accessible from the front of the unit.

### Performance

PDT101 offers high accuracy, sensitivity, and stability, with models providing accuracies of either 0.40 or 1 % of span. The sensor uses a micro-machined, ultra-thin silicon diaphragm which provides inherent sensor repeatability and stability. The sensor enables precise measurement and control in high performance environments. The PDT101 transmitter is available with voltage output (3-wire) or current output (2-wire).

### Applications

PDT101 is suitable for high performance environments in the life science, semiconductor, and electronics industries, as well as in building automation systems in data centers and other demanding buildings and environments.

When used in regulated environments as part of the viewLinc system, it is highly suitable for fulfilling the requirements of continuous, documented, and redundant data, to meet FDA, EMA and other international regulations.

The compact design is well suited for mounting in a cleanroom or in the adjacent corridor with LED indicator lights for quick and easy power status spot check.

# Technical data

## Models

Model	Measurement range	Output
PDT101-P4C	±60 Pa	4–20 mA
PDT101-P4V	±60 Pa	0–5 V
PDT101-P4C2	±125 Pa	4–20 mA
PDT101-P4V2	±125 Pa	0–5 V
PDT101-W4C	±0.25 inH <sub>2</sub> O	4–20 mA
PDT101-W4V	±0.25 inH <sub>2</sub> O	0–5 V
PDT101-W4C2	±0.5 inH <sub>2</sub> O	4–20 mA
PDT101-W4V2	±0.5 inH <sub>2</sub> O	0–5 V
PDT101-P10C	0–500 Pa	4–20 mA
PDT101-P10V	0–500 Pa	0–10 V
PDT101-W10C	0–2 inH <sub>2</sub> O	4–20 mA
PDT101-W10V	0–2 inH <sub>2</sub> O	0–10 V
PDT101-P10Cx <sup>1)</sup>	0–500 Pa	4–20 mA
PDT101-P10Vx <sup>1)</sup>	0–500 Pa	0–10 V
PDT101-W10Cx <sup>1)</sup>	0–2 inH <sub>2</sub> O	4–20 mA
PDT101-W10Vx <sup>1)</sup>	0–2 inH <sub>2</sub> O	0–10 V

<sup>1)</sup> The PDT101-P10Cx, PDT101-P10Vx, PDT101-W10Cx, and PDT101-W10Vx models do not include calibration certificate.

## Measurement performance

Measurement ranges (bidirectional)	±60 Pa, ±125 Pa, ±0.25 inH <sub>2</sub> O, or ±0.5 inH <sub>2</sub> O
Measurement ranges (unidirectional)	0–500 Pa, or 0–2 inH <sub>2</sub> O
Accuracy (incl. non-linearity, hysteresis, repeatability and zero/span calibration settings)	0.4 % of span (bidirectional models), 1% of span (unidirectional models)
Long-term stability	≤ 0.5 % span/year
Response time (10–90 %)	250 ms
Warm-up time	15 s
Compensated temperature range	+2 ... +54 °C (+35.6 ... +129.2 °F)
Temperature dependence	±(0.065 Pa + 0.054 % of reading) / °C or ±(0.00015 inH <sub>2</sub> O + 0.03 % of reading) / °F (reference 21 °C or 70 °F)
Pressure type	Differential, gauge, vacuum and compound
<b>Overpressure</b>	
Proof pressure	1.0 bar
Burst pressure	1.7 bar
Static pressure	1.7 bar
<b>Mounting position</b>	
Error (zero adjustable)	≤ 1 %/g (calibration in vertical position is standard)
<b>Adjustments (front accessible)</b>	
Zero	±5 % span
Span	±3 % span

## Compliance

EU directives and regulations	EMC
Electromagnetic compatibility (EMC)	EN 61326-1, basic immunity test requirements
Compliance marks	CE, RCM

## Mechanical specifications

Medium (measured gas)	Clean and dry air, non-conducting and non-corrosive gases
Mounting	Threaded fastener for wall mounting or DIN rail type EN 50022
IP rating	IP40
Weight	0.07 kg
<b>Material</b>	
Process connection	Brass
Sensor element	Silicon, aluminum, glass
Case	NEMA type 1 fire-retardant ABS 1 (meets UL94-5VA)

## Inputs and outputs

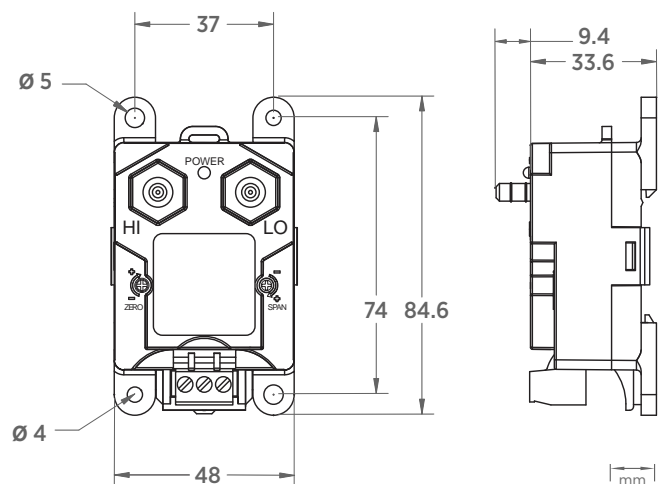
Process connection	1/4" barbed fittings
Tubing outer and inner dimensions	Outer dimension (O.D): 1/4" (6.35 mm) Inner dimension (I.D): 1/8" (3.17 mm)
Max. loop resistance for 4 ... 20 mA	≤ (Supply voltage - 12 V) / 0.022 A
Supply current	Max. 20 mA for 4–20 mA output signal
Optical process diagnostics	LED visual indicator
Electrical connection	Euro style pluggable terminal block accepts 12–26 AWG wire (0.13 up to 3.31 mm <sup>2</sup> )

Output signal	
2-wire	4–20 mA
3-wire	0–5 or 0–10 V DC (user selectable)
Operating voltage	
2-wire output 4–20 mA	12 ... 36 V DC
3-wire output 0–5 V DC	11.5–36 V DC or 24 V AC
3-wire output 0–10 V DC	14–36 V DC or 24 V AC

## Operating environment

Operating temperature	–18 ... +70 °C (–0.4 ... +158 °F)
Storage temperature	–40 ... +82 °C (–40 ... +179.6 °F)

Note: If used in an electromagnetic field of 3 V/m, with narrow frequency area of 80 ... 120 MHz, it is possible that the current output of PDT101 can deviate max. 0.8 % (with accuracy specified 0.4 %)



PDT101 dimensions



### Features

- In-place system calibration and online monitoring without disturbing process tubes with optional process valve actuator and test jacks
- Ultrathin profile ideally suited for DIN rail mount reduces installation and calibration costs
- High accuracy, two options; 0.25 % or 0.50 % of span
- Extremely robust MEMS silicon sensor technology provides very high accuracy, sensitivity, stability, and durability
- Calibrations traceable to SI units through national metrology institutes or accredited calibration laboratories
- Front side accessible zero and span adjustment potentiometers

Vaisala Differential Pressure Transmitter PDT102 offers ultra low pressure measurement for cleanroom control and monitoring applications.

### Operating environment

Vaisala Differential Pressure Transmitter PDT102 is a high performance instrument designed primarily for life science and high technology cleanroom applications. The front panel includes zero and span adjustment potentiometers for convenient adjustment. The PDT102 transmitter is ideal for incorporating into the Vaisala viewLinc Continuous Monitoring System to measure and monitor the critical environmental parameters as required in regulated environments.

### Performance

PDT102 offers very high accuracy, sensitivity and stability with two options for accuracy, 0.25% or 0.50% of span providing a highly reliable and

repeatable measurement. The sensor uses a micro-machined, ultra-thin silicon diaphragm which provides inherent sensor repeatability and stability. The sensor enables precise measurement and control in high performance cleanrooms. The PDT102 transmitter is available with voltage output (3-wire) or current output (2-wire).

### Available options

Online monitoring of PDT102 is simple using the optional process valve actuator and the front access test jacks. The front access test jacks provide online process reference signal or calibration signal without disconnecting power supply wiring. Measurements can be made using a standard multimeter.

### Applications

PDT102 is designed for use in critical monitoring of cleanrooms for pharmaceutical, biotechnology, medical device, and semiconductor controlled manufacturing environments.

# Technical data

## Measurement performance

Measurement ranges (bidirectional)	±50 Pa ±0.25 in H <sub>2</sub> O
Accuracy <sup>1)</sup>	0.25 % span or 0.5 % span, depending on choice
Repeatability for 0.25 % span accuracy	0.03 %
Repeatability for 0.5 % span accuracy	0.05 %
Electrical resolution	1 x 10 <sup>-4</sup> span
Long-term stability	≤0.5 % span/year
Response time (10– 90 %)	250 ms
Warm-up time	15 s
Compensated temperature range	+2 ... +57 °C (+35.6 ... +134.6 °F)
Temperature dependence	±(0.036 Pa + 0.036 % of reading) / °C or ±(0.0001 in H <sub>2</sub> O + 0.02 % of reading) / °F (reference 21 °C or 70 °F)
Pressure type	Differential, gauge, vacuum and compound
<b>Overpressure</b>	
Proof pressure	0.7 bar
Burst pressure	1.7 bar
Static pressure	1.7 bar
<b>Mounting position</b>	
Error (zero adjustable)	≤0.25 %
<b>Adjustments (front accessible)</b>	
Zero	±5 % span
Span	±3 % span

<sup>1)</sup> Incl. non-linearity, hysteresis, repeatability and zero/span calibration settings.

## Inputs and outputs

Process connection	1/8 NPT female according to ANSI/ ASME B1.20.1
Tubing dimensions	Outer dimension (O.D): 1/8" (3.17 mm)
Operating voltage	12–36 V DC
Max. loop resistance for 4–20 mA	≤ (Supply voltage - 12V)/0.022 A
Electrical connection	Screw terminals, 12– 22 AWG (0.33 up to 3.31 mm <sup>2</sup> )
<b>Output signal</b>	
2-wire	4–20 mA
3-wire	0–5 V
<b>Supply current</b>	
For 0–5 V output	Max. 10 mA
For 4–20 mA output	Max. 20 mA

## Mechanical specifications

Medium (measured gas)	Clean and dry air, non-conducting and non-corrosive gases
Mounting	DIN rail types EN 50022, EN 50035 and EN 50045
Weight	0.16 kg
<b>Material</b>	
Process connection	Brass
Sensor element	Silicon, aluminum, glass
Case	Polycarbonate, glass filled (UL94-V-1)

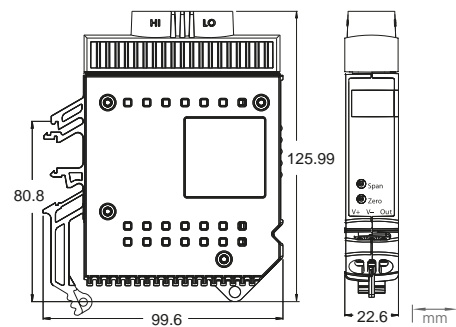
## Operating environment

Operating temperature	–29 ... +70 °C (–20.2 ... +158 °F)
Storage temperature	–40 ... +82 °C (–40 ... +179.6 °F)
IP rating	IP30

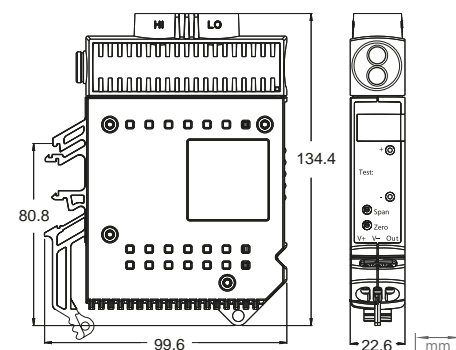
Note: If used in an electromagnetic field of 3 V/m, with narrow frequency area of 80 - 120 MHz, it is possible that the current output of PDT102 can deviate max. 0.3 % (with accuracy specified 0.25 %)

## Compliance

EU directives and regulations	EMC
Electromagnetic compatibility (EMC)	EN 61326-1, basic immunity test requirements
Compliance marks	CE, RCM



PDT102 transmitter dimensions



PDT102 dimensions with process valve actuator and test jacks

## PDT102 - XXXT

Measurement range:  
**P** (+/-50 Pa) or **W** (+/-0.25 in H<sub>2</sub>O) ———— ↑ ↑ ↑ ↑  
 Accuracy: **2** (0.25 % span) or **5** (0.5 % span) ———— ↑ ↑ ↑ ↑  
 Output: **C** (current) or **V** (voltage) ———— ↑ ↑ ↑ ↑  
 Option: (blank) or **T** ———— ↑ ↑ ↑ ↑

Order information for PDT102

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**VAISALA**

Please contact us at  
[vaisala.com/requestinfo](https://vaisala.com/requestinfo)



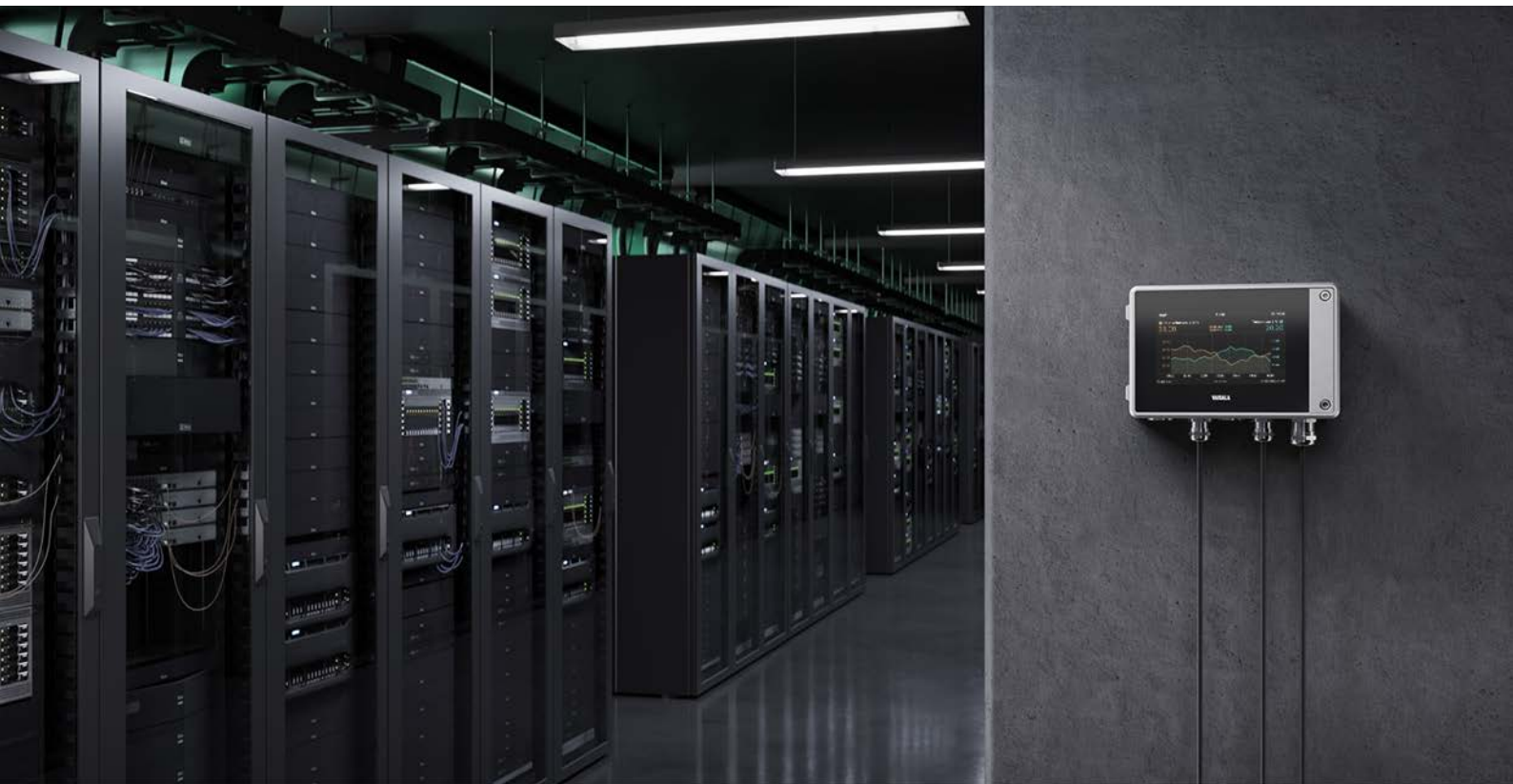
[www.vaisala.com/CMSCatalog](https://www.vaisala.com/CMSCatalog)



# Product Catalog

Humidity · Temperature · Dew point · Carbon dioxide  
Moisture in oil · Hydrogen peroxide · Pressure  
Liquid concentration · Weather · Service offering

## INDUSTRIAL INSTRUMENTS



**VAISALA**



# Instruments and intelligence for industrial needs

## Vaisala Industrial Measurements

Vaisala's Industrial Measurements business area provides customers with visibility into their own processes. Our products provide them with accurate and reliable measurement data which enables them to make decisions for optimized industrial processes.

### Heating, ventilation, and air-conditioning (HVAC)

Vaisala offers industry benchmark HVAC transmitters for measuring humidity, temperature, and carbon dioxide indoors and outdoors. Customers use these instruments to optimize heating ventilation and air conditioning controls, for example, in offices, hospitals, data centers, factories, and cooling towers. Our transmitters help in maintaining good indoor air quality and saving costs through improved efficiency.

### Liquid measurements

Vaisala's cutting-edge Polaris™ process refractometers offer unparalleled reliability and performance in liquid concentration and density measurements for industrial manufacturing. Designed for seamless inline process control, our solutions are trusted across a wide range of demanding sectors, including pulp and paper, food and sugar production, semiconductors, pharmaceuticals, chemicals, oil refining, and petrochemicals.

### Life Cycle Services

Our Life Cycle Services provide comprehensive care through the life cycle of our measurement instruments. As a trusted partner to our global customers, we enable sustainable decisions by maintaining the most accurate measurement data throughout the entire product and system life cycle.

This product catalog provides an overview of our products to help you select what best suits your needs. For more information, visit us at [vaisala.com](https://vaisala.com) or contact us at [vaisala.com/requestinfo](https://vaisala.com/requestinfo). Product user documentation is available at [docs.vaisala.com](https://docs.vaisala.com).



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#### Features

- Easy access to configuration settings and measurement data of supported devices
- Simple setup, diagnostics, and field calibration and adjustment
- Supports Indigo-compatible measurement 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 measurement probes and other supported devices.

#### Indigo product family

Vaisala Indigo-compatible probes are self-contained, interchangeable measurement probes. The probes can be used as standalone digital Modbus® RTU devices, or together with Indigo series transmitters or the Indigo80 indicator, which 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 local display of an Indigo transmitter or the Indigo80 indicator. Alternatively, 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 Windows 10 operating systems or newer. One product specific USB cable (type A connector) per connected probe is needed.

Vaisala Insight software is available for download at [vaisala.com/insight](https://vaisala.com/insight).

# Devices supported by Insight software

## 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
Carbon dioxide	GMP251, GMP252
Vaporized hydrogen peroxide	HPP271, HPP272
Moisture in oil	MMP8

## Indigo transmitters and handheld devices

Device or series	Models
Indigo200 Transmitter <sup>1)</sup>	INDIGO201, INDIGO202
Indigo300 Transmitter	INDIGO300
Indigo80 Handheld Indicator	INDIGO80
DMP80 Series Handheld Dew Point Probes	DMP80A, DMP80B
HMP80 Series Handheld Humidity and Temperature Probes	HMP80L, HMP80N
GMP80P Portable Carbon Dioxide Probe with Pump Sampling	GMP80P

1) Requires model with USB-C connection, introduced in 2022. Models with WLAN connection are not supported by Insight software.

## Other supported devices

Device or series	Models
DMT143 Miniature Dew Point Transmitters	DMT143, DMT143L
GMD110 Duct Carbon Dioxide Transmitter	GMD110
HMD60 Series Humidity and Temperature Transmitters	HMD62, HMD65, TMD62
HMDW110 Series Humidity and Temperature Transmitters	HMW110, HMW112, HMD110, HMD112, HMS110, HMS112, TMI110
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
HMT370EX Series Intrinsically Safe Humidity and Temperature Transmitters	HMT370EX, HMP371, HMP373, HMP374, HMP375, HMP377, HMP378
MGP260 Series Multigas Probes	MGP261, MGP262
Polaris™ Refractometers	PR53AC, PR53AP, PR53GC, PR53GP, PR53M, PR53W, PR53SD
VDL200 Data Logger	VDL200



## Indigo200 Series Transmitters

For Vaisala Indigo-compatible probes



### Features

- Transmitter USB-C port allows connecting to Vaisala Insight PC software with a generic USB cable
- 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 transmitting measurements 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 CO<sub>2</sub> 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 color display with numeric and graph measurement viewing options; 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.

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 H<sub>2</sub>O<sub>2</sub> and alcohol-based cleaning agents.

For easy access to configuration and monitoring options, Indigo200 can be connected to Vaisala Insight PC software using the USB-C port on the transmitter with any generic USB cable that has a USB-C connector.

With Insight PC software, you can configure both the host device and the probes connected to it. Insight PC software also provides options for temporary viewing of the measurement data and diagnostics.

For more information on Indigo transmitters and the Indigo product family, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## General

- Color display (Indigo201: optional non-display version)
- USB connection to Vaisala Insight PC software for easy access to configuration and monitoring options.

## 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
Carbon dioxide	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: <ul style="list-style-type: none"> <li>• H<sub>2</sub>O<sub>2</sub> (6000 ppm, non-condensing)</li> <li>• Alcohol-based cleaning agents such as ethanol and IPA (max. 70 % concentrate)</li> </ul>
IP rating	IP65 <sup>1)</sup>
Indoor/outdoor use	Indoor use

<sup>1)</sup> Note that the IP65 rating only applies when the cable gland wiring option is used, and the lead-through with the pierceable seal at the back of the transmitter is left intact. See user documentation for more information on Indigo200 wiring options.

## Inputs and outputs

Insight PC software configuration access <sup>1)</sup>	USB-C port on transmitter (compatible with generic USB cables)
Power supply input	15–30 V DC <sup>2)</sup> 24 V AC ±10 % 50/60 Hz
Relay contacts x 2	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
------------------------	--------------------

<sup>1)</sup> Vaisala Insight software for Windows\* available at [www.vaisala.com/insight](http://www.vaisala.com/insight).

<sup>2)</sup> When used with the HMP7 probe, the minimum required power supply input is 18 V DC.

## Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, RCM

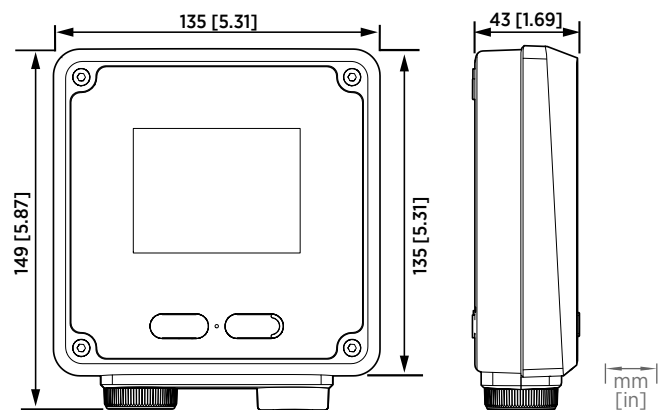
## Mechanical specifications

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

## Spare parts and accessories

USB-C connection cable (2 m, type C to A, for Insight PC software access) <sup>1)</sup>	273956
Probe connection cable, 1 m (3 ft 3 in)	INDIGOCABLE1M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 1 m (3 ft 3 in)	INDIGOCABLEHDM5
Probe connection cable, 3 m (9 ft 11 in)	INDIGOCABLE3M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 3 m (9 ft 11 in)	INDIGOCABLEHDM3
Probe connection cable, 5 m (16 ft 5 in)	INDIGOCABLE5M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 5 m (16 ft 5 in)	INDIGOCABLEHDM5
Probe connection cable, 10 m (32 ft 10 in)	INDIGOCABLE10M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 10 m (32 ft 10 in)	INDIGOCABLEHDM10
Universal mains power supply with EU/US/UK/AUS plugs	INDIGOPOWER24VSP

<sup>1)</sup> Note that a USB-C cable is not included in Indigo200 deliveries by default. A generic USB-C cable (type C to A) can also be used.



Indigo200 series dimensions

## Indigo300 Transmitter For Vaisala Indigo-compatible probes



### Features

- Numerical and graphical color display for up to 3 parameters
- Non-display version with an LED status indicator also available
- IP66-rated metal housing
- Support for one Indigo-compatible probe
- Tool-free locking wheel for the probe
- 24 V AC/DC power supply input
- 3 preconfigured analog outputs (mA or V)
- Service port on the front for connecting to Vaisala Insight PC software or Indigo80 handheld indicator

Vaisala Indigo300 Transmitter is a host device for displaying measurement values from Vaisala Indigo-compatible probes and/or transmitting them to automation systems through analog signals.

### Transmitter for Vaisala Indigo-compatible probes

- HMP series humidity and temperature probes
- TMP1 temperature probe
- DMP series dew point probes
- GMP250 series carbon dioxide probes
- HPP270 series vaporized hydrogen peroxide probes
- MMP8 moisture in oil probe

The Indigo300 transmitter is a plug-and-play host device for current and future Vaisala Indigo-compatible probes. The transmitter has a numerical and graphical color display showing up to 3 measurement parameters simultaneously.

A non-display transmitter version with an LED status indicator is also available.

### Simple to connect and service

Probes can be connected to the transmitter tool-free using the locking wheel of the probe connector. You can connect a probe directly or by using a cable. Instead of the locking wheel and a detachable cable, it is also possible to use a cable gland with a fixed cable.

The service port on the front can be opened with a 4-mm Allen key for access to the free Vaisala Insight PC software or Indigo80 handheld indicator.

With Insight and Indigo80, you can view live measurement data from the probe connected to the transmitter, configure both the transmitter and the probe, as well as calibrate and adjust the probe without having to detach it from the transmitter.

### Robust design

The IP66-rated, corrosion-resistant metal housing of the transmitter is suitable for harsh conditions.

### Versatile installation options

The mounting options include mounting through the transmitter body and mounting on a DIN rail. With an adapter plate, the transmitter can be installed to replace an HMT330, DMT340, or MMT330 series transmitter.

The transmitter can either be wired from the back, which leaves no trailing cables, or through the bottom lead-throughs.

For more information on the Indigo300 transmitter and the Indigo product family, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# 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
Carbon dioxide	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	With display: -30 ... +70 °C (-22 ... +158 °F) Without display: -40 ... +70 °C (-40 ... +158 °F)
Operating humidity	0-100 %RH
Maximum operating altitude	5000 m (approx. 16 400 ft)
IP rating	IP66 <sup>1)</sup>

1) IP40 for transmitters equipped with a locking wheel and a probe connection cable attached to it. This combination is recommended only for indoor conditions.

## Inputs and outputs

Power supply input	15-30 V DC <sup>1)</sup> 24 V AC ±10 % 50/60 Hz
Fuse size for power supply	2.5 A
Transmitter service port connection	<ul style="list-style-type: none"> <li>Connection to Insight with USB2 and cable 262195SP <sup>2)</sup></li> <li>Connection to Indigo80 with cable 262195SP</li> </ul>
<b>Analog outputs</b>	Current or voltage
Number of analog outputs	3
Selectable voltage output types	0-1 V, 0-5 V, 0-10 V, 1-5 V, scalable, $R_L \geq 10 \text{ k}\Omega$
Selectable current output types	4-20 mA, 0-20 mA, scalable, $R_L \leq 500 \Omega$
Accuracy of analog outputs at 20 °C (+68 °F)	±0.1 % full scale <sup>3)</sup>
Temperature dependence	±0.005 % / °C full scale

### Current consumption at 20 °C (+68 °F) ( $U_{in}$ 24 V DC)

Minimum consumption with display off, no analog outputs active, no probe connected <sup>4)</sup>	13 mA
Minimum consumption with display on, brightness normal mode, no analog outputs active, no probe connected	18 mA
$U_{out}$ 0-1 V, 0-5 V, 0-10 V, 1-5 V	+ 1.8 mA per connected channel at maximum load
$I_{out}$ 4-20 mA, 0-20 mA	+ 12.3 mA max. per connected channel

1) When used with the HMP7 probe, the minimum required power supply input is 18 V DC.

2) Vaisala Insight software for Windows™ available at <http://www.vaisala.com/insight>.

3) For the voltage outputs, small variation is possible around true zero.

4) For the current consumption of the connected probe, see the probe's user documentation.

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN IEC 61326-1, industrial environment
EMC emissions	CISPR 32 / EN 55032, Class A FCC part 15 B, Class A ICES-3 / NMB-3 (Class A)
Compliance marks	CE, China RoHS, FCC, RCM, UKCA

## Mechanical specifications

Housing material	EN AW-6082
Connection screw terminals	Max. 1.5 mm <sup>2</sup> wire (16 AWG)
Cable lead-throughs for output and power cables	<ul style="list-style-type: none"> <li>M20×1.5 cable gland / conduit fitting NPT 1/2"</li> <li>M16×1.5 cable gland / conduit fitting NPT 1/2"</li> </ul>
Cable diameter for M20×1.5 gland	7-13 mm (0.26-0.51 in)
Cable diameter for M16×1.5 gland	2-6 mm (0.08-0.24 in)
Dimensions	161 × 134 × 43.5 mm (6.34 × 5.26 × 1.71 in)
Weight	1200 g (2.65 lb)

## Probe connection cables

Detachable cables for use with locking wheel <sup>1)</sup>	
Probe connection cable, 1 m (3 ft 3 in)	INDIGOCABLE1M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 1 m (3 ft 3 in)	INDIGOCABLEHDM5
Probe connection cable, 3 m (9 ft 11 in)	INDIGOCABLE3M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 3 m (9 ft 11 in)	INDIGOCABLEHDM3M
Probe connection cable, 5 m (16 ft 5 in)	INDIGOCABLE5M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 5 m (16 ft 5 in)	INDIGOCABLEHDM5M
Probe connection cable, 10 m (32 ft 10 in)	INDIGOCABLE10M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 10 m (32 ft 10 in)	INDIGOCABLEHDM10M
Fixed cables for use with cable gland <sup>2)</sup>	
Probe connection cable, 0.3 m (12 in), open end <sup>3)</sup>	CBL210896-03MSP
Probe connection cable, 1 m (3 ft 3 in), open end	CBL210896-1MSP
Probe connection cable, 3 m (9 ft 11 in), open end	CBL210896-3MSP
Probe connection cable, 5 m (16 ft 5 in), open end	CBL210896-5MSP
Probe connection cable, 10 m (32 ft 10 in), open end	CBL210896-10MSP

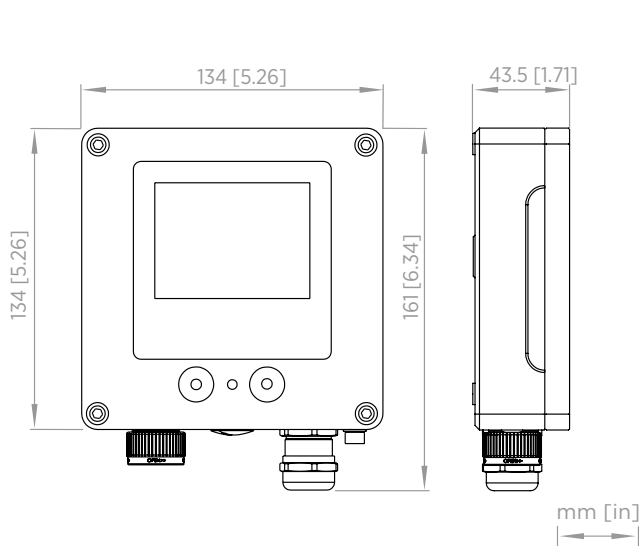
1) The IP rating of transmitters that use detachable probe connection cables with the locking wheel is IP40.

2) The IP rating of transmitters that use fixed probe connection cables with the cable gland is IP66.

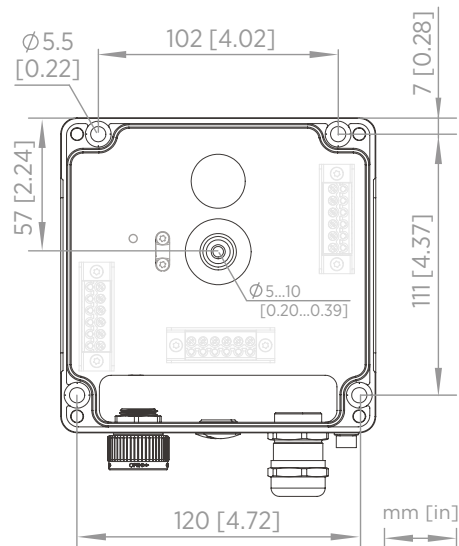
3) The usable length outside of the transmitter enclosure is approx. 0.1 m (4 in) shorter than the total length of the cable.

## Spare parts and accessories

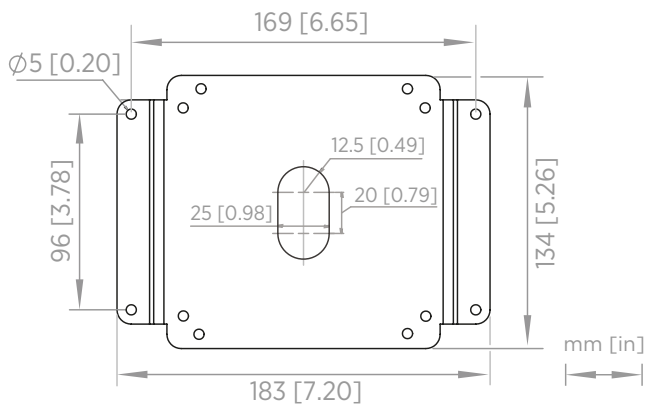
Adapter plate for replacing a Vaisala 330 series transmitter	DRW257715SP
DIN rail installation kit	ASM215071SP
Vaisala Indigo USB adapter and M12 - M8 service cable, for connecting to Insight	USB2 and 262195SP
M12 - M8 service cable 1.5 m (4.9 ft), for connecting to Indigo80	262195SP
Cable gland M20×1.5 for 7.0–13.0 mm (0.26–0.51 in) cable	253993SP
Conduit fitting M20×1.5 for NPT1/2" conduit	214780SP
Cable gland M16×1.5 for 2.0–6.0 mm (0.08–0.24 in) cable	ASM213671SP
Conduit fitting M16×1.5 for NPT1/2" conduit	210675SP
Plug for M20 lead-through	ASM213672SP
Plug for M16 lead-through	210369SP
Service port plug	DRW257660SP



Indigo300 transmitter dimensions



Indigo300 transmitter body mounting dimensions



Indigo300 adapter plate (DRW257715SP) mounting dimensions

## Indigo510 Transmitter For Vaisala Indigo-compatible probes



### Features

- Touchscreen display (optional non-display model with LED indicator also available)
- Data logging of all measurement parameters
- IP66 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
- UL Listed in USA and Canada

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

Indigo500 Series transmitters are the most versatile option for use with Indigo-compatible probes.

- HMP Series humidity and temperature probes
- DMP Series dew point probes
- GMP250 Series carbon dioxide probes
- HPP270 Series vaporized hydrogen peroxide probes
- 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.

Indigo500 Series transmitters can be connected to the MHT410 transmitter for display of measurement data and automation system connectivity. Indigo500 Series transmitters can also be connected to the portable diagnostics tool Indigo80 handheld indicator.

For more information on the Indigo product family, see [vaisala.com/indigo](https://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. The Ethernet connection also 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 H<sub>2</sub>O<sub>2</sub> (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
Carbon dioxide	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
Indigo80 Handheld Indicator	Indigo80

## Transmitter options

Display	<ul style="list-style-type: none"> <li>Capacitive touchscreen display</li> <li>No display (indicator LED) <sup>1)</sup></li> </ul>
Powering	Protective extra-low voltage (11–35 V DC, 24 V AC ± 15% 50/60 Hz)

<sup>1)</sup> Recommended when the transmitter is exposed to direct UV light, and for outdoor installations and high-humidity environments.

## User interfaces

User interfaces	Web interface for remote use, optional touchscreen display
Supported languages	English, Chinese, French, German, Japanese, Spanish
Optional display	5" capacitive touchscreen
Integrated data logging capabilities	Non-volatile memory, at least 10 years' storage with 24 h interval logging

## Mechanical specifications

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)
<b>Cable diameters for cable glands</b>	
M20×1.5 glands	5.0–9.0 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)

## Operating environment

Operating environment	Outdoor use
Use in wet location	Yes
Operating humidity	0–100 %RH
Maximum operating altitude	4000 m (approx. 13 100 ft)
IP rating	IP66 <sup>1)</sup>
UL 50E rating	Type 4

Operating temperature	
With display	–20 ... +60 °C (–4 ... +140 °F)
Without display	–40 ... +60 °C (–40 ... +140 °F)

Storage temperature	
With display	–30 ... +60 °C (–22 ... +140 °F)
Without display	–40 ... +60 °C (–40 ... +140 °F)

<sup>1)</sup> Evaluated by Eurofins, not by UL.

## Powering

Property	Description/Value
<b>Operating power</b>	
Protective extra-low voltage (PELV)	11–35 V DC, 24 V AC ±15 % 50/60 Hz, max. current 2 A (power supply 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)

Typical current consumption at +20 °C (+68 °F) (U <sub>in</sub> 24 V DC) <sup>1)</sup>	
Base consumption (no display, analog outputs, or communication)	50 mA
With display	+ 60 mA
With voltage analog output	< 2 mA per channel
With current analog output	+ 21 mA per channel
With Ethernet cable connected	+ 15 mA

<sup>1)</sup> For the current consumption of the connected measurement device, see the device's documentation, available at docs.vaisala.com.

## Inputs and outputs

Transmitter service port connection	Connection to Indigo80 with cable 262195SP
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Analog outputs	
Number of analog outputs	2
Isolation	Isolated from power supply
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 <sup>2</sup> (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 <sub>L</sub> < 500 Ω
0–1 V output	R <sub>L</sub> > 2 kΩ
0–5 V and 0–10 V outputs	R <sub>L</sub> > 10 kΩ

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

## Compliance

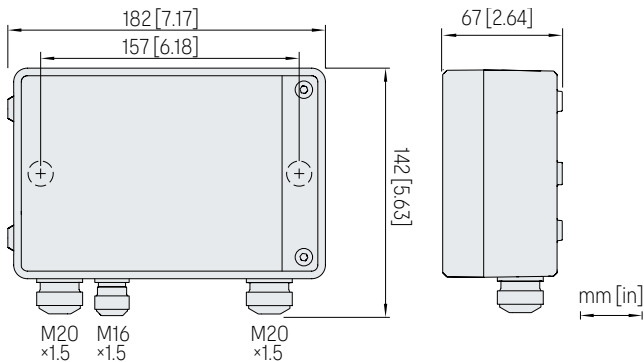
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B
Electrical safety	IEC/EN 61010-1
Type approvals	DNV GL certificate no. TAA000032M EU RO Mutual Recognition certificate no. MRA000004F
Compliance marks	CE, China RoHS, FCC, RCM, UKCA
Listing marks	UL Listed (USA and Canada)
FCC compliance	FCC Part 15, Class B



## Accessories

Adapter plate	DRW252186SP
Installation kit for pole or pipeline	215108
Installation kit with weather shield	215109
Indigo500 spatter guard	ASM214526
M12 - M8 service cable 1.5 m (4.9 ft), for connecting to Indigo80	262195SP
<b>Probe connection cables</b>	
Probe connection cable, 0.3 m (approx. 12 in), open end <sup>1)</sup>	CBL210896-03MSP
Probe connection cable, 1 m (approx. 3 ft 3 in), open end <sup>1)</sup>	CBL210896-1MSP
Probe connection cable, 3 m (approx. 9 ft 10 in), open end <sup>1)</sup>	CBL210896-3MSP
Probe connection cable, 5 m (approx. 16 ft 5 in), open end <sup>1)</sup>	CBL210896-5MSP
Probe connection cable, 10 m (approx. 32 ft 10 in), open end <sup>1)</sup>	CBL210896-10MSP

<sup>1)</sup> The usable length outside of the transmitter enclosure is approx. 0.1 m (4 in) shorter than the total length of the cable.

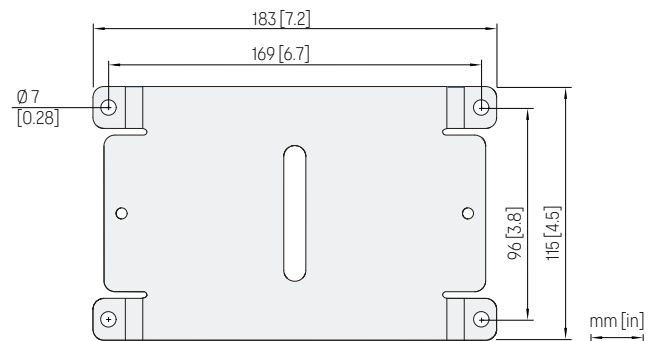


Indigo510 dimensions and lead-through sizes

## Spare parts

Cable gland, M20×1.5, 5.0–9.0 mm (0.20–0.35 in)	ASM213670SP
Cable gland with split bushing, M20×1.5 <sup>1)</sup>	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

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



Indigo500 adapter plate dimensions



## Indigo520 Transmitter For Vaisala Indigo-compatible probes



### Features

- Supports 2 detachable measurement devices simultaneously
- Data logging of all measurement parameters
- IP66 rated metal enclosure
- 4 configurable galvanically isolated analog outputs
- 2-wire current loop analog input
- 2 relays
- Ethernet connection with web interface for remote access
- Displays measurements on the spot and 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
- Optional non-display model with LED indicator

### Variety of probe options

Indigo500 Series transmitters are the most versatile option for use with Indigo-compatible probes.

- HMP Series humidity and temperature probes
- DMP Series dew point probes
- GMP250 Series carbon dioxide probes
- HPP270 Series vaporized hydrogen peroxide probes

- 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.

Indigo500 Series transmitters can be connected to the MHT410 transmitter for display of measurement data and automation system connectivity.

Indigo500 Series transmitters can also be connected to the portable diagnostics tool Indigo80 handheld indicator.

Indigo520 transmitter can be connected to Polaris™ PR53 process refractometers for measuring liquid concentrations.

For more information on the Indigo product family, see [vaisala.com/indigo](https://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. The Ethernet connection also 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 H<sub>2</sub>O<sub>2</sub> (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
Carbon dioxide	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
Polaris™ Process Refractometers <sup>1)</sup>	PR53AC, PR53AP, PR53GC, PR53GP, PR53M, PR53SD, PR53W
Indigo80 Handheld Indicator	Indigo80
MGP260 Series Multigas Probes	MGP261, MGP262
Differential Pressure Transmitters	PDT101, PDT102

<sup>1)</sup> Compatible with transmitters ordered with software configuration "L" for process refractometers.

## Transmitter options

Display	<ul style="list-style-type: none"> <li>Capacitive touchscreen display</li> <li>No display (indicator LED) <sup>1)</sup></li> </ul>
Powering	<ul style="list-style-type: none"> <li>Protective extra-low voltage (15–35 V DC, 24 V AC ± 20%)</li> <li>AC (mains) power (100–240 V AC 50/60 Hz)</li> <li>Power over Ethernet (no analog outputs, analog input, or relays)</li> </ul>

<sup>1)</sup> Recommended when the transmitter is exposed to direct UV light, and for outdoor installations and high-humidity environments.

## 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

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	5.0–9.0 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)

## Operating environment

Operating environment	Outdoor use
Use in wet location	Yes
Operating humidity	0–100 %RH
Maximum operating altitude, AC (mains) power	3000 m (approx. 9800 ft)
Maximum operating altitude, protective extra-low voltage (PELV) and Power over Ethernet (PoE)	4000 m (approx. 13 100 ft)
IP rating	IP66 <sup>1)</sup>
UL 50E rating	Type 4

### Operating temperature

With display	-25 ... +55 °C (-13 ... +131 °F)
Without display	-40 ... +60 °C (-40 ... +140 °F)
Without display with barometer module	-40 ... +55 °C (-40 ... +131 °F)

### Storage temperature

With display	-30 ... +60 °C (-22 ... +140 °F)
Without display	-40 ... +60 °C (-40 ... +140 °F)

<sup>1)</sup> Evaluated by Eurofins, not by UL.

## Powering

Property	Description/Value
<b>Operating power <sup>1)</sup></b>	
Protective extra-low voltage (PELV) version	15–35 V DC, 24 V AC $\pm 20\%$ 50/60 Hz, max. current 2 A (power supply is galvanically isolated) Fuse size for power supply: 3 A Isolation voltage: 500 V AC, 1000 V DC
PELV power cable temp. rating	$\geq +80\text{ }^{\circ}\text{C}$ (+176 $^{\circ}\text{F}$ )
AC (mains) power version	100–240 V AC 50/60 Hz, max. current 1 A (power supply is galvanically isolated) Fuse size for power supply: 10 A Isolation voltage: 1500 V AC
AC (mains) power cable length	2.5 m (approx. 8 ft 2 in)
Power over Ethernet version	Power over Ethernet (PoE) IEEE 802.3at Type 2 Class 4 Max. current 600 mA, max. power consumption 25.5 W Isolation voltage: 500 V AC, 1000 V DC

### Typical current consumption at +20 °C (+68 °F) ( $U_{in}$ 24 V DC) <sup>2)</sup>

Base consumption (no display, analog outputs, or communication)	50 mA
With display	+ 60 mA
With voltage analog output	< 2 mA per channel
With current analog output	+ 21 mA per channel
With relays	+ 9 mA per relay
With Ethernet cable connected	+ 15 mA
With barometer module	+ 5 mA

<sup>1)</sup> The power supply option is selected when ordering the transmitter.

<sup>2)</sup> For the current consumption of the connected measurement device, see the device's documentation, available at [docs.vaisala.com](http://docs.vaisala.com).

## User interfaces

User interfaces	Web interface for remote use, optional touchscreen display
Supported languages	English, Chinese, French, German, Japanese, Spanish
Optional display	5" capacitive touchscreen
Integrated data logging capabilities	Non-volatile memory, at least 10 years' storage with 24 h interval logging

## Inputs and outputs

Transmitter service port connection	Connection to Indigo80 with cable 262195SP
<b>Analog input <sup>1)</sup></b>	
Available ranges	4–20 mA
Resolution	6 $\mu\text{A}$
Display resolution	0.01 mA
Accuracy	$\pm 0.05\text{ mA}$
Input impedances	200 $\Omega$
Isolation	Isolated from power supply
Overload protection	40 mA max. (reverse polarity protected)

<b>Analog outputs <sup>1)</sup></b>	
Number of analog outputs	4
Isolation	Isolated from power supply
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 <sup>2</sup> (14 AWG)
Accuracy of analog outputs at +20 °C (+68 °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	$R_L > 10\ \text{k}\Omega$

<b>Relay outputs <sup>1)</sup></b>	
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 <sup>2</sup> (14 AWG)
Max. wire size in AC (mains) version	1.5 mm <sup>2</sup> (16 AWG)

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

<sup>1)</sup> Not available in transmitters that are powered with Power over Ethernet (PoE).

## Compliance

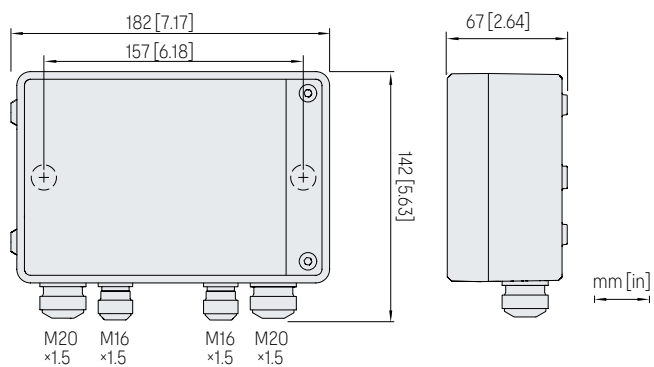
EU directives and regulations	EMC Directive (2014/30/EU) Low Voltage Directive (2014/35/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B
Electrical safety	IEC/EN 61010-1
Type approvals	DNV GL certificate no. TAA000032M EU RO Mutual Recognition certificate no. MRA000004F
Compliance marks	CE, China RoHS, FCC, RCM, UKCA
Listing marks	UL Listed (USA and Canada)
FCC compliance	FCC Part 15, Class B



## Accessories

Adapter plate	DRW252186SP
Installation kit for pole or pipeline	215108
Installation kit with weather shield	215109
Indigo500 spatter guard	ASM214526
M12 - M8 service cable 1.5 m (4.9 ft), for connecting to Indigo80	262195SP
<b>Probe connection cables</b>	
Probe connection cable, 0.3 m (approx. 12 in), open end <sup>1)</sup>	CBL210896-03MSP
Probe connection cable, 1 m (approx. 3 ft 3 in), open end <sup>1)</sup>	CBL210896-1MSP
Probe connection cable, 3 m (approx. 9 ft 10 in), open end <sup>1)</sup>	CBL210896-3MSP
Probe connection cable, 5 m (approx. 16 ft 5 in), open end <sup>1)</sup>	CBL210896-5MSP
Probe connection cable, 10 m (approx. 32 ft 10 in), open end <sup>1)</sup>	CBL210896-10MSP

<sup>1)</sup> The usable length outside of the transmitter enclosure is approx. 0.1 m (4 in) shorter than the total length of the cable.

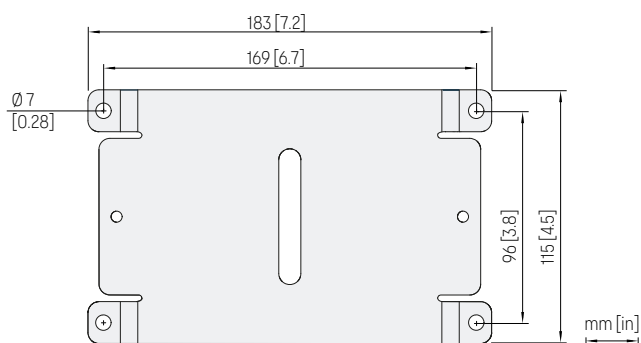


Indigo520 dimensions and lead-through sizes

## Spare parts

Cable gland, M20×1.5, 5.0–9.0 mm (0.20–0.35 in)	ASM213670SP
Cable gland with split bushing, M20×1.5 <sup>1)</sup>	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
Sintered filter (for barometer module)	DRW010335SP

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



Indigo500 adapter plate dimensions



### Features

- Outdoor installation kit for Indigo500 Series transmitters
- Supports wall and pole mounting
- Delivered pre-assembled according to selected options
- DTR502 Solar Radiation Shield option prevents temperature measurement error
- DTS1 Weather Shield option prevents a microclimate from forming around a heated probe
- SPH10 Static Pressure Head option eliminates pressure variations caused by wind

The Indigo500MIK Meteorological Installation Kit enables Vaisala Indigo500 Series transmitters to obtain professional grade outdoor measurements of environmental parameters. The kit is delivered pre-assembled with the selected options, with or without measurement equipment.

### Essential for critical weather measurements

Outdoor installation of measurement instruments must be done properly to avoid common sources of measurement error, and to ensure long service life. The Indigo500MIK Meteorological Installation Kit is designed to enable Indigo500 Series transmitters and compatible measurement probes to obtain reliable measurements in challenging weather conditions. The kit is recommended for use with the HMP3 and HMP7 humidity and temperature probes, and the TMP1 temperature probe.

### True humidity readings in condensing conditions

In weather observations dew formation makes reliable humidity measurement difficult. When dew has formed on the humidity sensor, it is impossible to obtain a true reading until the dew evaporates. Obtaining a true humidity

reading is particularly important in traffic safety, at airports, and at sea. It is essential, for example, in fog and frost prediction.

Combining an Indigo500 Series transmitter with a HMP7 and TMP1 probes provides a solution to the problem. HMP7 utilizes probe heating for condensation prevention. When the probe head is heated, risk of dew formation on the sensor is greatly reduced. When combined with accurate temperature measurement from TMP1 probe, the Indigo500 transmitter can calculate the ambient relative humidity precisely in all conditions.

### Open shield prevents microclimates

Traditional solar radiation shields are not optimal for use with heated probes, as sleet or snow can accumulate on the shield. This may prevent proper air circulation and create a humid microclimate around the probe head until the snow melts.

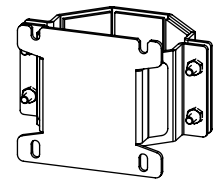
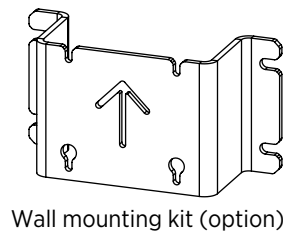
DTS1 Weather Shield option provides the heated HMP7 probe with appropriate protection that prevents the formation of a microclimate. The shield is open at the bottom to ensure steady air circulation to the sensor even in calm weather.



For calibration, a portable HMP77 reference probe is easy to attach beside the HMP7 probe head.

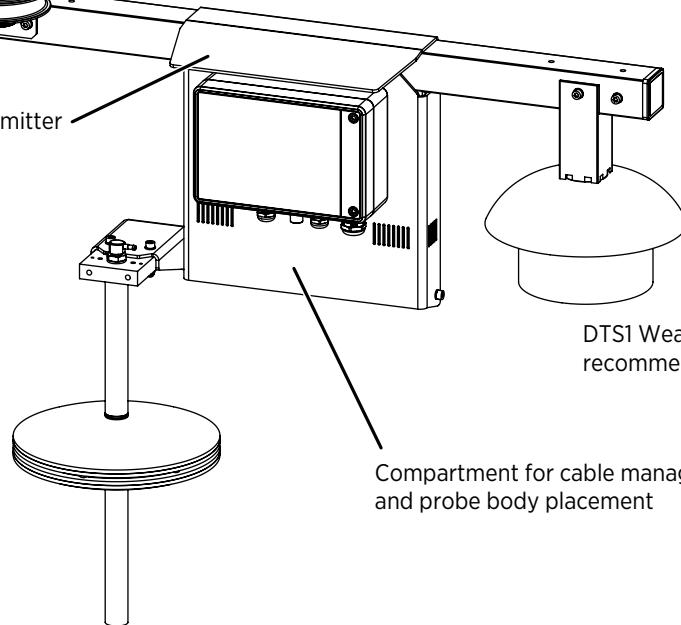
# Technical data

DTR502 Solar Radiation Shield (option) for humidity and temperature probes



Pole mounting kit (option)  
up to Ø 100 mm (3.9 in)

Rain shield for transmitter



DTS1 Weather Shield (option)  
recommended with warmed probe

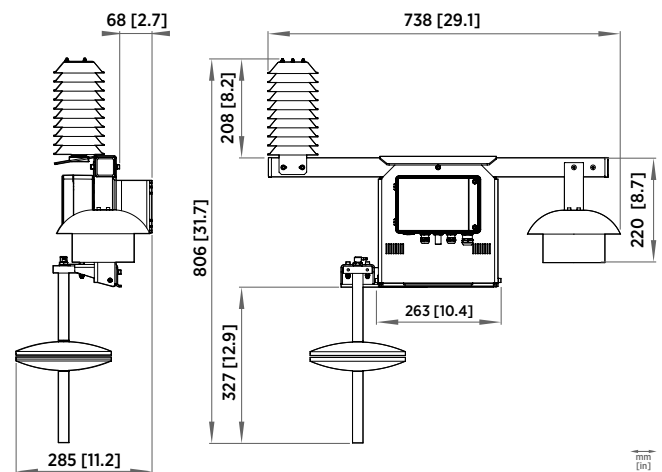
Compartment for cable management  
and probe body placement

SPH10 Static Pressure Head (option)  
for minimizing the effect of wind  
on pressure measurement

## Specifications

Compatible transmitters	Indigo510, Indigo520, HMT370EX
Compatible solar radiation shields	DTR502, DTR13, DTR250
Weather shield for heated probe	DTS1 <sup>1)</sup>
Static pressure head	SPH10 <sup>1)</sup>
Weight of mounting plate, probe compartment, and support bar	1.5 kg (3.3 lb)
Material of mounting plate, probe compartment, and support bar	Anodized marine grade aluminum

<sup>1)</sup> Attachment requires an adapter that is included when ordering the mounting kit with this option.



Indigo500MIK dimensions with wall mounting kit

## Indigo80 Handheld Indicator For portable diagnostics








### Features

- Flexible operation with Vaisala Indigo-compatible probes and transmitters, including HMP80 and DMP80 handheld probes and GMP80P probe with pump sampling
- Intuitive user interface available in 10 languages
- Rechargeable battery
- Robust design and modern appearance
- Logged measurement data can be transferred to PC via Vaisala Insight software

Vaisala Indigo80 Handheld Indicator is an industrial-grade portable diagnostics tool. Accommodating up to two Vaisala measurement probes, Indigo80 is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting Vaisala Indigo-compatible probes and transmitters.

### Variety of probe options

The Indigo80 indicator has two cable ports by which a combination of two probes or transmitters can be simultaneously connected to the indicator. Indigo80 can communicate with most current and future Vaisala probes and transmitters for measuring a wide range of parameters.

-  Humidity and temperature
-  Dew point
-  Carbon dioxide
-  Hydrogen peroxide vapor
-  Moisture in oil

For the full set of probes and transmitters currently compatible with Indigo80, see the following page. For more information on the Indigo product family, see [vaisala.com/indigo](https://vaisala.com/indigo).

### Robust and reliable

The sturdy aluminum body of Indigo80 is resistant to chemicals and dust. Indigo80 is powered by a rechargeable lithium-ion battery with a typical operation time of 10 h. During long-term logging Indigo80 can be powered by using an AC adapter.

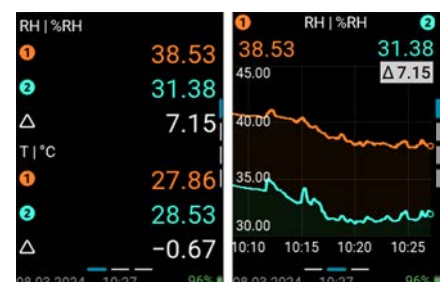
### Easy to use

Indigo80 has an intuitive user interface that guides the user if needed. The indicator is designed to be easy to use in numerous use cases and measurement environments.

To access logged data and configuration functionality, Indigo80 can be connected to Vaisala Insight PC software for Windows®. For more information, see [vaisala.com/insight](https://vaisala.com/insight).

### Multilingual user interface

Indigo80 has a multilingual, menu-based user interface that shows live measurement data both numerically and graphically. The Indigo80 user interface is available in 10 languages.



View live measurement data as numbers or graphs

# Vaisala devices compatible with Indigo80

## Vaisala Indigo-compatible probes

HMP1, HMP3, HMP4, HMP5, HMP7, HMP8, HMP9, HMP80L, HMP80N	Humidity and temperature
TMP1	Temperature
DMP5, DMP6, DMP7, DMP8, DMP80A, DMP80B	Dew point
GMP251, GMP252	Carbon dioxide
HPP271, HPP272	Vaporized hydrogen peroxide
MMP8	Moisture in oil

## Other Vaisala devices

HMP60, HMP63, HMP110, HMP113, HMP115, HMM170	Humidity and temperature
HMP110T, HMP115T, TMP115	Temperature
DMT143, DMT143L	Dew point

## Vaisala Indigo transmitters (host devices)

Indigo300, Indigo510, Indigo520
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# Technical data

## Operating environment

Operating temperature	-20 ... +50 °C (-4 ... +122 °F)
Storage temperature	-20 ... +60 °C (-4 ... +140 °F), recommended +20 °C (+68 °F)
Operating and storage humidity	20–85 %RH, when Ta ≤ +40 °C (+104 °F)
Charging temperature	0 ... +45 °C (+32 ... +113 °F) <sup>1)</sup>
IP rating	IP40
Use in wet location	No
Operating environment	Indoor use
Pollution degree	3
Maximum operating altitude	2000 m (approx. 6500 ft)

1) The battery will not charge at temperatures below 0 °C (+32 °F).

## Data logging and user interface specifications

Data logging capacity	Up to 5.5 million real-time data values
Logging interval	1 s - 12 h
Logging duration	1 min - memory full <sup>1)</sup>
Alarm	Audible alarm function
Supported languages	English, Chinese, Finnish, French, German, Italian, Japanese, Portuguese, Spanish, Swedish
Display	2.7" sunlight readable transfective TFT LCD color display with backlight and automatic brightness control

1) For example, data logging duration for one measurement parameter with a logging interval of one second is over eight weeks. Use an AC adapter to power Indigo80 during long-term logging.

## Battery operation time

Operation time (continuous use)	10 h at +20 °C (+68 °F) <sup>1)</sup>
Charging time	2 hours <sup>1)</sup>

1) Typical value. Actual performance depends on, for example, the number and type of devices connected to Indigo80 and the data logging interval.


## Mechanical specifications

Weight	385 g (14 oz)
Dimensions (H × W × D)	213 × 58 × 27 mm (8.4 × 2.3 × 1.1 in)
<b>Materials</b>	
Main body and rear piece	Aluminum EN AW-6082 T6
Back cover	Rubber (TPE) and polycarbonate (PC), reinforced with fiberglass Flammability rating UL94 V-1
Display	Strengthened glass with anti-fingerprint (AF) and anti-reflection (AR) coatings

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B FCC part 15 B, Class B ICES-3 / NMB-3 (Class B)
Electrical safety	IEC/EN 61010-1
Compliance marks	CE, China RoHS, FCC, RCM, UKCA

## Inputs and outputs

Max. number of connected probes	2
Connector type	M12 5-pin female (2 pcs)
<b>Battery</b> <sup>1)</sup>	
Type	Rechargeable lithium-ion battery
Nominal voltage	7.2 V
Rated capacity	2900 mAh / 20.88 Wh
Charge limit voltage	8.4 V
<b>AC adapter</b> <sup>2)</sup>	
Type	45 W USB-C AC adapter <sup>3)</sup>
Connector type	USB-C
AC input	100-240 V AC, 1.2 A, 50-60 Hz
DC output	5.0 V/9.0 V/12.0 V/15.0 V DC, 3.0 A 20.0 V DC, 2.25 A 45 W
Insulation	Double or reinforced, indicated with the following symbol: 
PC interface	Vaisala Insight PC software with USB-C cable (Windows OS). <sup>4)</sup> Data can be logged and transferred also without Insight.

1) The battery is not user-replaceable. Contact Vaisala Service Center for any battery-related maintenance needs.

2) The AC adapter is an optional accessory. If using an AC adapter not provided by Vaisala, make sure it fulfills the specifications given in this table and the safety requirements listed in Indigo80 Safety Guide (M212872EN), available at docs.vaisala.com.

3) 45 W AC adapter recommended for optimal performance of Indigo80. An AC adapter with a lower power rating can also be used.

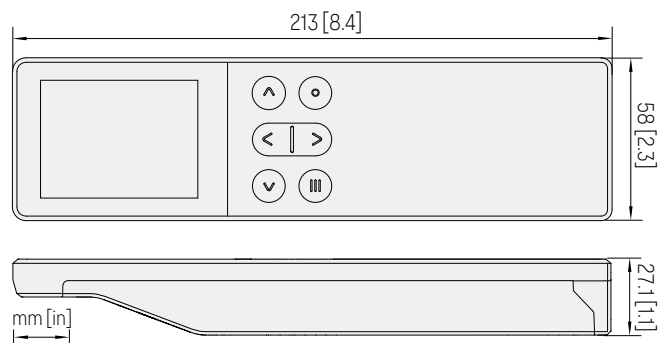
4) Insight software is available for download at [vaisala.com/insight](https://vaisala.com/insight).

## Spare parts and accessories

<b>Cables</b>	
Cable for transmitters (M12-M8), 1.5 m (4 ft 11 in)	262195SP
Cable for probes (M12-M12), 1.5 m (4 ft 11 in)	272075SP
Flat cable for probes (M12-M12), 1 m (3 ft 3 in)	CBL210493SP
Probe connection cable (M12-M12), 10 m (32 ft 10 in)	INDIGOCABLE10M
<b>Other</b>	
Magnetic hanger for indicator	ASM214318SP
Weatherproof carrying case for Indigo80 and HMP80 and DMP80 series probes	ASM214759
Weatherproof carrying case for Indigo80 and a series 8 probe <sup>1)</sup>	ASM215318
Light carrying case for HM40S or Indigo80 indicator and a compatible probe <sup>2)</sup>	230245SP

1) For example, MMP8, HMP8, or DMP8 with a max. 2-m (6 ft 7 in) probe connection cable.

2) For example, DMP80, HMP80N, or GMP252 probe with handle accessory and a max. 1.5-m (4 ft 11 in) probe connection cable.



Indigo80 dimensions (front and side view)

## HMP80 Series Handheld Humidity and Temperature Probes

For spot-checking applications



### Features

- Portable design optimized for industrial spot-checking and field calibration
- RH accuracy up to  $\pm 0.8$  %RH
- Temperature accuracy up to 0.1 °C (0.18 °F)
- Wide temperature measurement range
- Condensation-tolerant
- Sensor purge improves long-term stability and chemical resistance
- Compatible with Indigo80 handheld indicator and Insight PC software
- Calibration certificate included

Vaisala HUMICAP® Handheld Humidity and Temperature Probes HMP80 Series have been designed for portable use, especially with the Indigo80 handheld indicator. The combination of HMP80 probe and Indigo80 is ideal for spot-checking and field calibration of installed Vaisala humidity instruments.

### 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.

The 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.

HMP80 series probes are delivered with standard factory calibration certificates, with accredited calibration as an option. The probes can therefore be used as a working standard in field calibration.

### Robust design for handheld measurements

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

The design of the probe handle has been optimized for manual operation in versatile measurement environments. The IP66-classified probe handle offers excellent protection against moisture and dust with the probe connection cable attached. Also the cable connection is protected against mechanical stress by the robust design of the handle.

### Flexible connectivity

HMP80 probes are optimized for portable spot-checking, field calibration, and data logging use with the Indigo80 handheld indicator. For easy-to-use access to device analytics and configuration, HMP80 probes can be connected to Vaisala Insight software for Windows®.

For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo) and [www.vaisala.com/insight](http://www.vaisala.com/insight).

# Technical data

## HMP80 series measurement performance

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

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

## HMP80 series operating environment

Operating temperature of probe handle	-10 ... +60 °C (-14 ... +140 °F)
Operating temperature of probe head	HMP80N: -20 ... +60 °C (-4 ... +140 °F)
	HMP80L: -50 ... +120 °C (-58 ... +248 °F)
Storage temperature	-20 ... +60 °C (-4 ... +140 °F)
Measurement environment	For air, nitrogen, hydrogen, argon, helium, oxygen, and vacuum <sup>1)</sup>
IP rating of probe handle:	
with probe connection cable connected to the probe	IP66
without cable	IP55

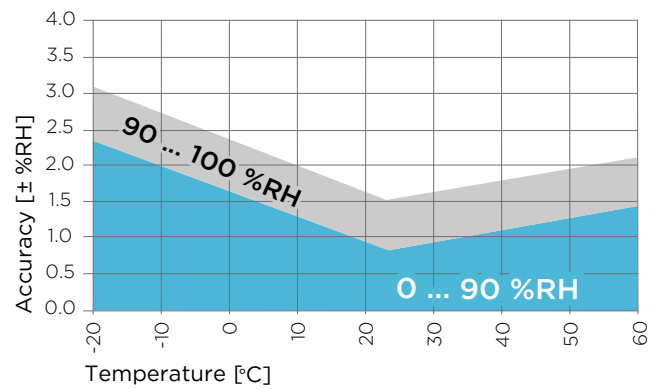
- 1) Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases.

## HMP80 series inputs and outputs

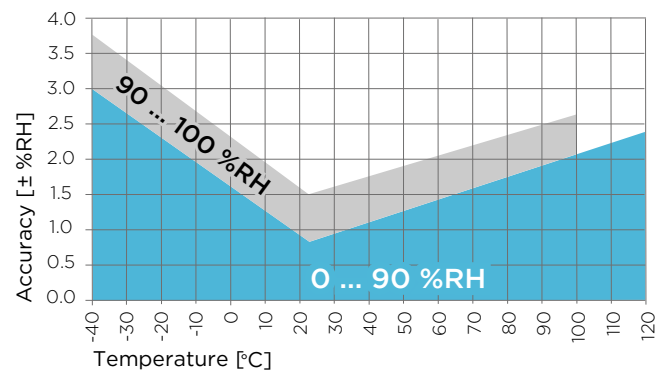
Operating voltage	15-30 V DC
Current consumption	10 mA typical, 500 mA max.
Digital output	RS-485, non-isolated

## HMP80 series compliance

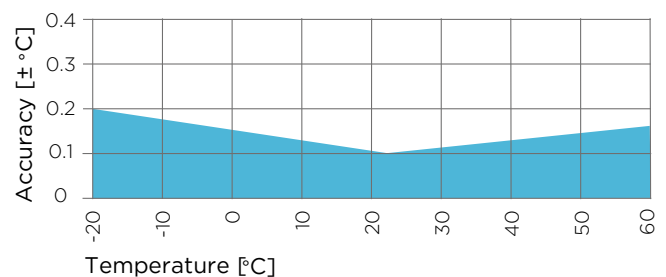
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Rough handling (excluding sensor inside probe head)	IEC 60068-2-31
Compliance marks	CE, China RoHS, RCM, UKCA



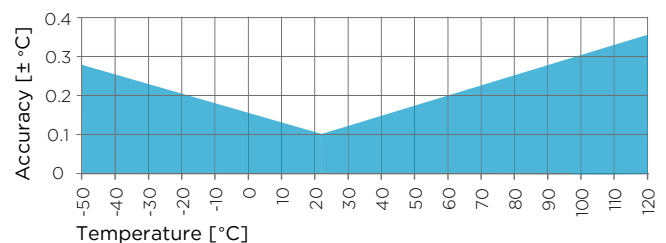
HMP80N humidity measurement accuracy as a function of temperature



HMP80L humidity measurement accuracy as a function of temperature



HMP80N temperature measurement accuracy over full range



HMP80L temperature measurement accuracy over full range

## HMP80 series output parameters

Absolute humidity (g/m <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>w</sub> )
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
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)

## HMP80 series mechanical specifications

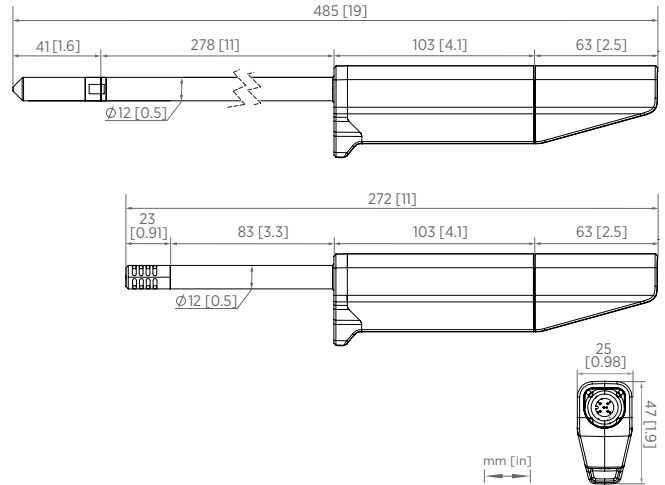
Connector type	M12 5-pin A-coded male
Weight	HMP80N: 200 g (7 oz) HMP80L: 300 g (10 oz)

Materials	
Probe handle	Polyamide (PA) and thermoplastic elastomer (TPE)
Probe shaft	Stainless steel (AISI 316L)
Filters	HMP80N: Stainless steel (AISI 316L) <sup>1)</sup> HMP80L: Porous stainless steel (AISI 316L) <sup>2)</sup>

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

## HMP80 series spare parts and accessories

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



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

## DMP80 Series Handheld Dew Point and Temperature Probes

For spot-checking applications



### Features

- Portable design optimized for industrial spot-checking and field calibration
- Dew point measurement accuracy up to  $\pm 2$  °C ( $\pm 3.6$  °F)  $T_{d/f}$
- Wide dew point measurement range
- Sensor purge improves long-term stability and chemical resistance
- Condensation-tolerant
- Compatible with Indigo80 handheld indicator and Insight PC software
- Calibration certificate included

Vaisala DRYCAP® Handheld Dew Point and Temperature Probes DMP80 Series have been designed for portable use, especially with the Indigo80 handheld indicator. The combination of DMP80 probe and Indigo80 is ideal for spot-checking and field calibration of installed Vaisala humidity instruments.

### Reliable measurements with the Vaisala DRYCAP sensor

Vaisala DRYCAP sensor is robust against particulate contamination, water condensation, oil vapor, and most chemicals. The sensor tolerates condensation and recovers perfectly if exposed to liquid water. The sensor's performance is excellent also in dynamic and low dew point applications, thanks to its fast reaction time and stability.

The probes can be inserted directly into pressurized processes, and respond rapidly from ambient to process conditions. The DMP80 probes are suitable for direct process dew point measurement in a wide temperature and pressure range.

DMP80 series probes are delivered with standard factory calibration certificates, with accredited calibration as an option. The probes can therefore be used as a working standard in field calibration.

### Sensor purge minimizes effects of contaminants

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

Sensor purge involves heating the sensor briefly to remove chemicals that could lower measurement performance and cause drifting.

### Robust design for handheld measurements

The design of the probe handle has been optimized for manual operation in versatile measurement environments. The IP66-classified probe handle offers excellent protection against moisture and dust with the probe connection

cable attached. Also the cable connection is protected against mechanical stress by the robust design of the handle.

### Flexible connectivity

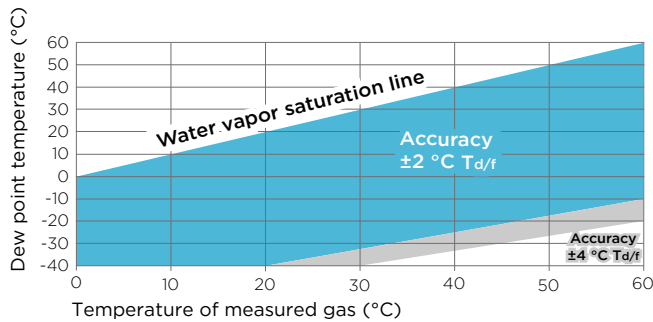
DMP80 probes are optimized for portable spot-checking, field calibration, and data logging use with the Indigo80 handheld indicator. For easy-to-use access to device analytics and configuration, DMP80 probes can be connected to Vaisala Insight software for Windows®.

For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo) and [www.vaisala.com/insight](http://www.vaisala.com/insight).

# Technical data

## DMP80A measurement performance

Dew point	
Sensor	DRYCAP® 180S
Measurement range	-40 ... +60 °C (-40 ... +140 °F) T <sub>d/f</sub>
Accuracy	Up to ±2 °C (±3.6 °F) T <sub>d/f</sub>
Response time 63 % [90 %]:	
From dry to wet	5 s [10 s]
From wet to dry	45 s [5 min]
Temperature	
Measurement range	0 ... +60 °C (+32 ... +140 °F)
Accuracy	±0.2 °C (±0.36 °F) at room temperature
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751
Mixing ratio	
Measurement range (typical)	0-150 g/kg (0-1050 gr/lbs)
Accuracy (typical)	±12 % of reading
Absolute humidity	
Measurement range	0-130 g/m <sup>3</sup>
Accuracy (typical)	±10 % of reading



Dew point accuracy vs. measurement conditions (DMP80A)

## DMP80 series operating environment

Operating temperature range	-10 ... +60 °C (+14 ... +140 °F)
Storage temperature	-20 ... +60 °C (-4 ... +140 °F)
Operating pressure of probe head	0-20 bar (0-290 psi), absolute
Measurement environment	For air, nitrogen, hydrogen, argon, helium, and oxygen <sup>1)</sup>
IP rating of probe handle:	
With probe connection cable connected to the probe	IP66
Without cable	IP55

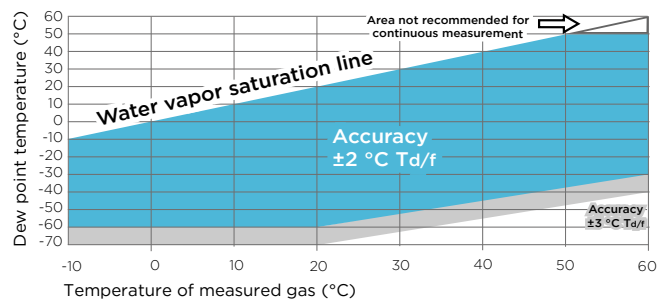
<sup>1)</sup> Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases.

## DMP80 series inputs and outputs

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

## DMP80B measurement performance

Dew point	
Sensor	DRYCAP® 180M
Measurement range	-70 ... +60 °C (-94 ... +140 °F) T <sub>d/f</sub>
Accuracy	Up to ±2 °C (±3.6 °F) T <sub>d/f</sub>
Response time 63 % [90 %]:	
From dry to wet	5 s [15 s]
From wet to dry	45 s [8 min]
Temperature	
Measurement range	0 ... +60 °C (+32 ... +140 °F)
Accuracy	±0.2 °C (±0.36 °F) 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



Dew point accuracy vs. measurement conditions (DMP80B)

## DMP80 series mechanical specifications

Connector type	M12 5-pin A-coded male
Weight	250 g (9 oz)
Mechanical connection options	G1/2" ISO 228/1 NPT1/2"
Materials	
Probe handle	Polyamide (PA) and thermoplastic elastomer (TPE)
Probe shaft	Stainless steel (AISI 316L)
Filter	Porous stainless steel (AISI 316L) <sup>1)</sup>

<sup>1)</sup> Vaisala item code: HM47280SP

## DMP80 series output parameters

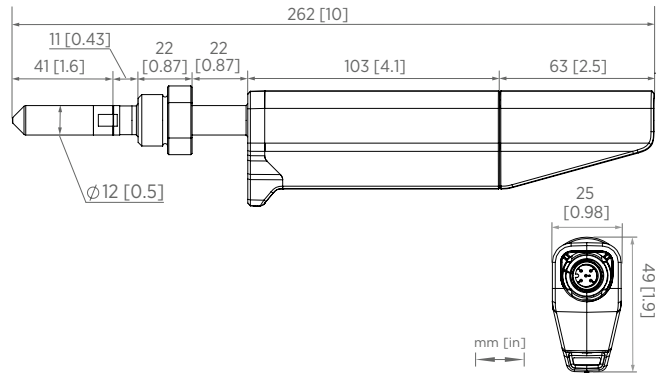
Absolute humidity (g/m <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>v</sub> )
Dew/frost point temperature at 1 atm (°C)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

## DMP80 series compliance

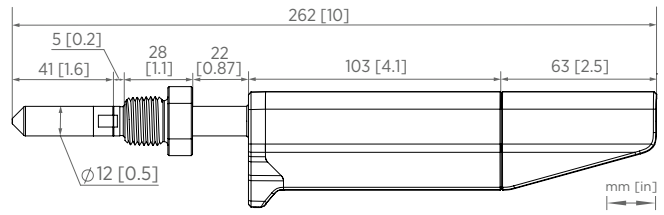
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Rough handling (excluding sensor inside probe head)	IEC 60068-2-31
Compliance marks	CE, China RoHS, RCM, UKCA

## DMP80 series spare parts and accessories

Cables	
Probe connection cable (M12-M12), 1.5 m (4.11 ft)	272075SP
Flat cable for probes (M12-M12), 1.0 m (3.4 ft)	CBL210493SP
Accessories for ISO G1/2" thread option	
Sampling cell with quick connector and leak screw	DSC74
Sampling cell with female connectors, inlet G3/8", outlet G1/4" ISO	DMT242SC
Sampling cell with Swagelok connectors for 1/4" tubing	DMT242SC2
Two-pressure sampling cell	DSC74B
Two-pressure sampling cell with coil	DSC74C
Other items	
Indigo USB adapter	USB2
Sintered stainless steel filter	HM47280SP



Dimensions of DMP80 series probes with G1/2" thread, side and bottom view



Dimensions of DMP80 series probes with NPT1/2" thread



### Features

- Humidity measurement range 0 ... 100 %RH
- Temperature measurement ranges -40 ... +100 °C (-40 ... +212 °F), depending on probe model. The HM46 model can measure up to +180 °C (+356 °F) for a short period of time.
- Incorporates proven Vaisala HUMICAP® sensor technology
- Calibration reminder function
- Probes can be user calibrated using an on-site reference
- Graphical display indicates when measurement has stabilized
- Hold-button to freeze the screen and save the reading
- Multilingual user interface available in 10 languages (EN, DE, FR, JA, ZH, PT, ES, RU, FI, SV)

The easy-to-use HM40 is a compact and portable humidity meter that provides reliable measurements in a wide range of applications. It is the ideal spot-checking tool for everything from structural moisture measurement and air conditioning systems to humidity measurement in industrial production processes and life science applications. There are four different models available: HM41, HM42, HM45, and HM46.

### Benefits

- Compact, portable, and easy to use
- Versatile meter with wide measurement range and multiple calculated parameters
- Ideal for spot-checking in a wide variety of applications

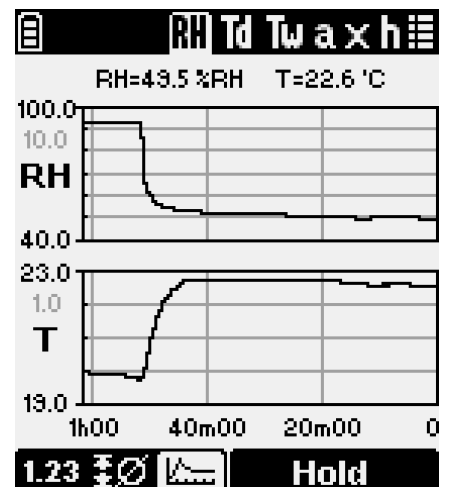
### Simple and Easy to Use

HM40 has a large, user-friendly graphical display and easy-to-use push buttons. The user interface is simple and intuitive, and available in 10 languages. Also, many settings can be modified to meet users' individual needs. In addition to relative humidity and temperature, HM40 provides five calculated humidity

parameters, all of which are available in metric and non-metric units. HM40 is powered by 2 AA batteries. An external USB-charger and rechargeable AA sized NiMH batteries are available as an option. Each model also comes with a handy belt clip and case.

### Easy Recalibration

Calibrating HM40 is easy. The meter or the probe can be sent to a Vaisala Service Center for recalibration. Alternatively, calibration can be completed on site by users with a humidity reference such as another hand-held meter or Vaisala Humidity Calibrator HMK15. The indicator includes a calibration reminder function that can be activated by the user.



The Graph Clearly Indicates When Readings Have Stabilized.



# HM40 Handheld Humidity and Temperature Meter Series

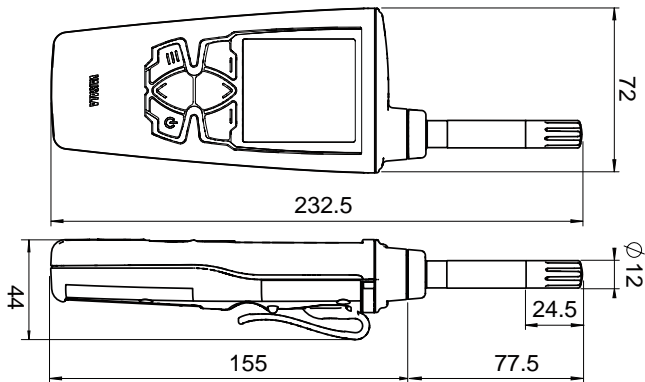


## HM41 Technical Data

Humidity Measurement Accuracy (Including Non-linearity, Hysteresis, and Repeatability):

At 0 ... +40 °C	±1.5 %RH (0 ... 90 %RH)
	±2.5 %RH (90 ... 100 %RH)
At -10 ... 0 °C and +40 ... +60 °C	±3.0 %RH (0 ... 90 %RH)
	±4.0 %RH (90 ... 100 %RH)

Humidity sensor	HUMICAP® 180R
Temperature measurement range	-10 ... +60 °C (+14 ... +140 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Measurement probe	Interchangeable HMP113 probe
Probe material	PC/ABS plastic blend (white)
IP rating	IP54
Weight (with alkaline batteries)	230 g (8.1 oz)
Filter material	PC (glass-reinforced)



HM41 dimensions in mm

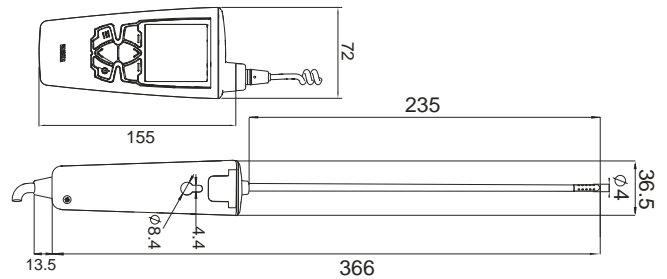
## HM42 Technical Data

Humidity Measurement Accuracy (Including Non-linearity, Hysteresis, and Repeatability):

At 0 ... +40 °C	±1.5 %RH (0 ... 90 %RH)
	±2.5 %RH (90 ... 100 %RH)
At -40 ... 0 °C and +40 ... +80 °C	±3.0 %RH (0 ... 90 %RH)
	±4.0 %RH (90 ... 100 %RH)
At +80 ... +100 °C	±4.0 %RH <sup>1)</sup>

Humidity sensor	HUMICAP® 100R-Mini
Temperature measurement range	-40 ... +100 °C (-40 ... +212 °F)
Temperature sensor	Pt1000 RTD Class F0.3 IEC60751
Measurement probe	HM42PROBE
Probe head material	Stainless steel
IP rating	IP40 (probe), IP54 (indicator)
Weight (with alkaline batteries)	370 g (13.1 oz)
Filter material	Stainless steel and PTFE membrane
Probe cable length	1500 mm (59 in)

<sup>1)</sup> Not recommended for  $T_d > 85 °C$



HM42 dimensions in mm

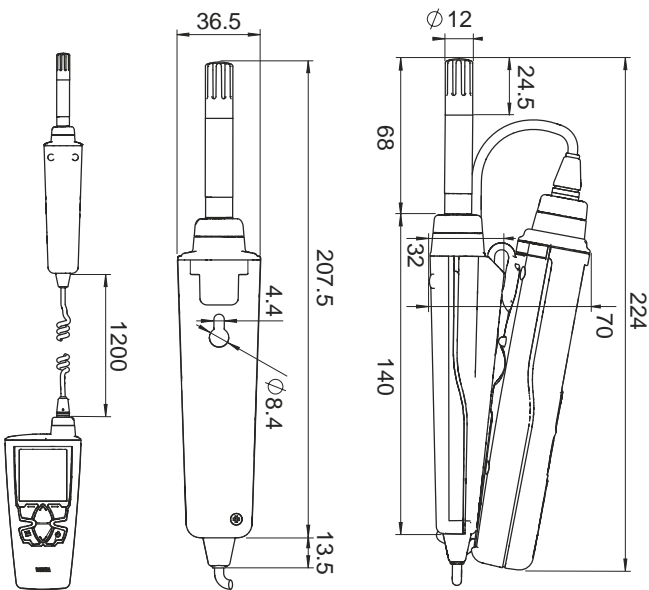


### HM45 Technical Data

Humidity Measurement Accuracy (Including Non-linearity, Hysteresis, and Repeatability):

At 0 ... +40 °C	±1.5 %RH (0 ... 90 %RH)
	±2.5 %RH (90 ... 100 %RH)
At -40 ... 0 °C and +40 ... +60 °C	±3.0 %RH (0 ... 90 %RH)
	±4.0 %RH (90 ... 100 %RH)

Humidity sensor	HUMICAP® 180R
Temperature measurement range	-40 ... +60 °C (-40 ... +140 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Measurement probe	Interchangeable HMP113 with HM40HANDLE
Probe material	PC/ABS plastic blend (white)
IP rating	IP54
Weight (with alkaline batteries)	330 g (11.6 oz)
Filter material	PC (glass-reinforced)
Probe cable length	1200 mm (47 in)



HM45 dimensions in mm



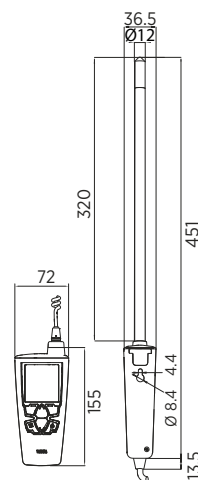
### HM46 Technical Data

Humidity Measurement Accuracy (Including Non-linearity, Hysteresis, and Repeatability):

At 0 ... +40 °C	±1.5 %RH (0 ... 90 %RH)
	±2.5 %RH (90 ... 100 %RH)
At -40 ... 0 °C and +40 ... +80 °C	±3.0 %RH (0 ... 90 %RH)
	±4.0 %RH (90 ... 100 %RH)
At +80 ... +100 °C	±4.0 %RH <sup>1)</sup>

Humidity sensor	HUMICAP® 180R
Temperature measurement range	-40 ... +100 °C (-40 ... +212 °F), short-term up to +180 °C (+356 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Measurement probe	HM46PROBE
Probe head material	Stainless steel, brass filter
IP rating	IP40 (probe), IP54 (indicator)
Weight (with alkaline batteries)	490 g (17.3 oz)
Filter material	Sintered brass
Probe cable length	1500 mm (59 in)

<sup>1)</sup> Not recommended for  $T_g > 85$  °C



HM46 dimensions in mm

# HM40 Series Technical Data

## Measurement Performance

Calculated parameters	Dew point, wet bulb temperature, absolute humidity, mixing ratio, enthalpy
<b>Relative Humidity</b>	
Measurement range	0 ... 100 %RH
Accuracy (including non-linearity, hysteresis, and repeatability) for different models at 0 ... +40 °C (+32 ... +104 °F)	±1.5 %RH (0 ... 90 %RH) ±2.5 %RH (90 ... 100 %RH)
Factory calibration uncertainty at +20 °C (+68 °F):	
HM42 and HM46	±1.5 %RH
HM41 and HM45	±1.1 %RH (0 ... 90 %RH) ±1.8 %RH (90 ... 100 %RH)
Stability	±2 %RH over 2 years
Humidity Measurement Response Time:	
(90 %) with plastic grid filter (HM41 and HM45)	17 s
(90 %) with membrane filter and steel grid (HM42)	26 s
(90 %) with brass sintered filter (HM46)	40 s
<b>Temperature</b>	
Accuracy over temperature range:	
At 0 ... +40 °C (+32 ... +104 °F)	±0.2 °C (0.36 °F)
At -40 ... 0 °C and +40 ... +100 °C (-40 ... +32 °F and +104 ... +212 °F)	±0.4 °C (0.72 °F)

## Operating Environment

<b>Operating temperature</b>	
Indicator	-10 ... +60 °C (+14 ... +140 °F)
Probe handle	-40 ... +60 °C (-40 ... +140 °F)
Probe head	Range -40 ... +180 °C (-40 ... +356 °F) See probe specifications
Storage temperature	-30 ... +70 °C (-22 ... +158 °F)
EMC compliance	EN61326-1, Portable Equipment

## Mechanical Specifications

<b>Materials</b>	
Indicator body	PC/ABS blend, acrylic display lens
Probe holder	PC/ABS blend (gray)
Probe handle	PC/ABS blend (white), PC/ABS blend (gray, HM45) or PBT (gray, HM42/46)
HMP113 probe or probe measurement head	PC/ABS blend (white, HM41/45) or stainless steel (HM42/46)
IP rating, HM40	IP54

## Indicator

Display	LCD (140 x 160 pixels)
Power-up time	< 3 s
Batteries	2 × AA, 1.5 V
Operation time (typical)	100 hours (without backlight)
Menu languages	English, Chinese (simplified), Finnish, French, German, Japanese, Portuguese, Russian, Spanish, Swedish

## Spare Parts and Accessories

<b>Indicator</b>	
Spare HM40 indicator	HM40INDI
Belt clip (3 pcs)	227710SP
Battery cover (3 pcs)	225688SP
NiMH rechargeable batteries (4 pcs)	229247SP
External battery recharger with USB connection and 4 batteries	229249SP
Case for short HM40 probes	235849SP
Case for long HM40 probes	DRW242351SP
<b>Standard Probe (HM41)</b>	
HMP113 probe for HM40	HMP113 (configuration: V00B2C1A0)
Plastic locking bushing (3 pcs) for attaching HMP113 probe to HM40 indicator	DRW238590SP
Plastic grid filter for HMP113 probe	DRW236214SP
Plastic grid with membrane filter for HMP113 probe	230727SP
<b>HM42 Probe (HM42)</b>	
Thin 4 mm diameter probe for HM40	HM42PROBE
Steel grid filter for HM42PROBE	19867HM
Membrane tube set (5 pcs) for HM42PROBE	19858HM
Rubber sleeve set (10 pcs) for HM42PROBE	19809HM
Calibration adapter for HM42PROBE	HM37067
<b>Remote Probe (HM45)</b>	
HMP113 probe for HM40	HMP113 (configuration: V00B2C1A0)
Plastic locking bushing (3 pcs) for attaching HMP113 probe to HM40 indicator	DRW238590SP
HM40 handle and cable	HM40HANDLE
Plastic grid filter for HMP113 probe	DRW236214SP
Plastic grid with membrane filter for HMP113 probe	230727SP
<b>HM46 Probe (HM46)</b>	
Stainless steel 12 mm diameter probe for HM40	HM46PROBE
Sintered filter for HM46PROBE	0195
Optional membrane filter for HM46PROBE (up to +80 °C)	10159HM
Plastic grid filter for HM46PROBE (up to +80 °C)	6221
Disposable sleeve, 50 pcs set	1558
Probe holder	HM36915



### HUMICAP sensor's unique benefits

- Excellent long-term stability and repeatability
- Insensitive to dust and most chemicals
- Fast response time
- Sensor heating
- Full recovery from condensation
- The most reliable and accurate humidity measurement

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.

Today, Vaisala is a leading provider of humidity measurement probes to multiple industries and in many applications. Relative humidity sensors are now an industry standard. Here is how it started.

### We need to fix this

Up until the early 1970s, hair hygrometers were widely used despite the unreliable humidity measurements they provided. To address this, Vaisala embarked on the development of a novel humidity sensor employing semiconductors and thin-film materials.

### HUMICAP is born

At the CIMO VI congress in 1973, Vaisala introduced the HUMICAP, the world's first thin-film capacitive humidity sensor. This groundbreaking innovation revolutionized humidity measurements. The HUMICAP sensor had no moving parts and thanks to the advanced utilization of semiconductor and thin-film technologies, it was amazingly small in size.

### From one company's invention to a global standard

Since then, Vaisala has emerged as the market leader in relative humidity measurements, and thin-film capacitive humidity sensors have transcended being one company's invention to a global industry standard.

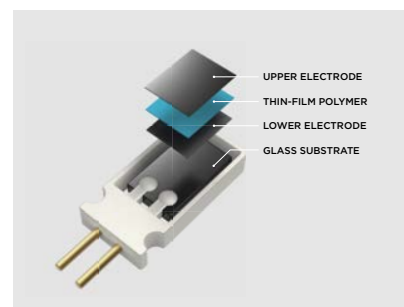
### How it works

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 electrode facing ambient air is made of porous metal to protect the sensor 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.



Structure of the HUMICAP sensor

### Constantly evolving

HUMICAP is not only a sensor, it is a solution to many challenging measurement positions and conditions. HUMICAP is in Vaisala's core and we develop it constantly.



Family of HUMICAP sensors

### Condensation prevention technology with warmed probe

One of Vaisala's innovations in the humidity measurement field includes warmed probe technology for the toughest high humidity environments.

Saturation in the environment causes condensation to form on all surfaces including measurement sensors, which can be fatal for some technologies. A warmed probe keeps the sensor continuously above the ambient temperature, ensuring condensation never forms. With Vaisala's solution, relative humidity measurement is possible in these conditions with an additional Indigo520 transmitter.

### HUMICAP applications

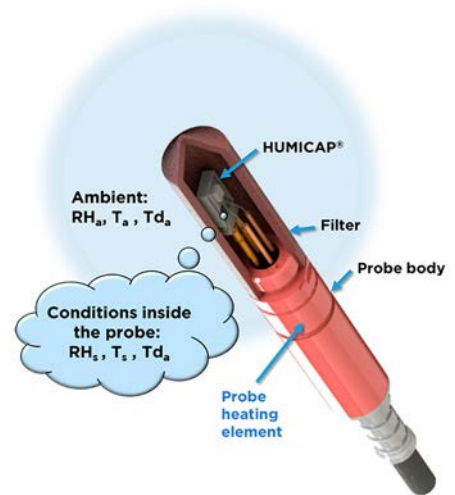
Even though the HUMICAP innovation was originally designed for a new type of a radiosonde, the word got around about reliable humidity measurements, and created a growing demand in many industries and applications. Today we offer everything you need for [measuring](#)

[humidity](#), with a wide range of humidity instruments covering applications from HVAC to the most demanding industrial applications, both indoors and outdoors.

### If it works on Mars, it works anywhere

The unforgiving conditions in space pose strict demands on technology, requiring the most reliable sensors that can be trusted to endure without repair. You simply cannot venture out into these conditions with just any instrumentation. Therefore, the HUMICAP products were a natural selection to measure conditions on the planet Mars since 1990s.

## How to select the right humidity instrument for your high-humidity application



High-humidity environments are tough for humidity measurement. Saturation in the environment causes condensation to form on all surfaces including measurement sensors, which can be fatal for some technologies. While Vaisala HUMICAP® technology can withstand condensation, it still needs time to recover from the effects of moisture before it can once again provide reliable measurements. Typical applications where high humidity or occasional condensing are expected include drying processes, test chambers, combustion air humidifiers, meteorological measurements, and fuel cells.

Keeping measurements accurate and reliable even in condensing environments calls for Vaisala's condensation prevention technology. A warmed probe keeps the sensor continuously above the ambient temperature, ensuring condensation never forms. The disadvantage of probe heating is that relative humidity can no longer be measured because the sensor is heated up above the ambient

temperature. In this state, independent humidity parameters can be measured, such as dew point or mixing ratio. However, it is also possible to measure relative humidity using an additional temperature sensor with our Indigo520 transmitter.

### Operating principle

The heating element inside the probe body heats the entire probe. In the illustration above, the probe and filter are glowing red to illustrate how the probe warming keeps the microclimate inside the filter at an elevated temperature. The actual temperature is only a few degrees above the ambient temperature, as seen in the following example:

#### Ambient conditions:

- $T_a = 14\text{ °C}$
- $RH_a = 97\text{ \%RH}$
- $Td_a = 13\text{ °C}$

#### HMP7 warmed probe:

- $T_s = 16\text{ °C}$
- $RH_s = 83\text{ \%RH}$
- $Td_a = 13\text{ °C (calculated)}$

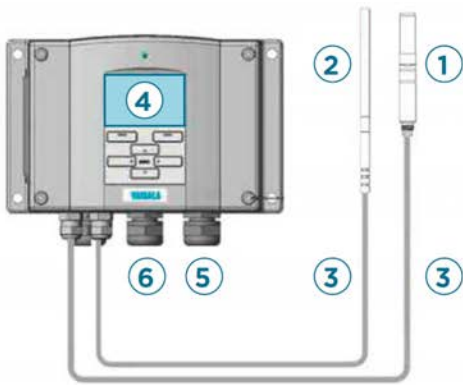
As shown in this example, heating does not affect dew point.

Dew point is the temperature where condensation begins, or where the relative humidity would be 100 %, if the air was cooled.

The 'relative' in relative humidity expresses the relation between the amount of water vapor present and the maximum amount that is physically possible at that temperature.

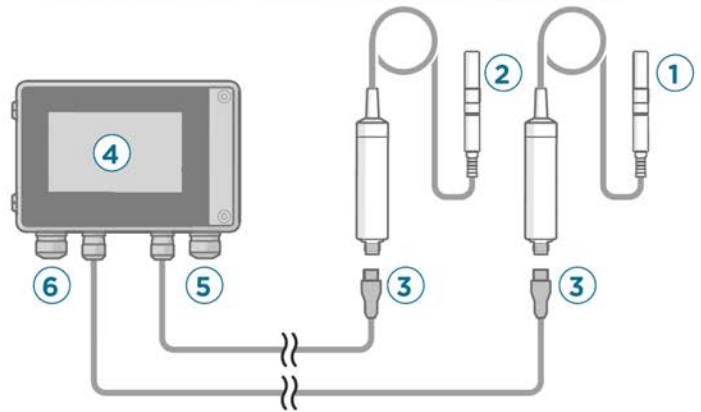
**Note:** The HMP7 warm probe mode when used by itself will only output dew point temperature digitally (Modbus RTU over RS-485) or offer analog outputs when combined with any Indigo Transmitter. If relative humidity and temperature are desired, then the separate ambient temperature probe (TMPI) must be ordered with the Indigo520 transmitter to calculate humidity from the dew point and temperature readings.

## HMT337 Transmitter Components



1. Warmed Humidity Probe (Dew point output)
2. Temperature Probe
3. Fixed Cables from Probe to Transmitter
  - Options for 2,5,10 and 20m lengths
4. Transmitter
  - Options for display or no display
5. Input Power Cable Gland
  - Options for 24Vac/dc, 100-240 Vac
6. Output Signals Cable Gland
  - 2 or 3 Analog outputs
  - RS-232 or RS-485 or LAN
  - 2 Relays
  - HM70 Compatible service port

## INDIGO520 Transmitter Components



1. HMP7 Warmed Humidity Probe (Dew point output)
2. TMP1 Temperature Probe
3. Fixed Cables from Probe to Transmitter
  - Options for 1,3,5 and 10m lengths
4. Transmitter
  - Options for display or no display
5. Input Power Cable Gland
  - Options for 24Vac/dc, 100-240 Vac, PoE+
6. Output Signals Cable Gland
  - 4 Analog outputs
  - Ethernet Modbus TCP/IP
  - 2 Relays
  - Built in Webserver
  - Service port\*\*
  - Analog input\*\*
  - \*\*To be added

### Conversion from HMT337WP (Warmed Probe) to an INDIGO solution

For current high humidity applications using the HMT337WP, we recommend using our Indigo520 transmitter with the TMP1 and HMP7 probes with condensation prevention mode turned on. The new Indigo platform is built on the same measurement technology as its predecessor. The most significant and widely desired feature of the Indigo platform is the interchangeability of the smart probes. Many functionalities that were traditionally inside the transmitter are now built into the smart probe

instead, allowing for field swapping and cross-functional located configurations. The following pictures illustrate the basic components of the previous and new instruments. The probe head dimensions, filters, and installation accessories are identical, which means that, the measurement HMP7 humidity probe fits the same process connection as the HMT337 probe.

### History of warm probe technology

Warmed probe technology was first developed by Vaisala over 25 years ago to address difficult outdoor humidity measurements for meteorological applications and then modified for industrial applications. In industrial applications with high-humidity, the temperature can change faster resulting in condensing conditions. The warmed probe technology eliminates downtime due to condensation and provides continuous measurement at condensing or saturating conditions.

## Products

The 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. TMP1 is designed for demanding temperature measurements in industrial applications, where accuracy and robustness are essential. HMP7 is designed for applications that involve constant high humidity or rapid changes in humidity, where measurement performance and chemical tolerance are essential. Together, this system can provide you with consistently accurate readings that you can trust. Please reference the below table that highlights their features.

Product	HMP7 probe	TMP1 probe	Indigo201 + HMP7	Indigo520 + TMP1 & HMP7	HMT317 probe	HMM170 module
<b>Probe warming</b>	Yes	Used for temp. compensation	Configurable	Configurable	Configurable	Configurable
<b>IP rating</b>	IP66	IP66	IP65	IP66	IP66	N/A
<b>Ambient temperature sensor allows RH calculation</b>	<sup>1)</sup> Possible with external temperature measurement	No	No	<sup>2)</sup> Configurable	No	<sup>1)</sup> Possible with external temperature measurement
<b>Available measurement parameters</b>	$T_d, T_{df}, X, \text{ppm}, p_w$ <sup>1)</sup> (RH, T, a, $T_w, P_{ws}, h, dT$ )	T	<sup>2)</sup> $T_d, T_{df}, X, P_w$	$T_d, T_{df}, X, P_w$ <sup>2)</sup> (RH, T, a, $T_w, P_{ws}, h, dT$ )	$T_d, T_{df}, X, P_w$	$T_d, T_{df}, X, \text{ppm}, p_w$ <sup>1)</sup> (RH, T, a, $T_w, P_{ws}, h, dT$ )
<b>Supply voltage</b>	18 ... 30 V DC	10 ... 35 V DC	Configurable: 10 ... 35 V DC, 24 V AC	Configurable: 10 ... 35 V DC, 24 V AC, 100 ... 240 V AC, 50/60 Hz	10 ... 35 V DC	15 ... 35 V DC
<b>Digital output</b>	RS-485: Modbus RTU	RS-485: Modbus RTU	None	Modbus TCP/IP, web based interface	RS-232: serial ASCII	RS-485: Modbus RTU
<b>Analog output</b>	None	None	3 × assignable analog outputs	4 × assignable analog outputs	2 ×	3 ×
<b>Display</b>	No	No	Optional	Optional	No	No
<b>Parametrization</b>	Insight software	Insight software	273956 or USB-C	Touch screen or LAN	Terminal program (e.g. PuTTY)	Insight software
<b>USB cable</b> (sold separately)	242659 or USB2	242659 or USB2	None, USB-C	219690 or USB2	238607	219690

1) Relative humidity calculation is possible by writing external temperature information on a Modbus register.

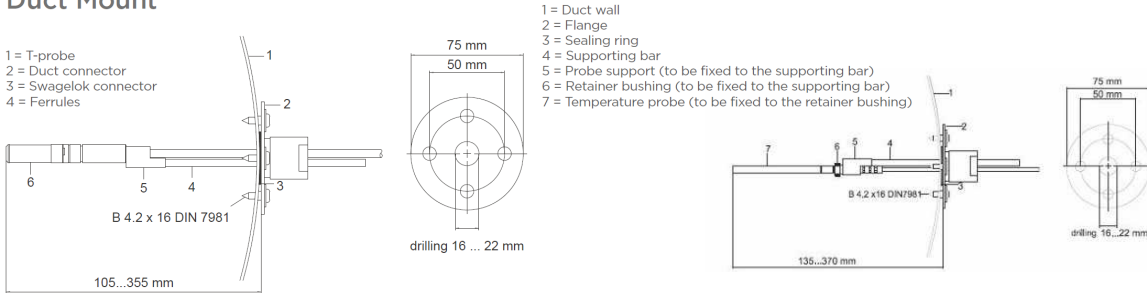
2) Configurable: additional temperature probe needed.



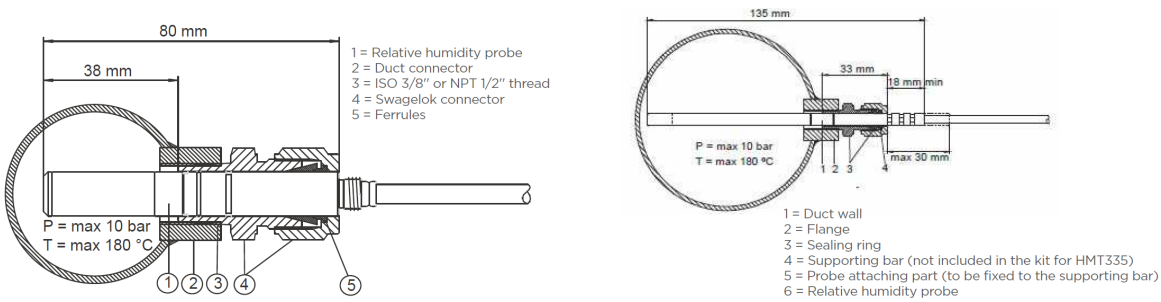
## Probe installation

Depending on the application, there are different mounting accessories available:

### Duct Mount

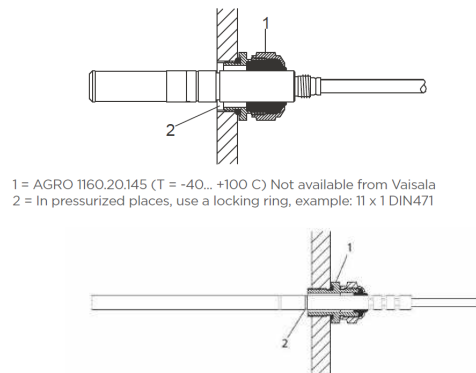
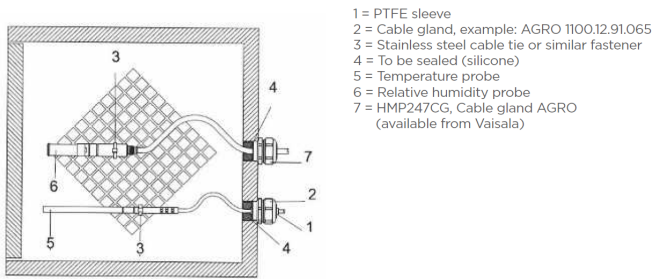


### Duct installation kit 210697 (215003 for HMT337 temperature probe)



Pressure-tight Swagelok installation kits **SWG12ISO38** with ISO3/8" or **SWG12NPT12** with NPT1/2" thread (SWG6ISO18 with ISO1/8" or SWG6NPT18 with NPT1/8" thread for HMT337 temperature probe).

### Example of Climate Chamber Installation



**HMP247CG:** Vapor-tight installation with cable gland.

## Insulation and leak-proof process connections

Choosing where to install a humidity probe can be challenging when there is high humidity combined with temperature variation.

For example, in a drying application where the exhaust air humidity is close to saturation (95 %RH) and the temperature is 40 °C, what happens when the sensor head is installed so that the filter is in the process and half of the sensor is in the 25 °C ambient temperature? In this situation even probe warming may not be able to compensate for the heat loss caused by thermal conduction through the metallic probe body; the heat loss will form a cold spot on the process side and condensation will result in inaccurate measurement. The solution here is to thoroughly insulate the probe.

If the process gas is colder than the ambient air it is critical to have a tight process connection for the probe. A leaking connection will allow warm and possibly humid air into the system, which can condensate near the sensor and cause measurement problems.

## Extreme conditions, such as PEM fuel cell applications

There are also extreme applications where warming just few degrees above the ambient temperature is just not enough. One example of such application is a Polymer Electrode Membrane (PEM) Fuel cell. Application specific configurations can be found in the order forms of the HMP7 and HMT310 series. These configuration versions are designed to withstand the extreme conditions by heating the probe head at a higher power. It is also possible to use

HMP7 and HMM170 in these applications, since the heating functionalities are freely configurable with the Insight PC software.

## Summary

Sensor saturation can be avoided in high-humidity and condensing conditions by using an instrument that has probe warming technology. In addition to this, proper insulation and leak-free installation guarantees the best possible environment for reliable humidity measurement.

The comparison table in this document will help you to choose the right product for your application. More detailed product information and features can be found in datasheets, user manuals, and order forms.

## HMP1 Wall-Mounted Humidity and Temperature Probe

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 Indigo300 and Indigo200 series transmitters to form a single wall-mounted unit.



### Features

- Compact size
- RH accuracy up to  $\pm 1.0$  %RH
- Temperature accuracy up to  $\pm 0.2$  °C (0.36 °F)
- Temperature measurement range -40 ... +60 °C (-40 ... +140 °F)
- Sensor purge improves long-term stability and chemical resistance
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products and Insight PC software
- Traceable calibration certificate: 6 points for humidity, 1 point for temperature

### Flexible connectivity

The probe can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://www.vaisala.com/insight).

For more information on the Indigo product family, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

### Sensor purge minimizes effects of contaminants

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

Sensor 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 a 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.

### Use with Indigo transmitters

With an Indigo300 or 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 transmitter and turn the locking wheel to hold the probe in place. Probe settings can be configured through the transmitter.



HMP1 with Indigo200 series



Probe holder

# Technical data

## Measurement performance

### Relative humidity

Measurement range	0-100 %RH
Accuracy at +23 °C (+73.4 °F) <sup>1) 2)</sup>	±1.0 %RH (0-90 %RH)
Factory calibration uncertainty <sup>3)</sup>	±0.7 %RH (0-40 %RH) ±1 %RH (40-95 %RH)

T<sub>63</sub> response time <sup>4)</sup> 21 s

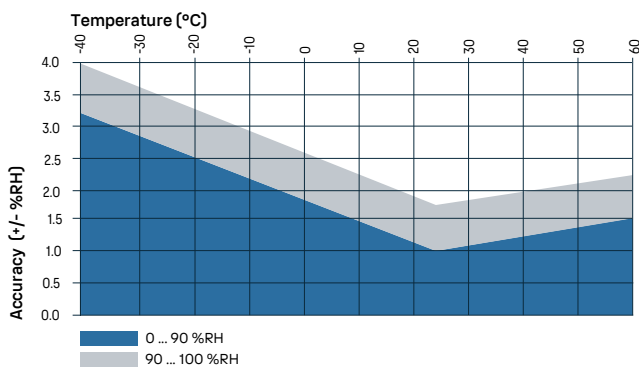
Sensor HUMICAP® I

### Temperature

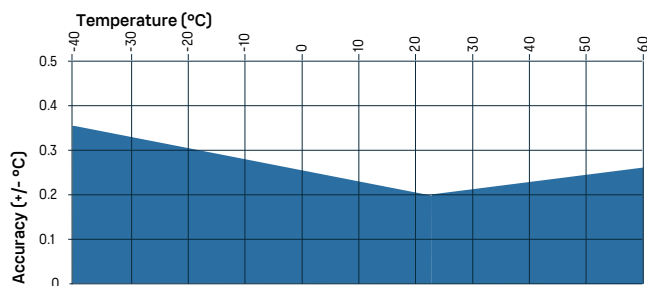
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy at +23 °C (+73.4 °F) <sup>1) 2)</sup>	±0.2 °C (±0.36 °F)
Factory calibration uncertainty <sup>3)</sup>	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)

T<sub>63</sub> response time <sup>4)</sup> 70 s

- 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.
- 4) In still air.



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 <sup>1)</sup>
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

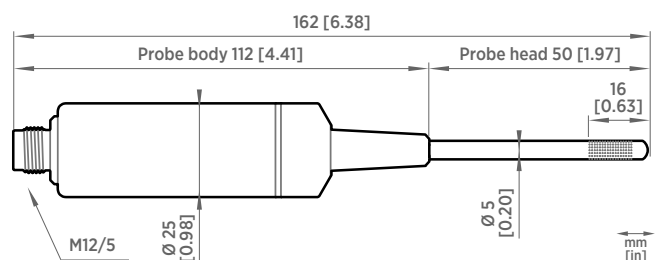
Absolute humidity (g/m <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>v</sub> )
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
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

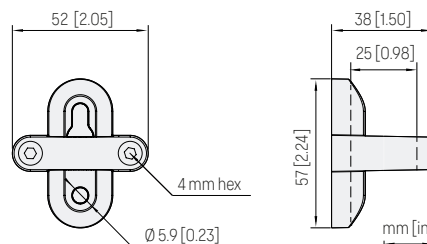
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, RCM

## Mechanical specifications

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



### HMP1 probe dimensions



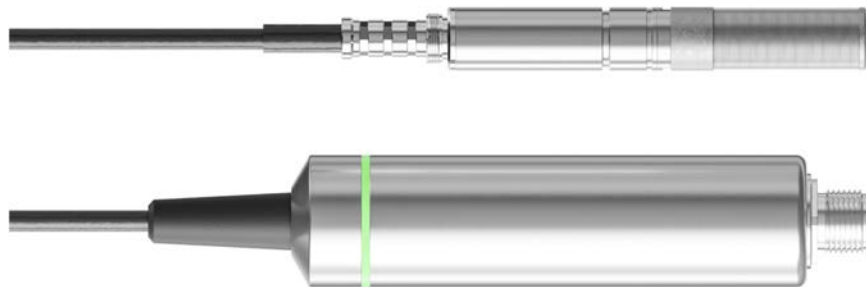
### Probe holder ASM213582 dimensions

## Accessories

Indigo USB adapter <sup>1)</sup>	USB2
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- 1) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).

## HMP3 General Purpose Humidity and Temperature Probe



### 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)
- Sensor purge improves long-term stability and chemical resistance
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products 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 the probe suitable for applications such as paint booths and other industrial applications where periodic recalibration alone is not sufficient for maintaining the probe performance. Other 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

### Sensor purge available with composite sensors

If purchased with a composite sensor instead of the field-replaceable HUMICAP® R2 sensor, HMP3 can use the sensor purge feature. In environments

with high concentrations of chemicals and cleaning agents, sensor purge helps to maintain measurement accuracy between calibration intervals.

Sensor 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

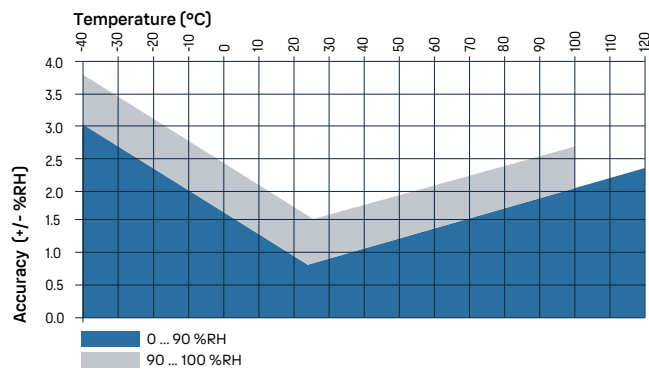
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

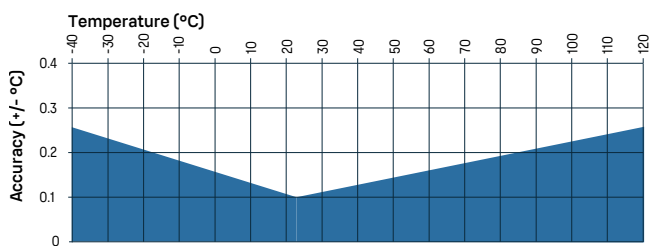
## Measurement performance

Relative humidity	
Measurement range	0–100 %RH, at max. +95 °C (203 °F) T <sub>d</sub>
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.8 %RH (0–90 %RH)
Factory calibration uncertainty <sup>2)</sup>	±0.5 %RH (0–40 %RH) ±0.8 %RH (40–95 %RH)
T <sub>63</sub> response time	15 s
Sensor options	HUMICAP® R2 HUMICAP® R2C <sup>3)</sup> HUMICAP® 180VC <sup>3) 4)</sup>
Temperature	
Sensor	Pt100 RTD Class F0.1 IEC 60751
Measurement range	–40 ... +120 °C (–40 ... +248 °F)
Accuracy <sup>1)</sup>	±0.1 °C (±0.18 °F)
Factory calibration uncertainty <sup>2)</sup>	±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) Sensor purge feature available with this sensor.  
 4) H<sub>2</sub>O<sub>2</sub> 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 body	–40 ... +80 °C (–40 ... +176 °F)
Operating temperature of probe head	–40 ... +120 °C (–40 ... +248 °F)
Operating humidity of probe head	Max. +100 °C (212 °F) T <sub>d</sub>
Storage temperature	–40 ... +80 °C (–40 ... +176 °F)
Operating environment	Suitable for outdoor use
Measurement environment	For air, nitrogen, hydrogen, argon, helium, and oxygen <sup>1)</sup>
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 <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>v</sub> )
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
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 and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Type approvals	DNV GL certificate no. TAA00002YT
Compliance marks	CE, China RoHS, RCM



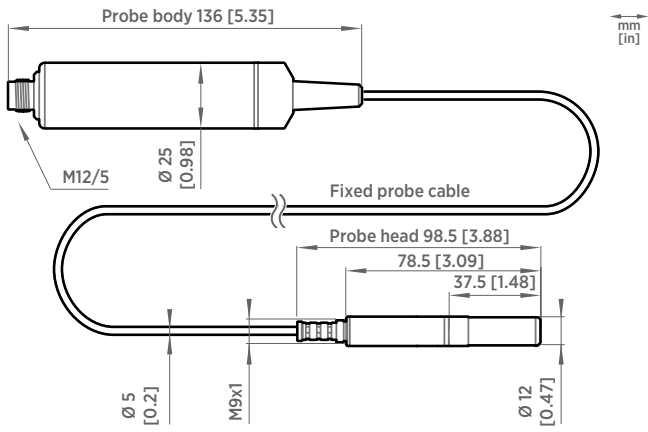
## Mechanical specifications

Connector	M12 5-pin A-coded male
Weight (with a 2-m cable)	302 g (10.65 oz)
Probe cable length	0.15 m (0.49 ft), 2 m (6.56 ft), 5 m (16.40 ft) or 10 m (32.80 ft)
Materials	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP

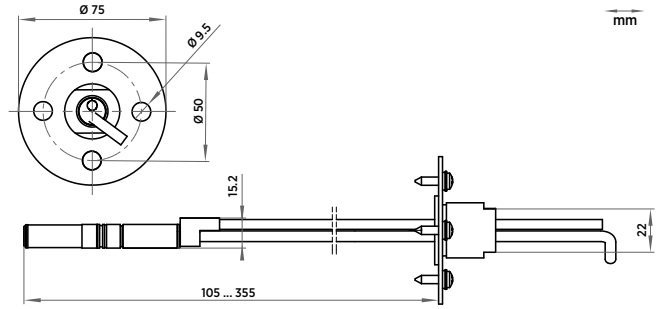
## Accessories

Duct installation kit for humidity probe	210697
Solar radiation shield DTR502B	DTR502B
Cable gland M20×1.5 with split seal	HMP247CG
Magnetic probe holder for Ø 12 mm probe heads <sup>1)</sup>	ASM213382SP
Indigo USB adapter <sup>2)</sup>	USB2

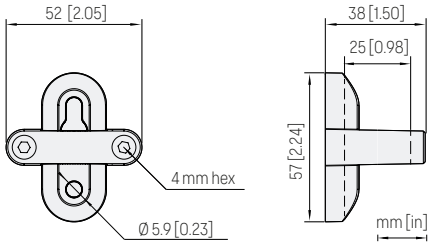
- 1) Not suitable for use at extreme temperatures.  
 2) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).



HMP3 probe dimensions



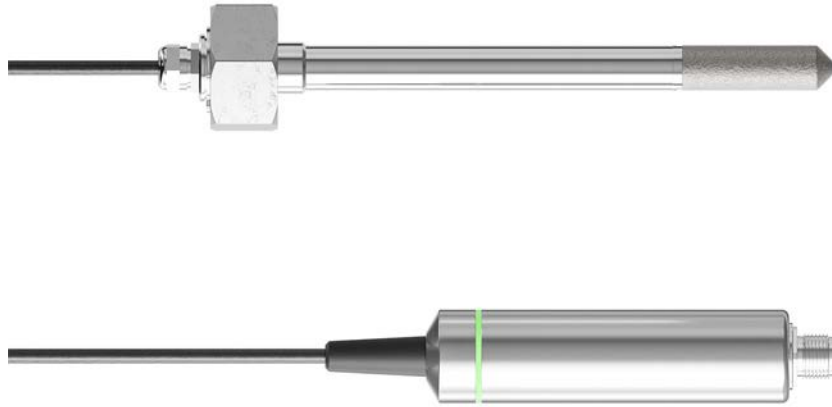
Duct installation kit 210697 dimensions with probe



Probe holder ASM213582 dimensions

## HMP4 Relative Humidity and Temperature Probe

For pressurized and vacuum processes



### Features

- RH accuracy up to  $\pm 0.8$  %RH
- Temperature accuracy up to  $\pm 0.1$  °C ( $\pm 0.18$  °F)
- Temperature measurement range  $-70 \dots +180$  °C ( $-94 \dots +356$  °F)
- Operating pressure 0–100 bar
- Sensor purge improves long-term stability and chemical resistance
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products 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.

### Sensor purge minimizes effects of contaminants

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

The sensor 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).



# Technical data

## Measurement performance

### Relative humidity

Measurement range 0–100 %RH, at max. +95 °C (203 °F)  $T_d$

Accuracy at +23 °C (+73.4 °F) <sup>1)</sup> ±0.8 %RH (0–90 %RH)

Factory calibration uncertainty <sup>2)</sup> ±0.5 %RH (0–40 %RH)  
±0.8 %RH (40–95 %RH)

$T_{63}$  response time 15 s

Sensor options HUMICAP® R2  
HUMICAP® R2C <sup>3)</sup>

### Temperature

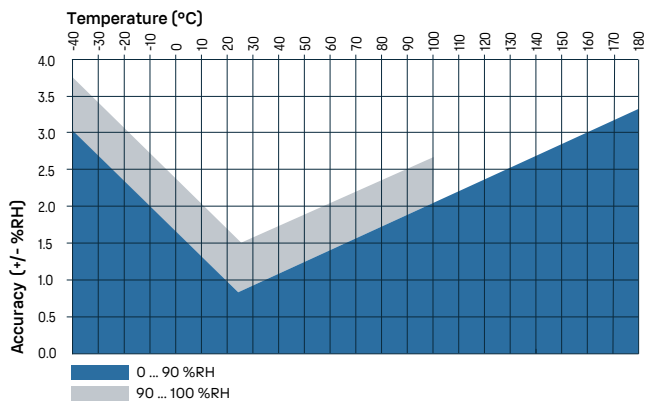
Measurement range –70 ... +180 °C (–94 ... +356 °F)

Accuracy <sup>1)</sup> ±0.1 °C (±0.18 °F)

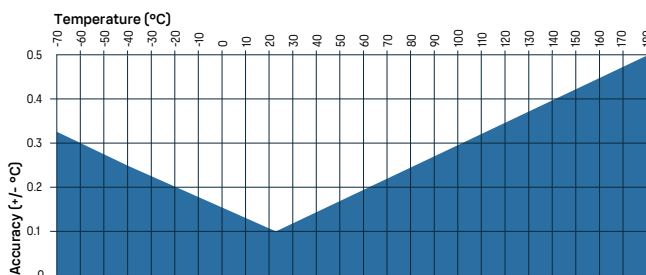
Factory calibration uncertainty <sup>2)</sup> ±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)

Sensor Pt100 RTD Class FO.1 IEC 60751

- <sup>1)</sup> Defined against calibration reference. Including non-linearity, hysteresis, and repeatability.  
<sup>2)</sup> Defined as ±2 standard deviation limits. Small variations possible; see calibration certificate.  
<sup>3)</sup> Sensor 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)

Operating humidity of probe head Max. +100 °C (212 °F)  $T_d$

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

Operational pressure < 100 bar

Operating environment Suitable for outdoor use

Measurement environment For air, nitrogen, hydrogen, argon, helium, oxygen, and vacuum <sup>1)</sup>

IP rating of probe body IP66

<sup>1)</sup> 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<sup>3</sup>) Relative humidity (%RH)

Absolute humidity at NTP (g/m<sup>3</sup>) Relative humidity (dew/frost) (%RH)

Dew point temperature (°C) Temperature (°C)

Dew/frost point temperature (°C) Water concentration (ppm<sub>v</sub>)

Dew/frost point temperature at 1 atm (°C) Water concentration (wet basis) (vol-%)

Dew point temperature at 1 atm (°C) Water mass fraction (ppm<sub>w</sub>)

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 and regulations EMC Directive (2014/30/EU)

RoHS Directive (2011/65/EU) as amended by 2015/863

Electromagnetic compatibility (EMC) 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 (with a 2-m cable) 530 g (18.7 oz)

Probe cable length 2 m (6.56 ft)

### Materials

Probe AISI 316

Probe body AISI 316

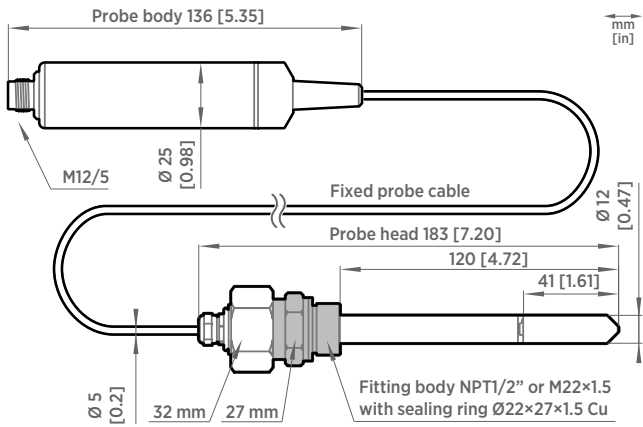
Cable jacket FEP

## Accessories

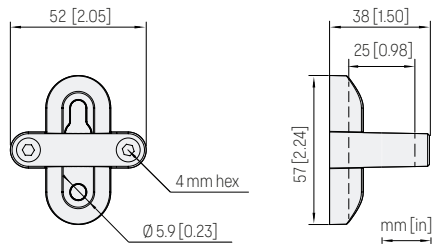
Indigo USB adapter <sup>1)</sup> USB2

Calibration adapter for HMK15 211302SP

<sup>1)</sup> Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).



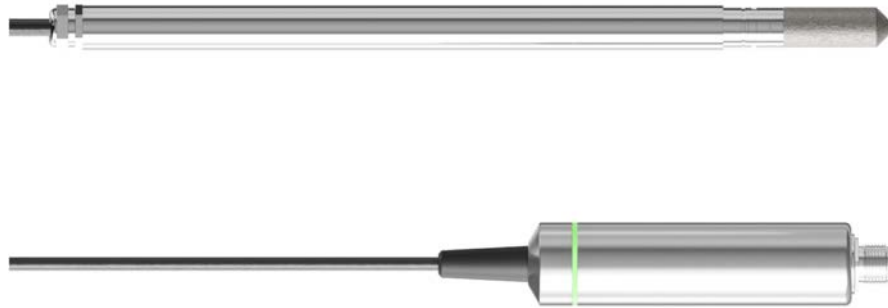
HMP4 probe dimensions



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  $\pm 0.1$  °C ( $\pm 0.18$  °F)
- Temperature measurement range  $-70 \dots +180$  °C ( $-94 \dots +356$  °F)
- Operating temperature of probe body  $-40 \dots +80$  °C ( $-40 \dots +176$  °F)
- Sensor purge improves long-term stability and chemical resistance
- Modbus® RTU over RS-485
- 250-mm (9.84 in) probe allows easy process installation through insulation
- Compatible with Vaisala Indigo products 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.

### Sensor purge minimizes effects of contaminants

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

Sensor 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

### Relative humidity

Measurement range 0–100 %RH, at max. +95 °C (203 °F)  $T_d$

Accuracy at +23 °C (+73.4 °F) <sup>1)</sup> ±0.8 %RH (0–90 %RH)

Factory calibration uncertainty <sup>2)</sup> ±0.5 %RH (0–40 %RH)  
±0.8 %RH (40–95 %RH)

$T_{63}$  response time 15 s

Sensor options HUMICAP® R2  
HUMICAP® R2C <sup>3)</sup>

### Temperature

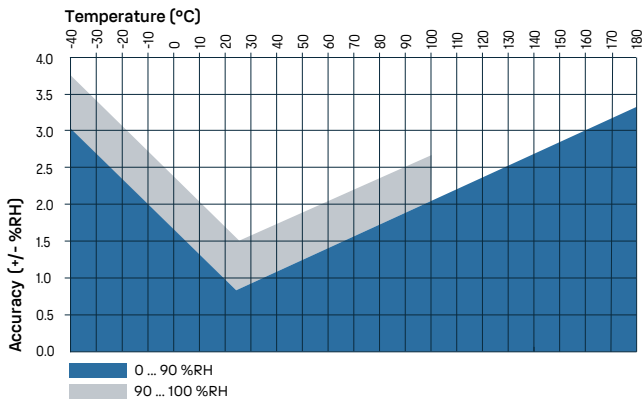
Measurement range –70 ... +180 °C (–94 ... +356 °F)

Accuracy at +23 °C (+73.4 °F) <sup>1)</sup> ±0.1 °C (±0.18 °F)

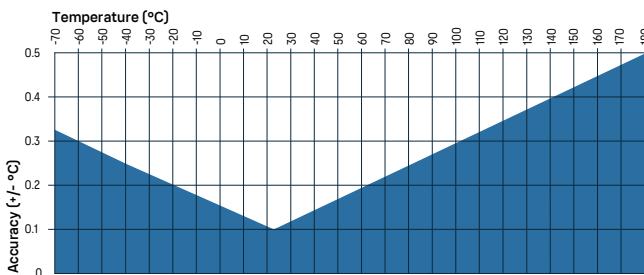
Factory calibration uncertainty <sup>2)</sup> ±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)

Sensor Pt100 RTD Class FO.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) Sensor 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 humidity of probe head Max. +100 °C (212 °F)  $T_d$

Storage temperature –40 ... +80 °C (–40 ... +176 °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<sup>3</sup>) Relative humidity (%RH)

Absolute humidity at NTP (g/m<sup>3</sup>) Relative humidity (dew/frost) (%RH)

Dew point temperature (°C) Temperature (°C)

Dew/frost point temperature (°C) Water concentration (ppm<sub>w</sub>)

Dew/frost point temperature at 1 atm (°C) Water concentration (wet basis) (vol-%)

Dew point temperature at 1 atm (°C) Water mass fraction (ppm<sub>w</sub>)

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 and regulations EMC Directive (2014/30/EU)

RoHS Directive (2011/65/EU) as amended by 2015/863

Electromagnetic compatibility (EMC) 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 (with a 2-m cable) 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

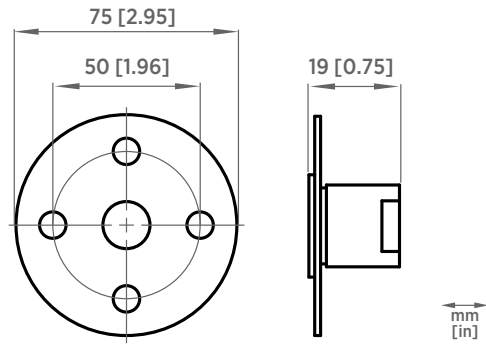
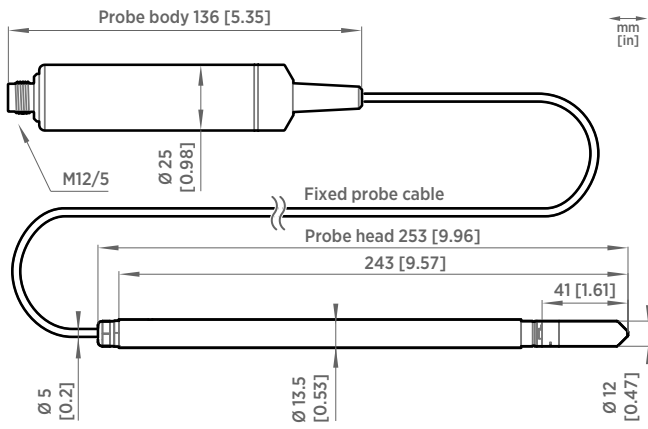
## Accessories

Mounting flange 210696

Indigo USB adapter <sup>1)</sup> USB2

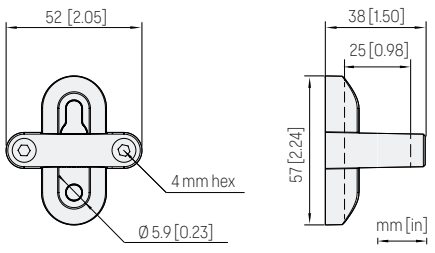
Calibration adapter for HMK15 211302SP

- <sup>1)</sup> Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).



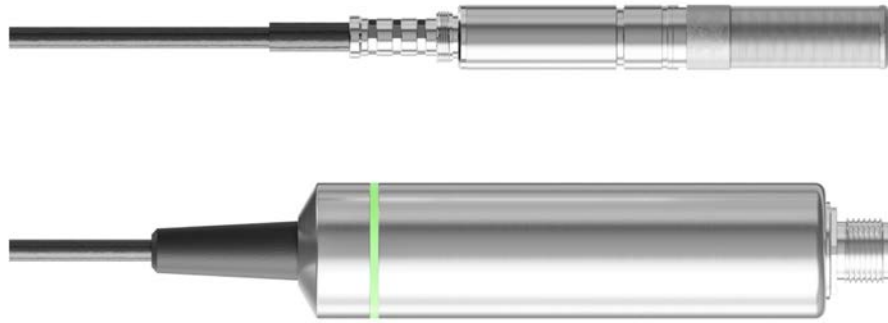
Mounting flange 210696 dimensions

HMP5 probe 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  $\pm 0.1$  °C ( $\pm 0.18$  °F)
- Temperature measurement range  $-70 \dots +180$  °C ( $-94 \dots +356$  °F)
- Vapor and pressure proof construction
- Condensation prevention with probe heating
- Sensor purge improves long-term stability and chemical resistance
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products 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.

### Flexible connectivity

The probe can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

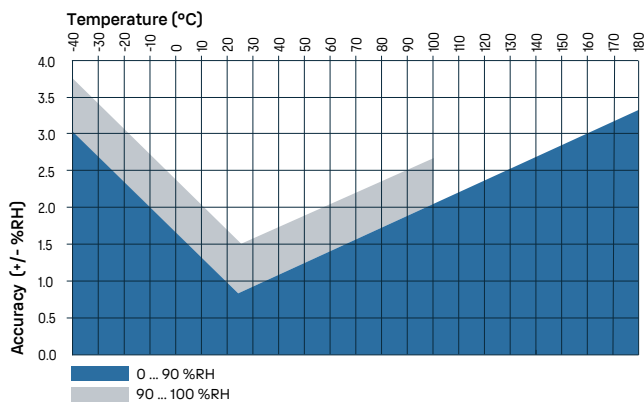
### Relative humidity

Measurement range	0–100 %RH, at max. +95 °C (203 °F) T <sub>d</sub>
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.8 %RH (0–90 %RH)
Factory calibration uncertainty <sup>2)</sup>	±0.5 %RH (0–40 %RH) ±0.8 %RH (40–95 %RH)
T <sub>63</sub> response time	15 s
Sensor options	HUMICAP® R2 HUMICAP® R2C <sup>3)</sup> HUMICAP® 180VC <sup>3) 4)</sup>

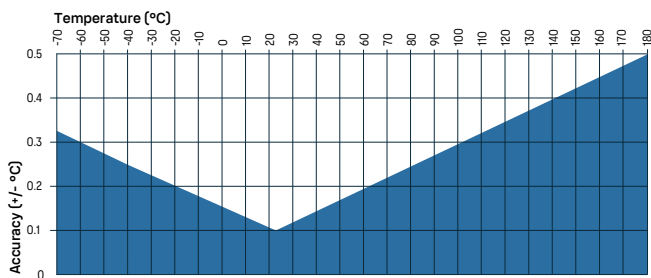
### Temperature

Measurement range	–70 ... +180 °C (–94 ... +356 °F)
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.1 °C (±0.18 °F)
Factory calibration uncertainty <sup>2)</sup>	±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) Sensor purge feature available with this sensor.  
 4) H<sub>2</sub>O<sub>2</sub> 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)
Operating humidity of probe head	Max. +100 °C (212 °F) T <sub>d</sub>
Storage temperature	–40 ... +80 °C (–40 ... +176 °F)
Operational pressure	< 10 bar
Operating environment	Suitable for outdoor use
Measurement environment	For air, nitrogen, hydrogen, argon, helium, oxygen, and vacuum <sup>1)</sup>
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 <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>v</sub> )
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
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 and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	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 (with a 2-m cable)	310 g (10.9 oz)
Probe cable length	0.15 m (0.49 ft), 2 m (6.56 ft) or 10 m (32.80 ft)

### Materials

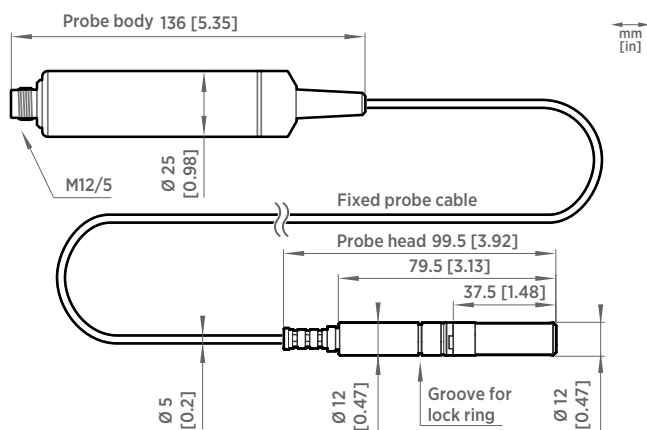
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP

## Accessories

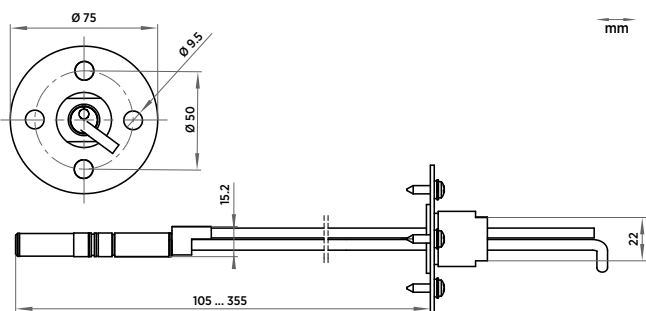
Duct installation kit for humidity probe	210697
Solar radiation shield DTR502B	DTR502B
Warmed probe accessory	HMT330WPA
Cable gland M20×1.5 with split seal	HMP247CG
Swagelok® for 12 mm probe, 1/2" ISO thread	SWG12ISO12
Swagelok® for 12 mm probe, 3/8" ISO thread	SWG12ISO38
Swagelok® for 12 mm probe, 1/2" NPT thread	SWG12NPT12
Magnetic probe holder for Ø 12 mm probe heads <sup>1)</sup>	ASM213382SP
Indigo USB adapter <sup>2)</sup>	USB2
Calibration adapter for HMK15	211302SP

1) Not suitable for use at extreme temperatures.

2) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).



HMP7 probe dimensions

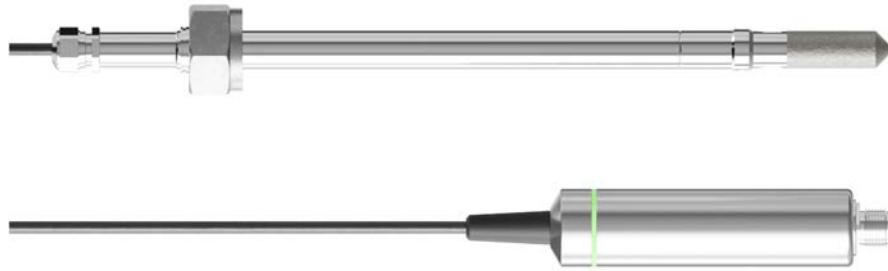


Duct installation kit 210697 dimensions with probe



## HMP8 Relative Humidity and Temperature Probe

For pressurized and vacuum processes



### Features

- RH accuracy up to  $\pm 0.8$  %RH
- Temperature accuracy up to  $\pm 0.1$  °C ( $\pm 0.18$  °F)
- Operating pressure 0–40 bar
- Temperature measurement range  $-70 \dots +180$  °C ( $-94 \dots +356$  °F)
- Sensor purge improves long-term stability and chemical resistance
- Probe installation depth can be freely adjusted and probe can be hot-swapped from pressurized pipelines with an optional ball valve kit
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products 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.

### Sensor purge minimizes effects of contaminants

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

Sensor 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

### Relative humidity

Measurement range 0–100 %RH, at max. +95 °C (203 °F) T<sub>d</sub>

Accuracy at +23 °C (+73.4 °F)<sup>1)</sup> ±0.8 %RH (0–90 %RH)

Factory calibration uncertainty<sup>2)</sup> ±0.5 %RH (0–40 %RH)  
±0.8 %RH (40–95 %RH)

T<sub>63</sub> response time 15 s

Sensor options HUMICAP® R2  
HUMICAP® R2C<sup>3)</sup>

### Temperature

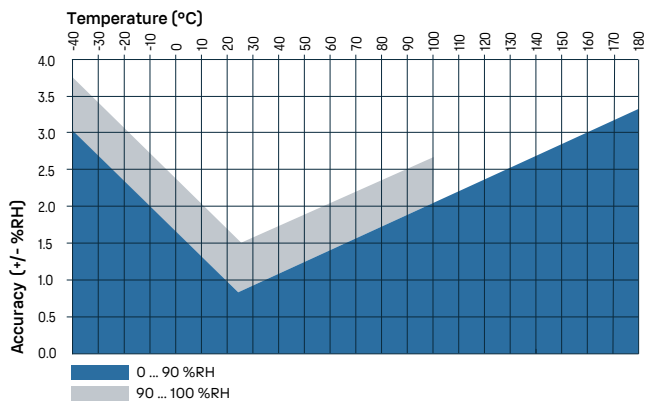
Measurement range –70 ... +180 °C (–94 ... +356 °F)

Accuracy at +23 °C (+73.4 °F)<sup>1)</sup> ±0.1 °C (±0.18 °F)

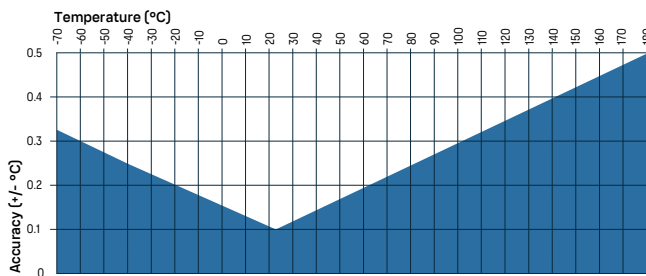
Factory calibration uncertainty<sup>2)</sup> ±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)

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) Sensor 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)

Operating humidity of probe head Max. +100 °C (212 °F) T<sub>d</sub>

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

Operational pressure < 40 bar

Operating environment Suitable for outdoor use

Measurement environment For air, nitrogen, hydrogen, argon, helium, oxygen, and vacuum<sup>1)</sup>

IP rating of probe body IP66

### Ball valve

Operating temperature Up to +100 °C (+212 °F)

Operating pressure Up to 40 bar (580 psi), absolute

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<sup>3</sup>) Relative humidity (%RH)

Absolute humidity at NTP (g/m<sup>3</sup>) Relative humidity (dew/frost) (%RH)

Dew point temperature (°C) Temperature (°C)

Dew/frost point temperature (°C) Water concentration (ppm<sub>v</sub>)

Dew/frost point temperature at 1 atm (°C) Water concentration (wet basis) (vol-%)

Dew point temperature at 1 atm (°C) Water mass fraction (ppm<sub>w</sub>)

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 and regulations EMC Directive (2014/30/EU)

RoHS Directive (2011/65/EU) as amended by 2015/863

Electromagnetic compatibility (EMC) EN 61326-1, industrial environment

Type approvals DNV GL certificate no. TAA00002YT

Compliance marks CE, China RoHS, RCM



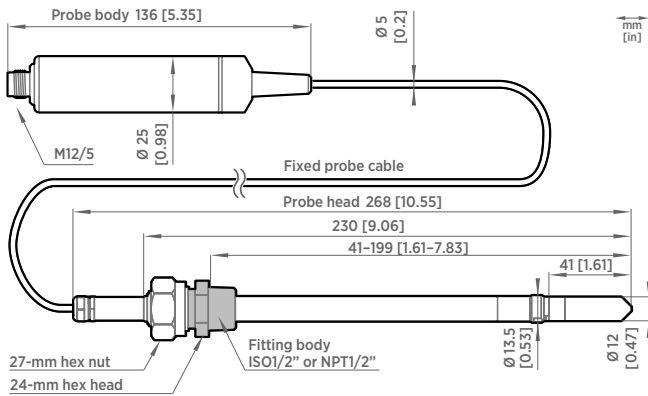
## Mechanical specifications

Connector	M12 5-pin A-coded male
Probe fitting	ISO1/2" and NPT1/2" fittings included
Weight (with a 2-m cable)	512 g (18.1 oz)
Probe cable length	2 m (6.56 ft) or 10 m (32.80 ft)
<b>Materials</b>	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP

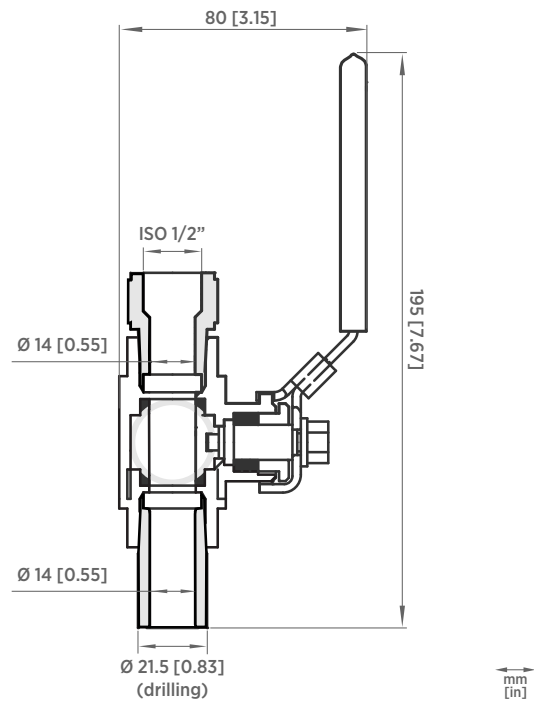
## Accessories

Ball valve kit ISO 1/2" with welding joint	BALLVALVE-1
Indigo USB adapter <sup>1)</sup>	USB2
Calibration adapter for HMK15	211302SP
Weatherproof carrying case for Indigo80 and a series 8 probe <sup>2)</sup>	ASM215318

1) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).  
 2) For example, MMP8, HMP8, or DMP8 with a max. 2-m (6.6-ft) probe connection cable.



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 improves long-term stability and chemical resistance
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products 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

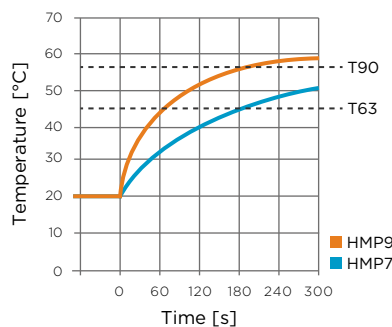
Vaisala HUMICAP® Humidity and Temperature Probe HMP9 is designed for easy installation into rapidly changing environments where fast response time, measurement performance, and chemical tolerance are essential.

### 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 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

### Sensor purge minimizes effects of contaminants

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

Sensor 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://www.vaisala.com/insight).

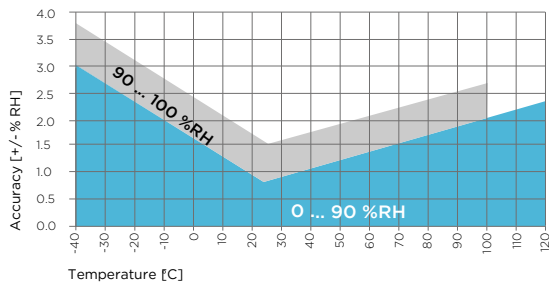
For more information on the Indigo product family, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

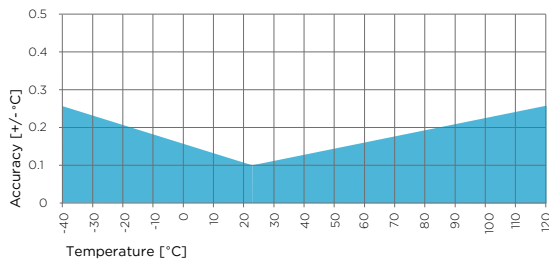
## Measurement performance

Relative humidity	
Measurement range	0–100 %RH, at max. +95 °C (203 °F) T <sub>d</sub>
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.8 %RH (0–90 %RH)
Factory calibration uncertainty <sup>2)</sup>	±0.7 %RH (0–40 %RH) ±1 %RH (40–95 %RH)
T <sub>63</sub> response time <sup>3)</sup>	15 s
Sensor	HUMICAP® I
Temperature	
Measurement range	–40 ... +120 °C (–40 ... +248 °F)
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.1 °C (±0.18 °F)
Factory calibration uncertainty <sup>2)</sup>	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)
T <sub>63</sub> response time <sup>3)</sup>	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)
Operating humidity of probe head	Max. +100 °C (212 °F) T <sub>d</sub>
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 <sup>1)</sup>
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 <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>w</sub> )
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
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 and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, RCM

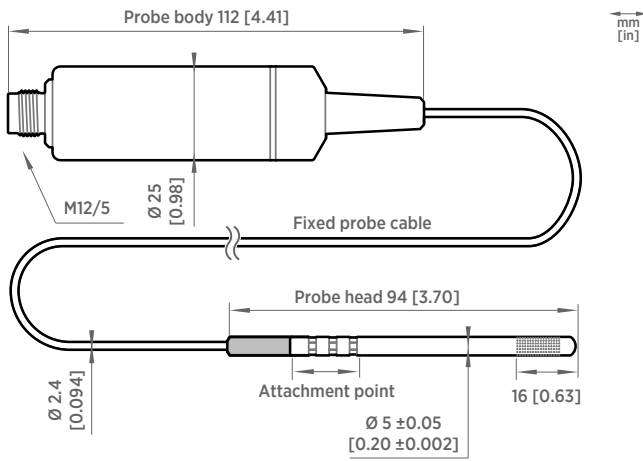
## Mechanical specifications

Connector	M12 5-pin A-coded male
Weight (with a 2-m cable)	68 g (2.40 oz)
Probe cable length	2 m (6.56 ft)
Materials	
Probe	AISI 316L
Probe body	PBT
Cable overmolds	FEP

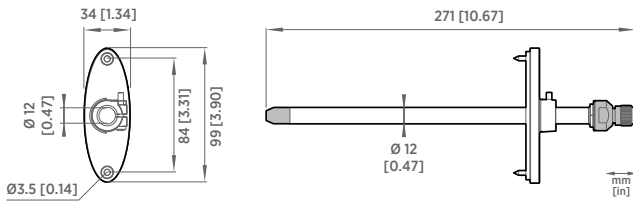
## Accessories

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 <sup>1)</sup>	USB2

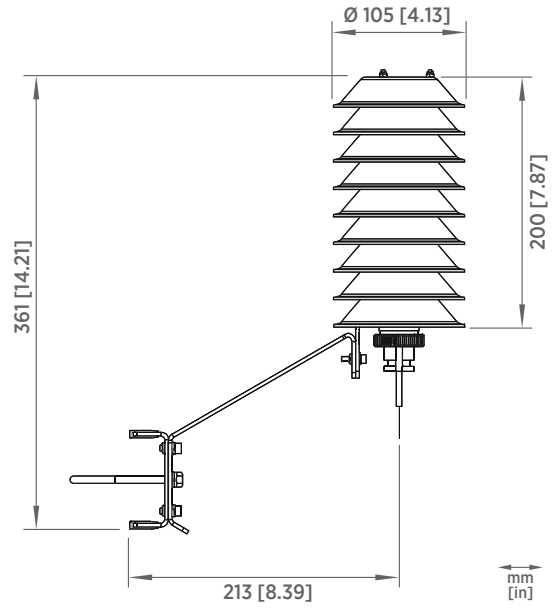
- 1) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).



HMP9 probe dimensions



HMP9 Duct Installation Kit ASM214055 dimensions



Solar Radiation Shield DTR502B dimensions



### Features

- Temperature accuracy up to  $\pm 0.1$  °C ( $\pm 0.18$  °F)
- Temperature measurement range  $-70 \dots +180$  °C ( $-94 \dots +356$  °F)
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see [www.vaisala.com/indigo](http://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.

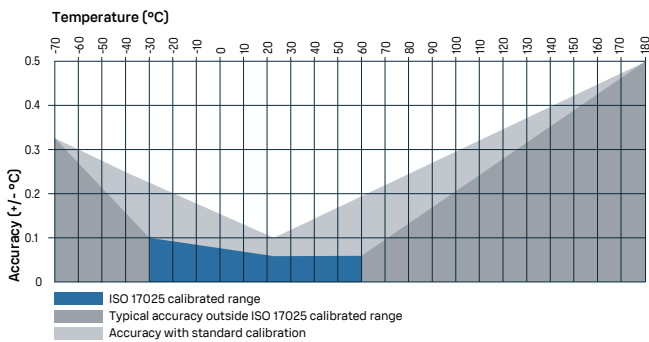
When the humidity probe is heated above dew point temperature, condensation can be avoided and the relative humidity in the actual process temperature can be back-calculated based on the true process temperature measurement received from TMP1.

# Technical data

## Measurement performance

Measurement range	-70 ... +180 °C (-94 ... +356 °F)
Sensor	Pt100 RTD Class F0.1 IEC 60751
<b>Standard calibration <sup>1)</sup></b>	
Accuracy at +23 °C (+73.4 °F)	±0.1 °C (±0.18 °F)
Factory calibration uncertainty <sup>2)</sup>	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)
<b>Optional ISO 17025 calibration <sup>3)</sup></b>	
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.06 °C (±0.108 °F)
Calibration uncertainty <sup>2)</sup>	±0.03 °C (±0.054 °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) Accuracy depends on selected calibration points. Accuracy with ISO 17025 calibration is defined here using a 5-point calibration in the following points: -30, -10, 0, +30, and +60 °C. For more information on calibration services offered by Vaisala, see [vaisala.com/calibration](http://vaisala.com/calibration).



## 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)
Storage temperature	-40 ... +80 °C (-40 ... +176 °F)
Operating environment	Suitable for outdoor use
<b>IP rating</b>	
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)

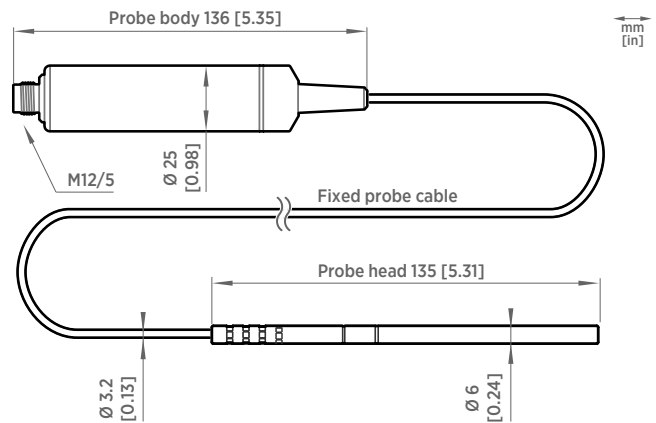
## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	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 (with a 2-m cable)	224 g (7.9 oz)
Probe cable length	2 m (6.56 ft) or 10 m (32.8 ft)
<b>Materials</b>	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP



## TMP1 probe dimensions

## Accessories

Duct installation kit for temperature 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 <sup>1)</sup>	USB2

<sup>1)</sup> Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).



## HMT370EX Series Intrinsically Safe Humidity and Temperature Transmitters

For operation in up to Zone 0 / 20



### Features

- Intrinsically safe (Ex i) for operation in up to Zone 0 / 20
- Measures RH and T, and outputs an extensive range of calculated parameters
- Designed for harsh conditions
- Temperature range between  $-70 \dots +180 \text{ }^{\circ}\text{C}$  ( $-94 \dots +356 \text{ }^{\circ}\text{F}$ ) depending on the probe option
- Vaisala HUMICAP® sensor features high accuracy, excellent long-term stability, and negligible hysteresis
- Display options: graphical LCD display and non-display model
- Traceable calibration (certificate included)
- Compatible with Vaisala Insight PC software

Vaisala HMT370EX Series HUMICAP® Humidity and Temperature Transmitters are the ideal solution for measuring humidity in hazardous areas. The intrinsically safe and robust transmitter operates safely and reliably even in the most hazardous classifications, such as Zone 0. The HMT370EX transmitter series can be used as a replacement of the long-running HMT360 transmitter series.

### Interchangeable probes and detachable probe module

HMT370EX offers several probe options for different applications:

- HMP371 — wall mount
- HMP373 — confined spaces
- HMP374 — pressurized spaces
- HMP375 — high temperature
- HMP377 — high humidity
- HMP378 — pressurized pipelines

For information on the HMP378F and HMP378H probe variants for oil and JET A-1 fuel moisture and temperature measurement, see [HMP378F and HMP378H Datasheet \(B212512EN\)](#).

HMP371 and HMP373 can be ordered as temperature-only versions.

Thanks to the detachable probe module, probes can be easily replaced and removed for calibration outside the hazardous area without removing the entire transmitter. Attaching new probes involves minimal reconfiguration, as up-to-date settings can be restored from the transmitter.

### Intrinsically safe and robust

The entire HMT370EX transmitter can be installed directly in hazardous areas. It can withstand continuous exposure to potentially explosive environments that contain flammable gases or dust. Operation in either gas or dust environments requires no additional protective enclosures. A rugged design,

combined with trouble-free operation, ensures a long-term solution for monitoring humidity and dew point in potentially explosive environments.

### Easy configuration access with local display and Insight PC software

Output configuration and measurement calibration and adjustment can be carried out directly on the local display interface. For additional configuration and monitoring options, you can connect the transmitter to Vaisala Insight PC software with an accessory USB cable. The probe and transmitter body can be connected to Insight for configuration either together as one unit or separately.

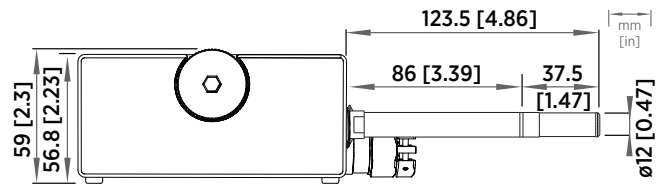
# Interchangeable probes for HMT370EX intrinsically safe humidity and temperature transmitter

## HMP371 for wall mounting

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



HMP371 probe shown with a stainless steel netting filter



HMP371 dimensions

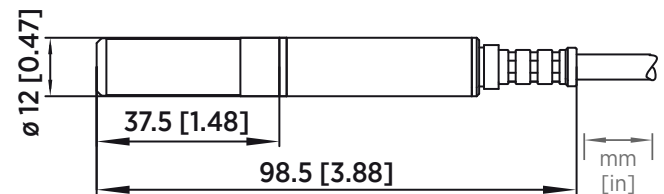
## HMP373 for confined spaces

Temperature range with Teflon cable	-40 ... +120 °C (-40 ... +248 °F)
Temperature range with rubber cable	-40 ... +80 °C (-40 ... +176 °F)
Probe cable length	2, 5, or 10 meters (6 ft 7 in, 16 ft 5 in, 32 ft 10 in)
Probe diameter	12 mm (0.47 in)

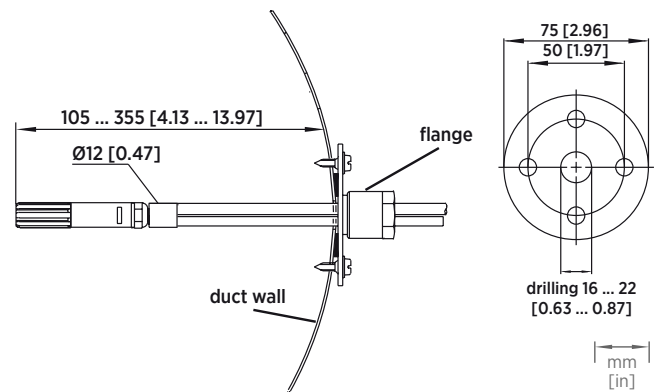
<b>Installation</b>	
Duct installation kit	210697
Cable gland M20x1.5 with splitting seal	HMP247CG
Swagelok for 12mm probe, 1/2" NPT thread	SWG12NPT12



The small-sized HMP373 probe fits into tight spaces: shown connected with a Teflon cable



HMP373 dimensions



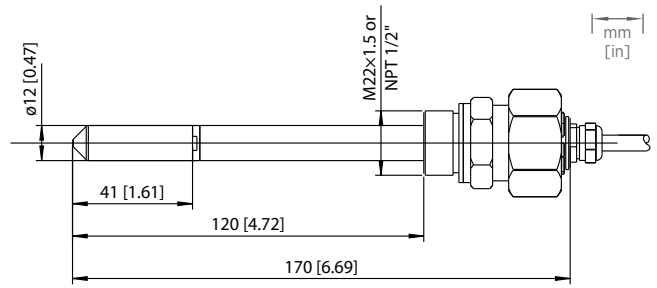
Left: Installation kit for duct mounting dimensions. Right: Installation flange dimensions. Aluminum or stainless steel.

### HMP374 for high pressure

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



HMP374 is designed for measurement in pressurized spaces or vacuum chambers



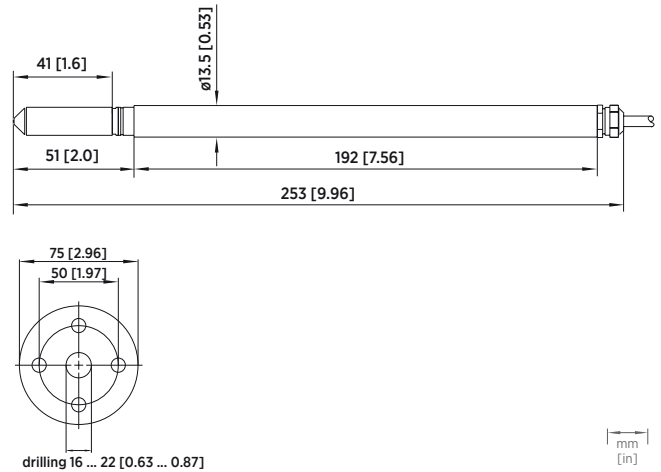
HMP374 dimensions

### HMP375 for high temperature

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



HMP375 is designed for high temperature environments



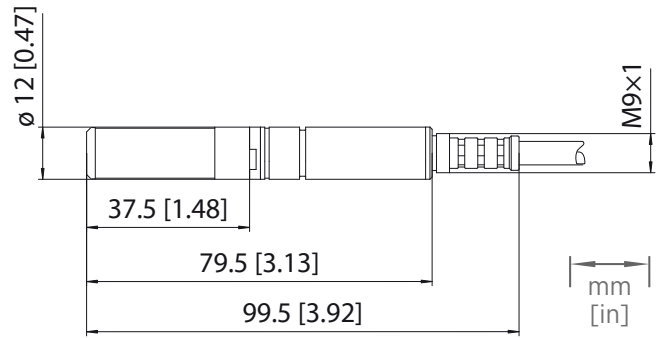
HMP375 probe and stainless steel installation flange dimensions

### HMP377 for high humidities

Temperature range	-70 ... +180 °C (-94 ... +356 °F)
Pressure range	0-1 MPa
Probe cable length	2, 5, or 10 meters (6 ft 7 in, 16 ft 5 in, 32 ft 10 in)
Probe diameter	12 mm (0.47 in)
<b>Installation</b>	
Duct installation kit	210697
Cable gland M20x1.5 with splitting seal	HMP247CG
Swagelok for 12 mm probe, 3/8" ISO thread	SWG12ISO38
Swagelok for 12 mm probe, 1/2" NPT thread	SWG12NPT12



HMP377 is constructed to be installed in environments with high humidities



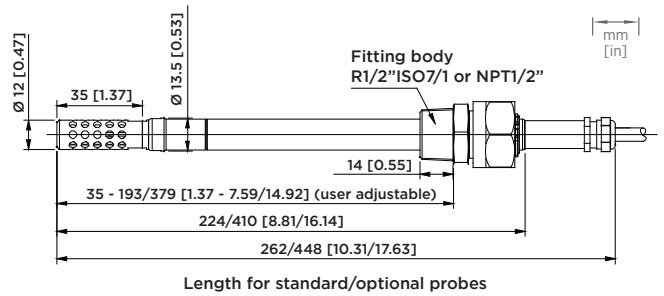
HMP377 dimensions

### HMP378 for pressurized pipelines

Temperature range	-70 ... +180 °C (-94 ... +356 °F)
Pressure range	0-4 MPa
Probe cable length	2, 5, or 10 meters (6 ft 7 in, 16 ft 5 in, 32 ft 10 in)
Probe diameter	13.5 mm / 12 mm (0.53 in / 0.47 in)
Available probe lengths	262 mm / 448 mm (10.31 in / 17.6 in)
<b>Installation</b>	
Fitting body ISO1/2 solid structure	DRW212076SP
Fitting body NPT1/2 solid structure	NPTFITBODASP
Ball valve ISO 1/2 with welding joint	BALLVALVE-1



HMP378 enables flexible installation in pressurized pipelines



HMP378 dimensions

# Technical data

## Measurement performance

### Relative humidity

Measurement range	0–100 %RH
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.8 %RH (0–90 %RH)
Factory calibration uncertainty <sup>2)</sup>	±0.5 %RH (0–40 %RH) ±0.8 %RH (40–95 %RH)

T<sub>63</sub> response time 15 s

Sensor options HUMICAP® R2

### Temperature

Measurement range	-70 ... +180 °C (-94 ... +356 °F)
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.1 °C (±0.18 °F)
Factory calibration uncertainty <sup>2)</sup>	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)
Sensor	Pt1000 RTD Class F0.1 IEC 60751

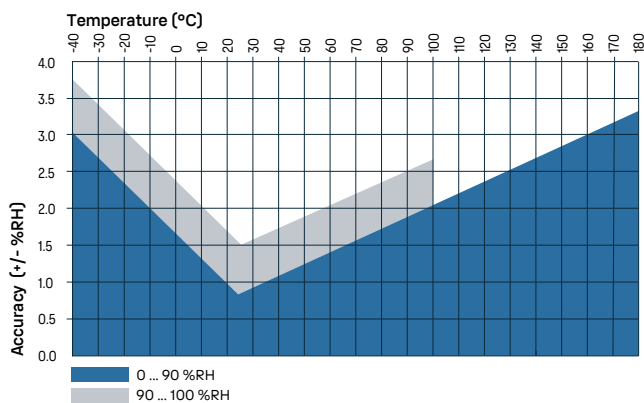
### Other available measurement parameters<sup>3)</sup>

Dew point temperature, dew point / frost point temperature, absolute humidity, mixing ratio, wet-bulb temperature, water concentration, water vapor pressure, water vapor saturation pressure, enthalpy, dew point temperature difference, absolute humidity at NTP, water mass fraction

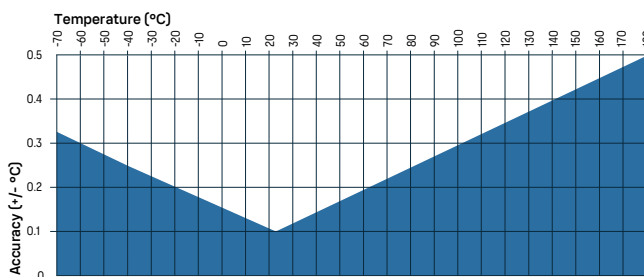
1) Defined against calibration reference. Including non-linearity, hysteresis, and repeatability.

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

3) Parameter options depend on selected probe variant. For specifications, see HMT370EX User Guide (MZ12305EN).



Humidity measurement accuracy as function of temperature



Temperature measurement accuracy over full range

## Operating environment

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

**Note:** Do not install the LCD display model in a location where the transmitter is exposed to direct sunlight.

## Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, RCM

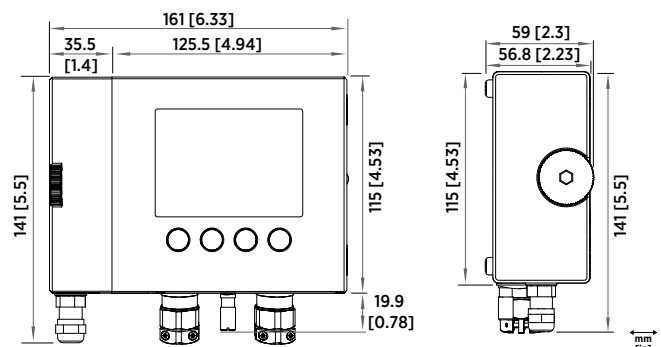
## Inputs and outputs

Operating voltage	12–28 V
Analog outputs	2 outputs (two-wire, 4–20 mA) Connection via safety barriers
Typical accuracy of analog outputs at +20 °C	±0.0625 % full scale
Typical temperature dependence of analog outputs	0.005 % / °C (0.005 % / °F) full scale
Transmitter service port connection	USB cable 219690
Probe service port connection	USB cable USB2
Display options	<ul style="list-style-type: none"> <li>Graphical LCD display</li> <li>Model without display<sup>1)</sup></li> </ul>

1) Recommended when the transmitter is exposed to direct UV light, and for outdoor installations and high-humidity environments.

## Mechanical specifications

Connections	Screw terminals, 0.33–2.0 mm <sup>2</sup> wires (AWG 14–22)
Cable glands	M20×1.5
Conduit fitting	NPT 1/2" and M16
Housing material	EN AW-6082
Housing weight	LCD transmitter: 1500 g (3.3 lb) LED transmitter: 1520 g (3.35 lb) HMP371 fixed probe: 320 g (0.7 lb)
IP rating	With probe connected to the transmitter: <b>IP66</b> With probe detached from the transmitter: <b>IP54</b>



HMT370EX transmitter dimensions

## Ex classifications by region

NOTE: The Ex classifications show the highest level of compliance. Although lower compliance levels are not shown in the classification, they are also included in the classification. For example, compliance with Division 1 also means compliance with Division 2, and compliance with Zone 0 also means compliance with Zone 1 and Zone 2.

### Europe (ATEX)

Gas classification	II 1 G Ex ia IIC T4 Ga
EU (2014/34/EU)	
Dust classification	II 1 D Ex ia IIIC T <sub>200</sub> 85 °C Da
Safety factors	U <sub>i</sub> = 28 VDC, I <sub>i</sub> = 100 mA, C <sub>i</sub> = 12.1 nF, P <sub>i</sub> = 700 mW, L <sub>i</sub> = 16 µH
Environmental specifications	
T <sub>amb</sub>	-40 ... +60 °C (-40 ... +140 °F)
P <sub>amb</sub>	0.8 ... 1.1 bar

### International (IECEx)

Gas classification	Ex ia IIC T4 Ga
Dust classification	II 1 D Ex ia IIIC T <sub>200</sub> 85 °C Da
Safety factors	U <sub>i</sub> = 28 VDC, I <sub>i</sub> = 100 mA, C <sub>i</sub> = 12.1 nF, P <sub>i</sub> = 700 mW, L <sub>i</sub> = 16 µH
Environmental specifications	
T <sub>amb</sub>	-40 ... +60 °C (-40 ... +140 °F)
P <sub>amb</sub>	0.8 ... 1.1 bar

### Japan (CML)

Ex classification	Ex ia IIC T4 Ga Ex ia IIIC T <sub>200</sub> 85°C Da CML 21JPN2417X
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### China (NEPSI)

Ex classification	Ex ia IIC T3-T6 Ga GYJ21.1325X
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### Korea (KCs)

Ex classification	Ex ia IIC T4 Ga Ex ia IIIC T200 85 °C Da -40 °C ≤ Tamb ≤ +60 °C IECEx EESF 20.0044.X 21-KA4BO-0891X, 21-KA4BO-0892X
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### US (FM)

Ex classification	Class I, Zone 0, AEx ia IIC T4 Ga Zone 20, AEx ia IIIC T85°C Da IS Class I, Division 1, Groups A, B, C, and D T4 IS Class II, III, Division 1, Groups E, F, and G T85°C
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### CAN (FM)

HMT370EX equipment rating	Intrinsically safe for: Class I, II, III Division 1, Groups A, B, C, D, E, F, and G, T4 Class I, Zone 0, Ex ia IIC T4 Zone 20, Ex ia IIIC Temperature Code T85°C Ta: -40 °C to +60 °C; IP54 (transmitter alone) IP66 (transmitter with the probe body attached)
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### UK (UKEX)

Ex classification	II 1 G Ex ia IIC T4 Ga II 1 D Ex ia IIIC T200 85 °C Da -40 °C ≤ Tamb ≤ +60 °C CML 21UKEX2316X
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## Transmitter accessory availability

Accessory	Item code	Compatible models
<b>Cable lead-through accessories</b>		
Cable gland M20 x 1.5 for Ø 5–11 mm cable	265207SP	All models
Cable gland M20 x 1.5 for Ø 10–14 mm cable	265208SP	All models
Conduit fitting M16	265243SP	All models
Conduit fitting NPT1/2"	265240SP	All models
Dummy plug (Ex, 2 pcs)	254931SP	All models
<b>Mounting, wiring, cable, and adapter accessories</b>		
HMT360 retrofit mounting plate	DRW253246SP	All models
Turbine mounting kit	HMT300TMK	All models
Outdoor installation kit (weather shield)	215109	All models
USB service cable for transmitter	219690	All models
Zener barrier for 1 channel (with 2 channels, order 2 pcs)	210664	All models
Galvanic isolator for 1 channel	212483	All models
Galvanic isolator for 1 channel	272886SP	All models
Galvanic isolator for 2 channels	272887SP	All models
Calibration adapter for HMK15	211302	HMP371, HMP373, HMP374, HMP377

## Probe spare parts and accessories

Accessory	Item code	Compatible models
M12 Indigo USB Adapter cable accessory for connecting HMT370EX probes to Insight	USB2	All models
Ball valve ISO 1/2 with welding joint <ul style="list-style-type: none"> <li>Pressure range at +20 °C (+68 °F) 0–20 bar (0–290 psi absolute) (during installation max. 10 bar (145 psi absolute))</li> </ul>	BALLVALVE-1	HMP378
Duct installation kit	210697	HMP373, HMP377
Mounting flange	210696	HMP375
Washer set for pressure-tight installation (3 pcs)	4PROBESETSP	HMP374
Cable gland M20×1.5 with split seal	HMP247CG	HMP373, HMP375, HMP377
Fitting body M22×1.5	17223SP	HMP374
Fitting body NPT1/2	17225SP	HMP374
Fitting body ISO1/2 solid structure	DRW212076SP	HMP378
Fitting body NPT1/2 solid structure	212810SP	HMP378
Swagelok fitting for 12 mm probe, 1/2" NPT thread	SWG12NPT12	HMP377
Swagelok fitting for 12 mm probe, 3/8" ISO thread	SWG12ISO38	HMP377
Swagelok fitting for 12 mm probe, 1/2" ISO thread	SWG12ISO12	HMP377
Thread adapter ISO 1/2" to NPT 1/2"	210662SP	All models
Manual press	HM36854SP	HMP378/F/H
Metallized PPS plastic filter grid with stainless steel mesh, for general use (pore size 15 µm)	DRW010281SP	All models
Stainless steel sintered filter (AISI 316L), for general use (pore size 38 µm)	HM47280SP	All models
Metallized PPS plastic filter grid, for fast response in clean environments (6.5 mm gaps)	DRW010276SP	All models
Stainless steel filter for high oil flow applications	220752SP	HMP378/F/H
Stainless steel filter (AISI 303) with PTFE membrane	214848SP	All models
Stainless steel filter for oil and vacuum environments (AISI 303)	HM47453SP	All models

## HMT310 Series Humidity and Temperature Transmitters

For demanding industrial applications



### Features

- 4th generation Vaisala HUMICAP® sensor for superior accuracy and stability
- Full 0 ... 100 %RH measurement, temperature range up to +180 °C (+356 °F), depending on model
- Small size, easy to integrate
- Insensitive to dust and most chemicals
- Two analog signals and RS-232 ASCII output
- Pressure tolerance up to 100 bar

HMT310 incorporates the latest generation Vaisala HUMICAP® sensor. The sensor is a capacitive thin-film polymer sensor providing high accuracy, excellent long-term stability, and negligible hysteresis. It is insensitive to dust, particulate dirt, and most chemicals. HMT310 has various options for different environments and measurements.

### Several Outputs, One Connector

HMT310 is powered up with 10 ... 35 VDC. It has two analog outputs and an RS-232 serial output in one M12 8-pin connector. The output signal and the supply power travel in the same cable, the only cable connected to the unit.

### Chemical Purge

Chemical purge helps to maintain measurement accuracy between calibration intervals. It involves heating the sensor to remove harmful chemicals. The function can be initiated manually or programmed to occur at set intervals.

### A Variety of Features to Choose From

The following optional features and accessories are available for the HMT310 series:

- Warmed probe and sensor heating for high humidity conditions
- Chemical purge for applications risking an interference with chemicals in the measuring environment
- Calculated humidity quantities
- Sensor protection options and probe cable lengths
- Mounting kits
- Rain shield

### Six Models for Demanding Applications

The HMT310 series includes:

- HMT311 for wall mounting
- HMT313 for duct mounting and tight spaces
- HMT314 for high pressures up to 100 bar and vacuum conditions
- HMT315 for high temperatures
- HMT317 for high humidity applications, warmed probe option
- HMT318 for pressurized pipelines up to 40 bar

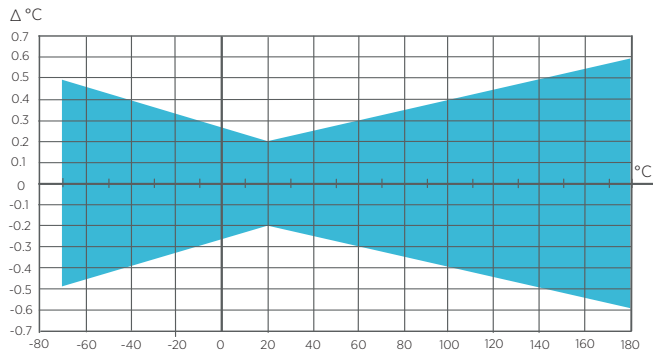


# Technical Data

## Measurement Performance

Relative Humidity	
Measurement range	0 ... 100 %RH
Response time (90 %) at +20 °C (+68 °F) in 0.1 m/s air flow	17 s with grid filter 50 s with grid and steel, netting filter 60 s with sintered filter
Factory calibration uncertainty (+20 °C)	±0.6 %RH (0 ... 40 %RH) <sup>1)</sup> ±1.0 %RH (40 ... 97 %RH) <sup>1)</sup>
Accuracy <sup>2) 3)</sup>	
at +15 ... +25 °C (+59 ... +77 °F)	±1 %RH (0 ... 90 %RH) ±1.7 %RH (90 ... 100 %RH)
at -20 ... +40 °C (-4 ... +104 °F)	±(1.0 + 0.008 x reading) %RH
at -40 ... +180 °C (-40 ... +356 °F)	±(1.5 + 0.015 x reading) %RH
Humidity Sensor Types	
HUMICAP® 180R	Typical applications
HUMICAP® 180RC	Applications with chemical purge/warmed probe
HUMICAP® 180V	Catalytic sensor for H <sub>2</sub> O <sub>2</sub> environments
HUMICAP® 180VC	Catalytic sensor with chemical purge for H <sub>2</sub> O <sub>2</sub> environments
Temperature	
HMT311	-40 ... +60 °C (-40 ... +140 °F)
HMT313	-40 ... +80 °C (-40 ... +176 °F) or -40 ... +120 °C (-40 ... +248 °F)
HMT314, HMT315, HMT317, HMT318	-70 ... +180 °C (-94 ... +356 °F)
Typical accuracy at +20 °C (+68 °F)	±0.2 °C (±0.36 °F)
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751

- 1) Defined as ±2 standard deviation limits. Small variations possible, see also calibration certificate.  
 2) Including non-linearity, hysteresis, and repeatability.  
 3) With HUMICAP® 180V and 180VC sensors, accuracy is not specified below -20 °C (-4 °F) operating temperature.



## Accuracy Over Temperature Range

## Operating Environment

Operating temperature for electronics	-40 ... +60 °C (-40 ... +140 °F)
Storage temperature	-55 ... +80 °C (-67 ... +176 °F)
Operating Pressure	
HMT314	0 ... 100 bar
HMT318	0 ... 40 bar
HMT315, HMT317	0 ... 10 bar
EMC compliance	EN61326-1, Industrial environment

## Inputs and Outputs

Two analog outputs, selectable and scalable	0 ... 20 mA or 4 ... 20 mA 0 ... 5 V or 0 ... 10 V 1 ... 5 V available through scaling
Typical accuracy of analog output at +20 °C	±0.05 % full scale
Typical temperature dependence of analog output	0.005 %/°C (0.003 %/°F) of full scale
Serial output	RS-232C
Connections	M12 8-pin male connector with RS-232C, current/voltage outputs (two channels) and U <sub>in</sub>
Operating voltage	10 ... 35 VDC
External load	R <sub>L</sub> < 500 Ω
Startup time after power-up	3 s
Minimum Operating Voltage	
RS-232C output	10 VDC
Analog output	15 VDC
Probe heating and chemical purge	15 VDC
Pressures above 10 bara (145 psia)	24 VDC
Power Consumption	
RS-232	12 mA
U <sub>out</sub> 10 V (10 kΩ) channel 1 & channel 2	12 mA
I <sub>out</sub> 20 mA (load 511 Ω) channel 1 & channel 2	50 mA
Chemical purge at 24 VDC	+ 220 mA
Warmed probe at 24 VDC	+ 240 mA

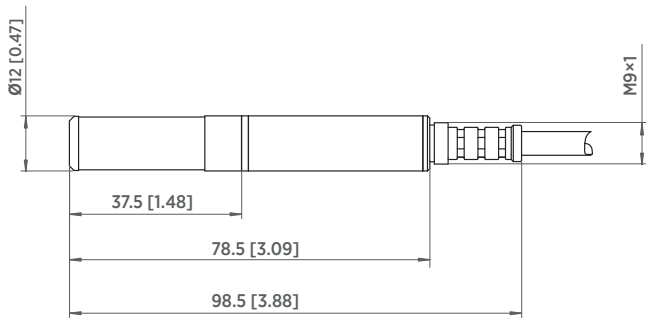
## Mechanical Specifications

Transmitter housing material	G-AISI10Mg
Transmitter base material	PPS
IP rating	IP66
Probe cable length	2, 5, or 10 m (6 ft 7 in, 16 ft 5 in, 32 ft 10 in)
Cable feed through alternatives	M12 8-pin male connector with 5 m cable, or 8-pin female screw terminal connector for cable diameter 4 ... 8 mm
Sensor protection	PPS grid with stainless steel net PPS grid Sintered filter Membrane stainless steel filter H <sub>2</sub> O <sub>2</sub> filter

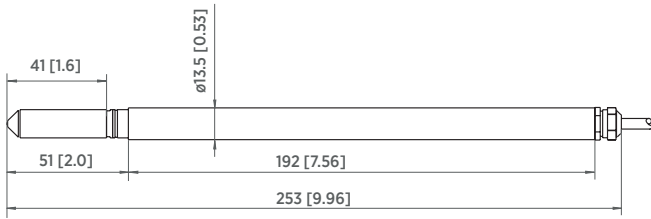
## Spare Parts and Accessories

Rain shield	ASM211103
USB cable	238607
PPS plastic grid with stainless steel netting	DRW010281SP
PPS plastic grid filter	DRW010276SP
Sintered filter AISI 316L	HM47280SP
Stainless steel filter	HM47453SP
Stainless steel filter with membrane	214848SP
Catalytic H <sub>2</sub> O <sub>2</sub> filter	231865

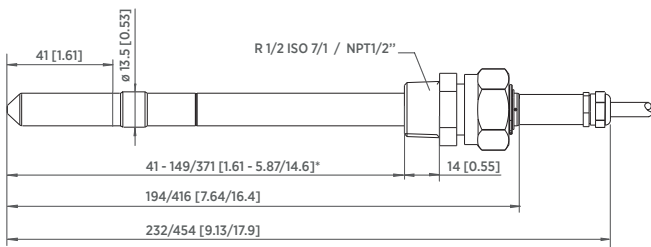
Dimensions in mm [in]



HMT313 Probe

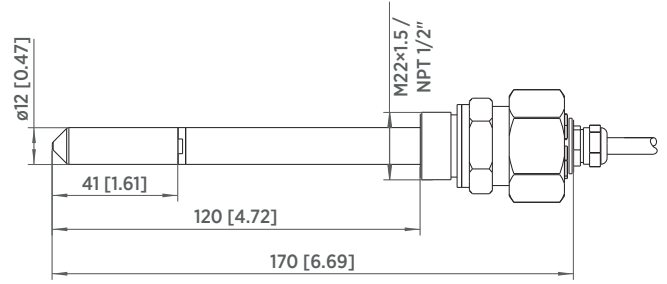


HMT315 Probe

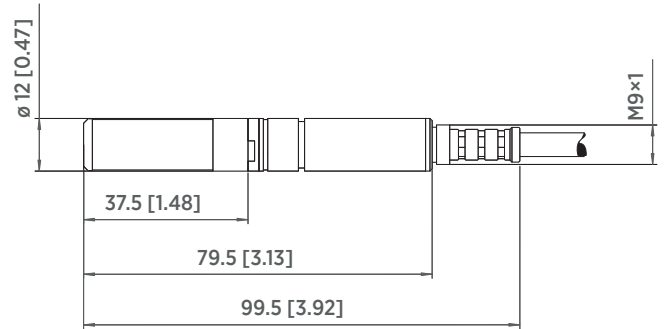


Lengths for standard/optional probes  
\* Freely user-adjustable length

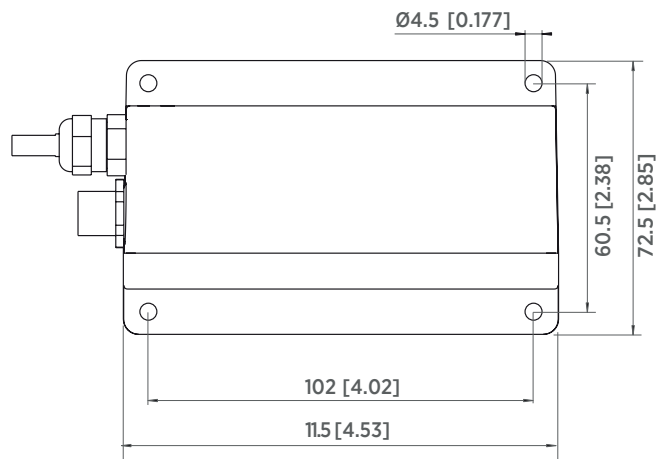
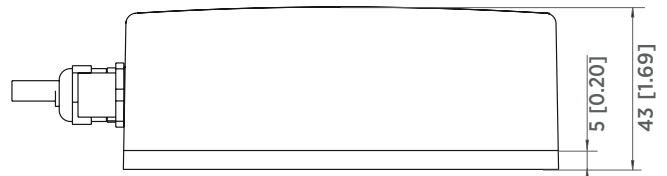
HMT318 Probe



HMT314 Probe



HMT317 Probe



HMT310 Transmitter Body



### Features

- Accurate and reliable measurement with Vaisala HUMICAP® humidity sensor technology
- Interchangeable probe (easy field calibration)
- Resistant to dust and most chemicals
- Enclosure IP65
- Traceable calibration certificate: 3 points for humidity, 1 point for temperature
- Temperature-only models TMT120 and TMT130 also available
- Suitable for cleanrooms and demanding HVAC and light industrial applications

Vaisala HUMICAP® Humidity and Temperature Transmitters HMT120 and HMT130 are designed for humidity and temperature monitoring in cleanrooms and are also suitable for demanding HVAC and light industrial applications.

### Options

- Humidity parameter options: relative humidity, dew point/frost point, wet bulb temperature, enthalpy, absolute humidity, mixing ratio, vapor pressure, and saturation vapor pressure
- 2-wire loop-powered or 3-wire voltage output configurations
- Optional LCD display
- USB cable available for a PC connection for maintenance
- Wall-mounted or with a remote probe
- Constant output probe available
- Can be mounted outdoors using a Vaisala installation kit and Vaisala Radiation Shield DTR504A

### Performance

The HMT120 and HMT130 transmitters incorporate Vaisala HUMICAP® humidity sensor technology that measures relative humidity accurately and reliably. Vaisala HUMICAP® sensors are resistant to dust and most chemicals.

The HMT120 and HMT130 transmitter enclosure is optimized for use in cleanrooms. The smooth surface of the enclosure makes it easy to clean and the enclosure material is chosen to tolerate purifying agents. Furthermore, cabling can be done through the back wall of the transmitter.

### Interchangeable probe

The HMT120 and HMT130 transmitters use a fully interchangeable relative humidity probe. The probe can be easily removed and replaced with a new one

without having to adjust the transmitter, which allows for easy and quick recalibration of the transmitter. The probe can be adjusted using one of Vaisala's handheld meters as a reference. Also available is a constant output probe with fixed RH and T output for convenient inspection of the monitoring system and signal transfer line.

### Available options

The HMT120 and HMT130 transmitters are available as wall mounted or with a remote probe. For high temperature applications or where space is limited, the remote probe is ideal.

The optional LCD display shows the measurement results of selected parameters in selected units. The parameters are displayed simultaneously on two separate rows on the display.

# Technical data

## Models

Model	Measured parameters	Output
HMT120	RH + T	2 analog outputs, 4 ... 20 mA (loop-powered)
HMT130	RH + T	2 analog outputs, 0 ... 1 V, 0 ... 5 V, 0 ... 10 V, or user-defined between 0 ... 10 V
TMT120	T	1 analog output, 4 ... 20 mA (loop-powered)
TMT130	T	1 analog output, 0 ... 1 V, 0 ... 5 V, 0 ... 10 V, or user-defined between 0 ... 10 V

## Measurement performance

Relative humidity <sup>1)</sup>	
Measurement range	0 ... 100 %RH
Accuracy <sup>2) 3)</sup>	
At 0 ... +40 °C (+32 ... +104 °F)	±1.5 %RH (0 ... 90 %RH) ±2.5 %RH (90 ... 100 %RH)
With HMP110 probe: At -40 ... 0 °C and +40 ... +80 °C (-40 ... +32 °F and +104 ... +176 °F)	±3.0 %RH (0 ... 90 %RH) ±4.0 %RH (90 ... 100 %RH)
With HMP113 probe: At -40 ... 0 °C and +40 ... +60 °C (-40 ... +32 °F and +104 ... +140 °F)	
Factory calibration uncertainty at +20 °C (+68 °F)	±1.1 %RH (0 ... 90 %RH) ±1.8 %RH (90 ... 100 %RH)
Humidity sensor types	HUMICAP® 180R HUMICAP® 180V <sup>4)</sup>
Stability	±2 %RH over 2 years
Stability in typical HVAC applications	±0.5 %RH per year
Temperature	
Measurement range	HMP110: -40 ... +80 °C (-40 ... +176 °F) HMP113: -40 ... +60 °C (-40 ... +140 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Accuracy over temperature range:	
HMP110:	
At +15 ... +25 °C (+59 ... +77 °F)	±0.1 °C (±0.18 °F)
At 0 ... +15 °C and +25 ... +40 °C (+32 ... +59 °F and +77 ... +104 °F)	±0.15 °C (±0.27 °F)
At -40 ... +0 °C and +40 ... +80 °C (-40 ... +32 °F and +104 ... +176 °F)	±0.4 °C (±0.72 °F)
HMP113:	
At 0 ... +40 °C (+32 ... +104 °F)	±0.2 °C (±0.36 °F)
At -40 ... 0 °C and +40 ... +60 °C (-40 ... +32 °F and +104 ... +140 °F)	±0.4 °C (±0.72 °F)
Other output parameters (optional)	
Dew point/frost point, wet bulb temperature, enthalpy, absolute humidity, mixing ratio, vapor pressure, saturation vapor pressure	

1) Relative humidity specifications excluding TMT120 and TMT130, which are temperature-only models.  
 2) Including non-linearity, hysteresis, and repeatability.  
 3) With HUMICAP® 180V sensor, accuracy is specified only in operating temperature -20 ... +80 °C (-4 ... +176 °F).  
 4) Not available with HMP113.

## Operating environment

IP rating (transmitter body)	IP65 <sup>1)</sup>
Operating temperature of transmitter body, no display	-40 ... +60 °C (-40 ... +140 °F)
Operating temperature of transmitter body with display	-20 ... +60 °C (-4 ... +140 °F)
Operating temperature, probe	HMP110: -40 ... +80 °C (-40 ... +176 °F) HMP113: -40 ... +60 °C (-40 ... +140 °F)
Storage temperature	-50 ... +70 °C (-58 ... +158 °F)

1) IP65 for the HMP110 probe only when using stainless steel sintered filter (HM46670SP) or PTFE sintered filter (item code DRW244938SP).

## Inputs and outputs

HMT120 and TMT120 2-wire transmitter (loop-powered)	
Current output signals	4 ... 20 mA
External loop voltage	10 ... 30 V DC (R <sub>L</sub> = 0 Ω) 20 ... 30 V DC (R <sub>L</sub> < 500 Ω)
HMT130 and TMT130 3-wire transmitter	
Voltage output signals	0 ... 1 V, 0 ... 5 V, 0 ... 10 V or user-defined between 0 ... 10 V
Min. output resistance	1 kΩ
Serial output	RS-485, non-isolated
Relay output	1 relay (max. 50 V DC, 200 mA)
Supply voltage	10 ... 35 V DC 15 ... 35 V DC (when output 0 ... 10 V) 24 V AC (±20 %)
Current consumption at 24 V DC	8 mA, if relay closed 15 mA
Max. additional error caused by the analog outputs after calibration at +20 °C (+68 °F) ambient temperature	±0.1 % of FS output signal
Temperature dependence of the analog outputs	±0.005 % of FS output signal

## Mechanical specifications

Weight	270 g (9.5 oz)
Probe cable lengths	3 m, 5 m, 10 m - up to 50 m (9.8 ft, 16 ft, 33 ft - up to 164 ft)
Display (optional)	128 x 64 resolution full graphics B&W display without backlight
Material	
Transmitter housing	PBT plastic
Display window	PC plastic
Probe body	HMP110: Stainless steel (AISI 316) HMP113: PC/ABS blend
Probe grid filter	HMP110: Chrome coated ABS plastic HMP113: PC (glass reinforced)
Connections	
Inputs and outputs	Screw terminals 0.5 ... 1.5 mm <sup>2</sup> (AWG 20 ... AWG 15)
Probe interface	4-pin M8 female panel connector

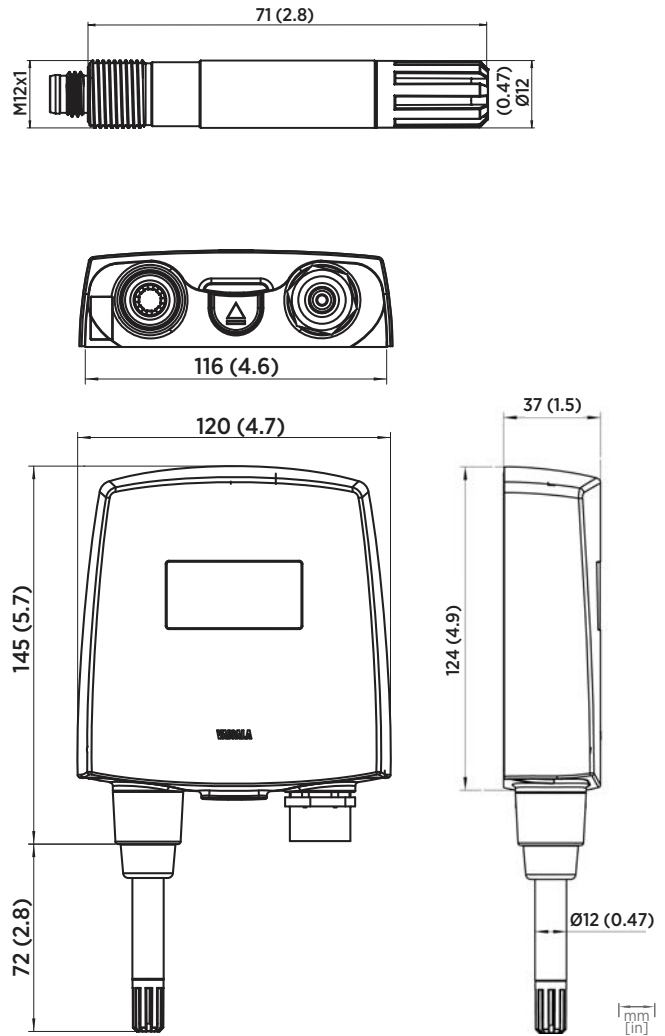
## Compliance

EU directives and regulations	EMC, RoHS
Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment CISPR 32 / EN 55032, Class B
Compliance marks	CE, RCM

## Spare parts and accessories

<b>Probes <sup>1)</sup></b>	
Humidity and temperature probe	HMP110
Humidity and temperature replacement probe	HMP110R
Temperature-only probe	HMP110T
Constant output probe	HMP110REF
Humidity and temperature probe	HMP113
<b>Sensors</b>	
Standard humidity sensor	HUMICAP180R
Catalytic humidity sensor for H <sub>2</sub> O <sub>2</sub>	HUMICAP180V <sup>2)</sup>
<b>Sensor protection</b>	
HMP110 probes:	
Plastic grid filter	DRW010522SP
Plastic grid with membrane filter	DRW010525SP
Stainless steel sintered filter	HM46670SP
PTFE membrane filter with stainless steel grid	ASM212652SP
PTFE sintered filter	DRW244938SP
HMP113 probe:	
Plastic grid filter	DRW240185SP
Plastic grid with membrane filter	ASM210856SP
Stainless steel sintered filter	HM47280SP
Porous PTFE filter	219452SP
<b>Probe installation</b>	
Probe mounting clamp, 1 pc	225501
Probe mounting clamps, 10 pcs	226067
Probe mounting flange	226061
Probe holder, 5 pcs	ASM213382SP
<b>Cables</b>	
Probe cable 3 m (9.8 ft)	HMT120Z300
Probe cable 5 m (16 ft)	HMT120Z500
Probe cable 10 m (33 ft)	HMT120Z1000
Probe cable 20 m (66 ft)	HMT120Z2000
HM70 connection cable	211339
USB serial interface cable	219685
<b>Transmitter protection and installation</b>	
Radiation shield	DTR504A
Rain shield with installation kit	215109
Duct installation kit	215619

<sup>1)</sup> See the separate HMP110 and HMP113 order forms.  
<sup>2)</sup> Not available with HMP113.



Dimensions of HMP110 remote probe (top image) and HMT120, HMT130, TMT120, and TMT130 transmitters

## HMW90 Series Humidity and Temperature Transmitters

For high-performance HVAC applications



### Features

- Both analog and field bus communication (Modbus® RTU)
- Easy installation, configuration, and field adjustment
- Humidity parameter options: relative humidity, dew point, mixing ratio, enthalpy, wet bulb temperature, dew point depression, and absolute humidity
- Full 0 ... 100 %RH measurement range
- Up to ±1.7 %RH accuracy
- User exchangeable humidity and temperature module
- Traceable calibration (certificate included)
- Available in two colors

Wall-mounted Vaisala HMW90 Series HUMICAP® Humidity and Temperature Transmitters measure relative humidity and temperature in indoor HVAC applications, where high accuracy, stability, and reliable operation are required.

The flexible HMW90 series offers a variety of options and features. Transmitters include a display and a sliding cover with either an opening for the display or a solid front. Both analog and field bus communication options, including special scalings and calculated parameters, are available.

### Quick and easy to install

HMW90 series transmitters are quick and easy to install. The wiring is connected through the back plate and the electronics with the sensors can be snapped on easily after the wiring is complete. The transmitter is configured using DIP switches, which are accessible when the enclosure is open.

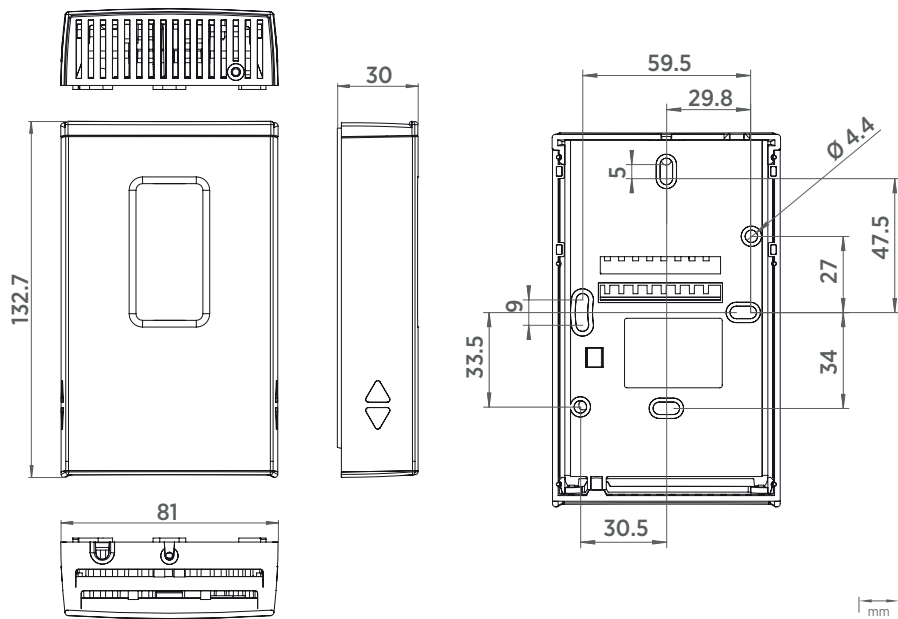
### Digital communication brings benefits

The introduction of Modbus® RTU communication to field level devices brings many advantages. For example, all sensors can be centrally accessed and their performance can be easily monitored. Wiring is simple when multiple sensors are installed on the same bus. Sensors can be set up using standardized tools, and the system can be expanded with additional sensors quickly and conveniently. In addition, parameters influencing measurements, such as pressure or site elevation, can be centrally set and updated.

### Choose from a wide variety of calibration options

On-site calibration and adjustment is exceptionally easy. The sliding cover exposes offset trimmers for one-point calibration without disturbing measurement. The display instantly indicates the effects of changes, making it clear and convenient to make adjustments. A service port enables two-point calibration, using either a PC or Vaisala HUMICAP® Handheld Humidity and Temperature Meter HM70. HMW90 series transmitters include a user-exchangeable measurement module, which can be ordered as a spare part.

# HMW90 dimensions and models



Dimensions of HMW90 series transmitter cover (left) and mounting base (right)

## Models

Model	Measurements	Output
TMW92	T-only	2-wire current output
TMW93	T-only	3-wire voltage output
TMW90	T-only	Analog output (configurable)
HMW92	RH+T	2-wire current output
HMW92D	RH+T	2-wire current output, model with display
HMW93	RH+T	3-wire voltage output
HMW93D	RH+T	3-wire voltage output, model with display
HMW90	RH+T	Analog/Modbus RTU output (configurable)
HMW95	RH+T	Modbus RTU output
HMW95D	RH+T	Modbus RTU output, model with display

# Technical data

## Measurement performance

### Relative humidity

Measurement range 0 ... 100 %RH, non-condensing

Accuracy at temperature range +10 ... +40 °C (+50 ... +104 °F):

0 ... 90 %RH ±1.7 %RH

90 ... 100 %RH ±2.5 %RH

Accuracy at temperature range -5 ... +10 °C, +40 ... +55 °C (+23 ... +50 °F, +104 ... +131 °F):

0 ... 90 %RH ±3 %RH

90 ... 100 %RH ±4 %RH

Stability in typical HVAC applications ±0.5 %RH/year

Humidity sensor HUMICAP® 180R

### Temperature

Measurement range -5 ... +55 °C (+23 ... +131 °F)

Accuracy at +20 ... +30 °C (+68 ... +86 °F) ±0.2 °C (± 0.36 °F)

Accuracy at +10 ... +20 °C, +30 ... +40 °C (+50 ... +68 °F, +86 ... +104 °F) ±0.3 °C (± 0.54 °F)

Accuracy at -5 ... +10 °C, +40 ... +55 °C (+23 ... +50 °F, +104 ... +131 °F) ±0.5 °C (± 0.90 °F)

Temperature sensor Digital temperature sensor

## Inputs and outputs

Service port RS-485 line for temporary service use

### Current output models

Outputs 2 × 4 ... 20 mA, loop powered

Loop resistance 0 ... 600 Ω

Supply voltage 20 ... 28 VDC at 500 Ω load  
10 ... 28 VDC at 0 Ω load

Isolation between output channels 500 VDC

### Voltage output models

Outputs 2 × 0 ... 5 V or 2 × 0 ... 10 V

Load resistance 10 kΩ min.

Supply voltage 18 ... 35 VDC, 24 VAC ±20 % 50/60 Hz

Max. current consumption 12 mA  
Max. with relay 25 mA

Relay 1 pc (max 50 VDC/50 VAC, 500 mA)

### Field bus models

Supply voltage 18 ... 35 VDC, 24 VAC ± 20 % 50/60 Hz

Max. current consumption (with 120 Ω termination) 30 mA at 24 VDC

Output type RS-485 (galvanic isolation, 1.5 kV)

RS-485 end of line termination Enable with jumper, 120 Ω

Supported protocol Modbus RTU

Modbus RTU address range 1 ... 247

## Operating environment

Operating temperature -5 ... +55 °C (+23 ... +131 °F)

Storage temperature -30 ... +60 °C (-22 ... +140 °F)

IP rating IP30

## Compliance

EU directives and regulations EMC Directive (2014/30/EU)  
RoHS Directive (2011/65/EU) as amended by 2015/863

Electromagnetic compatibility (EMC) EN 61326-1, industrial environment  
CISPR 32 / EN 55032, Class B

Compliance marks CE, RCM

## Mechanical specifications

Weight 155 g (5.5 oz)

Standard housing color White (RAL9003 <sup>1)</sup>)

Optional housing color (configurable models only) Black (RAL9005 <sup>1)</sup>)

Housing material ABS/PC, UL-V0 approved

Output connector Screw terminals  
Max. wire size 2 mm<sup>2</sup> (AWG14)

Service port connector 4-pin M8

<sup>1)</sup> RAL code is only indicative with potential small variations in color shade.

## Spare parts and accessories

Humidity and temperature module HTM10SP

Temperature module (for T-only models) TM10SP

Decorative cover set (10 pcs) 236285

Connection cable for HM70 handheld meter 219980

USB cable for PC connection 219690



## HMD60 Series Humidity and Temperature Transmitters

For demanding HVAC and light industrial applications



### Features

- Measurement accuracy up to  $\pm 1.5\%$  RH and  $\pm 0.1\text{ }^\circ\text{C}$  ( $\pm 0.18\text{ }^\circ\text{F}$ )
- 4 ... 20 mA analog outputs: HMD62 (RH and T) and TMD62 (T-only)
- 0 ... 10 V analog outputs: HMD65 (RH and T)
- BACnet MS/TP and Modbus RTU: HMD65
- All common humidity parameters available, including RH, dew point, enthalpy, and wet bulb temperature
- Resistant to chemicals and dust
- IP66-rated body
- Traceable calibration certificate
- Easy field adjustment and output configuration with quick access to electronics also when installed
- Compatible with Vaisala Insight PC software

The duct mounted HMD60 series HUMICAP® transmitters HMD62, TMD62, and HMD65 are designed for light industrial applications and demanding HVAC applications such as museums, cleanrooms, and laboratories.

### Analog or Digital Output with 3 Transmitter Options

HMD60 series transmitter options:

- HMD62: RH and T measurement, 4 ... 20 mA analog output
- TMD62: T-only transmitter, 4 ... 20 mA analog output
- HMD65: RH and T measurement, 0 ... 10 V analog output, Modbus RTU, and BACnet MS/TP

### Robust Design, Stability, and Reliability

The all-metal body is suitable for building sites and industrial settings. HMD60 series transmitters provide state-of-the-art stability and environmental resistance, thanks to the Vaisala HUMICAP® R2 sensor.

For applications where hydrogen peroxide disinfection is used, the HUMICAP® 180V catalytic sensor option provides improved stability during  $\text{H}_2\text{O}_2$  exposure.

### Traceable Accuracy

HMD60 series transmitters are always delivered with a traceable (ISO9001) calibration certificate. Upon request, accredited (ISO17025) calibration certificates can also be provided.

### Field Configurable Outputs

The analog HMD62 and TMD62 transmitter models use floating 4 ... 20 mA loop powered outputs. The HMD65 model has two 0 ... 10 V outputs in addition to BACnet MS/TP and

Modbus RTU interfaces (RS-485). The analog outputs are field configurable with easy humidity parameter selection using DIP switches.

For special scaling and other additional configuration and adjustment options, you can use the convenient Vaisala Insight PC software for Windows® (see [www.vaisala.com/insight](http://www.vaisala.com/insight)).

When required, HMD60 series transmitters can also be intuitively field adjusted using trimmers or with the Vaisala HM70 handheld meter.

# Technical Data

## Relative humidity measurement performance

Humidity sensor options	
HUMICAP® R2	Latest generation industrial sensor with improved corrosion resistance
HUMICAP® 180V	Humidity sensor with a catalytic surface for processes with H <sub>2</sub> O <sub>2</sub>
Measurement range	0 ... 100 %RH
Stability	±0.5 %RH/year in typical HVAC applications
Accuracy at 0 ... +40 °C (+32 ... +104 °F) <sup>1)</sup>	
0 ... 90 %RH	±1.5 %RH
90 ... 100 %RH	±2.5 %RH
Accuracy at +40 ... +80 °C (+104 ... +176 °F) and -40 ... 0 °C (-40 ... +32 °F) <sup>1) 2)</sup>	
0 ... 90 %RH	±2.5 %RH
90 ... 100 %RH	±3.5 %RH
Factory calibration uncertainty	±1.0 %RH
Start-up and response time	
Start-up time at +20 °C (+68 °F)	8 s
Response time (T63) at +20 °C (+68 °F)	15 s
Calculated humidity parameters (default analog output scale)	
Dew point	-40 ... +80 °C (-40 ... +176 °F)
Dew point / frost point	-40 ... +80 °C (-40 ... +176 °F)
Absolute humidity	0 ... 300 g/m <sup>3</sup> (0 ... 131.1 gr/ft <sup>3</sup> )
Wet bulb temperature	-40 ... +80 °C (-40 ... +176 °F)
Enthalpy	-40 ... 1600 kJ/kg (-9.5 ... 695.6 Btu/lb)
Mixing ratio	0 ... 600 g/kg (0 ... 4200 gr/lb)

<sup>1)</sup> Including non-linearity, hysteresis, and repeatability  
<sup>2)</sup> With HUMICAP® 180V sensor, accuracy is not specified below -20 °C (-4 °F) operating temperature

## Temperature measurement performance

Temperature sensor	Pt1000 RTD Class F 0.1 IEC 60751
Measurement range	-40 ... +80 °C (-40 ... +176 °F)
Default analog output scale	-20 ... +80 °C (-4 ... +176 °F)
Accuracy at +20 °C (+68 °F)	±0.1 °C (0.18 °F)
Temperature dependence	±0.005 °C/°C
Factory calibration uncertainty	±0.1 °C (0.18 °F)
Response time (T63) with free convection	8 min

## Analog output performance

Accuracy at +20 °C (68 °F):	±0.01 mA (HMD62 and TMD62) ±5 mV (HMD65)
Temperature dependence	±0.0008 mA/°C (HMD62 and TMD62) ±0.2 mV/°C (HMD65)

## Operating environment

Operating temperature, electronics	-40 ... +60 °C (-40 ... +140 °F)
Operating temperature, probe	-40 ... +80 °C (-40 ... +176 °F)
Storage temperature range	-40 ... +80 °C (-40 ... +176 °F)
Maximum flow speed	50 m/s with sintered filter
Electromagnetic compatibility	EN61326-1, Industrial Environment

## Inputs and outputs

Power supply input	HMD62 and TMD62: 10 ... 35 VDC (RL = 0 Ω) 20 ... 35 VDC (RL = 600 Ω) HMD65: 15 ... 35 VDC 16 ... 24 VAC
Power consumption (HMD65)	1.0 W (typical, for both AC and DC)
Analog outputs	TMD62: 1 × T output 4 ... 20 mA HMD62: 1 × RH output 4 ... 20 mA, 1 × T output 4 ... 20 mA <sup>1)</sup> HMD65: 1 × RH output 0 ... 10 V, 1 × T output 0 ... 10 V <sup>1)</sup> (load resistance: 10 kΩ min.)
Digital output (RS-485)	HMD65: Isolated, supports Modbus RTU and BACnet MS/TP protocols
BACnet MS/TP	Address range: 0 ... 127 (master mode only)
Modbus RTU	Address range: 1 ... 247
Service port	M8 4-pin male connector: • MI70 handheld indicator (requires cable 219980SP) • Vaisala Insight PC software <sup>2)</sup> (requires USB cable 219690)
Screw terminal wire size	0.5 ... 2.5 mm <sup>2</sup>

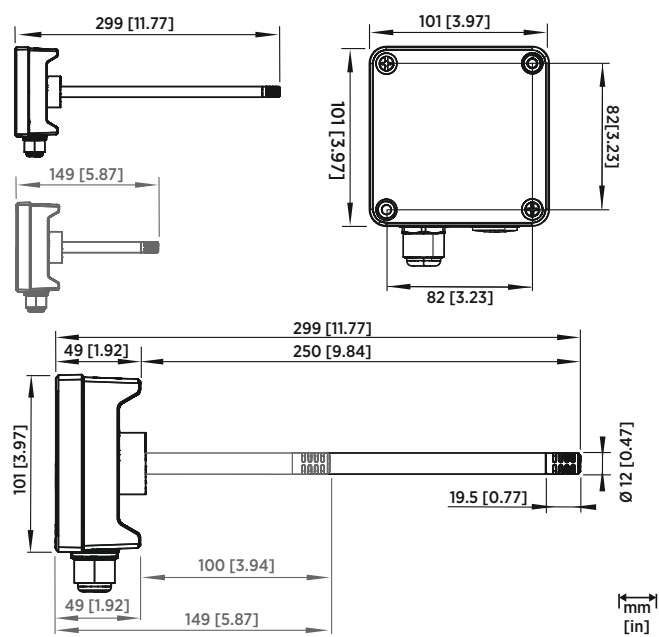
<sup>1)</sup> Calculated output parameters for HMD62 and HMD65 include  $T_{\phi}$ ,  $T_{gr}$ ,  $A$ ,  $X$ ,  $T_w$ , and  $H$ .  
<sup>2)</sup> Vaisala Insight software for Windows® available at [www.vaisala.com/insight](http://www.vaisala.com/insight).

## Spare parts and accessories

USB cable for PC operation (Vaisala Insight software)	219690
Connection cable for HM70 (MI70) handheld meter	219980SP
Membrane filter	ASM212652SP
Sintered filter	HM46670SP
Sintered teflon filter	DRW244938SP
Conduit fitting and O-ring (M16×1.5 / NPT1/2")	210675SP

## Mechanical specification

Housing material	Cast aluminum
Probe material	Stainless steel
IP rating	IP66 (NEMA 4X)
Weight	511 g (18 oz)



HMD60 Dimensions (Long and Short Probe Options)

## HMDW110 Series Humidity and Temperature Transmitters

For high-accuracy measurements in HVAC applications



### Features

- Accurate humidity and temperature transmitters for measurements in HVAC applications
- Proven Vaisala HUMICAP® 180R humidity sensor for superior long-term stability
- $\pm 2$  %RH accuracy
- 3-point traceable calibration (%RH), 1-point traceable calibration (T), certificate included
- Analog (4 ... 20 mA) and Modbus® RTU output options
- Display and non-display options
- M12 connector option

The high-accuracy transmitters HMD110/112 and HMW110/112 are designed for measuring humidity and temperature in HVAC applications. Calculated humidity parameters are also conveniently available, including dew point temperature, wet bulb temperature, and enthalpy. The measurement is highly accurate to enable precise and reliable control of HVAC systems. Options also include temperature transmitter models.

The transmitters belong to Vaisala HMDW110 Transmitter Series, which includes transmitters for duct mounting, IP65-rated wall transmitters, immersion temperature transmitters, and outdoor transmitters with integrated radiation shields. Display and non-display options are available.

### Highly accurate, proven Vaisala HUMICAP performance

The highly accurate HMD110/112 and HMW110/112 transmitters are designed for measuring humidity and temperature in various HVAC applications. The high accuracy and reliability of the measurement enable precise and reliable controls of HVAC systems.

The transmitters are equipped with the trusted HUMICAP 180R humidity sensor, which is the robust sensor designed for industrial applications. The sensor's

superior long-term stability allows for unbeatable long-term accuracy of the instrument and minimizes maintenance needs throughout the transmitter's lifetime.

Optional output parameters include dew point temperature, wet bulb temperature, and enthalpy, which are selectable with Vaisala Insight PC software.

### Excellent choice for challenging conditions

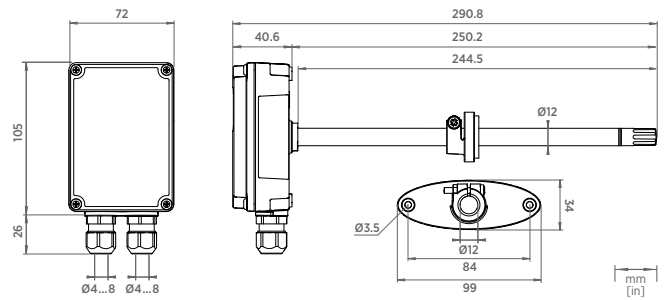
The IP65-rated HMD110/112 and HMW110/112 transmitters are optimal for even challenging conditions, such as cleanrooms, data centers and other industrial settings. The transmitters can also be ordered with the catalytic HUMICAP 180V humidity sensor. The

catalytic sensor improves stability especially in hydrogen peroxide sterilized environments where repeated condensation can be expected.

### Traceable accuracy

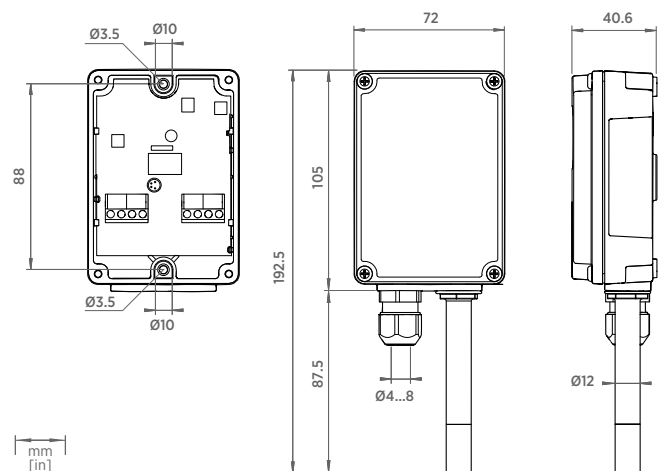
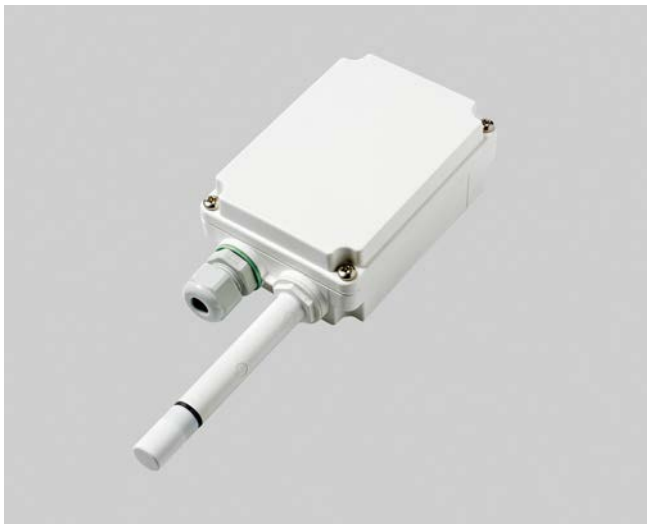
The instruments are individually adjusted and delivered with a traceable (ISO 9001) calibration certificate. If required later on, the transmitter can be easily field-calibrated using Vaisala Handheld Humidity and Temperature Meter HM70 or Vaisala Insight PC software.

# Technical data

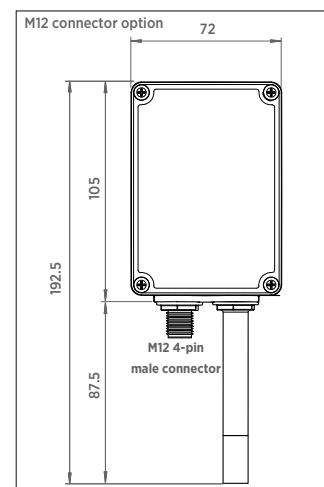


Dimensions in mm

HMD110/112 RH+T transmitters for ducts. Model options also include a display version and the TMD110 temperature transmitter.



HMW110/112 wall-mount RH+T transmitters with IP65 rating. Model options also include a display version and the TMW110 temperature transmitter. HMW110 and TMW110 transmitters can be ordered either with a cable gland and screw terminal wiring, or with an M12 connector.



Dimensions in mm

## Models

Model	Type	Output	Special features
HMW110	Wall-mount, RH+T	2-wire current or Modbus RTU output	Configurable model <sup>1)</sup> Optional display M12 connector option
HMW112	Wall-mount, RH+T	2-wire current output	
TMW110	Wall-mount, T	2-wire current output or Modbus RTU output	Configurable model <sup>1)</sup> Optional display M12 connector option
HMD110	Duct-mount, RH+T	2-wire current or Modbus RTU output	Configurable model <sup>1)</sup> Optional display
HMD112	Duct-mount, RH+T	2-wire current output	
TMD110	Duct-mount, T	2-wire current output or Modbus RTU output	Configurable model <sup>1)</sup> Optional display

<sup>1)</sup> Delivered with customer specific output settings, including calculated humidity parameters and custom scaling of outputs.

## Measurement performance

Relative humidity	
Measurement range	0–100 %RH
Accuracy: <sup>1)</sup>	
at +10 ... +30 °C (+50 ... +86 °F)	±2 %RH (0–90 %RH) ±3 %RH (90–100 %RH)
at –20 ... +10 °C, +30 ... +60 °C (–4 ... +50 °F, +86 ... +140 °F)	±3 %RH (0–90 %RH) ±4 %RH (90–100 %RH)
at –40 ... –20 °C (–40 ... –4 °F)	±4 %RH (0–100 %RH)
Stability in typical HVAC applications	±0.5 %RH/year
Humidity sensor types	HUMICAP <sup>®</sup> 180R HUMICAP <sup>®</sup> 180V
Temperature	
Measurement range	–40 ... +60 °C (–40 ... +140 °F)
Accuracy at +20 °C (+68 °F)	±0.2 °C (±0.36 °F)
Temperature dependence	±0.01 °C/°C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Factory calibration uncertainty at +20 °C (+68 °F)	±1.5 %RH/±0.2 °C

<sup>1)</sup> With HUMICAP<sup>®</sup> 180V humidity sensor, accuracy is not specified below –20 °C (–4 °F) operating temperature.

## Calculated parameters

Measurement range	
Dew point temperature and wet bulb temperature	–40 ... +80 °C (–40 ... +176 °F)
Enthalpy	–40 ... 1530 kJ/kg (–9.6 ... 648 BTU/lb)
Accuracy <sup>1) 2)</sup>	
Dew point	±0.7 °C (1.2 °F)
Wet bulb temperature	±0.5 °C (0.9 °F)
Enthalpy	±1.6 kJ/kg (0.7 BTU/lb)

<sup>1)</sup> At +20 °C (+68 °F) and 80 %RH.

<sup>2)</sup> Accuracy of the calculated parameters should be calculated at the actual condition based on the RH and temperature specification.

## Inputs and outputs

Devices ordered with analog output	
Outputs	4–20 mA, loop powered
Loop resistance	0–600 Ω
Supply voltage	20–28 V DC at 600 Ω load 10–28 V DC at 0 Ω load
Devices ordered with Modbus output	
Interface	RS-485, not isolated, no line termination
Default serial settings	19200 bps N 8 2
Protocols	Modbus <sup>®</sup> RTU
Supply voltage	10–28 V DC

## Mechanical specifications

Screw terminal wire size	Max. 1.5 mm <sup>2</sup> (AWG 16)
Standard housing color	White (RAL9003)
Housing material	PC + 10 %GF (UL-V0 approved)

## Operating environment

Operating temperature:	
with display	–5 ... +60 °C (+23 ... +140 °F)
without display	–40 ... +60 °C (–40 ... +140 °F)
Operating humidity	0–100 %RH
Maximum wind / flow speed	30 m/s
Storage temperature:	
with display	–5 ... +60 °C (+23 ... +140 °F)
without display	–40 ... +60 °C (–40 ... +140 °F)
IP rating	IP65

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electrical safety	EN 61326-1, industrial environment <sup>1)</sup>
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, RCM

<sup>1)</sup> HMDW110 series probes (HMD110/112, TMD110, HMW110/112, TMW110, and HMS110/112) fulfill the requirements for industrial electromagnetic environment, considering that a maximum permissible electrostatic air discharge of ±7 kV has been specified for this product.

## Spare parts and accessories

Conduit fitting + O-ring (M16 × 1.5 / NPT1/2")	210675SP
Conduit fitting + O-ring (M16 × 1.5 / PG9, RE-MS)	210674SP
Fastening flange assembly (screws included)	ASM210771SP
Porous PTFE filter	DRW239993SP
Membrane filter	ASM210856SP
Terminal block, blue	236620SP
USB cable for PC connection	219690
Connection cable (M12-4F / M8-4M), length 1.2 m	279222SP
Connection cable for HM70 handheld meter	219980SP
HUMICAP <sup>®</sup> 180R humidity sensor	HUMICAP180R
HUMICAP <sup>®</sup> 180V humidity sensor (catalytic)	HUMICAP180V

## TMI110 Temperature Transmitter

For high-accuracy measurements in HVAC applications



### Features

- Accurate temperature measurement of liquids and air
- Very fast response time
- 1-point traceable calibration (certificate included)
- Analog (4 ... 20 mA) and Modbus® RTU output options
- Installed in a thermowell for measurement in liquids
- Optimized for building automation and HVAC process control
- Several probe length options

The high-accuracy immersion temperature transmitter TMI110 is designed for measuring cooling/heating water temperatures in HVAC automation systems. TMI110 can also be used for air temperature measurements in air ventilation ducts. The transmitter has a fast response time, enabling precise and reliable control of HVAC systems.

The TMI110 transmitter belongs to the Vaisala HUMICAP® Humidity and Temperature Transmitter Series HMDW110, which includes transmitters for duct mounting, IP65-rated wall transmitters, immersion temperature transmitters, and outdoor transmitters with integrated radiation shields.

### Highly accurate

The highly accurate TMI110 measures the temperature of liquid in cooling/heating systems, and the temperature of air in ventilation ducts. When measuring the temperature of liquid, the transmitter is installed in a thermowell. For air temperature measurements, the transmitter can be installed in a duct.

Temperature is measured with a Pt1000 sensor element (class A). The high accuracy and quick response time of the measurement enable precise and reliable control of HVAC systems.

### Fast response time

Fast response time of measurement is a top priority in the design of TMI110, enabling instant response in the control loop. Speed and reliability are key factors in the measurement of cooling and heating processes, thus the capabilities of TMI110 are a significant advantage. The transmitter is optimal for building automation and HVAC process control.

### Traceable accuracy

All TMI110 transmitters are individually adjusted and delivered with a traceable (ISO 9001) calibration certificate. If required later on, the transmitter can also be field-calibrated using a Vaisala handheld meter or Vaisala Insight PC software.

# Technical data

## Measurement performance

Temperature	
Measurement range	-40 ... +120 °C (-40 ... +248 °F)
Accuracy at +20 °C (+68 °F)	±0.1 °C (±0.18 °F)
Temperature dependence	±0.01 °C/°C
Response time (T63) at +20 °C (+68 °F)	< 8 s typical
Temperature sensor	Pt1000 RTD Class A, IEC 60751
Factory calibration uncertainty at +20 °C (+68 °F)	±0.1 °C (±0.18 °F)

## Operating environment

Operating environment, probe	-40 ... +120 °C (-40 ... +248 °F)
Operating environment, electronics	-40 ... +60 °C (-40 ... +140 °F)
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
IP rating	IP65
UL 50E/NEMA rating	Type 4

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electrical safety	EN 61326-1, industrial environment
EMC emissions	CISPR 22 / EN 55022, Class B
Compliance marks	CE, RCM

## Inputs and outputs

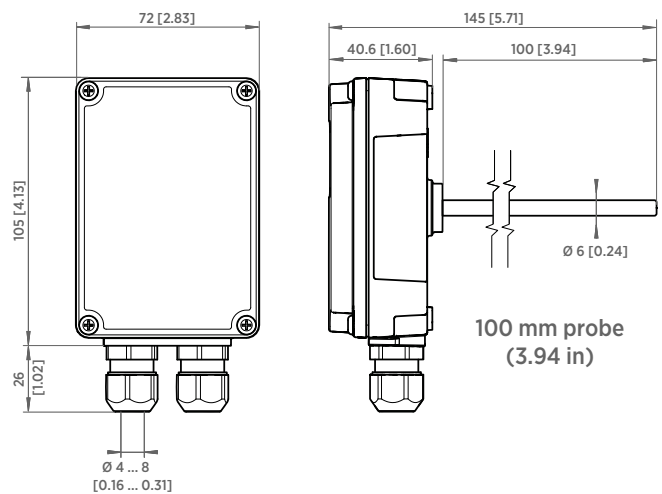
Devices ordered with analog output	
Outputs	4-20 mA, loop powered
Loop resistance	0-600 Ω
Supply voltage	20-28 V DC at 600 Ω load 10-28 V DC at 0 Ω load
Devices ordered with Modbus output	
Interface	RS-485, not isolated, no line termination
Default serial settings	19200 bps N 8 2
Protocol	Modbus RTU
Supply voltage	10-28 V DC

## Mechanical specifications

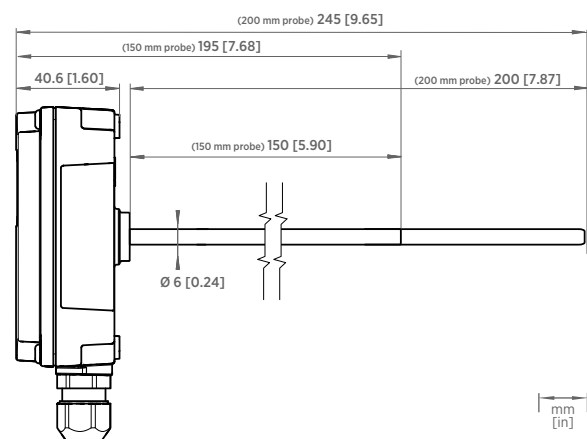
Probe material	Stainless steel
Probe diameter	6 mm (0.24 in)
Probe length options	<ul style="list-style-type: none"> <li>100 mm (3.94 in)</li> <li>150 mm (5.91 in)</li> <li>200 mm (7.87 in)</li> </ul>
Screw terminal wire size	Max. 1.5 mm <sup>2</sup> (AWG 16)
Standard housing color	White (RAL9003)
Housing material	PC + 10 %GF (UL-V0 approved)

## Spare parts and accessories

Conduit fitting + O-ring (M16×1.5 / NPT1/2")	210675SP
Conduit fitting + O-ring (M16×1.5 / PG9, RE-MS)	210674SP
Thermowell ISO 7 - R 1/2", for 100 mm probe	ASM214691
Thermowell 1/2" - 14 NPT, for 100 mm probe	ASM214707
Thermowell ISO 7 - R 1/2", for 150 mm probe	279722
Thermowell 1/2" - 14 NPT, for 150 mm probe	279724
Thermowell ISO 7 - R 1/2", for 200 mm probe	279723
Thermowell 1/2" - 14 NPT, for 200 mm probe	279725
Terminal block, blue	236620SP
USB cable for PC connection	219690
Connection cable for HM70 handheld meter	219980SP



## 150 mm (5.90 in) probe and 200 mm (7.87 in) probe





## HMS110 Series Humidity and Temperature Transmitters

For high-accuracy outdoor measurements in building automation applications



### Features

- Reliable outdoor transmitters with integrated radiation shields
- $\pm 2$  %RH accuracy
- Proven HUMICAP® 180R sensor for long-lasting accuracy
- 3-point traceable calibration (certificate included)
- Default output parameters are relative humidity and temperature. Dew point temperature, wet bulb temperature, and enthalpy outputs selectable with a PC connection
- Current output (4 ... 20 mA) and Modbus RTU
- On-site calibration with HM70 Hand-Held Meter or PC connection
- Ingress protection IP65
- Compatible with Vaisala Insight PC software

Vaisala HMS110 Series HUMICAP® Humidity and Temperature Transmitters are designed for demanding outdoor measurements in building automation applications. These  $\pm 2$  % transmitters include an integrated radiation shield to reduce the influence of solar radiation on temperature and humidity measurements.

### Proven Vaisala HUMICAP® performance for outdoor measurements

HMS110 transmitters are equipped with the trusted HUMICAP® 180R – a robust, general-purpose humidity sensor that functions well in high humidity. The sensor's superior stability ensures long-lasting accuracy and minimal maintenance throughout the transmitter's lifetime.

The integrated radiation shield allows unrivaled measurement performance, reducing the impact of sunshine on temperature and humidity measurements and ensuring measurement accuracy in outdoor conditions.

### Easy installation and maintenance

HMS110 transmitters are easy to install. They can be mounted directly onto a wall or pole without any extra accessories. There are no loose parts, screws are retained in the enclosure, all connectors are clearly labeled, and the connectors are within easy reach.

The HUMICAP® sensor's excellent long-term stability and high-quality materials ensure minimal need for maintenance. If necessary, the transmitter can be field-calibrated using either HM70 Hand-Held Humidity and Temperature Meter, or a PC

connection. For easy-to-use access to configuration and calibration options, the transmitter can be connected to Vaisala Insight PC software.

# Technical data

## Models

Model	Type	Output	IP rating
HMS110	Outdoor, RH+T	2-wire, current output Modbus RTU (configurable model)	IP65
HMS112	Outdoor, RH+T	2-wire, current output	IP65

## Inputs and outputs

Devices ordered with analog output	
Analog outputs	4 ... 20 mA, loop powered
Loop resistance	0 ... 600 Ω
Supply voltage	20 ... 28V DC at 600 Ω load 10 ... 28V DC at 0 Ω load
Devices ordered with Modbus output	
Interface	RS-485, not isolated, no line termination
Default serial settings	19200 bps N 8 2
Protocols	Modbus® RTU
Supply voltage	10 ... 28 V DC

## Measurement performance

Relative humidity	
Measurement range	0 ... 100 %RH
Stability in typical HVAC applications	±0.5 %RH/year
Humidity sensor	Vaisala HUMICAP® 180R
Accuracy at temperature range +10 ... +30 °C (+50 ... +86 °F):	
0 ... 90 %RH	±2 %RH
90 ... 100 %RH	±3 %RH
Accuracy at temperature range -20 ... +10 °C, +30 ... +60 °C (-4 ... +50 °F, +86 ... +140 °F):	
0 ... 90 %RH	±3 %RH
90 ... 100 %RH	±4 %RH
Accuracy at temperature range -40 ... -20 °C (-40 ... -4 °F):	
0 ... 100%RH	±4 %RH
Temperature	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy at +20 °C (+68 °F)	±0.2 °C (±0.36 °F)
Temperature dependence	±0.01 °C/°C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Calculated parameters	
Factory calibration uncertainty at 20 °C (+68 °F)	±1.5 %RH/±0.2 °C
Measurement range for dew point temperature and wet bulb temperature	-40 ... +60 °C (-40 ... +140 °F)
Measurement range for enthalpy	-40 ... 1530 kJ/kg (-9.6 ... 648 BTU/lb)
Accuracy of the calculated parameters should be calculated at the actual condition based on the RH and temperature specification.	
Accuracy at 20 °C (68 °F) and 80 %RH:	
Dew point	±0.7 °C (1.2 °F)
Wet bulb temperature	±0.5 °C (0.9 °F)
Enthalpy	±1.6 kJ/kg (0.7 BTU/lb)

## Operating environment

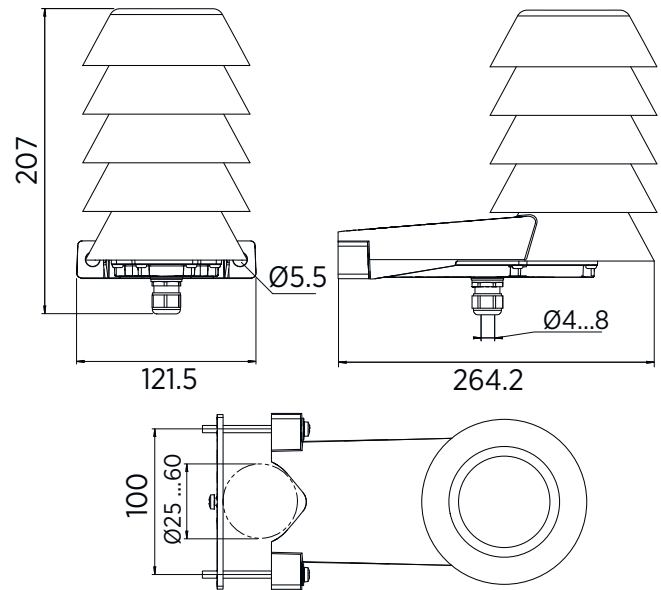
Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity	0 ... 100 %RH
Maximum wind/flow speed	30 m/s (67 mph)
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)

## Compliance

Property	Value/Description
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electrical safety	EN 61326-1, industrial environment
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, RCM

## Mechanical specifications

Max. wire size	1.5 mm <sup>2</sup> (AWG 16)
Standard housing color	White (RAL9003)
Housing material	PC + 10 %GF (UL-V0 approved)



Dimensions (in mm)

## Spare parts and accessories

Conduit fitting + O-ring (M16 × 1.5 / NPT1/2 Inch)	210675SP
Conduit fitting + O-ring (M16 × 1.5 / PG9, RE-MS)	210674SP
Fastening set HMS110	237805
Membrane filter	ASM210856SP
Terminal block, blue	236620SP
USB cable for PC connection	219690 <sup>1)</sup>
Connection cable for HM70 hand-held meter	219980SP
HUMICAP® 180R sensor	HUMICAP180R

<sup>1)</sup> Vaisala Insight PC software for Windows available [www.vaisala.com/insight](http://www.vaisala.com/insight).

## HMDW80 Series Humidity and Temperature Transmitters

For building automation applications



### Features

- Reliable transmitters for basic HVAC humidity measurements
- $\pm 3.0$  %RH accuracy
- Full 0 ... 100 %RH measurement range
- Optimized for easy installation and low maintenance
- User exchangeable INTERCAP® sensor for easy field replacement
- UL-V0 flammability rating
- Output parameters: relative humidity and temperature with optional dew point temperature, wet bulb temperature and enthalpy parameters

Vaisala HMDW80 Series INTERCAP® Humidity and Temperature Transmitters measure relative humidity and temperature in various building automation applications. HMDW80 series transmitters combine easy installation and reliable operation with a low requirement for maintenance.

### Typical installation locations

- Ventilation ducts
- Walls
- Wash-down areas
- Outdoor locations

The versatile HMDW80 series includes transmitters for wall and duct mounting, IP65-classified transmitters for humid areas, and transmitters with a radiation shield for outdoor use. It also includes temperature-only transmitters and transmitters with an optional display.

Calculated humidity parameters – dew point temperature, wet bulb temperature, and enthalpy – are also available.

### Easy installation

HMDW80 series transmitters are optimized for easy installation. There are no loose parts, screws are retained in the enclosure, all connectors are clearly labeled, and the connectors are within easy reach.

The duct mount transmitters are well suited to a variety of duct sizes, the outdoor transmitters can be mounted directly onto a wall or pole without any

extra accessories, and the wall mount transmitters can be installed without the need to make holes in the transmitter enclosure.

### Reliable operation

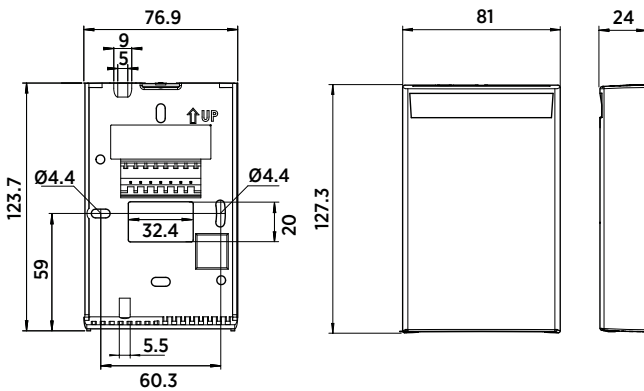
HMDW80 series transmitters require minimal maintenance thanks to their excellent sensor stability and high-quality materials. If necessary, the INTERCAP® sensor can be easily exchanged in the field with minimum downtime.

Model number	Type	Output	Special features	IP rating
TMW82	Wall-mount, T-only	2-wire, current output		IP30
HMW82	Wall-mount, RH+T	2-wire, current output		IP30
HMW82P100	Wall mount, RH+T	2-wire, current output	Additional Pt100 sensor	IP30
HMW83	Wall-mount, RH+T	3-wire, voltage output		IP30
TMW88	Wall-mount, T-only	2-wire, current output		IP65
HMW88	Wall-mount, RH+T	2-wire, current output	Calculated parameters <sup>1)</sup>	IP65
HMW88D	Wall-mount, RH+T	2-wire, current output	Display, calculated parameters <sup>1)</sup>	IP65
HMW89	Wall-mount, RH+T	3-wire, voltage output	Calculated parameters <sup>1)</sup>	IP65
HMW89D	Wall-mount, RH+T	3-wire, voltage output	Display, calculated parameters <sup>1)</sup>	IP65
TMD82	Duct-mount, T-only	2-wire, current output		IP65
HMD82	Duct-mount, RH+T	2-wire, current output	Calculated parameters <sup>1)</sup>	IP65
HMD82D	Duct-mount, RH+T	2-wire, current output	Display, calculated parameters <sup>1)</sup>	IP65
HMD83	Duct-mount, RH+T	3-wire, voltage output	Calculated parameters <sup>1)</sup>	IP65
HMD83D	Duct-mount, RH+T	3-wire, voltage output	Display, calculated parameters <sup>1)</sup>	IP65
HMS82	Outdoor, RH+T	2-wire, current output	Radiation shield, calculated parameters <sup>1)</sup>	IP65
HMS82C	Outdoor, RH+T	2-wire, current output	HMS82 with NPT ½" conduit fitting <sup>1)</sup>	IP65
HMS83	Outdoor, RH+T	3-wire, voltage output	Radiation shield, calculated parameters <sup>1)</sup>	IP65
HMS83C	Outdoor, RH+T	3-wire, voltage output	HMS83 with NPT ½" conduit fitting <sup>1)</sup>	IP65
TMS82	Outdoor, T-only	2-wire, current output	Radiation shield	IP65

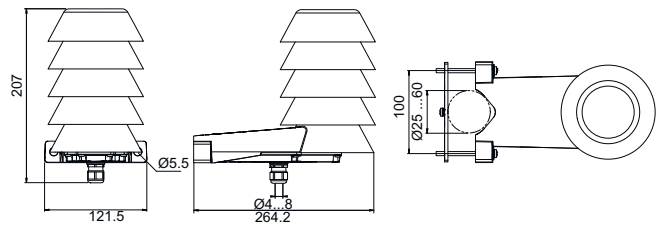
1) Output parameters for humidity: relative humidity, dew point temperature, wet bulb temperature, and enthalpy.

# Dimensions

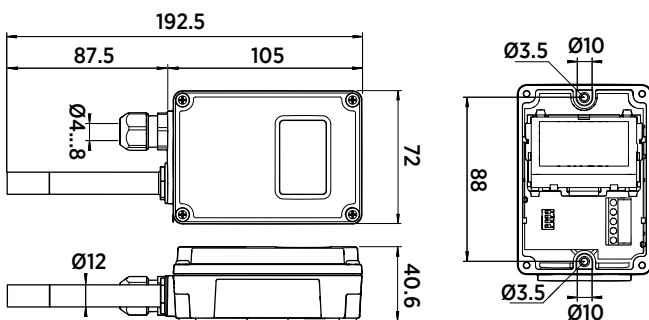
HMW82/83 RH+T and TMW82 T-only transmitters for wall-mounting



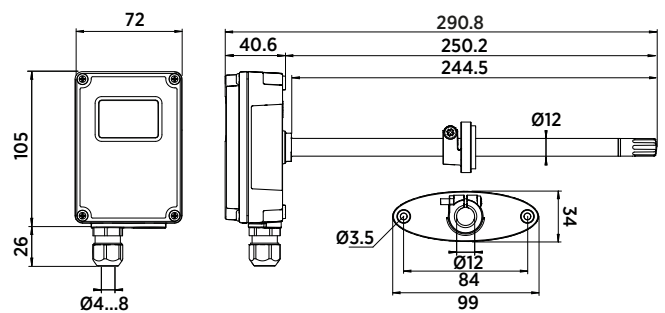
HMS82/83 RH+T and TMS82 T-only transmitters for outdoor measurements



HMW88/89(D) RH+T and TMW88 T-only transmitters for measurements in wet areas



HMD82/83(D) RH+T and TMD82 T-only transmitters for ducts



# Technical data

## Measurement performance, models HMW82/83 and TMW82

Relative humidity	
Measurement range	0 ... 100 %RH
Accuracy in temperature range +10 ... +30 °C (+50 ... +86 °F)	±3 %RH (0 ... 70 %RH) ±5 %RH (70 ... 100 %RH)
Accuracy in temperature range -5 ... +10 °C, +30 ... +55 °C (+23 ... +50 °F, +86 ... +131 °F)	±7 %RH (0 ... 100 %RH)
Stability in typical HVAC applications	±2 %RH over 2 years
Humidity sensor	Vaisala INTERCAP®
Temperature	
Measurement range	-5 ... +55 °C (+23 ... +131 °F)
Accuracy at +10 ... +30 °C (+50 °F ... +86 °F)	±0.5 °C (±0.9 °F)
Accuracy at -5 ... +10 °C, +30 ... +55 °C (+23 ... +50 °F, +86 ... +131 °F)	±1.0 °C (±1.8 °F)
Temperature sensor	Digital temperature sensor
Temperature sensor HMW82P100	Pt100 Class F 0.1 IEC 60751, 3-wire connection

## Measurement performance, models HMD82/83, TMD82, HMW88/89, TMW88, HMS82/83, and TMS82

Relative humidity	
Measurement range	0 ... 100 %RH
Accuracy in temperature range +10 ... +30 °C (+50 ... +86 °F)	±3 %RH (0 ... 90 %RH) ±5 %RH (90 ... 100 %RH)
Accuracy in temperature range -20 ... +10 °C, +30 ... +60 °C (-4 ... +50 °F, +86 ... +140 °F)	±5 %RH (0 ... 90 %RH) ±7 %RH (90 ... 100 %RH)
Accuracy in temperature range -40 ... -20 °C (-40 ... -4 °F)	±7 %RH (0 ... 100 %RH)
Stability in typical HVAC applications	±2 %RH over 2 years
Humidity sensor	Vaisala INTERCAP®
Temperature	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy at +20 °C (+68 °F)	±0.3 °C (±0.54 °F)
Temperature dependence	±0.01 °C/ °C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Calculated parameters	
Measurement range for dew point temperature and wet bulb temperature	-40 ... +60 °C (-40 ... +140 °F)
Measurement range for enthalpy	-40 ... 460 kJ/kg (-10 ... +190 BTU/lb)

## Operating environment

Maximum wind/flow speed	30 m/s
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
EMC compliance	EN61326-1, Industrial Environment
Operating temperature	
HMW82/83 and TMW82	-5 ... +55 °C (+23 ... +131 °F)
HMD82/83, TMD82, HMW88/89, TMW88, HMS82/83, and TMS82	-40 ... +60 °C (-40 ... +140 °F)
HMD82/83D and HMW88/89D	-5 ... +60 °C (+23 ... +140 °F)
Operating humidity	
HMD82/83, TMD82, HMW88/89, TMW88, HMS82/83, and TMS82	0 ... 100 %RH
HMW82/83, TMW82, HMD82/83D and HMW88/89D	0 ... 100 %RH, non-condensing

## Measurement performance, models HMD82/83D and HMW88/89D

Relative humidity	
Measurement range	0 ... 100 %RH
Accuracy in temperature range +10 ... +30 °C (+50 ... +86 °F)	±3 %RH (0 ... 90 %RH) ±5 %RH (90 ... 100 %RH)
Accuracy in temperature range -5 ... +10 °C, +30 ... +60 °C (+23 ... +50 °F, +86 ... +140 °F)	±5 %RH (0 ... 90 %RH) ±7 %RH (90 ... 100 %RH)
Stability in typical HVAC applications	±2 %RH over 2 years
Humidity sensor	Vaisala INTERCAP®
Temperature	
Measurement range	(Analog output scaling) -40 ... +60 °C (-40 ... +140 °F)
Accuracy at +20 °C (+68 °F)	±0.3 °C (±0.54 °F)
Temperature dependence	±0.01 °C/ °C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Calculated parameters	
Measurement range for dew point temperature and wet bulb temperature	-40 ... +60 °C (-40 ... +140 °F)
Measurement range for enthalpy	-40 ... 460 kJ/kg (-10 ... +190 BTU/lb)

## Inputs and outputs

Current output models (2-wire)	
Outputs	4 ... 20 mA, loop powered
Loop resistance	0 ... 600 Ω
Supply voltage	20 ... 28 VDC at 600 Ω load 10 ... 28 VDC at 0 Ω load
Voltage output models (3-wire)	
Outputs	0 ... 10 V
Load resistance	10 kΩ min
Supply voltage	18 ... 35 VDC 24 VAC ±20 % 50/60 Hz

## Mechanical specifications

Max wire size	1.5 mm <sup>2</sup> (AWG 16)
Standard housing color	White (RAL9003)
Housing material	
HMW82/83, TMW82	ABS/PC (UL-V0 approved)
HMW88/89(D), HMD82/83(D), TMW88, TMD82, HMS82/83, TMS82	PC + 10 %GF (UL-V0 approved)

## Spare parts and accessories

INTERCAP sensor	15778HM
10 pcs of INTERCAP sensors	INTERCAPSET-10PCS
Conduit fitting + O-ring (M16×1.5 / NPT ½")	210675SP
Conduit fitting + O-ring (M16×1.5 / PG9, RE-MS)	210674SP
Fastening set HMS80	237805
Porous PTFE filter	DRW239993SP
Membrane filter	ASM210856SP
Terminal block, blue	236620SP
HMD80 display lid	ASM210793SP

## HMS80 Series Humidity and Temperature Transmitters

For outdoor measurements in building automation applications



### Features

- Reliable outdoor transmitters with integrated radiation shields
- $\pm 3$  %RH accuracy
- User-exchangeable INTERCAP® sensor for easy field replacement
- Default output parameters are relative humidity and temperature. Dew point temperature, wet bulb temperature, and enthalpy outputs selectable using DIP switches
- Options for both current and voltage outputs
- Ingress protection IP65

Vaisala HMS80 Series INTERCAP® Humidity and Temperature Transmitters are designed for outdoor measurements in various building automation applications. These  $\pm 3$  % transmitters include an integrated radiation shield to reduce the influence of solar radiation on temperature and humidity measurements.

### Easy Installation

HMS80 transmitters are easy to install. They can be mounted directly onto a wall or pole without any extra accessories. There are no loose parts, screws are retained in the enclosure, all connectors are clearly labeled, and the connectors are within easy reach.

For fast and convenient configuration, the most popular control parameters in free cooling control – dew point temperature, wet bulb temperature, and enthalpy – are selectable using DIP switches.

### Low Maintenance

HMS80 series transmitters require minimal maintenance thanks to their excellent sensor stability and high-quality materials. If necessary, the INTERCAP® sensor can easily be replaced in the field with minimum downtime.



# Technical Data

## Models

Model	Type	Output	IP Rating
HMS82	Outdoor, RH+T	2-wire, current output	IP65
HMS83	Outdoor, RH+T	3-wire, voltage output	IP65

## Measurement Performance

Relative Humidity	
Measurement range	0 ... 100 %RH
Accuracy at temperature range +10 ... +30 °C (+50 ... +86 °F):	
0 ... 90 %RH	±3 %RH
90 ... 100 %RH	±5 %RH
Accuracy at temperature range -20 ... +10 °C, +30 ... +60 °C: (-4 ... +50 °F, +86 ... +140 °F)	
0 ... 90 %RH	±5 %RH
90 ... 100 %RH	±7 %RH
Accuracy in temperature range -40 ... -20 °C (-40 ... -4 °F):	
0 ... 100 %RH	±7 %RH
Stability in typical HVAC applications	±2 %RH over 2 years
Humidity sensor	Vaisala INTERCAP®
Temperature	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy at +20 °C (+68 °F)	±0.3 °C (±0.54 °F)
Temperature dependence	±0.01 °C/°C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Calculated Parameters <sup>1)</sup>	
Measurement range for dew point temperature and wet bulb temperature	-40 ... +60 °C (-40 ... +140 °F)
Measurement range for enthalpy	-40 ... 460 kJ/kg (-10 ... +190 BTU/lb)
Accuracy at 20 °C (68 °F) and 80 %RH	Dew point: ±0.9 °C (1.6 °F) Wet bulb temperature: ±0.7 °C (1.3 °F) Enthalpy: ±2 kJ/kg (0.9 BTU/lb)

<sup>1)</sup> Accuracy of the calculated parameters should be calculated at the actual condition based on the relative humidity and temperature specification.

## Inputs and Outputs

Current Output Model HMS82 (2-wire)	
Outputs	4 ... 20 mA, loop powered
Loop resistance	0 ... 600 Ω
Supply voltage	20 ... 28 VDC at 600 Ω load 10 ... 28 VDC at 0 Ω load
Voltage Output Model HMS83 (3-wire)	
Outputs	0 ... 10 V
Load resistance	10 kΩ min
Supply voltage	18 ... 35 VDC 24 VAC ±20 % 50/60 Hz

## Operating Environment

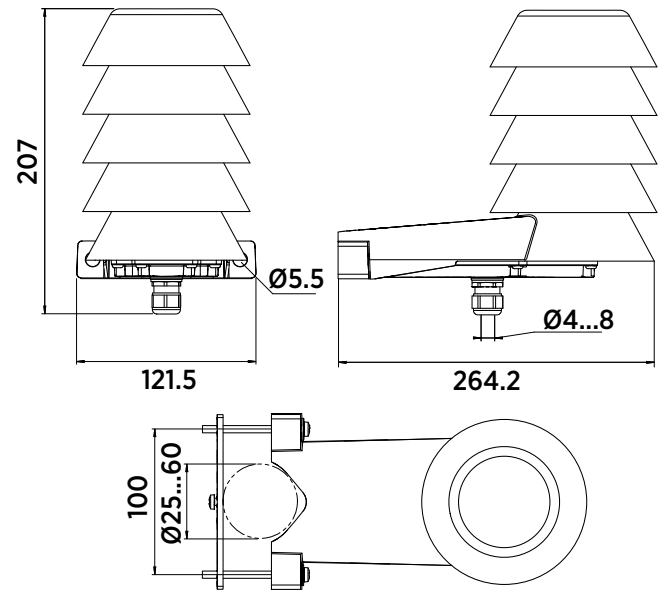
Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity	0 ... 100 %RH
Maximum wind/flow speed	30 m/s (67 mph)
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
EMC compliance	EN61326-1, Industrial Environment

## Mechanical Specifications

Max. wire size	1.5 mm <sup>2</sup> (AWG 16)
Standard housing color	White (RAL9003)
Housing material	PC + 10 %GF (UL-V0 approved)

## Spare Parts and Accessories

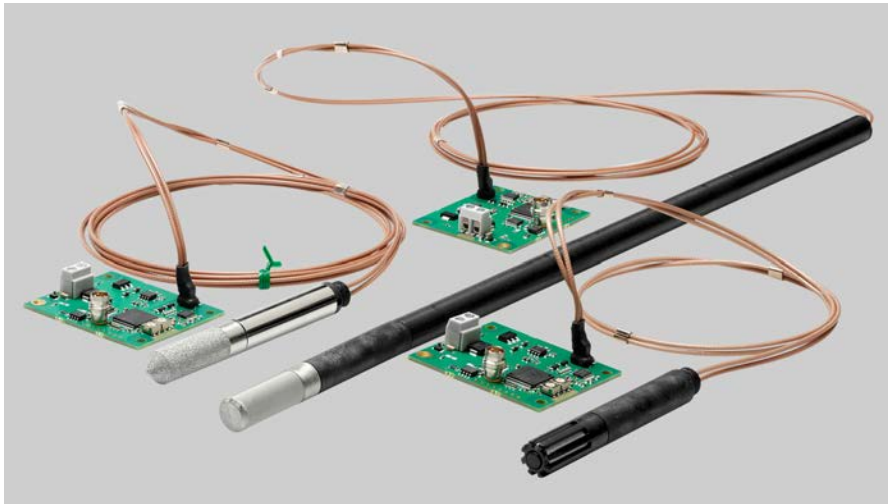
INTERCAP® sensor	15778HM
10 pcs of INTERCAP® sensors	INTERCAPSET-10PCS
Conduit fitting + O-ring (M16 × 1.5 / NPT1/2 Inch)	210675SP
Conduit fitting + O-ring (M16 × 1.5 / PG9, RE-MS)	210674SP
Fastening set HMS80	237805
Membrane Filter	ASM210856SP
Terminal Block, Blue	236620SP



Dimensions in mm



## HMM100 Humidity Module For environmental chambers



### Features

- Full temperature compensation over the operating temperature range of -70 °C ... +180 °C (-94 °F ... +356 °F)
- High temperature tolerance, also suitable for heat sterilization
- Vaisala HUMICAP® 180R sensor
- Easy field calibration by trimmers
- Applications: test chambers, incubators

Vaisala HUMICAP® Humidity Module HMM100 is an open frame module for integration into environmental chambers. The module provides a single analog output channel for relative humidity (RH) or dew point ( $T_d$ ).

### Benefits

- Excellent measurement accuracy
- Low-maintenance
- Easy to install
- Durable

Two types of probes are available, one made of stainless steel, the other of plastics. The plastic probe comes in two sizes, a standard one and an extended 400-mm-long option. Several cable lengths up to 3 meters are available. Both probes use the Vaisala HUMICAP® 180R sensor which ensures excellent measurement accuracy.

### Robust and Reliable

The HMM100 probe works in freezing conditions (-70 °C (-94 °F)) and also in temperatures up to +180 °C (+356 °F). HMM100 is easy to install and the probe can be freely placed in a test chamber as the speed of airflow does not affect the measurement.

### Low-Maintenance

Compared to psychrometers, HMM100 requires very little maintenance. There is no wick that needs changing and there is no need for a water tank or water pump. Thus, environmental stress screening can be done reliably.

### Accessories

The accessories available are a component board mounting bracket with a lid, probe clamp, USB cable for service use, a module housing, and a probe mounting flange.

# Technical Data

## Measurement Performance

Relative Humidity	
Measurement range	0 ... 100 %RH
Factory calibration uncertainty (+20 °C / +68 °F)	±1.5 %RH
Humidity sensor types	HUMICAP® 180R HUMICAP® 180
Accuracy <sup>1)</sup>	
at -20 ... +40 °C (-4 ... +104 °F)	±2 %RH (0 ... 90 %RH) ±3 %RH (90 ... 100 %RH)
at -40 ... -20 °C and +40 ... +180 °C (-40 ... -4 °F and +104 ... +356 °F)	±2.5 %RH (0 ... 90 %RH) ±3.5 %RH (90 ... 100 %RH)
Dew Point Temperature	
Measurement range	-20 ... +100 °C (-4 ... +212 °F) T <sub>d</sub>
Accuracy <sup>2)</sup>	±2 °C (±3.6 °F) T <sub>d</sub>

<sup>1)</sup> Including non-linearity, hysteresis, and repeatability.

<sup>2)</sup> Including non-linearity, hysteresis, and repeatability, when dew point depression is < +20 °C (+68 °F) (ambient temperature - dew point).

## Operating Environment

EMC compliance	Applicable parts of EN61326-1, generic environment
Operating Temperature	
Component board	-5 ... +55 °C (+23 ... +131 °F)
Stainless steel probe	-70 ... +180 °C (-94 ... +356 °F)
Plastic probe (standard body)	-70 ... +180 °C (-94 ... +356 °F)
Plastic probe (extended 400-mm (16-in) body)	-70 ... +120 °C (-94 ... +248 °F)
Plastic grid and membrane filter	-20 ... +80 °C (-4 ... +176 °F)
Porous PTFE, stainless steel sintered, and PPS plastic grid with stainless steel net filter	-70 ... +180 °C (-94 ... +356 °F)

## Mechanical Specifications

Service cable connector	M8 4-pin male
Probe diameter	12 mm (0.5 in)
Probe Cable Lengths	
Stainless steel probe	0.6/1.55/2.9 m (2/5.1/9.5 ft)
Plastic probe (standard body)	0.6/1.55/2.9 m (2/5.1/9.5 ft)
Plastic probe (extended 400-mm (16-in) body)	1.55 m (5.1 ft)
Probe Material	
Stainless steel probe	AISI316/PPS
Plastic probe	PPS
Extension tube for 400-mm probe	POM
Probe mounting clamp	AISI316
Mounting Bracket Material	
Lid	ABS/PC
Bottom plate	Al
Module housing material	ABS/PC (cover)

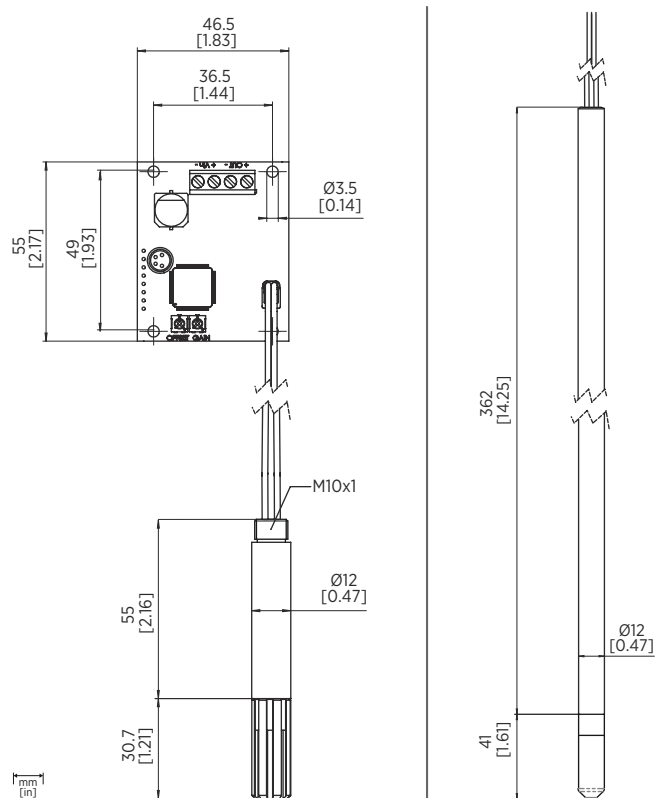
## Inputs and Outputs

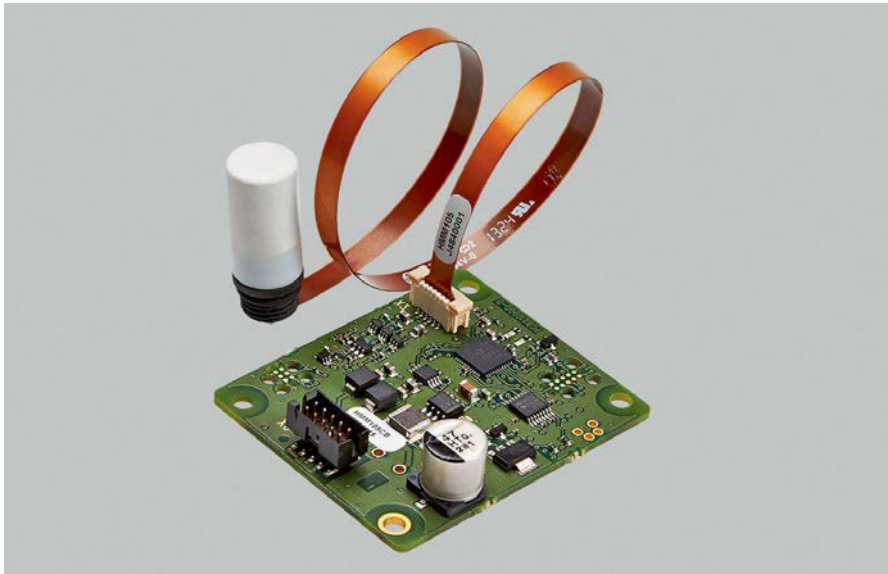
Power consumption	6 mA
Operating Voltage	
2-wire model	24 VDC
3-wire model	10 ... 35 VDC or 24 VAC ±20 % 15 ... 35 VDC or 24 VAC ±20 % when 0 ... 10 V output is used
Analog Output Types (1 Output Selectable)	
2-wire model	4 ... 20 mA (loop-powered)
3-wire model	0 ... 20 mA, 0 ... 1/5/10 V, 1 ... 5 V
Max. wire size	0.5 ... 1.5 mm <sup>2</sup> (AWG)
Service port	M8 connector for USB cable

## Spare Parts and Accessories

HUMICAP® 180R sensor	HUMICAP180R
HUMICAP® 180 sensor <sup>1)</sup>	15778HM
Plastic grid filter	6221
Membrane filter	10159HM
Porous PTFE filter	219452SP
Stainless steel sintered filter	HM47280SP
PPS plastic grid with stainless steel net filter	DRW010281SP
Mounting bracket with lid	225979
Module housing (IP65)	226060
Probe mounting flange	226061
Probe mounting clamp set (10 pcs)	226067
USB cable	226068

<sup>1)</sup> Spare part item name: Vaisala INTERCAP® humidity sensor.





### Features

- Digital I<sup>2</sup>C communication interface available
- Full temperature compensation over the operating temperature range of -40 °C ... +180 °C
- High temperature tolerance, suitable for heat sterilization up to +200 °C
- Vaisala HUMICAP® 180R sensor
- Detachable probe assembly
- Probe head with M10x1 threads
- Applications: test chambers, incubators

Vaisala HUMICAP® Digital Humidity Module HMM105 is an open frame module for integration into environmental chambers. The modules provide an I<sup>2</sup>C output for relative humidity (RH) or dew point (T<sub>d</sub>).

### Benefits

- Easy installation
- Excellent measurement accuracy
- Maintenance-free

The module consists of a detachable probe assembly – a probe head with M10x1 threads and a flex cable – and the module circuit board. The probe assembly is 30 cm in length. The module incorporates the Vaisala HUMICAP® 180R sensor which ensures excellent measurement accuracy.

### Reliable for OEM's

The HMM105 probe head works in freezing conditions (-40 °C) and also in temperatures up to +180 °C in continuous use. In short term use, the probe head can be exposed to temperatures up to +200 °C. HMM105 is intended for OEM chamber manufacturers for integration into test chambers and incubators.

### Maintenance-free

Compared to psychrometers, HMM105 is practically maintenance free. There is no wick that needs changing and there is no need for a water tank or water pump. Thus, environmental stress screening can be done reliably.

### I<sup>2</sup>C interface for better usability

HMM105 has an I<sup>2</sup>C interface for communicating with the incubator's controller. HMM105 implements I<sup>2</sup>C slave functionality, with the incubator's controller acting as the master. The interface can be used to read measurement values and status information, set operation parameters, and make adjustments.

# Technical Data

## Relative Humidity

Measurement range	0 ... 100 %RH
Factory calibration uncertainty (+20 °C)	±1.5 %RH
Humidity sensor	Vaisala HUMICAP® 180R
<b>Accuracy (incl. Non-Linearity, Hysteresis and Repeatability)</b>	
Temperature	-20 ... +40 °C
0 ... 90 %RH	±2 %RH
90 ... 100 %RH	±3 %RH
Temperature	-40 ... -20 °C, +40 ... +180 °C
0 ... 90 %RH	±2.5 %RH
90 ... 100 %RH	±3.5 %RH

## Dew Point Temperature

Measurement range	-20 ... +100 °C (-4 ... +212 °F) <sub>T<sub>d</sub></sub>
Accuracy (incl. non-linearity, hysteresis and repeatability) when dew point depression < 20 °C (Ambient temperature - dew point)	±2 °C T <sub>d</sub>

## Operating Environment

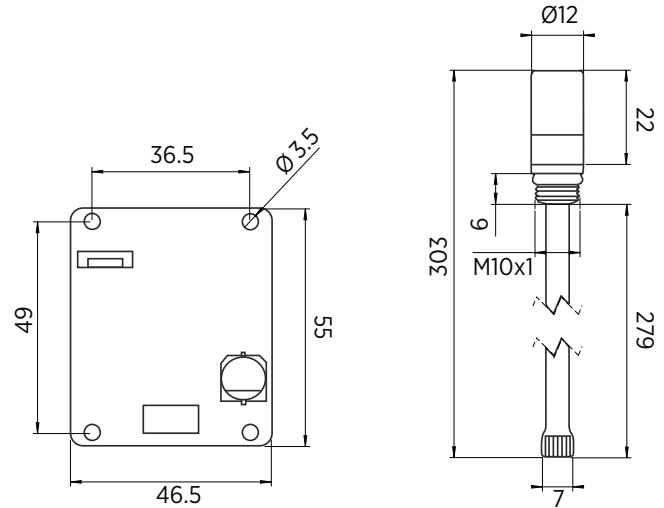
EMC compliance	Applicable parts of EN61326-1, Industrial Environment
Storage temperature	-40 ... +75 °C (-40 ... +167 °F)
<b>Operating Temperature</b>	
Component board	-5 ... +55 °C (+23 ... +131 °F)
Probe (continuous use)	-40 ... +180 °C (-40 ... +356 °F)
Probe (short term peak)	+200 °C (+392 °F)
Plastic grid, membrane filter	-20 ... +80 °C (-4 ... +176 °F)
PTFE sintered filters, stainless steel sintered filter	-40 ... +200 °C (-40 ... +392 °F)

## Inputs and Outputs

Supply voltage	10 ... 35 VDC, 24 VAC (±20 %)
Output voltage	I <sup>2</sup> C 5 V
Power consumption (DC/AC)	< 15/25 mA
Connector for supply voltage and I <sup>2</sup> C bus	Molex 87832-1007, 10-pin header bus

## Mechanical Specifications

Probe diameter	12 mm
Probe flex cable length	0.3 m
Probe lead-through material	PPS plastic



Dimensions in millimeters

## Spare Parts and Accessories

Humidity sensor	HUMICAP® 180R
Short PTFE sintered filter	DRW239993SP
Plastic grid filter	6221
Plastic grid and membrane filter	10159HM
PTFE sintered filter	219452SP
Stainless steel sintered filter	HM47280SP
0.6 m cable with Molex milli-grid connectors	ASM210962SP



## HMM170 Humidity and Temperature Module

For environmental chambers



### Features

- Warmed sensor and probe for condensation prevention
- Chemical purge for maintaining sensor performance
- Suitable for use in high humidity environments, vacuum, and pressurized chambers
- Temperature measurement range  $-70 \dots +180 \text{ }^{\circ}\text{C}$  ( $-94 \dots +356 \text{ }^{\circ}\text{F}$ )
- Sensor options for corrosion tolerance,  $\text{H}_2\text{O}_2$  tolerance, and moisture-in-oil measurement
- 3 analog output channels
- Modbus RTU over RS-485
- Several output parameters available
- 3 probe cable length options
- Compatible with Insight PC software

Vaisala HUMICAP® Humidity and Temperature Module HMM170 is an open frame OEM module for integration into demanding environmental chambers and harsh conditions. The module provides a digital RS-485/Modbus RTU output and three freely configurable analog output channels. The module provides relative humidity, temperature, dew point, and other calculated parameters.

### Designed for harsh environments

HMM170 probe covers the full temperature range  $-70 \dots +180 \text{ }^{\circ}\text{C}$  ( $-94 \dots +356 \text{ }^{\circ}\text{F}$ ) used in climate chambers and the whole humidity range up to condensation. The small probe and compact component board offer easy and flexible installation. The probe cable options (2, 5, or 10 m (6.5, 16.4, or 32.8 ft)) offer excellent cost optimization and flexibility to any OEM application. By ordering HMM170 with the appropriate sensor, you can use the module in environments that are frequently sterilized with vaporized hydrogen

peroxide ( $\text{H}_2\text{O}_2$ ) or to measure humidity in oil medium, for example, for transformer and engine monitoring applications.

### Robust sensor technology

The latest general purpose HUMICAP® R2 sensor has improved corrosion resistance. The sensor can tolerate typical chemicals, such as cleaning agents used in climate chambers. The automatic sensor chemical purge function keeps the sensor clean from typical chemical fumes and the additional probe warming function prevents condensation. In case HMM170

gets in contact with water, the automatic heating rapidly dries the sensor to enable fast and accurate humidity measurement.

### Convenient to use

HMM170 is easy to install and convenient to use. It provides both digital and analog outputs for multiple needs. An integrated service port enables a quick and simple way to configure, check, and calibrate the module with the help of a USB cable and Vaisala Insight PC software. In addition, the footprint of the HMM170 component board enables easy update for Vaisala HMM100 users.

# Technical data

## Measurement performance

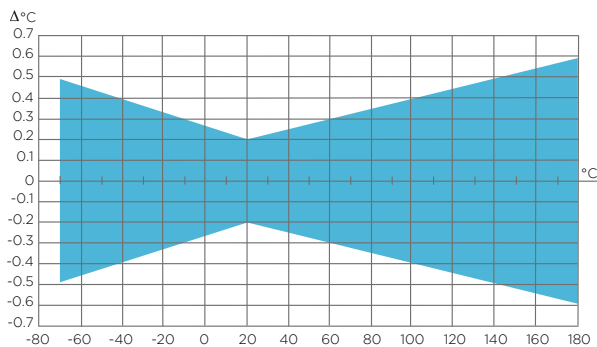
### Relative humidity

Measurement range	0 ... 100 %RH
Accuracy <sup>1) 2)</sup>	
at +15 ... +25 °C (59 ... +77 °F)	±1 %RH (0 ... 90 %RH) ±1.7 %RH (90 ... 100 %RH)
at -20 ... +40 °C (-4 ... +104 °F)	± (1.0 + 0.008 × reading) %RH
at -40 ... +180 °C (-40 ... +356 °F)	± (1.5 + 0.015 × reading) %RH
Factory calibration uncertainty at +20 °C (+68 °F) <sup>3)</sup>	±0.6 %RH (0 ... 40 %RH) ±1.0 %RH (40 ... 90 %RH) ±1.1 %RH (90 ... 95 %RH)
Humidity sensor types	HUMICAP® R2C HUMICAP® 180L2 HUMICAP® 180VC
T <sub>90</sub> response time <sup>4)</sup>	50 s with steel mesh filter 60 s with sintered filter

### Temperature

Measurement range	-70 ... +180 °C (-94 ... +356 °F)
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751
Typical accuracy at +20 °C (+68 °F)	±0.2 °C (± 0.36 °F)

- 1) Including non-linearity, hysteresis and repeatability.
- 2) With HUMICAP® 180VC sensor, accuracy is not specified below -20 °C (-4 °F) operating temperature.
- 3) Defined as ±2 standard deviation limits. Small variations possible; see also calibration certificate.
- 4) At +20 °C (+68 °F) in 0.1 m/s air flow with Vaisala HUMICAP® R2C sensor.



## Temperature measurement accuracy over temperature range

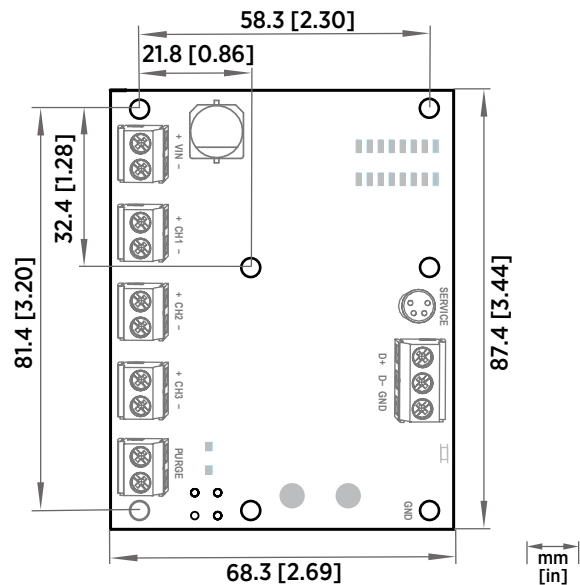
## Operating environment

Operating temperature for component board	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity for component board	0 ... 100 %RH, non-condensing
Storage temperature	-55 ... +80 °C (-67 ... +176 °F)
Operating pressure	0 ... 10 bar

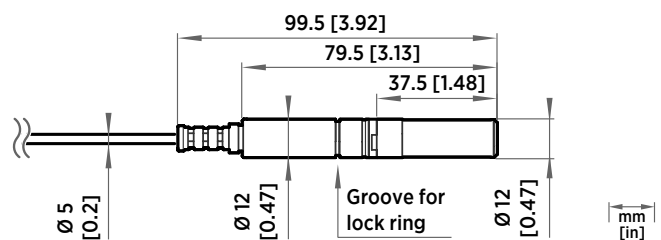
## Accessories

USB cable for PC connection <sup>1)</sup>	219690
Cable gland M20×1.5 for probe cable	HMP247CG
Swagelok NPT 1/2" adapter for probe	SWG12NPT12
Swagelok ISO 1/2" adapter for probe	SWG12ISO12
Duct installation kit for probe	210697

<sup>1)</sup> Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight)



HMM170 component board dimensions



HMM170 probe head dimensions

## Inputs and outputs

Three analog outputs (selectable and scalable)	0 - 20 mA, 4 - 20 mA 0 - 1 V, 0 - 5 V, 1 - 5 V, or 0 - 10 V
Typical accuracy of analog output at +20 °C (+68 °F)	±0.05 % full scale
Typical temperature dependence of analog output	0.005 %/°C (0.003 %/°F) full scale
External load	R <sub>L</sub> < 500 Ω
Digital output	RS-485 serial, Modbus
Service port	M8 connector for USB cable
Start-up time	3 s at power-up
Wire size	0.5 ... 1.5 mm <sup>2</sup> (20 ... 16 AWG)
<b>Supply voltage</b>	
when condensation prevention and chemical purge features are not used	12 - 35 V DC
all features available	18 - 35 V DC or 24 V AC ±10 %
<b>Power consumption</b>	
Analog outputs	12 mA (voltage), 50 mA (current)
Chemical purge at 24 V DC	+220 mA
Warmed probe at 24 V DC	+240 mA



### Features

- Miniature-size humidity probe
- Low power consumption
- Measurement range: 0–100 %RH; –40 ... +60 °C (–40 ... +140 °F)
- Cable detachable with standard M8 connector
- Rugged metal housing
- Interchangeable Vaisala INTERCAP® sensor
- Compatible with Vaisala Insight PC software and Vaisala Indigo80 Handheld Indicator
- Optional RS-485 digital output supports Modbus® RTU
- Optional dew/frost point, wet bulb temperature, absolute humidity, mixing ratio, and enthalpy output

Vaisala INTERCAP® Humidity and Temperature Probe HMP60 is a simple, durable and cost-effective humidity probe. It is suitable for volume applications, integration into other manufacturers' equipment, incubators, glove boxes, greenhouses, fermentation chambers, and data loggers.

### Easy installation

The probe cable has a screw-on quick connector for easy installation. Different cable lengths are available. Also other compatible M8 series cables can be used. Accessories are available for different installation needs.

### Low current consumption

HMP60 is suitable for battery-powered applications because of its very low current consumption.

### Several outputs

Temperature measurement is a standard feature in HMP60, with dew point temperature, wet bulb temperature, absolute humidity, mixing ratio, and

enthalpy as optional calculated parameters. Four voltage output ranges are available. An optional RS-485 output with Modbus support is also available.

### Flexible connectivity

In addition to analog and digital (Modbus) output options, the probe can also be used with Vaisala Indigo80 Handheld Indicator. For easy-to-use access to configuration and device analytics functionalities, the probe can be connected to Vaisala Insight PC software for Windows®. For more information, see [vaisala.com/indigo80](https://vaisala.com/indigo80) and [vaisala.com/insight](https://vaisala.com/insight).

### Rugged design

HMP60 is designed for extreme conditions. The stainless steel body of HMP60 is classified as IP65. The probe has a sealed structure and the sensor is protected by a membrane filter and a plastic grid, or optionally by a stainless steel filter.

### Recalibration not needed

The Vaisala INTERCAP® sensor is interchangeable. No recalibration is required; the sensor can simply be replaced, also in the field.



# Technical data

## Measurement performance

### Relative humidity

Measurement range	0–100 %RH
Typical accuracy:	
at 0 ... +40 °C (+32 ... +140 °F)	±3 %RH (0–90 %RH) ±5 %RH (90–100 %RH)
at –40 ... 0 °C and +40 ... +60 °C (–40 ... +32 °F and +104 ... +140 °F)	±5 %RH (0–90 %RH) ±7 %RH (90–100 %RH)
Humidity sensor	Vaisala INTERCAP®

### Temperature

Measurement range	–40 ... +60 °C (–40 ... +140 °F)
Accuracy:	
at +10 ... +30 °C (+50 ... +86 °F)	±0.5 °C (±0.9 °F)
at –40 ... +10 and +30 ... +60 °C (–40 ... +50 and +86 ... +140 °F)	±0.6 °C (±1.08 °F)

### Analog outputs

Accuracy at +20 °C (+68 °F)	±0.2 % of FS
Temperature dependence	±0.01 % of FS/°C (±0.006 % of FS/°F)

## Inputs and outputs

Power consumption	1 mA average, max. peak 5 mA
-------------------	------------------------------

### Operating voltage <sup>1)</sup>

With 1 V / 2.5 V output	5–28 V DC
With 5 V output	8–28 V DC
With loop power converter	8–28 V DC
With digital output	5–28 V DC

### Start-up time

Probes with analog output	4 s at operating voltage 13.5–16.5 V DC 2 s at other valid operating voltages
Probes with digital output	1 s

### Outputs

2 channels	0–1 V DC / 0–2.5 V DC / 0–5 V DC / 1–5 V DC
1-channel loop-power converter (separate module, compatible with humidity accuracy only)	4–20 mA
Digital output (optional)	RS-485 2-wire half duplex, supports Modbus RTU

### External loads

0–1 V	R <sub>L</sub> min. 10 kΩ
Other voltage outputs	R <sub>L</sub> min. 50 kΩ

### Output parameters

Relative humidity, temperature, dew/frost point temperature, wet bulb temperature, absolute humidity, mixing ratio, enthalpy

<sup>1)</sup> Use lowest available operating voltage to minimize heating.

## Operating environment

Operating temperature	–40 ... +60 °C (–40 ... +140 °F)
IP rating <sup>1)</sup>	IP65

<sup>1)</sup> Not applicable with the plastic grid filter.

## Mechanical specifications

Body thread	M12×1 / 10 mm (0.4 in)
Cable connector	4-pin M8 (IEC 60947-5-2)

### Materials

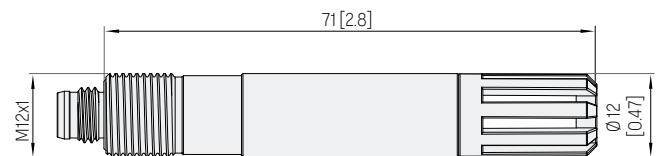
Body	Stainless steel (AISI 316)
Grid filter	Chrome coated ABS plastic
Cable	Polyurethane or FEP

### Weight

Probe	17 g (0.6 oz)
Probe with 0.3 m (1 ft) cable	28 g (1 oz)

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, RCM, UKCA



Dimensions in mm (inches)

## Spare parts and accessories

### Sensors

Vaisala INTERCAP® sensor, 1 pc	15778HM
Vaisala INTERCAP® sensor, 10 pcs	INTERCAPSET-10PCS

### Sensor protection

Plastic grid filter	DRW010522SP
Membrane filter	DRW010525SP
Stainless steel sintered filter	HM46670SP
PTFE membrane filter with stainless steel grid	ASM212652SP
PTFE sintered filter	DRW244938SP

### Probe installation

Duct installation kit	215619
Probe mounting clamp set, 10 pcs	226067
Probe mounting flange	226061
Probe holder, 5 pcs	ASM213382SP
Plastic M12 installation nuts, pair	18350SP
Flat extension cable 1 m (3 ft) <sup>1)</sup>	CBL210649SP

### Connection adapters

4-20 mA loop power converter	UI-CONVERTER-1CB
Mounting bracket for converter	225979
USB cable for PC connection	219690
Connection cable for Indigo80 handheld indicator	262195SP
Connection cable for MI70 indicator	219980SP

### Connection cables with open wires

+60 °C 0.3 m (+140 °F 1 ft)	HMP5OZ032SP
+60 °C 1.2 m (+140 °F 4 ft)	HMP5OZ120
+60 °C 3 m (+140 °F 9.8 ft)	HMP5OZ300SP
+80 °C 1.5 m (+176 °F 5 ft)	225777SP
+80 °C 3 m (+176 °F 10 ft)	225229SP
+180 °C 1.5 m (+356 °F 5 ft) FEP	238025
+180 °C 3 m (+356 °F 10 ft) FEP	226902SP

<sup>1)</sup> Connection cable 219980SP is also needed if this cable is used with MI70 indicator.

## HMP63 Humidity and Temperature Probe



### Features

- Fast thermal response time
- Low power consumption
- Start-up time < 2 s
- Measurement range: 0–100 %RH; –40 ... +60 °C (–40 ... +140 °F)
- Cable detachable with standard M8 connector
- IP54-rated plastic housing
- Interchangeable Vaisala INTERCAP® humidity sensor
- Compatible with Vaisala Insight PC software and Vaisala Indigo80 Handheld Indicator
- Optional RS-485 digital output supports Modbus® RTU
- Optional dew/frost point, wet bulb temperature, absolute humidity, mixing ratio, and enthalpy output
- Temperature-only model HMP63T with digital output also available

Vaisala INTERCAP® Humidity and Temperature Probe HMP63 is a cost-effective humidity probe with a plastic housing. It is designed for non-condensing indoor environments or integration into other manufacturers' equipment.

### Easy installation

The probe fits into tight spaces. The cable has a threaded M8 connector for easy installation. Different cable lengths are available and other compatible M8-series cables can also be used. Accessories are available for different installation needs.

### Low power consumption

HMP63 is suitable for battery-powered applications thanks to its very low power consumption and fast start-up time.

### Several output options

Temperature measurement is a standard feature in HMP63, with dew point temperature, wet bulb temperature, absolute humidity, mixing ratio, and

enthalpy as optional calculated parameters. Four voltage output ranges are available. An alternative RS-485 output with Modbus support is also available.

Output type, channel assignment of measurement parameters, and other probe features are configured when the probe is ordered.

### Flexible connectivity

In addition to analog and digital (Modbus) output options, the probe can also be used with Vaisala Indigo80 Handheld Indicator. For easy-to-use access to configuration and device analytics functionalities, the probe can

be connected to Vaisala Insight PC software for Windows®. For more information, see [vaisala.com/indigo80](https://vaisala.com/indigo80) and [vaisala.com/insight](https://vaisala.com/insight).

### Fast thermal response time

HMP63 has a PC/ABS plastic enclosure. It is ideal for environments with fast temperature changes where standard measurement accuracy is sufficient.

### No recalibration required

HMP63 includes an interchangeable Vaisala INTERCAP® humidity sensor. No recalibration is required – the humidity sensor can simply be replaced, even in the field.

# Technical data

## Models

Model	Measurement	Special features
HMP63	RH + T	INTERCAP® humidity sensor
HMP63T	T	Digital output only, for use with CWL100 data logger

## Measurement performance

Relative humidity	
Measurement range	0-100 %RH
Typical accuracy:	
at 0 ... +40 °C (+32 ... +140 °F)	±3 %RH (0-90 %RH) ±5 %RH (90-100 %RH)
at -40 ... 0 °C and +40 ... +60 °C (-40 ... +32 °F and +104 ... +140 °F)	±5 %RH (0-90 %RH) ±7 %RH (90-100 %RH)
Humidity sensor	Vaisala INTERCAP®
Temperature	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy:	
at +10 ... +30 °C (+50 ... +86 °F)	±0.5 °C (±0.9 °F)
at -40 ... +10 and +30 ... +60 °C (-40 ... +50 and +86 ... +140 °F)	±0.6 °C (±1.08 °F)
Analog outputs	
Accuracy at 20 °C (+68 °F)	±0.2 % of FS
Temperature dependence	±0.01 % of FS/°C (±0.006 % of FS/°F)

## Inputs and outputs

Power consumption	1 mA average, max. peak 5 mA
Operating voltage <sup>1)</sup>	
With 1 V / 2.5 V output	5-28 V DC
With 5 V output	8-28 V DC
With loop-power converter	8-28 V DC
With digital output	5-28 V DC
Start-up time	
Probes with analog output	4 s at operating voltage 13.5-16.5 V DC 2 s at other valid operating voltages
Probes with digital output	1 s
Outputs	
2 channels	0-1 V DC / 0-2.5 V DC / 0-5 V DC / 1-5 V DC
1-channel loop-power converter (separate module, compatible with humidity accuracy only)	4-20 mA
Digital output (optional)	RS-485 2-wire half duplex, supports Modbus RTU
External loads	
0-1 V	R <sub>L</sub> min. 10 kΩ
Other voltage outputs	R <sub>L</sub> min. 50 kΩ
Output parameters	
Relative humidity, temperature, dew/frost point temperature, wet bulb temperature, absolute humidity, mixing ratio, enthalpy	

<sup>1)</sup> Use lowest available operating voltage to minimize heating.

## Operating environment

Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
IP rating <sup>1)</sup>	IP54

<sup>1)</sup> Not applicable with the plastic grid filter.

## Mechanical specifications

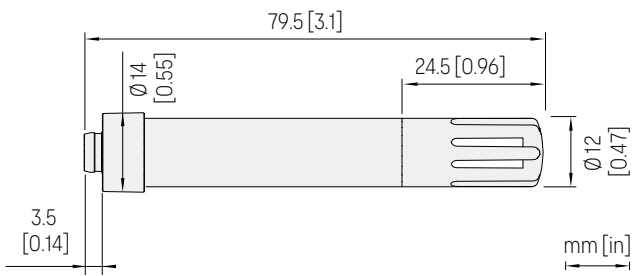
Cable connector	4-pin M8 (IEC 60947-5-2)
Materials	
Body	PC/ABS blend
Grid filter	PC (glass reinforced)
Cable	Polyurethane or FEP
Weight	
Probe	9 g (0.3 oz)
Probe with 0.3 m (1 ft) cable	20 g (0.7 oz)

## Compliance

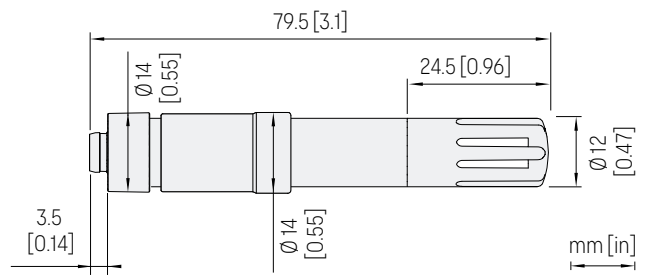
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, RCM, UKCA

## Spare parts and accessories

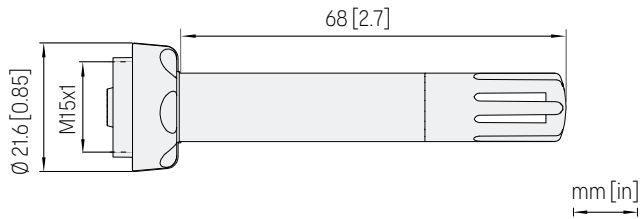
Sensors	
Vaisala INTERCAP® sensor, 1 pc	15778HM
Vaisala INTERCAP® sensor, 10 pcs	INTERCAPSET-10PCS
Sensor protection	
Plastic grid filter	DRW240185SP
Plastic grid with membrane filter	ASM210856SP
Stainless steel sintered filter	HM47280SP
Porous PTFE filter	219452SP
Probe installation	
Probe mounting clamp set, 10 pcs	226067
Probe mounting flange	226061
Probe holder, 5 pcs	ASM213382SP
Plastic locking bushing (3 pcs) for attaching probe to HM40	DRW238590SP
Connection adapters	
4-20 mA loop power converter	UI-CONVERTER-1CB
Mounting bracket for converter	225979
USB cable for PC connection	219690
Connection cable for Indigo80 handheld indicator	262195SP
Connection cable for HM70	219980SP
Connection cables with open wires	
+60 °C 0.3 m (+140 °F 1 ft)	HMP50Z032SP
+60 °C 1.2 m (+140 °F 4 ft)	HMP50Z120
+60 °C 3 m (+140 °F 9.8 ft)	HMP50Z300SP
+80 °C 1.5 m (+176 °F 5 ft)	225777SP
+80 °C 3 m (+176 °F 10 ft)	225229SP
+180 °C 1.5 m (+356 °F 5 ft) FEP	238025
+180 °C 3 m (+356 °F 10 ft) FEP	226902SP



HMP63 probe dimensions



HMP63 and HMP63T probe dimensions with sleeve for CWL100 data logger



HMP63 probe dimensions with plastic locking bushing



### Features

- Miniature-size humidity transmitter
- Low power consumption and fast start-up for battery-powered applications
- Measurement range: 0–100 %RH; –40 ... +80 °C (–40 ... +176 °F)
- Cable detachable with standard M8 quick connector
- IP65 metal housing
- Compatible with Vaisala Insight PC software and Vaisala Indigo80 handheld indicator
- Optional RS-485 digital output supports Modbus® RTU
- ±1.5 %RH measurement accuracy (0–90 %RH)
- Temperature-only model HMP110T also available

Vaisala HUMICAP® Humidity and Temperature Probe HMP110 is a trouble-free and cost-effective humidity transmitter with high accuracy and good stability. It is suitable for volume applications or integration into other manufacturers' equipment. HMP110 is also suitable for glove boxes, greenhouses, fermentation and stability chambers, data loggers, and incubators.

### Benefits

- Latest generation Vaisala HUMICAP® 180R sensor for best stability and high chemical tolerance
- Comes with calibration certificate
- Optional dew/frost point, wet bulb temperature, absolute humidity, mixing ratio, and enthalpy calculation

### Easy installation

The probe cable has a screw-on quick connector for easy installation. Different cable lengths and accessories are available.

### Low current consumption

HMP110 is suitable for battery-powered applications because of its very low current consumption. It also has a fast start-up time.

### Several outputs

Temperature measurement is a standard feature in the HMP110, with dew/frost point temperature, wet bulb temperature, absolute humidity, mixing ratio, and enthalpy as optional calculated parameters. Three standard voltage outputs are available. An optional RS-485 output with Modbus support is also available.

### Flexible connectivity

In addition to analog and digital (Modbus) output options, the probe can also be used with the Vaisala Indigo80 handheld indicator. For easy-to-use

access to configuration and device analytics functionalities, the probe can be connected to Vaisala Insight software for Windows®. For more information, see [www.vaisala.com/insight](http://www.vaisala.com/insight) and [www.vaisala.com/indigo80](http://www.vaisala.com/indigo80).

### Robust design

The stainless steel body of HMP110 is classified as IP65, making it ideal for rough conditions. HMP110 has high chemical tolerance thanks to the HUMICAP® 180R sensor.

# Technical data

## Models

Model	Output	Special features
HMP110	RH+T	-
HMP110T	T	-
HMP110REF	-	Fixed output probe for validation of HMT120 and HMT130 transmitters

## Measurement performance

Relative humidity	
Measurement range	0-100 %RH
Accuracy: <sup>1) 2)</sup>	
at 0 ... +40 °C (+32 ... +104 °F)	±1.5 %RH (0-90 %RH) ±2.5 %RH (90-100 %RH)
at -40 ... 0 °C (-40 ... +32 °F) and +40 ... +80 °C (+104 ... +176 °F)	±3.0 %RH (0-90 %RH) ±4.0 %RH (90-100 %RH)
Factory calibration uncertainty at +20 °C (+68 °F)	±1.1 %RH (0-90 %RH) ±1.8 %RH (90-100 %RH)
Humidity sensor types	HUMICAP® 180R HUMICAP® 180V
Stability	±2 %RH over 2 years
T <sub>90</sub> response time	With plastic grid filter: approx. 17 s With membrane filter: approx. 20s With stainless steel sintered filter: approx. 60 s
Temperature	
Measurement range	-40 ... +80 °C (-40 ... +176 °F)
Accuracy (probes with analog output):	
at 0 ... +40 °C (+32 ... +104 °F)	±0.2 °C (±0.36 °F)
at -40 ... 0 °C (-40 ... +32 °F) and +40 ... +80 °C (+104 ... +176 °F)	±0.4 °C (±0.72 °F)
Accuracy (probes with digital output):	
at +15 ... +25 °C (+59 ... +77 °F)	±0.1 °C (±0.18 °F)
at 0 ... +15 °C (+ 32 ... +59 °F) and +25 ... +40 °C (+77 ... +104 °F)	±0.15 °C (±0.27 °F)
at -40 ... 0 °C (-40 ... +32 °F) and +40 ... +80 °C (+104 ... +176 °F)	±0.4 °C (±0.72 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Analog outputs	
Accuracy at +20 °C (+68 °F)	±0.2 % of FS
Temperature dependence	±0.01 % of FS/°C (±0.006 % of FS/°F)

<sup>1)</sup> Including non-linearity, hysteresis, and repeatability.

<sup>2)</sup> With HUMICAP® 180V sensor, accuracy is not specified below -20 °C (-4 °F) operating temperature.

## Operating environment

Operating temperature	-40 ... +80 °C (-40 ... +176 °F)
IP rating <sup>1)</sup>	IP65

<sup>1)</sup> Not applicable with the plastic grid filter.

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, RCM, UKCA

## Inputs and outputs

Power consumption	1 mA average, max. peak 5 mA
Operating voltage <sup>1)</sup>	
With 1 V / 2.5 V output	5-28 V DC
With 5 V output	8-28 V DC
With loop power converter	8-28 V DC
With digital output	5-28 V DC
Start-up time	
HMP110 probes with analog output	4 s at operating voltage 13.5-16.5 V DC 2 s at other valid operating voltages
HMP110 probes with digital output	1 s
Outputs	
2 channels	0-1 V DC / 0-2.5 V DC / 0-5 V DC / 1-5 V DC
1-channel loop-power converter (separate module, compatible with humidity accuracy only)	4-20 mA
Digital output (HMP110 probes with digital output)	RS-485 2-wire half duplex, supports Modbus RTU
External loads	
0-1 V	R <sub>L</sub> min. 10 kΩ
Other voltage outputs	R <sub>L</sub> min. 50 kΩ

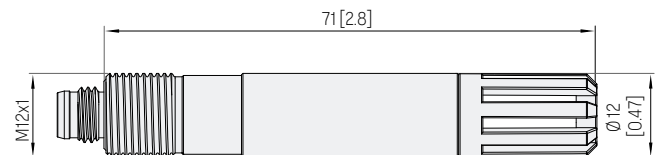
### Output parameters

Relative humidity, temperature, dew/frost point temperature, wet bulb temperature, absolute humidity, mixing ratio, enthalpy

<sup>1)</sup> Use lowest available operating voltage to minimize heating.

## Mechanical specifications

Body thread	M12x1 / 10 mm (0.4 in)
Cable connector	M8 4-pin female (IEC 60947-5-2)
Materials	
Body	Stainless steel (AISI 316)
Grid filter	Chrome coated ABS plastic
Cable	Polyurethane or FEP
Weight	
Probe	17 g (0.6 oz)
Probe with 0.3 m (1 ft) cable	28 g (1 oz)



HMP110 and HMP110T probe dimensions

## Spare parts and accessories

### Sensors

Vaisala HUMICAP® 180R HUMICAP180R

Vaisala HUMICAP® 180V HUMICAP180V

### Sensor protection

Plastic grid filter DRW010522SP

Membrane filter DRW010525SP

Stainless steel sintered filter HM46670SP

PTFE membrane filter with stainless steel grid ASM212652SP

PTFE sintered filter DRW244938SP

### Probe installation

Duct installation kit 215619

Probe mounting clamp set, 10-pcs 226067

Probe mounting flange 226061

Probe holder, 5 pcs ASM213382SP

Plastic M12 installation nuts, pair 18350SP

Flat extension cable 1 m (3 ft) <sup>1)</sup> CBL210649SP

### Connection adapters

4-20-mA loop power converter UI-CONVERTER-1CB

Mounting bracket for converter 225979

USB cable for PC connection 219690

Connection cable for Indigo80 handheld indicator 262195SP

Connection cable for MI70 indicator 219980SP

### Connection cables with open wires

+60-°C 0.3-m (+140-°F 1-ft) HMP5OZ032SP

+60-°C 1.2-m (+140-°F 4-ft) HMP5OZ120

+60-°C 3-m (+140-°F 9.8-ft) HMP5OZ300SP

+80-°C 1.5-m (+176-°F 5-ft) 225777SP

+80-°C 3-m (+176-°F 10-ft) 225229SP

+180-°C 1.5-m (+356-°F 5-ft) FEP 238025

+180-°C 3-m (+356-°F 10-ft) FEP 226902SP

<sup>1)</sup> Connection cable 219980SP is also needed if this cable is used with MI70 indicator.



## HMP113 Humidity and Temperature Probe



### Features

- Fast thermal response time
- Low power consumption and fast start-up for battery-powered applications
- Measurement range: 0–100 %RH; –40 ... +60 °C (–40 ... +140 °F)
- Detachable cable with standard 4-pin M8 connector
- Plastic enclosure with IP54 classification
- Proven Vaisala HUMICAP® 180R sensor for excellent stability
- Compatible with Vaisala Insight PC software, Vaisala Indigo80 Handheld Indicator, and Vaisala HM40 Handheld Meter
- Optional RS-485 digital output supports Modbus® RTU
- Comes with calibration certificate: ±1.5 %RH measurement accuracy (0–90 %RH)

Vaisala HUMICAP® Humidity and Temperature Probe HMP113 is a highly accurate and cost-effective humidity probe with plastic enclosure. It is designed for indoor environments, integration into other manufacturers' equipment, or use with Vaisala HUMICAP® Handheld Humidity and Temperature Meter HM40.

### Easy installation

The compact probe fits into tight spaces. The cable has a threaded M8 connector for easy installation. Different cable lengths and a selection of accessories are available.

### Low power consumption

HMP113 is suitable for battery powered applications due to its very low power consumption. It also has an extremely fast start-up time.

### Several outputs

Temperature measurement is a standard feature in HMP113, with dew point temperature, wet bulb temperature, absolute humidity, mixing ratio, and

enthalpy as optional calculated parameters. Four voltage output ranges are available. An optional RS-485 output with Modbus support is also available.

### Flexible connectivity

In addition to analog and digital (Modbus) output options, the probe can also be used with the Vaisala Indigo80 Handheld Indicator and the Vaisala HM40 Handheld Meter. For easy-to-use access to configuration and device analytics functionalities, the probe can be connected to Vaisala Insight software for Windows®. For more information, see [vaisala.com/insight](https://vaisala.com/insight) and [vaisala.com/indigo80](https://vaisala.com/indigo80).

### High performance

HMP113 has a PC/ABS plastic enclosure and is suitable for non-condensing environments with fast temperature changes and a need for high-accuracy measurements with traceability. HMP113 also has a high chemical tolerance thanks to the proven Vaisala HUMICAP® 180R sensor.

### Variety of calibration options

A quick field calibration can easily be carried out using a handheld device, for example the Indigo80 Handheld Indicator or the HM40 Handheld Meter. Alternatively, the probe can be calibrated using a PC with USB cable, or sent to a Vaisala Service Center.

# Technical data

## Measurement performance

<b>Relative humidity</b>	
Measurement range	0–100 %RH
Accuracy (incl. non-linearity, hysteresis, and repeatability):	
at 0 ... +40 °C (+32 ... +104 °F)	±1.5 %RH (0–90 %RH) ±2.5 %RH (90–100 %RH)
at –40 ... 0 °C (–40 ... +32 °F) and +40 ... +60 °C (+104 ... +140 °F)	±3.0 %RH (0–90 %RH) ±4.0 %RH (90–100 %RH)
Factory calibration uncertainty at +20 °C (+68 °F):	±1.1 %RH (0–90 %RH) ±1.8 %RH (90–100 %RH)
Humidity sensor	HUMICAP® 180R
Stability	±2 %RH over 2 years
<b>Temperature</b>	
Measurement range	–40 ... +60 °C (–40 ... +140 °F)
Accuracy (probes with analog output):	
at 0 ... +40 °C (+32 ... +104 °F)	±0.2 °C (±0.36 °F)
at –40 ... 0 °C (–40 ... +32 °F) and +40 ... +60 °C (+104 ... +140 °F)	±0.4 °C (±0.72 °F)
Accuracy (probes with digital output):	
at +15 ... +25 °C (+59 ... +77 °F)	±0.1 °C (±0.18 °F)
at 0 ... +15 °C (+ 32 ... +59 °F) and +25 ... +40 °C (+77 ... +104 °F)	±0.15 °C (±0.27 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
<b>Analog outputs</b>	
Accuracy at +20 °C (+68 °F)	±0.2 % of FS
Temperature dependence	±0.01 % of FS/°C (±0.006 % of FS/°F)

## Operating environment

Operating temperature	–40 ... +60 °C (–40 ... +140 °F)
IP rating <sup>1)</sup>	IP54

<sup>1)</sup> Not applicable with the plastic grid filter.

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, RCM, UKCA

## Inputs and outputs

Power consumption	1 mA average, max. peak 5 mA
<b>Operating voltage</b> <sup>1)</sup>	
With 1 V / 2.5 V output	5–28 V DC
With 5 V output	8–28 V DC
With loop power converter	8–28 V DC
With digital output	5–28 V DC
<b>Start-up time</b>	
Probes with analog output	4 s at operating voltage 13.5–16.5 V DC 2 s at other valid operating voltages
Probes with digital output	1 s
<b>Outputs</b>	
2 channels	0–1 V DC / 0–2.5 V DC / 0–5 V DC / 1–5 V DC
1-channel loop-power converter (separate module, compatible with humidity accuracy only)	4–20 mA
Digital output (optional)	RS-485 2-wire half duplex, supports Modbus RTU
<b>External loads</b>	
0–1 V	R <sub>L</sub> min 10 kΩ
Other voltage outputs	R <sub>L</sub> min 50 kΩ
<b>Output parameters</b>	
Relative humidity, temperature, dew/frost point temperature, wet bulb temperature, absolute humidity, mixing ratio, enthalpy	

<sup>1)</sup> Use lowest available operating voltage to minimize heating.

## Mechanical specifications

Cable connector	4-pin M8 (IEC 60947-5-2)
<b>Materials</b>	
Body	PC/ABS blend
Grid filter	PC (glass reinforced)
Cable	Polyurethane or FEP
<b>Weight</b>	
Probe	9 g (0.3 oz)
Probe with 0.3 m (1 ft) cable	20 (0.7 oz)

## Spare parts and accessories

### Sensors

Vaisala HUMICAP® 180R HUMICAP180R

Vaisala HUMICAP® 180V HUMICAP180V

### Sensor protection

Plastic grid filter DRW240185SP

Plastic grid with membrane filter ASM210856SP

Stainless steel sintered filter HM47280SP

Porous PTFE filter 219452SP

### Probe installation

Probe mounting clamp set, 10 pcs 226067

Probe mounting flange 226061

Probe holder, 5 pcs ASM213382SP

Plastic locking bushing (3 pcs) for attaching probe to HM40 DRW238590SP

### Connection adapters <sup>1)</sup>

4–20 mA loop power converter UI-CONVERTER-1CB

Mounting bracket for converter 225979

USB cable for PC connection 219690

Connection cable for Indigo80 handheld indicator 262195SP

Connection cable for MI70 indicator 219980SP

### Connection cables with open wires

+60 °C 0.3 m (+140 °F 1 ft) HMP5OZ032SP

+60 °C 1.2 m (+140 °F 4 ft) HMP5OZ120

+60 °C 3 m (+140 °F 9.8 ft) HMP5OZ300SP

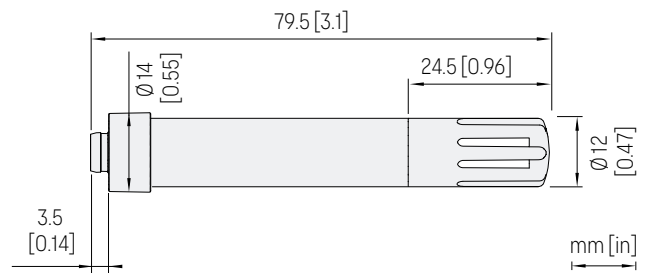
+80 °C 1.5 m (+176 °F 5 ft) 225777SP

+80 °C 3 m (+176 °F 10 ft) 225229SP

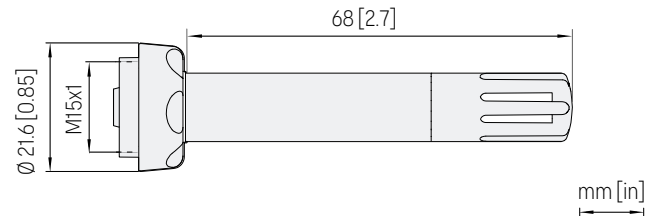
+180 °C 1.5 m (+356 °F 5 ft) FEP 238025

+180 °C 3 m (+356 °F 10 ft) FEP 226902SP

<sup>1)</sup> No separate adapter is needed for HM40 compatibility.



HMP113 dimensions



HMP113 dimensions with plastic locking bushing



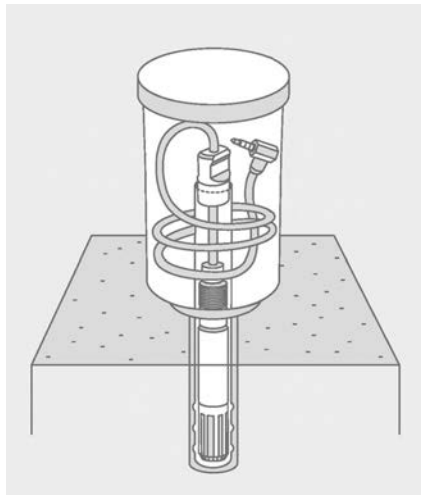
### Features

- Truly interchangeable measurement probes
- Accurate measurement data in numeric, statistic, or graph views
- Conforms to ASTM standard F2170
- IP65-rated measurement probe and case
- Standard contents of SHM40:
  - HM40 indicator with adapter
  - 1 pc HMP40S RH&T probe with cable
  - 12 pcs plastic tubes
  - 12 pcs rubber plugs
  - 3 pcs protective covers with lid
  - Traceable calibration certificate
  - Weather-proof carrying case with shoulder strap

Vaisala HUMICAP® Structural Humidity Measurement Kit SHM40 offers an easy and reliable solution for humidity measurements in concrete and other structures.

### Measuring Humidity Under the Surface

Concrete dries unevenly and is usually drier on the surface. Consequently, it is important to measure beneath the surface conditions. The borehole method provides information about the humidity profile under the surface. In this method, a humidity probe is left in the borehole until the humidity in the hole has reached an equilibrium state and the stabilized values can be read.



Borehole in concrete and an HMP40S measurement probe inserted in it.

### SHM40 is All You Need for Borehole Humidity Measurement

The Vaisala HUMICAP® Structural Humidity Measurement Kit SHM40 is an ideal solution for the borehole method. The starter kit is comprised of an HMP40S probe, HM40 indicator, and accessories for the borehole method in a weather-proof case, optimized for use in harsh and humid construction sites. Additional accessories for the SHM40 can be used to prepare a moisture measurement hole in fresh concrete. Pre-formed holes eliminate the need for drilling and the risk of damaging heating elements or tubing embedded in the concrete.

# SHM40 Structural Humidity Measurement Kit

## Easy Measurement with Multiple HMP40S Probes and Quick Connectors

HMP40S measurement probes are interchangeable. The probes connect easily to the HM40 indicator with a snap-on connector enabling convenient use of multiple probes with one indicator. The measurement data can be displayed in numeric, statistic, or graph views.



Snapping a connector to the HM40 indicator to read the measurement results.

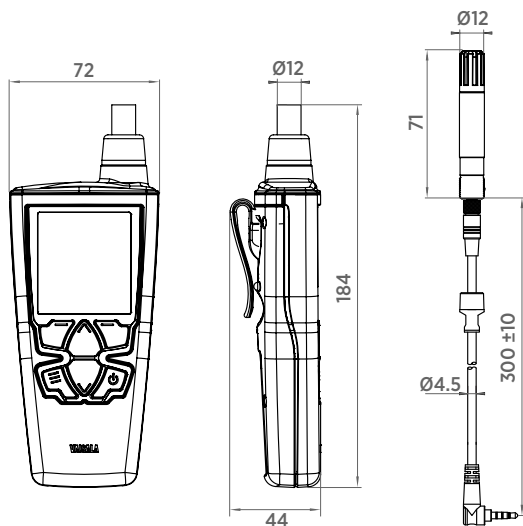
# Technical Data

## HMP40S Probe Measurement Performance

Relative Humidity	
Measurement range	0 ... 100 %RH
Accuracy (incl. non-linearity, hysteresis, and repeatability) over temperature range:	
0 ... +40 °C	0 ... 90 %RH: ±1.5 %RH 90 ... 100 %RH: ±2.5 %RH
-40 ... 0 °C and +40 ... +80 °C	0 ... 90 %RH: ±3.0 %RH 90 ... 100 %RH: ±4.0 %RH
Factory calibration uncertainty at +20 °C:	
0 ... 90 %RH	±1.1 %RH
90 ... 100 %RH	±1.8 %RH
Humidity sensor	HUMICAP® 180R
Stability	±2 %RH over 2 years
Temperature	
Measurement range	-40 ... +80 °C
Accuracy over temperature range:	
0 ... +40 °C	±0.2 °C
-40 ... 0 °C, +40 ... +80 °C	±0.4 °C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751

## HMP40S Probe Mechanical Specifications

Probe weight with standard cable	31 g
Probe housing material	Stainless steel
Probe filter and sensor protection	Membrane filter with chrome coated ABS plastic
Cable material	Wire PVC / Jacket PU
Cable connector	TRRS male 3.5 mm
Probe housing IP rating	IP65
Borehole diameter needed	16 mm
Measurement depth with standard accessories	Min. 30 mm, max. 90 mm



Dimensions in mm

## Operating Environment

Operating temperature range for probe	-40 ... +80 °C
Operating temperature range for indicator	-10 ... +60 °C
Storage temperature range	-30 ... +70 °C

## HM40 Indicator Mechanical Specifications

Weight	
Indicator with adapter	240 g
SHM40 case with standard content	3.7 kg
Indicator materials	PC/ABS blend, acrylic display lens
Indicator adapter materials	Nickel plated brass and plastic overmolding
Indicator housing IP rating	IP54
Mechanical drop endurance	1.0 m without the probe

## HM40 Indicator General Specifications

Power-up time	< 3 s
Alkaline batteries	2 × AA size, 1.5V (LR6)
Operation time (alkaline batteries)	Typical 100 hours (without backlight)
Calculated variables	Td, Tw, a, x, h
Menu languages	English, German, French, Finnish, Spanish, Swedish, Chinese (simplified), Russian, Japanese
Display	LCD (140 × 160 pixels)
Electromagnetic compatibility (EMC)	EN 61326-1, Portable equipment

## Spare Parts and Accessories

HM40 indicator with adapter and cable probe	HM40S
RH&T probe with cable	HMP40S
HM40 indicator with adapter	HM40SINDI
Quick connection adapter	HM40SADAPTER
Cable for RH&T probe	HMP40SCABLE
Long cable (2.7 m) for RH&T probe	HMP40SCABLE2
Plastic tube set (12 pcs)	19266HM
Long (200 mm) plastic tube set (12 pcs)	245789
Rubber plugs (12 pcs)	233976
Protective cover with lid (3 pcs)	19268HM
Weather-proof carrying case for SHM40 kit	CASEFORSHM40SP
USB recharger for HM40 indicator batteries	229249SP
Plastic grid with membrane filter for HMP40S probe	DRW010525SP
Accessories for Wet Concrete	
Plastic flange set (12 pcs)	26529HM
Long rubber plug for wet concrete (12 pcs)	26530HM





### Features

- Easy and reliable calibration of humidity probes and transmitters
- Based on saturated salt solutions
- Fast temperature equilibration
- No external power required
- Suitable for laboratory use and on-site checks
- Chambers and transit covers make HMK15 easy to transport
- Pre-measured certified salts available
- Vaisala Service Centers offer accredited calibrations for humidity, temperature, and barometric pressure

No measuring instrument stays accurate by itself. It is essential that the functioning of an instrument is periodically checked against a reference. Vaisala has developed Vaisala Humidity Calibrator HMK15 to make calibration and spot-checking of humidity probes and transmitters easy and reliable.

### Benefits

- Easy to use
- Reliable calibration
- Certified and pre-measured salts available on order form of HMK15

### Reliable calibration method

The operating principle of HMK15 is based on the fact that a saturated salt solution generates a certain relative humidity in the air above it. The reading of the humidity probe or transmitter can then be adjusted accordingly. Many calibration laboratories use this generally accepted and reliable method to

calibrate humidity instruments. Usually two or three different salt solutions are used. Salts are chosen according to the application. Available salts and their reference humidities:

- Lithium chloride LiCl (11 %RH)
- Magnesium chloride  $MgCl_2$  (33 %RH)
- Sodium chloride NaCl (75 %RH)
- Potassium chloride KCl (85 %RH)
- Potassium sulphate  $K_2SO_4$  (97 %RH)

### Certified salts

HMK15 can be ordered with certified and pre-measured salts. A sample calibration is made from each salt batch in Vaisala's Measurement Standards Laboratory (MSL).

### FINAS accredited measurement standards laboratory

Vaisala's Measurement Standards Laboratory is a FINAS accredited calibration laboratory. FINAS is a member of the EA (the European Cooperation for Accreditation).



# Technical data

## Operating environment

Operating temperature range	+0 ... +50 °C (+32 ... +122 °F)
-----------------------------	---------------------------------

## Mechanical specifications

Dimensions (H × W × L)	90 × 230 × 200 mm (3.54 × 9.06 × 7.87 in)
Weight	1 kg (2.20 lb) without salt solutions
Material (metal parts)	Anodized aluminum

## Parts

<b>Standard contents of HMK15 calibrator</b>
Base plate
Two salt chambers with basic lids and transit covers
Thermometer
Measurement cup and mixing spoon
Calibration adapter (Ø13.5 mm) for Ø12 mm probes with long sensor legs
Calibration adapter (Ø13.5 mm) for Ø12 mm probes with short sensor legs
<b>Optional items</b>
See table <i>Spare parts and accessories</i>

## Spare parts and accessories

Rubber plug set	19746HM
O-ring set	218096
Ion exchanged water	19767HM
Thermometer with red capillary liquid	25130HM
Transit bag	HM27032
<b>Salt chambers and lids</b>	
HMK15 basic lid	271549
HMK15 universal lid	271550
HMK15 custom lid for 4 × HMP110 with filter on	253277SP
HMK15 custom lid for DMT132 and HMP60/HMP110 with filter on	230914
HMK15 salt chamber with basic lid and transit cover	DRW255417SP
HMK15 salt chamber with universal lid and transit cover	19766HM
<b>Calibration adapters</b>	
Calibration adapter for HMP9 probe	ASM213801
Calibration adapter (Ø13.5 mm) for Ø12 mm probes with long sensor legs	211302SP
Calibration adapter (Ø13.5 mm) for Ø12 mm probes with short sensor legs	218377SP
Calibration adapter for HMP42 probe	HM37067
<b>Certified and ready-dosed salts <sup>1)</sup></b>	
Ready-dosed LiCl salt package (LiCl salt 11 %RH, total uncertainty ±1.3 %RH) <sup>2)</sup>	19729HM
Ready-dosed MgCl <sub>2</sub> salt package (MgCl <sub>2</sub> salt 33 %RH, total uncertainty ±1.2 %RH) <sup>2)</sup>	19730HM
Ready-dosed NaCl salt package (NaCl salt 75 %RH, total uncertainty ±1.5 %RH) <sup>2)</sup>	19731HM
Ready-dosed KCl salt package (KCl salt 85 %RH, total uncertainty ±2.0 %RH) <sup>2)</sup>	251377HM
Ready-dosed K <sub>2</sub> SO <sub>4</sub> salt package (K <sub>2</sub> SO <sub>4</sub> salt 97 %RH, total uncertainty ±2.0 %RH) <sup>2)</sup>	19732HM

1) Calibration certificate included with each salt package.  
2) Uncertainties given at +20 °C (+68 °F).



## HMP155 Humidity and Temperature Probe



HMP155 with an additional temperature probe and optional Stevenson screen installation kit.

### Features

- Vaisala HUMICAP®180R sensor: superior long-term stability
- Optional warmed humidity probe and chemical purge
- Plug-and-play
- USB connection for service use
- Use with DTR13 and DTR503 radiation shields and a Stevenson screen
- Weather-proof housing IP66
- Optional, fast temperature probe
- Different output possibilities: voltage, RS-485, resistive Pt100
- Applications: meteorology, aviation and road weather, instrumentation

Vaisala HUMICAP® Humidity and Temperature Probe HMP155 provides reliable humidity and temperature measurement. It is designed especially for demanding outdoor applications.

### Long-term stability

HMP155 uses the proven Vaisala HUMICAP®180R sensor that has excellent stability and withstands well harsh environments. The probe structure is solid and the sensor is protected by default with a sintered teflon filter, which gives maximum protection against water, dust, and dirt.

### Warmed probe and high-humidity environment

Measuring humidity reliably is challenging in environments where humidity is near saturation. Measurements may be corrupted by fog, mist, rain, and heavy dew. A wet probe may not give an accurate measurement in the ambient air.

This is an environment to which Vaisala has designed this patented, warmed probe for reliable measurements. As the sensor head is warmed continuously, the humidity level inside it stays below the ambient level. Thus, it also reduces the risk of condensation forming on the probe.

### Fast measurements

With its fast response time, the additional temperature probe for HMP155 is ideal for measuring in environments with changing temperatures. The membrane filter speeds up the relative humidity measurement.

### Long lifetime

Protecting the sensor from precipitation, and scattered and direct solar radiation increases its lifetime. Thus, Vaisala recommends installing HMP155 in one of the following radiation shields: DTR503, DTR13, or Stevenson screen. For the additional temperature probe, an installation kit is available for Vaisala DTR502 Radiation Shield.

### Calibration

The probe can be calibrated using a computer with a USB cable, with the push buttons, or with the MI70 indicator.

# Technical Data

## Humidity measurement performance

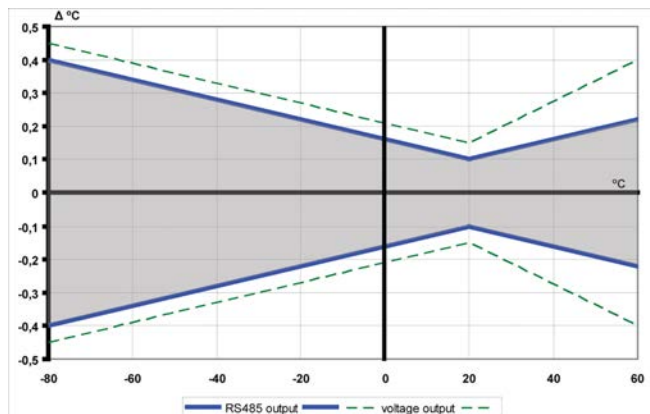
Sensor	HUMICAP®R2, 180R and INTERCAP for typical applications HUMICAP®R2C, 180RC and INTERCAPC for applications with chemical purge and/or warmed probe
Observation range	0-100 %RH
Response time at +20 °C (+68 °F) in still air with sintered Teflon filter	63 %: 20 s 90 %: 60 s
Factory calibration uncertainty at +20 °C (+68 °F) <sup>1)</sup>	±0.6 %RH (0-40 %RH) ±1.0 %RH (40-95 %RH)
<b>Accuracy (including non-linearity, hysteresis, and repeatability)</b>	
At +15 ... +25 °C (+59 ... +77 °F)	±1 %RH (0-90 %RH) ±1.7 %RH (90-100 %RH)
At -20 ... +40 °C (-4 ... +104 °F)	±(1.0 + 0.008 × reading) %RH
At -40 ... -20 °C (-40 ... -4 °F)	±(1.2 + 0.012 × reading) %RH
At +40 ... +60 °C (+104 ... +140 °F)	±(1.2 + 0.012 × reading) %RH
At -60 ... -40 °C (-76 ... -40 °F)	±(1.4 + 0.032 × reading) %RH

<sup>1)</sup> Defined as ±2 standard deviation limits. Small variations possible (see also the calibration certificate).

## Temperature measurement performance

Sensor	Pt100 RTD element, Class F 0.1 IEC 60751
Observation range	-80 ... +60 °C (-112 ... +140 °F)
Response time for additional temperature probe in 3 m/s (7 mph) air flow	63 %: < 20 s 90 %: < 35 s
Other measured variables	Dew point / frost point temperature, wet bulb temperature, mixing ratio
<b>Accuracy with voltage output</b>	
At -80 ... +20 °C (-112 ... +68 °F)	±(0.226 - 0.0028 × temperature) °C
At +20 ... +60 °C (+68 ... +140 °F)	±(0.055 + 0.0057 × temperature) °C
<b>Accuracy with passive (resistive) output</b>	
According to Tolerance Class AA IEC 60751 <sup>1)</sup>	±(0.1 + 0.0017 ×  temperature ) °C
<b>Accuracy with RS-485 output</b>	
At -80 ... +20 °C (-112 ... +68 °F)	±(0.176 - 0.0028 × temperature) °C
At +20 ... +60 °C (+68 ... +140 °F)	±(0.07 + 0.0025 × temperature) °C

<sup>1)</sup> Tolerance Class AA IEC 60751 corresponds to IEC 751 1/3 Class B



HMP155 accuracy over temperature range: voltage and RS-485

## Operating environment

Operating temperature for humidity measurement	-80 ... +60 °C (-112 ... +140 °F)
Storage temperature	-80 ... +60 °C (-112 ... +140 °F)
Operating humidity	0-100 %RH
IP rating	IP66

## Inputs and outputs

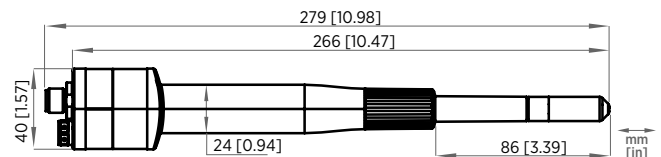
Operating voltage	7-28 V DC
Minimum operating voltage	0-1 V output or RS-485: 7 V 0-5 V output, or warmed probe: 12 V 0-10 V output, chemical purge, or XHEAT: 16 V
Outputs	Voltage output: 0-1 V, 0-5 V, 0-10 V Resistive Pt100 4-wire connection RS-485
Average power consumption (+15 V DC, load 100 kΩ)	0-1 V output: < 3 mA 0-10 V output: +0.5 mA RS-485: < 4 mA During chemical purge: Maximum 110 mA With warmed probe: Maximum 150 mA
Settling time at startup	Voltage output: 2 s RS-485: 3 s

## Mechanical specifications

Dimensions (H × W)	279 × 40 mm (10.9 × 1.6 in)
Weight	93 g (3.25 oz)
Length of additional T-probe cable	2 m (6 ft 7 in)
Connection	8-pin male M12 connector
Connection cables	3.5 m (11 ft 6 in), 10 m (32 ft 10 in), 30 m (98 ft 5 in)
Maximum wire size	0.129 mm <sup>2</sup> (26 AWG)
Service cables	USB connection cable MI70 connection cable

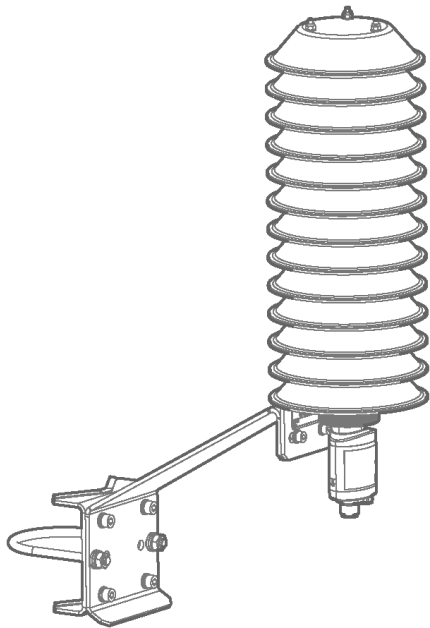
### Materials

Filter	Sintered Teflon or membrane
Housing	Polycarbonate (PC)
Additional temperature probe	Stainless steel AISI 316L
Cable	PUR



Dimensions in mm (inches)

## DTR500 Solar Radiation and Precipitation Shields



Vaisala Radiation Shield Series DTR500 are solar radiation and precipitation shields supporting humidity probe installations in outdoor applications.

### Sensor protection

The maintenance-free DTR500 series shields protect the humidity and temperature sensors from solar radiation and precipitation. They provide excellent ventilation while blocking both direct and reflected solar radiation.

The special plastic used in the plates has excellent thermal characteristics: the white outer surface reflects radiation, and the black inside absorbs accumulated heat. The shields can be easily installed on a vertical pole, horizontal beam, or flat surface.

The DTR shields can be used with the following Vaisala products:

### Features

- Protection for temperature and humidity probes from scattered and direct solar radiation and rain
- Maintenance-free
- Naturally ventilated
- Easy to install on a vertical pole, horizontal beam, or flat surface
- Suitable for a wide selection of applications
- Choice of shields and mounting accessories

### DTR503(A)

Vaisala HUMICAP® Humidity and Temperature Probe HMP155

### DTR504(A)

Vaisala HUMICAP® Humidity and Temperature Transmitters HMT120/130

Vaisala HUMICAP® Humidity and Temperature Probe HMP110

Vaisala INTERCAP® Humidity and Temperature Probe HMP60

### DTR502(A) with adapter 221072

Vaisala HUMICAP® Humidity and Temperature Probe HMP155's additional temperature sensor

### DTR502B

Vaisala HUMICAP® Humidity and Temperature Transmitters HMT333, HMT337, HMT373, and HMT377

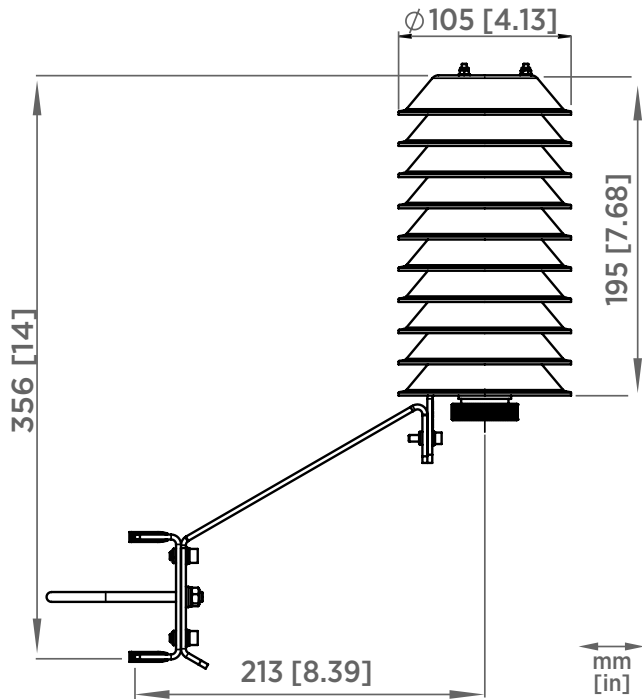
Vaisala HUMICAP® Humidity and Temperature Probes HMP3 and HMP7

Vaisala Combined Pressure, Humidity and Temperature Transmitters PTU303 and PTU307

# Technical data

## DTR502B for HMT333, HMT337, HMT373, HMT377, HMP3, HMP7, PTU303, and PTU307

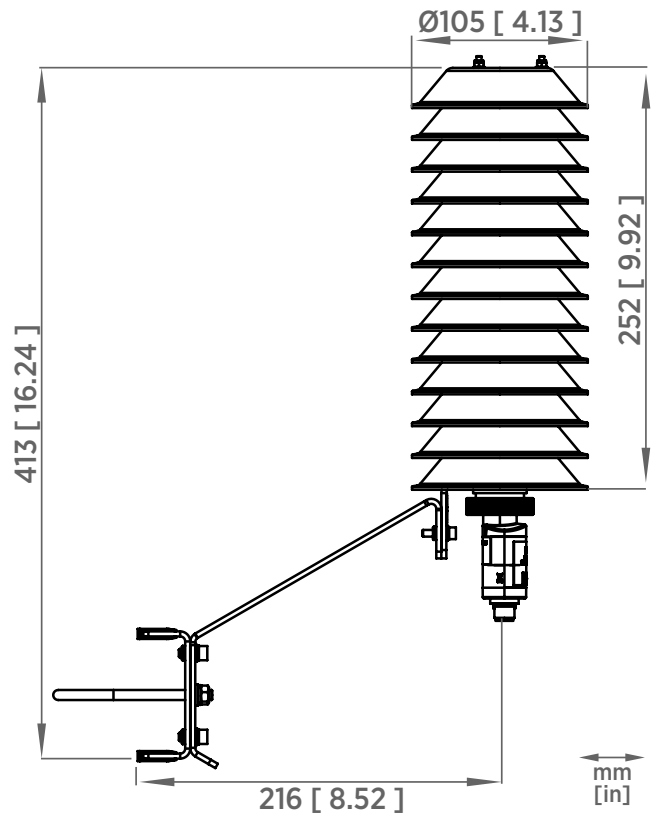
Dimensions (H × W)	195 × 105 mm (7.68 × 4.13 in)
Accessories	Product specific adapter



DTR502B dimensions

## DTR503A for HMP155

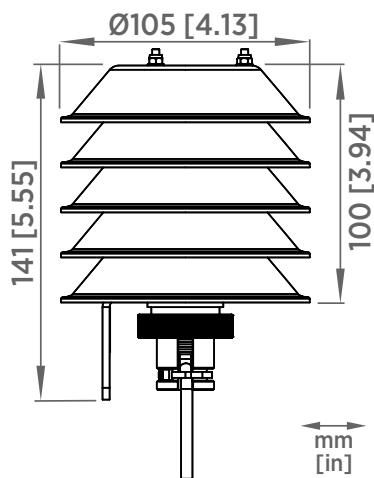
Dimensions (H × W)	252 × 105 mm (9.92 × 4.13 in)
Accessories	Horizontal beam assembly Pole mast installation kit



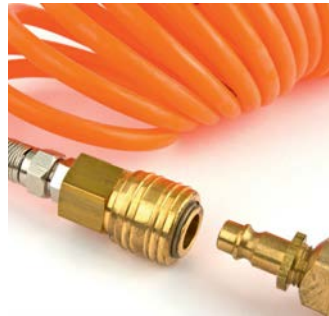
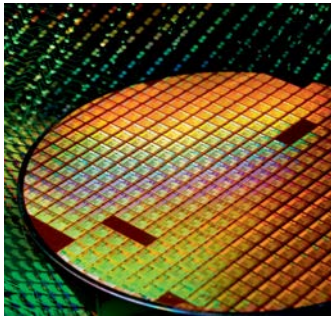
DTR503A dimensions

## DTR504 for HMT120/130 remote probes, HMP110, and HMP60

Dimensions (H × W)	141 × 105 mm (5.55 × 4.13 in)
Accessories	Horizontal beam assembly Pole mast installation kit



DTR504 dimensions



### DRYCAP sensor's key benefits and features

- High chemical tolerance
- Withstands saturation
- Fast response time
- Sensor purge and warming
- Excellent accuracy and stability
- Vaisala quality

As the leading developer and provider of humidity measurement instruments, Vaisala knows also the very dry measurement conditions.

### Reliable data needed

The demand for reliable moisture measurement instruments grew in the 90s, and it was noticed that the traditional humidity probes were not accurate enough at very low humidity levels. The commonly used aluminum oxide sensors were prone to drift and required frequent calibration. A new type of a moisture sensor was needed.

### Taking every measure for the planet

We took on the challenge by combining the highest quality polymer technology with a patented key feature – autocalibration – that would eliminate sensor drift in very dry conditions.

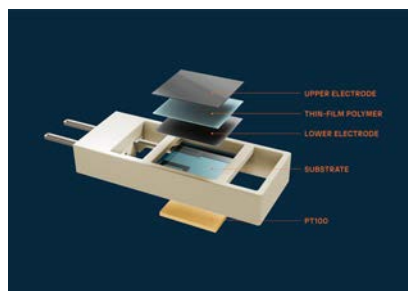
### The era of DRYCAP begins

In 1997, we introduced a new type of dew point sensor based on thin-film polymer technology, the DRYCAP sensor, that could be used in various Vaisala probes for dry measurement conditions.

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 Vaisala DRYCAP works

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



Structure of the DRYCAP sensor

### Autocalibration

Vaisala's patented autocalibration function optimizes the measurement stability in dry environments. The sensor is heated at regular intervals during the automated autocalibration 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.

### Sensor purge

Sensor purge is also an automatic procedure that minimizes the drift at the wet end readings of the dew point measurement. Sensor purge is performed regularly and when the power is switched on. The sensor is heated for several minutes, which will then evaporate all excess molecules out of the sensor polymer. This, together with the autocalibration, results in a very small drift. The measurement output of the transmitter is frozen to the last measured value for the duration of the sensor purge.

### **The parameter of high demand**

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 and this highly successful innovation is continuously growing its demand.

### **When process measurement truly matters**

An example of the several demanding industrial applications where Vaisala DRYCAP technology is used today is battery manufacturing. Due to the ultra-

low humidity requirement and highly controlled atmospheric conditions, reliable dew point measurement is a must. The accurate and stable data the instruments provide, enable controlling the moisture levels along any critical locations of the process, such as the electrode production.

### **DRYCAP application examples**

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.

## 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  $\pm 2$  °C ( $\pm 3.6$  °F)  $T_{d/f}$
- Sensor purge improves long-term stability and chemical resistance
- Condensation-tolerant
- Modbus RTU over RS-485
- Compatible with Vaisala Indigo products 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 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 autocalibrates to ensure accurate measurement.

### Sensor purge minimizes effects of contaminants

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

Sensor 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

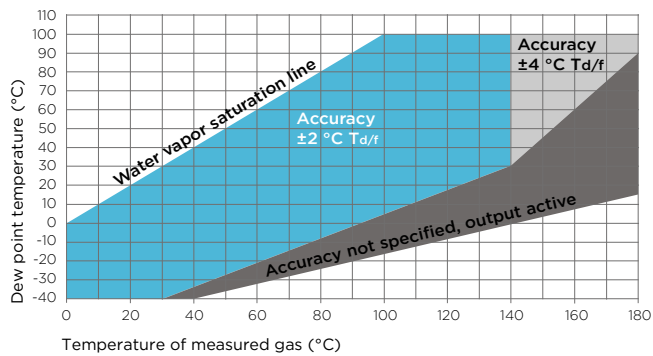
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring and troubleshooting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

Dew point	
Sensor	DRYCAP® 180S
Measurement range	-40 ... +100 °C (-40 ... +212 °F) T <sub>d/f</sub>
Accuracy	±2 °C (±3.6 °F) T <sub>d/f</sub> See accuracy graph
Response time 63 % [90 %] <sup>1)</sup>	
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)
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 <sup>3</sup>
Accuracy	±10 % of reading (typical)

1) Tested with sintered filter.



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

## Compliance

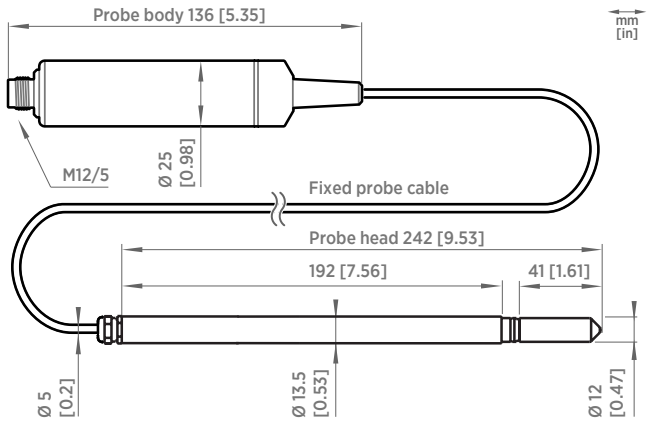
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Type approvals	DNV GL certificate no. TAA00002YT
Compliance marks	CE, China RoHS, RCM



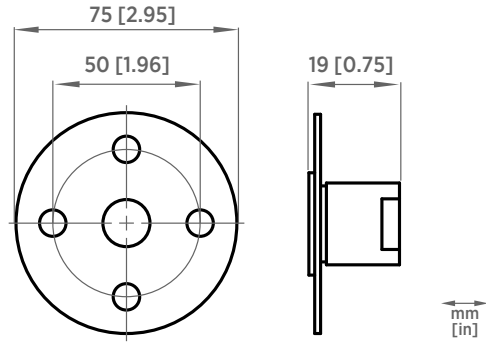
## Mechanical specifications

Connector	M12 5-pin A-coded male
Weight (with a 2-m cable)	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 <sup>1)</sup>	USB2

<sup>1)</sup> Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://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  $\pm 2$  °C ( $\pm 3.6$  °F)  $T_{d/f}$
- Sensor purge improves long-term stability and chemical resistance
- Condensation-tolerant
- Modbus RTU over RS-485
- Compatible with Vaisala Indigo products 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 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.

### Sensor purge minimizes effects of contaminants

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

Sensor 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring and troubleshooting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

### Dew point

Sensor	DRYCAP® 180S
Measurement range	-25 ... +100 °C (-13 ... +212 °F) T <sub>d/f</sub>
Accuracy	±2 °C (±3.6 °F) T <sub>d/f</sub>

### 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 <sup>1) 2)</sup>	+100 ... +350 °C (+212 ... +662 °F)
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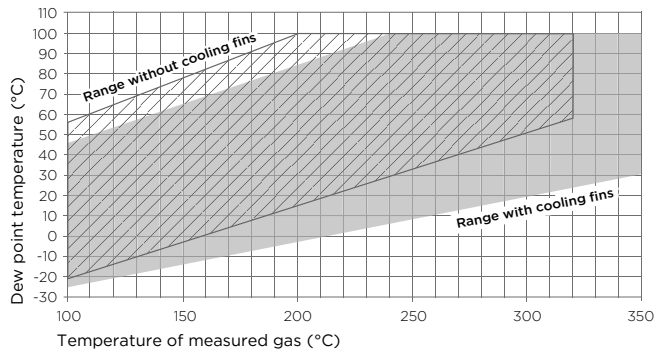
Operating temperature range of probe body	-40 ... +80 °C (-40 ... +176 °F)
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Storage temperature	-40 ... +80 °C (-40 ... +176 °F)
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Measurement environment	For air, nitrogen, hydrogen, argon, helium, and oxygen <sup>3)</sup>
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IP rating	IP66
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- 1) Installation of cooling fins on the cooling set affects the operating temperature range. See the operating range graph.
- 2) The operating range specifications apply in stand-still air. High flow rates in the process may reduce the probe performance and cause damage to the equipment.
- 3) 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 and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Type approvals	DNV GL certificate no. TAA00002YT
Compliance marks	CE, China RoHS, RCM



## Output parameters

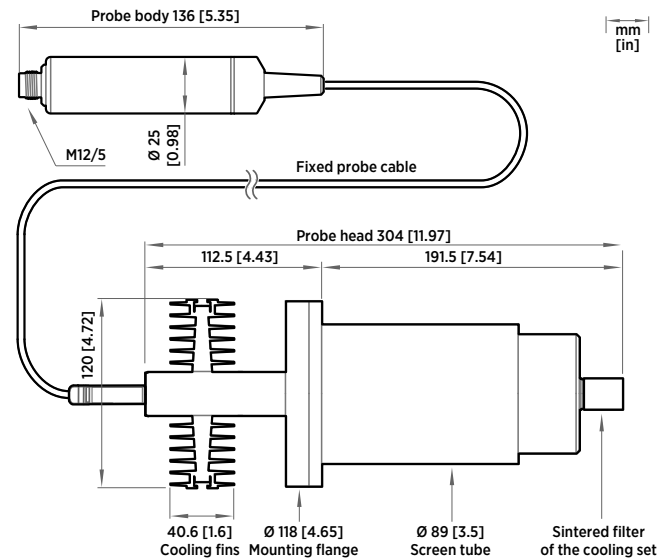
Dew point temperature (°C)	Water concentration (ppm <sub>v</sub> )
Dew/frost point temperature (°C)	Water concentration (wet basis) (vol-%)
Dew/frost point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
Dew point temperature at 1 atm (°C)	Water vapor pressure (hPa)
Mixing ratio (g/kg)	

## Mechanical specifications

Connector	M12 5-pin A-coded male
Probe weight (with a 2-m cable)	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

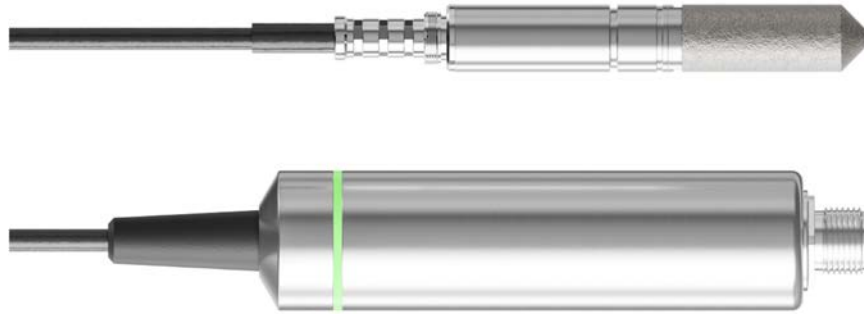
## Accessories

Cooling set	DMP246CS
Indigo USB adapter <sup>1)</sup>	USB2

<sup>1)</sup> Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://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 improves long-term stability and chemical resistance
- Tolerates condensation, oils, dust, and most chemicals
- Modbus RTU over RS-485
- Compatible with Vaisala Indigo products 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.

### Sensor purge minimizes effects of contaminants

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

Sensor 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

An 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

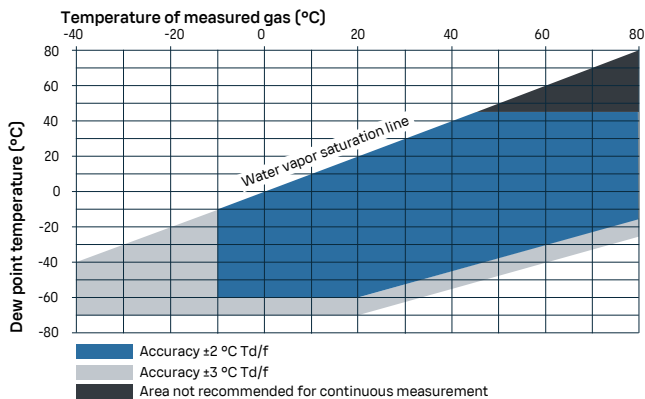
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring and troubleshooting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

Dew point	
Sensor	DRYCAP® 180M
Measurement range	-70 ... +80 °C (-94 ... +176 °F) T <sub>d/f</sub>
Measurement range for continuous use	-70 ... +45 °C (-94 ... +113 °F) T <sub>d/f</sub>
Accuracy	Up to ±2 °C (±3.6 °F) T <sub>d/f</sub> See accuracy graph
Response time 63 % [90 %] <sup>1)</sup>	
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 FO.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 psi), absolute
Measurement environment	For air, nitrogen, hydrogen, argon, helium, oxygen <sup>1)</sup> , 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

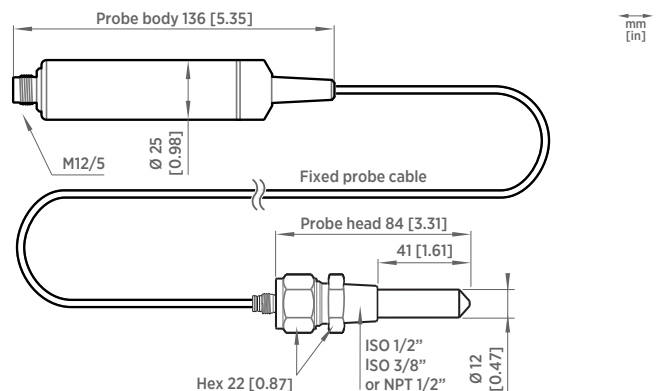
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, RCM

## Output parameters

Absolute humidity (g/m <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>v</sub> )
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
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
Probe cable length	0.15 m (0.49 ft), 2 m (6.56 ft) or 10 m (32.80 ft)
Materials	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP



## DMP7 dimensions

## Accessories

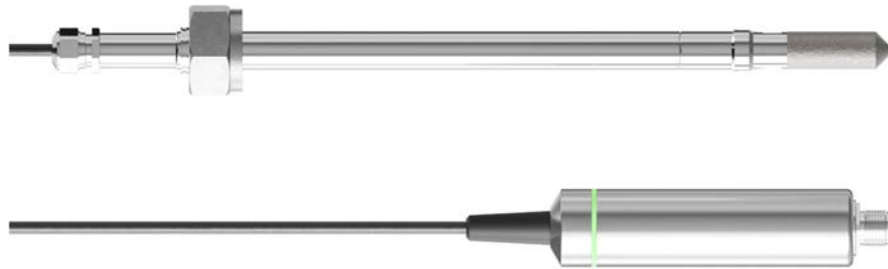
Swagelok ISO 3/8"	SWG12ISO38
Swagelok ISO 1/2"	SWG12ISO12
Swagelok NPT 1/2"	SWG12NPT12
Magnetic probe holder for Ø 12 mm probe heads <sup>1)</sup>	ASM213382SP
Indigo USB adapter <sup>2)</sup>	USB2

1) Not suitable for use at extreme temperatures.

2) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://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 0–40 bar (0–580 psi), absolute
- Adjustable installation depth
- Tolerates condensation, oils, dust, and most chemicals
- Sensor purge improves long-term stability and chemical resistance
- Modbus RTU over RS-485
- Compatible with Vaisala Indigo products 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.

### Sensor purge minimizes effects of contaminants

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

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

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

### Flexible connectivity

The probe can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring and troubleshooting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

### Dew point

Sensor	DRYCAP® 180M
Measurement range	-70 ... +80 °C (-94 ... +176 °F) T <sub>d/f</sub>
Measurement range for continuous use	-70 ... +45 °C (-94 ... +113 °F) T <sub>d/f</sub>
Accuracy up to 20 bar/290 psia	±2 °C/±3.6 °F T <sub>d/f</sub> See accuracy graph
Accuracy, 20 ... 40 bar/290 ... 580 psia	Additional inaccuracy +1 °C T <sub>d/f</sub>
Response time 63 % [90 %] <sup>1)</sup> :	
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

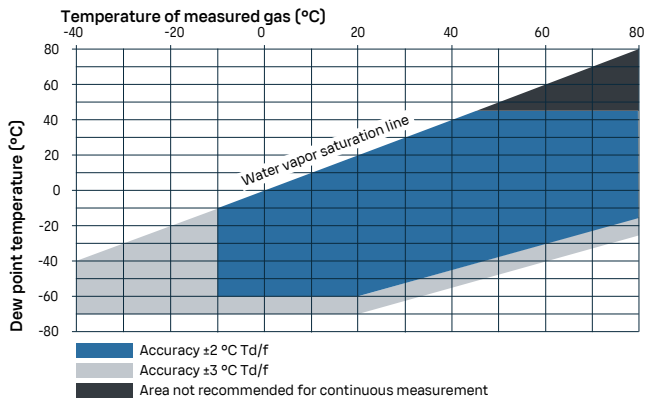
### Relative humidity

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

<sup>1)</sup> 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 psi), absolute
Measurement environment	For air, nitrogen, hydrogen, argon, helium, oxygen <sup>1)</sup> , and vacuum
IP rating for probe body	IP66
Mechanical durability of probe head	Up to +180 °C (+356 °F) Up to 70 bar/1015 psi, absolute

### Ball valve

Operating temperature	Up to +100 °C (+212 °F)
Operating pressure	Up to 40 bar (580 psi), absolute

<sup>1)</sup> 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

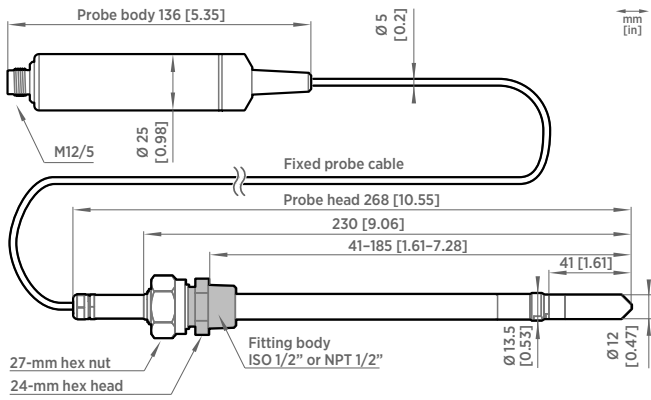
Absolute humidity (g/m <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>w</sub> )
Dew/frost point temperature at 1 atm (°C)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

## Compliance

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

## Mechanical specifications

Connector	M12 5-pin A-coded male
Weight (with a 2-m cable)	512 g (18.1 oz)
Probe cable length	2 m (6.56 ft)
<b>Materials</b>	
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 kit ISO 1/2" with welding joint	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 <sup>1)</sup>	242659
Weatherproof carrying case for Indigo80 and a series 8 probe <sup>2)</sup>	ASM215318

<sup>1)</sup> Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).

<sup>2)</sup> For example, MMP8, HMP8, or DMP8 with a max. 2-m (6.6-ft) probe connection cable.



## DMT152 Dew Point Transmitter

For low dew point measurement in OEM applications



### Features

- Vaisala DRYCAP® technology with a polymer sensor
- Measures dew point down to  $-80\text{ }^{\circ}\text{C}$  ( $-112\text{ }^{\circ}\text{F}$ )
- Withstands condensation
- Traceable calibration (certificate included)
- Applications: dry chambers, dry gases, semiconductor manufacturing, research and testing, and compressed air

Vaisala DRYCAP® Dew Point Transmitter DMT152 is designed for measuring low dew point in OEM applications, even down to  $-80\text{ }^{\circ}\text{C}$  ( $-112\text{ }^{\circ}\text{F}$ ). The excellent long-term stability and reliability of its performance is based on the latest DRYCAP polymer sensor technology.

### Low Maintenance

The DMT152 mechanics have been designed for harsh environments requiring protection against dust, dirt, and splashed water. The DRYCAP technology has a low maintenance need due to its excellent long-term stability and durability against condensation.

### Applications

The DMT152 is an ideal choice for industrial applications where it is necessary to control very low humidity. Most typical areas of use are air and plastics dryers, dry chambers, dry gases, and high-voltage circuit breakers.

The DMT152 measures accurately and reliably also in the challenging combination of low humidity and hot air, which is typical in plastics drying.

### Benefits

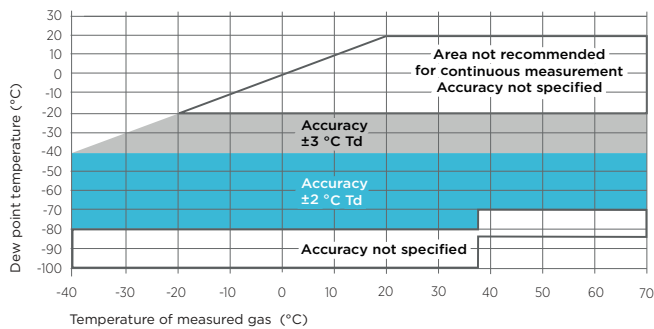
- Accurate
- Compact
- Fast response time
- Reduced maintenance costs due to long calibration interval

# Technical Data

## Measurement performance

Sensor	Vaisala DRYCAP® 180U Thin-film capacitive polymer sensor
Recommended calibration interval	2 years
<b>Dew point temperature<sup>1)</sup></b>	
Measurement range	-80 ... -20 °C (-112 ... -4 °F) T <sub>d</sub>
<b>Accuracy</b>	
-80 ... -40 °C (-112 ... -40 °F)	±2 °C (3.6 °F) T <sub>d</sub>
-40 ... -20 °C (-40 ... -4 °F)	±3 °C (5.4 °F) T <sub>d</sub>
Non-calibrated range	-100 ... +20 °C (-148 ... +68 °F) T <sub>d</sub>
Typical response time 63 % [90 %] at a gas temperature of +20 °C (+68 °F) and pressure of 1 bar:	
-20 ... -80 °C T <sub>d</sub>	0.5 min [7.5 min]
-80 ... -20 °C T <sub>d</sub>	2 s [5 s]
Typical long-term stability	Better than 2 °C (3.6 °F) / year
<b>Concentration by volume (ppm)</b>	
Measurement range (typical)	0 ... 500 ppm
Accuracy at +20 °C (+68 °F), 1013 mbar	±(0.2 ppm + 20 % of reading)

1) When the dew point is below 0 °C, the transmitter outputs frost point for T<sub>d</sub>.



## Accuracy over temperature range

## Inputs and outputs

Two analog outputs (scalable)	4 ... 20 mA, 0 ... 20 mA (3-wire) 0 ... 5 V, 0 ... 10 V
Digital output	RS-485 (2-wire)
Alarm-level indication by analog signal	User selectable
Purge information	5 V, 10 V, 20 mA, or LED
Accuracy of analog outputs	±0.01 V / ±0.01 mA
<b>Operating voltage</b>	
RS-485 output	11 ... 28 VDC <sup>1)</sup>
Voltage output	15 ... 28 VDC <sup>1)</sup>
Current output	21 ... 28 VDC
<b>Supply current</b>	
Normal measurement	20 mA + load current
During self-diagnostics	Max. 220 mA pulsed
Supply voltage fluctuation	Max. 0.3 V
<b>External load</b>	
Voltage output	Min. 10 kΩ
Current output	Max. 500 Ω

1) For extended temp. down to -40 °C (-40 °F) or pressure up to 50 bar (725 psia), the supply voltage is 21 ... 28 VDC.

## Operating environment

Temperature	-40 ... +70 °C (-40 ... +158 °F)
Relative humidity	0 ... 100 %RH (up to +20 °C / +68 °F)
Pressure	0 ... 50 bar (725 psia)
Measurement environment	For air, nitrogen, argon, helium, and oxygen <sup>1)</sup> Not suitable for measurements in hydrogen or pure carbon dioxide
Sample flow rate	No effect on measurement accuracy
EMC compliance	EN61326-1, Industrial environment

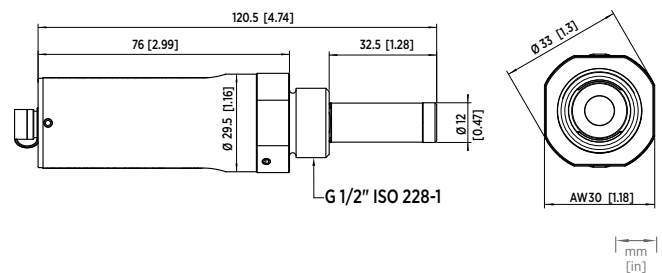
1) Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases.

## Mechanical specifications

Housing material (wetted parts)	AISI316L
Stainless steel mesh filter	Filter body AISI303, mesh AISI316L, grade 18 μm
Mechanical connections	ISO G1/2", NPT 1/2", UNF 3/4"-16", UNF 5/8"-18"
IP rating	IP66
Storage temperature range	-40 ... +80 °C (-40 ... +176 °F)
Weight (ISO G1/2")	190 g (6.70 oz)

## Accessories

Connection cable for MI70 handheld indicator	219980
USB cable for PC connection	219690
Loop-powered external display (Nokeval 301)	226476
Loop-powered external display with relays (Nokeval 302)	234759
NW40 flange	225220SP
<b>Sampling cells (available for ISO G1/2")</b>	
Basic sampling cell	DMT242SC
With Swagelok 1/4" male connectors	DMT242SC2
With a quick connector and leak screw	DSC74
Two-pressure sampling cell	DSC74B



DMT152 dimensions



## DMT143 Dew Point Transmitter For OEM applications



### Features

- Vaisala DRYCAP® technology with a unique autocalibration function
- Calibration interval of 2 years
- Dew point measurement range  $-70 \dots +60 \text{ }^{\circ}\text{C}$  ( $-94 \dots +140 \text{ }^{\circ}\text{F}$ )
- Accuracy  $\pm 2 \text{ }^{\circ}\text{C}$  ( $\pm 3.6 \text{ }^{\circ}\text{F}$ )
- Withstands condensation
- Compatible with Vaisala Indigo80 handheld indicator and Insight PC software
- Traceable calibration
- Voltage (V) or current (mA) analog output
- RS-485 digital output with Modbus® RTU support
- LED alarm for exceeded dew point level
- Fast response time

Due to its wide measurement range and excellent long-term stability, Vaisala DRYCAP® Dew Point Transmitter DMT143 is an ideal choice for small compressed air dryers, plastic dryers, and other OEM applications.

### Vaisala DRYCAP® technology

Vaisala DRYCAP® Dew Point Transmitter DMT143 is a miniature dew point measurement instrument.

The transmitter can be installed directly into pressurized systems at 50 bar (725 psia) maximum pressure. The long-term high performance is achieved with Vaisala DRYCAP® technology.

The sensor fully withstands getting wet, and therefore, the transmitter performs exceptionally well in applications that occasionally experience process water spikes, such as pipeline condensation during a system failure or start-up.

The sensor is also highly resistant to particulate contamination, oil vapor, and most chemicals, and is insensitive to the flow rate.

### Long calibration interval

The calibration interval of DMT143 is 2 years. For any adjustment needs, the transmitter can be sent to a Vaisala Service Center.

The unique autocalibration function, developed by Vaisala, detects possible measurement inaccuracies and automatically corrects dry-end drift in the calibration curve. This ensures accurate measurements and long calibration intervals.

### Easy installation

DMT143 has a variety of features to choose from, including different output and installation options, and alarm LED.

Due to its small size and light weight, DMT143 is quickly and easily installed in tight spaces or in small-size pipelines.

The alarm LED indicates too high dew point in the process. The trigger point is preset at the factory. It can be later adjusted with the convenient Vaisala Insight PC software for Windows®.

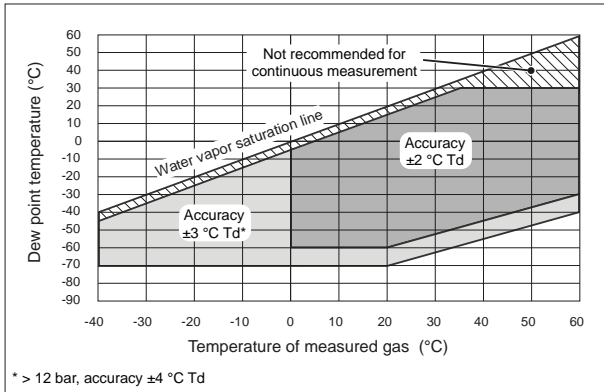
Insight PC software and the Indigo80 handheld indicator can also be used for other configuration options, as well as for viewing and logging measurement data (for more information, see [www.vaisala.com/insight](http://www.vaisala.com/insight) and [www.vaisala.com/indigo](http://www.vaisala.com/indigo)).

# Technical data

## Measurement performance

Sensor	DRYCAP® 180D
Sensor protection	Stainless steel sintered filter
Recommended calibration interval to confirm the specified accuracy	2 years
<b>Dew point temperature</b>	
Measurement range (typical)	-70 ... +60 °C (-94 ... +140 °F) T <sub>d</sub>
Accuracy in air or N <sub>2</sub> <sup>1)</sup>	±2 °C (±3.6 °F) T <sub>d</sub> (see graph below)

### Dew point accuracy vs. measurement conditions:



### Analog output scalings:

Option 1	-80 ... +20 °C (-112 ... +68 °F) T <sub>d</sub>
Option 2	-80 ... +20 °C (-112 ... +68 °F) T <sub>d</sub> dew point at ambient pressure
Option 3	Free scaling

### Response time 63 % [90 %]: <sup>2)</sup>

-70 → -20 °C T <sub>d</sub> (-94 → -4 °F T <sub>d</sub> )	5 s [15 s] (typical)
-20 → -70 °C T <sub>d</sub> (-4 → -94 °F T <sub>d</sub> )	45 s [10 min] (typical)

### Water concentration by volume (ppm)

Measurement range (typical)	10 ... 40 000 ppm
Accuracy at +20 °C (+68 °F), 1 bar	1 ppm + 20 % of reading

- <sup>1)</sup> When the dew point is below 0 °C (32 °F), the transmitter outputs frost point.  
<sup>2)</sup> At +20 °C gas temperature and 1 bar pressure and 1 liter/min flow rate.

## Operating environment

Measurement environment	For air, nitrogen, hydrogen, argon, helium, and oxygen <sup>1) 2)</sup>
Temperature <sup>3)</sup>	-40 ... +60 °C (-40 ... +140 °F)
Relative humidity	0 ... 100 % RH
Pressure <sup>3)</sup>	0 ... 50 bar <sub>a</sub> (725 psi <sub>a</sub> )
Sample flow rate	No effect for measurement accuracy
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
IP rating	IP66

- <sup>1)</sup> Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases. The transmitter is not certified for use in hazardous areas with potentially explosive atmospheres.  
<sup>2)</sup> The transmitter not tested for leakages, which may occur especially with small-molecule gases such as hydrogen and helium.  
<sup>3)</sup> For extended temperature below 0 °C (+32 °F) or pressure above 20 bar<sub>a</sub> (290 psi<sub>a</sub>) the supply voltage must be 24 ... 28 V DC.

## Inputs and outputs

Analog output (scalable)	4 ... 20 mA (3-wire), 0 ... 1 V / 5 V, 1 ... 5 V
Resolution for current output	0.002 mA
Resolution for voltage output	0.3 mV
Accuracy for current output at +20 °C	±0.05 mA
Accuracy for voltage output at +20 °C	±0.01 V
Operating voltage with digital output	12 ... 28 V DC
Operating voltage with voltage output	12 ... 28 V DC
Operating voltage with current output	18 ... 28 V DC
Load for current output	Max. 500 Ω
Load for voltage output	Min. 10 kΩ
Typical temperature dependence	0.005 % of span/°C
Digital output	RS-485, non-isolated
Supported protocols	Vaisala industrial protocol Modbus RTU
Connector	4-pin M8 (IEC 60947-5-2)
<b>Supply current at +20 °C (U<sub>in</sub> 24 V DC)</b>	
Normal measurement	10 mA + load current (typical)
During self-diagnostics	220 mA pulsed (typical)

## Mechanical specifications

Mechanical connection	ISO 228-1 G1/2" 1/2" NPT 3/4"-16 UNF 5/8"-18 UNF
Housing material	Stainless steel (AISI316L)
Weight:	
G thread and UNF thread models	90 g (3.2 oz)
NPT thread model	100 g (3.5 oz)

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B
Compliance marks	CE, China RoHS, RCM, UKCA

## Spare parts and accessories

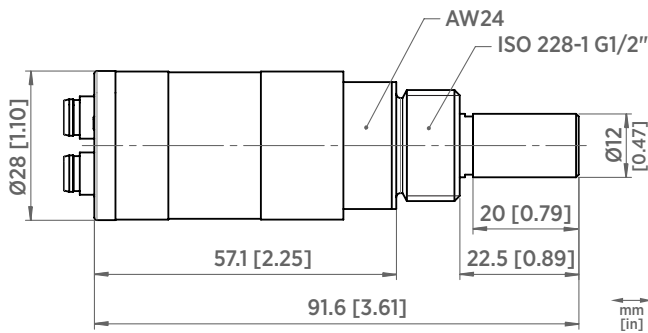
USB cable for PC connection <sup>1)</sup>	219690
M12 - M8 cable 1.5 m (4.9 ft), for connecting to Indigo80	262195SP
M12 - M8 cable 2 m (6.5 ft), for connecting to DM70	219980SP
Loop powered external display	226476
Loop powered external display with relays	234759

### Sampling cells

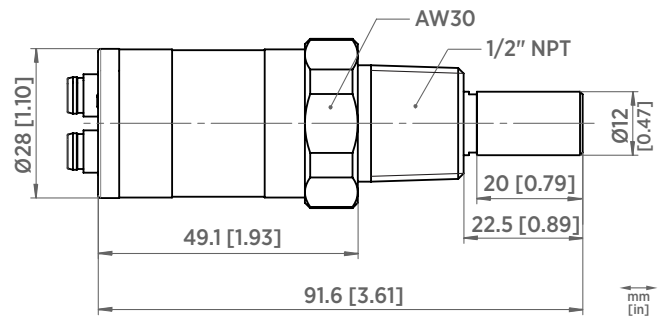
Basic sampling cell	DMT242SC
With Swagelok 1/4" male connectors	DMT242SC2
With UNF5/8"-18 thread	DSC74UNF58SP
With quick connector and leak screw	DSC74SP
Two-pressure sampling cell	DSC74BSP
Cooling/venting coil	DMCOILSP

See the DSS70A product page at [www.vaisala.com](http://www.vaisala.com) for further information about the sampling cells available for DM70.

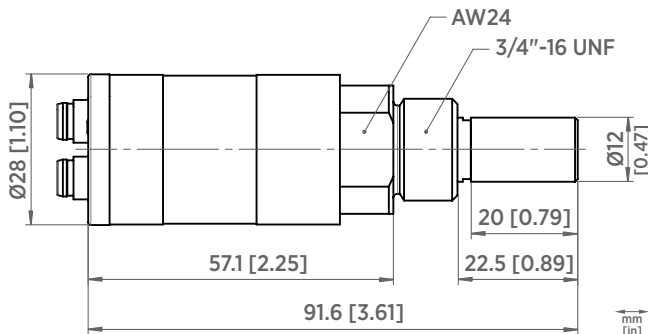
<sup>1)</sup> Vaisala Insight software for Windows is available at [www.vaisala.com/insight](http://www.vaisala.com/insight).



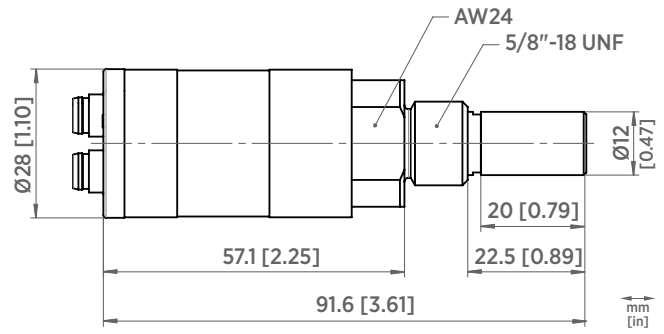
DMT143 with ISO 228-1 G1/2" thread



DMT143 with 1/2" NPT thread



DMT143 with 3/4"-16 UNF thread



DMT143 with 5/8"-18 UNF thread

## DMT143L Dew Point Transmitter For OEM applications (DMT242 replacement)



### Features

- Vaisala DRYCAP® technology with auto-calibration
- Calibration interval of two years
- Two sensor options cover a dew point measurement range of  $-60 \dots +60 \text{ }^{\circ}\text{C}$  ( $-76 \dots +140 \text{ }^{\circ}\text{F}$ )
- Accuracy  $\pm 2 \text{ }^{\circ}\text{C}$  ( $\pm 3.6 \text{ }^{\circ}\text{F}$ )
- Compatible with Vaisala Indigo80 handheld indicator and Insight PC software
- Traceable calibration (certificate included)
- Analog current (mA) output and RS-485 digital output with Modbus® RTU support
- LED alarm for exceeded dew point level
- Fast response time

Due to its wide measurement range and excellent long-term stability, Vaisala DRYCAP® Dew Point Transmitter DMT143L is an ideal choice for low dew point industrial applications, such as compressed air dryers, plastic dryers, and other OEM applications.

### Vaisala DRYCAP®

Vaisala DRYCAP® Dew Point Transmitter DMT143L is a miniature dew point measurement instrument.

The transmitter can be installed directly into pressurized systems at 20 bar (290 psia) maximum pressure. It is designed for extreme conditions.

DMT143L incorporates Vaisala DRYCAP® thin film polymer sensor and auto-calibration software. The standard sensor choice for dry gases and desiccant dryers is the DRYCAP® 180M, and for more humid applications such as refrigeration dryers, the DRYCAP® 180S is optimal.

The sensors fully withstand getting wet, and therefore, the transmitter performs exceptionally well in applications that occasionally experience process water

spikes, such as pipeline condensation during a system failure or start-up. The sensors are also highly resistant to particulate contamination, oil vapor, and most chemicals, and insensitive to the flow rate.

### Long calibration interval

The calibration interval of DMT143L is two years. For any adjustment needs, the transmitter can be sent to a Vaisala Service Center.

The auto-calibration software works online while the process is running. If the measurement accuracy is not confirmed, corrections are made automatically.

### Easy installation

DMT143L has a variety of features to choose from, including different output and installation options, and alarm LED.

Due to its small size and light weight, DMT143L is quickly and easily installed in tight spaces or in small-size pipelines.

The alarm LED indicates too high dew point in the process. The trigger point is preset at the factory. It can be later adjusted with the convenient Vaisala Insight PC software for Windows®.

Insight PC software and the Indigo80 handheld indicator can also be used for other configuration options, as well as for viewing and logging measurement data (for more information, see [www.vaisala.com/insight](http://www.vaisala.com/insight) and [www.vaisala.com/indigo](http://www.vaisala.com/indigo)).

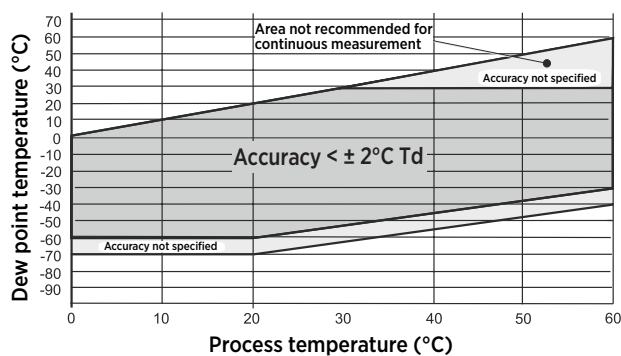
# Technical data

## Measurement performance

Sensors	DRYCAP® 180M DRYCAP® 180S (optimal for refrigeration dryers)
Sensor protection	Stainless steel sintered filter Stainless steel filter for vacuum
Recommended calibration interval to confirm the specified accuracy	2 years
Measurement range (typical)	-60 ... +60 °C (-76 ... +140 °F)
Different analog output scalings available. <sup>1)</sup>	
Accuracy with DRYCAP® 180M	±2 °C (±3.6 °F) <sup>2)</sup> (see the graph below)

1) For more information, see the DMT143L order form.

2) When the dew point is below 0 °C (32 °F), the transmitter outputs frost point.

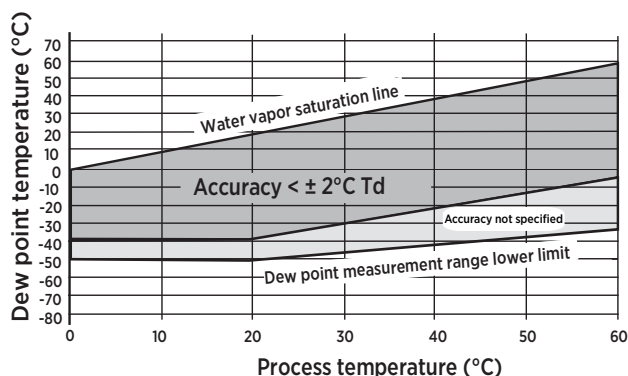


### Dew point accuracy vs. measurement conditions

Response time 63 % [90 %] at +20 °C (+68 °F) gas temperature and 1 bar pressure and 1 liter/min flow rate:

-60 → -20 °C T <sub>d</sub> (-76 → -4 °F T <sub>d</sub> )	5 s [10 s] (typical)
-20 → -60 °C T <sub>d</sub> (-4 → -76 °F T <sub>d</sub> )	45 s [10 min] (typical)
Accuracy with DRYCAP® 180S	±2 °C (±3.6 °F) <sup>1)</sup> (see the graph below)

1) When the dew point is below 0 °C (32 °F), the transmitter outputs frost point.



## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B
Compliance marks	CE, China RoHS, RCM, UKCA

## Operating environment

Measurement environment	For air, nitrogen, hydrogen, argon, helium, and oxygen <sup>1) 2)</sup>
Temperature	0 ... +60 °C (+32 ... +140 °F)
Higher temperature peaks	Short-term OK
Relative humidity	0 ... 100 %RH
Pressure	0 ... 20 bara (0 ... 290 psia)
Sample flow rate	No effect
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
IP rating	IP66

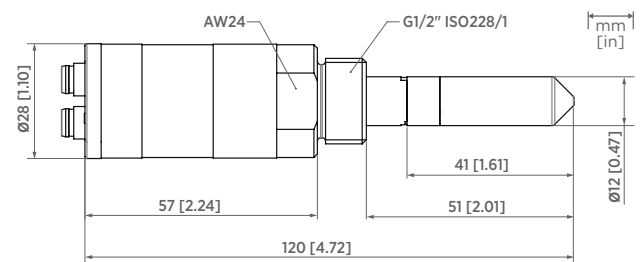
1) Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases. The transmitter is not certified for use in hazardous areas with potentially explosive atmospheres.  
2) The transmitter not tested for leakages, which may occur especially with small-molecule gases such as hydrogen and helium.

## Inputs and outputs

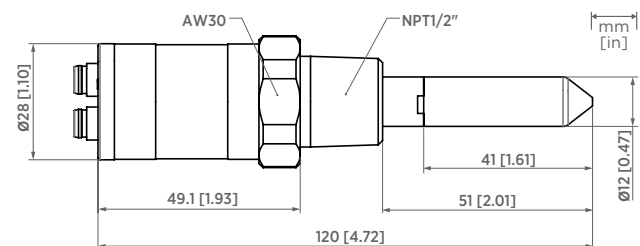
Analog current output	4 ... 20 mA (3-wire)
Digital output	RS-485, non-isolated
Supported protocols	Vaisala industrial protocol Modbus RTU
Resolution for current output	0.002 mA
Accuracy for current output at +20 °C	±0.05 mA
External load for current output	Max. 500 Ω
Operating voltage with current output	18 ... 28 V DC
Operating voltage with digital output	12 ... 28 V DC
Typical temperature dependence	0.0008 mA/°C
Power consumption at 24 V DC	Max. 220 mA

## Mechanical specifications

Mechanical connection	G1/2" ISO228-1 with bonded seal ring (U-seal) or NPT1/2" thread
Housing material	Stainless steel (AISI 316L)
<b>Weight</b>	
G thread model	90 g (3.2 oz)
NPT thread model	100 g (3.5 oz)



DMT143L with G1/2" thread



DMT143L with NPT1/2" thread

## DMT132 Dew Point Transmitter For refrigerant dryers



### Features

- High accuracy  $\pm 1\text{ }^{\circ}\text{C}$  ( $\pm 1.8\text{ }^{\circ}\text{F}$ ) in the measurement range of refrigerant dryers
- Excellent long-term stability - resistant to compressor oil and most other chemicals thanks to HUMICAP® technology
- Low power requirements, 10 ... 28 VDC
- Easy to verify functionality with compatible Vaisala DM70 or HM70 hand-held meters
- Optional LED warning light

Vaisala HUMICAP® Dew Point Transmitter DMT132 is an affordable dew point measurement instrument designed to verify the functionality of refrigerant dryers. It is especially well suited for OEM dryer manufacturers.

### Direct Measurement Cuts Costs

Direct outlet air dew point measurement provides accurate information about dryer functionality and is more reliable than the traditional method of measuring refrigerator temperature only. Knowledge of the real dew point ensures high quality compressed air at all times and enables customers to optimize dryer capacity. This helps to prevent investment in redundant dryer capacity and avoid unnecessary maintenance and costly malfunctions.

### High Accuracy and Long-Term Stability

DMT132 provides optimal performance in the operating range of refrigerant dryers. In the measurement range of  $-3\text{ }^{\circ}\text{C}$  ...  $20\text{ }^{\circ}\text{C}$  ( $+26.6\text{ }^{\circ}\text{F}$  ...  $+68\text{ }^{\circ}\text{F}$ ), where the refrigerator

dryers typically operate, the  $T_d$  accuracy is  $\pm 1\text{ }^{\circ}\text{C}$  ( $\pm 1.8\text{ }^{\circ}\text{F}$ ). The instrument incorporates the proven Vaisala HUMICAP® sensor, which is resistant to compressor oil and most other chemicals, thereby providing excellent long-term stability.

### Quick Installation and Easy Field Checking

It takes just a few minutes to install DMT132 directly into a dryer or compressed air line through a G1/2" ISO thread. Vaisala sampling cells can also be used. The loop-powered electronics mean that wiring is easy and power requirements are low. DMT132 operating voltages can be as low as 10 VDC.

Verifying the performance of DMT132 is easy with the compatible Vaisala DM70 or HM70 hand-held meters. The user can perform possible adjustments with Vaisala HMK15 Humidity Calibrator.



Demand for dew point sensors to verify refrigerant dryers is increasing. Direct dew point measurement enables energy savings and improved efficiency.



# Technical Data

## Measurement Performance

Measurement range	-30 ... +50 °C (-22 ... +122 °F) $T_d$
Accuracy at +20 °C (+68 °F)	±1 °C for -3 ... 20 °C (+26.6 ... +68 °F) $T_d$ <sup>1)</sup> ±2 °C for -15 ... -3 °C (+5 ... +26.6 °F) $T_d$ <sup>1)</sup> See accuracy graph below

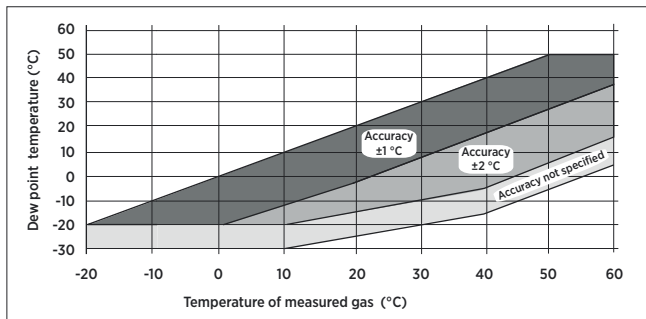
### Typical Response Time at 20 °C (+68 °F) Gas Temperature and 1 Bar Pressure

-14 → +3 °C (+7 → +37 °F) $T_d$	17 s (63 %) 40 s (90 %)
+3 → -14 °C (+37 → +7 °F) $T_d$	33 s (63 %) 85 s (90 %)

### Calculated Variables

Dew point converted to atmospheric pressure	$T_{d/f}$ atm
---	---------------

1) When dew point is below 0 °C (+32 °F), the transmitter outputs frost point.



## Operating Environment

Operating temperature	-30 ... +50 °C (-22 ... +122 °F)
Operating pressure	0 ... 20 bar
Relative humidity	0 ... 100 %RH
Sample flow rate	No effect on measurement accuracy
Measured gases	Non-corrosive gases
EMC compliance	EN61326-1, Industrial Environment

## Outputs

Analog output (scalable)	4 ... 20 mA, 2-wire
Resolution for current output	0.002 mA
Accuracy of analog outputs at +20 °C	±0.05 % full scale
Typical temperature dependence	±0.005 % of full scale/ °C
Connector	4-pin M8 (IEC 60947-5-2)

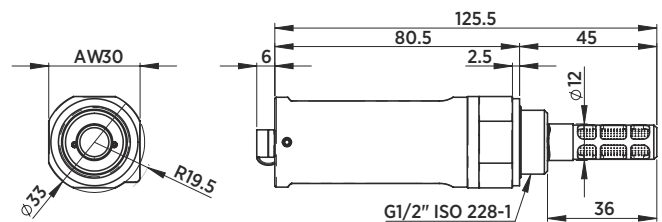
LED indication available for defined dew point limit/error state indication  
RS-485 serial line for service use

## Mechanical Specifications

Sensor	Vaisala HUMICAP® 180R
Recommended calibration interval (in refrigerant dryer application)	2 years
Mechanical connection	G1/2" ISO
Operating voltage	10 ... 28 VDC
External load	Max. 100 Ω for supply voltages < 20 VDC Max. 500 Ω for supply voltages 20 ... 28 VDC
Weight	65 g (2.3 oz)
Housing material	PPS + 40 % GF
IP rating	IP65 (NEMA 4)
Storage temperature range	-40 ... +80 °C (-40 ... +176 °F)
Start-up time	3 s

## Spare Parts and Accessories

Tube filter	230602
Special cover set for HMK15 (calibrator fitting DMT132 and HMP60)	230914
NPT Adapter	210662SP
Sample cells	DMT242SC, DMT242SC2, DSC74, DSC74B, DSC74C, DMCOIL
Duct installation flange	DM240FA
Cables (several lengths available)	HMP50Z032, HMP50Z300SP, HMP50Z500SP, HMP50Z1000SP
Loop powered external display	226476
USB service cable	219690
Connection cable to DM70/HM70	219980
LED plug	230388
ISO 1/2" plug	218773
NPT 1/2" plug	222507
Sealing ring set (3 pcs U-seal)	221525SP



Dimensions in mm



## DPT146 Dew Point and Pressure Transmitter

For compressed air



### Features

- The first transmitter that monitors both dew point and process pressure
- A simple and convenient transmitter for monitoring of compressed air
- Highly accurate humidity information thanks to dew point data coupled with live pressure input
- Proven sensor technology
- Compatible with Vaisala Handheld Meter DM70 for easy spot-checking, local display, and data logging

Vaisala Dew Point and Pressure Transmitter DPT146 for compressed air makes monitoring compressed air simple and convenient. DPT146 measures both dew point and process pressure simultaneously, and is the ideal choice for anyone using or monitoring compressed air.

### Simple and efficient installation

One transmitter providing two of the most important compressed air measurements means reduced installation costs and a much easier setup – with only one instrument needing connection and wiring.

### Make more informed decisions

Dew point measurement combined with process pressure measurement offers further unique advantages. When dew point data is coupled with live pressure input, conversions to atmospheric pressure or ppm are available online, leaving no ambiguity in the information. As an example, regulative requirements of medical gas can be fulfilled easily and quickly.

### A unique combination of two world-class sensors

DPT146 combines the knowledge of more than 20 years of sensor technology development. Proven measurements from DRYCAP® sensor for dew point and BAROCAP® sensor for pressure are now combined into one easy-to-use transmitter.

### Convenience with proven performance

Well-developed technology brings both proven results and convenience. Spot-checking and verification of dew point is easy thanks to fully compatible Vaisala DRYCAP® Handheld Dew Point Meter

DM70. The meter can also be used as a local display and data logger. Temperature measurement is available when RS-485 is in use.

### Output and performance

- Pressure: 1 ... 12 bar
- Dew point: -70 ... +30 °C (-94 ... +86 °F)
- Digital output RS-485 with Modbus

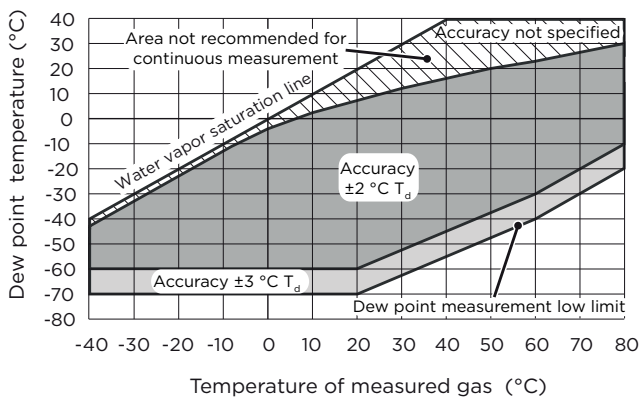
# Technical data

## Parameters

Measured parameters	
Dew point	-70 ... +30 °C (-94 ... +86 °F)
Pressure, absolute	1 ... 12 bar (14.5 ... 174 psi)
Temperature (available if output RS-485 only selected)	-40 ... +80 °C (-40 ... +176 °F)
Calculated parameters	
ppm moisture, by volume	1 ... 40 000 ppm
Dew point, converted to atmospheric pressure	-75 ... +30 °C (-103 ... +86 °F)

## Measurement performance

Sensor	Vaisala MPS1 multiparameter sensor
Dew point accuracy	±2 °C (±3.6 °F)
Pressure accuracy at 23 °C (73.4 °F)	±0.4 %FS
Pressure temperature dependence	±0.01 bar / 10 °C (18 °F)
ppm accuracy (7 bar)	±(14 ppm + 12 % of reading)
Temperature accuracy	
0 ... 40 °C (+32 ... +104 °F)	±0.5 °C (±0.9 °F)
-40 ... 80 °C (-40 ... +176 °F)	±1 °C (±1.8 °F)
Sensor response time	
Pressure response time	< 1 s
Dew point response time 63 % [90 %] at 20 °C and 1 bar:	
-50 → -10 °C Tdf	5 s [10 s]
-10 → -50 °C Tdf	10 s [2.5 min]



## Operating environment

Operating temperature of electronics	-40 ... +60 °C (-40 ... +140 °F)
Operating pressure	1 ... 12 bar (14.5 ... 174 psi)
Mechanical durability	0 ... 50 bar (0 ... 725 psi)
Relative humidity	0 ... 100 %
Measured gases	Air/non-corrosive gases
Sample flow rate	No effect on measurement accuracy
Storage temperature	
Transmitter only	-40 ... +80 °C (-40 ... +176 °F)
Shipment package	-20 ... +80 °C (-4 ... +176 °F)

## Compliance

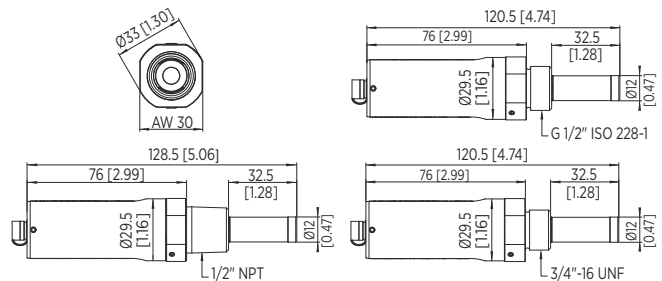
IP rating	IP66
EMC compliance	EN 61326-1, Basic electromagnetic environment

## Inputs and outputs

Accuracy of analog outputs	±0.01 V / ±0.01 mA
Digital output	RS-485, non-isolated, Vaisala protocol, Modbus RTU protocol
Connector	M8 4-pin male
Operating voltage	
Current output	21 ... 28 VDC
Voltage output and/or use in cold temperatures (-40 ... -20 °C (-40 ... -4 °F))	20 ... 28 VDC
RS-485 only	15 ... 28 VDC
Analog outputs (2 channels)	
Current output	0 ... 20 mA, 4 ... 20 mA
Voltage output	0 ... 5 V, 0 ... 10 V
Supply current	
During normal measurement	20 mA + load current
During self-diagnostics	300 mA + load current
External load for	
Current output	Max. 500 Ω
Voltage output	Min. 10 kΩ

## Mechanical specifications

Housing material	AISI316L
Mechanical connection	ISO G1/2", NPT 1/2", UNF 3/4"-16
Recommended calibration interval	2 years
Sensor protection	Mesh filter AISI303, grade 18 μm
Weight (ISO1/2")	190 g (6.70 oz)



Dimensions in mm (inches)

## Spare parts and accessories

Connection cable for MI70 indicator / DM70 meter	219980
USB connection cable	219690
Sampling cells	DMT242SC, DMT242SC2, DSC74, DSC74B, DSC74C
Flange	DM240FA
Loop-powered external display	226476
ISO 1/2" plug	218773
NPT 1/2" plug	222507





Vaisala Multiparameter Transmitter DPT145 with DILO DN20 connector

Vaisala Multiparameter Transmitter DPT145 for SF<sub>6</sub> gas is a unique innovation that enables online measurement of dew point, pressure, and temperature. It also calculates four other values, including SF<sub>6</sub> density. DPT145 is especially well suited for integration into OEM systems.

### Online reliability

Online dew point measurement combined with pressure measurement provides an excellent assessment of the condition of SF<sub>6</sub> insulation. Sudden and minor leakages are immediately detected by the direct normalized pressure measurement, while online dew point measurement alerts the user to moisture issues, which can weaken the insulation properties of SF<sub>6</sub> and cause rapid deterioration. With DPT145, it is also easy to build a redundant solution for multiple parameters.

### Savings across the board

A single transmitter, instead of several, saves time and money across the board, from investment to installation, operation, and servicing. Lower assembly

costs, fewer cables and connectors, minimized need for on-site visits and field operations - all these translate into cumulative savings. The long calibration interval results in further savings.

### Risk-free, greener solution

Online measurement enables gas trends to be followed via a data collection system, making monitoring fast, risk-free, and accurate. Using one instrument for monitoring seven different parameters means also fewer mechanical connections and reduces the risk of leaks. Monitoring is environmentally friendly because there is no need for sampling - no SF<sub>6</sub> gas is released into the atmosphere.

### Features

- The first transmitter to offer online measurement of seven SF<sub>6</sub> parameters in one unit
- Measured parameters: dew point, pressure, temperature
- Calculated parameters: SF<sub>6</sub> density, normalized pressure, dew point in atmospheric pressure, ppm
- More reliable assessment of the condition of SF<sub>6</sub> insulation due to online measurement
- Digital output: RS-485 with Modbus®
- Long calibration interval of years



DPT145 with weather shield

### The fruit of experience

Vaisala has over 80 years of extensive measurement experience and knowledge. DPT145 brings together the proven DRYCAP® dew point sensor technology and BAROCAP® pressure sensor technology in one package, providing an innovative and convenient solution for monitoring SF<sub>6</sub> gas.

# Technical data

## Measured parameters

Dew point	-60 ... +30 °C (-76 ... +86 °F)
Pressure, absolute	1 ... 12 bar (14.5 ... 174 psi)
Temperature	-40 ... +80 °C (-40 ... +176 °F)

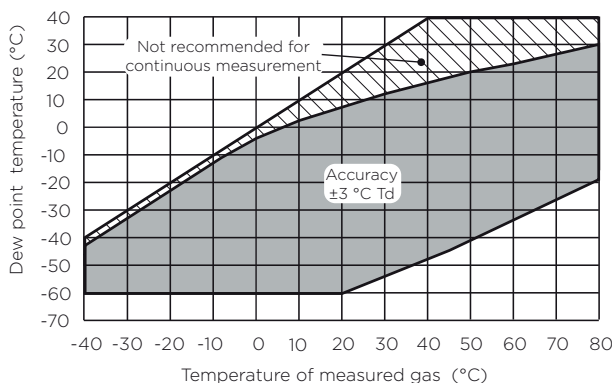
## Calculated parameters

Pressure, normalized to +20 °C (+68 °F)	1 ... 12 bar (14.5 ... 174 psi)
SF <sub>6</sub> or SF <sub>6</sub> /N <sub>2</sub> mixture density	0 ... 100 kg/m <sup>3</sup>
Moisture by volume, ppm	40 ... 40 000 ppm
Dew point, converted to atmospheric pressure	-65 ... +30 °C (-85 ... +86 °F)

## Measurement performance

Dew point accuracy	±3 °C (±5.4 °F), see graph below
Dew point stability	Typical drift < 2 °C (3.6 °F) / 5 years
Pressure accuracy at +23 °C (+73.4 °F)	±0.4 %FS
Pressure temperature dependence	±0.01 bar/10 °C (18 °F)
Pressure stability	Typical drift < 1 %FS / 5 years
Temperature accuracy	0 ... +40 °C (+32 ... +104 °F): ±0.5 °C (± 0.9 °F) -40 ... 80 °C (-40 ... +176 °F): ±1 °C (± 1.8 °F)
Density accuracy (pure SF <sub>6</sub> , 1 ... 12 bara)	0 ... +40 °C (+32 ... +104 °F): ±1 %FS -40 ... +60 °C (-40 ... +140 °F): ±2.2 %FS
Typical ppm accuracy (5 ... 1000 ppm, 7 bar)	±(7 ppm + 15 % of reading)
Sensor	Vaisala MPS1 multiparameter sensor
<b>Sensor response time</b>	
Pressure response time	< 1 s
Dew point response time <sup>1)</sup>	-50 → -10 °C Tdf: 5 s [10 s] 63 % [90 %] at 20 °C and 1 bar -10 → -50 °C Tdf: 10 s [2.5 min]

### DPT145 dew point measurement accuracy:



1) System equilibrium related response time is typically longer.

## Inputs and outputs

Digital outputs	RS-485, non-isolated, Vaisala protocol Modbus RTU protocol
Connector	M8 4-pin male
Operating voltage	15 ... 28 VDC 20 ... 28 VDC in cold temperatures (-40 ... -20 °C (-40 ... -4 °F))
Supply current, during normal measurement	20 mA
Supply current, during self-diagnostics	Max. 300 mA pulsed

## Operating environment

Operating temperature of electronics	-40 ... +60 °C (-40 ... +140 °F)
Operating pressure	1 ... 12 bar (14.5 ... 174 psi)
Mechanical durability	0 ... 50 bar (0 ... 725 psi)
Relative humidity	0 ... 100 %
Measured gases	SF <sub>6</sub> , SF <sub>6</sub> /N <sub>2</sub> mixture
Storage temperature, transmitter only	-40 ... +80 °C (-40 ... +176 °F)
Storage temperature, shipment package	-20 ... +80 °C (-4 ... +176 °F)

## Mechanical specifications

Housing material	AISI316L
Mechanical connection	DILO DN20, DILO DN8, ABB Malmquist, or Alstom G1/2" compatible connector Every connection is helium leak tested at the factory.
Weight (with DILO adapter)	765 g (27.0 oz)
IP rating	IP66 <sup>1)</sup>

1) Weather shield to be used in continuous outdoor installations.

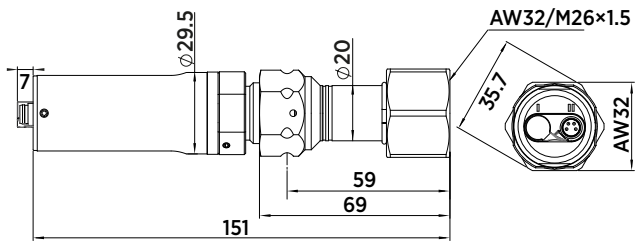
## Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment
Compliance marks	CE, RCM
<b>Mechanical vibration</b>	
Vibration (sinusoidal) IEC 60068-2-6	±6 g, 5-500 Hz sweep 60 min/axis, 3-axis

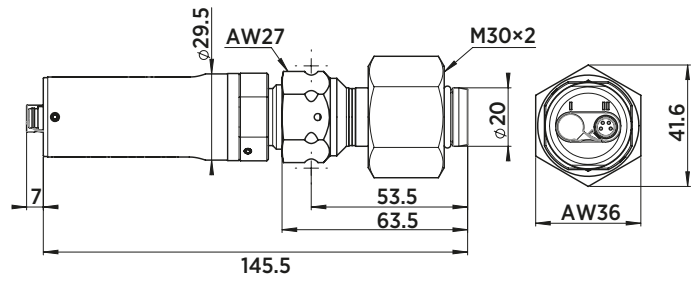
## Spare parts and accessories

Connection cable for the MI70/DM70 handheld	219980
USB connection cable	219690
Protection plug for connector	218675SP
1.5 m shielded PUR cable with 90° connector	231519SP
3 m shielded PUR cable with 90° connector	231520SP
5 m shielded PUR cable with 90° connector	231521SP
10 m shielded PUR cable with 90° connector	231522SP
3 m shielded FEP cable with straight connector	226902SP
Weather shield	ASM210326SP

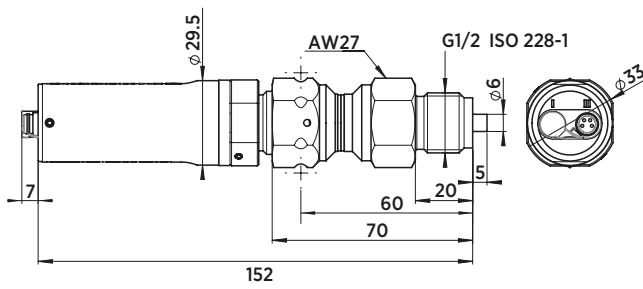
# Technical data



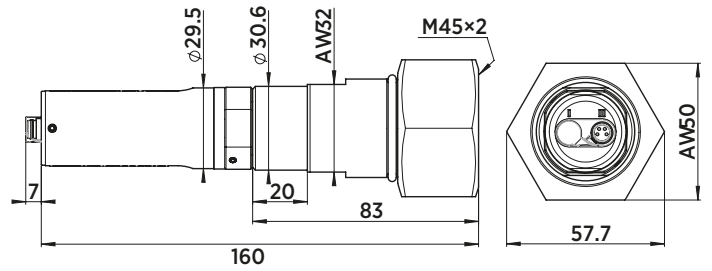
DPT145 with DILO DN8 connector



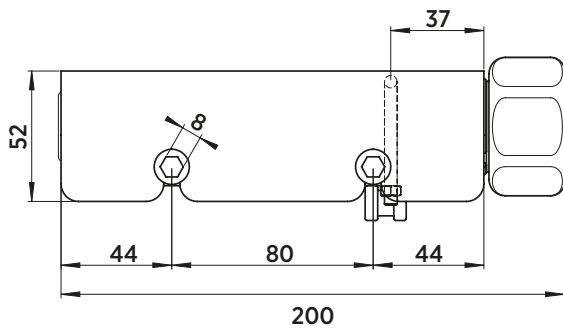
DPT145 with ABB Malmquist connector



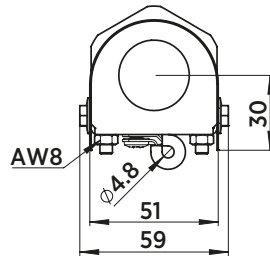
DPT145 with Alstom connector



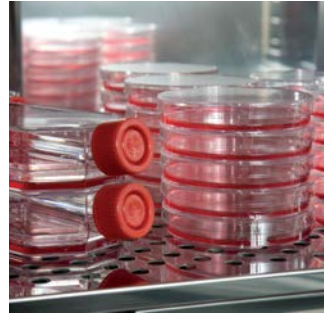
DPT145 with DILO DN20 connector



DPT145 with weather shield



mm



### CARBOCAP's unique benefits

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

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.

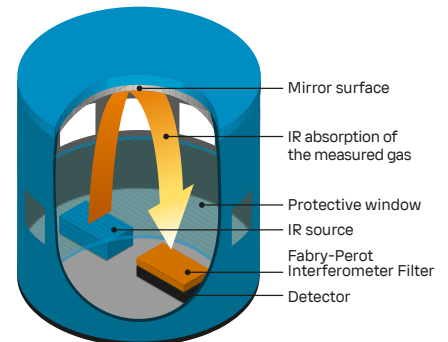
Instruments measuring at several absorption and reference wavelengths with a single light source are known as single-beam multi-wavelength instruments. The technology is widely applied in costly analyzers. The unique feature of the CARBOCAP® sensor is its micromachined FPI filter, which performs a multiwavelength 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.

First launched in 1997, the Vaisala CARBOCAP 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.

Vaisala uses a single-beam and dual-wavelength NDIR (Non-dispersive infrared) technology for measuring CO<sub>2</sub>. The patented CARBOCAP technology is used in all our CO<sub>2</sub> sensors. This technology incorporates a unique tunable band pass filter that was developed by Vaisala and is manufactured in our own state-of-the-art cleanroom. Learn more on our [carbon dioxide page](#).



Structure of the CARBOCAP sensor. Both reference and gas absorption are measured in the same optical path.

### Typical applications for carbon dioxide measurement

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 CO<sub>2</sub> replaces oxygen, it can be harmful to people in very high concentrations. CO<sub>2</sub> 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 CO<sub>2</sub> incubators.

Normal atmospheric air includes CO<sub>2</sub> at ppm levels. Typical CARBOCAP applications include ventilation control in buildings occupied by people, animal shelters, and greenhouses. In areas where large volumes of CO<sub>2</sub> are handled,

reliable CO<sub>2</sub> 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 handheld meters, measurement modules, and industrial transmitters for CO<sub>2</sub> measurements to multigas measurement solutions.



## GMP343 Carbon Dioxide Probe

For demanding measurements



### Features

- Vaisala CARBOCAP® sensor, a silicon-based non-dispersive infrared (NDIR) sensor
- Single-beam, dual wavelength CO<sub>2</sub> measurement with no moving parts
- Compensation options for temperature, pressure, humidity, and oxygen
- Designed for outdoor use

Vaisala CARBOCAP® Carbon Dioxide Probe GMP343 is an accurate and rugged probe-type instrument for ecological measurements. Typical applications include CO<sub>2</sub> soil respiration, ambient CO<sub>2</sub> monitoring, plant growth chambers, and OEM applications.

### Benefits

- Low power consumption and heat emission
- Compact and lightweight
- Excellent accuracy and stability

GMP343 can output both numerically filtered and raw measurement data, and it can also compensate the measurement with an internal temperature measurement and user-set relative humidity, pressure, and oxygen values.

In combination with an MI70 indicator, GMP343 provides a tool for accurate in-situ measurement. MI70 can be used as a display, communication, and data logging device.

Each GMP343 is calibrated using  $\pm 0.5\%$  accurate gases at 0 ppm, 200 ppm, 370 ppm, 600 ppm, 1000 ppm, 4000 ppm, and 2%. Calibration is also done at temperature points of  $-30\text{ }^{\circ}\text{C}$  ( $-22\text{ }^{\circ}\text{F}$ ),  $0\text{ }^{\circ}\text{C}$  ( $32\text{ }^{\circ}\text{F}$ ),  $25\text{ }^{\circ}\text{C}$  ( $77\text{ }^{\circ}\text{F}$ ), and  $50\text{ }^{\circ}\text{C}$  ( $122\text{ }^{\circ}\text{F}$ ).

If needed, the customer can recalibrate the instrument using the multipoint calibration (MPC) feature allowing up to 8 user-defined calibration points.

# Technical data

## Measurement performance

Measurement range options	0 ... 1000 ppm, 0 ... 2000 ppm, 0 ... 3000 ppm, 0 ... 4000 ppm, 0 ... 5000 ppm, 0 ... 2 %
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### Accuracy (excluding noise) at 25 °C (77 °F) and 1013 hPa after factory calibration with 0.5 % accurate gases with different range options

0 ... 1000 ppm	±(3 ppm + 1 % of reading)
0 ... 2000 ppm - 0 ... 2 % <sup>1)</sup>	±(5 ppm + 2 % of reading)

### Noise (repeatability) at 370 ppmCO<sub>2</sub>

With no output averaging	±3 ppmCO <sub>2</sub>
With 30 s output averaging	±1 ppmCO <sub>2</sub>

### Long-term stability (see graph 'GMP343 operating conditions')

Easy	±2 % of reading <sup>2)</sup> / year
Moderate	±2 % of reading <sup>2)</sup> / 6 months
Harsh	±2 % of reading <sup>2)</sup> / 3 months

### Warm-up time

To full accuracy ±0.5 %	10 min
To full accuracy	30 min

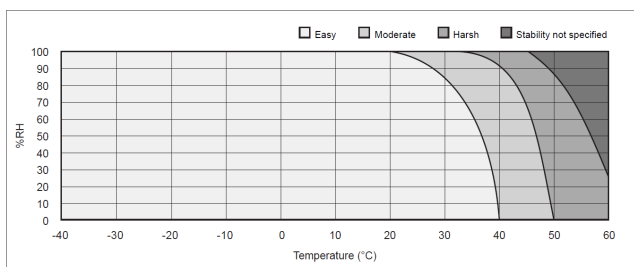
- 1) Accuracy below 200 ppmCO<sub>2</sub> not specified for 2 % range option.  
2) Always at least ±10 ppmCO<sub>2</sub>.

### Effect on accuracy with temperature compensation

CO <sub>2</sub> range options	0 ... 1000 ppm	0 ... 2 000 - 5000 ppm	0 ... 2 %
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Temperature °C (°F)	Accuracy (% of reading) <sup>1)</sup>		
+10 ... +40 (+50 ... +104)	±1	±1	±2
+40 ... +60 (+104 ... +140)	±2	±3	±4
-40 ... +10 (-40 ... +50)	±3	±3	±5

- 1) Always at least ±10 ppmCO<sub>2</sub>.  
Temperature compensation is performed by an integrated Pt1000 element.



## GMP343 operating conditions

### Effect on accuracy with pressure compensation

CO <sub>2</sub> range options	0 ... 1000 ppm	0 ... 2000 - 2 %
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Pressure (hPa)	Accuracy (% of reading)	
900 ... 1050	±0.5	±1
700 ... 1300	±1	±2

Integrated pressure sensor **not** included in GMP343.

## Response time (90 %)

### Diffusion model

Filter attached	Averaging (s)	Response (s)
Yes	0	75
Yes	30	82
No	0	4
No	30	30

### Flow-through model

Gas flow (l/min)	Averaging (s)	Response (s)
0.3	0	26
0.3	30	44
1.2	0	8
1.2	30	23

## Operating environment

Operating temperature -40 ... +60 °C (-40 ... +140 °F)

Storage temperature -40 ... +70 °C (-40 ... 158 °F)

Operating humidity See graph 'GMP343 operating conditions'

Compensated pressure range 700 ... 1300 hPa

Operating pressure < 5 bar

Gas flow for flow-through model 0 ... 10 liters/min

EMC compliance IEC/EN 61326-1, Basic environment <sup>1)</sup>

- 1) Compliance with IEC/EN 61000-4-3: At 3 V/m RF field test within frequency range 300 ... 400 MHz may cause additional deviation of 150 ppmCO<sub>2</sub>.

## Inputs and outputs

Operating voltage 11 ... 36 VDC

Power consumption Without optics heating : < 1 W

With optics heating : < 3.5 W

Digital outputs RS-485, RS-232

### Analog outputs

Current output range 4 ... 20 mA

Current output resolution 14 bits

Current output maximum load 800 Ω at 24 VDC, 150 Ω at 10 VDC

Voltage output range 0 ... 2.5 V, 0 ... 5 V

Voltage output resolution 14 bits (13 bits with 0 ... 2.5 V)

Voltage output minimum load 5 kΩ

## Mechanical specifications

Housing Anodized aluminium

Filter cover PC

Cable connector type 8-pin M12

Weight (probe only) 360 g (12.7 oz)

### IP rating

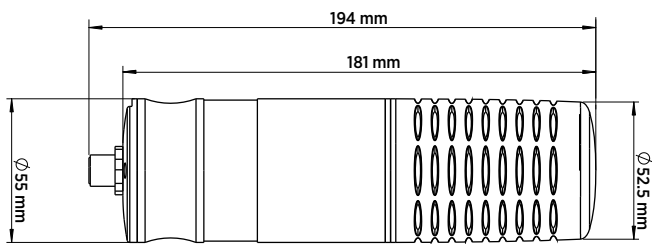
Housing (cable attached) IP67

Diffusion filter (weather protection) IP65

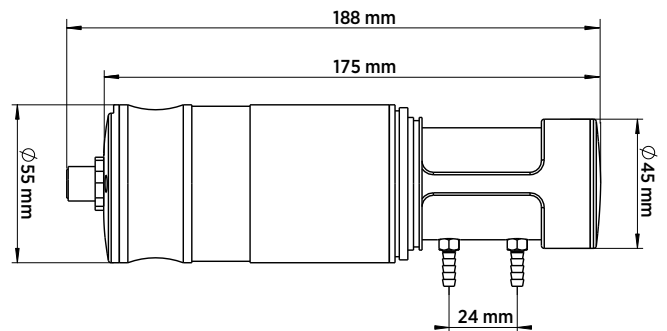
Diffusion filter (sintered PTFE) IP66

## Spare parts and accessories

Wall mount bracket	GMP343BRACKET
Mounting flange	GMP343FLANGE
Standard diffusion filter (weather protection, IP65) with filter cover	GMP343FILTER
Diffusion filter (sintered PTFE filter, IP66) with filter cover	215521
Calibration adapter (for the diffusion model)	GMP343ADAPTER
Junction box	JUNCTIONBOX-8
<b>Probe cables</b>	
PC connection cable, 2 m (6 ft 7 in)	219687
Interface cable for MI70, 2 m (6 ft 7 in)	DRW216050SP
Soil adapter kit for horizontal positioning	215519
Soil adapter kit for vertical positioning	215520
<b>Cable options</b>	
2 m (6 ft 7 in)	GMP343Z200SP
6 m (19 ft 8 in)	GMP343Z600SP
10 m (32 ft 10 in)	GMP343Z1000SP



GMP343 dimensions (diffusion model)



GMP343 dimensions (flow-through model)

## GMP231 Carbon Dioxide Probe For CO<sub>2</sub> incubators



### Features

- Maximum temperature durability +195 °C (+383 °F)
- Incubator can be heat sterilized with probe in place, saving time and reducing risk of cross-contamination
- Heat durability and excellent long-term stability with next generation CARBOCAP® sensor
- Designed for OEM use in CO<sub>2</sub> incubators – installation options available
- CO<sub>2</sub> sensor measurement optimized for 5 % CO<sub>2</sub>, measurement range up to 20 % CO<sub>2</sub>
- 4-point traceable calibration for CO<sub>2</sub>

Vaisala CARBOCAP® Carbon Dioxide Probe GMP231 withstands high temperature sterilization.

GMP231 is designed to provide incubator manufacturers with accurate and reliable carbon dioxide measurements and sterilization durability at high temperatures. The probe is based on Vaisala's patented CARBOCAP® technology and a new type of infrared (IR) light source. These technologies allow for continuous sterilization temperatures of up to 180 °C (+356 °F), enabling easier and more complete sterilization without the risk of cross-contamination. Maximum temperature durability of +195 °C (+383 °F) provides a comfortable operating margin.

The probe is installed through the incubator wall, ensuring that only the IR sensor and optical components are exposed to the incubation

environment. This allows the incubator to be sterilized with the probe in place, removing the need to decontaminate the probe separately. This saves time and reduces the risk of contamination.

The probe's sensor performance is optimized at 5 %CO<sub>2</sub>, but the sensor measures CO<sub>2</sub> up to 20 % with high accuracy. In addition, GMP231 can measure pressure and temperature for CO<sub>2</sub> measurement compensation purposes, ensuring the product remains stable and accurate in all CO<sub>2</sub> incubation conditions. The sensor is made of highly durable materials to achieve outstanding stability over both time and temperature.

Since water vapor, dust, and most chemicals do not affect measurements, GMP231 module is ideal for CO<sub>2</sub> incubator environments.

### Benefits

- Internal pressure and temperature measurement improves accuracy and stability
- Full temperature and pressure compensations available
- Sensor head heating for condensation prevention

# Technical Data

## Measurement performance

Measurement range	0 ... 20 %CO <sub>2</sub>
Calibration uncertainty at 5 %CO <sub>2</sub>	±0.1 %CO <sub>2</sub>
Start-up time	< 20 s
Warm-up time for full spec.	< 3 min
<b>Response time</b>	
T63	< 30 s
T90	< 50 s
<b>Accuracy at 37 °C, 1013 hPa</b>	
Repeatability at:	
0 ... 8 %CO <sub>2</sub>	±0.1 %CO <sub>2</sub>
8 ... 12 %CO <sub>2</sub>	±0.2 %CO <sub>2</sub>
12 ... 20 %CO <sub>2</sub>	±0.4 %CO <sub>2</sub>
Non-linearity at 0 ... 20 %CO <sub>2</sub>	±0.1 %CO <sub>2</sub>
<b>Temperature dependence</b>	
With compensation at 3 ... 12 %CO <sub>2</sub> , 20 ... 60 °C	±0.1 %CO <sub>2</sub>
Without compensation (typical)	-0.4 % of reading/°C
<b>Pressure dependence</b>	
With compensation at 3 ... 12 %CO <sub>2</sub> , 700 ... 1100 hPa	±0.015 % of reading/hPa
Without compensation (typical)	+0.15 % of reading/hPa
<b>Humidity dependence</b>	
With compensation at 0 ... 20 %CO <sub>2</sub> , 0 ... 100 %RH	±0.9 % of reading (at 37 °C)
Without compensation (typical)	+0.05 % of reading/%RH
<b>O<sub>2</sub> dependence</b>	
With compensation at 0 ... 20 %CO <sub>2</sub> , 0 ... 90 %O <sub>2</sub>	±0.6 % of reading
Without compensation (typical)	-0.08 % of reading/%O <sub>2</sub>
<b>Long-term stability</b>	
0 ... 8 %CO <sub>2</sub>	< ±0.2 %CO <sub>2</sub> /year
8 % ... 12 %CO <sub>2</sub>	< ±0.5 %CO <sub>2</sub> /year
12 % ... 20 %CO <sub>2</sub>	< ±1.0 %CO <sub>2</sub> /year

## Mechanical specifications

Connector	M12/8 pin
Weight	150 g (5.29 oz) without cable
IP rating	IP54 (sensor head) IP20 (electronics housing)
<b>Materials</b>	
Housing	Metal coated plastic ABS+PC
Inner tube	Aluminum
Probe tube	PPSU
Filter	PTFE
<b>Dimensions</b>	
Probe tube max. diameter	30.2 mm (1.19 in)
Probe tube length	118.5 mm (4.67 in)
Sensor filter length	12 mm (0.47 in)

## Operating environment

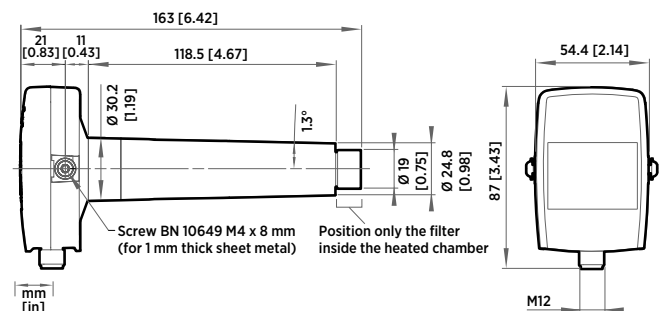
Operating temperature for CO <sub>2</sub> measurement	0 ... +70 °C (+32 ... +158 °F)
Max. temperature durability in standby mode (sensor head only)	Max. +195 °C (+383 °F)
Heat sterilization 180 °C durability	At least 120 cycles
Storage temperature	-40 ... +75 °C (-40 ... +167 °F)
Pressure (compensated)	500 ... 1100 hPa
Pressure (operating)	< 1500 hPa
Humidity	0 ... 100 %, non-condensing
Condensation prevention	Sensor head heating when power on
Chemical tolerance	DMSO, IPA (70 %), H <sub>2</sub> O <sub>2</sub> (2000 ppm, non-condensing), ethanol, acetic acid
Electromagnetic compatibility	EN61326-1, Generic Environment

## Inputs and outputs

Digital outputs	I <sup>2</sup> C 5 V, RS-485 (2-wire with Vaisala Industrial Protocol)
Analog output	0 ... 20 mA (scalable) max. load 600 Ω
Power consumption	< 1 W (pulsed)
Operating voltage	11 ... 30 VDC 20 ... 30 VDC (with analog output)

## Accessories

M12 Connection Cable 0.9 m with open ends	DRW240977SP
M12 Connection Cable 0.6 m with Milli-Grid connector	ASM210903SP
Silicone plug	DRW240015SP
Attachment bracket	DRW240247SP
PTFE filter	DRW240494SP
USB PC connection cable	221040
MI70 connection cable	221801
Calibration adapter for GMP231	239523



GMP231 dimensions



## GMP251 Carbon Dioxide Probe For %-level measurements



### Features

- Measurement range 0 ... 20 %CO<sub>2</sub>
- Intelligent, standalone probe with analog and digital outputs
- Compatible with Vaisala Indigo products, Insight PC software, and RFL100 data logger
- Wide operating temperature range (-40 ... +60 °C) (-40 ... +140 °F)
- IP65-classified housing
- Integrated temperature measurement for CO<sub>2</sub> compensation purposes
- Compensations also for pressure, oxygen, and humidity
- Sensor head heated to prevent condensation

Vaisala CARBOCAP® Carbon Dioxide Probe GMP251 is an 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

- Excellent 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 CO<sub>2</sub> measurement according to ambient temperature. The effects of pressure and background gas can also be compensated for. The measurement range is 0 ... 20 %CO<sub>2</sub> and the sensor performance is optimized at 5 %CO<sub>2</sub> 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 H<sub>2</sub>O<sub>2</sub> 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 and the Indigo80 handheld indicator for an extended range of output and configuration options. See [www.vaisala.com/indigo](http://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 software for Windows®. See [www.vaisala.com/insight](http://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 CO<sub>2</sub> 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. <sup>1)</sup>

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

# Technical data

## Measurement performance

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

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

## Compliance

EU directives and regulations	EMC, RoHS
Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, China RoHS, RCM

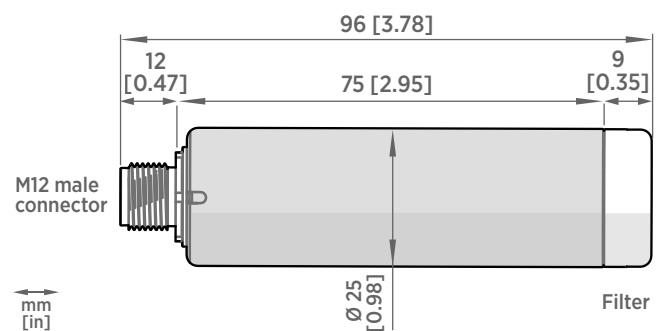
## Operating environment

Operating temperature of CO <sub>2</sub> measurement	-40 ... +60 °C (-40 ... +140 °F) <sup>1)</sup>
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)	<ul style="list-style-type: none"> <li>• H<sub>2</sub>O<sub>2</sub> (2000 ppm, non-condensing)</li> <li>• Alcohol-based cleaning agents (for example ethanol and IPA)</li> <li>• Acetone</li> <li>• Acetic acid</li> </ul>
<b>Pressure</b>	
Compensated	500-1100 hPa
Operating	< 1.5 bar
<b>Gas flow (for flow-through option)</b>	
Operating range	< 10 l/min
Recommended range	0.1-0.8 l/min

<sup>1)</sup> 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
<b>Materials</b>	
Probe housing	PBT polymer
Filter	PTFE membrane, PBT polymer grid
Connector	Nickel plated brass
<b>Dimensions</b>	
Probe diameter	25 mm (0.98 in)
Probe length	96 mm (3.78 in)



GMP251 dimensions

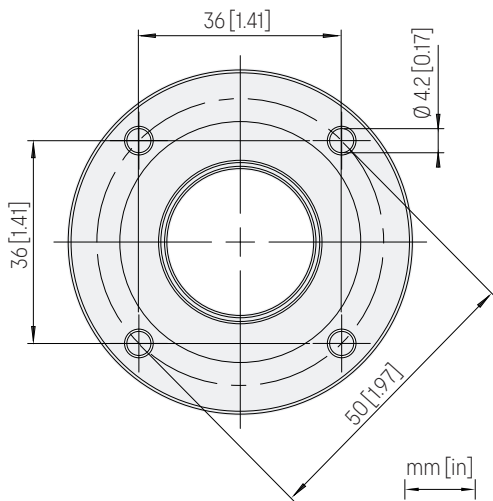
## Inputs and outputs

Analog outputs	<ul style="list-style-type: none"> <li>0–5/10 V (scalable), min. load 10 kΩ</li> <li>0/4–20 mA (scalable), max. load 500 Ω</li> </ul>
Digital output	Over RS-485: <ul style="list-style-type: none"> <li>Modbus</li> <li>Vaisala Industrial Protocol</li> </ul>
<b>Operating voltage</b>	
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
<b>Power consumption</b>	
Typical (continuous operation)	0.4 W
Maximum	0.5 W

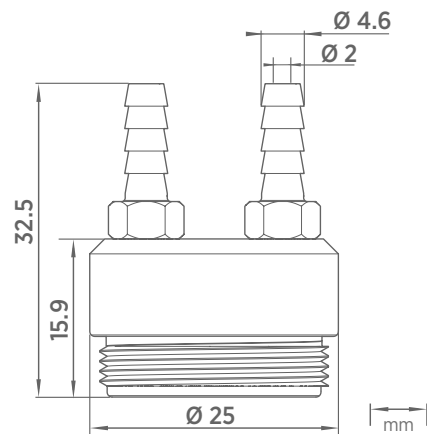
## Spare parts and accessories

Standard membrane filter	ASM211650SP
Porous sintered PTFE filter	DRW243649SP
Probe connection cable with open wires (1.5 m), shielded	223263SP
Probe connection cable with open wires (1.5 m), shielded	254294SP
Probe connection cable with open wires (3 m), shielded	26719SP
Probe connection cable with open wires (10 m), shielded	216546SP
Probe connection cable with open wires and 90° plug (0.6 m), shielded	244669SP
Probe connection cable with open wires and 90° plug (1.5 m), shielded	255102
MI70 connection cable, M12 5-pin	CBL210472
Connection cable for Indigo80, M12-5F - M12-5M, 1.5 m	272075SP
Flat cable for GMP250 probes, M12 5-pin	CBL210493SP
Indigo USB adapter <sup>1)</sup>	USB2
Probe mounting clips (2 pcs)	243257SP
Probe mounting flange	243261SP
Probe holder assembly	ASM213582
Flow-through adapter with gas ports	ASM211697SP
Calibration adapter	DRW244827SP
Spray shield	ASM212017SP

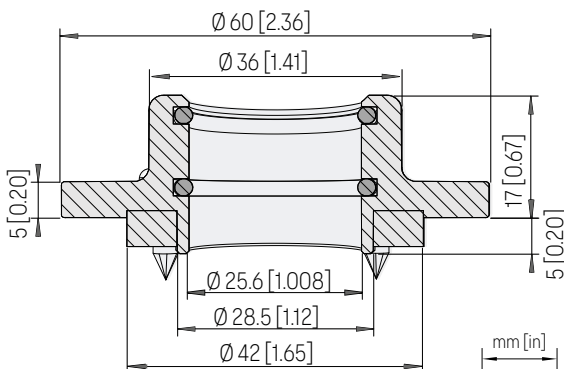
<sup>1)</sup> Vaisala Insight software for Windows available at [vaisala.com/insight](http://vaisala.com/insight)



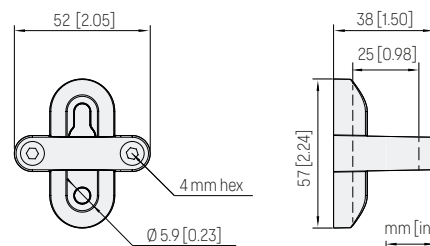
Probe mounting flange 243261SP dimensions



Flow-through adapter with gas ports ASM211697SP. Suitable for tubes with 4 mm inner diameter.



Probe mounting flange 243261SP dimensions, cross section



Probe holder ASM213582 dimensions



## GMP252 Carbon Dioxide Probe For ppm-level measurements



### Features

- Measurement range  
0 ... 10 000 ppm CO<sub>2</sub>
- Intelligent, standalone probe with analog and digital outputs
- Compatible with Vaisala Indigo products and Insight PC software
- Wide operating temperature range, -40 ... +60 °C (-40 ... +140 °F)
- IP65-classified housing
- Integrated temperature measurement for CO<sub>2</sub> compensation purposes
- Compensations also for pressure, oxygen, and humidity
- Sensor head heated to prevent condensation

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

### Benefits

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

GMP252 is suitable for harsh and humid CO<sub>2</sub> measurement environments where stable and accurate ppm-level CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> (measurements up to 30 000 ppm CO<sub>2</sub> 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 H<sub>2</sub>O<sub>2</sub> 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 and the Indigo80 handheld indicator for an extended range of outputs and configuration options. See [www.vaisala.com/indigo](http://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 software for Windows®. See [www.vaisala.com/insight](http://www.vaisala.com/insight).

### Applications

GMP252 is ideal for agriculture, refrigeration, greenhouses, and demanding HVAC applications where stable and accurate ppm-level CO<sub>2</sub> 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. <sup>2)</sup>

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

# Technical data

## Measurement performance

Measurement range	0–10 000 ppm CO <sub>2</sub> (up to 30 000 ppm CO <sub>2</sub> with reduced accuracy)
<b>Accuracy</b> <sup>1)</sup>	
0–3000 ppm CO <sub>2</sub>	±40 ppm CO <sub>2</sub>
3000–10 000 ppm CO <sub>2</sub>	±2 % of reading
Up to 30 000 ppm CO <sub>2</sub>	±3.5 % of reading
<b>Calibration uncertainty</b>	
at 2000 ppm CO <sub>2</sub>	±31 ppm CO <sub>2</sub>
at 10 000 ppm CO <sub>2</sub>	±105 ppm CO <sub>2</sub>
<b>Long-term stability</b>	
0–3000 ppm CO <sub>2</sub>	±60 ppm CO <sub>2</sub> /year
3000–6000 ppm CO <sub>2</sub>	±150 ppm CO <sub>2</sub> /year
6000–10 000 ppm CO <sub>2</sub>	±300 ppm CO <sub>2</sub> /year
<b>Temperature dependence 0–10 000 ppm CO<sub>2</sub></b>	
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 <sub>2</sub> (typical)	–0.5 % of reading/°C
<b>Pressure dependence</b>	
With compensation at 0–10 000 ppm CO <sub>2</sub> , 500–1100 hPa	±0.015 % of reading/hPa
Without compensation (typical)	+0.15 % of reading/hPa
<b>Humidity dependence</b>	
With compensation, 0–10 000 ppm CO <sub>2</sub> , 0–100 %RH	±0.7 % of reading (at +25 °C (+77 °F))
Without compensation (typical)	+0.05 % of reading/%RH
<b>O<sub>2</sub> dependence</b>	
With compensation, 0–10 000 ppm %CO <sub>2</sub> , 0–90 %O <sub>2</sub>	±0.6 % of reading (at +25 °C (+77 °F))
Without compensation (typical)	–0.08 % of reading/%O <sub>2</sub>
<b>Start-up, warm-up, and response time</b>	
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
<b>Flow rate dependence (for flow-through option)</b>	
< 1 l/min flow	No effect
1–10 l/min flow	< 0.6 % of reading l/min

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

## Inputs and outputs

Analog outputs	<ul style="list-style-type: none"> <li>0–5/10 V (scalable), min. load 10 kΩ</li> <li>0/4–20 mA (scalable), max. load 500 Ω</li> </ul>
Digital output	Over RS-485: <ul style="list-style-type: none"> <li>Modbus</li> <li>Vaisala Industrial Protocol</li> </ul>
<b>Operating voltage</b>	
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
<b>Power consumption</b>	
Typical (continuous operation)	0.4 W
Maximum	0.5 W

## Operating environment

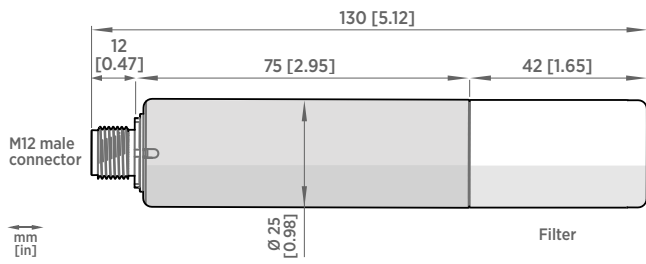
Operating temperature of CO <sub>2</sub> measurement	–40 ... +60 °C (–40 ... +140 °F)
Storage temperature	–40 ... +70 °C (–40 ... +158 °F)
Operating humidity	0–100 %RH, non-condensing
Condensation prevention	Sensor head heating when power on
IP rating, probe body	IP65
Chemical tolerance (temporary exposure during cleaning)	<ul style="list-style-type: none"> <li>H<sub>2</sub>O<sub>2</sub> (2000 ppm, non-condensing)</li> <li>Alcohol-based cleaning agents (for example ethanol and IPA)</li> <li>Acetone</li> <li>Acetic acid</li> </ul>
<b>Pressure</b>	
Compensated	500–1100 hPa
Operating	< 1.5 bar
<b>Gas flow (for flow-through option)</b>	
Operating range	< 10 l/min
Recommended range	0.1–0.8 l/min

## Compliance

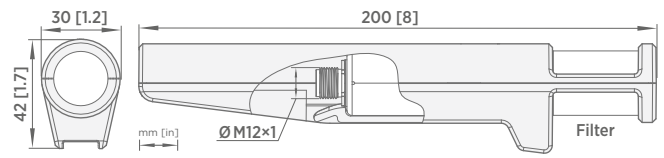
EU directives and regulations	EMC, RoHS
Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, RCM

## Mechanical specifications

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



GMP252 probe dimensions

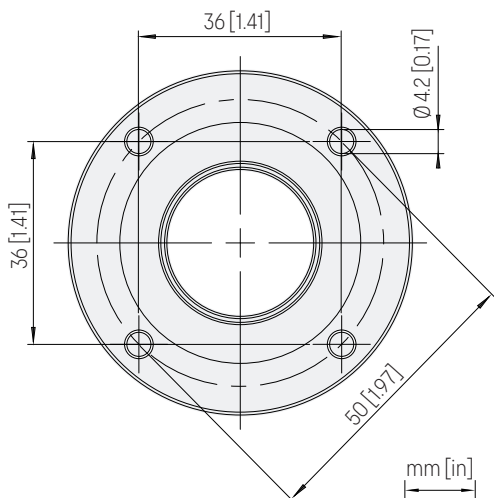


GMP252 probe handle dimensions

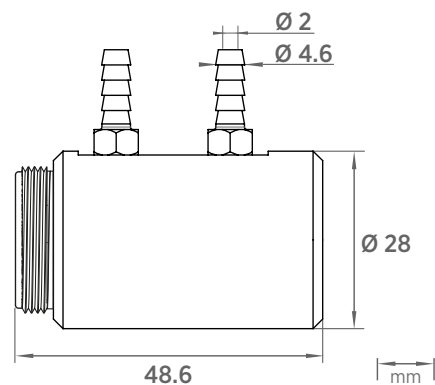
## Spare parts and accessories

Porous sintered PTFE filter for GMP252	DRW244221SP
Probe connection cable with open wires (1.5 m), shielded	223263SP
Probe connection cable with open wires (1.5 m), shielded	254294SP
Probe connection cable with open wires (3 m), shielded	26719SP
Probe connection cable with open wires (10 m), shielded	216546SP
Probe connection cable with open wires and 90° plug (0.6 m), shielded	244669SP
Probe connection cable with open wires and 90° plug (1.5 m), shielded	255102
M170 connection cable, M12 5-pin	CBL210472
Connection cable for Indigo80, M12-5F - M12-5M, 1.5 m	272075SP
Flat cable for GMP250 probes, M12 5-pin	CBL210493SP
Indigo USB adapter <sup>1)</sup>	USB2
Probe mounting clips (2 pcs)	243257SP
Probe mounting flange	243261SP
Probe holder assembly	ASM213582
Probe handle with magnetic hanger	GMP252HANDLESP
Probe handle	ASM214342SP
Flow-through adapter with gas ports	ASM212011SP
Calibration adapter	DRW244827SP
Spray shield	ASM212017SP
Radiation shield DTR250	DTR250
Radiation shield DTR250 with pole mounting kit	DTR250A

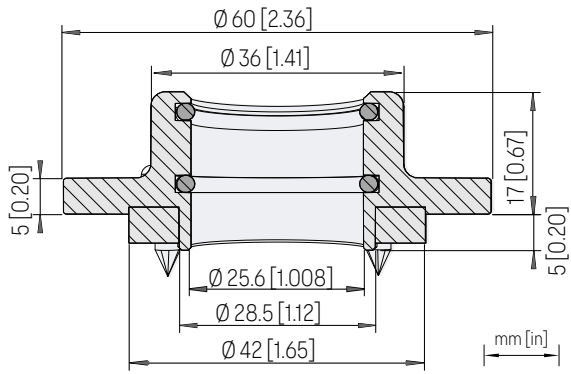
<sup>1)</sup> Vaisala Insight software for Windows is available at [www.vaisala.com/insight](http://www.vaisala.com/insight).



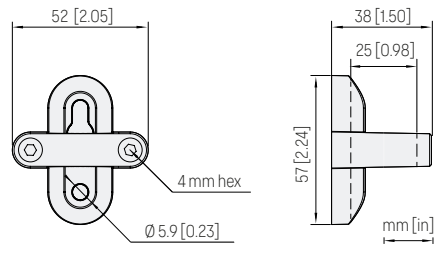
Probe mounting flange 243261SP dimensions



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



Probe mounting flange 243261SP dimensions, cross section



Probe holder ASM213582 dimensions

## GMW90 Series Carbon Dioxide, Temperature and Humidity Transmitters



### Features

- Measured parameters: carbon dioxide, temperature, and humidity (optional)
- Superior long-term stability with the latest-generation Vaisala CARBOCAP® sensor
- Accurate temperature and humidity measurements due to the low-power microglow infrared source
- Quick and easy installation and maintenance
- Calibrated, user-exchangeable measurement modules
- 3-point traceable CO<sub>2</sub> calibration (certification included)
- Both analog and field bus communication (Modbus® RTU)

GMW90 series transmitters are available with either a display opening or a solid front. An optional traffic light indication is also available.

GMW90 Series CARBOCAP® Carbon Dioxide, Temperature and Humidity Transmitters for HVAC are based on new measurement technology for improved reliability and stability. With the new technology the transmitter's inspection interval is extended to five years.

Designed for demand controlled ventilation, GMW90 series transmitters measure carbon dioxide and temperature, with the option for humidity measurements. The instruments come with a calibration certificate that meets traceability and compliance requirements.

### Reliability from unique measurement technology

GMW90 series transmitters use advanced Micro-Electro-Mechanical System (MEMS) technology for measuring carbon dioxide. The CARBOCAP® carbon dioxide sensor's continuous reference measurement enables reliable and accurate readings and outstanding long-term stability also in buildings with round-the-clock occupancy.

The latest-generation CARBOCAP® sensor no longer uses an incandescent light bulb, which limits sensor lifetime. This unique sensor consumes very little power compared to other sensors on the market. As a result, instrument self-heating is low and humidity and temperature can be measured correctly.

### Convenient installation

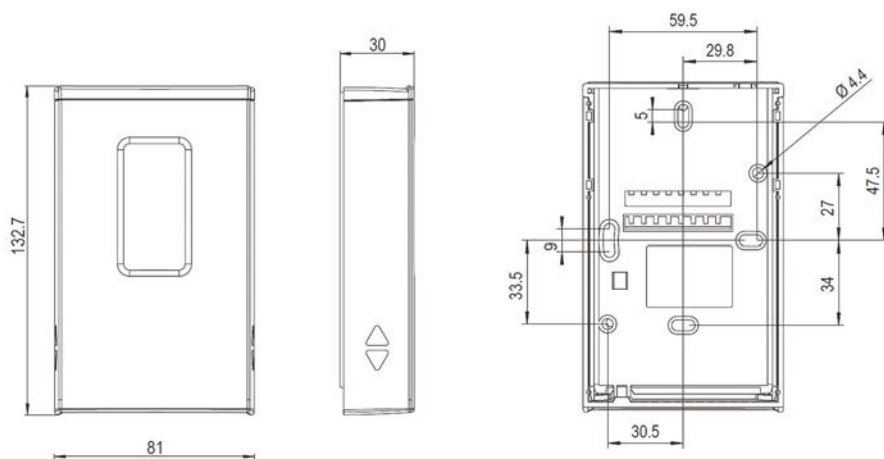
GMW90 series transmitters have been designed for quick and easy installation and maintenance. Every model includes a display for easy startup and convenient maintenance. To protect the sensor from dust and dirt during construction and installation, the units can be cabled with back-plate only. Electronics can be

snapped on later at an appropriate phase in the construction project. DIP switches make it quick and easy to configure the transmitters.

### Easy calibration

Regular instrument maintenance guarantees a long product lifetime. Calibration is easiest done with the exchangeable measurement modules. Sensor traceability and measurement quality is easily maintained by snapping on a new module calibrated at Vaisala factory. The instrument can also be calibrated using a handheld meter or reference gas CO<sub>2</sub> bottle. The service interfaces are easy to reach by simply sliding the cover down. The closed cover keeps the measurement environment stable during calibration and ensures top-quality final result.

# GMW90 dimensions and models



Dimensions (in mm) of GMW90 series transmitter cover (left) and mounting base (right)

## Models

Model	Measurements	Output
GMW93	CO <sub>2</sub> +T	3-wire voltage output
GMW93D	CO <sub>2</sub> +T	3-wire voltage output, with display
GMW94	CO <sub>2</sub> +T	3-wire current output
GMW94D	CO <sub>2</sub> +T	3-wire current output, with display
GMW93R	CO <sub>2</sub> +T+RH	3-wire voltage output
GMW93RD	CO <sub>2</sub> +T+RH	3-wire voltage output, with display
GMW93RA	CO <sub>2</sub> +T+RH	3-wire voltage output, with display and CO <sub>2</sub> indicator LEDs
GMW94R	CO <sub>2</sub> +T+RH	3-wire current output
GMW94RD	CO <sub>2</sub> +T+RH	3-wire current output, with display
GMW95	CO <sub>2</sub> +T	Modbus RTU output
GMW95D	CO <sub>2</sub> +T	Modbus RTU output, with display
GMW95R	CO <sub>2</sub> +T+RH	Modbus RTU output
GMW95RD	CO <sub>2</sub> +T+RH	Modbus RTU output, with display
GMW90	CO <sub>2</sub> +T	Analog or Modbus RTU output (configurable)
GMW90R	CO <sub>2</sub> +T+RH	Analog or Modbus RTU output (configurable)

# Technical data

## Measurement performance

Carbon dioxide	
Measurement range	0 ... 5000 ppm
Stability in typical HVAC applications	Total accuracy at room temperature ±75 ppm at 600 and 1000 ppm incl. 5 years drift
Carbon dioxide sensor	CARBOCAP® GM10
Accuracy:	
+20 ... +30 °C (+68 ... +86 °F)	±(30 ppm + 2 % of reading)
+10 ... +20 °C, +30 ... +40 °C (+50 ... +68 °F, +86 ... +104 °F)	±(35 ppm + 2.7 % of reading)
-5 ... +10 °C, +40 ... +55 °C (+23 ... +50 °F, +104 ... +131 °F)	±(45 ppm + 3.8 % of reading)
Temperature	
Measurement range	-5 ... +55 °C (+23 ... +131 °F)
Temperature sensor	Digital temperature sensor
Accuracy:	
+20 ... +30 °C (+68 ... +86 °F)	±0.5 °C (±0.9 °F)
+10 ... +20 °C, +30 ... +40 °C (+50 ... +68 °F, +86 ... +104 °F)	±0.6 °C (±1.08 °F)
-5 ... +10 °C, +40 ... +55 °C (+23 ... +50 °F, +104 ... +131 °F)	±0.8 °C (± 1.44 °F)
Relative humidity	
Measurement range	0 ... 95 %RH
Stability in typical HVAC applications	±0.5 %RH/year
Humidity sensor	HUMICAP® 180R
Accuracy at temperature range +10 ... +40 °C (+50 ... +104 °F):	
0 ... 60 %RH	±2.5 %RH
60 ... 80 %RH	±3.0 %RH
80 ... 95 %RH	±4.0 %RH
Accuracy at temperature range -5 ... +10 °C, +40 ... +55 °C (+23 ... +50 °F, +104 ... +131 °F):	
0 ... 60 %RH	±3.5 %RH
60 ... 80 %RH	±4.0 %RH
80 ... 95 %RH	±5.0 %RH

1) Complies with CEC-400-2008-001-CMF

## Operating environment

Operating temperature	-5 ... +55 °C (+23 ... +131 °F)
Storage temperature	-30 ... +60 °C (-22 ... +140 °F)
Operating humidity	0 ... 95 %RH Dew point < +30 °C (+86 °F)
IP rating	IP30



Optional decorative cover blends the transmitter into your interior design.

## Inputs and outputs

Supply voltage	18 ... 35 V DC, 24 V AC ± 20% 50/60 Hz
Service port	RS-485 line for temporary service use
Current output models	
Outputs	0/4 ... 20 mA, 2 and 3 channel models
Loop resistance	0 ... 600 Ω
Power consumption	< 2 W
Voltage output models	
Outputs	0 ... 5/10 V, 2 and 3 channel models
Load resistance	10 kΩ min.
Power consumption	< 1 W
Default analog scales	
CO <sub>2</sub>	0 ... 2000 ppm
T	-5 ... +55 °C
RH	0 ... 100 %RH
Field bus models	
Power consumption	< 1.5 W
Output type	RS-485 (galvanic isolation, 1.5 kV)
RS-485 end of line termination	Enable with jumper, 120 Ω
Modbus RTU address range	0 ... 247

## Mechanical specifications

Standard housing color	White (RAL9003)
Housing material	ABS/PC, UL-V0 approved
Output connector	Screw terminals Max. wire size 2 mm <sup>2</sup> (AWG14)
Service port connector	4-pin M8
Weight	163 g (5.75 oz)

1) RAL code is only indicative with potential small variations in color shade

## Spare parts and accessories

CO <sub>2</sub> module	GM10SP
Temperature module (CO <sub>2</sub> +T models)	TM10SP
Humidity and temperature module (CO <sub>2</sub> +T+RH models)	HTM10SP
Decorative cover set (10 pcs)	236285
Connection cable for MI70	219980
USB cable for PC connection	219690
Universal AC power supply	245866

## Compliance

EU directives and regulations	EMC, RoHS
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
EMC emissions	CISPR 22 / EN 55022, Class B
Compliance marks	CE, RCM

## GMW80 Series Carbon Dioxide, Humidity, and Temperature Transmitters for DCV



### Features

- Superior stability with the advanced proprietary CARBOCAP® technology
- Improved accuracy due to low self-heating of microglow light source
- Modbus® RTU support over RS-485 with model GMW87

Vaisala CARBOCAP® Carbon Dioxide, Humidity, and Temperature Transmitter Series GMW80 is based on Vaisala's patented latest-generation CARBOCAP technology with improved reliability and stability.

The GMW80 series transmitters are designed to fulfill the needs for CO<sub>2</sub> measurements in standard demand-controlled ventilation applications. Temperature measurement is included in most GMW80 series transmitters. Combined with humidity measurement, relay, and LED CO<sub>2</sub> level indication, GMW80 series provides you the flexibility needed for a variety of projects.

The CARBOCAP sensors measure CO<sub>2</sub> accurately immediately when powered on. As they have a built-in reference measurement they do not need a lengthy learning phase before the measured values are correct. Proper operation can be verified immediately after snapping on the device cover.

### Easy installation

With modern buildings often having hundreds of sensors, installation time per unit can be a significant cost factor. Returning to the building site to check sensor operation adds further costs. The GMW80 series transmitters include a number of subtle design features that have been introduced to make installation and commissioning quick and easy.

The pull-out tab makes opening the transmitter faster than before, while also doubling as a quality check slip and holder for the anti-tamper screw. The backplate can be twisted onto pre-mounted screws, and the wiring can be done easily on the clearly marked backplate. The electronics can be snapped on later when the building automation system is commissioned.

For measurements in more demanding conditions (for example, dusty or humid installation locations), the GMW87 and GMW88 models provide an IP64-rated enclosure with a cable gland.

### Reliable operation

The GMW80 series transmitters are optimized for low maintenance. The unique, low-power CARBOCAP technology enables a longer lifetime and better stability than ever before. As the power consumption is low, the heat generated by the electronics does not distort the temperature inside the sensor. The internal reference in the CO<sub>2</sub> sensor guarantees superior stability and flawless operation even in constantly occupied buildings, without the need for frequent readjustments.

The reliable operation and accurate measurement values of the GMW80 series transmitters contribute to the significant cost savings brought by demand-controlled ventilation.

### Benefits

- Cost-efficient, affordable
- Reliable and maintenance-free operation for up to 15 years
- Easy to install, easy to use
- Versatile – works well in buildings occupied 24/7
- Ideal for demand-controlled ventilation



# Technical data

## Models

Model	Meas. parameters	Output	CO <sub>2</sub> range (ppm)
GMW86P	CO <sub>2</sub> +T	Current and voltage output, Pt1000	0 ... 2000
GMW83RP <sup>1)</sup>	CO <sub>2</sub> +RH+T	Voltage outputs, Pt1000	0 ... 2000
GMW83DRP <sup>1)</sup>	CO <sub>2</sub> +RH+T	Voltage outputs, Pt1000, display with metric scale output	0 ... 2000
GMW83	CO <sub>2</sub> +T	Voltage outputs	0 ... 2000
GMW83A	CO <sub>2</sub> +T	Voltage outputs, CO <sub>2</sub> indicator LEDs	0 ... 2000
GMW83D	CO <sub>2</sub> +T	Voltage outputs, display with metric scale output	0 ... 2000
GMW84	CO <sub>2</sub> +T	Current output	0 ... 2000
GMW84S	CO <sub>2</sub> +T	Current output, relay	0 ... 2000
GMW87	CO <sub>2</sub>	RS-485 Modbus RTU output	0 ... 5000
GMW88	CO <sub>2</sub>	Current and voltage output	0 ... 2000 / 0 ... 5000 <sup>2)</sup>

<sup>1)</sup> Models with calibration certificate available (GMW83RPC/GMW83DRPC).

<sup>2)</sup> Range user-selectable with dip switch. Default range 0 ... 5000 ppm.

## Measurement performance

Carbon dioxide	
Measurement range	0 ... 2000/5000 ppm (see table <i>Models</i> )
Accuracy <sup>1)</sup> :	
at +20 ... +30 °C (+68 ... +86 °F)	±(30 ppm +3 % of reading)
at +10 ... +20 °C (+50 ... +68 °F) and +30 ... +40 °C (+86 ... +104 °F)	±(35 ppm +3.7 % of reading)
at +0 ... +10 °C (+32 ... +50 °F) and +40 ... +50 °C (+104 ... +122 °F)	±(40 ppm +4.8 % of reading)
Stability in typical HVAC applications	±(15 ppm + 2 % of reading) over 5 years
Warm-up time	1 min 10 min for full specification
Response time (63 %)	60 s 7 min (GMW87 and GMW88)
Carbon dioxide sensor	CARBOCAP® GM10
Temperature	
Measurement range	0 ... +50 °C (+32 ... +122 °F)
Temperature sensor	On P models: Pt1000 RTD Class F0.15 IEC 60751 For analog outputs: Digital temperature sensor
Accuracy (GMW83 and GMW84):	
at +10 ... +30 °C (+50 ... +86 °F)	±0.5 °C (0.9 °F)
at +0 ... +10 °C (+32 ... +50 °F) and +30 ... 50 °C (+86 ... +122 °F)	±1 °C (1.8 °F)
Humidity	
Measurement range	0 ... 95 %RH
Accuracy at temperature range +10 ... +30 °C (+50 ... +86 °F):	
0 ... 80 %RH	±3 %RH
80 ... 95 %RH	±5 %RH
Accuracy at temperature ranges 0 ... +10 °C (+32 ... +50 °F) and +30 ... +50 °C (+86 ... +122 °F):	
0 ... 95 %RH	±7 %RH
Stability in typical HVAC applications	±2 %RH over 2 years
Product lifetime	> 15 years

<sup>1)</sup> Accuracy applicable to 2000 ppm measurements at 1013 hPa pressure. Pressure or temperature dependencies not included in the values.

## Compliance

EU directives and regulations	EMC, RoHS
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, RCM

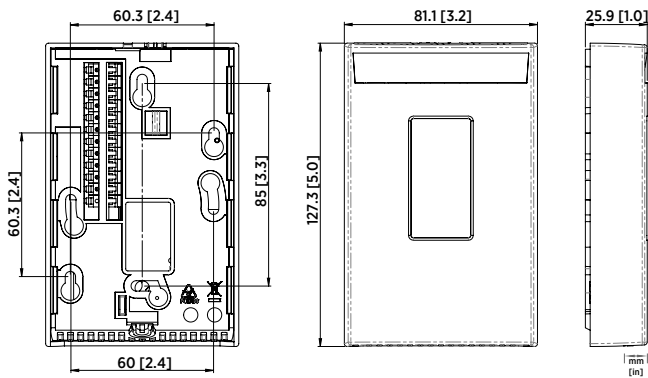
## Operating environment

Operating temperature	0 ... +50 °C (+32 ... +122 °F)
Operating humidity	0 ... 95 %RH Dew point < 30 °C (+86 °F)
Storage temperature	Models without display: -40 ... +70 °C (-40 ... +158 °F) Models with display: -30 ... +70 °C (-22 ... +158 °F)

## Inputs and outputs

Supply voltage	18 ... 35 V DC 24 V AC $\pm 20\%$ 50/60 Hz
Max. current consumption at 18 V DC	45 mA 70 mA (GMW84 models)
Max. power consumption at 30 V AC	0.7 W (GMW83 models) 1 W (GMW86 models, GMW87, and GMW88) 1.2 W (GMW84 models)
RS-485 interface (in GMW87 only)	Isolated, supports Modbus RTU protocol <ul style="list-style-type: none"> <li>• Modbus RTU address range: <ul style="list-style-type: none"> <li>• 1 ... 247 (up to 255 possible, non-standard)</li> </ul> </li> <li>• Bit rates: <ul style="list-style-type: none"> <li>• 4800, 9600, 19200, 38400, 57600, 76800, 115200</li> </ul> </li> <li>• Parity: <ul style="list-style-type: none"> <li>• None or Even</li> </ul> </li> <li>• Supports automatically both 1 and 2 stop bits</li> </ul>
Outputs	4 ... 20 mA and/or 0 ... 10 V <sup>1)</sup>
Current loop resistance (4 ... 20 mA)	0 ... 600 $\Omega$
Voltage output load resistance	Min. 10 k $\Omega$
CO <sub>2</sub> output scale	0 ... 2000/5000 ppm
Temperature output scale	0 ... +50 °C (+32 ... +122 °F)
Humidity output scale	0 ... 100 %RH
Passive temperature sensor (P models)	Pt1000 RTD
Temperature setpoint (T models)	10 k $\Omega$ potentiometer
Relay (S models)	1 pc, SPST-NO Max. 50 V DC / 50 V AC, 500 mA
CO <sub>2</sub> indicator LED levels (A model)	Flashing red: > 2000 ppm Red: 1200 ... 2000 ppm Yellow: 800 ... 1200 ppm Green: < 800 ppm

<sup>1)</sup> Analog outputs are not available in model GMW87.



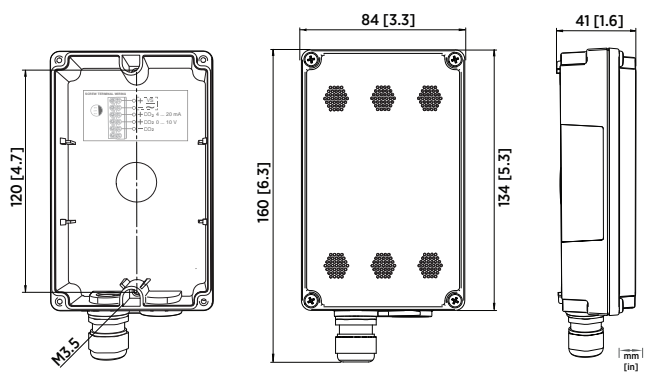
GMW83, GMW83A, GMW83RP, GMW84, GMW84S, GMW86P, GMW83D, and GMW83DRP dimensions (display in models with the letter D)

## Mechanical specifications

IP rating	IP30 IP64 (GMW87 and GMW88)
Housing material	ABS/PC UL-V0 approved PC (GMW87 and GMW88)
Housing color	White (RAL9003)
Output connector	Screw terminal
Max. wire size	2 mm <sup>2</sup> (AWG14)
Weight	Plain and LED version: 114 g (4.02 oz) Display version: 124 g (4.37 oz) GMW87 and GMW88: 160 g (5.64 oz)

## Spare parts and accessories

CO <sub>2</sub> module	GM10SP80
INTERCAP® humidity sensor	15778HM
Universal AC power supply	245866



GMW87 and GMW88 dimensions

## GMD110 Duct Carbon Dioxide Transmitter

For demanding ventilation applications



### Features

- Designed for highly reliable CO<sub>2</sub> measurement in air ducts
- Vaisala CARBOCAP® sensor
- ± 40 ppm CO<sub>2</sub> accuracy
- Excellent long-term stability
- Analog and Modbus RTU output options
- IP65-rated housing
- Traceable calibration (certificate included)

GMD110 is a high-accuracy duct transmitter for measuring carbon dioxide in air-handling systems and ventilation ducts. The transmitter is equipped with the renowned CARBOCAP® sensor that has unique accuracy and measurement stability, which supports precise and reliable controls of HVAC systems even in demanding conditions and sites.

The transmitter belongs to Vaisala HMDW110 Transmitter Series, which include transmitters for duct mounting, IP65-rated wall transmitters, immersion temperature transmitters and outdoor transmitters with integrated radiation shields.

### Highly accurate, highly reliable

The duct-mounted transmitter GMD110 is designed to measure carbon dioxide in demanding HVAC applications. With the outstanding accuracy of measurement, it is an ideal choice for demand-controlled ventilation systems even in challenging conditions.

CO<sub>2</sub> concentration is measured inside the duct without risks for leaks or wrong flow direction affecting the measurement. The temperature and flow dependencies of the sensor are negligible, and the measurement accuracy is not affected by dust, water vapor, or chemicals.

### Stable measurement

The high quality and excellent stability of the measurement enables precise and reliable controls of HVAC systems, even in demanding conditions or sites. The transmitter is equipped with the renowned CARBOCAP® sensor that has

unique capabilities in terms of precision and stability of the measurement. Its structure and reference measurement capabilities make this single-beam, dual-wavelength NDIR sensor extremely stable and reliable.

### Traceable accuracy

All GMD110 transmitters are individually adjusted and delivered with a traceable (ISO9001) calibration certificate. If required later on, the transmitter can also be field-calibrated using a Vaisala handheld meter or Vaisala Insight PC software.

# Technical data

## Measurement performance

Measurement range	0 ... 10 000 ppm CO <sub>2</sub> Orderable with analog output scaled to 0 ... 2000 ppm, 0 ... 5000 ppm, or 0 ... 10 000 ppm
<b>Accuracy</b> <sup>1)</sup>	
0 ... 3000 ppm CO <sub>2</sub>	±40 ppm CO <sub>2</sub>
3000 ... 10 000 ppm CO <sub>2</sub>	±2 % of reading
<b>Calibration uncertainty</b>	
at 2000 ppm CO <sub>2</sub>	±31 ppm CO <sub>2</sub> (typical)
at 10 000 ppm CO <sub>2</sub>	±105 ppm CO <sub>2</sub> (typical)
<b>Long-term stability</b>	
0 ... 3000 ppm CO <sub>2</sub>	±60 ppm CO <sub>2</sub> /year
3000 ... 6000 ppm CO <sub>2</sub>	±150 ppm CO <sub>2</sub> /year
6000 ... 10 000 ppm CO <sub>2</sub>	±300 ppm CO <sub>2</sub> /year
<b>Temperature dependence 0 ... 10 000 ppm CO<sub>2</sub></b>	
-10 ... +50 °C	±0.05 % of reading/°C
-40 ... +60 °C	< ±0.1 % of reading/°C
<b>Pressure dependence</b>	
Typical	+0.15 % of reading/hPa
<b>Start-up, warm-up, and response time</b>	
Start-up time at +25 °C	< 12 s
Warm-up time for full specification	< 2 min
Response time (T <sub>90</sub> )	< 1 min

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

## Operating environment

Operating temperature	-20 ... +60 °C (-4 ... +140 °F)
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
Humidity	0 ... 95 %RH, non-condensing
Condensation prevention	Sensor head heating when power on
IP rating	IP65

## Mechanical specifications

Probe diameter	25 mm (0.98 in)
Probe length	126 mm (4.96 in)
Weight	215 g (0.47 lb)
Screw terminal wire size	0.5 ... 2.5 mm <sup>2</sup> (AWG 24 ... 14)
Housing color	White (RAL9003)
Mounting methods	Screws or optional mounting flange 243261SP
<b>Materials</b>	
Probe	PBT polymer
Probe filter	PTFE
Housing	PC + 10 %GF (UL-V0 approved)

## Inputs and outputs

Output parameter	Carbon dioxide (ppm)
Output modes	0/4 ... 20 mA, scalable, max. load 500 Ω 0 ... 5/10 V, scalable, min. load 10 kΩ RS-485 with Modbus RTU
Power consumption	0.5 W typical, 1.1 W max.
<b>Supply voltage</b>	
With current output	20 ... 30 V DC
With voltage output or RS-485	12 ... 30 V DC
<b>Digital communication</b>	
Interface	RS-485, non-isolated, no line termination
Default serial settings	19200 bps N 8 2
Protocol	Modbus RTU
Modbus device address	240
<b>Service port</b>	
Connector	M8 4-pin male
Compatibility	<ul style="list-style-type: none"> <li>Indigo80 handheld indicator<sup>1)</sup></li> <li>MI70 handheld indicator<sup>2)</sup></li> <li>Vaisala Insight PC software<sup>3)</sup></li> </ul>

<sup>1)</sup> Requires M12-M8 cable 262195SP.

<sup>2)</sup> Requires connection cable 219980SP.

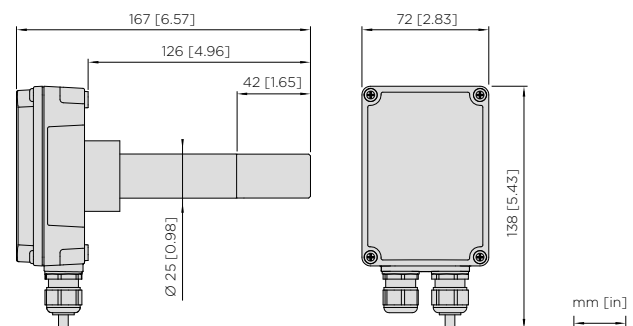
<sup>3)</sup> Requires USB adapter USB2 with M12-M8 cable 262195SP. Vaisala Insight software for Windows is available at [www.vaisala.com/insight](http://www.vaisala.com/insight).

## Compliance

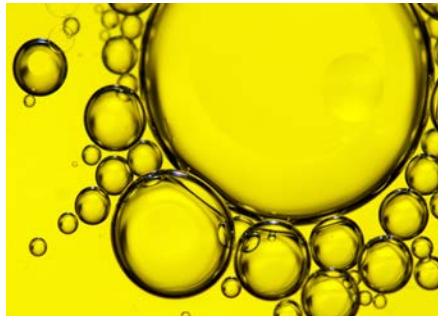
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment
Compliance marks	CE, RCM

## Accessories and spare parts

Probe mounting flange	243261SP
Conduit fitting + O-ring (M16 × 1.5 / NPT1/2")	210675SP
Conduit fitting + O-ring (M16 × 1.5 / PG9, RE-MS)	210674SP
USB adapter for Insight and M12 - M8 cable	USB2 and 262195SP
Connection cable for GM70 (MI70) handheld meter	219980SP
Calibration adapter	DRW244827SP
Porous sintered PTFE filter	DRW244221SP



GMD110 dimensions



### 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

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.

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.

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.
- Our sensor technology tells the true margin to water saturation point in all changing conditions, taking into account, for example, temperature changes and aging of oil.
- Highly stable pressure and temperature tolerances.
- Easy to install through ball valve – no need to shut down the process.
- Enables predictive maintenance work and quick identification of damaging trends.

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.

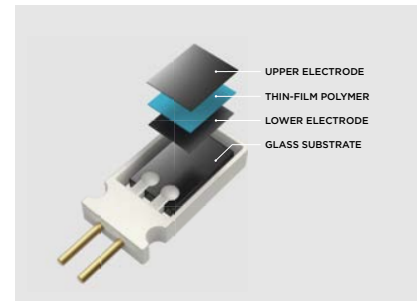
Oil molecules or additives do not penetrate the electrode. Thus the sensor output is independent of the oil type.

### Online measurement

Online 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 online 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  $\pm 0.01 a_w$  ( $\pm 1 \text{ } \% \text{RS}$ )
- Incorporates the proven Vaisala HUMICAP<sup>®</sup> sensor
- Modbus<sup>®</sup> RTU over RS-485
- Two lengths available for the probe head: 262 mm and 448 mm
- Traceable calibration certificate
- Compatible with Vaisala Indigo products and Insight PC software

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

### Reliable Vaisala HUMICAP<sup>®</sup> technology

MMP8 incorporates the latest-generation Vaisala HUMICAP<sup>®</sup> 180L2 sensor, which is the result of over 20 years of field experience.

The 180L2 sensor's excellent chemical tolerance provides accurate and reliable measurement over a wide measurement range. The 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 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 an optional ball valve kit, MMP8 is ideal for installation into processes where the probe needs to be installed or removed while the process is running. MMP8 is available in two different lengths, and the installation depth of the probe 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.

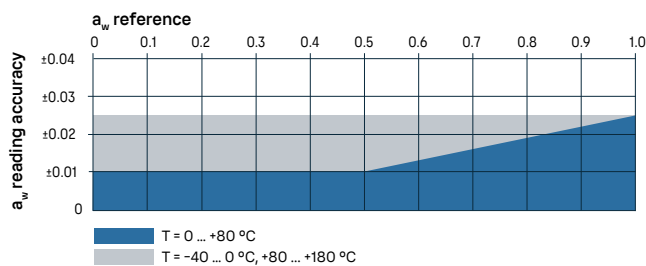
For more information on Indigo family products and Insight PC software that can be used with the probe, see [www.vaisala.com/insight](http://www.vaisala.com/insight) and [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

Water activity	
Measurement range	0–1 $a_w$
$T_{90}$ response time <sup>1)</sup>	10 min
Sensor	HUMICAP® 180L2
Accuracy <sup>2)</sup>	±0.01 $a_w$ (±1 %RS)
Water concentration in oil	
Typical accuracy	10 % of the reading
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 psi), absolute
Installation pressure	Up to 10 bar (145 psi), absolute
IP rating of probe body	IP66
Ball valve	
Operating temperature	Up to +100 °C (+212 °F)
Operating pressure	Up to 40 bar (580 psi), absolute

## 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 concentration in oil (ppm <sub>w</sub> )

## Mechanical specifications

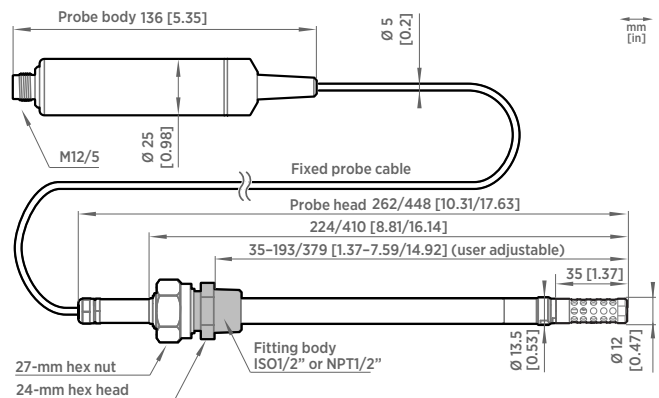
Connector	M12 5-pin A-coded male
Weight (with a 2-m cable)	262-mm-long MMP8: 510 g (18.0 oz) 448-mm-long MMP8: 610 g (21.5 oz)
Filter options	Stainless steel grid standard filter Stainless steel grid filter for high flow rates (> 1 m/s)
Probe cable length	2 m (6.56 ft)
Adjustable installation depth	262-mm-long MMP8: 35–193 mm (1.37–7.59 in) 448-mm-long MMP8: 35–379 mm (1.37–14.92 in)
Materials	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP

## Compliance

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



- 1) DNV GL certificate applies to the 262-mm-long MMP8 model only, not to the 448-mm-long model.



## MMP8 dimensions

## Accessories

Ball valve kit ISO 1/2" with welding joint	BALLVALVE-1
Ball valve kit ISO 1/2" – ISO 3/4" with thread joint	BALLVALVE-2
Indigo USB adapter <sup>1)</sup>	USB2
Calibration adapter for HMK15	211302SP
Weatherproof carrying case for Indigo80 and a series 8 probe <sup>2)</sup>	ASM215318

- 1) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).  
 2) For example, MMP8, HMP8, or DMP8 with a max. 2-m (6.6-ft) probe connection cable.





### Features

- Continuous measurement of moisture in oil
- Proven Vaisala HUMICAP® sensor, over 15 years in oil applications
- Measurements in lubrication, hydraulic and transformer oils
- Excellent pressure and temperature tolerance
- Measuring water activity - ppm calculation for transformer oil
- Small size, easy to integrate
- Traceable calibration for measurement and analog outputs (certificates included)
- Applications: e.g. monitoring of transformer oil and of lubrication systems in marine and paper industry

Vaisala HUMICAP® Moisture and Temperature Transmitter Series for Oil MMT310 is a fast and reliable online detector for moisture in oil.

### Reliable Vaisala HUMICAP® Technology

The MMT310 series incorporates the latest generation of the Vaisala HUMICAP® sensor, developed for demanding moisture measurement in liquid hydrocarbons. The sensor's excellent chemical tolerance provides accurate and reliable measurement over the wide measurement range.

### Measuring Water Activity

MMT310 measures moisture in oil in terms of the water activity ( $a_w$ ) and temperature (T). Water activity indicates directly whether there is a risk of free-water formation. The measurement is independent of oil type, age, and temperature.

### Water Content as PPM Calculation for Transformer Oils

PPM units are traditionally used in transformer applications. They indicate the average mass concentration of water in oil. The ppm calculation for mineral oil based transformer oil is optional in the MMT310 series.

### Diverse Applications and Demanding Conditions

MMT310 can be used in lubrication and hydraulic systems as well as in transformers. It can be used for on-line moisture monitoring and as a control function, allowing separators and oil purifiers to be started only when necessary.

### Installation Options

MMT310 has two adjustable probe lengths. The transmitter can be ordered with a ball-valve set that enables the insertion and removal of the moisture probe for calibration, without the need to empty the oil system.

MMT317 has a small pressure-tight probe with optional Swagelok fittings.

An optional rain shield is available for outdoor installations.

### Several Outputs, One Connector

MMT310 transmitters have two analog outputs and an RS-232 serial output. The output signals and the supply power travel in the same cable, the only cable connected to the unit.

# Technical Data

## Measurement Performance

Water Activity	
Measurement range $a_w$ (%RS)	0 ... 1 (0 ... 100 %)
Accuracy (Including Non-Linearity, Hysteresis, and Repeatability):	
0 ... 0.9 (0 ... 90 %)	±0.02
0.9 ... 1.0	±0.03
Response time (90 %) at +20 °C in still oil (with stainless steel filter)	10 min
Sensor	Vaisala HUMICAP® 180L2
Temperature	
Measurement range	-40 ... +180 °C (-40 ... +356 °F)
Typical accuracy at +20 °C (68 °F)	±0.2 °C (±0.36 °F)
Sensor	Pt100 RTD Class F0.1 IEC 60751

## Mechanical Specifications

IP rating	IP66
Weight example: MMT317 with 2 m cable	476 g
(Weight depends on selected probe and cable)	
Cable feed through alternatives	8-pole connector with 5 m cable Female 8-pin connector screw joint for cable diameter 4 ... 8 mm
Sensor protection	Stainless steel grid standard filter Stainless steel grid filter for high flow rates (> 1 m/s)
Materials	
Transmitter housing	G-AlSi 10 Mg
Transmitter base	PPS
Probe Cable Length	
MMT317	2 m, 5 m, or 10 m
MMT318	2 m, 5 m, or 10 m
Probe installation MMT317	
Swagelok®	NPT 1/2", ISO 3/8" or ISO 1/2"
Probe installation MMT318	
Fitting bodies	ISO 1/2", NPT 1/2"

## Spare Parts and Accessories

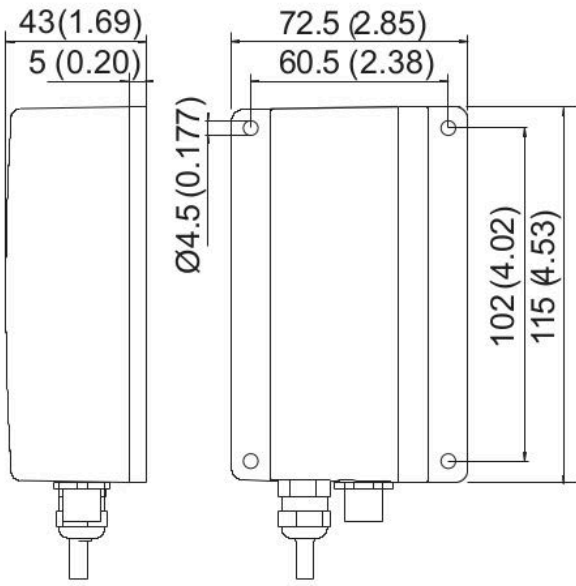
Rain shield	ASM211103
USB cable	238607
Stainless steel filter	HM47453SP
Stainless steel filter (high flow rate)	220752SP
Ball-Valve Set	BALLVALVE-1

## Operating Environment

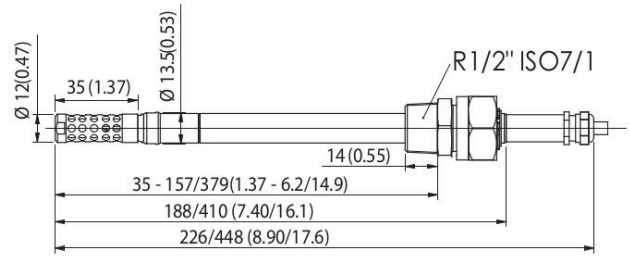
Operating temperature for electronics	-40 ... +60 °C (-40 ... +140 °F)
Storage temperature	-55 ... +80 °C (-67 ... +176 °F)
Pressure range for MMT318 with ball-valve up to 120 °C	0 ... 40 bar
Pressure range for MMT317	0 ... 10 bar
EMC compliance	EN61326-1, Industrial environment

## Inputs and Outputs

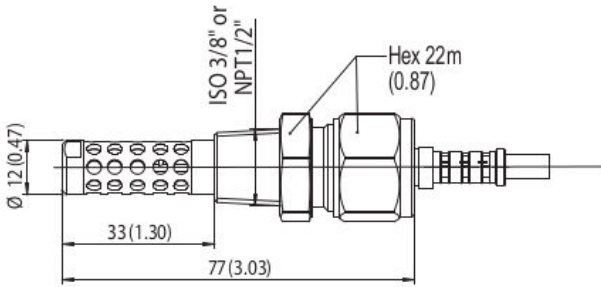
Two analog outputs, selectable and scalable	0 ... 20 mA or 4 ... 20 mA 0 ... 5 V or 0 ... 10 V 1 ... 5 V available through scaling
Typical accuracy of analog output at +20 °C	±0.05 % full scale
Typical temperature dependence of analog output	0.005 %/°C (0.003 %/°F) full scale
Serial output	RS-232C
Connections	8-pole connector with RS232C, current/ voltage outputs (two channels) and $U_{in}$
Operating voltage	10 ... 35 VDC
External load	$R_L < 500 \Omega$
Startup time after power-up	3 s
Minimum Operating Voltage	
RS232C output	10 VDC
Analog output	15 VDC
Pressures above 10 bara (145 psia)	24 VDC
Power Consumption	
RS232C	12 mA
$U_{out}$ 10 V (10 k $\Omega$ )	12 mA
Channel 1 & channel 2	
$I_{out}$ 20 mA (load 511 $\Omega$ )	50 mA
Channel 1 & channel 2	



Transmitter body, dimensions in mm (inches)



MMT318 probe, dimensions in mm (inches)



MMT317 probe, dimensions in mm (inches)

## MMT162 Moisture and Temperature Transmitter for Oil

For OEM applications



### Features

- Continuous measurement of moisture in oil
- Measures in lubrication, hydraulic, and transformer oils
- Excellent pressure and temperature tolerance
- Proven Vaisala HUMICAP® sensor: over 20 years in oil applications
- Measures water activity - ppm calculation available for transformer oil
- Digital output RS-485 with Modbus
- Traceable calibration (certificate included)

Vaisala HUMICAP® Moisture and Temperature Transmitter for Oil MMT162 is an excellent economical solution for reliable on-line detection of moisture in oil.

### Benefits

- Reliable
- Durable
- Small size, easy to integrate

### Reliable Vaisala HUMICAP® technology

MMT162 incorporates the latest generation of the Vaisala HUMICAP® sensor. The sensor is developed for demanding moisture measurement in liquid hydrocarbons and has been successfully used in oil applications for over two decades. The sensor's excellent chemical tolerance provides accurate and reliable measurement over the measurement range.

### Water activity measurement

MMT162 measures moisture in oil in terms of the water activity ( $a_w$ ) and temperature (T). Water activity indicates directly whether there is a risk of free water formation. The measurement is independent of oil type, age, and temperature. The ppm calculation for mineral oil based transformer oil is optional in MMT162.

### Several outputs - one connector

MMT162 has two analog outputs that can be scaled and the measurement ranges changed. Additionally, the transmitter has an RS-485 serial output. The signals and the unit power travel in the same cable.

An optional LED cable enables a visual alarm.

### Compact, rugged, and intelligent

Due to its compact size, MMT162 is quickly and easily installed in tight spaces. Units are delivered fully assembled - however, you can reconfigure them to suit your needs.

### MM70 moisture and temperature meter

In combination with an MM70 Handheld Moisture and Temperature Meter, the MMT162 provides an ideal tool for on-site calibration. MM70 Handheld Measurement Indicator (included in the MM70 package) can be used as a communication and datalogging device and display for the MMT162.

# Technical data

## Measurement performance

### Water activity

Measurement range 0–1  $a_w$

Accuracy (including non-linearity, hysteresis, and repeatability):

0–0.9  $a_w$   $\pm$  0.02  $a_w$

0.9–1.0  $a_w$   $\pm$  0.03  $a_w$

Response time in oil flow (typical) < 1 min (dry-wet)

### Temperature

Accuracy at +20 °C (+68 °F)  $\pm$  0.2 °C (0.36 °F)

### Moisture

Calculated moisture content in ppm for mineral transformer oil

## Operating environment

Operating temperature –40 ... +60 °C (–40 ... +140 °F)

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

Oil temperature –40 ... +80 °C (–40 ... +176 °F)

Oil flow Some flow recommended

Pressure range Up to 200 bar

## Inputs and outputs

Alarm level indication by analog signal User selectable

Digital outputs RS-485, non-isolated, Vaisala protocol, Modbus RTU protocol

Analog current output 0–20 mA, 4–20 mA

Analog voltage output 0–5 V, 0–10 V

## Compliance

EU directives and regulations EMC Directive (2014/30/EU)  
RoHS Directive (2011/65/EU) as amended by 2015/863

Electromagnetic compatibility (EMC) IEC/EN 61326-1, industrial environment  
1)

Compliance marks CE, China RoHS, RCM, UKCA

1) Temperature output may deviate in industrial environments of 80–700 MHz.

## Mechanical specifications

Sensor HUMICAP®

Cable connections (2 ports) M8 4-pin male

Mechanical connections G 1/2" ISO or NPT 1/2"  
with bonded seal ring (washer)

Weight 200 g (7 oz)

### Minimum operating voltage with

RS-485 output 14–28 V DC

Voltage output 16–28 V DC

Current output 22–28 V DC

### Supply current

Normal measurement 20 mA + load current

### External load for

Voltage output Min. 10 k $\Omega$

Current output Max. 500  $\Omega$

### Housing

Probe body material Stainless steel (AISI 316L)

IP rating IP66

## Spare parts and accessories

Stainless steel filter (standard) 225356SP

Stainless steel filter for high flow (> 1 m/s) 221494SP

Connection cable for MM70 handheld meter 219980

USB serial interface cable 219690

Sealing ring set (U-seal) ISO G1/2, 3 pcs 221525SP

Sealing ring set (copper) ISO G1/2, 3 pcs 221524SP

ISO 1/2" plug 218773

NPT 1/2" plug 222507

Sampling cell DMT242SC

Sampling cell with Swagelok connectors DMT242SC2

### Connection cables

0.32 m (1 ft) shielded, M8 threaded HMP50Z032

3.0 m (9.8 ft), shielded, M8 threaded HMP50Z300SP

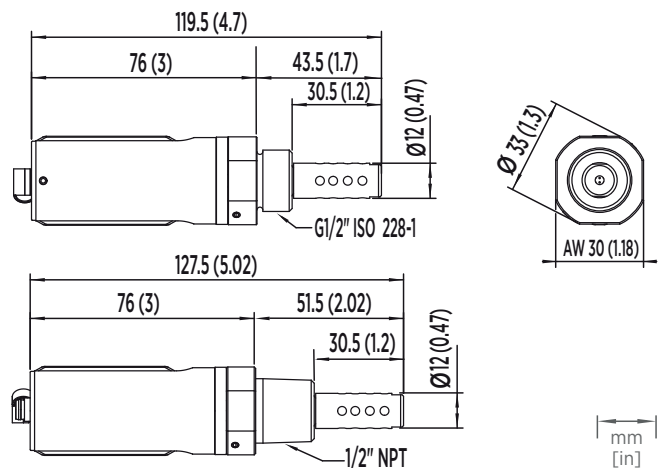
5.0 m (16.4 ft), shielded, M8 threaded HMP50Z500SP

10 m (32.8 ft), shielded, M8 threaded HMP50Z1000SP

3 m, shielded, connector 90° angle 231520SP

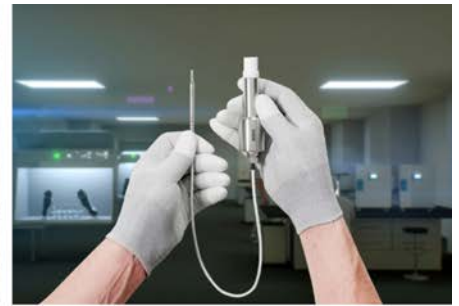
5 m, shielded, connector 90° angle 231521SP

M8 threaded, Ch1 signal + Ch2 LED MP300LEDCBL



MMT162 dimensions

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



### PEROXCAP's unique benefits

- **Chemical purge:** The probe heats up at intervals to maintain measurement performance and lengthen the sensors' lifespan. Rapid heating of the sensor also removes impurities.
- **Sensor vitality:** Sensor performance can be evaluated using the "Sensor Vitality" value, accessible through [Vaisala Insight software](#) and displayed as a percentage.

The unique PEROXCAP technology enables accurate measurement of multiple parameters in vaporized hydrogen peroxide bio-decontamination. Probes use two capacitive thin-film polymer [HUMICAP® sensors](#) to provide high accuracy, excellent long-term stability, and negligible hysteresis in demanding high-concentration  $vH_2O_2$  applications in atmospheric pressure.

The HUMICAP sensor, used in PEROXCAP technology, is a capacitive thin-film polymer sensor consisting of a substrate on which a thin polymer film is deposited 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, as does the capacitance of the sensor. The probe's electronics measure the capacitance of the sensor and convert it to a humidity reading.

PEROXCAP uses two HUMICAP sensors, one with and one without a catalytic layer. The thin-film polymer absorbs water and  $H_2O_2$  vapor. The amount is proportional to the ambient relative humidity (sensor with catalytic layer) or relative saturation (sensor without catalytic layer) depending on the sensor. Learn more about [HPP270 series probes](#).

### Intelligent PEROXCAP measurement technology

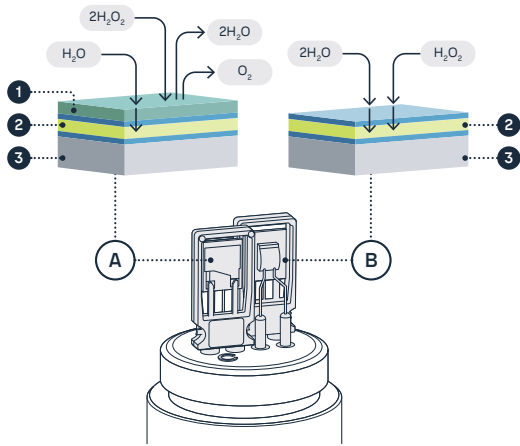
One unique feature of PEROXCAP is that it provides the critical **relative saturation** value. Water ( $H_2O$ ) and hydrogen peroxide ( $H_2O_2$ ) have similar molecular structures, however, while relative humidity (RH) indicates the level of water vapor in the air at a given temperature, relative saturation is the level of water *and* hydrogen peroxide vapor. Air that contains hydrogen peroxide vapor will condense before 100 % relative humidity, which is why relative saturation allows you to predict condensation.

### Multiple measurements for comprehensive bio-decontamination monitoring

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

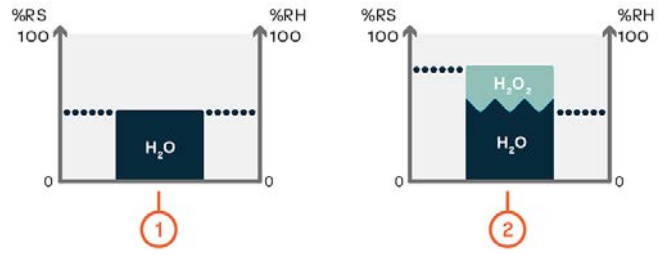
- HPP271 probes measure  $H_2O_2$  vapor concentration (ppm) and temperature dew point.
- HPP272 probes measure  $H_2O_2$  vapor concentration (ppm), temperature, dew point, vapor pressure, and humidity as both relative saturation and relative humidity.

### 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 layer over the thin-film polymer decomposes hydrogen peroxide into water and oxygen and prevents it from entering the sensing polymer.
- 2** Thin-film polymer between two electrodes.
- 3** Alumina substrate.

### PEROXCAP'S critical difference: relative saturation



- 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.

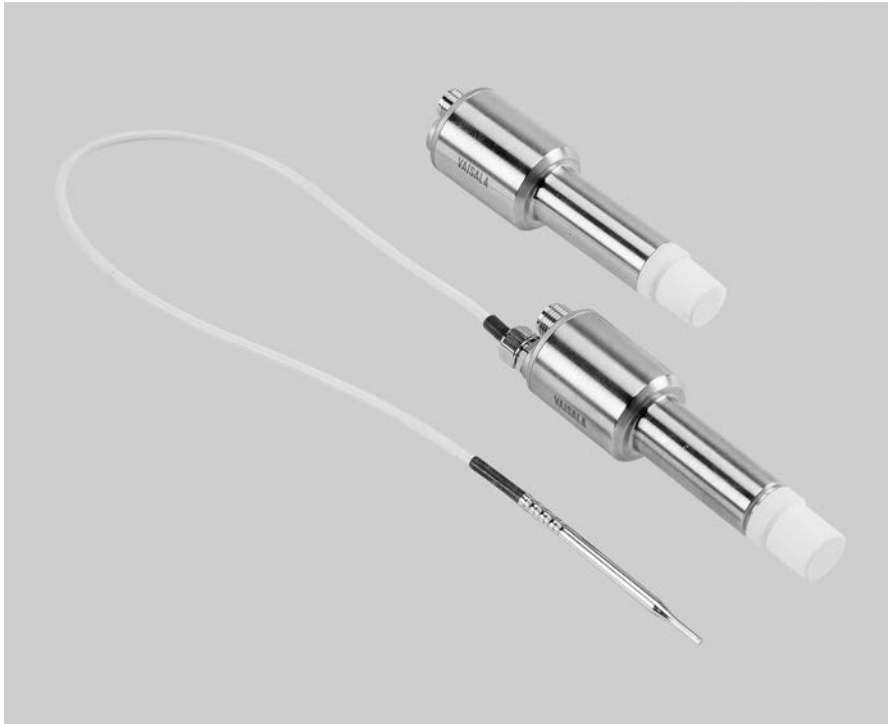
For example, at 20 °C with an  $H_2O_2$  concentration of 500 ppm, the humidity level 25 %RH is equivalent to 60 %RS. When this gas mixture starts to condense, i.e. when RS is 100 %, RH is 45 %.

### Traceable $H_2O_2$ factory calibration

Every PEROXCAP sensor is manufactured in [Vaisala's own cleanrooms](#) 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. You can also [calibrate your own HPP270 series probes](#).

## HPP270 Series Probes

For hydrogen peroxide, humidity, and temperature measurement



### Features

- Basic probe option HPP271 for H<sub>2</sub>O<sub>2</sub> vapor concentration measurement
- Advanced probe option HPP272: compact 3-in-1 probe with real-time measurement of H<sub>2</sub>O<sub>2</sub> 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 Indigo products and Insight PC software

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.

### Relative saturation for comprehensive humidity monitoring

Similar to water, H<sub>2</sub>O<sub>2</sub> 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<sub>2</sub>O<sub>2</sub> vapor together. This tells you reliably when the bio-decontaminated air starts to condense.

### Repeatable measurement for highly condensing environments

Intelligent measurement technology including the sensor purge function helps to maintain accuracy between calibrations in challenging H<sub>2</sub>O<sub>2</sub> 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.

### Indigo and Insight compatible

The probe can be connected to Vaisala Indigo transmitters and the Indigo80 handheld indicator to extend the selection of available features.

Indigo products provide a range of additional display, output, and relay options, as well as convenient interfaces for monitoring, configuration, and calibration and adjustment. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

For easy-to-use access to configuration, calibration, and adjustment, the probe can be connected to Vaisala Insight PC software. See [www.vaisala.com/insight](http://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<sub>2</sub>O<sub>2</sub>, 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 <sub>2</sub> O <sub>2</sub>	±10 ppm
Accuracy at +10 ... +25 °C (+50 ... +77 °F), 10 ... 2000 ppm H <sub>2</sub> O <sub>2</sub> <sup>1)</sup>	±10 ppm or 5 % of reading (whichever is greater)
Factory calibration uncertainty at +25 °C (+77 °F), 500 ppm H <sub>2</sub> O <sub>2</sub> <sup>2)</sup>	±10 ppm
Response time (T <sub>63</sub> )	70 s
Other parameters	
H <sub>2</sub> O ppm by volume, dew point temperature	

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 V DC Analog output: 15 ... 25 V DC
Current consumption at +25 °C (+77 °F)	
In digital mode	Max. 10 mA
In analog mode	Max. 50 mA
During sensor 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 dependence

## Operating environment

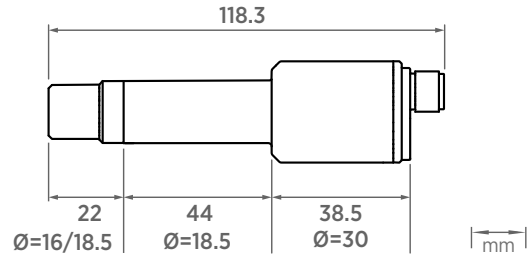
Operating temperature	+0 ... +70 °C (+32 ... +158 °F)
Storage temperature	-20 ... +70 °C (-4 ... +158 °F)
Ambient pressure	Normal atmospheric pressure
IP rating	IP65

## Compliance

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

## Mechanical specifications

Connector	M12-5M
Materials	
Probe body	AISI316L stainless steel
Filter cap	Porous PTFE



## HPP271 dimensions

## Spare parts and accessories

Indigo USB adapter <sup>1)</sup>	USB2
Probe connection cable with open wires, 1.5 m (4.9 ft)	254294SP
Probe connection cable with open wires, 3 m (9.8 ft)	254295SP
Probe connection cable with open wires, 5 m (16 ft)	254296SP
Probe connection 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
Indigo transmitters	See <a href="http://www.vaisala.com/indigo">www.vaisala.com/indigo</a>
Indigo80 handheld indicator	See <a href="http://www.vaisala.com/indigo80">www.vaisala.com/indigo80</a>

1) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://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 <sub>2</sub> O <sub>2</sub>	±10 ppm
Accuracy at +10 ... +25 °C (+50 ... +77 °F), 10 ... 2000 ppm H <sub>2</sub> O <sub>2</sub> <sup>1)</sup>	±10 ppm or 5 % of reading (whichever is greater)
Factory calibration uncertainty at +25 °C (+77 °F), 500 ppm H <sub>2</sub> O <sub>2</sub> <sup>2)</sup>	±10 ppm
Response time (T <sub>63</sub> )	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 <sub>2</sub> O <sub>2</sub>	±0.5 %RS
Accuracy at +25 °C (+77 °F) <sup>1)</sup>	±4 %RS
Factory calibration uncertainty at +25 °C (+77 °F), 500 ppm H <sub>2</sub> O <sub>2</sub> <sup>2)</sup>	±2 %RS
Relative humidity	
Measurement range	0 ... 100 %RH
Measurement temperature range	+5 ... +70 °C (+41 ... +158 °F)
Accuracy: <sup>1)</sup>	
at +25 °C (77 °F), 0 ppm H <sub>2</sub> O <sub>2</sub> , 0 ... 90 %RH	±1 %RH
over full temperature measurement and H <sub>2</sub> O <sub>2</sub> range	±2 %RH
Response time (T <sub>63</sub> )	20 s
Factory calibration uncertainty at +25 °C (77 °F), 0 ppm H <sub>2</sub> O <sub>2</sub> , 0 ... 95 %RH <sup>2)</sup>	±1 %RH
Temperature	
Sensor	Pt1000 RTD Class F0.1
Accuracy over temperature range	±0.2 °C (±0.36 °F)
Other parameters	
Absolute H <sub>2</sub> O <sub>2</sub> and H <sub>2</sub> O, H <sub>2</sub> O ppm by volume, water vapor saturation pressure (H <sub>2</sub> O and H <sub>2</sub> O+H <sub>2</sub> O <sub>2</sub> ), dew point temperature, vapor pressure (H <sub>2</sub> O and H <sub>2</sub> O <sub>2</sub> )	

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 V DC Analog output: 15 ... 25 V DC
Current consumption at +25 °C (+77 °F)	
In digital mode	Max. 10 mA
In analog mode	Max. 50 mA
During sensor purge	Max. 250 mA
Digital output	
Interface	RS-485, not isolated; do not use termination on the RS-485 line
Communication protocol	Modbus RTU v.1.02
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

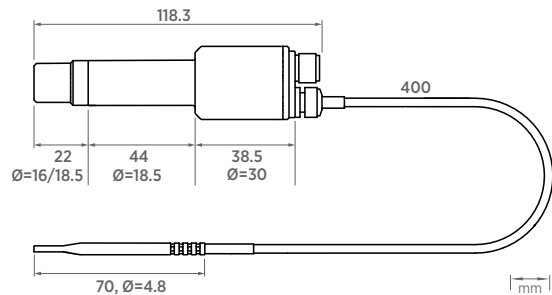
Operating temperature	+0 ... +70 °C (+32 ... +158 °F)
Storage temperature	-20 ... +70 °C (-4 ... +158 °F)
Ambient pressure	Normal atmospheric pressure
IP rating	IP65

## Compliance

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

## Mechanical specifications

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



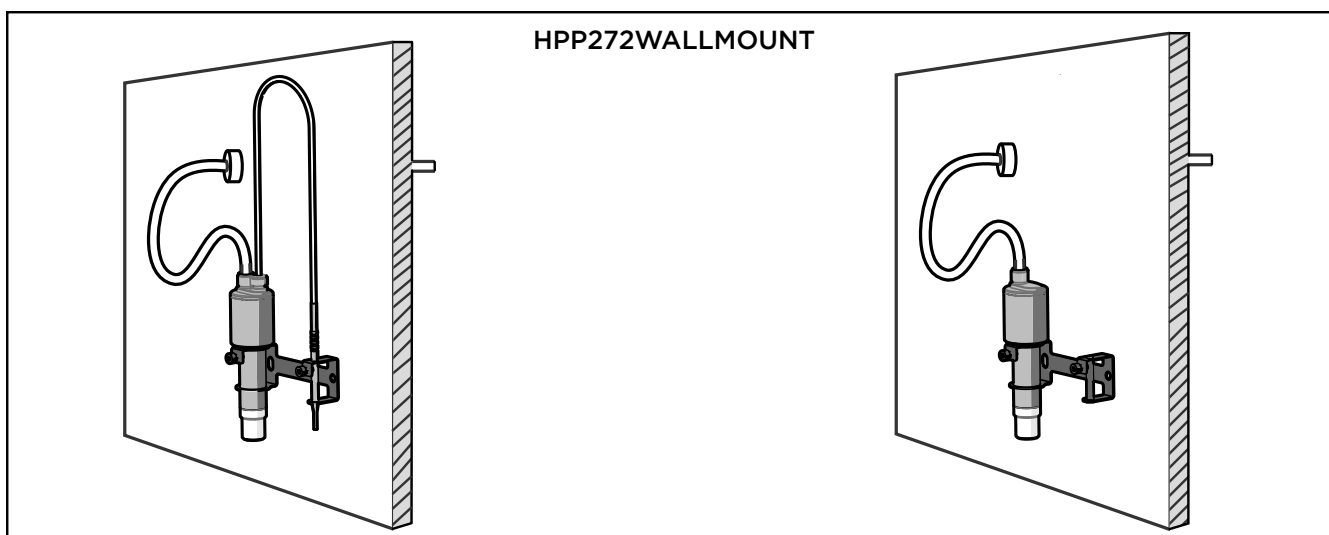
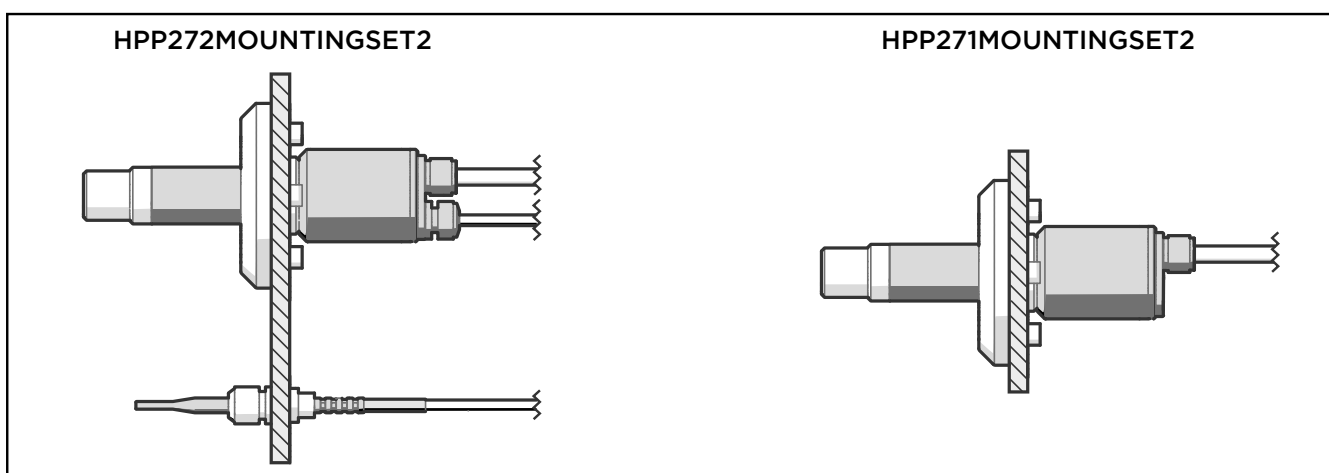
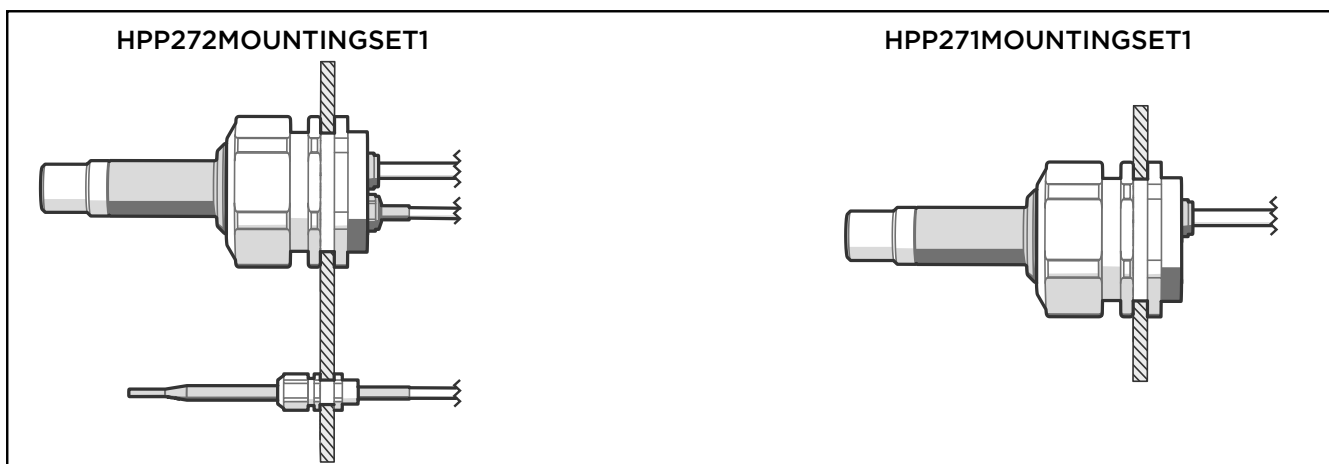
## HPP272 dimensions

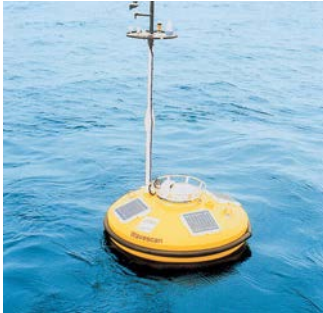
## Spare parts and accessories

Indigo USB adapter <sup>1)</sup>	USB2
Probe connection cable with open wires, 1.5 m (4.9 ft)	254294SP
Probe connection cable with open wires, 3 m (9.8 ft)	254295SP
Probe connection cable with open wires, 5 m (16 ft)	254296SP
Probe connection 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 <a href="http://www.vaisala.com/indigo">www.vaisala.com/indigo</a>
Indigo80 handheld indicator	See <a href="http://www.vaisala.com/indigo80">www.vaisala.com/indigo80</a>

1) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).

# HPP271 and HPP272 installation accessories





### BAROCAP in brief

- Over 35 years of accurate pressure measurement
- Silicon-based capacitive sensor for absolute pressure measurement
- Barometric pressure range 500 ... 1100 hPa
- 50 ... 1100 hPa pressure range available for industrial applications
- Process pressure measurement range 1 ... 10 bar
- NIST-traceable pressure measurement

First introduced in 1985, Vaisala BAROCAP is a silicon-based micromechanical pressure sensor that offers reliable performance in a wide variety of applications, from meteorology to industrial measurements. Combining two powerful technologies – single-crystal silicon material and capacitive measurement – BAROCAP sensors feature low hysteresis combined with excellent accuracy and long-term stability.

### How it works

BAROCAP is a micromechanical sensor that uses dimensional changes in its silicon membrane to measure pressure. As the surrounding pressure increases or decreases, the membrane bends, thereby increasing or decreasing the height of the vacuum gap inside the sensor. The opposite sides of the vacuum gap act as electrodes, and as the distance between the two electrodes changes, the sensor capacitance changes. The capacitance is measured and converted into a pressure reading.

The BAROCAP sensor's properties – good elasticity, low hysteresis, excellent repeatability, low temperature dependence, and superior long-term stability – are the result of its single-crystal silicon material. The capacitive structure gives the sensor its wide dynamic range and provides a built-in mechanism for overpressure blocking.

### Typical applications for barometric pressure measurement

Barometric pressure measurement has a wide variety of applications within meteorology. Pressure data is required for estimating the amount of precipitable water vapor in the atmosphere. Typical applications include weather stations, data buoys, GPS meteorology, and environmental data logging. Barometric pressure measurement is also used in hydrology and agronomy applications.

Barometric pressure data is also required in several industrial applications. It is measured in pressure-sensitive industrial equipment, such as laser interferometers and lithography systems, aviation applications, and in exhaust-gas analysis. Metrological applications include laboratory pressure standard measurements and environmental monitoring in calibration laboratories.

Vaisala offers a range of professional-grade barometers for both indoor and outdoor use. BAROCAP barometers operate over a wide temperature range and perform reliably even in highly demanding applications such as professional meteorology and aviation. View the complete range of Vaisala barometers at [www.vaisala.com/pressure](http://www.vaisala.com/pressure).

### BAROCAP's unique benefits

- Low hysteresis, high repeatability
- Superior long-term stability
- Tolerates harsh conditions

**BAROCAP applications for measurements in pressurized systems**

Vaisala DRYCAP® dew point instruments have a long history of providing reliable and stable measurements in compressed air systems and SF6 insulation gas monitoring in high-voltage equipment. In addition to the need for dew point measurement, these two applications also share the need for accurate and stable pressure measurement. Vaisala has integrated its DRYCAP and BAROCAP technologies into a range of products that offer a unique combination of pressure and dew point measurement for pressurized systems.

In compressed air, combining dew point measurement with live process pressure data provides a unique advantage: The conversion of measured pressure dew point to atmospheric pressure or ppm unit is available online, eliminating the possibility of any ambiguity in the dew point data. This is important because changes in the pressure of the gas being monitored alter its dew point.

Combined dew point and pressure measurement in SF6 gas monitoring of high-voltage equipment provides a superior tool for assessing the condition of SF6 insulation. Leakages can be immediately detected and early warning

is given for moisture issues. Measuring dew point, pressure, and temperature enables the calculation of SF6 gas density, normalized pressure, dew point at atmospheric pressure, and ppm – all essential elements in SF6 monitoring.

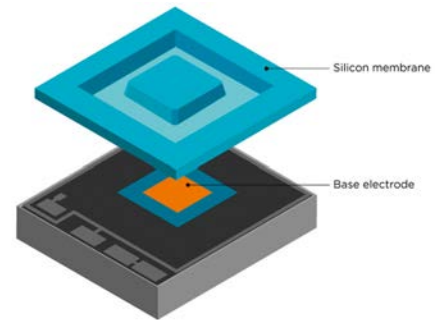
View the complete range of Vaisala products for combined pressure and dew point measurement at [www.vaisala.com/pressure](http://www.vaisala.com/pressure).

**The BAROCAP story**

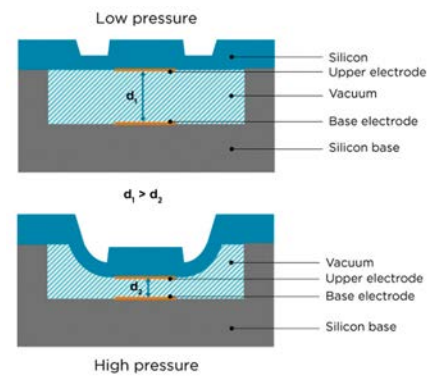
The story of BAROCAP began in the late 1970s during preliminary micromechanical pressure sensor studies for the new-generation Vaisala Radiosonde RS80. Micromechanics proved to be challenging, and Vaisala worked in close cooperation with universities and research institutes in Finland and internationally to develop a new pressure-sensing technology based on silicon processing. The critical breakthrough came on the brink of the project deadline. The first BAROCAP sensors were delivered to two icebreakers and the Helsinki Telephone Company.

BAROCAP sensors have traveled to places where no human has ever set foot, including as part of several Mars exploration missions and the Cassini-Huygens mission to explore Saturn and

its largest moon, Titan. BAROCAP's out-of-this-world journey continues with its inclusion in instruments that form part of NASA's Mars Science Laboratory, launched in November 2011.



BAROCAP sensor



Cross-section of the BAROCAP sensor

## PTB330 Digital Barometer

For professional meteorology, aviation, and industrial users



### Features

- Vaisala BAROCAP sensor
- Accurate measurement
- Excellent long-term stability
- Added reliability through redundancy
- Graphical trend display with 1-year history data
- Height and altitude corrected pressure (QFE, QNH)
- For aviation, professional meteorology, laboratories, and demanding industrial applications
- Corrosion-resistant IP65/IP66 housing, suitable for outdoor and marine environment

Vaisala BAROCAP® Digital Barometer PTB330 is designed for a wide range of high-end atmospheric pressure measurements. The pressure measurement of PTB330 is based on the Vaisala silicon capacitive, absolute pressure sensor - the Vaisala BAROCAP sensor. It provides high measurement accuracy and excellent long-term stability.

### Highly accurate

The PTB330 series is highly accurate. Class A barometers for the most demanding applications are fine-tuned and calibrated against a high-precision pressure calibrator. Class B barometers are adjusted and calibrated using an electronic working standard. All PTB330 barometers come with a traceable factory calibration certificate.

### Reliability through redundancy

According to your choice, PTB330 can incorporate 1, 2, or 3 BAROCAP sensors. When 2 or 3 sensors are used, the barometer continuously compares the readings of the pressure sensors against one another and reports if they are within the set internal difference criteria. This unique feature provides redundancy in pressure measurement.

Users also get a stable and reliable pressure reading at all times, as well as a pre-indication of when to service or recalibrate the barometer.

### QNH and QFE

PTB330 can be set to compensate for the QNH and QFE pressure used especially in aviation. The QNH represents the pressure reduced to sea level, based on the altitude and temperature of the observation site. The QFE represents the height-corrected pressure of small differences in altitude, for example, the air pressure at the airfield elevation.

### Graphical display

PTB330 features a multilingual, graphical display allowing users to monitor measurement trends. PTB330 updates the graph automatically during measurement and it provides a 1-year measurement history. In addition to instant pressure, PTB330 provides the WMO pressure trend and tendency codes.

### Applications

PTB330 can be used successfully for aviation, professional meteorology, and for demanding industrial pressure measurement applications such as accurate laser interferometric measurement and exhaust gas analysis in engine test benches.

# Technical data

## Measurement performance

Property	Class A	Class B
<b>Barometric pressure range 500–1100 hPa</b>		
Linearity <sup>1)</sup>	±0.05 hPa	±0.10 hPa
Hysteresis <sup>1)</sup>	±0.03 hPa	±0.03 hPa
Repeatability <sup>1)</sup>	±0.03 hPa	±0.03 hPa
Calibration uncertainty <sup>2)</sup>	±0.07 hPa	±0.15 hPa
Accuracy at +20 °C (+68 °F) <sup>3)</sup>	±0.10 hPa	±0.20 hPa
<b>Barometric pressure range 50–1100 hPa</b>		
Linearity <sup>1)</sup>	–	±0.20 hPa
Hysteresis <sup>1)</sup>	–	±0.08 hPa
Repeatability <sup>1)</sup>	–	±0.08 hPa
Calibration uncertainty <sup>2)</sup>	–	±0.15 hPa
Accuracy at +20 °C (+68 °F) <sup>3)</sup>	–	±0.20 hPa
<b>Temperature dependence <sup>4)</sup></b>		
500–1100 hPa	±0.1 hPa	±0.1 hPa
50–1100 hPa	±0.3 hPa	±0.3 hPa
<b>Total accuracy –40 ... +60 °C (–40 ... +140 °F)</b>		
500–1100 hPa	±0.15 hPa	±0.25 hPa
50–1100 hPa	–	±0.45 hPa
<b>Long-term stability</b>		
500–1100 hPa	±0.1 hPa/year	±0.1 hPa/year
50–1100 hPa	±0.2 hPa/year	±0.2 hPa/year
<b>Miscellaneous</b>		
Pressure units	hPa, mbar, kPa, Pa inHg, mmH2O, mmHg, torr, psia	hPa, mbar, kPa, Pa inHg, mmH2O, mmHg, torr, psia
Resolution	0.01 hPa	0.1 hPa
Settling time at startup (1 sensor)	4 s	3 s
Response time (1 sensor)	2 s	1 s
Acceleration sensitivity	–	Negligible
Maximum pressure limit	–	5000 hPa absolute
Maximum measurement rate <sup>5)</sup>	–	10 Hz

- 1) Defined as ±2 standard deviation limits of endpoint non-linearity, hysteresis, or repeatability error.  
 2) Defined as ±2 standard deviation limits of inaccuracy of the working standard including traceability to international standards.  
 3) Defined as the root sum of the squares (RSS) of endpoint non-linearity, hysteresis error, repeatability error, and calibration uncertainty at room temperature.  
 4) Defined as ±2 standard deviation limits of temperature dependence over the operating temperature range.  
 5) For class A you need a longer averaging time or measurement interval.

## Operating environment

Operating pressure	500–1100 hPa, 50–1100 hPa
Operating temperature	PTB330 without display: –40 ... +60 °C (–40 ... +140 °F) PTB330 with display: +0 ... +60 °C (+32 ... +140 °F)
Operating humidity	0–100 %RH, non-condensing
Storage temperature	PTB330 without display: –55 ... +80 °C (–67 ... +176 °F) PTB330 with display: –40 ... +80 °C (–40 ... +176 °F)
IP rating	IP66 IP65 (NEMA4) with local display <sup>1)</sup>

- 1) IP rating of PTB330AWS is IP40.

## Mechanical specifications

Pressure fitting	Barbed fitting for 1/8-inch (inside diameter) tubing or quick connector with shutoff valve for 1/8-inch hose
Pressure connector	M5 (10-32) internal thread
Housing material	G AISI10 Mg (DIN 1725)
Weight	1–1.5 kg (2.2–3.3 lb)

## Inputs and outputs

Supply voltage	10–35 V DC
Supply voltage sensitivity	Negligible
Typical power consumption at +20 °C (+68 °F) (voltage at 24 V DC with 1 pressure sensor)	RS-232: 25 mA RS-485: 40 mA
	Output voltage U <sub>out</sub> : 25 mA Output current I <sub>out</sub> : 40 mA Display and backlight: +20 mA
Serial communication	RS-232, RS-485, RS-422

## Analog output (optional)

Current output	0–20 mA, 4–20 mA	
Voltage output	0–1 V, 0–5 V, 0–10 V	
<b>Accuracy at pressure range</b>	500–1100 hPa	50–1100 hPa
At +20 °C (+68 °F)	±0.30 hPa	±0.40 hPa
At –40 ... +60 °C (–40 ... 140 °F)	±0.60 hPa	±0.75 hPa

## Data transfer software

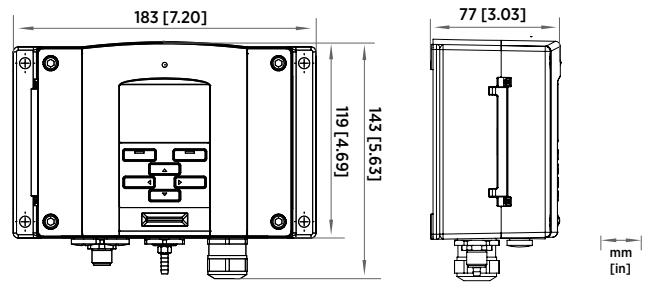
MI70 Link Interface software requirements	Microsoft® Windows OS Microsoft® Excel
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## Accessories

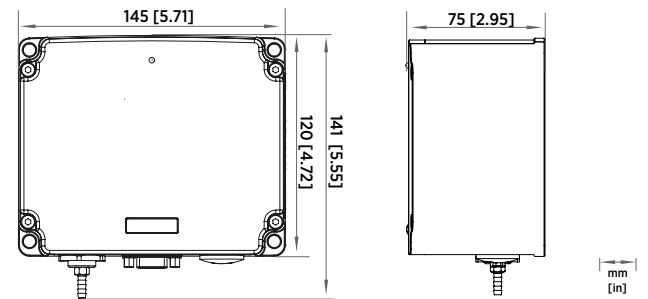
Modules	
Relay module	RELAY-1L
Temperature-compensated analog output module	AOUT-1T
Isolated RS-485 module	RS485-1
Power supply module	POWER-1
AC adapters for devices already equipped with an external AC adapter connector	
AC adapter, EU	MI70EUROADAPTER
AC adapter, USA	MI70USADAPTER
AC adapter, UK	MI70UKADAPTER
AC adapter, AUS	MI70AUSADAPTER
Static pressure head	
Static pressure head	SPH10
Static pressure head with heating	SPH20
Barometer mounting accessories	
Junction box	ASM211113
Wall mounting kit	214829
Installation kit for pole or pipeline	215108
Outdoor installation kit (weather shield)	215109
DIN rail clips with installation plate	215094
Panel mounting frame	216038
Connection cables	
Connection cable for PTB330 and MI70 handheld meters for spot check or calibration and adjustment	211339
Service cables	
USB-RJ45 serial connection cable	219685
D9-RJ45 serial connection cable	215005
Output cables for 8-pin connector	
Connection cable 5 m with 8-pin M12 female, black	212142
Female connector 8-pin M12 with screw terminals	212416
Cable bushings	
PTB330/220/PTU200 DC adapter and RS-232 cable for PC	213019
PTB330/PTB220/PTU200 DC adapter cable	213026
Others	
Dust filter	237018SP
Barbed pressure fitting 1/8-inch	19498SP
Quick connector 1/8-inch	220186

## Compliance

Property	Value
EU directives and regulations	RoHS Directive (2011/65/EU) as amended by 2015/863 EMC Directive (2014/30/EU) Low Voltage Directive (2014/35/EU), applies to units equipped with single-phase AC power supply Power-1
Electrical safety	EN 61010-1:2010 + A1:2019, applies to units equipped with single-phase AC power supply Power-1
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment EN 55011:2009 + A1:2010
Environmental	EN IEC 63000:2018



PTB330 dimensions



PTB330AWS dimensions



## PTB330TS Barometric Pressure Transfer Standard

For portable use



### Features

- PTB330 digital barometer for accurate pressure measurement
- Handheld MI70 indicator with a user-friendly, multilingual display
- Service port for MI70 Link software or computer
- Vaisala HUMICAP® humidity and temperature probe HMP155
- Weatherproof transport case

Barometric Pressure Transfer Standard PTB330TS combines a PTB330 digital barometer with a handheld MI70 indicator into a portable unit that can be used as a transfer standard.

### Barometer for Portable Use

PTB330TS uses a PTB330 series digital barometer that is housed in a tabletop casing. PTB330TS is designed to be operated using the handheld MI70 indicator. The MI70 indicator also provides the operation power for the barometer. Optional HMP155 probe is available for accurate humidity and temperature measurement.

### For Measurements in Industrial and Meteorological Areas

PTB330TS is suitable for reference measurements in industrial and meteorological areas. PTB330TS is housed in a durable and weatherproof

transport case that can be easily carried and shipped. The components of the PTB330TS are placed in a foam interior with accessories and User Guide in the lid organizer. The case includes a shoulder strap.

### Available Options

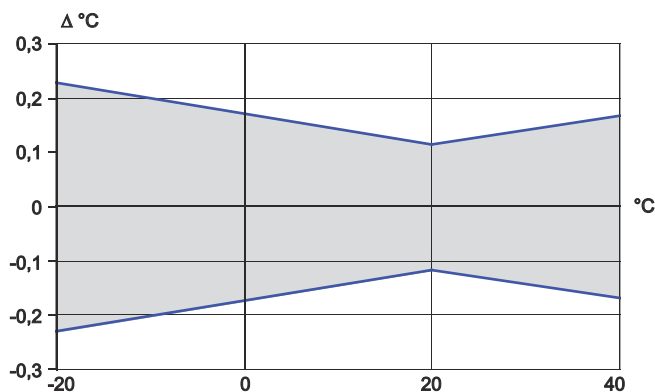
- ISO/IEC 17025 Accredited calibration for PTB330
- HMP155 options: additional temperature probe, manually controlled chemical purge feature
- MI70 Link software and USB or RS-232 cable for downloading measurement data to a computer
- USB service cable for connecting to PTB330 service port

# Technical Data

These specifications apply when MI70, PTB330, and HMP155 are used together in PTB330TS. For PTB330 and HMP155 specifications, see the product documentation.

## General

<b>Operating temperature</b>	
MI70	-10 ... +40 °C (+14 ... +104 °F)
PTB330	-40 ... +60 °C (-40 ... +140 °F)
HMP155	-80 ... +60 °C (-112 ... +140 °F)
<b>Operating humidity</b>	
Non-condensing	
<b>Maximum pressure limit</b>	
5000 hPa abs.	
<b>Power supply</b>	
Rechargeable NiMH battery pack with AC-adaptor or 4xAA-size alkalines, type IEC LR6	
<b>Menu languages</b>	
English, Chinese, French, Spanish, German, Russian, Japanese, Swedish, Finnish	
<b>Display</b>	
LCD with backlight, graphic trend display of any parameter, character height up to 16 mm	
<b>Data logging capacity</b>	
2700 points	
<b>Alarm</b>	
Audible alarm function	
<b>Compliance</b>	
<ul style="list-style-type: none"> <li>• EMC Directive (2004/108/EC) Complies with the EMC product family standard EN61326-1</li> <li>• Electrical equipment for measurement control and laboratory use</li> <li>• Basic immunity test requirements</li> <li>• Low Voltage Directive (2006/95/EC)</li> <li>• ROHS Directive (2002/95/EC)</li> </ul>	
<b>Operation Time (Using Rechargeable Battery Pack)</b>	
Continuous use with PTB330	11 h typical at +20 °C (+68 °F)
Datalogging use	Up to 30 days



Accuracy of HMP155 temperature measurement over temperature range

## Measurement Performance

### Barometric Pressure (PTB330)

Measurement range	500 ... 1100 hPa
Linearity <sup>1)</sup>	±0.05 hPa
Hysteresis <sup>1)</sup>	±0.03 hPa
Repeatability <sup>1)</sup>	±0.03 hPa
Calibration uncertainty <sup>2)</sup>	±0.07 hPa
Accuracy at +20 °C (+68 °F) <sup>3)</sup>	±0.10 hPa
Temperature dependence <sup>4)</sup>	±0.1 hPa
Total accuracy -40 ... +60 °C (-40 ... +140 °F)	±0.15 hPa
Long-term stability	±0.1 hPa/year
Settling time at startup (one sensor)	4 s
Response time (one sensor)	2 s
Acceleration sensitivity	Negligible

### Relative Humidity (HMP155)

Measurement range	0 ... 100 %RH
Accuracy (incl. non-linearity, hysteresis and repeatability)	
at +15 ... +25 °C (+59 ... +77 °F)	±1 %RH (0 ... 90 %RH) ±1.7 %RH (90 ... 100 %RH)
at -10 ... +40 °C (-4 ... 104 °F)	±(1.0 + 0.008 reading) %RH
Factory calibration uncertainty at +20 °C (+68 °F)	±0.6 %RH (0 ... 40 %RH) <sup>5)</sup> ±1.0 %RH (40 ... 97 %RH) <sup>5)</sup>
Humidity sensor	
HUMICAP180R HUMICAP180RC	
Response time at +20 °C (+68 °F) in still air with a sintered PTFE filter	
63%	20 s
90%	60 s

### Temperature (HMP155)

Measurement range	-10 ... +40 °C (+14 ... +104 °F)
Accuracy	
-10 ... +20 °C (+14 ... +68 °F)	±(0.176 - 0.0028 x temperature) °C
+20 ... +40 °C (+68 ... +104 °F)	±(0.07 + 0.0025 x temperature) °C
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751
Response time with additional temperature probe in 3 m/s air flow	
63%	< 20 s
90%	< 35 s

- <sup>1)</sup> Defined as ±2 standard deviation limits of endpoint non-linearity, hysteresis, or repeatability error.
- <sup>2)</sup> Defined as ±2 standard deviation limits of inaccuracy of the working standard including traceability to NIST.
- <sup>3)</sup> Defined as the root sum of the squares (RSS) of endpoint non-linearity, hysteresis error, repeatability error, and calibration uncertainty at room temperature.
- <sup>4)</sup> Defined as ±2 standard deviation limits of temperature dependence over the operating temperature range.
- <sup>5)</sup> Defined as ±2 standard deviation limits. Small variations possible, see also calibration certificate.

## Available Parameters

Pressure parameters	P, P3h, HCP, QFE, QNH
Humidity and temperature parameters	RH, T, Tdf, Td, x, Tw

## Inputs and Outputs

MI70 probe ports	2
MI70 data interface	RS-232 (accessible only with MI70 Link software)
PTB330 supply voltage	10 ... 35 VDC (if not powered by MI70)
PTB330 data interface	RS-232C
PTB330 serial I/O connectors	RJ45 (service port) Male 8-pin M12 (user port)
HMP155 data interface	RS-485
HMP155 serial I/O connector	Male 8-pin M12

## Mechanical Specifications

<b>PTB330</b>	
Housing material	G-AlSi 10 Mg (DIN 1725)
IP rating	IP65
Pressure connector	M5 (10-32) internal thread
Pressure fitting	Barbed fitting for 1/8 inch I.D. tubing or quick connector with shutoff valve for 1/8 inch hose
<b>HMP155</b>	
Housing material	PC
IP rating	IP66
Additional T-probe cable length	2 m (6 ft 6 in)
Cable material	PUR
Sensor protection	Sintered PTFE
<b>MI70 Measurement Indicator</b>	
IP rating	IP54
Housing material	ABS/PC blend
<b>Transport Case</b>	
IP rating (when closed)	IP67
Plastic parts	TTX01®, PP+SEBS, POM
Metal parts	Stainless steel AISI303
Interior foam material	Polyethylene and polyether
Weight with all instruments and typical accessories	5.9 kg (13 lb)
Exterior dimensions (L × W × H)	405 × 330 × 165 mm (15.94 × 12.99 × 6.50 in)

## Spare Parts and Accessories

<b>PTB330</b>	
MI70 – PTB330 spiral cable	223235SP
USB-RJ45 serial connection cable	219685
Serial connection cable	19446ZZ
Barbed fitting 1/8 in	19498SP
Quick connector 1/8 in	220186
Transport case with interior foams and tabletop casing for PTB330	224068SP
<b>MI70</b>	
USB cable for MI70, includes MI70 Link software	219687
MI70 Link software	MI70LINK
MI70 connection cable to HMT330, MMT330, DMT340, HMT100, PTB330	211339
MI70 battery pack variety of AC adapters available	26755
<b>HMP155</b>	
HMP155 - MI70 connection cable	221801
Protection set for HMP155 calibration buttons: protective cover, 2 O-rings and protective plug	221318
USB cable for HMP155	221040
Sintered teflon filter + O-ring	219452SP
Humidity sensor	HUMICAP180R
Humidity calibrator	HMK15





### Features

- 500 ... 1100 hPa or 50 ... 1100 hPa pressure ranges with serial output
- Different scalings between 500 ... 1100 hPa with analog output
- Electronics housing IP65 protected against sprayed water
- Accurate and stable measurement
- Traceable calibration (certificate included)

Vaisala BAROCAP® Digital Barometer PTB210 is a reliable outdoor barometer for harsh conditions.

### For harsh environments

PTB210 is ideal for outdoor installations and harsh environments. PTB210 is designed to operate in a wide temperature range, and the electronics housing provides IP65 (NEMA 4) standardized protection against sprayed water.

PTB210 is ideal for use in applications such as weather stations, data buoys, ships, airports, and agrology. It is also an excellent solution for monitoring barometric pressure in industrial equipment such as laser interferometers and engine test benches.

### Several pressure ranges

PTB210 is designed for various pressure ranges. It is available in 2 pressure ranges in 3 configurations:

- Serial output for 500 ... 1100 hPa
- Serial output for 50 ... 1100 hPa
- Analog output with different scalings between 500 ... 1100 hPa

### Accurate and stable measurement

PTB210 is digitally adjusted and calibrated by using electronic working standards. A higher accuracy barometer, which is fine-tuned and calibrated against a high-precision pressure calibrator, is available for the 500 ... 1100 hPa pressure range.

In addition, PTB210 integrates directly with Vaisala Static Pressure Head Series SPH10/20. This pairing offers accurate measurement in all wind conditions.

### Vaisala BAROCAP technology

PTB210 uses the Vaisala BAROCAP sensor, a silicon capacitive absolute pressure sensor developed by Vaisala for barometric pressure applications. The Vaisala BAROCAP sensor provides excellent hysteresis and repeatability

characteristics and outstanding temperature and long-term stability. PTB210 is delivered with a traceable factory calibration certificate.



PTB210 paired with SPH10 static pressure head

# Technical Data

## Measurement performance

Pressure range	
Serial output	500 ... 1100 hPa 50 ... 1100 hPa
Analog output	500 ... 1100 hPa 600 ... 1060 hPa 800 ... 1060 hPa 900 ... 1100 hPa

Serial output, accuracy (hPa)			
Pressure range	500 ... 1100		50 ... 1100
	Class A	Class B	
Non-linearity <sup>1)</sup>	± 0.10	± 0.15	± 0.20
Hysteresis <sup>1)</sup>	± 0.05	± 0.05	± 0.10
Repeatability <sup>1)</sup>	± 0.05	± 0.05	± 0.10
Calibration uncertainty <sup>2)</sup>	± 0.07	± 0.15	± 0.20
Accuracy at +20 °C (+68 °F) <sup>3)</sup>	± 0.15	± 0.20	± 0.35
Temperature dependency <sup>4)</sup>	± 0.20	± 0.20	± 0.40
Total accuracy -40 ... +60 °C (-40 ... +140 °F) <sup>3)</sup>	± 0.25	± 0.30	± 0.50
Long-term stability (hPa/year)	± 0.10	± 0.10	± 0.20

Analog output, accuracy	
Non-linearity <sup>1)</sup>	± 0.20 hPa
Hysteresis <sup>1)</sup>	± 0.05 hPa
Repeatability <sup>1)</sup>	± 0.05 hPa
Calibration uncertainty <sup>2)</sup>	± 0.15 hPa
Accuracy at +20 °C (+68 °F) <sup>3)</sup>	± 0.30 hPa
Temperature dependency <sup>4)</sup>	± 0.50 hPa
Total accuracy -40 ... +60 °C (-40 ... +140 °F) <sup>3)</sup>	± 0.60 hPa
Long-term stability	± 0.10 hPa/year

1) Defined as the ±2 standard deviation limits of end point non-linearity, hysteresis error, or repeatability error.

2) Defined as ±2 standard deviation limits of inaccuracy of the working standard including traceability to international standards.

3) Defined as the root sum of the squares (RSS) of end point non-linearity, hysteresis error, repeatability error, and calibration uncertainty at room temperature.

4) Defined as ±2 standard deviation limits of temperature dependence over the operating temperature range.

## Operating environment

Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity	0-100 %RH, non-condensing

## Compliance

Directives	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU)
Electromagnetic compatibility (EMC)	EN / IEC 61326-1, Electrical equipment for measurement, control and laboratory use - EMC requirement; Basic environment CISPR 32 / EN 55032, Class B
Compliance	CE, FCC, UKCA

## Mechanical specifications

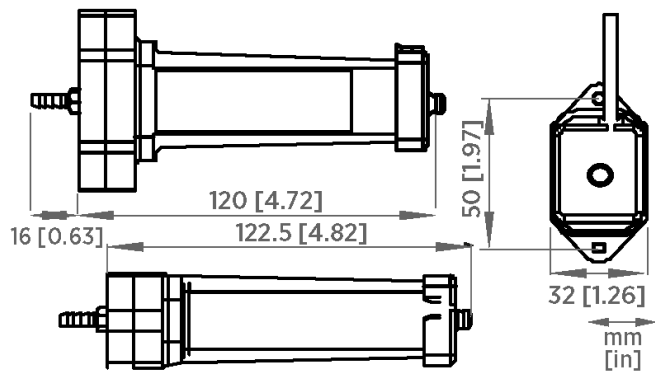
Housing material	PC plastic
IP rating, electronics	IP65 (NEMA 4)
IP rating, sensor	IP53
Weight, sensor	110 g (3.9 oz)
Cable weight	28 g/m (1.0 oz)

## Inputs and outputs

Serial output	
Shutdown	ON/OFF
Settling time at startup	2 s
Serial I/O	RS-232C RS-232C / TTL (optional) RS-485, non-isolated (optional)
Parity	None, even, odd
Data bits	7, 8
Stop bits	1, 2
Baud rate	1200, 2400, 4800, 9600, 19200
Response time	1 s
Resolution	0.01 hPa (1 measurement/s) 0.03 hPa (10 measurements/s)
Current consumption, normal mode	< 15 mA (factory setting)
Current consumption, shutdown mode	0.2 mA

Analog output	
Outputs	0 ... 5 V DC, 0 ... 2.5 V DC (order specified)
Shutdown	ON/OFF
Response time	500 ms
Resolution	300 µV
Measurement rate	3 measurements/s
Current consumption, normal mode	< 8 mA
Current consumption, shutdown mode	0.2 mA

All models	
Max. pressure	5 000 hPa absolute
Pressure connector	M5 (10-32) internal thread
Pressure fitting	Barbed fitting for 1/8 in I.D. tubing
Supply voltage (reverse polarity protected), with RS-232/TTL output	5 ... 28 V DC
Supply voltage (reverse polarity protected), with RS-485 or analog output	8 ... 18 V DC





### Features

- Vaisala BAROCAP® sensor
- Several pressure ranges
- Accuracy  $\pm 0.3$  hPa at  $+20$  °C
- Long-term stability
- On/Off control with external trigger
- Output voltage 0 ... 2.5 or 0 ... 5 VDC
- Current consumption less than 4 mA
- Mountable on 35 mm wide DIN rail
- Traceable calibration (certificate included)

Vaisala BAROCAP® Barometer PTB110 is designed both for accurate barometric pressure measurements at room temperature and for general environmental pressure monitoring over a wide temperature range.

### Vaisala BAROCAP Technology

PTB110 uses the Vaisala BAROCAP sensor, a silicon capacitive absolute pressure sensor developed by Vaisala for barometric pressure measurement applications. The sensor combines the outstanding elasticity characteristics and mechanical stability of single-crystal silicon with the proven capacitive detection principle.

### Applications

PTB110 is suitable for a variety of applications, such as environmental pressure monitoring, data buoys, laser interferometers, and agriculture and hydrology. The compact PTB110 is ideal for data logger applications as it has low power consumption. The external On/Off control is practical when electricity supply is limited.

### Accuracy and Stability

The excellent long-term stability of the barometer minimizes or even removes the need for field adjustment in many applications.

# Technical Data

## Measurement performance

Pressure range (1 hPa= 1 mbar)	500 ... 1100 hPa
	600 ... 1100 hPa
	800 ... 1100 hPa
	800 ... 1060 hPa
	600 ... 1060 hPa
Resolution	0.1 hPa
Load resistance	10 000 Ω minimum
Load capacitance	47 nF maximum
Settling time to full accuracy after startup	1 s
Response time to full accuracy after a pressure step	500 ms
Acceleration sensitivity	Negligible
<b>Accuracy</b>	
Linearity <sup>1)</sup>	±0.25 hPa
Hysteresis <sup>1)</sup>	±0.03 hPa
Repeatability <sup>1)</sup>	±0.03 hPa
Pressure calibration uncertainty <sup>2)</sup>	±0.15 hPa
Voltage calibration uncertainty	±0.7 mV
Frequency calibration uncertainty	±0.3 Hz
Accuracy at +20 °C (+68 °F) <sup>3)</sup>	±0.3 hPa
<b>Total accuracy at</b>	
+15 ... +25 °C (+59 ... +77 °F)	±0.3 hPa
0 ... +40 °C (+32 ... +104 °F)	±0.6 hPa
-20 ... +45 °C (-4 ... +113 °F)	±1.0 hPa
-40 ... +60 °C (-40 ... +140 °F)	±1.5 hPa
Long-term stability	±0.1 hPa / year

1) Defined as ±2 standard deviation limits of end-point non-linearity, hysteresis error, or repeatability error.

2) Defined as ±2 standard deviation limits of inaccuracy of the working standard including traceability to international standards.

3) Defined as the root sum of the squares (RSS) of end-point non-linearity, hysteresis error, repeatability error, and calibration uncertainty at room temperature.

## Operating environment

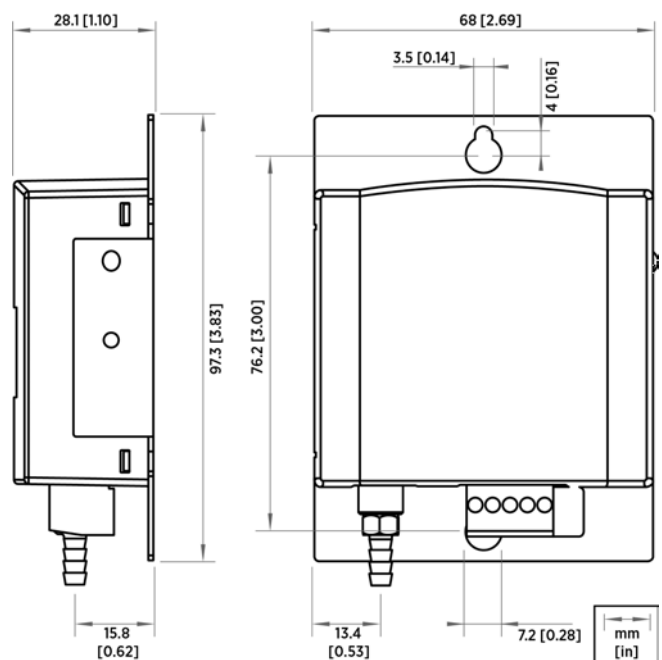
Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity	Non-condensing
IP rating	IP32
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment

## Mechanical specifications

Dimensions (H × W × D)	97.3 × 68.4 × 28.1 mm (3.83 × 2.69 × 1.10 in)
Weight	90 g (3.2 oz)
<b>Materials</b>	
Housing cover	Plastic ABS/PC blend
Mounting plate	Aluminum

## Inputs and outputs

Supply voltage	10 ... 30 V DC
Supply voltage control	With TTL-level (Transistor-Transistor-Logic) trigger
Supply voltage sensitivity	Negligible
Average power consumption	0.10 W at 12 V
Output voltage	0 ... 2.5 V DC 0 ... 5 V DC
Output frequency	500 ... 1100 Hz
Pressure connector	M5 (10 ... 32) internal thread
Pressure fitting	Barbed fitting for 1/8 in
Minimum pressure limit	0 hPa abs
Maximum pressure limit	2000 hPa abs
Electrical connector	A removable connector for 5 wires (AWG 28 ... 16)
Terminals	Pin 1: External triggering Pin 2: Signal ground Pin 3: Supply ground Pin 4: Supply voltage Pin 5: Voltage/Frequency output



Dimensions





## SPH10/20 Static Pressure Heads For minimizing wind induced error



SPH10/20 is easy to install and connect. In the picture, SPH10 is connected to PTB210.

### Features

- Minimizes wind induced error
- Reliable barometric pressure measurement in all weather
- Wind tunnel tested structure
- Easy to clean
- Easy to install

SPH10/20 Static Pressure Heads minimize the effects of wind on barometric pressure readings.

Wind induced effects are one of the main sources of error when measuring barometric pressure. Variations due to strong and gusty wind can be overcome by using a static pressure head to reduce the effect of dynamic pressure.

Vaisala Static Pressure Head Series SPH10/20 are designed to minimize the errors caused by wind. Their wind tunnel tested structure is both horizontally and vertically symmetrical. This design ensures reliable barometric pressure measurements in all weather.

### Ideal for Outdoor Installations

Vaisala static pressure heads are available in two models: Vaisala Static Pressure Head SPH10 is a basic version, and Vaisala Static Pressure Head SPH20 is a heated version for reliable operation in snowy and icy conditions. The heated SPH20 contains a thermostat that switches on the warming power at temperatures where the risk of icing may occur.

Composed of ultraviolet stabilized PC plastics and offshore aluminum, SPH10/20 static pressure heads are durable and weather resistant.

SPH10/20 protects against rain and condensed water. This prevents capillary condensation of a water column in the pressure channel resulting in a pressure error. The drain holes in the lower plate allow rain and water to flow out. The static pressure heads have internal netting that prevents insects and debris from blocking the pressure channel.

### Carefree Maintenance

SPH10/20 static pressure heads are easy to install and disassemble, service, and clean – even at the installation site. Vaisala BAROCAP® Digital Barometer PTB210 can be installed directly on top of SPH10/20 static pressure heads. Other barometers can be connected to the heads with pressure tubing.

SPH10 and SPH20 are a perfect pair for all Vaisala barometers. They ensure an accurate and reliable measurement in all weather conditions.

# Technical Data

## Operating Environment

Operating temperature -60 ... +80 °C (-76... +176 °F)

## Mechanical Specifications

Weight	SPH10: 800 g (1.76 lb) SPH20: 1360 g (3.0 lb)
Materials	PC plastic, offshore aluminium
Mounting	With 2 bolts (M6 × 20 mm min.)
Hose connection	Barbed fitting for 4 mm I.D. hose or Rp1/4 thread (parallel)

## SPH20 Inputs and Outputs

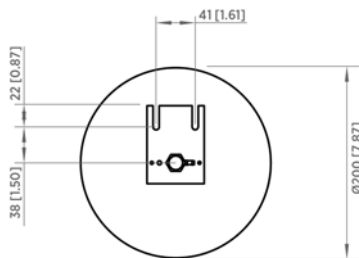
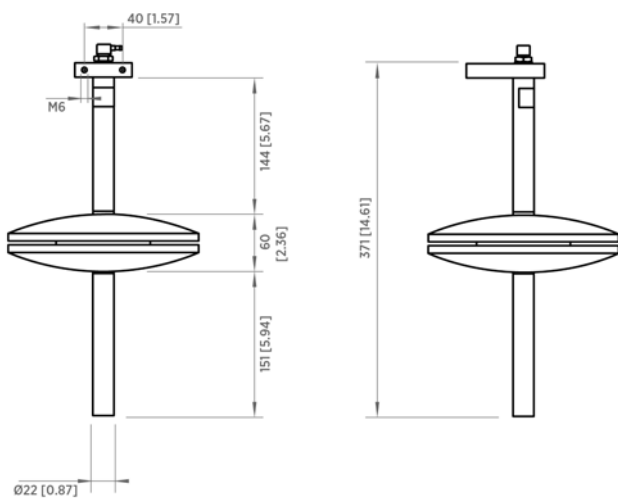
Electrical connections	M12 connector
Power supply	Factory setting: 12 V Changed connection: 24 V

Power consumption during heating 70 W

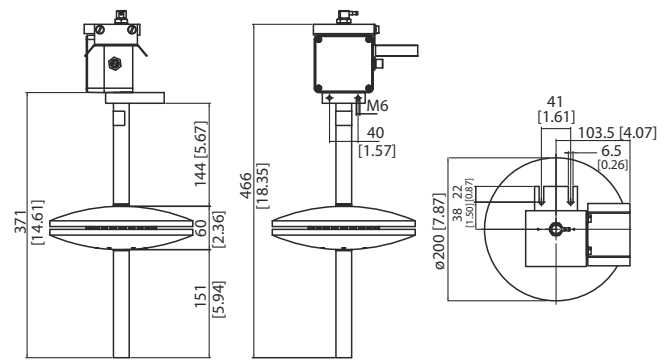
### Thermostat Switching Temperature

On	+4 °C (±3 °C) +39.2 °F (±4.4 °F)
Off	+13 °C (±3 °C) +55.4 °F (±4.4 °F)

## Dimensions in mm (inches)



SPH10



SPH20





### Features

- Easy mounting on wall, DIN rail, or panel
- 3 pressure ranges (Pa and inH<sub>2</sub>O)
- Unidirectional and bidirectional models
- Accessible zero and span adjustment potentiometers
- LED status indicator
- Dedicated models for critical and regulated environments and for air handling systems
- Euro style detachable connector
- Calibrations traceable to SI units through national metrology institutes or accredited calibration laboratories

Vaisala Differential Pressure Transmitter PDT101 offers precise measurement of differential air pressure. PDT101 offers dedicated models for critical and regulated environments with very low differential pressures and unidirectional models for air handling systems.

### Operating environment

The highly accurate bidirectional models of PDT101 are designed especially for demanding life science and cleanroom applications, and are the perfect choice for any application requiring precise pressure differential measurement. The transmitter is ideal for incorporating into the Vaisala viewLinc Continuous Monitoring System to measure and monitor the critical environmental parameters as required in regulated environments.

The unidirectional models of PDT101 are optimal for air handling units to measure differential pressure over fans or filters, for example.

Zero and span adjustment screws are available on every PDT101 model. Both adjustments are accessible from the front of the unit.

### Performance

PDT101 offers high accuracy, sensitivity, and stability, with models providing accuracies of either 0.40 or 1 % of span. The sensor uses a micro-machined, ultra-thin silicon diaphragm which provides inherent sensor repeatability and stability. The sensor enables precise measurement and control in high performance environments. The PDT101 transmitter is available with voltage output (3-wire) or current output (2-wire).

### Applications

PDT101 is suitable for high performance environments in the life science, semiconductor, and electronics industries, as well as in building automation systems in data centers and other demanding buildings and environments.

When used in regulated environments as part of the viewLinc system, it is highly suitable for fulfilling the requirements of continuous, documented, and redundant data, to meet FDA, EMA and other international regulations.

The compact design is well suited for mounting in a cleanroom or in the adjacent corridor with LED indicator lights for quick and easy power status spot check.

# Technical data

## Models

Model	Measurement range	Output
PDT101-P4C	±60 Pa	4–20 mA
PDT101-P4V	±60 Pa	0–5 V
PDT101-P4C2	±125 Pa	4–20 mA
PDT101-P4V2	±125 Pa	0–5 V
PDT101-W4C	±0.25 inH <sub>2</sub> O	4–20 mA
PDT101-W4V	±0.25 inH <sub>2</sub> O	0–5 V
PDT101-W4C2	±0.5 inH <sub>2</sub> O	4–20 mA
PDT101-W4V2	±0.5 inH <sub>2</sub> O	0–5 V
PDT101-P10C	0–500 Pa	4–20 mA
PDT101-P10V	0–500 Pa	0–10 V
PDT101-W10C	0–2 inH <sub>2</sub> O	4–20 mA
PDT101-W10V	0–2 inH <sub>2</sub> O	0–10 V
PDT101-P10Cx <sup>1)</sup>	0–500 Pa	4–20 mA
PDT101-P10Vx <sup>1)</sup>	0–500 Pa	0–10 V
PDT101-W10Cx <sup>1)</sup>	0–2 inH <sub>2</sub> O	4–20 mA
PDT101-W10Vx <sup>1)</sup>	0–2 inH <sub>2</sub> O	0–10 V

<sup>1)</sup> The PDT101-P10Cx, PDT101-P10Vx, PDT101-W10Cx, and PDT101-W10Vx models do not include calibration certificate.

## Measurement performance

Measurement ranges (bidirectional)	±60 Pa, ±125 Pa, ±0.25 inH <sub>2</sub> O, or ±0.5 inH <sub>2</sub> O
Measurement ranges (unidirectional)	0–500 Pa, or 0–2 inH <sub>2</sub> O
Accuracy (incl. non-linearity, hysteresis, repeatability and zero/span calibration settings)	0.4 % of span (bidirectional models), 1% of span (unidirectional models)
Long-term stability	≤ 0.5 % span/year
Response time (10–90 %)	250 ms
Warm-up time	15 s
Compensated temperature range	+2 ... +54 °C (+35.6 ... +129.2 °F)
Temperature dependence	±(0.065 Pa + 0.054 % of reading) / °C or ±(0.00015 inH <sub>2</sub> O + 0.03 % of reading) / °F (reference 21 °C or 70 °F)
Pressure type	Differential, gauge, vacuum and compound
<b>Overpressure</b>	
Proof pressure	1.0 bar
Burst pressure	1.7 bar
Static pressure	1.7 bar
<b>Mounting position</b>	
Error (zero adjustable)	≤ 1 %/g (calibration in vertical position is standard)
<b>Adjustments (front accessible)</b>	
Zero	±5 % span
Span	±3 % span

## Compliance

EU directives and regulations	EMC
Electromagnetic compatibility (EMC)	EN 61326-1, basic immunity test requirements
Compliance marks	CE, RCM

## Mechanical specifications

Medium (measured gas)	Clean and dry air, non-conducting and non-corrosive gases
Mounting	Threaded fastener for wall mounting or DIN rail type EN 50022
IP rating	IP40
Weight	0.07 kg
<b>Material</b>	
Process connection	Brass
Sensor element	Silicon, aluminum, glass
Case	NEMA type 1 fire-retardant ABS 1 (meets UL94-5VA)

## Inputs and outputs

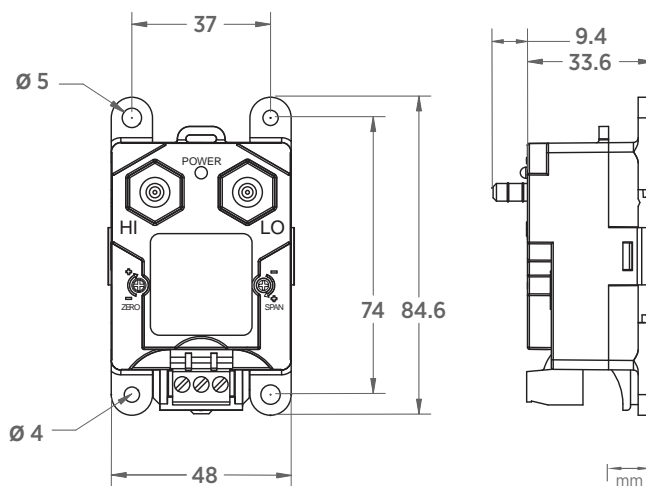
Process connection	1/4" barbed fittings
Tubing outer and inner dimensions	Outer dimension (O.D): 1/4" (6.35 mm) Inner dimension (I.D): 1/8" (3.17 mm)
Max. loop resistance for 4 ... 20 mA	≤ (Supply voltage - 12 V) / 0.022 A
Supply current	Max. 20 mA for 4–20 mA output signal
Optical process diagnostics	LED visual indicator
Electrical connection	Euro style pluggable terminal block accepts 12–26 AWG wire (0.13 up to 3.31 mm <sup>2</sup> )

Output signal	
2-wire	4–20 mA
3-wire	0–5 or 0–10 V DC (user selectable)
Operating voltage	
2-wire output 4–20 mA	12 ... 36 V DC
3-wire output 0–5 V DC	11.5–36 V DC or 24 V AC
3-wire output 0–10 V DC	14–36 V DC or 24 V AC

## Operating environment

Operating temperature	–18 ... +70 °C (–0.4 ... +158 °F)
Storage temperature	–40 ... +82 °C (–40 ... +179.6 °F)

Note: If used in an electromagnetic field of 3 V/m, with narrow frequency area of 80 ... 120 MHz, it is possible that the current output of PDT101 can deviate max. 0.8 % (with accuracy specified 0.4 %)



PDT101 dimensions



### Features

- In-place system calibration and online monitoring without disturbing process tubes with optional process valve actuator and test jacks
- Ultrathin profile ideally suited for DIN rail mount reduces installation and calibration costs
- High accuracy, two options; 0.25 % or 0.50 % of span
- Extremely robust MEMS silicon sensor technology provides very high accuracy, sensitivity, stability, and durability
- Calibrations traceable to SI units through national metrology institutes or accredited calibration laboratories
- Front side accessible zero and span adjustment potentiometers

Vaisala Differential Pressure Transmitter PDT102 offers ultra low pressure measurement for cleanroom control and monitoring applications.

### Operating environment

Vaisala Differential Pressure Transmitter PDT102 is a high performance instrument designed primarily for life science and high technology cleanroom applications. The front panel includes zero and span adjustment potentiometers for convenient adjustment. The PDT102 transmitter is ideal for incorporating into the Vaisala viewLinc Continuous Monitoring System to measure and monitor the critical environmental parameters as required in regulated environments.

### Performance

PDT102 offers very high accuracy, sensitivity and stability with two options for accuracy, 0.25% or 0.50% of span providing a highly reliable and

repeatable measurement. The sensor uses a micro-machined, ultra-thin silicon diaphragm which provides inherent sensor repeatability and stability. The sensor enables precise measurement and control in high performance cleanrooms. The PDT102 transmitter is available with voltage output (3-wire) or current output (2-wire).

### Available options

Online monitoring of PDT102 is simple using the optional process valve actuator and the front access test jacks. The front access test jacks provide online process reference signal or calibration signal without disconnecting power supply wiring. Measurements can be made using a standard multimeter.

### Applications

PDT102 is designed for use in critical monitoring of cleanrooms for pharmaceutical, biotechnology, medical device, and semiconductor controlled manufacturing environments.

# Technical data

## Measurement performance

Measurement ranges (bidirectional)	±50 Pa ±0.25 in H <sub>2</sub> O
Accuracy <sup>1)</sup>	0.25 % span or 0.5 % span, depending on choice
Repeatability for 0.25 % span accuracy	0.03 %
Repeatability for 0.5 % span accuracy	0.05 %
Electrical resolution	1 x 10 <sup>-4</sup> span
Long-term stability	≤0.5 % span/year
Response time (10– 90 %)	250 ms
Warm-up time	15 s
Compensated temperature range	+2 ... +57 °C (+35.6 ... +134.6 °F)
Temperature dependence	±(0.036 Pa + 0.036 % of reading) / °C or ±(0.0001 in H <sub>2</sub> O + 0.02 % of reading) / °F (reference 21 °C or 70 °F)
Pressure type	Differential, gauge, vacuum and compound
<b>Overpressure</b>	
Proof pressure	0.7 bar
Burst pressure	1.7 bar
Static pressure	1.7 bar
<b>Mounting position</b>	
Error (zero adjustable)	≤0.25 %
<b>Adjustments (front accessible)</b>	
Zero	±5 % span
Span	±3 % span

<sup>1)</sup> Incl. non-linearity, hysteresis, repeatability and zero/span calibration settings.

## Inputs and outputs

Process connection	1/8 NPT female according to ANSI/ ASME B1.20.1
Tubing dimensions	Outer dimension (O.D.): 1/8" (3.17 mm)
Operating voltage	12–36 V DC
Max. loop resistance for 4–20 mA	≤ (Supply voltage - 12V)/0.022 A
Electrical connection	Screw terminals, 12– 22 AWG (0.33 up to 3.31 mm <sup>2</sup> )
<b>Output signal</b>	
2-wire	4–20 mA
3-wire	0–5 V
<b>Supply current</b>	
For 0–5 V output	Max. 10 mA
For 4–20 mA output	Max. 20 mA

## Mechanical specifications

Medium (measured gas)	Clean and dry air, non-conducting and non-corrosive gases
Mounting	DIN rail types EN 50022, EN 50035 and EN 50045
Weight	0.16 kg
<b>Material</b>	
Process connection	Brass
Sensor element	Silicon, aluminum, glass
Case	Polycarbonate, glass filled (UL94-V-1)

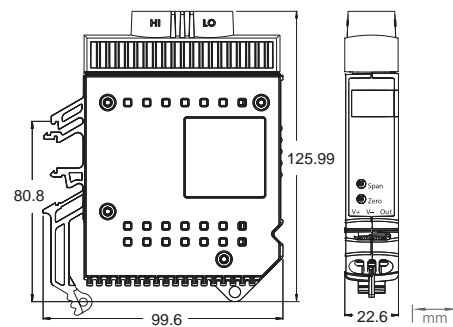
## Operating environment

Operating temperature	–29 ... +70 °C (–20.2 ... +158 °F)
Storage temperature	–40 ... +82 °C (–40 ... +179.6 °F)
IP rating	IP30

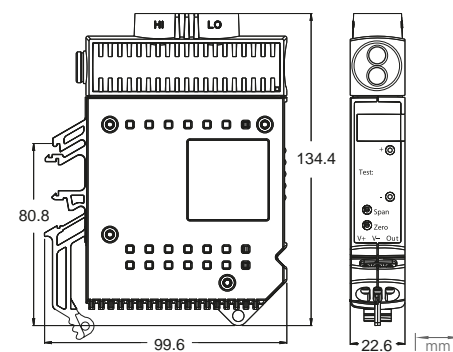
Note: If used in an electromagnetic field of 3 V/m, with narrow frequency area of 80 - 120 MHz, it is possible that the current output of PDT102 can deviate max. 0.3 % (with accuracy specified 0.25 %)

## Compliance

EU directives and regulations	EMC
Electromagnetic compatibility (EMC)	EN 61326-1, basic immunity test requirements
Compliance marks	CE, RCM



PDT102 transmitter dimensions



PDT102 dimensions with process valve actuator and test jacks

## PDT102 - XXXT

Measurement range:  
**P** (+/-50 Pa) or **W** (+/-0.25 in H<sub>2</sub>O) ———— ↑ ↑ ↑ ↑  
 Accuracy: **2** (0.25 % span) or **5** (0.5 % span) ———— ↑ ↑  
 Output: **C** (current) or **V** (voltage) ———— ↑  
 Option: (blank) or **T** ———— ↑

Order information for PDT102

## Polaris™ PR53AC Sanitary Compact Process Refractometer



### Features

- Reliable optical concentration measurements with refractive index
- Brix, Total Solids, Oechsle, Baume, Plato, and more than 500 concentration curves
- 3-A and EHEDG certified
- 3-A and Type N sanitary couplings
- Measurement not affected by bubbles, particles, suspended solids, or color
- Various flow cells available
- Indigo520-compatible
- Built-in 4–20 mA and Modbus RTU outputs

The Vaisala Polaris PR53AC sanitary compact process refractometer is designed to measure liquid concentrations, such as Brix, inline. Applications include food, beverage, dairy and brewery industry customers, and OEMs. 3-A and EHEDG certifications ensure that all hygienic demands and safety requirements are met. Easy to install directly in pipelines with a sanitary clamp and optional flow cells.

### Benefits

The optical measurement is based on the refractive index (RI). The RI can be measured from practically any liquid and it responds to dissolved material. Bubbles, particles, or fibers in the process do not affect measurement. The outstanding long-term stability provides years of accurate, continuous, fast, and stable measurement for concentration of sugar (Brix) and various other chemical concentrations directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance. The PR53AC continues the success of the Vaisala K-PATENTS® process refractometer series. Based on 40 years of experience and continuous development, the PR53 family is the latest generation of digital process refractometers.

### Safe for sanitary applications

The product is compatible with both clean-in-place (CIP) and sterilization-in-place (SIP) systems. The material offering, including stainless-steel wetted parts, PTFE, and sapphire, are all suitable for direct contact with the process with convenient installations directly to process lines with standard sanitary and Type N couplings, or with a sanitary flow cell. Stainless steel is easy to maintain and keep clean, and traceability ensures safety.

### Brix and beyond

Brix is a common measurement unit in the food, dairy, and beverage processing industries. Measurements can also be shown in total solids, Oechsle, Baume, or Plato. Other measurement units include concentration of sucrose, gelatin, lactulose, and hydrogen peroxide. The refractometer comes pre-configured with the selected concentration curve.

### Wash system

Most applications do not need wash systems due to the self-cleaning effect: the shear force of the process flow keeps the measurement point clean. For the most demanding applications, the powerful wash system ensures correct measurement when process conditions are sticky.

### Plug and play to Indigo

The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. It provides access to features such as data storage, graphical interface, and analog and digital interface. The Indigo520 transmitter is required when the application or the installation position requires washing, to control the process. Changing settings, measurement parameters, or other servicing updates can be done directly from the Indigo520, or through a USB cable using Vaisala software.

# Technical data

## Measurement performance

### Refractive index

Measurement range 1.32–1.53 nD  
(Corresponds to 0–100 °Bx)

Accuracy  $\pm 0.00014$  nD (0.1 °Bx)<sup>1)</sup>

Repeatability  $\pm 0.00002$  nD<sup>2)</sup>

Resolution  $\pm 0.000015$  nD

Response time  $T_{63}$  with default damping 10 s<sup>3)</sup>

Measurement cycle 1 / s

Long-term stability Max. 0.1 % full scale / a

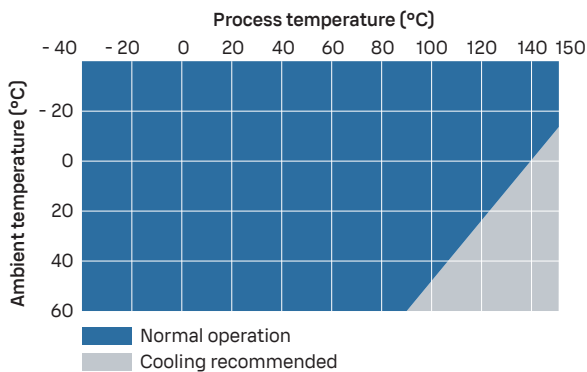
### Temperature

Accuracy at 20 °C (68 °F)  $\pm 0.3$  °C (0.54 °F)<sup>1)</sup>

Sensor class F0.15 IEC 60751

Temperature coefficient  $\pm 0.002$  °C / °C

- 1) Accuracy specified with respect to calibration reference, including non-linearity, hysteresis at +20 °C.
- 2) Repeatability, confidence level  $k=2$ , including random noise, at  $T_a = +20$  °C, with standard low-pass filtering.
- 3) With standard low-pass filtering.



PR53AC process temperature, options Sanitary 2.5" and Type N (indicative)

## Operating environment

### Process parameters

Process temperature -40 ... +150 °C (-40 ... +302 °F)<sup>1)</sup>

Design temperature +180 °C (356 °F)<sup>2)</sup>

Design pressure 40 bar<sup>3)</sup>

### Operating environment

Storage temperature -40 ... +65 °C (-40 ... +149 °F)

Operating temperature -40 ... +60 °C (-40 ... +140 °F)

Maximum operating altitude 2000 m (approx. 6500 ft)

Operating humidity 0–100 %RH

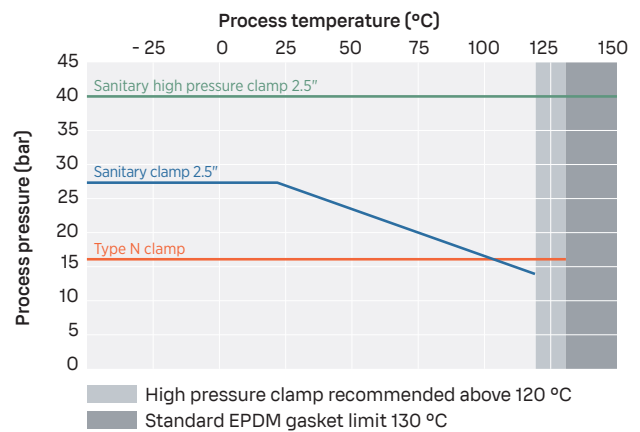
Storage humidity 0–100 %RH, non-condensing

UL 50E/NEMA rating Type 4X

IP rating IP66

IP67

- 1) -40 ... +130 °C (-40 ... 266 °F) EPDM gasket, -40 ... +150 °C (-40 ... +302 °F) PTFE gasket.
- 2) Maximum momentary temperature peak.
- 3) Maximum at +20 °C (68 °F), operating pressure to the clamp rating pressure.



PR53AC process pressure

## Inputs and outputs

### Supply

Operating voltage 24 V DC nominal (9–30 V DC)

Power consumption Less than 1 W

Protection class 3, PELV

### Outputs

Output parameters RI, temperature, concentration, quality factor

### Analog outputs

mA Sourcing, isolated, NAMUR NE 43, configurable

mA range 3.8–20.5 mA

Loop impedance Max. 600 Ω

Accuracy of analog outputs at +20 °C  $\pm 0.1$  % of full scale ( $\pm 0.00002$  RI)

### Digital outputs

Digital output RS-485, non-isolated

Maximum cable run 300 m (approx. 1000 ft) (digital)

Supported protocol Modbus RTU

### Connectors

External connectors 1 × M12 M 4 pins, A-coded<sup>1)</sup>  
2 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5<sup>2)</sup> / NPT 1/2"

- 1) For USB2 adapter and Insight software, see [www.vaisala.com/insight](http://www.vaisala.com/insight).
- 2) Conduit hub is not compatible with SD/IS Safe-Drive system.

## Compliance

Electromagnetic compatibility (EMC) EN 61326-1, industrial environment

Safety IEC/EN/UL 61010-1

Pressure CRN all territories, ASME BPVC Sec VIII Div. 1 Ed. 2021

Material compliance FDA 21 CFR 177.150, 177.2600, 177.1550  
EC 1935/2004  
EC 2023/2006, GMP  
EU 10/2011

Compliance marks CE, China RoHS, RCM, UKCA

Vibration and shock Tested according to IEC 60068-2

Listing marks MET listed (US and Canada)



## Sanitary compliance

Hygienic design	3-A 46-04 EHEDG
Compliance marks	3-A, EHEDG (for EHEDG compliant installation, use 2.5" / 4" sanitary gasket)
Biocompatibility	USP Class VI <88>, 70 °C
ADI free (Animal Derived Ingredients)	Yes

## Mechanical specifications

Wetted parts	
Sensor head	EN 1.4435 BN2 (AISI 316L) <sup>1)</sup>
Surface roughness	Ra 0.8 µm Ra 0.38 µm electropolished <sup>1)</sup>
Prism	Sapphire monocrystalline, 99.996 % Al <sub>2</sub> O <sub>3</sub> <sup>2)</sup>
Prism gasket	Modified PTFE <sup>3)</sup>
Sanitary 2.5" gasket	EPDM <sup>2)</sup>
Type N gasket	EPDM <sup>2)</sup>
Welding ferrule	EN 1.4435 (AISI 316L) <sup>1) 4)</sup> ASME BPE-2019 (DIN 32676-C)
Non-wetted parts	
Housing	EN 1.4404 (AISI 316L)
Screws TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable gland	EN 1.4305 (AISI 303) HUMMEL 1.693.1600.50
Dummy plug	EN 1.4305 (AISI 303) AGRO 8717.96.08.70
Conduit hub	EN 1.4404 (AISI 316L) Vaisala, DRW257718, M16×1.5 / NPT ½ in
M12 connector	Gland, EN 1.4305 (AISI 303) Contacts, CuZn with Ni/Au plating Phoenix Contact, 1405233, M12/4(M), A, 4×0.34 mm <sup>2</sup> , TPE, 0.5 m Carrier, PA 6.6
Sanitary 2.5" clamp	EN 1.4301 (AISI 304) <sup>2)</sup>
Type N Clamp	EN 1.4301 (AISI 304) <sup>2)</sup>
Cable	2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
Weight	2.7 kg (5.95 lb)

1) EN 10204 / 3.1 certificate included.

2) Manufacturer's declaration included.

3) ADI free, FDA 21 C.F.R 177.1550, 3A Sanitary Standard, USP Class VI <88>, 70 °C.

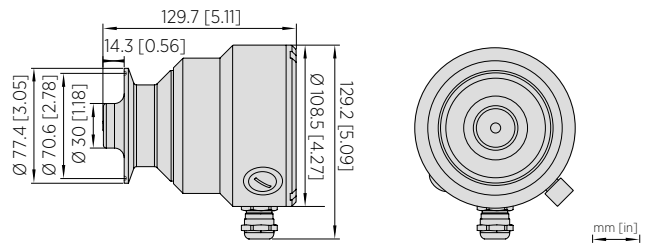
4) 3-A certificate, EHEDG certificate.

## Calibration accessories

Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

## Accessories

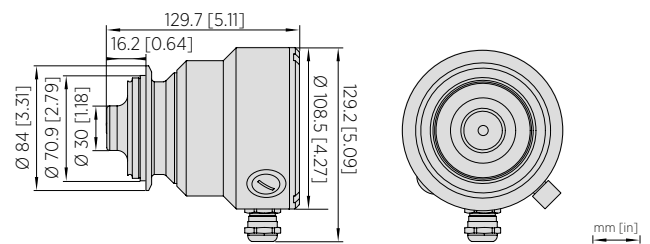
Item	Item code
USB adapter for service port, for Insight service software (see <a href="http://www.vaisala.com/insight">www.vaisala.com/insight</a> )	USB2
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Cooling cover	ASM214675SP



Dimensions for PR53AC Sanitary 2.5"

## Sanitary 2.5" mounting accessories

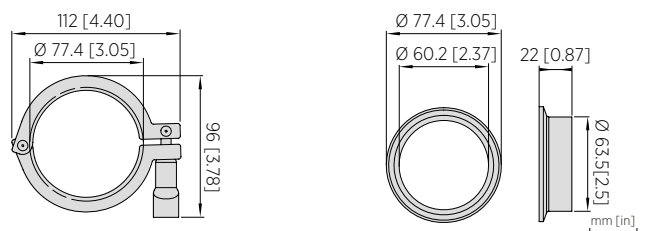
Item
Welding ferrule, 2.5"
Sanitary clamp 2.5"
High-pressure clamp 2.5"
Blind flange 2.5"
Sanitary gasket, 2.5", EPDM
Sanitary gasket, 2.5", EHEDG compliant, PTFE/steel, Combifit VOE-2034 (optional)



Dimensions for PR53AC Type N

## Type N mounting accessories

Item
Type N clamp 2.5", DN 50/40
Type N blind flange
Gasket 59.5×3 mm, EPDM



Mounting kit for PR53AC Sanitary 2.5"

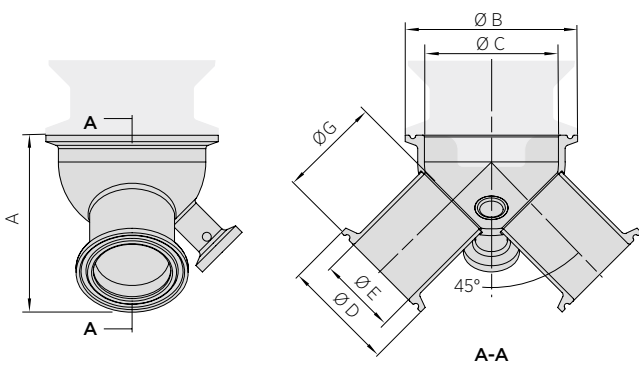
# Flow cells for PR53AC

## Operating pressure

Flow cell model	Max. pressure
SEFC for 1" pipelines	27 bar at 20 °C 13.8 bar at 120 °C
SEFC for 1,5" pipelines	25 bar
SEFC for 2" pipelines	20 bar
SEFC for 2.5" pipelines	15 bar
SEFCL for 3" pipelines	12.5 bar
SEFCL for 4" pipelines	10 bar
MFC	27 bar at 20 °C 13.8 bar at 120 °C

## SEFC Sanitary Elbow Flow Cell, dimensions

Dimension	1"	1½"	2"	2½"
A	65.7 mm (2.59 in)	79.6 mm (3.13 in)	97.5 mm (3.84 in)	115.7 mm (4.56 in)
ØB	77.4 mm (3.05 in)	77.4 mm (3.05 in)	77.4 mm (3.05 in)	77.4 mm (3.05 in)
ØC	60.2 mm (2.37 in)	60.2 mm (2.37 in)	60.2 mm (2.37 in)	60.2 mm (2.37 in)
ØD	50.4 mm (1.98 in)	50.4 mm (1.98 in)	63.9 mm (2.52 in)	77.4 mm (3.05 in)
ØE	22.1 mm (0.87 in)	34.8 mm (1.37 in)	47.5 mm (1.87 in)	60.2 mm (2.37 in)
ØG	21.7 mm (0.85 in)	44.9 mm (1.77 in)	41.9 mm (1.65 in)	64.8 mm (2.55 in)



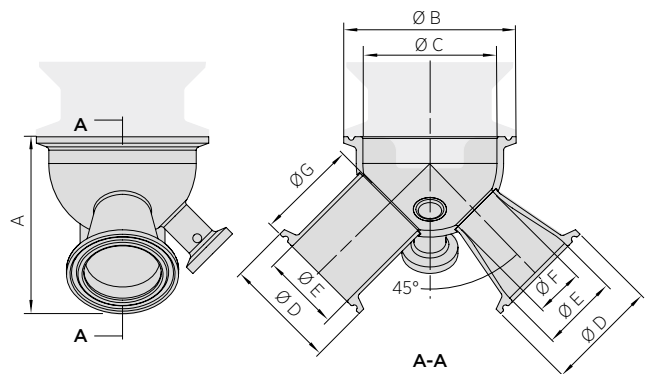
SEFC Sanitary Elbow Flow Cell

## SEFC Sanitary Elbow Flow Cell

Item
SEFC Sanitary Elbow Flow Cell, DIN 32676-C sanitary coupling
Wetted parts
Sanitary coupling 1", reduced inlet for < 1.5 m/s flow rate
Sanitary coupling 1.5", reduced inlet for < 1.5 m/s flow rate
Sanitary coupling 2.5", reduced inlet for < 1.5 m/s flow rate
Sanitary coupling 1"
Sanitary coupling 1.5"
Sanitary coupling 2.5"
Wash nozzle
No wash nozzle option
Steam wash nozzle
Water wash nozzle
Pressurized water wash nozzle
Documentation
EN 1024 3.1 material certificate included
Material: EN 1.4435
Other variants, surface treatments and special materials available on request

## SEFC Sanitary Elbow Flow Cell reduced inlet, dimensions

Dimension	1"	1½"	2"
A	65.7 mm (2.59 in)	79.6 mm (3.13 in)	97.5 mm (3.84 in)
ØB	77.4 mm (3.05 in)	77.4 mm (3.05 in)	77.4 mm (3.05 in)
ØC	60.2 mm (2.37 in)	60.2 mm (2.37 in)	60.2 mm (2.37 in)
ØD	50.4 mm (1.98 in)	50.4 mm (1.98 in)	63.9 mm (2.52 in)
ØE	22.1 mm (0.87 in)	34.8 mm (1.37 in)	47.5 mm (1.87 in)
ØF	16 mm (0.63 in)	22.1 mm (0.87 in)	34.8 mm (1.37 in)
ØG	21.7 mm (0.85 in)	44.9 mm (1.77 in)	41.9 mm (1.65 in)



SEFC Sanitary Elbow Flow Cell, reduced inlet

## SEFCL Sanitary Elbow Flow Cell, for Large Pipelines

### Item

SEFCL Sanitary Elbow Flow Cell, for Large Pipelines

### Wetted parts

Sanitary coupling 3"

Sanitary coupling 4"

### Wash nozzle

No wash nozzle option

Steam wash nozzle

Water wash nozzle

Pressurized water wash nozzle

### Documentation

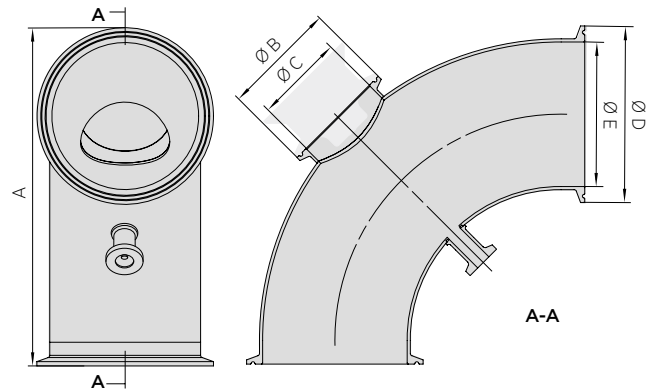
Material certificate included

Material: AISI 316L

Other variants, surface treatments and special materials available on request

## SEFCL Sanitary Elbow Flow Cell, for Large Pipelines, dimensions

Dimension	3"	4"
A	172.5 mm (6.79 in)	227.8 mm (8.97 in)
ØB	77.9 mm (3.07 in)	77.9 mm (3.07 in)
ØC	60.2 mm (2.37 in)	60.2 mm (2.37 in)
ØD	90.9 mm (3.58 in)	118.9 mm (4.68 in)
ØE	72.9 mm (2.87 in)	97.4 mm (3.83 in)



SEFCL Sanitary Elbow Flow cell, Large (3 in)

## MFC Miniature Flow Cell

### Item

MFC Miniature Flow Cell

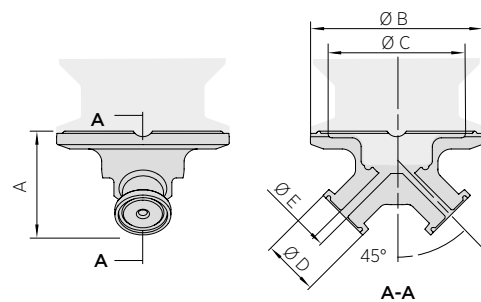
Material: EN 1.4435, EN 1024 3.1 material certificate included

Wetted surface Ra: Electropolished 0.4 um, batch traceable, certificate included

Other variants, surface treatments and special materials available on request

## MFC Miniature Flow Cell, dimensions

Dimension	4 mm	5 mm	6 mm
A	46.6 mm (1.83 in)	46.6 mm (1.83 in)	46.6 mm (1.83 in)
ØB	77.5 mm (3.05 in)	77.5 mm (3.05 in)	77.5 mm (3.05 in)
ØC	61.6 mm (2.43 in)	61.6 mm (2.43 in)	61.6 mm (2.43 in)
ØD	25 mm (0.98 in)	25 mm (0.98 in)	25 mm (0.98 in)
ØE	4 mm (0.16 in)	5 mm (0.2 in)	6 mm (0.24 in)



MFC Miniature Flow Cell

## Flow cell accessories for MFC

### Item

Gasket 22.2×3.0 mm EPDM

Sanitary clamp 0.5"

## Polaris™ PR53AP Sanitary Probe Process Refractometer



### Features

- Reliable optical concentration measurements with refractive index
- Brix, Total Solids, Oechsle, Baume, Plato, and more than 500 concentration curves
- 3-A and EHEDG certified
- Sanitary and tank bottom flange couplings
- Measurement not affected by bubbles, particles, suspended solids, or color
- Indigo520-compatible
- Built-in 4–20 mA and Modbus RTU outputs

### Benefits

The optical measurement is based on the refractive index (RI). The RI can be measured from practically any liquid, and it responds to dissolved material. The long probe allows representative measurement in tanks and hot processes, such as jam cooking.

The outstanding long-term stability provides years of accurate, continuous, fast, and stable measurement for concentration of sugar (Brix) and various other chemical concentrations directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

The PR53AP continues the success of the Vaisala K-PATENTS® process refractometer series. Based on 40 years of experience and continuous development, the PR53 family is the latest generation of digital process refractometers.

### Safe for sanitary applications

The product design welcomes both cleaning-in-place (CIP) and sterilization-in-place (SIP) systems. Stainless-steel wetted parts, PTFE and sapphire, are suitable to be in direct contact with the process, and traceability ensures safety. Stainless steel is easy to maintain and keep clean. The long probe with common tank bottom flanges enables installation depths of up to 170 mm. The flush mount option allows installation in tanks with scrapers or mixers.

### Brix and beyond

Brix is a common measurement unit in the food, dairy, and beverage processing industries. Measurements can also be shown in total solids, Oechsle, Baume, or Plato. Other measurement units include concentration of sucrose, gelatin, lactulose, and hydrogen peroxide. The refractometer comes pre-configured with the selected concentration curve.

### Wash system

Most applications do not need wash systems due to the self-cleaning effect: the shear force of the process flow keeps the measurement point clean. For the most demanding applications, the powerful wash system ensures correct measurement when process conditions are sticky.

### Plug and play to Indigo

The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. It provides access to features such as data storage, graphical interface, and analog and digital interface. The Indigo520 transmitter is required when the application or the installation position requires washing, to control the process. Changing settings, measurement parameters, or other servicing updates can be done directly from the Indigo520, or through a USB cable using Vaisala software.

# Technical data

## Measurement performance

### Refractive index

Measurement range 1.32-1.53 nD  
(Corresponds to 0-100 °Bx)

Accuracy  $\pm 0.00014$  nD (0.1 °Bx) <sup>1)</sup>

Repeatability  $\pm 0.00002$  nD <sup>2)</sup>

Resolution  $\pm 0.000015$  nD

Response time  $T_{63}$  with default damping 10 s <sup>3)</sup>

Measurement cycle 1 / s

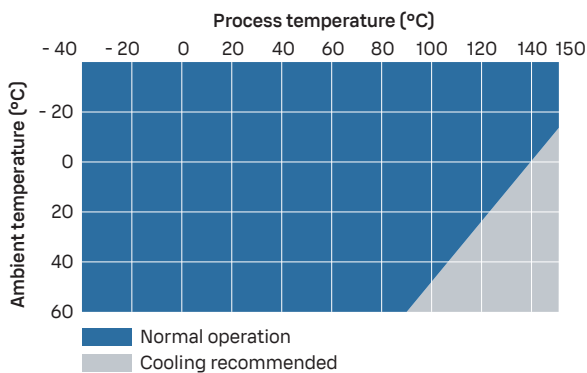
Long-term stability Max. 0.1 % full scale / a

### Temperature

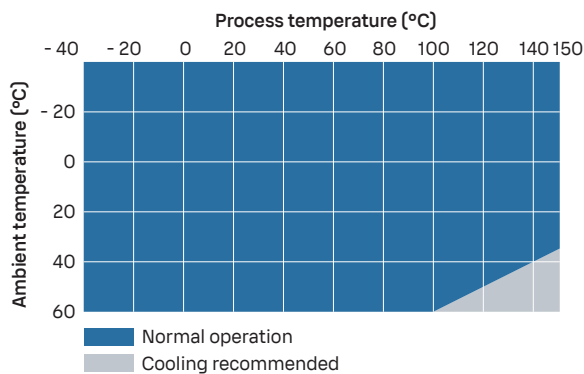
Accuracy at 20 °C (68 °F)  $\pm 0.3$  °C (0.54 °F) <sup>1)</sup>

Sensor class F0.15 IEC 60751

Temperature coefficient  $\pm 0.002$  °C / C



PR53AP, depth 170 mm process temperature (indicative)



PR53AP, depth 42 mm and 66 mm process temperature (indicative)

## Operating environment

### Process parameters

Process temperature -40 ... +150 °C (-40 ... +302 °F) <sup>1)</sup>

Design temperature +180 °C (356 °F) <sup>2)</sup>

Design pressure 40 bar <sup>3)</sup>

### Operating environment

Storage temperature -40 ... +65 °C (-40 ... +149 °F)

Operating temperature -40 ... +60 °C (-40 ... +140 °F)

Maximum operating altitude 2000 m (approx. 6500 ft)

Operating humidity 0-100 %RH

Storage humidity 0-100 %RH, non-condensing

UL 50E/NEMA rating Type 4X

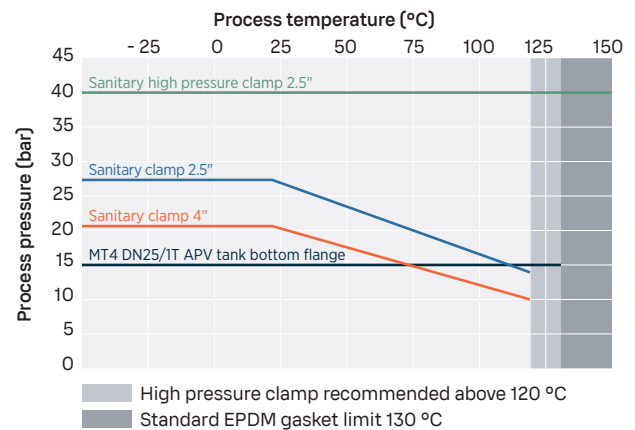
IP rating IP66

IP67

<sup>1)</sup> -40 ... +130 °C (-40 ... 266 °F) EPDM gasket, -40... +150 °C (-40 ... +302 °F) PTFE gasket

<sup>2)</sup> Maximum momentary temperature peak.

<sup>3)</sup> Maximum at +20 °C (68 °F), operating pressure to the clamp rating pressure.



PR53AP process pressure

## Inputs and outputs

### Supply

Operating voltage 24 V DC nominal (9-30 V DC)

Power consumption Less than 1 W

Protection class 3, PELV

### Outputs

Output parameters RI, temperature, concentration, quality factor

### Analog outputs

mA Sourcing, isolated, NAMUR NE 43, configurable

mA range 3.8-20.5 mA

Loop impedance Max. 600 Ω

Accuracy of analog outputs at +20 °C  $\pm 0.1$  % of full scale ( $\pm 0.00002$  RI)

### Digital outputs

Digital output RS-485, non-isolated

Maximum cable run 300 m (approx. 1000 ft) (digital)

Supported protocol Modbus RTU

### Connectors

External connectors 1 × M12 M 4 pins, A-coded <sup>1)</sup>  
2 × M16×1.5 cable gland, Cable D 5-10 mm / Adapter for conduit entry M16×1.5 <sup>2)</sup> / NPT ½"

## Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Safety	IEC/EN/UL 61010-1
Pressure	CRN all territories, ASME BPVC Sec VIII Div. 1 Ed. 2021
Material compliance	FDA 21 CFR 177.150, 177.2600, 177.1550 EC 1935/2004 EC 2023/2006, GMP EU 10/2011
Compliance marks	CE, China RoHS, RCM, UKCA
Vibration and shock	Tested according to IEC 60068-2
Listing marks	MET listed (US and Canada)

## Sanitary compliance

Hygienic design	3-A 46-04 EHEDG <sup>1)</sup>
Compliance marks	3-A, EHEDG <sup>2)</sup>
Biocompatibility	USP Class VI <88>, 70 °C
ADI free (Animal Derived Ingredients)	Yes

<sup>1)</sup> Excluding tank bottom flange.

<sup>2)</sup> For EHEDG compliant installation, use 2.5" / 4" sanitary gasket.

## Calibration accessories

Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

## Mechanical specifications

Wetted parts	
Sensor head	EN 1.4435 BN2 (AISI 316L) <sup>1)</sup>
Wash nozzle	EN 1.4404 (AISI316L) <sup>1)</sup> EPDM gasket <sup>2)</sup>
Surface roughness	Ra 0.8 µm
Prism	Sapphire monocrystalline, 99.996 % Al <sub>2</sub> O <sub>3</sub> <sup>2)</sup>
Prism gasket	Modified PTFE <sup>3)</sup>
Sanitary gasket 2.5" / 4"	EPDM <sup>2)</sup>
Tank bottom gasket MT4 DN25/1T for tank bottom flange	EPDM <sup>2)</sup>
Tank bottom flange	AISI316L <sup>1)</sup>
Welding ferrule	EN 1.4435 (AISI 316L) <sup>1) 4)</sup>
Non-wetted parts	
Housing	EN 1.4404 (AISI 316L)
Screws, TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable gland	EN 1.4305 (AISI 303) HUMMEL 1.693.1600.50
Dummy plug	EN 1.4305 (AISI 303) AGRO 8717.96.08.70
Conduit hub	EN 1.4404 (AISI 316L) Vaisala, DRW257718, M16×1.5 / NPT ½ in
M12 connector	Gland, EN 1.4305 (AISI 303) Contacts, CuZn with Ni/Au plating Phoenix Contact, 1405233, M12/4(M), A, 4×0.34 mm <sup>2</sup> , TPE, 0.5 m Carrier, PA 6.6
Sanitary clamp 2.5" / 4"	EN 1.4301 (AISI 304) <sup>2)</sup>
Cable	2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, black 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
<b>Weight</b>	3.6–4.2 kg (7.94–9.26 lb)

<sup>1)</sup> Material certificate included.

<sup>2)</sup> Manufacturer's declaration included.

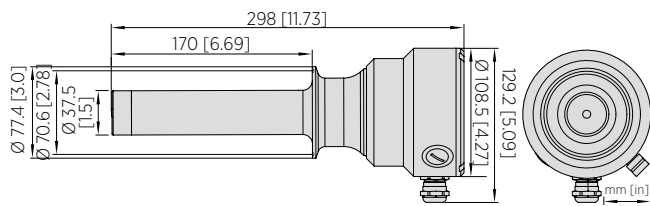
<sup>3)</sup> ADI free, FDA 21 C.F.R. 177.1550, 3A Sanitary Standard, USP Class VI <88>, 70 °C.

<sup>4)</sup> 3-A certificate, EHEDG certificate.

## Accessories

Item	Item code
USB adapter for service port, for Insight service software (see <a href="http://www.vaisala.com/insight">www.vaisala.com/insight</a> )	USB2
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Cooling cover	ASM214675SP

# Options for PR53AP

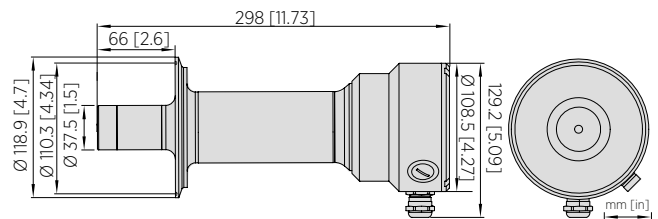


Dimensions of PR53AP Sanitary 2.5", depth 170 mm

## Mounting accessories for PR53AP Sanitary 2.5", depth 170 mm

**Item**

- Welding ferrule, 2.5"
- Sanitary clamp 2.5"
- Blind flange 2.5"
- Sanitary gasket 2.5", EPDM
- Sanitary gasket 2.5", PTFE/steel, Combifit VOE-2034 (EHEDG)

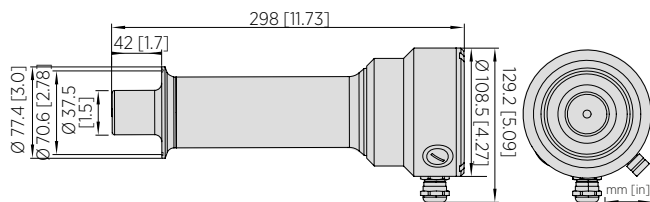


Dimensions of PR53AP Sanitary 4", depth 66 mm

## Mounting accessories for PR53AP Sanitary 4", depth 66 mm

**Item**

- Welding ferrule, 4"
- Sanitary clamp 4"
- Blind flange 4"
- Sanitary gasket 4", EPDM
- Sanitary gasket 4", PTFE/steel, Combifit VOE-2036 (EHEDG)

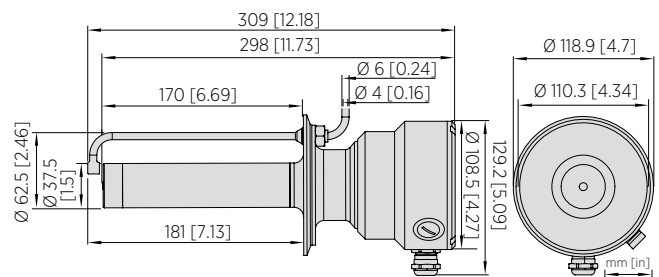


Dimensions of PR53AP Sanitary 2.5", depth 42 mm

## Mounting accessories for PR53AP Sanitary 2.5", depth 42 mm

**Item**

- Welding ferrule, 2.5"
- Sanitary clamp 2.5"
- Blind flange 2.5"
- Sanitary gasket 2.5", EPDM
- Sanitary gasket 2.5", PTFE/steel, Combifit VOE-2034 (EHEDG)

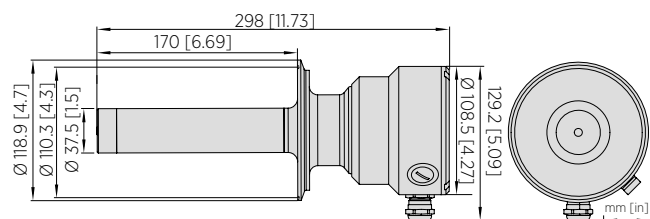


Dimensions of PR53AP Sanitary 4", depth 170 mm, with wash nozzle

## Mounting accessories for PR53AP Sanitary 4", depth 170 mm, with wash nozzle

**Item**

- Welding ferrule, 4"
- Sanitary clamp 4"
- Blind flange 4"
- Sanitary gasket 4", EPDM
- Sanitary gasket 4", PTFE/steel, Combifit VOE-2036 (EHEDG)



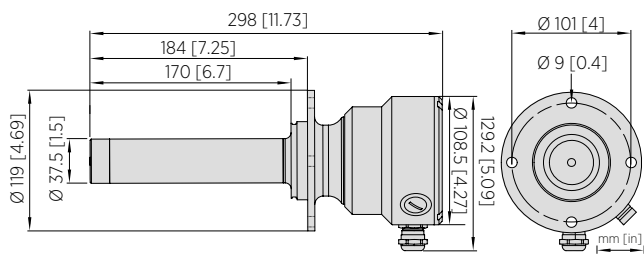
Dimensions of PR53AP Sanitary 4", depth 170 mm

## Mounting accessories for PR53AP Sanitary 4", depth 170 mm

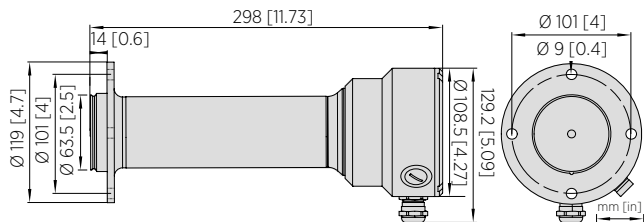
**Item**

- Welding ferrule, 4"
- Sanitary clamp 4"
- Blind flange 4"
- Sanitary gasket 4", EPDM
- Sanitary gasket 4", PTFE/steel, Combifit VOE-2036 (EHEDG)

# Options for PR53AP



Dimensions of PR53AP tank bottom flange, depth 170 mm



Dimensions of PR53AP tank bottom flange, flush mounted

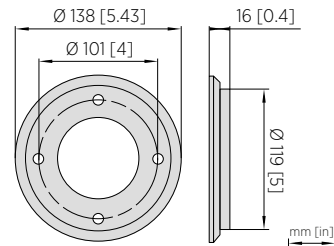
## Mounting accessories for PR53AP tank bottom flange, depth 170 mm and tank bottom flange, flush mounted

### Item

Tank bottom welding flange

Tank bottom blind flange

Gasket MT4 DN25/1T EPDM



Dimensions of PR53AP tank bottom welding flange



## Polaris™ PR53GC Compact Process Refractometer



### Features

- Reliable optical concentration measurements with refractive index
- Sulfuric acid, sodium hydroxide, and more than 500 concentration curves
- Special alloy materials available for demanding environments
- Type L coupling
- Measurement not affected by bubbles, particles, suspended solids, or color
- Various flow cells available
- Indigo520-compatible
- Built-in 4–20 mA and Modbus RTU outputs

### Benefits

The optical measurement is based on the refractive index (RI). The RI can be measured from practically any liquid or slurry, and it responds to dissolved material. Bubbles, particles, or fibers in the process do not affect measurement.

The outstanding long-term stability provides years of accurate, continuous, fast, and stable concentration measurement directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

The PR53GC continues the success of the Vaisala K-PATENTS® process refractometer series. Based on 40 years of experience and continuous development, the PR53 family is the latest generation in the digital process refractometers.

### Accurate and reliable

The optical measurement principle offers accurate and drift-free measurement. Because temperature measurement is incorporated inside the process refractometer, the changing process temperature does not affect the concentration measurement.

### Easy mounting

Type L clamp connections allow easy installation directly into the process line. The unit can also be installed into a flange-mounted flow cell, which enables the use of an additional wash system for applications where prism wash is required.

Selected alloy materials provide durability under challenging process conditions. Other special materials and engineered solutions are available upon request.

### Plug and play to Indigo

The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. It provides access to features such as data storage, graphical interface, and analog and digital interface. The Indigo520 transmitter is required when the application or the installation position requires washing, to control the process. Changing settings, measurement parameters, or other servicing updates can be done directly from the Indigo520, or through a USB cable using Vaisala software.

# Technical data

## Measurement performance

### Refractive index

Measurement range 1.32–1.53 nD  
(Corresponds to 0–100 °Bx)

Accuracy  $\pm 0.00014$  nD (0.1 °Bx)<sup>1)</sup>

Repeatability  $\pm 0.00002$  nD<sup>2)</sup>

Resolution  $\pm 0.000015$  nD

Response time  $T_{63}$  with default damping 10 s<sup>3)</sup>

Measurement cycle 1 / s

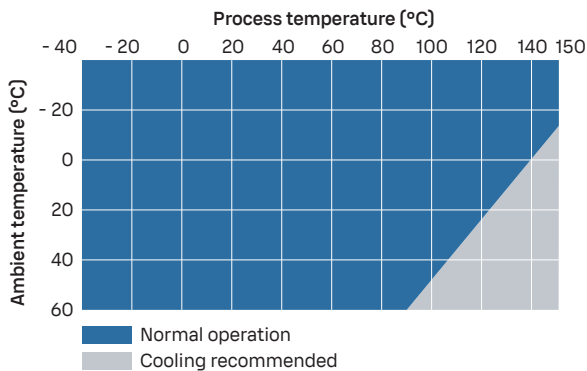
Long-term stability Max. 0.1 % full scale / a

### Temperature

Accuracy at 20 °C (68 °F)  $\pm 0.3$  °C (0.54 °F)<sup>1)</sup>

Sensor class F0.15 IEC 60751

Temperature coefficient  $\pm 0.002$  °C / °C



PR53GC process temperature (indicative)

## Operating environment

### Process parameters

Process temperature -40 ... +150 °C (-40 ... +302 °F)

Design temperature +180 °C (356 °F)<sup>1)</sup>

### Operating environment

Storage temperature -40 ... +65 °C (-40 ... +149 °F)

Operating temperature -40 ... +60 °C (-40 ... +140 °F)

Maximum operating altitude 2000 m (approx. 6500 ft)

Operating humidity 0–100 %RH

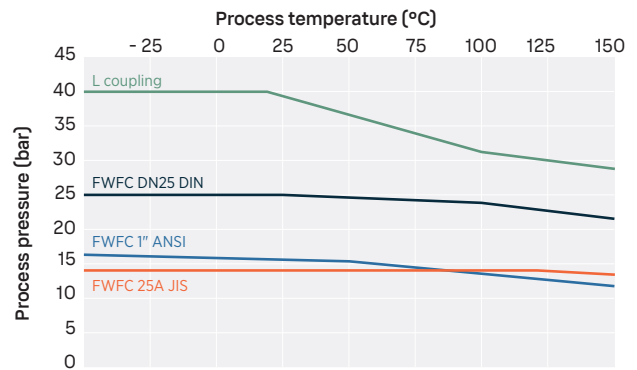
Storage humidity 0–100 %RH, non-condensing

UL 50E/NEMA rating Type 4X

IP rating IP66

IP67

1) Maximum momentary temperature peak.



PR53GC process pressure

## Inputs and outputs

### Supply

Operating voltage 24 V DC nominal (9–30 V DC)

Power consumption Less than 1 W

Protection class 3, PELV

### Outputs

Output parameters RI, temperature, concentration, quality factor

### Analog outputs

mA Sourcing, isolated, NAMUR NE 43, configurable

mA range 3.8–20.5 mA

Loop impedance Max. 600 Ω

Accuracy of analog outputs at +20 °C  $\pm 0.1$  % of full scale ( $\pm 0.00002$  RI)

### Digital outputs

Digital output RS-485, non-isolated

Maximum cable run 300 m (approx. 1000 ft) (digital)

Supported protocol Modbus RTU

### Connectors

External connectors 1 × M12 M 4 pins, A-coded<sup>1)</sup>  
2 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5<sup>2)</sup> / NPT ½"

1) For USB2 adapter and Insight software, see [www.valisala.com/insight](http://www.valisala.com/insight).

2) Conduit hub is not compatible with SD/IS Safe-Drive system.

## Compliance

Electromagnetic compatibility (EMC) EN 61326-1, industrial environment

Safety IEC/EN/UL 61010-1

Pressure CRN all territories, ASME BPVC Sec VIII Div. 1 Ed. 2021

Compliance marks CE, China RoHS, RCM, UKCA

Vibration and shock Tested according to IEC 60068-2

## Mechanical specifications

Wetted parts	
Sensor head	EN 1.4404 (AISI 316L) EN 2.4660 (Alloy 20) EN 2.4819 (Alloy C276) 1)
Surface roughness	Ra 0.8 µm
Prism	Sapphire monocrystalline, 99.996 % Al <sub>2</sub> O <sub>3</sub> 2)
Prism gasket	Modified PTFE 2)
L coupling gasket	PTFE 2)
Welding ferrule	EN 1.4404 (AISI 316L) EN 2.4660 (Alloy 20) EN 2.4819 (Alloy C276) 2)
Non-wetted parts	
Housing	EN 1.4404 (AISI 316L)
Screws, TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable gland	EN 1.4305 (AISI 303) HUMMEL 1.693.1600.50
Dummy plug	EN 1.4305 (AISI 303) AGRO 8717.96.08.70
Conduit hub	EN 1.4404 (AISI 316L) Vaisala, DRW257718, M16×1.5 / NPT ½ in
M12 connector	Gland, EN 1.4305 (AISI 303) Contacts, CuZn with Ni/Au plating Phoenix Contact, 1405233, M12/4(M), A, 4×0.34 mm <sup>2</sup> , TPE, 0.5 m Carrier, PA 6.6
L coupling clamp (60.3 mm)	EN 1.4301 (AISI 304) 2)
Cable	2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
<b>Weight</b>	2.7 kg (5.95 lb)

- 1) Material certificate included.  
2) Manufacturer's declaration included.

## Mounting accessories

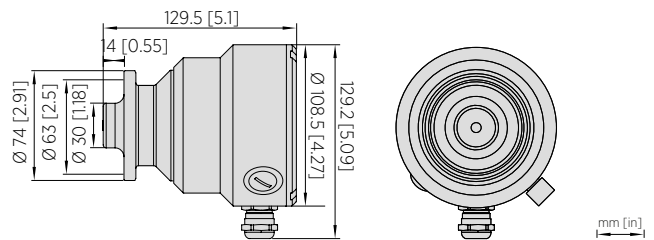
Item
L coupling clamp 60.3 mm (23.7 in)
L coupling ferrule 60.3 mm (23.7 in)
L coupling blind flange 60.3 mm (23.7 in)
L coupling gasket 60.3 mm (23.7 in)

## Accessories

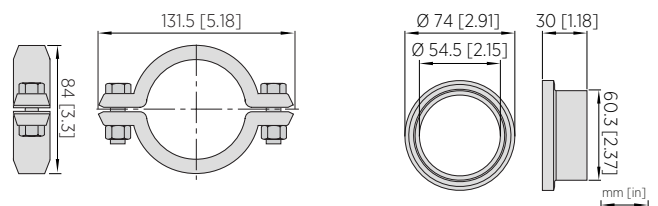
Item	Item code
USB adapter for service port, for Insight service software (see <a href="http://www.vaisala.com/insight">www.vaisala.com/insight</a> )	USB2
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Cooling cover	ASM214675SP

## Calibration accessories

Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

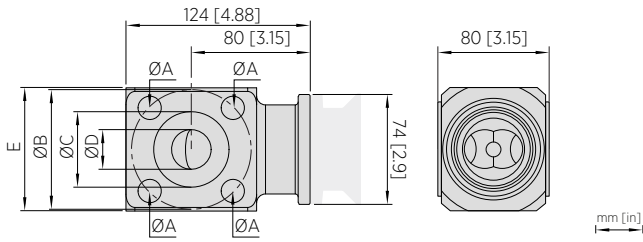


### Dimensions of PR53GC



### Dimensions of PR53GC L coupling clamp

# Flow cells for PR53GC



FWFC Flange Wafer Flow Cell

## Dimensions FWFC Flange Wafer Flow Cell

Dimension	ANSI	DIN	JIS
ØA	15.7 mm (0.62 in)	14 mm (0.55 in)	19 mm (0.75 in)
ØB	79.2 mm (3.12 in)	85 mm (3.35 in)	90 mm (3.54 in)
ØC	50.8 mm (2 in)	68 mm (2.68 in)	68 mm (2.68 in)
ØD	26.7 mm (1.05 in)	28.5 mm (1.12 in)	28.5 mm (1.12 in)
E	83 mm (3.27 in)	83 mm (3.27 in)	89 mm (3.50 in)

## FWFC Flange Wafer Flow Cell

### Item

#### Wetted parts

DIN flange DN25

ANSI flange 1"

JIS flange DN25

#### Length

Length 84 mm (3.3 in)

#### Wash nozzle

No wash nozzle, plugged

Steam wash nozzle

Water wash nozzle

Pressurized water wash nozzle

#### Documentation

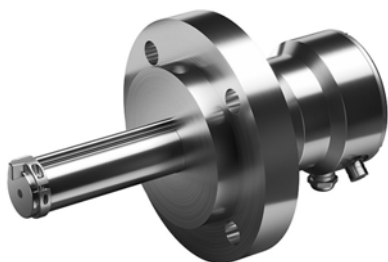
Material EN 1024 3.1 certificate included

Material: EN 1.4404 <sup>1)</sup>

Other variants, surface treatments and special materials available on request.

<sup>1)</sup> 3.1 material declaration included

## Polaris™ PR53GP Probe Process Refractometer



### Features

- Reliable optical concentration measurements with refractive index
- Sulfuric acid, sodium hydroxide, and more than 500 concentration curves
- Special alloy materials available for demanding environments
- Clamp and flange connections available
- Measurement not affected by bubbles, particles, suspended solids, or color
- Indigo520-compatible
- Built-in 4–20 mA and Modbus RTU outputs

### Benefits

The optical measurement is based on the refractive index (RI). The RI can be measured from practically any liquid, and it responds to dissolved material.

Because bubbles, particles, or crystals in the process do not affect measurement, the RI allows accurate measurement for different chemicals. Typical applications include crystallizers, wet scrubbers, reactors, transport pipelines, blending, and distillation operations.

The outstanding long-term stability provides years of accurate, continuous, fast, and stable concentration measurement directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance. The PR53GP continues the success of the Vaisala K-PATENTS® process refractometer series. Based on 40 years of experience and continuous development, the PR53 family is the latest generation of the digital process refractometers.

### Accurate and reliable

The optical measurement principle offers accurate and drift-free measurement. Because temperature measurement is incorporated inside the process refractometer, the changing process temperature does not affect the concentration measurement.

### Easy mounting

The PR53GP can be installed in standard flanges, making it easy to mount to process line. With the optional cooling cover accessory, the instrument tolerates

high process pressures and temperatures. The optional flange-mounted pipe flow cell installation accessory allows flange-mounted installation in a wide variety of pipe sizes. Selected alloy materials provide durability under challenging process conditions. Other special materials and engineered solutions are available upon request.

### Wash system

Most applications do not need wash systems due to the self-cleaning effect: the shear force of the process flow keeps the measurement point clean. For the most demanding applications, the powerful wash system ensures correct measurement when process conditions are sticky.

### Plug and play to Indigo

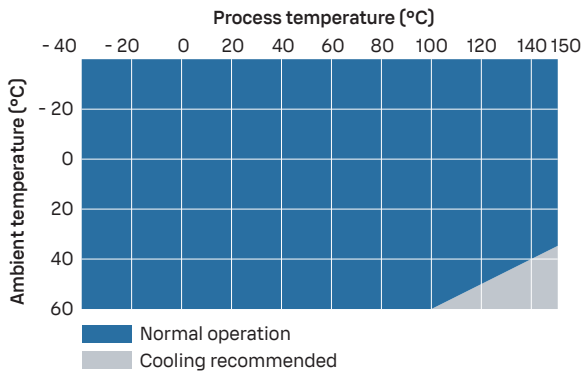
The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. It provides access to features such as data storage, graphical interface, and analog and digital interface. The Indigo520 transmitter is required when the application or the installation position requires washing, to control the process. Changing settings, measurement parameters, or other servicing updates can be done directly from the Indigo520, or through a USB cable using Vaisala software.

# Technical data

## Measurement performance

Refractive index	
Measurement range	1.32–1.53 nD (Corresponds to 0–100 °Bx)
Accuracy	±0.00014 nD (0.1 °Bx) <sup>1) 2)</sup>
Repeatability	±0.00002 nD <sup>3)</sup>
Resolution	±0.000015 nD
Response time T <sub>63</sub> with default damping	10 s <sup>4)</sup>
Measurement cycle	1 / s
Long-term stability	Max. 0.1 % full scale / a
Temperature	
Accuracy at 20 °C (68 °F)	±0.3 °C (0.54 °F) <sup>1)</sup>
Sensor class	F0.15 IEC 60751
Temperature coefficient	±0.002 °C / °C

- 1) Accuracy specified with respect to calibration reference, including non-linearity, hysteresis at +20 °C.  
 2) VD algorithm accuracy is 0.00030.  
 3) Repeatability, confidence level k=2, including random noise, at T<sub>a</sub> = +20 °C, with standard low-pass filtering.  
 4) With standard low-pass filtering.

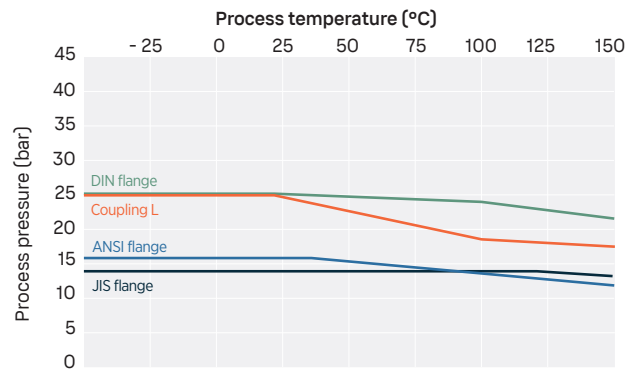


PR53GP process temperature (indicative)

## Operating environment

Process parameters	
Process temperature	-40 ... +150 °C (-40 ... +302 °F)
Design temperature	+180 °C (+356 °F) <sup>1)</sup>
Design pressure	40 bar <sup>2)</sup>
Operating environment	
Storage temperature	-40 ... +65 °C (-40 ... +149 °F)
Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Maximum operating altitude	2000 m (approx. 6500 ft)
Operating humidity	0–100 %RH
Storage humidity	0–100 %RH, non-condensing
UL 50E/NEMA rating	Type 4X
IP rating	IP66 IP67

- 1) Maximum momentary temperature peak.  
 2) Maximum at +20 °C, operating pressure to the process connection rating pressure.



PR53GP process pressure

## Inputs and outputs

Supply	
Operating voltage	24 V DC nominal (9–30 V DC)
Power consumption	Less than 1 W
Protection class	3, PELV
Outputs	
Output parameters	RI, temperature, concentration, quality factor
Analog outputs	
mA	Sourcing, isolated, NAMUR NE 43, configurable
mA range	3.8–20.5 mA
Loop impedance	Max. 600 Ω
Accuracy of analog outputs at +20 °C	±0.1 % of full scale (±0.00002 RI)
Digital outputs	
Digital output	RS-485, non-isolated
Maximum cable run	300 m (approx. 1000 ft) (digital)
Supported protocol	Modbus RTU
Connectors	
External connectors	1 × M12 M 4 pins, A-coded <sup>1)</sup> 2 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5 <sup>2)</sup> / NPT ½"

## Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Safety	IEC/EN/UL 61010-1
Pressure	CRN all territories, ASME BPVC Sec VIII Div. 1 Ed. 2021
Compliance marks	CE, China RoHS, RCM, UKCA
Vibration and shock	Tested according to IEC 60068-2

## Mechanical specifications

Wetted parts	
Sensor head	EN 1.4404 (AISI 316L) <sup>1)</sup>
Surface roughness	Ra 0.8 µm
Prism	Sapphire monocrystalline, 99.996 % Al <sub>2</sub> O <sub>3</sub> <sup>2)</sup>
Prism gasket	Modified PTFE <sup>2)</sup>
L coupling gasket	PTFE <sup>2)</sup>
L coupling welding ferrule	EN 1.4404 (AISI 316L) <sup>1)</sup>
Wash nozzle parts	EN 1.4404 (AISI 316L) <sup>1)</sup>
Non-wetted parts	
Housing	EN 1.4404 (AISI 316L)
Screws TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable gland	EN 1.4305 (AISI 303) HUMMEL 1.693.1600.50
Dummy plug	EN 1.4305 (AISI 303) AGRO 8717.96.08.70
Conduit hub	EN 1.4404 (AISI 316L) Vaisala, DRW257718, M16×1.5 / NPT ½ in
M12 connector	Gland, EN 1.4305 (AISI 303) Contacts, CuZn with Ni/Au plating Phoenix Contact, 1405233, M12/4(M), A, 4×0.34 mm <sup>2</sup> , TPE, 0.5 m Carrier, PA 6.6
Flange	EN 1.4404 (AISI 316L) Dimensioning and tolerances as per ASME B16.5, DIN 2543, JIS B2220
L coupling clamp, 88.9 mm	EN 1.4301 (AISI 304)
Cable	2×2×0.5 mm <sup>2</sup> (21 AWG) PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
Weight	PR53GP 2" flange 7.2 kg (15.87 lb) - 7.7 kg (16.98 lb) PR53GP 3" flange 10.5 kg (23.15 lb) - 11.7 kg (25.79 lb) PR53 L coupling 5.1 kg (11.24 lb)

1) Material certificate included.

2) Manufacturer's declaration included.

## Mounting accessories

Item
L coupling clamp D 88.9 mm
L coupling ferrule 88.9 / 3.6 mm PN25
L coupling blind flange 88.9 mm
L coupling gasket 88.9 / 84 mm

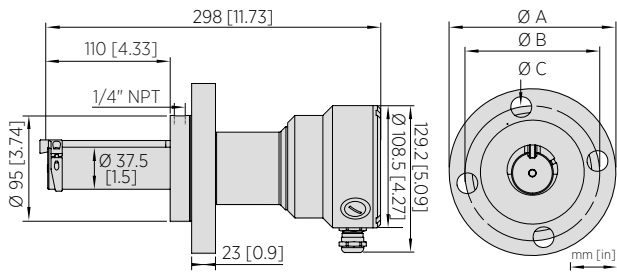
## Accessories

Item	Item code
USB adapter for service port, for Insight service software (see <a href="http://www.vaisala.com/insight">www.vaisala.com/insight</a> )	USB2
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Cooling cover	ASM214675SP

## Calibration accessories

Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

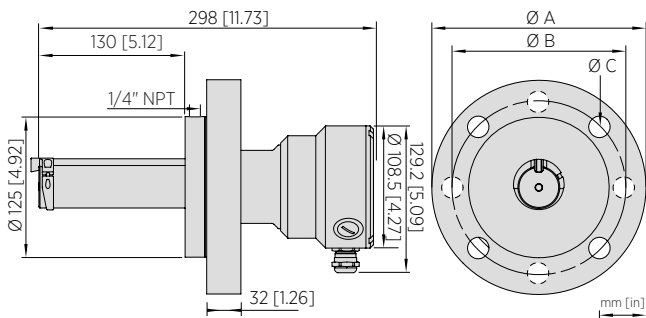
# PR53GP technical data



Dimensions of PR53GP 2" flange

## Dimensions of 2" flange, depth 110 mm

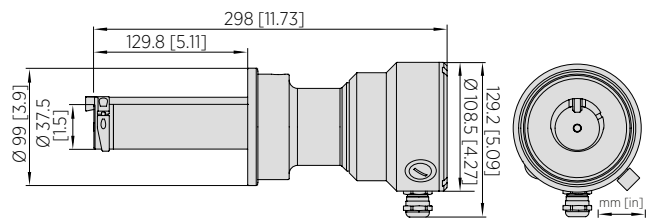
Dimension	ANSI 2"	DIN DN50	JIS 50A
ØA	152.4 mm (6 in)	165 mm (6.5 in)	155 mm (6.1 in)
ØB	120.7 mm (4.75 in)	125 mm (4.92 in)	120 mm (4.72 in)
ØC	19.1 mm (0.75 in)	18 mm (0.71 in)	19 mm (0.75 in)



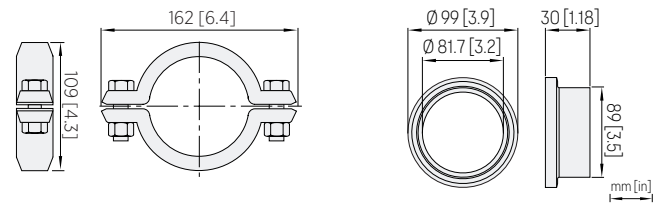
Dimensions of PR53GP 3" flange

## Dimensions of 3" flange, depth 130 mm

Dimension	ANSI 3"	DIN DN80	JIS 80A
ØA	190.5 mm (7.5 in)	200 mm (7.87 in)	185 mm (7.28 in)
ØB	152.4 mm (6 in)	160 mm (6.3 in)	150 mm (5.9 in)
ØC	19.1 mm (0.75 in)	18 mm (0.71 in)	19 mm (0.75 in)



Dimensions of PR53GP L coupling 88.9 mm (3.5 in)



Dimensions of PR53GP L coupling clamp



## Polaris™ PR53M PTFE-Body Process Refractometer



### Features

- Non-metallic wetted parts, integrated ultra-pure PTFE and sapphire flow cell for demanding environments
- Reliable optical concentration measurements with refractive index
- Potassium hydroxide, sodium hydroxide, hydrochloric acid, and more than 500 concentration curves
- Measurement not affected by bubbles, particles, suspended solids, or color
- Various fittings and connections available for ½ inch tubing
- Indigo520-compatible
- Built-in 4–20 mA and Modbus RTU outputs

### Benefits

The optical measurement is based on the refractive index (RI). The RI can be measured from practically any liquid, and it responds to dissolved material.

Because bubbles, particles, or crystals in the process do not affect measurement, the RI allows accurate measurement for different chemicals, also slurries. Typical applications include different chemical-mixing and monitoring installations in the fine chemical and semiconductor industries. In addition to a wide selection of product options, Vaisala offers the possibility to customize the product for specific needs. The outstanding long-term stability provides years of accurate, continuous, fast, and stable concentration measurement directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

The PR53M continues the success of the Vaisala K-PATENTS® process refractometer series. Based on 40 years of experience and continuous development, the PR53 family is the latest generation of digital process refractometers.

The Vaisala Polaris PR53M PTFE-body process refractometer is designed to measure concentrations of aggressive chemicals, such as hydrochloric acid (HCl), sodium hydroxide (NaOH), sodium chloride (NaCl), and sulfuric acid (H<sub>2</sub>SO<sub>4</sub>) in the chemical and semiconductor industries. The integrated ultra-pure PTFE flow cell has no metallic wetted parts, minimizing contamination risk and making it suitable for contact with aggressive chemicals. The PR53M can be mounted to ½ inch process lines with a standard NTP-threaded connection.

### Accurate and reliable

The optical measurement principle offers accurate and drift-free measurement. Because temperature measurement is incorporated inside the process refractometer, the changing process temperature does not affect the concentration measurement.

### Plug and play to Indigo

The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. It provides access to features such as data storage, graphical interface, and analog and digital interface. Changing settings, measurement parameters, or other servicing updates can be done directly from the Indigo520, or through a USB cable using Vaisala software.

# Technical data

## Measurement performance

### Refractive index

Measurement range 1.32–1.53 nD  
(Corresponds to 0–100 °Bx)

Accuracy  $\pm 0.00014$  nD (0.1 °Bx)<sup>1)</sup>

Repeatability  $\pm 0.00002$  nD<sup>2)</sup>

Resolution  $\pm 0.000015$  nD

Response time  $T_{63}$  with default damping 10 s<sup>3)</sup>

Measurement cycle 1 / s

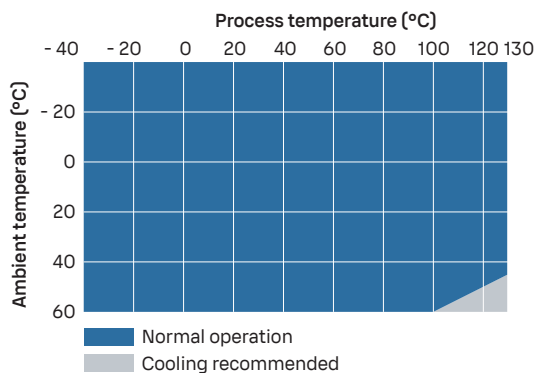
Long-term stability Max. 0.1 % full scale / a

### Temperature

Accuracy at 20 °C (68 °F)  $\pm 0.3$  °C (0.54 °F)<sup>1)</sup>

Sensor class F0.15 IEC 60751

Temperature coefficient  $\pm 0.002$  °C / °C



PR53M process temperature (indicative)

## Operating environment

### Process parameters

Process temperature -10 ... +130 °C (+14 ... +266 °F)

Pressure 10 bar at 20 °C, 4.5 bar at 130 °C  
(145 psi at 68 °F, 652 psi at 266 °F)

### Operating environment

Storage temperature -40 ... +65 °C (-40 ... +149 °F)

Operating temperature -40 ... +60 °C (-40 ... +140 °F)

Maximum operating altitude 2000 m (approx. 6500 ft)

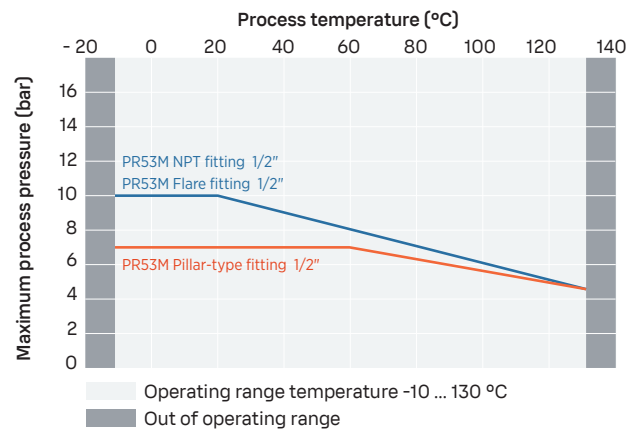
Operating humidity 0–100 %RH

Storage humidity 0–100 %RH, non-condensing

UL 50E/NEMA rating Type 4X

IP rating IP66

IP67



PR53M process pressure

## Inputs and outputs

### Supply

Operating voltage 24 V DC nominal (9–30 V DC)

Power consumption Less than 1 W

Protection class 3, PELV

### Outputs

Output parameters RI, temperature, concentration, quality factor

### Analog outputs

mA Sourcing, isolated, NAMUR NE 43, configurable

mA range 3.8–20.5 mA

Loop impedance Max. 600  $\Omega$

Accuracy of analog outputs at +20 °C  $\pm 0.1$  % of full scale ( $\pm 0.00002$  RI)

### Digital outputs

Digital output RS-485, non-isolated

Maximum cable run 300 m (approx. 1000 ft) (digital)

Supported protocol Modbus RTU

### Connectors

External connectors 1  $\times$  M12 M 4 pins, A-coded<sup>1)</sup>  
2  $\times$  M16 $\times$ 1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry  
M16 $\times$ 1.5<sup>2)</sup> / NPT 1/2"

<sup>1)</sup> For USB2 adapter and Insight software, see [www.vaisala.com/insight](http://www.vaisala.com/insight).

<sup>2)</sup> Conduit hub is not compatible with SD15 Safe-Drive system.

## Compliance

Electromagnetic compatibility (EMC) EN 61326-1, industrial environment

Safety IEC/EN/UL 61010-1

Compliance marks CE, China RoHS, RCM, UKCA

Vibration and shock Tested according to

IEC 60068-2

## Mechanical specifications

### Wetted parts

Prism and sapphire plate	Sapphire monocrystalline, 99.996 % Al <sub>2</sub> O <sub>3</sub> <sup>1)</sup>
Flow cell	Ultra pure PTFE <sup>1)</sup>
Prism gasket	Modified PTFE <sup>1)</sup>
Process gasket	Kalrez W240UP <sup>1)</sup>

### Non-wetted parts

Housing	Stainless steel (AISI 316)
Coating	Cerakote, white (PR53M with integrated fittings)
Screws TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable	2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1

<sup>1)</sup> Manufacturer's declaration included.

## Mounting accessories

### Item

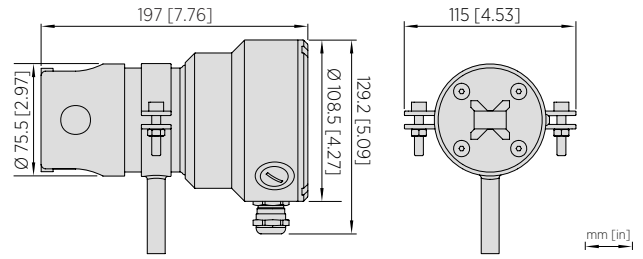
Flare fitting nut
Pillar nut and sleeve

## Calibration accessories

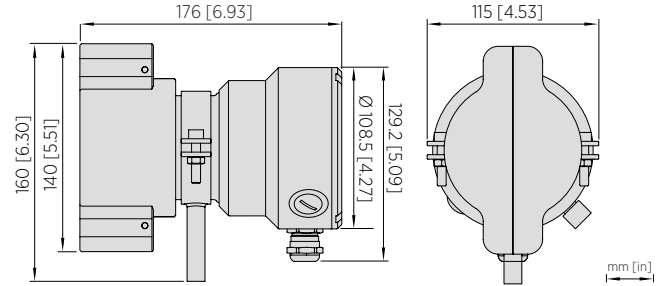
Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

## Accessories

Item	Item code
USB adapter for service port, for Insight service software (see <a href="http://www.vaisala.com/insight">www.vaisala.com/insight</a> )	USB2
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Cooling cover	ASM214675SP



Dimensions of PR53M flow cell end plate bolts (NPT fitting)



Dimensions of PR53M flow cell end plate bolts (integrated fittings, Flare and Pillar-type)

## Polaris™ PR53W Valve-Body Process Refractometer



### Features

- ETFE-lined valve-body flow cell with non-metallic wetted parts, for aggressive chemicals in pressurized pipelines
- Reliable optical concentration measurements with refractive index
- Hydrochloric acid, sulfuric acid, amino acid, potassium hydroxide, and more than 500 concentration curves
- Measurement not affected by bubbles, particles, suspended solids, or color
- ANSI, JIS, and DIN flanges for 2 inch process lines
- Indigo520-compatible
- Built-in 4–20 mA and Modbus RTU outputs

The Vaisala Polaris PR53W valve-body process refractometer is designed to measure concentrations of aggressive chemicals, such as sulfuric acid, hydrochloric acid (HCl), and sodium hydroxide (NaOH) in production pipelines such as in the chemical, biochemical, and pharmaceutical industries. The PR53W is mounted in a membrane-lined valve body that has no metallic wetted parts. This allows convenient flange mounting to 2 inch ANSI, JIS, and DN50 flanges.

### Benefits

The optical measurement is based on the refractive index (RI). RI can be measured from practically any liquid and it responds to dissolved material. Because bubbles, particles, or crystals in the process do not affect measurement, RI allows accurate measurement for different chemicals, also slurries. Typical applications include different chemical-mixing and monitoring installations in the fine chemical and semiconductor industries. In addition to a wide selection of product options, it is possible to customize the product for specific needs. The outstanding long-term stability provides years of accurate, continuous, fast, and stable concentration measurement directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

The PR53W continues the success of the Vaisala K-PATENTS® process refractometer series. Based on 40 years of experience and continuous development, the PR53 family is the latest generation of digital process refractometers.

### Accurate and reliable

The optical measurement principle offers accurate and drift-free measurement. Because temperature measurement is incorporated inside the process refractometer, the changing process temperature does not affect the concentration measurement.

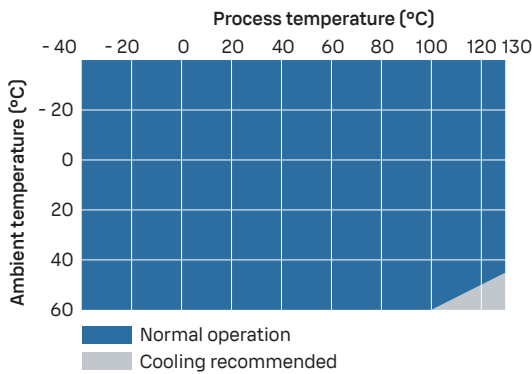
### Plug and play to Indigo

The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. It provides access to features such as data storage, graphical interface, and analog and digital interface. Changing settings, measurement parameters, or other servicing updates can be done directly from the Indigo520, or through a USB cable using Vaisala software.

# Technical data

## Measurement performance

Refractive index	
Measurement range	1.32–1.53 nD (Corresponds to 0–100 °Bx)
Accuracy	±0.00014 nD (0.1 °Bx) <sup>1)</sup>
Repeatability	±0.00002 nD <sup>2)</sup>
Resolution	±0.000015 nD
Response time T <sub>63</sub> with default damping	10 s <sup>3)</sup>
Measurement cycle	1 / s
Long-term stability	Max. 0.1 % full scale / a
Temperature	
Accuracy at 20 °C (68 °F)	±0.3 °C (0.54 °F) <sup>1)</sup>
Sensor class	F0.15 IEC 60751
Temperature coefficient	±0.002 °C / C



PR53W process temperature (indicative)

## Operating environment

Process parameters	
Process temperature	-10 ... +130 °C (+14 ... +266 °F)
Operating pressure	10 bar (145 psi)
Operating environment	
Storage temperature	-40 ... +65 °C (-40 ... +149 °F)
Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Maximum operating altitude	2000 m (approx. 6500 ft)
Operating humidity	0–100 %RH
Storage humidity	0–100 %RH, non-condensing
UL 50E/NEMA rating	Type 4X
IP rating	IP66 IP67

## Inputs and outputs

Supply	
Operating voltage	24 V DC nominal (9–30 V DC)
Power consumption	Less than 1 W
Protection class	3, PELV
Outputs	
Output parameters	RI, temperature, concentration, quality factor
Analog outputs	
mA	Sourcing, isolated, NAMUR NE 43, configurable
mA range	3.8–20.5 mA
Loop impedance	Max. 600 Ω
Accuracy of analog outputs at +20 °C	±0.1 % of full scale (±0.00002 RI)
Digital outputs	
Digital output	RS-485, non-isolated
Maximum cable run	300 m (approx. 1000 ft) (digital)
Supported protocol	Modbus RTU
Connectors	
External connectors	1 × M12 M 4 pins, A-coded <sup>1)</sup> 2 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5 <sup>2)</sup> / NPT ½"

## Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Safety	IEC/EN/UL 61010-1
Compliance marks	CE, China RoHS, RCM, UKCA
Vibration and shock	Tested according to IEC 60068-2

## Mechanical specifications

Wetted parts	
Prism and sapphire plate	Sapphire monocrystalline, 99.996 % Al <sub>2</sub> O <sub>3</sub> <sup>1)</sup>
Valve body lining	ETFE <sup>1)</sup>
Prism gasket	Modified PTFE <sup>1)</sup>
Valve body gasket	PTFE <sup>1)</sup>
Process gasket	Kalrez W240UP <sup>1)</sup>
Valve body M10 stud	EN 1.4404 (AISI 316L) <sup>1)</sup>
Non-wetted parts	
Valve body	Cast iron <sup>1)</sup>
Housing	EN 1.4404 (AISI 316L)
Screws TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable	2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1

<sup>1)</sup> Manufacturer's declaration included

## Calibration accessories

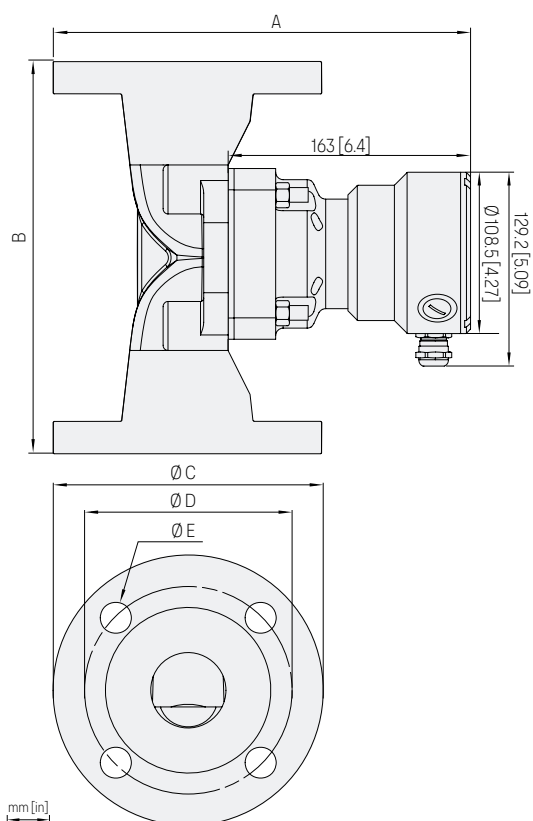
Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

## Dimensions

Dimension	ANSI 2"	DIN DN50	JIS 50A
A	268 mm (10.55 in)	275 mm (10.83 in)	270 mm (10.63 in)
B	196 mm (7.7 in)	230 mm (9.1 in)	196 mm (7.7 in)
ØA	152.4 mm (6 in)	165 mm (6.5 in)	155 mm (6.1 in)
ØB	120.7 mm (4.75 in)	125 mm (4.92 in)	120 mm (4.72 in)
ØC	19.1 mm (0.75 in)	18 mm (0.71 in)	19 mm (0.75 in)

## Accessories

Item	Item code
USB adapter for service port, for Insight service software (see <a href="http://www.vaisala.com/insight">www.vaisala.com/insight</a> )	USB2
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Cooling cover	ASM214675SP



Dimensions of PR53W valve body

## Polaris™ PR53SD Safe-Drive Process Refractometer



### Features

- Designed for safe and easy retraction from pressurized process lines
- Reliable optical concentration measurements with refractive index
- Black liquor, green liquor, filtrates, and other liquids in chemical recovery line and fiberline
- SAF 2205 material for demanding environments
- Measurement not affected by bubbles, particles, suspended solids, or color
- Indigo520-compatible
- Built-in 4–20 mA and Modbus RTU outputs

The retractable Vaisala Polaris PR53SD Safe-Drive process refractometer is designed for safety-critical measurements in pulp mills, such as firing liquor concentration. The newest design of the Safe-Drive retractor system allows insertion and removal of the measurement instrument when the process is running, ensuring operator safety. Prism wash systems enable reliable measurements in various installation positions, from fiberline to brown stock washing, evaporation, black liquor firing, slaker, and lime operations. The design complies with the **BLRBAC** Recommended Good Practice Safe Firing of Black Liquor in Black Liquor Recovery Boilers.

### Benefits

The optical measurement is based on the refractive index (RI). The outstanding long-term stability provides years of accurate, continuous, fast, and stable measurement for total dissolved solids and other concentration measurements, directly in the process stream. The PR53SD is designed for the critical safety measurements in pulp mills. The PR53SD measurement instrument can be retracted for maintenance without requiring process shutdown, minimizing measurement downtime. To ensure operator safety, the PR53SD and retractor prevents inadvertent errors in use: the Safe-Drive retractor tool is built into the isolation valve and ensures that

the isolation valve is always closed when the refractometer is removed from the pressurized line. The PR53SD continues the success of the Vaisala K-PATENTS® process refractometer series. Based on 40 years of experience and continuous development, the PR53 family is the latest generation of digital process refractometers.

### True dissolved solids measurement

Weak liquor and black liquor are a mixture of cooking chemicals and dissolved organic material. The RI measurement responds to all dissolved solids. Bubbles, foam, particles, suspended solids, or fibers do not affect

measurement. The measurement enables process optimization through advanced process control: continuous and accurate optical measurement for true dissolved solids allows immediate reaction to process variations.

### Fiberline and chemical recovery lines

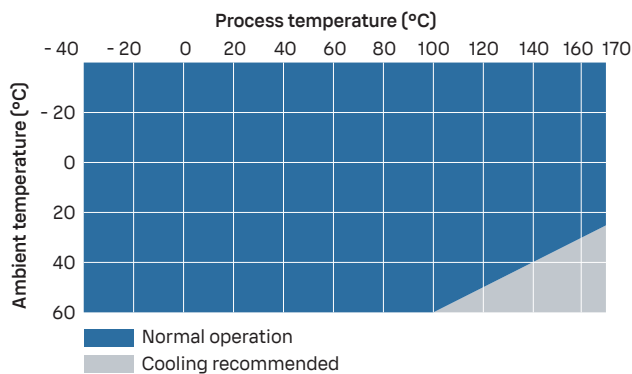
Measurement is suitable for low and medium consistency pulp, filtrates, and process liquids. In black liquor applications, total dissolved solids concentrations up to 90 % can be measured directly inline. Field-proven prism wash systems allow accurate measurement in challenging process media and conditions.

# Technical data

## Measurement performance

Refractive index	
Measurement range	1.32–1.53 nD (0–90 % total solids), normal-range prism 1.36–1.57 nD (20–100 % total solids), high-range prism
Accuracy	±0.00014 nD (0.1 °Bx) <sup>1)</sup>
Repeatability	±0.00002 nD <sup>2)</sup>
Resolution	±0.000015 nD
Response time T <sub>63</sub> with default damping	10 s <sup>3)</sup>
Measurement cycle	1 / s
Long-term stability	Max. 0.1 % full scale / a
Temperature	
Accuracy at 20 °C (68 °F)	±0.3 °C (0.54 °F) <sup>1)</sup>
Sensor class	F0.15 IEC 60751
Temperature coefficient	±0.002 °C / C

- 1) Accuracy specified with respect to calibration reference, including non-linearity, hysteresis at +20 °C.  
2) Repeatability, confidence level k=2, including random noise, at T<sub>a</sub> = +20 °C, with standard low-pass filtering.  
3) At standard low-pass filtering.



PR53SD process temperature (indicative)

## Operating environment

Process parameters	
Process temperature	-40 ... +170 °C (-40 ... +338 °F)
Design temperature	+180 °C (+356 °F) <sup>1)</sup>
Design pressure / maximum operating pressure	35 bar (507.6 psi)
Maximum retraction pressure	35 bar (507.6 psi)
Operating environment	
Storage temperature	-40 ... +65 °C (-40 ... +149 °F)
Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Maximum operating altitude	2000 m (approx. 6500 ft)
Operating humidity	0–100 %RH
Storage humidity	0–100 %RH, non-condensing
UL 50E/NEMA rating	Type 4X
IP rating	IP66 IP67

1) Maximum momentary temperature peak.

## Inputs and outputs

Supply	
Operating voltage	24 V DC nominal (9–30 V DC)
Power consumption	Less than 1 W
Protection class	3, PELV
Outputs	
Output parameters	RI, temperature, concentration, quality factor
Analog outputs	
mA	Sourcing, isolated, NAMUR NE 43, configurable
mA range	3.8–20.5 mA
Loop impedance	Max. 600 Ω
Accuracy of analog outputs at +20 °C	±0.1 % of full scale (±0.00002 RI)
Digital outputs	
Digital output	RS-485, non-isolated
Maximum cable run	300 m (approx. 1000 ft) (digital)
Supported protocol	Modbus RTU
Connectors	
External connectors	1 × M12 M 4 pins, A-coded <sup>1)</sup> 2 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5 <sup>2)</sup> / NPT ½"

## Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Safety	IEC/EN/UL 61010-1
Pressure	CRN all territories, ASME BPVC Sec VIII Div. 1 Ed. 2021
Compliance marks	CE, China RoHS, RCM, UKCA
Vibration and shock	Tested according to IEC 60068-2



## Mechanical specifications

Wetted parts	
Sensor head	EN 1.4462 <sup>1)</sup>
Prism	Sapphire monocrystalline, 99.996 % Al <sub>2</sub> O <sub>3</sub> <sup>2)</sup>
Process gasket	Co-Cr-Ni Alloy (AMS 5876) lined PTFE <sup>2)</sup>
Prism gasket	Modified PTFE <sup>2)</sup>
SD flange	EN 1.4462 <sup>1)</sup>
Wash nozzle	EN 1.4462 <sup>2)</sup>
Non-wetted parts	
Housing	EN 1.4404
Screws, TX20 torque 2.0 Nm	EN 1.4404 (AISI 316L)
Stud bolts, M12 torque 75 Nm, M10 torque 40 Nm	EN 1.4435 (AISI 316L), grade 8.8
Flanges (3 pcs)	EN 1.4462 (AISI 2205) ASME B16.5, DIN 2543
Cable	2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
<b>Weight</b>	Retractor and wash connection 15 kg (33.07 lb) Refractometer 5.4 kg (11.9 lb)

1) EN 10204 / 3.1 certificate included.  
2) Manufacturer's declaration included.

## Mounting accessories

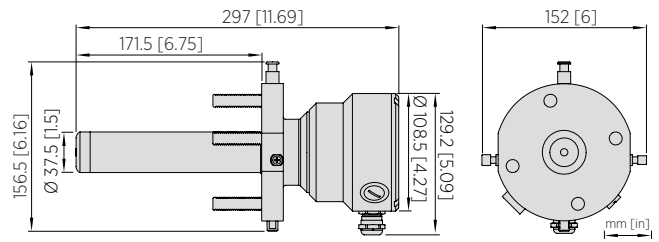
Item	Item code
Blind flanges for SDI5, spare kit	278299SP

## Calibration accessories

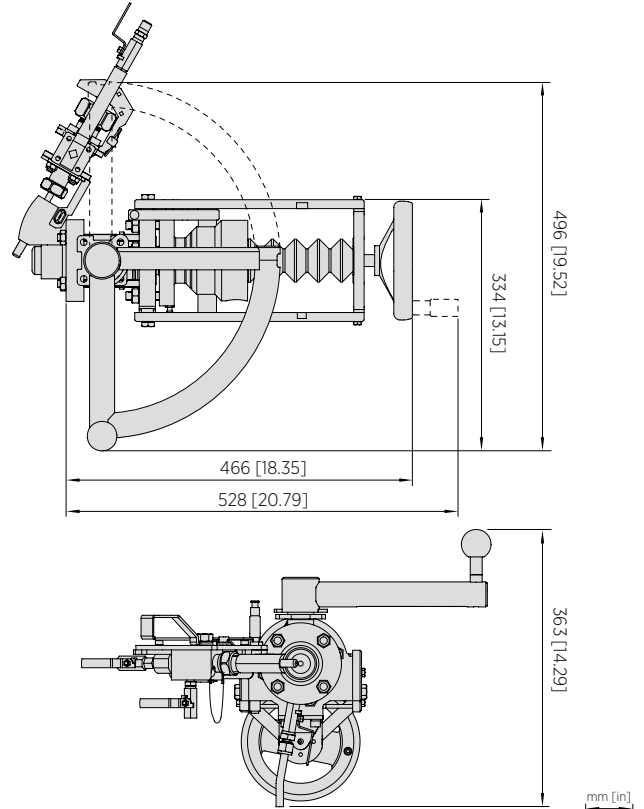
Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

## Accessories

Item	Item code
USB adapter for service port, for Insight service software (see <a href="http://www.vaisala.com/insight">www.vaisala.com/insight</a> )	USB2
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Cooling cover	ASM214675SP



Dimensions of PR53SD



Dimensions of PR53 SDI5 Safe-Drive isolation valve and retractor

## Wind and weather sensor technologies for measurements in industrial applications



### Wind and weather sensors

#### Vaisala ultrasonic wind sensors:

- Wind sensor with no moving parts
- Unique triangular design for accurate measurements from all directions
- Optional sensor heating available
- Maintenance free, no field calibration required
- Measurement range up to 90 m/s

#### Vaisala mechanical wind sensors:

- Accurate wind speed and direction sensors
- Fast and linear response
- Low measurement starting threshold
- Sensors with heating elements available for cold climates

#### Vaisala weather sensor:

- Measurement of the six essential weather parameters: wind speed and direction, liquid precipitation, barometric pressure, temperature, and relative humidity
- Feature proprietary Vaisala sensor technologies: WINDCAP®, RAINCAP®, HUMICAP®, and BAROCAP®

Vaisala's long history in wind and weather measurements started already in the 1930s from the development of a radiosonde to measure the conditions in the upper atmosphere. Today, Vaisala wind and weather instruments are used in dozens of applications and industries all over the world.

### Industrial applications for wind and weather measurements

Wind and weather data are required in many activities across industries. For example, in power industry, the efficiency of power lines is a function of wind speed and direction.

Nuclear power plants require wind data for safety reasons to be able to model the dispersion of potentially radioactive leakages. In addition to nuclear power plants, also chemical factories need to gather wind data for dispersion monitoring.

Accurate outdoor measurements are essential in operating modern buildings. Processes such as free cooling, natural ventilation, and automated shading are dependent on real-time weather data.

Ventilation control in greenhouses also relies on localized weather data to ensure an optimized environment for plant growth.

### Vaisala wind and weather instruments

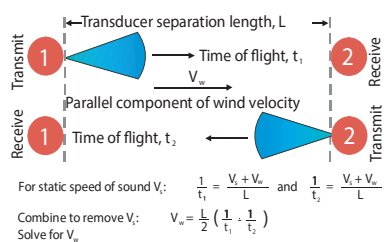
Vaisala manufactures wind and weather instruments for different applications, requirements and budgets. The wind sensor portfolio for industrial applications includes both mechanical and ultrasonic sensors. View the complete range of wind products at [www.vaisala.com/wind](http://www.vaisala.com/wind). Have a look at the multiparameter Vaisala Weather Transmitter WXT530 at [www.vaisala.com/wxt530](http://www.vaisala.com/wxt530).

# Vaisala sensor technologies for wind and rain measurements

## Vaisala WINDCAP Sensor

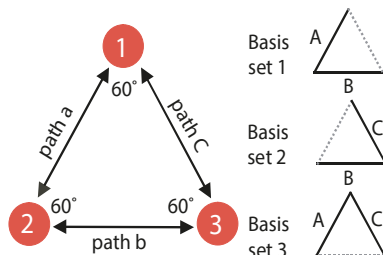
Vaisala WINDCAP Ultrasonic Wind Sensor uses ultrasound to determine wind speed and direction. The sensor has no moving parts, which makes it independent of the limitations of mechanical wind sensors such as friction, inertia, time constant, over-speeding, and starting threshold.

WINDCAP sensor features an array of three ultrasonic transducers oriented to form an equilateral triangle. Wind measurement is based on time of flight (TOF) of the sonic impulse – the time it takes for the signal to travel from one transducer to another. TOF is measured in both directions for each pair of transducer heads. Simple algebra allows solving for the parallel component of wind velocity independently of the static speed of sound.



The equilateral triangle configuration of the three transducers provides three possible sets of basis vectors. The combinations yield bi-directional

measurements on the paths labeled A, B, and C. These measurements are used to determine the wind velocity components parallel to each of the three paths.



## Vaisala RAINCAP Sensor

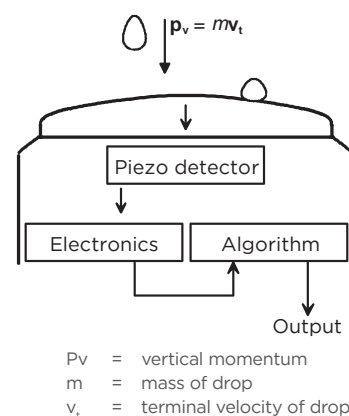
Vaisala RAINCAP Sensor is an acoustic sensor that measures the impact of individual raindrops on a smooth stainless steel surface using a piezoelectric detector. The sensor provides real time information on rain intensity, duration, and accumulated rainfall.

The RAINCAP sensor consists of a round stainless steel cover, approximately 90 mm in diameter mounted to a rigid frame. A piezoelectric detector is located beneath the cover.

Raindrops hit the RAINCAP sensor surface at terminal velocity, which is a function of the raindrop diameter. Rain measurement is based on acoustic

detection of each individual rain drop as it impacts the sensor cover. Larger drops create a larger acoustic signal than smaller drops.

The piezoelectric detector converts the acoustic signals into voltages. Total rain is calculated from the sum of the individual voltage signals per unit time and the known surface area of the RAINCAP sensor. In addition, the intensity and duration of rain can be calculated.





### Features

- WMO and ICAO compliant
- Data output rate 4 Hz and 8 Hz
- Stainless steel structure
- Maintenance-free
- 3-transducer layout provides accurate data
- Data format outputs: polar coordinates and vectors
- Fully compensates effects of temperature, humidity, and pressure
- Measurement range up to 90 m/s (201 mph)
- Heating up to 250 W
- IP66 and IP67
- Large transducers provide high ultrasound power
- Optional bird prevention kit
- Wind gust calculated according to WMO guidelines
- US National Weather Service and the FAA rely on Vaisala WINDCAP® technology

WMT700 Series has been designed for professional use in meteorology, aviation, maritime, wind energy, and many other applications.

Vaisala WINDCAP® Ultrasonic Wind Sensor WMT700 Series is a robust and reliable ultrasonic anemometer. It measures surface wind, which is one of the key parameters for meteorology and aviation.

WMT700 series meets WMO CIMO Guide (WMO-No.8) and ICAO requirements.

### Accurate and maintenance-free

WMT700 series has a durable full steel structure with welded arms, clear North indication, and one-point, quick bayonet-style mounting. It has no moving parts, and it is resistant to contamination and corrosion.

It measures accurately and produces reliable data in demanding wind conditions and climates without periodic or on-demand maintenance. Self-diagnostics and measurement validation are standard features. The 60-minute average is available for polar coordinates and vectors.

### Measurement based on ultrasound

WMT700 series uses ultrasound to determine the horizontal wind speed and direction. The measurement is based on transit time, the time it takes for the ultrasound to travel from one transducer to another, depending on the wind speed.

The transit time is measured in both directions for a pair of transducer heads. Using 2 measurements for each of the 3 ultrasonic paths at 60° angles to each other, WMT700 computes the wind speed and direction.

The wind measurement is calculated in a way that completely eliminates the effects of altitude, temperature, and humidity.

### Standard and heated models

WMT700 series operates with a power supply of 9 ... 36 V DC. For the heated model, an additional heating power supply of 24 ... 36 V DC is required.

Thermostatically controlled heaters in the transducer heads and arms of the heated model prevent build-up of freezing rain and snow. A model with a heated transducer, arms, and body is available for operation in the harshest and coldest environments.

In addition, accessories are available for mounting and connecting WMT700. To minimize interference from birds, a bird prevention kit is available.



DNV GL TYPE EXAMINATION  
CERTIFICATE No. TAA00000U5



# Technical data

## Wind speed measurement performance

Observation range	WMT701: 0 ... 40 m/s (89 mph) WMT702: 0 ... 65 m/s (145 mph) WMT703: 0 ... 75 m/s (168 mph) WMT704: 0 ... 90 m/s (201 mph)
Starting threshold	0.01 m/s (0.0223 mph)
Resolution	0.01 m/s (0.0223 mph)
Response time	250 ms
Accuracy	0 ... 75 m/s (168 mph): ±0.1 m/s (0.2 mph) or 2 % of reading, whichever is greater 75 ... 90 m/s (201 mph): ±5 % of reading

## Wind direction measurement performance

Observation range	0 ... 360°
Starting threshold	0.1 m/s (0.2 mph)
Resolution	0.01°
Response time	250 ms
Accuracy	±2°

## Powering specifications

Operating voltage	9 ... 36 V DC (absolute max. 40 V DC) <sup>1)</sup>
Heating voltage	24 ... 36 V DC (absolute max. 40 V DC) <sup>1)</sup>

### Heating power supply requirement <sup>2)</sup>

Heated transducers	Average 32 W Peak 40 W
Heated transducers and arms	Average 152 W Peak 200 W
Heated transducers, arms, and body	Average 252 W Peak 350 W at 24 V DC

<sup>1)</sup> In maritime environments, the normal input voltage ranges are: operating voltage 10 ... 30 V DC (-10 ... +30 %) and heating voltage 24 ... 30 V DC (-10 ... +30 %), as defined in the maritime standard IEC 60945.

<sup>2)</sup> The actual power consumption depends on the temperature.

## Messaging specifications

Readout update interval	4 Hz (default) and 8 Hz (optional)
Units available	m/s, knots, mph, km/h, V, mA, Hz
Operating mode	Automatic message or poll mode
Sonic temperature	Celsius degrees

## Mechanical specifications

Dimensions (H × W × Ø <sup>1)</sup> )	348 × 250 × 285 mm (13.70 × 9.84 × 11.22 in)
Weight	1.8 kg (4.0 lb)

### Materials

Body and arms, mounting kit	Stainless steel AISI 316
Transducers	Silicone
Connector housing surface	Nickel-plated brass

<sup>1)</sup> Diameter of area covered by transducers.

## Analog outputs

Wind speed	Voltage, current, frequency
Wind direction	Voltage, current, potentiometer

## Operating environment

Heating <sup>1)</sup>	0 W, 30 W, 150 W, or 250 W
Operating temperature <sup>1)</sup>	-10 ... +60 °C (+14 ... +140 °F) -40 ... +60 °C (-40 ... +140 °F) -55 ... +70 °C (-67 ... +158 °F)
Storage temperature	-60 ... +80 °C (-76 ... +176 °F)
IP rating	IP66 and IP67

<sup>1)</sup> For freezing conditions, select appropriate combination of heating and temperature ranges.

## Digital outputs

Communication interfaces	COM1: RS-485 COM2: RS-485, RS-422, RS-232, SDI-12
Communication profiles	WMT700, WS425 ASCII, NMEA Standard and Extended (version 0183), SDI-12 (version 1.3), WS425 ASOS, ROSA MES 12, customized
Bit rate	300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200
Available averages	Max. 3600 s

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863 REACH Regulation (EC 1907/2006)
EMC immunity	IEC 61326-1:2013, IEC 60945
EMC emissions	CISPR 32 / EN 55032, Class B
Environmental	IEC 60068-2-1, 2, 6/34, 30, 31, 67, 78, IEC 60529 VDA 621-415
Maritime	IEC 60945:2002 + IEC 60945/Cor1:2008, DNVGL-CG-0339
Electrical safety	UL 61010-1 CAN/CSA C22.2 No. 61010-1-12
Compliance marks	CE, China RoHS, RCM, UKCA
Listing marks	SGS (USA and Canada)



### Features

- Right parameter combination
- Easy to use and integrate
- Weather parameter hub
- Analog sensors can be added
- Compact, lightweight
- Low power consumption
- mA output suitable for industrial applications
- Cost-effective
- DNV GL Type Examination

Vaisala Weather Transmitter WXT530 is a unique series of sensors with parameter combinations that allow you to choose what is right for your application. WXT530 is a flexible, integrated building block for weather applications. WXT530 series improves your grip on weather.

### Flexibility

WXT530 is a series of weather instruments that provides 6 of the most important weather parameters: air pressure, temperature, humidity, rainfall, wind speed and direction through various combinations. You can select the transmitter with the needed parameter(s) into your weather application, with a large variety of digital communication modes and wide range of voltages. A heated option is available. Low power consumption enables solar panel applications. WXT530 Series focuses on maintenance-free operations in a cost-effective manner.

### Integration

The series offers analog input options for additional third-party analog sensors. With the help of the built-in analog-to-digital converters, you can turn WXT530 into a small, cost-effective weather parameter hub.

Additional parameters include solar radiation and external temperature sensor. Further, the analog mA output for wind speed and wind direction enables a wide variety of industrial applications. WXT530 exceeds IEC60945 maritime standard.

### Solid performance

WXT530 Series has a unique Vaisala solid-state sensor technology. To measure wind, Vaisala WINDCAP® ultrasonic wind sensors are applied to determine horizontal wind speed and direction. Barometric pressure, temperature, and humidity measurements are combined in the PTU module. The PTU module is easy to change without any contact with the sensors. The precipitation measurement is based on the unique acoustic Vaisala RAINCAP® Sensor without flooding, clogging, wetting, and evaporation losses.

Option	Rain	Wind	PTU <sup>1)</sup>
WXT531	✓		
WXT532		✓	
WXT533	✓	✓	
WXT534			✓
WXT535	✓		✓
WXT536	✓	✓	✓

<sup>1)</sup> PTU is a compact changeable module. Vaisala recommends changing it every 2 years.



DNV GL TYPE EXAMINATION  
CERTIFICATE No. TAA00000VF

# Technical data

## Barometric pressure measurement performance

Observation range	500–1100 hPa
Accuracy (for sensor element) at 600–1100 hPa	±0.5 hPa at 0 ... +30 °C (+32 ... +86 °F) ±1 hPa at –52 ... +60 °C (–60 ... +140 °F)
Output resolution	0.1 hPa / 10 Pa / 0.001 bar / 0.1 mmHg / 0.01 inHg

## Air temperature measurement performance

Observation range	–52 ... +60 °C (–60 ... +140 °F)
Accuracy (for sensor element) at +20 °C (+68 °F)	±0.3 °C (±0.54 °F)
Output resolution	0.1 °C (0.1 °F)

## Relative humidity measurement performance

Observation range	0–100 %RH
Accuracy (for sensor element)	±3 %RH at 0–90 %RH ±5 %RH at 90–100 %RH
Output resolution	0.1 %RH

## Wind measurement performance

Wind speed	
Observation range	0–60 m/s (134 mph)
Reporting range	0–75 m/s (168 mph)
Response time	0.25 s
Available variables	Average, maximum, and minimum
Accuracy	±3 % at 10 m/s (22 mph)
Output resolution	0.1 m/s (km/h, mph, knots)
Wind direction	
Azimuth	0–360°
Response time	0.25 s
Available variables	Average, maximum, and minimum
Accuracy	±3.0° at 10 m/s (22 mph)
Output resolution	1°
Averaging time	1–3600 s, sample rate 1, 2, or 4 Hz (configurable)

## Mechanical specifications

Weight	
WXT534, WXT535, WXT536	0.7 kg (1.54 lb)
WXT531, WXT532, WXT533	0.5 kg (1.1 lb)

## Operating environment

Operating environment	Outdoor use
Operating temperature	–52 ... +60 °C (–60 ... +140 °F)
Storage temperature	–60 ... +70 °C (–76 ... +158 °F)
Operating humidity	0–100 %RH
Operating pressure	500–1100 hPa
Wind <sup>1)</sup>	0–60 m/s (0–134 mph)
IP rating	Without mounting kit: IP65 With mounting kit: IP66

<sup>1)</sup> Due to the measurement frequency used in the sonic transducers, RF interference in the 200–400 kHz range can disturb wind measurement.

## Precipitation measurement performance

Collecting area	60 cm <sup>2</sup> (9.3 in <sup>2</sup> )
<b>Rainfall</b> <sup>1)</sup>	
Output resolution	0.01 mm (0.001 in)
Field accuracy for daily accumulation	Better than 5 %, weather-dependent
Duration	Counting each 10-second increment whenever droplet detected
Duration output resolution	10 s
Intensity	Running 1-minute average, 10 s steps
Intensity observation range	0–200 mm/h (0–7.87 in/h) (broader with reduced accuracy)
Intensity output resolution	0.1 mm/h (0.01 in/h)
<b>Hail</b> <sup>2)</sup>	
Output resolution	0.1 hits/cm <sup>2</sup> (1 hits/in <sup>2</sup> ), 1 hit
Intensity output resolution	0.1 hits/cm <sup>2</sup> h (1 hits/in <sup>2</sup> h), 1 hit/h

<sup>1)</sup> Cumulative accumulation after the latest automatic or manual reset.

<sup>2)</sup> Cumulative number of hits against collecting surface.

## Inputs and outputs

Operating voltage	6–24 V DC (–10 ... +30 %)
Average power consumption	Minimum: 0.1 mA at 12 V DC (SDI-12 standby) Typical: 3.5 mA at 12 V DC (typical measuring intervals) Maximum: 15 mA at 6 V DC (constant measurement of all parameters)
Heating voltage	DC, AC, or full-wave rectified AC 12–24 V DC (–10 ... +30 %) 12–17 V AC <sub>rms</sub> (–10 ... +30 %)
Typical heating current	12 V DC: 800 mA, 24 V DC: 400 mA
Digital outputs	SDI-12, RS-232, RS-485, RS-422
Communication protocols	SDI-12 v1.3, Modbus RTU, ASCII automatic and polled, NMEA 0183 v3.0 with query option

## WXT536 analog input options

Solar radiation	0–25 mV
Voltage input	0–2.5 V, 0–5 V, 0–10 V
Tipping bucket rain gauge	0–100 Hz
Temperature (Pt1000)	800–1330 Ω

## WXT532 analog mA output options

When the analog output option is applied, digital communication is not available.	
Wind speed	0–20 mA or 4–20 mA
Wind direction	0–20 mA or 4–20 mA

## Compliance

EU directives and regulations	EMC, RoHS
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B
Environmental	IEC 60068-2-1, 2, 6, 14, 30, 31, 78 IEC 60529, VDA 621-415
Maritime	IEC 60945 (Exposed) DNV GL Type Examination Certificate No. TAA00000VF
Compliance marks	CE, RCM, RoHS, China RoHS, UKCA



### Much more than just a calibration

#### The calibration services include:

- Traceable multi-point calibration
- Instrument adjustment to meet its original specifications
- Filter replacement as needed
- Calibration certificate with as-found and as-left results
- Software updates
- Service report
- Calibration dates update
- Visit [store.vaisala.com](https://store.vaisala.com) to order calibrations and repairs online 24/7 or read more at [vaisala.com/calibration](https://vaisala.com/calibration)

Regular calibration of measurement instruments ensures continuous accuracy and regulatory compliance for your Vaisala products. As a manufacturer, Vaisala offers high-quality calibration services to ensure your instrument will meet its original accuracy and performance after the service. Order on-demand or through a multi-year Calibration Care Agreement.

## Service Center calibration options

### Standard

Matches the original factory calibration performed on new instruments

In compliance with  
**ISO 9001**  
quality requirements

### Accredited

Calibration especially for regulated industries and reference instruments

In compliance with  
**ISO/IEC 17025**  
quality requirements

Available from Online store 24/7



Our service centers are **accredited** according ISO/IEC 17025 meeting the tightest quality requirements





## Selecting the right filter for humidity instruments



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 or 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 <sup>1)</sup>

	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
<b>Example image</b>					
<b>Particulate protection</b>	★★★★☆	★★★★☆	★★★★☆	★★★★★	★★★★☆
<b>Mechanical protection</b>	★★★★☆	★★★★☆	★★★★★	★★★★★	★★★★★
<b>Response time</b>	★★★★☆	★★★★☆	★★☆☆☆	★☆☆☆☆	★★★★☆
<b>Typical use / Features</b>	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
<b>High-end probes</b>					
HMP series, HMT330, HMT310, HMT360, HMT370EX, HMM170	<b>DRW010281SP</b>	—	—	HM47280SP	—
DMP series, DMT340	DRW010281SP	—	—	<b>HM47280SP</b>	—
<b>Compact humidity probes</b>					
HMP110, HMP60, HMT120, HMT130	—	<b>DRW010525SP</b>	ASM212652SP	HM46670SP	—
HMP113, HMP63, RFL100	—	<b>ASM210856SP</b>	—	HM47280SP	—
<b>Handhelds</b>					
HM40	—	For HM41 and HM45: ASM210856SP For HM46: 10159HM	For HMP42: 19867HM, 19858HM	For HM46: 0195 (brass)	—
HM70	For HMP77: DRW010281SP	10159HM	—	<b>DRW212987SP</b> (brass) HM47280SP	—
DM70	DRW010281SP	—	—	<b>HM47280SP</b>	—
<b>OEM models</b>					
DMT143	—	—	—	<b>DRW010335SP</b>	—
DMT143L	—	—	—	<b>HM47280SP</b>	—
DMT152	—	—	—	—	<b>220957SP</b>
DPT146	—	—	—	—	<b>220957SP</b>

1) Recommended filter marked in bold.

**OTHER FILTERS <sup>1)</sup>**

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

1) Recommended filter marked in bold.

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*Continued overleaf*

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[www.vaisala.com/InstrumentsCatalog](https://www.vaisala.com/InstrumentsCatalog)

# Product Catalog

Dissolved gas analysis · Moisture in oil

**POWER TRANSFORMER MONITORING**



**VAISALA**





# Instruments and intelligence for industrial needs

## **Vaisala Industrial Measurements**

Vaisala's Industrial Measurements business area provides customers with visibility into their own processes. Our products provide them with accurate and reliable measurement data which enables them to make decisions for optimized industrial processes.

## **Power generation and transmission**

For power generation and transmission industry, Vaisala provides unique measurement equipment for online monitoring of transformer insulation oil. Our reliable solutions support in planning and optimizing the preventive maintenance of power transformers, and thus help to extend their lifetime and reduce the risk of unexpected and costly outages.

This product catalog provides an overview of our products to help you select what best suits your needs. For more information, visit us at [vaisala.com](https://vaisala.com) or contact us at [vaisala.com/requestinfo](https://vaisala.com/requestinfo). Product user documentation is available at [docs.vaisala.com](https://docs.vaisala.com).



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### Advanced DGA monitoring

- Maintenance-free operation without consumables
- Intuitive user experience
- Smart analysis tools
- Oil sampling with vacuum gas extraction
- Long-term measurement stability through autocalibration and IR reference measurement
- Total gas pressure detects air leaks without oxygen sensors
- Robust mechanics
- Easy installation
- Manufactured in Vaisala's cleanroom

Vaisala OPT100 Optimus™ DGA Monitor is the right solution for safe-guarding critical transformers in harsh environments. It delivers out-of-the-box performance, eliminates false alarms, and gives you the best long-term stable measurements for all fault gases.

### Prevent transformer failure

**There is nothing worse than an unplanned outage. Lost revenue, damage to your reputation and brand – all of it avoidable. Over 50 percent of serious power transformer faults can be detected and severe failures prevented ahead of time with the right online monitoring tools.**

**Vaisala OPT100 Optimus™ DGA Monitor is robust and intuitive to use. With real-time, trouble-free fault gas monitoring – there are no false alarms, no maintenance and no consumables required. Optimus™ is the culmination of decades of experience, extensive research, and it builds on customer needs. Made with the ultimate safety and reliability in mind, ready for the most demanding operating environments.**

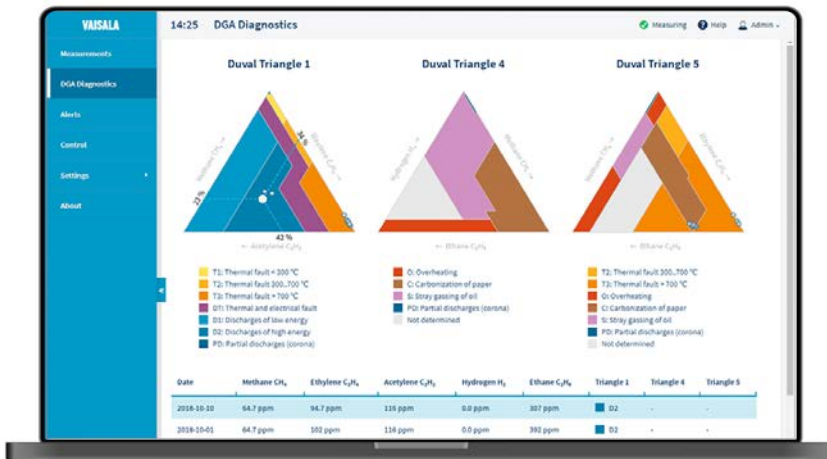
### Intuitive and smart design

The web-based user interface eliminates the need for additional software. Optimus™ can be connected to an existing control and monitoring system using digital communication and relays, or used as a standalone monitoring device. And in case of a disturbance such as a power outage, self-diagnostics enable automatic self-recovery. Optimus™ can be installed in less than 2 hours: connect oil, power, and data – and you're set.

### Reliable data – no false alarms

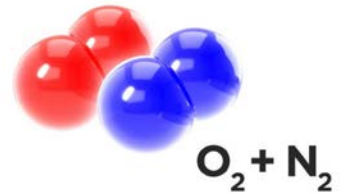
Thanks to autocalibration and IR reference measurement, Optimus™ provides reliable gas trending data at all times. Vacuum gas extraction eliminates fluctuation caused by oil temperature or

pressure, and the hermetically sealed and protected optics prevent sensor contamination. Moisture and hydrogen are measured directly in the oil with our capacitive thin-film polymer HUMICAP® sensor and solid-state sensors. The IR sensor is based on Vaisala core measurement technology and components manufactured in our own cleanroom. The result is data you can rely on to make critical operational decisions.



tank, the majority of the dissolved gases are nitrogen and oxygen, and the proportion of fault gases in the pressure value is negligible. The pressure trend of the dissolved gases gives a reliable indication of a leak, as nitrogen is the dominant component, and it is not formed or consumed in reactions inside the transformer.

### Total gas pressure



### Robust construction

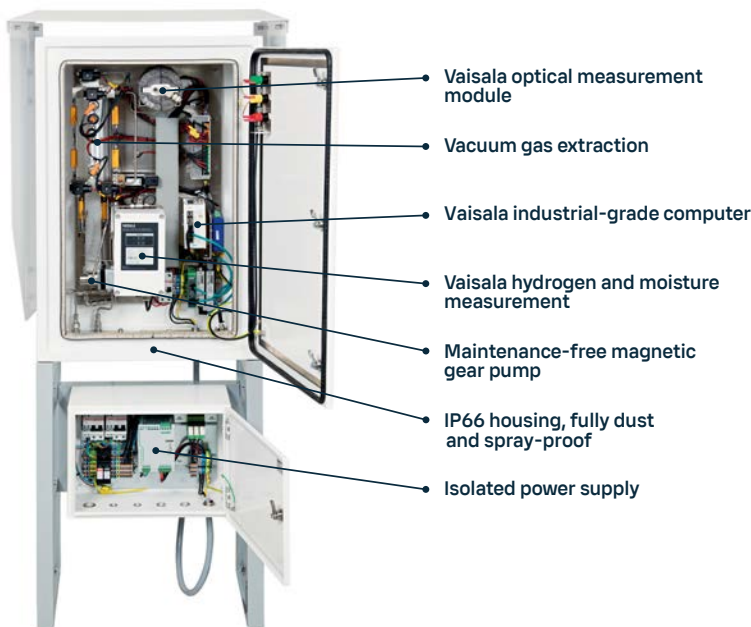
Stainless steel pipes, IP66-rated housing, as well as a magnetic drive gear pump and valves bring superb performance and durability – from the arctic to the tropics. What's more, there are no consumables to service or replace.

### DGA diagnostics with Duval Triangles

The publicly available and commonly used dissolved gas analysis method for transformer fault diagnostics purposes, Duval Triangles (IEC 60599, Annex B), is available as an optional feature. The user interface displays the progression of data points from the past year overlaid on top of Duval Triangles.

### Air leak detection using total gas pressure

Oxygen accelerates the aging of transformers, potentially cutting years from their operational life. With a groundbreaking method, Optimus™ DGA Monitor measures the total dissolved gas pressure of the sampled oil volume and detects any air leaks on sealed transformers without oxygen sensors. In case of an air leak into the transformer's



# Technical data

## Measurement specification

Parameter <sup>1)</sup>	Range	Accuracy <sup>2) 3)</sup>	Repeatability <sup>3)</sup>
Methane (CH <sub>4</sub> )	0–10 000 ppm <sub>v</sub>	±4 ppm or ±5 % of reading	10 ppm or 5 % of reading
Ethane (C <sub>2</sub> H <sub>6</sub> )	0–10 000 ppm <sub>v</sub>	±10 ppm or ±5 % of reading	10 ppm or 5 % of reading <sup>4)</sup>
Ethylene (C <sub>2</sub> H <sub>4</sub> )	0–10 000 ppm <sub>v</sub>	±4 ppm or ±5 % of reading	10 ppm or 5 % of reading
Acetylene (C <sub>2</sub> H <sub>2</sub> )	0–5000 ppm <sub>v</sub>	±0.5 ppm or ±5 % of reading	1 ppm or 5 % of reading
Carbon monoxide (CO)	0–10 000 ppm <sub>v</sub>	±4 ppm or ±5 % of reading	10 ppm or 5 % of reading
Carbon dioxide (CO <sub>2</sub> )	0–10 000 ppm <sub>v</sub>	±4 ppm or ±5 % of reading	10 ppm or 5 % of reading
Hydrogen (H <sub>2</sub> )	0–5000 ppm <sub>v</sub>	±15 ppm or ±10 % of reading	15 ppm or 10 % of reading
Moisture <sup>5)</sup> (H <sub>2</sub> O)	0–100 ppm <sub>w</sub> <sup>6)</sup>	±2 ppm <sup>7)</sup> or ±10 % of reading	Included in accuracy
Total gas pressure	0–2000 hPa	±10 hPa or ±2 % of reading	10 hPa or 5 % of reading

- 1) ppm values are defined as µl/l according to IEC 60567 standard conditions.  
 2) Accuracy specified is the accuracy of the sensors during calibration gas measurements.  
 3) Whichever is greater.  
 4) Repeatability of ethane measurement is specified with averaging of five measurements.  
 5) Measured as relative saturation (%RS).  
 6) Upper range limited to saturation.  
 7) Calculated ppm value is based on average solubility of mineral oils.

## Measurement operation

Measurement cycle duration	1–1.5 h (typical)
Response time (T63)	One measurement cycle <sup>1)</sup>
Warm-up time until first measurement data available	Two measurement cycles
Initialization time to full accuracy	Two days
Data storage	At least 10 years <sup>2)</sup>
Expected operating life	> 15 years

- 1) Three cycles for ethane and hydrogen.  
 2) Data storage may run out of space after 20 years of measurements. To keep the old data, it is recommended to download it every 10 years.

## Field performance

Parameter	Typical variance to laboratory DGA <sup>1) 2)</sup>
Acetylene (C <sub>2</sub> H <sub>2</sub> )	±1 ppm or ±10 % of reading
Hydrogen (H <sub>2</sub> )	±15 ppm or ±15 % of reading
Other measured gases	±10 ppm or ±10 % of reading
Moisture (H <sub>2</sub> O)	±2 ppm or ±10 % of reading

- 1) Compared with gas chromatography result from an oil sample considering also laboratory uncertainty. Performance of the gas-in-oil measurement may also be affected by oil properties and other chemical compounds dissolved in oil.  
 2) ppm values are defined as µl/l according to IEC 60567 standard conditions.

## Calculated parameters

Total dissolved combustible gases (TDCG)	Combined total of H <sub>2</sub> , CO, CH <sub>4</sub> , C <sub>2</sub> H <sub>6</sub> , C <sub>2</sub> H <sub>4</sub> , and C <sub>2</sub> H <sub>2</sub>
24 h average	Available for single gases, moisture, TDCG, and total gas pressure
Rate of change (ROC)	Available for single gases and TDCG for 24 h, 7 d, and 30 d periods
Gas ratios <sup>1)</sup>	Available ratios: <ul style="list-style-type: none"> <li>• CH<sub>4</sub>/H<sub>2</sub></li> <li>• C<sub>2</sub>H<sub>2</sub>/C<sub>2</sub>H<sub>4</sub></li> <li>• C<sub>2</sub>H<sub>2</sub>/CH<sub>4</sub></li> <li>• C<sub>2</sub>H<sub>6</sub>/C<sub>2</sub>H<sub>2</sub></li> <li>• C<sub>2</sub>H<sub>4</sub>/C<sub>2</sub>H<sub>6</sub></li> <li>• CO<sub>2</sub>/CO</li> </ul>

1) Calculated from 24 h average values. See standard IEC 60599.

## Power supply

Operating voltage	OPTPSU1: 100–240 V AC, 50–60 Hz, ±10 % OPTPSU2: 110–220 V DC, ±10 %
Overvoltage category	III
Maximum power consumption	500 W
Typical power consumption at +25 °C (+77 °F)	100 W

## Outputs

<b>RS-485 interface</b>	
Supported protocols	Modbus RTU, DNP3 (optional feature)
Galvanic isolation	2 kV RMS, 1 min
<b>Ethernet interface</b>	
Supported protocols	Modbus TCP, HTTP, HTTPS, DNP3 (optional feature), IEC 61850 (optional feature)
Galvanic isolation	4 kV AC (50 Hz, 1 min)
<b>Relay outputs</b>	
Number of relays	3 pcs, normally open (NO) or normally closed (NC), user-selectable
Trigger type	Gas alert with user-selectable limits
Max. switching current	6 A (at 250 V AC) 2 A (at 24 V DC) 0.2 A (at 250 V DC)
<b>Auxiliary device interface</b>	
Maximum power	48 W
Voltage output	24 V DC
<b>User interface</b>	
Interface type	Web-based user interface, can be operated with standard web browsers

## Mechanical specifications

Oil fitting	Stainless steel Swagelok® fitting for 10 mm (0.39 in) outer diameter tubing.
Max. length of oil pipe to transformer for mineral oil	Max. 10 m (33 ft) with 7 mm (0.28 in) inner diameter tubing <sup>1)</sup> Max. 5 m (16 ft) with 4 mm (0.15 in) inner diameter tubing
Max. length of pipe to transformer for ester liquid	Max. 10 m (33 ft) with 8 mm (0.31 in) inner diameter tubing
Housing material	Marine aluminum (EN AW-5754) (DGA Monitor), stainless steel AISI 316 (OPTPSU)
Installation options	Ground Mounting Set, Wall Mounting Set, Antivibration Wall Mounting Set

1) Bigger pipe volume will increase response time.

## Operating environment

Transformer liquid type <sup>1)</sup>	Mineral oil or ester liquids
Required minimum fire point of insulation liquid <sup>2)</sup>	+125 °C (+257 °F)
Transformer oil pressure at oil inlet	Max. 2 bar (absolute) continuous Burst pressure 20 bar (absolute)
Transformer insulation liquid temperature at oil inlet	Max. +100 °C (+212 °F) Min. +0 °C (+32 °F) for ester liquids Min. temperature for mineral oil depends on the pour point of the mineral oil.
Ambient humidity range	0–100 %RH, condensing
Ambient temperature range in operation	–40 ... +55 °C (–40 ... +131 °F)
Storage temperature range	–40 ... +60 °C (–40 ... +140 °F)
IP rating	IP66

<sup>1)</sup> Selected when ordering the device.

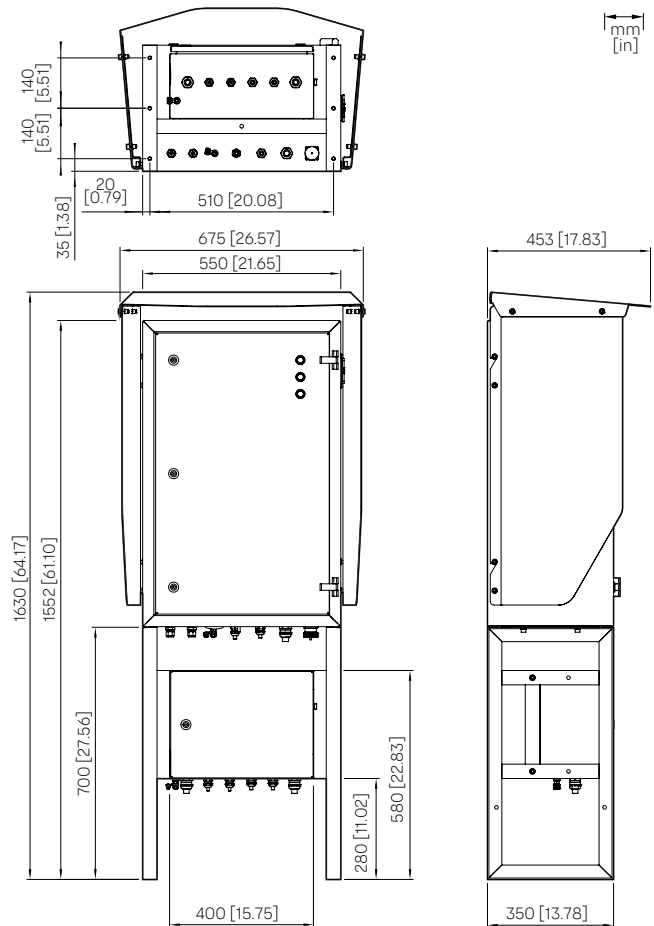
<sup>2)</sup> "The fire point [of transformer oil] is normally approximately 10 °C [18 °F] higher than the closed flash point." Heathcote, Martin J. *The J & P Transformer Book*. 13th ed. Elsevier, 2007.

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) Low Voltage Directive (2014/35/EU) OPT100 is specifically designed to be installed as part of another type of equipment that is excluded from the RoHS directive (2011/65/EU) scope.
EMC immunity	EN 61326-1, industrial environment IEC 61000-6-5, class 4
EMC emissions	FCC 47 CFR 15, section 15.107, class A ISED ICES-003, section 5(a)(i), class A
Safety	IEC/EN/UL/CSA-C22.2 61010-1
Environmental	IEC 60068-2-1 IEC 60068-2-2 ISO 6270-1:2017, constant humidity condensation atmosphere, C5 ISO 9227:2017, salt fog, C5 IEC 61010-1:2010/AMD1:2016, pollution degree 4 (outdoor), 3 (industrial area), 2 (device internal)
Compliance marks	CE, China RoHS, EAC, RCM

Vaisala is a global leader in measurement instruments and intelligence for climate action. We equip our customers with devices and data to improve resource efficiency, drive energy transition, and care for the safety and well-being of people and societies worldwide. With almost 90 years of innovation and expertise, we employ a team of over 2,300 experts committed to taking every measure for the planet.

Vaisala sensors are used in the harshest environments on Earth – Arctic, maritime and tropical – and even on Mars.



Dimensions with Ground Mounting Set

## Power transformer monitoring that works

Vaisala Optimus™ DGA Monitor delivers out-of-the-box performance, eliminates false alarms, and gives you the best long-term stable measurements for the key fault gases used in transformer diagnostics.

## MHT410 Moisture, Hydrogen, and Temperature Transmitter

For online transformer condition monitoring



### Features and benefits

- Measures moisture and hydrogen directly in transformer oil
- Compatible with mineral oil, natural ester oil, synthetic ester oil, and silicone oil
- Easy to install
- Provides early warning on potential transformer faults
- Unique probe design allows for direct measurement in oil
- 5-year standard warranty
- Robust design providing reliable operation and no false alarms
- Maintenance-free operation
- No cross-sensitivity to other gases
- Indigo520 compatible, with easy access to measurement data

Vaisala MHT410 Moisture, Hydrogen and Temperature Transmitter provides reliable online monitoring of insulating oil in power transformers.

### Real-time measurement

Vaisala Moisture, Hydrogen and Temperature Transmitter MHT410 provides an accurate real-time measurement result for critical parameters measured in oil, enabling reliable conclusions on the transformer's condition. With its unique probe design, MHT410 delivers accurate measurement and trend data about the health of the transformer in real time.

### Enabling proactive maintenance decisions

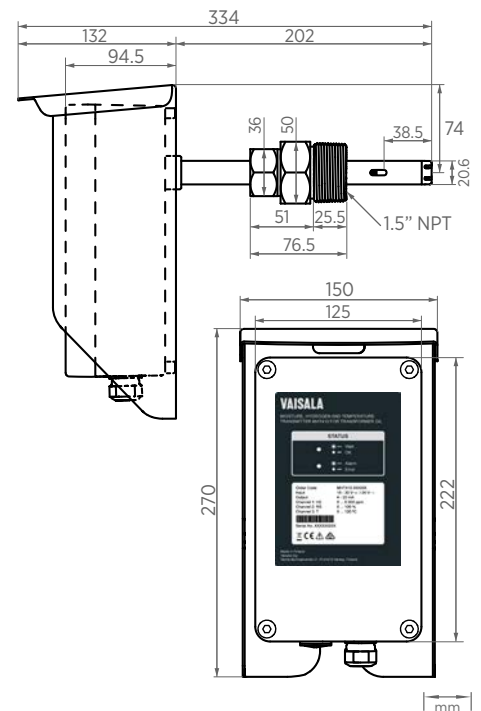
All of the transmitter's measured parameters are available through digital and analog outputs, providing information on transformer fault situations and enabling timely, proactive maintenance decisions to minimize expensive service shutdowns and outages.

MHT410 is also compatible with the Vaisala Indigo500 series transmitters. With its local graphical display, Indigo520 is a great addition to MHT410. It helps you to identify data trends at the site, as well as power the MHT410 with a single-wire solution.

### Robust and maintenance-free operation

MHT410 is designed for ease of use in demanding environments. It has undergone extensive testing to ensure it withstands wide temperature changes, vibration, and harsh outdoor conditions. The transmitter has no consumables or moving parts that could break, and is encased in an IP66-rated metal housing equipped with a weather shield.

Every unit is individually tested for a pressure of at least 10 bar and also withstands vacuum conditions. Special attention has been given to EMC tolerance: for example, all electrical connections are isolated. MHT410 can also tolerate short-term power outages.



# Technical data

## Measurement performance

Hydrogen	
Measurement range (in oil)	0–5000 ppm <sub>v</sub>
Accuracy <sup>1) 2)</sup>	±10 % of reading or ±15 ppm <sub>v</sub> (whichever is greater)
Repeatability	±10 % of reading or ±15 ppm <sub>v</sub> (whichever is greater)
Minimum detection limit	15 ppm <sub>v</sub>
Typical long-term stability	3 % of reading / year
Cross sensitivity to other gases	< 2 % (CO <sub>2</sub> , C <sub>2</sub> H <sub>2</sub> , C <sub>2</sub> H <sub>4</sub> , CO)
Response time	63 % of full response: 2 h (when sensor is not in reference cycle)
Warm-up time	2 h, 12 h for full specification
Sensor	Catalytic palladium-nickel alloy film solid-state sensor
Moisture in oil	
Measurement range (in oil)	0–100 %RS / a <sub>w</sub> 0–1
Response time (90 % of full response at +20 °C (+68 °F) in still oil)	10 min
Sensor	HUMICAP® 180L2
Accuracy (including non-linearity, hysteresis, and repeatability):	
0–90 %RS	±2 %RS (a <sub>w</sub> ± 0.02)
90–100 %RS	±3 %RS (a <sub>w</sub> ± 0.03)
Temperature	
Measurement range	–40 ... +120 °C (–40 ... +248 °F)
Accuracy at +20 °C (+68 °F)	±0.2 °C (0.36 °F)
Sensor	Pt1000 RTD Class F0.1 IEC 60751
<sup>1)</sup> The H <sub>2</sub> accuracy specified is the accuracy during calibration against gas in oil standard. Field performance may be affected, for example, by variation in hydrogen solubility (partition coefficients) between different mineral oils.	
<sup>2)</sup> The H <sub>2</sub> accuracy specified is applicable in the oil temperature specified (–20 ... +75 °C (–4 ... +167 °F)).	

## Inputs and outputs

Operating voltage	15–30 V DC, 24 V AC (±15 %) (power supply input is galvanically isolated) <sup>1)</sup>
Power consumption	Typical 4 W, maximum 12 W
Analog output (current) <sup>1)</sup>	
Channels	3 isolated 4–20 mA (loop-powering)
External load	Max. 500 Ω
Error status indication in case of device error	3.5 mA default, user-configurable for each channel
mA output accuracy at +20 °C (+68 F)	±0.125 % full scale
Temperature dependence of the analog outputs	±0.006 % / °C full scale
Digital outputs <sup>1)</sup>	
Interfaces	Isolated RS-485 half-duplex RS-485 (Service Port, non-isolated)
Protocols	Modbus® RTU, DNP3, serial ASCII
Screw terminals	Wire size AWG 22-14 Single wire (solid) 1.5 mm <sup>2</sup> Stranded wire (flex.) 1.0 mm <sup>2</sup> Recommended wire torque 0.4 Nm

<sup>1)</sup> Max. isolation voltage 1.5 kV DC.

## Mechanical specifications

Mechanical connection on transmitter	1.5" NPT (male)
Cable gland (optional, for use with Indigo520)	M20×1.5 for cable diameter 5 ... 9 mm (0.20–0.35 in)
Cable gland (optional)	M20×1.5 for cable diameter 8 ... 11 mm (0.31–0.43 in)
Cable gland (optional)	M20×1.5 for cable diameter 11 ... 14.5 mm (0.43–0.57 in)
Conduit fitting (optional)	1/2" NPT
Interface cable (optional, pre-assembled)	5 m (16 ft 5 in), 9.2 mm (0.36 in) outer diameter
Interface cable (optional)	10 m (33 ft), 9.2 mm (0.36 in) outer diameter
Interface cable (optional, for use with Indigo520)	10 m (33 ft), 6.2 mm (0.24 in) outer diameter
Housing material	AlSi 10 Mg
Transmitter weight without cables	4.1 kg (9.04 lb)
Self-diagnostics indication	Status LEDs, analog output, Modbus
Integrated data logging capabilities	Non-volatile memory, up to 44 years' storage with default logging
Individual functional test reports	Calibration test reports for moisture, hydrogen, and temperature; probe leak test report (5 bara nominal)
Factory warranty	5 years

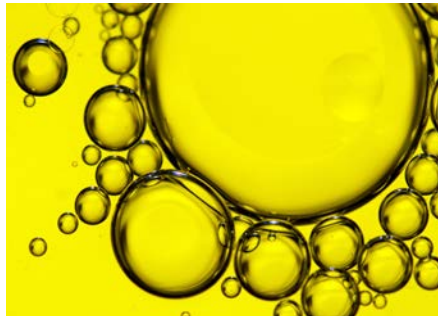
## Operating environment

Oil type	Mineral oil / Natural ester oil / Synthetic ester oil / Silicone oil
Operating temperature of probe head	–40 ... +120 °C (–40 ... +248 °F)
Operating temperature of enclosure	–40 ... +60 °C (–40 ... +140 °F)
Storage temperature	–40 ... +60 °C (–40 ... +140 °F)
Operating humidity	0–100 %RH, condensing
Pressure tolerance (probe, short-term)	Max. 10 bara
Pressure tolerance (probe, continuous)	Max. 4 bara
Integrated protection for short power outages	> 3 s
IP rating	IP66

## Compliance

EU directives and regulations	EMC, RoHS
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B (when DC powered)
Environmental	ISO 6270-1:2017, constant humidity condensation atmosphere, C5-M ISO 9227:2017, salt fog, C5-M ISO 12994-6, Paints and varnishes – Corrosion protection of steel structures by protective paint systems, part 6, C5
Compliance marks	CE, EAC, RCM, UKCA





### 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

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.

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.

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.
- Our sensor technology tells the true margin to water saturation point in all changing conditions, taking into account, for example, temperature changes and aging of oil.
- Highly stable pressure and temperature tolerances.
- Easy to install through ball valve – no need to shut down the process.
- Enables predictive maintenance work and quick identification of damaging trends.

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.

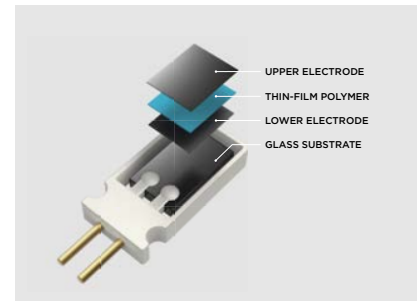
Oil molecules or additives do not penetrate the electrode. Thus the sensor output is independent of the oil type.

### Online measurement

Online 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 online 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  $\pm 0.01 a_w$  ( $\pm 1 \text{ } \% \text{RS}$ )
- Incorporates the proven Vaisala HUMICAP<sup>®</sup> sensor
- Modbus<sup>®</sup> RTU over RS-485
- Two lengths available for the probe head: 262 mm and 448 mm
- Traceable calibration certificate
- Compatible with Vaisala Indigo products and Insight PC software

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

### Reliable Vaisala HUMICAP<sup>®</sup> technology

MMP8 incorporates the latest-generation Vaisala HUMICAP<sup>®</sup> 180L2 sensor, which is the result of over 20 years of field experience.

The 180L2 sensor's excellent chemical tolerance provides accurate and reliable measurement over a wide measurement range. The 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 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 an optional ball valve kit, MMP8 is ideal for installation into processes where the probe needs to be installed or removed while the process is running. MMP8 is available in two different lengths, and the installation depth of the probe 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.

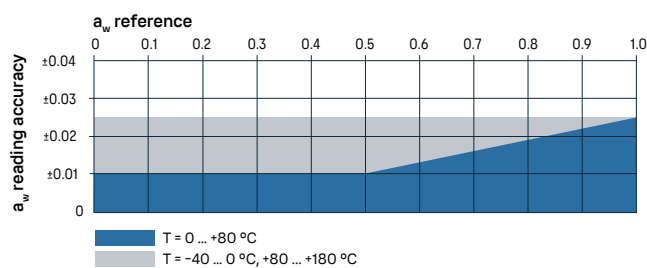
For more information on Indigo family products and Insight PC software that can be used with the probe, see [www.vaisala.com/insight](http://www.vaisala.com/insight) and [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

Water activity	
Measurement range	0–1 $a_w$
$T_{90}$ response time <sup>1)</sup>	10 min
Sensor	HUMICAP® 180L2
Accuracy <sup>2)</sup>	$\pm 0.01 a_w$ ( $\pm 1\%$ RS)
Water concentration in oil	
Typical accuracy	10 % of the reading
Temperature	
Measurement range	$-40 \dots +180$ °C ( $-40 \dots +356$ °F)
Accuracy at $+20$ °C ( $+68$ °F)	$\pm 0.2$ °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	$-40 \dots +180$ °C ( $-40 \dots +356$ °F)
Operating temperature of probe body	$-40 \dots +80$ °C ( $-40 \dots +176$ °F)
Storage temperature range	$-40 \dots +80$ °C ( $-40 \dots +176$ °F)
Operating pressure range	0–40 bar (0–580 psi), absolute
Installation pressure	Up to 10 bar (145 psi), absolute
IP rating of probe body	IP66
Ball valve	
Operating temperature	Up to $+100$ °C ( $+212$ °F)
Operating pressure	Up to 40 bar (580 psi), absolute

## 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 concentration in oil ( $\text{ppm}_w$ )

## Mechanical specifications

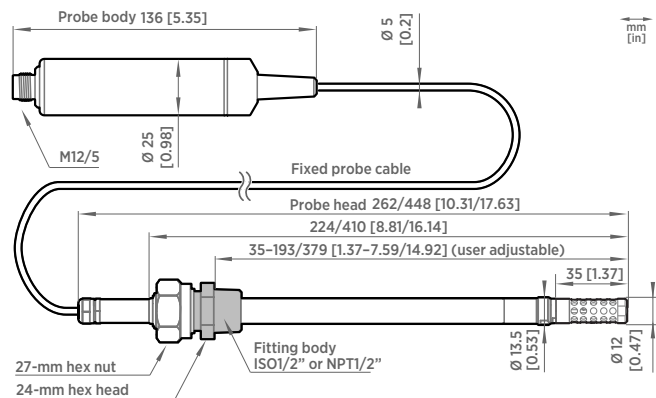
Connector	M12 5-pin A-coded male
Weight (with a 2-m cable)	262-mm-long MMP8: 510 g (18.0 oz) 448-mm-long MMP8: 610 g (21.5 oz)
Filter options	Stainless steel grid standard filter Stainless steel grid filter for high flow rates ( $> 1$ m/s)
Probe cable length	2 m (6.56 ft)
Adjustable installation depth	262-mm-long MMP8: 35–193 mm (1.37–7.59 in) 448-mm-long MMP8: 35–379 mm (1.37–14.92 in)
Materials	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP

## Compliance

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



- 1) DNV GL certificate applies to the 262-mm-long MMP8 model only, not to the 448-mm-long model.



## MMP8 dimensions

## Accessories

Ball valve kit ISO 1/2" with welding joint	BALLVALVE-1
Ball valve kit ISO 1/2" – ISO 3/4" with thread joint	BALLVALVE-2
Indigo USB adapter <sup>1)</sup>	USB2
Calibration adapter for HMK15	211302SP
Weatherproof carrying case for Indigo80 and a series 8 probe <sup>2)</sup>	ASM215318

- 1) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).  
 2) For example, MMP8, HMP8, or DMP8 with a max. 2-m (6.6-ft) probe connection cable.



### Features

- Continuous measurement of moisture in oil
- Proven Vaisala HUMICAP® sensor, over 15 years in oil applications
- Measurements in lubrication, hydraulic and transformer oils
- Excellent pressure and temperature tolerance
- Measuring water activity - ppm calculation for transformer oil
- Small size, easy to integrate
- Traceable calibration for measurement and analog outputs (certificates included)
- Applications: e.g. monitoring of transformer oil and of lubrication systems in marine and paper industry

Vaisala HUMICAP® Moisture and Temperature Transmitter Series for Oil MMT310 is a fast and reliable online detector for moisture in oil.

### Reliable Vaisala HUMICAP® Technology

The MMT310 series incorporates the latest generation of the Vaisala HUMICAP® sensor, developed for demanding moisture measurement in liquid hydrocarbons. The sensor's excellent chemical tolerance provides accurate and reliable measurement over the wide measurement range.

### Measuring Water Activity

MMT310 measures moisture in oil in terms of the water activity ( $a_w$ ) and temperature (T). Water activity indicates directly whether there is a risk of free-water formation. The measurement is independent of oil type, age, and temperature.

### Water Content as PPM Calculation for Transformer Oils

PPM units are traditionally used in transformer applications. They indicate the average mass concentration of water in oil. The ppm calculation for mineral oil based transformer oil is optional in the MMT310 series.

### Diverse Applications and Demanding Conditions

MMT310 can be used in lubrication and hydraulic systems as well as in transformers. It can be used for on-line moisture monitoring and as a control function, allowing separators and oil purifiers to be started only when necessary.

### Installation Options

MMT310 has two adjustable probe lengths. The transmitter can be ordered with a ball-valve set that enables the insertion and removal of the moisture probe for calibration, without the need to empty the oil system.

MMT317 has a small pressure-tight probe with optional Swagelok fittings.

An optional rain shield is available for outdoor installations.

### Several Outputs, One Connector

MMT310 transmitters have two analog outputs and an RS-232 serial output. The output signals and the supply power travel in the same cable, the only cable connected to the unit.

# Technical Data

## Measurement Performance

### Water Activity

Measurement range  $a_w$  (%RS) 0 ... 1 (0 ... 100 %)

Accuracy (Including Non-Linearity, Hysteresis, and Repeatability):

0 ... 0.9 (0 ... 90 %)  $\pm 0.02$

0.9 ... 1.0  $\pm 0.03$

Response time (90 %) at +20 °C in still oil (with stainless steel filter) 10 min

Sensor Vaisala HUMICAP® 180L2

### Temperature

Measurement range -40 ... +180 °C (-40 ... +356 °F)

Typical accuracy at +20 °C (68 °F)  $\pm 0.2$  °C ( $\pm 0.36$  °F)

Sensor Pt100 RTD Class F0.1 IEC 60751

## Mechanical Specifications

IP rating IP66

Weight example: MMT317 with 2 m cable 476 g

(Weight depends on selected probe and cable)

Cable feed through alternatives 8-pole connector with 5 m cable  
Female 8-pin connector screw joint for cable diameter 4 ... 8 mm

Sensor protection Stainless steel grid standard filter  
Stainless steel grid filter for high flow rates (> 1 m/s)

### Materials

Transmitter housing G-AlSi 10 Mg

Transmitter base PPS

### Probe Cable Length

MMT317 2 m, 5 m, or 10 m

MMT318 2 m, 5 m, or 10 m

### Probe installation MMT317

Swagelok® NPT 1/2", ISO 3/8" or ISO 1/2"

### Probe installation MMT318

Fitting bodies ISO 1/2", NPT 1/2"

## Spare Parts and Accessories

Rain shield ASM211103

USB cable 238607

Stainless steel filter HM47453SP

Stainless steel filter (high flow rate) 220752SP

Ball-Valve Set BALLVALVE-1

## Operating Environment

Operating temperature for electronics -40 ... +60 °C (-40 ... +140 °F)

Storage temperature -55 ... +80 °C (-67 ... +176 °F)

Pressure range for MMT318 with ball-valve up to 120 °C 0 ... 40 bar

Pressure range for MMT317 0 ... 10 bar

EMC compliance EN61326-1, Industrial environment

## Inputs and Outputs

Two analog outputs, selectable and scalable 0 ... 20 mA or 4 ... 20 mA  
0 ... 5 V or 0 ... 10 V  
1 ... 5 V available through scaling

Typical accuracy of analog output at +20 °C  $\pm 0.05$  % full scale

Typical temperature dependence of analog output 0.005 %/°C (0.003 %/°F) full scale

Serial output RS-232C

Connections 8-pole connector with RS232C, current/ voltage outputs (two channels) and  $U_{in}$

Operating voltage 10 ... 35 VDC

External load  $R_L < 500 \Omega$

Startup time after power-up 3 s

### Minimum Operating Voltage

RS232C output 10 VDC

Analog output 15 VDC

Pressures above 10 bara (145 psia) 24 VDC

### Power Consumption

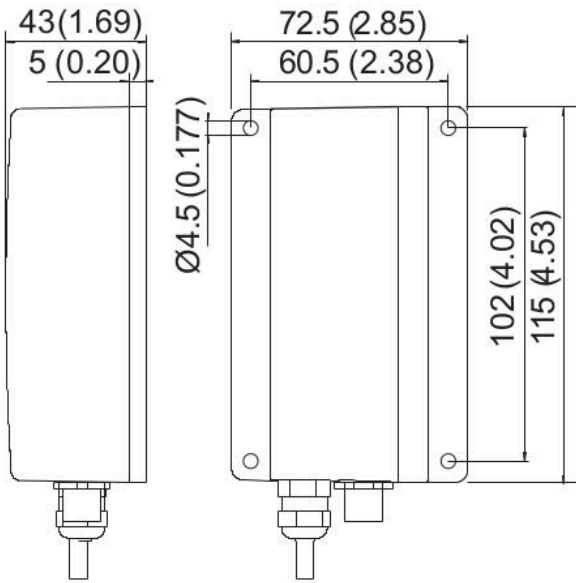
RS232C 12 mA

$U_{out}$  10 V (10 k $\Omega$ ) 12 mA

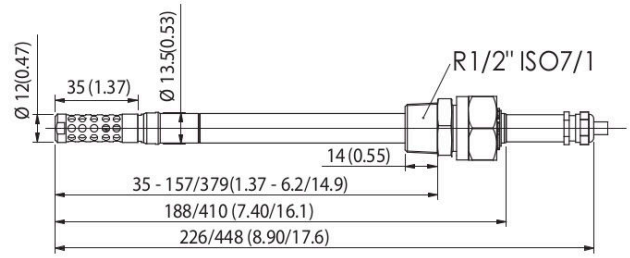
Channel 1 & channel 2

$I_{out}$  20 mA (load 511  $\Omega$ ) 50 mA

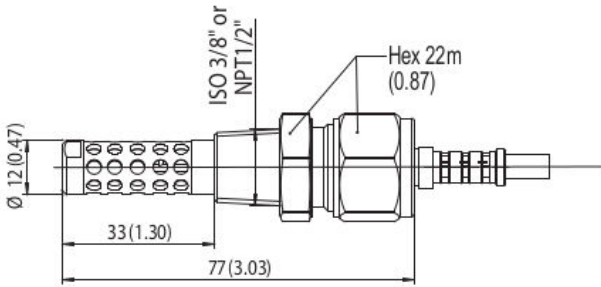
Channel 1 & channel 2



Transmitter body, dimensions in mm (inches)



MMT318 probe, dimensions in mm (inches)



MMT317 probe, dimensions in mm (inches)

## MMT162 Moisture and Temperature Transmitter for Oil

For OEM applications



### Features

- Continuous measurement of moisture in oil
- Measures in lubrication, hydraulic, and transformer oils
- Excellent pressure and temperature tolerance
- Proven Vaisala HUMICAP® sensor: over 20 years in oil applications
- Measures water activity - ppm calculation available for transformer oil
- Digital output RS-485 with Modbus
- Traceable calibration (certificate included)

Vaisala HUMICAP® Moisture and Temperature Transmitter for Oil MMT162 is an excellent economical solution for reliable on-line detection of moisture in oil.

### Benefits

- Reliable
- Durable
- Small size, easy to integrate

### Reliable Vaisala HUMICAP® technology

MMT162 incorporates the latest generation of the Vaisala HUMICAP® sensor. The sensor is developed for demanding moisture measurement in liquid hydrocarbons and has been successfully used in oil applications for over two decades. The sensor's excellent chemical tolerance provides accurate and reliable measurement over the measurement range.

### Water activity measurement

MMT162 measures moisture in oil in terms of the water activity ( $a_w$ ) and temperature (T). Water activity indicates directly whether there is a risk of free water formation. The measurement is independent of oil type, age, and temperature. The ppm calculation for mineral oil based transformer oil is optional in MMT162.

### Several outputs - one connector

MMT162 has two analog outputs that can be scaled and the measurement ranges changed. Additionally, the transmitter has an RS-485 serial output. The signals and the unit power travel in the same cable.

An optional LED cable enables a visual alarm.

### Compact, rugged, and intelligent

Due to its compact size, MMT162 is quickly and easily installed in tight spaces. Units are delivered fully assembled - however, you can reconfigure them to suit your needs.

### MM70 moisture and temperature meter

In combination with an MM70 Handheld Moisture and Temperature Meter, the MMT162 provides an ideal tool for on-site calibration. MM70 Handheld Measurement Indicator (included in the MM70 package) can be used as a communication and datalogging device and display for the MMT162.



# Technical data

## Measurement performance

### Water activity

Measurement range 0–1  $a_w$

Accuracy (including non-linearity, hysteresis, and repeatability):

0–0.9  $a_w$   $\pm$  0.02  $a_w$

0.9–1.0  $a_w$   $\pm$  0.03  $a_w$

Response time in oil flow (typical) < 1 min (dry-wet)

### Temperature

Accuracy at +20 °C (+68 °F)  $\pm$  0.2 °C (0.36 °F)

### Moisture

Calculated moisture content in ppm for mineral transformer oil

## Operating environment

Operating temperature –40 ... +60 °C (–40 ... +140 °F)

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

Oil temperature –40 ... +80 °C (–40 ... +176 °F)

Oil flow Some flow recommended

Pressure range Up to 200 bar

## Inputs and outputs

Alarm level indication by analog signal User selectable

Digital outputs RS-485, non-isolated, Vaisala protocol, Modbus RTU protocol

Analog current output 0–20 mA, 4–20 mA

Analog voltage output 0–5 V, 0–10 V

## Compliance

EU directives and regulations EMC Directive (2014/30/EU)  
RoHS Directive (2011/65/EU) as amended by 2015/863

Electromagnetic compatibility (EMC) IEC/EN 61326-1, industrial environment  
1)

Compliance marks CE, China RoHS, RCM, UKCA

1) Temperature output may deviate in industrial environments of 80–700 MHz.

## Mechanical specifications

Sensor HUMICAP®

Cable connections (2 ports) M8 4-pin male

Mechanical connections G 1/2" ISO or NPT 1/2"  
with bonded seal ring (washer)

Weight 200 g (7 oz)

### Minimum operating voltage with

RS-485 output 14–28 V DC

Voltage output 16–28 V DC

Current output 22–28 V DC

### Supply current

Normal measurement 20 mA + load current

### External load for

Voltage output Min. 10 k $\Omega$

Current output Max. 500  $\Omega$

### Housing

Probe body material Stainless steel (AISI 316L)

IP rating IP66

## Spare parts and accessories

Stainless steel filter (standard) 225356SP

Stainless steel filter for high flow 221494SP  
(> 1 m/s)

Connection cable for MM70 handheld meter 219980

USB serial interface cable 219690

Sealing ring set (U-seal) ISO G1/2, 3 pcs 221525SP

Sealing ring set (copper) ISO G1/2, 3 pcs 221524SP

ISO 1/2" plug 218773

NPT 1/2" plug 222507

Sampling cell DMT242SC

Sampling cell with Swagelok connectors DMT242SC2

### Connection cables

0.32 m (1 ft) shielded, M8 threaded HMP50Z032

3.0 m (9.8 ft), shielded, M8 threaded HMP50Z300SP

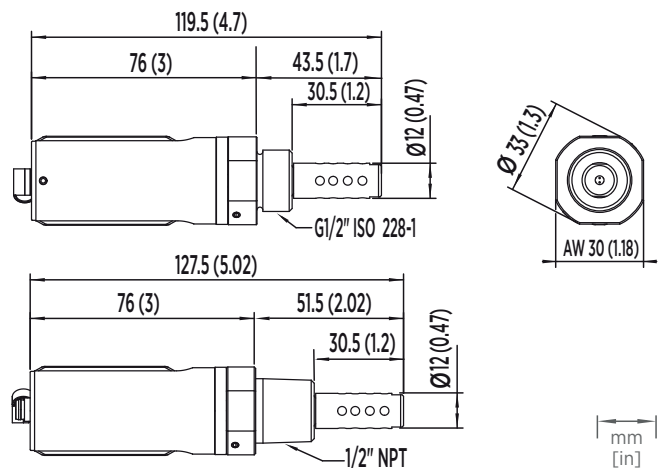
5.0 m (16.4 ft), shielded, M8 threaded HMP50Z500SP

10 m (32.8 ft), shielded, M8 threaded HMP50Z1000SP

3 m, shielded, connector 90° angle 231520SP

5 m, shielded, connector 90° angle 231521SP

M8 threaded, Ch1 signal + Ch2 LED MP300LEDCBL



MMT162 dimensions

## Indigo80 Handheld Indicator For portable diagnostics








### Features

- Flexible operation with Vaisala Indigo-compatible probes and transmitters, including HMP80 and DMP80 handheld probes and GMP80P probe with pump sampling
- Intuitive user interface available in 10 languages
- Rechargeable battery
- Robust design and modern appearance
- Logged measurement data can be transferred to PC via Vaisala Insight software

Vaisala Indigo80 Handheld Indicator is an industrial-grade portable diagnostics tool. Accommodating up to two Vaisala measurement probes, Indigo80 is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting Vaisala Indigo-compatible probes and transmitters.

### Variety of probe options

The Indigo80 indicator has two cable ports by which a combination of two probes or transmitters can be simultaneously connected to the indicator. Indigo80 can communicate with most current and future Vaisala probes and transmitters for measuring a wide range of parameters.

-  Humidity and temperature
-  Dew point
-  Carbon dioxide
-  Hydrogen peroxide vapor
-  Moisture in oil

For the full set of probes and transmitters currently compatible with Indigo80, see the following page. For more information on the Indigo product family, see [vaisala.com/indigo](https://vaisala.com/indigo).

### Robust and reliable

The sturdy aluminum body of Indigo80 is resistant to chemicals and dust. Indigo80 is powered by a rechargeable lithium-ion battery with a typical operation time of 10 h. During long-term logging Indigo80 can be powered by using an AC adapter.

### Easy to use

Indigo80 has an intuitive user interface that guides the user if needed. The indicator is designed to be easy to use in numerous use cases and measurement environments.

To access logged data and configuration functionality, Indigo80 can be connected to Vaisala Insight PC software for Windows®. For more information, see [vaisala.com/insight](https://vaisala.com/insight).

### Multilingual user interface

Indigo80 has a multilingual, menu-based user interface that shows live measurement data both numerically and graphically. The Indigo80 user interface is available in 10 languages.



View live measurement data as numbers or graphs

# Vaisala devices compatible with Indigo80

## Vaisala Indigo-compatible probes

HMP1, HMP3, HMP4, HMP5, HMP7, HMP8, HMP9, HMP80L, HMP80N	Humidity and temperature
TMP1	Temperature
DMP5, DMP6, DMP7, DMP8, DMP80A, DMP80B	Dew point
GMP251, GMP252	Carbon dioxide
HPP271, HPP272	Vaporized hydrogen peroxide
MMP8	Moisture in oil

## Other Vaisala devices

HMP60, HMP63, HMP110, HMP113, HMP115, HMM170	Humidity and temperature
HMP110T, HMP115T, TMP115	Temperature
DMT143, DMT143L	Dew point

## Vaisala Indigo transmitters (host devices)

Indigo300, Indigo510, Indigo520
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# Technical data

## Operating environment

Operating temperature	-20 ... +50 °C (-4 ... +122 °F)
Storage temperature	-20 ... +60 °C (-4 ... +140 °F), recommended +20 °C (+68 °F)
Operating and storage humidity	20–85 %RH, when Ta ≤ +40 °C (+104 °F)
Charging temperature	0 ... +45 °C (+32 ... +113 °F) <sup>1)</sup>
IP rating	IP40
Use in wet location	No
Operating environment	Indoor use
Pollution degree	3
Maximum operating altitude	2000 m (approx. 6500 ft)

1) The battery will not charge at temperatures below 0 °C (+32 °F).

## Data logging and user interface specifications

Data logging capacity	Up to 5.5 million real-time data values
Logging interval	1 s - 12 h
Logging duration	1 min - memory full <sup>1)</sup>
Alarm	Audible alarm function
Supported languages	English, Chinese, Finnish, French, German, Italian, Japanese, Portuguese, Spanish, Swedish
Display	2.7" sunlight readable transfective TFT LCD color display with backlight and automatic brightness control

1) For example, data logging duration for one measurement parameter with a logging interval of one second is over eight weeks. Use an AC adapter to power Indigo80 during long-term logging.

## Battery operation time

Operation time (continuous use)	10 h at +20 °C (+68 °F) <sup>1)</sup>
Charging time	2 hours <sup>1)</sup>

1) Typical value. Actual performance depends on, for example, the number and type of devices connected to Indigo80 and the data logging interval.


## Mechanical specifications

Weight	385 g (14 oz)
Dimensions (H × W × D)	213 × 58 × 27 mm (8.4 × 2.3 × 1.1 in)
<b>Materials</b>	
Main body and rear piece	Aluminum EN AW-6082 T6
Back cover	Rubber (TPE) and polycarbonate (PC), reinforced with fiberglass Flammability rating UL94 V-1
Display	Strengthened glass with anti-fingerprint (AF) and anti-reflection (AR) coatings

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B FCC part 15 B, Class B ICES-3 / NMB-3 (Class B)
Electrical safety	IEC/EN 61010-1
Compliance marks	CE, China RoHS, FCC, RCM, UKCA

## Inputs and outputs

Max. number of connected probes	2
Connector type	M12 5-pin female (2 pcs)
<b>Battery</b> <sup>1)</sup>	
Type	Rechargeable lithium-ion battery
Nominal voltage	7.2 V
Rated capacity	2900 mAh / 20.88 Wh
Charge limit voltage	8.4 V
<b>AC adapter</b> <sup>2)</sup>	
Type	45 W USB-C AC adapter <sup>3)</sup>
Connector type	USB-C
AC input	100-240 V AC, 1.2 A, 50-60 Hz
DC output	5.0 V/9.0 V/12.0 V/15.0 V DC, 3.0 A 20.0 V DC, 2.25 A 45 W
Insulation	Double or reinforced, indicated with the following symbol: 
PC interface	Vaisala Insight PC software with USB-C cable (Windows OS). <sup>4)</sup> Data can be logged and transferred also without Insight.

1) The battery is not user-replaceable. Contact Vaisala Service Center for any battery-related maintenance needs.

2) The AC adapter is an optional accessory. If using an AC adapter not provided by Vaisala, make sure it fulfills the specifications given in this table and the safety requirements listed in Indigo80 Safety Guide (M212872EN), available at docs.vaisala.com.

3) 45 W AC adapter recommended for optimal performance of Indigo80. An AC adapter with a lower power rating can also be used.

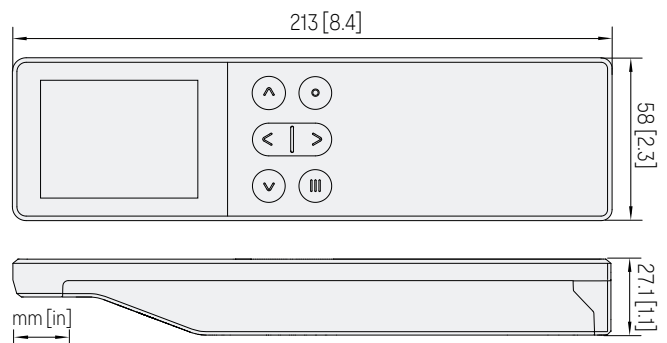
4) Insight software is available for download at [vaisala.com/insight](https://vaisala.com/insight).

## Spare parts and accessories

<b>Cables</b>	
Cable for transmitters (M12-M8), 1.5 m (4 ft 11 in)	262195SP
Cable for probes (M12-M12), 1.5 m (4 ft 11 in)	272075SP
Flat cable for probes (M12-M12), 1 m (3 ft 3 in)	CBL210493SP
Probe connection cable (M12-M12), 10 m (32 ft 10 in)	INDIGOCABLE10M
<b>Other</b>	
Magnetic hanger for indicator	ASM214318SP
Weatherproof carrying case for Indigo80 and HMP80 and DMP80 series probes	ASM214759
Weatherproof carrying case for Indigo80 and a series 8 probe <sup>1)</sup>	ASM215318
Light carrying case for HM40S or Indigo80 indicator and a compatible probe <sup>2)</sup>	230245SP

1) For example, MMP8, HMP8, or DMP8 with a max. 2-m (6 ft 7 in) probe connection cable.

2) For example, DMP80, HMP80N, or GMP252 probe with handle accessory and a max. 1.5-m (4 ft 11 in) probe connection cable.



Indigo80 dimensions (front and side view)

## Indigo520 Transmitter For Vaisala Indigo-compatible probes



### Features

- Supports 2 detachable measurement devices simultaneously
- Data logging of all measurement parameters
- IP66 rated metal enclosure
- 4 configurable galvanically isolated analog outputs
- 2-wire current loop analog input
- 2 relays
- Ethernet connection with web interface for remote access
- Displays measurements on the spot and 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
- Optional non-display model with LED indicator

### Variety of probe options

Indigo500 Series transmitters are the most versatile option for use with Indigo-compatible probes.

- HMP Series humidity and temperature probes
- DMP Series dew point probes
- GMP250 Series carbon dioxide probes
- HPP270 Series vaporized hydrogen peroxide probes

- 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.

Indigo500 Series transmitters can be connected to the MHT410 transmitter for display of measurement data and automation system connectivity.

Indigo500 Series transmitters can also be connected to the portable diagnostics tool Indigo80 handheld indicator.

Indigo520 transmitter can be connected to Polaris™ PR53 process refractometers for measuring liquid concentrations.

For more information on the Indigo product family, see [vaisala.com/indigo](https://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. The Ethernet connection also 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 H<sub>2</sub>O<sub>2</sub> (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
Carbon dioxide	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
Polaris™ Process Refractometers <sup>1)</sup>	PR53AC, PR53AP, PR53GC, PR53GP, PR53M, PR53SD, PR53W
Indigo80 Handheld Indicator	Indigo80
MGP260 Series Multigas Probes	MGP261, MGP262
Differential Pressure Transmitters	PDT101, PDT102

<sup>1)</sup> Compatible with transmitters ordered with software configuration "L" for process refractometers.

## Transmitter options

Display	<ul style="list-style-type: none"> <li>Capacitive touchscreen display</li> <li>No display (indicator LED) <sup>1)</sup></li> </ul>
Powering	<ul style="list-style-type: none"> <li>Protective extra-low voltage (15–35 V DC, 24 V AC ± 20%)</li> <li>AC (mains) power (100–240 V AC 50/60 Hz)</li> <li>Power over Ethernet (no analog outputs, analog input, or relays)</li> </ul>

<sup>1)</sup> Recommended when the transmitter is exposed to direct UV light, and for outdoor installations and high-humidity environments.

## 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

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	5.0–9.0 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)

## Operating environment

Operating environment	Outdoor use
Use in wet location	Yes
Operating humidity	0–100 %RH
Maximum operating altitude, AC (mains) power	3000 m (approx. 9800 ft)
Maximum operating altitude, protective extra-low voltage (PELV) and Power over Ethernet (PoE)	4000 m (approx. 13 100 ft)
IP rating	IP66 <sup>1)</sup>
UL 50E rating	Type 4

### Operating temperature

With display	-25 ... +55 °C (-13 ... +131 °F)
Without display	-40 ... +60 °C (-40 ... +140 °F)
Without display with barometer module	-40 ... +55 °C (-40 ... +131 °F)

### Storage temperature

With display	-30 ... +60 °C (-22 ... +140 °F)
Without display	-40 ... +60 °C (-40 ... +140 °F)

<sup>1)</sup> Evaluated by Eurofins, not by UL.

## Powering

Property	Description/Value
<b>Operating power <sup>1)</sup></b>	
Protective extra-low voltage (PELV) version	15–35 V DC, 24 V AC $\pm 20\%$ 50/60 Hz, max. current 2 A (power supply is galvanically isolated) Fuse size for power supply: 3 A Isolation voltage: 500 V AC, 1000 V DC
PELV power cable temp. rating	$\geq +80\text{ }^{\circ}\text{C}$ (+176 $^{\circ}\text{F}$ )
AC (mains) power version	100–240 V AC 50/60 Hz, max. current 1 A (power supply is galvanically isolated) Fuse size for power supply: 10 A Isolation voltage: 1500 V AC
AC (mains) power cable length	2.5 m (approx. 8 ft 2 in)
Power over Ethernet version	Power over Ethernet (PoE) IEEE 802.3at Type 2 Class 4 Max. current 600 mA, max. power consumption 25.5 W Isolation voltage: 500 V AC, 1000 V DC

### Typical current consumption at +20 °C (+68 °F) ( $U_{in}$ 24 V DC) <sup>2)</sup>

Base consumption (no display, analog outputs, or communication)	50 mA
With display	+ 60 mA
With voltage analog output	< 2 mA per channel
With current analog output	+ 21 mA per channel
With relays	+ 9 mA per relay
With Ethernet cable connected	+ 15 mA
With barometer module	+ 5 mA

<sup>1)</sup> The power supply option is selected when ordering the transmitter.

<sup>2)</sup> For the current consumption of the connected measurement device, see the device's documentation, available at [docs.vaisala.com](http://docs.vaisala.com).

## User interfaces

User interfaces	Web interface for remote use, optional touchscreen display
Supported languages	English, Chinese, French, German, Japanese, Spanish
Optional display	5" capacitive touchscreen
Integrated data logging capabilities	Non-volatile memory, at least 10 years' storage with 24 h interval logging

## Inputs and outputs

Transmitter service port connection	Connection to Indigo80 with cable 262195SP
<b>Analog input <sup>1)</sup></b>	
Available ranges	4–20 mA
Resolution	6 $\mu\text{A}$
Display resolution	0.01 mA
Accuracy	$\pm 0.05\text{ mA}$
Input impedances	200 $\Omega$
Isolation	Isolated from power supply
Overload protection	40 mA max. (reverse polarity protected)

<b>Analog outputs <sup>1)</sup></b>	
Number of analog outputs	4
Isolation	Isolated from power supply
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 <sup>2</sup> (14 AWG)
Accuracy of analog outputs at +20 °C (+68 °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	$R_L > 10\ \text{k}\Omega$

<b>Relay outputs <sup>1)</sup></b>	
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 <sup>2</sup> (14 AWG)
Max. wire size in AC (mains) version	1.5 mm <sup>2</sup> (16 AWG)

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

<sup>1)</sup> Not available in transmitters that are powered with Power over Ethernet (PoE).

## Compliance

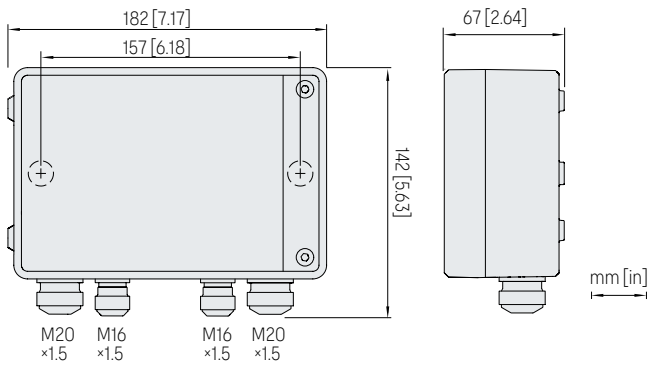
EU directives and regulations	EMC Directive (2014/30/EU) Low Voltage Directive (2014/35/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B
Electrical safety	IEC/EN 61010-1
Type approvals	DNV GL certificate no. TAA000032M EU RO Mutual Recognition certificate no. MRA000004F
Compliance marks	CE, China RoHS, FCC, RCM, UKCA
Listing marks	UL Listed (USA and Canada)
FCC compliance	FCC Part 15, Class B



## Accessories

Adapter plate	DRW252186SP
Installation kit for pole or pipeline	215108
Installation kit with weather shield	215109
Indigo500 spatter guard	ASM214526
M12 - M8 service cable 1.5 m (4.9 ft), for connecting to Indigo80	262195SP
<b>Probe connection cables</b>	
Probe connection cable, 0.3 m (approx. 12 in), open end <sup>1)</sup>	CBL210896-03MSP
Probe connection cable, 1 m (approx. 3 ft 3 in), open end <sup>1)</sup>	CBL210896-1MSP
Probe connection cable, 3 m (approx. 9 ft 10 in), open end <sup>1)</sup>	CBL210896-3MSP
Probe connection cable, 5 m (approx. 16 ft 5 in), open end <sup>1)</sup>	CBL210896-5MSP
Probe connection cable, 10 m (approx. 32 ft 10 in), open end <sup>1)</sup>	CBL210896-10MSP

<sup>1)</sup> The usable length outside of the transmitter enclosure is approx. 0.1 m (4 in) shorter than the total length of the cable.

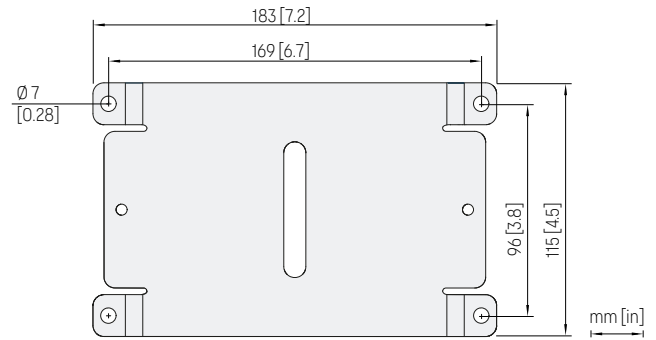


Indigo520 dimensions and lead-through sizes

## Spare parts

Cable gland, M20×1.5, 5.0–9.0 mm (0.20–0.35 in)	ASM213670SP
Cable gland with split bushing, M20×1.5 <sup>1)</sup>	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
Sintered filter (for barometer module)	DRW010335SP

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



Indigo500 adapter plate dimensions





Vaisala Multiparameter Transmitter DPT145 with DILO DN20 connector

Vaisala Multiparameter Transmitter DPT145 for SF<sub>6</sub> gas is a unique innovation that enables online measurement of dew point, pressure, and temperature. It also calculates four other values, including SF<sub>6</sub> density. DPT145 is especially well suited for integration into OEM systems.

### Online reliability

Online dew point measurement combined with pressure measurement provides an excellent assessment of the condition of SF<sub>6</sub> insulation. Sudden and minor leakages are immediately detected by the direct normalized pressure measurement, while online dew point measurement alerts the user to moisture issues, which can weaken the insulation properties of SF<sub>6</sub> and cause rapid deterioration. With DPT145, it is also easy to build a redundant solution for multiple parameters.

### Savings across the board

A single transmitter, instead of several, saves time and money across the board, from investment to installation, operation, and servicing. Lower assembly

costs, fewer cables and connectors, minimized need for on-site visits and field operations - all these translate into cumulative savings. The long calibration interval results in further savings.

### Risk-free, greener solution

Online measurement enables gas trends to be followed via a data collection system, making monitoring fast, risk-free, and accurate. Using one instrument for monitoring seven different parameters means also fewer mechanical connections and reduces the risk of leaks. Monitoring is environmentally friendly because there is no need for sampling - no SF<sub>6</sub> gas is released into the atmosphere.

### Features

- The first transmitter to offer online measurement of seven SF<sub>6</sub> parameters in one unit
- Measured parameters: dew point, pressure, temperature
- Calculated parameters: SF<sub>6</sub> density, normalized pressure, dew point in atmospheric pressure, ppm
- More reliable assessment of the condition of SF<sub>6</sub> insulation due to online measurement
- Digital output: RS-485 with Modbus®
- Long calibration interval of years



DPT145 with weather shield

### The fruit of experience

Vaisala has over 80 years of extensive measurement experience and knowledge. DPT145 brings together the proven DRYCAP® dew point sensor technology and BAROCAP® pressure sensor technology in one package, providing an innovative and convenient solution for monitoring SF<sub>6</sub> gas.

# Technical data

## Measured parameters

Dew point	-60 ... +30 °C (-76 ... +86 °F)
Pressure, absolute	1 ... 12 bar (14.5 ... 174 psi)
Temperature	-40 ... +80 °C (-40 ... +176 °F)

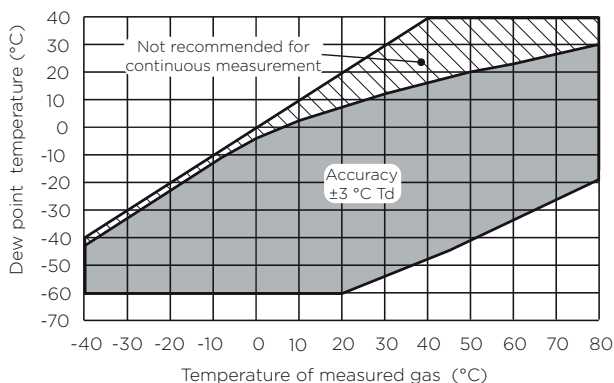
## Calculated parameters

Pressure, normalized to +20 °C (+68 °F)	1 ... 12 bar (14.5 ... 174 psi)
SF <sub>6</sub> or SF <sub>6</sub> /N <sub>2</sub> mixture density	0 ... 100 kg/m <sup>3</sup>
Moisture by volume, ppm	40 ... 40 000 ppm
Dew point, converted to atmospheric pressure	-65 ... +30 °C (-85 ... +86 °F)

## Measurement performance

Dew point accuracy	±3 °C (±5.4 °F), see graph below
Dew point stability	Typical drift < 2 °C (3.6 °F) / 5 years
Pressure accuracy at +23 °C (+73.4 °F)	±0.4 %FS
Pressure temperature dependence	±0.01 bar/10 °C (18 °F)
Pressure stability	Typical drift < 1 %FS / 5 years
Temperature accuracy	0 ... +40 °C (+32 ... +104 °F): ±0.5 °C (± 0.9 °F) -40 ... 80 °C (-40 ... +176 °F): ±1 °C (± 1.8 °F)
Density accuracy (pure SF <sub>6</sub> , 1 ... 12 bara)	0 ... +40 °C (+32 ... +104 °F): ±1 %FS -40 ... +60 °C (-40 ... +140 °F): ±2.2 %FS
Typical ppm accuracy (5 ... 1000 ppm, 7 bar)	±(7 ppm + 15 % of reading)
Sensor	Vaisala MPS1 multiparameter sensor
<b>Sensor response time</b>	
Pressure response time	< 1 s
Dew point response time <sup>1)</sup>	-50 → -10 °C Tdf: 5 s [10 s] 63 % [90 %] at 20 °C and 1 bar -10 → -50 °C Tdf: 10 s [2.5 min]

### DPT145 dew point measurement accuracy:



1) System equilibrium related response time is typically longer.

## Inputs and outputs

Digital outputs	RS-485, non-isolated, Vaisala protocol Modbus RTU protocol
Connector	M8 4-pin male
Operating voltage	15 ... 28 VDC 20 ... 28 VDC in cold temperatures (-40 ... -20 °C (-40 ... -4 °F))
Supply current, during normal measurement	20 mA
Supply current, during self-diagnostics	Max. 300 mA pulsed

## Operating environment

Operating temperature of electronics	-40 ... +60 °C (-40 ... +140 °F)
Operating pressure	1 ... 12 bar (14.5 ... 174 psi)
Mechanical durability	0 ... 50 bar (0 ... 725 psi)
Relative humidity	0 ... 100 %
Measured gases	SF <sub>6</sub> , SF <sub>6</sub> /N <sub>2</sub> mixture
Storage temperature, transmitter only	-40 ... +80 °C (-40 ... +176 °F)
Storage temperature, shipment package	-20 ... +80 °C (-4 ... +176 °F)

## Mechanical specifications

Housing material	AISI316L
Mechanical connection	DILO DN20, DILO DN8, ABB Malmquist, or Alstom G1/2" compatible connector Every connection is helium leak tested at the factory.
Weight (with DILO adapter)	765 g (27.0 oz)
IP rating	IP66 <sup>1)</sup>

1) Weather shield to be used in continuous outdoor installations.

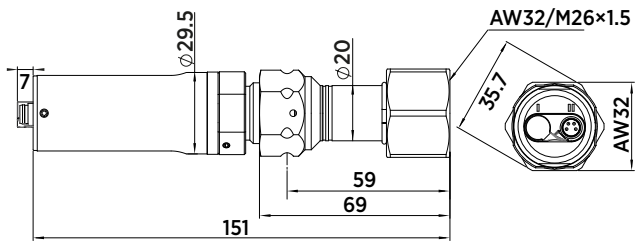
## Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment
Compliance marks	CE, RCM
<b>Mechanical vibration</b>	
Vibration (sinusoidal)	±6 g, 5-500 Hz sweep
IEC 60068-2-6	60 min/axis, 3-axis

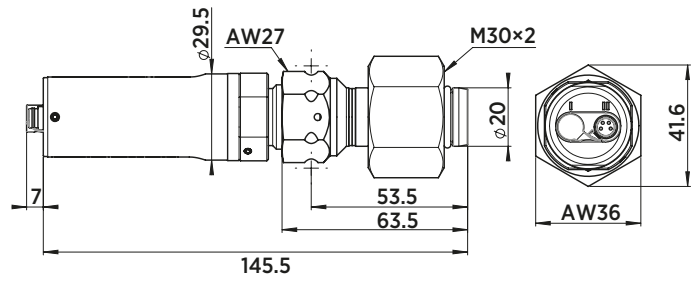
## Spare parts and accessories

Connection cable for the MI70/DM70 handheld	219980
USB connection cable	219690
Protection plug for connector	218675SP
1.5 m shielded PUR cable with 90° connector	231519SP
3 m shielded PUR cable with 90° connector	231520SP
5 m shielded PUR cable with 90° connector	231521SP
10 m shielded PUR cable with 90° connector	231522SP
3 m shielded FEP cable with straight connector	226902SP
Weather shield	ASM210326SP

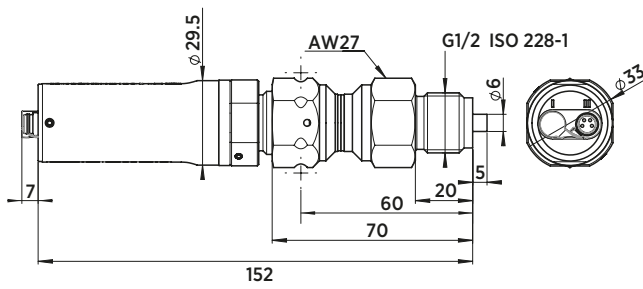
# Technical data



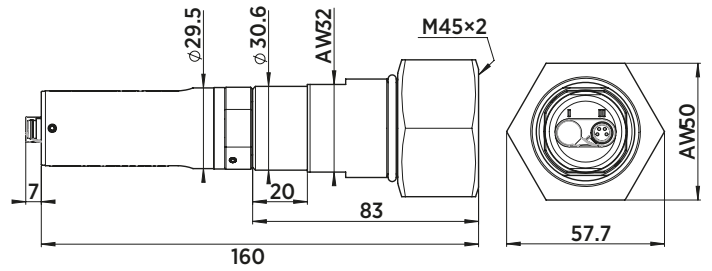
DPT145 with DILO DN8 connector



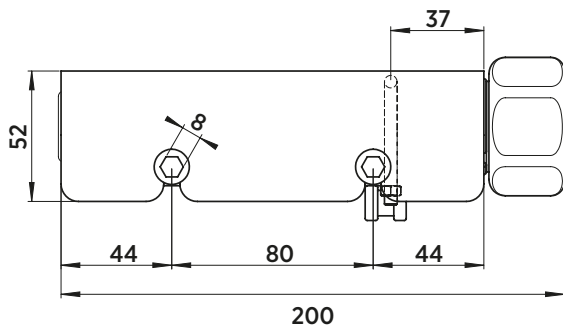
DPT145 with ABB Malmquist connector



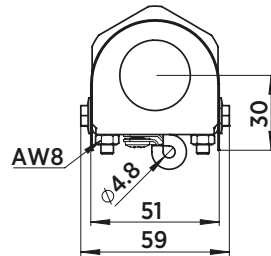
DPT145 with Alstom connector



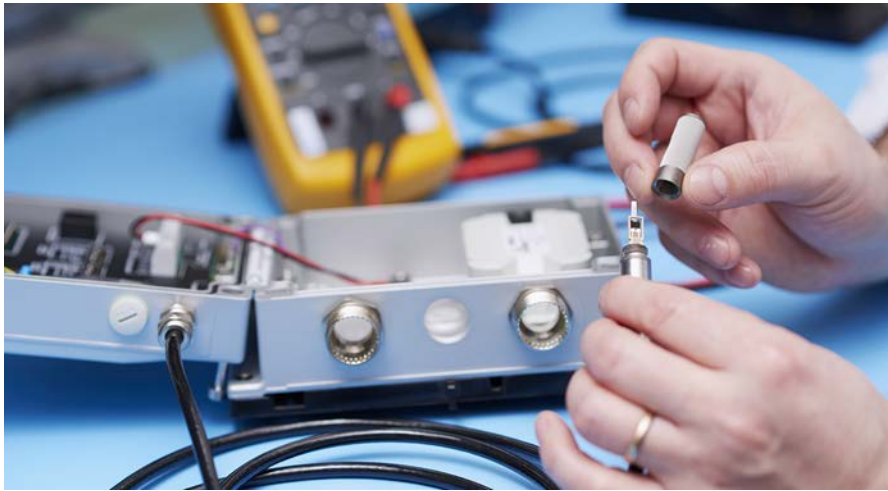
DPT145 with DILO DN20 connector



DPT145 with weather shield



mm



### Much more than calibration

All of our calibration options include:

- Functional testing
- Traceable calibration
- Accuracy adjustment as needed
- Filter replacement as needed
- Calibration certificate with as-found and as-left results
- Service report
- Updated calibration due-date reminder label

Using our calibration services is the most convenient way to ensure that your Vaisala instrument meets its original accuracy specifications. You can browse and order calibration services from our online store, including ISO 9001 and ISO/IEC 17025 accredited calibrations. We provide calibrations both as an on-demand service or with a multi-year Calibration Care Agreement.

## Three common questions about calibration

### 1. Why is calibration important?

- Anything worth measuring is worth measuring right – all electronics and sensors are subject to drift over time
- Regular calibration is important to verify the accuracy of a device and adjust if needed
- A calibration certificate is often required by quality management systems and regulations

### 2. Do I need calibration or adjustment?

- Calibration means comparing the output of a measurement instrument against a reference instrument and reporting the result
- Adjustment means changing the output of a measurement instrument so that it corresponds to the output of a reference instrument
- Both are always included in Vaisala Service Center calibrations

### 3. How often should I calibrate my instruments?

- The answer to this question will depend on your accuracy requirements, operating environment, and quality system requirements
- The most common calibration interval is 12 months but this is up to each individual customer

Please visit [store.vaisala.com/en/services](https://store.vaisala.com/en/services) to browse service availability and terms in your area.



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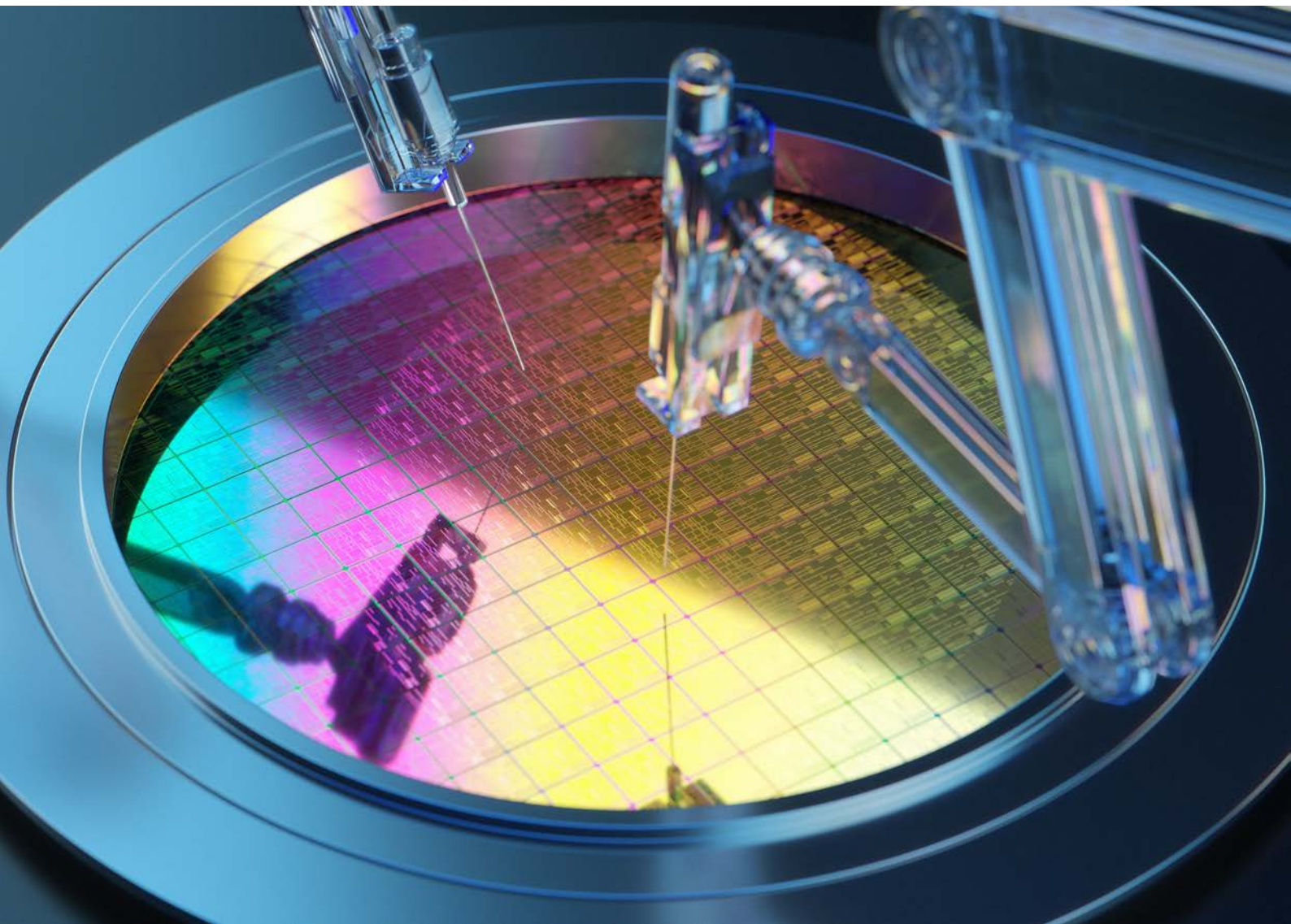
[vaisala.com/PowerCatalog](https://vaisala.com/PowerCatalog)



# Product Catalog

Humidity · Temperature · Dew point · Carbon dioxide  
Biogas quality · Moisture in oil · Continuous monitoring  
Dissolved gas analysis · Hydrogen peroxide · Pressure  
Liquid concentration · Weather · Service offering

**INDUSTRIAL MEASUREMENTS**



**VAISALA**



# Instruments and intelligence for industrial needs

Vaisala's Industrial Measurements business area provides customers with visibility into their own processes. Our products provide them with accurate and reliable measurement data which enables them to make decisions for optimized industrial processes.

## Customer groups

Vaisala's measurement products are used by a variety of industries, such as life science, power generation and transmission, HVAC, electronics, automotive, lithium battery manufacturing and food processing. The stable real time measurements extend equipment lifetime, and improve processes, productivity, and end-product quality.

## Life Cycle Services

Our Life Cycle Services provide comprehensive care through the life cycle of our measurement instruments. As a trusted partner to our global customers, we enable sustainable decisions by maintaining the most accurate measurement data throughout the entire product and system life cycle.

This product catalog provides an overview of our products to help you select what best suits your needs. For more information, visit us at [vaisala.com](https://vaisala.com) or contact us at [vaisala.com/requestinfo](https://vaisala.com/requestinfo). Product user documentation is available at [docs.vaisala.com](https://docs.vaisala.com).



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### Features

- Easy access to configuration settings and measurement data of supported devices
- Simple setup, diagnostics, and field calibration and adjustment
- Supports Indigo-compatible measurement 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 measurement probes and other supported devices.

### Indigo product family

Vaisala Indigo-compatible probes are self-contained, interchangeable measurement probes. The probes can be used as standalone digital Modbus® RTU devices, or together with Indigo series transmitters or the Indigo80 indicator, which 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 local display of an Indigo transmitter or the Indigo80 indicator. Alternatively, 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 Windows 10 operating systems or newer. One product specific USB cable (type A connector) per connected probe is needed.

Vaisala Insight software is available for download at [vaisala.com/insight](https://vaisala.com/insight).



# Devices supported by Insight software

## 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
Carbon dioxide	GMP251, GMP252
Vaporized hydrogen peroxide	HPP271, HPP272
Moisture in oil	MMP8

## Indigo transmitters and handheld devices

Device or series	Models
Indigo200 Transmitter <sup>1)</sup>	INDIGO201, INDIGO202
Indigo300 Transmitter	INDIGO300
Indigo80 Handheld Indicator	INDIGO80
DMP80 Series Handheld Dew Point Probes	DMP80A, DMP80B
HMP80 Series Handheld Humidity and Temperature Probes	HMP80L, HMP80N
GMP80P Portable Carbon Dioxide Probe with Pump Sampling	GMP80P

1) Requires model with USB-C connection, introduced in 2022. Models with WLAN connection are not supported by Insight software.

## Other supported devices

Device or series	Models
DMT143 Miniature Dew Point Transmitters	DMT143, DMT143L
GMD110 Duct Carbon Dioxide Transmitter	GMD110
HMD60 Series Humidity and Temperature Transmitters	HMD62, HMD65, TMD62
HMDW110 Series Humidity and Temperature Transmitters	HMW110, HMW112, HMD110, HMD112, HMS110, HMS112, TMI110
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
HMT370EX Series Intrinsically Safe Humidity and Temperature Transmitters	HMT370EX, HMP371, HMP373, HMP374, HMP375, HMP377, HMP378
MGP260 Series Multigas Probes	MGP261, MGP262
Polaris™ Refractometers	PR53AC, PR53AP, PR53GC, PR53GP, PR53M, PR53W, PR53SD
VDL200 Data Logger	VDL200

## Indigo200 Series Transmitters

For Vaisala Indigo-compatible probes



### Features

- Transmitter USB-C port allows connecting to Vaisala Insight PC software with a generic USB cable
- 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 transmitting measurements 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 CO<sub>2</sub> 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 color display with numeric and graph measurement viewing options; 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.

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 H<sub>2</sub>O<sub>2</sub> and alcohol-based cleaning agents.

For easy access to configuration and monitoring options, Indigo200 can be connected to Vaisala Insight PC software using the USB-C port on the transmitter with any generic USB cable that has a USB-C connector.

With Insight PC software, you can configure both the host device and the probes connected to it. Insight PC software also provides options for temporary viewing of the measurement data and diagnostics.

For more information on Indigo transmitters and the Indigo product family, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## General

- Color display (Indigo201: optional non-display version)
- USB connection to Vaisala Insight PC software for easy access to configuration and monitoring options.

## 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
Carbon dioxide	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:
	<ul style="list-style-type: none"> <li>• H<sub>2</sub>O<sub>2</sub> (6000 ppm, non-condensing)</li> <li>• Alcohol-based cleaning agents such as ethanol and IPA (max. 70 % concentrate)</li> </ul>
IP rating	IP65 <sup>1)</sup>
Indoor/outdoor use	Indoor use

<sup>1)</sup> Note that the IP65 rating only applies when the cable gland wiring option is used, and the lead-through with the pierceable seal at the back of the transmitter is left intact. See user documentation for more information on Indigo200 wiring options.

## Inputs and outputs

Insight PC software configuration access <sup>1)</sup>	USB-C port on transmitter (compatible with generic USB cables)
Power supply input	15–30 V DC <sup>2)</sup>
	24 V AC ±10 % 50/60 Hz
Relay contacts x 2	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
------------------------	--------------------

<sup>1)</sup> Vaisala Insight software for Windows\* available at [www.vaisala.com/insight](http://www.vaisala.com/insight).

<sup>2)</sup> When used with the HMP7 probe, the minimum required power supply input is 18 V DC.

## Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, RCM

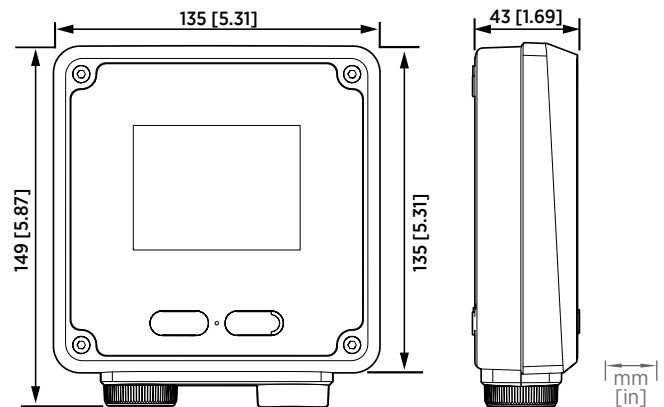
## Mechanical specifications

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

## Spare parts and accessories

USB-C connection cable (2 m, type C to A, for Insight PC software access) <sup>1)</sup>	273956
Probe connection cable, 1 m (3 ft 3 in)	INDIGOCABLE1M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 1 m (3 ft 3 in)	INDIGOCABLEHDM5
Probe connection cable, 3 m (9 ft 11 in)	INDIGOCABLE3M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 3 m (9 ft 11 in)	INDIGOCABLEHDM3M
Probe connection cable, 5 m (16 ft 5 in)	INDIGOCABLE5M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 5 m (16 ft 5 in)	INDIGOCABLEHDM5M
Probe connection cable, 10 m (32 ft 10 in)	INDIGOCABLE10M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 10 m (32 ft 10 in)	INDIGOCABLEHDM10M
Universal mains power supply with EU/US/UK/AUS plugs	INDIGOPOWER24VSP

<sup>1)</sup> Note that a USB-C cable is not included in Indigo200 deliveries by default. A generic USB-C cable (type C to A) can also be used.



Indigo200 series dimensions

## Indigo300 Transmitter For Vaisala Indigo-compatible probes



### Features

- Numerical and graphical color display for up to 3 parameters
- Non-display version with an LED status indicator also available
- IP66-rated metal housing
- Support for one Indigo-compatible probe
- Tool-free locking wheel for the probe
- 24 V AC/DC power supply input
- 3 preconfigured analog outputs (mA or V)
- Service port on the front for connecting to Vaisala Insight PC software or Indigo80 handheld indicator

Vaisala Indigo300 Transmitter is a host device for displaying measurement values from Vaisala Indigo-compatible probes and/or transmitting them to automation systems through analog signals.

### Transmitter for Vaisala Indigo-compatible probes

- HMP series humidity and temperature probes
- TMP1 temperature probe
- DMP series dew point probes
- GMP250 series carbon dioxide probes
- HPP270 series vaporized hydrogen peroxide probes
- MMP8 moisture in oil probe

The Indigo300 transmitter is a plug-and-play host device for current and future Vaisala Indigo-compatible probes. The transmitter has a numerical and graphical color display showing up to 3 measurement parameters simultaneously.

A non-display transmitter version with an LED status indicator is also available.

### Simple to connect and service

Probes can be connected to the transmitter tool-free using the locking wheel of the probe connector. You can connect a probe directly or by using a cable. Instead of the locking wheel and a detachable cable, it is also possible to use a cable gland with a fixed cable.

The service port on the front can be opened with a 4-mm Allen key for access to the free Vaisala Insight PC software or Indigo80 handheld indicator.

With Insight and Indigo80, you can view live measurement data from the probe connected to the transmitter, configure both the transmitter and the probe, as well as calibrate and adjust the probe without having to detach it from the transmitter.

### Robust design

The IP66-rated, corrosion-resistant metal housing of the transmitter is suitable for harsh conditions.

### Versatile installation options

The mounting options include mounting through the transmitter body and mounting on a DIN rail. With an adapter plate, the transmitter can be installed to replace an HMT330, DMT340, or MMT330 series transmitter.

The transmitter can either be wired from the back, which leaves no trailing cables, or through the bottom lead-throughs.

For more information on the Indigo300 transmitter and the Indigo product family, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# 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
Carbon dioxide	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	With display: -30 ... +70 °C (-22 ... +158 °F)
	Without display: -40 ... +70 °C (-40 ... +158 °F)
Operating humidity	0-100 %RH
Maximum operating altitude	5000 m (approx. 16 400 ft)
IP rating	IP66 <sup>1)</sup>

1) IP40 for transmitters equipped with a locking wheel and a probe connection cable attached to it. This combination is recommended only for indoor conditions.

## Inputs and outputs

Power supply input	15-30 V DC <sup>1)</sup>
	24 V AC ±10 % 50/60 Hz
Fuse size for power supply	2.5 A
Transmitter service port connection	<ul style="list-style-type: none"> <li>• Connection to Insight with USB2 and cable 262195SP <sup>2)</sup></li> <li>• Connection to Indigo80 with cable 262195SP</li> </ul>
<b>Analog outputs</b>	Current or voltage
Number of analog outputs	3
Selectable voltage output types	0-1 V, 0-5 V, 0-10 V, 1- 5 V, scalable, $R_L \geq 10 \text{ k}\Omega$
Selectable current output types	4-20 mA, 0-20 mA, scalable, $R_L \leq 500 \Omega$
Accuracy of analog outputs at 20 °C (+68 °F)	±0.1 % full scale <sup>3)</sup>
Temperature dependence	±0.005 % / °C full scale

### Current consumption at 20 °C (+68 °F) ( $U_{in}$ 24 V DC)

Minimum consumption with display off, no analog outputs active, no probe connected <sup>4)</sup>	13 mA
Minimum consumption with display on, brightness normal mode, no analog outputs active, no probe connected	18 mA
$U_{out}$ 0-1 V, 0-5 V, 0-10 V, 1-5 V	+ 1.8 mA per connected channel at maximum load
$I_{out}$ 4-20 mA, 0-20 mA	+ 12.3 mA max. per connected channel

1) When used with the HMP7 probe, the minimum required power supply input is 18 V DC.

2) Vaisala Insight software for Windows™ available at <http://www.vaisala.com/insight>.

3) For the voltage outputs, small variation is possible around true zero.

4) For the current consumption of the connected probe, see the probe's user documentation.

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN IEC 61326-1, industrial environment
EMC emissions	CISPR 32 / EN 55032, Class A FCC part 15 B, Class A ICES-3 / NMB-3 (Class A)
Compliance marks	CE, China RoHS, FCC, RCM, UKCA

## Mechanical specifications

Housing material	EN AW-6082
Connection screw terminals	Max. 1.5 mm <sup>2</sup> wire (16 AWG)
Cable lead-throughs for output and power cables	<ul style="list-style-type: none"> <li>• M20×1.5 cable gland / conduit fitting NPT 1/2"</li> <li>• M16×1.5 cable gland / conduit fitting NPT 1/2"</li> </ul>
Cable diameter for M20×1.5 gland	7-13 mm (0.26-0.51 in)
Cable diameter for M16×1.5 gland	2-6 mm (0.08-0.24 in)
Dimensions	161 × 134 × 43.5 mm (6.34 × 5.26 × 1.71 in)
Weight	1200 g (2.65 lb)

## Probe connection cables

Detachable cables for use with locking wheel <sup>1)</sup>	
Probe connection cable, 1 m (3 ft 3 in)	INDIGOCABLE1M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 1 m (3 ft 3 in)	INDIGOCABLEHD1M5
Probe connection cable, 3 m (9 ft 11 in)	INDIGOCABLE3M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 3 m (9 ft 11 in)	INDIGOCABLEHD3M
Probe connection cable, 5 m (16 ft 5 in)	INDIGOCABLE5M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 5 m (16 ft 5 in)	INDIGOCABLEHD5M
Probe connection cable, 10 m (32 ft 10 in)	INDIGOCABLE10M
Probe connection cable, H <sub>2</sub> O <sub>2</sub> compatible, 10 m (32 ft 10 in)	INDIGOCABLEHD10M
Fixed cables for use with cable gland <sup>2)</sup>	
Probe connection cable, 0.3 m (12 in), open end <sup>3)</sup>	CBL210896-03MSP
Probe connection cable, 1 m (3 ft 3 in), open end	CBL210896-1MSP
Probe connection cable, 3 m (9 ft 11 in), open end	CBL210896-3MSP
Probe connection cable, 5 m (16 ft 5 in), open end	CBL210896-5MSP
Probe connection cable, 10 m (32 ft 10 in), open end	CBL210896-10MSP

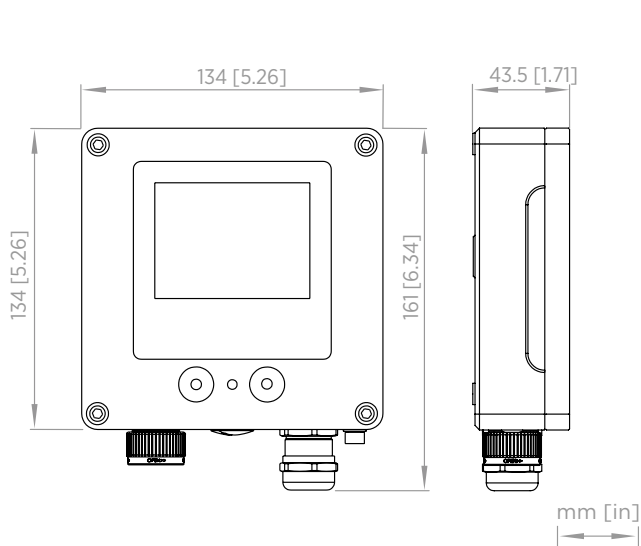
1) The IP rating of transmitters that use detachable probe connection cables with the locking wheel is IP40.

2) The IP rating of transmitters that use fixed probe connection cables with the cable gland is IP66.

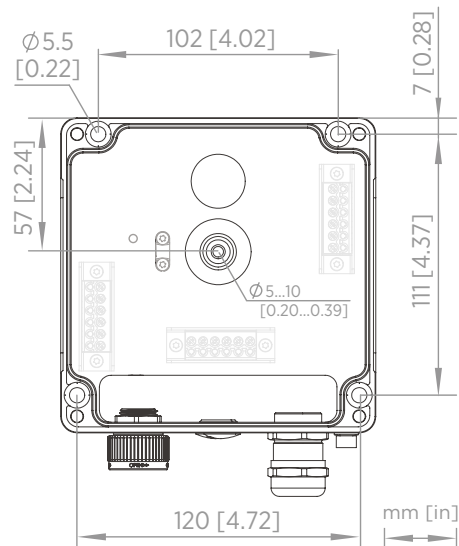
3) The usable length outside of the transmitter enclosure is approx. 0.1 m (4 in) shorter than the total length of the cable.

## Spare parts and accessories

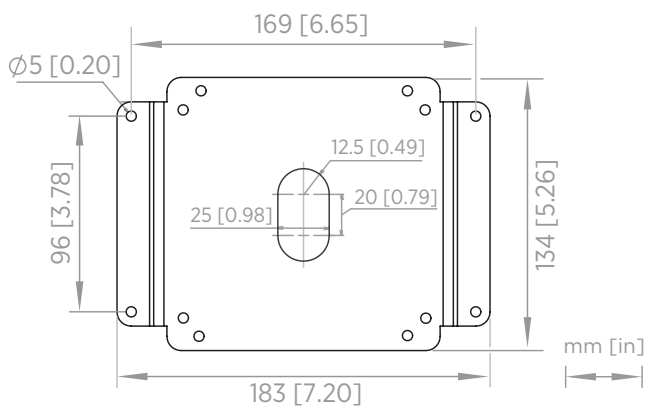
Adapter plate for replacing a Vaisala 330 series transmitter	DRW257715SP
DIN rail installation kit	ASM215071SP
Vaisala Indigo USB adapter and M12 - M8 service cable, for connecting to Insight	USB2 and 262195SP
M12 - M8 service cable 1.5 m (4.9 ft), for connecting to Indigo80	262195SP
Cable gland M20×1.5 for 7.0–13.0 mm (0.26–0.51 in) cable	253993SP
Conduit fitting M20×1.5 for NPT1/2" conduit	214780SP
Cable gland M16×1.5 for 2.0–6.0 mm (0.08–0.24 in) cable	ASM213671SP
Conduit fitting M16×1.5 for NPT1/2" conduit	210675SP
Plug for M20 lead-through	ASM213672SP
Plug for M16 lead-through	210369SP
Service port plug	DRW257660SP



Indigo300 transmitter dimensions



Indigo300 transmitter body mounting dimensions



Indigo300 adapter plate (DRW257715SP) mounting dimensions

## Indigo510 Transmitter

For Vaisala Indigo-compatible probes



### Features

- Touchscreen display (optional non-display model with LED indicator also available)
- Data logging of all measurement parameters
- IP66 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
- UL Listed in USA and Canada

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

Indigo500 Series transmitters are the most versatile option for use with Indigo-compatible probes.

- HMP Series humidity and temperature probes
- DMP Series dew point probes
- GMP250 Series carbon dioxide probes
- HPP270 Series vaporized hydrogen peroxide probes
- 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.

Indigo500 Series transmitters can be connected to the MHT410 transmitter for display of measurement data and automation system connectivity. Indigo500 Series transmitters can also be connected to the portable diagnostics tool Indigo80 handheld indicator.

For more information on the Indigo product family, see [vaisala.com/indigo](https://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. The Ethernet connection also 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 H<sub>2</sub>O<sub>2</sub> (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
Carbon dioxide	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
Indigo80 Handheld Indicator	Indigo80

## Transmitter options

Display	<ul style="list-style-type: none"> <li>Capacitive touchscreen display</li> <li>No display (indicator LED)<sup>1)</sup></li> </ul>
Powering	Protective extra-low voltage (11–35 V DC, 24 V AC ± 15% 50/60 Hz)

<sup>1)</sup> Recommended when the transmitter is exposed to direct UV light, and for outdoor installations and high-humidity environments.

## User interfaces

User interfaces	Web interface for remote use, optional touchscreen display
Supported languages	English, Chinese, French, German, Japanese, Spanish
Optional display	5" capacitive touchscreen
Integrated data logging capabilities	Non-volatile memory, at least 10 years' storage with 24 h interval logging

## Mechanical specifications

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)
<b>Cable diameters for cable glands</b>	
M20×1.5 glands	5.0–9.0 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)

## Operating environment

Operating environment	Outdoor use
Use in wet location	Yes
Operating humidity	0–100 %RH
Maximum operating altitude	4000 m (approx. 13 100 ft)
IP rating	IP66 <sup>1)</sup>
UL 50E rating	Type 4

Operating temperature	
With display	–20 ... +60 °C (–4 ... +140 °F)
Without display	–40 ... +60 °C (–40 ... +140 °F)

Storage temperature	
With display	–30 ... +60 °C (–22 ... +140 °F)
Without display	–40 ... +60 °C (–40 ... +140 °F)

<sup>1)</sup> Evaluated by Eurofins, not by UL.

## Powering

Property	Description/Value
<b>Operating power</b>	
Protective extra-low voltage (PELV)	11–35 V DC, 24 V AC ±15 % 50/60 Hz, max. current 2 A (power supply 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)

Typical current consumption at +20 °C (+68 °F) (U <sub>in</sub> 24 V DC) <sup>1)</sup>	
Base consumption (no display, analog outputs, or communication)	50 mA
With display	+ 60 mA
With voltage analog output	< 2 mA per channel
With current analog output	+ 21 mA per channel
With Ethernet cable connected	+ 15 mA

<sup>1)</sup> For the current consumption of the connected measurement device, see the device's documentation, available at docs.vaisala.com.

## Inputs and outputs

Transmitter service port connection	Connection to Indigo80 with cable 262195SP
-------------------------------------	--

Analog outputs	
Number of analog outputs	2
Isolation	Isolated from power supply
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 <sup>2</sup> (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 <sub>L</sub> < 500 Ω
0–1 V output	R <sub>L</sub> > 2 kΩ
0–5 V and 0–10 V outputs	R <sub>L</sub> > 10 kΩ

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



## Compliance

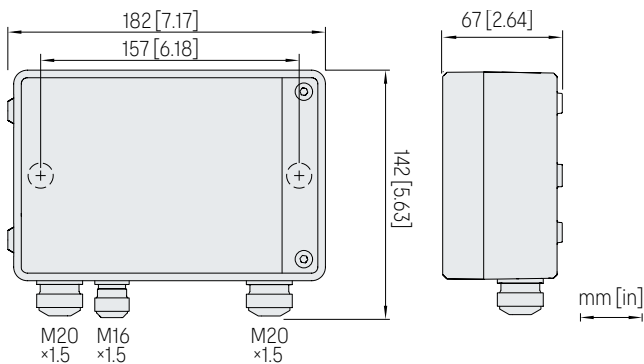
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B
Electrical safety	IEC/EN 61010-1
Type approvals	DNV GL certificate no. TAA000032M EU RO Mutual Recognition certificate no. MRA000004F
Compliance marks	CE, China RoHS, FCC, RCM, UKCA
Listing marks	UL Listed (USA and Canada)
FCC compliance	FCC Part 15, Class B



## Accessories

Adapter plate	DRW252186SP
Installation kit for pole or pipeline	215108
Installation kit with weather shield	215109
Indigo500 spatter guard	ASM214526
M12 - M8 service cable 1.5 m (4.9 ft), for connecting to Indigo80	262195SP
<b>Probe connection cables</b>	
Probe connection cable, 0.3 m (approx. 12 in), open end <sup>1)</sup>	CBL210896-03MSP
Probe connection cable, 1 m (approx. 3 ft 3 in), open end <sup>1)</sup>	CBL210896-1MSP
Probe connection cable, 3 m (approx. 9 ft 10 in), open end <sup>1)</sup>	CBL210896-3MSP
Probe connection cable, 5 m (approx. 16 ft 5 in), open end <sup>1)</sup>	CBL210896-5MSP
Probe connection cable, 10 m (approx. 32 ft 10 in), open end <sup>1)</sup>	CBL210896-10MSP

<sup>1)</sup> The usable length outside of the transmitter enclosure is approx. 0.1 m (4 in) shorter than the total length of the cable.

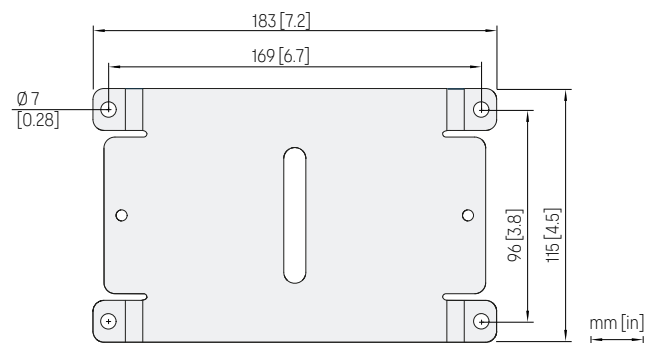


Indigo510 dimensions and lead-through sizes

## Spare parts

Cable gland, M20×1.5, 5.0–9.0 mm (0.20–0.35 in)	ASM213670SP
Cable gland with split bushing, M20×1.5 <sup>1)</sup>	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

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



Indigo500 adapter plate dimensions

## Indigo520 Transmitter For Vaisala Indigo-compatible probes



### Features

- Supports 2 detachable measurement devices simultaneously
- Data logging of all measurement parameters
- IP66 rated metal enclosure
- 4 configurable galvanically isolated analog outputs
- 2-wire current loop analog input
- 2 relays
- Ethernet connection with web interface for remote access
- Displays measurements on the spot and 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
- Optional non-display model with LED indicator

### Variety of probe options

Indigo500 Series transmitters are the most versatile option for use with Indigo-compatible probes.

- HMP Series humidity and temperature probes
- DMP Series dew point probes
- GMP250 Series carbon dioxide probes
- HPP270 Series vaporized hydrogen peroxide probes

- 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.

Indigo500 Series transmitters can be connected to the MHT410 transmitter for display of measurement data and automation system connectivity.

Indigo500 Series transmitters can also be connected to the portable diagnostics tool Indigo80 handheld indicator.

Indigo520 transmitter can be connected to Polaris™ PR53 process refractometers for measuring liquid concentrations.

For more information on the Indigo product family, see [vaisala.com/indigo](https://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. The Ethernet connection also 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 H<sub>2</sub>O<sub>2</sub> (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
Carbon dioxide	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
Polaris™ Process Refractometers <sup>1)</sup>	PR53AC, PR53AP, PR53GC, PR53GP, PR53M, PR53SD, PR53W
Indigo80 Handheld Indicator	Indigo80
MGP260 Series Multigas Probes	MGP261, MGP262
Differential Pressure Transmitters	PDT101, PDT102

<sup>1)</sup> Compatible with transmitters ordered with software configuration "L" for process refractometers.

## Transmitter options

Display	<ul style="list-style-type: none"> <li>Capacitive touchscreen display</li> <li>No display (indicator LED) <sup>1)</sup></li> </ul>
Powering	<ul style="list-style-type: none"> <li>Protective extra-low voltage (15–35 V DC, 24 V AC ± 20%)</li> <li>AC (mains) power (100–240 V AC 50/60 Hz)</li> <li>Power over Ethernet (no analog outputs, analog input, or relays)</li> </ul>

<sup>1)</sup> Recommended when the transmitter is exposed to direct UV light, and for outdoor installations and high-humidity environments.

## 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

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	5.0–9.0 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)

## Operating environment

Operating environment	Outdoor use
Use in wet location	Yes
Operating humidity	0–100 %RH
Maximum operating altitude, AC (mains) power	3000 m (approx. 9800 ft)
Maximum operating altitude, protective extra-low voltage (PELV) and Power over Ethernet (PoE)	4000 m (approx. 13 100 ft)
IP rating	IP66 <sup>1)</sup>
UL 50E rating	Type 4

### Operating temperature

With display	-25 ... +55 °C (-13 ... +131 °F)
Without display	-40 ... +60 °C (-40 ... +140 °F)
Without display with barometer module	-40 ... +55 °C (-40 ... +131 °F)

### Storage temperature

With display	-30 ... +60 °C (-22 ... +140 °F)
Without display	-40 ... +60 °C (-40 ... +140 °F)

<sup>1)</sup> Evaluated by Eurofins, not by UL.

## Powering

Property	Description/Value
<b>Operating power <sup>1)</sup></b>	
Protective extra-low voltage (PELV) version	15–35 V DC, 24 V AC $\pm 20\%$ 50/60 Hz, max. current 2 A (power supply is galvanically isolated) Fuse size for power supply: 3 A Isolation voltage: 500 V AC, 1000 V DC
PELV power cable temp. rating	$\geq +80\text{ }^{\circ}\text{C}$ (+176 $^{\circ}\text{F}$ )
AC (mains) power version	100–240 V AC 50/60 Hz, max. current 1 A (power supply is galvanically isolated) Fuse size for power supply: 10 A Isolation voltage: 1500 V AC
AC (mains) power cable length	2.5 m (approx. 8 ft 2 in)
Power over Ethernet version	Power over Ethernet (PoE) IEEE 802.3at Type 2 Class 4 Max. current 600 mA, max. power consumption 25.5 W Isolation voltage: 500 V AC, 1000 V DC

### Typical current consumption at +20 $^{\circ}\text{C}$ (+68 $^{\circ}\text{F}$ ) ( $U_{in}$ 24 V DC) <sup>2)</sup>

Base consumption (no display, analog outputs, or communication)	50 mA
With display	+ 60 mA
With voltage analog output	< 2 mA per channel
With current analog output	+ 21 mA per channel
With relays	+ 9 mA per relay
With Ethernet cable connected	+ 15 mA
With barometer module	+ 5 mA

<sup>1)</sup> The power supply option is selected when ordering the transmitter.

<sup>2)</sup> For the current consumption of the connected measurement device, see the device's documentation, available at [docs.vaisala.com](http://docs.vaisala.com).

## User interfaces

User interfaces	Web interface for remote use, optional touchscreen display
Supported languages	English, Chinese, French, German, Japanese, Spanish
Optional display	5" capacitive touchscreen
Integrated data logging capabilities	Non-volatile memory, at least 10 years' storage with 24 h interval logging

## Inputs and outputs

Transmitter service port connection	Connection to Indigo80 with cable 262195SP
<b>Analog input <sup>1)</sup></b>	
Available ranges	4–20 mA
Resolution	6 $\mu\text{A}$
Display resolution	0.01 mA
Accuracy	$\pm 0.05\text{ mA}$
Input impedances	200 $\Omega$
Isolation	Isolated from power supply
Overload protection	40 mA max. (reverse polarity protected)

<b>Analog outputs <sup>1)</sup></b>	
Number of analog outputs	4
Isolation	Isolated from power supply
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 <sup>2</sup> (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	$R_L > 10\ \text{k}\Omega$

<b>Relay outputs <sup>1)</sup></b>	
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 <sup>2</sup> (14 AWG)
Max. wire size in AC (mains) version	1.5 mm <sup>2</sup> (16 AWG)

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

<sup>1)</sup> Not available in transmitters that are powered with Power over Ethernet (PoE).

## Compliance

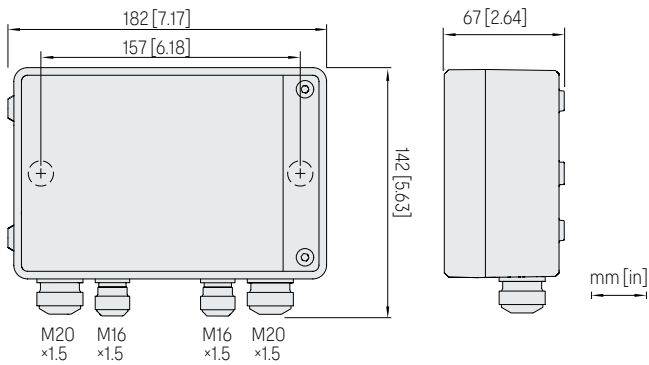
EU directives and regulations	EMC Directive (2014/30/EU) Low Voltage Directive (2014/35/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B
Electrical safety	IEC/EN 61010-1
Type approvals	DNV GL certificate no. TAA000032M EU RO Mutual Recognition certificate no. MRA000004F
Compliance marks	CE, China RoHS, FCC, RCM, UKCA
Listing marks	UL Listed (USA and Canada)
FCC compliance	FCC Part 15, Class B



## Accessories

Adapter plate	DRW252186SP
Installation kit for pole or pipeline	215108
Installation kit with weather shield	215109
Indigo500 spatter guard	ASM214526
M12 - M8 service cable 1.5 m (4.9 ft), for connecting to Indigo80	262195SP
<b>Probe connection cables</b>	
Probe connection cable, 0.3 m (approx. 12 in), open end <sup>1)</sup>	CBL210896-03MSP
Probe connection cable, 1 m (approx. 3 ft 3 in), open end <sup>1)</sup>	CBL210896-1MSP
Probe connection cable, 3 m (approx. 9 ft 10 in), open end <sup>1)</sup>	CBL210896-3MSP
Probe connection cable, 5 m (approx. 16 ft 5 in), open end <sup>1)</sup>	CBL210896-5MSP
Probe connection cable, 10 m (approx. 32 ft 10 in), open end <sup>1)</sup>	CBL210896-10MSP

<sup>1)</sup> The usable length outside of the transmitter enclosure is approx. 0.1 m (4 in) shorter than the total length of the cable.

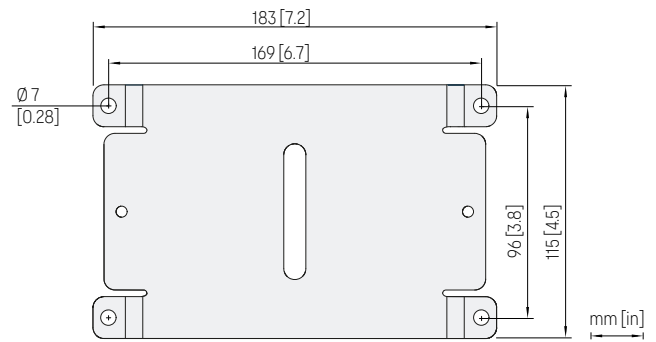


Indigo520 dimensions and lead-through sizes

## Spare parts

Cable gland, M20×1.5, 5.0–9.0 mm (0.20–0.35 in)	ASM213670SP
Cable gland with split bushing, M20×1.5 <sup>1)</sup>	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
Sintered filter (for barometer module)	DRW010335SP

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



Indigo500 adapter plate dimensions



### Features

- Outdoor installation kit for Indigo500 Series transmitters
- Supports wall and pole mounting
- Delivered pre-assembled according to selected options
- DTR502 Solar Radiation Shield option prevents temperature measurement error
- DTS1 Weather Shield option prevents a microclimate from forming around a heated probe
- SPH10 Static Pressure Head option eliminates pressure variations caused by wind

The Indigo500MIK Meteorological Installation Kit enables Vaisala Indigo500 Series transmitters to obtain professional grade outdoor measurements of environmental parameters. The kit is delivered pre-assembled with the selected options, with or without measurement equipment.

### Essential for critical weather measurements

Outdoor installation of measurement instruments must be done properly to avoid common sources of measurement error, and to ensure long service life. The Indigo500MIK Meteorological Installation Kit is designed to enable Indigo500 Series transmitters and compatible measurement probes to obtain reliable measurements in challenging weather conditions. The kit is recommended for use with the HMP3 and HMP7 humidity and temperature probes, and the TMP1 temperature probe.

### True humidity readings in condensing conditions

In weather observations dew formation makes reliable humidity measurement difficult. When dew has formed on the humidity sensor, it is impossible to obtain a true reading until the dew evaporates. Obtaining a true humidity

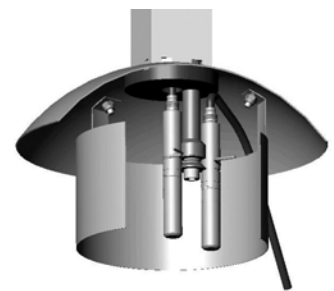
reading is particularly important in traffic safety, at airports, and at sea. It is essential, for example, in fog and frost prediction.

Combining an Indigo500 Series transmitter with a HMP7 and TMP1 probes provides a solution to the problem. HMP7 utilizes probe heating for condensation prevention. When the probe head is heated, risk of dew formation on the sensor is greatly reduced. When combined with accurate temperature measurement from TMP1 probe, the Indigo500 transmitter can calculate the ambient relative humidity precisely in all conditions.

### Open shield prevents microclimates

Traditional solar radiation shields are not optimal for use with heated probes, as sleet or snow can accumulate on the shield. This may prevent proper air circulation and create a humid microclimate around the probe head until the snow melts.

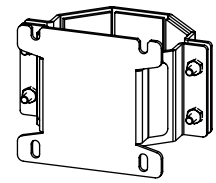
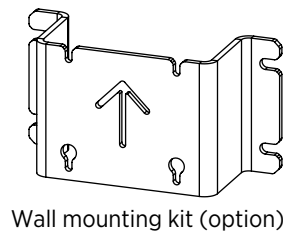
DTS1 Weather Shield option provides the heated HMP7 probe with appropriate protection that prevents the formation of a microclimate. The shield is open at the bottom to ensure steady air circulation to the sensor even in calm weather.



For calibration, a portable HMP77 reference probe is easy to attach beside the HMP7 probe head.

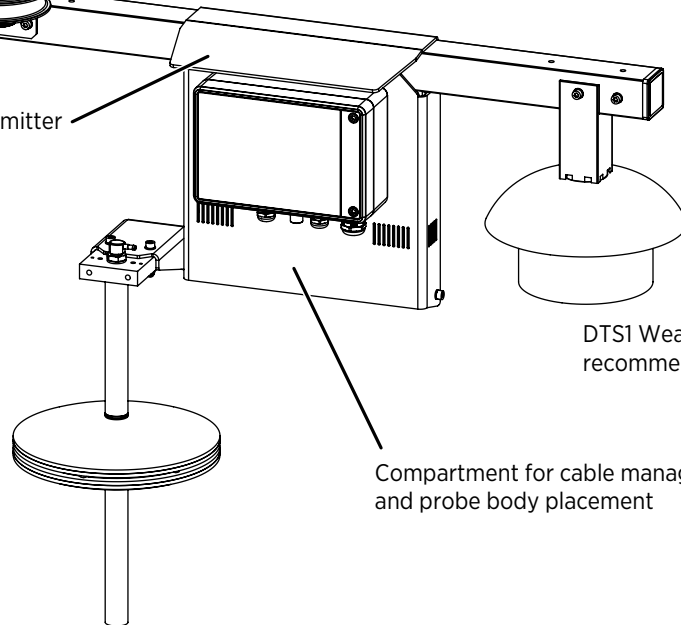
# Technical data

DTR502 Solar Radiation Shield (option) for humidity and temperature probes



Pole mounting kit (option)  
up to Ø 100 mm (3.9 in)

Rain shield for transmitter



DTS1 Weather Shield (option)  
recommended with warmed probe

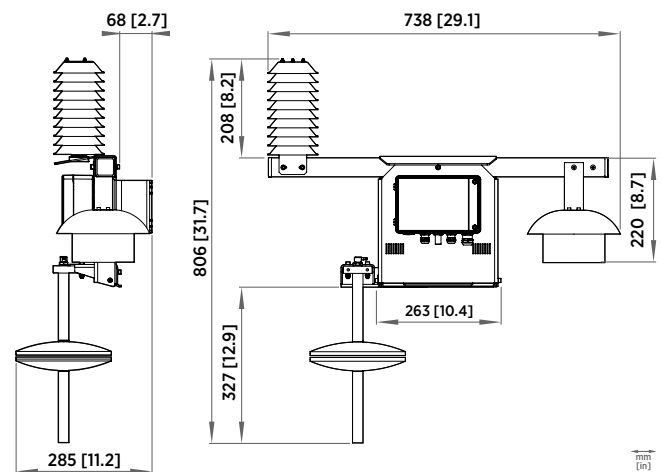
Compartment for cable management  
and probe body placement

SPH10 Static Pressure Head (option)  
for minimizing the effect of wind  
on pressure measurement

## Specifications

Compatible transmitters	Indigo510, Indigo520, HMT370EX
Compatible solar radiation shields	DTR502, DTR13, DTR250
Weather shield for heated probe	DTS1 <sup>1)</sup>
Static pressure head	SPH10 <sup>1)</sup>
Weight of mounting plate, probe compartment, and support bar	1.5 kg (3.3 lb)
Material of mounting plate, probe compartment, and support bar	Anodized marine grade aluminum

<sup>1)</sup> Attachment requires an adapter that is included when ordering the mounting kit with this option.



Indigo500MIK dimensions with wall mounting kit

## Indigo80 Handheld Indicator For portable diagnostics








### Features

- Flexible operation with Vaisala Indigo-compatible probes and transmitters, including HMP80 and DMP80 handheld probes and GMP80P probe with pump sampling
- Intuitive user interface available in 10 languages
- Rechargeable battery
- Robust design and modern appearance
- Logged measurement data can be transferred to PC via Vaisala Insight software

Vaisala Indigo80 Handheld Indicator is an industrial-grade portable diagnostics tool. Accommodating up to two Vaisala measurement probes, Indigo80 is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting Vaisala Indigo-compatible probes and transmitters.

### Variety of probe options

The Indigo80 indicator has two cable ports by which a combination of two probes or transmitters can be simultaneously connected to the indicator. Indigo80 can communicate with most current and future Vaisala probes and transmitters for measuring a wide range of parameters.

-  Humidity and temperature
-  Dew point
-  Carbon dioxide
-  Hydrogen peroxide vapor
-  Moisture in oil

For the full set of probes and transmitters currently compatible with Indigo80, see the following page. For more information on the Indigo product family, see [vaisala.com/indigo](https://vaisala.com/indigo).

### Robust and reliable

The sturdy aluminum body of Indigo80 is resistant to chemicals and dust. Indigo80 is powered by a rechargeable lithium-ion battery with a typical operation time of 10 h. During long-term logging Indigo80 can be powered by using an AC adapter.

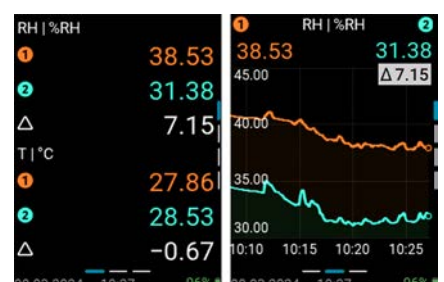
### Easy to use

Indigo80 has an intuitive user interface that guides the user if needed. The indicator is designed to be easy to use in numerous use cases and measurement environments.

To access logged data and configuration functionality, Indigo80 can be connected to Vaisala Insight PC software for Windows®. For more information, see [vaisala.com/insight](https://vaisala.com/insight).

### Multilingual user interface

Indigo80 has a multilingual, menu-based user interface that shows live measurement data both numerically and graphically. The Indigo80 user interface is available in 10 languages.



View live measurement data as numbers or graphs



# Vaisala devices compatible with Indigo80

## Vaisala Indigo-compatible probes

HMP1, HMP3, HMP4, HMP5, HMP7, HMP8, HMP9, HMP80L, HMP80N	Humidity and temperature
TMP1	Temperature
DMP5, DMP6, DMP7, DMP8, DMP80A, DMP80B	Dew point
GMP251, GMP252	Carbon dioxide
HPP271, HPP272	Vaporized hydrogen peroxide
MMP8	Moisture in oil

## Other Vaisala devices

HMP60, HMP63, HMP110, HMP113, HMP115, HMM170	Humidity and temperature
HMP110T, HMP115T, TMP115	Temperature
DMT143, DMT143L	Dew point

## Vaisala Indigo transmitters (host devices)

Indigo300, Indigo510, Indigo520
---------------------------------

# Technical data

## Operating environment

Operating temperature	-20 ... +50 °C (-4 ... +122 °F)
Storage temperature	-20 ... +60 °C (-4 ... +140 °F), recommended +20 °C (+68 °F)
Operating and storage humidity	20–85 %RH, when Ta ≤ +40 °C (+104 °F)
Charging temperature	0 ... +45 °C (+32 ... +113 °F) <sup>1)</sup>
IP rating	IP40
Use in wet location	No
Operating environment	Indoor use
Pollution degree	3
Maximum operating altitude	2000 m (approx. 6500 ft)

1) The battery will not charge at temperatures below 0 °C (+32 °F).

## Data logging and user interface specifications

Data logging capacity	Up to 5.5 million real-time data values
Logging interval	1 s - 12 h
Logging duration	1 min - memory full <sup>1)</sup>
Alarm	Audible alarm function
Supported languages	English, Chinese, Finnish, French, German, Italian, Japanese, Portuguese, Spanish, Swedish
Display	2.7" sunlight readable transfective TFT LCD color display with backlight and automatic brightness control

1) For example, data logging duration for one measurement parameter with a logging interval of one second is over eight weeks. Use an AC adapter to power Indigo80 during long-term logging.

## Battery operation time

Operation time (continuous use)	10 h at +20 °C (+68 °F) <sup>1)</sup>
Charging time	2 hours <sup>1)</sup>

1) Typical value. Actual performance depends on, for example, the number and type of devices connected to Indigo80 and the data logging interval.


## Mechanical specifications

Weight	385 g (14 oz)
Dimensions (H × W × D)	213 × 58 × 27 mm (8.4 × 2.3 × 1.1 in)
<b>Materials</b>	
Main body and rear piece	Aluminum EN AW-6082 T6
Back cover	Rubber (TPE) and polycarbonate (PC), reinforced with fiberglass Flammability rating UL94 V-1
Display	Strengthened glass with anti-fingerprint (AF) and anti-reflection (AR) coatings

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B FCC part 15 B, Class B ICES-3 / NMB-3 (Class B)
Electrical safety	IEC/EN 61010-1
Compliance marks	CE, China RoHS, FCC, RCM, UKCA

## Inputs and outputs

Max. number of connected probes	2
Connector type	M12 5-pin female (2 pcs)
<b>Battery</b> <sup>1)</sup>	
Type	Rechargeable lithium-ion battery
Nominal voltage	7.2 V
Rated capacity	2900 mAh / 20.88 Wh
Charge limit voltage	8.4 V
<b>AC adapter</b> <sup>2)</sup>	
Type	45 W USB-C AC adapter <sup>3)</sup>
Connector type	USB-C
AC input	100-240 V AC, 1.2 A, 50-60 Hz
DC output	5.0 V/9.0 V/12.0 V/15.0 V DC, 3.0 A 20.0 V DC, 2.25 A 45 W
Insulation	Double or reinforced, indicated with the following symbol: 
PC interface	Vaisala Insight PC software with USB-C cable (Windows OS). <sup>4)</sup> Data can be logged and transferred also without Insight.

1) The battery is not user-replaceable. Contact Vaisala Service Center for any battery-related maintenance needs.

2) The AC adapter is an optional accessory. If using an AC adapter not provided by Vaisala, make sure it fulfills the specifications given in this table and the safety requirements listed in Indigo80 Safety Guide (M212872EN), available at docs.vaisala.com.

3) 45 W AC adapter recommended for optimal performance of Indigo80. An AC adapter with a lower power rating can also be used.

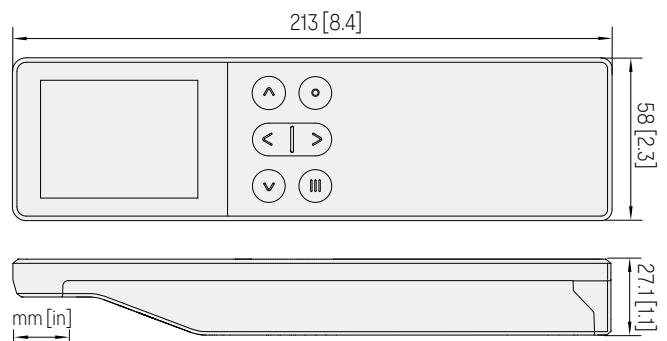
4) Insight software is available for download at [vaisala.com/insight](https://vaisala.com/insight).

## Spare parts and accessories

<b>Cables</b>	
Cable for transmitters (M12-M8), 1.5 m (4 ft 11 in)	262195SP
Cable for probes (M12-M12), 1.5 m (4 ft 11 in)	272075SP
Flat cable for probes (M12-M12), 1 m (3 ft 3 in)	CBL210493SP
Probe connection cable (M12-M12), 10 m (32 ft 10 in)	INDIGOCABLE10M
<b>Other</b>	
Magnetic hanger for indicator	ASM214318SP
Weatherproof carrying case for Indigo80 and HMP80 and DMP80 series probes	ASM214759
Weatherproof carrying case for Indigo80 and a series 8 probe <sup>1)</sup>	ASM215318
Light carrying case for HM40S or Indigo80 indicator and a compatible probe <sup>2)</sup>	230245SP

1) For example, MMP8, HMP8, or DMP8 with a max. 2-m (6 ft 7 in) probe connection cable.

2) For example, DMP80, HMP80N, or GMP252 probe with handle accessory and a max. 1.5-m (4 ft 11 in) probe connection cable.



Indigo80 dimensions (front and side view)

## HMP80 Series Handheld Humidity and Temperature Probes

For spot-checking applications



### Features

- Portable design optimized for industrial spot-checking and field calibration
- RH accuracy up to  $\pm 0.8$  %RH
- Temperature accuracy up to 0.1 °C (0.18 °F)
- Wide temperature measurement range
- Condensation-tolerant
- Sensor purge improves long-term stability and chemical resistance
- Compatible with Indigo80 handheld indicator and Insight PC software
- Calibration certificate included

Vaisala HUMICAP® Handheld Humidity and Temperature Probes HMP80 Series have been designed for portable use, especially with the Indigo80 handheld indicator. The combination of HMP80 probe and Indigo80 is ideal for spot-checking and field calibration of installed Vaisala humidity instruments.

### 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.

The 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.

HMP80 series probes are delivered with standard factory calibration certificates, with accredited calibration as an option. The probes can therefore be used as a working standard in field calibration.

### Robust design for handheld measurements

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

The design of the probe handle has been optimized for manual operation in versatile measurement environments. The IP66-classified probe handle offers excellent protection against moisture and dust with the probe connection cable attached. Also the cable connection is protected against mechanical stress by the robust design of the handle.

### Flexible connectivity

HMP80 probes are optimized for portable spot-checking, field calibration, and data logging use with the Indigo80 handheld indicator. For easy-to-use access to device analytics and configuration, HMP80 probes can be connected to Vaisala Insight software for Windows®.

For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo) and [www.vaisala.com/insight](http://www.vaisala.com/insight).

# Technical data

## HMP80 series measurement performance

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

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

## HMP80 series operating environment

Operating temperature of probe handle	-10 ... +60 °C (-14 ... +140 °F)
Operating temperature of probe head	HMP80N: -20 ... +60 °C (-4 ... +140 °F)
	HMP80L: -50 ... +120 °C (-58 ... +248 °F)
Storage temperature	-20 ... +60 °C (-4 ... +140 °F)
Measurement environment	For air, nitrogen, hydrogen, argon, helium, oxygen, and vacuum <sup>1)</sup>
IP rating of probe handle:	
with probe connection cable connected to the probe	IP66
without cable	IP55

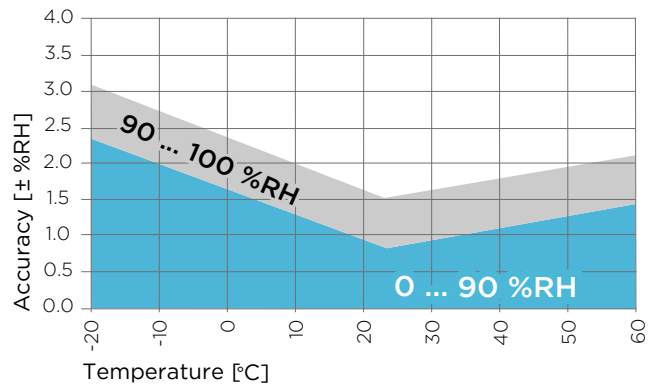
<sup>1)</sup> Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases.

## HMP80 series inputs and outputs

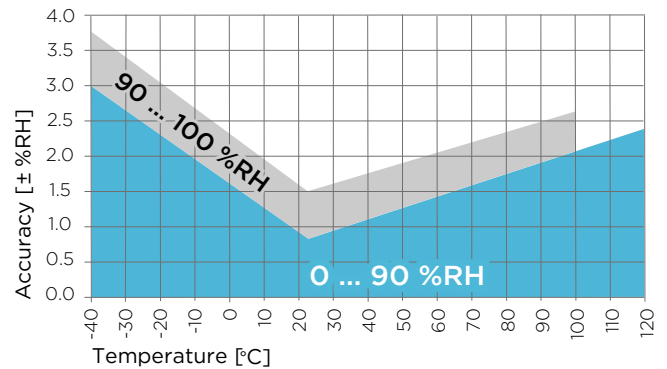
Operating voltage	15-30 V DC
Current consumption	10 mA typical, 500 mA max.
Digital output	RS-485, non-isolated

## HMP80 series compliance

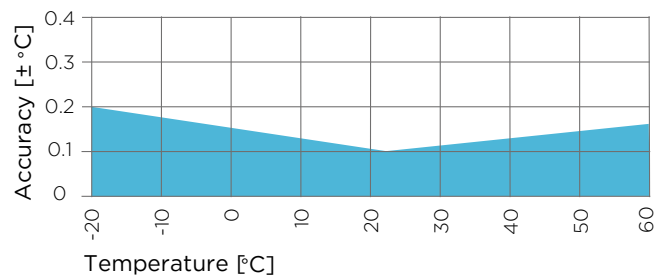
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Rough handling (excluding sensor inside probe head)	IEC 60068-2-31
Compliance marks	CE, China RoHS, RCM, UKCA



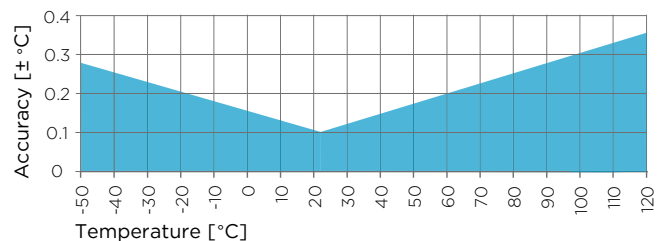
HMP80N humidity measurement accuracy as a function of temperature



HMP80L humidity measurement accuracy as a function of temperature



HMP80N temperature measurement accuracy over full range



HMP80L temperature measurement accuracy over full range

## HMP80 series output parameters

Absolute humidity (g/m <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>w</sub> )
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
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)

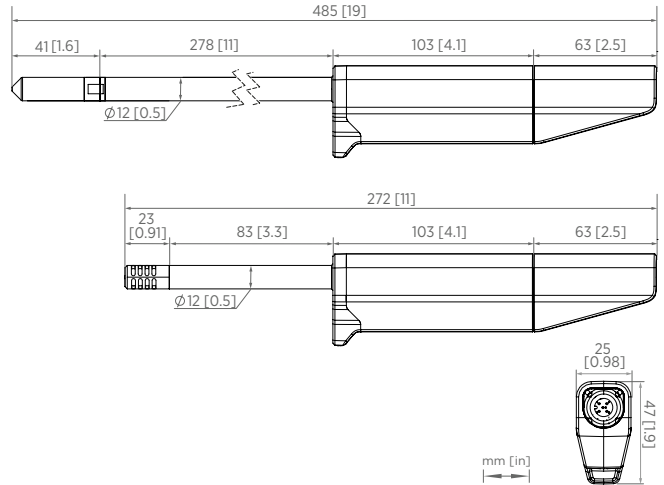
## HMP80 series mechanical specifications

Connector type	M12 5-pin A-coded male
Weight	HMP80N: 200 g (7 oz) HMP80L: 300 g (10 oz)
<b>Materials</b>	
Probe handle	Polyamide (PA) and thermoplastic elastomer (TPE)
Probe shaft	Stainless steel (AISI 316L)
Filters	HMP80N: Stainless steel (AISI 316L) <sup>1)</sup> HMP80L: Porous stainless steel (AISI 316L) <sup>2)</sup>

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

## HMP80 series spare parts and accessories

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



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

## DMP80 Series Handheld Dew Point and Temperature Probes

For spot-checking applications



### Features

- Portable design optimized for industrial spot-checking and field calibration
- Dew point measurement accuracy up to  $\pm 2$  °C ( $\pm 3.6$  °F)  $T_{d/f}$
- Wide dew point measurement range
- Sensor purge improves long-term stability and chemical resistance
- Condensation-tolerant
- Compatible with Indigo80 handheld indicator and Insight PC software
- Calibration certificate included

Vaisala DRYCAP® Handheld Dew Point and Temperature Probes DMP80 Series have been designed for portable use, especially with the Indigo80 handheld indicator. The combination of DMP80 probe and Indigo80 is ideal for spot-checking and field calibration of installed Vaisala humidity instruments.

### Reliable measurements with the Vaisala DRYCAP sensor

Vaisala DRYCAP sensor is robust against particulate contamination, water condensation, oil vapor, and most chemicals. The sensor tolerates condensation and recovers perfectly if exposed to liquid water. The sensor's performance is excellent also in dynamic and low dew point applications, thanks to its fast reaction time and stability.

The probes can be inserted directly into pressurized processes, and respond rapidly from ambient to process conditions. The DMP80 probes are suitable for direct process dew point measurement in a wide temperature and pressure range.

DMP80 series probes are delivered with standard factory calibration certificates, with accredited calibration as an option. The probes can therefore be used as a working standard in field calibration.

### Sensor purge minimizes effects of contaminants

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

Sensor purge involves heating the sensor briefly to remove chemicals that could lower measurement performance and cause drifting.

### Robust design for handheld measurements

The design of the probe handle has been optimized for manual operation in versatile measurement environments. The IP66-classified probe handle offers excellent protection against moisture and dust with the probe connection

cable attached. Also the cable connection is protected against mechanical stress by the robust design of the handle.

### Flexible connectivity

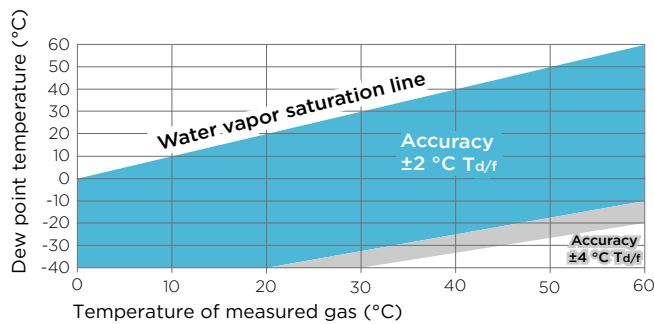
DMP80 probes are optimized for portable spot-checking, field calibration, and data logging use with the Indigo80 handheld indicator. For easy-to-use access to device analytics and configuration, DMP80 probes can be connected to Vaisala Insight software for Windows®.

For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo) and [www.vaisala.com/insight](http://www.vaisala.com/insight).

# Technical data

## DMP80A measurement performance

Dew point	
Sensor	DRYCAP® 180S
Measurement range	-40 ... +60 °C (-40 ... +140 °F) T <sub>d/f</sub>
Accuracy	Up to ±2 °C (±3.6 °F) T <sub>d/f</sub>
Response time 63 % [90 %]:	
From dry to wet	5 s [10 s]
From wet to dry	45 s [5 min]
Temperature	
Measurement range	0 ... +60 °C (+32 ... +140 °F)
Accuracy	±0.2 °C (±0.36 °F) at room temperature
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751
Mixing ratio	
Measurement range (typical)	0-150 g/kg (0-1050 gr/lbs)
Accuracy (typical)	±12 % of reading
Absolute humidity	
Measurement range	0-130 g/m <sup>3</sup>
Accuracy (typical)	±10 % of reading



Dew point accuracy vs. measurement conditions (DMP80A)

## DMP80 series operating environment

Operating temperature range	-10 ... +60 °C (+14 ... +140 °F)
Storage temperature	-20 ... +60 °C (-4 ... +140 °F)
Operating pressure of probe head	0-20 bar (0-290 psi), absolute
Measurement environment	For air, nitrogen, hydrogen, argon, helium, and oxygen <sup>1)</sup>
IP rating of probe handle:	
With probe connection cable connected to the probe	IP66
Without cable	IP55

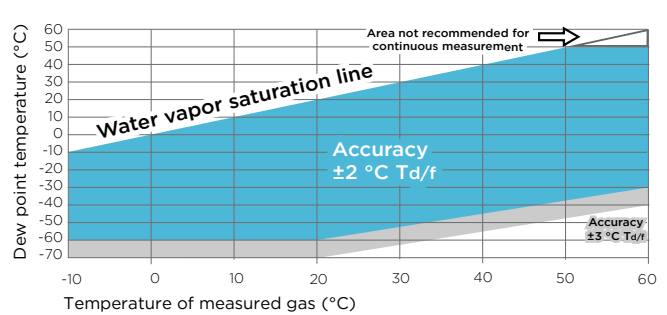
<sup>1)</sup> Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases.

## DMP80 series inputs and outputs

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

## DMP80B measurement performance

Dew point	
Sensor	DRYCAP® 180M
Measurement range	-70 ... +60 °C (-94 ... +140 °F) T <sub>d/f</sub>
Accuracy	Up to ±2 °C (±3.6 °F) T <sub>d/f</sub>
Response time 63 % [90 %]:	
From dry to wet	5 s [15 s]
From wet to dry	45 s [8 min]
Temperature	
Measurement range	0 ... +60 °C (+32 ... +140 °F)
Accuracy	±0.2 °C (±0.36 °F) 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



Dew point accuracy vs. measurement conditions (DMP80B)

## DMP80 series mechanical specifications

Connector type	M12 5-pin A-coded male
Weight	250 g (9 oz)
Mechanical connection options	G1/2" ISO 228/1 NPT1/2"
Materials	
Probe handle	Polyamide (PA) and thermoplastic elastomer (TPE)
Probe shaft	Stainless steel (AISI 316L)
Filter	Porous stainless steel (AISI 316L) <sup>1)</sup>

<sup>1)</sup> Vaisala item code: HM47280SP

## DMP80 series output parameters

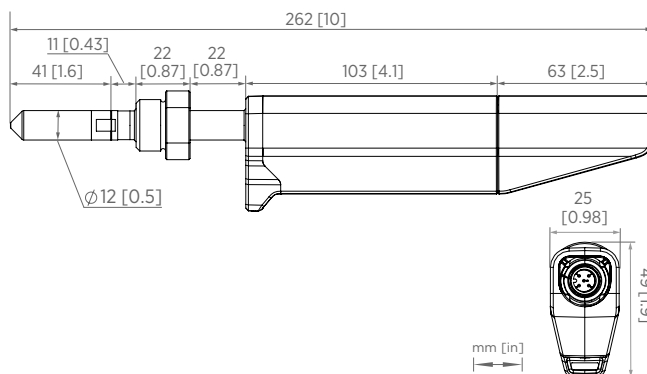
Absolute humidity (g/m <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>v</sub> )
Dew/frost point temperature at 1 atm (°C)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

## DMP80 series compliance

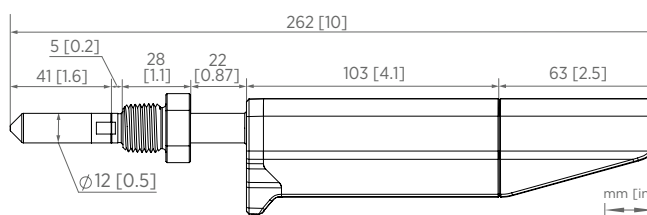
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Rough handling (excluding sensor inside probe head)	IEC 60068-2-31
Compliance marks	CE, China RoHS, RCM, UKCA

## DMP80 series spare parts and accessories

Cables	
Probe connection cable (M12-M12), 1.5 m (4.11 ft)	272075SP
Flat cable for probes (M12-M12), 1.0 m (3.4 ft)	CBL210493SP
Accessories for ISO G1/2" thread option	
Sampling cell with quick connector and leak screw	DSC74
Sampling cell with female connectors, inlet G3/8", outlet G1/4" ISO	DMT242SC
Sampling cell with Swagelok connectors for 1/4" tubing	DMT242SC2
Two-pressure sampling cell	DSC74B
Two-pressure sampling cell with coil	DSC74C
Other items	
Indigo USB adapter	USB2
Sintered stainless steel filter	HM47280SP



Dimensions of DMP80 series probes with G1/2" thread, side and bottom view



Dimensions of DMP80 series probes with NPT1/2" thread





### Features

- Humidity measurement range 0 ... 100 %RH
- Temperature measurement ranges -40 ... +100 °C (-40 ... +212 °F), depending on probe model. The HM46 model can measure up to +180 °C (+356 °F) for a short period of time.
- Incorporates proven Vaisala HUMICAP® sensor technology
- Calibration reminder function
- Probes can be user calibrated using an on-site reference
- Graphical display indicates when measurement has stabilized
- Hold-button to freeze the screen and save the reading
- Multilingual user interface available in 10 languages (EN, DE, FR, JA, ZH, PT, ES, RU, FI, SV)

The easy-to-use HM40 is a compact and portable humidity meter that provides reliable measurements in a wide range of applications. It is the ideal spot-checking tool for everything from structural moisture measurement and air conditioning systems to humidity measurement in industrial production processes and life science applications. There are four different models available: HM41, HM42, HM45, and HM46.

### Benefits

- Compact, portable, and easy to use
- Versatile meter with wide measurement range and multiple calculated parameters
- Ideal for spot-checking in a wide variety of applications

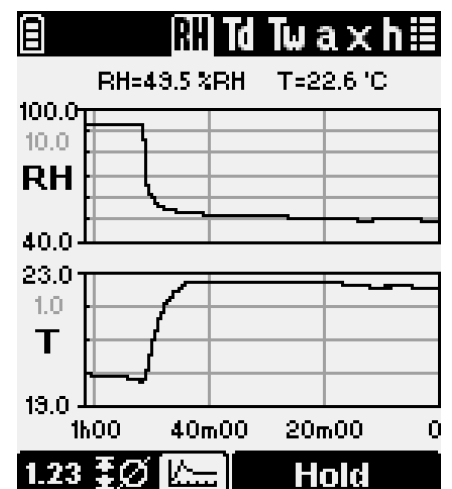
### Simple and Easy to Use

HM40 has a large, user-friendly graphical display and easy-to-use push buttons. The user interface is simple and intuitive, and available in 10 languages. Also, many settings can be modified to meet users' individual needs. In addition to relative humidity and temperature, HM40 provides five calculated humidity

parameters, all of which are available in metric and non-metric units. HM40 is powered by 2 AA batteries. An external USB-charger and rechargeable AA sized NiMH batteries are available as an option. Each model also comes with a handy belt clip and case.

### Easy Recalibration

Calibrating HM40 is easy. The meter or the probe can be sent to a Vaisala Service Center for recalibration. Alternatively, calibration can be completed on site by users with a humidity reference such as another hand-held meter or Vaisala Humidity Calibrator HMK15. The indicator includes a calibration reminder function that can be activated by the user.



The Graph Clearly Indicates When Readings Have Stabilized.

# HM40 Handheld Humidity and Temperature Meter Series

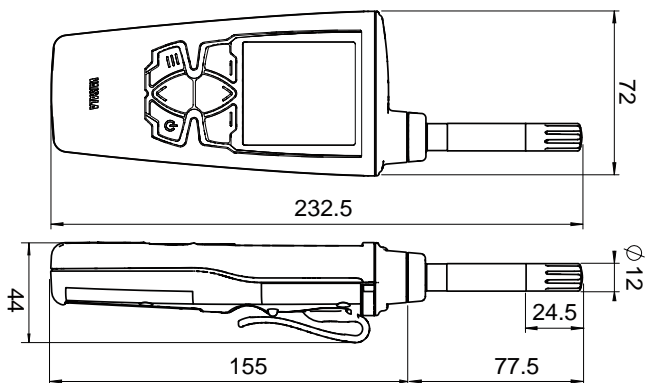


## HM41 Technical Data

Humidity Measurement Accuracy (Including Non-linearity, Hysteresis, and Repeatability):

At 0 ... +40 °C	±1.5 %RH (0 ... 90 %RH)
	±2.5 %RH (90 ... 100 %RH)
At -10 ... 0 °C and +40 ... +60 °C	±3.0 %RH (0 ... 90 %RH)
	±4.0 %RH (90 ... 100 %RH)

Humidity sensor	HUMICAP® 180R
Temperature measurement range	-10 ... +60 °C (+14 ... +140 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Measurement probe	Interchangeable HMP113 probe
Probe material	PC/ABS plastic blend (white)
IP rating	IP54
Weight (with alkaline batteries)	230 g (8.1 oz)
Filter material	PC (glass-reinforced)



HM41 dimensions in mm

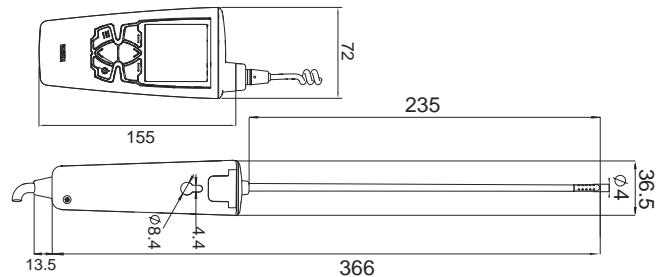
## HM42 Technical Data

Humidity Measurement Accuracy (Including Non-linearity, Hysteresis, and Repeatability):

At 0 ... +40 °C	±1.5 %RH (0 ... 90 %RH)
	±2.5 %RH (90 ... 100 %RH)
At -40 ... 0 °C and +40 ... +80 °C	±3.0 %RH (0 ... 90 %RH)
	±4.0 %RH (90 ... 100 %RH)
At +80 ... +100 °C	±4.0 %RH <sup>1)</sup>

Humidity sensor	HUMICAP® 100R-Mini
Temperature measurement range	-40 ... +100 °C (-40 ... +212 °F)
Temperature sensor	Pt1000 RTD Class F0.3 IEC60751
Measurement probe	HM42PROBE
Probe head material	Stainless steel
IP rating	IP40 (probe), IP54 (indicator)
Weight (with alkaline batteries)	370 g (13.1 oz)
Filter material	Stainless steel and PTFE membrane
Probe cable length	1500 mm (59 in)

1) Not recommended for  $T_d > 85 °C$



HM42 dimensions in mm

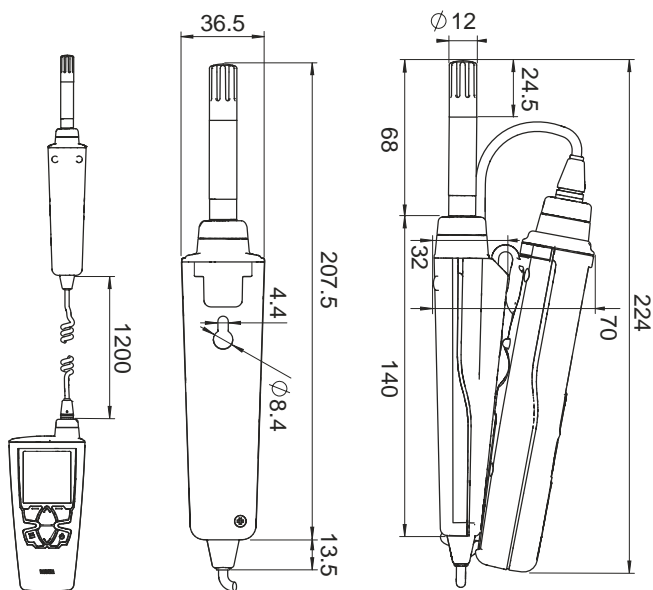


### HM45 Technical Data

Humidity Measurement Accuracy (Including Non-linearity, Hysteresis, and Repeatability):

At 0 ... +40 °C	±1.5 %RH (0 ... 90 %RH)
	±2.5 %RH (90 ... 100 %RH)
At -40 ... 0 °C and +40 ... +60 °C	±3.0 %RH (0 ... 90 %RH)
	±4.0 %RH (90 ... 100 %RH)

Humidity sensor	HUMICAP® 180R
Temperature measurement range	-40 ... +60 °C (-40 ... +140 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Measurement probe	Interchangeable HMP113 with HM40HANDLE
Probe material	PC/ABS plastic blend (white)
IP rating	IP54
Weight (with alkaline batteries)	330 g (11.6 oz)
Filter material	PC (glass-reinforced)
Probe cable length	1200 mm (47 in)



HM45 dimensions in mm

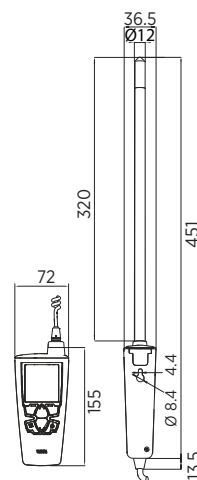
### HM46 Technical Data

Humidity Measurement Accuracy (Including Non-linearity, Hysteresis, and Repeatability):

At 0 ... +40 °C	±1.5 %RH (0 ... 90 %RH)
	±2.5 %RH (90 ... 100 %RH)
At -40 ... 0 °C and +40 ... +80 °C	±3.0 %RH (0 ... 90 %RH)
	±4.0 %RH (90 ... 100 %RH)
At +80 ... +100 °C	±4.0 %RH <sup>1)</sup>

Humidity sensor	HUMICAP® 180R
Temperature measurement range	-40 ... +100 °C (-40 ... +212 °F), short-term up to +180 °C (+356 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Measurement probe	HM46PROBE
Probe head material	Stainless steel, brass filter
IP rating	IP40 (probe), IP54 (indicator)
Weight (with alkaline batteries)	490 g (17.3 oz))
Filter material	Sintered brass
Probe cable length	1500 mm (59 in)

<sup>1)</sup> Not recommended for  $T_g > 85$  °C



HM46 dimensions in mm

# HM40 Series Technical Data

## Measurement Performance

Calculated parameters	Dew point, wet bulb temperature, absolute humidity, mixing ratio, enthalpy
<b>Relative Humidity</b>	
Measurement range	0 ... 100 %RH
Accuracy (including non-linearity, hysteresis, and repeatability) for different models at 0 ... +40 °C (+32 ... +104 °F)	±1.5 %RH (0 ... 90 %RH) ±2.5 %RH (90 ... 100 %RH)
Factory calibration uncertainty at +20 °C (+68 °F):	
HM42 and HM46	±1.5 %RH
HM41 and HM45	±1.1 %RH (0 ... 90 %RH) ±1.8 %RH (90 ... 100 %RH)
Stability	±2 %RH over 2 years
Humidity Measurement Response Time:	
(90 %) with plastic grid filter (HM41 and HM45)	17 s
(90 %) with membrane filter and steel grid (HM42)	26 s
(90 %) with brass sintered filter (HM46)	40 s
<b>Temperature</b>	
Accuracy over temperature range:	
At 0 ... +40 °C (+32 ... +104 °F)	±0.2 °C (0.36 °F)
At -40 ... 0 °C and +40 ... +100 °C (-40 ... +32 °F and +104 ... +212 °F)	±0.4 °C (0.72 °F)

## Operating Environment

<b>Operating temperature</b>	
Indicator	-10 ... +60 °C (+14 ... +140 °F)
Probe handle	-40 ... +60 °C (-40 ... +140 °F)
Probe head	Range -40 ... +180 °C (-40 ... +356 °F) See probe specifications
Storage temperature	-30 ... +70 °C (-22 ... +158 °F)
EMC compliance	EN61326-1, Portable Equipment

## Mechanical Specifications

<b>Materials</b>	
Indicator body	PC/ABS blend, acrylic display lens
Probe holder	PC/ABS blend (gray)
Probe handle	PC/ABS blend (white), PC/ABS blend (gray, HM45) or PBT (gray, HM42/46)
HMP113 probe or probe measurement head	PC/ABS blend (white, HM41/45) or stainless steel (HM42/46)
IP rating, HM40	IP54

## Indicator

Display	LCD (140 x 160 pixels)
Power-up time	< 3 s
Batteries	2 × AA, 1.5 V
Operation time (typical)	100 hours (without backlight)
Menu languages	English, Chinese (simplified), Finnish, French, German, Japanese, Portuguese, Russian, Spanish, Swedish

## Spare Parts and Accessories

<b>Indicator</b>	
Spare HM40 indicator	HM40INDI
Belt clip (3 pcs)	227710SP
Battery cover (3 pcs)	225688SP
NiMH rechargeable batteries (4 pcs)	229247SP
External battery recharger with USB connection and 4 batteries	229249SP
Case for short HM40 probes	235849SP
Case for long HM40 probes	DRW242351SP
<b>Standard Probe (HM41)</b>	
HMP113 probe for HM40	HMP113 (configuration: V00B2C1A0)
Plastic locking bushing (3 pcs) for attaching HMP113 probe to HM40 indicator	DRW238590SP
Plastic grid filter for HMP113 probe	DRW236214SP
Plastic grid with membrane filter for HMP113 probe	230727SP
<b>HM42 Probe (HM42)</b>	
Thin 4 mm diameter probe for HM40	HM42PROBE
Steel grid filter for HM42PROBE	19867HM
Membrane tube set (5 pcs) for HM42PROBE	19858HM
Rubber sleeve set (10 pcs) for HM42PROBE	19809HM
Calibration adapter for HM42PROBE	HM37067
<b>Remote Probe (HM45)</b>	
HMP113 probe for HM40	HMP113 (configuration: V00B2C1A0)
Plastic locking bushing (3 pcs) for attaching HMP113 probe to HM40 indicator	DRW238590SP
HM40 handle and cable	HM40HANDLE
Plastic grid filter for HMP113 probe	DRW236214SP
Plastic grid with membrane filter for HMP113 probe	230727SP
<b>HM46 Probe (HM46)</b>	
Stainless steel 12 mm diameter probe for HM40	HM46PROBE
Sintered filter for HM46PROBE	0195
Optional membrane filter for HM46PROBE (up to +80 °C)	10159HM
Plastic grid filter for HM46PROBE (up to +80 °C)	6221
Disposable sleeve, 50 pcs set	1558
Probe holder	HM36915



### HUMICAP sensor's unique benefits

- Excellent long-term stability and repeatability
- Insensitive to dust and most chemicals
- Fast response time
- Sensor heating
- Full recovery from condensation
- The most reliable and accurate humidity measurement

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.

Today, Vaisala is a leading provider of humidity measurement probes to multiple industries and in many applications. Relative humidity sensors are now an industry standard. Here is how it started.

### We need to fix this

Up until the early 1970s, hair hygrometers were widely used despite the unreliable humidity measurements they provided. To address this, Vaisala embarked on the development of a novel humidity sensor employing semiconductors and thin-film materials.

### HUMICAP is born

At the CIMO VI congress in 1973, Vaisala introduced the HUMICAP, the world's first thin-film capacitive humidity sensor. This groundbreaking innovation revolutionized humidity measurements. The HUMICAP sensor had no moving parts and thanks to the advanced utilization of semiconductor and thin-film technologies, it was amazingly small in size.

### From one company's invention to a global standard

Since then, Vaisala has emerged as the market leader in relative humidity measurements, and thin-film capacitive humidity sensors have transcended being one company's invention to a global industry standard.

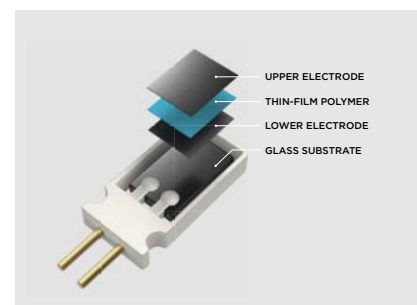
### How it works

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 electrode facing ambient air is made of porous metal to protect the sensor 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.



Structure of the HUMICAP sensor

### Constantly evolving

HUMICAP is not only a sensor, it is a solution to many challenging measurement positions and conditions. HUMICAP is in Vaisala's core and we develop it constantly.



Family of HUMICAP sensors

### Condensation prevention technology with warmed probe

One of Vaisala's innovations in the humidity measurement field includes warmed probe technology for the toughest high humidity environments.

Saturation in the environment causes condensation to form on all surfaces including measurement sensors, which can be fatal for some technologies. A warmed probe keeps the sensor continuously above the ambient temperature, ensuring condensation never forms. With Vaisala's solution, relative humidity measurement is possible in these conditions with an additional Indigo520 transmitter.

### HUMICAP applications

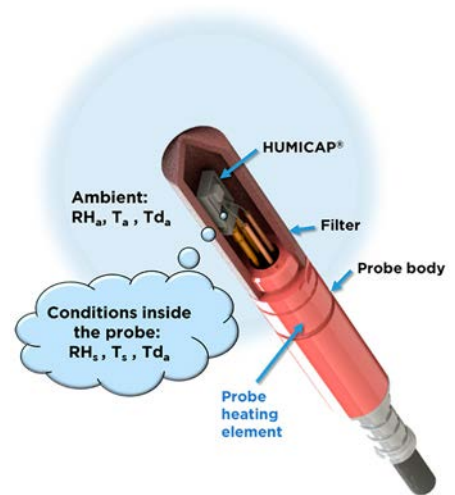
Even though the HUMICAP innovation was originally designed for a new type of a radiosonde, the word got around about reliable humidity measurements, and created a growing demand in many industries and applications. Today we offer everything you need for [measuring](#)

[humidity](#), with a wide range of humidity instruments covering applications from HVAC to the most demanding industrial applications, both indoors and outdoors.

### If it works on Mars, it works anywhere

The unforgiving conditions in space pose strict demands on technology, requiring the most reliable sensors that can be trusted to endure without repair. You simply cannot venture out into these conditions with just any instrumentation. Therefore, the HUMICAP products were a natural selection to measure conditions on the planet Mars since 1990s.

## How to select the right humidity instrument for your high-humidity application



High-humidity environments are tough for humidity measurement. Saturation in the environment causes condensation to form on all surfaces including measurement sensors, which can be fatal for some technologies. While Vaisala HUMICAP® technology can withstand condensation, it still needs time to recover from the effects of moisture before it can once again provide reliable measurements. Typical applications where high humidity or occasional condensing are expected include drying processes, test chambers, combustion air humidifiers, meteorological measurements, and fuel cells.

Keeping measurements accurate and reliable even in condensing environments calls for Vaisala's condensation prevention technology. A warmed probe keeps the sensor continuously above the ambient temperature, ensuring condensation never forms. The disadvantage of probe heating is that relative humidity can no longer be measured because the sensor is heated up above the ambient

temperature. In this state, independent humidity parameters can be measured, such as dew point or mixing ratio. However, it is also possible to measure relative humidity using an additional temperature sensor with our Indigo520 transmitter.

### Operating principle

The heating element inside the probe body heats the entire probe. In the illustration above, the probe and filter are glowing red to illustrate how the probe warming keeps the microclimate inside the filter at an elevated temperature. The actual temperature is only a few degrees above the ambient temperature, as seen in the following example:

#### Ambient conditions:

- $T_a = 14\text{ °C}$
- $RH_a = 97\text{ \%RH}$
- $Td_a = 13\text{ °C}$

#### HMP7 warmed probe:

- $T_s = 16\text{ °C}$
- $RH_s = 83\text{ \%RH}$
- $Td_a = 13\text{ °C (calculated)}$

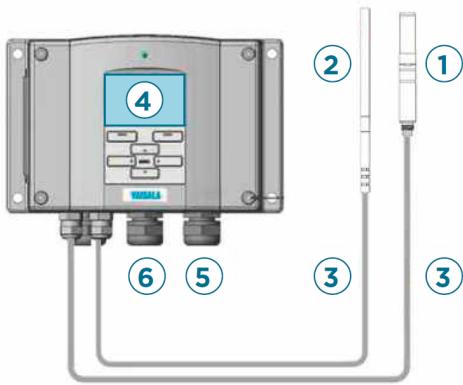
As shown in this example, heating does not affect dew point.

Dew point is the temperature where condensation begins, or where the relative humidity would be 100 %, if the air was cooled.

The 'relative' in relative humidity expresses the relation between the amount of water vapor present and the maximum amount that is physically possible at that temperature.

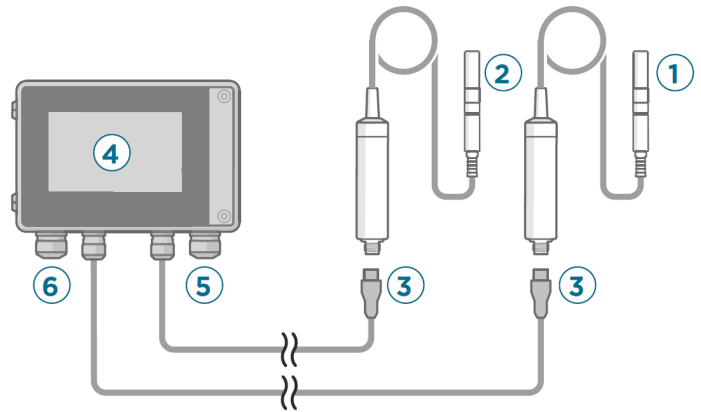
**Note:** The HMP7 warm probe mode when used by itself will only output dew point temperature digitally (Modbus RTU over RS-485) or offer analog outputs when combined with any Indigo Transmitter. If relative humidity and temperature are desired, then the separate ambient temperature probe (TMPI) must be ordered with the Indigo520 transmitter to calculate humidity from the dew point and temperature readings.

## HMT337 Transmitter Components



1. Warmed Humidity Probe (Dew point output)
2. Temperature Probe
3. Fixed Cables from Probe to Transmitter
  - Options for 2,5,10 and 20m lengths
4. Transmitter
  - Options for display or no display
5. Input Power Cable Gland
  - Options for 24Vac/dc, 100-240 Vac
6. Output Signals Cable Gland
  - 2 or 3 Analog outputs
  - RS-232 or RS-485 or LAN
  - 2 Relays
  - HM70 Compatible service port

## INDIGO520 Transmitter Components



1. HMP7 Warmed Humidity Probe (Dew point output)
2. TMP1 Temperature Probe
3. Fixed Cables from Probe to Transmitter
  - Options for 1,3,5 and 10m lengths
4. Transmitter
  - Options for display or no display
5. Input Power Cable Gland
  - Options for 24Vac/dc, 100-240 Vac, PoE+
6. Output Signals Cable Gland
  - 4 Analog outputs
  - Ethernet Modbus TCP/IP
  - 2 Relays
  - Built in Webserver
  - Service port\*\*
  - Analog input\*\*
  - \*\*To be added

### Conversion from HMT337WP (Warmed Probe) to an INDIGO solution

For current high humidity applications using the HMT337WP, we recommend using our Indigo520 transmitter with the TMP1 and HMP7 probes with condensation prevention mode turned on. The new Indigo platform is built on the same measurement technology as its predecessor. The most significant and widely desired feature of the Indigo platform is the interchangeability of the smart probes. Many functionalities that were traditionally inside the transmitter are now built into the smart probe

instead, allowing for field swapping and cross-functional located configurations. The following pictures illustrate the basic components of the previous and new instruments. The probe head dimensions, filters, and installation accessories are identical, which means that, the measurement HMP7 humidity probe fits the same process connection as the HMT337 probe.

### History of warm probe technology

Warmed probe technology was first developed by Vaisala over 25 years ago to address difficult outdoor humidity measurements for meteorological applications and then modified for industrial applications. In industrial applications with high-humidity, the temperature can change faster resulting in condensing conditions. The warmed probe technology eliminates downtime due to condensation and provides continuous measurement at condensing or saturating conditions.



## Products

The 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. TMP1 is designed for demanding temperature measurements in industrial applications, where accuracy and robustness are essential. HMP7 is designed for applications that involve constant high humidity or rapid changes in humidity, where measurement performance and chemical tolerance are essential. Together, this system can provide you with consistently accurate readings that you can trust. Please reference the below table that highlights their features.

Product	HMP7 probe	TMP1 probe	Indigo201 + HMP7	Indigo520 + TMP1 & HMP7	HMT317 probe	HMM170 module
<b>Probe warming</b>	Yes	Used for temp. compensation	Configurable	Configurable	Configurable	Configurable
<b>IP rating</b>	IP66	IP66	IP65	IP66	IP66	N/A
<b>Ambient temperature sensor allows RH calculation</b>	<sup>1)</sup> Possible with external temperature measurement	No	No	<sup>2)</sup> Configurable	No	<sup>1)</sup> Possible with external temperature measurement
<b>Available measurement parameters</b>	$T_d, T_{df}, X, \text{ppm}, p_w$ <sup>1)</sup> (RH, T, a, $T_w, P_{ws}, h,$ dT)	T	<sup>2)</sup> $T_d, T_{df}, X, P_w$	$T_d, T_{df}, X, P_w$ <sup>2)</sup> (RH, T, a, $T_w, P_{ws}, h,$ dT)	$T_d, T_{df}, X, P_w$	$T_d, T_{df}, X, \text{ppm}, p_w$ <sup>1)</sup> (RH, T, a, $T_w, P_{ws}, h,$ dT)
<b>Supply voltage</b>	18 ... 30 V DC	10 ... 35 V DC	Configurable: 10 ... 35 V DC, 24 V AC	Configurable: 10 ... 35 V DC, 24 V AC, 100 ... 240 V AC, 50/60 Hz	10 ... 35 V DC	15 ... 35 V DC
<b>Digital output</b>	RS-485: Modbus RTU	RS-485: Modbus RTU	None	Modbus TCP/IP, web based interface	RS-232: serial ASCII	RS-485: Modbus RTU
<b>Analog output</b>	None	None	3 × assignable analog outputs	4 × assignable analog outputs	2 ×	3 ×
<b>Display</b>	No	No	Optional	Optional	No	No
<b>Parametrization</b>	Insight software	Insight software	273956 or USB-C	Touch screen or LAN	Terminal program (e.g. PuTTY)	Insight software
<b>USB cable</b> (sold separately)	242659 or USB2	242659 or USB2	None, USB-C	219690 or USB2	238607	219690

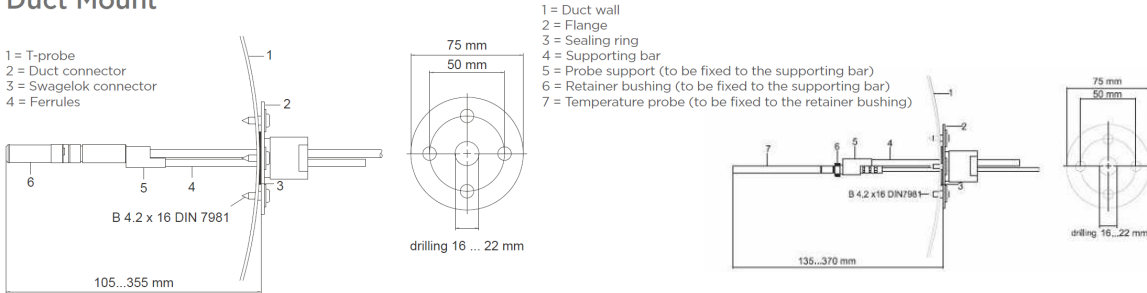
<sup>1)</sup> Relative humidity calculation is possible by writing external temperature information on a Modbus register.

<sup>2)</sup> Configurable: additional temperature probe needed.

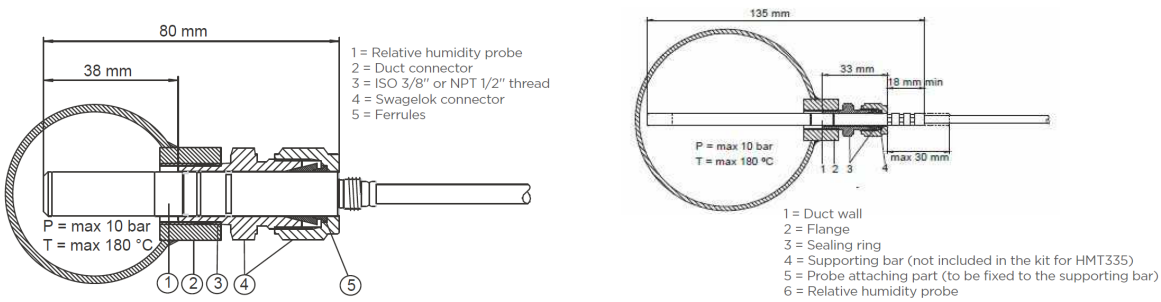
## Probe installation

Depending on the application, there are different mounting accessories available:

### Duct Mount

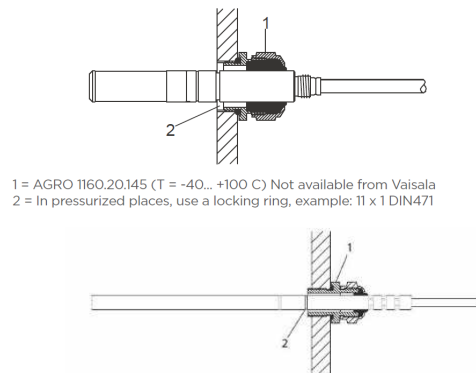
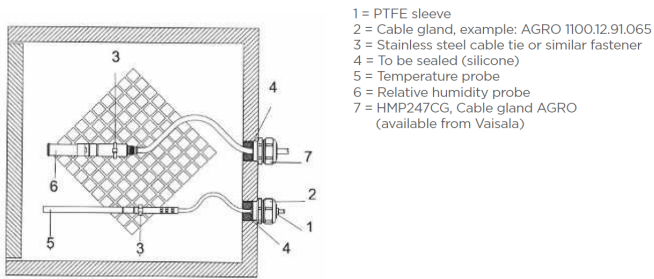


### Duct installation kit 210697 (215003 for HMT337 temperature probe)



Pressure-tight Swagelok installation kits **SWG12ISO38** with ISO3/8" or **SWG12NPT12** with NPT1/2" thread (SWG6ISO18 with ISO1/8" or SWG6NPT18 with NPT1/8" thread for HMT337 temperature probe).

### Example of Climate Chamber Installation



**HMP247CG:** Vapor-tight installation with cable gland.

## Insulation and leak-proof process connections

Choosing where to install a humidity probe can be challenging when there is high humidity combined with temperature variation.

For example, in a drying application where the exhaust air humidity is close to saturation (95 %RH) and the temperature is 40 °C, what happens when the sensor head is installed so that the filter is in the process and half of the sensor is in the 25 °C ambient temperature? In this situation even probe warming may not be able to compensate for the heat loss caused by thermal conduction through the metallic probe body; the heat loss will form a cold spot on the process side and condensation will result in inaccurate measurement. The solution here is to thoroughly insulate the probe.

If the process gas is colder than the ambient air it is critical to have a tight process connection for the probe. A leaking connection will allow warm and possibly humid air into the system, which can condensate near the sensor and cause measurement problems.

## Extreme conditions, such as PEM fuel cell applications

There are also extreme applications where warming just few degrees above the ambient temperature is just not enough. One example of such application is a Polymer Electrode Membrane (PEM) Fuel cell. Application specific configurations can be found in the order forms of the HMP7 and HMT310 series. These configuration versions are designed to withstand the extreme conditions by heating the probe head at a higher power. It is also possible to use

HMP7 and HMM170 in these applications, since the heating functionalities are freely configurable with the Insight PC software.

## Summary

Sensor saturation can be avoided in high-humidity and condensing conditions by using an instrument that has probe warming technology. In addition to this, proper insulation and leak-free installation guarantees the best possible environment for reliable humidity measurement.

The comparison table in this document will help you to choose the right product for your application. More detailed product information and features can be found in datasheets, user manuals, and order forms.

## HMP1 Wall-Mounted Humidity and Temperature Probe

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 Indigo300 and Indigo200 series transmitters to form a single wall-mounted unit.



### Features

- Compact size
- RH accuracy up to  $\pm 1.0$  %RH
- Temperature accuracy up to  $\pm 0.2$  °C (0.36 °F)
- Temperature measurement range -40 ... +60 °C (-40 ... +140 °F)
- Sensor purge improves long-term stability and chemical resistance
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products and Insight PC software
- Traceable calibration certificate: 6 points for humidity, 1 point for temperature

### Flexible connectivity

The probe can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://www.vaisala.com/insight).

For more information on the Indigo product family, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

### Sensor purge minimizes effects of contaminants

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

Sensor 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 a 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.

### Use with Indigo transmitters

With an Indigo300 or 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 transmitter and turn the locking wheel to hold the probe in place. Probe settings can be configured through the transmitter.



HMP1 with Indigo200 series



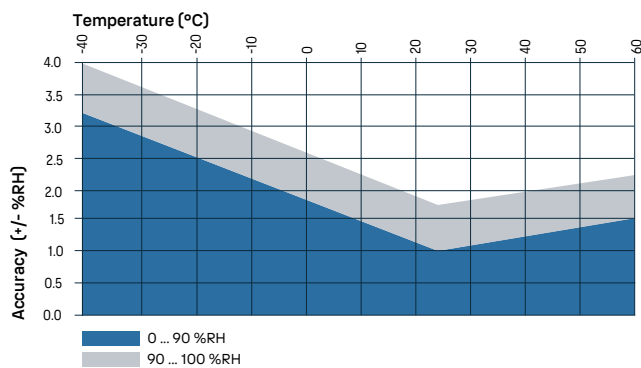
Probe holder

# Technical data

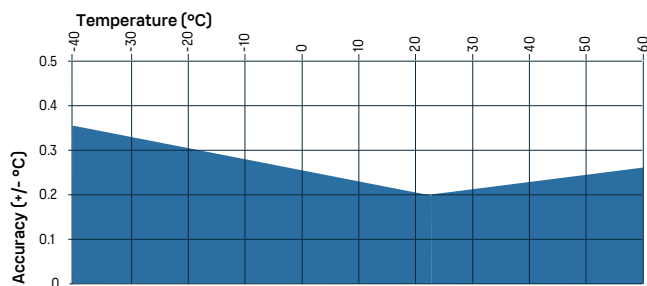
## Measurement performance

Relative humidity	
Measurement range	0-100 %RH
Accuracy at +23 °C (+73.4 °F) <sup>1) 2)</sup>	±1.0 %RH (0-90 %RH)
Factory calibration uncertainty <sup>3)</sup>	±0.7 %RH (0-40 %RH) ±1 %RH (40-95 %RH)
T <sub>63</sub> response time <sup>4)</sup>	21 s
Sensor	HUMICAP® I
Temperature	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy at +23 °C (+73.4 °F) <sup>1) 2)</sup>	±0.2 °C (±0.36 °F)
Factory calibration uncertainty <sup>3)</sup>	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)
T <sub>63</sub> response time <sup>4)</sup>	70 s

- 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.  
 4) In still air.



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 <sup>1)</sup>
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

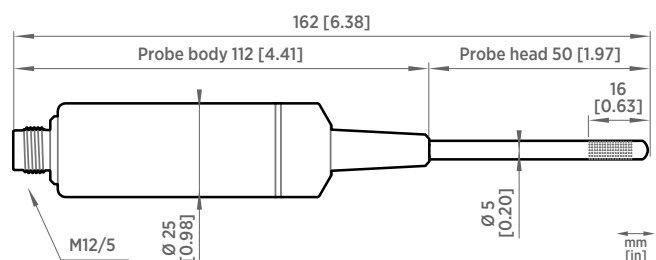
Absolute humidity (g/m <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>v</sub> )
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
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

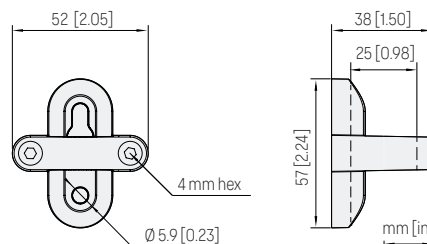
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, RCM

## 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

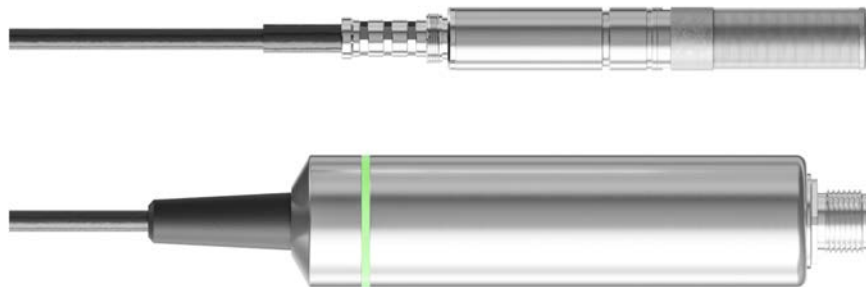


Probe holder ASM213582 dimensions

## Accessories

Indigo USB adapter <sup>1)</sup>	USB2
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- 1) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://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)
- Sensor purge improves long-term stability and chemical resistance
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products 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 the probe suitable for applications such as paint booths and other industrial applications where periodic recalibration alone is not sufficient for maintaining the probe performance. Other 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

### Sensor purge available with composite sensors

If purchased with a composite sensor instead of the field-replaceable HUMICAP® R2 sensor, HMP3 can use the sensor purge feature. In environments

with high concentrations of chemicals and cleaning agents, sensor purge helps to maintain measurement accuracy between calibration intervals.

Sensor 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

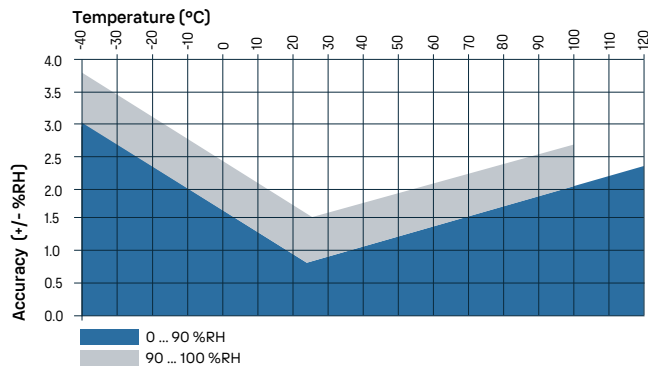
### Relative humidity

Measurement range	0–100 %RH, at max. +95 °C (203 °F) T <sub>d</sub>
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.8 %RH (0–90 %RH)
Factory calibration uncertainty <sup>2)</sup>	±0.5 %RH (0–40 %RH) ±0.8 %RH (40–95 %RH)
T <sub>63</sub> response time	15 s
Sensor options	HUMICAP® R2 HUMICAP® R2C <sup>3)</sup> HUMICAP® 180VC <sup>3) 4)</sup>

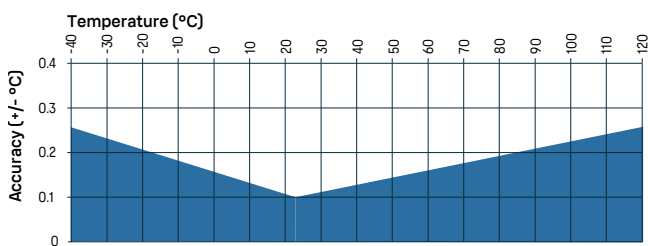
### Temperature

Sensor	Pt100 RTD Class F0.1 IEC 60751
Measurement range	–40 ... +120 °C (–40 ... +248 °F)
Accuracy <sup>1)</sup>	±0.1 °C (±0.18 °F)
Factory calibration uncertainty <sup>2)</sup>	±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) Sensor purge feature available with this sensor.
- 4) H<sub>2</sub>O<sub>2</sub> 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 body	–40 ... +80 °C (–40 ... +176 °F)
Operating temperature of probe head	–40 ... +120 °C (–40 ... +248 °F)
Operating humidity of probe head	Max. +100 °C (212 °F) T <sub>d</sub>
Storage temperature	–40 ... +80 °C (–40 ... +176 °F)
Operating environment	Suitable for outdoor use
Measurement environment	For air, nitrogen, hydrogen, argon, helium, and oxygen <sup>1)</sup>
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 <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>v</sub> )
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
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 and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	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 (with a 2-m cable)	302 g (10.65 oz)
Probe cable length	0.15 m (0.49 ft), 2 m (6.56 ft), 5 m (16.40 ft) or 10 m (32.80 ft)

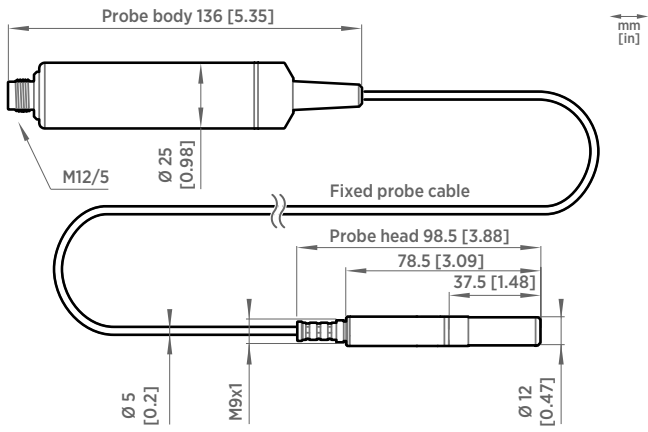
### Materials

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

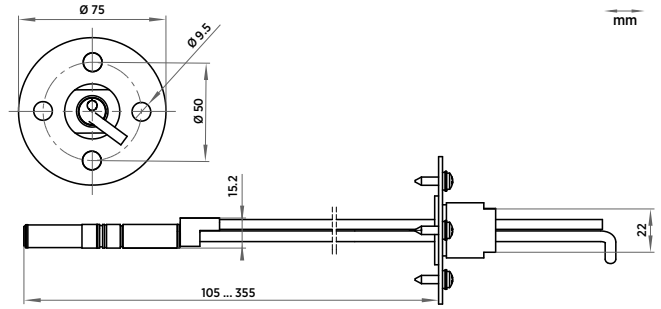
## Accessories

Duct installation kit for humidity probe	210697
Solar radiation shield DTR502B	DTR502B
Cable gland M20×1.5 with split seal	HMP247CG
Magnetic probe holder for Ø 12 mm probe heads <sup>1)</sup>	ASM213382SP
Indigo USB adapter <sup>2)</sup>	USB2

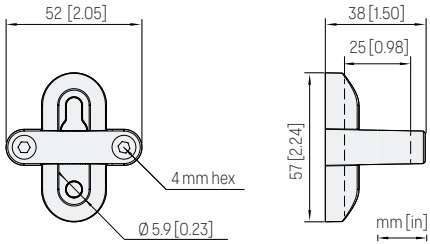
- 1) Not suitable for use at extreme temperatures.
- 2) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).



HMP3 probe dimensions



Duct installation kit 210697 dimensions with probe

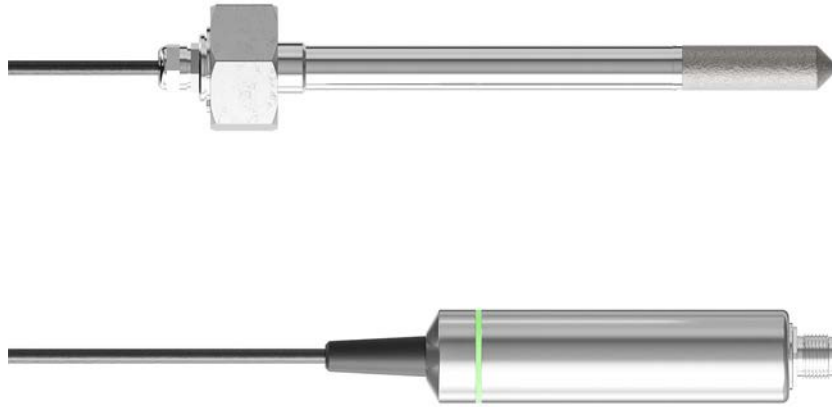


Probe holder ASM213582 dimensions



## HMP4 Relative Humidity and Temperature Probe

For pressurized and vacuum processes



### Features

- RH accuracy up to  $\pm 0.8$  %RH
- Temperature accuracy up to  $\pm 0.1$  °C ( $\pm 0.18$  °F)
- Temperature measurement range  $-70 \dots +180$  °C ( $-94 \dots +356$  °F)
- Operating pressure 0–100 bar
- Sensor purge improves long-term stability and chemical resistance
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products 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.

### Sensor purge minimizes effects of contaminants

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

The sensor 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

### Relative humidity

Measurement range 0–100 %RH, at max. +95 °C (203 °F)  $T_d$

Accuracy at +23 °C (+73.4 °F) <sup>1)</sup> ±0.8 %RH (0–90 %RH)

Factory calibration uncertainty <sup>2)</sup> ±0.5 %RH (0–40 %RH)  
±0.8 %RH (40–95 %RH)

$T_{63}$  response time 15 s

Sensor options HUMICAP® R2  
HUMICAP® R2C <sup>3)</sup>

### Temperature

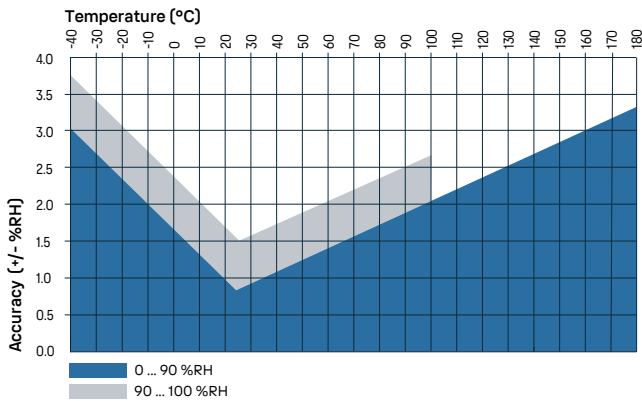
Measurement range –70 ... +180 °C (–94 ... +356 °F)

Accuracy <sup>1)</sup> ±0.1 °C (±0.18 °F)

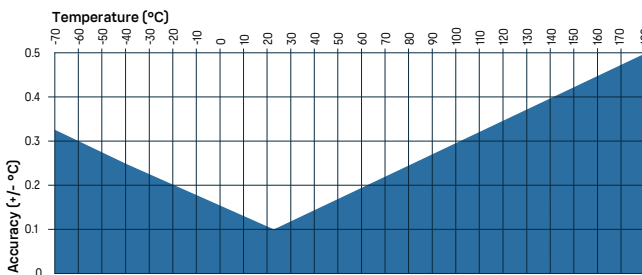
Factory calibration uncertainty <sup>2)</sup> ±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)

Sensor Pt100 RTD Class FO.1 IEC 60751

- <sup>1)</sup> Defined against calibration reference. Including non-linearity, hysteresis, and repeatability.  
<sup>2)</sup> Defined as ±2 standard deviation limits. Small variations possible; see calibration certificate.  
<sup>3)</sup> Sensor 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)

Operating humidity of probe head Max. +100 °C (212 °F)  $T_d$

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

Operational pressure < 100 bar

Operating environment Suitable for outdoor use

Measurement environment For air, nitrogen, hydrogen, argon, helium, oxygen, and vacuum <sup>1)</sup>

IP rating of probe body IP66

<sup>1)</sup> 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<sup>3</sup>) Relative humidity (%RH)

Absolute humidity at NTP (g/m<sup>3</sup>) Relative humidity (dew/frost) (%RH)

Dew point temperature (°C) Temperature (°C)

Dew/frost point temperature (°C) Water concentration (ppm<sub>v</sub>)

Dew/frost point temperature at 1 atm (°C) Water concentration (wet basis) (vol-%)

Dew point temperature at 1 atm (°C) Water mass fraction (ppm<sub>w</sub>)

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 and regulations EMC Directive (2014/30/EU)

RoHS Directive (2011/65/EU) as amended by 2015/863

Electromagnetic compatibility (EMC) 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 (with a 2-m cable) 530 g (18.7 oz)

Probe cable length 2 m (6.56 ft)

### Materials

Probe AISI 316

Probe body AISI 316

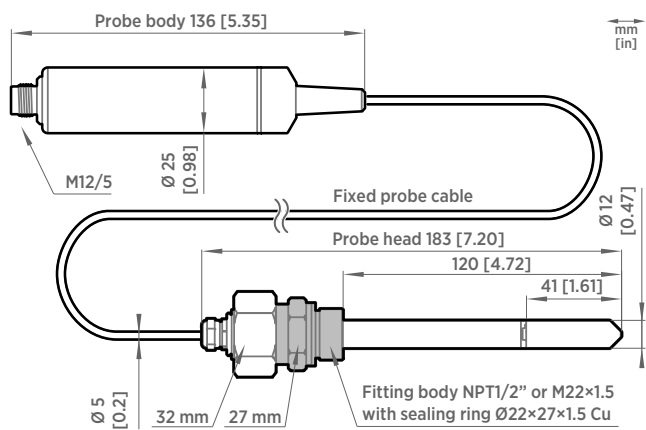
Cable jacket FEP

## Accessories

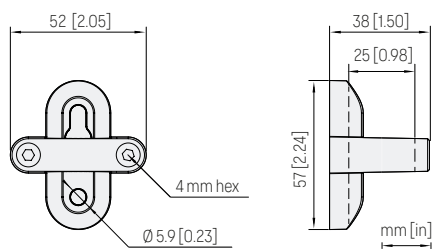
Indigo USB adapter <sup>1)</sup> USB2

Calibration adapter for HMK15 211302SP

<sup>1)</sup> Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).



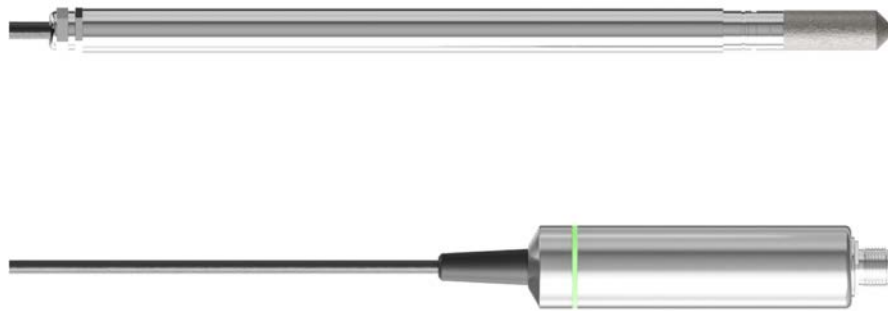
HMP4 probe dimensions



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  $\pm 0.1$  °C ( $\pm 0.18$  °F)
- Temperature measurement range  $-70 \dots +180$  °C ( $-94 \dots +356$  °F)
- Operating temperature of probe body  $-40 \dots +80$  °C ( $-40 \dots +176$  °F)
- Sensor purge improves long-term stability and chemical resistance
- Modbus® RTU over RS-485
- 250-mm (9.84 in) probe allows easy process installation through insulation
- Compatible with Vaisala Indigo products 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.

### Sensor purge minimizes effects of contaminants

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

Sensor 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

### Relative humidity

Measurement range 0–100 %RH, at max. +95 °C (203 °F)  $T_d$

Accuracy at +23 °C (+73.4 °F) <sup>1)</sup> ±0.8 %RH (0–90 %RH)

Factory calibration uncertainty <sup>2)</sup> ±0.5 %RH (0–40 %RH)  
±0.8 %RH (40–95 %RH)

$T_{63}$  response time 15 s

Sensor options HUMICAP® R2  
HUMICAP® R2C <sup>3)</sup>

### Temperature

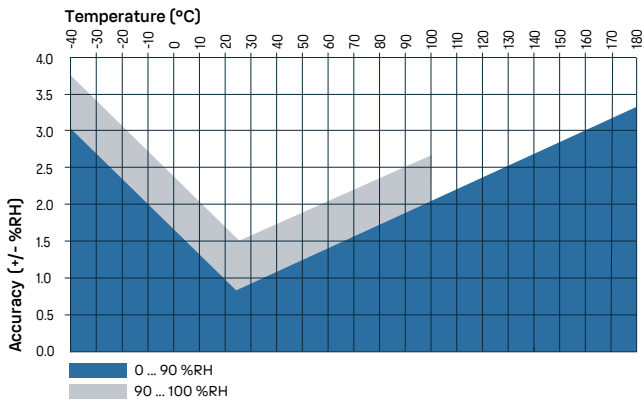
Measurement range –70 ... +180 °C (–94 ... +356 °F)

Accuracy at +23 °C (+73.4 °F) <sup>1)</sup> ±0.1 °C (±0.18 °F)

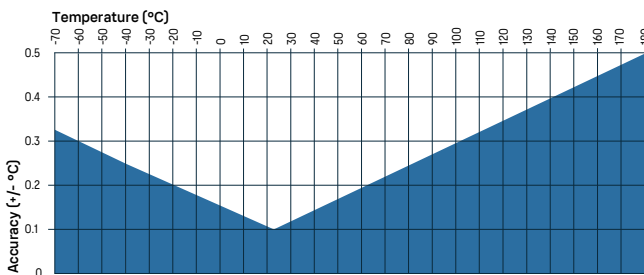
Factory calibration uncertainty <sup>2)</sup> ±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)

Sensor Pt100 RTD Class FO.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) Sensor 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 humidity of probe head Max. +100 °C (212 °F)  $T_d$

Storage temperature –40 ... +80 °C (–40 ... +176 °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<sup>3</sup>) Relative humidity (%RH)

Absolute humidity at NTP (g/m<sup>3</sup>) Relative humidity (dew/frost) (%RH)

Dew point temperature (°C) Temperature (°C)

Dew/frost point temperature (°C) Water concentration (ppm<sub>w</sub>)

Dew/frost point temperature at 1 atm (°C) Water concentration (wet basis) (vol-%)

Dew point temperature at 1 atm (°C) Water mass fraction (ppm<sub>w</sub>)

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 and regulations EMC Directive (2014/30/EU)

RoHS Directive (2011/65/EU) as amended by 2015/863

Electromagnetic compatibility (EMC) 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 (with a 2-m cable) 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

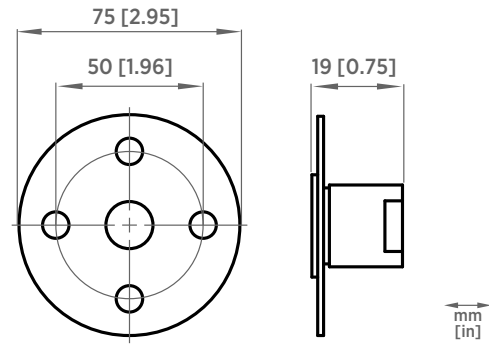
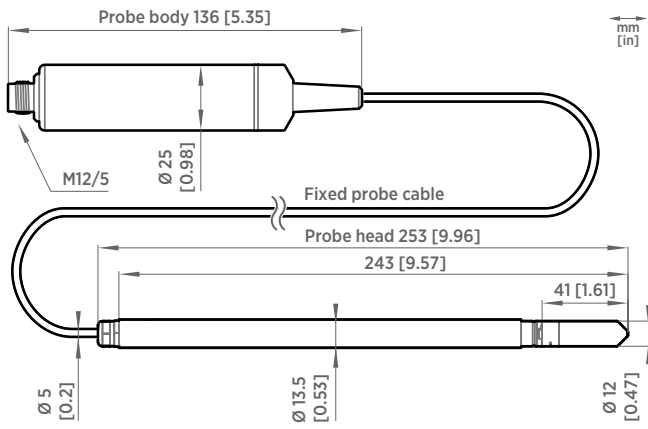
## Accessories

Mounting flange 210696

Indigo USB adapter <sup>1)</sup> USB2

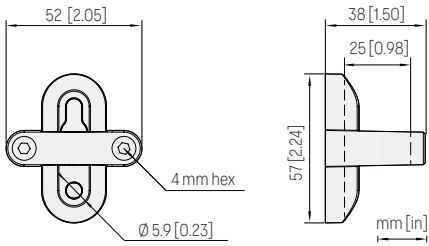
Calibration adapter for HMK15 211302SP

<sup>1)</sup> Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).



Mounting flange 210696 dimensions

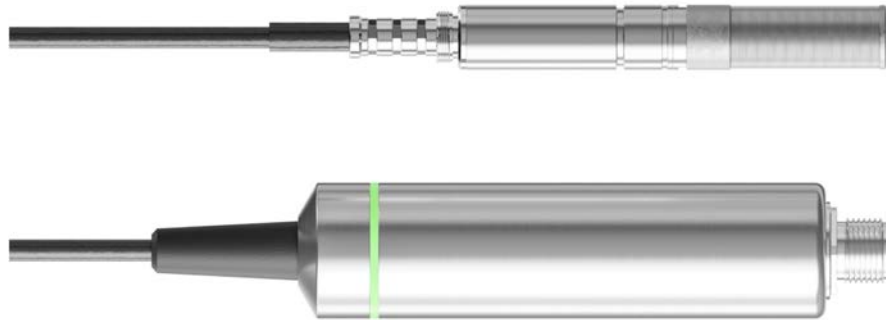
HMP5 probe dimensions



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 improves long-term stability and chemical resistance
- Modbus<sup>®</sup> RTU over RS-485
- Compatible with Vaisala Indigo products and Insight PC software
- Traceable calibration certificate: 6 points for humidity, 1 point for temperature

Vaisala HUMICAP<sup>®</sup> 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<sup>®</sup> 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<sup>®</sup> 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.

### Flexible connectivity

The probe can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows<sup>®</sup>. For more information, see [www.vaisala.com/insight](http://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.

The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

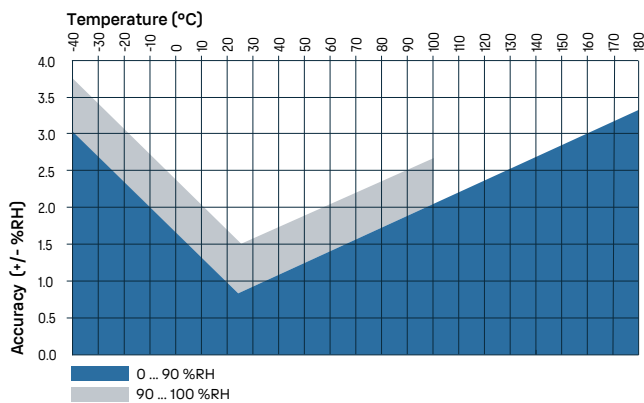
### Relative humidity

Measurement range	0–100 %RH, at max. +95 °C (203 °F) T <sub>d</sub>
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.8 %RH (0–90 %RH)
Factory calibration uncertainty <sup>2)</sup>	±0.5 %RH (0–40 %RH) ±0.8 %RH (40–95 %RH)
T <sub>63</sub> response time	15 s
Sensor options	HUMICAP® R2 HUMICAP® R2C <sup>3)</sup> HUMICAP® 180VC <sup>3) 4)</sup>

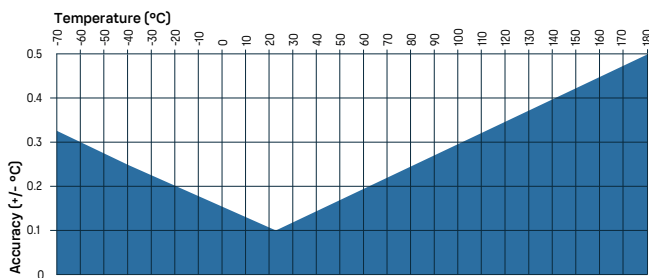
### Temperature

Measurement range	–70 ... +180 °C (–94 ... +356 °F)
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.1 °C (±0.18 °F)
Factory calibration uncertainty <sup>2)</sup>	±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) Sensor purge feature available with this sensor.  
 4) H<sub>2</sub>O<sub>2</sub> 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)
Operating humidity of probe head	Max. +100 °C (212 °F) T <sub>d</sub>
Storage temperature	–40 ... +80 °C (–40 ... +176 °F)
Operational pressure	< 10 bar
Operating environment	Suitable for outdoor use
Measurement environment	For air, nitrogen, hydrogen, argon, helium, oxygen, and vacuum <sup>1)</sup>
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 <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>v</sub> )
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
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 and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	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 (with a 2-m cable)	310 g (10.9 oz)
Probe cable length	0.15 m (0.49 ft), 2 m (6.56 ft) or 10 m (32.80 ft)

### Materials

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

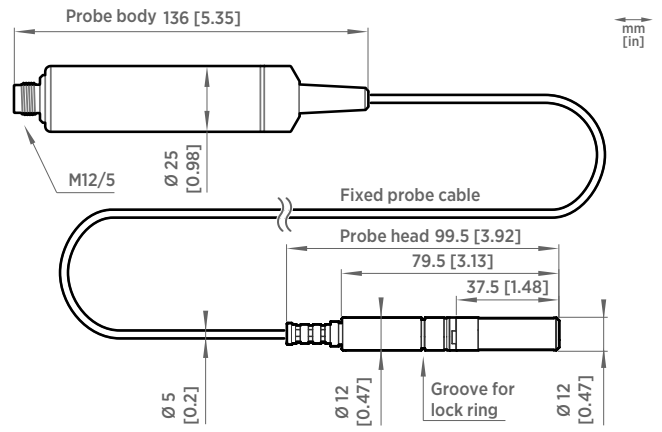


## Accessories

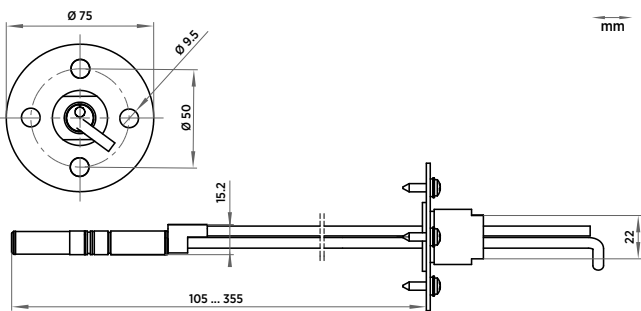
Duct installation kit for humidity probe	210697
Solar radiation shield DTR502B	DTR502B
Warmed probe accessory	HMT330WPA
Cable gland M20×1.5 with split seal	HMP247CG
Swagelok® for 12 mm probe, 1/2" ISO thread	SWG12ISO12
Swagelok® for 12 mm probe, 3/8" ISO thread	SWG12ISO38
Swagelok® for 12 mm probe, 1/2" NPT thread	SWG12NPT12
Magnetic probe holder for Ø 12 mm probe heads <sup>1)</sup>	ASM213382SP
Indigo USB adapter <sup>2)</sup>	USB2
Calibration adapter for HMK15	211302SP

1) Not suitable for use at extreme temperatures.

2) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).



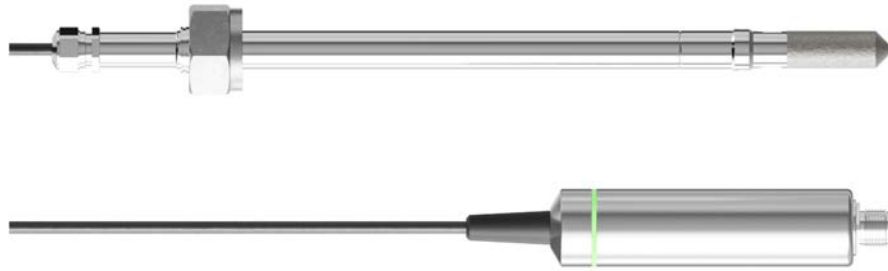
HMP7 probe dimensions



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  $\pm 0.1$  °C ( $\pm 0.18$  °F)
- Operating pressure 0–40 bar
- Temperature measurement range  $-70 \dots +180$  °C ( $-94 \dots +356$  °F)
- Sensor purge improves long-term stability and chemical resistance
- Probe installation depth can be freely adjusted and probe can be hot-swapped from pressurized pipelines with an optional ball valve kit
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products 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.

### Sensor purge minimizes effects of contaminants

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

Sensor 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

### Relative humidity

Measurement range 0–100 %RH, at max. +95 °C (203 °F) T<sub>d</sub>

Accuracy at +23 °C (+73.4 °F)<sup>1)</sup> ±0.8 %RH (0–90 %RH)

Factory calibration uncertainty<sup>2)</sup> ±0.5 %RH (0–40 %RH)  
±0.8 %RH (40–95 %RH)

T<sub>63</sub> response time 15 s

Sensor options HUMICAP® R2  
HUMICAP® R2C<sup>3)</sup>

### Temperature

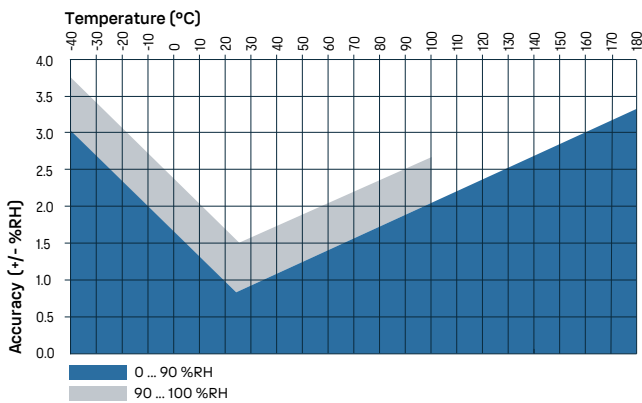
Measurement range –70 ... +180 °C (–94 ... +356 °F)

Accuracy at +23 °C (+73.4 °F)<sup>1)</sup> ±0.1 °C (±0.18 °F)

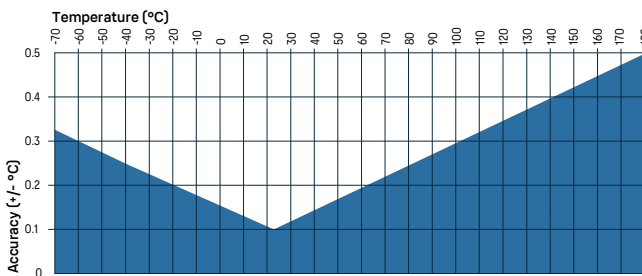
Factory calibration uncertainty<sup>2)</sup> ±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)

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) Sensor 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)

Operating humidity of probe head Max. +100 °C (212 °F) T<sub>d</sub>

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

Operational pressure < 40 bar

Operating environment Suitable for outdoor use

Measurement environment For air, nitrogen, hydrogen, argon, helium, oxygen, and vacuum<sup>1)</sup>

IP rating of probe body IP66

### Ball valve

Operating temperature Up to +100 °C (+212 °F)

Operating pressure Up to 40 bar (580 psi), absolute

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<sup>3</sup>) Relative humidity (%RH)

Absolute humidity at NTP (g/m<sup>3</sup>) Relative humidity (dew/frost) (%RH)

Dew point temperature (°C) Temperature (°C)

Dew/frost point temperature (°C) Water concentration (ppm<sub>v</sub>)

Dew/frost point temperature at 1 atm (°C) Water concentration (wet basis) (vol-%)

Dew point temperature at 1 atm (°C) Water mass fraction (ppm<sub>w</sub>)

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 and regulations EMC Directive (2014/30/EU)

RoHS Directive (2011/65/EU) as amended by 2015/863

Electromagnetic compatibility (EMC) EN 61326-1, industrial environment

Type approvals DNV GL certificate no. TAA00002YT

Compliance marks CE, China RoHS, RCM



## Mechanical specifications

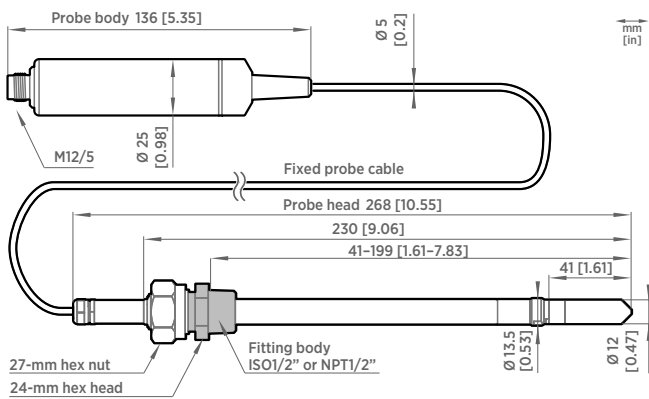
Connector	M12 5-pin A-coded male
Probe fitting	ISO1/2" and NPT1/2" fittings included
Weight (with a 2-m cable)	512 g (18.1 oz)
Probe cable length	2 m (6.56 ft) or 10 m (32.80 ft)

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

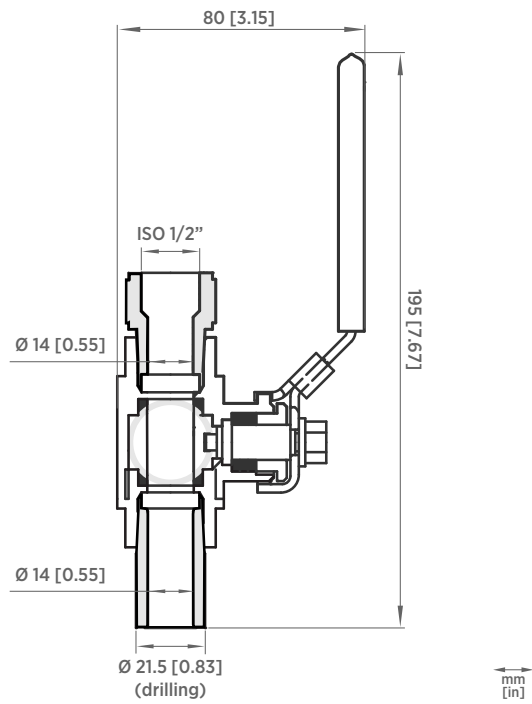
## Accessories

Ball valve kit ISO 1/2" with welding joint	BALLVALVE-1
Indigo USB adapter <sup>1)</sup>	USB2
Calibration adapter for HMK15	211302SP
Weatherproof carrying case for Indigo80 and a series 8 probe <sup>2)</sup>	ASM215318

1) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).  
 2) For example, MMP8, HMP8, or DMP8 with a max. 2-m (6.6-ft) probe connection cable.



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 improves long-term stability and chemical resistance
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products 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

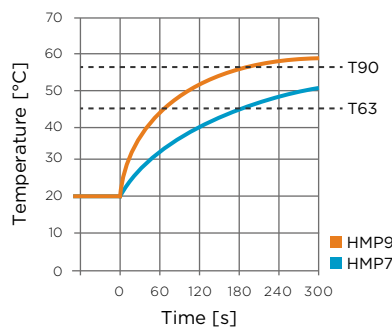
Vaisala HUMICAP® Humidity and Temperature Probe HMP9 is designed for easy installation into rapidly changing environments where fast response time, measurement performance, and chemical tolerance are essential.

### 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 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

### Sensor purge minimizes effects of contaminants

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

Sensor 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://www.vaisala.com/insight).

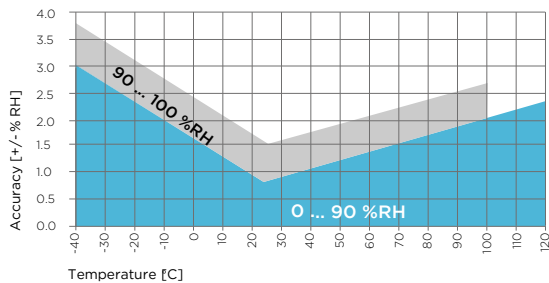
For more information on the Indigo product family, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

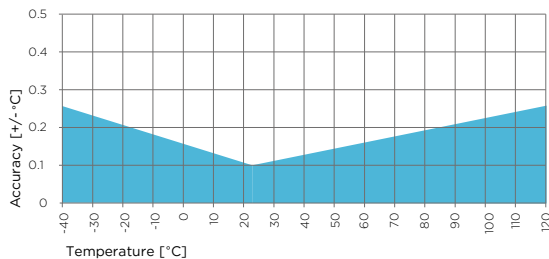
## Measurement performance

Relative humidity	
Measurement range	0–100 %RH, at max. +95 °C (203 °F) T <sub>d</sub>
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.8 %RH (0–90 %RH)
Factory calibration uncertainty <sup>2)</sup>	±0.7 %RH (0–40 %RH) ±1 %RH (40–95 %RH)
T <sub>63</sub> response time <sup>3)</sup>	15 s
Sensor	HUMICAP® I
Temperature	
Measurement range	–40 ... +120 °C (–40 ... +248 °F)
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.1 °C (±0.18 °F)
Factory calibration uncertainty <sup>2)</sup>	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)
T <sub>63</sub> response time <sup>3)</sup>	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)
Operating humidity of probe head	Max. +100 °C (212 °F) T <sub>d</sub>
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 <sup>1)</sup>
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 <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>v</sub> )
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
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 and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, RCM

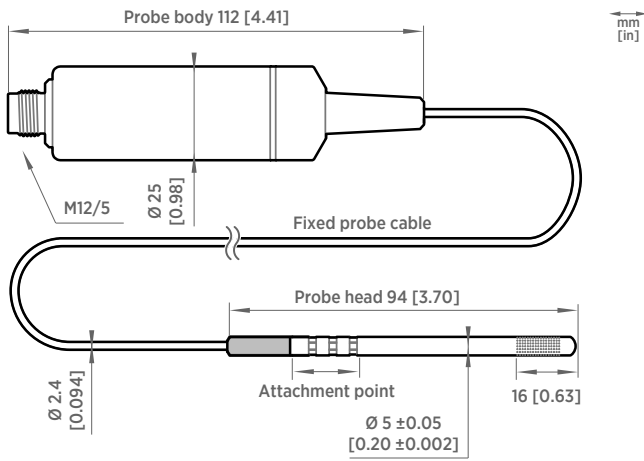
## Mechanical specifications

Connector	M12 5-pin A-coded male
Weight (with a 2-m cable)	68 g (2.40 oz)
Probe cable length	2 m (6.56 ft)
Materials	
Probe	AISI 316L
Probe body	PBT
Cable overmolds	FEP

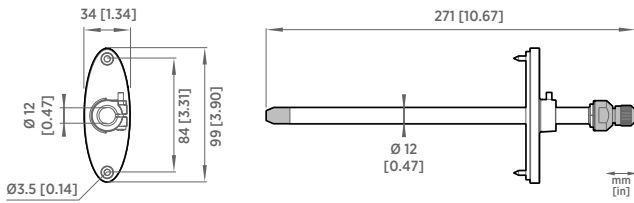
## Accessories

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 <sup>1)</sup>	USB2

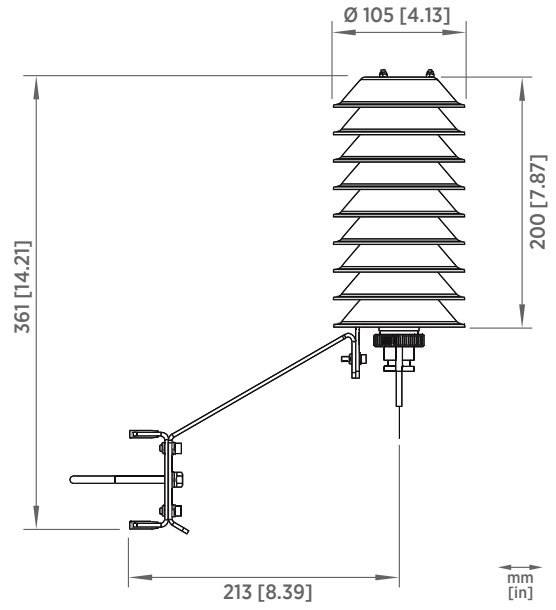
1) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).



HMP9 probe dimensions



HMP9 Duct Installation Kit ASM214055 dimensions



Solar Radiation Shield DTR502B dimensions



### Features

- Temperature accuracy up to  $\pm 0.1$  °C ( $\pm 0.18$  °F)
- Temperature measurement range  $-70 \dots +180$  °C ( $-94 \dots +356$  °F)
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see [www.vaisala.com/indigo](http://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.

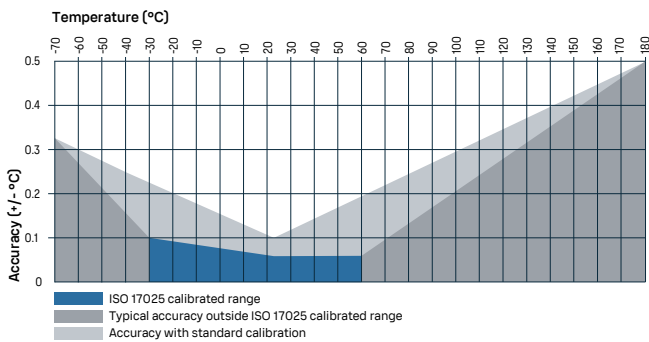


# Technical data

## Measurement performance

Measurement range	-70 ... +180 °C (-94 ... +356 °F)
Sensor	Pt100 RTD Class F0.1 IEC 60751
<b>Standard calibration <sup>1)</sup></b>	
Accuracy at +23 °C (+73.4 °F)	±0.1 °C (±0.18 °F)
Factory calibration uncertainty <sup>2)</sup>	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)
<b>Optional ISO 17025 calibration <sup>3)</sup></b>	
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.06 °C (±0.108 °F)
Calibration uncertainty <sup>2)</sup>	±0.03 °C (±0.054 °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) Accuracy depends on selected calibration points. Accuracy with ISO 17025 calibration is defined here using a 5-point calibration in the following points: -30, -10, 0, +30, and +60 °C. For more information on calibration services offered by Vaisala, see [vaisala.com/calibration](http://vaisala.com/calibration).



## 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)
Storage temperature	-40 ... +80 °C (-40 ... +176 °F)
Operating environment	Suitable for outdoor use
<b>IP rating</b>	
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)

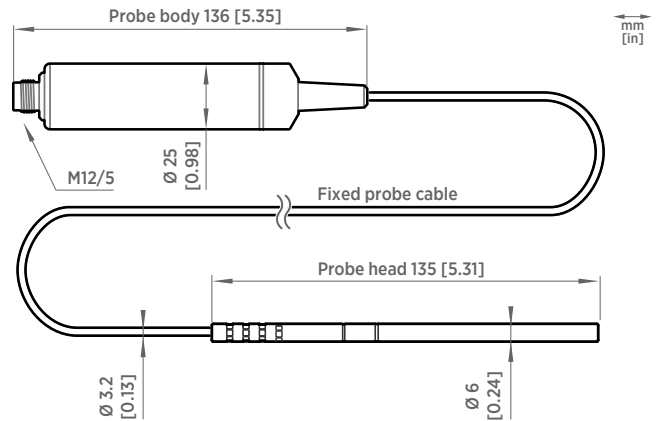
## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	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 (with a 2-m cable)	224 g (7.9 oz)
Probe cable length	2 m (6.56 ft) or 10 m (32.8 ft)
<b>Materials</b>	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP



## TMP1 probe dimensions

## Accessories

Duct installation kit for temperature 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 <sup>1)</sup>	USB2

<sup>1)</sup> Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).

## HMT370EX Series Intrinsically Safe Humidity and Temperature Transmitters

For operation in up to Zone 0 / 20



### Features

- Intrinsically safe (Ex i) for operation in up to Zone 0 / 20
- Measures RH and T, and outputs an extensive range of calculated parameters
- Designed for harsh conditions
- Temperature range between  $-70 \dots +180 \text{ }^{\circ}\text{C}$  ( $-94 \dots +356 \text{ }^{\circ}\text{F}$ ) depending on the probe option
- Vaisala HUMICAP<sup>®</sup> sensor features high accuracy, excellent long-term stability, and negligible hysteresis
- Display options: graphical LCD display and non-display model
- Traceable calibration (certificate included)
- Compatible with Vaisala Insight PC software

Vaisala HMT370EX Series HUMICAP<sup>®</sup> Humidity and Temperature Transmitters are the ideal solution for measuring humidity in hazardous areas. The intrinsically safe and robust transmitter operates safely and reliably even in the most hazardous classifications, such as Zone 0. The HMT370EX transmitter series can be used as a replacement of the long-running HMT360 transmitter series.

### Interchangeable probes and detachable probe module

HMT370EX offers several probe options for different applications:

- HMP371 — wall mount
- HMP373 — confined spaces
- HMP374 — pressurized spaces
- HMP375 — high temperature
- HMP377 — high humidity
- HMP378 — pressurized pipelines

For information on the HMP378F and HMP378H probe variants for oil and JET A-1 fuel moisture and temperature measurement, see [HMP378F and HMP378H Datasheet \(B212512EN\)](#).

HMP371 and HMP373 can be ordered as temperature-only versions.

Thanks to the detachable probe module, probes can be easily replaced and removed for calibration outside the hazardous area without removing the entire transmitter. Attaching new probes involves minimal reconfiguration, as up-to-date settings can be restored from the transmitter.

### Intrinsically safe and robust

The entire HMT370EX transmitter can be installed directly in hazardous areas. It can withstand continuous exposure to potentially explosive environments that contain flammable gases or dust. Operation in either gas or dust environments requires no additional protective enclosures. A rugged design,

combined with trouble-free operation, ensures a long-term solution for monitoring humidity and dew point in potentially explosive environments.

### Easy configuration access with local display and Insight PC software

Output configuration and measurement calibration and adjustment can be carried out directly on the local display interface. For additional configuration and monitoring options, you can connect the transmitter to Vaisala Insight PC software with an accessory USB cable. The probe and transmitter body can be connected to Insight for configuration either together as one unit or separately.

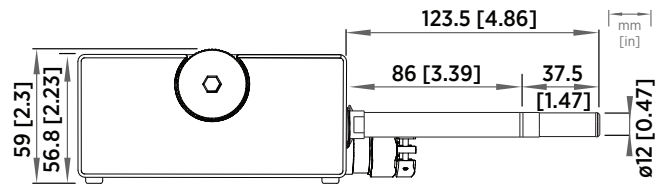
# Interchangeable probes for HMT370EX intrinsically safe humidity and temperature transmitter

## HMP371 for wall mounting

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



HMP371 probe shown with a stainless steel netting filter



HMP371 dimensions

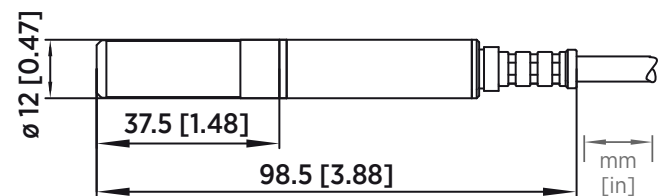
## HMP373 for confined spaces

Temperature range with Teflon cable	-40 ... +120 °C (-40 ... +248 °F)
Temperature range with rubber cable	-40 ... +80 °C (-40 ... +176 °F)
Probe cable length	2, 5, or 10 meters (6 ft 7 in, 16 ft 5 in, 32 ft 10 in)
Probe diameter	12 mm (0.47 in)

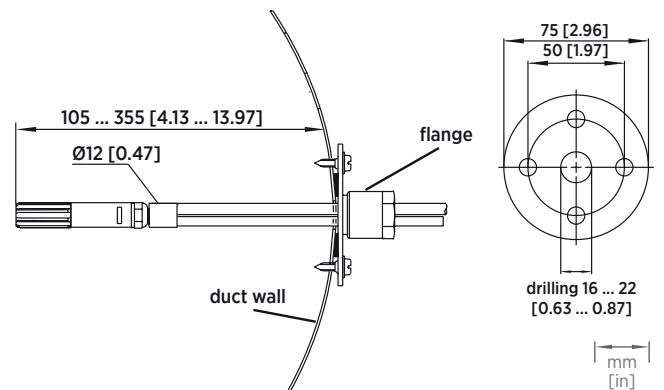
Installation	
Duct installation kit	210697
Cable gland M20x1.5 with splitting seal	HMP247CG
Swagelok for 12mm probe, 1/2" NPT thread	SWG12NPT12



The small-sized HMP373 probe fits into tight spaces: shown connected with a Teflon cable



HMP373 dimensions



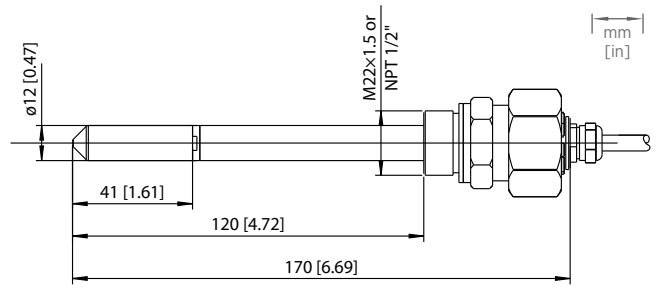
Left: Installation kit for duct mounting dimensions. Right: Installation flange dimensions. Aluminum or stainless steel.

### HMP374 for high pressure

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



HMP374 is designed for measurement in pressurized spaces or vacuum chambers



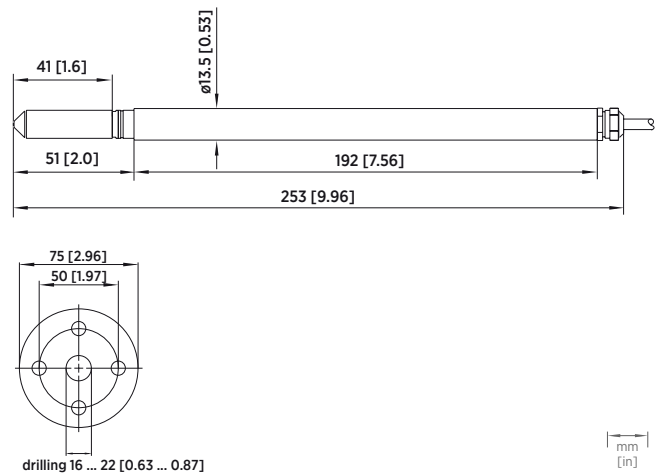
HMP374 dimensions

### HMP375 for high temperature

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



HMP375 is designed for high temperature environments



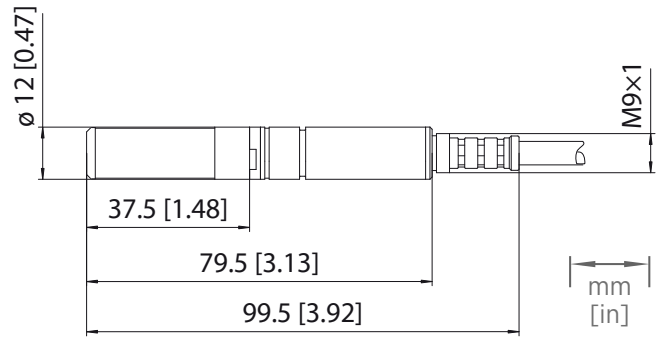
HMP375 probe and stainless steel installation flange dimensions

### HMP377 for high humidities

Temperature range	-70 ... +180 °C (-94 ... +356 °F)
Pressure range	0-1 MPa
Probe cable length	2, 5, or 10 meters (6 ft 7 in, 16 ft 5 in, 32 ft 10 in)
Probe diameter	12 mm (0.47 in)
<b>Installation</b>	
Duct installation kit	210697
Cable gland M20x1.5 with splitting seal	HMP247CG
Swagelok for 12 mm probe, 3/8" ISO thread	SWG12ISO38
Swagelok for 12 mm probe, 1/2" NPT thread	SWG12NPT12



HMP377 is constructed to be installed in environments with high humidities



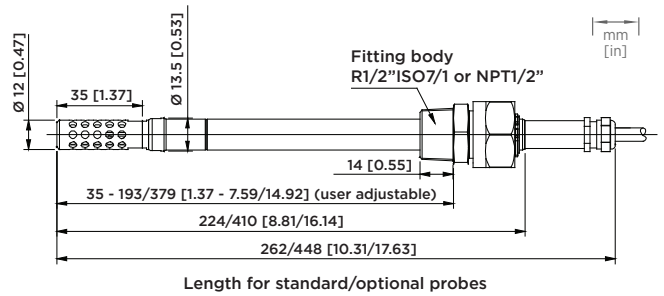
HMP377 dimensions

### HMP378 for pressurized pipelines

Temperature range	-70 ... +180 °C (-94 ... +356 °F)
Pressure range	0-4 MPa
Probe cable length	2, 5, or 10 meters (6 ft 7 in, 16 ft 5 in, 32 ft 10 in)
Probe diameter	13.5 mm / 12 mm (0.53 in / 0.47 in)
Available probe lengths	262 mm / 448 mm (10.31 in / 17.6 in)
<b>Installation</b>	
Fitting body ISO1/2 solid structure	DRW212076SP
Fitting body NPT1/2 solid structure	NPTFITBODASP
Ball valve ISO 1/2 with welding joint	BALLVALVE-1



HMP378 enables flexible installation in pressurized pipelines



HMP378 dimensions

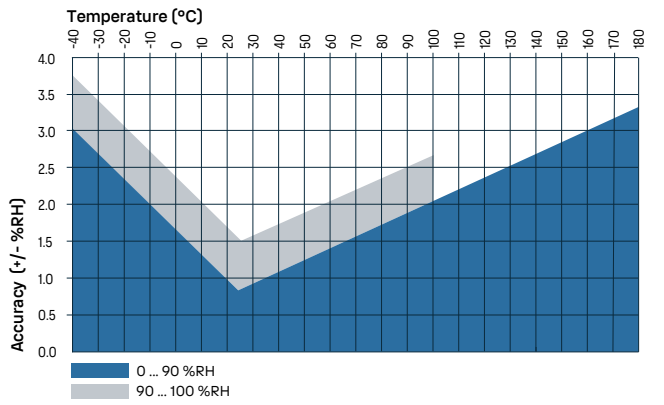
# Technical data

## Measurement performance

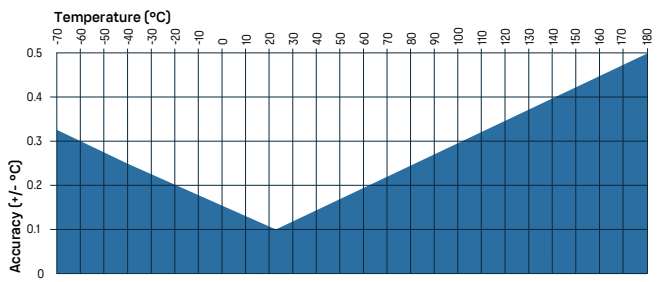
Relative humidity	
Measurement range	0-100 %RH
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.8 %RH (0-90 %RH)
Factory calibration uncertainty <sup>2)</sup>	±0.5 %RH (0-40 %RH) ±0.8 %RH (40-95 %RH)
T <sub>63</sub> response time	15 s
Sensor options	HUMICAP® R2
Temperature	
Measurement range	-70 ... +180 °C (-94 ... +356 °F)
Accuracy at +23 °C (+73.4 °F) <sup>1)</sup>	±0.1 °C (±0.18 °F)
Factory calibration uncertainty <sup>2)</sup>	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)
Sensor	Pt1000 RTD Class F0.1 IEC 60751

**Other available measurement parameters <sup>3)</sup>**  
 Dew point temperature, dew point / frost point temperature, absolute humidity, mixing ratio, wet-bulb temperature, water concentration, water vapor pressure, water vapor saturation pressure, enthalpy, dew point temperature difference, absolute humidity at NTP, water mass fraction

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) Parameter options depend on selected probe variant. For specifications, see HMT370EX User Guide (M212305EN).



Humidity measurement accuracy as function of temperature



Temperature measurement accuracy over full range

## Operating environment

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

**Note:** Do not install the LCD display model in a location where the transmitter is exposed to direct sunlight.

## Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, RCM

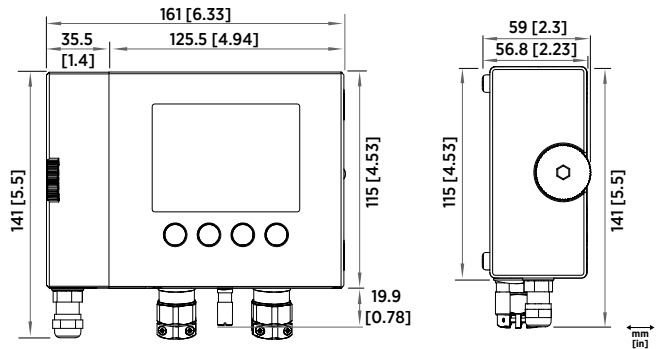
## Inputs and outputs

Operating voltage	12-28 V
Analog outputs	2 outputs (two-wire, 4-20 mA) Connection via safety barriers
Typical accuracy of analog outputs at +20 °C	±0.0625 % full scale
Typical temperature dependence of analog outputs	0.005 % / °C (0.005 % / °F) full scale
Transmitter service port connection	USB cable 219690
Probe service port connection	USB cable USB2
Display options	<ul style="list-style-type: none"> <li>Graphical LCD display</li> <li>Model without display <sup>1)</sup></li> </ul>

<sup>1)</sup> Recommended when the transmitter is exposed to direct UV light, and for outdoor installations and high-humidity environments.

## Mechanical specifications

Connections	Screw terminals, 0.33-2.0 mm <sup>2</sup> wires (AWG 14-22)
Cable glands	M20×1.5
Conduit fitting	NPT 1/2" and M16
Housing material	EN AW-6082
Housing weight	LCD transmitter: 1500 g (3.3 lb) LED transmitter: 1520 g (3.35 lb) HMP371 fixed probe: 320 g (0.7 lb)
IP rating	With probe connected to the transmitter: <b>IP66</b> With probe detached from the transmitter: <b>IP54</b>



HMT370EX transmitter dimensions

## Ex classifications by region

NOTE: The Ex classifications show the highest level of compliance. Although lower compliance levels are not shown in the classification, they are also included in the classification. For example, compliance with Division 1 also means compliance with Division 2, and compliance with Zone 0 also means compliance with Zone 1 and Zone 2.

### Europe (ATEX)

Gas classification	II 1 G Ex ia IIC T4 Ga
EU (2014/34/EU)	
Dust classification	II 1 D Ex ia IIIC T <sub>200</sub> 85 °C Da
Safety factors	U <sub>i</sub> = 28 VDC, I <sub>i</sub> = 100 mA, C <sub>i</sub> = 12.1 nF, P <sub>i</sub> = 700 mW, L <sub>i</sub> = 16 μH
Environmental specifications	
T <sub>amb</sub>	-40 ... +60 °C (-40 ... +140 °F)
P <sub>amb</sub>	0.8 ... 1.1 bar

### International (IECEX)

Gas classification	Ex ia IIC T4 Ga
Dust classification	II 1 D Ex ia IIIC T <sub>200</sub> 85 °C Da
Safety factors	U <sub>i</sub> = 28 VDC, I <sub>i</sub> = 100 mA, C <sub>i</sub> = 12.1 nF, P <sub>i</sub> = 700 mW, L <sub>i</sub> = 16 μH
Environmental specifications	
T <sub>amb</sub>	-40 ... +60 °C (-40 ... +140 °F)
P <sub>amb</sub>	0.8 ... 1.1 bar

### Japan (CML)

Ex classification	Ex ia IIC T4 Ga Ex ia IIIC T <sub>200</sub> 85°C Da CML 21JPN2417X
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### China (NEPSI)

Ex classification	Ex ia IIC T3-T6 Ga GYJ21.1325X
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### Korea (KCs)

Ex classification	Ex ia IIC T4 Ga Ex ia IIIC T200 85 °C Da -40 °C ≤ Tamb ≤ +60 °C IECEX EESF 20.0044.X 21-KA4BO-0891X, 21-KA4BO-0892X
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### US (FM)

Ex classification	Class I, Zone 0, AEx ia IIC T4 Ga Zone 20, AEx ia IIIC T85°C Da IS Class I, Division 1, Groups A, B, C, and D T4 IS Class II, III, Division 1, Groups E, F, and G T85°C
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### CAN (FM)

HMT370EX equipment rating	Intrinsically safe for: Class I, II, III Division 1, Groups A, B, C, D, E, F, and G, T4 Class I, Zone 0, Ex ia IIC T4 Zone 20, Ex ia IIIC Temperature Code T85°C Ta: -40 °C to +60 °C; IP54 (transmitter alone) IP66 (transmitter with the probe body attached)
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### UK (UKEX)

Ex classification	II 1 G Ex ia IIC T4 Ga II 1 D Ex ia IIIC T200 85 °C Da -40 °C ≤ Tamb ≤ +60 °C CML 21UKEX2316X
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## Transmitter accessory availability

Accessory	Item code	Compatible models
<b>Cable lead-through accessories</b>		
Cable gland M20 x 1.5 for Ø 5–11 mm cable	265207SP	All models
Cable gland M20 x 1.5 for Ø 10–14 mm cable	265208SP	All models
Conduit fitting M16	265243SP	All models
Conduit fitting NPT1/2"	265240SP	All models
Dummy plug (Ex, 2 pcs)	254931SP	All models
<b>Mounting, wiring, cable, and adapter accessories</b>		
HMT360 retrofit mounting plate	DRW253246SP	All models
Turbine mounting kit	HMT300TMK	All models
Outdoor installation kit (weather shield)	215109	All models
USB service cable for transmitter	219690	All models
Zener barrier for 1 channel (with 2 channels, order 2 pcs)	210664	All models
Galvanic isolator for 1 channel	212483	All models
Galvanic isolator for 1 channel	272886SP	All models
Galvanic isolator for 2 channels	272887SP	All models
Calibration adapter for HMK15	211302	HMP371, HMP373, HMP374, HMP377

## Probe spare parts and accessories

Accessory	Item code	Compatible models
M12 Indigo USB Adapter cable accessory for connecting HMT370EX probes to Insight	USB2	All models
Ball valve ISO 1/2 with welding joint <ul style="list-style-type: none"> <li>Pressure range at +20 °C (+68 °F) 0–20 bar (0–290 psi absolute) (during installation max. 10 bar (145 psi absolute))</li> </ul>	BALLVALVE-1	HMP378
Duct installation kit	210697	HMP373, HMP377
Mounting flange	210696	HMP375
Washer set for pressure-tight installation (3 pcs)	4PROBESETSP	HMP374
Cable gland M20×1.5 with split seal	HMP247CG	HMP373, HMP375, HMP377
Fitting body M22×1.5	17223SP	HMP374
Fitting body NPT1/2	17225SP	HMP374
Fitting body ISO1/2 solid structure	DRW212076SP	HMP378
Fitting body NPT1/2 solid structure	212810SP	HMP378
Swagelok fitting for 12 mm probe, 1/2" NPT thread	SWG12NPT12	HMP377
Swagelok fitting for 12 mm probe, 3/8" ISO thread	SWG12ISO38	HMP377
Swagelok fitting for 12 mm probe, 1/2" ISO thread	SWG12ISO12	HMP377
Thread adapter ISO 1/2" to NPT 1/2"	210662SP	All models
Manual press	HM36854SP	HMP378/F/H
Metallized PPS plastic filter grid with stainless steel mesh, for general use (pore size 15 µm)	DRW010281SP	All models
Stainless steel sintered filter (AISI 316L), for general use (pore size 38 µm)	HM47280SP	All models
Metallized PPS plastic filter grid, for fast response in clean environments (6.5 mm gaps)	DRW010276SP	All models
Stainless steel filter for high oil flow applications	220752SP	HMP378/F/H
Stainless steel filter (AISI 303) with PTFE membrane	214848SP	All models
Stainless steel filter for oil and vacuum environments (AISI 303)	HM47453SP	All models



## HMT310 Series Humidity and Temperature Transmitters

For demanding industrial applications



### Features

- 4th generation Vaisala HUMICAP® sensor for superior accuracy and stability
- Full 0 ... 100 %RH measurement, temperature range up to +180 °C (+356 °F), depending on model
- Small size, easy to integrate
- Insensitive to dust and most chemicals
- Two analog signals and RS-232 ASCII output
- Pressure tolerance up to 100 bar

HMT310 incorporates the latest generation Vaisala HUMICAP® sensor. The sensor is a capacitive thin-film polymer sensor providing high accuracy, excellent long-term stability, and negligible hysteresis. It is insensitive to dust, particulate dirt, and most chemicals. HMT310 has various options for different environments and measurements.

### Several Outputs, One Connector

HMT310 is powered up with 10 ... 35 VDC. It has two analog outputs and an RS-232 serial output in one M12 8-pin connector. The output signal and the supply power travel in the same cable, the only cable connected to the unit.

### Chemical Purge

Chemical purge helps to maintain measurement accuracy between calibration intervals. It involves heating the sensor to remove harmful chemicals. The function can be initiated manually or programmed to occur at set intervals.

### A Variety of Features to Choose From

The following optional features and accessories are available for the HMT310 series:

- Warmed probe and sensor heating for high humidity conditions
- Chemical purge for applications risking an interference with chemicals in the measuring environment
- Calculated humidity quantities
- Sensor protection options and probe cable lengths
- Mounting kits
- Rain shield

### Six Models for Demanding Applications

The HMT310 series includes:

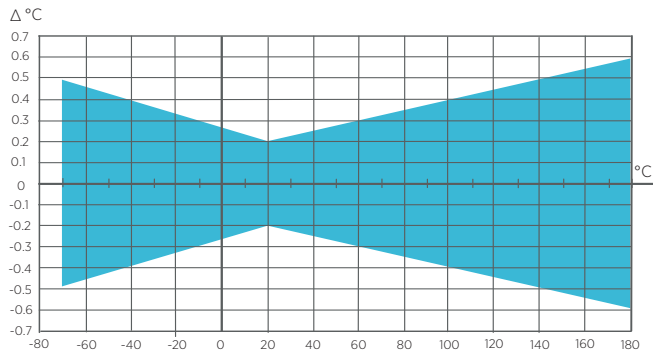
- HMT311 for wall mounting
- HMT313 for duct mounting and tight spaces
- HMT314 for high pressures up to 100 bar and vacuum conditions
- HMT315 for high temperatures
- HMT317 for high humidity applications, warmed probe option
- HMT318 for pressurized pipelines up to 40 bar

# Technical Data

## Measurement Performance

Relative Humidity	
Measurement range	0 ... 100 %RH
Response time (90 %) at +20 °C (+68 °F) in 0.1 m/s air flow	17 s with grid filter 50 s with grid and steel, netting filter 60 s with sintered filter
Factory calibration uncertainty (+20 °C)	±0.6 %RH (0 ... 40 %RH) <sup>1)</sup> ±1.0 %RH (40 ... 97 %RH) <sup>1)</sup>
Accuracy <sup>2) 3)</sup>	
at +15 ... +25 °C (+59 ... +77 °F)	±1 %RH (0 ... 90 %RH) ±1.7 %RH (90 ... 100 %RH)
at -20 ... +40 °C (-4 ... +104 °F)	±(1.0 + 0.008 x reading) %RH
at -40 ... +180 °C (-40 ... +356 °F)	±(1.5 + 0.015 x reading) %RH
Humidity Sensor Types	
HUMICAP® 180R	Typical applications
HUMICAP® 180RC	Applications with chemical purge/warmed probe
HUMICAP® 180V	Catalytic sensor for H <sub>2</sub> O <sub>2</sub> environments
HUMICAP® 180VC	Catalytic sensor with chemical purge for H <sub>2</sub> O <sub>2</sub> environments
Temperature	
HMT311	-40 ... +60 °C (-40 ... +140 °F)
HMT313	-40 ... +80 °C (-40 ... +176 °F) or -40 ... +120 °C (-40 ... +248 °F)
HMT314, HMT315, HMT317, HMT318	-70 ... +180 °C (-94 ... +356 °F)
Typical accuracy at +20 °C (+68 °F)	±0.2 °C (±0.36 °F)
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751

- 1) Defined as ±2 standard deviation limits. Small variations possible, see also calibration certificate.  
 2) Including non-linearity, hysteresis, and repeatability.  
 3) With HUMICAP® 180V and 180VC sensors, accuracy is not specified below -20 °C (-4 °F) operating temperature.



## Accuracy Over Temperature Range

## Operating Environment

Operating temperature for electronics	-40 ... +60 °C (-40 ... +140 °F)
Storage temperature	-55 ... +80 °C (-67 ... +176 °F)
Operating Pressure	
HMT314	0 ... 100 bar
HMT318	0 ... 40 bar
HMT315, HMT317	0 ... 10 bar
EMC compliance	EN61326-1, Industrial environment

## Inputs and Outputs

Two analog outputs, selectable and scalable	0 ... 20 mA or 4 ... 20 mA 0 ... 5 V or 0 ... 10 V 1 ... 5 V available through scaling
Typical accuracy of analog output at +20 °C	±0.05 % full scale
Typical temperature dependence of analog output	0.005 %/°C (0.003 %/°F) of full scale
Serial output	RS-232C
Connections	M12 8-pin male connector with RS-232C, current/voltage outputs (two channels) and U <sub>in</sub>
Operating voltage	10 ... 35 VDC
External load	R <sub>L</sub> < 500 Ω
Startup time after power-up	3 s
Minimum Operating Voltage	
RS-232C output	10 VDC
Analog output	15 VDC
Probe heating and chemical purge	15 VDC
Pressures above 10 bara (145 psia)	24 VDC
Power Consumption	
RS-232	12 mA
U <sub>out</sub> 10 V (10 kΩ) channel 1 & channel 2	12 mA
I <sub>out</sub> 20 mA (load 511 Ω) channel 1 & channel 2	50 mA
Chemical purge at 24 VDC	+ 220 mA
Warmed probe at 24 VDC	+ 240 mA

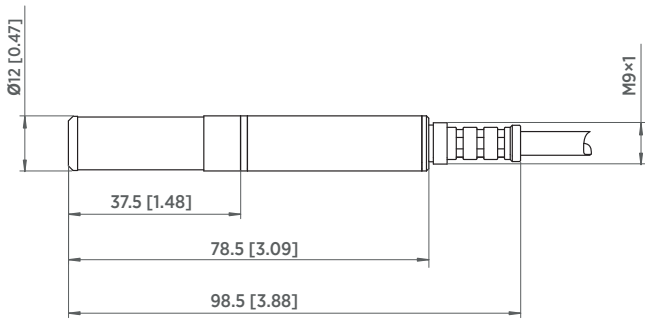
## Mechanical Specifications

Transmitter housing material	G-AISI10Mg
Transmitter base material	PPS
IP rating	IP66
Probe cable length	2, 5, or 10 m (6 ft 7 in, 16 ft 5 in, 32 ft 10 in)
Cable feed through alternatives	M12 8-pin male connector with 5 m cable, or 8-pin female screw terminal connector for cable diameter 4 ... 8 mm
Sensor protection	PPS grid with stainless steel net PPS grid Sintered filter Membrane stainless steel filter H <sub>2</sub> O <sub>2</sub> filter

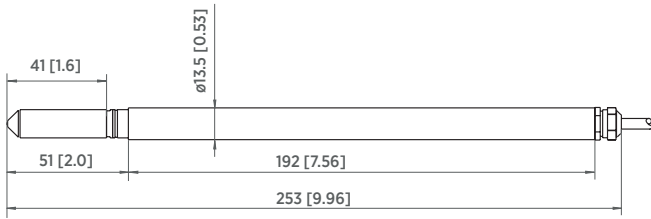
## Spare Parts and Accessories

Rain shield	ASM211103
USB cable	238607
PPS plastic grid with stainless steel netting	DRW010281SP
PPS plastic grid filter	DRW010276SP
Sintered filter AISI 316L	HM47280SP
Stainless steel filter	HM47453SP
Stainless steel filter with membrane	214848SP
Catalytic H <sub>2</sub> O <sub>2</sub> filter	231865

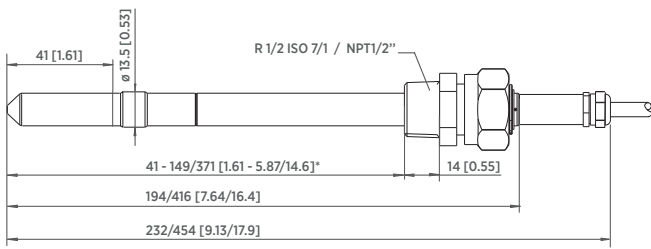
Dimensions in mm [in]



HMT313 Probe

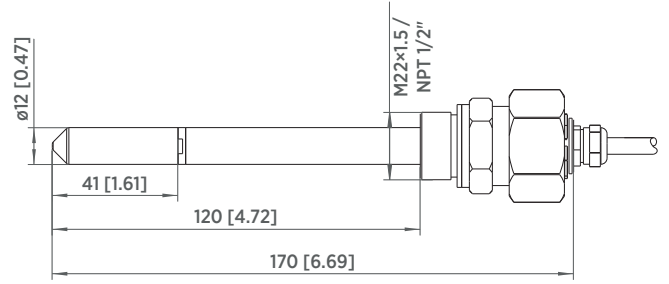


HMT315 Probe

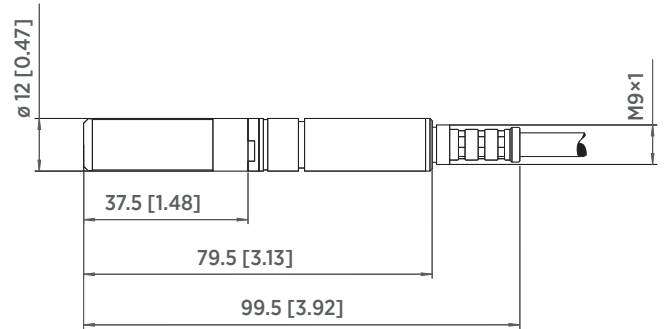


Lengths for standard/optional probes  
 \* Freely user-adjustable length

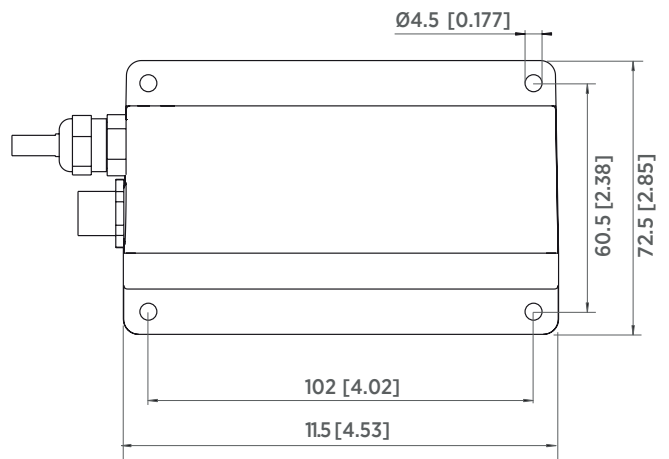
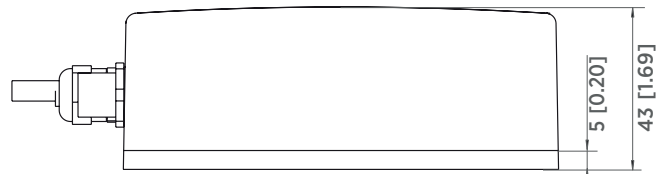
HMT318 Probe



HMT314 Probe



HMT317 Probe



HMT310 Transmitter Body



### Features

- Accurate and reliable measurement with Vaisala HUMICAP® humidity sensor technology
- Interchangeable probe (easy field calibration)
- Resistant to dust and most chemicals
- Enclosure IP65
- Traceable calibration certificate: 3 points for humidity, 1 point for temperature
- Temperature-only models TMT120 and TMT130 also available
- Suitable for cleanrooms and demanding HVAC and light industrial applications

Vaisala HUMICAP® Humidity and Temperature Transmitters HMT120 and HMT130 are designed for humidity and temperature monitoring in cleanrooms and are also suitable for demanding HVAC and light industrial applications.

### Options

- Humidity parameter options: relative humidity, dew point/frost point, wet bulb temperature, enthalpy, absolute humidity, mixing ratio, vapor pressure, and saturation vapor pressure
- 2-wire loop-powered or 3-wire voltage output configurations
- Optional LCD display
- USB cable available for a PC connection for maintenance
- Wall-mounted or with a remote probe
- Constant output probe available
- Can be mounted outdoors using a Vaisala installation kit and Vaisala Radiation Shield DTR504A

### Performance

The HMT120 and HMT130 transmitters incorporate Vaisala HUMICAP® humidity sensor technology that measures relative humidity accurately and reliably. Vaisala HUMICAP® sensors are resistant to dust and most chemicals.

The HMT120 and HMT130 transmitter enclosure is optimized for use in cleanrooms. The smooth surface of the enclosure makes it easy to clean and the enclosure material is chosen to tolerate purifying agents. Furthermore, cabling can be done through the back wall of the transmitter.

### Interchangeable probe

The HMT120 and HMT130 transmitters use a fully interchangeable relative humidity probe. The probe can be easily removed and replaced with a new one

without having to adjust the transmitter, which allows for easy and quick recalibration of the transmitter. The probe can be adjusted using one of Vaisala's handheld meters as a reference. Also available is a constant output probe with fixed RH and T output for convenient inspection of the monitoring system and signal transfer line.

### Available options

The HMT120 and HMT130 transmitters are available as wall mounted or with a remote probe. For high temperature applications or where space is limited, the remote probe is ideal.

The optional LCD display shows the measurement results of selected parameters in selected units. The parameters are displayed simultaneously on two separate rows on the display.

# Technical data

## Models

Model	Measured parameters	Output
HMT120	RH + T	2 analog outputs, 4 ... 20 mA (loop-powered)
HMT130	RH + T	2 analog outputs, 0 ... 1 V, 0 ... 5 V, 0 ... 10 V, or user-defined between 0 ... 10 V
TMT120	T	1 analog output, 4 ... 20 mA (loop-powered)
TMT130	T	1 analog output, 0 ... 1 V, 0 ... 5 V, 0 ... 10 V, or user-defined between 0 ... 10 V

## Measurement performance

Relative humidity <sup>1)</sup>	
Measurement range	0 ... 100 %RH
Accuracy <sup>2) 3)</sup>	
At 0 ... +40 °C (+32 ... +104 °F)	±1.5 %RH (0 ... 90 %RH) ±2.5 %RH (90 ... 100 %RH)
With HMP110 probe: At -40 ... 0 °C and +40 ... +80 °C (-40 ... +32 °F and +104 ... +176 °F)	±3.0 %RH (0 ... 90 %RH) ±4.0 %RH (90 ... 100 %RH)
With HMP113 probe: At -40 ... 0 °C and +40 ... +60 °C (-40 ... +32 °F and +104 ... +140 °F)	
Factory calibration uncertainty at +20 °C (+68 °F)	±1.1 %RH (0 ... 90 %RH) ±1.8 %RH (90 ... 100 %RH)
Humidity sensor types	HUMICAP® 180R HUMICAP® 180V <sup>4)</sup>
Stability	±2 %RH over 2 years
Stability in typical HVAC applications	±0.5 %RH per year
Temperature	
Measurement range	HMP110: -40 ... +80 °C (-40 ... +176 °F) HMP113: -40 ... +60 °C (-40 ... +140 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Accuracy over temperature range:	
HMP110:	
At +15 ... +25 °C (+59 ... +77 °F)	±0.1 °C (±0.18 °F)
At 0 ... +15 °C and +25 ... +40 °C (+32 ... +59 °F and +77 ... +104 °F)	±0.15 °C (±0.27 °F)
At -40 ... +0 °C and +40 ... +80 °C (-40 ... +32 °F and +104 ... +176 °F)	±0.4 °C (±0.72 °F)
HMP113:	
At 0 ... +40 °C (+32 ... +104 °F)	±0.2 °C (±0.36 °F)
At -40 ... 0 °C and +40 ... +60 °C (-40 ... +32 °F and +104 ... +140 °F)	±0.4 °C (±0.72 °F)
Other output parameters (optional)	
Dew point/frost point, wet bulb temperature, enthalpy, absolute humidity, mixing ratio, vapor pressure, saturation vapor pressure	

1) Relative humidity specifications excluding TMT120 and TMT130, which are temperature-only models.  
2) Including non-linearity, hysteresis, and repeatability.  
3) With HUMICAP® 180V sensor, accuracy is specified only in operating temperature -20 ... +80 °C (-4 ... +176 °F).  
4) Not available with HMP113.

## Operating environment

IP rating (transmitter body)	IP65 <sup>1)</sup>
Operating temperature of transmitter body, no display	-40 ... +60 °C (-40 ... +140 °F)
Operating temperature of transmitter body with display	-20 ... +60 °C (-4 ... +140 °F)
Operating temperature, probe	HMP110: -40 ... +80 °C (-40 ... +176 °F) HMP113: -40 ... +60 °C (-40 ... +140 °F)
Storage temperature	-50 ... +70 °C (-58 ... +158 °F)

1) IP65 for the HMP110 probe only when using stainless steel sintered filter (HM46670SP) or PTFE sintered filter (item code DRW244938SP).

## Inputs and outputs

HMT120 and TMT120 2-wire transmitter (loop-powered)	
Current output signals	4 ... 20 mA
External loop voltage	10 ... 30 V DC (R <sub>L</sub> = 0 Ω) 20 ... 30 V DC (R <sub>L</sub> < 500 Ω)
HMT130 and TMT130 3-wire transmitter	
Voltage output signals	0 ... 1 V, 0 ... 5 V, 0 ... 10 V or user-defined between 0 ... 10 V
Min. output resistance	1 kΩ
Serial output	RS-485, non-isolated
Relay output	1 relay (max. 50 V DC, 200 mA)
Supply voltage	10 ... 35 V DC 15 ... 35 V DC (when output 0 ... 10 V) 24 V AC (±20 %)
Current consumption at 24 V DC	8 mA, if relay closed 15 mA
Max. additional error caused by the analog outputs after calibration at +20 °C (+68 °F) ambient temperature	±0.1 % of FS output signal
Temperature dependence of the analog outputs	±0.005 % of FS output signal

## Mechanical specifications

Weight	270 g (9.5 oz)
Probe cable lengths	3 m, 5 m, 10 m - up to 50 m (9.8 ft, 16 ft, 33 ft - up to 164 ft)
Display (optional)	128 x 64 resolution full graphics B&W display without backlight
Material	
Transmitter housing	PBT plastic
Display window	PC plastic
Probe body	HMP110: Stainless steel (AISI 316) HMP113: PC/ABS blend
Probe grid filter	HMP110: Chrome coated ABS plastic HMP113: PC (glass reinforced)
Connections	
Inputs and outputs	Screw terminals 0.5 ... 1.5 mm <sup>2</sup> (AWG 20 ... AWG 15)
Probe interface	4-pin M8 female panel connector

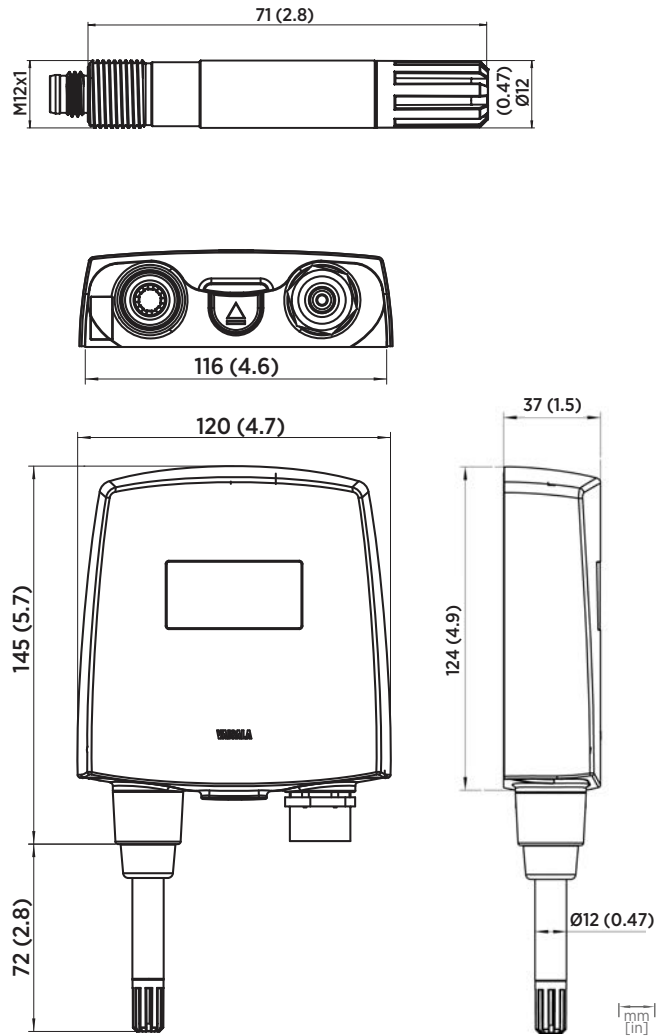
## Compliance

EU directives and regulations	EMC, RoHS
Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment CISPR 32 / EN 55032, Class B
Compliance marks	CE, RCM

## Spare parts and accessories

<b>Probes <sup>1)</sup></b>	
Humidity and temperature probe	HMP110
Humidity and temperature replacement probe	HMP110R
Temperature-only probe	HMP110T
Constant output probe	HMP110REF
Humidity and temperature probe	HMP113
<b>Sensors</b>	
Standard humidity sensor	HUMICAP180R
Catalytic humidity sensor for H <sub>2</sub> O <sub>2</sub>	HUMICAP180V <sup>2)</sup>
<b>Sensor protection</b>	
HMP110 probes:	
Plastic grid filter	DRW010522SP
Plastic grid with membrane filter	DRW010525SP
Stainless steel sintered filter	HM46670SP
PTFE membrane filter with stainless steel grid	ASM212652SP
PTFE sintered filter	DRW244938SP
HMP113 probe:	
Plastic grid filter	DRW240185SP
Plastic grid with membrane filter	ASM210856SP
Stainless steel sintered filter	HM47280SP
Porous PTFE filter	219452SP
<b>Probe installation</b>	
Probe mounting clamp, 1 pc	225501
Probe mounting clamps, 10 pcs	226067
Probe mounting flange	226061
Probe holder, 5 pcs	ASM213382SP
<b>Cables</b>	
Probe cable 3 m (9.8 ft)	HMT120Z300
Probe cable 5 m (16 ft)	HMT120Z500
Probe cable 10 m (33 ft)	HMT120Z1000
Probe cable 20 m (66 ft)	HMT120Z2000
HM70 connection cable	211339
USB serial interface cable	219685
<b>Transmitter protection and installation</b>	
Radiation shield	DTR504A
Rain shield with installation kit	215109
Duct installation kit	215619

<sup>1)</sup> See the separate HMP110 and HMP113 order forms.  
<sup>2)</sup> Not available with HMP113.



Dimensions of HMP110 remote probe (top image) and HMT120, HMT130, TMT120, and TMT130 transmitters

## HMW90 Series Humidity and Temperature Transmitters

For high-performance HVAC applications



### Features

- Both analog and field bus communication (Modbus® RTU)
- Easy installation, configuration, and field adjustment
- Humidity parameter options: relative humidity, dew point, mixing ratio, enthalpy, wet bulb temperature, dew point depression, and absolute humidity
- Full 0 ... 100 %RH measurement range
- Up to  $\pm 1.7$  %RH accuracy
- User exchangeable humidity and temperature module
- Traceable calibration (certificate included)
- Available in two colors

Wall-mounted Vaisala HMW90 Series HUMICAP® Humidity and Temperature Transmitters measure relative humidity and temperature in indoor HVAC applications, where high accuracy, stability, and reliable operation are required.

The flexible HMW90 series offers a variety of options and features. Transmitters include a display and a sliding cover with either an opening for the display or a solid front. Both analog and field bus communication options, including special scalings and calculated parameters, are available.

### Quick and easy to install

HMW90 series transmitters are quick and easy to install. The wiring is connected through the back plate and the electronics with the sensors can be snapped on easily after the wiring is complete. The transmitter is configured using DIP switches, which are accessible when the enclosure is open.

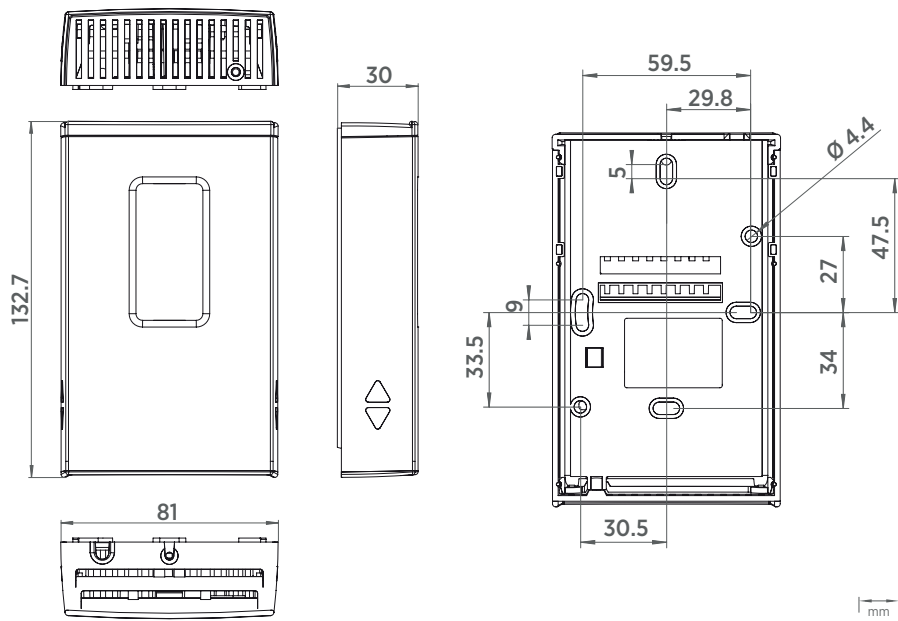
### Digital communication brings benefits

The introduction of Modbus® RTU communication to field level devices brings many advantages. For example, all sensors can be centrally accessed and their performance can be easily monitored. Wiring is simple when multiple sensors are installed on the same bus. Sensors can be set up using standardized tools, and the system can be expanded with additional sensors quickly and conveniently. In addition, parameters influencing measurements, such as pressure or site elevation, can be centrally set and updated.

### Choose from a wide variety of calibration options

On-site calibration and adjustment is exceptionally easy. The sliding cover exposes offset trimmers for one-point calibration without disturbing measurement. The display instantly indicates the effects of changes, making it clear and convenient to make adjustments. A service port enables two-point calibration, using either a PC or Vaisala HUMICAP® Handheld Humidity and Temperature Meter HM70. HMW90 series transmitters include a user-exchangeable measurement module, which can be ordered as a spare part.

# HMW90 dimensions and models



Dimensions of HMW90 series transmitter cover (left) and mounting base (right)

## Models

Model	Measurements	Output
TMW92	T-only	2-wire current output
TMW93	T-only	3-wire voltage output
TMW90	T-only	Analog output (configurable)
HMW92	RH+T	2-wire current output
HMW92D	RH+T	2-wire current output, model with display
HMW93	RH+T	3-wire voltage output
HMW93D	RH+T	3-wire voltage output, model with display
HMW90	RH+T	Analog/Modbus RTU output (configurable)
HMW95	RH+T	Modbus RTU output
HMW95D	RH+T	Modbus RTU output, model with display



# Technical data

## Measurement performance

### Relative humidity

Measurement range 0 ... 100 %RH, non-condensing

Accuracy at temperature range +10 ... +40 °C (+50 ... +104 °F):

0 ... 90 %RH ±1.7 %RH

90 ... 100 %RH ±2.5 %RH

Accuracy at temperature range -5 ... +10 °C, +40 ... +55 °C (+23 ... +50 °F, +104 ... +131 °F):

0 ... 90 %RH ±3 %RH

90 ... 100 %RH ±4 %RH

Stability in typical HVAC applications ±0.5 %RH/year

Humidity sensor HUMICAP® 180R

### Temperature

Measurement range -5 ... +55 °C (+23 ... +131 °F)

Accuracy at +20 ... +30 °C (+68 ... +86 °F) ±0.2 °C (± 0.36 °F)

Accuracy at +10 ... +20 °C, +30 ... +40 °C (+50 ... +68 °F, +86 ... +104 °F) ±0.3 °C (± 0.54 °F)

Accuracy at -5 ... +10 °C, +40 ... +55 °C (+23 ... +50 °F, +104 ... +131 °F) ±0.5 °C (± 0.90 °F)

Temperature sensor Digital temperature sensor

## Inputs and outputs

Service port RS-485 line for temporary service use

### Current output models

Outputs 2 × 4 ... 20 mA, loop powered

Loop resistance 0 ... 600 Ω

Supply voltage 20 ... 28 VDC at 500 Ω load  
10 ... 28 VDC at 0 Ω load

Isolation between output channels 500 VDC

### Voltage output models

Outputs 2 × 0 ... 5 V or 2 × 0 ... 10 V

Load resistance 10 kΩ min.

Supply voltage 18 ... 35 VDC, 24 VAC ±20 % 50/60 Hz

Max. current consumption 12 mA  
Max. with relay 25 mA

Relay 1 pc (max 50 VDC/50 VAC, 500 mA)

### Field bus models

Supply voltage 18 ... 35 VDC, 24 VAC ± 20 % 50/60 Hz

Max. current consumption (with 120 Ω termination) 30 mA at 24 VDC

Output type RS-485 (galvanic isolation, 1.5 kV)

RS-485 end of line termination Enable with jumper, 120 Ω

Supported protocol Modbus RTU

Modbus RTU address range 1 ... 247

## Operating environment

Operating temperature -5 ... +55 °C (+23 ... +131 °F)

Storage temperature -30 ... +60 °C (-22 ... +140 °F)

IP rating IP30

## Compliance

EU directives and regulations EMC Directive (2014/30/EU)  
RoHS Directive (2011/65/EU) as amended by 2015/863

Electromagnetic compatibility (EMC) EN 61326-1, industrial environment  
CISPR 32 / EN 55032, Class B

Compliance marks CE, RCM

## Mechanical specifications

Weight 155 g (5.5 oz)

Standard housing color White (RAL9003 <sup>1)</sup>)

Optional housing color (configurable models only) Black (RAL9005 <sup>1)</sup>)

Housing material ABS/PC, UL-V0 approved

Output connector Screw terminals  
Max. wire size 2 mm<sup>2</sup> (AWG14)

Service port connector 4-pin M8

<sup>1)</sup> RAL code is only indicative with potential small variations in color shade.

## Spare parts and accessories

Humidity and temperature module HTM10SP

Temperature module (for T-only models) TM10SP

Decorative cover set (10 pcs) 236285

Connection cable for HM70 handheld meter 219980

USB cable for PC connection 219690

## HMD60 Series Humidity and Temperature Transmitters

For demanding HVAC and light industrial applications



### Features

- Measurement accuracy up to  $\pm 1.5\% \text{RH}$  and  $\pm 0.1\text{ }^\circ\text{C}$  ( $\pm 0.18\text{ }^\circ\text{F}$ )
- 4 ... 20 mA analog outputs: HMD62 (RH and T) and TMD62 (T-only)
- 0 ... 10 V analog outputs: HMD65 (RH and T)
- BACnet MS/TP and Modbus RTU: HMD65
- All common humidity parameters available, including RH, dew point, enthalpy, and wet bulb temperature
- Resistant to chemicals and dust
- IP66-rated body
- Traceable calibration certificate
- Easy field adjustment and output configuration with quick access to electronics also when installed
- Compatible with Vaisala Insight PC software

The duct mounted HMD60 series HUMICAP® transmitters HMD62, TMD62, and HMD65 are designed for light industrial applications and demanding HVAC applications such as museums, cleanrooms, and laboratories.

### Analog or Digital Output with 3 Transmitter Options

HMD60 series transmitter options:

- HMD62: RH and T measurement, 4 ... 20 mA analog output
- TMD62: T-only transmitter, 4 ... 20 mA analog output
- HMD65: RH and T measurement, 0 ... 10 V analog output, Modbus RTU, and BACnet MS/TP

### Robust Design, Stability, and Reliability

The all-metal body is suitable for building sites and industrial settings. HMD60 series transmitters provide state-of-the-art stability and environmental resistance, thanks to the Vaisala HUMICAP® R2 sensor.

For applications where hydrogen peroxide disinfection is used, the HUMICAP® 180V catalytic sensor option provides improved stability during  $\text{H}_2\text{O}_2$  exposure.

### Traceable Accuracy

HMD60 series transmitters are always delivered with a traceable (ISO9001) calibration certificate. Upon request, accredited (ISO17025) calibration certificates can also be provided.

### Field Configurable Outputs

The analog HMD62 and TMD62 transmitter models use floating 4 ... 20 mA loop powered outputs. The HMD65 model has two 0 ... 10 V outputs in addition to BACnet MS/TP and

Modbus RTU interfaces (RS-485). The analog outputs are field configurable with easy humidity parameter selection using DIP switches.

For special scaling and other additional configuration and adjustment options, you can use the convenient Vaisala Insight PC software for Windows® (see [www.vaisala.com/insight](http://www.vaisala.com/insight)).

When required, HMD60 series transmitters can also be intuitively field adjusted using trimmers or with the Vaisala HM70 handheld meter.

# Technical Data

## Relative humidity measurement performance

Humidity sensor options	
HUMICAP® R2	Latest generation industrial sensor with improved corrosion resistance
HUMICAP® 180V	Humidity sensor with a catalytic surface for processes with H <sub>2</sub> O <sub>2</sub>
Measurement range	0 ... 100 %RH
Stability	±0.5 %RH/year in typical HVAC applications
Accuracy at 0 ... +40 °C (+32 ... +104 °F) <sup>1)</sup>	
0 ... 90 %RH	±1.5 %RH
90 ... 100 %RH	±2.5 %RH
Accuracy at +40 ... +80 °C (+104 ... +176 °F) and -40 ... 0 °C (-40 ... +32 °F) <sup>1) 2)</sup>	
0 ... 90 %RH	±2.5 %RH
90 ... 100 %RH	±3.5 %RH
Factory calibration uncertainty	±1.0 %RH
Start-up and response time	
Start-up time at +20 °C (+68 °F)	8 s
Response time (T63) at +20 °C (+68 °F)	15 s
Calculated humidity parameters (default analog output scale)	
Dew point	-40 ... +80 °C (-40 ... +176 °F)
Dew point / frost point	-40 ... +80 °C (-40 ... +176 °F)
Absolute humidity	0 ... 300 g/m <sup>3</sup> (0 ... 131.1 gr/ft <sup>3</sup> )
Wet bulb temperature	-40 ... +80 °C (-40 ... +176 °F)
Enthalpy	-40 ... 1600 kJ/kg (-9.5 ... 695.6 Btu/lb)
Mixing ratio	0 ... 600 g/kg (0 ... 4200 gr/lb)

<sup>1)</sup> Including non-linearity, hysteresis, and repeatability  
<sup>2)</sup> With HUMICAP® 180V sensor, accuracy is not specified below -20 °C (-4 °F) operating temperature

## Temperature measurement performance

Temperature sensor	Pt1000 RTD Class F 0.1 IEC 60751
Measurement range	-40 ... +80 °C (-40 ... +176 °F)
Default analog output scale	-20 ... +80 °C (-4 ... +176 °F)
Accuracy at +20 °C (+68 °F)	±0.1 °C (0.18 °F)
Temperature dependence	±0.005 °C/°C
Factory calibration uncertainty	±0.1 °C (0.18 °F)
Response time (T63) with free convection	8 min

## Analog output performance

Accuracy at +20 °C (68 °F):	±0.01 mA (HMD62 and TMD62) ±5 mV (HMD65)
Temperature dependence	±0.0008 mA/°C (HMD62 and TMD62) ±0.2 mV/°C (HMD65)

## Operating environment

Operating temperature, electronics	-40 ... +60 °C (-40 ... +140 °F)
Operating temperature, probe	-40 ... +80 °C (-40 ... +176 °F)
Storage temperature range	-40 ... +80 °C (-40 ... +176 °F)
Maximum flow speed	50 m/s with sintered filter
Electromagnetic compatibility	EN61326-1, Industrial Environment

## Inputs and outputs

Power supply input	HMD62 and TMD62: 10 ... 35 VDC (RL = 0 Ω) 20 ... 35 VDC (RL = 600 Ω) HMD65: 15 ... 35 VDC 16 ... 24 VAC
Power consumption (HMD65)	1.0 W (typical, for both AC and DC)
Analog outputs	TMD62: 1 × T output 4 ... 20 mA HMD62: 1 × RH output 4 ... 20 mA, 1 × T output 4 ... 20 mA <sup>1)</sup> HMD65: 1 × RH output 0 ... 10 V, 1 × T output 0 ... 10 V <sup>1)</sup> (load resistance: 10 kΩ min.)
Digital output (RS-485)	HMD65: Isolated, supports Modbus RTU and BACnet MS/TP protocols
BACnet MS/TP	Address range: 0 ... 127 (master mode only)
Modbus RTU	Address range: 1 ... 247
Service port	M8 4-pin male connector: • MI70 handheld indicator (requires cable 219980SP) • Vaisala Insight PC software <sup>2)</sup> (requires USB cable 219690)
Screw terminal wire size	0.5 ... 2.5 mm <sup>2</sup>

<sup>1)</sup> Calculated output parameters for HMD62 and HMD65 include  $T_{\phi}$ ,  $T_{gr}$ ,  $A$ ,  $X$ ,  $T_w$ , and  $H$ .

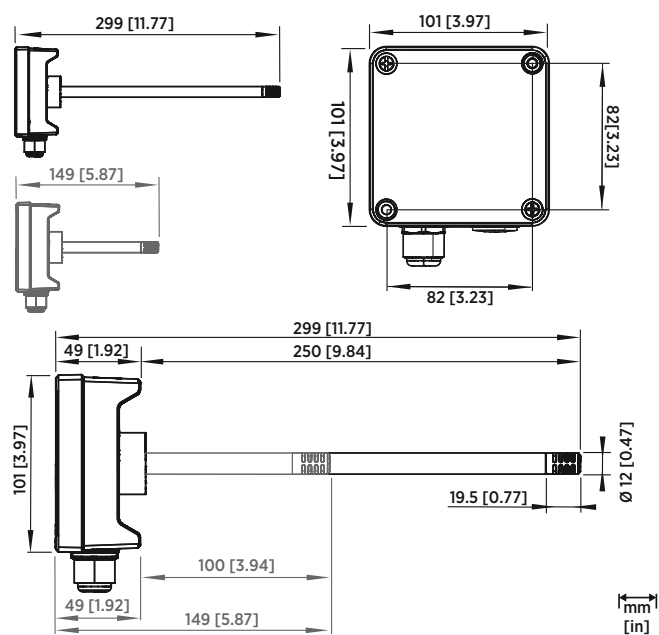
<sup>2)</sup> Vaisala Insight software for Windows® available at [www.vaisala.com/insight](http://www.vaisala.com/insight).

## Spare parts and accessories

USB cable for PC operation (Vaisala Insight software)	219690
Connection cable for HM70 (MI70) handheld meter	219980SP
Membrane filter	ASM212652SP
Sintered filter	HM46670SP
Sintered teflon filter	DRW244938SP
Conduit fitting and O-ring (M16×1.5 / NPT1/2")	210675SP

## Mechanical specification

Housing material	Cast aluminum
Probe material	Stainless steel
IP rating	IP66 (NEMA 4X)
Weight	511 g (18 oz)



HMD60 Dimensions (Long and Short Probe Options)

## HMDW110 Series Humidity and Temperature Transmitters

For high-accuracy measurements in HVAC applications



### Features

- Accurate humidity and temperature transmitters for measurements in HVAC applications
- Proven Vaisala HUMICAP® 180R humidity sensor for superior long-term stability
- $\pm 2$  %RH accuracy
- 3-point traceable calibration (%RH), 1-point traceable calibration (T), certificate included
- Analog (4 ... 20 mA) and Modbus® RTU output options
- Display and non-display options
- M12 connector option

The high-accuracy transmitters HMD110/112 and HMW110/112 are designed for measuring humidity and temperature in HVAC applications. Calculated humidity parameters are also conveniently available, including dew point temperature, wet bulb temperature, and enthalpy. The measurement is highly accurate to enable precise and reliable control of HVAC systems. Options also include temperature transmitter models.

The transmitters belong to Vaisala HMDW110 Transmitter Series, which includes transmitters for duct mounting, IP65-rated wall transmitters, immersion temperature transmitters, and outdoor transmitters with integrated radiation shields. Display and non-display options are available.

### Highly accurate, proven Vaisala HUMICAP performance

The highly accurate HMD110/112 and HMW110/112 transmitters are designed for measuring humidity and temperature in various HVAC applications. The high accuracy and reliability of the measurement enable precise and reliable controls of HVAC systems.

The transmitters are equipped with the trusted HUMICAP 180R humidity sensor, which is the robust sensor designed for industrial applications. The sensor's

superior long-term stability allows for unbeatable long-term accuracy of the instrument and minimizes maintenance needs throughout the transmitter's lifetime.

Optional output parameters include dew point temperature, wet bulb temperature, and enthalpy, which are selectable with Vaisala Insight PC software.

### Excellent choice for challenging conditions

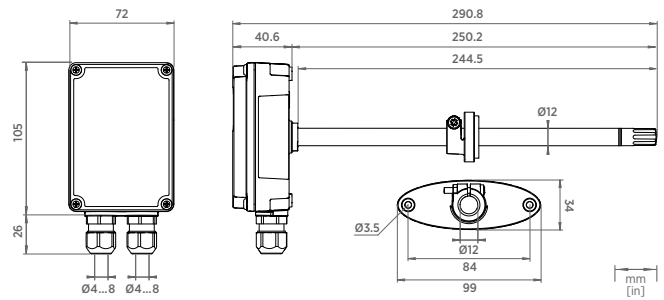
The IP65-rated HMD110/112 and HMW110/112 transmitters are optimal for even challenging conditions, such as cleanrooms, data centers and other industrial settings. The transmitters can also be ordered with the catalytic HUMICAP 180V humidity sensor. The

catalytic sensor improves stability especially in hydrogen peroxide sterilized environments where repeated condensation can be expected.

### Traceable accuracy

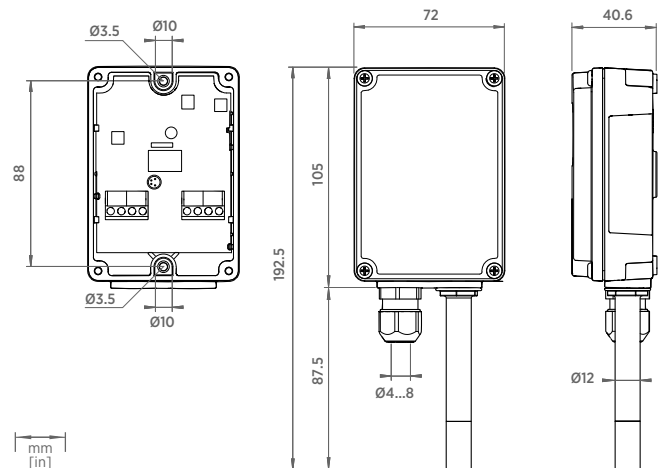
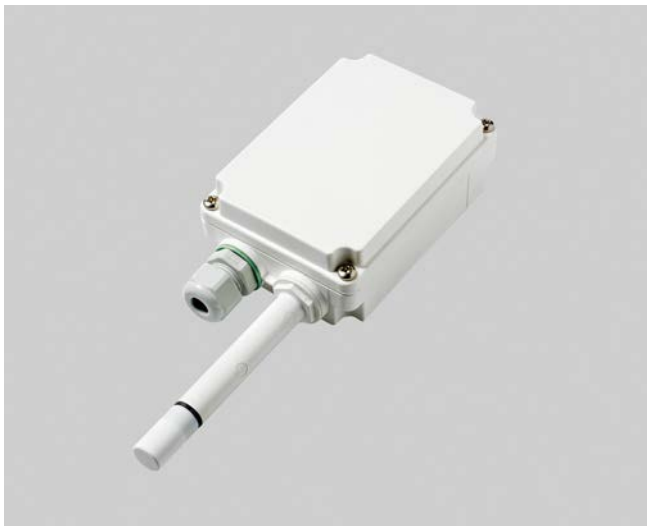
The instruments are individually adjusted and delivered with a traceable (ISO 9001) calibration certificate. If required later on, the transmitter can be easily field-calibrated using Vaisala Handheld Humidity and Temperature Meter HM70 or Vaisala Insight PC software.

# Technical data



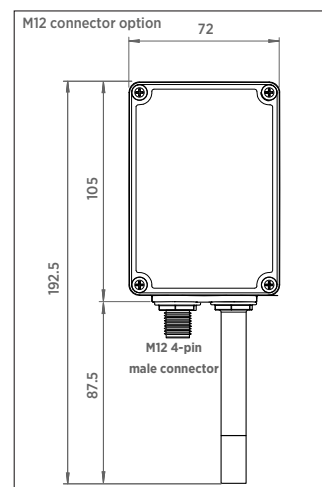
Dimensions in mm

HMD110/112 RH+T transmitters for ducts. Model options also include a display version and the TMD110 temperature transmitter.



mm [in]

HMW110/112 wall-mount RH+T transmitters with IP65 rating. Model options also include a display version and the TMW110 temperature transmitter. HMW110 and TMW110 transmitters can be ordered either with a cable gland and screw terminal wiring, or with an M12 connector.



Dimensions in mm

## Models

Model	Type	Output	Special features
HMW110	Wall-mount, RH+T	2-wire current or Modbus RTU output	Configurable model <sup>1)</sup> Optional display M12 connector option
HMW112	Wall-mount, RH+T	2-wire current output	
TMW110	Wall-mount, T	2-wire current output or Modbus RTU output	Configurable model <sup>1)</sup> Optional display M12 connector option
HMD110	Duct-mount, RH+T	2-wire current or Modbus RTU output	Configurable model <sup>1)</sup> Optional display
HMD112	Duct-mount, RH+T	2-wire current output	
TMD110	Duct-mount, T	2-wire current output or Modbus RTU output	Configurable model <sup>1)</sup> Optional display

<sup>1)</sup> Delivered with customer specific output settings, including calculated humidity parameters and custom scaling of outputs.

## Measurement performance

Relative humidity	
Measurement range	0–100 %RH
Accuracy: <sup>1)</sup>	
at +10 ... +30 °C (+50 ... +86 °F)	±2 %RH (0–90 %RH) ±3 %RH (90–100 %RH)
at –20 ... +10 °C, +30 ... +60 °C (–4 ... +50 °F, +86 ... +140 °F)	±3 %RH (0–90 %RH) ±4 %RH (90–100 %RH)
at –40 ... –20 °C (–40 ... –4 °F)	±4 %RH (0–100 %RH)
Stability in typical HVAC applications	±0.5 %RH/year
Humidity sensor types	HUMICAP® 180R HUMICAP® 180V
Temperature	
Measurement range	–40 ... +60 °C (–40 ... +140 °F)
Accuracy at +20 °C (+68 °F)	±0.2 °C (±0.36 °F)
Temperature dependence	±0.01 °C/°C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Factory calibration uncertainty at +20 °C (+68 °F)	±1.5 %RH/±0.2 °C

<sup>1)</sup> With HUMICAP® 180V humidity sensor, accuracy is not specified below –20 °C (–4 °F) operating temperature.

## Calculated parameters

Measurement range	
Dew point temperature and wet bulb temperature	–40 ... +80 °C (–40 ... +176 °F)
Enthalpy	–40 ... 1530 kJ/kg (–9.6 ... 648 BTU/lb)
Accuracy <sup>1) 2)</sup>	
Dew point	±0.7 °C (1.2 °F)
Wet bulb temperature	±0.5 °C (0.9 °F)
Enthalpy	±1.6 kJ/kg (0.7 BTU/lb)

<sup>1)</sup> At +20 °C (+68 °F) and 80 %RH.

<sup>2)</sup> Accuracy of the calculated parameters should be calculated at the actual condition based on the RH and temperature specification.

## Inputs and outputs

Devices ordered with analog output	
Outputs	4–20 mA, loop powered
Loop resistance	0–600 Ω
Supply voltage	20–28 V DC at 600 Ω load 10–28 V DC at 0 Ω load
Devices ordered with Modbus output	
Interface	RS-485, not isolated, no line termination
Default serial settings	19200 bps N 8 2
Protocols	Modbus® RTU
Supply voltage	10–28 V DC

## Mechanical specifications

Screw terminal wire size	Max. 1.5 mm <sup>2</sup> (AWG 16)
Standard housing color	White (RAL9003)
Housing material	PC + 10 %GF (UL-V0 approved)

## Operating environment

Operating temperature:	
with display	–5 ... +60 °C (+23 ... +140 °F)
without display	–40 ... +60 °C (–40 ... +140 °F)
Operating humidity	0–100 %RH
Maximum wind / flow speed	30 m/s
Storage temperature:	
with display	–5 ... +60 °C (+23 ... +140 °F)
without display	–40 ... +60 °C (–40 ... +140 °F)
IP rating	IP65

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electrical safety	EN 61326-1, industrial environment <sup>1)</sup>
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, RCM

<sup>1)</sup> HMDW110 series probes (HMD110/112, TMD110, HMW110/112, TMW110, and HMS110/112) fulfill the requirements for industrial electromagnetic environment, considering that a maximum permissible electrostatic air discharge of ±7 kV has been specified for this product.

## Spare parts and accessories

Conduit fitting + O-ring (M16 × 1.5 / NPT1/2")	210675SP
Conduit fitting + O-ring (M16 × 1.5 / PG9, RE-MS)	210674SP
Fastening flange assembly (screws included)	ASM210771SP
Porous PTFE filter	DRW239993SP
Membrane filter	ASM210856SP
Terminal block, blue	236620SP
USB cable for PC connection	219690
Connection cable (M12-4F / M8-4M), length 1.2 m	279222SP
Connection cable for HM70 handheld meter	219980SP
HUMICAP® 180R humidity sensor	HUMICAP180R
HUMICAP® 180V humidity sensor (catalytic)	HUMICAP180V

## TMI110 Temperature Transmitter

For high-accuracy measurements in HVAC applications



### Features

- Accurate temperature measurement of liquids and air
- Very fast response time
- 1-point traceable calibration (certificate included)
- Analog (4 ... 20 mA) and Modbus® RTU output options
- Installed in a thermowell for measurement in liquids
- Optimized for building automation and HVAC process control
- Several probe length options

The high-accuracy immersion temperature transmitter TMI110 is designed for measuring cooling/heating water temperatures in HVAC automation systems. TMI110 can also be used for air temperature measurements in air ventilation ducts. The transmitter has a fast response time, enabling precise and reliable control of HVAC systems.

The TMI110 transmitter belongs to the Vaisala HUMICAP® Humidity and Temperature Transmitter Series HMDW110, which includes transmitters for duct mounting, IP65-rated wall transmitters, immersion temperature transmitters, and outdoor transmitters with integrated radiation shields.

### Highly accurate

The highly accurate TMI110 measures the temperature of liquid in cooling/heating systems, and the temperature of air in ventilation ducts. When measuring the temperature of liquid, the transmitter is installed in a thermowell. For air temperature measurements, the transmitter can be installed in a duct.

Temperature is measured with a Pt1000 sensor element (class A). The high accuracy and quick response time of the measurement enable precise and reliable control of HVAC systems.

### Fast response time

Fast response time of measurement is a top priority in the design of TMI110, enabling instant response in the control loop. Speed and reliability are key factors in the measurement of cooling and heating processes, thus the capabilities of TMI110 are a significant advantage. The transmitter is optimal for building automation and HVAC process control.

### Traceable accuracy

All TMI110 transmitters are individually adjusted and delivered with a traceable (ISO 9001) calibration certificate. If required later on, the transmitter can also be field-calibrated using a Vaisala handheld meter or Vaisala Insight PC software.



# Technical data

## Measurement performance

Temperature	
Measurement range	-40 ... +120 °C (-40 ... +248 °F)
Accuracy at +20 °C (+68 °F)	±0.1 °C (±0.18 °F)
Temperature dependence	±0.01 °C/°C
Response time (T63) at +20 °C (+68 °F)	< 8 s typical
Temperature sensor	Pt1000 RTD Class A, IEC 60751
Factory calibration uncertainty at +20 °C (+68 °F)	±0.1 °C (±0.18 °F)

## Operating environment

Operating environment, probe	-40 ... +120 °C (-40 ... +248 °F)
Operating environment, electronics	-40 ... +60 °C (-40 ... +140 °F)
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
IP rating	IP65
UL 50E/NEMA rating	Type 4

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electrical safety	EN 61326-1, industrial environment
EMC emissions	CISPR 22 / EN 55022, Class B
Compliance marks	CE, RCM

## Inputs and outputs

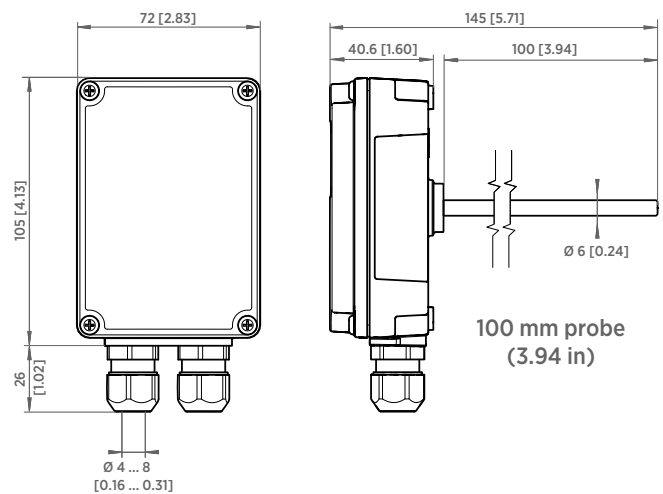
Devices ordered with analog output	
Outputs	4-20 mA, loop powered
Loop resistance	0-600 Ω
Supply voltage	20-28 V DC at 600 Ω load 10-28 V DC at 0 Ω load
Devices ordered with Modbus output	
Interface	RS-485, not isolated, no line termination
Default serial settings	19200 bps N 8 2
Protocol	Modbus RTU
Supply voltage	10-28 V DC

## Mechanical specifications

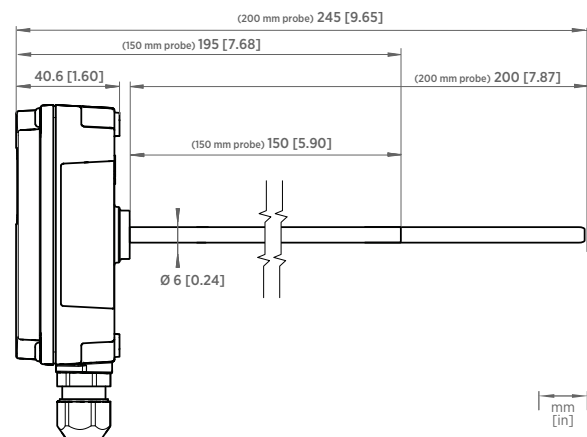
Probe material	Stainless steel
Probe diameter	6 mm (0.24 in)
Probe length options	<ul style="list-style-type: none"> <li>100 mm (3.94 in)</li> <li>150 mm (5.91 in)</li> <li>200 mm (7.87 in)</li> </ul>
Screw terminal wire size	Max. 1.5 mm <sup>2</sup> (AWG 16)
Standard housing color	White (RAL9003)
Housing material	PC + 10 %GF (UL-V0 approved)

## Spare parts and accessories

Conduit fitting + O-ring (M16×1.5 / NPT1/2")	210675SP
Conduit fitting + O-ring (M16×1.5 / PG9, RE-MS)	210674SP
Thermowell ISO 7 - R 1/2", for 100 mm probe	ASM214691
Thermowell 1/2" - 14 NPT, for 100 mm probe	ASM214707
Thermowell ISO 7 - R 1/2", for 150 mm probe	279722
Thermowell 1/2" - 14 NPT, for 150 mm probe	279724
Thermowell ISO 7 - R 1/2", for 200 mm probe	279723
Thermowell 1/2" - 14 NPT, for 200 mm probe	279725
Terminal block, blue	236620SP
USB cable for PC connection	219690
Connection cable for HM70 handheld meter	219980SP



150 mm (5.90 in) probe and 200 mm (7.87 in) probe



## HMS110 Series Humidity and Temperature Transmitters

For high-accuracy outdoor measurements in building automation applications



### Features

- Reliable outdoor transmitters with integrated radiation shields
- $\pm 2$  %RH accuracy
- Proven HUMICAP® 180R sensor for long-lasting accuracy
- 3-point traceable calibration (certificate included)
- Default output parameters are relative humidity and temperature. Dew point temperature, wet bulb temperature, and enthalpy outputs selectable with a PC connection
- Current output (4 ... 20 mA) and Modbus RTU
- On-site calibration with HM70 Hand-Held Meter or PC connection
- Ingress protection IP65
- Compatible with Vaisala Insight PC software

Vaisala HMS110 Series HUMICAP® Humidity and Temperature Transmitters are designed for demanding outdoor measurements in building automation applications. These  $\pm 2$  % transmitters include an integrated radiation shield to reduce the influence of solar radiation on temperature and humidity measurements.

### Proven Vaisala HUMICAP® performance for outdoor measurements

HMS110 transmitters are equipped with the trusted HUMICAP® 180R – a robust, general-purpose humidity sensor that functions well in high humidity. The sensor's superior stability ensures long-lasting accuracy and minimal maintenance throughout the transmitter's lifetime.

The integrated radiation shield allows unrivaled measurement performance, reducing the impact of sunshine on temperature and humidity measurements and ensuring measurement accuracy in outdoor conditions.

### Easy installation and maintenance

HMS110 transmitters are easy to install. They can be mounted directly onto a wall or pole without any extra accessories. There are no loose parts, screws are retained in the enclosure, all connectors are clearly labeled, and the connectors are within easy reach.

The HUMICAP® sensor's excellent long-term stability and high-quality materials ensure minimal need for maintenance. If necessary, the transmitter can be field-calibrated using either HM70 Hand-Held Humidity and Temperature Meter, or a PC

connection. For easy-to-use access to configuration and calibration options, the transmitter can be connected to Vaisala Insight PC software.

# Technical data

## Models

Model	Type	Output	IP rating
HMS110	Outdoor, RH+T	2-wire, current output  Modbus RTU (configurable model)	IP65
HMS112	Outdoor, RH+T	2-wire, current output	IP65

## Inputs and outputs

Devices ordered with analog output	
Analog outputs	4 ... 20 mA, loop powered
Loop resistance	0 ... 600 Ω
Supply voltage	20 ... 28V DC at 600 Ω load 10 ... 28V DC at 0 Ω load
Devices ordered with Modbus output	
Interface	RS-485, not isolated, no line termination
Default serial settings	19200 bps N 8 2
Protocols	Modbus® RTU
Supply voltage	10 ... 28 V DC

## Measurement performance

Relative humidity	
Measurement range	0 ... 100 %RH
Stability in typical HVAC applications	±0.5 %RH/year
Humidity sensor	Vaisala HUMICAP® 180R
Accuracy at temperature range +10 ... +30 °C (+50 ... +86 °F):	
0 ... 90 %RH	±2 %RH
90 ... 100 %RH	±3 %RH
Accuracy at temperature range -20 ... +10 °C, +30 ... +60 °C (-4 ... +50 °F, +86 ... +140 °F):	
0 ... 90 %RH	±3 %RH
90 ... 100 %RH	±4 %RH
Accuracy at temperature range -40 ... -20 °C (-40 ... -4 °F):	
0 ... 100%RH	±4 %RH
Temperature	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy at +20 °C (+68 °F)	±0.2 °C (±0.36 °F)
Temperature dependence	±0.01 °C/°C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Calculated parameters	
Factory calibration uncertainty at 20 °C (+68 °F)	±1.5 %RH/±0.2 °C
Measurement range for dew point temperature and wet bulb temperature	-40 ... +60 °C (-40 ... +140 °F)
Measurement range for enthalpy	-40 ... 1530 kJ/kg (-9.6 ... 648 BTU/lb)
Accuracy of the calculated parameters should be calculated at the actual condition based on the RH and temperature specification.	
Accuracy at 20 °C (68 °F) and 80 %RH:	
Dew point	±0.7 °C (1.2 °F)
Wet bulb temperature	±0.5 °C (0.9 °F)
Enthalpy	±1.6 kJ/kg (0.7 BTU/lb)

## Operating environment

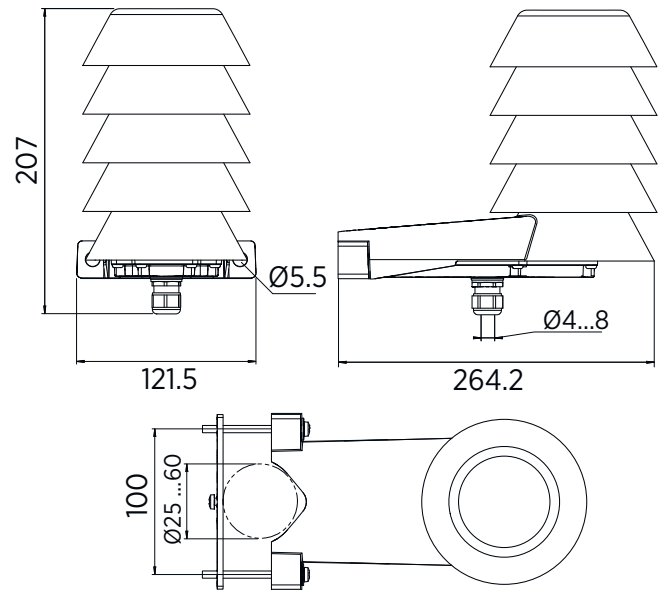
Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity	0 ... 100 %RH
Maximum wind/flow speed	30 m/s (67 mph)
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)

## Compliance

Property	Value/Description
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electrical safety	EN 61326-1, industrial environment
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, RCM

## Mechanical specifications

Max. wire size	1.5 mm <sup>2</sup> (AWG 16)
Standard housing color	White (RAL9003)
Housing material	PC + 10 %GF (UL-V0 approved)



Dimensions (in mm)

## Spare parts and accessories

Conduit fitting + O-ring (M16 × 1.5 / NPT1/2 Inch)	210675SP
Conduit fitting + O-ring (M16 × 1.5 / PG9, RE-MS)	210674SP
Fastening set HMS110	237805
Membrane filter	ASM210856SP
Terminal block, blue	236620SP
USB cable for PC connection	219690 <sup>1)</sup>
Connection cable for HM70 hand-held meter	219980SP
HUMICAP® 180R sensor	HUMICAP180R

<sup>1)</sup> Vaisala Insight PC software for Windows available [www.vaisala.com/insight](http://www.vaisala.com/insight).

## HMDW80 Series Humidity and Temperature Transmitters

For building automation applications



### Features

- Reliable transmitters for basic HVAC humidity measurements
- $\pm 3.0$  %RH accuracy
- Full 0 ... 100 %RH measurement range
- Optimized for easy installation and low maintenance
- User exchangeable INTERCAP® sensor for easy field replacement
- UL-V0 flammability rating
- Output parameters: relative humidity and temperature with optional dew point temperature, wet bulb temperature and enthalpy parameters

Vaisala HMDW80 Series INTERCAP® Humidity and Temperature Transmitters measure relative humidity and temperature in various building automation applications. HMDW80 series transmitters combine easy installation and reliable operation with a low requirement for maintenance.

### Typical installation locations

- Ventilation ducts
- Walls
- Wash-down areas
- Outdoor locations

The versatile HMDW80 series includes transmitters for wall and duct mounting, IP65-classified transmitters for humid areas, and transmitters with a radiation shield for outdoor use. It also includes temperature-only transmitters and transmitters with an optional display.

Calculated humidity parameters – dew point temperature, wet bulb temperature, and enthalpy – are also available.

### Easy installation

HMDW80 series transmitters are optimized for easy installation. There are no loose parts, screws are retained in the enclosure, all connectors are clearly labeled, and the connectors are within easy reach.

The duct mount transmitters are well suited to a variety of duct sizes, the outdoor transmitters can be mounted directly onto a wall or pole without any

extra accessories, and the wall mount transmitters can be installed without the need to make holes in the transmitter enclosure.

### Reliable operation

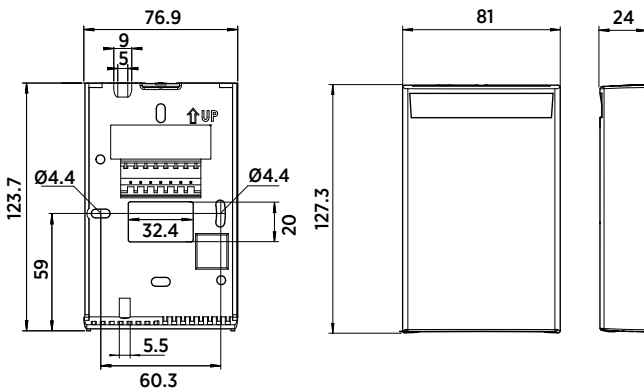
HMDW80 series transmitters require minimal maintenance thanks to their excellent sensor stability and high-quality materials. If necessary, the INTERCAP® sensor can be easily exchanged in the field with minimum downtime.

<b>Model number</b>	<b>Type</b>	<b>Output</b>	<b>Special features</b>	<b>IP rating</b>
TMW82	Wall-mount, T-only	2-wire, current output		IP30
HMW82	Wall-mount, RH+T	2-wire, current output		IP30
HMW82P100	Wall mount, RH+T	2-wire, current output	Additional Pt100 sensor	IP30
HMW83	Wall-mount, RH+T	3-wire, voltage output		IP30
TMW88	Wall-mount, T-only	2-wire, current output		IP65
HMW88	Wall-mount, RH+T	2-wire, current output	Calculated parameters <sup>1)</sup>	IP65
HMW88D	Wall-mount, RH+T	2-wire, current output	Display, calculated parameters <sup>1)</sup>	IP65
HMW89	Wall-mount, RH+T	3-wire, voltage output	Calculated parameters <sup>1)</sup>	IP65
HMW89D	Wall-mount, RH+T	3-wire, voltage output	Display, calculated parameters <sup>1)</sup>	IP65
TMD82	Duct-mount, T-only	2-wire, current output		IP65
HMD82	Duct-mount, RH+T	2-wire, current output	Calculated parameters <sup>1)</sup>	IP65
HMD82D	Duct-mount, RH+T	2-wire, current output	Display, calculated parameters <sup>1)</sup>	IP65
HMD83	Duct-mount, RH+T	3-wire, voltage output	Calculated parameters <sup>1)</sup>	IP65
HMD83D	Duct-mount, RH+T	3-wire, voltage output	Display, calculated parameters <sup>1)</sup>	IP65
HMS82	Outdoor, RH+T	2-wire, current output	Radiation shield, calculated parameters <sup>1)</sup>	IP65
HMS82C	Outdoor, RH+T	2-wire, current output	HMS82 with NPT ½" conduit fitting <sup>1)</sup>	IP65
HMS83	Outdoor, RH+T	3-wire, voltage output	Radiation shield, calculated parameters <sup>1)</sup>	IP65
HMS83C	Outdoor, RH+T	3-wire, voltage output	HMS83 with NPT ½" conduit fitting <sup>1)</sup>	IP65
TMS82	Outdoor, T-only	2-wire, current output	Radiation shield	IP65

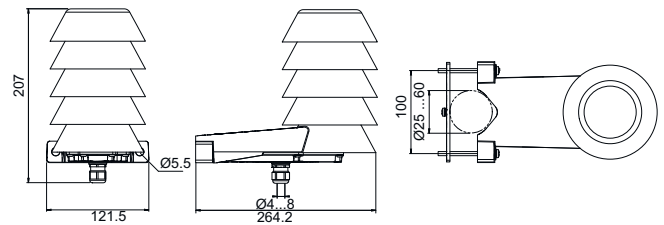
1) Output parameters for humidity: relative humidity, dew point temperature, wet bulb temperature, and enthalpy.

# Dimensions

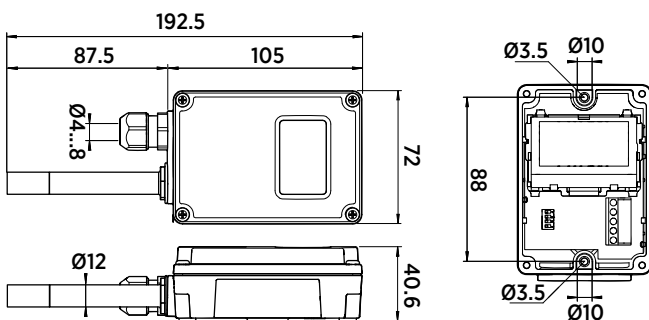
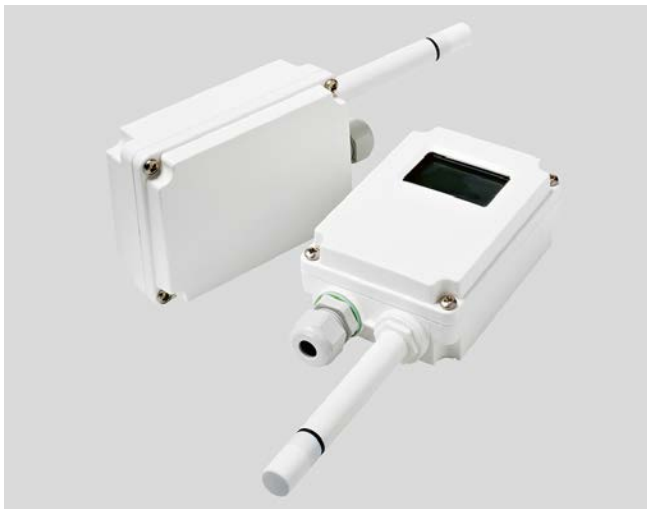
HMW82/83 RH+T and TMW82 T-only transmitters for wall-mounting



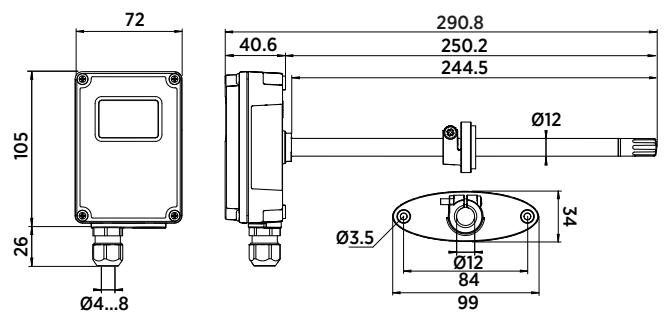
HMS82/83 RH+T and TMS82 T-only transmitters for outdoor measurements



HMW88/89(D) RH+T and TMW88 T-only transmitters for measurements in wet areas



HMD82/83(D) RH+T and TMD82 T-only transmitters for ducts



# Technical data

## Measurement performance, models HMW82/83 and TMW82

Relative humidity	
Measurement range	0 ... 100 %RH
Accuracy in temperature range +10 ... +30 °C (+50 ... +86 °F)	±3 %RH (0 ... 70 %RH) ±5 %RH (70 ... 100 %RH)
Accuracy in temperature range -5 ... +10 °C, +30 ... +55 °C (+23 ... +50 °F, +86 ... +131 °F)	±7 %RH (0 ... 100 %RH)
Stability in typical HVAC applications	±2 %RH over 2 years
Humidity sensor	Vaisala INTERCAP®
Temperature	
Measurement range	-5 ... +55 °C (+23 ... +131 °F)
Accuracy at +10 ... +30 °C (+50 °F ... +86 °F)	±0.5 °C (±0.9 °F)
Accuracy at -5 ... +10 °C, +30 ... +55 °C (+23 ... +50 °F, +86 ... +131 °F)	±1.0 °C (±1.8 °F)
Temperature sensor	Digital temperature sensor
Temperature sensor HMW82P100	Pt100 Class F 0.1 IEC 60751, 3-wire connection

## Measurement performance, models HMD82/83, TMD82, HMW88/89, TMW88, HMS82/83, and TMS82

Relative humidity	
Measurement range	0 ... 100 %RH
Accuracy in temperature range +10 ... +30 °C (+50 ... +86 °F)	±3 %RH (0 ... 90 %RH) ±5 %RH (90 ... 100 %RH)
Accuracy in temperature range -20 ... +10 °C, +30 ... +60 °C (-4 ... +50 °F, +86 ... +140 °F)	±5 %RH (0 ... 90 %RH) ±7 %RH (90 ... 100 %RH)
Accuracy in temperature range -40 ... -20 °C (-40 ... -4 °F)	±7 %RH (0 ... 100 %RH)
Stability in typical HVAC applications	±2 %RH over 2 years
Humidity sensor	Vaisala INTERCAP®
Temperature	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy at +20 °C (+68 °F)	±0.3 °C (±0.54 °F)
Temperature dependence	±0.01 °C/ °C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Calculated parameters	
Measurement range for dew point temperature and wet bulb temperature	-40 ... +60 °C (-40 ... +140 °F)
Measurement range for enthalpy	-40 ... 460 kJ/kg (-10 ... +190 BTU/lb)

## Operating environment

Maximum wind/flow speed	30 m/s
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
EMC compliance	EN61326-1, Industrial Environment
Operating temperature	
HMW82/83 and TMW82	-5 ... +55 °C (+23 ... +131 °F)
HMD82/83, TMD82, HMW88/89, TMW88, HMS82/83, and TMS82	-40 ... +60 °C (-40 ... +140 °F)
HMD82/83D and HMW88/89D	-5 ... +60 °C (+23 ... +140 °F)
Operating humidity	
HMD82/83, TMD82, HMW88/89, TMW88, HMS82/83, and TMS82	0 ... 100 %RH
HMW82/83, TMW82, HMD82/83D and HMW88/89D	0 ... 100 %RH, non-condensing

## Measurement performance, models HMD82/83D and HMW88/89D

Relative humidity	
Measurement range	0 ... 100 %RH
Accuracy in temperature range +10 ... +30 °C (+50 ... +86 °F)	±3 %RH (0 ... 90 %RH) ±5 %RH (90 ... 100 %RH)
Accuracy in temperature range -5 ... +10 °C, +30 ... +60 °C (+23 ... +50 °F, +86 ... +140 °F)	±5 %RH (0 ... 90 %RH) ±7 %RH (90 ... 100 %RH)
Stability in typical HVAC applications	±2 %RH over 2 years
Humidity sensor	Vaisala INTERCAP®
Temperature	
Measurement range	(Analog output scaling) -40 ... +60 °C (-40 ... +140 °F)
Accuracy at +20 °C (+68 °F)	±0.3 °C (±0.54 °F)
Temperature dependence	±0.01 °C/ °C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Calculated parameters	
Measurement range for dew point temperature and wet bulb temperature	-40 ... +60 °C (-40 ... +140 °F)
Measurement range for enthalpy	-40 ... 460 kJ/kg (-10 ... +190 BTU/lb)

## Inputs and outputs

Current output models (2-wire)	
Outputs	4 ... 20 mA, loop powered
Loop resistance	0 ... 600 Ω
Supply voltage	20 ... 28 VDC at 600 Ω load 10 ... 28 VDC at 0 Ω load
Voltage output models (3-wire)	
Outputs	0 ... 10 V
Load resistance	10 kΩ min
Supply voltage	18 ... 35 VDC 24 VAC ±20 % 50/60 Hz

## Mechanical specifications

Max wire size	1.5 mm <sup>2</sup> (AWG 16)
Standard housing color	White (RAL9003)
Housing material	
HMW82/83, TMW82	ABS/PC (UL-V0 approved)
HMW88/89(D), HMD82/83(D), TMW88, TMD82, HMS82/83, TMS82	PC + 10 %GF (UL-V0 approved)

## Spare parts and accessories

INTERCAP sensor	15778HM
10 pcs of INTERCAP sensors	INTERCAPSET-10PCS
Conduit fitting + O-ring (M16×1.5 / NPT ½")	210675SP
Conduit fitting + O-ring (M16×1.5 / PG9, RE-MS)	210674SP
Fastening set HMS80	237805
Porous PTFE filter	DRW239993SP
Membrane filter	ASM210856SP
Terminal block, blue	236620SP
HMD80 display lid	ASM210793SP



## HMS80 Series Humidity and Temperature Transmitters

For outdoor measurements in building automation applications



### Features

- Reliable outdoor transmitters with integrated radiation shields
- $\pm 3$  %RH accuracy
- User-exchangeable INTERCAP® sensor for easy field replacement
- Default output parameters are relative humidity and temperature. Dew point temperature, wet bulb temperature, and enthalpy outputs selectable using DIP switches
- Options for both current and voltage outputs
- Ingress protection IP65

Vaisala HMS80 Series INTERCAP® Humidity and Temperature Transmitters are designed for outdoor measurements in various building automation applications. These  $\pm 3$  % transmitters include an integrated radiation shield to reduce the influence of solar radiation on temperature and humidity measurements.

### Easy Installation

HMS80 transmitters are easy to install. They can be mounted directly onto a wall or pole without any extra accessories. There are no loose parts, screws are retained in the enclosure, all connectors are clearly labeled, and the connectors are within easy reach.

For fast and convenient configuration, the most popular control parameters in free cooling control – dew point temperature, wet bulb temperature, and enthalpy – are selectable using DIP switches.

### Low Maintenance

HMS80 series transmitters require minimal maintenance thanks to their excellent sensor stability and high-quality materials. If necessary, the INTERCAP® sensor can easily be replaced in the field with minimum downtime.

# Technical Data

## Models

Model	Type	Output	IP Rating
HMS82	Outdoor, RH+T	2-wire, current output	IP65
HMS83	Outdoor, RH+T	3-wire, voltage output	IP65

## Measurement Performance

Relative Humidity	
Measurement range	0 ... 100 %RH
Accuracy at temperature range +10 ... +30 °C (+50 ... +86 °F):	
0 ... 90 %RH	±3 %RH
90 ... 100 %RH	±5 %RH
Accuracy at temperature range -20 ... +10 °C, +30 ... +60 °C: (-4 ... +50 °F, +86 ... +140 °F)	
0 ... 90 %RH	±5 %RH
90 ... 100 %RH	±7 %RH
Accuracy in temperature range -40 ... -20 °C (-40 ... -4 °F):	
0 ... 100 %RH	±7 %RH
Stability in typical HVAC applications	±2 %RH over 2 years
Humidity sensor	Vaisala INTERCAP®
Temperature	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy at +20 °C (+68 °F)	±0.3 °C (±0.54 °F)
Temperature dependence	±0.01 °C/°C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Calculated Parameters <sup>1)</sup>	
Measurement range for dew point temperature and wet bulb temperature	-40 ... +60 °C (-40 ... +140 °F)
Measurement range for enthalpy	-40 ... 460 kJ/kg (-10 ... +190 BTU/lb)
Accuracy at 20 °C (68 °F) and 80 %RH	Dew point: ±0.9 °C (1.6 °F) Wet bulb temperature: ±0.7 °C (1.3 °F) Enthalpy: ±2 kJ/kg (0.9 BTU/lb)

<sup>1)</sup> Accuracy of the calculated parameters should be calculated at the actual condition based on the relative humidity and temperature specification.

## Inputs and Outputs

Current Output Model HMS82 (2-wire)	
Outputs	4 ... 20 mA, loop powered
Loop resistance	0 ... 600 Ω
Supply voltage	20 ... 28 VDC at 600 Ω load 10 ... 28 VDC at 0 Ω load
Voltage Output Model HMS83 (3-wire)	
Outputs	0 ... 10 V
Load resistance	10 kΩ min
Supply voltage	18 ... 35 VDC 24 VAC ±20 % 50/60 Hz

## Operating Environment

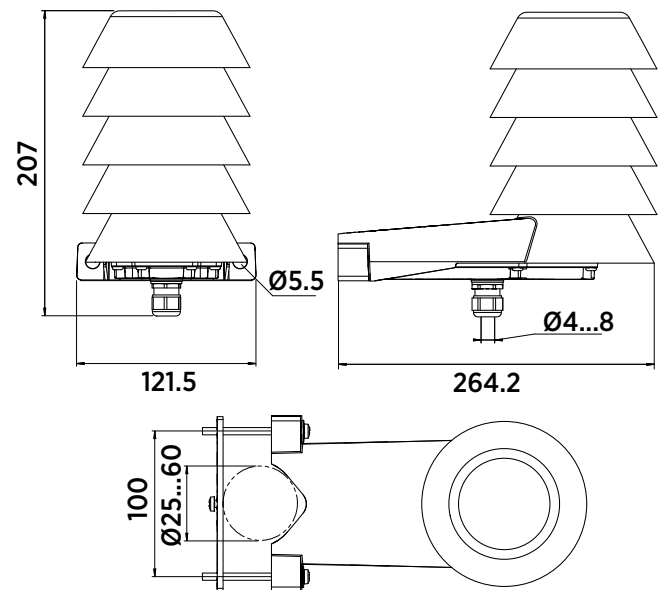
Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity	0 ... 100 %RH
Maximum wind/flow speed	30 m/s (67 mph)
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
EMC compliance	EN61326-1, Industrial Environment

## Mechanical Specifications

Max. wire size	1.5 mm <sup>2</sup> (AWG 16)
Standard housing color	White (RAL9003)
Housing material	PC + 10 %GF (UL-V0 approved)

## Spare Parts and Accessories

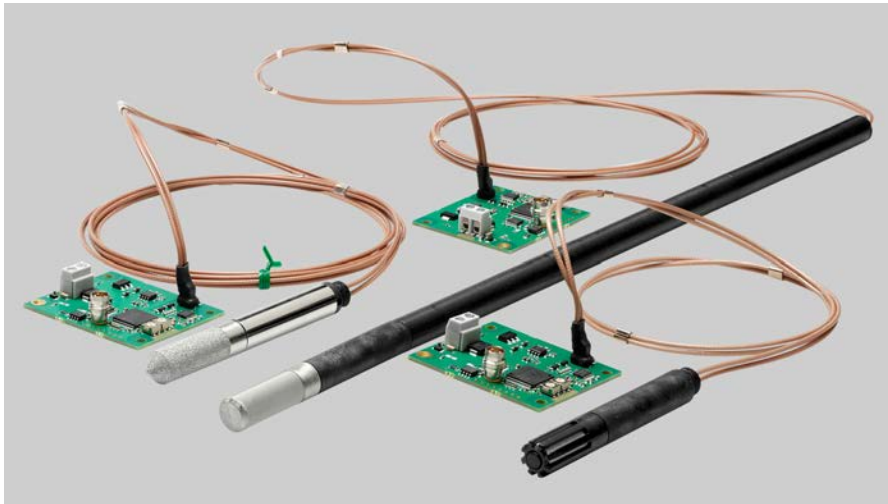
INTERCAP® sensor	15778HM
10 pcs of INTERCAP® sensors	INTERCAPSET-10PCS
Conduit fitting + O-ring (M16 × 1.5 / NPT1/2 Inch)	210675SP
Conduit fitting + O-ring (M16 × 1.5 / PG9, RE-MS)	210674SP
Fastening set HMS80	237805
Membrane Filter	ASM210856SP
Terminal Block, Blue	236620SP



Dimensions in mm



## HMM100 Humidity Module For environmental chambers



### Features

- Full temperature compensation over the operating temperature range of -70 °C ... +180 °C (-94 °F ... +356 °F)
- High temperature tolerance, also suitable for heat sterilization
- Vaisala HUMICAP® 180R sensor
- Easy field calibration by trimmers
- Applications: test chambers, incubators

Vaisala HUMICAP® Humidity Module HMM100 is an open frame module for integration into environmental chambers. The module provides a single analog output channel for relative humidity (RH) or dew point ( $T_d$ ).

### Benefits

- Excellent measurement accuracy
- Low-maintenance
- Easy to install
- Durable

Two types of probes are available, one made of stainless steel, the other of plastics. The plastic probe comes in two sizes, a standard one and an extended 400-mm-long option. Several cable lengths up to 3 meters are available. Both probes use the Vaisala HUMICAP® 180R sensor which ensures excellent measurement accuracy.

### Robust and Reliable

The HMM100 probe works in freezing conditions (-70 °C (-94 °F)) and also in temperatures up to +180 °C (+356 °F). HMM100 is easy to install and the probe can be freely placed in a test chamber as the speed of airflow does not affect the measurement.

### Low-Maintenance

Compared to psychrometers, HMM100 requires very little maintenance. There is no wick that needs changing and there is no need for a water tank or water pump. Thus, environmental stress screening can be done reliably.

### Accessories

The accessories available are a component board mounting bracket with a lid, probe clamp, USB cable for service use, a module housing, and a probe mounting flange.

# Technical Data

## Measurement Performance

Relative Humidity	
Measurement range	0 ... 100 %RH
Factory calibration uncertainty (+20 °C / +68 °F)	±1.5 %RH
Humidity sensor types	HUMICAP® 180R HUMICAP® 180
Accuracy <sup>1)</sup>	
at -20 ... +40 °C (-4 ... +104 °F)	±2 %RH (0 ... 90 %RH) ±3 %RH (90 ... 100 %RH)
at -40 ... -20 °C and +40 ... +180 °C (-40 ... -4 °F and +104 ... +356 °F)	±2.5 %RH (0 ... 90 %RH) ±3.5 %RH (90 ... 100 %RH)
Dew Point Temperature	
Measurement range	-20 ... +100 °C (-4 ... +212 °F) T <sub>d</sub>
Accuracy <sup>2)</sup>	±2 °C (±3.6 °F) T <sub>d</sub>

<sup>1)</sup> Including non-linearity, hysteresis, and repeatability.

<sup>2)</sup> Including non-linearity, hysteresis, and repeatability, when dew point depression is < +20 °C (+68 °F) (ambient temperature - dew point).

## Operating Environment

EMC compliance	Applicable parts of EN61326-1, generic environment
Operating Temperature	
Component board	-5 ... +55 °C (+23 ... +131 °F)
Stainless steel probe	-70 ... +180 °C (-94 ... +356 °F)
Plastic probe (standard body)	-70 ... +180 °C (-94 ... +356 °F)
Plastic probe (extended 400-mm (16-in) body)	-70 ... +120 °C (-94 ... +248 °F)
Plastic grid and membrane filter	-20 ... +80 °C (-4 ... +176 °F)
Porous PTFE, stainless steel sintered, and PPS plastic grid with stainless steel net filter	-70 ... +180 °C (-94 ... +356 °F)

## Mechanical Specifications

Service cable connector	M8 4-pin male
Probe diameter	12 mm (0.5 in)
Probe Cable Lengths	
Stainless steel probe	0.6/1.55/2.9 m (2/5.1/9.5 ft)
Plastic probe (standard body)	0.6/1.55/2.9 m (2/5.1/9.5 ft)
Plastic probe (extended 400-mm (16-in) body)	1.55 m (5.1 ft)
Probe Material	
Stainless steel probe	AISI316/PPS
Plastic probe	PPS
Extension tube for 400-mm probe	POM
Probe mounting clamp	AISI316
Mounting Bracket Material	
Lid	ABS/PC
Bottom plate	Al
Module housing material	ABS/PC (cover)

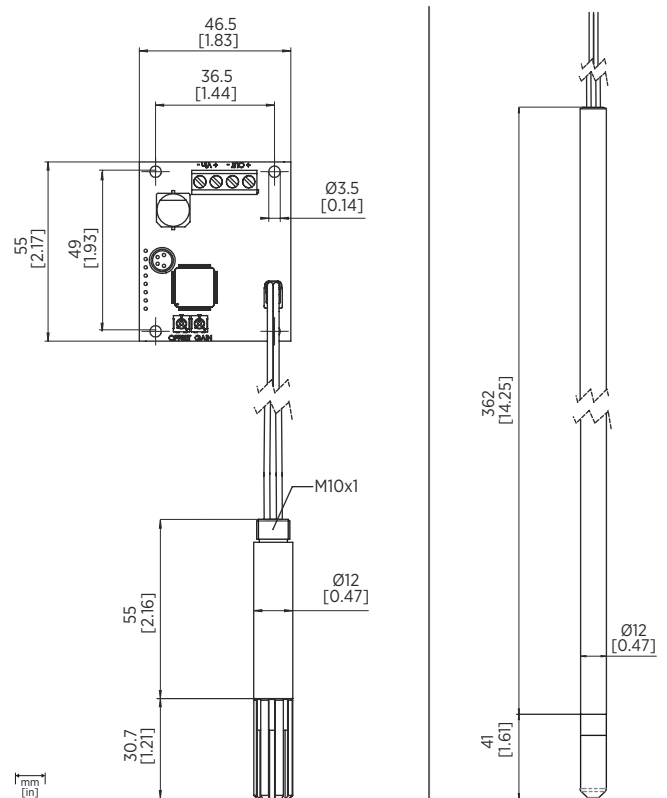
## Inputs and Outputs

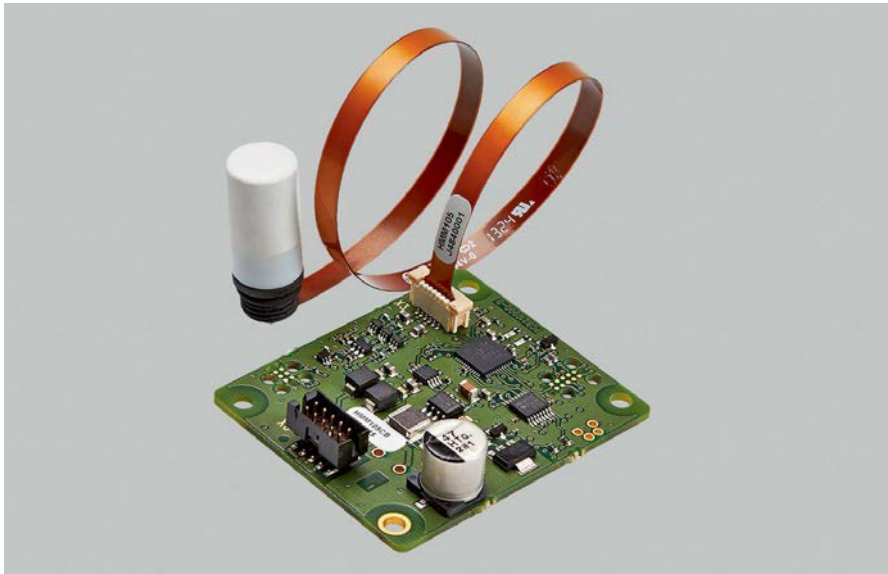
Power consumption	6 mA
Operating Voltage	
2-wire model	24 VDC
3-wire model	10 ... 35 VDC or 24 VAC ±20 % 15 ... 35 VDC or 24 VAC ±20 % when 0 ... 10 V output is used
Analog Output Types (1 Output Selectable)	
2-wire model	4 ... 20 mA (loop-powered)
3-wire model	0 ... 20 mA, 0 ... 1/5/10 V, 1 ... 5 V
Max. wire size	0.5 ... 1.5 mm <sup>2</sup> (AWG)
Service port	M8 connector for USB cable

## Spare Parts and Accessories

HUMICAP® 180R sensor	HUMICAP180R
HUMICAP® 180 sensor <sup>1)</sup>	15778HM
Plastic grid filter	6221
Membrane filter	10159HM
Porous PTFE filter	219452SP
Stainless steel sintered filter	HM47280SP
PPS plastic grid with stainless steel net filter	DRW010281SP
Mounting bracket with lid	225979
Module housing (IP65)	226060
Probe mounting flange	226061
Probe mounting clamp set (10 pcs)	226067
USB cable	226068

<sup>1)</sup> Spare part item name: Vaisala INTERCAP® humidity sensor.





### Features

- Digital I<sup>2</sup>C communication interface available
- Full temperature compensation over the operating temperature range of -40 °C ... +180 °C
- High temperature tolerance, suitable for heat sterilization up to +200 °C
- Vaisala HUMICAP® 180R sensor
- Detachable probe assembly
- Probe head with M10x1 threads
- Applications: test chambers, incubators

Vaisala HUMICAP® Digital Humidity Module HMM105 is an open frame module for integration into environmental chambers. The modules provide an I<sup>2</sup>C output for relative humidity (RH) or dew point (T<sub>d</sub>).

### Benefits

- Easy installation
- Excellent measurement accuracy
- Maintenance-free

The module consists of a detachable probe assembly – a probe head with M10x1 threads and a flex cable – and the module circuit board. The probe assembly is 30 cm in length. The module incorporates the Vaisala HUMICAP® 180R sensor which ensures excellent measurement accuracy.

### Reliable for OEM's

The HMM105 probe head works in freezing conditions (-40 °C) and also in temperatures up to +180 °C in continuous use. In short term use, the probe head can be exposed to temperatures up to +200 °C. HMM105 is intended for OEM chamber manufacturers for integration into test chambers and incubators.

### Maintenance-free

Compared to psychrometers, HMM105 is practically maintenance free. There is no wick that needs changing and there is no need for a water tank or water pump. Thus, environmental stress screening can be done reliably.

### I<sup>2</sup>C interface for better usability

HMM105 has an I<sup>2</sup>C interface for communicating with the incubator's controller. HMM105 implements I<sup>2</sup>C slave functionality, with the incubator's controller acting as the master. The interface can be used to read measurement values and status information, set operation parameters, and make adjustments.

# Technical Data

## Relative Humidity

Measurement range	0 ... 100 %RH
Factory calibration uncertainty (+20 °C)	±1.5 %RH
Humidity sensor	Vaisala HUMICAP® 180R

### Accuracy (incl. Non-Linearity, Hysteresis and Repeatability)

Temperature	-20 ... +40 °C
0 ... 90 %RH	±2 %RH
90 ... 100 %RH	±3 %RH
Temperature	-40 ... -20 °C, +40 ... +180 °C
0 ... 90 %RH	±2.5 %RH
90 ... 100 %RH	±3.5 %RH

## Dew Point Temperature

Measurement range	-20 ... +100 °C (-4 ... +212 °F) <sub>T<sub>d</sub></sub>
Accuracy (incl. non-linearity, hysteresis and repeatability) when dew point depression < 20 °C (Ambient temperature - dew point)	±2 °C T <sub>d</sub>

## Operating Environment

EMC compliance	Applicable parts of EN61326-1, Industrial Environment
Storage temperature	-40 ... +75 °C (-40 ... +167 °F)

### Operating Temperature

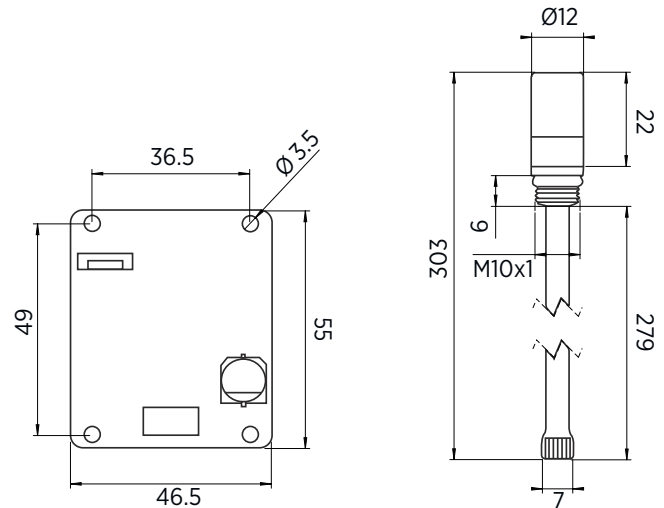
Component board	-5 ... +55 °C (+23 ... +131 °F)
Probe (continuous use)	-40 ... +180 °C (-40 ... +356 °F)
Probe (short term peak)	+200 °C (+392 °F)
Plastic grid, membrane filter	-20 ... +80 °C (-4 ... +176 °F)
PTFE sintered filters, stainless steel sintered filter	-40 ... +200 °C (-40 ... +392 °F)

## Inputs and Outputs

Supply voltage	10 ... 35 VDC, 24 VAC (±20 %)
Output voltage	I <sup>2</sup> C 5 V
Power consumption (DC/AC)	< 15/25 mA
Connector for supply voltage and I <sup>2</sup> C bus	Molex 87832-1007, 10-pin header bus

## Mechanical Specifications

Probe diameter	12 mm
Probe flex cable length	0.3 m
Probe lead-through material	PPS plastic



Dimensions in millimeters

## Spare Parts and Accessories

Humidity sensor	HUMICAP® 180R
Short PTFE sintered filter	DRW239993SP
Plastic grid filter	6221
Plastic grid and membrane filter	10159HM
PTFE sintered filter	219452SP
Stainless steel sintered filter	HM47280SP
0.6 m cable with Molex milli-grid connectors	ASM210962SP



## HMM170 Humidity and Temperature Module

For environmental chambers



### Features

- Warmed sensor and probe for condensation prevention
- Chemical purge for maintaining sensor performance
- Suitable for use in high humidity environments, vacuum, and pressurized chambers
- Temperature measurement range  $-70 \dots +180 \text{ }^{\circ}\text{C}$  ( $-94 \dots +356 \text{ }^{\circ}\text{F}$ )
- Sensor options for corrosion tolerance,  $\text{H}_2\text{O}_2$  tolerance, and moisture-in-oil measurement
- 3 analog output channels
- Modbus RTU over RS-485
- Several output parameters available
- 3 probe cable length options
- Compatible with Insight PC software

Vaisala HUMICAP® Humidity and Temperature Module HMM170 is an open frame OEM module for integration into demanding environmental chambers and harsh conditions. The module provides a digital RS-485/Modbus RTU output and three freely configurable analog output channels. The module provides relative humidity, temperature, dew point, and other calculated parameters.

### Designed for harsh environments

HMM170 probe covers the full temperature range  $-70 \dots +180 \text{ }^{\circ}\text{C}$  ( $-94 \dots +356 \text{ }^{\circ}\text{F}$ ) used in climate chambers and the whole humidity range up to condensation. The small probe and compact component board offer easy and flexible installation. The probe cable options (2, 5, or 10 m (6.5, 16.4, or 32.8 ft)) offer excellent cost optimization and flexibility to any OEM application. By ordering HMM170 with the appropriate sensor, you can use the module in environments that are frequently sterilized with vaporized hydrogen

peroxide ( $\text{H}_2\text{O}_2$ ) or to measure humidity in oil medium, for example, for transformer and engine monitoring applications.

### Robust sensor technology

The latest general purpose HUMICAP® R2 sensor has improved corrosion resistance. The sensor can tolerate typical chemicals, such as cleaning agents used in climate chambers. The automatic sensor chemical purge function keeps the sensor clean from typical chemical fumes and the additional probe warming function prevents condensation. In case HMM170

gets in contact with water, the automatic heating rapidly dries the sensor to enable fast and accurate humidity measurement.

### Convenient to use

HMM170 is easy to install and convenient to use. It provides both digital and analog outputs for multiple needs. An integrated service port enables a quick and simple way to configure, check, and calibrate the module with the help of a USB cable and Vaisala Insight PC software. In addition, the footprint of the HMM170 component board enables easy update for Vaisala HMM100 users.

# Technical data

## Measurement performance

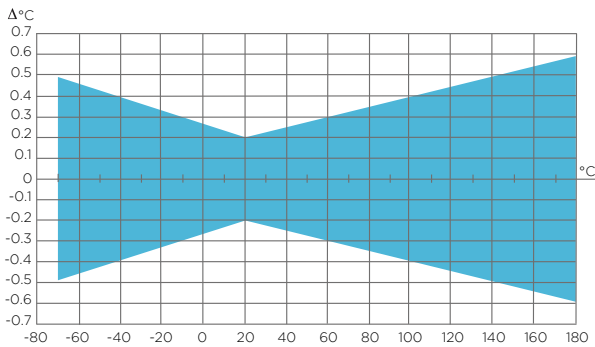
### Relative humidity

Measurement range	0 ... 100 %RH
Accuracy <sup>1) 2)</sup>	
at +15 ... +25 °C (59 ... +77 °F)	±1 %RH (0 ... 90 %RH) ±1.7 %RH (90 ... 100 %RH)
at -20 ... +40 °C (-4 ... +104 °F)	± (1.0 + 0.008 × reading) %RH
at -40 ... +180 °C (-40 ... +356 °F)	± (1.5 + 0.015 × reading) %RH
Factory calibration uncertainty at +20 °C (+68 °F) <sup>3)</sup>	±0.6 %RH (0 ... 40 %RH) ±1.0 %RH (40 ... 90 %RH) ±1.1 %RH (90 ... 95 %RH)
Humidity sensor types	HUMICAP® R2C HUMICAP® 180L2 HUMICAP® 180VC
T <sub>90</sub> response time <sup>4)</sup>	50 s with steel mesh filter 60 s with sintered filter

### Temperature

Measurement range	-70 ... +180 °C (-94 ... +356 °F)
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751
Typical accuracy at +20 °C (+68 °F)	±0.2 °C (± 0.36 °F)

- 1) Including non-linearity, hysteresis and repeatability.  
 2) With HUMICAP® 180VC sensor, accuracy is not specified below -20 °C (-4 °F) operating temperature.  
 3) Defined as ±2 standard deviation limits. Small variations possible; see also calibration certificate.  
 4) At +20 °C (+68 °F) in 0.1 m/s air flow with Vaisala HUMICAP® R2C sensor.



## Temperature measurement accuracy over temperature range

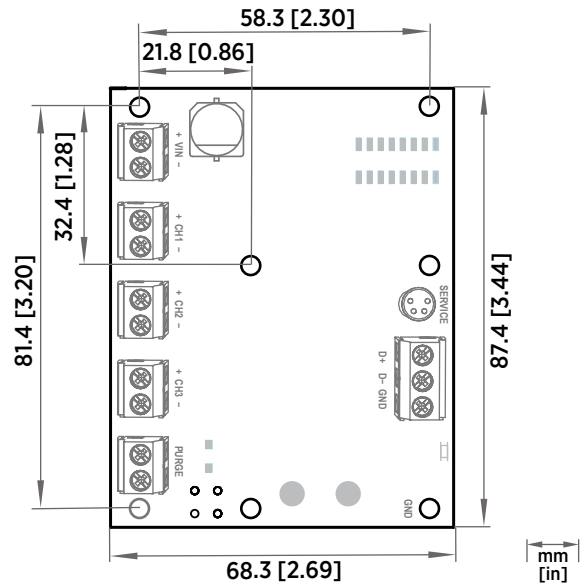
## Operating environment

Operating temperature for component board	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity for component board	0 ... 100 %RH, non-condensing
Storage temperature	-55 ... +80 °C (-67 ... +176 °F)
Operating pressure	0 ... 10 bar

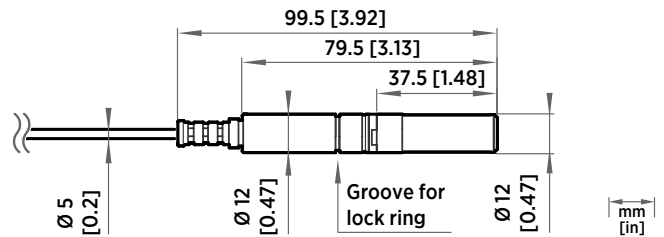
## Accessories

USB cable for PC connection <sup>1)</sup>	219690
Cable gland M20×1.5 for probe cable	HMP247CG
Swagelok NPT 1/2" adapter for probe	SWG12NPT12
Swagelok ISO 1/2" adapter for probe	SWG12ISO12
Duct installation kit for probe	210697

<sup>1)</sup> Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight)



HMM170 component board dimensions



HMM170 probe head dimensions

## Inputs and outputs

Three analog outputs (selectable and scalable)	0 - 20 mA, 4 - 20 mA 0 - 1 V, 0 - 5 V, 1 - 5 V, or 0 - 10 V
Typical accuracy of analog output at +20 °C (+68 °F)	±0.05 % full scale
Typical temperature dependence of analog output	0.005 %/°C (0.003 %/°F) full scale
External load	R <sub>L</sub> < 500 Ω
Digital output	RS-485 serial, Modbus
Service port	M8 connector for USB cable
Start-up time	3 s at power-up
Wire size	0.5 ... 1.5 mm <sup>2</sup> (20 ... 16 AWG)
<b>Supply voltage</b>	
when condensation prevention and chemical purge features are not used	12 - 35 V DC
all features available	18 - 35 V DC or 24 V AC ±10 %
<b>Power consumption</b>	
Analog outputs	12 mA (voltage), 50 mA (current)
Chemical purge at 24 V DC	+220 mA
Warmed probe at 24 V DC	+240 mA





### Features

- Miniature-size humidity probe
- Low power consumption
- Measurement range: 0–100 %RH; –40 ... +60 °C (–40 ... +140 °F)
- Cable detachable with standard M8 connector
- Rugged metal housing
- Interchangeable Vaisala INTERCAP® sensor
- Compatible with Vaisala Insight PC software and Vaisala Indigo80 Handheld Indicator
- Optional RS-485 digital output supports Modbus® RTU
- Optional dew/frost point, wet bulb temperature, absolute humidity, mixing ratio, and enthalpy output

Vaisala INTERCAP® Humidity and Temperature Probe HMP60 is a simple, durable and cost-effective humidity probe. It is suitable for volume applications, integration into other manufacturers' equipment, incubators, glove boxes, greenhouses, fermentation chambers, and data loggers.

### Easy installation

The probe cable has a screw-on quick connector for easy installation. Different cable lengths are available. Also other compatible M8 series cables can be used. Accessories are available for different installation needs.

### Low current consumption

HMP60 is suitable for battery-powered applications because of its very low current consumption.

### Several outputs

Temperature measurement is a standard feature in HMP60, with dew point temperature, wet bulb temperature, absolute humidity, mixing ratio, and

enthalpy as optional calculated parameters. Four voltage output ranges are available. An optional RS-485 output with Modbus support is also available.

### Flexible connectivity

In addition to analog and digital (Modbus) output options, the probe can also be used with Vaisala Indigo80 Handheld Indicator. For easy-to-use access to configuration and device analytics functionalities, the probe can be connected to Vaisala Insight PC software for Windows®. For more information, see [vaisala.com/indigo80](https://vaisala.com/indigo80) and [vaisala.com/insight](https://vaisala.com/insight).

### Rugged design

HMP60 is designed for extreme conditions. The stainless steel body of HMP60 is classified as IP65. The probe has a sealed structure and the sensor is protected by a membrane filter and a plastic grid, or optionally by a stainless steel filter.

### Recalibration not needed

The Vaisala INTERCAP® sensor is interchangeable. No recalibration is required; the sensor can simply be replaced, also in the field.

# Technical data

## Measurement performance

Relative humidity	
Measurement range	0–100 %RH
Typical accuracy:	
at 0 ... +40 °C (+32 ... +140 °F)	±3 %RH (0–90 %RH) ±5 %RH (90–100 %RH)
at –40 ... 0 °C and +40 ... +60 °C (–40 ... +32 °F and +104 ... +140 °F)	±5 %RH (0–90 %RH) ±7 %RH (90–100 %RH)
Humidity sensor	Vaisala INTERCAP®
Temperature	
Measurement range	–40 ... +60 °C (–40 ... +140 °F)
Accuracy:	
at +10 ... +30 °C (+50 ... +86 °F)	±0.5 °C (±0.9 °F)
at –40 ... +10 and +30 ... +60 °C (–40 ... +50 and +86 ... +140 °F)	±0.6 °C (±1.08 °F)
Analog outputs	
Accuracy at +20 °C (+68 °F)	±0.2 % of FS
Temperature dependence	±0.01 % of FS/°C (±0.006 % of FS/°F)

## Inputs and outputs

Power consumption	1 mA average, max. peak 5 mA
Operating voltage <sup>1)</sup>	
With 1 V / 2.5 V output	5–28 V DC
With 5 V output	8–28 V DC
With loop power converter	8–28 V DC
With digital output	5–28 V DC
Start-up time	
Probes with analog output	4 s at operating voltage 13.5–16.5 V DC 2 s at other valid operating voltages
Probes with digital output	1 s
Outputs	
2 channels	0–1 V DC / 0–2.5 V DC / 0–5 V DC / 1–5 V DC
1-channel loop-power converter (separate module, compatible with humidity accuracy only)	4–20 mA
Digital output (optional)	RS-485 2-wire half duplex, supports Modbus RTU
External loads	
0–1 V	R <sub>L</sub> min. 10 kΩ
Other voltage outputs	R <sub>L</sub> min. 50 kΩ
Output parameters	
Relative humidity, temperature, dew/frost point temperature, wet bulb temperature, absolute humidity, mixing ratio, enthalpy	

<sup>1)</sup> Use lowest available operating voltage to minimize heating.

## Operating environment

Operating temperature	–40 ... +60 °C (–40 ... +140 °F)
IP rating <sup>1)</sup>	IP65

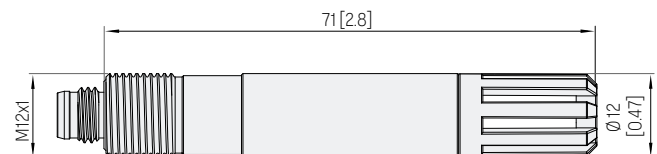
<sup>1)</sup> Not applicable with the plastic grid filter.

## Mechanical specifications

Body thread	M12×1 / 10 mm (0.4 in)
Cable connector	4-pin M8 (IEC 60947-5-2)
Materials	
Body	Stainless steel (AISI 316)
Grid filter	Chrome coated ABS plastic
Cable	Polyurethane or FEP
Weight	
Probe	17 g (0.6 oz)
Probe with 0.3 m (1 ft) cable	28 g (1 oz)

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, RCM, UKCA



Dimensions in mm (inches)

## Spare parts and accessories

### Sensors

Vaisala INTERCAP® sensor, 1 pc	15778HM
Vaisala INTERCAP® sensor, 10 pcs	INTERCAPSET-10PCS

### Sensor protection

Plastic grid filter	DRW010522SP
Membrane filter	DRW010525SP
Stainless steel sintered filter	HM46670SP
PTFE membrane filter with stainless steel grid	ASM212652SP
PTFE sintered filter	DRW244938SP

### Probe installation

Duct installation kit	215619
Probe mounting clamp set, 10 pcs	226067
Probe mounting flange	226061
Probe holder, 5 pcs	ASM213382SP
Plastic M12 installation nuts, pair	18350SP
Flat extension cable 1 m (3 ft) <sup>1)</sup>	CBL210649SP

### Connection adapters

4-20 mA loop power converter	UI-CONVERTER-1CB
Mounting bracket for converter	225979
USB cable for PC connection	219690
Connection cable for Indigo80 handheld indicator	262195SP
Connection cable for MI70 indicator	219980SP

### Connection cables with open wires

+60 °C 0.3 m (+140 °F 1 ft)	HMP5OZ032SP
+60 °C 1.2 m (+140 °F 4 ft)	HMP5OZ120
+60 °C 3 m (+140 °F 9.8 ft)	HMP5OZ300SP
+80 °C 1.5 m (+176 °F 5 ft)	225777SP
+80 °C 3 m (+176 °F 10 ft)	225229SP
+180 °C 1.5 m (+356 °F 5 ft) FEP	238025
+180 °C 3 m (+356 °F 10 ft) FEP	226902SP

<sup>1)</sup> Connection cable 219980SP is also needed if this cable is used with MI70 indicator.

## HMP63 Humidity and Temperature Probe



### Features

- Fast thermal response time
- Low power consumption
- Start-up time < 2 s
- Measurement range: 0–100 %RH; –40 ... +60 °C (–40 ... +140 °F)
- Cable detachable with standard M8 connector
- IP54-rated plastic housing
- Interchangeable Vaisala INTERCAP® humidity sensor
- Compatible with Vaisala Insight PC software and Vaisala Indigo80 Handheld Indicator
- Optional RS-485 digital output supports Modbus® RTU
- Optional dew/frost point, wet bulb temperature, absolute humidity, mixing ratio, and enthalpy output
- Temperature-only model HMP63T with digital output also available

Vaisala INTERCAP® Humidity and Temperature Probe HMP63 is a cost-effective humidity probe with a plastic housing. It is designed for non-condensing indoor environments or integration into other manufacturers' equipment.

### Easy installation

The probe fits into tight spaces. The cable has a threaded M8 connector for easy installation. Different cable lengths are available and other compatible M8-series cables can also be used. Accessories are available for different installation needs.

### Low power consumption

HMP63 is suitable for battery-powered applications thanks to its very low power consumption and fast start-up time.

### Several output options

Temperature measurement is a standard feature in HMP63, with dew point temperature, wet bulb temperature, absolute humidity, mixing ratio, and

enthalpy as optional calculated parameters. Four voltage output ranges are available. An alternative RS-485 output with Modbus support is also available.

Output type, channel assignment of measurement parameters, and other probe features are configured when the probe is ordered.

### Flexible connectivity

In addition to analog and digital (Modbus) output options, the probe can also be used with Vaisala Indigo80 Handheld Indicator. For easy-to-use access to configuration and device analytics functionalities, the probe can

be connected to Vaisala Insight PC software for Windows®. For more information, see [vaisala.com/indigo80](https://vaisala.com/indigo80) and [vaisala.com/insight](https://vaisala.com/insight).

### Fast thermal response time

HMP63 has a PC/ABS plastic enclosure. It is ideal for environments with fast temperature changes where standard measurement accuracy is sufficient.

### No recalibration required

HMP63 includes an interchangeable Vaisala INTERCAP® humidity sensor. No recalibration is required – the humidity sensor can simply be replaced, even in the field.

# Technical data

## Models

Model	Measurement	Special features
HMP63	RH + T	INTERCAP® humidity sensor
HMP63T	T	Digital output only, for use with CWL100 data logger

## Measurement performance

Relative humidity	
Measurement range	0-100 %RH
Typical accuracy:	
at 0 ... +40 °C (+32 ... +140 °F)	±3 %RH (0-90 %RH) ±5 %RH (90-100 %RH)
at -40 ... 0 °C and +40 ... +60 °C (-40 ... +32 °F and +104 ... +140 °F)	±5 %RH (0-90 %RH) ±7 %RH (90-100 %RH)
Humidity sensor	Vaisala INTERCAP®
Temperature	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy:	
at +10 ... +30 °C (+50 ... +86 °F)	±0.5 °C (±0.9 °F)
at -40 ... +10 and +30 ... +60 °C (-40 ... +50 and +86 ... +140 °F)	±0.6 °C (±1.08 °F)
Analog outputs	
Accuracy at 20 °C (+68 °F)	±0.2 % of FS
Temperature dependence	±0.01 % of FS/°C (±0.006 % of FS/°F)

## Inputs and outputs

Power consumption	1 mA average, max. peak 5 mA
Operating voltage <sup>1)</sup>	
With 1 V / 2.5 V output	5-28 V DC
With 5 V output	8-28 V DC
With loop-power converter	8-28 V DC
With digital output	5-28 V DC
Start-up time	
Probes with analog output	4 s at operating voltage 13.5-16.5 V DC 2 s at other valid operating voltages
Probes with digital output	1 s
Outputs	
2 channels	0-1 V DC / 0-2.5 V DC / 0-5 V DC / 1-5 V DC
1-channel loop-power converter (separate module, compatible with humidity accuracy only)	4-20 mA
Digital output (optional)	RS-485 2-wire half duplex, supports Modbus RTU
External loads	
0-1 V	R <sub>L</sub> min. 10 kΩ
Other voltage outputs	R <sub>L</sub> min. 50 kΩ
Output parameters	
Relative humidity, temperature, dew/frost point temperature, wet bulb temperature, absolute humidity, mixing ratio, enthalpy	

<sup>1)</sup> Use lowest available operating voltage to minimize heating.

## Operating environment

Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
IP rating <sup>1)</sup>	IP54

<sup>1)</sup> Not applicable with the plastic grid filter.

## Mechanical specifications

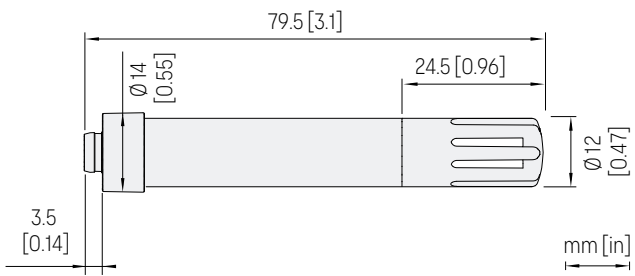
Cable connector	4-pin M8 (IEC 60947-5-2)
Materials	
Body	PC/ABS blend
Grid filter	PC (glass reinforced)
Cable	Polyurethane or FEP
Weight	
Probe	9 g (0.3 oz)
Probe with 0.3 m (1 ft) cable	20 g (0.7 oz)

## Compliance

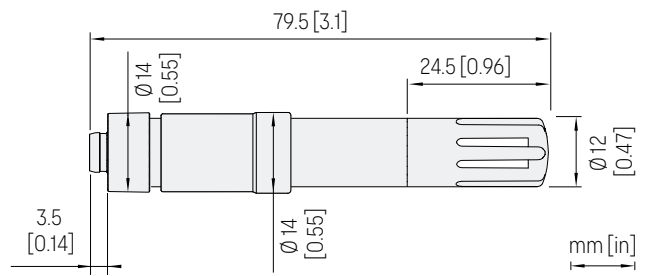
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, RCM, UKCA

## Spare parts and accessories

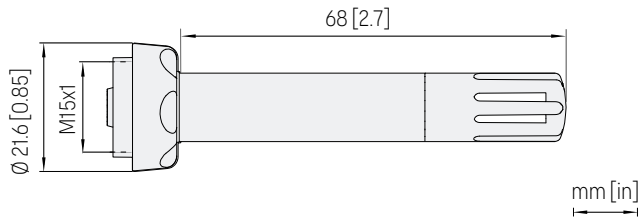
Sensors	
Vaisala INTERCAP® sensor, 1 pc	15778HM
Vaisala INTERCAP® sensor, 10 pcs	INTERCAPSET-10PCS
Sensor protection	
Plastic grid filter	DRW240185SP
Plastic grid with membrane filter	ASM210856SP
Stainless steel sintered filter	HM47280SP
Porous PTFE filter	219452SP
Probe installation	
Probe mounting clamp set, 10 pcs	226067
Probe mounting flange	226061
Probe holder, 5 pcs	ASM213382SP
Plastic locking bushing (3 pcs) for attaching probe to HM40	DRW238590SP
Connection adapters	
4-20 mA loop power converter	UI-CONVERTER-1CB
Mounting bracket for converter	225979
USB cable for PC connection	219690
Connection cable for Indigo80 handheld indicator	262195SP
Connection cable for HM70	219980SP
Connection cables with open wires	
+60 °C 0.3 m (+140 °F 1 ft)	HMP50Z032SP
+60 °C 1.2 m (+140 °F 4 ft)	HMP50Z120
+60 °C 3 m (+140 °F 9.8 ft)	HMP50Z300SP
+80 °C 1.5 m (+176 °F 5 ft)	225777SP
+80 °C 3 m (+176 °F 10 ft)	225229SP
+180 °C 1.5 m (+356 °F 5 ft) FEP	238025
+180 °C 3 m (+356 °F 10 ft) FEP	226902SP



HMP63 probe dimensions



HMP63 and HMP63T probe dimensions with sleeve for CWL100 data logger



HMP63 probe dimensions with plastic locking bushing



### Features

- Miniature-size humidity transmitter
- Low power consumption and fast start-up for battery-powered applications
- Measurement range: 0–100 %RH; –40 ... +80 °C (–40 ... +176 °F)
- Cable detachable with standard M8 quick connector
- IP65 metal housing
- Compatible with Vaisala Insight PC software and Vaisala Indigo80 handheld indicator
- Optional RS-485 digital output supports Modbus® RTU
- ±1.5 %RH measurement accuracy (0–90 %RH)
- Temperature-only model HMP110T also available

Vaisala HUMICAP® Humidity and Temperature Probe HMP110 is a trouble-free and cost-effective humidity transmitter with high accuracy and good stability. It is suitable for volume applications or integration into other manufacturers' equipment. HMP110 is also suitable for glove boxes, greenhouses, fermentation and stability chambers, data loggers, and incubators.

### Benefits

- Latest generation Vaisala HUMICAP® 180R sensor for best stability and high chemical tolerance
- Comes with calibration certificate
- Optional dew/frost point, wet bulb temperature, absolute humidity, mixing ratio, and enthalpy calculation

### Easy installation

The probe cable has a screw-on quick connector for easy installation. Different cable lengths and accessories are available.

### Low current consumption

HMP110 is suitable for battery-powered applications because of its very low current consumption. It also has a fast start-up time.

### Several outputs

Temperature measurement is a standard feature in the HMP110, with dew/frost point temperature, wet bulb temperature, absolute humidity, mixing ratio, and enthalpy as optional calculated parameters. Three standard voltage outputs are available. An optional RS-485 output with Modbus support is also available.

### Flexible connectivity

In addition to analog and digital (Modbus) output options, the probe can also be used with the Vaisala Indigo80 handheld indicator. For easy-to-use

access to configuration and device analytics functionalities, the probe can be connected to Vaisala Insight software for Windows®. For more information, see [www.vaisala.com/insight](http://www.vaisala.com/insight) and [www.vaisala.com/indigo80](http://www.vaisala.com/indigo80).

### Robust design

The stainless steel body of HMP110 is classified as IP65, making it ideal for rough conditions. HMP110 has high chemical tolerance thanks to the HUMICAP® 180R sensor.

# Technical data

## Models

Model	Output	Special features
HMP110	RH+T	-
HMP110T	T	-
HMP110REF	-	Fixed output probe for validation of HMT120 and HMT130 transmitters

## Measurement performance

Relative humidity	
Measurement range	0-100 %RH
Accuracy: <sup>1) 2)</sup>	
at 0 ... +40 °C (+32 ... +104 °F)	±1.5 %RH (0-90 %RH) ±2.5 %RH (90-100 %RH)
at -40 ... 0 °C (-40 ... +32 °F) and +40 ... +80 °C (+104 ... +176 °F)	±3.0 %RH (0-90 %RH) ±4.0 %RH (90-100 %RH)
Factory calibration uncertainty at +20 °C (+68 °F)	±1.1 %RH (0-90 %RH) ±1.8 %RH (90-100 %RH)
Humidity sensor types	HUMICAP® 180R HUMICAP® 180V
Stability	±2 %RH over 2 years
T <sub>90</sub> response time	With plastic grid filter: approx. 17 s With membrane filter: approx. 20s With stainless steel sintered filter: approx. 60 s

Temperature	
Measurement range	-40 ... +80 °C (-40 ... +176 °F)
Accuracy (probes with analog output):	
at 0 ... +40 °C (+32 ... +104 °F)	±0.2 °C (±0.36 °F)
at -40 ... 0 °C (-40 ... +32 °F) and +40 ... +80 °C (+104 ... +176 °F)	±0.4 °C (±0.72 °F)
Accuracy (probes with digital output):	
at +15 ... +25 °C (+59 ... +77 °F)	±0.1 °C (±0.18 °F)
at 0 ... +15 °C (+ 32 ... +59 °F) and +25 ... +40 °C (+77 ... +104 °F)	±0.15 °C (±0.27 °F)
at -40 ... 0 °C (-40 ... +32 °F) and +40 ... +80 °C (+104 ... +176 °F)	±0.4 °C (±0.72 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
<b>Analog outputs</b>	
Accuracy at +20 °C (+68 °F)	±0.2 % of FS
Temperature dependence	±0.01 % of FS/°C (±0.006 % of FS/°F)

<sup>1)</sup> Including non-linearity, hysteresis, and repeatability.

<sup>2)</sup> With HUMICAP® 180V sensor, accuracy is not specified below -20 °C (-4 °F) operating temperature.

## Operating environment

Operating temperature	-40 ... +80 °C (-40 ... +176 °F)
IP rating <sup>1)</sup>	IP65

<sup>1)</sup> Not applicable with the plastic grid filter.

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, RCM, UKCA

## Inputs and outputs

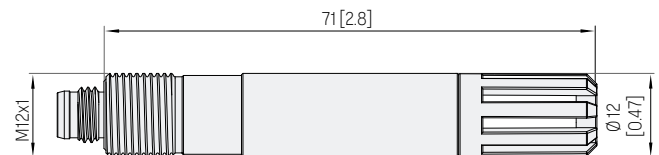
Power consumption	1 mA average, max. peak 5 mA
<b>Operating voltage <sup>1)</sup></b>	
With 1 V / 2.5 V output	5-28 V DC
With 5 V output	8-28 V DC
With loop power converter	8-28 V DC
With digital output	5-28 V DC
<b>Start-up time</b>	
HMP110 probes with analog output	4 s at operating voltage 13.5-16.5 V DC 2 s at other valid operating voltages
HMP110 probes with digital output	1 s
<b>Outputs</b>	
2 channels	0-1 V DC / 0-2.5 V DC / 0-5 V DC / 1-5 V DC
1-channel loop-power converter (separate module, compatible with humidity accuracy only)	4-20 mA
Digital output (HMP110 probes with digital output)	RS-485 2-wire half duplex, supports Modbus RTU
<b>External loads</b>	
0-1 V	R <sub>L</sub> min. 10 kΩ
Other voltage outputs	R <sub>L</sub> min. 50 kΩ

Output parameters	
Relative humidity, temperature, dew/frost point temperature, wet bulb temperature, absolute humidity, mixing ratio, enthalpy	

<sup>1)</sup> Use lowest available operating voltage to minimize heating.

## Mechanical specifications

Body thread	M12x1 / 10 mm (0.4 in)
Cable connector	M8 4-pin female (IEC 60947-5-2)
<b>Materials</b>	
Body	Stainless steel (AISI 316)
Grid filter	Chrome coated ABS plastic
Cable	Polyurethane or FEP
<b>Weight</b>	
Probe	17 g (0.6 oz)
Probe with 0.3 m (1 ft) cable	28 g (1 oz)



HMP110 and HMP110T probe dimensions



## Spare parts and accessories

### Sensors

Vaisala HUMICAP® 180R HUMICAP180R

Vaisala HUMICAP® 180V HUMICAP180V

### Sensor protection

Plastic grid filter DRW010522SP

Membrane filter DRW010525SP

Stainless steel sintered filter HM46670SP

PTFE membrane filter with stainless steel grid ASM212652SP

PTFE sintered filter DRW244938SP

### Probe installation

Duct installation kit 215619

Probe mounting clamp set, 10-pcs 226067

Probe mounting flange 226061

Probe holder, 5 pcs ASM213382SP

Plastic M12 installation nuts, pair 18350SP

Flat extension cable 1 m (3 ft) <sup>1)</sup> CBL210649SP

### Connection adapters

4-20-mA loop power converter UI-CONVERTER-1CB

Mounting bracket for converter 225979

USB cable for PC connection 219690

Connection cable for Indigo80 handheld indicator 262195SP

Connection cable for MI70 indicator 219980SP

### Connection cables with open wires

+60-°C 0.3-m (+140-°F 1-ft) HMP5OZ032SP

+60-°C 1.2-m (+140-°F 4-ft) HMP5OZ120

+60-°C 3-m (+140-°F 9.8-ft) HMP5OZ300SP

+80-°C 1.5-m (+176-°F 5-ft) 225777SP

+80-°C 3-m (+176-°F 10-ft) 225229SP

+180-°C 1.5-m (+356-°F 5-ft) FEP 238025

+180-°C 3-m (+356-°F 10-ft) FEP 226902SP

<sup>1)</sup> Connection cable 219980SP is also needed if this cable is used with MI70 indicator.

## HMP113 Humidity and Temperature Probe



### Features

- Fast thermal response time
- Low power consumption and fast start-up for battery-powered applications
- Measurement range: 0–100 %RH; –40 ... +60 °C (–40 ... +140 °F)
- Detachable cable with standard 4-pin M8 connector
- Plastic enclosure with IP54 classification
- Proven Vaisala HUMICAP® 180R sensor for excellent stability
- Compatible with Vaisala Insight PC software, Vaisala Indigo80 Handheld Indicator, and Vaisala HM40 Handheld Meter
- Optional RS-485 digital output supports Modbus® RTU
- Comes with calibration certificate: ±1.5 %RH measurement accuracy (0–90 %RH)

Vaisala HUMICAP® Humidity and Temperature Probe HMP113 is a highly accurate and cost-effective humidity probe with plastic enclosure. It is designed for indoor environments, integration into other manufacturers' equipment, or use with Vaisala HUMICAP® Handheld Humidity and Temperature Meter HM40.

### Easy installation

The compact probe fits into tight spaces. The cable has a threaded M8 connector for easy installation. Different cable lengths and a selection of accessories are available.

### Low power consumption

HMP113 is suitable for battery powered applications due to its very low power consumption. It also has an extremely fast start-up time.

### Several outputs

Temperature measurement is a standard feature in HMP113, with dew point temperature, wet bulb temperature, absolute humidity, mixing ratio, and

enthalpy as optional calculated parameters. Four voltage output ranges are available. An optional RS-485 output with Modbus support is also available.

### Flexible connectivity

In addition to analog and digital (Modbus) output options, the probe can also be used with the Vaisala Indigo80 Handheld Indicator and the Vaisala HM40 Handheld Meter. For easy-to-use access to configuration and device analytics functionalities, the probe can be connected to Vaisala Insight software for Windows®. For more information, see [vaisala.com/insight](https://vaisala.com/insight) and [vaisala.com/indigo80](https://vaisala.com/indigo80).

### High performance

HMP113 has a PC/ABS plastic enclosure and is suitable for non-condensing environments with fast temperature changes and a need for high-accuracy measurements with traceability. HMP113 also has a high chemical tolerance thanks to the proven Vaisala HUMICAP® 180R sensor.

### Variety of calibration options

A quick field calibration can easily be carried out using a handheld device, for example the Indigo80 Handheld Indicator or the HM40 Handheld Meter. Alternatively, the probe can be calibrated using a PC with USB cable, or sent to a Vaisala Service Center.

# Technical data

## Measurement performance

<b>Relative humidity</b>	
Measurement range	0–100 %RH
Accuracy (incl. non-linearity, hysteresis, and repeatability):	
at 0 ... +40 °C (+32 ... +104 °F)	±1.5 %RH (0–90 %RH) ±2.5 %RH (90–100 %RH)
at –40 ... 0 °C (–40 ... +32 °F) and +40 ... +60 °C (+104 ... +140 °F)	±3.0 %RH (0–90 %RH) ±4.0 %RH (90–100 %RH)
Factory calibration uncertainty at +20 °C (+68 °F):	±1.1 %RH (0–90 %RH) ±1.8 %RH (90–100 %RH)
Humidity sensor	HUMICAP® 180R
Stability	±2 %RH over 2 years
<b>Temperature</b>	
Measurement range	–40 ... +60 °C (–40 ... +140 °F)
Accuracy (probes with analog output):	
at 0 ... +40 °C (+32 ... +104 °F)	±0.2 °C (±0.36 °F)
at –40 ... 0 °C (–40 ... +32 °F) and +40 ... +60 °C (+104 ... +140 °F)	±0.4 °C (±0.72 °F)
Accuracy (probes with digital output):	
at +15 ... +25 °C (+59 ... +77 °F)	±0.1 °C (±0.18 °F)
at 0 ... +15 °C (+ 32 ... +59 °F) and +25 ... +40 °C (+77 ... +104 °F)	±0.15 °C (±0.27 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
<b>Analog outputs</b>	
Accuracy at +20 °C (+68 °F)	±0.2 % of FS
Temperature dependence	±0.01 % of FS/°C (±0.006 % of FS/°F)

## Operating environment

Operating temperature	–40 ... +60 °C (–40 ... +140 °F)
IP rating <sup>1)</sup>	IP54

<sup>1)</sup> Not applicable with the plastic grid filter.

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, RCM, UKCA

## Inputs and outputs

Power consumption	1 mA average, max. peak 5 mA
<b>Operating voltage</b> <sup>1)</sup>	
With 1 V / 2.5 V output	5–28 V DC
With 5 V output	8–28 V DC
With loop power converter	8–28 V DC
With digital output	5–28 V DC
<b>Start-up time</b>	
Probes with analog output	4 s at operating voltage 13.5–16.5 V DC 2 s at other valid operating voltages
Probes with digital output	1 s
<b>Outputs</b>	
2 channels	0–1 V DC / 0–2.5 V DC / 0–5 V DC / 1–5 V DC
1-channel loop-power converter (separate module, compatible with humidity accuracy only)	4–20 mA
Digital output (optional)	RS-485 2-wire half duplex, supports Modbus RTU
<b>External loads</b>	
0–1 V	R <sub>L</sub> min 10 kΩ
Other voltage outputs	R <sub>L</sub> min 50 kΩ
<b>Output parameters</b>	
Relative humidity, temperature, dew/frost point temperature, wet bulb temperature, absolute humidity, mixing ratio, enthalpy	

<sup>1)</sup> Use lowest available operating voltage to minimize heating.

## Mechanical specifications

Cable connector	4-pin M8 (IEC 60947-5-2)
<b>Materials</b>	
Body	PC/ABS blend
Grid filter	PC (glass reinforced)
Cable	Polyurethane or FEP
<b>Weight</b>	
Probe	9 g (0.3 oz)
Probe with 0.3 m (1 ft) cable	20 (0.7 oz)

## Spare parts and accessories

### Sensors

Vaisala HUMICAP® 180R HUMICAP180R

Vaisala HUMICAP® 180V HUMICAP180V

### Sensor protection

Plastic grid filter DRW240185SP

Plastic grid with membrane filter ASM210856SP

Stainless steel sintered filter HM47280SP

Porous PTFE filter 219452SP

### Probe installation

Probe mounting clamp set, 10 pcs 226067

Probe mounting flange 226061

Probe holder, 5 pcs ASM213382SP

Plastic locking bushing (3 pcs) for attaching probe to HM40 DRW238590SP

### Connection adapters <sup>1)</sup>

4–20 mA loop power converter UI-CONVERTER-1CB

Mounting bracket for converter 225979

USB cable for PC connection 219690

Connection cable for Indigo80 handheld indicator 262195SP

Connection cable for MI70 indicator 219980SP

### Connection cables with open wires

+60 °C 0.3 m (+140 °F 1 ft) HMP5OZ032SP

+60 °C 1.2 m (+140 °F 4 ft) HMP5OZ120

+60 °C 3 m (+140 °F 9.8 ft) HMP5OZ300SP

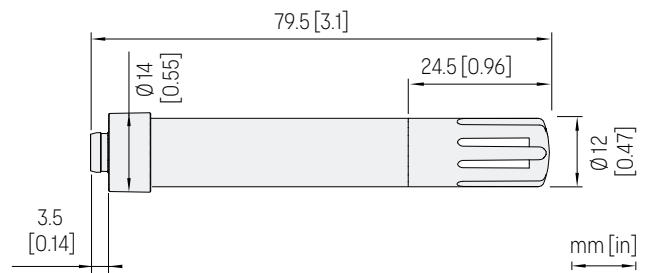
+80 °C 1.5 m (+176 °F 5 ft) 225777SP

+80 °C 3 m (+176 °F 10 ft) 225229SP

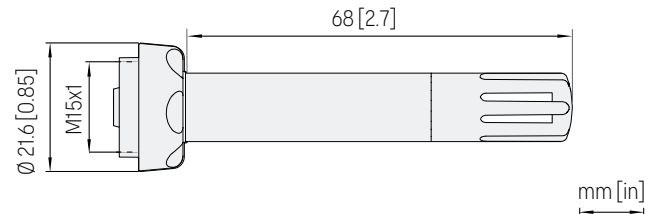
+180 °C 1.5 m (+356 °F 5 ft) FEP 238025

+180 °C 3 m (+356 °F 10 ft) FEP 226902SP

<sup>1)</sup> No separate adapter is needed for HM40 compatibility.



HMP113 dimensions



HMP113 dimensions with plastic locking bushing



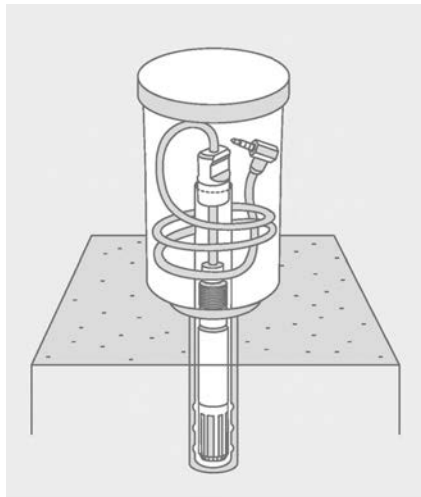
### Features

- Truly interchangeable measurement probes
- Accurate measurement data in numeric, statistic, or graph views
- Conforms to ASTM standard F2170
- IP65-rated measurement probe and case
- Standard contents of SHM40:
  - HM40 indicator with adapter
  - 1 pc HMP40S RH&T probe with cable
  - 12 pcs plastic tubes
  - 12 pcs rubber plugs
  - 3 pcs protective covers with lid
  - Traceable calibration certificate
  - Weather-proof carrying case with shoulder strap

Vaisala HUMICAP® Structural Humidity Measurement Kit SHM40 offers an easy and reliable solution for humidity measurements in concrete and other structures.

### Measuring Humidity Under the Surface

Concrete dries unevenly and is usually drier on the surface. Consequently, it is important to measure beneath the surface conditions. The borehole method provides information about the humidity profile under the surface. In this method, a humidity probe is left in the borehole until the humidity in the hole has reached an equilibrium state and the stabilized values can be read.



Borehole in concrete and an HMP40S measurement probe inserted in it.

### SHM40 is All You Need for Borehole Humidity Measurement

The Vaisala HUMICAP® Structural Humidity Measurement Kit SHM40 is an ideal solution for the borehole method. The starter kit is comprised of an HMP40S probe, HM40 indicator, and accessories for the borehole method in a weather-proof case, optimized for use in harsh and humid construction sites. Additional accessories for the SHM40 can be used to prepare a moisture measurement hole in fresh concrete. Pre-formed holes eliminate the need for drilling and the risk of damaging heating elements or tubing embedded in the concrete.

# SHM40 Structural Humidity Measurement Kit

## Easy Measurement with Multiple HMP40S Probes and Quick Connectors

HMP40S measurement probes are interchangeable. The probes connect easily to the HM40 indicator with a snap-on connector enabling convenient use of multiple probes with one indicator. The measurement data can be displayed in numeric, statistic, or graph views.



Snapping a connector to the HM40 indicator to read the measurement results.

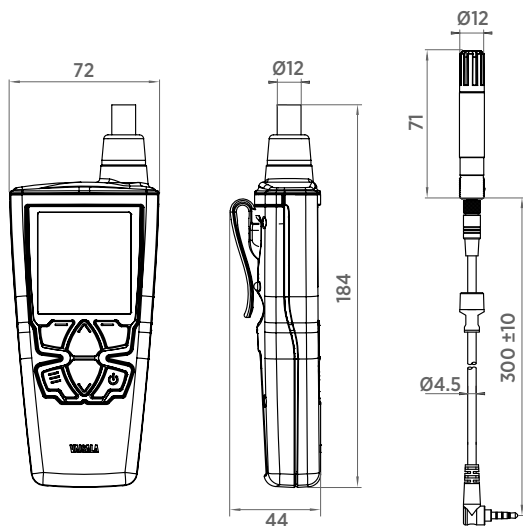
# Technical Data

## HMP40S Probe Measurement Performance

Relative Humidity	
Measurement range	0 ... 100 %RH
Accuracy (incl. non-linearity, hysteresis, and repeatability) over temperature range:	
0 ... +40 °C	0 ... 90 %RH: ±1.5 %RH 90 ... 100 %RH: ±2.5 %RH
-40 ... 0 °C and +40 ... +80 °C	0 ... 90 %RH: ±3.0 %RH 90 ... 100 %RH: ±4.0 %RH
Factory calibration uncertainty at +20 °C:	
0 ... 90 %RH	±1.1 %RH
90 ... 100 %RH	±1.8 %RH
Humidity sensor	HUMICAP® 180R
Stability	±2 %RH over 2 years
Temperature	
Measurement range	-40 ... +80 °C
Accuracy over temperature range:	
0 ... +40 °C	±0.2 °C
-40 ... 0 °C, +40 ... +80 °C	±0.4 °C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751

## HMP40S Probe Mechanical Specifications

Probe weight with standard cable	31 g
Probe housing material	Stainless steel
Probe filter and sensor protection	Membrane filter with chrome coated ABS plastic
Cable material	Wire PVC / Jacket PU
Cable connector	TRRS male 3.5 mm
Probe housing IP rating	IP65
Borehole diameter needed	16 mm
Measurement depth with standard accessories	Min. 30 mm, max. 90 mm



Dimensions in mm

## Operating Environment

Operating temperature range for probe	-40 ... +80 °C
Operating temperature range for indicator	-10 ... +60 °C
Storage temperature range	-30 ... +70 °C

## HM40 Indicator Mechanical Specifications

Weight	
Indicator with adapter	240 g
SHM40 case with standard content	3.7 kg
Indicator materials	PC/ABS blend, acrylic display lens
Indicator adapter materials	Nickel plated brass and plastic overmolding
Indicator housing IP rating	IP54
Mechanical drop endurance	1.0 m without the probe

## HM40 Indicator General Specifications

Power-up time	< 3 s
Alkaline batteries	2 × AA size, 1.5V (LR6)
Operation time (alkaline batteries)	Typical 100 hours (without backlight)
Calculated variables	Td, Tw, a, x, h
Menu languages	English, German, French, Finnish, Spanish, Swedish, Chinese (simplified), Russian, Japanese
Display	LCD (140 × 160 pixels)
Electromagnetic compatibility (EMC)	EN 61326-1, Portable equipment

## Spare Parts and Accessories

HM40 indicator with adapter and cable probe	HM40S
RH&T probe with cable	HMP40S
HM40 indicator with adapter	HM40SINDI
Quick connection adapter	HM40SADAPTER
Cable for RH&T probe	HMP40SCABLE
Long cable (2.7 m) for RH&T probe	HMP40SCABLE2
Plastic tube set (12 pcs)	19266HM
Long (200 mm) plastic tube set (12 pcs)	245789
Rubber plugs (12 pcs)	233976
Protective cover with lid (3 pcs)	19268HM
Weather-proof carrying case for SHM40 kit	CASEFORSHM40SP
USB recharger for HM40 indicator batteries	229249SP
Plastic grid with membrane filter for HMP40S probe	DRW010525SP
Accessories for Wet Concrete	
Plastic flange set (12 pcs)	26529HM
Long rubber plug for wet concrete (12 pcs)	26530HM





### Features

- Easy and reliable calibration of humidity probes and transmitters
- Based on saturated salt solutions
- Fast temperature equilibration
- No external power required
- Suitable for laboratory use and on-site checks
- Chambers and transit covers make HMK15 easy to transport
- Pre-measured certified salts available
- Vaisala Service Centers offer accredited calibrations for humidity, temperature, and barometric pressure

No measuring instrument stays accurate by itself. It is essential that the functioning of an instrument is periodically checked against a reference. Vaisala has developed Vaisala Humidity Calibrator HMK15 to make calibration and spot-checking of humidity probes and transmitters easy and reliable.

### Benefits

- Easy to use
- Reliable calibration
- Certified and pre-measured salts available on order form of HMK15

### Reliable calibration method

The operating principle of HMK15 is based on the fact that a saturated salt solution generates a certain relative humidity in the air above it. The reading of the humidity probe or transmitter can then be adjusted accordingly. Many calibration laboratories use this generally accepted and reliable method to

calibrate humidity instruments. Usually two or three different salt solutions are used. Salts are chosen according to the application. Available salts and their reference humidities:

- Lithium chloride LiCl (11 %RH)
- Magnesium chloride  $MgCl_2$  (33 %RH)
- Sodium chloride NaCl (75 %RH)
- Potassium chloride KCl (85 %RH)
- Potassium sulphate  $K_2SO_4$  (97 %RH)

### Certified salts

HMK15 can be ordered with certified and pre-measured salts. A sample calibration is made from each salt batch in Vaisala's Measurement Standards Laboratory (MSL).

### FINAS accredited measurement standards laboratory

Vaisala's Measurement Standards Laboratory is a FINAS accredited calibration laboratory. FINAS is a member of the EA (the European Cooperation for Accreditation).





# Technical data

## Operating environment

Operating temperature range	+0 ... +50 °C (+32 ... +122 °F)
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## Mechanical specifications

Dimensions (H × W × L)	90 × 230 × 200 mm (3.54 × 9.06 × 7.87 in)
Weight	1 kg (2.20 lb) without salt solutions
Material (metal parts)	Anodized aluminum

## Parts

<b>Standard contents of HMK15 calibrator</b>
Base plate
Two salt chambers with basic lids and transit covers
Thermometer
Measurement cup and mixing spoon
Calibration adapter (Ø13.5 mm) for Ø12 mm probes with long sensor legs
Calibration adapter (Ø13.5 mm) for Ø12 mm probes with short sensor legs
<b>Optional items</b>
See table <i>Spare parts and accessories</i>

## Spare parts and accessories

Rubber plug set	19746HM
O-ring set	218096
Ion exchanged water	19767HM
Thermometer with red capillary liquid	25130HM
Transit bag	HM27032
<b>Salt chambers and lids</b>	
HMK15 basic lid	271549
HMK15 universal lid	271550
HMK15 custom lid for 4 × HMP110 with filter on	253277SP
HMK15 custom lid for DMT132 and HMP60/HMP110 with filter on	230914
HMK15 salt chamber with basic lid and transit cover	DRW255417SP
HMK15 salt chamber with universal lid and transit cover	19766HM
<b>Calibration adapters</b>	
Calibration adapter for HMP9 probe	ASM213801
Calibration adapter (Ø13.5 mm) for Ø12 mm probes with long sensor legs	211302SP
Calibration adapter (Ø13.5 mm) for Ø12 mm probes with short sensor legs	218377SP
Calibration adapter for HMP42 probe	HM37067
<b>Certified and ready-dosed salts <sup>1)</sup></b>	
Ready-dosed LiCl salt package (LiCl salt 11 %RH, total uncertainty ±1.3 %RH) <sup>2)</sup>	19729HM
Ready-dosed MgCl <sub>2</sub> salt package (MgCl <sub>2</sub> salt 33 %RH, total uncertainty ±1.2 %RH) <sup>2)</sup>	19730HM
Ready-dosed NaCl salt package (NaCl salt 75 %RH, total uncertainty ±1.5 %RH) <sup>2)</sup>	19731HM
Ready-dosed KCl salt package (KCl salt 85 %RH, total uncertainty ±2.0 %RH) <sup>2)</sup>	251377HM
Ready-dosed K <sub>2</sub> SO <sub>4</sub> salt package (K <sub>2</sub> SO <sub>4</sub> salt 97 %RH, total uncertainty ±2.0 %RH) <sup>2)</sup>	19732HM

1) Calibration certificate included with each salt package.  
2) Uncertainties given at +20 °C (+68 °F).

## HMP155 Humidity and Temperature Probe



HMP155 with an additional temperature probe and optional Stevenson screen installation kit.

### Features

- Vaisala HUMICAP®180R sensor: superior long-term stability
- Optional warmed humidity probe and chemical purge
- Plug-and-play
- USB connection for service use
- Use with DTR13 and DTR503 radiation shields and a Stevenson screen
- Weather-proof housing IP66
- Optional, fast temperature probe
- Different output possibilities: voltage, RS-485, resistive Pt100
- Applications: meteorology, aviation and road weather, instrumentation

Vaisala HUMICAP® Humidity and Temperature Probe HMP155 provides reliable humidity and temperature measurement. It is designed especially for demanding outdoor applications.

### Long-term stability

HMP155 uses the proven Vaisala HUMICAP®180R sensor that has excellent stability and withstands well harsh environments. The probe structure is solid and the sensor is protected by default with a sintered teflon filter, which gives maximum protection against water, dust, and dirt.

### Warmed probe and high-humidity environment

Measuring humidity reliably is challenging in environments where humidity is near saturation. Measurements may be corrupted by fog, mist, rain, and heavy dew. A wet probe may not give an accurate measurement in the ambient air.

This is an environment to which Vaisala has designed this patented, warmed probe for reliable measurements. As the sensor head is warmed continuously, the humidity level inside it stays below the ambient level. Thus, it also reduces the risk of condensation forming on the probe.

### Fast measurements

With its fast response time, the additional temperature probe for HMP155 is ideal for measuring in environments with changing temperatures. The membrane filter speeds up the relative humidity measurement.

### Long lifetime

Protecting the sensor from precipitation, and scattered and direct solar radiation increases its lifetime. Thus, Vaisala recommends installing HMP155 in one of the following radiation shields: DTR503, DTR13, or Stevenson screen. For the additional temperature probe, an installation kit is available for Vaisala DTR502 Radiation Shield.

### Calibration

The probe can be calibrated using a computer with a USB cable, with the push buttons, or with the MI70 indicator.

# Technical Data

## Humidity measurement performance

Sensor	HUMICAP®R2, 180R and INTERCAP for typical applications HUMICAP®R2C, 180RC and INTERCAPC for applications with chemical purge and/or warmed probe
Observation range	0-100 %RH
Response time at +20 °C (+68 °F) in still air with sintered Teflon filter	63 %: 20 s 90 %: 60 s
Factory calibration uncertainty at +20 °C (+68 °F) <sup>1)</sup>	±0.6 %RH (0-40 %RH) ±1.0 %RH (40-95 %RH)
<b>Accuracy (including non-linearity, hysteresis, and repeatability)</b>	
At +15 ... +25 °C (+59 ... +77 °F)	±1 %RH (0-90 %RH) ±1.7 %RH (90-100 %RH)
At -20 ... +40 °C (-4 ... +104 °F)	±(1.0 + 0.008 × reading) %RH
At -40 ... -20 °C (-40 ... -4 °F)	±(1.2 + 0.012 × reading) %RH
At +40 ... +60 °C (+104 ... +140 °F)	±(1.2 + 0.012 × reading) %RH
At -60 ... -40 °C (-76 ... -40 °F)	±(1.4 + 0.032 × reading) %RH

<sup>1)</sup> Defined as ±2 standard deviation limits. Small variations possible (see also the calibration certificate).

## Temperature measurement performance

Sensor	Pt100 RTD element, Class F 0.1 IEC 60751
Observation range	-80 ... +60 °C (-112 ... +140 °F)
Response time for additional temperature probe in 3 m/s (7 mph) air flow	63 %: < 20 s 90 %: < 35 s
Other measured variables	Dew point / frost point temperature, wet bulb temperature, mixing ratio

### Accuracy with voltage output

At -80 ... +20 °C (-112 ... +68 °F)	±(0.226 - 0.0028 × temperature) °C
At +20 ... +60 °C (+68 ... +140 °F)	±(0.055 + 0.0057 × temperature) °C

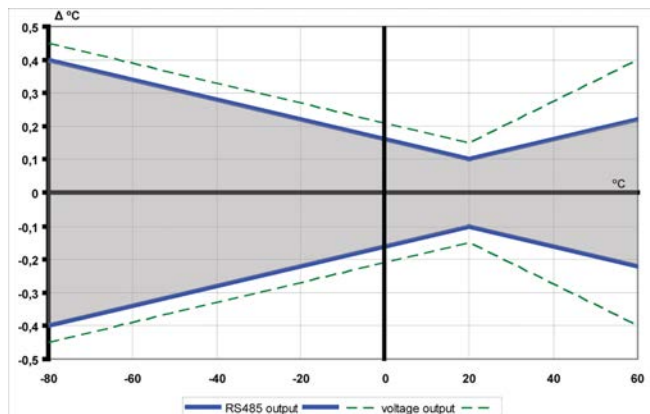
### Accuracy with passive (resistive) output

According to Tolerance Class AA IEC 60751 <sup>1)</sup>	±(0.1 + 0.0017 ×  temperature ) °C
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### Accuracy with RS-485 output

At -80 ... +20 °C (-112 ... +68 °F)	±(0.176 - 0.0028 × temperature) °C
At +20 ... +60 °C (+68 ... +140 °F)	±(0.07 + 0.0025 × temperature) °C

<sup>1)</sup> Tolerance Class AA IEC 60751 corresponds to IEC 751 1/3 Class B



HMP155 accuracy over temperature range: voltage and RS-485

## Operating environment

Operating temperature for humidity measurement	-80 ... +60 °C (-112 ... +140 °F)
Storage temperature	-80 ... +60 °C (-112 ... +140 °F)
Operating humidity	0-100 %RH
IP rating	IP66

## Inputs and outputs

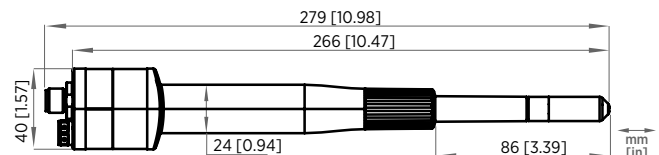
Operating voltage	7-28 V DC
Minimum operating voltage	0-1 V output or RS-485: 7 V 0-5 V output, or warmed probe: 12 V 0-10 V output, chemical purge, or XHEAT: 16 V
Outputs	Voltage output: 0-1 V, 0-5 V, 0-10 V Resistive Pt100 4-wire connection RS-485
Average power consumption (+15 V DC, load 100 kΩ)	0-1 V output: < 3 mA 0-10 V output: +0.5 mA RS-485: < 4 mA During chemical purge: Maximum 110 mA With warmed probe: Maximum 150 mA
Settling time at startup	Voltage output: 2 s RS-485: 3 s

## Mechanical specifications

Dimensions (H × W)	279 × 40 mm (10.9 × 1.6 in)
Weight	93 g (3.25 oz)
Length of additional T-probe cable	2 m (6 ft 7 in)
Connection	8-pin male M12 connector
Connection cables	3.5 m (11 ft 6 in), 10 m (32 ft 10 in), 30 m (98 ft 5 in)
Maximum wire size	0.129 mm <sup>2</sup> (26 AWG)
Service cables	USB connection cable MI70 connection cable

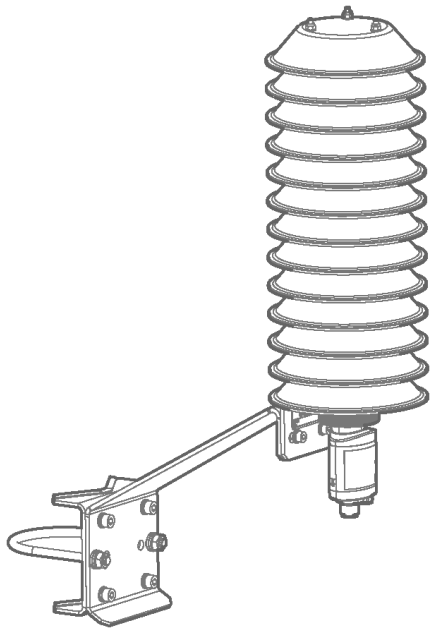
### Materials

Filter	Sintered Teflon or membrane
Housing	Polycarbonate (PC)
Additional temperature probe	Stainless steel AISI 316L
Cable	PUR



Dimensions in mm (inches)

## DTR500 Solar Radiation and Precipitation Shields



Vaisala Radiation Shield Series DTR500 are solar radiation and precipitation shields supporting humidity probe installations in outdoor applications.

### Sensor protection

The maintenance-free DTR500 series shields protect the humidity and temperature sensors from solar radiation and precipitation. They provide excellent ventilation while blocking both direct and reflected solar radiation.

The special plastic used in the plates has excellent thermal characteristics: the white outer surface reflects radiation, and the black inside absorbs accumulated heat. The shields can be easily installed on a vertical pole, horizontal beam, or flat surface.

The DTR shields can be used with the following Vaisala products:

### Features

- Protection for temperature and humidity probes from scattered and direct solar radiation and rain
- Maintenance-free
- Naturally ventilated
- Easy to install on a vertical pole, horizontal beam, or flat surface
- Suitable for a wide selection of applications
- Choice of shields and mounting accessories

### DTR503(A)

Vaisala HUMICAP® Humidity and Temperature Probe HMP155

### DTR504(A)

Vaisala HUMICAP® Humidity and Temperature Transmitters HMT120/130

Vaisala HUMICAP® Humidity and Temperature Probe HMP110

Vaisala INTERCAP® Humidity and Temperature Probe HMP60

### DTR502(A) with adapter 221072

Vaisala HUMICAP® Humidity and Temperature Probe HMP155's additional temperature sensor

### DTR502B

Vaisala HUMICAP® Humidity and Temperature Transmitters HMT333, HMT337, HMT373, and HMT377

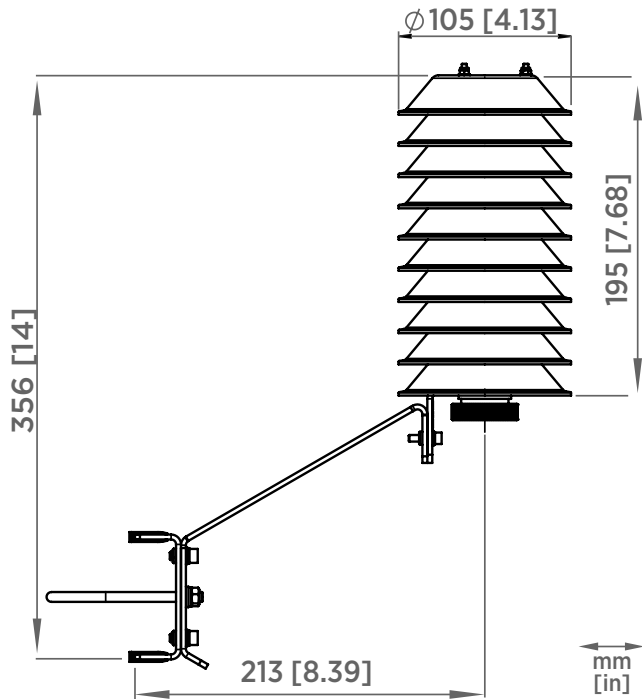
Vaisala HUMICAP® Humidity and Temperature Probes HMP3 and HMP7

Vaisala Combined Pressure, Humidity and Temperature Transmitters PTU303 and PTU307

# Technical data

## DTR502B for HMT333, HMT337, HMT373, HMT377, HMP3, HMP7, PTU303, and PTU307

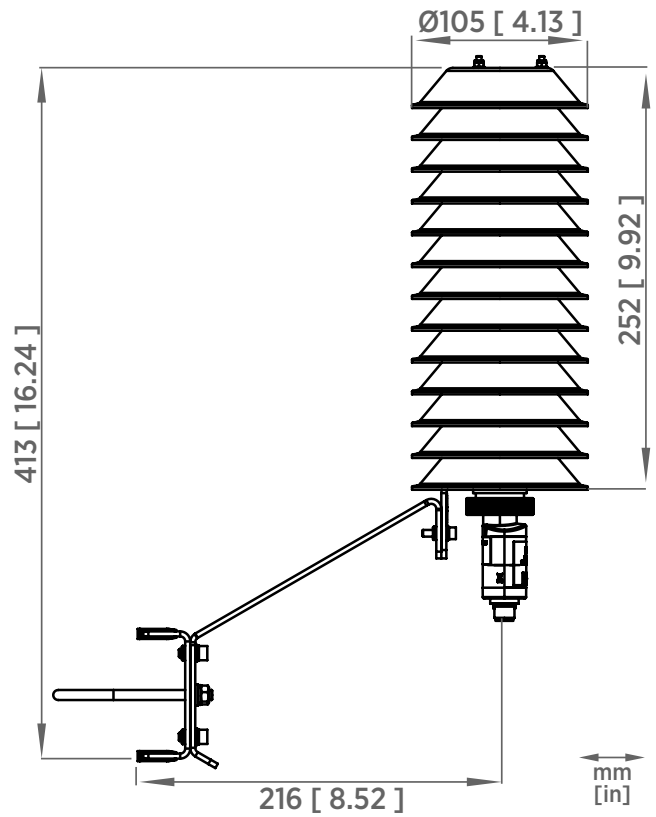
Dimensions (H × W)	195 × 105 mm (7.68 × 4.13 in)
Accessories	Product specific adapter



DTR502B dimensions

## DTR503A for HMP155

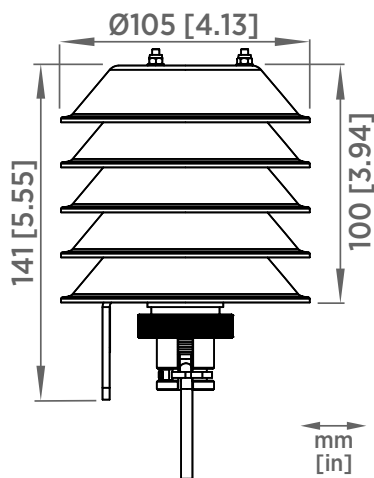
Dimensions (H × W)	252 × 105 mm (9.92 × 4.13 in)
Accessories	Horizontal beam assembly Pole mast installation kit



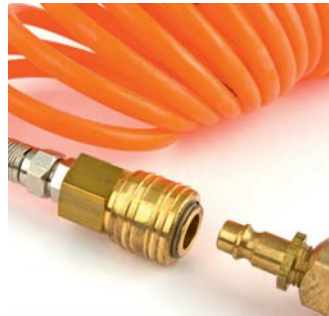
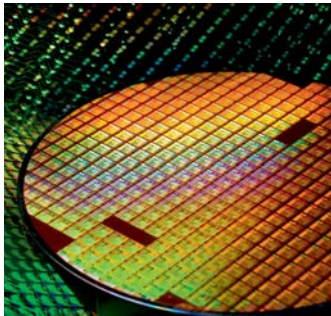
DTR503A dimensions

## DTR504 for HMT120/130 remote probes, HMP110, and HMP60

Dimensions (H × W)	141 × 105 mm (5.55 × 4.13 in)
Accessories	Horizontal beam assembly Pole mast installation kit



DTR504 dimensions



### DRYCAP sensor's key benefits and features

- High chemical tolerance
- Withstands saturation
- Fast response time
- Sensor purge and warming
- Excellent accuracy and stability
- Vaisala quality

As the leading developer and provider of humidity measurement instruments, Vaisala knows also the very dry measurement conditions.

### Reliable data needed

The demand for reliable moisture measurement instruments grew in the 90s, and it was noticed that the traditional humidity probes were not accurate enough at very low humidity levels. The commonly used aluminum oxide sensors were prone to drift and required frequent calibration. A new type of a moisture sensor was needed.

### Taking every measure for the planet

We took on the challenge by combining the highest quality polymer technology with a patented key feature – autocalibration – that would eliminate sensor drift in very dry conditions.

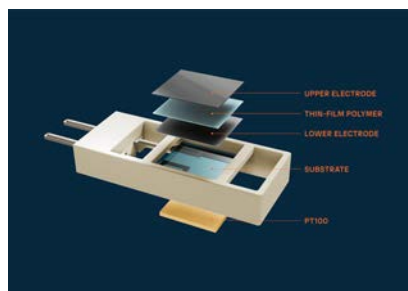
### The era of DRYCAP begins

In 1997, we introduced a new type of dew point sensor based on thin-film polymer technology, the DRYCAP sensor, that could be used in various Vaisala probes for dry measurement conditions.

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 Vaisala DRYCAP works

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



Structure of the DRYCAP sensor

### Autocalibration

Vaisala's patented autocalibration function optimizes the measurement stability in dry environments. The sensor is heated at regular intervals during the automated autocalibration 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.

### Sensor purge

Sensor purge is also an automatic procedure that minimizes the drift at the wet end readings of the dew point measurement. Sensor purge is performed regularly and when the power is switched on. The sensor is heated for several minutes, which will then evaporate all excess molecules out of the sensor polymer. This, together with the autocalibration, results in a very small drift. The measurement output of the transmitter is frozen to the last measured value for the duration of the sensor purge.

### **The parameter of high demand**

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 and this highly successful innovation is continuously growing its demand.

### **When process measurement truly matters**

An example of the several demanding industrial applications where Vaisala DRYCAP technology is used today is battery manufacturing. Due to the ultra-

low humidity requirement and highly controlled atmospheric conditions, reliable dew point measurement is a must. The accurate and stable data the instruments provide, enable controlling the moisture levels along any critical locations of the process, such as the electrode production.

### **DRYCAP application examples**

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.

## 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  $\pm 2$  °C ( $\pm 3.6$  °F)  $T_{d/f}$
- Sensor purge improves long-term stability and chemical resistance
- Condensation-tolerant
- Modbus RTU over RS-485
- Compatible with Vaisala Indigo products 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 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 autocalibrates to ensure accurate measurement.

### Sensor purge minimizes effects of contaminants

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

Sensor 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring and troubleshooting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

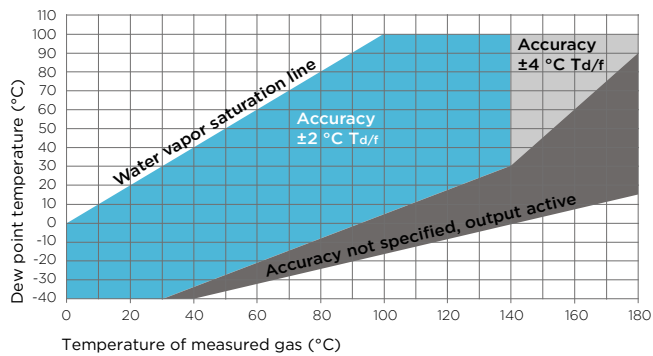


# Technical data

## Measurement performance

Dew point	
Sensor	DRYCAP® 180S
Measurement range	-40 ... +100 °C (-40 ... +212 °F) T <sub>d/f</sub>
Accuracy	±2 °C (±3.6 °F) T <sub>d/f</sub> See accuracy graph
Response time 63 % [90 %] <sup>1)</sup>	
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)
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 <sup>3</sup>
Accuracy	±10 % of reading (typical)

1) Tested with sintered filter.



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

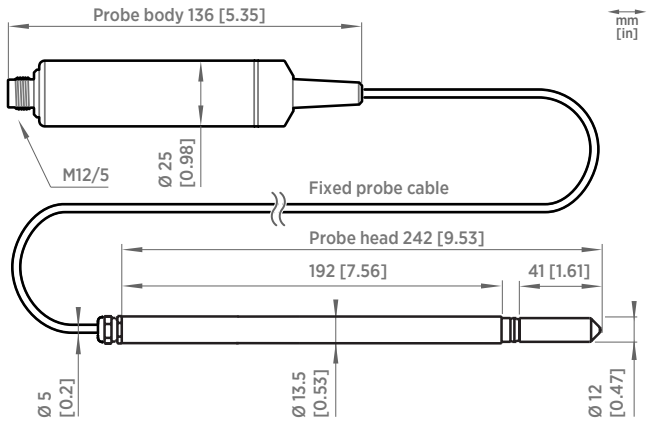
## Compliance

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

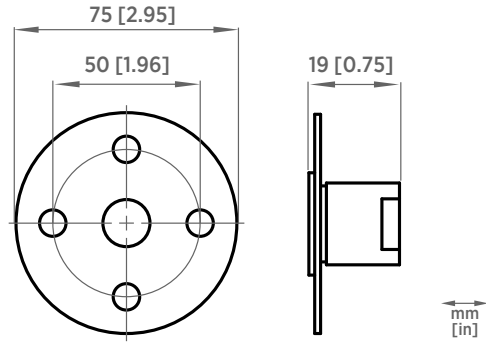


## Mechanical specifications

Connector	M12 5-pin A-coded male
Weight (with a 2-m cable)	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 <sup>1)</sup>	USB2

<sup>1)</sup> Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://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  $\pm 2$  °C ( $\pm 3.6$  °F)  $T_{d/f}$
- Sensor purge improves long-term stability and chemical resistance
- Condensation-tolerant
- Modbus RTU over RS-485
- Compatible with Vaisala Indigo products 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 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.

### Sensor purge minimizes effects of contaminants

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

Sensor 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring and troubleshooting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

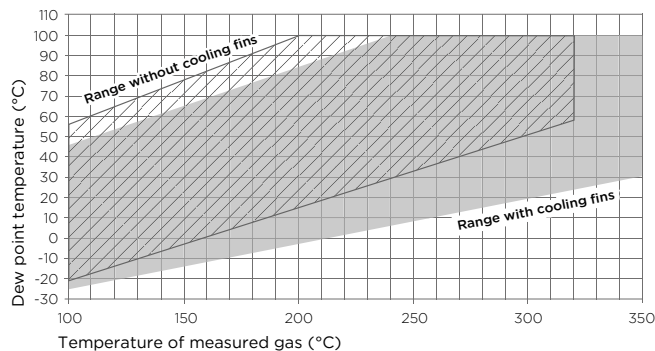
## Measurement performance

Dew point	
Sensor	DRYCAP® 180S
Measurement range	-25 ... +100 °C (-13 ... +212 °F) T <sub>d/f</sub>
Accuracy	±2 °C (±3.6 °F) T <sub>d/f</sub>
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 <sup>1) 2)</sup>	+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 <sup>3)</sup>
IP rating	IP66

- 1) Installation of cooling fins on the cooling set affects the operating temperature range. See the operating range graph.
- 2) The operating range specifications apply in stand-still air. High flow rates in the process may reduce the probe performance and cause damage to the equipment.
- 3) 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 and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Type approvals	DNV GL certificate no. TAA00002YT
Compliance marks	CE, China RoHS, RCM

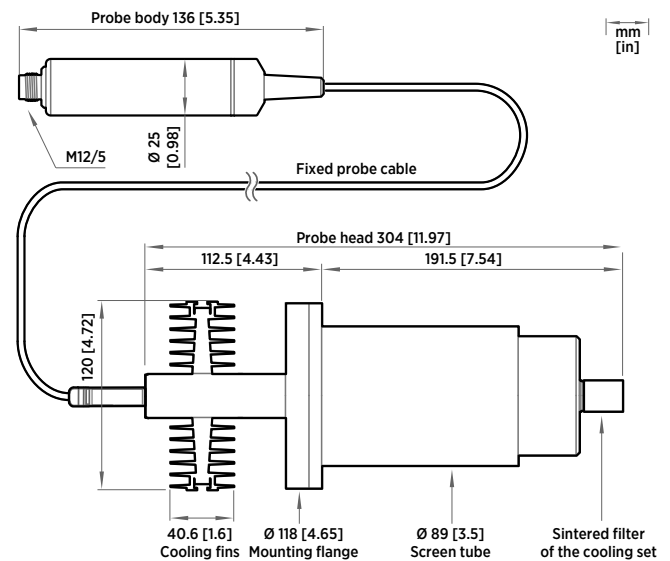


## Output parameters

Dew point temperature (°C)	Water concentration (ppm <sub>v</sub> )
Dew/frost point temperature (°C)	Water concentration (wet basis) (vol-%)
Dew/frost point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
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 (with a 2-m cable)	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

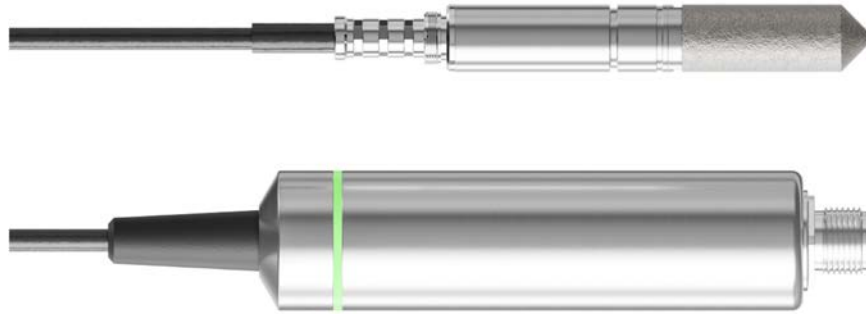
## Accessories

Cooling set	DMP246CS
Indigo USB adapter <sup>1)</sup>	USB2

<sup>1)</sup> Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://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 improves long-term stability and chemical resistance
- Tolerates condensation, oils, dust, and most chemicals
- Modbus RTU over RS-485
- Compatible with Vaisala Indigo products 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.

### Sensor purge minimizes effects of contaminants

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

Sensor 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

An 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 can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

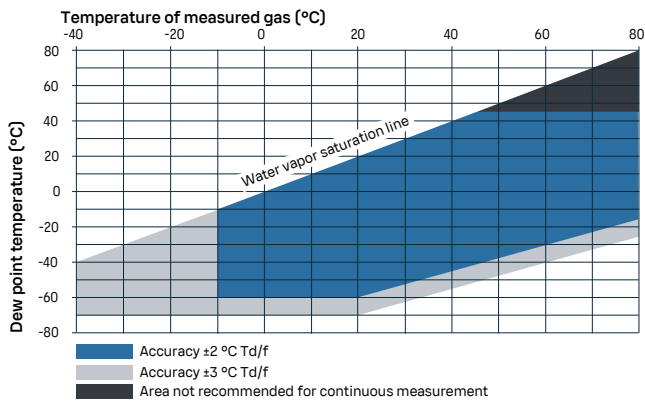
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring and troubleshooting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

Dew point	
Sensor	DRYCAP® 180M
Measurement range	-70 ... +80 °C (-94 ... +176 °F) T <sub>d/f</sub>
Measurement range for continuous use	-70 ... +45 °C (-94 ... +113 °F) T <sub>d/f</sub>
Accuracy	Up to ±2 °C (±3.6 °F) T <sub>d/f</sub> See accuracy graph
Response time 63 % [90 %] <sup>1)</sup>	
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 FO.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 psi), absolute
Measurement environment	For air, nitrogen, hydrogen, argon, helium, oxygen <sup>1)</sup> , 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

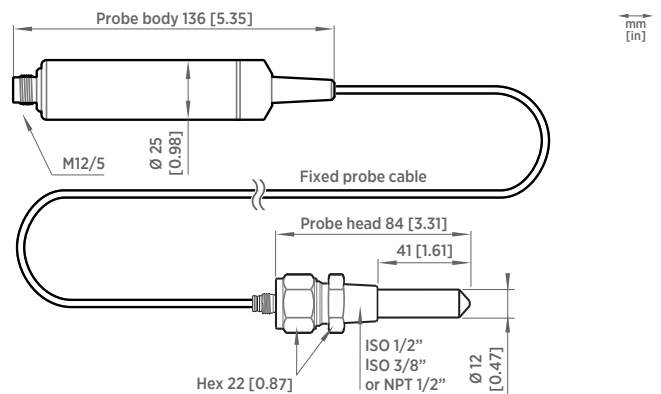
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, RCM

## Output parameters

Absolute humidity (g/m <sup>3</sup> )	Relative humidity (%RH)
Absolute humidity at NTP (g/m <sup>3</sup> )	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm <sub>v</sub> )
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm <sub>w</sub> )
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
Probe cable length	0.15 m (0.49 ft), 2 m (6.56 ft) or 10 m (32.80 ft)
Materials	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP



## DMP7 dimensions

## Accessories

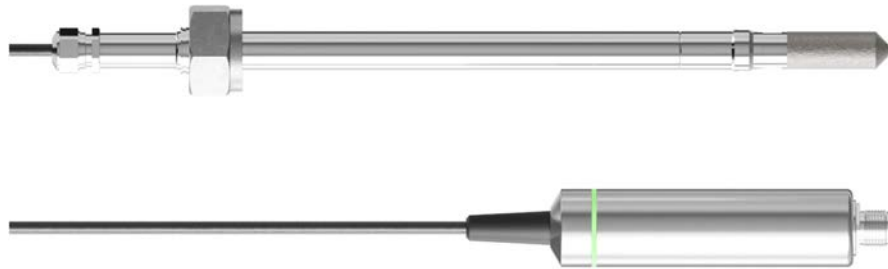
Swagelok ISO 3/8"	SWG12ISO38
Swagelok ISO 1/2"	SWG12ISO12
Swagelok NPT 1/2"	SWG12NPT12
Magnetic probe holder for Ø 12 mm probe heads <sup>1)</sup>	ASM213382SP
Indigo USB adapter <sup>2)</sup>	USB2

1) Not suitable for use at extreme temperatures.

2) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://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 0–40 bar (0–580 psi), absolute
- Adjustable installation depth
- Tolerates condensation, oils, dust, and most chemicals
- Sensor purge improves long-term stability and chemical resistance
- Modbus RTU over RS-485
- Compatible with Vaisala Indigo products 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.

### Sensor purge minimizes effects of contaminants

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

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

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

### Flexible connectivity

The probe can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. 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](http://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.

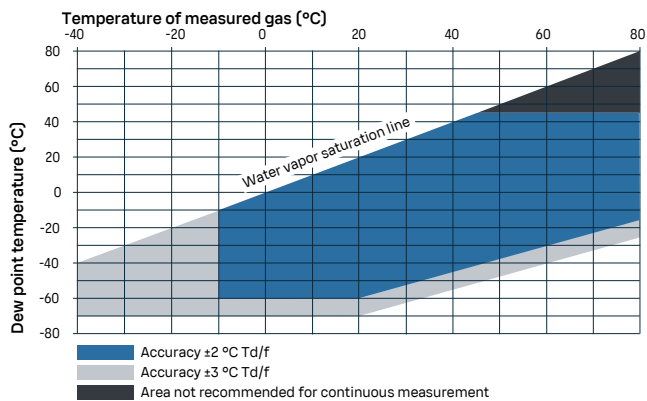
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring and troubleshooting the probe. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

<b>Dew point</b>	
Sensor	DRYCAP® 180M
Measurement range	-70 ... +80 °C (-94 ... +176 °F) T <sub>d/f</sub>
Measurement range for continuous use	-70 ... +45 °C (-94 ... +113 °F) T <sub>d/f</sub>
Accuracy up to 20 bar/290 psia	±2 °C/±3.6 °F T <sub>d/f</sub> See accuracy graph
Accuracy, 20 ... 40 bar/290 ... 580 psia	Additional inaccuracy +1 °C T <sub>d/f</sub>
Response time 63 % [90 %] <sup>1)</sup> :	
From dry to wet	5 s [15 s]
From wet to dry	45 s [8 min]
<b>Temperature</b>	
Measurement range	0 ... +80 °C (+32 ... +176 °F)
Accuracy	±0.2 °C at room temperature
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751
<b>Relative humidity</b>	
Measurement range	0-70 %RH
Accuracy (RH <10 %RH, at +20 °C)	±0.004 %RH + 20% of reading
<b>Concentration by volume (ppm)</b>	
Measurement range (typical)	10-2500 ppm
Accuracy (at +20 °C, 1 bar)	1 ppm + 20% of reading

<sup>1)</sup> 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 psi), absolute
Measurement environment	For air, nitrogen, hydrogen, argon, helium, oxygen <sup>1)</sup> , and vacuum
IP rating for probe body	IP66
Mechanical durability of probe head	Up to +180 °C (+356 °F) Up to 70 bar/1015 psi, absolute
<b>Ball valve</b>	
Operating temperature	Up to +100 °C (+212 °F)
Operating pressure	Up to 40 bar (580 psi), absolute

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

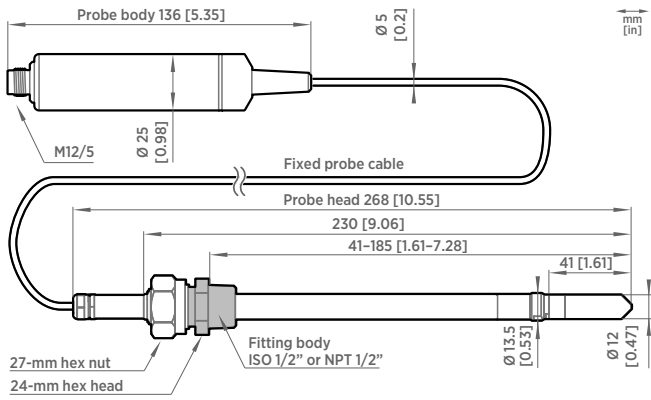
## Compliance

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

## Mechanical specifications

Connector	M12 5-pin A-coded male
Weight (with a 2-m cable)	512 g (18.1 oz)
Probe cable length	2 m (6.56 ft)
<b>Materials</b>	
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 kit ISO 1/2" with welding joint	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 <sup>1)</sup>	242659
Weatherproof carrying case for Indigo80 and a series 8 probe <sup>2)</sup>	ASM215318

<sup>1)</sup> Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).

<sup>2)</sup> For example, MMP8, HMP8, or DMP8 with a max. 2-m (6.6-ft) probe connection cable.

## DMT152 Dew Point Transmitter

For low dew point measurement in OEM applications



### Features

- Vaisala DRYCAP® technology with a polymer sensor
- Measures dew point down to  $-80\text{ °C}$  ( $-112\text{ °F}$ )
- Withstands condensation
- Traceable calibration (certificate included)
- Applications: dry chambers, dry gases, semiconductor manufacturing, research and testing, and compressed air

Vaisala DRYCAP® Dew Point Transmitter DMT152 is designed for measuring low dew point in OEM applications, even down to  $-80\text{ °C}$  ( $-112\text{ °F}$ ). The excellent long-term stability and reliability of its performance is based on the latest DRYCAP polymer sensor technology.

### Low Maintenance

The DMT152 mechanics have been designed for harsh environments requiring protection against dust, dirt, and splashed water. The DRYCAP technology has a low maintenance need due to its excellent long-term stability and durability against condensation.

### Applications

The DMT152 is an ideal choice for industrial applications where it is necessary to control very low humidity. Most typical areas of use are air and plastics dryers, dry chambers, dry gases, and high-voltage circuit breakers.

The DMT152 measures accurately and reliably also in the challenging combination of low humidity and hot air, which is typical in plastics drying.

### Benefits

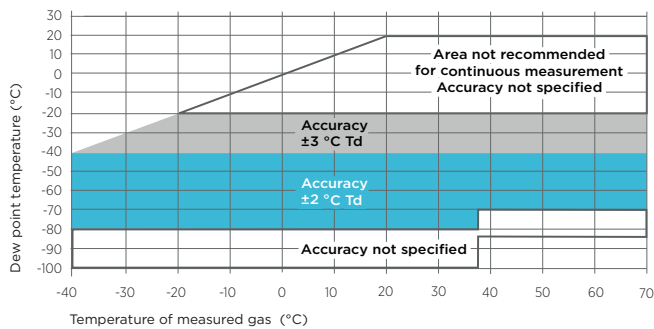
- Accurate
- Compact
- Fast response time
- Reduced maintenance costs due to long calibration interval

# Technical Data

## Measurement performance

Sensor	Vaisala DRYCAP® 180U Thin-film capacitive polymer sensor
Recommended calibration interval	2 years
<b>Dew point temperature<sup>1)</sup></b>	
Measurement range	-80 ... -20 °C (-112 ... -4 °F) T <sub>d</sub>
<b>Accuracy</b>	
-80 ... -40 °C (-112 ... -40 °F)	±2 °C (3.6 °F) T <sub>d</sub>
-40 ... -20 °C (-40 ... -4 °F)	±3 °C (5.4 °F) T <sub>d</sub>
Non-calibrated range	-100 ... +20 °C (-148 ... +68 °F) T <sub>d</sub>
Typical response time 63 % [90 %] at a gas temperature of +20 °C (+68 °F) and pressure of 1 bar:	
-20 ... -80 °C T <sub>d</sub>	0.5 min [7.5 min]
-80 ... -20 °C T <sub>d</sub>	2 s [5 s]
Typical long-term stability	Better than 2 °C (3.6 °F) / year
<b>Concentration by volume (ppm)</b>	
Measurement range (typical)	0 ... 500 ppm
Accuracy at +20 °C (+68 °F), 1013 mbar	±(0.2 ppm + 20 % of reading)

1) When the dew point is below 0 °C, the transmitter outputs frost point for T<sub>d</sub>.



## Accuracy over temperature range

## Inputs and outputs

Two analog outputs (scalable)	4 ... 20 mA, 0 ... 20 mA (3-wire) 0 ... 5 V, 0 ... 10 V
Digital output	RS-485 (2-wire)
Alarm-level indication by analog signal	User selectable
Purge information	5 V, 10 V, 20 mA, or LED
Accuracy of analog outputs	±0.01 V / ±0.01 mA
<b>Operating voltage</b>	
RS-485 output	11 ... 28 VDC <sup>1)</sup>
Voltage output	15 ... 28 VDC <sup>1)</sup>
Current output	21 ... 28 VDC
<b>Supply current</b>	
Normal measurement	20 mA + load current
During self-diagnostics	Max. 220 mA pulsed
Supply voltage fluctuation	Max. 0.3 V
<b>External load</b>	
Voltage output	Min. 10 kΩ
Current output	Max. 500 Ω

1) For extended temp. down to -40 °C (-40 °F) or pressure up to 50 bar (725 psia), the supply voltage is 21 ... 28 VDC.

## Operating environment

Temperature	-40 ... +70 °C (-40 ... +158 °F)
Relative humidity	0 ... 100 %RH (up to +20 °C / +68 °F)
Pressure	0 ... 50 bar (725 psia)
Measurement environment	For air, nitrogen, argon, helium, and oxygen <sup>1)</sup> Not suitable for measurements in hydrogen or pure carbon dioxide
Sample flow rate	No effect on measurement accuracy
EMC compliance	EN61326-1, Industrial environment

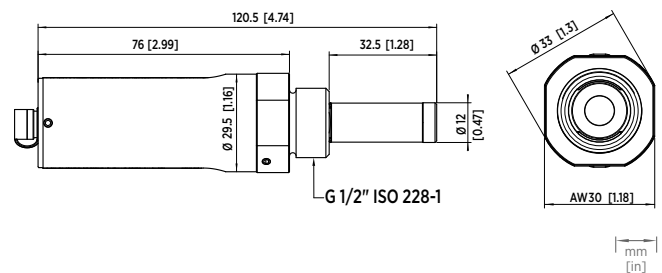
1) Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases.

## Mechanical specifications

Housing material (wetted parts)	AISI316L
Stainless steel mesh filter	Filter body AISI303, mesh AISI316L, grade 18 μm
Mechanical connections	ISO G1/2", NPT 1/2", UNF 3/4"-16", UNF 5/8"-18"
IP rating	IP66
Storage temperature range	-40 ... +80 °C (-40 ... +176 °F)
Weight (ISO G1/2")	190 g (6.70 oz)

## Accessories

Connection cable for MI70 handheld indicator	219980
USB cable for PC connection	219690
Loop-powered external display (Nokeval 301)	226476
Loop-powered external display with relays (Nokeval 302)	234759
NW40 flange	225220SP
<b>Sampling cells (available for ISO G1/2")</b>	
Basic sampling cell	DMT242SC
With Swagelok 1/4" male connectors	DMT242SC2
With a quick connector and leak screw	DSC74
Two-pressure sampling cell	DSC74B



DMT152 dimensions



## DMT143 Dew Point Transmitter For OEM applications



### Features

- Vaisala DRYCAP® technology with a unique autocalibration function
- Calibration interval of 2 years
- Dew point measurement range  $-70 \dots +60 \text{ }^{\circ}\text{C}$  ( $-94 \dots +140 \text{ }^{\circ}\text{F}$ )
- Accuracy  $\pm 2 \text{ }^{\circ}\text{C}$  ( $\pm 3.6 \text{ }^{\circ}\text{F}$ )
- Withstands condensation
- Compatible with Vaisala Indigo80 handheld indicator and Insight PC software
- Traceable calibration
- Voltage (V) or current (mA) analog output
- RS-485 digital output with Modbus® RTU support
- LED alarm for exceeded dew point level
- Fast response time

Due to its wide measurement range and excellent long-term stability, Vaisala DRYCAP® Dew Point Transmitter DMT143 is an ideal choice for small compressed air dryers, plastic dryers, and other OEM applications.

### Vaisala DRYCAP® technology

Vaisala DRYCAP® Dew Point Transmitter DMT143 is a miniature dew point measurement instrument.

The transmitter can be installed directly into pressurized systems at 50 bar (725 psia) maximum pressure. The long-term high performance is achieved with Vaisala DRYCAP® technology.

The sensor fully withstands getting wet, and therefore, the transmitter performs exceptionally well in applications that occasionally experience process water spikes, such as pipeline condensation during a system failure or start-up.

The sensor is also highly resistant to particulate contamination, oil vapor, and most chemicals, and is insensitive to the flow rate.

### Long calibration interval

The calibration interval of DMT143 is 2 years. For any adjustment needs, the transmitter can be sent to a Vaisala Service Center.

The unique autocalibration function, developed by Vaisala, detects possible measurement inaccuracies and automatically corrects dry-end drift in the calibration curve. This ensures accurate measurements and long calibration intervals.

### Easy installation

DMT143 has a variety of features to choose from, including different output and installation options, and alarm LED.

Due to its small size and light weight, DMT143 is quickly and easily installed in tight spaces or in small-size pipelines.

The alarm LED indicates too high dew point in the process. The trigger point is preset at the factory. It can be later adjusted with the convenient Vaisala Insight PC software for Windows®.

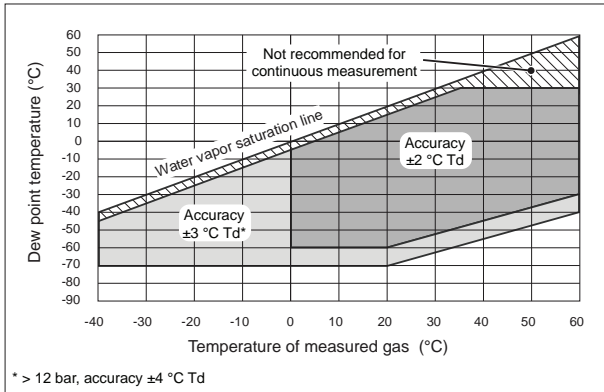
Insight PC software and the Indigo80 handheld indicator can also be used for other configuration options, as well as for viewing and logging measurement data (for more information, see [www.vaisala.com/insight](http://www.vaisala.com/insight) and [www.vaisala.com/indigo](http://www.vaisala.com/indigo)).

# Technical data

## Measurement performance

Sensor	DRYCAP® 180D
Sensor protection	Stainless steel sintered filter
Recommended calibration interval to confirm the specified accuracy	2 years
<b>Dew point temperature</b>	
Measurement range (typical)	-70 ... +60 °C (-94 ... +140 °F) T <sub>d</sub>
Accuracy in air or N <sub>2</sub> <sup>1)</sup>	±2 °C (±3.6 °F) T <sub>d</sub> (see graph below)

### Dew point accuracy vs. measurement conditions:



### Analog output scalings:

Option 1	-80 ... +20 °C (-112 ... +68 °F) T <sub>d</sub>
Option 2	-80 ... +20 °C (-112 ... +68 °F) T <sub>d</sub> dew point at ambient pressure
Option 3	Free scaling

### Response time 63 % [90 %]: <sup>2)</sup>

-70 → -20 °C T <sub>d</sub> (-94 → -4 °F T <sub>d</sub> )	5 s [15 s] (typical)
-20 → -70 °C T <sub>d</sub> (-4 → -94 °F T <sub>d</sub> )	45 s [10 min] (typical)

### Water concentration by volume (ppm)

Measurement range (typical)	10 ... 40 000 ppm
Accuracy at +20 °C (+68 °F), 1 bar	1 ppm + 20 % of reading

- <sup>1)</sup> When the dew point is below 0 °C (32 °F), the transmitter outputs frost point.  
<sup>2)</sup> At +20 °C gas temperature and 1 bar pressure and 1 liter/min flow rate.

## Operating environment

Measurement environment	For air, nitrogen, hydrogen, argon, helium, and oxygen <sup>1) 2)</sup>
Temperature <sup>3)</sup>	-40 ... +60 °C (-40 ... +140 °F)
Relative humidity	0 ... 100 % RH
Pressure <sup>3)</sup>	0 ... 50 bar <sub>a</sub> (725 psi <sub>a</sub> )
Sample flow rate	No effect for measurement accuracy
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
IP rating	IP66

- <sup>1)</sup> Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases. The transmitter is not certified for use in hazardous areas with potentially explosive atmospheres.  
<sup>2)</sup> The transmitter not tested for leakages, which may occur especially with small-molecule gases such as hydrogen and helium.  
<sup>3)</sup> For extended temperature below 0 °C (+32 °F) or pressure above 20 bar<sub>a</sub> (290 psi<sub>a</sub>) the supply voltage must be 24 ... 28 V DC.

## Inputs and outputs

Analog output (scalable)	4 ... 20 mA (3-wire), 0 ... 1 V / 5 V, 1 ... 5 V
Resolution for current output	0.002 mA
Resolution for voltage output	0.3 mV
Accuracy for current output at +20 °C	±0.05 mA
Accuracy for voltage output at +20 °C	±0.01 V
Operating voltage with digital output	12 ... 28 V DC
Operating voltage with voltage output	12 ... 28 V DC
Operating voltage with current output	18 ... 28 V DC
Load for current output	Max. 500 Ω
Load for voltage output	Min. 10 kΩ
Typical temperature dependence	0.005 % of span/°C
Digital output	RS-485, non-isolated
Supported protocols	Vaisala industrial protocol Modbus RTU
Connector	4-pin M8 (IEC 60947-5-2)
<b>Supply current at +20 °C (U<sub>in</sub> 24 V DC)</b>	
Normal measurement	10 mA + load current (typical)
During self-diagnostics	220 mA pulsed (typical)

## Mechanical specifications

Mechanical connection	ISO 228-1 G1/2" 1/2" NPT 3/4"-16 UNF 5/8"-18 UNF
Housing material	Stainless steel (AISI316L)
Weight:	
G thread and UNF thread models	90 g (3.2 oz)
NPT thread model	100 g (3.5 oz)

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B
Compliance marks	CE, China RoHS, RCM, UKCA

## Spare parts and accessories

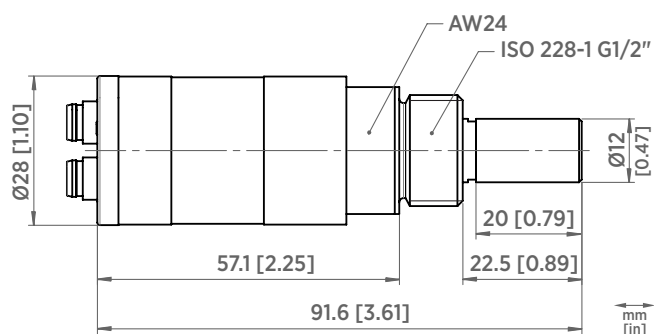
USB cable for PC connection <sup>1)</sup>	219690
M12 - M8 cable 1.5 m (4.9 ft), for connecting to Indigo80	262195SP
M12 - M8 cable 2 m (6.5 ft), for connecting to DM70	219980SP
Loop powered external display	226476
Loop powered external display with relays	234759

### Sampling cells

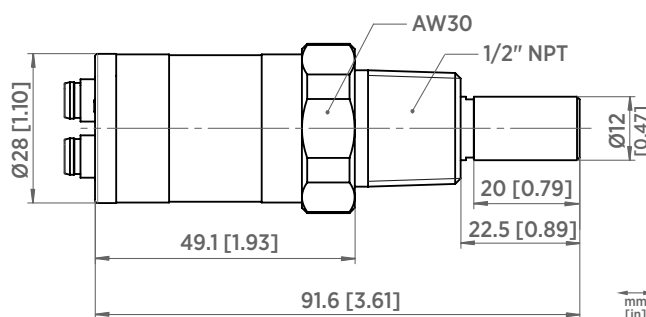
Basic sampling cell	DMT242SC
With Swagelok 1/4" male connectors	DMT242SC2
With UNF5/8"-18 thread	DSC74UNF58SP
With quick connector and leak screw	DSC74SP
Two-pressure sampling cell	DSC74BSP
Cooling/venting coil	DMCOILSP

See the DSS70A product page at [www.vaisala.com](http://www.vaisala.com) for further information about the sampling cells available for DM70.

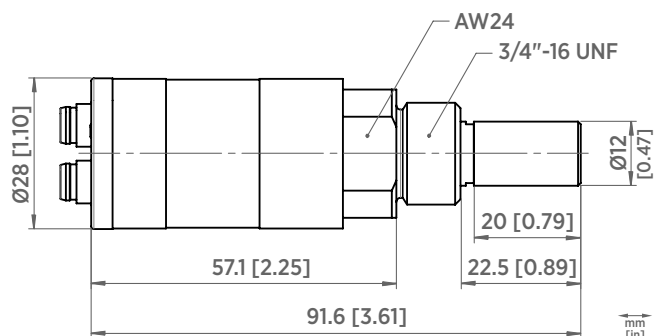
<sup>1)</sup> Vaisala Insight software for Windows is available at [www.vaisala.com/insight](http://www.vaisala.com/insight).



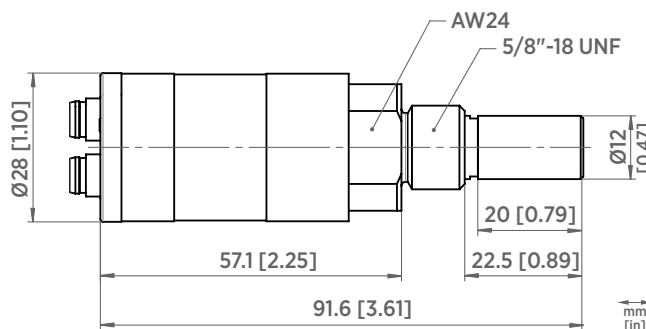
DMT143 with ISO 228-1 G1/2" thread



DMT143 with 1/2" NPT thread



DMT143 with 3/4"-16 UNF thread



DMT143 with 5/8"-18 UNF thread

## DMT143L Dew Point Transmitter For OEM applications (DMT242 replacement)



### Features

- Vaisala DRYCAP® technology with auto-calibration
- Calibration interval of two years
- Two sensor options cover a dew point measurement range of  $-60 \dots +60 \text{ }^{\circ}\text{C}$  ( $-76 \dots +140 \text{ }^{\circ}\text{F}$ )
- Accuracy  $\pm 2 \text{ }^{\circ}\text{C}$  ( $\pm 3.6 \text{ }^{\circ}\text{F}$ )
- Compatible with Vaisala Indigo80 handheld indicator and Insight PC software
- Traceable calibration (certificate included)
- Analog current (mA) output and RS-485 digital output with Modbus® RTU support
- LED alarm for exceeded dew point level
- Fast response time

Due to its wide measurement range and excellent long-term stability, Vaisala DRYCAP® Dew Point Transmitter DMT143L is an ideal choice for low dew point industrial applications, such as compressed air dryers, plastic dryers, and other OEM applications.

### Vaisala DRYCAP®

Vaisala DRYCAP® Dew Point Transmitter DMT143L is a miniature dew point measurement instrument.

The transmitter can be installed directly into pressurized systems at 20 bar (290 psia) maximum pressure. It is designed for extreme conditions.

DMT143L incorporates Vaisala DRYCAP® thin film polymer sensor and auto-calibration software. The standard sensor choice for dry gases and desiccant dryers is the DRYCAP® 180M, and for more humid applications such as refrigeration dryers, the DRYCAP® 180S is optimal.

The sensors fully withstand getting wet, and therefore, the transmitter performs exceptionally well in applications that occasionally experience process water

spikes, such as pipeline condensation during a system failure or start-up. The sensors are also highly resistant to particulate contamination, oil vapor, and most chemicals, and insensitive to the flow rate.

### Long calibration interval

The calibration interval of DMT143L is two years. For any adjustment needs, the transmitter can be sent to a Vaisala Service Center.

The auto-calibration software works online while the process is running. If the measurement accuracy is not confirmed, corrections are made automatically.

### Easy installation

DMT143L has a variety of features to choose from, including different output and installation options, and alarm LED.

Due to its small size and light weight, DMT143L is quickly and easily installed in tight spaces or in small-size pipelines.

The alarm LED indicates too high dew point in the process. The trigger point is preset at the factory. It can be later adjusted with the convenient Vaisala Insight PC software for Windows®.

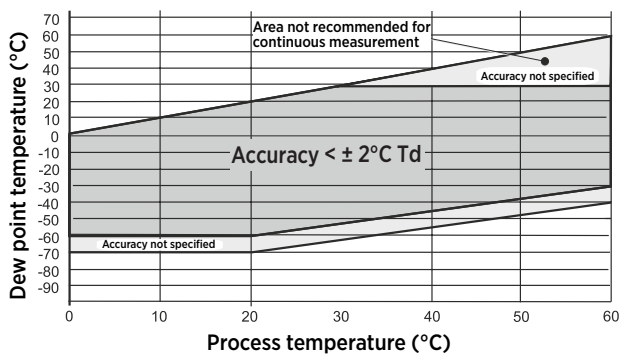
Insight PC software and the Indigo80 handheld indicator can also be used for other configuration options, as well as for viewing and logging measurement data (for more information, see [www.vaisala.com/insight](http://www.vaisala.com/insight) and [www.vaisala.com/indigo](http://www.vaisala.com/indigo)).

# Technical data

## Measurement performance

Sensors	DRYCAP® 180M DRYCAP® 180S (optimal for refrigeration dryers)
Sensor protection	Stainless steel sintered filter Stainless steel filter for vacuum
Recommended calibration interval to confirm the specified accuracy	2 years
Measurement range (typical)	-60 ... +60 °C (-76 ... +140 °F)
Different analog output scalings available. <sup>1)</sup>	
Accuracy with DRYCAP® 180M	±2 °C (±3.6 °F) <sup>2)</sup> (see the graph below)

- 1) For more information, see the DMT143L order form.  
2) When the dew point is below 0 °C (32 °F), the transmitter outputs frost point.

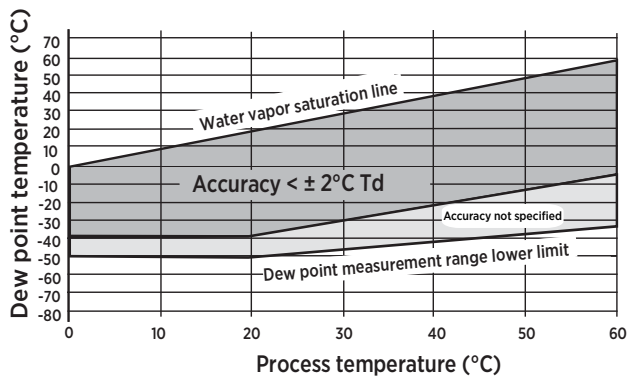


### Dew point accuracy vs. measurement conditions

Response time 63 % [90 %] at +20 °C (+68 °F) gas temperature and 1 bar pressure and 1 liter/min flow rate:

-60 → -20 °C T <sub>d</sub> (-76 → -4 °F T <sub>d</sub> )	5 s [10 s] (typical)
-20 → -60 °C T <sub>d</sub> (-4 → -76 °F T <sub>d</sub> )	45 s [10 min] (typical)
Accuracy with DRYCAP® 180S	±2 °C (±3.6 °F) <sup>1)</sup> (see the graph below)

- 1) When the dew point is below 0 °C (32 °F), the transmitter outputs frost point.



## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B
Compliance marks	CE, China RoHS, RCM, UKCA

## Operating environment

Measurement environment	For air, nitrogen, hydrogen, argon, helium, and oxygen <sup>1) 2)</sup>
Temperature	0 ... +60 °C (+32 ... +140 °F)
Higher temperature peaks	Short-term OK
Relative humidity	0 ... 100 %RH
Pressure	0 ... 20 bara (0 ... 290 psia)
Sample flow rate	No effect
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
IP rating	IP66

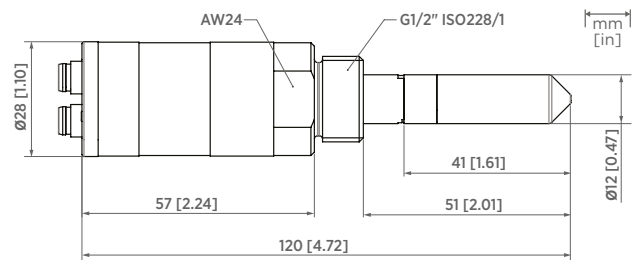
- 1) Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases. The transmitter is not certified for use in hazardous areas with potentially explosive atmospheres.  
2) The transmitter not tested for leakages, which may occur especially with small-molecule gases such as hydrogen and helium.

## Inputs and outputs

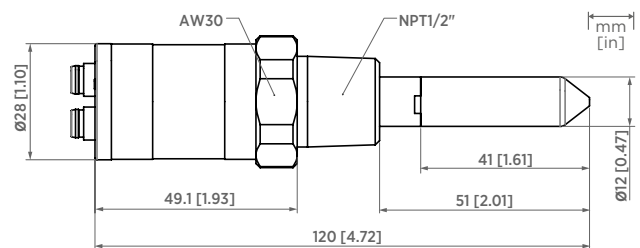
Analog current output	4 ... 20 mA (3-wire)
Digital output	RS-485, non-isolated
Supported protocols	Vaisala industrial protocol Modbus RTU
Resolution for current output	0.002 mA
Accuracy for current output at +20 °C	±0.05 mA
External load for current output	Max. 500 Ω
Operating voltage with current output	18 ... 28 V DC
Operating voltage with digital output	12 ... 28 V DC
Typical temperature dependence	0.0008 mA/°C
Power consumption at 24 V DC	Max. 220 mA

## Mechanical specifications

Mechanical connection	G1/2" ISO228-1 with bonded seal ring (U-seal) or NPT1/2" thread
Housing material	Stainless steel (AISI 316L)
<b>Weight</b>	
G thread model	90 g (3.2 oz)
NPT thread model	100 g (3.5 oz)



DMT143L with G1/2" thread



DMT143L with NPT1/2" thread



## DMT132 Dew Point Transmitter For refrigerant dryers



### Features

- High accuracy  $\pm 1\text{ }^{\circ}\text{C}$  ( $\pm 1.8\text{ }^{\circ}\text{F}$ ) in the measurement range of refrigerant dryers
- Excellent long-term stability - resistant to compressor oil and most other chemicals thanks to HUMICAP® technology
- Low power requirements, 10 ... 28 VDC
- Easy to verify functionality with compatible Vaisala DM70 or HM70 hand-held meters
- Optional LED warning light

Vaisala HUMICAP® Dew Point Transmitter DMT132 is an affordable dew point measurement instrument designed to verify the functionality of refrigerant dryers. It is especially well suited for OEM dryer manufacturers.

### Direct Measurement Cuts Costs

Direct outlet air dew point measurement provides accurate information about dryer functionality and is more reliable than the traditional method of measuring refrigerator temperature only. Knowledge of the real dew point ensures high quality compressed air at all times and enables customers to optimize dryer capacity. This helps to prevent investment in redundant dryer capacity and avoid unnecessary maintenance and costly malfunctions.

### High Accuracy and Long-Term Stability

DMT132 provides optimal performance in the operating range of refrigerant dryers. In the measurement range of  $-3\text{ }^{\circ}\text{C}$  ...  $20\text{ }^{\circ}\text{C}$  ( $+26.6\text{ }^{\circ}\text{F}$  ...  $+68\text{ }^{\circ}\text{F}$ ), where the refrigerator

dryers typically operate, the  $T_d$  accuracy is  $\pm 1\text{ }^{\circ}\text{C}$  ( $\pm 1.8\text{ }^{\circ}\text{F}$ ). The instrument incorporates the proven Vaisala HUMICAP® sensor, which is resistant to compressor oil and most other chemicals, thereby providing excellent long-term stability.

### Quick Installation and Easy Field Checking

It takes just a few minutes to install DMT132 directly into a dryer or compressed air line through a G1/2" ISO thread. Vaisala sampling cells can also be used. The loop-powered electronics mean that wiring is easy and power requirements are low. DMT132 operating voltages can be as low as 10 VDC.

Verifying the performance of DMT132 is easy with the compatible Vaisala DM70 or HM70 hand-held meters. The user can perform possible adjustments with Vaisala HMK15 Humidity Calibrator.



Demand for dew point sensors to verify refrigerant dryers is increasing. Direct dew point measurement enables energy savings and improved efficiency.

# Technical Data

## Measurement Performance

Measurement range	-30 ... +50 °C (-22 ... +122 °F) $T_d$
Accuracy at +20 °C (+68 °F)	±1 °C for -3 ... 20 °C (+26.6 ... +68 °F) $T_d$ <sup>1)</sup> ±2 °C for -15 ... -3 °C (+5 ... +26.6 °F) $T_d$ <sup>1)</sup> See accuracy graph below

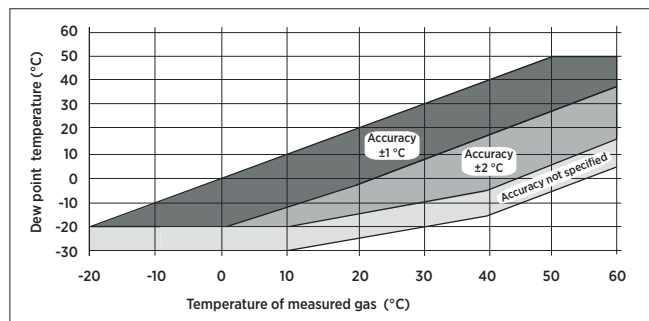
### Typical Response Time at 20 °C (+68 °F) Gas Temperature and 1 Bar Pressure

-14 → +3 °C (+7 → +37 °F) $T_d$	17 s (63 %) 40 s (90 %)
+3 → -14 °C (+37 → +7 °F) $T_d$	33 s (63 %) 85 s (90 %)

### Calculated Variables

Dew point converted to atmospheric pressure	$T_{d/r}$ atm
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1) When dew point is below 0 °C (+32 °F), the transmitter outputs frost point.



## Operating Environment

Operating temperature	-30 ... +50 °C (-22 ... +122 °F)
Operating pressure	0 ... 20 bar
Relative humidity	0 ... 100 %RH
Sample flow rate	No effect on measurement accuracy
Measured gases	Non-corrosive gases
EMC compliance	EN61326-1, Industrial Environment

## Outputs

Analog output (scalable)	4 ... 20 mA, 2-wire
Resolution for current output	0.002 mA
Accuracy of analog outputs at +20 °C	±0.05 % full scale
Typical temperature dependence	±0.005 % of full scale/ °C
Connector	4-pin M8 (IEC 60947-5-2)

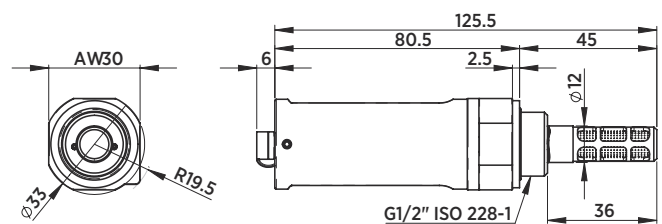
LED indication available for defined dew point limit/error state indication  
RS-485 serial line for service use

## Mechanical Specifications

Sensor	Vaisala HUMICAP® 180R
Recommended calibration interval (in refrigerant dryer application)	2 years
Mechanical connection	G1/2" ISO
Operating voltage	10 ... 28 VDC
External load	Max. 100 Ω for supply voltages < 20 VDC Max. 500 Ω for supply voltages 20 ... 28 VDC
Weight	65 g (2.3 oz)
Housing material	PPS + 40 % GF
IP rating	IP65 (NEMA 4)
Storage temperature range	-40 ... +80 °C (-40 ... +176 °F)
Start-up time	3 s

## Spare Parts and Accessories

Tube filter	230602
Special cover set for HMK15 (calibrator fitting DMT132 and HMP60)	230914
NPT Adapter	210662SP
Sample cells	DMT242SC, DMT242SC2, DSC74, DSC74B, DSC74C, DMCOIL
Duct installation flange	DM240FA
Cables (several lengths available)	HMP50Z032, HMP50Z300SP, HMP50Z500SP, HMP50Z1000SP
Loop powered external display	226476
USB service cable	219690
Connection cable to DM70/HM70	219980
LED plug	230388
ISO 1/2" plug	218773
NPT 1/2" plug	222507
Sealing ring set (3 pcs U-seal)	221525SP



Dimensions in mm



## DPT146 Dew Point and Pressure Transmitter

For compressed air



### Features

- The first transmitter that monitors both dew point and process pressure
- A simple and convenient transmitter for monitoring of compressed air
- Highly accurate humidity information thanks to dew point data coupled with live pressure input
- Proven sensor technology
- Compatible with Vaisala Handheld Meter DM70 for easy spot-checking, local display, and data logging

Vaisala Dew Point and Pressure Transmitter DPT146 for compressed air makes monitoring compressed air simple and convenient. DPT146 measures both dew point and process pressure simultaneously, and is the ideal choice for anyone using or monitoring compressed air.

### Simple and efficient installation

One transmitter providing two of the most important compressed air measurements means reduced installation costs and a much easier setup – with only one instrument needing connection and wiring.

### Make more informed decisions

Dew point measurement combined with process pressure measurement offers further unique advantages. When dew point data is coupled with live pressure input, conversions to atmospheric pressure or ppm are available online, leaving no ambiguity in the information. As an example, regulative requirements of medical gas can be fulfilled easily and quickly.

### A unique combination of two world-class sensors

DPT146 combines the knowledge of more than 20 years of sensor technology development. Proven measurements from DRYCAP® sensor for dew point and BAROCAP® sensor for pressure are now combined into one easy-to-use transmitter.

### Convenience with proven performance

Well-developed technology brings both proven results and convenience. Spot-checking and verification of dew point is easy thanks to fully compatible Vaisala DRYCAP® Handheld Dew Point Meter

DM70. The meter can also be used as a local display and data logger. Temperature measurement is available when RS-485 is in use.

### Output and performance

- Pressure: 1 ... 12 bar
- Dew point: -70 ... +30 °C (-94 ... +86 °F)
- Digital output RS-485 with Modbus

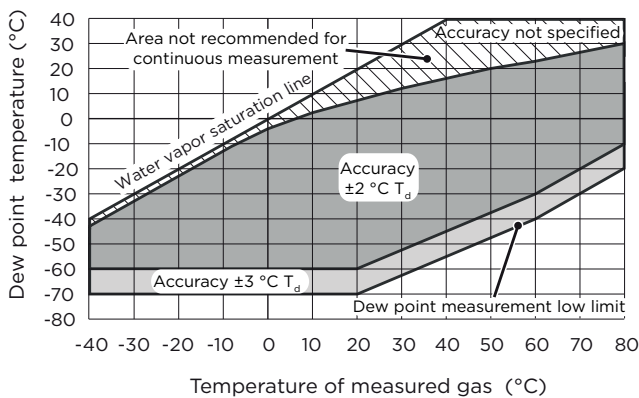
# Technical data

## Parameters

Measured parameters	
Dew point	-70 ... +30 °C (-94 ... +86 °F)
Pressure, absolute	1 ... 12 bar (14.5 ... 174 psi)
Temperature (available if output RS-485 only selected)	-40 ... +80 °C (-40 ... +176 °F)
Calculated parameters	
ppm moisture, by volume	1 ... 40 000 ppm
Dew point, converted to atmospheric pressure	-75 ... +30 °C (-103 ... +86 °F)

## Measurement performance

Sensor	Vaisala MPS1 multiparameter sensor
Dew point accuracy	±2 °C (±3.6 °F)
Pressure accuracy at 23 °C (73.4 °F)	±0.4 %FS
Pressure temperature dependence	±0.01 bar / 10 °C (18 °F)
ppm accuracy (7 bar)	±(14 ppm + 12 % of reading)
Temperature accuracy	
0 ... 40 °C (+32 ... +104 °F)	±0.5 °C (±0.9 °F)
-40 ... 80 °C (-40 ... +176 °F)	±1 °C (±1.8 °F)
Sensor response time	
Pressure response time	< 1 s
Dew point response time 63 % [90 %] at 20 °C and 1 bar:	
-50 → -10 °C Tdf	5 s [10 s]
-10 → -50 °C Tdf	10 s [2.5 min]



## Operating environment

Operating temperature of electronics	-40 ... +60 °C (-40 ... +140 °F)
Operating pressure	1 ... 12 bar (14.5 ... 174 psi)
Mechanical durability	0 ... 50 bar (0 ... 725 psi)
Relative humidity	0 ... 100 %
Measured gases	Air/non-corrosive gases
Sample flow rate	No effect on measurement accuracy
Storage temperature	
Transmitter only	-40 ... +80 °C (-40 ... +176 °F)
Shipment package	-20 ... +80 °C (-4 ... +176 °F)

## Compliance

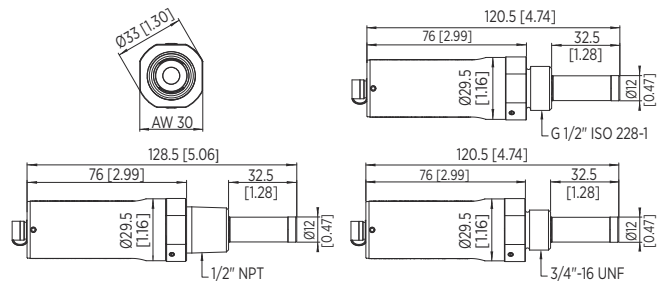
IP rating	IP66
EMC compliance	EN 61326-1, Basic electromagnetic environment

## Inputs and outputs

Accuracy of analog outputs	±0.01 V / ±0.01 mA
Digital output	RS-485, non-isolated, Vaisala protocol, Modbus RTU protocol
Connector	M8 4-pin male
Operating voltage	
Current output	21 ... 28 VDC
Voltage output and/or use in cold temperatures (-40 ... -20 °C (-40 ... -4 °F))	20 ... 28 VDC
RS-485 only	15 ... 28 VDC
Analog outputs (2 channels)	
Current output	0 ... 20 mA, 4 ... 20 mA
Voltage output	0 ... 5 V, 0 ... 10 V
Supply current	
During normal measurement	20 mA + load current
During self-diagnostics	300 mA + load current
External load for	
Current output	Max. 500 Ω
Voltage output	Min. 10 kΩ

## Mechanical specifications

Housing material	AISI316L
Mechanical connection	ISO G1/2", NPT 1/2", UNF 3/4"-16
Recommended calibration interval	2 years
Sensor protection	Mesh filter AISI303, grade 18 μm
Weight (ISO1/2")	190 g (6.70 oz)



Dimensions in mm (inches)

## Spare parts and accessories

Connection cable for MI70 indicator / DM70 meter	219980
USB connection cable	219690
Sampling cells	DMT242SC, DMT242SC2, DSC74, DSC74B, DSC74C
Flange	DM240FA
Loop-powered external display	226476
ISO 1/2" plug	218773
NPT 1/2" plug	222507





Vaisala Multiparameter Transmitter DPT145 with DILO DN20 connector

Vaisala Multiparameter Transmitter DPT145 for SF<sub>6</sub> gas is a unique innovation that enables online measurement of dew point, pressure, and temperature. It also calculates four other values, including SF<sub>6</sub> density. DPT145 is especially well suited for integration into OEM systems.

### Online reliability

Online dew point measurement combined with pressure measurement provides an excellent assessment of the condition of SF<sub>6</sub> insulation. Sudden and minor leakages are immediately detected by the direct normalized pressure measurement, while online dew point measurement alerts the user to moisture issues, which can weaken the insulation properties of SF<sub>6</sub> and cause rapid deterioration. With DPT145, it is also easy to build a redundant solution for multiple parameters.

### Savings across the board

A single transmitter, instead of several, saves time and money across the board, from investment to installation, operation, and servicing. Lower assembly

costs, fewer cables and connectors, minimized need for on-site visits and field operations - all these translate into cumulative savings. The long calibration interval results in further savings.

### Risk-free, greener solution

Online measurement enables gas trends to be followed via a data collection system, making monitoring fast, risk-free, and accurate. Using one instrument for monitoring seven different parameters means also fewer mechanical connections and reduces the risk of leaks. Monitoring is environmentally friendly because there is no need for sampling - no SF<sub>6</sub> gas is released into the atmosphere.

### Features

- The first transmitter to offer online measurement of seven SF<sub>6</sub> parameters in one unit
- Measured parameters: dew point, pressure, temperature
- Calculated parameters: SF<sub>6</sub> density, normalized pressure, dew point in atmospheric pressure, ppm
- More reliable assessment of the condition of SF<sub>6</sub> insulation due to online measurement
- Digital output: RS-485 with Modbus®
- Long calibration interval of years



DPT145 with weather shield

### The fruit of experience

Vaisala has over 80 years of extensive measurement experience and knowledge. DPT145 brings together the proven DRYCAP® dew point sensor technology and BAROCAP® pressure sensor technology in one package, providing an innovative and convenient solution for monitoring SF<sub>6</sub> gas.

# Technical data

## Measured parameters

Dew point	-60 ... +30 °C (-76 ... +86 °F)
Pressure, absolute	1 ... 12 bar (14.5 ... 174 psi)
Temperature	-40 ... +80 °C (-40 ... +176 °F)

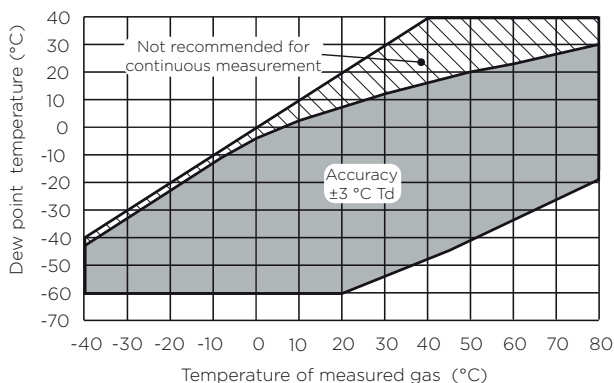
## Calculated parameters

Pressure, normalized to +20 °C (+68 °F)	1 ... 12 bar (14.5 ... 174 psi)
SF <sub>6</sub> or SF <sub>6</sub> /N <sub>2</sub> mixture density	0 ... 100 kg/m <sup>3</sup>
Moisture by volume, ppm	40 ... 40 000 ppm
Dew point, converted to atmospheric pressure	-65 ... +30 °C (-85 ... +86 °F)

## Measurement performance

Dew point accuracy	±3 °C (±5.4 °F), see graph below
Dew point stability	Typical drift < 2 °C (3.6 °F) / 5 years
Pressure accuracy at +23 °C (+73.4 °F)	±0.4 %FS
Pressure temperature dependence	±0.01 bar/10 °C (18 °F)
Pressure stability	Typical drift < 1 %FS / 5 years
Temperature accuracy	0 ... +40 °C (+32 ... +104 °F): ±0.5 °C (± 0.9 °F) -40 ... 80 °C (-40 ... +176 °F): ±1 °C (± 1.8 °F)
Density accuracy (pure SF <sub>6</sub> , 1 ... 12 bara)	0 ... +40 °C (+32 ... +104 °F): ±1 %FS -40 ... +60 °C (-40 ... +140 °F): ±2.2 %FS
Typical ppm accuracy (5 ... 1000 ppm, 7 bar)	±(7 ppm + 15 % of reading)
Sensor	Vaisala MPS1 multiparameter sensor
<b>Sensor response time</b>	
Pressure response time	< 1 s
Dew point response time <sup>1)</sup>	-50 → -10 °C Tdf: 5 s [10 s] 63 % [90 %] at 20 °C and 1 bar -10 → -50 °C Tdf: 10 s [2.5 min]

### DPT145 dew point measurement accuracy:



<sup>1)</sup> System equilibrium related response time is typically longer.

## Inputs and outputs

Digital outputs	RS-485, non-isolated, Vaisala protocol Modbus RTU protocol
Connector	M8 4-pin male
Operating voltage	15 ... 28 VDC 20 ... 28 VDC in cold temperatures (-40 ... -20 °C (-40 ... -4 °F))
Supply current, during normal measurement	20 mA
Supply current, during self-diagnostics	Max. 300 mA pulsed

## Operating environment

Operating temperature of electronics	-40 ... +60 °C (-40 ... +140 °F)
Operating pressure	1 ... 12 bar (14.5 ... 174 psi)
Mechanical durability	0 ... 50 bar (0 ... 725 psi)
Relative humidity	0 ... 100 %
Measured gases	SF <sub>6</sub> , SF <sub>6</sub> /N <sub>2</sub> mixture
Storage temperature, transmitter only	-40 ... +80 °C (-40 ... +176 °F)
Storage temperature, shipment package	-20 ... +80 °C (-4 ... +176 °F)

## Mechanical specifications

Housing material	AISI316L
Mechanical connection	DILO DN20, DILO DN8, ABB Malmquist, or Alstom G1/2" compatible connector Every connection is helium leak tested at the factory.
Weight (with DILO adapter)	765 g (27.0 oz)
IP rating	IP66 <sup>1)</sup>

<sup>1)</sup> Weather shield to be used in continuous outdoor installations.

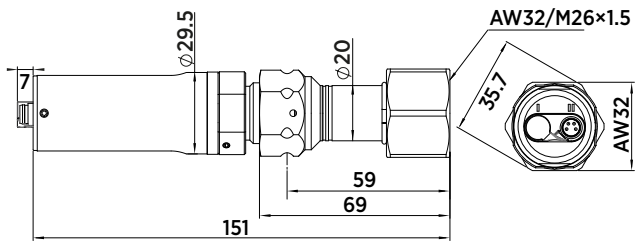
## Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment
Compliance marks	CE, RCM
<b>Mechanical vibration</b>	
Vibration (sinusoidal) IEC 60068-2-6	±6 g, 5-500 Hz sweep 60 min/axis, 3-axis

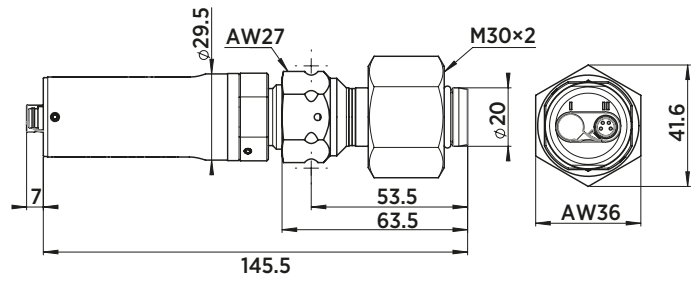
## Spare parts and accessories

Connection cable for the MI70/DM70 handheld	219980
USB connection cable	219690
Protection plug for connector	218675SP
1.5 m shielded PUR cable with 90° connector	231519SP
3 m shielded PUR cable with 90° connector	231520SP
5 m shielded PUR cable with 90° connector	231521SP
10 m shielded PUR cable with 90° connector	231522SP
3 m shielded FEP cable with straight connector	226902SP
Weather shield	ASM210326SP

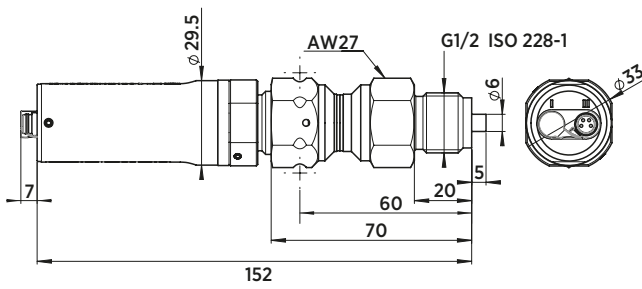
# Technical data



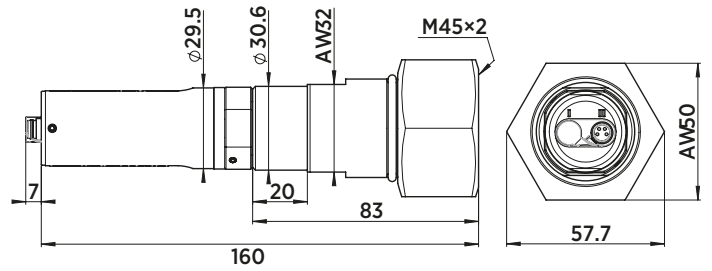
DPT145 with DILO DN8 connector



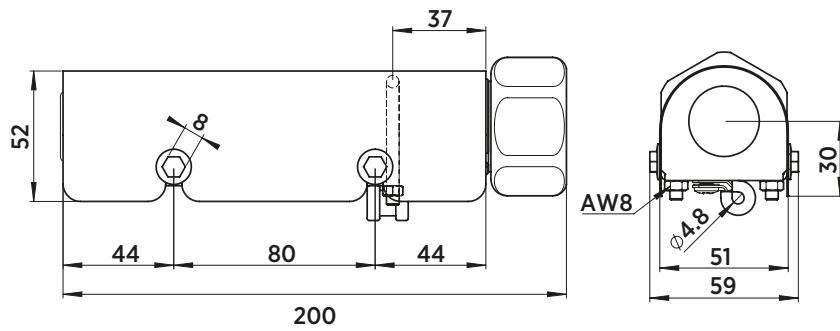
DPT145 with ABB Malmquist connector



DPT145 with Alstom connector



DPT145 with DILO DN20 connector



DPT145 with weather shield

mm



### CARBOCAP's unique benefits

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

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.

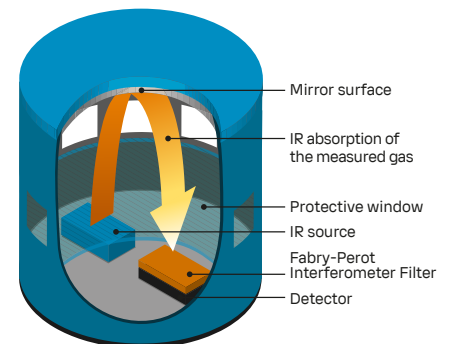
Instruments measuring at several absorption and reference wavelengths with a single light source are known as single-beam multi-wavelength instruments. The technology is widely applied in costly analyzers. The unique feature of the CARBOCAP® sensor is its micromachined FPI filter, which performs a multiwavelength 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.

First launched in 1997, the Vaisala CARBOCAP 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.

Vaisala uses a single-beam and dual-wavelength NDIR (Non-dispersive infrared) technology for measuring CO<sub>2</sub>. The patented CARBOCAP technology is used in all our CO<sub>2</sub> sensors. This technology incorporates a unique tunable band pass filter that was developed by Vaisala and is manufactured in our own state-of-the-art cleanroom. Learn more on our [carbon dioxide page](#).



Structure of the CARBOCAP sensor. Both reference and gas absorption are measured in the same optical path.

### Typical applications for carbon dioxide measurement

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 CO<sub>2</sub> replaces oxygen, it can be harmful to people in very high concentrations. CO<sub>2</sub> 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 CO<sub>2</sub> incubators.

Normal atmospheric air includes CO<sub>2</sub> at ppm levels. Typical CARBOCAP applications include ventilation control in buildings occupied by people, animal shelters, and greenhouses. In areas where large volumes of CO<sub>2</sub> are handled,

reliable CO<sub>2</sub> 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 handheld meters, measurement modules, and industrial transmitters for CO<sub>2</sub> measurements to multigas measurement solutions.

## GMP343 Carbon Dioxide Probe For demanding measurements



### Features

- Vaisala CARBOCAP® sensor, a silicon-based non-dispersive infrared (NDIR) sensor
- Single-beam, dual wavelength CO<sub>2</sub> measurement with no moving parts
- Compensation options for temperature, pressure, humidity, and oxygen
- Designed for outdoor use

Vaisala CARBOCAP® Carbon Dioxide Probe GMP343 is an accurate and rugged probe-type instrument for ecological measurements. Typical applications include CO<sub>2</sub> soil respiration, ambient CO<sub>2</sub> monitoring, plant growth chambers, and OEM applications.

### Benefits

- Low power consumption and heat emission
- Compact and lightweight
- Excellent accuracy and stability

GMP343 can output both numerically filtered and raw measurement data, and it can also compensate the measurement with an internal temperature measurement and user-set relative humidity, pressure, and oxygen values.

In combination with an MI70 indicator, GMP343 provides a tool for accurate in-situ measurement. MI70 can be used as a display, communication, and data logging device.

Each GMP343 is calibrated using  $\pm 0.5\%$  accurate gases at 0 ppm, 200 ppm, 370 ppm, 600 ppm, 1000 ppm, 4000 ppm, and 2%. Calibration is also done at temperature points of  $-30\text{ }^{\circ}\text{C}$  ( $-22\text{ }^{\circ}\text{F}$ ),  $0\text{ }^{\circ}\text{C}$  ( $32\text{ }^{\circ}\text{F}$ ),  $25\text{ }^{\circ}\text{C}$  ( $77\text{ }^{\circ}\text{F}$ ), and  $50\text{ }^{\circ}\text{C}$  ( $122\text{ }^{\circ}\text{F}$ ).

If needed, the customer can recalibrate the instrument using the multipoint calibration (MPC) feature allowing up to 8 user-defined calibration points.

# Technical data

## Measurement performance

Measurement range options	0 ... 1000 ppm, 0 ... 2000 ppm, 0 ... 3000 ppm, 0 ... 4000 ppm, 0 ... 5000 ppm, 0 ... 2 %
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### Accuracy (excluding noise) at 25 °C (77 °F) and 1013 hPa after factory calibration with 0.5 % accurate gases with different range options

0 ... 1000 ppm	±(3 ppm + 1 % of reading)
0 ... 2000 ppm - 0 ... 2 % <sup>1)</sup>	±(5 ppm + 2 % of reading)

### Noise (repeatability) at 370 ppmCO<sub>2</sub>

With no output averaging	±3 ppmCO <sub>2</sub>
With 30 s output averaging	±1 ppmCO <sub>2</sub>

### Long-term stability (see graph 'GMP343 operating conditions')

Easy	±2 % of reading <sup>2)</sup> / year
Moderate	±2 % of reading <sup>2)</sup> / 6 months
Harsh	±2 % of reading <sup>2)</sup> / 3 months

### Warm-up time

To full accuracy ±0.5 %	10 min
To full accuracy	30 min

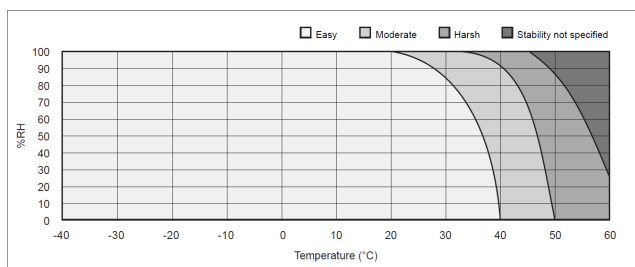
- 1) Accuracy below 200 ppmCO<sub>2</sub> not specified for 2 % range option.  
2) Always at least ±10 ppmCO<sub>2</sub>.

### Effect on accuracy with temperature compensation

CO <sub>2</sub> range options	0 ... 1000 ppm	0 ... 2 000 - 5000 ppm	0 ... 2 %
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Temperature °C (°F)	Accuracy (% of reading) <sup>1)</sup>		
+10 ... +40 (+50 ... +104)	±1	±1	±2
+40 ... +60 (+104 ... +140)	±2	±3	±4
-40 ... +10 (-40 ... +50)	±3	±3	±5

- 1) Always at least ±10 ppmCO<sub>2</sub>.  
Temperature compensation is performed by an integrated Pt1000 element.



## GMP343 operating conditions

### Effect on accuracy with pressure compensation

CO <sub>2</sub> range options	0 ... 1000 ppm	0 ... 2000 - 2 %
-------------------------------	----------------	------------------

Pressure (hPa)	Accuracy (% of reading)	
900 ... 1050	±0.5	±1
700 ... 1300	±1	±2

Integrated pressure sensor **not** included in GMP343.

## Response time (90 %)

### Diffusion model

Filter attached	Averaging (s)	Response (s)
Yes	0	75
Yes	30	82
No	0	4
No	30	30

### Flow-through model

Gas flow (l/min)	Averaging (s)	Response (s)
0.3	0	26
0.3	30	44
1.2	0	8
1.2	30	23

## Operating environment

Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Storage temperature	-40 ... +70 °C (-40 ... 158 °F)
Operating humidity	See graph 'GMP343 operating conditions'
Compensated pressure range	700 ... 1300 hPa
Operating pressure	< 5 bar
Gas flow for flow-through model	0 ... 10 liters/min
EMC compliance	IEC/EN 61326-1, Basic environment <sup>1)</sup>

- 1) Compliance with IEC/EN 61000-4-3: At 3 V/m RF field test within frequency range 300 ... 400 MHz may cause additional deviation of 150 ppmCO<sub>2</sub>.

## Inputs and outputs

Operating voltage	11 ... 36 VDC
Power consumption	Without optics heating : < 1 W With optics heating : < 3.5 W
Digital outputs	RS-485, RS-232

### Analog outputs

Current output range	4 ... 20 mA
Current output resolution	14 bits
Current output maximum load	800 Ω at 24 VDC, 150 Ω at 10 VDC
Voltage output range	0 ... 2.5 V, 0 ... 5 V
Voltage output resolution	14 bits (13 bits with 0 ... 2.5 V)
Voltage output minimum load	5 kΩ

## Mechanical specifications

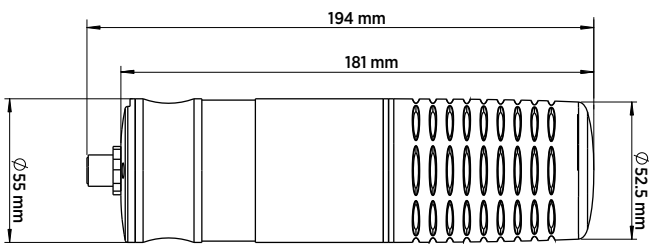
Housing	Anodized aluminium
Filter cover	PC
Cable connector type	8-pin M12
Weight (probe only)	360 g (12.7 oz)

### IP rating

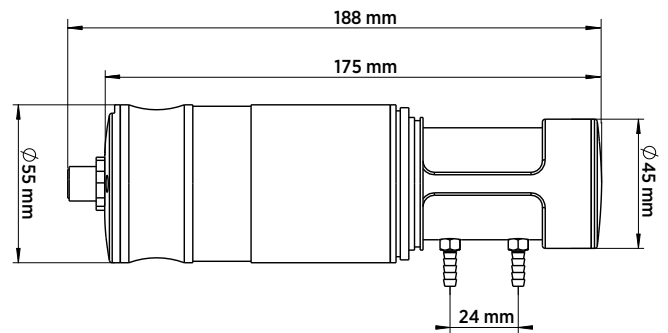
Housing (cable attached)	IP67
Diffusion filter (weather protection)	IP65
Diffusion filter (sintered PTFE)	IP66

## Spare parts and accessories

Wall mount bracket	GMP343BRACKET
Mounting flange	GMP343FLANGE
Standard diffusion filter (weather protection, IP65) with filter cover	GMP343FILTER
Diffusion filter (sintered PTFE filter, IP66) with filter cover	215521
Calibration adapter (for the diffusion model)	GMP343ADAPTER
Junction box	JUNCTIONBOX-8
<b>Probe cables</b>	
PC connection cable, 2 m (6 ft 7 in)	219687
Interface cable for MI70, 2 m (6 ft 7 in)	DRW216050SP
Soil adapter kit for horizontal positioning	215519
Soil adapter kit for vertical positioning	215520
<b>Cable options</b>	
2 m (6 ft 7 in)	GMP343Z200SP
6 m (19 ft 8 in)	GMP343Z600SP
10 m (32 ft 10 in)	GMP343Z1000SP



GMP343 dimensions (diffusion model)



GMP343 dimensions (flow-through model)

## GMP231 Carbon Dioxide Probe For CO<sub>2</sub> incubators



### Features

- Maximum temperature durability +195 °C (+383 °F)
- Incubator can be heat sterilized with probe in place, saving time and reducing risk of cross-contamination
- Heat durability and excellent long-term stability with next generation CARBOCAP® sensor
- Designed for OEM use in CO<sub>2</sub> incubators – installation options available
- CO<sub>2</sub> sensor measurement optimized for 5 % CO<sub>2</sub>, measurement range up to 20 % CO<sub>2</sub>
- 4-point traceable calibration for CO<sub>2</sub>

Vaisala CARBOCAP® Carbon Dioxide Probe GMP231 withstands high temperature sterilization.

GMP231 is designed to provide incubator manufacturers with accurate and reliable carbon dioxide measurements and sterilization durability at high temperatures. The probe is based on Vaisala's patented CARBOCAP® technology and a new type of infrared (IR) light source. These technologies allow for continuous sterilization temperatures of up to 180 °C (+356 °F), enabling easier and more complete sterilization without the risk of cross-contamination. Maximum temperature durability of +195 °C (+383 °F) provides a comfortable operating margin.

The probe is installed through the incubator wall, ensuring that only the IR sensor and optical components are exposed to the incubation

environment. This allows the incubator to be sterilized with the probe in place, removing the need to decontaminate the probe separately. This saves time and reduces the risk of contamination.

The probe's sensor performance is optimized at 5 %CO<sub>2</sub>, but the sensor measures CO<sub>2</sub> up to 20 % with high accuracy. In addition, GMP231 can measure pressure and temperature for CO<sub>2</sub> measurement compensation purposes, ensuring the product remains stable and accurate in all CO<sub>2</sub> incubation conditions. The sensor is made of highly durable materials to achieve outstanding stability over both time and temperature.

Since water vapor, dust, and most chemicals do not affect measurements, GMP231 module is ideal for CO<sub>2</sub> incubator environments.

### Benefits

- Internal pressure and temperature measurement improves accuracy and stability
- Full temperature and pressure compensations available
- Sensor head heating for condensation prevention

# Technical Data

## Measurement performance

Measurement range	0 ... 20 %CO <sub>2</sub>
Calibration uncertainty at 5 %CO <sub>2</sub>	±0.1 %CO <sub>2</sub>
Start-up time	< 20 s
Warm-up time for full spec.	< 3 min
<b>Response time</b>	
T63	< 30 s
T90	< 50 s
<b>Accuracy at 37 °C, 1013 hPa</b>	
Repeatability at:	
0 ... 8 %CO <sub>2</sub>	±0.1 %CO <sub>2</sub>
8 ... 12 %CO <sub>2</sub>	±0.2 %CO <sub>2</sub>
12 ... 20 %CO <sub>2</sub>	±0.4 %CO <sub>2</sub>
Non-linearity at 0 ... 20 %CO <sub>2</sub>	±0.1 %CO <sub>2</sub>
<b>Temperature dependence</b>	
With compensation at 3 ... 12 %CO <sub>2</sub> , 20 ... 60 °C	±0.1 %CO <sub>2</sub>
Without compensation (typical)	-0.4 % of reading/°C
<b>Pressure dependence</b>	
With compensation at 3 ... 12 %CO <sub>2</sub> , 700 ... 1100 hPa	±0.015 % of reading/hPa
Without compensation (typical)	+0.15 % of reading/hPa
<b>Humidity dependence</b>	
With compensation at 0 ... 20 %CO <sub>2</sub> , 0 ... 100 %RH	±0.9 % of reading (at 37 °C)
Without compensation (typical)	+0.05 % of reading/%RH
<b>O<sub>2</sub> dependence</b>	
With compensation at 0 ... 20 %CO <sub>2</sub> , 0 ... 90 %O <sub>2</sub>	±0.6 % of reading
Without compensation (typical)	-0.08 % of reading/%O <sub>2</sub>
<b>Long-term stability</b>	
0 ... 8 %CO <sub>2</sub>	< ±0.2 %CO <sub>2</sub> /year
8 % ... 12 %CO <sub>2</sub>	< ±0.5 %CO <sub>2</sub> /year
12 % ... 20 %CO <sub>2</sub>	< ±1.0 %CO <sub>2</sub> /year

## Mechanical specifications

Connector	M12/8 pin
Weight	150 g (5.29 oz) without cable
IP rating	IP54 (sensor head) IP20 (electronics housing)
<b>Materials</b>	
Housing	Metal coated plastic ABS+PC
Inner tube	Aluminum
Probe tube	PPSU
Filter	PTFE
<b>Dimensions</b>	
Probe tube max. diameter	30.2 mm (1.19 in)
Probe tube length	118.5 mm (4.67 in)
Sensor filter length	12 mm (0.47 in)

## Operating environment

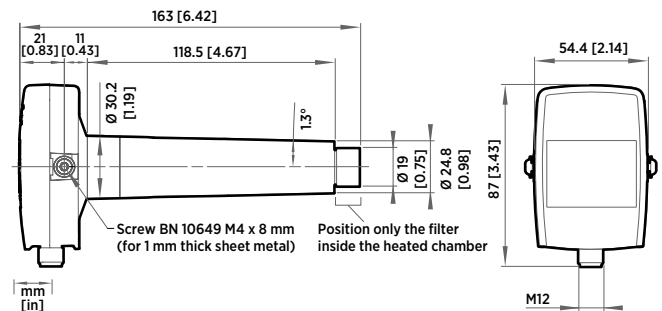
Operating temperature for CO <sub>2</sub> measurement	0 ... +70 °C (+32 ... +158 °F)
Max. temperature durability in standby mode (sensor head only)	Max. +195 °C (+383 °F)
Heat sterilization 180 °C durability	At least 120 cycles
Storage temperature	-40 ... +75 °C (-40 ... +167 °F)
Pressure (compensated)	500 ... 1100 hPa
Pressure (operating)	< 1500 hPa
Humidity	0 ... 100 %, non-condensing
Condensation prevention	Sensor head heating when power on
Chemical tolerance	DMSO, IPA (70 %), H <sub>2</sub> O <sub>2</sub> (2000 ppm, non-condensing), ethanol, acetic acid
Electromagnetic compatibility	EN61326-1, Generic Environment

## Inputs and outputs

Digital outputs	I <sup>2</sup> C 5 V, RS-485 (2-wire with Vaisala Industrial Protocol)
Analog output	0 ... 20 mA (scalable) max. load 600 Ω
Power consumption	< 1 W (pulsed)
Operating voltage	11 ... 30 VDC 20 ... 30 VDC (with analog output)

## Accessories

M12 Connection Cable 0.9 m with open ends	DRW240977SP
M12 Connection Cable 0.6 m with Milli-Grid connector	ASM210903SP
Silicone plug	DRW240015SP
Attachment bracket	DRW240247SP
PTFE filter	DRW240494SP
USB PC connection cable	221040
MI70 connection cable	221801
Calibration adapter for GMP231	239523



GMP231 dimensions



## GMP251 Carbon Dioxide Probe For %-level measurements



### Features

- Measurement range 0 ... 20 %CO<sub>2</sub>
- Intelligent, standalone probe with analog and digital outputs
- Compatible with Vaisala Indigo products, Insight PC software, and RFL100 data logger
- Wide operating temperature range (-40 ... +60 °C) (-40 ... +140 °F)
- IP65-classified housing
- Integrated temperature measurement for CO<sub>2</sub> compensation purposes
- Compensations also for pressure, oxygen, and humidity
- Sensor head heated to prevent condensation

Vaisala CARBOCAP® Carbon Dioxide Probe GMP251 is an 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

- Excellent 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 CO<sub>2</sub> measurement according to ambient temperature. The effects of pressure and background gas can also be compensated for. The measurement range is 0 ... 20 %CO<sub>2</sub> and the sensor performance is optimized at 5 %CO<sub>2</sub> 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 H<sub>2</sub>O<sub>2</sub> 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 and the Indigo80 handheld indicator for an extended range of output and configuration options. See [www.vaisala.com/indigo](http://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 software for Windows®. See [www.vaisala.com/insight](http://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 CO<sub>2</sub> 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. <sup>1)</sup>

<sup>1)</sup> Third-party pump and multiplexer not provided by Vaisala.

# Technical data

## Measurement performance

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

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

## Compliance

EU directives and regulations	EMC, RoHS
Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, China RoHS, RCM

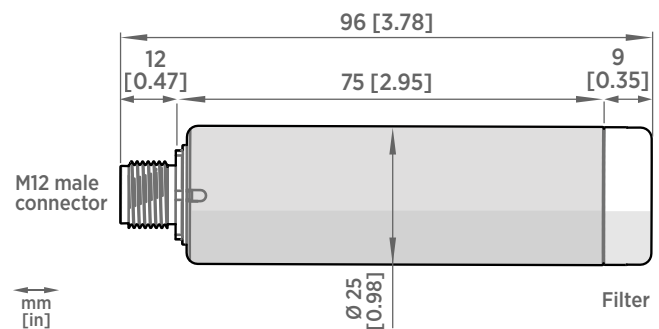
## Operating environment

Operating temperature of CO <sub>2</sub> measurement	-40 ... +60 °C (-40 ... +140 °F) <sup>1)</sup>
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)	<ul style="list-style-type: none"> <li>• H<sub>2</sub>O<sub>2</sub> (2000 ppm, non-condensing)</li> <li>• Alcohol-based cleaning agents (for example ethanol and IPA)</li> <li>• Acetone</li> <li>• Acetic acid</li> </ul>
<b>Pressure</b>	
Compensated	500-1100 hPa
Operating	< 1.5 bar
<b>Gas flow (for flow-through option)</b>	
Operating range	< 10 l/min
Recommended range	0.1-0.8 l/min

<sup>1)</sup> 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
<b>Materials</b>	
Probe housing	PBT polymer
Filter	PTFE membrane, PBT polymer grid
Connector	Nickel plated brass
<b>Dimensions</b>	
Probe diameter	25 mm (0.98 in)
Probe length	96 mm (3.78 in)



GMP251 dimensions



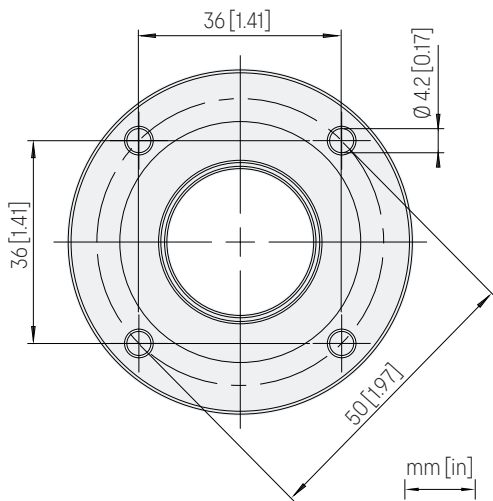
## Inputs and outputs

Analog outputs	<ul style="list-style-type: none"> <li>0–5/10 V (scalable), min. load 10 k<math>\Omega</math></li> <li>0/4–20 mA (scalable), max. load 500 <math>\Omega</math></li> </ul>
Digital output	Over RS-485: <ul style="list-style-type: none"> <li>Modbus</li> <li>Vaisala Industrial Protocol</li> </ul>
<b>Operating voltage</b>	
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
<b>Power consumption</b>	
Typical (continuous operation)	0.4 W
Maximum	0.5 W

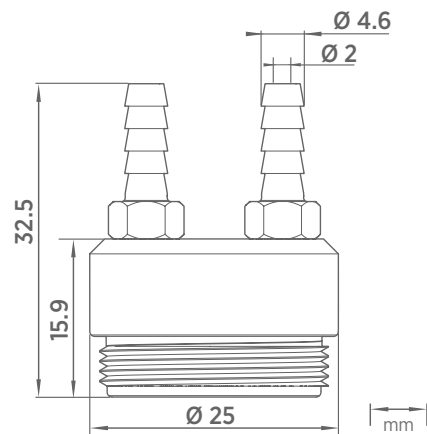
## Spare parts and accessories

Standard membrane filter	ASM211650SP
Porous sintered PTFE filter	DRW243649SP
Probe connection cable with open wires (1.5 m), shielded	223263SP
Probe connection cable with open wires (1.5 m), shielded	254294SP
Probe connection cable with open wires (3 m), shielded	26719SP
Probe connection cable with open wires (10 m), shielded	216546SP
Probe connection cable with open wires and 90° plug (0.6 m), shielded	244669SP
Probe connection cable with open wires and 90° plug (1.5 m), shielded	255102
MI70 connection cable, M12 5-pin	CBL210472
Connection cable for Indigo80, M12-5F - M12-5M, 1.5 m	272075SP
Flat cable for GMP250 probes, M12 5-pin	CBL210493SP
Indigo USB adapter <sup>1)</sup>	USB2
Probe mounting clips (2 pcs)	243257SP
Probe mounting flange	243261SP
Probe holder assembly	ASM213582
Flow-through adapter with gas ports	ASM211697SP
Calibration adapter	DRW244827SP
Spray shield	ASM212017SP

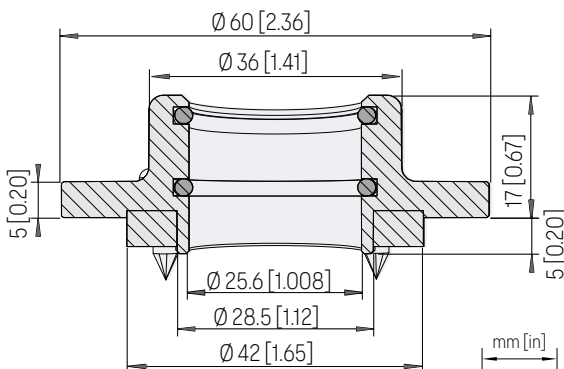
<sup>1)</sup> Vaisala Insight software for Windows available at [vaisala.com/insight](http://vaisala.com/insight)



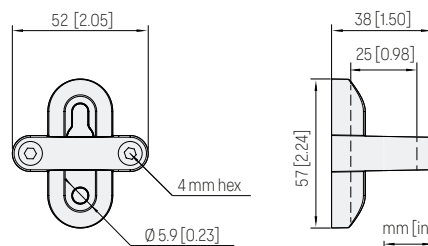
Probe mounting flange 243261SP dimensions



Flow-through adapter with gas ports ASM211697SP. Suitable for tubes with 4 mm inner diameter.



Probe mounting flange 243261SP dimensions, cross section



Probe holder ASM213582 dimensions

## GMP252 Carbon Dioxide Probe For ppm-level measurements



### Features

- Measurement range  
0 ... 10 000 ppm CO<sub>2</sub>
- Intelligent, standalone probe with analog and digital outputs
- Compatible with Vaisala Indigo products and Insight PC software
- Wide operating temperature range, -40 ... +60 °C (-40 ... +140 °F)
- IP65-classified housing
- Integrated temperature measurement for CO<sub>2</sub> compensation purposes
- Compensations also for pressure, oxygen, and humidity
- Sensor head heated to prevent condensation

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

### Benefits

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

GMP252 is suitable for harsh and humid CO<sub>2</sub> measurement environments where stable and accurate ppm-level CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> (measurements up to 30 000 ppm CO<sub>2</sub> 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 H<sub>2</sub>O<sub>2</sub> 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 and the Indigo80 handheld indicator for an extended range of outputs and configuration options. See [www.vaisala.com/indigo](http://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 software for Windows®. See [www.vaisala.com/insight](http://www.vaisala.com/insight).

### Applications

GMP252 is ideal for agriculture, refrigeration, greenhouses, and demanding HVAC applications where stable and accurate ppm-level CO<sub>2</sub> 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. <sup>1)</sup>

<sup>1)</sup> Third-party pump and multiplexer not provided by Vaisala.

# Technical data

## Measurement performance

Measurement range	0–10 000 ppm CO <sub>2</sub> (up to 30 000 ppm CO <sub>2</sub> with reduced accuracy)
<b>Accuracy</b> <sup>1)</sup>	
0–3000 ppm CO <sub>2</sub>	±40 ppm CO <sub>2</sub>
3000–10 000 ppm CO <sub>2</sub>	±2 % of reading
Up to 30 000 ppm CO <sub>2</sub>	±3.5 % of reading
<b>Calibration uncertainty</b>	
at 2000 ppm CO <sub>2</sub>	±31 ppm CO <sub>2</sub>
at 10 000 ppm CO <sub>2</sub>	±105 ppm CO <sub>2</sub>
<b>Long-term stability</b>	
0–3000 ppm CO <sub>2</sub>	±60 ppm CO <sub>2</sub> /year
3000–6000 ppm CO <sub>2</sub>	±150 ppm CO <sub>2</sub> /year
6000–10 000 ppm CO <sub>2</sub>	±300 ppm CO <sub>2</sub> /year
<b>Temperature dependence 0–10 000 ppm CO<sub>2</sub></b>	
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 <sub>2</sub> (typical)	–0.5 % of reading/°C
<b>Pressure dependence</b>	
With compensation at 0–10 000 ppm CO <sub>2</sub> , 500–1100 hPa	±0.015 % of reading/hPa
Without compensation (typical)	+0.15 % of reading/hPa
<b>Humidity dependence</b>	
With compensation, 0–10 000 ppm CO <sub>2</sub> , 0–100 %RH	±0.7 % of reading (at +25 °C (+77 °F))
Without compensation (typical)	+0.05 % of reading/%RH
<b>O<sub>2</sub> dependence</b>	
With compensation, 0–10 000 ppm %CO <sub>2</sub> , 0–90 %O <sub>2</sub>	±0.6 % of reading (at +25 °C (+77 °F))
Without compensation (typical)	–0.08 % of reading/%O <sub>2</sub>
<b>Start-up, warm-up, and response time</b>	
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
<b>Flow rate dependence (for flow-through option)</b>	
< 1 l/min flow	No effect
1–10 l/min flow	< 0.6 % of reading l/min

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

## Inputs and outputs

Analog outputs	<ul style="list-style-type: none"> <li>0–5/10 V (scalable), min. load 10 kΩ</li> <li>0/4–20 mA (scalable), max. load 500 Ω</li> </ul>
Digital output	Over RS-485: <ul style="list-style-type: none"> <li>Modbus</li> <li>Vaisala Industrial Protocol</li> </ul>
<b>Operating voltage</b>	
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
<b>Power consumption</b>	
Typical (continuous operation)	0.4 W
Maximum	0.5 W

## Operating environment

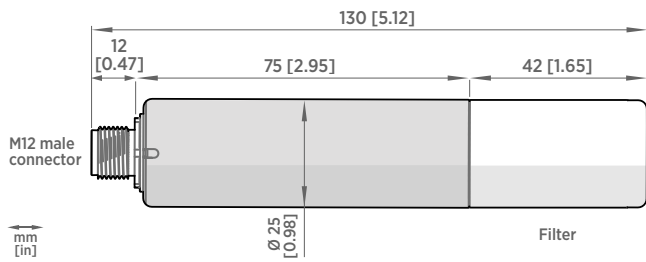
Operating temperature of CO <sub>2</sub> measurement	–40 ... +60 °C (–40 ... +140 °F)
Storage temperature	–40 ... +70 °C (–40 ... +158 °F)
Operating humidity	0–100 %RH, non-condensing
Condensation prevention	Sensor head heating when power on
IP rating, probe body	IP65
Chemical tolerance (temporary exposure during cleaning)	<ul style="list-style-type: none"> <li>H<sub>2</sub>O<sub>2</sub> (2000 ppm, non-condensing)</li> <li>Alcohol-based cleaning agents (for example ethanol and IPA)</li> <li>Acetone</li> <li>Acetic acid</li> </ul>
<b>Pressure</b>	
Compensated	500–1100 hPa
Operating	< 1.5 bar
<b>Gas flow (for flow-through option)</b>	
Operating range	< 10 l/min
Recommended range	0.1–0.8 l/min

## Compliance

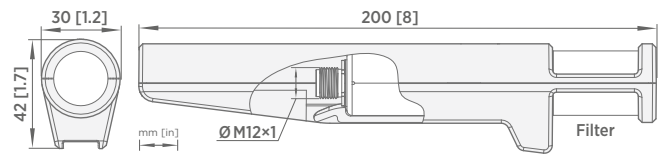
EU directives and regulations	EMC, RoHS
Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, RCM

## Mechanical specifications

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



GMP252 probe dimensions

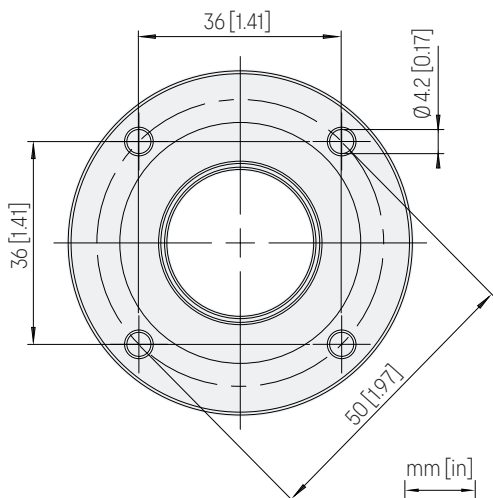


GMP252 probe handle dimensions

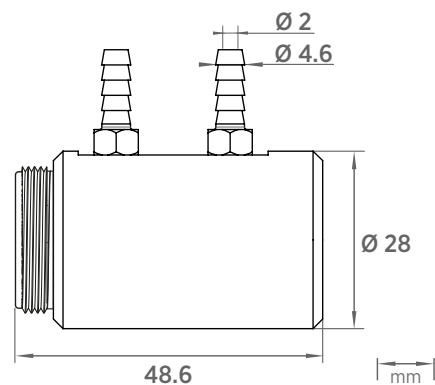
## Spare parts and accessories

Porous sintered PTFE filter for GMP252	DRW244221SP
Probe connection cable with open wires (1.5 m), shielded	223263SP
Probe connection cable with open wires (1.5 m), shielded	254294SP
Probe connection cable with open wires (3 m), shielded	26719SP
Probe connection cable with open wires (10 m), shielded	216546SP
Probe connection cable with open wires and 90° plug (0.6 m), shielded	244669SP
Probe connection cable with open wires and 90° plug (1.5 m), shielded	255102
M170 connection cable, M12 5-pin	CBL210472
Connection cable for Indigo80, M12-5F - M12-5M, 1.5 m	272075SP
Flat cable for GMP250 probes, M12 5-pin	CBL210493SP
Indigo USB adapter <sup>1)</sup>	USB2
Probe mounting clips (2 pcs)	243257SP
Probe mounting flange	243261SP
Probe holder assembly	ASM213582
Probe handle with magnetic hanger	GMP252HANDLESP
Probe handle	ASM214342SP
Flow-through adapter with gas ports	ASM212011SP
Calibration adapter	DRW244827SP
Spray shield	ASM212017SP
Radiation shield DTR250	DTR250
Radiation shield DTR250 with pole mounting kit	DTR250A

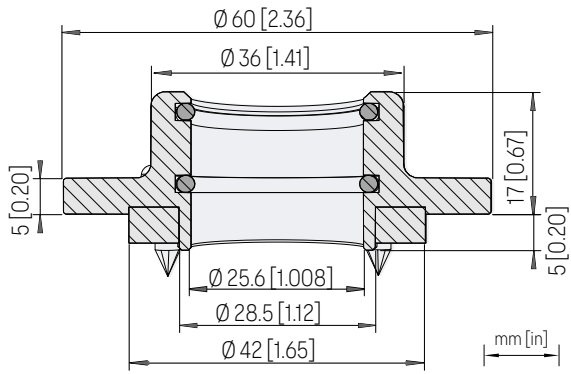
<sup>1)</sup> Vaisala Insight software for Windows is available at [www.vaisala.com/insight](http://www.vaisala.com/insight).



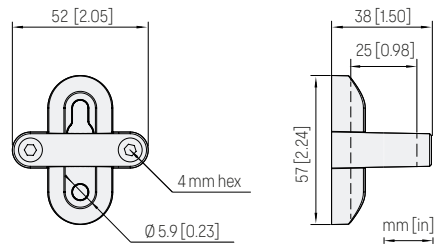
Probe mounting flange 243261SP dimensions



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



Probe mounting flange 243261SP dimensions, cross section



Probe holder ASM213582 dimensions

## GMP80P Portable Carbon Dioxide Probe with Pump Sampling



### Features

- Measurement range 0–20 %CO<sub>2</sub>
- Operating temperature range +15 ... +40 °C (+59 ... +104 °F)
- Easy CO<sub>2</sub> sampling through standard incubator sampling ports
- Stainless steel pipe and plastic tube options for sampling
- Compatible with Vaisala Indigo80 Handheld Indicator and Insight PC software
- Excellent long-term stability
- Reliable and accurate
- Calibration certificate included

Vaisala CARBOCAP® Portable Carbon Dioxide Probe with Pump Sampling GMP80P combines intelligent CO<sub>2</sub> measurement with pump-aspirated sampling functionality.

This robust and portable measurement device is designed for use in demanding applications, such as life science incubators, where stable, reliable, and accurate performance is required.

### GMP80P is ideal for:

- CO<sub>2</sub> sampling from incubators
- Spot-checking fixed CO<sub>2</sub> transmitters
- Sampling from areas otherwise difficult to access

### Ease of use with Indigo80

CO<sub>2</sub> measurement data can be monitored with the compact Vaisala Indigo80 Handheld Indicator connected to GMP80P. Indigo80 can be used for short-time logging of measurement data, as well as for calibrating and adjusting GMP80P.

Indigo80 has two cable ports for connecting Vaisala probes or transmitters to the indicator for measuring a wide range of parameters. GMP80P is powered by Indigo80, which can supply power for up to two GMP80P probes.

For more information on Indigo80, see [vaisala.com/indigo80](https://vaisala.com/indigo80).

### Flexible connectivity

For easy access to field calibration, device analytics, configuration functionality, and powering, GMP80P can also be connected to a PC running Vaisala Insight PC software for Windows®. For more information on Insight, see [vaisala.com/insight](https://vaisala.com/insight).

### Applications

GMP80P is ideal for life science incubators and for all demanding applications where stable and accurate percentage-level measurements are needed.



# Technical data

## Measurement performance

Measurement range	0–20 %CO <sub>2</sub>
<b>Accuracy</b> <sup>1) 2)</sup>	
At 5 %CO <sub>2</sub>	±0.1 %CO <sub>2</sub>
At 0–8 %CO <sub>2</sub>	±0.2 %CO <sub>2</sub>
At 8–20 %CO <sub>2</sub>	±0.4 %CO <sub>2</sub>
<b>Calibration uncertainty</b>	
At 5 %CO <sub>2</sub>	±0.07 %CO <sub>2</sub>
At 20 %CO <sub>2</sub>	±0.27 %CO <sub>2</sub>
<b>Long-term stability</b>	
At 0–8 %CO <sub>2</sub>	±0.3 %CO <sub>2</sub> /year
At 8–12 %CO <sub>2</sub>	±0.5 %CO <sub>2</sub> /year
At 12–20 %CO <sub>2</sub>	±1.0 %CO <sub>2</sub> /year
<b>Start-up, warm-up, and response time</b>	
Start-up time at +25 °C (+77 °F)	< 10 s
Warm-up time to full specification	< 4 min
Response time (T90)	< 1 min
<b>Other</b>	
Sampling frequency	1 s

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

2) As the gas sample dries during the sampling process, the CO<sub>2</sub> concentration of the dry sample will be higher than in the wet sample taken in the measurement environment. This is due to water condensing off the warm gas sample as it cools down. To determine the most accurate measurement values in your sampling environment, see GMP251 and GMP80P User Guide (M211799EN) at docs.vaisala.com for a table listing the dilution coefficients for gas samples taken at different temperatures.

## Operating environment

Operating environment	Indoor use
Operating temperature	+15 ... +40 °C (+59 ... +104 °F)
Storage temperature	-20 ... +60 °C (-4 ... +140 °F)
Operating humidity	0–95 %RH
Storage humidity	20–85 %RH
IP rating	IP4X
Flow rate of sampled/aspirated gas	0.3 l/min

## Powering

Operating voltage	12–30 V DC
Power consumption	Typical: 0.7 W Maximum: 0.9 W
Current consumption	60 mA typical at minimum voltage

## Digital communication

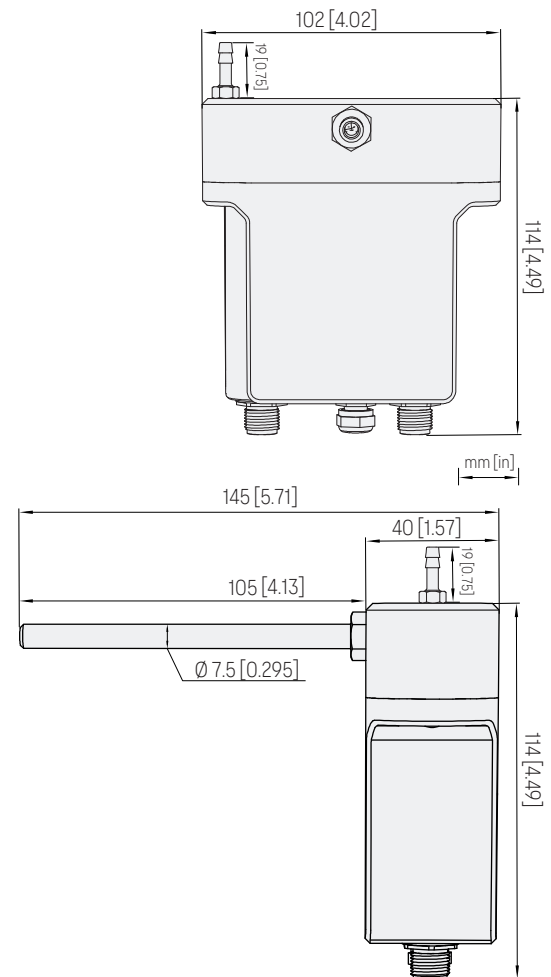
Digital output	RS-485
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## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863 REACH Regulation (EC 1907/2006)
Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment FCC part 15 B, Class B ICES-3 / NMB-3 (Class B)
Compliance marks	CE, China RoHS, RCM

## Mechanical specifications

Cable connector type	M12 5-pin A-coded male
Barbed fitting for gas outlet (optional)	For tube with ID 4 mm (approx. 5/32 in)
<b>Dimensions (H × W × D)</b>	
Probe body (incl. cable connectors), without sampling pipe:	114 × 102 × 40 mm (4.49 × 4.02 × 1.57 in)
Depth with sampling pipe:	145 mm (5.71 in)
<b>Weight</b>	410 g (14.46 oz)
<b>Materials</b>	
GMP80P (excluding GMP251 probe):	
Housing	Aluminum and polyamide
Sampling pipe	Stainless steel
Barbed fitting for gas outlet	Nickel-plated brass
Connectors (on the bottom)	Nickel-plated brass
GMP251 probe:	
Housing	PBT polymer
Filter	PTFE membrane, PBT polymer grid
Connector	Nickel-plated brass



GMP80P dimensions, front and side

## Spare parts and accessories

GMP251 CO <sub>2</sub> probe	Configuration code A1COC0N1 <sup>1)</sup>
Cable for probes (M12-M12), 1.5 m (4 ft 11 in)	272075SP
Sampling pipe (stainless steel), 100 mm (3.94 in)	DRW259158SP
Sampling tube (Nafion™ membrane and PUR), 2.1 m (6 ft 11 in) <sup>2)</sup>	GMTUBESP
Sampling tube (Nafion membrane), 0.6 m (1 ft 12 in)	212807SP
Sampling tube (PUR), 1.5 m (4 ft 11 in)	279471SP
Adapter for sampling tube	279473SP
Barbed fitting for gas outlet	279524SP
Magnetic hanger	ASM214318SP
Indigo USB adapter	USB2

1) See the GMP251 Order Form at [docs.vaisala.com](https://docs.vaisala.com) for more information.

2) Consists of a 0.6-m (1 ft 12 in) Nafion tube and a 1.5-m (4 ft 11 in) polyurethane tube.



## GMW90 Series Carbon Dioxide, Temperature and Humidity Transmitters



### Features

- Measured parameters: carbon dioxide, temperature, and humidity (optional)
- Superior long-term stability with the latest-generation Vaisala CARBOCAP® sensor
- Accurate temperature and humidity measurements due to the low-power microglow infrared source
- Quick and easy installation and maintenance
- Calibrated, user-exchangeable measurement modules
- 3-point traceable CO<sub>2</sub> calibration (certification included)
- Both analog and field bus communication (Modbus® RTU)

GMW90 series transmitters are available with either a display opening or a solid front. An optional traffic light indication is also available.

GMW90 Series CARBOCAP® Carbon Dioxide, Temperature and Humidity Transmitters for HVAC are based on new measurement technology for improved reliability and stability. With the new technology the transmitter's inspection interval is extended to five years.

Designed for demand controlled ventilation, GMW90 series transmitters measure carbon dioxide and temperature, with the option for humidity measurements. The instruments come with a calibration certificate that meets traceability and compliance requirements.

### Reliability from unique measurement technology

GMW90 series transmitters use advanced Micro-Electro-Mechanical System (MEMS) technology for measuring carbon dioxide. The CARBOCAP® carbon dioxide sensor's continuous reference measurement enables reliable and accurate readings and outstanding long-term stability also in buildings with round-the-clock occupancy.

The latest-generation CARBOCAP® sensor no longer uses an incandescent light bulb, which limits sensor lifetime. This unique sensor consumes very little power compared to other sensors on the market. As a result, instrument self-heating is low and humidity and temperature can be measured correctly.

### Convenient installation

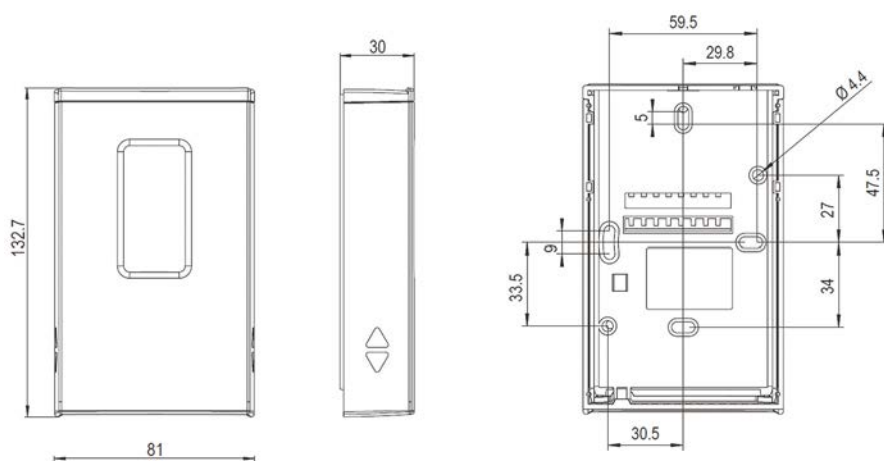
GMW90 series transmitters have been designed for quick and easy installation and maintenance. Every model includes a display for easy startup and convenient maintenance. To protect the sensor from dust and dirt during construction and installation, the units can be cabled with back-plate only. Electronics can be

snapped on later at an appropriate phase in the construction project. DIP switches make it quick and easy to configure the transmitters.

### Easy calibration

Regular instrument maintenance guarantees a long product lifetime. Calibration is easiest done with the exchangeable measurement modules. Sensor traceability and measurement quality is easily maintained by snapping on a new module calibrated at Vaisala factory. The instrument can also be calibrated using a handheld meter or reference gas CO<sub>2</sub> bottle. The service interfaces are easy to reach by simply sliding the cover down. The closed cover keeps the measurement environment stable during calibration and ensures top-quality final result.

# GMW90 dimensions and models



Dimensions (in mm) of GMW90 series transmitter cover (left) and mounting base (right)

## Models

Model	Measurements	Output
GMW93	CO <sub>2</sub> +T	3-wire voltage output
GMW93D	CO <sub>2</sub> +T	3-wire voltage output, with display
GMW94	CO <sub>2</sub> +T	3-wire current output
GMW94D	CO <sub>2</sub> +T	3-wire current output, with display
GMW93R	CO <sub>2</sub> +T+RH	3-wire voltage output
GMW93RD	CO <sub>2</sub> +T+RH	3-wire voltage output, with display
GMW93RA	CO <sub>2</sub> +T+RH	3-wire voltage output, with display and CO <sub>2</sub> indicator LEDs
GMW94R	CO <sub>2</sub> +T+RH	3-wire current output
GMW94RD	CO <sub>2</sub> +T+RH	3-wire current output, with display
GMW95	CO <sub>2</sub> +T	Modbus RTU output
GMW95D	CO <sub>2</sub> +T	Modbus RTU output, with display
GMW95R	CO <sub>2</sub> +T+RH	Modbus RTU output
GMW95RD	CO <sub>2</sub> +T+RH	Modbus RTU output, with display
GMW90	CO <sub>2</sub> +T	Analog or Modbus RTU output (configurable)
GMW90R	CO <sub>2</sub> +T+RH	Analog or Modbus RTU output (configurable)

# Technical data

## Measurement performance

Carbon dioxide	
Measurement range	0 ... 5000 ppm
Stability in typical HVAC applications	Total accuracy at room temperature ±75 ppm at 600 and 1000 ppm incl. 5 years drift
Carbon dioxide sensor	CARBOCAP® GM10
Accuracy:	
+20 ... +30 °C (+68 ... +86 °F)	±(30 ppm + 2 % of reading)
+10 ... +20 °C, +30 ... +40 °C (+50 ... +68 °F, +86 ... +104 °F)	±(35 ppm + 2.7 % of reading)
-5 ... +10 °C, +40 ... +55 °C (+23 ... +50 °F, +104 ... +131 °F)	±(45 ppm + 3.8 % of reading)
Temperature	
Measurement range	-5 ... +55 °C (+23 ... +131 °F)
Temperature sensor	Digital temperature sensor
Accuracy:	
+20 ... +30 °C (+68 ... +86 °F)	±0.5 °C (±0.9 °F)
+10 ... +20 °C, +30 ... +40 °C (+50 ... +68 °F, +86 ... +104 °F)	±0.6 °C (±1.08 °F)
-5 ... +10 °C, +40 ... +55 °C (+23 ... +50 °F, +104 ... +131 °F)	±0.8 °C (± 1.44 °F)
Relative humidity	
Measurement range	0 ... 95 %RH
Stability in typical HVAC applications	±0.5 %RH/year
Humidity sensor	HUMICAP® 180R
Accuracy at temperature range +10 ... +40 °C (+50 ... +104 °F):	
0 ... 60 %RH	±2.5 %RH
60 ... 80 %RH	±3.0 %RH
80 ... 95 %RH	±4.0 %RH
Accuracy at temperature range -5 ... +10 °C, +40 ... +55 °C (+23 ... +50 °F, +104 ... +131 °F):	
0 ... 60 %RH	±3.5 %RH
60 ... 80 %RH	±4.0 %RH
80 ... 95 %RH	±5.0 %RH

1) Complies with CEC-400-2008-001-CMF

## Operating environment

Operating temperature	-5 ... +55 °C (+23 ... +131 °F)
Storage temperature	-30 ... +60 °C (-22 ... +140 °F)
Operating humidity	0 ... 95 %RH Dew point < +30 °C (+86 °F)
IP rating	IP30



Optional decorative cover blends the transmitter into your interior design.

## Inputs and outputs

Supply voltage	18 ... 35 V DC, 24 V AC ± 20% 50/60 Hz
Service port	RS-485 line for temporary service use
Current output models	
Outputs	0/4 ... 20 mA, 2 and 3 channel models
Loop resistance	0 ... 600 Ω
Power consumption	< 2 W
Voltage output models	
Outputs	0 ... 5/10 V, 2 and 3 channel models
Load resistance	10 kΩ min.
Power consumption	< 1 W
Default analog scales	
CO <sub>2</sub>	0 ... 2000 ppm
T	-5 ... +55 °C
RH	0 ... 100 %RH
Field bus models	
Power consumption	< 1.5 W
Output type	RS-485 (galvanic isolation, 1.5 kV)
RS-485 end of line termination	Enable with jumper, 120 Ω
Modbus RTU address range	0 ... 247

## Mechanical specifications

Standard housing color	White (RAL9003)
Housing material	ABS/PC, UL-V0 approved
Output connector	Screw terminals Max. wire size 2 mm <sup>2</sup> (AWG14)
Service port connector	4-pin M8
Weight	163 g (5.75 oz)

1) RAL code is only indicative with potential small variations in color shade

## Spare parts and accessories

CO <sub>2</sub> module	GM10SP
Temperature module (CO <sub>2</sub> +T models)	TM10SP
Humidity and temperature module (CO <sub>2</sub> +T+RH models)	HTM10SP
Decorative cover set (10 pcs)	236285
Connection cable for MI70	219980
USB cable for PC connection	219690
Universal AC power supply	245866

## Compliance

EU directives and regulations	EMC, RoHS
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
EMC emissions	CISPR 22 / EN 55022, Class B
Compliance marks	CE, RCM

## GMW80 Series Carbon Dioxide, Humidity, and Temperature Transmitters for DCV



### Features

- Superior stability with the advanced proprietary CARBOCAP® technology
- Improved accuracy due to low self-heating of microglow light source
- Modbus® RTU support over RS-485 with model GMW87

Vaisala CARBOCAP® Carbon Dioxide, Humidity, and Temperature Transmitter Series GMW80 is based on Vaisala's patented latest-generation CARBOCAP technology with improved reliability and stability.

The GMW80 series transmitters are designed to fulfill the needs for CO<sub>2</sub> measurements in standard demand-controlled ventilation applications. Temperature measurement is included in most GMW80 series transmitters. Combined with humidity measurement, relay, and LED CO<sub>2</sub> level indication, GMW80 series provides you the flexibility needed for a variety of projects.

The CARBOCAP sensors measure CO<sub>2</sub> accurately immediately when powered on. As they have a built-in reference measurement they do not need a lengthy learning phase before the measured values are correct. Proper operation can be verified immediately after snapping on the device cover.

### Easy installation

With modern buildings often having hundreds of sensors, installation time per unit can be a significant cost factor. Returning to the building site to check sensor operation adds further costs. The GMW80 series transmitters include a number of subtle design features that have been introduced to make installation and commissioning quick and easy.

The pull-out tab makes opening the transmitter faster than before, while also doubling as a quality check slip and holder for the anti-tamper screw. The backplate can be twisted onto pre-mounted screws, and the wiring can be done easily on the clearly marked backplate. The electronics can be snapped on later when the building automation system is commissioned.

For measurements in more demanding conditions (for example, dusty or humid installation locations), the GMW87 and GMW88 models provide an IP64-rated enclosure with a cable gland.

### Reliable operation

The GMW80 series transmitters are optimized for low maintenance. The unique, low-power CARBOCAP technology enables a longer lifetime and better stability than ever before. As the power consumption is low, the heat generated by the electronics does not distort the temperature inside the sensor. The internal reference in the CO<sub>2</sub> sensor guarantees superior stability and flawless operation even in constantly occupied buildings, without the need for frequent readjustments.

The reliable operation and accurate measurement values of the GMW80 series transmitters contribute to the significant cost savings brought by demand-controlled ventilation.

### Benefits

- Cost-efficient, affordable
- Reliable and maintenance-free operation for up to 15 years
- Easy to install, easy to use
- Versatile – works well in buildings occupied 24/7
- Ideal for demand-controlled ventilation

# Technical data

## Models

Model	Meas. parameters	Output	CO <sub>2</sub> range (ppm)
GMW86P	CO <sub>2</sub> +T	Current and voltage output, Pt1000	0 ... 2000
GMW83RP <sup>1)</sup>	CO <sub>2</sub> +RH+T	Voltage outputs, Pt1000	0 ... 2000
GMW83DRP <sup>1)</sup>	CO <sub>2</sub> +RH+T	Voltage outputs, Pt1000, display with metric scale output	0 ... 2000
GMW83	CO <sub>2</sub> +T	Voltage outputs	0 ... 2000
GMW83A	CO <sub>2</sub> +T	Voltage outputs, CO <sub>2</sub> indicator LEDs	0 ... 2000
GMW83D	CO <sub>2</sub> +T	Voltage outputs, display with metric scale output	0 ... 2000
GMW84	CO <sub>2</sub> +T	Current output	0 ... 2000
GMW84S	CO <sub>2</sub> +T	Current output, relay	0 ... 2000
GMW87	CO <sub>2</sub>	RS-485 Modbus RTU output	0 ... 5000
GMW88	CO <sub>2</sub>	Current and voltage output	0 ... 2000 / 0 ... 5000 <sup>2)</sup>

<sup>1)</sup> Models with calibration certificate available (GMW83RPC/GMW83DRPC).

<sup>2)</sup> Range user-selectable with dip switch. Default range 0 ... 5000 ppm.

## Measurement performance

Carbon dioxide	
Measurement range	0 ... 2000/5000 ppm (see table <i>Models</i> )
Accuracy <sup>1)</sup> :	
at +20 ... +30 °C (+68 ... +86 °F)	±(30 ppm +3 % of reading)
at +10 ... +20 °C (+50 ... +68 °F) and +30 ... +40 °C (+86 ... +104 °F)	±(35 ppm +3.7 % of reading)
at +0 ... +10 °C (+32 ... +50 °F) and +40 ... +50 °C (+104 ... +122 °F)	±(40 ppm +4.8 % of reading)
Stability in typical HVAC applications	±(15 ppm + 2 % of reading) over 5 years
Warm-up time	1 min 10 min for full specification
Response time (63 %)	60 s 7 min (GMW87 and GMW88)
Carbon dioxide sensor	CARBOCAP® GM10
Temperature	
Measurement range	0 ... +50 °C (+32 ... +122 °F)
Temperature sensor	On P models: Pt1000 RTD Class F0.15 IEC 60751 For analog outputs: Digital temperature sensor
Accuracy (GMW83 and GMW84):	
at +10 ... +30 °C (+50 ... +86 °F)	±0.5 °C (0.9 °F)
at +0 ... +10 °C (+32 ... +50 °F) and +30 ... 50 °C (+86 ... +122 °F)	±1 °C (1.8 °F)
Humidity	
Measurement range	0 ... 95 %RH
Accuracy at temperature range +10 ... +30 °C (+50 ... +86 °F):	
0 ... 80 %RH	±3 %RH
80 ... 95 %RH	±5 %RH
Accuracy at temperature ranges 0 ... +10 °C (+32 ... +50 °F) and +30 ... +50 °C (+86 ... +122 °F):	
0 ... 95 %RH	±7 %RH
Stability in typical HVAC applications	±2 %RH over 2 years
Product lifetime	> 15 years

<sup>1)</sup> Accuracy applicable to 2000 ppm measurements at 1013 hPa pressure. Pressure or temperature dependencies not included in the values.

## Compliance

EU directives and regulations	EMC, RoHS
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, RCM

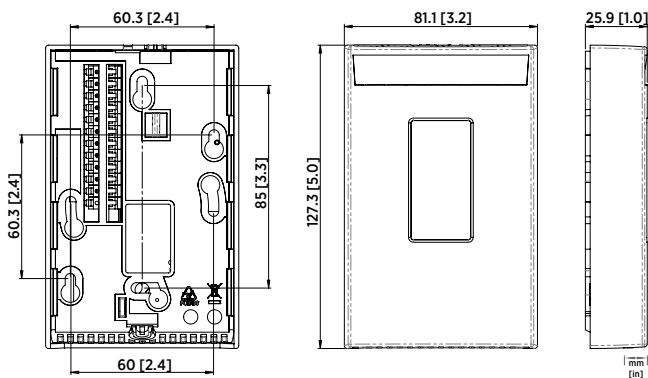
## Operating environment

Operating temperature	0 ... +50 °C (+32 ... +122 °F)
Operating humidity	0 ... 95 %RH Dew point < 30 °C (+86 °F)
Storage temperature	Models without display: -40 ... +70 °C (-40 ... +158 °F) Models with display: -30 ... +70 °C (-22 ... +158 °F)

## Inputs and outputs

Supply voltage	18 ... 35 V DC 24 V AC $\pm 20\%$ 50/60 Hz
Max. current consumption at 18 V DC	45 mA 70 mA (GMW84 models)
Max. power consumption at 30 V AC	0.7 W (GMW83 models) 1 W (GMW86 models, GMW87, and GMW88) 1.2 W (GMW84 models)
RS-485 interface (in GMW87 only)	Isolated, supports Modbus RTU protocol <ul style="list-style-type: none"> <li>• Modbus RTU address range: <ul style="list-style-type: none"> <li>• 1 ... 247 (up to 255 possible, non-standard)</li> </ul> </li> <li>• Bit rates: <ul style="list-style-type: none"> <li>• 4800, 9600, 19200, 38400, 57600, 76800, 115200</li> </ul> </li> <li>• Parity: <ul style="list-style-type: none"> <li>• None or Even</li> </ul> </li> <li>• Supports automatically both 1 and 2 stop bits</li> </ul>
Outputs	4 ... 20 mA and/or 0 ... 10 V <sup>1)</sup>
Current loop resistance (4 ... 20 mA)	0 ... 600 $\Omega$
Voltage output load resistance	Min. 10 k $\Omega$
CO <sub>2</sub> output scale	0 ... 2000/5000 ppm
Temperature output scale	0 ... +50 °C (+32 ... +122 °F)
Humidity output scale	0 ... 100 %RH
Passive temperature sensor (P models)	Pt1000 RTD
Temperature setpoint (T models)	10 k $\Omega$ potentiometer
Relay (S models)	1 pc, SPST-NO Max. 50 V DC / 50 V AC, 500 mA
CO <sub>2</sub> indicator LED levels (A model)	Flashing red: > 2000 ppm Red: 1200 ... 2000 ppm Yellow: 800 ... 1200 ppm Green: < 800 ppm

<sup>1)</sup> Analog outputs are not available in model GMW87.



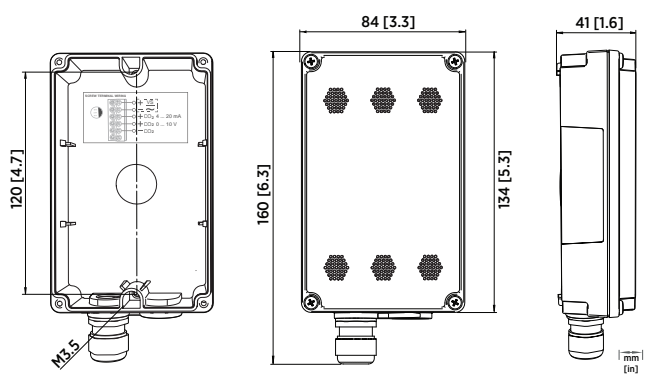
GMW83, GMW83A, GMW83RP, GMW84, GMW84S, GMW86P, GMW83D, and GMW83DRP dimensions (display in models with the letter D)

## Mechanical specifications

IP rating	IP30 IP64 (GMW87 and GMW88)
Housing material	ABS/PC UL-V0 approved PC (GMW87 and GMW88)
Housing color	White (RAL9003)
Output connector	Screw terminal
Max. wire size	2 mm <sup>2</sup> (AWG14)
Weight	Plain and LED version: 114 g (4.02 oz) Display version: 124 g (4.37 oz) GMW87 and GMW88: 160 g (5.64 oz)

## Spare parts and accessories

CO <sub>2</sub> module	GM10SP80
INTERCAP® humidity sensor	15778HM
Universal AC power supply	245866



GMW87 and GMW88 dimensions

## GMD110 Duct Carbon Dioxide Transmitter

For demanding ventilation applications



### Features

- Designed for highly reliable CO<sub>2</sub> measurement in air ducts
- Vaisala CARBOCAP® sensor
- ± 40 ppm CO<sub>2</sub> accuracy
- Excellent long-term stability
- Analog and Modbus RTU output options
- IP65-rated housing
- Traceable calibration (certificate included)

GMD110 is a high-accuracy duct transmitter for measuring carbon dioxide in air-handling systems and ventilation ducts. The transmitter is equipped with the renowned CARBOCAP® sensor that has unique accuracy and measurement stability, which supports precise and reliable controls of HVAC systems even in demanding conditions and sites.

The transmitter belongs to Vaisala HMDW110 Transmitter Series, which include transmitters for duct mounting, IP65-rated wall transmitters, immersion temperature transmitters and outdoor transmitters with integrated radiation shields.

### Highly accurate, highly reliable

The duct-mounted transmitter GMD110 is designed to measure carbon dioxide in demanding HVAC applications. With the outstanding accuracy of measurement, it is an ideal choice for demand-controlled ventilation systems even in challenging conditions.

CO<sub>2</sub> concentration is measured inside the duct without risks for leaks or wrong flow direction affecting the measurement. The temperature and flow dependencies of the sensor are negligible, and the measurement accuracy is not affected by dust, water vapor, or chemicals.

### Stable measurement

The high quality and excellent stability of the measurement enables precise and reliable controls of HVAC systems, even in demanding conditions or sites. The transmitter is equipped with the renowned CARBOCAP® sensor that has

unique capabilities in terms of precision and stability of the measurement. Its structure and reference measurement capabilities make this single-beam, dual-wavelength NDIR sensor extremely stable and reliable.

### Traceable accuracy

All GMD110 transmitters are individually adjusted and delivered with a traceable (ISO9001) calibration certificate. If required later on, the transmitter can also be field-calibrated using a Vaisala handheld meter or Vaisala Insight PC software.

# Technical data

## Measurement performance

Measurement range	0 ... 10 000 ppm CO <sub>2</sub> Orderable with analog output scaled to 0 ... 2000 ppm, 0 ... 5000 ppm, or 0 ... 10 000 ppm
<b>Accuracy</b> <sup>1)</sup>	
0 ... 3000 ppm CO <sub>2</sub>	±40 ppm CO <sub>2</sub>
3000 ... 10 000 ppm CO <sub>2</sub>	±2 % of reading
<b>Calibration uncertainty</b>	
at 2000 ppm CO <sub>2</sub>	±31 ppm CO <sub>2</sub> (typical)
at 10 000 ppm CO <sub>2</sub>	±105 ppm CO <sub>2</sub> (typical)
<b>Long-term stability</b>	
0 ... 3000 ppm CO <sub>2</sub>	±60 ppm CO <sub>2</sub> /year
3000 ... 6000 ppm CO <sub>2</sub>	±150 ppm CO <sub>2</sub> /year
6000 ... 10 000 ppm CO <sub>2</sub>	±300 ppm CO <sub>2</sub> /year
<b>Temperature dependence 0 ... 10 000 ppm CO<sub>2</sub></b>	
-10 ... +50 °C	±0.05 % of reading/°C
-40 ... +60 °C	< ±0.1 % of reading/°C
<b>Pressure dependence</b>	
Typical	+0.15 % of reading/hPa
<b>Start-up, warm-up, and response time</b>	
Start-up time at +25 °C	< 12 s
Warm-up time for full specification	< 2 min
Response time (T <sub>90</sub> )	< 1 min

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

## Operating environment

Operating temperature	-20 ... +60 °C (-4 ... +140 °F)
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
Humidity	0 ... 95 %RH, non-condensing
Condensation prevention	Sensor head heating when power on
IP rating	IP65

## Mechanical specifications

Probe diameter	25 mm (0.98 in)
Probe length	126 mm (4.96 in)
Weight	215 g (0.47 lb)
Screw terminal wire size	0.5 ... 2.5 mm <sup>2</sup> (AWG 24 ... 14)
Housing color	White (RAL9003)
Mounting methods	Screws or optional mounting flange 243261SP
<b>Materials</b>	
Probe	PBT polymer
Probe filter	PTFE
Housing	PC + 10 %GF (UL-V0 approved)

## Inputs and outputs

Output parameter	Carbon dioxide (ppm)
Output modes	0/4 ... 20 mA, scalable, max. load 500 Ω 0 ... 5/10 V, scalable, min. load 10 kΩ RS-485 with Modbus RTU
Power consumption	0.5 W typical, 1.1 W max.
<b>Supply voltage</b>	
With current output	20 ... 30 V DC
With voltage output or RS-485	12 ... 30 V DC
<b>Digital communication</b>	
Interface	RS-485, non-isolated, no line termination
Default serial settings	19200 bps N 8 2
Protocol	Modbus RTU
Modbus device address	240
<b>Service port</b>	
Connector	M8 4-pin male
Compatibility	<ul style="list-style-type: none"> <li>Indigo80 handheld indicator <sup>1)</sup></li> <li>MI70 handheld indicator <sup>2)</sup></li> <li>Vaisala Insight PC software <sup>3)</sup></li> </ul>

<sup>1)</sup> Requires M12-M8 cable 262195SP.

<sup>2)</sup> Requires connection cable 219980SP.

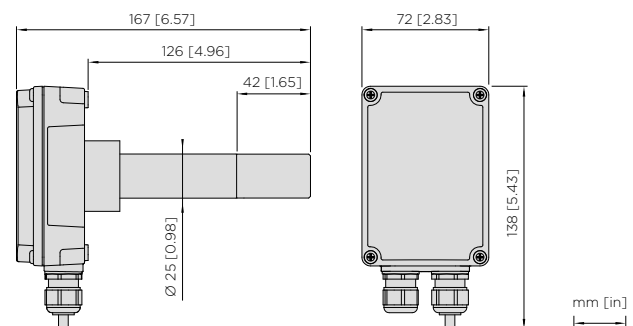
<sup>3)</sup> Requires USB adapter USB2 with M12-M8 cable 262195SP. Vaisala Insight software for Windows is available at [www.vaisala.com/insight](http://www.vaisala.com/insight).

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment
Compliance marks	CE, RCM

## Accessories and spare parts

Probe mounting flange	243261SP
Conduit fitting + O-ring (M16 × 1.5 / NPT1/2")	210675SP
Conduit fitting + O-ring (M16 × 1.5 / PG9, RE-MS)	210674SP
USB adapter for Insight and M12 - M8 cable	USB2 and 262195SP
Connection cable for GM70 (MI70) handheld meter	219980SP
Calibration adapter	DRW244827SP
Porous sintered PTFE filter	DRW244221SP



GMD110 dimensions



## MGP261 Multigas Probe

For methane, carbon dioxide, and humidity measurement



### Features

- Compact in situ probe with CH<sub>4</sub>, CO<sub>2</sub>, and H<sub>2</sub>O vapor measurement
- Excellent long-term stability and repeatability with proprietary infrared technology — no calibration gases needed
- Direct installation into process: no sample treatment needed
- Certified for Ex Zone 0/1
- Probe heating eliminates condensation in wet processes
- Corrosion-resistant stainless steel housing (IP66)
- Standalone probe with digital Modbus RTU over RS-485 or 3 analog outputs (4-20 mA)
- Compatible with Vaisala Insight PC software

Vaisala CARBOCAP® MGP261 Multigas Probe for Methane, Carbon Dioxide, and Humidity Measurement is designed for in situ measurements in demanding biogas processing conditions where repeatable, stable, and accurate measurement is essential. MGP261 is Ex-certified for use in Ex Zone 0 (parts inserted into process) and Ex Zone 1 (parts outside the process). The probe belongs to the Vaisala MGP260 series product family.

### Up to three measurements in one compact unit

MGP261 measures the main components of biogas and landfill gas: methane (CH<sub>4</sub>), carbon dioxide (CO<sub>2</sub>), and humidity. These gases make up the bulk of biogas, and measuring all three parameters gives you a 100 % picture of the process. MGP261 measures CH<sub>4</sub>, CO<sub>2</sub>, and humidity in vol-% units, or alternatively dewpoint temperature (T<sub>d</sub>) in degrees Celsius.

### Methane measurement for biogas quality and process control

Methane concentration measurement tells you the calorific value of the gas produced in real time. With internal temperature measurement for

compensation purposes and an option for external pressure or temperature compensation input, the patented CARBOCAP® measurement gives unparalleled stability and reliability without calibration gases. Application areas include anaerobic digestion and landfill gas monitoring, activated carbon filter monitoring in biogas treatment process, and CHP engine feed gas monitoring.

### Direct in situ measurement without sample treatment

MGP261 measures gases directly in the process pipeline without a need for moisture removal. This simplifies the measurement both in situ and as part of an extractive system with optional flow through cell accessory. The heated

optical elements provide reliable measurements even in most demanding process conditions with condensate in the process gas.

MGP261 is Ex-certified for use in Ex Zone 0 (parts inserted into process) and Ex Zone 1 (parts outside the process). The electronics and optics of the IP66-rated instrument are protected by encapsulation in a potting compound to ensure maximum resistance to weather, dust, and ingress of process gases in the probe. Materials exposed to process gas are carefully selected for good chemical resistance against hydrogen sulfide: they include stainless 316L steel and polytetrafluoroethylene (PTFE).

# Technical data

## Measurement performance

Property	Methane CH <sub>4</sub>	Carbon dioxide CO <sub>2</sub>	Water vapor H <sub>2</sub> O
Sensor	CARBOCAP®	CARBOCAP®	CARBOCAP®
Measurement unit	Volume-%	Volume-%	Volume-%, dew point °C
Measurement range	0–100 vol-%	0–100 vol-%	0–25 vol-%, –10 ... +60 °C (14 ... +140 °F)
Accuracy at +25 °C (+77 °F) and 1013 hPa <sup>1) 2)</sup>	<ul style="list-style-type: none"> <li>0–40 vol-%: <b>±2 vol-%</b></li> <li>40–70 vol-%: <b>±1 vol-%</b></li> <li>70–100 vol-%: <b>±2 vol-%</b></li> </ul>	<ul style="list-style-type: none"> <li>0–30 vol-%: <b>±2 vol-%</b></li> <li>30–50 vol-%: <b>±1 vol-%</b></li> <li>50–100 vol-%: <b>±2 vol-%</b></li> </ul>	0–25 vol-%: <b>±0.5 vol-%</b>
Repeatability <sup>2)</sup>	±0.5 vol-% at 60 vol-%	±0.3 vol-% at 40 vol-%	±0.1 vol-% at 2.5 vol-%
Temperature dependence, compensated	Compensated, 0–100 vol-%: ±0.1 % of reading/°C	Compensated, 0–100 vol-%: ±0.1 % of reading/°C	Compensated, 0–25 vol-%: ±0.1 % of reading/°C
Temperature dependence, uncompensated	Uncompensated, 0–100 vol-%: –0.9 % of reading/°C	Uncompensated, 0–100 vol-%: –0.9 % of reading/°C	Uncompensated, 0–25 vol-%: –0.4 % of reading/°C
Pressure dependence, compensated	Compensated, 0–100 vol-%: ±0.015 % of reading/hPa	Compensated, 0–100 vol-%: ±0.01 % of reading/hPa	Compensated, 0–25 vol-%: ±0.06 % of reading/hPa
Pressure dependence, uncompensated	Uncompensated, 0–100 vol-%: +0.2 % of reading/hPa	Uncompensated, 0–100 vol-%: +0.2 % of reading/hPa	Uncompensated, 0–25 vol-%: +0.2 % of reading/hPa
Long-term stability	±2 vol-%/year	±2 vol-%/year	±2 vol-%/year
Start-up time <sup>3)</sup>			30 s
Warm-up time <sup>4)</sup>			2 min <sup>5)</sup>
Response time (T <sub>90</sub> )			90 s <sup>6)</sup>
Response time with flow-through adapter			90 s at ≥ 0.5 l/min <sup>6)</sup> (recommended: 0.5–1 l/min)

<sup>1)</sup> Excluding cross-interferences to other gases.

<sup>2)</sup> Accuracy specification at 25 °C (+77 °F) and 1013 hPa including non-linearity, calibration uncertainty, and repeatability; temperature and pressure compensated.

<sup>3)</sup> Time to first reading

<sup>4)</sup> Time to specified accuracy

<sup>5)</sup> At +20 °C (+68 °F) ambient temperature

<sup>6)</sup> With standard PTFE filter

## Inputs and outputs

Operating voltage	18–30 V DC
Power consumption	Typical: 3 W Maximum: 6 W
Digital output	RS-485 (Modbus RTU)
Analog output	3 × 4–20 mA scalable, isolated
Analog output load	Minimum: 0 Ω Maximum: 500 Ω
Analog output accuracy	±0.2 % of full scale at 25 °C (77 °F)
Analog output temperature dependence	0.005 %/°C (0.003 %/°F) full scale
Analog input (optional)	1 × 4–20 mA (Ex ia) for external pressure or temperature sensor <sup>1)</sup>

<sup>1)</sup> The optional analog input is galvanically isolated and provides power for the connected external pressure sensor.

## Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, RCM
Ex approval marks	EU (ATEX), international (IECEX), US/CAN (cMETus), Japan (CML), UK(UKEX), Korea (KCs) <sup>1)</sup>
Ex classification	Ex II 1/2 (I) G Ex eb mb [ia] IIB T3 Ga/Gb –40 °C ≤ Tamb ≤ +60 °C Class I, Division 2, Groups C, D; T3

<sup>1)</sup> See product documentation for full Ex classifications for each region.

## Operating environment

Operating temperature range	–40 ... +60 °C (–40 ... +140 °F)
Operating humidity range	0–100 %RH
Storage temperature range	–40 ... +60 °C (–40 ... +140 °F)
Storage humidity range	0–90 %RH
Process pressure range	–500 ... +500 hPa
Process temperature range	+0 ... +60 °C (+32 ... +140 °F)
Process flow range	0–20 m/s

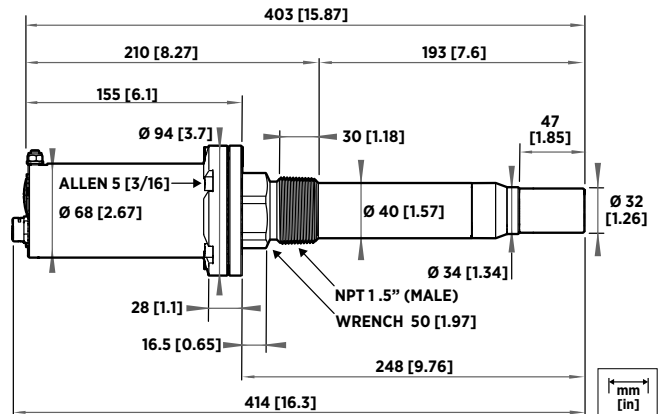
## Mechanical specification

Weight	3 kg (6.6 lb)
Thread type	1.5" male NPT
Mechanical pressure tolerance	20 bar(g)
Cable lead-throughs	1 × M16×1.5 2 × M20×1.5
IP rating	IP66
<b>Materials</b>	
Probe body	AISI316L stainless steel, PPS
Filter cap	Sintered PTFE

## Options and accessories

Configuration cable (RS-485/USB) <sup>1)</sup>	257295
Flow-through adapter	258877
Sintered PTFE filter (includes O-ring)	DRW249919SP
NPT 1.5" thread test plug	257525SP

<sup>1)</sup> Vaisala Insight software for Windows® available at [www.vaisala.com/insight](http://www.vaisala.com/insight)



MGP261 dimensions

## MGP262 Multigas Probe

For low concentration methane and high concentration carbon dioxide measurement



### Features

- Compact in situ probe with low-% CH<sub>4</sub> and high-% CO<sub>2</sub> measurement
- Excellent long-term stability and repeatability with proprietary infrared technology — no calibration gases needed
- Direct installation into process: no sample treatment needed
- Certified for Ex Zone 0/1
- Probe heating eliminates condensation in wet processes
- Corrosion-resistant stainless steel housing (IP66)
- Standalone probe with digital Modbus RTU over RS-485 or 3 analog outputs (4–20 mA)
- Compatible with Vaisala Insight PC software

Vaisala CARBOCAP® MGP262 Multigas Probe for Methane and Carbon Dioxide Measurement is designed for demanding in situ measurement of the offgas in the biogas upgrading process, where low concentrations of methane need to be measured reliably and with high accuracy in the presence of high concentrations of carbon dioxide. The probe belongs to the Vaisala MGP260 series product family.

### Direct view to process performance

MGP262 measures the concentrations of the main components in the offgas stream of a biogas upgrading process: methane and carbon dioxide. The methane concentration in the offgas is one of the direct indicators of the process performance. The lower the offgas methane concentration, the lower the methane loss, hence higher yield from the biogas and the smaller the environmental impact. Monitoring offgas composition reliably and accurately enables optimizing the upgrading process as well as determining the amount of greenhouse gases emitted from the process for environmental compliance purposes.

### Outstanding methane measurement performance

MGP262 has been optimized for measuring methane concentrations below 5 vol-% with an accuracy of ±0.15 vol-%. Combined with a wide temperature range (-40 to +60 °C), MGP262 is ideal for a wide range of upgrading technologies and processes.

### Ease of use

MGP262 is unique in being an in situ probe for demanding explosive environments. No sampling system is needed and there are no moving parts in the probe. Apart from an annual calibration check, MGP262 does not need any consumables or calibration gas cylinders, which makes its maintenance very easy.

### Robust, weatherproof, and Ex-certified for Zones 0 and 1

MGP262 is internationally certified for Zone 0 inside the pipeline and Zone 1 on the outside, allowing installation in any Ex hazardous environment expected in the biogas and natural gas industry. The probe is IP66-rated and specified for ambient temperatures from -40 to +60°C for outdoor installation in harsh environments. Stainless-steel construction, hermetic sealing of optics, and encapsulated electronics provide the probe with maximum robustness and resilience to mechanical shocks, vibration, and corrosive chemicals.

# Technical data

## Measurement performance

Property	Methane CH <sub>4</sub>	Carbon dioxide CO <sub>2</sub>
Sensor	CARBOCAP®	CARBOCAP®
Measurement unit		Volume-%
Measurement range	0–5 vol-%	0–100 vol-%
Accuracy at +25 °C (+77 °F) and 1013 hPa <sup>1) 2)</sup>	0–2 vol-%: <b>±0.1 vol-%CH<sub>4</sub></b> 2–5 vol-%: <b>±5% of reading</b>	90–100 vol-%: <b>±1 vol-%</b> 0–90 vol-%: <b>±2 vol-%</b>
Repeatability <sup>2)</sup>	< ±0.1 vol-% at 1% CH <sub>4</sub>	±0.4 vol-% at 95 vol-%
Temperature dependence (typical)	Compensated: 0–2 vol-%: <b>±0.05%CH<sub>4</sub></b> 2–5 vol-%: <b>±0.2%CH<sub>4</sub></b> Uncompensated: <b>±0.7 % of reading / °C</b>	Compensated, 0–100 vol-%: <b>±0.4 vol-%</b> Uncompensated, 0–100 vol-%: <b>±0.1 % of reading / °C</b>
Pressure dependence (typical)	Compensated: 0–2 vol-%: <b>±0.05%CH<sub>4</sub></b> 2–5 vol-%: <b>±0.1%CH<sub>4</sub></b> Uncompensated: <b>±0.2 % of reading / hPa</b>	Compensated, 0–100 vol-%: <b>±1 vol-%CO<sub>2</sub></b> Uncompensated, 0–100 vol-%: <b>±0.15 % of reading / hPa</b>
Long-term stability	0–2 vol-%: <b>±0.1 vol-%CH<sub>4</sub> / year</b> 2–5 vol-%: <b>±5% of reading / year</b>	±2 vol-%/year
Start-up time <sup>3)</sup>		30 s
Warm-up time <sup>4)</sup>		2 min <sup>5)</sup>
Response time (T <sub>90</sub> )		90 s <sup>6)</sup>
Response time with flow-through adapter		90 s at ≥ 0.5 l/min <sup>6)</sup> (recommended: 0.5–1 l/min)

1) Excluding cross-references to other gases.

2) Accuracy specification at 25 °C (+77 °F) and 1013 hPa including non-linearity, calibration uncertainty, and repeatability; temperature and pressure compensated.

3) Time to first reading.

4) Time to specified accuracy.

5) At +20 °C (+68 °F) ambient temperature.

6) With standard PTFE filter.

## Operating environment

Operating temperature range	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity range	0–100 %RH
Storage temperature range	-40 ... +60 °C (-40 ... +140 °F)
Storage humidity range	0–90 %RH
Process pressure range	-500 ... +500 hPa
Process temperature range	+0 ... +60 °C (+32 ... +140 °F)
Process flow range	0–20 m/s

## Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, RCM
Ex approval marks	EU (ATEX), international (IECEx), US/CAN (cMETus), Japan (CML), UK (UKEX), Korea (KCs) <sup>1)</sup>
Ex classification	Ex II 1/2 (I) G Ex eb mb [ia] IIB T3 Ga/Gb -40 °C ≤ Tamb ≤ +60 °C Class I, Division 2, Groups C, D; T3

1) See product documentation for full Ex classifications for each region.

## Inputs and outputs

Operating voltage	18–30 V DC
Power consumption	Typical: 3 W Maximum: 6 W
Digital output	RS-485 (Modbus RTU)
Analog output	3 × 4–20 mA scalable, isolated
Analog output load	Minimum: 0 Ω Maximum: 500 Ω
Analog output accuracy	±0.2 % of full scale at 25 °C (77 °F)
Analog output temperature dependence	0.005 %/°C (0.003 %/°F) full scale
Analog input (recommended)	1 × 4–20 mA (Ex ia) for external pressure or temperature sensor <sup>1)</sup>

1) The optional analog input is galvanically isolated and provides power for the connected external pressure sensor.

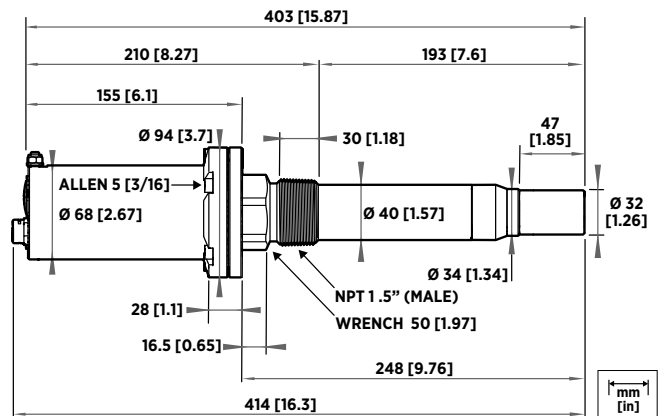
## Mechanical specification

Weight	3 kg (6.6 lb)
Thread type	1.5" male NPT
Mechanical pressure tolerance	20 bar(g)
Cable lead-throughs	1 × M16x1.5 2 × M20x1.5
IP rating	IP66
<b>Materials</b>	
Probe body	AlSi316L stainless steel, PPS
Filter cap	Sintered PTFE

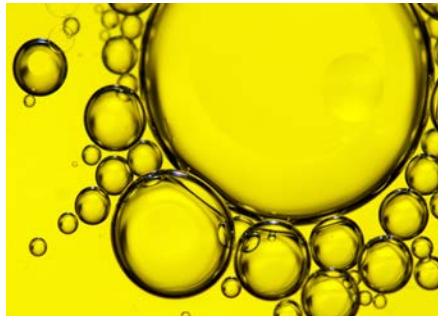
## Options and accessories

Configuration cable (RS485/USB) <sup>1)</sup>	257295
Flow-through adapter	258877
Sintered PTFE filter (includes O-ring)	DRW249919SP
MGP260 Series Ex e connector set	265897
NPT 1.5" thread test plug	257525SP

1) Vaisala Insight software for Windows® available at [www.vaisala.com/insight](http://www.vaisala.com/insight).



MGP262 dimensions



### 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

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.

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.

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.
- Our sensor technology tells the true margin to water saturation point in all changing conditions, taking into account, for example, temperature changes and aging of oil.
- Highly stable pressure and temperature tolerances.
- Easy to install through ball valve – no need to shut down the process.
- Enables predictive maintenance work and quick identification of damaging trends.

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.

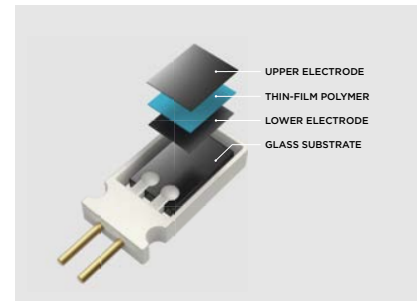
Oil molecules or additives do not penetrate the electrode. Thus the sensor output is independent of the oil type.

### Online measurement

Online 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 online 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  $\pm 0.01 a_w$  ( $\pm 1 \text{ } \% \text{RS}$ )
- Incorporates the proven Vaisala HUMICAP<sup>®</sup> sensor
- Modbus<sup>®</sup> RTU over RS-485
- Two lengths available for the probe head: 262 mm and 448 mm
- Traceable calibration certificate
- Compatible with Vaisala Indigo products and Insight PC software

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

### Reliable Vaisala HUMICAP<sup>®</sup> technology

MMP8 incorporates the latest-generation Vaisala HUMICAP<sup>®</sup> 180L2 sensor, which is the result of over 20 years of field experience.

The 180L2 sensor's excellent chemical tolerance provides accurate and reliable measurement over a wide measurement range. The 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 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 an optional ball valve kit, MMP8 is ideal for installation into processes where the probe needs to be installed or removed while the process is running. MMP8 is available in two different lengths, and the installation depth of the probe 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.

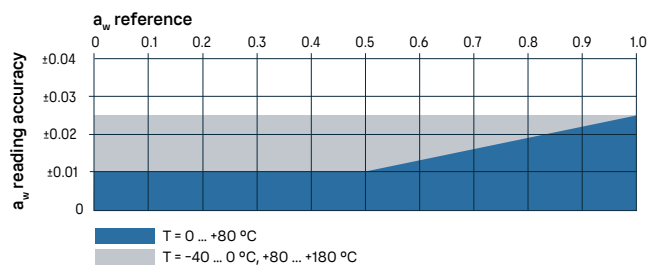
For more information on Indigo family products and Insight PC software that can be used with the probe, see [www.vaisala.com/insight](http://www.vaisala.com/insight) and [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

# Technical data

## Measurement performance

Water activity	
Measurement range	0–1 $a_w$
$T_{90}$ response time <sup>1)</sup>	10 min
Sensor	HUMICAP® 180L2
Accuracy <sup>2)</sup>	±0.01 $a_w$ (±1 %RS)
Water concentration in oil	
Typical accuracy	10 % of the reading
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 psi), absolute
Installation pressure	Up to 10 bar (145 psi), absolute
IP rating of probe body	IP66
Ball valve	
Operating temperature	Up to +100 °C (+212 °F)
Operating pressure	Up to 40 bar (580 psi), absolute

## 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 concentration in oil (ppm <sub>w</sub> )

## Mechanical specifications

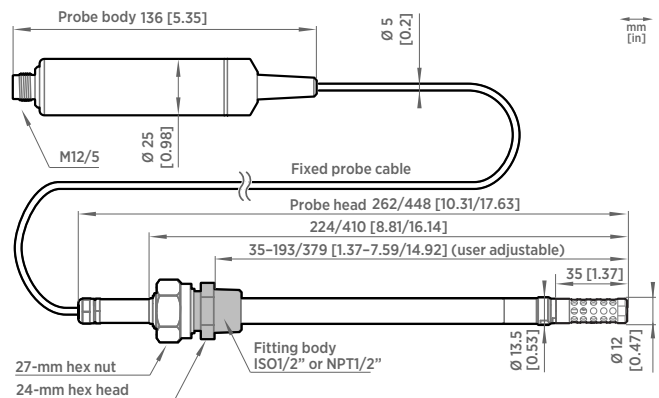
Connector	M12 5-pin A-coded male
Weight (with a 2-m cable)	262-mm-long MMP8: 510 g (18.0 oz) 448-mm-long MMP8: 610 g (21.5 oz)
Filter options	Stainless steel grid standard filter Stainless steel grid filter for high flow rates (> 1 m/s)
Probe cable length	2 m (6.56 ft)
Adjustable installation depth	262-mm-long MMP8: 35–193 mm (1.37–7.59 in) 448-mm-long MMP8: 35–379 mm (1.37–14.92 in)
Materials	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP

## Compliance

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



- 1) DNV GL certificate applies to the 262-mm-long MMP8 model only, not to the 448-mm-long model.



## MMP8 dimensions

## Accessories

Ball valve kit ISO 1/2" with welding joint	BALLVALVE-1
Ball valve kit ISO 1/2" – ISO 3/4" with thread joint	BALLVALVE-2
Indigo USB adapter <sup>1)</sup>	USB2
Calibration adapter for HMK15	211302SP
Weatherproof carrying case for Indigo80 and a series 8 probe <sup>2)</sup>	ASM215318

- 1) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).  
 2) For example, MMP8, HMP8, or DMP8 with a max. 2-m (6.6-ft) probe connection cable.





### Features

- Continuous measurement of moisture in oil
- Proven Vaisala HUMICAP® sensor, over 15 years in oil applications
- Measurements in lubrication, hydraulic and transformer oils
- Excellent pressure and temperature tolerance
- Measuring water activity - ppm calculation for transformer oil
- Small size, easy to integrate
- Traceable calibration for measurement and analog outputs (certificates included)
- Applications: e.g. monitoring of transformer oil and of lubrication systems in marine and paper industry

Vaisala HUMICAP® Moisture and Temperature Transmitter Series for Oil MMT310 is a fast and reliable online detector for moisture in oil.

### Reliable Vaisala HUMICAP® Technology

The MMT310 series incorporates the latest generation of the Vaisala HUMICAP® sensor, developed for demanding moisture measurement in liquid hydrocarbons. The sensor's excellent chemical tolerance provides accurate and reliable measurement over the wide measurement range.

### Measuring Water Activity

MMT310 measures moisture in oil in terms of the water activity ( $a_w$ ) and temperature (T). Water activity indicates directly whether there is a risk of free-water formation. The measurement is independent of oil type, age, and temperature.

### Water Content as PPM Calculation for Transformer Oils

PPM units are traditionally used in transformer applications. They indicate the average mass concentration of water in oil. The ppm calculation for mineral oil based transformer oil is optional in the MMT310 series.

### Diverse Applications and Demanding Conditions

MMT310 can be used in lubrication and hydraulic systems as well as in transformers. It can be used for on-line moisture monitoring and as a control function, allowing separators and oil purifiers to be started only when necessary.

### Installation Options

MMT310 has two adjustable probe lengths. The transmitter can be ordered with a ball-valve set that enables the insertion and removal of the moisture probe for calibration, without the need to empty the oil system.

MMT317 has a small pressure-tight probe with optional Swagelok fittings.

An optional rain shield is available for outdoor installations.

### Several Outputs, One Connector

MMT310 transmitters have two analog outputs and an RS-232 serial output. The output signals and the supply power travel in the same cable, the only cable connected to the unit.

# Technical Data

## Measurement Performance

### Water Activity

Measurement range  $a_w$  (%RS) 0 ... 1 (0 ... 100 %)

Accuracy (Including Non-Linearity, Hysteresis, and Repeatability):

0 ... 0.9 (0 ... 90 %)  $\pm 0.02$

0.9 ... 1.0  $\pm 0.03$

Response time (90 %) at +20 °C in still oil (with stainless steel filter) 10 min

Sensor Vaisala HUMICAP® 180L2

### Temperature

Measurement range -40 ... +180 °C (-40 ... +356 °F)

Typical accuracy at +20 °C (68 °F)  $\pm 0.2$  °C ( $\pm 0.36$  °F)

Sensor Pt100 RTD Class F0.1 IEC 60751

## Mechanical Specifications

IP rating IP66

Weight example: MMT317 with 2 m cable 476 g

(Weight depends on selected probe and cable)

Cable feed through alternatives 8-pole connector with 5 m cable  
Female 8-pin connector screw joint for cable diameter 4 ... 8 mm

Sensor protection Stainless steel grid standard filter  
Stainless steel grid filter for high flow rates (> 1 m/s)

### Materials

Transmitter housing G-AlSi 10 Mg

Transmitter base PPS

### Probe Cable Length

MMT317 2 m, 5 m, or 10 m

MMT318 2 m, 5 m, or 10 m

### Probe installation MMT317

Swagelok® NPT 1/2", ISO 3/8" or ISO 1/2"

### Probe installation MMT318

Fitting bodies ISO 1/2", NPT 1/2"

## Spare Parts and Accessories

Rain shield ASM211103

USB cable 238607

Stainless steel filter HM47453SP

Stainless steel filter (high flow rate) 220752SP

Ball-Valve Set BALLVALVE-1

## Operating Environment

Operating temperature for electronics -40 ... +60 °C (-40 ... +140 °F)

Storage temperature -55 ... +80 °C (-67 ... +176 °F)

Pressure range for MMT318 with ball-valve up to 120 °C 0 ... 40 bar

Pressure range for MMT317 0 ... 10 bar

EMC compliance EN61326-1, Industrial environment

## Inputs and Outputs

Two analog outputs, selectable and scalable 0 ... 20 mA or 4 ... 20 mA  
0 ... 5 V or 0 ... 10 V  
1 ... 5 V available through scaling

Typical accuracy of analog output at +20 °C  $\pm 0.05$  % full scale

Typical temperature dependence of analog output 0.005 %/°C (0.003 %/°F) full scale

Serial output RS-232C

Connections 8-pole connector with RS232C, current/ voltage outputs (two channels) and  $U_{in}$

Operating voltage 10 ... 35 VDC

External load  $R_L < 500 \Omega$

Startup time after power-up 3 s

### Minimum Operating Voltage

RS232C output 10 VDC

Analog output 15 VDC

Pressures above 10 bara (145 psia) 24 VDC

### Power Consumption

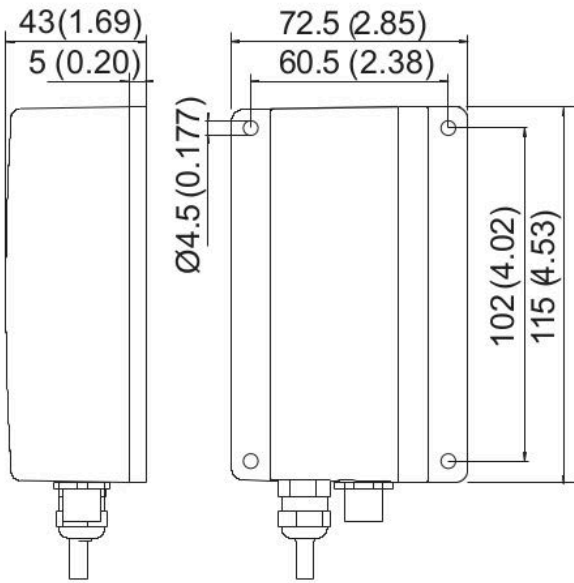
RS232C 12 mA

$U_{out}$  10 V (10 k $\Omega$ ) 12 mA

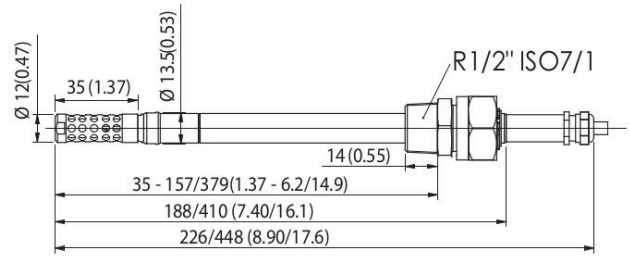
Channel 1 & channel 2

$I_{out}$  20 mA (load 511  $\Omega$ ) 50 mA

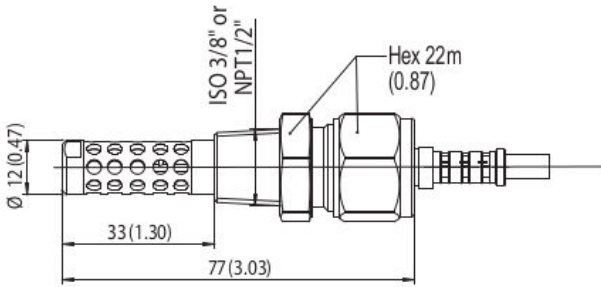
Channel 1 & channel 2



Transmitter body, dimensions in mm (inches)



MMT318 probe, dimensions in mm (inches)



MMT317 probe, dimensions in mm (inches)

## MMT162 Moisture and Temperature Transmitter for Oil

For OEM applications



### Features

- Continuous measurement of moisture in oil
- Measures in lubrication, hydraulic, and transformer oils
- Excellent pressure and temperature tolerance
- Proven Vaisala HUMICAP® sensor: over 20 years in oil applications
- Measures water activity - ppm calculation available for transformer oil
- Digital output RS-485 with Modbus
- Traceable calibration (certificate included)

Vaisala HUMICAP® Moisture and Temperature Transmitter for Oil MMT162 is an excellent economical solution for reliable on-line detection of moisture in oil.

### Benefits

- Reliable
- Durable
- Small size, easy to integrate

### Reliable Vaisala HUMICAP® technology

MMT162 incorporates the latest generation of the Vaisala HUMICAP® sensor. The sensor is developed for demanding moisture measurement in liquid hydrocarbons and has been successfully used in oil applications for over two decades. The sensor's excellent chemical tolerance provides accurate and reliable measurement over the measurement range.

### Water activity measurement

MMT162 measures moisture in oil in terms of the water activity ( $a_w$ ) and temperature (T). Water activity indicates directly whether there is a risk of free water formation. The measurement is independent of oil type, age, and temperature. The ppm calculation for mineral oil based transformer oil is optional in MMT162.

### Several outputs - one connector

MMT162 has two analog outputs that can be scaled and the measurement ranges changed. Additionally, the transmitter has an RS-485 serial output. The signals and the unit power travel in the same cable.

An optional LED cable enables a visual alarm.

### Compact, rugged, and intelligent

Due to its compact size, MMT162 is quickly and easily installed in tight spaces. Units are delivered fully assembled - however, you can reconfigure them to suit your needs.

### MM70 moisture and temperature meter

In combination with an MM70 Handheld Moisture and Temperature Meter, the MMT162 provides an ideal tool for on-site calibration. MI70 Handheld Measurement Indicator (included in the MM70 package) can be used as a communication and datalogging device and display for the MMT162.

# Technical data

## Measurement performance

Water activity	
Measurement range	0–1 $a_w$
Accuracy (including non-linearity, hysteresis, and repeatability):	
0–0.9 $a_w$	$\pm 0.02 a_w$
0.9–1.0 $a_w$	$\pm 0.03 a_w$
Response time in oil flow (typical)	< 1 min (dry-wet)
Temperature	
Accuracy at +20 °C (+68 °F)	$\pm 0.2$ °C (0.36 °F)
Moisture	
Calculated moisture content in ppm for mineral transformer oil	

## Operating environment

Operating temperature	–40 ... +60 °C (–40 ... +140 °F)
Storage temperature	–40 ... +80 °C (–40 ... +176 °F)
Oil temperature	–40 ... +80 °C (–40 ... +176 °F)
Oil flow	Some flow recommended
Pressure range	Up to 200 bar

## Inputs and outputs

Alarm level indication by analog signal	User selectable
Digital outputs	RS-485, non-isolated, Vaisala protocol, Modbus RTU protocol
Analog current output	0–20 mA, 4–20 mA
Analog voltage output	0–5 V, 0–10 V

## Compliance

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

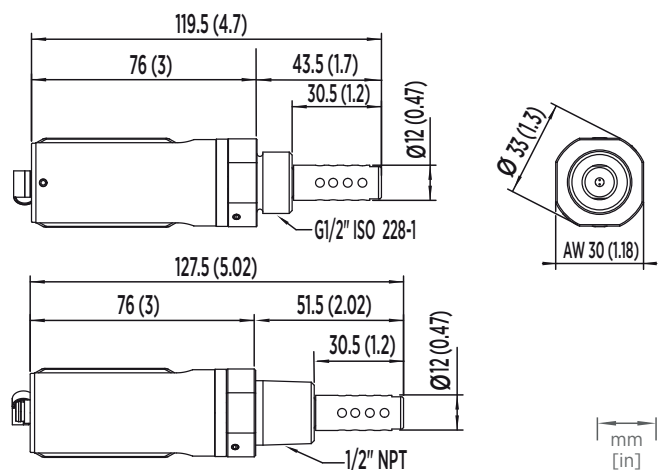
1) Temperature output may deviate in industrial environments of 80–700 MHz.

## Mechanical specifications

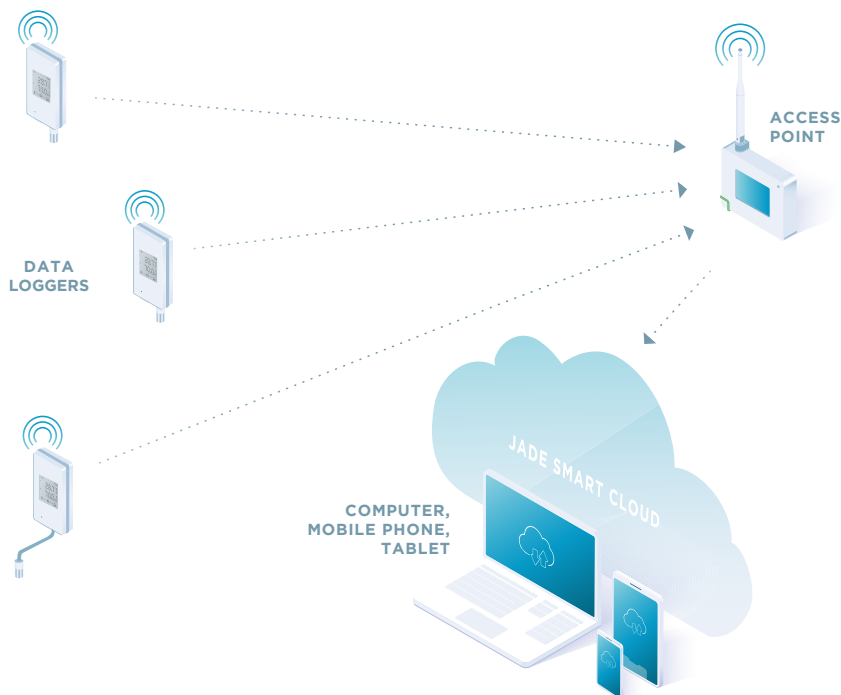
Sensor	HUMICAP®
Cable connections (2 ports)	M8 4-pin male
Mechanical connections with bonded seal ring (washer)	G 1/2" ISO or NPT 1/2"
Weight	200 g (7 oz)
Minimum operating voltage with	
RS-485 output	14–28 V DC
Voltage output	16–28 V DC
Current output	22–28 V DC
Supply current	
Normal measurement	20 mA + load current
External load for	
Voltage output	Min. 10 k $\Omega$
Current output	Max. 500 $\Omega$
Housing	
Probe body material	Stainless steel (AISI 316L)
IP rating	IP66

## Spare parts and accessories

Stainless steel filter (standard)	225356SP
Stainless steel filter for high flow (> 1 m/s)	221494SP
Connection cable for MM70 handheld meter	219980
USB serial interface cable	219690
Sealing ring set (U-seal) ISO G1/2, 3 pcs	221525SP
Sealing ring set (copper) ISO G1/2, 3 pcs	221524SP
ISO 1/2" plug	218773
NPT 1/2" plug	222507
Sampling cell	DMT242SC
Sampling cell with Swagelok connectors	DMT242SC2
Connection cables	
0.32 m (1 ft) shielded, M8 threaded	HMP50Z032
3.0 m (9.8 ft), shielded, M8 threaded	HMP50Z300SP
5.0 m (16.4 ft), shielded, M8 threaded	HMP50Z500SP
10 m (32.8 ft), shielded, M8 threaded	HMP50Z1000SP
3 m, shielded, connector 90° angle	231520SP
5 m, shielded, connector 90° angle	231521SP
M8 threaded, Ch1 signal + Ch2 LED	MP300LEDCBL



MMT162 dimensions



### Features

- Online service for monitoring of measurement parameters such as humidity and temperature
- Secure cloud storage of data
- Management of measurement locations using an intuitive system of sites and locations
- Connect using a web browser on your mobile phone, tablet or computer
- Add devices and users based on your needs
- No device pairing needed, as devices are associated with a specific cloud account when they are purchased

Vaisala Jade Smart Cloud is a convenient cloud-based data service for managing measurement data. The application can be accessed through a web browser on your mobile phone, tablet, or computer, making it ideal for professionals who want access to quality measurement data anywhere and at any time.

### Easy setup

The system is very easy to get started with. No device pairing is needed, as the devices are associated with a Jade Smart Cloud account when they are purchased. New devices become automatically available in the system. With the intuitive user interface, users can assign devices to measurement locations. Measurement locations can then be organized into measurement groups and sites for easy navigation.

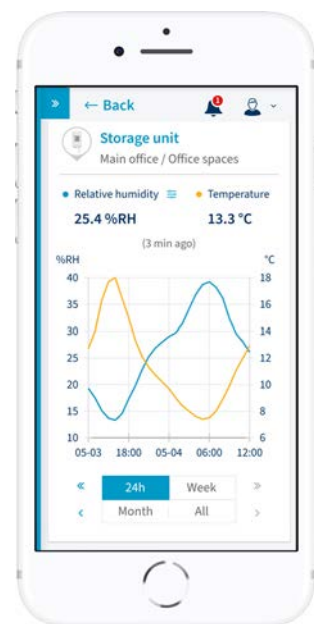
### Licensing

Access to the user interface, as well as features that are enabled, are based on license tiers. Basic tier provides the essential management features. Additional tiers will be made available later.

The number of active devices that can send their data to the cloud is controlled using device connection subscriptions. All data is safely stored in the cloud.

### Web application

The web application user interface is built on modern web technologies and supported by all major desktop and mobile browsers. There is no app to install and maintain. The user interface is always available online at: <https://jade.vaisala.com>



Graph on mobile screen

# Technical data

## Web application

Web address	<a href="https://jade.vaisala.com">https://jade.vaisala.com</a>
Web interface protocol	TLS 1.2
Supported Internet browsers	All modern and up-to-date browsers, including, but not limited to: Google Chrome™ Apple Safari® Microsoft Edge® Mozilla Firefox®
User interface languages	English, Finnish, French, German, Portuguese, Spanish, Swedish

## License tiers

Feature	Basic tier
Live measurement data	✓
Viewing historical measurement data using graph or table view	✓
Exporting measurement data reports in PDF and CSV format	✓
Organizing measurement locations under groups and sites	✓
Device and probe details, including calibration date	✓
Alerts for measurement locations and devices	✓
User configurable alert rules	✓
Alert notifications by email	✓
Inviting new users to access your account	✓
User rights and site access control using Administrator, Operator, and Viewer roles	✓

## Supported devices

Device model	Connection requirements
CWL100 Cloud Wireless Data Logger	Connects wirelessly through CA10 Cloud Access Point. The access point must be associated with the same customer account. See <a href="#">CWL100 Data Logger Datasheet (B211912EN)</a> .
CA10 Cloud Access Point	Ethernet network with Internet connection. See <a href="#">CA10 Access Point Datasheet (B211911EN)</a> .



### Features

- Connects up to 32 CWL100 wireless data loggers to Vaisala Jade Smart Cloud
- Display shows connection status of data loggers and cloud service
- Long range LoRa™ radio with over 100 m (328 ft) typical indoor range
- End-to-end encryption ensures secure data transmission and storage
- Powered by Power over Ethernet (PoE) or DC adapter
- Requires Internet connection through cabled Ethernet network or cellular modem

Cloud Access Point CA10 is a wireless networking hardware device for connecting CWL100 data loggers to Vaisala Jade Smart Cloud service.

### CA10 and Jade Smart Cloud

CA10 access point transfers measurement data from wireless CWL100 data loggers to Jade Smart Cloud service, and enables management of the data loggers from the cloud interface. Data is encrypted during transfers to protect against eavesdropping, data tampering, and transfer errors.

CA10 access points and CWL100 data loggers are associated with a specific cloud account when they are purchased, so there is no need for the user to do any device pairing. CA10 always requires power and Internet connection for operation.

### Redundancy

Redundancy of the wireless connection is achieved through use of multiple access points and free connection capacity in the system. If a data logger has a connection problem, it will automatically connect to another available nearby access point in the system. At least two access points with free capacity are needed for failover to function.

In case of temporary network disruptions, the CWL100 data loggers can record up to 30 days of measurements. Recorded data can be downloaded directly from the data logger through the USB port.

### Time synchronization

CA10 requires accurate time to operate its LoRa wireless connection, and to maintain correct time on the connected data loggers. To achieve the accurate time, CA10 automatically synchronizes with Network Time Protocol (NTP) servers over the Internet.



# Technical data

## Wireless

Networking standards	LoRa™
Wireless connection capacity	Up to 32 supported devices
Modulation	LoRa chirp spread spectrum modulation
Output power	13 dBm (20 mW)
Antenna	Non-removable external antenna
Typical range (indoors)	At least 100 m (approx. 330 ft)
Maximum number of access points in an area	8
<b>Frequency bands</b>	
Model CA10E	868 MHz
Model CA10A	915 MHz

## General

Compatible host systems	Vaisala Jade Smart Cloud
Supported devices	CWL100 data logger
Display language	English
Internal clock	Synchronizes with Network Time Protocol (NTP) servers over the Internet

### Requirements for connectivity

Cabled Ethernet network with Internet connection (can be provided using a cellular modem)

Network provides IP address through DHCP

CA10 must be able to access TCP port 443 and UDP port 123

## Inputs and outputs

Operating voltage using dedicated power supply connector	10 ... 30 V DC
PoE power class	Class 0
Power consumption	Max. 13 W
<b>Ethernet interface</b>	
Supported standards	10BASE-T, 100BASE-TX
IPv4 address assignment	DHCP (automatic)
<b>Connectors</b>	
Power supply connector	2.0 mm center pin locking type DC power jack
Service port	Micro-USB (2.0)
Expansion port	USB type A (2.0)
Ethernet	8P8C (RJ-45)

## Operating environment

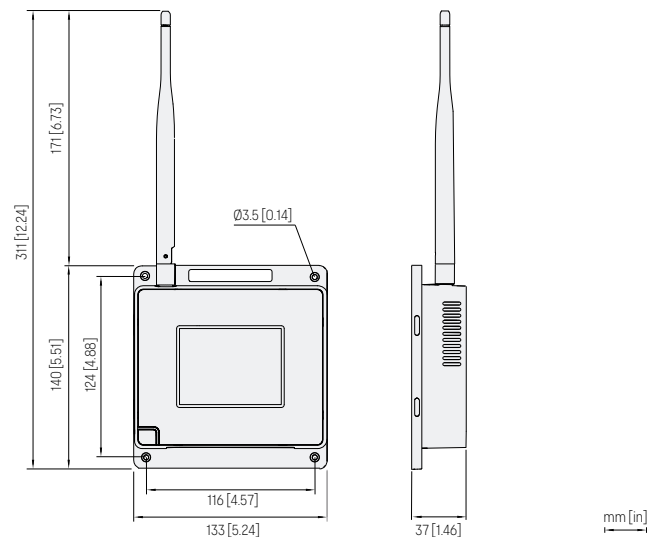
Operating environment	Indoor use
IP rating	IP30
Operating temperature	-20 ... +60 °C (-4 ... +140 °F)
Operating humidity	0 ... 90 %RH, non-condensing
Storage temperature	-20 ... +60 °C (-4 ... +140 °F)

## Compliance

Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment
Electrical safety	IEC/EN 61010-1
<b>CA10E model</b>	
EU directives and regulations	RoHS Directive (2011/65/EU) as amended by 2015/863 Radio Equipment Directive, RED (2014/53/EU)
Radio standards and approvals	ETSI EN 300 220-2 ETSI EN 301 489-1 ICASA No: TA-2022/0596 IMDA No: DB105576 Serbia: V005 21
Compliance marks	AAA, CE, ICASA, UKCA
<b>CA10A model</b>	
Radio standards and approvals	Anatel ID: 04763-19-12322 AS/NZS 4268 FCC ID: 2AO39-AP10A IC ID: 23830-AP10A
Compliance marks	ANATEL, RCM

## Mechanical specifications

Housing color	White
Mounting methods	Screws, tie wrap
Weight	386 g (13.6 oz)
Dimensions (H × W × D)	311 × 133 × 37 mm (12.24 × 5.24 × 1.46 in)
<b>Materials</b>	
Housing	PC/ABS blend
Display window	Chemically strengthened glass
Antenna	ABS



CA10 access point dimensions



### Features

- Reliable >100 m (approx. 330 ft) wireless range utilizing LoRa™ radio technology
- Detachable high-accuracy relative humidity and temperature probes
- Typical battery life of 18 months
- Uses standard alkaline batteries
- Optional magnetic mounting bracket available

CWL100 Cloud Wireless Data Logger uses long range LoRa wireless technology. It can be used to monitor temperature and humidity in a wide range of environments such as warehouses, production areas, cleanrooms, and laboratories. CWL100 is also suitable for construction moisture measurement.

### LoRa wireless

CWL100 connects wirelessly to Vaisala Jade Smart Cloud service, which provides real-time data, trend graphs, and alerts. The LoRa modulation technique provides a robust wireless signal that is extremely reliable over long distances and in complex, obstructed conditions. This wireless technology allows the data logger's signal to travel over 100 m (approx. 330 ft) indoors without the aid of signal amplifiers or repeaters. Wireless communications are encrypted to ensure data integrity and security.

Measurements are updated on the local display and stored on the data logger's local memory every 60 seconds, and sent through the wireless connection every 4 minutes. Jade Smart Cloud service stores the data in the original 1-minute resolution.

In case of a temporary network disruption the data logger can record up to 30 days of measurements. Recorded data can be downloaded directly from CWL100 through the USB port.

### Versatility and convenience

CWL100 requires no startup configuration, and the included mounting bracket supports several installation methods. Detailed custom display shows the latest measurement results, battery status, and signal strength of the current access point connection. The housing is classified IP54 to protect the device from dust and cleaning.

CWL100 is powered by 2 standard AA size 1.5 V batteries (LR6 alkaline or FR6 lithium) for 18 months of operation at approximately 20 °C (68 °F). When fresh batteries are inserted during yearly calibration, battery replacement between calibrations is not needed.

### Detachable probe

CWL100 supports several probe types for humidity and temperature measurement. Models with plastic housing are suitable for ambient measurements and provide a fast temperature response time. Stainless

steel probes are robust and suitable for demanding applications such as construction moisture measurement using the borehole method.

The probes use Vaisala HUMICAP® humidity sensors and platinum temperature sensors for superior stability. Probes can be integrated with the CWL100 housing or connected using a cable.

The probe is detachable, and easy to switch out for calibration. Jade Smart Cloud service detects the changed probe information automatically and maintains accurate and complete historical records.

# Probe options

Probe model	Measurement	Application <sup>1)</sup>	Measurement temperature	Mounting	Calibration certificate
HMP63	RH + T	General purpose humidity and temperature probe. Ideal for ambient measurement.	-40 ... +60 °C (-40 ... +140 °F)	Integrated or cable probe	No
HMP63T	T	General purpose temperature probe. Ideal for ambient measurement.	-40 ... +60 °C (-40 ... +140 °F)	Integrated or cable probe	No
HMP110	RH + T	Robust probe for demanding conditions. Suitable for structural humidity measurement using the borehole method.	-40 ... +80 °C (-40 ... +176 °F)	Cable probe only	Yes
HMP115	RH + T	Calibrated probe for high accuracy general purpose humidity and temperature measurement.	-40 ... +60 °C (-40 ... +140 °F)	Integrated or cable probe	Yes
HMP115T	T	Calibrated probe for high accuracy general purpose temperature measurement.	-40 ... +60 °C (-40 ... +140 °F)	Integrated or cable probe	Yes
TMP115	T	Wide-range temperature probe. Suitable for measurement in extremely cold temperatures. Available as 50 cm (1 ft 7.7 in) and 3 m (9.8 ft) long versions.	-196 ... +90 °C (-320 ... +194 °F)	Integrated or cable probe	Yes

1) See probe datasheets for detailed probe specifications and probe-specific accessories.

## Accessories

Accessory	Item code	HMP63	HMP110	HMP115/T	TMP115
Probe cable 1.5 m	CBL210555-1M5SP	✓	✓	✓	✓
Probe cable 3 m	CBL210555-3MSP	✓	✓	✓	✓
Probe cable 10 m	CBL210555-10MSP	✓	✓	✓	✓
Flat cable 3 m	CBL210647SP	✓	✓	✓	✓

## Accessories for concrete moisture measurement

Accessory	Item code	HMP63	HMP110	HMP115/T	TMP115
Plastic tube set (12 pcs)	19266HM		✓		
Long (200 mm) plastic tube set (12 pcs)	245789		✓		
Rubber plugs (12 pcs)	233976		✓		
Plastic flange set (12 pcs)	26529HM		✓		
Long rubber plug for wet concrete (12 pcs)	26530HM		✓		



HMP63/T and HMP115/T probes



HMP110 probe



TMP115 probe

# Technical data

## Wireless

Networking standards	LoRa™
Modulation	LoRa chirp spread spectrum modulation
Output power	13 dBm (20 mW)
Antenna	Internal
Typical range (indoors)	At least 100 m (approx. 330 ft)
Range with line-of-sight	Over 500 m (1640 ft)
Frequency bands	868 MHz and 915 MHz

## Memory

Sample capacity	30 days (43200 samples per channel)
Memory type	Non-volatile EEPROM
Memory mode	Ring buffer (FIFO)
Sampling rate	One sample / channel / minute (non-changeable)

## General

Compatible probes	HMP63, HMP63T, HMP110, HMP115, HMP115T, TMP115
Batteries	2 × AA sized, 1.5 V (LR6 or FR6)
Operation time at 20 °C (68 °F) without external power supply	18 months
Internal clock accuracy	±30 s/month Synchronizes time from CA10 access point

## Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Electrical safety	EN 61010-1
<b>868 MHz model</b>	
EU directives and regulations	RoHS Directive (2011/65/EU) as amended by 2015/863 Radio Equipment Directive, RED (2014/53/EU)
Radio standards and approvals	ETSI EN 300 220-2 ETSI EN 301 489-1 ICASA No: TA-2022-0748 IMDA No: DB105576 Serbia: M005 21
Compliance marks	AAA, CE, ICASA, UKCA
<b>915 MHz model</b>	
Radio standards and approvals	Anatel ID: 04761-19-12322 AS/NZS 4268 FCC ID: 2A039-RFL100A IC ID: 23830-RFL100A
Compliance marks	ANATEL, RCM

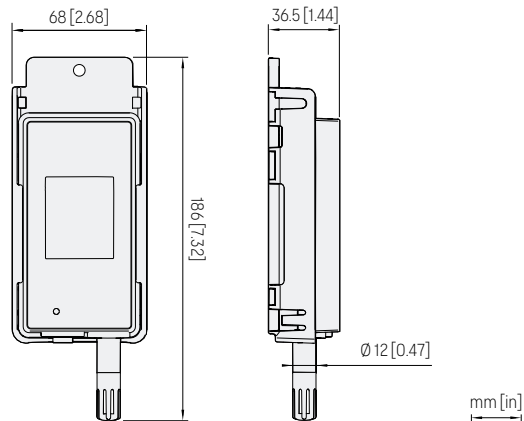
## Operating environment

Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity	0-100 %RH, non-condensing
IP rating	IP54
<b>Operating temperature <sup>1)</sup></b>	
with alkaline batteries	+2 ... +60 °C (+35.6 ... +140 °F)
with lithium batteries	-20 ... +60 °C (-4 ... +140 °F)

<sup>1)</sup> For both alkaline and lithium, battery temperature operating specifications apply.

## Mechanical specifications

Housing color	White
Mounting methods	Screws, tie-wrap, hook, or magnetic mounting bracket (optional accessory)
Probe interface	4-pin female M8 connector
Service port	USB 2.0 with micro-USB connector
<b>Dimensions (H × W × D) with HMP115 probe</b>	
Without mounting bracket	158 × 62 × 31 mm (6.22 × 2.4 × 1.22 in)
With mounting bracket	186 × 68 × 36.5 mm (7.32 × 2.68 × 1.44 in)
<b>Weight</b>	
With batteries (2 pcs alkaline), HMP115 probe, and magnetic mounting bracket	254 g (8.96 oz)
<b>Materials</b>	
Housing	PC/ABS blend
Display window	PMMA (acrylic)
Sealings	TPE



CWL100 dimensions with HMP115 probe



### Features

- Cloud service for monitoring measurement parameters such as temperature, humidity, and CO<sub>2</sub>
- Secure cloud storage of data
- Support for ten languages
- Configurable alarm notifications by email
- Continual, automated validation of the system
- Connect using a web browser
- Add devices and users based on your needs
- Automatic device pairing

Vaisala viewLinc Cloud is a powerful cloud-based environmental monitoring system designed specifically for GxP applications, providing automated alarming and reporting capabilities to ensure the safety and efficacy of your products. The system is accessed through a web browser from anywhere with an Internet connection, making it ideal for professionals who want access to quality measurement data anywhere and at any time. viewLinc Cloud is instantly scalable to suit your monitoring requirements, allowing your system to range from one to thousands of measurements and multiple users with different roles and responsibilities.

viewLinc Cloud helps ensure that enterprises in GxP-regulated industries achieve and demonstrate compliance with stringent quality guidelines and processes. From its data integrity, access controls, and encryption to its continuous validation system, viewLinc Cloud provides a faster and simpler path to a compliant monitoring system.

### Easy setup

As a cloud service, there is no software to install or servers to manage. No device pairing is needed. New devices connect to the cloud service automatically and become available in the system within minutes. With the intuitive user interface, administrators can easily configure alarms to notify staff before conditions go out of specification. And users can see current conditions and report on historical conditions instantly.

### Cloud-based service

viewLinc Cloud is offered as Software-as-a-Service (SaaS). Vaisala takes care of most of the typical IT functions for you, such as server management, security and backup. With reduced load on your IT department and a convenient subscription model that eliminates significant upfront costs, viewLinc Cloud is very easy to adopt.

### Security

In viewLinc Cloud, data is always encrypted, both in transit and at rest. Access to the application is controlled via multi-factor authentication and within the application access is further restricted by role-based user rights, allowing for a high degree of control over who can see and do what.

### Data integrity

The software maintains your data in a complete, consistent, and accurate state, adhering to the principles of ALCOA++. Modification or deletion of data is prevented, and modification of configurations is restricted and recorded in the secure audit trail.

### Validation

viewLinc Cloud simplifies the process of validating your monitoring system. An initial qualification report is provided with your subscription. Additionally, the Continuous Validation System performs regular, automated tests on system status and functionality, and provides documented evidence of compliance.

### Scalable

You can quickly expand or reduce your viewLinc Cloud installation. Our system accommodates installations ranging from a few measurements to several thousand, and can be localized at one site or spread across the globe.

# Technical data

## License tiers

The license tier defines which set of features is available in the user interface. The Standard tier provides all of the essential management and user features. Additional tiers with more complex functionality will be made available later.

## Web application

The user interface is built on modern web technologies and supports most major browsers. There is no app to install and maintain.

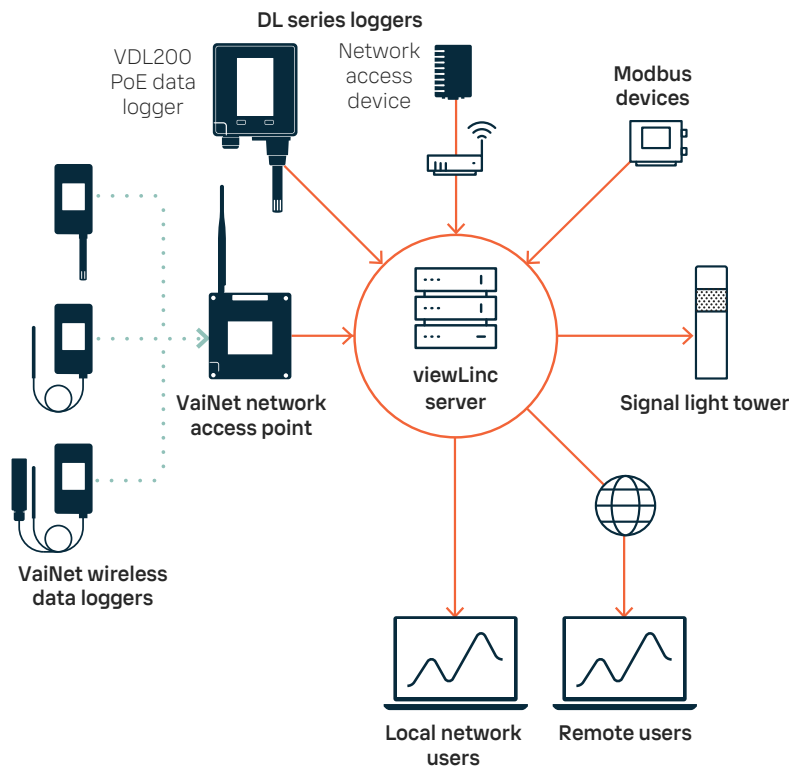
## Supported devices

viewLinc Cloud supports the RFL100 family of data loggers. Support for other measurement devices will be added in an on-going basis. Service subscriptions can be easily updated as your monitoring needs grow.

Feature	Standard tier
Configurable interface to match your facility or organizational structure	✓
Live measurement data	✓
Trend graph	✓
Alarms for measurement locations and devices	✓
Alarm notifications by email	✓
User configurable alarm rules	✓
Device and probe details, including calibration date and battery status	✓
Reports available in XLSX, CSV, and PDF	✓
Rights-based access defines what users can do and see within the system	✓

Web address	<a href="https://viewlinc.com">https://viewlinc.com</a>
Web interface protocol	TLS 1.3
Supported Internet browsers	All modern and up-to-date browsers, including, but not limited to: Google Chrome™ Microsoft Edge®
User interface languages	English, Finnish, French, German, Portuguese, Spanish, Swedish, Italian, Chinese, Japanese

Device type	Connection requirements
RFL100 Wireless Data Logger	Connects wirelessly through AP10 access point. The access point must be associated with the same customer account.
AP10 VaiNet Wireless Access Point	Ethernet network with Internet connection



### Features

- Software for continuous monitoring of temperature, humidity, and other parameters
- Eleven language versions for enterprise-wide, multi-site use
- Preconfigured and custom reports
- Windows Active Directory for easy user management
- Configurable alarm notifications: email, SMS, voice calls, signal towers, browser alerts
- Scheduled threshold alarming and alarm notification delivery times to accommodate maintenance periods or work shifts
- Interactive tours for novice users
- Licensed features: Voice/SMS web service, 3rd-party Modbus devices, Vaisala OPC UA Server, REST API

Vaisala viewLinc Enterprise Server software lets you network Vaisala data loggers or Modbus devices using a combination of wired and wireless connections. It supports installations from one or two measurement points to large systems with thousands of locations. Through user engagement and agile development, Vaisala delivers an always-improving product with new features and better performance. From its data integrity, access controls, and encryption to its validation protocols, viewLinc provides a faster and simpler implementation of your compliant monitoring system, particularly for enterprises in GxP-regulated industries seeking stringent quality guidelines and processes.

### Upgrading

- Only viewLinc 4.3.6 and higher can upgrade to 5.2 directly. Lower versions must first upgrade to 4.3.6.
- During upgrade, confirm list of previously provided hostnames/aliases so users can connect to viewLinc.
- Starting in 5.2, viewLinc uses Transport Layer Security (TLS) 1.3, so all Vaisala VaiNet AP10 Access Points in the installation need firmware version 4.5 or newer. AP10s version F and older must be replaced.

### System requirements

- A dedicated server (virtual server is recommended) continuously available 24/7 to run viewLinc software
- At least one Vaisala data logger or transmitter
- Vaisala cables to connect data loggers and set up wireless transmitters

### Continuous reliability

- Accessible via browser on any network computer or mobile device

- Runs as a Microsoft® Windows® service
- Supports UTF-8 compliant multi-byte character sets

### Licensing

- License key required for each installation and determines the number of devices
- Additional licenses enable voice or SMS web notifications, Vaisala OPC UA Server integration, the viewLinc REST API, or third-party Modbus devices

# Technical data

## Requirements based on system size

System size in measurement points	1 ... 20	21 ... 400	400+
Dedicated or shared server	Either	Either	Dedicated
CPU	1.6 GHz dual core	1.6 GHz dual core	3.2 GHz quad core
RAM	8 GB	12 GB	16 GB
Disk space increase/year	1.5 GB/year for 20 data points	15 GB/year for 200 data points	75 GB/year for 1000 data points
Continuous free disk space for reports <sup>1)</sup>	2 GB	4 GB	10 GB

<sup>1)</sup> 1 month duration with 1 minute scan/sample

## Server requirements

Availability	Dedicated server (a virtual server is recommended) available 24 hours a day, 7 days a week
Server management	Connected to an uninterruptible power supply (UPS) A tested backup solution with support for open file backup Synchronizes time with a Network Time Protocol (NTP) server
Operating system	Windows Server® 2022 Windows Server® 2022 Datacenter Edition Windows Server® 2019 Windows Server® 2019 Datacenter Edition Windows Server® 2016 Windows Server® 2016 Datacenter Edition Windows® 10 Enterprise (64-bit) Windows® 11 Pro
Application disk space	350 MB
Database disk space <sup>1)</sup>	200 KB/data point <sup>2)</sup> /day
Network traffic <sup>3)</sup>	Approx. 100 KB/minute/device
Web interface protocol <sup>4)</sup>	TLS 1.3
Security certificate for web interface	Authorized TLS certificate and key <sup>5)</sup>
Email encoding	RFC 2047
Secure email protocol	TLS 1.3
Active Directory server	2048-bit RSA certificate

<sup>1)</sup> Not applicable to Device Host installation.

<sup>2)</sup> Data points are device channels monitoring and recording data.

<sup>3)</sup> Depends on number of devices, system configuration and type of communication devices used.

<sup>4)</sup> viewLinc 5.2 includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit. <http://www.openssl.org/>

<sup>5)</sup> viewLinc-signed certificate and key can be generated during installation.

## Client requirements

Internet browser	Google Chrome™ Microsoft® Edge™
Computer clients	Any network computer with a supported Internet browser, a minimum 2.4 GHz CPU, and 4 GB of RAM.
Display and tablet clients	Touchscreen or mouse-operated panel with a supported Internet browser. Must be connected to the same network as viewLinc Enterprise Server.

## Wireless device connectivity

RFL100 series <sup>1)</sup>	Connects using Vaisala VaiNet protocol. Requires installation of an AP10 access point.
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<sup>1)</sup> VaiNet devices not available in all regions.

## Wired device connectivity

VDL200	Connects to a viewLinc Device host via Ethernet after its network settings have been configured through a USB-A – USB-C cable.
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DL series using vNet device	vNet Power-over-Ethernet devices are 802.3af compliant and work with both end-point and mid-span systems. viewLinc Aware automatically detects and configures vNet devices. <sup>1)</sup> Requires vNet device drivers (provided).
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DL series using single or multi-port Ethernet device	Ethernet connectivity devices must be configured with static or reserved IP addresses. If the devices are being installed on different subnets, they need to be configured before being installed. Ethernet device drivers must be installed on each server used to connect Vaisala devices.
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DL series using USB cable	Connect devices directly to viewLinc Device Hosts using a USB-to-logger cable. Requires USB ports.
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Modbus devices (RTU or TCP)	<ul style="list-style-type: none"> <li>Connect Modbus RTU devices directly to viewLinc Device Hosts using a USB-to-serial cable</li> <li>Connect Modbus RTU devices to viewLinc over the Ethernet network using a Serial to Ethernet adapter (like a Digi PortServer)</li> <li>Connect Modbus TCP devices to viewLinc over the Ethernet network</li> </ul> RTU devices require serial COM ports. TCP devices require a static IP address.
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Signal tower (light and/or buzzer)	Connect devices according to manufacturer directions. Preconfigured device settings are selectable in viewLinc. Note that you must assign a static or reserved IP address for signal towers.
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<sup>1)</sup> vNet devices maintain a low power rating by operating at a network speed of 10 Mbps. To ensure your network devices can operate at different speeds, set the network speed for the connected vNet port (see vNet User Guide).

## Network ports

Default	Type	Used by
80	TCP	Signal towers
389	TCP	Active Directory (less secure)
443	TCP	viewLinc web interface
502	TCP	Modbus TCP-enabled devices
636	TCP	Active Directory (secure connection)
771	TCP	vNet and multi-port Ethernet devices
950	TCP	Moxa serial-to-Wi-Fi devices
9065	UDP	viewLinc Aware service for vNet discovery
12500	TCP	Twilio web services
12600	TCP/UDP	AP10 and viewLinc device host
55000	TCP	Vaisala OPC UA Server





### Features

- Connects up to 32 RFL100 data loggers to a Vaisala monitoring system
- Powered by Power over Ethernet (PoE) or DC adapter
- Minimal infrastructure and no signal amplifiers needed
- Chirp spread spectrum wireless modulation is resistant to multi-path fading
- Secure data transmission
- Secure firewall and tamper-proof data backup

VaiNet Access Point AP10 is a wireless networking hardware device for Vaisala's proprietary wireless technology: VaiNet. AP10 transfers measurement data from wireless VaiNet data loggers to the monitoring system, and enables the remote configuration and management of VaiNet data loggers by the system's administrator. A wired Ethernet network connection is required.

### AP10 with a cloud-based monitoring system

AP10 supports viewLinc Cloud, a cloud-based data service for managing measurement data. When used with viewLinc Cloud, the installation is very simple. No device pairing is needed, as the devices are associated with the cloud account when they are purchased. New devices become automatically available in the system.

viewLinc Cloud systems can utilize 8 access points and up to 256 wireless data loggers on a single site.

### AP10 with an on-premise monitoring system

On-premise monitoring systems utilize Vaisala viewLinc Enterprise Server software. Instead of device pairing being preconfigured at the factory, the administrator of the viewLinc Enterprise Server has control over pairing. Whenever a new data logger is added to the system, AP10 automatically identifies

it and forwards its information to viewLinc. The administrator of the viewLinc Enterprise Server makes the decision to accept the new device.

With viewLinc Enterprise Server, the access points and data loggers can be deployed as a large VaiNet system by using the VaiNet segmentation feature. Systems with up to 32 access points and up to 1024 data loggers can be deployed on a single site, as long as the large system installation guidelines are followed.

AP10 synchronizes with default NTP servers over the Internet. When used with the viewLinc Enterprise Server, AP10 can be configured to use your local NTP server, which allows operation without an Internet connection.

### Data integrity

Data is encrypted during VaiNet transfers to protect against eavesdropping, data tampering, and transfer errors. Both the access point and the monitoring system

verify that the data has been received correctly. Once the data is verified, it is stored to the monitoring system's secure database and protected from tampering and loss.

### Redundancy

Redundancy of the wireless connection is achieved through use of multiple VaiNet access points and free connection capacity in the system. If a VaiNet data logger has a connection problem, it will automatically connect to another available access point in the system. At least 2 access points with free capacity are needed for failover to function.

### Time synchronization

AP10 requires accurate time to operate its VaiNet wireless connection, and to maintain correct time on the connected data loggers. To achieve the accurate time, AP10 synchronizes with Network Time Protocol (NTP) servers.

# Technical data

## Wireless

Networking standards	Vaisala VaiNet
Wireless connection capacity	Up to 32 supported devices
Modulation	Chirp spread spectrum modulation
Output power	13 dBm (20 mW)
Antenna	Non-removable external antenna
Typical range (indoors)	At least 100 m (approx. 330 ft)
<b>Maximum number of access points in an area</b>	
Standard system	8
Large system <sup>1)</sup>	32
<b>Frequency bands</b>	
Model API0C	500 MHz
Model API0E	868 MHz
Model API0A	915 MHz
Model API0J	920 MHz
Model API0T	922 MHz

<sup>1)</sup> Requires viewLinc Enterprise Server. Subject to additional installation requirements. See *Guidelines for Large VaiNet Systems (M212596EN)*.

## General

Compatible Vaisala monitoring systems	viewLinc Enterprise Server 5.0 and newer viewLinc Cloud
Supported wireless devices	RFL100 data logger
User interfaces	Touchscreen interface Web browser interface <sup>1)</sup>
User interface languages <sup>2)</sup>	English, German, French, Portuguese, Spanish, Swedish, Chinese, Japanese
Internal clock	Synchronizes with Network Time Protocol (NTP) server on UDP port 123. NTP server connection required for operation.

<sup>1)</sup> Not available on cloud-connected variant.

<sup>2)</sup> Only English language is available on the cloud-connected variant.

## Inputs and outputs

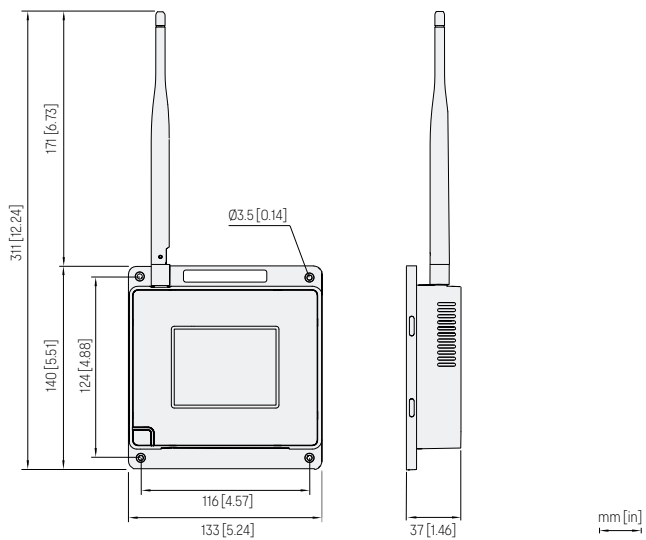
Supply voltage using dedicated power supply connector	10–30 V DC
PoE power class	Class 0
Power consumption	Max. 13 W
<b>Ethernet interface</b>	
Supported standards	10BASE-T, 100BASE-TX
IPv4 address assignment	DHCP (automatic), static
<b>Connectors</b>	
Power supply connector	2.0 mm center pin locking type DC power jack
Service port	Micro-USB (2.0)
Expansion port	USB type A (2.0)
Ethernet	8P8C (RJ-45)

## Operating environment

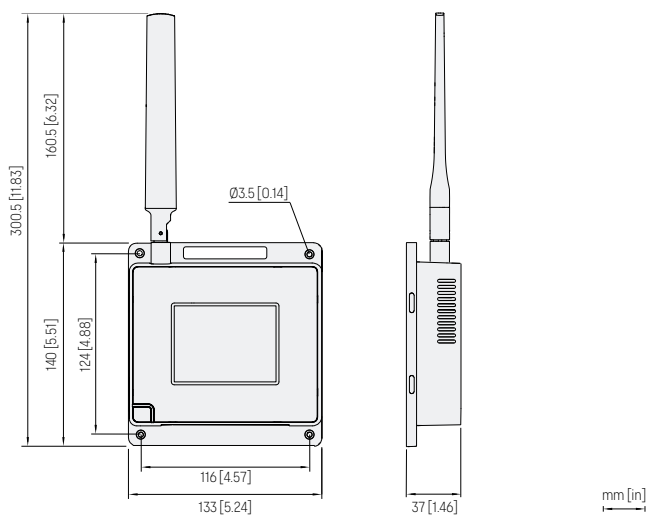
Operating environment	Indoor use
IP rating	IP30
Operating temperature	–20 ... +60 °C (–4 ... +140 °F)
Operating humidity	0–90 %RH, non-condensing
Storage temperature	–20 ... +60 °C (–4 ... +140 °F)

## Compliance

Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment
Electrical safety	IEC/EN 61010-1
<b>API0E model</b>	
EU directives and regulations	RoHS Directive (2011/65/EU) as amended by 2015/863 Radio Equipment Directive, RED (2014/53/EU)
Radio standards and approvals	ETSI EN 300 220-2 ETSI EN 301 489-1 ICASA No: TA 2020-7918 IMDA No: DB105576 TRA No: ER67585/18 Serbia: M005 21
Compliance marks	AAA, CE, ICASA, UKCA
<b>API0A model</b>	
Radio standards and approvals	Anatel ID: 04763-19-12322 AS/NZS 4268 FCC ID: 2AO39-AP10A IC ID: 23830-AP10A NOM ID: 1901C00393
Compliance marks	ANATEL, NOM, NYCE, RCM
<b>API0J model</b>	
Radio standards and approvals	MIC ID: 012-200006
Compliance marks	GITEKI
<b>API0C model</b>	
Radio standards and approvals	China MIIT 工业和信息化部公告 2019 年第 52号
Compliance marks	China RoHS
<b>API0T model</b>	
Radio standards and approvals	NCC ID: CCAP21LP1250T6
Compliance marks	NCC



AP10 access point dimensions



AP10C model dimensions

## Mechanical specifications

Housing color	White
Mounting methods	Screws, tie wrap
Weight	386 g (13.62 oz)
<b>Dimensions (H × W × D)</b>	
AP10C model	300.5 × 133 × 37 mm (11.83 × 5.24 × 1.46 in)
Other models	311 × 133 × 37 mm (12.24 × 5.24 × 1.46 in)
<b>Materials</b>	
Housing	PC/ABS blend
Display window	Chemically strengthened glass
Antenna	ABS

## RFL100 Wireless Data Logger for Continuous Monitoring Systems



### Features

- Industry-leading measurement precision
- Interchangeable high-accuracy probes for T, RH, and CO<sub>2</sub>
- 30-day memory buffer
- Typical battery life of 18 months in RH and T measurement
- Uses standard AA batteries
- Probe calibrations are traceable to SI units through national metrology institutes or accredited calibration laboratories
- Cost-effective alternative to chart recorders

RFL100 Data Logger uses Vaisala's proprietary VaiNet wireless technology. It can be used to monitor temperature (T), relative humidity (RH), and carbon dioxide level (CO<sub>2</sub>) in a wide range of environments. Suitable applications include warehouses, production areas, cleanrooms, laboratories, incubators, fridges, cold storage areas, and freezers down to -196 °C (approx. -320 °F).

### VaiNet wireless

RFL100 connects wirelessly through the AP10 VaiNet Wireless Access Point to Vaisala monitoring systems for real-time trends, alarms, and historical reporting. VaiNet wireless technology provides a robust wireless signal that is extremely reliable over long distances and in complex, obstructed conditions. This wireless technology allows the data logger's signal to travel over 100 m (approx. 330 ft) indoors without the aid of signal amplifiers or repeaters. Wireless communications are encrypted to ensure data integrity and security.

Measurements are updated and stored every 60 seconds, and sent from the data logger every 4 minutes. In case of temporary network disruptions, the data logger can record up to 30 days of measurements that are automatically transmitted to the monitoring system when communications are restored. Recorded data can also be downloaded directly from RFL100 through the USB port.

### Versatility and convenience

RFL100 requires no startup configuration, and the included mounting bracket supports several installation methods. Detailed custom display shows the latest measurement results, alarm and battery status, and signal strength of the current access point connection. The housing is classified IP54 to protect the device from dust and cleaning.




RFL100 is powered by two standard AA size 1.5 V batteries (LR6 alkaline or FR6 lithium) for 18 months of operation at approximately 20 °C (68 °F) in RH and T measurement. When fresh batteries are inserted during yearly calibration, battery replacement between calibrations is not needed. External power is required for CO<sub>2</sub> measurement, with the batteries serving as backup in case the external power becomes unavailable.

### Interchangeable probes

The probes are detachable and easy to switch out for calibration. The monitoring system detects the changed probe information automatically and maintains accurate and complete historical records. RH and T probes use Vaisala HUMICAP® humidity sensors and platinum temperature sensors (Pt100 and Pt1000 type) for superior stability. Probes can be integrated with the RFL100 housing or connected using a cable.

CO<sub>2</sub> measurement is provided by the GMP251 probe that uses Vaisala's patented, latest-generation CARBOCAP® technology with exceptional stability. The probe automatically compensates the CO<sub>2</sub> measurement according to ambient temperature.

# Probe options

Probe	Description <sup>1)</sup>	Installation notes
<b>HMP110, HMP110T, and HMP110REF</b> 	<p><b>Humidity and temperature</b> probe for measurement in demanding conditions. Robust stainless steel construction. Temperature-only version HMP110T available.</p> <p>Plastic grid filter provides the fastest response time. For added protection, select the membrane filter, the PTFE filter, or the stainless steel sintered filter.</p> <p>Measurement temperature range <math>-40 \dots +80 \text{ }^{\circ}\text{C}</math> (<math>-40 \dots +176 \text{ }^{\circ}\text{F}</math>).</p>	<p>Suitable for measurement inside chambers, incubators, fridges, and freezers.</p> <p>Versatile mounting options using accessories.</p> <p>Must be connected to RFL100 using a cable.</p> <p>A constant output probe version HMP110REF is also available for validating installations. The constant output version does not measure - instead, it outputs unchanging humidity and temperature values.</p>
<b>HMP115 and HMP115T</b> 	<p><b>Humidity and temperature</b> probe for general purpose measurement. Temperature-only version HMP115T available.</p> <p>Plastic grid filter provides the fastest response time. For added protection, select the membrane filter or the PTFE filter.</p> <p>Measurement temperature range <math>-40 \dots +60 \text{ }^{\circ}\text{C}</math> (<math>-40 \dots +140 \text{ }^{\circ}\text{F}</math>).</p>	<p>Ideal choice for ambient measurement.</p> <p>Can be integrated with the RFL100 housing or connected using a cable.</p>
<b>TMP115</b> 	<p><b>Temperature</b> probe for measurement in a wide range of conditions.</p> <p>Available as 50 cm (1 ft 7.7 in) and 3 m (9.8 ft) long versions. Length includes the probe body and sensor tip.</p> <p>Measurement temperature range <math>-196 \dots +150 \text{ }^{\circ}\text{C}</math> (<math>-320 \dots +302 \text{ }^{\circ}\text{F}</math>).</p> <p>Operating temperature range of the probe body is <math>-40 \dots +60 \text{ }^{\circ}\text{C}</math> (<math>-40 \dots +140 \text{ }^{\circ}\text{F}</math>).</p>	<p>Suitable for measurement inside chambers, fridges, and freezers.</p> <p>Can be integrated with the RFL100 housing or connected using a cable.</p> <p>Sensor tip withstands immersion in glycol and liquid nitrogen.</p> <p>Use the thermal dampener block accessory (item code 236310SP) to add thermal mass to the sensor tip.</p>
<b>GMP251</b> 	<p><b>Carbon dioxide</b> probe for %-level measurements. Designed for use in demanding applications such as life science incubators.</p> <p>Operating temperature range <math>-40 \dots +60 \text{ }^{\circ}\text{C}</math> (<math>-40 \dots +140 \text{ }^{\circ}\text{F}</math>).</p> <p>When ordered with the RFL100 data logger, the probe is delivered with a mounting kit that includes a probe holder designed for use with GMP251 and the other supported probes. The kit also includes a magnetic holder for the Probe Splitter M8/M12 accessory.</p>	<p>Must be connected using the Probe Splitter M8/M12 accessory. Any one of the other supported probes can be connected at the same time in the M8 connector of the probe splitter.</p> <p>Requires use of external power supply due to power consumption. Data logger batteries provide a backup in case the external power is not available.</p> <p>Note that the logged temperature data of all probes is limited to range <math>-40 \dots +60 \text{ }^{\circ}\text{C}</math> (<math>-40 \dots +140 \text{ }^{\circ}\text{F}</math>) when GMP251 is connected.</p>

<sup>1)</sup> See [probe datasheets at docs.vaisala.com](https://docs.vaisala.com) for detailed probe specifications.

# Accessories

## Accessories

Accessory <sup>1)</sup>	Item code
Probe cable for RFL100, 1.5 m	CBL210555-1M5SP
Probe cable for RFL100, 3 m	CBL210555-3MSP
Probe cable for RFL100, 10 m	CBL210555-10MSP
Flat cable for RFL100, 3 m	CBL210647SP
Probe holder (5 pcs) for Ø 12 mm probes	ASM213382SP
CO <sub>2</sub> probe mounting kit	ASM214253SP
Probe splitter M8 (for connecting two T probes)	CBL210834SP
Probe splitter M8/M12 (for connecting a CO <sub>2</sub> probe)	CBL211050SP
1 m high-temperature cable M12 (for CO <sub>2</sub> probe) <sup>2)</sup>	271038SP
1 m high-temperature cable M8 (for RH/T probe in CO <sub>2</sub> applications) <sup>2)</sup>	271039SP
Universal power supply (100–240 V AC / 5 V DC) with micro-USB connector	ASM214178SP

1) See [probe datasheets at docs.vaisala.com](https://docs.vaisala.com) for probe-specific accessories.

2) High-temperature cables are extensions for the probe splitter M8/M12 in CO<sub>2</sub> applications. They tolerate –20 ... +180 °C (–4 ... +356 °F) temperatures and can remain inside an incubator during a typical heat sterilization cycle. Due to heat conduction, leave half of the cable in ambient temperature when installed.



RFL100 with two TMP115 probes (left) and with HMP110 and GMP251 probes (right)

# Technical data

## Wireless

Networking standards	Vaisala VaiNet
Modulation	Chirp spread spectrum modulation
Output power	≤ 13 dBm (≤ 20 mW)
Antenna	Internal
Typical range (indoors) <sup>1)</sup>	At least 100 m (approx. 330 ft)
Range with line-of-sight	Over 500 m (1640 ft)
Frequency bands	500 MHz, 868 MHz, 915 MHz, 920 MHz, and 922 MHz

<sup>1)</sup> Attaching the data logger directly to an interfering barrier, for example a metal surface, will reduce the range of the radio signal and typical range may not be achieved.

## Memory

Sample capacity	30 days (43200 samples per channel)
Memory type	Non-volatile EEPROM
Memory mode	Ring buffer (FIFO)
Sampling rate	One sample / channel / minute (non-changeable)

## General

Compatible probes	GMP251, HMP110, HMP110T, HMP115, HMP115T, TMP115
Batteries	2 × AA sized, 1.5 V (LR6 or FR6)
<b>Operation time on battery power at 20 °C (68 °F)</b>	
RH and T measurement in any probe combination	18 months
CO <sub>2</sub> measurement	Typically 12 hours with lithium batteries

## Compatibility requirements

Item	Required minimum version(s)
Vaisala monitoring system	<ul style="list-style-type: none"> <li>viewLinc Enterprise Server 5.0</li> <li>viewLinc Cloud (all versions)</li> </ul>
Dual T probe support using Probe Splitter M8 accessory	<ul style="list-style-type: none"> <li>RFL100 firmware 1.2.0</li> <li>AP10 firmware 3.0</li> <li>viewLinc Enterprise Server 5.0.2</li> </ul>
CO <sub>2</sub> measurement using Probe Splitter M8/M12 accessory and external power	<ul style="list-style-type: none"> <li>RFL100 firmware 1.4.0</li> <li>RFL100 hardware manufactured after July 2021</li> <li>AP10 firmware 4.0 and hardware revision G</li> <li>viewLinc Enterprise Server 5.1</li> </ul>

## Operating environment

Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity	0-100 %RH, non-condensing
IP rating	IP54
IP rating with external power supply	IP20
<b>Operating temperature<sup>1)</sup></b>	
with alkaline batteries	+2 ... +60 °C (+35.6 ... +140 °F)
with lithium batteries	-20 ... +60 °C (-4 ... +140 °F)
with external power supply	+0 ... +60 °C (+32 ... +140 °F)

<sup>1)</sup> Verify operating temperature specification when using third party batteries and power supplies.

## Compliance

Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment
Electrical safety	IEC/EN 61010-1
<b>500 MHz model</b>	
Radio standards and approvals	China MIIT 工业和信息化部公告 2019 年第 52 号
Compliance marks	China RoHS
<b>868 MHz model</b>	
EU directives and regulations	RoHS Directive (2011/65/EU) as amended by 2015/863 Radio Equipment Directive, RED (2014/53/EU)
Radio standards and approvals	ETSI EN 300 220-2 ETSI EN 301 489-1 ICASA No: TA 2020-7761 IMDA No: DB105576 TRA No: 67584/18 Serbia: M005 21
Compliance marks	AAA, CE, ICASA, UKCA
<b>915 MHz model</b>	
Radio standards and approvals	Anatel ID: 04761-19-12322 AS/NZS 4268 FCC ID: 2AO39-RFL100A IC ID: 23830-RFL100A NOM ID: 1901C00493
Compliance marks	ANATEL, NOM, NYCE, RCM
<b>920 MHz model</b>	
Radio standards and approvals	MIC ID: 012-200007
Compliance marks	GITEKI
<b>922 MHz model</b>	
Radio standards and approvals	NCC ID: CCAP21LP1240T3
Compliance marks	NCC

## Mechanical specifications

Housing color	White
Mounting methods	Screws, cable ties, hook, or magnetic mounting bracket (optional accessory)

Probe interface	4-pin female M8 connector
Service port	USB 2.0 with micro-USB connector

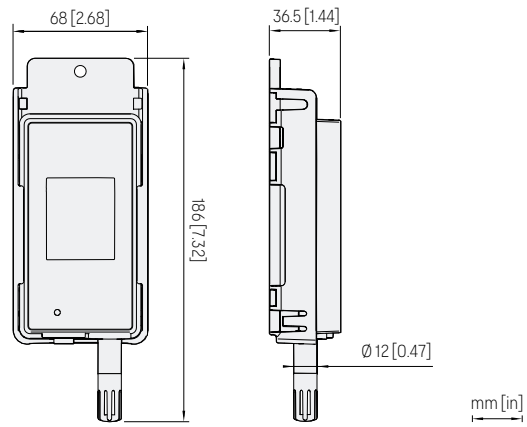
<b>Dimensions (H × W × D) with HMP115 probe</b>	
Without mounting bracket	158 × 62 × 31 mm (6.22 × 2.4 × 1.22 in)
With mounting bracket	186 × 68 × 36.5 mm (7.32 × 2.68 × 1.44 in)

<b>Weight</b>	
With batteries (2 pcs alkaline) and HMP115 probe	190 g (6.7 oz)
With batteries (2 pcs alkaline), HMP115 probe, and magnetic mounting bracket	254 g (8.96 oz)

<b>Materials</b>	
Housing	PC/ABS blend
Display window	PMMA (acrylic)
Sealings	TPE

## Requirements for external power supply

Output voltage	5 V DC
Output power	Min. 1 W
Output connector	Micro-USB
Certifications and approvals	<ul style="list-style-type: none"> <li>• Certified to IEC 62368-1</li> <li>• Approved for use in your country</li> </ul>



RFL100 dimensions with HMP115 probe





### Features

- Optimized for fast transfer of measurement and alarm data
- 2 probe ports
- Records and displays up to 4 parameters
- PoE (Power over Ethernet) and battery backup
- Local memory buffer for a minimum of 30 days of data
- Ethernet connection to Vaisala viewLinc Enterprise Server software
- Easy configuration with Insight PC software using USB-C connection

VDL200 is an Ethernet-connected data logger for continuous monitoring systems. It provides high-accuracy measurements from up to 2 detachable humidity, temperature, and carbon dioxide probes. Suitable applications include real-time measurements in environments where wired connections are preferred. VDL200 is compatible with the Vaisala viewLinc Enterprise Server software.

### Ease of deployment

VDL200 has a versatile mounting bracket that supports installation using screws, cable ties, or the included magnet. Connected probes are detected at startup, and measurement parameters are automatically selected for display and data logging.

VDL200 is powered by PoE (Power over Ethernet), and secured with a battery backup. VDL200 uses commonly available AA size 1.5 V alkaline (LR6) and lithium (FR6) batteries.

Only minimal configuration is needed to connect the VDL200 to its host system. Typically only the address of the host system must be set, and possibly the network settings must be configured according to the local network requirements. When the data logger is accepted to the host system, it automatically identifies the connected devices and the available parameters – manual configuration is not needed.

VDL200 has a USB-C service port for on-site access to configuration settings. To connect, you need a USB-C cable and the Insight PC software for Windows®. For more information, see [vaisala.com/insight](https://vaisala.com/insight).

### Ease of use

The display and status LED on the data logger show the measurement and connectivity status of the data logger at a glance. All 4 measurement parameters and their units fit on the display at the same time.

Connected VDL200 data loggers can be remotely managed from the host system.

### Gap-free data

If the VDL200 loses connection with its host system, it continues to measure and display data, and store the data in its local memory. When the connection is restored, the locally stored data is quickly uploaded to the host system.

In case of a power outage, the data logger continues to record data to its local memory using the battery backup. The battery type and measurement probe combination determine how long the battery backup lasts.

### Interchangeable probes

VDL200 utilizes external, interchangeable Vaisala measurement probes. Probes can be replaced with factory calibrated ones as part of an applicable service, or they can be calibrated on the spot. Probe calibration information is automatically updated to the host system, and can be used to remind the system administrator to take action when calibration is due.

# Probe options

Probe	Description <sup>1)</sup>	Installation notes
<b>HMP110 and HMP110T</b> 	<p><b>Humidity and temperature</b> probe for measurement in demanding conditions. Robust stainless steel construction. Temperature-only version HMP110T available.</p> <p>Plastic grid filter provides the fastest response time. For added protection, select the membrane filter, the PTFE filter, or the stainless steel sintered filter.</p> <p>Measurement temperature range -40 ... +80 °C (-40 ... +176 °F).</p>	<p>Suitable for measurement inside chambers, incubators, fridges, and freezers.</p> <p>Versatile mounting options using accessories.</p> <p>Must be connected to VDL200 using an M8/M8 probe cable (for example, CBL211293-3MSP).</p>
<b>HMP115 and HMP115T</b> 	<p><b>Humidity and temperature</b> probe for general purpose measurement. Temperature-only version HMP115T available.</p> <p>Plastic grid filter provides the fastest response time. For added protection, select the membrane filter or the PTFE filter.</p> <p>Measurement temperature range -40 ... +60 °C (-40 ... +140 °F).</p>	<p>Ideal choice for ambient measurement.</p> <p>Can be connected to VDL200 directly or using an M8/M8 probe cable (for example, CBL211293-3MSP).</p>
<b>TMP115</b> 	<p><b>Temperature</b> probe for measurement in a wide range of conditions.</p> <p>Available as 50 cm (1 ft 7.7 in) and 3 m (9.8 ft) long versions. Length includes the probe body and sensor tip.</p> <p>Measurement temperature range -196 ... +150 °C (-320 ... +302 °F).</p> <p>Operating temperature range of the probe body is -40 ... +60 °C (-40 ... +140 °F).</p>	<p>Suitable for measurement inside chambers, fridges, and freezers. Sensor tip withstands immersion in glycol and liquid nitrogen.</p> <p>Can be connected to VDL200 directly or using an M8/M8 probe cable (for example, CBL211293-3MSP).</p> <p>Use the thermal dampener block accessory (item code 236310SP) to add thermal mass to the sensor tip.</p>
<b>GMP251</b> 	<p><b>Carbon dioxide</b> probe for %-level measurements. Designed for use in demanding applications such as life science incubators.</p> <p>Measurement temperature range -40 ... +60 °C (-40 ... +140 °F).</p> <p>When ordered with the VDL200 data logger, the probe is delivered with an M8-M12 adapter cable (item code CBL211291SP) and the CO<sub>2</sub> probe mounting kit (item code ASM214253SP). The kit includes a probe holder that has attachments for the GMP251 probe, a Ø 12 mm probe (for example, HMP110) and the sensor tip of the TMP115 probe.</p>	<p>Must be connected to VDL200 using the M8/M12 flat cable (item code CBL211291SP).</p>

<sup>1)</sup> See probe *datasheets* for detailed probe specifications.

# Cables and accessories

## Cables

Cable	Item code
Probe cable for VDL200, M8-4M – M8-4F, 3 m	CBL211293-3MSP
Probe cable for VDL200, M8-4M – M8-4F, 10 m	CBL211293-10MSP
Flat probe cable for VDL200, M8-4M – M8-4F, 3 m	CBL211292SP
Flat probe cable for VDL200, M8-4M – M12-5F, 3 m	CBL211291SP
USB-A – USB-C cable for service port connection, 2 m	273956
High-temperature cable, M12-5M – M12-5F, 1 m <sup>1) 2)</sup>	271038SP
High-temperature cable, M8-4M – M8-4F, 1 m <sup>2)</sup>	271039SP

1) For CO<sub>2</sub> probe. Connect to VDL200 using M8-M12 adapter cable CBL211291SP.

2) High-temperature cables tolerate –20 ... +180 °C (–4 ... +356 °F) temperatures and can remain inside an incubator during a typical heat sterilization cycle. Due to heat conduction, leave half of the cable in ambient temperature when installed.

## Selected probe-specific accessories

Accessory <sup>1)</sup>	Compatible probes	Item code
Thermal dampener block for 3/16" probes (4.8 mm)	TMP115	236310SP
Probe holder (5 pcs) for Ø 12 mm probes	HMP110/T, HMP115/T, TMP115	ASM213382SP
CO <sub>2</sub> probe mounting kit	GMP251	ASM214253SP

1) See probe [datasheets](#) for more accessories.

# Technical data

## Compatible probes

Measurement	Compatible measurement probes
Humidity and temperature (RH+T)	HMP110, HMP115
Temperature (T)	HMP110T, HMP115T, TMP115
Carbon dioxide (CO <sub>2</sub> )	GMP251

## Compatible systems and software

System or software	Version	Connection
viewLinc Enterprise Server	Version 5.2.1 or above	TCP port 8883 (default)
Insight PC software	Version 1.3.0 or above	USB-C
Time server <sup>1)</sup>	Any	UDP port 123

<sup>1)</sup> Connection to Network Time Protocol (NTP) server is required for operation.

## Inputs and outputs

Ethernet connector	8P8C (RJ-45)
Probe connector (2 pcs)	4-pin female M8 connector
Service port	USB-C
<b>Ethernet interface</b>	
Supported standards	10BASE-T, 100BASE-TX
IPv4 address assignment	DHCP (automatic), static IP

## Operating environment

Operating environment	Indoor use
Use in wet location	No
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
Operating temperature	-20 ... +60 °C (-4 ... +140 °F)
Operating humidity	0-100 %RH, non-condensing
IP rating	IP30
Do not place the VDL200 unit in an environment that can exceed this specification, for example inside a climate chamber. Insert only the measurement probe(s) in the chamber and leave the VDL200 unit outside it.	

## Powering

Powering options	Power over Ethernet (PoE) Battery backup <sup>1)</sup> USB-C for temporary service use
PoE supply voltage	48 V DC
USB-C supply voltage	5 V DC
Power consumption	Max. 2 W
Battery type	AA size, 1.5 V, LR6 (alkaline) or FR6 (lithium)
Number of batteries	4
<b>Typical operating time on battery power at 20 °C (68 °F)</b>	
RH and T measurement combinations	2 weeks with alkaline batteries
CO <sub>2</sub> measurement	24 hours with lithium batteries

<sup>1)</sup> Network connection is not available when VDL200 is operating on battery power.

## Data logging and user interface specifications

Number of samples <sup>1)</sup>	50 000
Sampling rate	1 min
Minimum recording span	30 days
Memory type	Flash
Memory mode	Ring buffer (FIFO)
Display	3.16" reflective matrix display
Display languages	English
Interaction	2 capacitive buttons

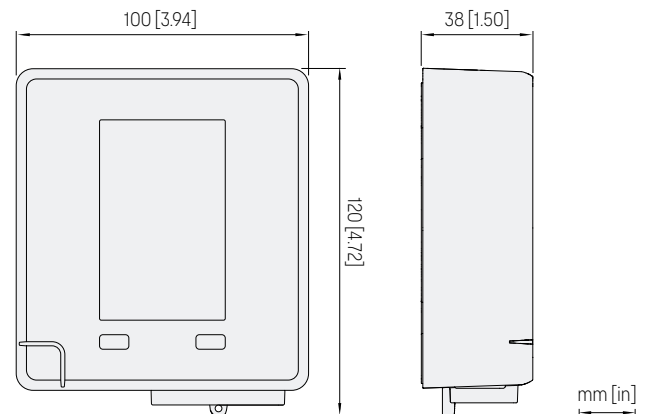
<sup>1)</sup> 1 sample can include up to 4 measurement values.

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment EN 61000-6-2 EN 61000-6-4 FCC part 15 B, Class A ICES-3 / NMB-3 (Class A)
Compliance marks	CE, China RoHS

## Mechanical specifications

Housing color	RAL 9003 (white)
Mounting methods	Screws, cable ties, or magnet
Dimensions without probes (H × W × D)	120 × 100 × 38 mm (4.72 × 3.94 × 1.50 in)
Display size (H × W)	68 × 42 mm (2.68 × 1.65 in)
Weight without batteries and probes	260 g (9.17 oz)
<b>Materials</b>	
Housing	PBT plastic
Display window	PMMA (acrylic)
Mounting bracket	PC/ABS plastic blend



VDL200 dimensions

## HMP115 Humidity and Temperature Probe



### Features

- Humidity and temperature probe designed for use with RFL100, CWL100, and VDL200 data loggers
- Measurement temperature range: -40 ... +60 °C (-40 ... +140 °F)
- Proven Vaisala HUMICAP® 180R sensor for excellent stability
- Fast thermal response time
- Low power consumption
- Temperature-only model HMP115T available
- Compatible with Vaisala Insight PC software and Vaisala Indigo80 Handheld Indicator
- Comes with calibration certificate: ±1.5 %RH measurement accuracy (0-90 %RH)

Vaisala HUMICAP® Humidity and Temperature Probe HMP115 is a highly accurate and cost-effective humidity probe with plastic enclosure. It is designed for indoor measurements with compatible Vaisala data loggers.

### Designed for use with Vaisala data loggers

HMP115 provides an ideal solution for ambient measurement as it can be directly connected to the housing of Vaisala RFL100, CWL100, and VDL200 data loggers. It can also be connected using a cable for remote probe use.

### High performance

HMP115 has a PC/ABS plastic enclosure and is suitable for non-condensing environments with fast temperature changes and a need for high-accuracy

measurements with traceability. HMP115 also has excellent chemical tolerance thanks to the proven Vaisala HUMICAP® 180R sensor.

Plastic grid filter provides the fastest response time. For added protection, select the membrane filter or the PTFE filter.

### Low power consumption

HMP115 is suitable for battery-powered applications due to its very low power consumption. It also has an extremely fast start-up time.

### Variety of calibration options

A quick field calibration can easily be carried out using a handheld device, for example, Vaisala Indigo80 Handheld Indicator or Vaisala Handheld Meter HM40. Alternatively, the probe can be calibrated using a PC with Vaisala Insight PC software and a compatible USB connection cable, or sent to Vaisala for calibration. Vaisala Service Centers offer both ISO 9001 and ISO 17025 calibrations.

# Technical data

## Measurement performance

Relative humidity	
Measurement range	0-100 %RH
Accuracy <sup>1)</sup>	
at 0 ... +40 °C (+32 ... +104 °F)	±1.5 %RH (0-90 %RH) ±2.5 %RH (90-100 %RH)
at -40 ... 0 °C (-40 ... +32 °F) and +40 ... +60 °C (+104 ... +140 °F)	±3.0 %RH (0-90 %RH) ±4.0 %RH (90-100 %RH)
Typical factory calibration uncertainty	±0.8 %RH
Humidity sensor	HUMICAP® 180R
Stability	±2 %RH over 2 years
Temperature	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy	
at +15 ... +25 °C (+59 ... +77 °F)	±0.1 °C (±0.18 °F)
at 0 ... +40 °C (+32 ... +104 °F)	±0.2 °C (±0.36 °F)
at -40 ... 0 °C (-40 ... +32 °F) and +40 ... +60 °C (+104 ... +140 °F)	±0.4 °C (±0.72 °F)
Typical factory calibration uncertainty	±0.12 °C (±0.22 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751

<sup>1)</sup> Including non-linearity, hysteresis, and repeatability.

## Operating environment

Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity	0-100 %RH, non-condensing
IP rating <sup>1)</sup>	IP54

<sup>1)</sup> Not applicable with the plastic grid filter.

## Compliance

EU directives and regulations	RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, RCM

## Inputs and outputs

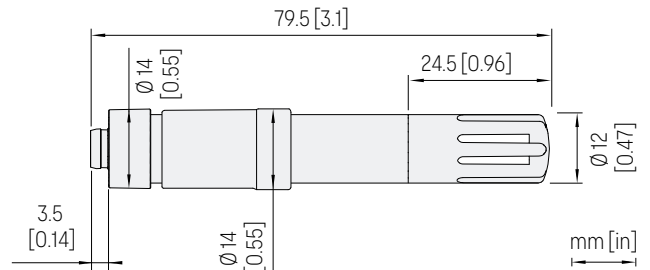
Power consumption	1 mA average, max. peak 5 mA
Operating voltage	5-28 V DC
Start-up time	1 s
Digital output	RS-485 2-wire half duplex, supports Modbus RTU

## Output parameters

Output parameter	HMP115	HMP115T
Temperature (°C)	✓	✓
Relative humidity (%RH)	✓	

## Mechanical specifications

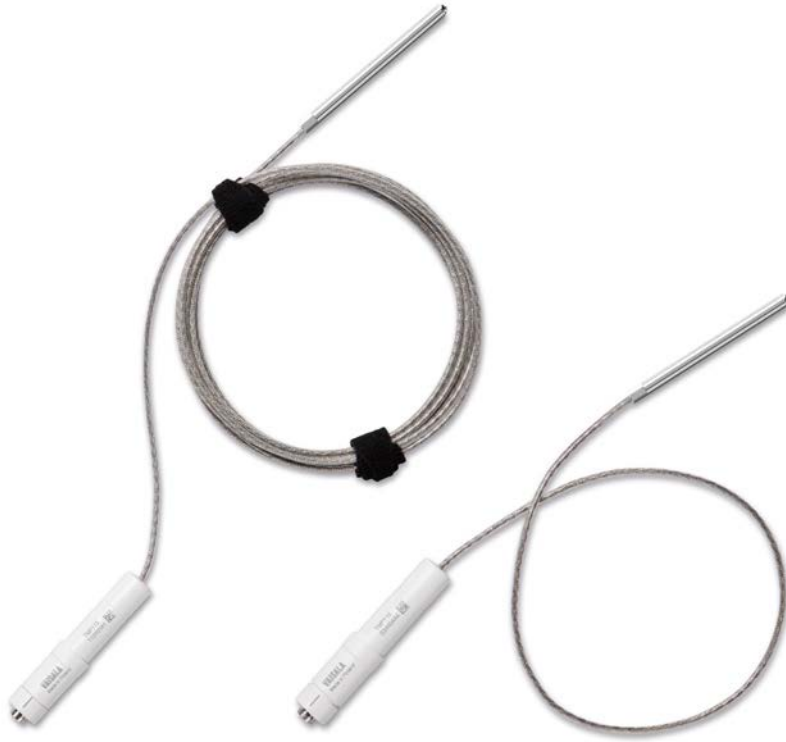
Cable connector	4-pin M8 (IEC 60947-5-2)
Weight	9 g (0.3 oz)
Materials	
Body	PC/ABS blend
Grid filter	PC (glass reinforced)



HMP115 dimensions

## Accessories

Probe holder, 5 pcs	ASM213382SP
USB cable for PC connection	219690
Connection cable for Indigo80 handheld indicator	262195SP
Connection cable for MI70 indicator	219980SP
Connection cable for HM40 handheld meter	HMT120Z300



### Features

- Temperature probe designed for use with RFL100, CWL100, and VDL200 data loggers
- Measurement range  $-196 \dots +150 \text{ }^{\circ}\text{C}$  ( $-320 \dots +302 \text{ }^{\circ}\text{F}$ )
- Platinum RTD temperature sensor for superior measurement stability
- Available as 0.5 m (1 ft 7.7 in) and 3 m (9.8 ft) long versions
- Compatible with Vaisala Insight PC software and Vaisala Indigo80 Handheld Indicator
- Traceable calibration certificate

Wide-Range Temperature Probe TMP115 is ideal for use in temperature-controlled chambers, cryogenic applications, incubators,  $\text{LN}_2$  tanks, and blood/tissue banks. TMP115 uses a platinum RTD temperature sensor for superior measurement stability.

### Designed for use with Vaisala data loggers

TMP115 can be directly connected to Vaisala RFL100, CWL100, and VDL200 data loggers. It can also be connected using a cable for remote probe use. The probe is available in two lengths: 0.5 m (1 ft 7.7 in) and 3 m (9.8 ft). The length includes probe body and sensor tip.

The operating temperature range of the probe body is  $-40 \dots +60 \text{ }^{\circ}\text{C}$  ( $-40 \dots +140 \text{ }^{\circ}\text{F}$ ). It is usually best to leave the probe body outside the measured environment, and just insert the probe tip and some cable.

### Low power consumption

TMP115 is suitable for battery-powered applications due to its very low power consumption. It also has an extremely fast start-up time.

### Features for cold storage applications

Some cold storage applications may require slowing down the naturally fast response time of the probe. You can easily accomplish this by adding more thermal mass to the sensor tip. The thermal dampener block accessory (item code 236310SP) is designed for this purpose. The damping effect of the block is equivalent to that of 40 ml of glycol.

The 4.8 mm (0.19 in) diameter sensor tip withstands immersion in glycol and liquid nitrogen.

Flat cables are available as accessories for the compatible data loggers in case door seal insertion to chambers and freezers is required.

### Variety of calibration options

A quick field calibration can easily be carried out using a handheld device, for example, Vaisala Indigo80 Handheld Indicator or Vaisala Handheld Meter HM40. Alternatively, the probe can be calibrated using a PC with Vaisala Insight PC software and a compatible USB connection cable, or sent to Vaisala for calibration. Vaisala Service Centers offer both ISO 9001 and ISO 17025 calibrations.

# Technical data

## Measurement performance

Temperature	
Measurement range	-196 ... +150 °C (-320 ... +302 °F)
Accuracy over temperature range <sup>1)</sup>	
at -196 ... -90 °C (-320 ... -130 °F)	±2.5 °C (±4.5 °F)
at -90 ... -30 °C (-130 ... -22 °F)	±0.75 °C (±1.35 °F)
at -30 ... 0 °C (-22 ... +32 °F)	±0.5 °C (±0.9 °F)
at 0 ... +50 °C (+32 ... +122 °F)	±0.25 °C (±0.45 °F)
at +50 ... +90 °C (+122 ... +194 °F)	±0.75 °C (±1.35 °F)
at +90 ... +150 °C (+194 ... +302 °F)	±2.5 °C (±4.5 °F)
Temperature sensor	Pt100 RTD Class A IEC 751
Typical factory calibration uncertainty	
at -90 °C (-130 °F)	±0.13 °C (±0.234 °F)
at -45 °C (-49 °F)	±0.07 °C (±0.149 °F)
at 0 °C (32 °F) and warmer	±0.06 °C (±0.128 °F)

<sup>1)</sup> Includes non-linearity, hysteresis, and repeatability.

## Operating environment

Operating temperature of sensor tip	-196 ... +150 °C (-320 ... +302 °F)
Operating temperature of probe body <sup>1)</sup>	-40 ... +60 °C (-40 ... +140 °F)
IP rating of sensor tip	IP67
IP rating of probe body	IP65

<sup>1)</sup> Heat conduction along the probe cable may affect the temperature of the probe body. Model with 3 m (9.8 ft) probe cable is recommended for continuous measurement of very hot and cold temperatures.

## Compliance

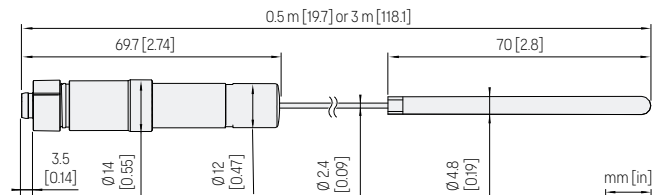
EU directives and regulations	RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, RCM

## Inputs and outputs

Operating voltage	5-28 V DC
Start-up time	1 s
Digital output	RS-485 2-wire half duplex, supports Modbus RTU
Output parameters	Temperature (°C)

## Mechanical specifications

Cable connector	4-pin male M8 (IEC 60947-5-2)
<b>Materials</b>	
Probe body	PC/ABS blend
Cable	FEP
Sensor tip	Stainless steel (AISI 316)
<b>Dimensions</b>	
Probe length including cable and sensor tip	0.5 m (1 ft 7.7 in) or 3 m (9 ft 10.1 in)
Probe body diameter	14 mm (0.55 in)
Sensor tip length	70 mm (2.76 in)
Sensor tip diameter	4.76 mm (0.19 in)

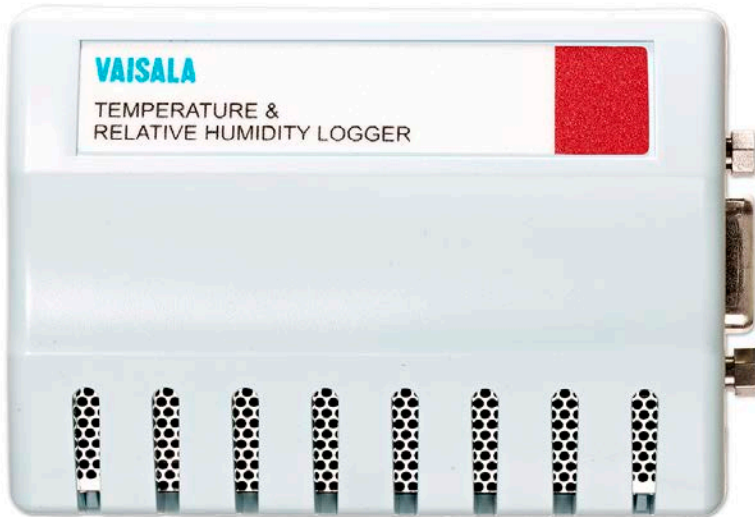


## TMP115 dimensions

## Accessories

Thermal dampener block for 3/16" probes (4.8 mm)	236310SP
Probe holder (5 pcs)	ASM213382SP
USB cable for PC connection	219690
Connection cable for Indigo80 handheld indicator	262195SP
Connection cable for MI70 indicator	219980SP
Connection cable for HM40 handheld meter	HMT120Z300





### Features

- Industry-leading temperature and relative humidity measurement precision
- High accuracy, adjustable timebased digital recording
- Printed reports for any time period
- 10-year battery
- Ability to perform validation and continuous monitoring with the same model
- Traceable to SI units through national metrology institutes
- Superior alternative to chart recorders and hard-wired systems
- Integrated high-accuracy RH sensor

Vaisala's 2000 series of data loggers are designed to provide high accuracy measurements for temperature, relative humidity and an analog sensor of your choice.

The 2000 logger combines internal temperature and RH sensors with optional external channels for either current or voltage inputs for recording parameters such as differential pressure, CO<sub>2</sub>, level, particles, or conductivity. The 2000 logger can also include a Boolean channel for door switches or alarm contacts. The 2000 logger includes calibrations traceable to SI units through national metrology institutes.<sup>1)</sup>

Ideal for use in standalone or networked applications, the 2000 data logger connects directly to a PC with USB, or installs to an existing network via

Ethernet, Power over Ethernet, or WiFi. Each data logger contains a 10-year battery and onboard memory for recording at the point of measurement. With autonomous power and recording capacity, data is immune to network and power interruptions.

The DL2000 data loggers can be used with Vaisala software, either viewLinc or vLog, to download, display, and analyze environmental data. The viewLinc monitoring system provides 24/7

multi-stage alarm notification, remote, real-time monitoring and gap-free data. The vLog software is a simple solution for validation/ mapping applications. The measurement results are traceable to the international system of units (SI) through national metrology institutes (NIST USA, MIKES Finland, or equivalent) or ISO/IEC 17025 accredited calibration laboratories.

All reports are customizable and can be exported to spreadsheets and PDF to provide records that meet the requirements of 21 CFR Part 11 and Annex 11.

<sup>1)</sup> The measurement results are traceable to the international system of units (SI) through national metrology institutes (NIST USA, MIKES Finland, or equivalent) or ISO/IEC 17025 accredited calibration laboratories.

# Technical Data

## General

Size	85 × 59 × 26 mm (3.4 × 2.3 × 1 in)
Weight	76 g (2.7 oz.)
Interfaces	RS-232 serial, USB, WiFi, Ethernet and Power over Ethernet (vNet)
Mounting	3M Dual Lock™ fasteners
Power source	Internal 10-year lithium battery (Battery life specified at +23 °C with sample interval of 1 min or longer)
Internal clock	Accuracy ±1 min/month at -25 °C ... +70 °C (-13 ... +158 °F)
Electromagnetic compatibility	FCC Part 15 and CE EN 50581:2012 EN 55032:2012/AC:2013 Class B EN 61326-1:2013
RoHS compliance	2011/65/EU
<b>PC Software</b>	
Monitoring, alarming and reporting	viewLinc
Validation/mapping GxP environments	vLog VL for validated vLog SP for non validated
Adding loggers to an existing OPC-compatible monitoring system	OPC Server

## Channel Configuration and Recording Span

Model	Channel Types			
	CH 1	CH 2	CH 3	CH 4
2000-20R	T	RH		
2000-3CR	T	RH	4 ... 20 mA	
2000-35R	T	RH	0 ... 5 VDC	
2000-3AR	T	RH	0 ... 10 VDC	
2000-4BR	T	RH	Boolean	Boolean
<b>Number of Channels Enabled<sup>1)</sup></b>				
Sample Interval	1	2	3	4
10 seconds	14.1 days	7.1 days	4.7 days	3.5 days
1 minute	2.8 months	1.4 months	23.8 days	21.2 days
5 minutes	1.2 years	7.1 months	4.7 months	3.5 months
15 minutes	3.5 years	1.7 years	1.2 years	10.6 months
1 hour	13.9 years	7.0 years	4.6 years	3.5 years

1) Temperature channel must be enabled when the RH channel is enabled.

## Memory

Sample capacity	122 197 12-bit samples
Memory type	Non-volatile EEPROM
Memory modes	User-selectable wrap (FIFO) or stop when memory is full. User-selectable start and stop times.
Sampling rates	User-selectable from once every 10 seconds to once a day.

## Current Loop and Voltage Inputs

Input Type	Current Loop	Analog Voltage
Available ranges	0 ... 22 mA	0 ... 5 VDC, 0 ... 10 VDC
Resolution	5.5 µA	0.025 % F.S.
Accuracy	±0.15 % F.S. at +25 °C (+77 °F)	±0.15 % F.S. at +25 °C (+77 °F)
Input impedances	75 Ω <sup>1)</sup>	>1 MΩ
Isolation	One common per logger	One common per logger
Overload protection	40 mA max. (reverse-polarity protected)	±24 VDC max. (reverse-polarity protected)

1) Termination resistance plus approximately 0.4 volt drop through a protection diode.

## Internal Sensors

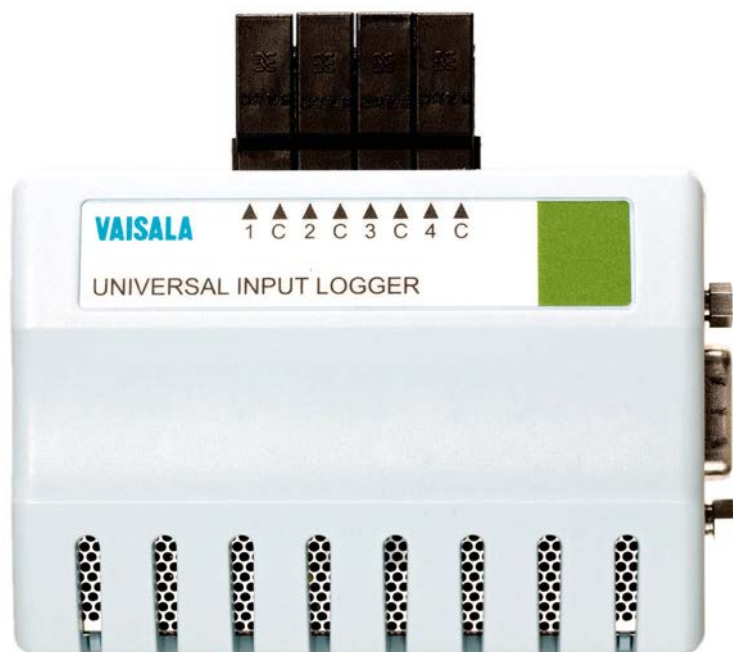
Internal Temperature Sensor	
Calibrated measurement range <sup>1)</sup>	-25 ... +70 °C (-13 ... +158 °F)
Operating range	-35 ... +85 °C (-31 ... +185 °F)
Initial accuracy <sup>2)</sup>	
± 0.10 °C over +20 °C ... +30 °C (± 0.18 °F over +68 °F ... +86 °F)	
± 0.20 °C over -25 °C ... +70 °C (± 0.36 °F over -13 °F ... +158 °F)	
One Year Accuracy <sup>3)</sup>	
± 0.15 °C over +20 °C ... +30 °C (± 0.27 °F over +68 °F ... +86 °F)	
± 0.25 °C over -25 °C ... +70 °C (± 0.45 °F over -13 °F ... +158 °F)	
Resolution	0.02 °C at +25 °C (0.04 °F at +77 °F)
Internal RH Sensor	
Calibrated measurement range <sup>1)</sup>	45 %RH at +10 °C (+50 °F) 10 ... 80 %RH at +25 °C (+77 °F) 45 %RH at +45 °C (+113 °F)
Operating range	0 ... 100 %RH (non-condensing)
Initial accuracy <sup>2)</sup>	
± 1 %RH over 10 ... 80 %RH at +20 ... +30 °C (+68 ... +86 °F)	
± 1.5 %RH over 80 ... 90 %RH at +20 ... +30 °C (+68 ... +86 °F)	
± 2 %RH over 10 ... 90 %RH at -20 ... +70 °C (-4 ... +158 °F)	
One year accuracy <sup>3)</sup>	
± 2 %RH over 10 ... 90 %RH at +20 ... +30 °C (+68 ... +86 °F)	
± 3 %RH over 10 ... 90 %RH at -20 ... +70 °C (-4 ... +158 °F)	
Resolution	0.05 %RH

1) Custom calibration points available upon request including full ICH coverage.

2) Initial accuracy includes all known influence quantities present at the time of calibration including calibration uncertainty, mathematical fit, data logger resolution, hysteresis and reproducibility.

3) One Year Accuracy includes all known influence quantities present during the operation of a data logger over the course of one year including Initial Accuracy and Long Term Drift. Not included is any drift related to atypical contamination or misuse.





### Features

- 10-year battery and large onboard memory
- Single and multi-channel models with up to four input channels
- Easily set scaling and measurement units for recording
- Time-based digital recording in a range of sample intervals
- Multiple connectivity options - USB, Ethernet, WiFi
- Optional vNet cradle for Ethernet or Power over Ethernet connectivity
- Traceable to SI units through national metrology institutes.
- Two year limited warranty

DL4000 series of data loggers are designed to interface with a wide range of transducers, transmitters, and sensors with a DC voltage or 0 - 20 mA current loop output.

DL4000 is a simple solution for recording and monitoring pressure, flow, fluid level, PH, electrical properties, moisture and gas concentrations.

Ideal for use in standalone or networked applications, the DL4000 Universal Input logger connects directly to a PC with USB or installs to an existing network via Ethernet, Power over Ethernet or WiFi. Each logger contains a 10-year battery and onboard memory for recording a wide range of variables at the point of measurement. With autonomous power and recording capacity, data is immune to network and power interruptions.

The DL4000 data loggers can be used with Vaisala software, either viewLinc or vLog, to download, display, and analyze environmental data. The viewLinc monitoring system provides 24/7 multi-stage alarm notification, remote, real-time monitoring and gap-free data. The vLog software is a simple solution for validation/mapping applications. The DL4000 data loggers include calibrations traceable to SI units through national metrology institutes.<sup>1)</sup>

All reports are customizable and can be exported to spreadsheets and PDF to provide records that meet the requirements of 21 CFR Part 11 and Annex 11.

Choose the DL4000 VL series data logger for GxP-compliant environments and the DL4000 SP series for non-GxP applications.

<sup>1)</sup> Measurement results are traceable to the international system of units (SI) through national metrology institutes (NIST USA, MIKES Finland, or equivalent) or ISO/IEC 17025 accredited calibration laboratories.

# Technical Data

## General specifications

Operating range	-40 ... +85 °C (-40 ... +185 °F) and 0 ... 100 %RH (non-condensing)
Interfaces	RS-232 serial USB Wifi module Ethernet and Power over Ethernet (vNet)
Weight	76 g (2.7 oz)
Size	85 × 59 × 26 mm (3.4 × 2.3 × 1 in)
Mounting	3M Dual Lock™ fasteners
PC software	Graphing & Reporting Software vLog SP for SP-series vLog VL for VL-series viewLinc for continuous monitoring & alarming OPC Server to add on to existing OPC compatible monitoring systems
Internal clock	Accuracy ±1 min/month at -25 ... +70 °C (-13 ... +158 °F)
Electromagnetic compatibility	FCC Part 15 and CE EN 50581:2012 EN 55032:2012/AC:2013 Class B EN 61326-1:2013
RoHS compliance	2011/65/EU
Power source	Internal 10-year lithium battery (Battery life specified with sample interval of 1 min or longer)

## Memory specifications

Memory type	Non-volatile EEPROM
Data sample capacity	120 000 12-bit samples
Memory modes	User-selectable wrap (FIFO) or stop when memory is full. User-selectable start and stop times.
Sampling rates	User-selectable from once every 10 seconds to once a day. (Battery life specified with sample interval of 1 min or longer)
Recording span	Recording span depends upon sample interval selected and number of channels enabled. Please see table above.

## Recording span

	1	2	3	4
10 seconds	13.8 days	6.9 days	4.6 days	3.4 days
1 minute	2.7 months	1.3 months	27.7 days	20.8 days
5 minutes	1.1 years	6.9 months	4.6 months	3.4 months
15 minutes	3.4 years	1.7 years	1.1 years	10.4 months
1 hour	13.6 years	6.8 years	4.5 years	3.4 years

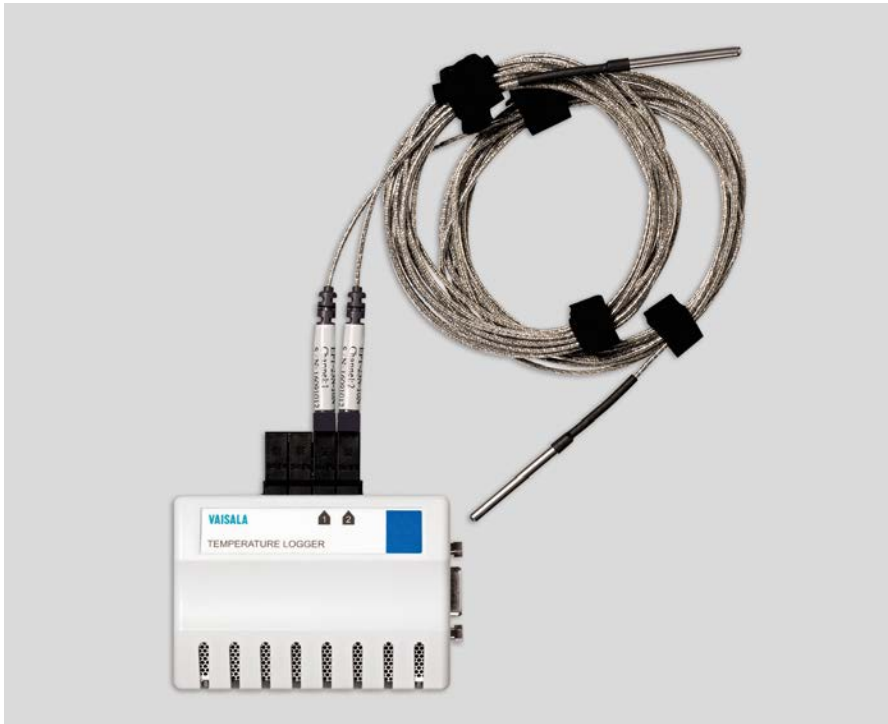
## Current loop and voltage inputs

Available ranges	0 ... 20mA	0 ... 5 V DC, 0 ... 10 V DC
Resolution	5.5 µA	0.025 % F.S.
Accuracy	±0.15 % F.S. at +25 °C (+77 °F)	±0.15 % F.S. at +25 °C (+77 °F)
Input impedances	75 Ω	> 1 MΩ
Isolation	One common per logger	One common per logger
Overload protection	40 mA max. (reverse-polarity protected)	±24 V DC max. (reverse-polarity protected)

## Channel configurations

4000-405	0 ... 5 V DC
4000-40A	0 ... 10 V DC
4000-40C	0 ... 20 mA





### Features

- Industry-leading precision and accuracy
- Printed reports for any time period
- Internal battery with up to 10 years' lifetime
- Validation and continuous monitoring with the same model
- 2-year limited warranty
- Superior alternative to chart recorders and hard-wired systems
- Timebase calibrated over the operating temperature range
- Adjustable time-based recording
- Snap-in logger cradle for easy network connectivity
- Two probe options give high accuracy – from  $-90\text{ }^{\circ}\text{C}$  to  $+70\text{ }^{\circ}\text{C}$  ( $-130\text{ }^{\circ}\text{F}$  to  $+158\text{ }^{\circ}\text{F}$ )
- Traceable to SI units through national metrology institutes

The DL1000-1400 temperature data loggers include the VL series for regulated environments and the SP series for non FDA/GxP regulated industries.

### Suitable for validated and standard precision monitoring

Validatable data loggers, together with Vaisala software solutions, provide a superior, high accuracy solution for use in FDA/GxP regulated environments by ensuring tamperproof files and electronic records that meet 21 CFR Part 11 requirements.

The DL1000-1400 temperature data loggers include calibrations traceable to SI units through national metrology institutes.<sup>1)</sup>

DL data loggers are compatible with the browser-based Vaisala viewLinc continuous monitoring software. viewLinc provides 24/7 multi-stage alarm notification and remote monitoring, and is suitable for regulated environments.

Additional software options include vLog VL for regulated environments and vLog SP for standard precision monitoring. vLog software solutions allow downloading, displaying, analyzing, and reporting of recorded environmental data.

### Applications

The DL1000-1400 temperature data loggers are ideal for monitoring and validation of:

- Refrigerators and freezers (to  $-90\text{ }^{\circ}\text{C}$  ( $-130\text{ }^{\circ}\text{F}$ ))
- Incubators
- Stability chambers
- Warehouses
- Ambient conditions

### Autonomous power and recording capacity

Each data logger contains a battery<sup>2)</sup> and onboard memory for recording at the point of measurement. With autonomous power and recording capacity, data is immune to network and power interruptions.

1) Measurement results are traceable to the international system of units (SI) through national metrology institutes (NIST USA, MIKES Finland, or equivalent) or ISO/IEC 17025 accredited calibration laboratories.

2) Expected battery lifetime up to 10 years in typical use.

# Technical data

## General specifications

Interfaces	<ul style="list-style-type: none"> <li>Internal: RS-232 serial</li> <li>With additional connectors/devices: USB, Ethernet, Wi-Fi, PoE</li> </ul>
PC software	<ul style="list-style-type: none"> <li>vLog software for graphing and reporting (vLog SP for SP series and vLog VL for VL series)</li> <li>viewLinc Enterprise Server software for continuous monitoring and alarming</li> <li>OPC DA Server to add Vaisala recorders to any OPC-compatible monitoring system</li> </ul>
Internal clock	Accuracy ±1 min/month -25 °C ... +70 °C (-13 °F ... +158 °F)
Logger operating/ Storage range	-40 °C ... +85 °C (-40 °F ... +185 °F) 0 ... 100 %RH non-condensing
Power source	Internal lithium battery with typical lifetime of 10 years <sup>1)</sup>

<sup>1)</sup> Typical battery lifetime specified with sample interval of 1 min or longer.

## Mechanical specifications

Size	85 × 59 × 26 mm (3.4 × 2.3 × 1 in)
Weight	76 g (2.7 oz)
Mounting	3M Dual Lock™ fasteners Snap-in connector locks provide secure probe connections

## Internal temperature sensor

1000-21x series	Precision-tolerance epoxy-encapsulated NTC thermistor
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## Memory

1000-2XX series	48 100 12-bit samples
1400-44X series	85 300 12-bit samples
Memory type	Non-volatile EEPROM
Memory modes	User selectable: wrap (FIFO) or stop when memory is full. User selectable start time. User selectable stop time (VL series only).
Sampling rates	User-selectable (in 10-second intervals) from once every 10 seconds to once a day.

## Compliance

EU directives and regulations	EMC Directive (2014/35/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment
EMC emissions	CISPR 32 / EN 55032, Class B FCC part 15 B, Class B
Compliance marks	CE, China RoHS, RCM

## Recording span: 1000-2xx

Sample interval	Number of channels enabled	
	1	2
10 seconds	5.5 days	2.7 days
1 minute	1.1 months	16.7 days
5 minutes	5.5 months	2.7 months
15 minutes	1.3 years	8.3 months
1 hour	5.4 years	2.7 years



Data logger model VL-1000-21x



Data logger model VL-1000-22x

# Technical data

## Recording span: 1400-44x

Sample interval	Number of channels enabled			
	1	2	3	4
10 seconds	9.8 days	4.9 days	3.2 days	2.4 days
1 minute	1.9 months	29.6 days	19.7 days	14.8 days
5 minutes	9.8 months	4.9 months	3.2 months	2.4 months
15 minutes	2.4 years	1.2 years	9.8 months	7.4 months
1 hour	9.7 years	4.8 years	3.2 years	2.4 years



Data logger model VL-1400-44x

## EPT series temperature probes

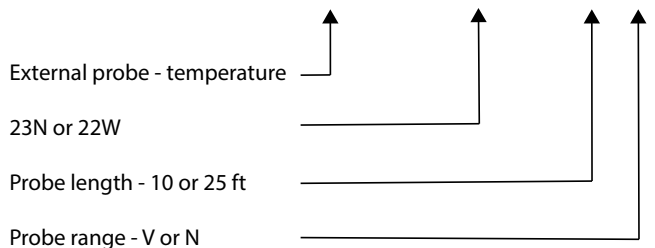
Sensor models	
"N" range external probes	EPT-23N-XXN and EPT-22W-XXN
Operating/storage range	-40 °C ... +95 °C (-40 ... +203 °F)
Connector color code	Black
"V" range external probes	EPT-23N-XXV and EPT-22W-XXV
Operating/storage range	-95 °C ... +95 °C (-139 ... +203 °F)
Connector color code	Blue
Sensor tips	
EPT-23N-XXX	Stainless steel Diameter 3.2 mm (0.13 in) Length 38 mm (1.5 in)
EPT-22W-XXX (liquid submersible)	Sealed Teflon® tip Diameter 3 mm (0.12 in) Length 28 mm (1.1 in)
Probe lengths	3 m (10 ft) and 7.6 m (25 ft)
Cable construction	2 mm (0.08 in) diameter Teflon® coated cable

## Temperature probe accessories

Thermal dampening block, for use in refrigerators and freezers, simulates a glycol bottle to reduce viewLinc alarms generated by opening and closing a door.



## EPT - XXX - XXX



# Technical data

## Temperature range and accuracy

### Internal sensor

Calibrated measurement range	-25 ... +70 °C (-13 ... +158 °F)
Operating/storage range	-40 ... +85 °C (-40 ... +185 °F) 0 ... 100 %RH non-condensing
Initial accuracy <sup>1)</sup>	±0.10 °C over +20 ... +30 °C (±0.18 °F over +68 ... +86 °F) ±0.20 °C over -25 ... +70 °C (±0.36 °F over -13 ... +158 °F)
1-year accuracy <sup>2)</sup>	±0.15 °C over +20 ... +30 °C (±0.27 °F over +68 ... +86 °F) ±0.25 °C over -25 ... +70 °C (±0.45 °F over -13 ... +158 °F)

### External probes - all models

#### "N" range external probe

Calibrated measurement range	-25 ... +70 °C (-13 ... +158 °F)
Operating/storage range	-40 ... +95 °C (-40 ... +203 °F)
Initial accuracy <sup>1) 3)</sup>	±0.10 °C over +20 ... +30 °C (±0.18 °F over +68 ... +86 °F) ±0.20 °C over -25 ... +70 °C (±0.36 °F over -13 ... +158 °F)

1-year accuracy <sup>2) 3)</sup>	±0.20 °C over +20 ... +30 °C (±0.36 °F over +68 ... +86 °F) ±0.25 °C over -25 ... +70 °C (±0.45 °F over -13 ... +158 °F)
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Resolution	0.02 °C at +25 °C (0.04 °F at +77 °F)
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#### "V" range external probe

Operating/storage range	-95 ... +95 °C (-139 ... +203 °F)
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Initial accuracy <sup>1) 3)</sup>	±0.20 °C over -90 ... -40 °C (±0.36 °F over -130 ... -40 °F)
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1-year accuracy <sup>2) 3)</sup>	±0.25 °C over -90 ... -40 °C (±0.45 °F over -130 ... -40 °F)
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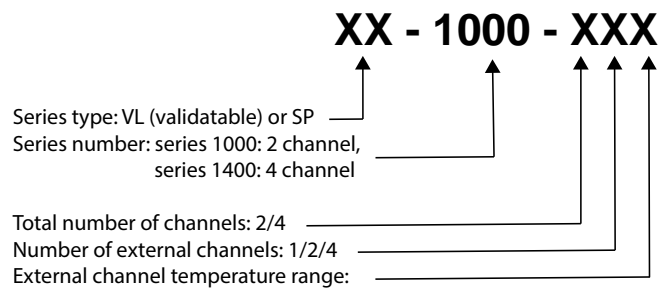
Resolution	0.02 °C at -80 °C (0.04 °F at -112 °F)
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Calibrated measurement range	-90 ... -40 °C (-130 ... -40 °F)
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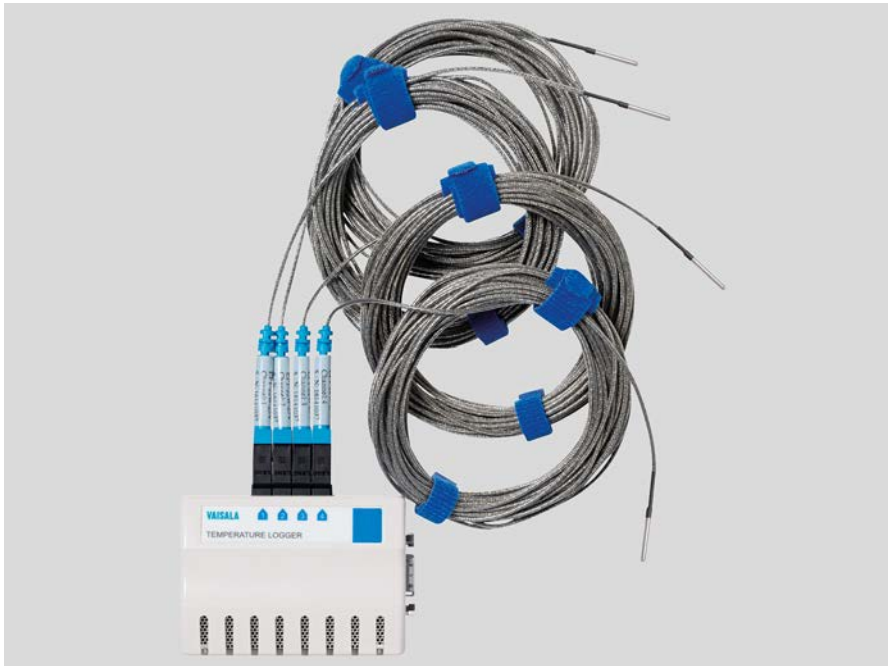
- 1) Initial accuracy includes all known influence quantities present at the time of calibration including calibration uncertainty, mathematical fit, data logger resolution, hysteresis, and reproducibility.  
 2) 1-year accuracy includes all known influence quantities present during the operation of a data logger over the course of 1 year including initial accuracy and long term drift. Not included is any drift related to atypical contamination or misuse.  
 3) Specification for external channels is for a probe calibrated to the specific channel of the data logger and with the data logger at -25 °C ... +70 °C (-13 °F ... +158 °F).

## Product part number legend

Guide for reading the product tables and selecting the most appropriate model for your application.



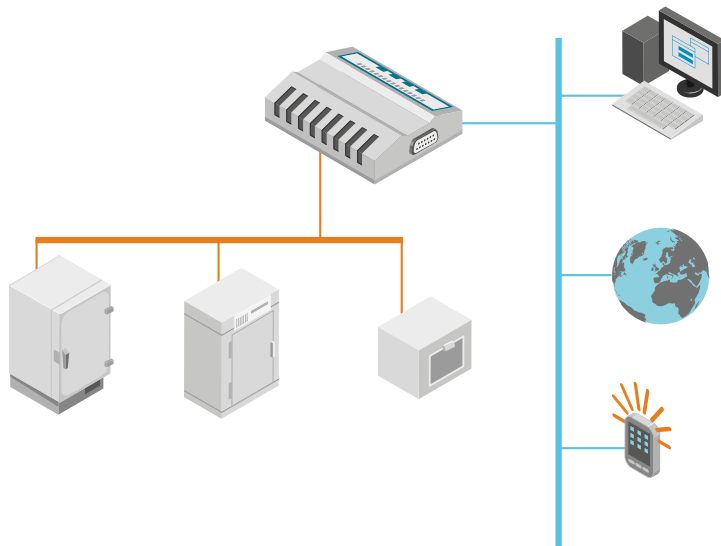




### Features

- Industry-leading precision and accuracy
- Real-time monitoring & alarming with viewLinc software
- Reliable validation/mapping with vLog software
- Easy connectivity to your existing network – wired or wireless
- Validation and continuous monitoring with the same data logger
- Superior alternative to chart recorders and hard-wired systems
- Traceable to SI units through national metrology institutes

Vaisala's multi-application temperature data loggers monitor temperatures in up to four applications with one logger – ultra-low temperature freezers, freezer/refrigerators and incubators.



DL1016-1416 data loggers include calibrations traceable to SI units through national metrology institutes.<sup>1)</sup>

Choose the DL1016-1416 VL series data logger for GxP-compliant environments and the DL1016-1416 SP series for non-GxP applications.

### Model numbers and channels

- VL-1016-22V: Two external channels for validatable applications
- VL-1416-44V: Four external channels for validatable applications
- SP-1016-22V: Two external channels
- SP-1416-44V: Four external channels

DL1016-1416 data loggers can be used with Vaisala software, either viewLinc or vLog, to download, display, and analyze environmental data.

The viewLinc monitoring system provides 24/7 multi-stage alarm notification, remote, real-time monitoring and gap-free data.

The vLog software is a simple solution for validation/mapping applications. All reports are customizable and can be exported to spreadsheets and PDF to provide records that meet the requirements of 21 CFR Part 11 and Annex 11.

<sup>1)</sup> Measurement results are traceable to the international system of units (SI) through national metrology institutes (NIST USA, MIKES Finland, or equivalent) or ISO/IEC 17025 accredited calibration laboratories.

# Technical data

## General specifications

Interfaces	<ul style="list-style-type: none"> <li>Internal: RS-232 serial</li> <li>With additional connectors/devices: USB, Ethernet, Wi-Fi, PoE</li> </ul>
Software	<ul style="list-style-type: none"> <li>vLog software for graphing and reporting</li> <li>viewLinc Enterprise Server software for continuous monitoring and alarming</li> <li>OPC Server to add Vaisala recorders to any OPC-compatible monitoring system</li> </ul>
Internal clock accuracy	±1 min/month 0 ... +50 °C (+32 ... +122 °F)
Power source	Lithium battery with typical lifetime of 10 years <sup>1)</sup>

<sup>1)</sup> Typical battery life specified with sample interval of 1 min or longer.

## Measurement performance

Sensor	"V" Range External Probe
Calibrated measurement range	-90 ... +50 °C (-130 ... +122 °F)
Operating range	-95 ... +70 °C (-139 ... +158 °F)
Initial accuracy <sup>1)</sup>	±0.25 °C over -90 ... +50 °C (±0.45 °F over -130 ... +122 °F)
One year accuracy <sup>1)</sup>	±0.35 °C over -90 ... +50 °C (±0.63 °F over -130 ... +122 °F)
Resolution	0.01 °C at +25 °C (0.02 °F at +77 °F)

<sup>1)</sup> Specification for external channels is for a probe calibrated to the specified channel of the data logger, with the logger at 0 °C to +50 °C (+32 °F to +77 °F).

## Memory

1016 Series	68 600 16-bit samples
1416 Series	101 375 16-bit samples
Memory type	Non-volatile EEPROM
Memory modes and sampling rates	User-selectable rates from once every 10 seconds to once per day (with sample interval of ≥1 min)

## Operating environment

Operating temperature	0 ... +50 °C (+32 ... +122 °F)
Operating humidity	0 ... 100 %RH non-condensing
Storage temperature	-40 ... +85 °C (-40 ... +185 °F)
Storage humidity	0 ... 100 %RH non-condensing

## Recording span: 1016-22V

Sample interval	Number of channels enabled	
	1	2
1 minute	1.5 months	23.8 days
5 minutes	7.6 months	3.8 months
15 minutes	1.9 years	11.5 months
1 hour	7.8 years	3.9 years

## Recording span: 1416-44V

Sample interval	Number of channels enabled			
	1	2	3	4
1 minute	2.3 months	1.1 months	23.5 days	17.6 days
5 minutes	11.3 months	5.6 months	3.7 months	2.8 months
15 minutes	2.8 years	1.4 years	11.3 months	8.5 months
1 hour	11.5 years	5.7 years	3.8 years	2.8 years

## Thermistor probes

Sensor	"V" range external probe
Operating temperature	-95 ... +70 °C (-139 ... +158 °F)
Connector color code	Blue
Probe length	3 m (10 ft) and 7.6 m (25 ft) lengths available
Cable construction	2 mm (0.07 in) diameter, Teflon coated cable

### Stainless steel sensor tip

Diameter	3.2 mm (1/8 in)
Length	38 mm (1.5 in)

### Sealed Teflon sensor tip

Diameter	3 mm (0.12 in)
Length	28 mm (1.1 in)

## Mechanical specifications

Dimensions	85 × 59 × 26 mm (3.4 × 2.3 × 1 in)
Weight	76 g (2.7 oz)
Mounting	3M Dual Lock™ fasteners Snap-in connector locks provide secure probe connections

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
EMC emissions	EN 55032:2012/AC:2013 Class B
Compliance marks	CE, FCC Part 15

## Spare parts and accessories

### Immersion/Dry probes

Thermistor V range probe 25 ft	235139SP
Thermistor V range probe 10 ft	235218SP
Thermistor immersion V range probe 25 ft	235140SP
Thermistor immersion V range probe 10 ft	235217SP

### Temperature probe accessories

Thermal dampening block, for use in refrigerators and freezers. The block simulates a glycol bottle to reduce alarms generated by opening and closing a door.	EPT-TDB-2
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### Designed for Controlled Environments

- Extreme temperatures
- Liquid nitrogen (LN<sub>2</sub>)
- Ovens
- Sterilization chambers

The Vaisala DL1700 series data loggers provide highly accurate temperature data acquisition and are ideal for demanding environments. The DL1700 data loggers can be used with Vaisala software, either viewLinc or vLog, to download, display, and analyze environmental data.

### Applications

- Ideal for extreme temperatures from -240 °C to +1760 °C
- Accepts type J, K, T, E, R and S thermocouples
- No programming or complicated equations required
- Highly accurate replacement for bulky data acquisition systems
- Traceable to SI units through national metrology institutes

The viewLinc monitoring system provides 24/7 multi-stage alarm notification, remote, real-time monitoring and gap-free data. The vLog software is a simple solution for validation/ mapping applications. All reports are customizable and can be exported to spreadsheets and PDF to provide records that meet the requirements of 21 CFR Part 11 and Annex 11.

Easy to use with standard thermocouples, these compact data loggers can offer up to five channels of data in temperatures ranging from -240 °C to +1760 °C.

We offer models for both validated and non-validated applications. Choose the DL1700 VL series for GxP-compliant environments and the DL1700 SP series for non-validated applications. DL1700 series data loggers include calibrations traceable to SI units through national metrology institutes.<sup>1)</sup>

<sup>1)</sup> Measurement results are traceable to the international system of units (SI) through national metrology institutes (NIST USA, MIKES Finland, or equivalent) or ISO/IEC 17025 accredited calibration laboratories.

# Technical Data

## General

Interfaces	RS-232 serial, USB, Ethernet, WiFi network interface available
Internal clock	Accuracy: $\pm 1$ min./month at $-25 \dots +70$ °C
Software	viewLinc for Monitoring, Alarming and Reporting vLogVL for Validation/ Mapping GxP environments vLogSP for graphing and reporting non-GxP environments OPC Server to add Vaisala loggers to any OPC- compatible monitoring system

## Temperature Accuracy

	Temperature Measurement Range	Accuracy at Mid-range	Resolution at Mid-range
Type K	$-220 \dots +1370$ °C ( $-364 \dots +2498$ °F)	$\pm 1.3$ °C ( $\pm 2.3$ °F)	0.37 °C (0.67 °F)
Type J	$-130 \dots +900$ °C ( $-202 \dots +1652$ °F)	$\pm 1.0$ °C ( $\pm 1.8$ °F)	0.29 °C (0.52 °F)
Type T	$-240 \dots +350$ °C ( $-400 \dots +662$ °F)	$\pm 1.2$ °C ( $\pm 2.2$ °F)	0.34 °C (0.61 °F)
Type E	$-110 \dots +740$ °C ( $-166 \dots +1364$ °F)	$\pm 0.70$ °C ( $\pm 1.3$ °F)	0.20 °C (0.36 °F)
Type R	$-50 \dots +1760$ °C ( $-58 \dots +3200$ °F)	$\pm 4.4$ °C ( $\pm 7.9$ °F)	1.3 °C (2.3 °F)
Type S	$-50 \dots +1700$ °C ( $-58 \dots +3092$ °F)	$\pm 5.1$ °C ( $\pm 9.2$ °F)	1.5 °C (2.7 °F)

## Operating Environment

Operating temperature	$-40 \dots +85$ °C ( $-40 \dots +185$ °F)
Operating humidity	0 ... 100 %RH (non-condensing)
EMC compliance	FCC Part 15 and CE EN 50581:2012 EN 55032:2012/AC:2013 Class B EN 61326-1:2013
RoHS compliance	2011/65/EU

## Mechanical Specifications

Dimensions	85 × 59 × 26 mm (3.4 × 2.1 × 1 in)
Weight	60 g (2.7 oz)
Mounting	3M Dual Lock™ fasteners
Power source	Internal 10-year lithium battery (Battery life specified with sample interval of 1 min. or longer)

## Cold Junction Temperature Channel

Measurement range	$-40 \dots +85$ °C ( $-40 \dots +185$ °F)
Accuracy	$\pm 0.25$ °C over $+20 \dots +30$ °C ( $\pm 0.45$ °F over $+68 \dots +86$ °F) $\pm 0.35$ °C over $-25 \dots +70$ °C ( $\pm 0.63$ °F over $-13 \dots +158$ °F)

## Data Logger Inputs

1700 Model	Number of Channels Enabled		
	Thermocouple	CJT	Total
170-54T	4	1	5

**Note:** One channel is designated for Cold Junction Temperature (CJT) reference using an on-board precision-tolerance thermistor.

## Thermocouple Input Channels

<b>Compatible Thermocouple Types: J, K, T, E, R, S</b>	
<b>Initial Accuracy</b>	
Input range	$-7.2 \dots +55.4$ mV
Resolution	0.016 mV
Initial Accuracy	$\pm 0.042$ mV at $+25$ °C ( $+77$ °F)
<b>Input Impedance: 10M <math>\Omega</math></b>	
Input range	$-7.2 \dots +55.4$ mV
Resolution	0.016 mV
1-Year Accuracy	$\pm 0.055$ mV at $+25$ °C ( $+77$ °F)
<b>Additional Error</b>	
At 3 V/m RF field from 450 MHz ... 580 MHz	$\pm 0.350$ mV
At 3 V conducted RF from 3 MHz ... 80 MHz	$\pm 1.0$ mV

## Memory

Memory type	Non-volatile EEPROM
Data sample capacity	135,165 12-bit samples
Memory modes	User-selectable wrap (FIFO) or stop when memory is full. User-selectable start time.
Sampling rates	User-selectable from once every 10 seconds to once a day. (Battery life specified with sample interval of 1 min. or longer)
Recording span	Recording span depends upon sample interval selected and number of channels enabled.

## Spare Parts and Accessories

<b>Thermocouple probe</b>	EPT-22T-20T
Type	T
Conductors	Copper/Constantan
Operating range	$-200 \dots +200$ °C ( $-328 \dots +392$ °F)
Length	6.096 m (20 ft)
Error	$\pm 1$ °C ... $\pm 1.5$ %



## Mid-range Data Loggers

For temperature, humidity, and contact channel measurement



### Designed for controlled environments

- Drug discovery, R&D
- Early phase clinical trials
- Blood and tissue banks
- Hospitals and pharmacies
- Nutraceutical manufacturing
- Food and dietary supplement applications
- Aerospace
- Semiconductors
- Museums and archives

Vaisala Mid-range Data Loggers are designed for early phase drug and device development applications where speed and economy are critical. The MR loggers can be used with Vaisala software to monitor and analyze environmental data and provide presentation-quality records that are easily exported to PDF and spreadsheets.

### Simplified calibration

Easy to install and configure, the MR loggers are calibrated with an abbreviated process that provides reliable accuracy in operating environments between  $-55$  to  $+50$  °C ( $-67$  to  $122$  °F).

The MR loggers include calibrations traceable to SI units through national metrology institutes to ensure cGMP, ISO 9000, and HACCP quality standards.<sup>1)</sup> Optional services are available, including extended warranties and onsite calibration.

### Easy configuration

Additional connectivity devices enable data transfer with several options, including USB, wireless, and Power over Ethernet with the vNet PoE network interface. When MR loggers are used with the vNet PoE device, installation takes minutes. With the vNet device, loggers are automatically identified on your network by the software.

### Lean validation

For applications that require validation, we offer efficient and practical protocols that allow for quick verification of data logger functions. For information on IQOQ documents, see [www.vaisala.com/gamp-gxp-validation](http://www.vaisala.com/gamp-gxp-validation).

### Software options

Whether you need multistage alarming sent via text, email, PC display, or dial-out, or to perform a comprehensive mapping study, Vaisala has user-friendly software designed for use in regulated environments, including:

- viewLinc Continuous Monitoring and Alarming
- vLogSP for Validation/Mapping applications

### Data logger options

Six versions of the MR loggers are available with up to four channels of temperature-only, temperature + humidity, or Boolean contact channel for door switches/alarm contact recording:

- DL1000MR - 1 internal temperature channel
- DL1016MR - 2 channel temperature with probes
- DL1016MRB - 2 channel with 1 temperature probe, and 1 contact input
- DL1416MR - 4 channel temperature with probes
- DL1416MRB - 2 channel temperature with probes, and 2 contact inputs
- DL2000MR - 2 internal channels temperature and RH

<sup>1)</sup> Measurement results are traceable to the International System of units (SI) through national metrology institutes (NIST USA, MIKES Finland, or an equivalent) or ISO/IEC 17025 accredited calibration laboratories.

# Technical data

## General

Interfaces	RS-232 serial, Ethernet, USB, Wi-Fi, vNet PoE network interface
Software	<ul style="list-style-type: none"> <li>vLog Validation/Mapping</li> <li>viewLinc Continuous Monitoring &amp; Alarming</li> <li>OPC DA Server to add Vaisala loggers to any OPC compatible monitoring system</li> </ul>
Internal clock accuracy	±1 min/month 0 to +50 °C (+32 to +122 °F)
Power source	Lithium battery with typical lifetime of 10 years <sup>1)</sup>

<sup>1)</sup> Typical battery life specified with sample interval of 1 min or longer.

## Memory

Memory type	Non-volatile EEPROM
Memory mode	User-selectable wrap (FIFO) or stop when memory is full
Sampling rates	User-selectable rates from once every 10 seconds to once per day (Typical battery life specified with sample interval of 1 min or longer)
<b>Data sample capacity</b>	
DL1000MR	48 100 12-bit samples
DL1016MR/MRB	68 600 16-bit samples
DL1416MR/MRB	101 375 16-bit samples
DL2000MR	122 197 12-bit samples

## Mechanical specifications

Dimensions	85 × 59 × 26 mm (3.4 × 2.3 × 1 in)
Weight	76 g (2.7 oz)
Mounting	3M Dual Lock™ Fasteners Snap-in connector for secure probe connections

## Temperature sensors

Internal sensor type	Precision-tolerance epoxy encapsulated NTC thermistor
Cable construction	2 mm (0.07 in) diameter, Teflon coated cable

### External temperature probes

Sensor tip	Stainless steel
Diameter	3.2 mm (1/8 in)
Length	38 mm (1.5 in)

### Probe cable lengths

DL1016MR/MRB	3 m (10 ft)
DL1416MR/MRB	7.6 m (25 ft)

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
EMC emissions	EN 55032:2012/AC:2013 Class B
Compliance marks	CE, FCC Part 15

# Technical data

## DL1000MR internal temperature sensor

### Range and accuracy

Logger operating range	-35 ... +85 °C (-31 ... +185 °F)
Calibrated measurement range	-25 ... +70 °C (-13 ... +158 °F)
Resolution	0.02 at +25 °C (0.04 at +77 °F)
Accuracy over temperature range at -25 ... +70 °C (-13 ... +122 °F) <sup>1)</sup>	±0.5 °C (±0.9 °F)

<sup>1)</sup> Initial accuracy includes all known influence quantities present at the time of calibration including calibration uncertainty, mathematical fit, data logger resolution, hysteresis and reproducibility. Not included is any drift related to atypical contamination or misuse.

## DL2000MR internal temperature/RH sensor

### Temperature range and accuracy

Operating range	-35 ... +85 °C (-31 ... +185 °F)
Calibrated measurement range	-25 ... +70 °C (-13 ... +158 °F)
Accuracy over temperature range at -25 ... +70 °C (-13 ... +122 °F) <sup>1)</sup>	±0.5 °C (±0.9 °F)
Resolution	0.02 °C at +25 °C (0.04 °F at +77 °F)

### Relative humidity range and accuracy

Calibrated measurement points	<ul style="list-style-type: none"> <li>• 45 %RH at +10 °C (+50 °F)</li> <li>• 10 %RH and 80 %RH at +25 °C (+77 °F)</li> <li>• 45 %RH at +25 °C (+77 °F)</li> <li>• 45 %RH at +45 °C (+113 °F)</li> </ul>
Operating range	0 ... 100 %RH (non-condensing)
Temperature range +20 ... +30 °C (68 ... 86 °F)	10 ... 90 %RH ±2.0 %RH
Temperature range -20 ... +20 °C, +30 ... +70 °C (-4 ... 68 °F, 86 ... 158 °F)	10 ... 90 %RH ±3.0 %RH
Resolution	0.05 %RH
Humidity sensor	HUMICAP <sup>®</sup> 180R
Stability	±2 %RH over 2 years

<sup>1)</sup> Initial accuracy includes all known influence quantities present at the time of calibration including calibration uncertainty, mathematical fit, data logger resolution, hysteresis and reproducibility. Not included is any drift related to atypical contamination or misuse.

## DL1016/1416MR external temperature sensors

### Range and accuracy

Logger operating range	0 ... +50 °C (32 ... +122 °F)
Probe operating range	-95 ... +70 °C (-139 ... +158 °F)
Calibrated measurement range	-55 ... +50 °C (-130 ... +122 °F)
Resolution	0.01 °C at +25 °C (0.02 °F at +77 °F)
Accuracy over temperature range at -55 ... +50 °C (-67 ... +122 °F) <sup>1)</sup>	±0.5 °C (±0.9 °F)

<sup>1)</sup> Specification for external channels is for a probe calibrated to the specified channel of the data logger, with the logger at 0 °C to +50 °C (32 °F to +122 °F).

## Accessories

Thermal dampening block, for use in refrigerators and freezers. The block simulates a glycol bottle to reduce alarms generated by opening and closing doors.	EPT-TDB
Cable with magnetic contact switch (7.6 m (25 in)) for use with MRB loggers	EPT-DS-25



### Features

- Eliminates the cost of wiring AC power to each monitored point
- Data loggers can be installed wherever a LAN cable can be run
- Increased data communication protection from power outage because the server room's UPS can provide backup power
- Plug and Play connectivity when using viewLinc Aware function

Wherever reliable network communications and cost are important, more companies are using Power over Ethernet (PoE) devices. Vaisala vNet PoE network interface brings easy connectivity with Vaisala DL series data loggers at a lower cost than alternative networking devices.

The snap-in design streamlines data logger connectivity into a small footprint, eliminating wires between normally separate data loggers and PoE devices. When power and data are carried over the same cable, you can also eliminate the cost of installing an AC power source.

vNet PoE integrates VL and SP data loggers without compromising their high accuracy. It brings greater flexibility and simplicity to the deployment of Vaisala Continuous Monitoring system.

The viewLinc Aware function in viewLinc monitoring software allows you to quickly configure data loggers, alone or in batches. Simply place data loggers in a vNet cradle, connect to a Local Area Network, and viewLinc discovers and configures the data loggers.

vNet PoE interface comes in four models:

- CDL-VNET-P with a fan inside the cradle for data loggers with an internal temperature channel
- CDL-VNET-LP without a fan for data loggers without an internal temperature channel
- CDL-VNET-PC with 15 V output to power external sensors and transmitters; includes internal fan
- CDL-VNET-LPC with 15 V output to power external sensors and transmitters; without internal fan

There is also an option to power the interface with AC. Select the model that fits your application to monitor and record temperature, humidity, CO<sub>2</sub>, differential pressure, door switches, and many other parameters.



# Technical Data

## Measurement performance

### Heating effect on measurements

CDL-VNET-P and CDL-VNET-PC	Temperature rise from electronics (important only for data loggers with internal sensors): < 0.05 °C as seen by the data logger sensor
CDL-VNET-LP and CDL-VNET-LPC	Not to be used for data loggers with internal sensors

## Operating environment

Operating temperature	-25 ... +70 °C (-13 ... +158 °F)
Storage temperature	-40 ... +85 °C (-40 ... +185 °F)
Operating humidity	0 ... 90 %RH (non-condensing and not to exceed a mixing ratio of 38.5 g/kg)

## Inputs and outputs

Ethernet connectivity	IEEE 802.3af (Class 1) <sup>1)</sup> , bandwidth 10Base-T
Connectivity cable	Category 5/5e RJ-45 connector 1.83 m (6 ft)
Operating voltage <sup>2)</sup>	12 ... 30 V DC Plugs into vNet jack labeled 12 V

### Output voltage

CDL-VNET-P and CDL-VNET-LP	Not available
CDL-VNET-PC and CDL-VNET-LPC	Nominal: 15 V DC Maximum: 350 mW

### Power consumption

CDL-VNET-P and CDL-VNET-LP	Typical: 625 mW Maximum: 700 mW
CDL-VNET-PC and CDL-VNET-LPC	Typical: 900 mW Maximum: 1.35 W

### Power supply <sup>3)</sup>

North America	12 V DC / 0.5 A max. out 120 V AC in
International	12 V DC / 1.66 A max. out 100 ... 240 V AC in

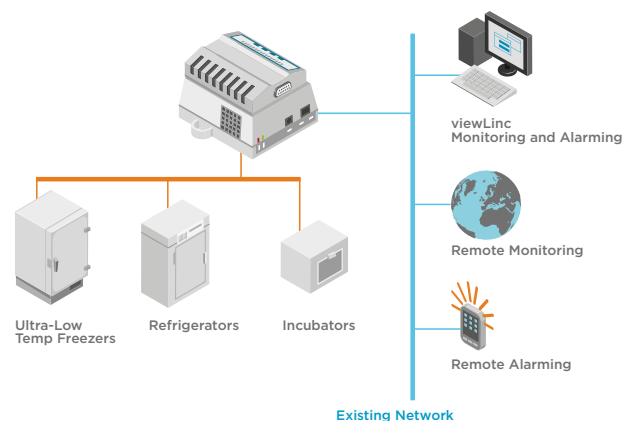
1) Max. PSE power reservation is 4.00 W.  
2) Optional for use without PoE.  
3) Included but not required when using PoE.

## Mechanical specifications

Dimensions (H × W × L)	43 × 102 × 102 mm (1.7 × 4.0 × 4.0 in)
Weight	180 g (6.3 oz)

## General specifications

Data logger compatibility	v6.00 hardware and higher Includes models VL and SP 1000, 1700, 1200, 1016, 1416, 1400, 2000, 4000
LED indicators	Link, activity, power, data logger communications
Device configuration	HTTP Web Interface PC-based configuration wizard
viewLinc Aware	Requires one vNet to be programmed with the viewLinc server IP address. Other vNets on the subnet will automatically self-configure.
Addressing	DHCP/RARP ARP-Ping Static IP for IP address assignment Net BIOS name
Firmware	Field upgradable firmware
<b>Compliance</b>	
Emissions/Immunity	FCC Part 15 and CE EN 50581:2012 EN 55032:2012/AC:2013 Class B EN 61326-1:2013
Conformity	RoHs, 2011/65/EU WEEE



## CAB100 CMS Industrial Cabinet

For data collection in cleanrooms and industrial settings



### Features

- Measurement options include differential pressure and analog inputs for a variety of parameters
- Analog inputs can be made intrinsically safe with a safety barrier or galvanic isolator
- Reporting via viewLinc is compliant with FDA, Annex 11, GxP, and GAMP
- Networking options include PoE and/or a multiport Ethernet adapter
- Large cabinets (CAB100B) feature an integrated 24 V DC / 2.5 A power supply
- Small cabinets (CAB100A) have the option of integrated power supply, or Power over Ethernet

Vaisala CMS Industrial Cabinet CAB100 integrates Vaisala's world-class instruments for monitoring differential pressure and other parameters into a simple, pre-configured instrument panel. In combination with the Vaisala viewLinc Enterprise Server software, the cabinet provides pre-installed real-time monitoring of your critical environments.

### Easy data collection with quality and compliance

Cabinets are configurable to your application requirements, with options for differential pressure transmitters, analog inputs for the connection of remote transmitters, and safety barriers or galvanic isolators for hazardous areas that require intrinsically safe devices. CAB100 enables you to combine differential pressure and other transmitters with data loggers in a single enclosure for centralized monitoring and reliable alarming.

### Configured for your cleanroom

CAB100 is designed to ensure regulatory compliance in multiple cleanroom applications, including: pharmaceutical, healthcare, biotechnology, medical

device, aerospace, automotive, and semiconductor manufacturing. Select from two cabinet sizes: small and large. Small cabinets can contain up to four analog inputs which can also be intrinsically safe, or four differential pressure transmitters. Large cabinets can accommodate up to 12 differential pressure transmitters and up to 32 analog input channels with intrinsically safe options.

Communication is achieved over Ethernet to the viewLinc server database. CAB100 is an ideal solution for many monitoring applications, providing device protection, economy and serviceability.

The lockable metal enclosure protects the measurement instruments from tampering and accidental damage.

### The benefits of centralization

It is often impossible or impractical to run power or network cables to each desired point of measurement. With CAB100 you can centralize and economize by running a single power and network cable to the cabinet to support numerous transmitters, while also reducing the number of network adapters needed.

Centralization of measurement devices also simplifies serviceability. With multiple transmitters and data loggers located together, regular maintenance activities like calibration are easy and efficient.

## CAB100 configuration options

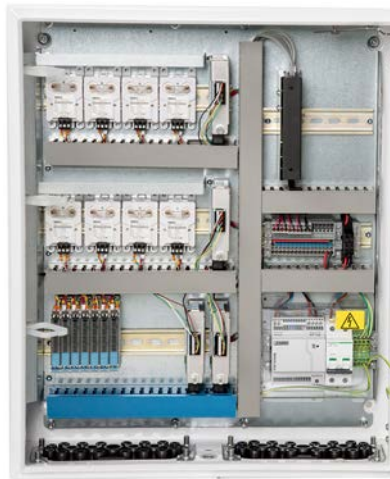
<b>Cabinet size and material (H × W × L)</b>	Model CAB100A (small cabinet)	200 × 300 × 400 mm (7.87 × 11.81 × 15.75 in) Aluminum, painted white
	Model CAB100B (large cabinet)	200 × 500 × 600 mm (7.87 × 19.69 × 23.62 in) Stainless steel AISI 316, painted white
<b>Powering</b>	AC (mains) power	110–240 V AC, 50–60 Hz 0.5 A maximum (120 V AC)
	Power supply module within cabinet	24 V DC / 2.5 A / Fused 2 A
	Power over Ethernet <sup>1)</sup>	Power over Ethernet, with loop power, without fan
	Maximum power consumption	CAB100A: 20 W CAB100B: 40 W
<b>IP rating</b>	CAB100A (small cabinet)	IP54
	CAB100B (large cabinet)	IP66/NEMA 4
<b>Analog channels</b>	4–32 channels	4–20 mA
<b>Safety barrier</b>	1–16 pieces	1 barrier per channel
<b>Galvanic isolator</b>	1–12 pieces	1 isolator per channel
<b>Differential pressure</b>	1–12 pieces	±60 Pa or ±0.25 in H <sub>2</sub> O
<b>Ethernet communication</b>	Model CAB100B (large cabinet)	Up to 2 serial-to-Ethernet devices via RJ45 (DIGI PortServer TS4)
	Model CAB100A (small cabinet)	Vaisala vNet Ethernet interface for DL series data loggers with PoE option via RJ45 connector
<b>Ethernet</b>	Ethernet switch	+4 PoE IEEE 802.3af/at
<b>Compliance</b>	Model CAB100A (small cabinet)	EN/IEC 61326-1 (Basic electromagnetic environment) <sup>2)</sup>
	Model CAB100B (large cabinet)	CISPR 32 / EN 55032, Class A FCC part 15 B, Class A IEC/UL/EN 61010-1 SGS safety listed in USA and Canada CE, UKCA, China RoHS, and RCM compliant Conducted immunity: Output may deviate in 1–40 MHz environment, measured deviation ≤0.25 mA Radiated immunity: Output may deviate in 80–250 MHz environment, measured deviation ≤0.3 mA.

1) Only with PDTs and small CAB100.

2) Excluding CAB100 analog input channels, which are not surge protected.



CAB100 supports internal differential pressure transmitters, analog inputs, and safety barriers or galvanic isolators.



**For accuracy specifications, see devices on [www.vaisala.com](http://www.vaisala.com)**

- DL4000 data loggers for multiple parameters
- PDT101 differential pressure transmitter
- HMT370EX series transmitters for intrinsically safe temperature and humidity measurement
- HMT120 and HMT130 series transmitters for analog inputs



### Our service offering

- Maintenance Agreement
- Installation and configuration
- Validation
- Calibration services
- Training
- Validation mapping

Vaisala provides comprehensive customer care for the entire life cycle of the Vaisala viewLinc Continuous Monitoring System (CMS). These expert services will ensure that your CMS provides reliable monitoring throughout its operational lifespan.

### Worldwide experts at your service

Vaisala's service and support teams provide you with an in-depth understanding of critical environments, network technologies, and measurement devices. We help ensure that your CMS is efficiently and effectively deployed so that it meets or exceeds the most stringent compliance requirements for installation in GxP-regulated environments.



*"The Vaisala team is well qualified, easy to work with, and became a part of our team. This relationship was a major reason that our original goal of project completion [for a 2000 point, 60 site system] within two years was met."*

Joe Cwiertniewicz,  
Facilities Manager, McKesson

Choose the optimal combination of life cycle services for your viewLinc CMS:



MAINTENANCE AGREEMENT



INSTALLATION & CONFIGURATION



IQ/OQ VALIDATION



CALIBRATION SERVICES



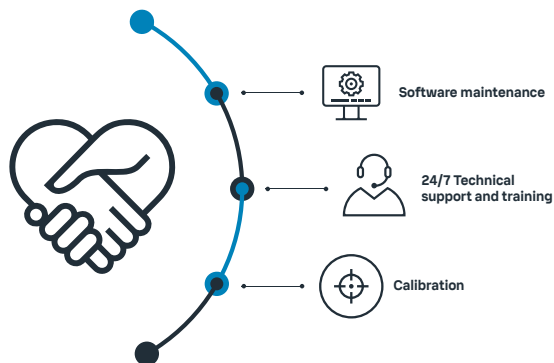
TRAINING



VALIDATION MAPPING

# viewLinc Life Cycle Maintenance Agreement

Our life cycle services provide you with expert support throughout the lifetime of your CMS to ensure reliable monitoring. Choose the services that suit your needs best, or consult our experts to help you decide.



## viewLinc Life Cycle Maintenance Agreement

The viewLinc Life Cycle Maintenance Agreement (LCMA) is an agreement designed to ensure that your viewLinc CMS is always up to date in terms of performance and regulatory compliance. It also helps ensure you get maximum benefit from your viewLinc CMS with support from our experts. The agreement comprises software updates, enhanced support and training for your staff, and remote emergency support.

### Software updates

Software updates ensure that your viewLinc CMS is updated regularly to address technological advances and changes in regulations. Updates are provided free of charge and include supporting documentation.

### Enhanced support and training for your staff

Enhanced support means that Vaisala technical experts will help you to solve any technical challenge you might face when using Vaisala hardware and software. All queries are answered by a Vaisala expert on the next working day at the latest. The service also includes a fixed amount of pre-planned training and/or consultation on topics of your choosing. Training is recommended when you first start using viewLinc and when you are onboarding new staff.

For technical support, contact us via [MyVaisala portal](#) or the Vaisala helpdesk at [helpdesk@vaisala.com](mailto:helpdesk@vaisala.com).

### Remote emergency support

Remote emergency support is available to help troubleshoot the root cause of critical issues with Vaisala hardware and software that inhibit core system functions. Support is available 24/7 via Vaisala's dedicated emergency support number.



*"Over the years, Vaisala's field support has assisted us for complex system integrations, supporting all our needs effectively. Vaisala has enabled us to reduce the time it takes to create a fully GMP-monitored environment. That provides us with a competitive edge."*

David Teer, Senior Engineering Manager, Viral-based Therapeutics, Lonza Houston.

# Installation and configuration

Vaisala’s experienced technicians are available to manage and perform the installation and configuration of your viewLinc CMS. Our installation service ensures flawless system deployment and efficient start-up without burdening your resources. We also offer update and expansion services for existing viewLinc systems.

## Installation service includes:

- Collaborative planning
- Installation of all measurement devices and network hardware
- Software installation and configuration
- User and administrator training
- System handover



## Efficient and worry-free installation

With our comprehensive installation service you can be certain that the system deployment meets all your operational and regulatory requirements.

## Comprehensive training

Our installation service includes hands-on user and administrator training to ensure staff can make effective use of the CMS from day one.

## Expert support

Vaisala’s service technicians have expert knowledge of our hardware, software, and associated technologies. They are experienced in setting up systems for critical and GxP-regulated environments.

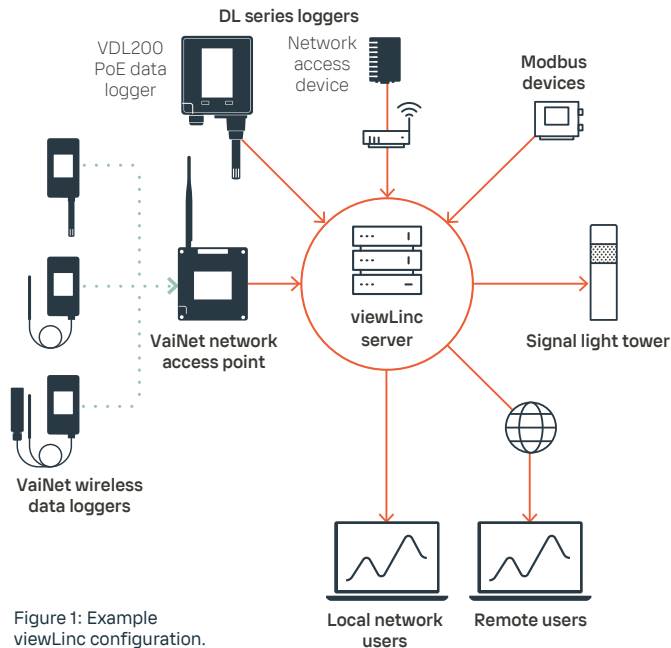


Figure 1: Example viewLinc configuration.

*“The system was installed with the help of Vaisala Field Service. When a Joint Commission surveyor returned, we presented him with printouts of viewLinc records for the dates and times of his choosing. He was impressed.”*

Frank Gee, Director of Facilities,  
Hazel Hawkins Memorial Hospital, California

# Validation

Ensure a high quality validation of your monitoring system and reduce system implementation time by using our expertise and understanding of GxP quality systems.



## **IQ/OQ validation**

Ensure high-quality validation of your monitoring system and reduce system implementation time by using our expertise and understanding of GxP quality systems.

Vaisala offers on-site Installation Qualification (IQ) and Operational Qualification (OQ) services for the Vaisala viewLinc CMS.

IQ captures the baseline configuration of your system and provides evidence of control that aligns with GxP guidelines. OQ provides evidence that your monitoring system is operating as designed, encompassing all GxP functions of the system including audit trails, tamper-proof data, and the relevant requirements of 21 CFR Part 11, EU GMP Annex 11, and PSFB 040122.

## **Economical and efficient**

Monitoring system validation performed by a skilled and experienced Vaisala technician is an economical choice, providing significant savings in time and resources. Let us take care of IQ/OQ system validation so that you can concentrate on your core business.

## **The quickest way to audit-ready monitoring**

Our understanding of GxP regulations and quality system standards in life science industries ensures that your viewLinc CMS is validated, documented, and ready for regulatory scrutiny.

## **Comprehensive validation documents**

Our validation service includes full documentation to demonstrate that the system is operating according to specifications and that it meets quality standards and regulatory requirements.

*"The viewLinc system is not only easy to validate to GMP compliance, but it's also more efficient than all the hard wiring typically required by automation and control systems."*

David Teer, Senior Engineering Manager, Viral-based Therapeutics, Lonza Houston



# Calibration services

Vaisala offers several calibration options for CMS data loggers and instruments to verify and ensure their measurement accuracy.

Simply choose from Service Center Calibration, On-site Calibration, or our Probe-Swapping Service and leave the rest to our experts. All calibration options include official calibration certificates for both internal and external audit purposes.

We also offer cost-efficient Calibration Care agreements which include priority processing. You can learn more about the benefits of a Calibration Care agreement [here](#).



## Service Center Calibration

Traceable ISO 9001 or accredited ISO/IEC 17025 calibration performed at a Vaisala calibration laboratory:

- Wide calibration ranges and extensive options
- Adjustment included and repair services available as an option
- Includes calibration certificate with as-found and as-left results

## On-site Calibration

Single or multi-point calibration, accredited if required, performed at your site by Vaisala experts:

- No system downtime or lost data
- Carefree and convenient – saves in-house resources
- Includes calibration certificate

## Probe-Swapping Service

Avoid calibration-related downtime with our Probe-Swapping Service, which provides you with a replacement probe with an as-found calibration certificate.

- Factory calibration accuracy with minimal downtime
- Probe replacement can be performed in seconds

## Vaisala service centers providing ISO and Accredited calibration services

Boston	Helsinki	Beijing	Tokyo
  <p>CALIBRATION LABORATORY CERTIFICATE # 2083.01</p>	  <p>FINAS Finnish Accreditation Service K008 (EN ISO/IEC 17025)</p>	  <p>中国认可 国际互认 校准 CALIBRATION CNAS L10243</p>	  <p>JCSS JCSS 0123</p>
<p><b>ALL PARAMETERS CALIBRATED:</b> Relative Humidity, Temperature, Dew Point, Pressure, Carbon dioxide and Hydrogen peroxide</p>			
<p>Please visit <a href="http://store.vaisala.com">store.vaisala.com</a> to see services availability and terms in your area.</p>			

# Training

Vaisala offers comprehensive training services for viewLinc customers to ensure staff are properly trained on the system's functions and capabilities. Whether you are deploying a new monitoring system, expanding an existing one, or adapting to staff changes, our comprehensive training ensures proper use of the system and compliance with regulations such as FDA 21 CFR 211.25.



### Choose the training option that serves your needs best:

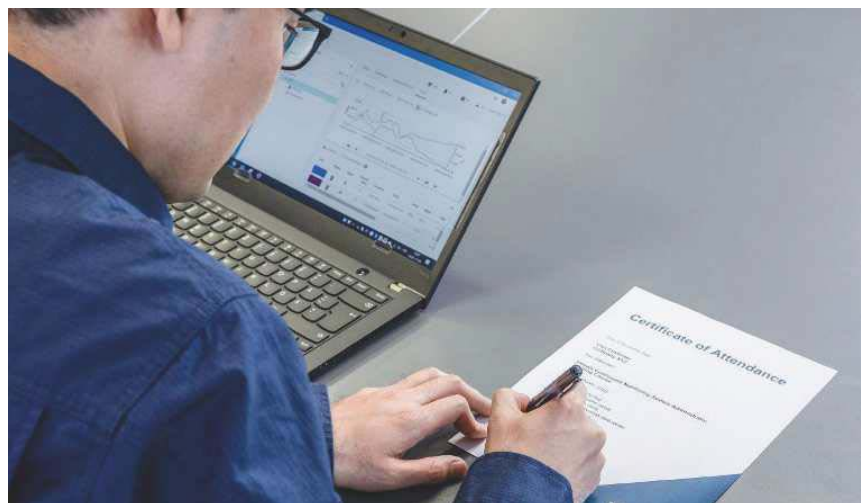
- Remote training with Vaisala technical support experts via Teams
- On-site training with hands-on exercises; typically delivered with our [Installation Service](#).

# Validation mapping

Understanding the critical process parameters of a controlled environment is crucial to the safe and effective use of that space for manufacturing, storing, processing, and distributing pharmaceuticals, biological materials, and medical devices. The Vaisala Validation Mapping Service ensures that you fully understand the variability of conditions and qualify controlled environments.

### The Validation Mapping Service includes:

- Thermal mapping and analysis of environments
- Mapping equipment used during the service
- Mapping study documents



Inquire about availability of the Validation Mapping Service in your region [here](#).

*"As our research has evolved, viewLinc has met our needs. We are extremely pleased with the viewLinc system and the services Vaisala provides."*

Dr. Leonardo Motta, Medical Laboratory Supervisor, Health Research Institute, University of Caxias do Sul, Brazil



### Features

- Achieve time and cost savings by preventing production downtime
- Ensure highly accurate measurements
- Provide certification and mandatory documentation for instrument calibration standards
- Free up staff to focus on primary work assignments
- Enjoy peace of mind with Vaisala-certified calibration expertise and components
- Take advantage of a wide array of available calibrations

Calibrating Vaisala Continuous Monitoring Systems (CMS) on-site helps to maximize reliability and profitability by minimizing costly equipment downtime, removing the need for in-house or factory calibration, and allowing your staff to focus on what is truly important: your business.

### Reliable On-site Calibration for Life Science Applications

On-site Calibration Service offers a range of benefits over the conventional options of either shipping equipment back to the manufacturer or calibrating in-house. Reliable on-site calibration minimizes downtime by keeping your monitoring system in place and operational.

Certain calibrations require removal of the device from process. For these situations Vaisala offers rental devices and device swap services to ensure continuity of monitoring and gap-free

data. By outsourcing calibration to Vaisala, you remove the need to invest in specialized calibration equipment and training – allowing staff to focus on their primary tasks.

We provide you with a range of single- and multi-point calibration options using application-specific reference instruments, complete with a certificate of NIST traceability. To maintain the high levels of accuracy and optimal performance of your CMS, the system sends a reminder when calibration is due.

### Complete Documentation

On-site Calibration Service provides a thorough analysis with comprehensive paper and digital documentation, including a calibration certificate to ensure verification and standards compliance. Calibration reports, data sheets, and calibration labels can be supplied on-site, with digital backup files saved to disk. Our highly accurate calibrations fulfill international standards and make it easy to comply with regulatory requirements.

# Technical Data

## Single-point Calibration

Temperature	
Range	-90 ... +70 °C
Unit Under Test acceptance limits	±1 °C
Calibration points	One point at point of use
Adjustment	Not available
Certificate	Includes as-found/as-left data
Traceability	NIST
Available for the following devices	Vaisala Temperature Data Loggers <ul style="list-style-type: none"> <li>• DL1000</li> <li>• DL1016</li> <li>• DL1400</li> <li>• DL1416</li> <li>• DL2000</li> <li>• HMT140</li> </ul>
Reference instrument	Vaisala Temperature Data Logger
Temperature for Liquid Nitrogen Applications	
Range	-196 °C
Unit Under Test acceptance limits	±3 °C
Calibration points	One point at point of use
Adjustment	Not available
Certificate	Includes as-found/as-left data
Traceability	NIST
Available for the following devices	Vaisala Temperature Data Loggers DL1700
Reference instrument	Vaisala Temperature Data Logger, Fluke 52 Series II
Relative Humidity	
Range	Ambient RH (within range of 10 ... 90 %RH) at any temperature within range of +10 ... +45 °C
Unit Under Test acceptance limits	±5 %RH
Calibration points	One point at point of use
Adjustment	Not available
Traceability	NIST
Applicable loggers and transmitters	Vaisala Humidity Data Logger DL2000, HMT140
Reference instrument	Vaisala Humidity Data Logger
Carbon Dioxide	
Range	0 ... 20 % at point of use
Unit Under Test acceptance limits	Application dependent
Calibration points	One point at point of use
Adjustment	Not available
Certificate	Includes as-found/as-left data
Traceability	NIST
Available for the following devices	Vaisala Carbon Dioxide Transmitter Series GMT220
Reference instrument	Vaisala GM70

## Multi-point Calibration

Temperature	
Range	-90 ... +90 °C
Unit Under Test acceptance limits	±0.5 °C
Calibration points	Application-dependent
Adjustment	Available on 3+ point calibrations
Certificate	Includes as-found/as-left data and uncertainties
Traceability	NIST
Available for the following devices	Vaisala Temperature Data Loggers with Probes <ul style="list-style-type: none"> <li>• DL1000</li> <li>• DL1016</li> <li>• DL1400</li> <li>• DL1416</li> <li>• HMT143</li> <li>• HMT148</li> </ul>
Reference instrument	Ametek ETC159
Relative Humidity	
Range	10 ... 90 %RH at ambient temperature
Unit Under Test acceptance limits	Loggers ±3 %RH
Calibration points	Application-dependent
Adjustment	Available on 3+ point calibrations
Certificate	Includes as-found/as-left data and uncertainties
Traceability	NIST
Available for the following devices	Vaisala Relative Humidity Data Loggers HMT141, DL2000
Reference instrument	Vaisala HMT330
Differential Pressure	
Range	-15 ... 200 psi
Unit Under Test acceptance limits	Range-dependent
Calibration points	Application-dependent
Adjustment	Available on 3+ point calibrations
Certificate	Includes as-found/as-left data
Traceability	NIST
Available for the following devices	Vaisala Differential Pressure Transmitter Series PDT100
Reference instrument	Fluke Process Calibrator / Pressure Modules
Current and Voltage	
Range	0 ... 5 VDC 0 ... 10 VDC 0 ... 20 mA
Unit Under Test acceptance limits	±0.15 %FS at +25 °C
Calibration points	Match Factory Calibration
Adjustment	Yes
Certificate	Includes as-found/as-left data and uncertainties
Traceability	NIST
Available for the following devices	Vaisala Relative Data Loggers HMT140, DL4000, DL2000
Reference instrument	National Instruments PHLe-4141



## GxP Documentation Package for Vaisala viewLinc Continuous Monitoring System



**User Requirements Specification (URS)**  
**Functional Specification (FS)**  
**Design Qualification (DQ)**  
**Traceability Matrix (TM)**  
**Risk Assessment (RA)**

### Features

- System validation documentation package designed to provide ISPE Good Automated Manufacturing Practice (GAMP) methodology for viewLinc system validation.
- Available in English, Portuguese, Japanese, and Chinese.
- Specify the required attributes of your viewLinc system using the viewLinc-specific GxP documentation:
  - User Requirements Specification
  - Functional Specification
  - Design Qualification
  - Traceability Matrix
  - Risk Assessment

Vaisala viewLinc Continuous Monitoring System is ideal for GxP-regulated applications and environments that contain high-value products. If you are required to maintain compliant environmental monitoring methods and documentation, Vaisala can provide a GxP System Documentation package for the viewLinc monitoring system to help ensure your system implementation fulfills the recommendations of ISPE Good Automated Manufacturing Practice (GAMP).

### Specify, then verify

The goal of the GAMP approach is to ensure, through specification and testing, that the monitoring system is fit for its intended use and implemented in a controlled manner. The required attributes of the system are described in specifications, and then verified in testing. The GxP Documentation Package provides the required specifications, which can then be verified using the Vaisala IQOQ (Installation Qualification/Operation Qualification) Documentation Package.

### User Requirements Specification (URS)

The User Requirements Specification defines the capabilities you have deemed necessary for the Vaisala Continuous Monitoring System to fulfil its intended role in your process. This document provides a clear and concise list of requirements for a typical continuous monitoring application, while providing the option to add new requirements according to your unique business processes.

### Functional Specification (FS)

The Functional Specification outlines all functions of the Vaisala Continuous Monitoring System. This document can be used by stakeholders to evaluate the CMS as a candidate system by comparison to a User Requirements Specification.

### Design Qualification (DQ)

The Design Qualification ensures that the Vaisala Continuous Monitoring System is appropriately designed and capable of meeting the requirements of the system user. The DQ compares individual User Requirements in the URS against the system functions, and provides traceable verification that each User Requirement is fulfilled by a function listed in the FS.

### Traceability Matrix (TM)

The Traceability Matrix ensures traceability of the requirements through the assessment and testing processes. The Traceability Matrix is used to verify that each requirement from the URS is fulfilled by a corresponding function in the CMS. It verifies that each requirement and corresponding function has been fully evaluated through Risk Assessment, IQ Testing, and OQ Testing.

### Risk Assessment (RA)

The Risk Assessment outlines the CMS functions that are critical to preserving the safety and efficacy of GxP products. This Risk Assessment provides justification for the items in the Vaisala CMS that will be tested (or not tested). This analysis serves as a guide for your testing efforts.

A central tenet of GAMP philosophy is to leverage supplier involvement. Items identified as not requiring testing in the CMS IQOQ have either been tested thoroughly by Vaisala during system development, or are tested elsewhere during the implementation process.

### More information

For more information on the GxP Documentation Package for viewLinc, see [www.vaisala.com/gamp-gxp-validation](http://www.vaisala.com/gamp-gxp-validation).



### Advanced DGA monitoring

- Maintenance-free operation without consumables
- Intuitive user experience
- Smart analysis tools
- Oil sampling with vacuum gas extraction
- Long-term measurement stability through autocalibration and IR reference measurement
- Total gas pressure detects air leaks without oxygen sensors
- Robust mechanics
- Easy installation
- Manufactured in Vaisala's cleanroom

Vaisala OPT100 Optimus™ DGA Monitor is the right solution for safe-guarding critical transformers in harsh environments. It delivers out-of-the-box performance, eliminates false alarms, and gives you the best long-term stable measurements for all fault gases.

### Prevent transformer failure

**There is nothing worse than an unplanned outage. Lost revenue, damage to your reputation and brand – all of it avoidable. Over 50 percent of serious power transformer faults can be detected and severe failures prevented ahead of time with the right online monitoring tools.**

**Vaisala OPT100 Optimus™ DGA Monitor is robust and intuitive to use. With real-time, trouble-free fault gas monitoring – there are no false alarms, no maintenance and no consumables required. Optimus™ is the culmination of decades of experience, extensive research, and it builds on customer needs. Made with the ultimate safety and reliability in mind, ready for the most demanding operating environments.**

### Intuitive and smart design

The web-based user interface eliminates the need for additional software. Optimus™ can be connected to an existing control and monitoring system using digital communication and relays, or used as a standalone monitoring device. And in case of a disturbance such as a power outage, self-diagnostics enable automatic self-recovery. Optimus™ can be installed in less than 2 hours: connect oil, power, and data – and you're set.

### Reliable data – no false alarms

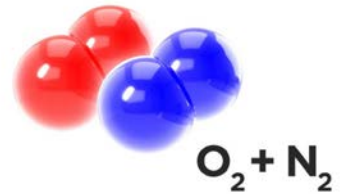
Thanks to autocalibration and IR reference measurement, Optimus™ provides reliable gas trending data at all times. Vacuum gas extraction eliminates fluctuation caused by oil temperature or

pressure, and the hermetically sealed and protected optics prevent sensor contamination. Moisture and hydrogen are measured directly in the oil with our capacitive thin-film polymer HUMICAP® sensor and solid-state sensors. The IR sensor is based on Vaisala core measurement technology and components manufactured in our own cleanroom. The result is data you can rely on to make critical operational decisions.



tank, the majority of the dissolved gases are nitrogen and oxygen, and the proportion of fault gases in the pressure value is negligible. The pressure trend of the dissolved gases gives a reliable indication of a leak, as nitrogen is the dominant component, and it is not formed or consumed in reactions inside the transformer.

### Total gas pressure



### Robust construction

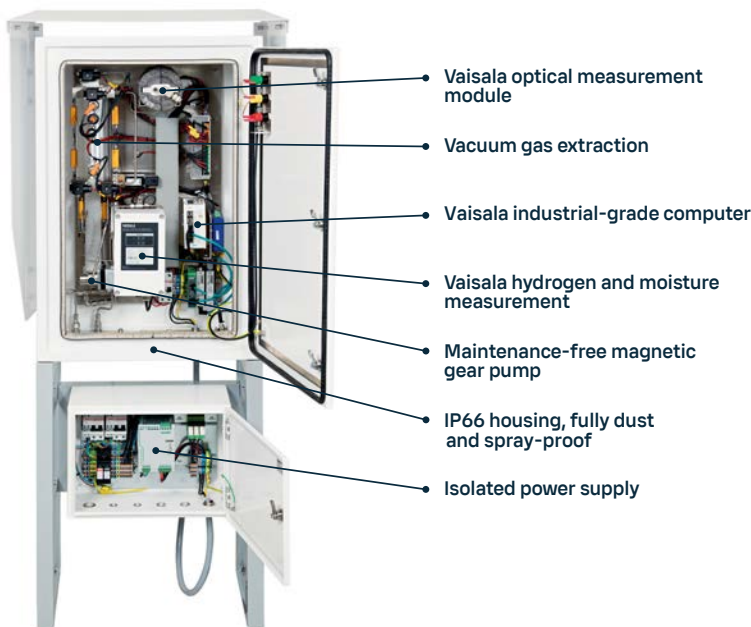
Stainless steel pipes, IP66-rated housing, as well as a magnetic drive gear pump and valves bring superb performance and durability – from the arctic to the tropics. What's more, there are no consumables to service or replace.

### DGA diagnostics with Duval Triangles

The publicly available and commonly used dissolved gas analysis method for transformer fault diagnostics purposes, Duval Triangles (IEC 60599, Annex B), is available as an optional feature. The user interface displays the progression of data points from the past year overlaid on top of Duval Triangles.

### Air leak detection using total gas pressure

Oxygen accelerates the aging of transformers, potentially cutting years from their operational life. With a groundbreaking method, Optimus™ DGA Monitor measures the total dissolved gas pressure of the sampled oil volume and detects any air leaks on sealed transformers without oxygen sensors. In case of an air leak into the transformer's





# Technical data

## Measurement specification

Parameter <sup>1)</sup>	Range	Accuracy <sup>2) 3)</sup>	Repeatability <sup>3)</sup>
Methane (CH <sub>4</sub> )	0–10 000 ppm <sub>v</sub>	±4 ppm or ±5 % of reading	10 ppm or 5 % of reading
Ethane (C <sub>2</sub> H <sub>6</sub> )	0–10 000 ppm <sub>v</sub>	±10 ppm or ±5 % of reading	10 ppm or 5 % of reading <sup>4)</sup>
Ethylene (C <sub>2</sub> H <sub>4</sub> )	0–10 000 ppm <sub>v</sub>	±4 ppm or ±5 % of reading	10 ppm or 5 % of reading
Acetylene (C <sub>2</sub> H <sub>2</sub> )	0–5000 ppm <sub>v</sub>	±0.5 ppm or ±5 % of reading	1 ppm or 5 % of reading
Carbon monoxide (CO)	0–10 000 ppm <sub>v</sub>	±4 ppm or ±5 % of reading	10 ppm or 5 % of reading
Carbon dioxide (CO <sub>2</sub> )	0–10 000 ppm <sub>v</sub>	±4 ppm or ±5 % of reading	10 ppm or 5 % of reading
Hydrogen (H <sub>2</sub> )	0–5000 ppm <sub>v</sub>	±15 ppm or ±10 % of reading	15 ppm or 10 % of reading
Moisture <sup>5)</sup> (H <sub>2</sub> O)	0–100 ppm <sub>w</sub> <sup>6)</sup>	±2 ppm <sup>7)</sup> or ±10 % of reading	Included in accuracy
Total gas pressure	0–2000 hPa	±10 hPa or ±2 % of reading	10 hPa or 5 % of reading

- 1) ppm values are defined as µl/l according to IEC 60567 standard conditions.  
 2) Accuracy specified is the accuracy of the sensors during calibration gas measurements.  
 3) Whichever is greater.  
 4) Repeatability of ethane measurement is specified with averaging of five measurements.  
 5) Measured as relative saturation (%RS).  
 6) Upper range limited to saturation.  
 7) Calculated ppm value is based on average solubility of mineral oils.

## Measurement operation

Measurement cycle duration	1–1.5 h (typical)
Response time (T63)	One measurement cycle <sup>1)</sup>
Warm-up time until first measurement data available	Two measurement cycles
Initialization time to full accuracy	Two days
Data storage	At least 10 years <sup>2)</sup>
Expected operating life	> 15 years

- 1) Three cycles for ethane and hydrogen.  
 2) Data storage may run out of space after 20 years of measurements. To keep the old data, it is recommended to download it every 10 years.

## Field performance

Parameter	Typical variance to laboratory DGA <sup>1)</sup> <sup>2)</sup>
Acetylene (C <sub>2</sub> H <sub>2</sub> )	±1 ppm or ±10 % of reading
Hydrogen (H <sub>2</sub> )	±15 ppm or ±15 % of reading
Other measured gases	±10 ppm or ±10 % of reading
Moisture (H <sub>2</sub> O)	±2 ppm or ±10 % of reading

- 1) Compared with gas chromatography result from an oil sample considering also laboratory uncertainty. Performance of the gas-in-oil measurement may also be affected by oil properties and other chemical compounds dissolved in oil.  
 2) ppm values are defined as µl/l according to IEC 60567 standard conditions.

## Calculated parameters

Total dissolved combustible gases (TDCG)	Combined total of H <sub>2</sub> , CO, CH <sub>4</sub> , C <sub>2</sub> H <sub>6</sub> , C <sub>2</sub> H <sub>4</sub> , and C <sub>2</sub> H <sub>2</sub>
24 h average	Available for single gases, moisture, TDCG, and total gas pressure
Rate of change (ROC)	Available for single gases and TDCG for 24 h, 7 d, and 30 d periods
Gas ratios <sup>1)</sup>	Available ratios: <ul style="list-style-type: none"> <li>• CH<sub>4</sub>/H<sub>2</sub></li> <li>• C<sub>2</sub>H<sub>2</sub>/C<sub>2</sub>H<sub>4</sub></li> <li>• C<sub>2</sub>H<sub>2</sub>/CH<sub>4</sub></li> <li>• C<sub>2</sub>H<sub>6</sub>/C<sub>2</sub>H<sub>2</sub></li> <li>• C<sub>2</sub>H<sub>4</sub>/C<sub>2</sub>H<sub>6</sub></li> <li>• CO<sub>2</sub>/CO</li> </ul>

1) Calculated from 24 h average values. See standard IEC 60599.

## Power supply

Operating voltage	OPTPSU1: 100–240 V AC, 50–60 Hz, ±10 % OPTPSU2: 110–220 V DC, ±10 %
Overvoltage category	III
Maximum power consumption	500 W
Typical power consumption at +25 °C (+77 °F)	100 W

## Outputs

<b>RS-485 interface</b>	
Supported protocols	Modbus RTU, DNP3 (optional feature)
Galvanic isolation	2 kV RMS, 1 min
<b>Ethernet interface</b>	
Supported protocols	Modbus TCP, HTTP, HTTPS, DNP3 (optional feature), IEC 61850 (optional feature)
Galvanic isolation	4 kV AC (50 Hz, 1 min)
<b>Relay outputs</b>	
Number of relays	3 pcs, normally open (NO) or normally closed (NC), user-selectable
Trigger type	Gas alert with user-selectable limits
Max. switching current	6 A (at 250 V AC) 2 A (at 24 V DC) 0.2 A (at 250 V DC)
<b>Auxiliary device interface</b>	
Maximum power	48 W
Voltage output	24 V DC
<b>User interface</b>	
Interface type	Web-based user interface, can be operated with standard web browsers

## Mechanical specifications

Oil fitting	Stainless steel Swagelok® fitting for 10 mm (0.39 in) outer diameter tubing.
Max. length of oil pipe to transformer for mineral oil	Max. 10 m (33 ft) with 7 mm (0.28 in) inner diameter tubing <sup>1)</sup> Max. 5 m (16 ft) with 4 mm (0.15 in) inner diameter tubing
Max. length of pipe to transformer for ester liquid	Max. 10 m (33 ft) with 8 mm (0.31 in) inner diameter tubing
Housing material	Marine aluminum (EN AW-5754) (DGA Monitor), stainless steel AISI 316 (OPTPSU)
Installation options	Ground Mounting Set, Wall Mounting Set, Antivibration Wall Mounting Set

1) Bigger pipe volume will increase response time.

## Operating environment

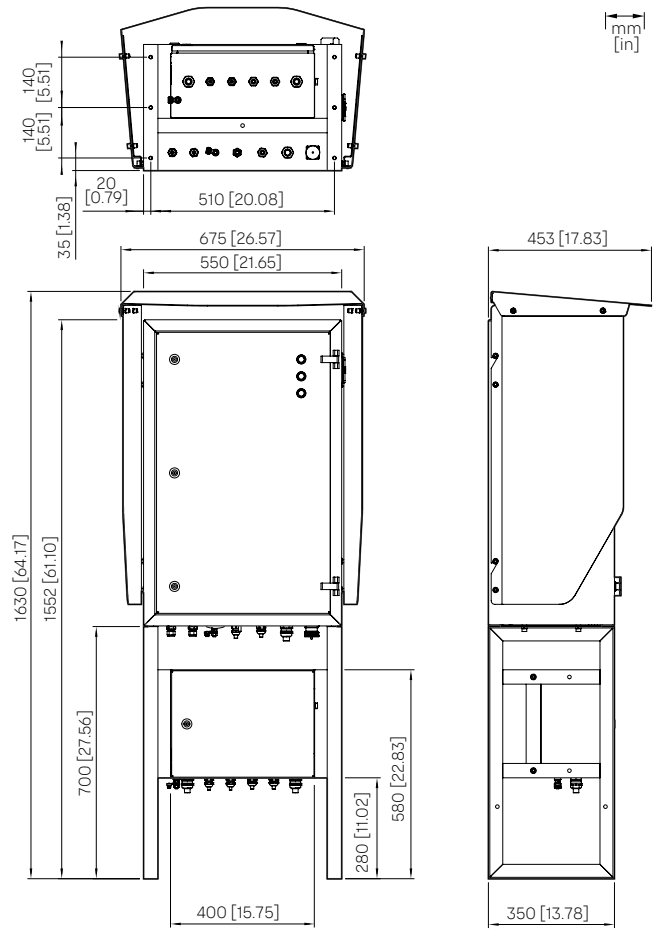
Transformer liquid type <sup>1)</sup>	Mineral oil or ester liquids
Required minimum fire point of insulation liquid <sup>2)</sup>	+125 °C (+257 °F)
Transformer oil pressure at oil inlet	Max. 2 bar (absolute) continuous Burst pressure 20 bar (absolute)
Transformer insulation liquid temperature at oil inlet	Max. +100 °C (+212 °F) Min. +0 °C (+32 °F) for ester liquids Min. temperature for mineral oil depends on the pour point of the mineral oil.
Ambient humidity range	0-100 %RH, condensing
Ambient temperature range in operation	-40 ... +55 °C (-40 ... +131 °F)
Storage temperature range	-40 ... +60 °C (-40 ... +140 °F)
IP rating	IP66

1) Selected when ordering the device.

2) "The fire point [of transformer oil] is normally approximately 10 °C [18 °F] higher than the closed flash point." Heathcote, Martin J. The J & P Transformer Book. 13th ed. Elsevier, 2007.

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) Low Voltage Directive (2014/35/EU) OPT100 is specifically designed to be installed as part of another type of equipment that is excluded from the RoHS directive (2011/65/EU) scope.
EMC immunity	EN 61326-1, industrial environment IEC 61000-6-5, class 4
EMC emissions	FCC 47 CFR 15, section 15.107, class A ISED ICES-003, section 5(a)(i), class A
Safety	IEC/EN/UL/CSA-C22.2 61010-1
Environmental	IEC 60068-2-1 IEC 60068-2-2 ISO 6270-1:2017, constant humidity condensation atmosphere, C5 ISO 9227:2017, salt fog, C5 IEC 61010-1:2010/AMD1:2016, pollution degree 4 (outdoor), 3 (industrial area), 2 (device internal)
Compliance marks	CE, China RoHS, EAC, RCM



Dimensions with Ground Mounting Set

Vaisala is a global leader in measurement instruments and intelligence for climate action. We equip our customers with devices and data to improve resource efficiency, drive energy transition, and care for the safety and well-being of people and societies worldwide. With almost 90 years of innovation and expertise, we employ a team of over 2,300 experts committed to taking every measure for the planet.

Vaisala sensors are used in the harshest environments on Earth – Arctic, maritime and tropical – and even on Mars.

## Power transformer monitoring that works

Vaisala Optimus™ DGA Monitor delivers out-of-the-box performance, eliminates false alarms, and gives you the best long-term stable measurements for the key fault gases used in transformer diagnostics.

## MHT410 Moisture, Hydrogen, and Temperature Transmitter

For online transformer condition monitoring



### Features and benefits

- Measures moisture and hydrogen directly in transformer oil
- Compatible with mineral oil, natural ester oil, synthetic ester oil, and silicone oil
- Easy to install
- Provides early warning on potential transformer faults
- Unique probe design allows for direct measurement in oil
- 5-year standard warranty
- Robust design providing reliable operation and no false alarms
- Maintenance-free operation
- No cross-sensitivity to other gases
- Indigo520 compatible, with easy access to measurement data

Vaisala MHT410 Moisture, Hydrogen and Temperature Transmitter provides reliable online monitoring of insulating oil in power transformers.

### Real-time measurement

Vaisala Moisture, Hydrogen and Temperature Transmitter MHT410 provides an accurate real-time measurement result for critical parameters measured in oil, enabling reliable conclusions on the transformer's condition. With its unique probe design, MHT410 delivers accurate measurement and trend data about the health of the transformer in real time.

### Enabling proactive maintenance decisions

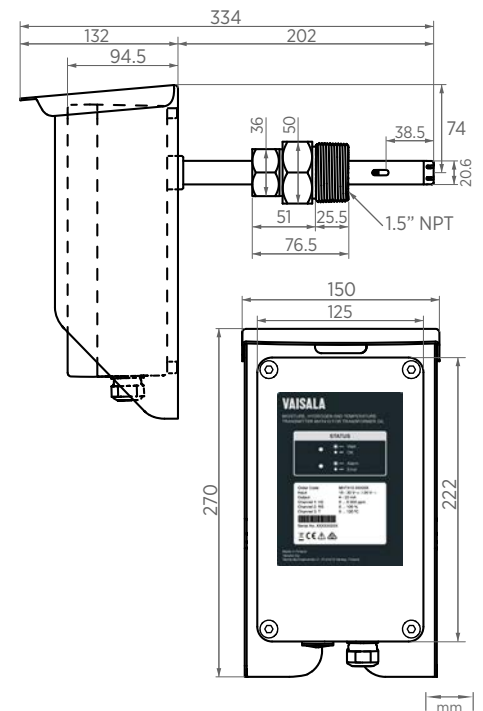
All of the transmitter's measured parameters are available through digital and analog outputs, providing information on transformer fault situations and enabling timely, proactive maintenance decisions to minimize expensive service shutdowns and outages.

MHT410 is also compatible with the Vaisala Indigo500 series transmitters. With its local graphical display, Indigo520 is a great addition to MHT410. It helps you to identify data trends at the site, as well as power the MHT410 with a single-wire solution.

### Robust and maintenance-free operation

MHT410 is designed for ease of use in demanding environments. It has undergone extensive testing to ensure it withstands wide temperature changes, vibration, and harsh outdoor conditions. The transmitter has no consumables or moving parts that could break, and is encased in an IP66-rated metal housing equipped with a weather shield.

Every unit is individually tested for a pressure of at least 10 bar and also withstands vacuum conditions. Special attention has been given to EMC tolerance: for example, all electrical connections are isolated. MHT410 can also tolerate short-term power outages.



# Technical data

## Measurement performance

Hydrogen	
Measurement range (in oil)	0–5000 ppm <sub>v</sub>
Accuracy <sup>1) 2)</sup>	±10 % of reading or ±15 ppm <sub>v</sub> (whichever is greater)
Repeatability	±10 % of reading or ±15 ppm <sub>v</sub> (whichever is greater)
Minimum detection limit	15 ppm <sub>v</sub>
Typical long-term stability	3 % of reading / year
Cross sensitivity to other gases	< 2 % (CO <sub>2</sub> , C <sub>2</sub> H <sub>2</sub> , C <sub>2</sub> H <sub>4</sub> , CO)
Response time	63 % of full response: 2 h (when sensor is not in reference cycle)
Warm-up time	2 h, 12 h for full specification
Sensor	Catalytic palladium-nickel alloy film solid-state sensor
Moisture in oil	
Measurement range (in oil)	0–100 %RS / a <sub>w</sub> 0–1
Response time (90 % of full response at +20 °C (+68 °F) in still oil)	10 min
Sensor	HUMICAP® 180L2
Accuracy (including non-linearity, hysteresis, and repeatability):	
0–90 %RS	±2 %RS (a <sub>w</sub> ± 0.02)
90–100 %RS	±3 %RS (a <sub>w</sub> ± 0.03)
Temperature	
Measurement range	–40 ... +120 °C (–40 ... +248 °F)
Accuracy at +20 °C (+68 °F)	±0.2 °C (0.36 °F)
Sensor	Pt1000 RTD Class F0.1 IEC 60751
<sup>1)</sup> The H <sub>2</sub> accuracy specified is the accuracy during calibration against gas in oil standard. Field performance may be affected, for example, by variation in hydrogen solubility (partition coefficients) between different mineral oils.	
<sup>2)</sup> The H <sub>2</sub> accuracy specified is applicable in the oil temperature specified (–20 ... +75 °C (–4 ... +167 °F)).	

## Inputs and outputs

Operating voltage	15–30 V DC, 24 V AC (±15 %) (power supply input is galvanically isolated) <sup>1)</sup>
Power consumption	Typical 4 W, maximum 12 W
Analog output (current) <sup>1)</sup>	
Channels	3 isolated 4–20 mA (loop-powering)
External load	Max. 500 Ω
Error status indication in case of device error	3.5 mA default, user-configurable for each channel
mA output accuracy at +20 °C (+68 F)	±0.125 % full scale
Temperature dependence of the analog outputs	±0.006 % / °C full scale
Digital outputs <sup>1)</sup>	
Interfaces	Isolated RS-485 half-duplex RS-485 (Service Port, non-isolated)
Protocols	Modbus® RTU, DNP3, serial ASCII
Screw terminals	Wire size AWG 22-14 Single wire (solid) 1.5 mm <sup>2</sup> Stranded wire (flex.) 1.0 mm <sup>2</sup> Recommended wire torque 0.4 Nm

<sup>1)</sup> Max. isolation voltage 1.5 kV DC.

## Mechanical specifications

Mechanical connection on transmitter	1.5" NPT (male)
Cable gland (optional, for use with Indigo520)	M20×1.5 for cable diameter 5 ... 9 mm (0.20–0.35 in)
Cable gland (optional)	M20×1.5 for cable diameter 8 ... 11 mm (0.31–0.43 in)
Cable gland (optional)	M20×1.5 for cable diameter 11 ... 14.5 mm (0.43–0.57 in)
Conduit fitting (optional)	1/2" NPT
Interface cable (optional, pre-assembled)	5 m (16 ft 5 in), 9.2 mm (0.36 in) outer diameter
Interface cable (optional)	10 m (33 ft), 9.2 mm (0.36 in) outer diameter
Interface cable (optional, for use with Indigo520)	10 m (33 ft), 6.2 mm (0.24 in) outer diameter
Housing material	AlSi 10 Mg
Transmitter weight without cables	4.1 kg (9.04 lb)
Self-diagnostics indication	Status LEDs, analog output, Modbus
Integrated data logging capabilities	Non-volatile memory, up to 44 years' storage with default logging
Individual functional test reports	Calibration test reports for moisture, hydrogen, and temperature; probe leak test report (5 bara nominal)
Factory warranty	5 years

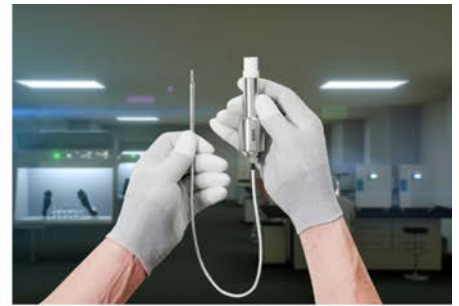
## Operating environment

Oil type	Mineral oil / Natural ester oil / Synthetic ester oil / Silicone oil
Operating temperature of probe head	–40 ... +120 °C (–40 ... +248 °F)
Operating temperature of enclosure	–40 ... +60 °C (–40 ... +140 °F)
Storage temperature	–40 ... +60 °C (–40 ... +140 °F)
Operating humidity	0–100 %RH, condensing
Pressure tolerance (probe, short-term)	Max. 10 bara
Pressure tolerance (probe, continuous)	Max. 4 bara
Integrated protection for short power outages	> 3 s
IP rating	IP66

## Compliance

EU directives and regulations	EMC, RoHS
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B (when DC powered)
Environmental	ISO 6270-1:2017, constant humidity condensation atmosphere, C5-M ISO 9227:2017, salt fog, C5-M ISO 12994-6, Paints and varnishes – Corrosion protection of steel structures by protective paint systems, part 6, C5
Compliance marks	CE, EAC, RCM, UKCA

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



### PEROXCAP's unique benefits

- **Chemical purge:** The probe heats up at intervals to maintain measurement performance and lengthen the sensors' lifespan. Rapid heating of the sensor also removes impurities.
- **Sensor vitality:** Sensor performance can be evaluated using the "Sensor Vitality" value, accessible through [Vaisala Insight software](#) and displayed as a percentage.

The unique PEROXCAP technology enables accurate measurement of multiple parameters in vaporized hydrogen peroxide bio-decontamination. Probes use two capacitive thin-film polymer [HUMICAP® sensors](#) to provide high accuracy, excellent long-term stability, and negligible hysteresis in demanding high-concentration  $vH_2O_2$  applications in atmospheric pressure.

The HUMICAP sensor, used in PEROXCAP technology, is a capacitive thin-film polymer sensor consisting of a substrate on which a thin polymer film is deposited 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, as does the capacitance of the sensor. The probe's electronics measure the capacitance of the sensor and convert it to a humidity reading.

PEROXCAP uses two HUMICAP sensors, one with and one without a catalytic layer. The thin-film polymer absorbs water and  $H_2O_2$  vapor. The amount is proportional to the ambient relative humidity (sensor with catalytic layer) or relative saturation (sensor without catalytic layer) depending on the sensor. Learn more about [HPP270 series probes](#).

### Intelligent PEROXCAP measurement technology

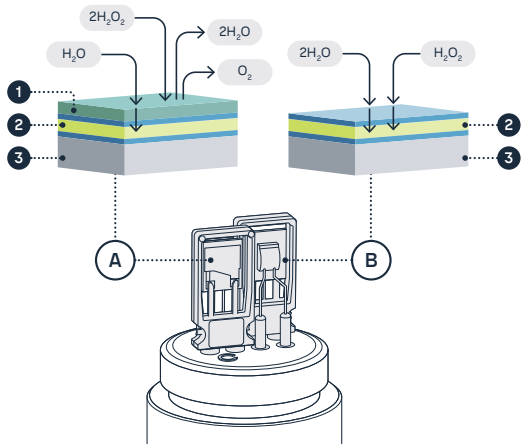
One unique feature of PEROXCAP is that it provides the critical **relative saturation** value. Water ( $H_2O$ ) and hydrogen peroxide ( $H_2O_2$ ) have similar molecular structures, however, while relative humidity (RH) indicates the level of water vapor in the air at a given temperature, relative saturation is the level of water *and* hydrogen peroxide vapor. Air that contains hydrogen peroxide vapor will condense before 100 % relative humidity, which is why relative saturation allows you to predict condensation.

### Multiple measurements for comprehensive bio-decontamination monitoring

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

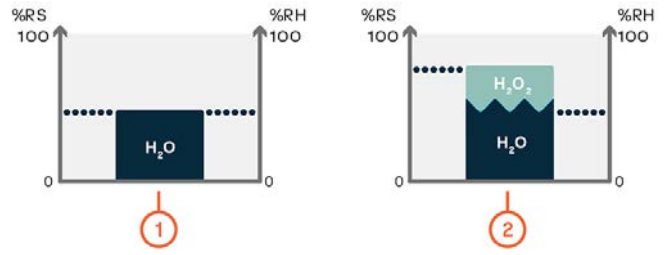
- HPP271 probes measure  $H_2O_2$  vapor concentration (ppm) and temperature dew point.
- HPP272 probes measure  $H_2O_2$  vapor concentration (ppm), temperature, dew point, vapor pressure, and humidity as both relative saturation and relative humidity.

### 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 layer over the thin-film polymer decomposes hydrogen peroxide into water and oxygen and prevents it from entering the sensing polymer.
- 2** Thin-film polymer between two electrodes.
- 3** Alumina substrate.

### PEROXCAP'S critical difference: relative saturation



- 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.

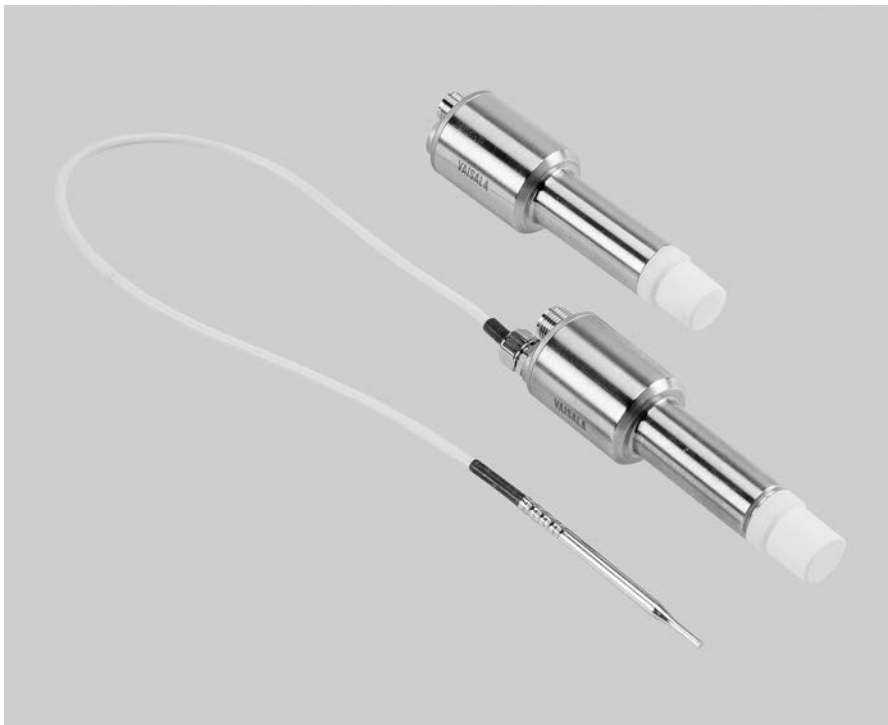
For example, at 20 °C with an  $H_2O_2$  concentration of 500 ppm, the humidity level 25 %RH is equivalent to 60 %RS. When this gas mixture starts to condense, i.e. when RS is 100 %, RH is 45 %.

### Traceable $H_2O_2$ factory calibration

Every PEROXCAP sensor is manufactured in [Vaisala's own cleanrooms](#) 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. You can also [calibrate your own](#) HPP270 series probes.

## HPP270 Series Probes

For hydrogen peroxide, humidity, and temperature measurement



### Features

- Basic probe option HPP271 for H<sub>2</sub>O<sub>2</sub> vapor concentration measurement
- Advanced probe option HPP272: compact 3-in-1 probe with real-time measurement of H<sub>2</sub>O<sub>2</sub> 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 Indigo products and Insight PC software

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.

### Relative saturation for comprehensive humidity monitoring

Similar to water, H<sub>2</sub>O<sub>2</sub> 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<sub>2</sub>O<sub>2</sub> vapor together. This tells you reliably when the bio-decontaminated air starts to condense.

### Repeatable measurement for highly condensing environments

Intelligent measurement technology including the sensor purge function helps to maintain accuracy between calibrations in challenging H<sub>2</sub>O<sub>2</sub> 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.

### Indigo and Insight compatible

The probe can be connected to Vaisala Indigo transmitters and the Indigo80 handheld indicator to extend the selection of available features.

Indigo products provide a range of additional display, output, and relay options, as well as convenient interfaces for monitoring, configuration, and calibration and adjustment. For more information, see [www.vaisala.com/indigo](http://www.vaisala.com/indigo).

For easy-to-use access to configuration, calibration, and adjustment, the probe can be connected to Vaisala Insight PC software. See [www.vaisala.com/insight](http://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<sub>2</sub>O<sub>2</sub>, 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 <sub>2</sub> O <sub>2</sub>	±10 ppm
Accuracy at +10 ... +25 °C (+50 ... +77 °F), 10 ... 2000 ppm H <sub>2</sub> O <sub>2</sub> <sup>1)</sup>	±10 ppm or 5 % of reading (whichever is greater)
Factory calibration uncertainty at +25 °C (+77 °F), 500 ppm H <sub>2</sub> O <sub>2</sub> <sup>2)</sup>	±10 ppm
Response time (T <sub>63</sub> )	70 s
Other parameters	
H <sub>2</sub> O ppm by volume, dew point temperature	

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 V DC Analog output: 15 ... 25 V DC
Current consumption at +25 °C (+77 °F)	
In digital mode	Max. 10 mA
In analog mode	Max. 50 mA
During sensor 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

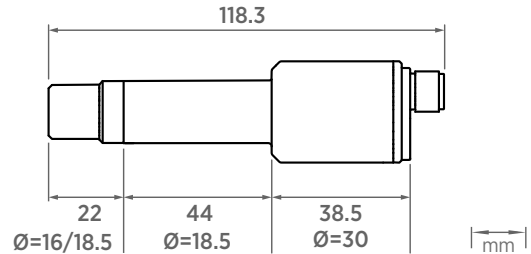
Operating temperature	+0 ... +70 °C (+32 ... +158 °F)
Storage temperature	-20 ... +70 °C (-4 ... +158 °F)
Ambient pressure	Normal atmospheric pressure
IP rating	IP65

## Compliance

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

## Mechanical specifications

Connector	M12-5M
Materials	
Probe body	AISI316L stainless steel
Filter cap	Porous PTFE



## HPP271 dimensions

## Spare parts and accessories

Indigo USB adapter <sup>1)</sup>	USB2
Probe connection cable with open wires, 1.5 m (4.9 ft)	254294SP
Probe connection cable with open wires, 3 m (9.8 ft)	254295SP
Probe connection cable with open wires, 5 m (16 ft)	254296SP
Probe connection 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
Indigo transmitters	See <a href="http://www.vaisala.com/indigo">www.vaisala.com/indigo</a>
Indigo80 handheld indicator	See <a href="http://www.vaisala.com/indigo80">www.vaisala.com/indigo80</a>

1) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://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 <sub>2</sub> O <sub>2</sub>	±10 ppm
Accuracy at +10 ... +25 °C (+50 ... +77 °F), 10 ... 2000 ppm H <sub>2</sub> O <sub>2</sub> <sup>1)</sup>	±10 ppm or 5 % of reading (whichever is greater)
Factory calibration uncertainty at +25 °C (+77 °F), 500 ppm H <sub>2</sub> O <sub>2</sub> <sup>2)</sup>	±10 ppm
Response time (T <sub>63</sub> )	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 <sub>2</sub> O <sub>2</sub>	±0.5 %RS
Accuracy at +25 °C (+77 °F) <sup>1)</sup>	±4 %RS
Factory calibration uncertainty at +25 °C (+77 °F), 500 ppm H <sub>2</sub> O <sub>2</sub> <sup>2)</sup>	±2 %RS
Relative humidity	
Measurement range	0 ... 100 %RH
Measurement temperature range	+5 ... +70 °C (+41 ... +158 °F)
Accuracy: <sup>1)</sup>	
at +25 °C (77 °F), 0 ppm H <sub>2</sub> O <sub>2</sub> , 0 ... 90 %RH	±1 %RH
over full temperature measurement and H <sub>2</sub> O <sub>2</sub> range	±2 %RH
Response time (T <sub>63</sub> )	20 s
Factory calibration uncertainty at +25 °C (77 °F), 0 ppm H <sub>2</sub> O <sub>2</sub> , 0 ... 95 %RH <sup>2)</sup>	±1 %RH
Temperature	
Sensor	Pt1000 RTD Class F0.1
Accuracy over temperature range	±0.2 °C (±0.36 °F)
Other parameters	
Absolute H <sub>2</sub> O <sub>2</sub> and H <sub>2</sub> O, H <sub>2</sub> O ppm by volume, water vapor saturation pressure (H <sub>2</sub> O and H <sub>2</sub> O+H <sub>2</sub> O <sub>2</sub> ), dew point temperature, vapor pressure (H <sub>2</sub> O and H <sub>2</sub> O <sub>2</sub> )	

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 V DC Analog output: 15 ... 25 V DC
Current consumption at +25 °C (+77 °F)	
In digital mode	Max. 10 mA
In analog mode	Max. 50 mA
During sensor purge	Max. 250 mA
Digital output	
Interface	RS-485, not isolated; do not use termination on the RS-485 line
Communication protocol	Modbus RTU v.1.02
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

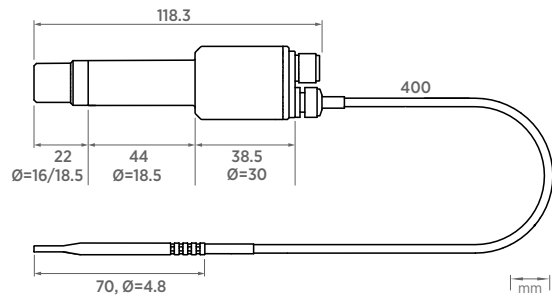
Operating temperature	+0 ... +70 °C (+32 ... +158 °F)
Storage temperature	-20 ... +70 °C (-4 ... +158 °F)
Ambient pressure	Normal atmospheric pressure
IP rating	IP65

## Compliance

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

## Mechanical specifications

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



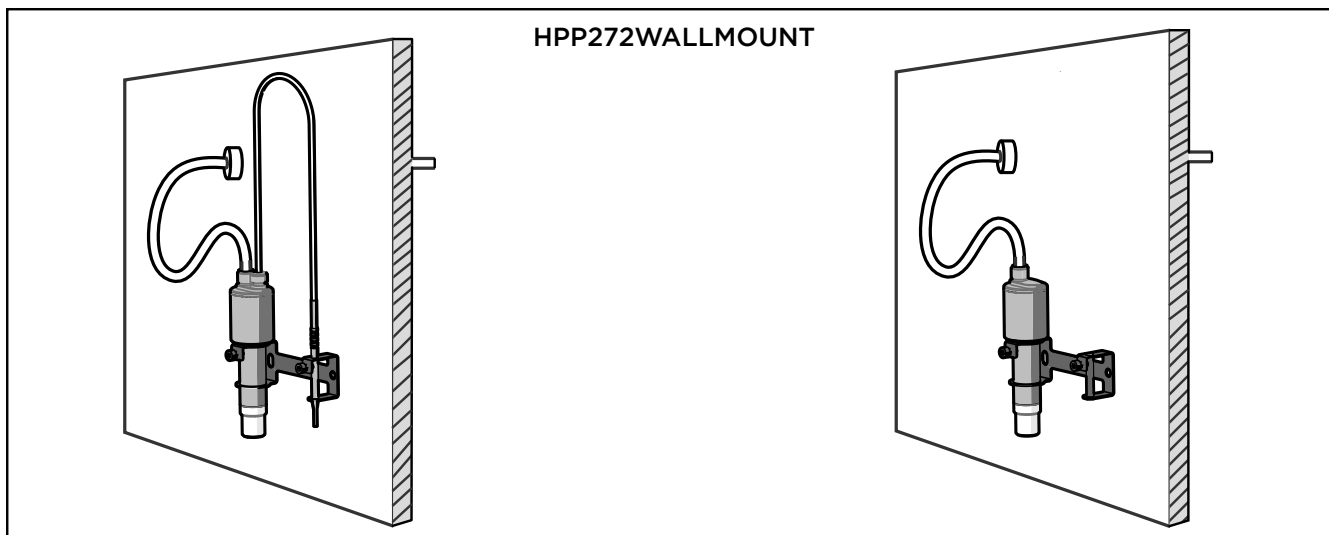
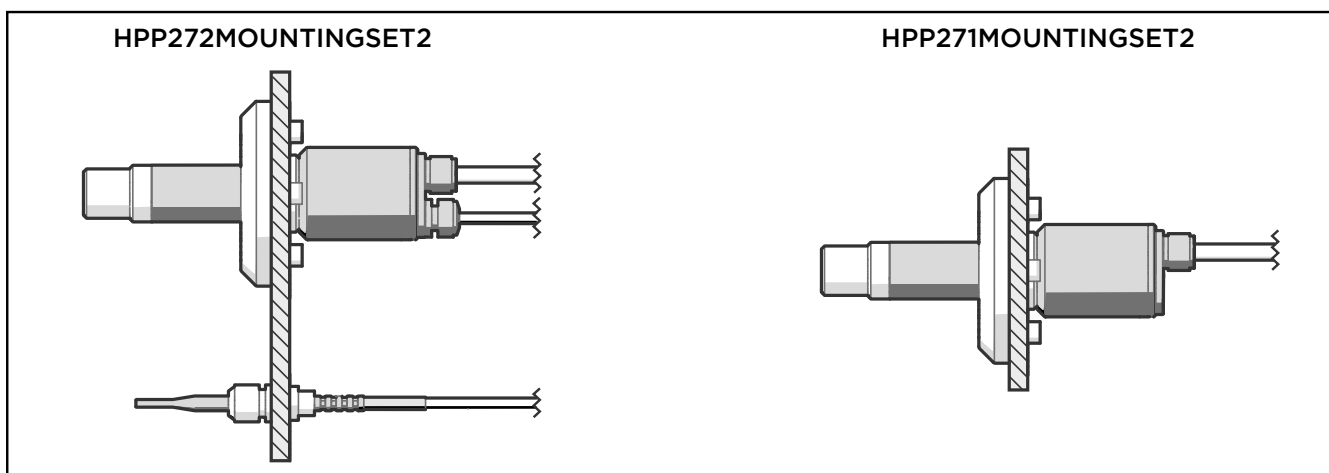
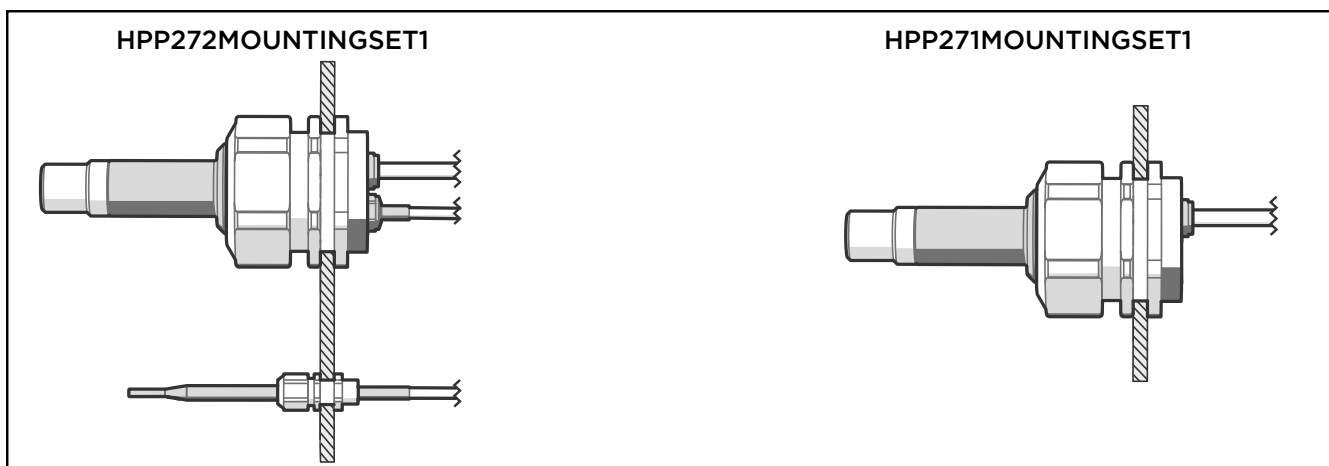
## HPP272 dimensions

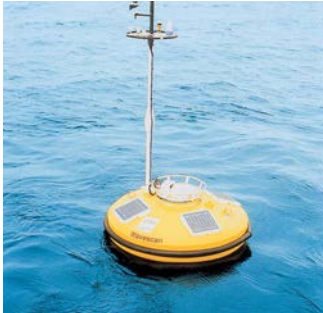
## Spare parts and accessories

Indigo USB adapter <sup>1)</sup>	USB2
Probe connection cable with open wires, 1.5 m (4.9 ft)	254294SP
Probe connection cable with open wires, 3 m (9.8 ft)	254295SP
Probe connection cable with open wires, 5 m (16 ft)	254296SP
Probe connection 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 <a href="http://www.vaisala.com/indigo">www.vaisala.com/indigo</a>
Indigo80 handheld indicator	See <a href="http://www.vaisala.com/indigo80">www.vaisala.com/indigo80</a>

1) Vaisala Insight software for Windows available at [www.vaisala.com/insight](http://www.vaisala.com/insight).

# HPP271 and HPP272 installation accessories





### BAROCAP in brief

- Over 35 years of accurate pressure measurement
- Silicon-based capacitive sensor for absolute pressure measurement
- Barometric pressure range 500 ... 1100 hPa
- 50 ... 1100 hPa pressure range available for industrial applications
- Process pressure measurement range 1 ... 10 bar
- NIST-traceable pressure measurement

First introduced in 1985, Vaisala BAROCAP is a silicon-based micromechanical pressure sensor that offers reliable performance in a wide variety of applications, from meteorology to industrial measurements. Combining two powerful technologies – single-crystal silicon material and capacitive measurement – BAROCAP sensors feature low hysteresis combined with excellent accuracy and long-term stability.

### How it works

BAROCAP is a micromechanical sensor that uses dimensional changes in its silicon membrane to measure pressure. As the surrounding pressure increases or decreases, the membrane bends, thereby increasing or decreasing the height of the vacuum gap inside the sensor. The opposite sides of the vacuum gap act as electrodes, and as the distance between the two electrodes changes, the sensor capacitance changes. The capacitance is measured and converted into a pressure reading.

The BAROCAP sensor's properties – good elasticity, low hysteresis, excellent repeatability, low temperature dependence, and superior long-term stability – are the result of its single-crystal silicon material. The capacitive structure gives the sensor its wide dynamic range and provides a built-in mechanism for overpressure blocking.

### Typical applications for barometric pressure measurement

Barometric pressure measurement has a wide variety of applications within meteorology. Pressure data is required for estimating the amount of precipitable water vapor in the atmosphere. Typical applications include weather stations, data buoys, GPS meteorology, and environmental data logging. Barometric pressure measurement is also used in hydrology and agronomy applications.

Barometric pressure data is also required in several industrial applications. It is measured in pressure-sensitive industrial equipment, such as laser interferometers and lithography systems, aviation applications, and in exhaust-gas analysis. Metrological applications include laboratory pressure standard measurements and environmental monitoring in calibration laboratories.

Vaisala offers a range of professional-grade barometers for both indoor and outdoor use. BAROCAP barometers operate over a wide temperature range and perform reliably even in highly demanding applications such as professional meteorology and aviation. View the complete range of Vaisala barometers at [www.vaisala.com/pressure](http://www.vaisala.com/pressure).

### BAROCAP's unique benefits

- Low hysteresis, high repeatability
- Superior long-term stability
- Tolerates harsh conditions

## BAROCAP applications for measurements in pressurized systems

Vaisala DRYCAP® dew point instruments have a long history of providing reliable and stable measurements in compressed air systems and SF6 insulation gas monitoring in high-voltage equipment. In addition to the need for dew point measurement, these two applications also share the need for accurate and stable pressure measurement. Vaisala has integrated its DRYCAP and BAROCAP technologies into a range of products that offer a unique combination of pressure and dew point measurement for pressurized systems.

In compressed air, combining dew point measurement with live process pressure data provides a unique advantage: The conversion of measured pressure dew point to atmospheric pressure or ppm unit is available online, eliminating the possibility of any ambiguity in the dew point data. This is important because changes in the pressure of the gas being monitored alter its dew point.

Combined dew point and pressure measurement in SF6 gas monitoring of high-voltage equipment provides a superior tool for assessing the condition of SF6 insulation. Leakages can be immediately detected and early warning

is given for moisture issues. Measuring dew point, pressure, and temperature enables the calculation of SF6 gas density, normalized pressure, dew point at atmospheric pressure, and ppm – all essential elements in SF6 monitoring.

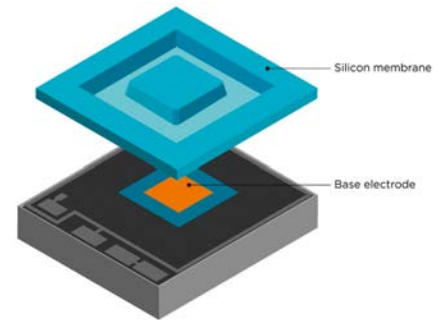
View the complete range of Vaisala products for combined pressure and dew point measurement at [www.vaisala.com/pressure](http://www.vaisala.com/pressure).

## The BAROCAP story

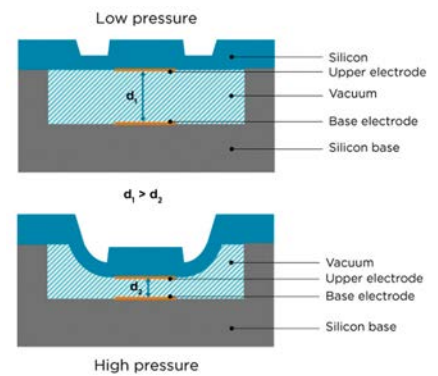
The story of BAROCAP began in the late 1970s during preliminary micromechanical pressure sensor studies for the new-generation Vaisala Radiosonde RS80. Micromechanics proved to be challenging, and Vaisala worked in close cooperation with universities and research institutes in Finland and internationally to develop a new pressure-sensing technology based on silicon processing. The critical breakthrough came on the brink of the project deadline. The first BAROCAP sensors were delivered to two icebreakers and the Helsinki Telephone Company.

BAROCAP sensors have traveled to places where no human has ever set foot, including as part of several Mars exploration missions and the Cassini-Huygens mission to explore Saturn and

its largest moon, Titan. BAROCAP's out-of-this-world journey continues with its inclusion in instruments that form part of NASA's Mars Science Laboratory, launched in November 2011.



BAROCAP sensor



Cross-section of the BAROCAP sensor

## PTB330 Digital Barometer

For professional meteorology, aviation, and industrial users



### Features

- Vaisala BAROCAP sensor
- Accurate measurement
- Excellent long-term stability
- Added reliability through redundancy
- Graphical trend display with 1-year history data
- Height and altitude corrected pressure (QFE, QNH)
- For aviation, professional meteorology, laboratories, and demanding industrial applications
- Corrosion-resistant IP65/IP66 housing, suitable for outdoor and marine environment

Vaisala BAROCAP® Digital Barometer PTB330 is designed for a wide range of high-end atmospheric pressure measurements. The pressure measurement of PTB330 is based on the Vaisala silicon capacitive, absolute pressure sensor - the Vaisala BAROCAP sensor. It provides high measurement accuracy and excellent long-term stability.

### Highly accurate

The PTB330 series is highly accurate. Class A barometers for the most demanding applications are fine-tuned and calibrated against a high-precision pressure calibrator. Class B barometers are adjusted and calibrated using an electronic working standard. All PTB330 barometers come with a traceable factory calibration certificate.

### Reliability through redundancy

According to your choice, PTB330 can incorporate 1, 2, or 3 BAROCAP sensors. When 2 or 3 sensors are used, the barometer continuously compares the readings of the pressure sensors against one another and reports if they are within the set internal difference criteria. This unique feature provides redundancy in pressure measurement.

Users also get a stable and reliable pressure reading at all times, as well as a pre-indication of when to service or recalibrate the barometer.

### QNH and QFE

PTB330 can be set to compensate for the QNH and QFE pressure used especially in aviation. The QNH represents the pressure reduced to sea level, based on the altitude and temperature of the observation site. The QFE represents the height-corrected pressure of small differences in altitude, for example, the air pressure at the airfield elevation.

### Graphical display

PTB330 features a multilingual, graphical display allowing users to monitor measurement trends. PTB330 updates the graph automatically during measurement and it provides a 1-year measurement history. In addition to instant pressure, PTB330 provides the WMO pressure trend and tendency codes.

### Applications

PTB330 can be used successfully for aviation, professional meteorology, and for demanding industrial pressure measurement applications such as accurate laser interferometric measurement and exhaust gas analysis in engine test benches.

# Technical data

## Measurement performance

Property	Class A	Class B
<b>Barometric pressure range 500–1100 hPa</b>		
Linearity <sup>1)</sup>	±0.05 hPa	±0.10 hPa
Hysteresis <sup>1)</sup>	±0.03 hPa	±0.03 hPa
Repeatability <sup>1)</sup>	±0.03 hPa	±0.03 hPa
Calibration uncertainty <sup>2)</sup>	±0.07 hPa	±0.15 hPa
Accuracy at +20 °C (+68 °F) <sup>3)</sup>	±0.10 hPa	±0.20 hPa
<b>Barometric pressure range 50–1100 hPa</b>		
Linearity <sup>1)</sup>	–	±0.20 hPa
Hysteresis <sup>1)</sup>	–	±0.08 hPa
Repeatability <sup>1)</sup>	–	±0.08 hPa
Calibration uncertainty <sup>2)</sup>	–	±0.15 hPa
Accuracy at +20 °C (+68 °F) <sup>3)</sup>	–	±0.20 hPa
<b>Temperature dependence <sup>4)</sup></b>		
500–1100 hPa	±0.1 hPa	±0.1 hPa
50–1100 hPa	±0.3 hPa	±0.3 hPa
<b>Total accuracy –40 ... +60 °C (–40 ... +140 °F)</b>		
500–1100 hPa	±0.15 hPa	±0.25 hPa
50–1100 hPa	–	±0.45 hPa
<b>Long-term stability</b>		
500–1100 hPa	±0.1 hPa/year	±0.1 hPa/year
50–1100 hPa	±0.2 hPa/year	±0.2 hPa/year
<b>Miscellaneous</b>		
Pressure units	hPa, mbar, kPa, Pa inHg, mmH2O, mmHg, torr, psia	hPa, mbar, kPa, Pa inHg, mmH2O, mmHg, torr, psia
Resolution	0.01 hPa	0.1 hPa
Settling time at startup (1 sensor)	4 s	3 s
Response time (1 sensor)	2 s	1 s
Acceleration sensitivity	–	Negligible
Maximum pressure limit	–	5000 hPa absolute
Maximum measurement rate <sup>5)</sup>	–	10 Hz

- 1) Defined as ±2 standard deviation limits of endpoint non-linearity, hysteresis, or repeatability error.  
 2) Defined as ±2 standard deviation limits of inaccuracy of the working standard including traceability to international standards.  
 3) Defined as the root sum of the squares (RSS) of endpoint non-linearity, hysteresis error, repeatability error, and calibration uncertainty at room temperature.  
 4) Defined as ±2 standard deviation limits of temperature dependence over the operating temperature range.  
 5) For class A you need a longer averaging time or measurement interval.

## Operating environment

Operating pressure	500–1100 hPa, 50–1100 hPa
Operating temperature	PTB330 without display: –40 ... +60 °C (–40 ... +140 °F) PTB330 with display: +0 ... +60 °C (+32 ... +140 °F)
Operating humidity	0–100 %RH, non-condensing
Storage temperature	PTB330 without display: –55 ... +80 °C (–67 ... +176 °F) PTB330 with display: –40 ... +80 °C (–40 ... +176 °F)
IP rating	IP66 IP65 (NEMA4) with local display <sup>1)</sup>

- 1) IP rating of PTB330AWS is IP40.

## Mechanical specifications

Pressure fitting	Barbed fitting for 1/8-inch (inside diameter) tubing or quick connector with shutoff valve for 1/8-inch hose
Pressure connector	M5 (10-32) internal thread
Housing material	G AISI10 Mg (DIN 1725)
Weight	1–1.5 kg (2.2–3.3 lb)

## Inputs and outputs

Supply voltage	10–35 V DC
Supply voltage sensitivity	Negligible
Typical power consumption at +20 °C (+68 °F) (voltage at 24 V DC with 1 pressure sensor)	RS-232: 25 mA RS-485: 40 mA
	Output voltage U <sub>out</sub> : 25 mA Output current I <sub>out</sub> : 40 mA Display and backlight: +20 mA
Serial communication	RS-232, RS-485, RS-422

## Analog output (optional)

Current output	0–20 mA, 4–20 mA	
Voltage output	0–1 V, 0–5 V, 0–10 V	
<b>Accuracy at pressure range</b>	500–1100 hPa	50–1100 hPa
At +20 °C (+68 °F)	±0.30 hPa	±0.40 hPa
At –40 ... +60 °C (–40 ... 140 °F)	±0.60 hPa	±0.75 hPa

## Data transfer software

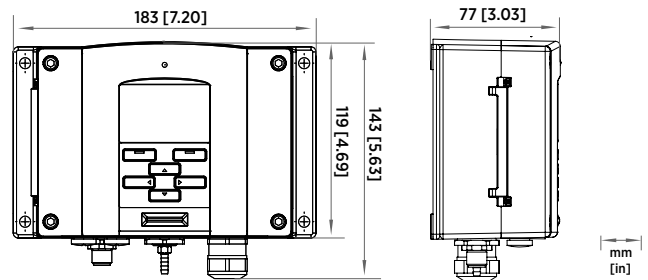
MI70 Link Interface software requirements	Microsoft® Windows OS Microsoft® Excel
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## Accessories

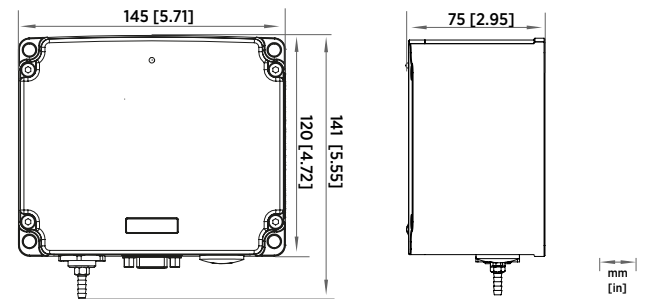
Modules	
Relay module	RELAY-1L
Temperature-compensated analog output module	AOUT-1T
Isolated RS-485 module	RS485-1
Power supply module	POWER-1
AC adapters for devices already equipped with an external AC adapter connector	
AC adapter, EU	MI70EUROADAPTER
AC adapter, USA	MI70USADAPTER
AC adapter, UK	MI70UKADAPTER
AC adapter, AUS	MI70AUSADAPTER
Static pressure head	
Static pressure head	SPH10
Static pressure head with heating	SPH20
Barometer mounting accessories	
Junction box	ASM211113
Wall mounting kit	214829
Installation kit for pole or pipeline	215108
Outdoor installation kit (weather shield)	215109
DIN rail clips with installation plate	215094
Panel mounting frame	216038
Connection cables	
Connection cable for PTB330 and MI70 handheld meters for spot check or calibration and adjustment	211339
Service cables	
USB-RJ45 serial connection cable	219685
D9-RJ45 serial connection cable	215005
Output cables for 8-pin connector	
Connection cable 5 m with 8-pin M12 female, black	212142
Female connector 8-pin M12 with screw terminals	212416
Cable bushings	
PTB330/220/PTU200 DC adapter and RS-232 cable for PC	213019
PTB330/PTB220/PTU200 DC adapter cable	213026
Others	
Dust filter	237018SP
Barbed pressure fitting 1/8-inch	19498SP
Quick connector 1/8-inch	220186

## Compliance

Property	Value
EU directives and regulations	RoHS Directive (2011/65/EU) as amended by 2015/863 EMC Directive (2014/30/EU) Low Voltage Directive (2014/35/EU), applies to units equipped with single-phase AC power supply Power-1
Electrical safety	EN 61010-1:2010 + A1:2019, applies to units equipped with single-phase AC power supply Power-1
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment EN 55011:2009 + A1:2010
Environmental	EN IEC 63000:2018



PTB330 dimensions



PTB330AWS dimensions

## PTB330TS Barometric Pressure Transfer Standard

For portable use



### Features

- PTB330 digital barometer for accurate pressure measurement
- Handheld MI70 indicator with a user-friendly, multilingual display
- Service port for MI70 Link software or computer
- Vaisala HUMICAP® humidity and temperature probe HMP155
- Weatherproof transport case

Barometric Pressure Transfer Standard PTB330TS combines a PTB330 digital barometer with a handheld MI70 indicator into a portable unit that can be used as a transfer standard.

### Barometer for Portable Use

PTB330TS uses a PTB330 series digital barometer that is housed in a tabletop casing. PTB330TS is designed to be operated using the handheld MI70 indicator. The MI70 indicator also provides the operation power for the barometer. Optional HMP155 probe is available for accurate humidity and temperature measurement.

### For Measurements in Industrial and Meteorological Areas

PTB330TS is suitable for reference measurements in industrial and meteorological areas. PTB330TS is housed in a durable and weatherproof

transport case that can be easily carried and shipped. The components of the PTB330TS are placed in a foam interior with accessories and User Guide in the lid organizer. The case includes a shoulder strap.

### Available Options

- ISO/IEC 17025 Accredited calibration for PTB330
- HMP155 options: additional temperature probe, manually controlled chemical purge feature
- MI70 Link software and USB or RS-232 cable for downloading measurement data to a computer
- USB service cable for connecting to PTB330 service port

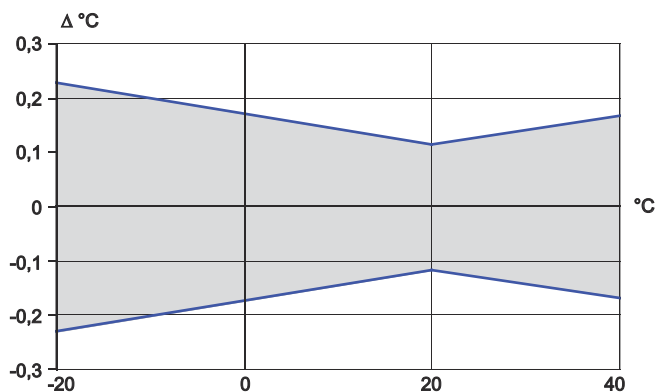


# Technical Data

These specifications apply when MI70, PTB330, and HMP155 are used together in PTB330TS. For PTB330 and HMP155 specifications, see the product documentation.

## General

<b>Operating temperature</b>	
MI70	-10 ... +40 °C (+14 ... +104 °F)
PTB330	-40 ... +60 °C (-40 ... +140 °F)
HMP155	-80 ... +60 °C (-112 ... +140 °F)
<b>Operating humidity</b>	
Non-condensing	
<b>Maximum pressure limit</b>	
5000 hPa abs.	
<b>Power supply</b>	
Rechargeable NiMH battery pack with AC-adaptor or 4xAA-size alkalines, type IEC LR6	
<b>Menu languages</b>	
English, Chinese, French, Spanish, German, Russian, Japanese, Swedish, Finnish	
<b>Display</b>	
LCD with backlight, graphic trend display of any parameter, character height up to 16 mm	
<b>Data logging capacity</b>	
2700 points	
<b>Alarm</b>	
Audible alarm function	
<b>Compliance</b>	
<ul style="list-style-type: none"> <li>• EMC Directive (2004/108/EC) Complies with the EMC product family standard EN61326-1</li> <li>• Electrical equipment for measurement control and laboratory use</li> <li>• Basic immunity test requirements</li> <li>• Low Voltage Directive (2006/95/EC)</li> <li>• ROHS Directive (2002/95/EC)</li> </ul>	
<b>Operation Time (Using Rechargeable Battery Pack)</b>	
Continuous use with PTB330	11 h typical at +20 °C (+68 °F)
Datalogging use	Up to 30 days



Accuracy of HMP155 temperature measurement over temperature range

## Measurement Performance

<b>Barometric Pressure (PTB330)</b>	
Measurement range	500 ... 1100 hPa
Linearity <sup>1)</sup>	±0.05 hPa
Hysteresis <sup>1)</sup>	±0.03 hPa
Repeatability <sup>1)</sup>	±0.03 hPa
Calibration uncertainty <sup>2)</sup>	±0.07 hPa
Accuracy at +20 °C (+68 °F) <sup>3)</sup>	±0.10 hPa
Temperature dependence <sup>4)</sup>	±0.1 hPa
Total accuracy -40 ... +60 °C (-40 ... +140 °F)	±0.15 hPa
Long-term stability	±0.1 hPa/year
Settling time at startup (one sensor)	4 s
Response time (one sensor)	2 s
Acceleration sensitivity	Negligible
<b>Relative Humidity (HMP155)</b>	
Measurement range	0 ... 100 %RH
Accuracy (incl. non-linearity, hysteresis and repeatability)	
at +15 ... +25 °C (+59 ... +77 °F)	±1 %RH (0 ... 90 %RH) ±1.7 %RH (90 ... 100 %RH)
at -10 ... +40 °C (-4 ... 104 °F)	±(1.0 + 0.008 reading) %RH
Factory calibration uncertainty at +20 °C (+68 °F)	±0.6 %RH (0 ... 40 %RH) <sup>5)</sup> ±1.0 %RH (40 ... 97 %RH) <sup>5)</sup>
Humidity sensor	HUMICAP180R HUMICAP180RC
Response time at +20 °C (+68 °F) in still air with a sintered PTFE filter	
63%	20 s
90%	60 s
<b>Temperature (HMP155)</b>	
Measurement range	-10 ... +40 °C (+14 ... +104 °F)
Accuracy	
-10 ... +20 °C (+14 ... +68 °F)	±(0.176 - 0.0028 x temperature) °C
+20 ... +40 °C (+68 ... +104 °F)	±(0.07 + 0.0025 x temperature) °C
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751
Response time with additional temperature probe in 3 m/s air flow	
63%	< 20 s
90%	< 35 s

- 1) Defined as ±2 standard deviation limits of endpoint non-linearity, hysteresis, or repeatability error.
- 2) Defined as ±2 standard deviation limits of inaccuracy of the working standard including traceability to NIST.
- 3) Defined as the root sum of the squares (RSS) of endpoint non-linearity, hysteresis error, repeatability error, and calibration uncertainty at room temperature.
- 4) Defined as ±2 standard deviation limits of temperature dependence over the operating temperature range.
- 5) Defined as ±2 standard deviation limits. Small variations possible, see also calibration certificate.

## Available Parameters

Pressure parameters	P, P3h, HCP, QFE, QNH
Humidity and temperature parameters	RH, T, Tdf, Td, x, Tw

## Inputs and Outputs

MI70 probe ports	2
MI70 data interface	RS-232 (accessible only with MI70 Link software)
PTB330 supply voltage	10 ... 35 VDC (if not powered by MI70)
PTB330 data interface	RS-232C
PTB330 serial I/O connectors	RJ45 (service port) Male 8-pin M12 (user port)
HMP155 data interface	RS-485
HMP155 serial I/O connector	Male 8-pin M12

## Mechanical Specifications

<b>PTB330</b>	
Housing material	G-AlSi 10 Mg (DIN 1725)
IP rating	IP65
Pressure connector	M5 (10-32) internal thread
Pressure fitting	Barbed fitting for 1/8 inch I.D. tubing or quick connector with shutoff valve for 1/8 inch hose
<b>HMP155</b>	
Housing material	PC
IP rating	IP66
Additional T-probe cable length	2 m (6 ft 6 in)
Cable material	PUR
Sensor protection	Sintered PTFE
<b>MI70 Measurement Indicator</b>	
IP rating	IP54
Housing material	ABS/PC blend
<b>Transport Case</b>	
IP rating (when closed)	IP67
Plastic parts	TTX01®, PP+SEBS, POM
Metal parts	Stainless steel AISI303
Interior foam material	Polyethylene and polyether
Weight with all instruments and typical accessories	5.9 kg (13 lb)
Exterior dimensions (L × W × H)	405 × 330 × 165 mm (15.94 × 12.99 × 6.50 in)

## Spare Parts and Accessories

<b>PTB330</b>	
MI70 – PTB330 spiral cable	223235SP
USB-RJ45 serial connection cable	219685
Serial connection cable	19446ZZ
Barbed fitting 1/8 in	19498SP
Quick connector 1/8 in	220186
Transport case with interior foams and tabletop casing for PTB330	224068SP
<b>MI70</b>	
USB cable for MI70, includes MI70 Link software	219687
MI70 Link software	MI70LINK
MI70 connection cable to HMT330, MMT330, DMT340, HMT100, PTB330	211339
MI70 battery pack variety of AC adapters available	26755
<b>HMP155</b>	
HMP155 - MI70 connection cable	221801
Protection set for HMP155 calibration buttons: protective cover, 2 O-rings and protective plug	221318
USB cable for HMP155	221040
Sintered teflon filter + O-ring	219452SP
Humidity sensor	HUMICAP180R
Humidity calibrator	HMK15





### Features

- 500 ... 1100 hPa or 50 ... 1100 hPa pressure ranges with serial output
- Different scalings between 500 ... 1100 hPa with analog output
- Electronics housing IP65 protected against sprayed water
- Accurate and stable measurement
- Traceable calibration (certificate included)

Vaisala BAROCAP® Digital Barometer PTB210 is a reliable outdoor barometer for harsh conditions.

### For harsh environments

PTB210 is ideal for outdoor installations and harsh environments. PTB210 is designed to operate in a wide temperature range, and the electronics housing provides IP65 (NEMA 4) standardized protection against sprayed water.

PTB210 is ideal for use in applications such as weather stations, data buoys, ships, airports, and agrology. It is also an excellent solution for monitoring barometric pressure in industrial equipment such as laser interferometers and engine test benches.

### Several pressure ranges

PTB210 is designed for various pressure ranges. It is available in 2 pressure ranges in 3 configurations:

- Serial output for 500 ... 1100 hPa
- Serial output for 50 ... 1100 hPa
- Analog output with different scalings between 500 ... 1100 hPa

### Accurate and stable measurement

PTB210 is digitally adjusted and calibrated by using electronic working standards. A higher accuracy barometer, which is fine-tuned and calibrated against a high-precision pressure calibrator, is available for the 500 ... 1100 hPa pressure range.

In addition, PTB210 integrates directly with Vaisala Static Pressure Head Series SPH10/20. This pairing offers accurate measurement in all wind conditions.

### Vaisala BAROCAP technology

PTB210 uses the Vaisala BAROCAP sensor, a silicon capacitive absolute pressure sensor developed by Vaisala for barometric pressure applications. The Vaisala BAROCAP sensor provides excellent hysteresis and repeatability

characteristics and outstanding temperature and long-term stability. PTB210 is delivered with a traceable factory calibration certificate.



PTB210 paired with SPH10 static pressure head

# Technical Data

## Measurement performance

Pressure range	
Serial output	500 ... 1100 hPa 50 ... 1100 hPa
Analog output	500 ... 1100 hPa 600 ... 1060 hPa 800 ... 1060 hPa 900 ... 1100 hPa

Serial output, accuracy (hPa)			
Pressure range	500 ... 1100		50 ... 1100
	Class A	Class B	
Non-linearity <sup>1)</sup>	± 0.10	± 0.15	± 0.20
Hysteresis <sup>1)</sup>	± 0.05	± 0.05	± 0.10
Repeatability <sup>1)</sup>	± 0.05	± 0.05	± 0.10
Calibration uncertainty <sup>2)</sup>	± 0.07	± 0.15	± 0.20
Accuracy at +20 °C (+68 °F) <sup>3)</sup>	± 0.15	± 0.20	± 0.35
Temperature dependency <sup>4)</sup>	± 0.20	± 0.20	± 0.40
Total accuracy -40 ... +60 °C (-40 ... +140 °F) <sup>3)</sup>	± 0.25	± 0.30	± 0.50
Long-term stability (hPa/year)	± 0.10	± 0.10	± 0.20

Analog output, accuracy	
Non-linearity <sup>1)</sup>	± 0.20 hPa
Hysteresis <sup>1)</sup>	± 0.05 hPa
Repeatability <sup>1)</sup>	± 0.05 hPa
Calibration uncertainty <sup>2)</sup>	± 0.15 hPa
Accuracy at +20 °C (+68 °F) <sup>3)</sup>	± 0.30 hPa
Temperature dependency <sup>4)</sup>	± 0.50 hPa
Total accuracy -40 ... +60 °C (-40 ... +140 °F) <sup>3)</sup>	± 0.60 hPa
Long-term stability	± 0.10 hPa/year

1) Defined as the ±2 standard deviation limits of end point non-linearity, hysteresis error, or repeatability error.

2) Defined as ±2 standard deviation limits of inaccuracy of the working standard including traceability to international standards.

3) Defined as the root sum of the squares (RSS) of end point non-linearity, hysteresis error, repeatability error, and calibration uncertainty at room temperature.

4) Defined as ±2 standard deviation limits of temperature dependence over the operating temperature range.

## Operating environment

Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity	0-100 %RH, non-condensing

## Compliance

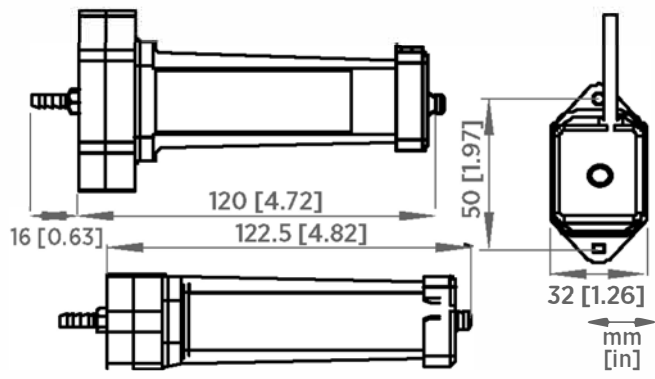
Directives	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU)
Electromagnetic compatibility (EMC)	EN / IEC 61326-1, Electrical equipment for measurement, control and laboratory use - EMC requirement; Basic environment CISPR 32 / EN 55032, Class B
Compliance	CE, FCC, UKCA

## Mechanical specifications

Housing material	PC plastic
IP rating, electronics	IP65 (NEMA 4)
IP rating, sensor	IP53
Weight, sensor	110 g (3.9 oz)
Cable weight	28 g/m (1.0 oz)

## Inputs and outputs

Serial output	
Shutdown	ON/OFF
Settling time at startup	2 s
Serial I/O	RS-232C RS-232C / TTL (optional) RS-485, non-isolated (optional)
Parity	None, even, odd
Data bits	7, 8
Stop bits	1, 2
Baud rate	1200, 2400, 4800, 9600, 19200
Response time	1 s
Resolution	0.01 hPa (1 measurement/s) 0.03 hPa (10 measurements/s)
Current consumption, normal mode	< 15 mA (factory setting)
Current consumption, shutdown mode	0.2 mA
Analog output	
Outputs	0 ... 5 V DC, 0 ... 2.5 V DC (order specified)
Shutdown	ON/OFF
Response time	500 ms
Resolution	300 µV
Measurement rate	3 measurements/s
Current consumption, normal mode	< 8 mA
Current consumption, shutdown mode	0.2 mA
All models	
Max. pressure	5 000 hPa absolute
Pressure connector	M5 (10-32) internal thread
Pressure fitting	Barbed fitting for 1/8 in I.D. tubing
Supply voltage (reverse polarity protected), with RS-232/TTL output	5 ... 28 V DC
Supply voltage (reverse polarity protected), with RS-485 or analog output	8 ... 18 V DC





### Features

- Vaisala BAROCAP® sensor
- Several pressure ranges
- Accuracy  $\pm 0.3$  hPa at  $+20$  °C
- Long-term stability
- On/Off control with external trigger
- Output voltage 0 ... 2.5 or 0 ... 5 VDC
- Current consumption less than 4 mA
- Mountable on 35 mm wide DIN rail
- Traceable calibration (certificate included)

Vaisala BAROCAP® Barometer PTB110 is designed both for accurate barometric pressure measurements at room temperature and for general environmental pressure monitoring over a wide temperature range.

### Vaisala BAROCAP Technology

PTB110 uses the Vaisala BAROCAP sensor, a silicon capacitive absolute pressure sensor developed by Vaisala for barometric pressure measurement applications. The sensor combines the outstanding elasticity characteristics and mechanical stability of single-crystal silicon with the proven capacitive detection principle.

### Applications

PTB110 is suitable for a variety of applications, such as environmental pressure monitoring, data buoys, laser interferometers, and agriculture and hydrology. The compact PTB110 is ideal for data logger applications as it has low power consumption. The external On/Off control is practical when electricity supply is limited.

### Accuracy and Stability

The excellent long-term stability of the barometer minimizes or even removes the need for field adjustment in many applications.

# Technical Data

## Measurement performance

Pressure range (1 hPa= 1 mbar)	500 ... 1100 hPa
	600 ... 1100 hPa
	800 ... 1100 hPa
	800 ... 1060 hPa
	600 ... 1060 hPa
Resolution	0.1 hPa
Load resistance	10 000 Ω minimum
Load capacitance	47 nF maximum
Settling time to full accuracy after startup	1 s
Response time to full accuracy after a pressure step	500 ms
Acceleration sensitivity	Negligible
<b>Accuracy</b>	
Linearity <sup>1)</sup>	±0.25 hPa
Hysteresis <sup>1)</sup>	±0.03 hPa
Repeatability <sup>1)</sup>	±0.03 hPa
Pressure calibration uncertainty <sup>2)</sup>	±0.15 hPa
Voltage calibration uncertainty	±0.7 mV
Frequency calibration uncertainty	±0.3 Hz
Accuracy at +20 °C (+68 °F) <sup>3)</sup>	±0.3 hPa
<b>Total accuracy at</b>	
+15 ... +25 °C (+59 ... +77 °F)	±0.3 hPa
0 ... +40 °C (+32 ... +104 °F)	±0.6 hPa
-20 ... +45 °C (-4 ... +113 °F)	±1.0 hPa
-40 ... +60 °C (-40 ... +140 °F)	±1.5 hPa
Long-term stability	±0.1 hPa / year

1) Defined as ±2 standard deviation limits of end-point non-linearity, hysteresis error, or repeatability error.

2) Defined as ±2 standard deviation limits of inaccuracy of the working standard including traceability to international standards.

3) Defined as the root sum of the squares (RSS) of end-point non-linearity, hysteresis error, repeatability error, and calibration uncertainty at room temperature.

## Operating environment

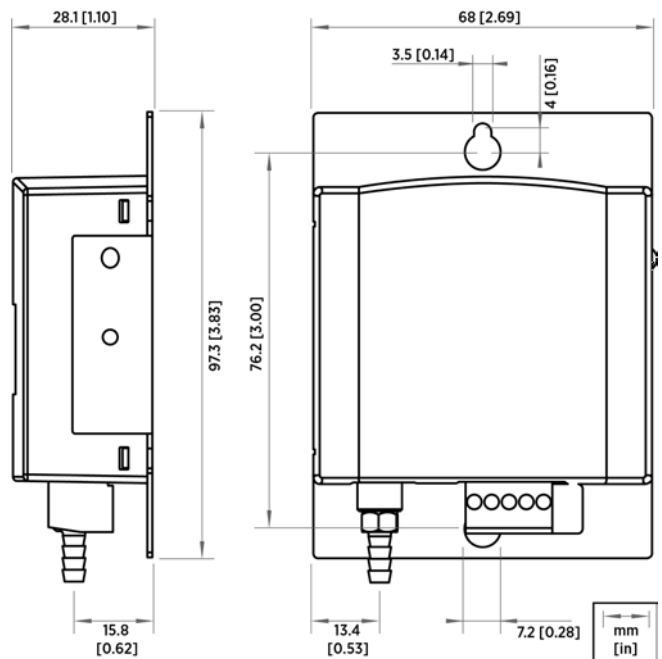
Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity	Non-condensing
IP rating	IP32
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment

## Mechanical specifications

Dimensions (H × W × D)	97.3 × 68.4 × 28.1 mm (3.83 × 2.69 × 1.10 in)
Weight	90 g (3.2 oz)
<b>Materials</b>	
Housing cover	Plastic ABS/PC blend
Mounting plate	Aluminum

## Inputs and outputs

Supply voltage	10 ... 30 V DC
Supply voltage control	With TTL-level (Transistor-Transistor-Logic) trigger
Supply voltage sensitivity	Negligible
Average power consumption	0.10 W at 12 V
Output voltage	0 ... 2.5 V DC 0 ... 5 V DC
Output frequency	500 ... 1100 Hz
Pressure connector	M5 (10 ... 32) internal thread
Pressure fitting	Barbed fitting for 1/8 in
Minimum pressure limit	0 hPa abs
Maximum pressure limit	2000 hPa abs
Electrical connector	A removable connector for 5 wires (AWG 28 ... 16)
Terminals	Pin 1: External triggering Pin 2: Signal ground Pin 3: Supply ground Pin 4: Supply voltage Pin 5: Voltage/Frequency output



Dimensions



## SPH10/20 Static Pressure Heads For minimizing wind induced error



SPH10/20 is easy to install and connect. In the picture, SPH10 is connected to PTB210.

### Features

- Minimizes wind induced error
- Reliable barometric pressure measurement in all weather
- Wind tunnel tested structure
- Easy to clean
- Easy to install

SPH10/20 Static Pressure Heads minimize the effects of wind on barometric pressure readings.

Wind induced effects are one of the main sources of error when measuring barometric pressure. Variations due to strong and gusty wind can be overcome by using a static pressure head to reduce the effect of dynamic pressure.

Vaisala Static Pressure Head Series SPH10/20 are designed to minimize the errors caused by wind. Their wind tunnel tested structure is both horizontally and vertically symmetrical. This design ensures reliable barometric pressure measurements in all weather.

### Ideal for Outdoor Installations

Vaisala static pressure heads are available in two models: Vaisala Static Pressure Head SPH10 is a basic version, and Vaisala Static Pressure Head SPH20 is a heated version for reliable operation in snowy and icy conditions. The heated SPH20 contains a thermostat that switches on the warming power at temperatures where the risk of icing may occur.

Composed of ultraviolet stabilized PC plastics and offshore aluminum, SPH10/20 static pressure heads are durable and weather resistant.

SPH10/20 protects against rain and condensed water. This prevents capillary condensation of a water column in the pressure channel resulting in a pressure error. The drain holes in the lower plate allow rain and water to flow out. The static pressure heads have internal netting that prevents insects and debris from blocking the pressure channel.

### Carefree Maintenance

SPH10/20 static pressure heads are easy to install and disassemble, service, and clean – even at the installation site. Vaisala BAROCAP® Digital Barometer PTB210 can be installed directly on top of SPH10/20 static pressure heads. Other barometers can be connected to the heads with pressure tubing.

SPH10 and SPH20 are a perfect pair for all Vaisala barometers. They ensure an accurate and reliable measurement in all weather conditions.



# Technical Data

## Operating Environment

Operating temperature -60 ... +80 °C (-76... +176 °F)

## Mechanical Specifications

Weight	SPH10: 800 g (1.76 lb) SPH20: 1360 g (3.0 lb)
Materials	PC plastic, offshore aluminium
Mounting	With 2 bolts (M6 × 20 mm min.)
Hose connection	Barbed fitting for 4 mm I.D. hose or Rp1/4 thread (parallel)

## SPH20 Inputs and Outputs

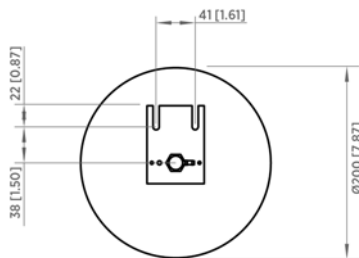
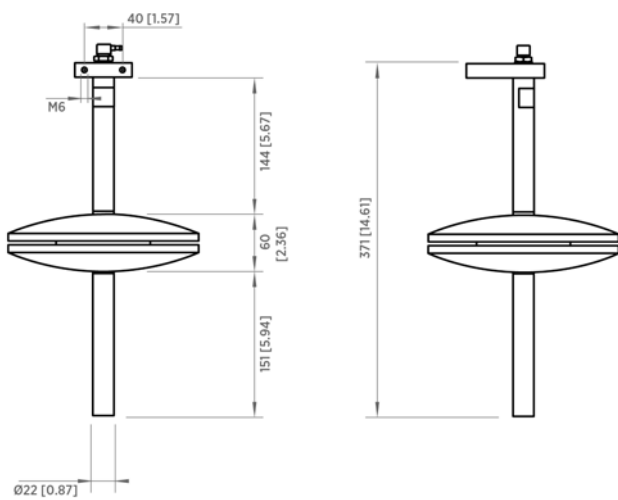
Electrical connections	M12 connector
Power supply	Factory setting: 12 V Changed connection: 24 V

Power consumption during heating 70 W

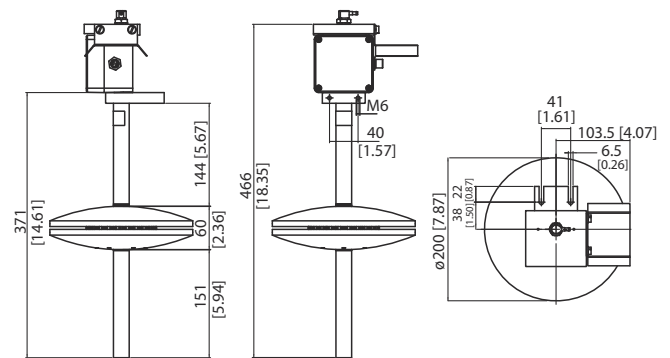
### Thermostat Switching Temperature

On	+4 °C (±3 °C) +39.2 °F (±4.4 °F)
Off	+13 °C (±3 °C) +55.4 °F (±4.4 °F)

## Dimensions in mm (inches)



SPH10



SPH20





### Features

- Easy mounting on wall, DIN rail, or panel
- 3 pressure ranges (Pa and inH<sub>2</sub>O)
- Unidirectional and bidirectional models
- Accessible zero and span adjustment potentiometers
- LED status indicator
- Dedicated models for critical and regulated environments and for air handling systems
- Euro style detachable connector
- Calibrations traceable to SI units through national metrology institutes or accredited calibration laboratories

Vaisala Differential Pressure Transmitter PDT101 offers precise measurement of differential air pressure. PDT101 offers dedicated models for critical and regulated environments with very low differential pressures and unidirectional models for air handling systems.

### Operating environment

The highly accurate bidirectional models of PDT101 are designed especially for demanding life science and cleanroom applications, and are the perfect choice for any application requiring precise pressure differential measurement. The transmitter is ideal for incorporating into the Vaisala viewLinc Continuous Monitoring System to measure and monitor the critical environmental parameters as required in regulated environments.

The unidirectional models of PDT101 are optimal for air handling units to measure differential pressure over fans or filters, for example.

Zero and span adjustment screws are available on every PDT101 model. Both adjustments are accessible from the front of the unit.

### Performance

PDT101 offers high accuracy, sensitivity, and stability, with models providing accuracies of either 0.40 or 1 % of span. The sensor uses a micro-machined, ultra-thin silicon diaphragm which provides inherent sensor repeatability and stability. The sensor enables precise measurement and control in high performance environments. The PDT101 transmitter is available with voltage output (3-wire) or current output (2-wire).

### Applications

PDT101 is suitable for high performance environments in the life science, semiconductor, and electronics industries, as well as in building automation systems in data centers and other demanding buildings and environments.

When used in regulated environments as part of the viewLinc system, it is highly suitable for fulfilling the requirements of continuous, documented, and redundant data, to meet FDA, EMA and other international regulations.

The compact design is well suited for mounting in a cleanroom or in the adjacent corridor with LED indicator lights for quick and easy power status spot check.

# Technical data

## Models

Model	Measurement range	Output
PDT101-P4C	±60 Pa	4–20 mA
PDT101-P4V	±60 Pa	0–5 V
PDT101-P4C2	±125 Pa	4–20 mA
PDT101-P4V2	±125 Pa	0–5 V
PDT101-W4C	±0.25 inH <sub>2</sub> O	4–20 mA
PDT101-W4V	±0.25 inH <sub>2</sub> O	0–5 V
PDT101-W4C2	±0.5 inH <sub>2</sub> O	4–20 mA
PDT101-W4V2	±0.5 inH <sub>2</sub> O	0–5 V
PDT101-P10C	0–500 Pa	4–20 mA
PDT101-P10V	0–500 Pa	0–10 V
PDT101-W10C	0–2 inH <sub>2</sub> O	4–20 mA
PDT101-W10V	0–2 inH <sub>2</sub> O	0–10 V
PDT101-P10Cx <sup>1)</sup>	0–500 Pa	4–20 mA
PDT101-P10Vx <sup>1)</sup>	0–500 Pa	0–10 V
PDT101-W10Cx <sup>1)</sup>	0–2 inH <sub>2</sub> O	4–20 mA
PDT101-W10Vx <sup>1)</sup>	0–2 inH <sub>2</sub> O	0–10 V

<sup>1)</sup> The PDT101-P10Cx, PDT101-P10Vx, PDT101-W10Cx, and PDT101-W10Vx models do not include calibration certificate.

## Measurement performance

Measurement ranges (bidirectional)	±60 Pa, ±125 Pa, ±0.25 inH <sub>2</sub> O, or ±0.5 inH <sub>2</sub> O
Measurement ranges (unidirectional)	0–500 Pa, or 0–2 inH <sub>2</sub> O
Accuracy (incl. non-linearity, hysteresis, repeatability and zero/span calibration settings)	0.4 % of span (bidirectional models), 1% of span (unidirectional models)
Long-term stability	≤ 0.5 % span/year
Response time (10–90 %)	250 ms
Warm-up time	15 s
Compensated temperature range	+2 ... +54 °C (+35.6 ... +129.2 °F)
Temperature dependence	±(0.065 Pa + 0.054 % of reading) / °C or ±(0.00015 inH <sub>2</sub> O + 0.03 % of reading) / °F (reference 21 °C or 70 °F)
Pressure type	Differential, gauge, vacuum and compound
<b>Overpressure</b>	
Proof pressure	1.0 bar
Burst pressure	1.7 bar
Static pressure	1.7 bar
<b>Mounting position</b>	
Error (zero adjustable)	≤ 1 %/g (calibration in vertical position is standard)
<b>Adjustments (front accessible)</b>	
Zero	±5 % span
Span	±3 % span

## Compliance

EU directives and regulations	EMC
Electromagnetic compatibility (EMC)	EN 61326-1, basic immunity test requirements
Compliance marks	CE, RCM

## Mechanical specifications

Medium (measured gas)	Clean and dry air, non-conducting and non-corrosive gases
Mounting	Threaded fastener for wall mounting or DIN rail type EN 50022
IP rating	IP40
Weight	0.07 kg
<b>Material</b>	
Process connection	Brass
Sensor element	Silicon, aluminum, glass
Case	NEMA type 1 fire-retardant ABS 1 (meets UL94-5VA)

## Inputs and outputs

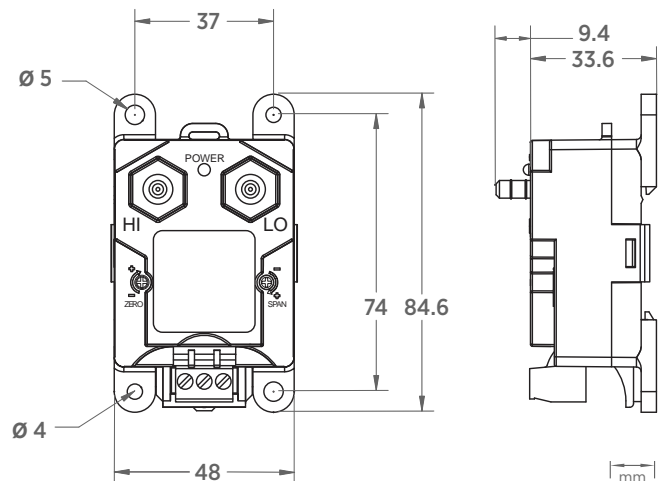
Process connection	1/4" barbed fittings
Tubing outer and inner dimensions	Outer dimension (O.D): 1/4" (6.35 mm) Inner dimension (I.D): 1/8" (3.17 mm)
Max. loop resistance for 4 ... 20 mA	≤ (Supply voltage - 12 V) / 0.022 A
Supply current	Max. 20 mA for 4–20 mA output signal
Optical process diagnostics	LED visual indicator
Electrical connection	Euro style pluggable terminal block accepts 12–26 AWG wire (0.13 up to 3.31 mm <sup>2</sup> )

Output signal	
2-wire	4–20 mA
3-wire	0–5 or 0–10 V DC (user selectable)
Operating voltage	
2-wire output 4–20 mA	12 ... 36 V DC
3-wire output 0–5 V DC	11.5–36 V DC or 24 V AC
3-wire output 0–10 V DC	14–36 V DC or 24 V AC

## Operating environment

Operating temperature	–18 ... +70 °C (–0.4 ... +158 °F)
Storage temperature	–40 ... +82 °C (–40 ... +179.6 °F)

Note: If used in an electromagnetic field of 3 V/m, with narrow frequency area of 80 ... 120 MHz, it is possible that the current output of PDT101 can deviate max. 0.8 % (with accuracy specified 0.4 %)



PDT101 dimensions



### Features

- In-place system calibration and online monitoring without disturbing process tubes with optional process valve actuator and test jacks
- Ultrathin profile ideally suited for DIN rail mount reduces installation and calibration costs
- High accuracy, two options; 0.25 % or 0.50 % of span
- Extremely robust MEMS silicon sensor technology provides very high accuracy, sensitivity, stability, and durability
- Calibrations traceable to SI units through national metrology institutes or accredited calibration laboratories
- Front side accessible zero and span adjustment potentiometers

Vaisala Differential Pressure Transmitter PDT102 offers ultra low pressure measurement for cleanroom control and monitoring applications.

### Operating environment

Vaisala Differential Pressure Transmitter PDT102 is a high performance instrument designed primarily for life science and high technology cleanroom applications. The front panel includes zero and span adjustment potentiometers for convenient adjustment. The PDT102 transmitter is ideal for incorporating into the Vaisala viewLinc Continuous Monitoring System to measure and monitor the critical environmental parameters as required in regulated environments.

### Performance

PDT102 offers very high accuracy, sensitivity and stability with two options for accuracy, 0.25% or 0.50% of span providing a highly reliable and

repeatable measurement. The sensor uses a micro-machined, ultra-thin silicon diaphragm which provides inherent sensor repeatability and stability. The sensor enables precise measurement and control in high performance cleanrooms. The PDT102 transmitter is available with voltage output (3-wire) or current output (2-wire).

### Available options

Online monitoring of PDT102 is simple using the optional process valve actuator and the front access test jacks. The front access test jacks provide online process reference signal or calibration signal without disconnecting power supply wiring. Measurements can be made using a standard multimeter.

### Applications

PDT102 is designed for use in critical monitoring of cleanrooms for pharmaceutical, biotechnology, medical device, and semiconductor controlled manufacturing environments.

# Technical data

## Measurement performance

Measurement ranges (bidirectional)	±50 Pa ±0.25 in H <sub>2</sub> O
Accuracy <sup>1)</sup>	0.25 % span or 0.5 % span, depending on choice
Repeatability for 0.25 % span accuracy	0.03 %
Repeatability for 0.5 % span accuracy	0.05 %
Electrical resolution	1 x 10 <sup>-4</sup> span
Long-term stability	≤0.5 % span/year
Response time (10– 90 %)	250 ms
Warm-up time	15 s
Compensated temperature range	+2 ... +57 °C (+35.6 ... +134.6 °F)
Temperature dependence	±(0.036 Pa + 0.036 % of reading) / °C or ±(0.0001 in H <sub>2</sub> O + 0.02 % of reading) / °F (reference 21 °C or 70 °F)
Pressure type	Differential, gauge, vacuum and compound
<b>Overpressure</b>	
Proof pressure	0.7 bar
Burst pressure	1.7 bar
Static pressure	1.7 bar
<b>Mounting position</b>	
Error (zero adjustable)	≤0.25 %
<b>Adjustments (front accessible)</b>	
Zero	±5 % span
Span	±3 % span

<sup>1)</sup> Incl. non-linearity, hysteresis, repeatability and zero/span calibration settings.

## Inputs and outputs

Process connection	1/8 NPT female according to ANSI/ ASME B1.20.1
Tubing dimensions	Outer dimension (O.D.): 1/8" (3.17 mm)
Operating voltage	12–36 V DC
Max. loop resistance for 4–20 mA	≤ (Supply voltage - 12V)/0.022 A
Electrical connection	Screw terminals, 12– 22 AWG (0.33 up to 3.31 mm <sup>2</sup> )
<b>Output signal</b>	
2-wire	4–20 mA
3-wire	0–5 V
<b>Supply current</b>	
For 0–5 V output	Max. 10 mA
For 4–20 mA output	Max. 20 mA

## Mechanical specifications

Medium (measured gas)	Clean and dry air, non-conducting and non-corrosive gases
Mounting	DIN rail types EN 50022, EN 50035 and EN 50045
Weight	0.16 kg
<b>Material</b>	
Process connection	Brass
Sensor element	Silicon, aluminum, glass
Case	Polycarbonate, glass filled (UL94-V-1)

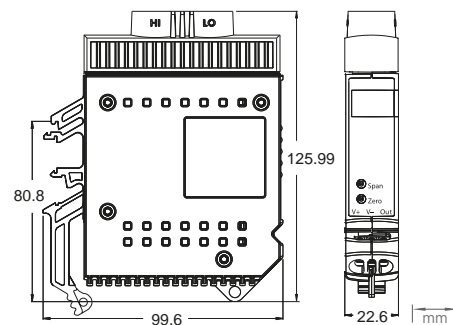
## Operating environment

Operating temperature	–29 ... +70 °C (–20.2 ... +158 °F)
Storage temperature	–40 ... +82 °C (–40 ... +179.6 °F)
IP rating	IP30

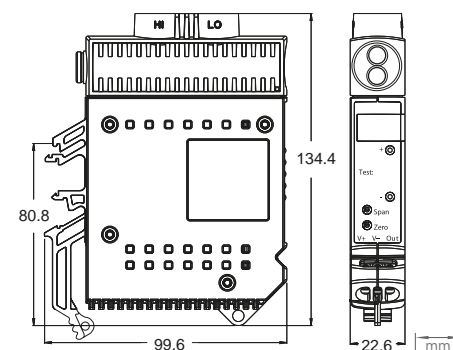
Note: If used in an electromagnetic field of 3 V/m, with narrow frequency area of 80 - 120 MHz, it is possible that the current output of PDT102 can deviate max. 0.3 % (with accuracy specified 0.25 %)

## Compliance

EU directives and regulations	EMC
Electromagnetic compatibility (EMC)	EN 61326-1, basic immunity test requirements
Compliance marks	CE, RCM



PDT102 transmitter dimensions



PDT102 dimensions with process valve actuator and test jacks

## PDT102 - XXXT

Measurement range:  
**P** (+/-50 Pa) or **W** (+/-0.25 in H<sub>2</sub>O) ———— ↑ ↑ ↑ ↑  
 Accuracy: **2** (0.25 % span) or **5** (0.5 % span) ———— ↑ ↑ ↑ ↑  
 Output: **C** (current) or **V** (voltage) ———— ↑ ↑ ↑ ↑  
 Option: (blank) or **T** ———— ↑ ↑ ↑ ↑

Order information for PDT102

## Polaris™ PR53AC Sanitary Compact Process Refractometer



### Features

- Reliable optical concentration measurements with refractive index
- Brix, Total Solids, Oechsle, Baume, Plato, and more than 500 concentration curves
- 3-A and EHEDG certified
- 3-A and Type N sanitary couplings
- Measurement not affected by bubbles, particles, suspended solids, or color
- Various flow cells available
- Indigo520-compatible
- Built-in 4–20 mA and Modbus RTU outputs

The Vaisala Polaris PR53AC sanitary compact process refractometer is designed to measure liquid concentrations, such as Brix, inline. Applications include food, beverage, dairy and brewery industry customers, and OEMs. 3-A and EHEDG certifications ensure that all hygienic demands and safety requirements are met. Easy to install directly in pipelines with a sanitary clamp and optional flow cells.

### Benefits

The optical measurement is based on the refractive index (RI). The RI can be measured from practically any liquid and it responds to dissolved material. Bubbles, particles, or fibers in the process do not affect measurement. The outstanding long-term stability provides years of accurate, continuous, fast, and stable measurement for concentration of sugar (Brix) and various other chemical concentrations directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance. The PR53AC continues the success of the Vaisala K-PATENTS® process refractometer series. Based on 40 years of experience and continuous development, the PR53 family is the latest generation of digital process refractometers.

### Safe for sanitary applications

The product is compatible with both clean-in-place (CIP) and sterilization-in-place (SIP) systems. The material offering, including stainless-steel wetted parts, PTFE, and sapphire, are all suitable for direct contact with the process with convenient installations directly to process lines with standard sanitary and Type N couplings, or with a sanitary flow cell. Stainless steel is easy to maintain and keep clean, and traceability ensures safety.

### Brix and beyond

Brix is a common measurement unit in the food, dairy, and beverage processing industries. Measurements can also be shown in total solids, Oechsle, Baume, or Plato. Other measurement units include concentration of sucrose, gelatin, lactulose, and hydrogen peroxide. The refractometer comes pre-configured with the selected concentration curve.

### Wash system

Most applications do not need wash systems due to the self-cleaning effect: the shear force of the process flow keeps the measurement point clean. For the most demanding applications, the powerful wash system ensures correct measurement when process conditions are sticky.

### Plug and play to Indigo

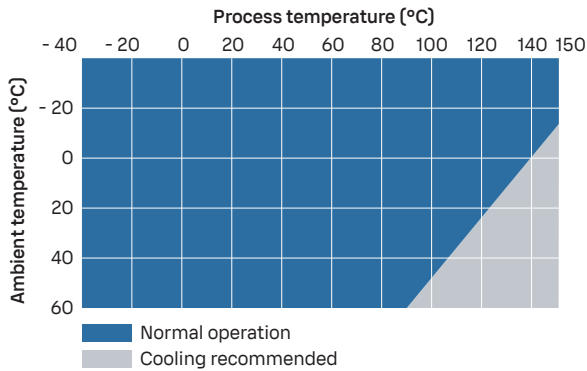
The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. It provides access to features such as data storage, graphical interface, and analog and digital interface. The Indigo520 transmitter is required when the application or the installation position requires washing, to control the process. Changing settings, measurement parameters, or other servicing updates can be done directly from the Indigo520, or through a USB cable using Vaisala software.

# Technical data

## Measurement performance

Refractive index	
Measurement range	1.32–1.53 nD (Corresponds to 0–100 °Bx)
Accuracy	±0.00014 nD (0.1 °Bx) <sup>1)</sup>
Repeatability	±0.00002 nD <sup>2)</sup>
Resolution	±0.000015 nD
Response time T <sub>63</sub> with default damping	10 s <sup>3)</sup>
Measurement cycle	1 / s
Long-term stability	Max. 0.1 % full scale / a
Temperature	
Accuracy at 20 °C (68 °F)	±0.3 °C (0.54 °F) <sup>1)</sup>
Sensor class	F0.15 IEC 60751
Temperature coefficient	±0.002 °C / C

- 1) Accuracy specified with respect to calibration reference, including non-linearity, hysteresis at +20 °C.  
 2) Repeatability, confidence level k=2, including random noise, at T<sub>a</sub> = +20 °C, with standard low-pass filtering.  
 3) With standard low-pass filtering.

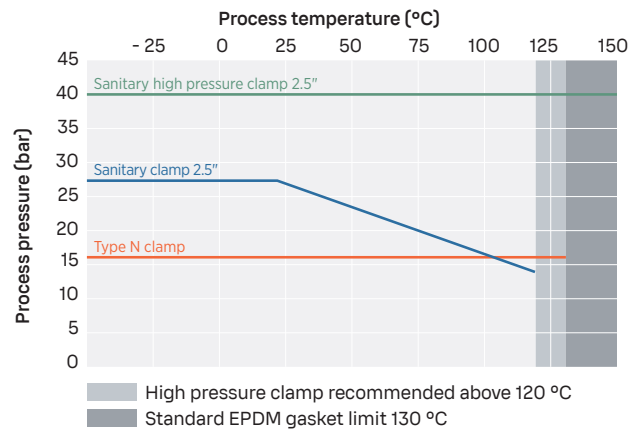


PR53AC process temperature, options Sanitary 2.5" and Type N (indicative)

## Operating environment

Process parameters	
Process temperature	-40 ... +150 °C (-40 ... +302 °F) <sup>1)</sup>
Design temperature	+180 °C (356 °F) <sup>2)</sup>
Design pressure	40 bar <sup>3)</sup>
Operating environment	
Storage temperature	-40 ... +65 °C (-40 ... +149 °F)
Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Maximum operating altitude	2000 m (approx. 6500 ft)
Operating humidity	0–100 %RH
Storage humidity	0–100 %RH, non-condensing
UL 50E/NEMA rating	Type 4X
IP rating	IP66 IP67

- 1) -40 ... +130 °C (-40 ... 266 °F) EPDM gasket, -40 ... +150 °C (-40 ... +302 °F) PTFE gasket.  
 2) Maximum momentary temperature peak.  
 3) Maximum at +20 °C (68 °F), operating pressure to the clamp rating pressure.



PR53AC process pressure

## Inputs and outputs

Supply	
Operating voltage	24 V DC nominal (9–30 V DC)
Power consumption	Less than 1 W
Protection class	3, PELV
Outputs	
Output parameters	RI, temperature, concentration, quality factor
Analog outputs	
mA	Sourcing, isolated, NAMUR NE 43, configurable
mA range	3.8–20.5 mA
Loop impedance	Max. 600 Ω
Accuracy of analog outputs at +20 °C	±0.1 % of full scale (±0.00002 RI)
Digital outputs	
Digital output	RS-485, non-isolated
Maximum cable run	300 m (approx. 1000 ft) (digital)
Supported protocol	Modbus RTU
Connectors	
External connectors	1 × M12 M 4 pins, A-coded <sup>1)</sup> 2 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5 <sup>2)</sup> / NPT 1/2"

- 1) For USB2 adapter and Insight software, see [www.vaisala.com/insight](http://www.vaisala.com/insight).  
 2) Conduit hub is not compatible with SD/IS Safe-Drive system.

## Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Safety	IEC/EN/UL 61010-1
Pressure	CRN all territories, ASME BPVC Sec VIII Div. 1 Ed. 2021
Material compliance	FDA 21 CFR 177.150, 177.2600, 177.1550 EC 1935/2004 EC 2023/2006, GMP EU 10/2011
Compliance marks	CE, China RoHS, RCM, UKCA
Vibration and shock	Tested according to IEC 60068-2
Listing marks	MET listed (US and Canada)

## Sanitary compliance

Hygienic design	3-A 46-04 EHEDG
Compliance marks	3-A, EHEDG (for EHEDG compliant installation, use 2.5" / 4" sanitary gasket)
Biocompatibility	USP Class VI <88>, 70 °C
ADI free (Animal Derived Ingredients)	Yes

## Mechanical specifications

Wetted parts	
Sensor head	EN 1.4435 BN2 (AISI 316L) <sup>1)</sup>
Surface roughness	Ra 0.8 µm Ra 0.38 µm electropolished <sup>1)</sup>
Prism	Sapphire monocrystalline, 99.996 % Al <sub>2</sub> O <sub>3</sub> <sup>2)</sup>
Prism gasket	Modified PTFE <sup>3)</sup>
Sanitary 2.5" gasket	EPDM <sup>2)</sup>
Type N gasket	EPDM <sup>2)</sup>
Welding ferrule	EN 1.4435 (AISI 316L) <sup>1) 4)</sup> ASME BPE-2019 (DIN 32676-C)
Non-wetted parts	
Housing	EN 1.4404 (AISI 316L)
Screws TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable gland	EN 1.4305 (AISI 303) HUMMEL 1.693.1600.50
Dummy plug	EN 1.4305 (AISI 303) AGRO 8717.96.08.70
Conduit hub	EN 1.4404 (AISI 316L) Vaisala, DRW257718, M16×1.5 / NPT ½ in
M12 connector	Gland, EN 1.4305 (AISI 303) Contacts, CuZn with Ni/Au plating Phoenix Contact, 1405233, M12/4(M), A, 4×0.34 mm <sup>2</sup> , TPE, 0.5 m Carrier, PA 6.6
Sanitary 2.5" clamp	EN 1.4301 (AISI 304) <sup>2)</sup>
Type N Clamp	EN 1.4301 (AISI 304) <sup>2)</sup>
Cable	2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
<b>Weight</b>	2.7 kg (5.95 lb)

1) EN 10204 / 3.1 certificate included.

2) Manufacturer's declaration included.

3) ADI free, FDA 21 C.F.R 177.1550, 3A Sanitary Standard, USP Class VI <88>, 70 °C.

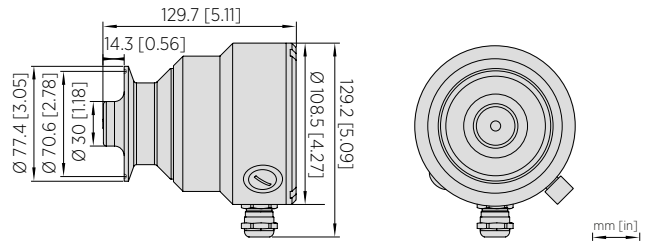
4) 3-A certificate, EHEDG certificate.

## Calibration accessories

Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

## Accessories

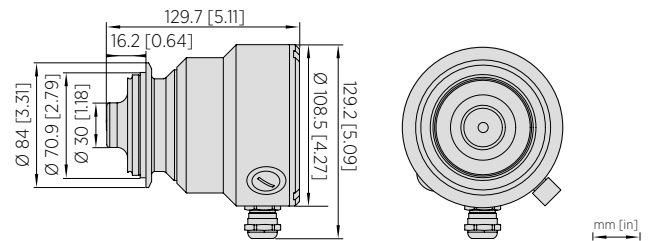
Item	Item code
USB adapter for service port, for Insight service software (see <a href="http://www.vaisala.com/insight">www.vaisala.com/insight</a> )	USB2
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Cooling cover	ASM214675SP



Dimensions for PR53AC Sanitary 2.5"

## Sanitary 2.5" mounting accessories

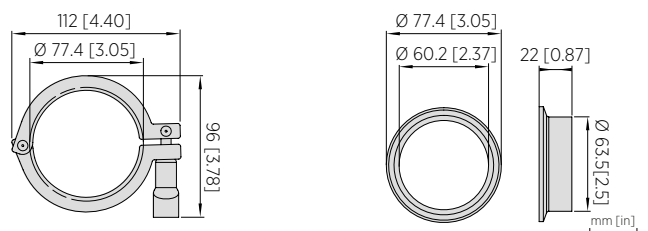
Item
Welding ferrule, 2.5"
Sanitary clamp 2.5"
High-pressure clamp 2.5"
Blind flange 2.5"
Sanitary gasket, 2.5", EPDM
Sanitary gasket, 2.5", EHEDG compliant, PTFE/steel, Combifit VOE-2034 (optional)



Dimensions for PR53AC Type N

## Type N mounting accessories

Item
Type N clamp 2.5", DN 50/40
Type N blind flange
Gasket 59.5×3 mm, EPDM



Mounting kit for PR53AC Sanitary 2.5"



# Flow cells for PR53AC

## Operating pressure

Flow cell model	Max. pressure
SEFC for 1" pipelines	27 bar at 20 °C 13.8 bar at 120 °C
SEFC for 1,5" pipelines	25 bar
SEFC for 2" pipelines	20 bar
SEFC for 2.5" pipelines	15 bar
SEFCL for 3" pipelines	12.5 bar
SEFCL for 4" pipelines	10 bar
MFC	27 bar at 20 °C 13.8 bar at 120 °C

## SEFC Sanitary Elbow Flow Cell

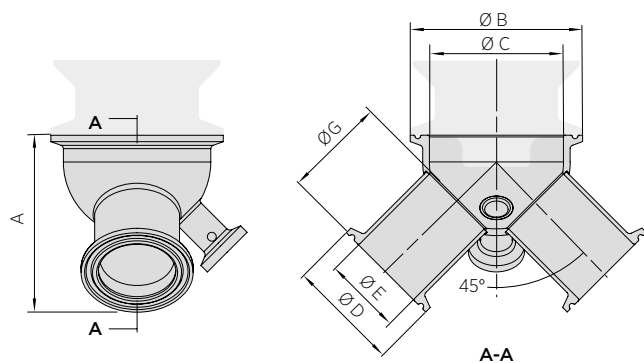
Item
SEFC Sanitary Elbow Flow Cell, DIN 32676-C sanitary coupling
Wetted parts
Sanitary coupling 1", reduced inlet for < 1.5 m/s flow rate
Sanitary coupling 1.5", reduced inlet for < 1.5 m/s flow rate
Sanitary coupling 2.5", reduced inlet for < 1.5 m/s flow rate
Sanitary coupling 1"
Sanitary coupling 1.5"
Sanitary coupling 2.5"
Wash nozzle
No wash nozzle option
Steam wash nozzle
Water wash nozzle
Pressurized water wash nozzle
Documentation
EN 1024 3.1 material certificate included
Material: EN 1.4435
Other variants, surface treatments and special materials available on request

## SEFC Sanitary Elbow Flow Cell, dimensions

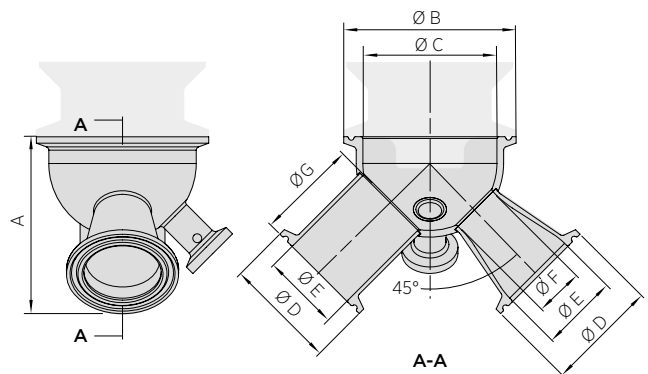
Dimension	1"	1½"	2"	2½"
A	65.7 mm (2.59 in)	79.6 mm (3.13 in)	97.5 mm (3.84 in)	115.7 mm (4.56 in)
ØB	77.4 mm (3.05 in)	77.4 mm (3.05 in)	77.4 mm (3.05 in)	77.4 mm (3.05 in)
ØC	60.2 mm (2.37 in)	60.2 mm (2.37 in)	60.2 mm (2.37 in)	60.2 mm (2.37 in)
ØD	50.4 mm (1.98 in)	50.4 mm (1.98 in)	63.9 mm (2.52 in)	77.4 mm (3.05 in)
ØE	22.1 mm (0.87 in)	34.8 mm (1.37 in)	47.5 mm (1.87 in)	60.2 mm (2.37 in)
ØG	21.7 mm (0.85 in)	44.9 mm (1.77 in)	41.9 mm (1.65 in)	64.8 mm (2.55 in)

## SEFC Sanitary Elbow Flow Cell reduced inlet, dimensions

Dimension	1"	1½"	2"
A	65.7 mm (2.59 in)	79.6 mm (3.13 in)	97.5 mm (3.84 in)
ØB	77.4 mm (3.05 in)	77.4 mm (3.05 in)	77.4 mm (3.05 in)
ØC	60.2 mm (2.37 in)	60.2 mm (2.37 in)	60.2 mm (2.37 in)
ØD	50.4 mm (1.98 in)	50.4 mm (1.98 in)	63.9 mm (2.52 in)
ØE	22.1 mm (0.87 in)	34.8 mm (1.37 in)	47.5 mm (1.87 in)
ØF	16 mm (0.63 in)	22.1 mm (0.87 in)	34.8 mm (1.37 in)
ØG	21.7 mm (0.85 in)	44.9 mm (1.77 in)	41.9 mm (1.65 in)



SEFC Sanitary Elbow Flow Cell



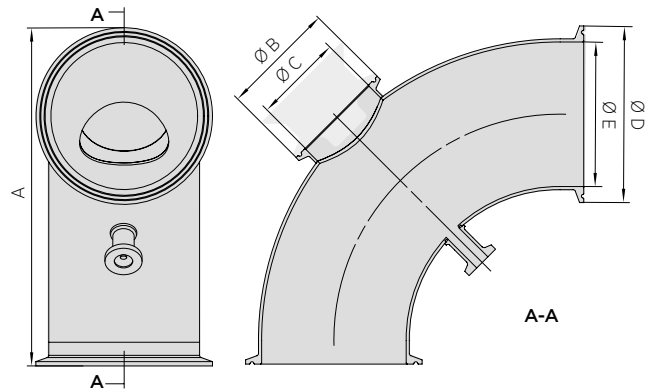
SEFC Sanitary Elbow Flow Cell, reduced inlet

## SEFCL Sanitary Elbow Flow Cell, for Large Pipelines

<b>Item</b>	SEFCL Sanitary Elbow Flow Cell, for Large Pipelines	
<b>Wetted parts</b>	Sanitary coupling 3" Sanitary coupling 4"	
<b>Wash nozzle</b>	No wash nozzle option Steam wash nozzle Water wash nozzle Pressurized water wash nozzle	
<b>Documentation</b>	Material certificate included Material: AISI 316L Other variants, surface treatments and special materials available on request	

## SEFCL Sanitary Elbow Flow Cell, for Large Pipelines, dimensions

Dimension	3"	4"
A	172.5 mm (6.79 in)	227.8 mm (8.97 in)
ØB	77.9 mm (3.07 in)	77.9 mm (3.07 in)
ØC	60.2 mm (2.37 in)	60.2 mm (2.37 in)
ØD	90.9 mm (3.58 in)	118.9 mm (4.68 in)
ØE	72.9 mm (2.87 in)	97.4 mm (3.83 in)



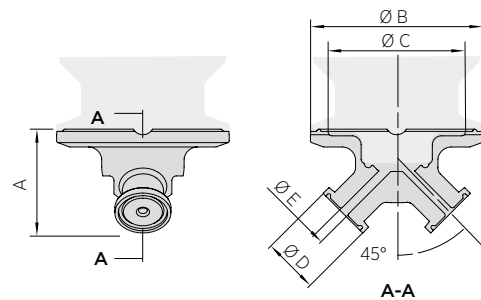
SEFCL Sanitary Elbow Flow cell, Large (3 in)

## MFC Miniature Flow Cell

<b>Item</b>	MFC Miniature Flow Cell		
	Material: EN 1.4435, EN 1024 3.1 material certificate included		
	Wetted surface Ra: Electropolished 0.4 um, batch traceable, certificate included		
	Other variants, surface treatments and special materials available on request		

## MFC Miniature Flow Cell, dimensions

Dimension	4 mm	5 mm	6 mm
A	46.6 mm (1.83 in)	46.6 mm (1.83 in)	46.6 mm (1.83 in)
ØB	77.5 mm (3.05 in)	77.5 mm (3.05 in)	77.5 mm (3.05 in)
ØC	61.6 mm (2.43 in)	61.6 mm (2.43 in)	61.6 mm (2.43 in)
ØD	25 mm (0.98 in)	25 mm (0.98 in)	25 mm (0.98 in)
ØE	4 mm (0.16 in)	5 mm (0.2 in)	6 mm (0.24 in)



MFC Miniature Flow Cell

## Flow cell accessories for MFC

<b>Item</b>	Gasket 22.2×3.0 mm EPDM
	Sanitary clamp 0.5"

## Polaris™ PR53AP Sanitary Probe Process Refractometer



### Features

- Reliable optical concentration measurements with refractive index
- Brix, Total Solids, Oechsle, Baume, Plato, and more than 500 concentration curves
- 3-A and EHEDG certified
- Sanitary and tank bottom flange couplings
- Measurement not affected by bubbles, particles, suspended solids, or color
- Indigo520-compatible
- Built-in 4–20 mA and Modbus RTU outputs

### Benefits

The optical measurement is based on the refractive index (RI). The RI can be measured from practically any liquid, and it responds to dissolved material. The long probe allows representative measurement in tanks and hot processes, such as jam cooking.

The outstanding long-term stability provides years of accurate, continuous, fast, and stable measurement for concentration of sugar (Brix) and various other chemical concentrations directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

The PR53AP continues the success of the Vaisala K-PATENTS® process refractometer series. Based on 40 years of experience and continuous development, the PR53 family is the latest generation of digital process refractometers.

### Safe for sanitary applications

The product design welcomes both cleaning-in-place (CIP) and sterilization-in-place (SIP) systems. Stainless-steel wetted parts, PTFE and sapphire, are suitable to be in direct contact with the process, and traceability ensures safety. Stainless steel is easy to maintain and keep clean. The long probe with common tank bottom flanges enables installation depths of up to 170 mm. The flush mount option allows installation in tanks with scrapers or mixers.

### Brix and beyond

Brix is a common measurement unit in the food, dairy, and beverage processing industries. Measurements can also be shown in total solids, Oechsle, Baume, or Plato. Other measurement units include concentration of sucrose, gelatin, lactulose, and hydrogen peroxide. The refractometer comes pre-configured with the selected concentration curve.

### Wash system

Most applications do not need wash systems due to the self-cleaning effect: the shear force of the process flow keeps the measurement point clean. For the most demanding applications, the powerful wash system ensures correct measurement when process conditions are sticky.

### Plug and play to Indigo

The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. It provides access to features such as data storage, graphical interface, and analog and digital interface. The Indigo520 transmitter is required when the application or the installation position requires washing, to control the process. Changing settings, measurement parameters, or other servicing updates can be done directly from the Indigo520, or through a USB cable using Vaisala software.

# Technical data

## Measurement performance

### Refractive index

Measurement range 1.32-1.53 nD  
(Corresponds to 0-100 °Bx)

Accuracy ±0.00014 nD (0.1 °Bx) <sup>1)</sup>

Repeatability ±0.00002 nD <sup>2)</sup>

Resolution ±0.000015 nD

Response time T<sub>63</sub> with default damping 10 s <sup>3)</sup>

Measurement cycle 1 / s

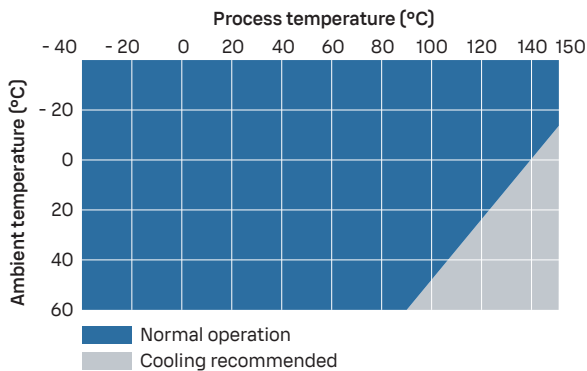
Long-term stability Max. 0.1 % full scale / a

### Temperature

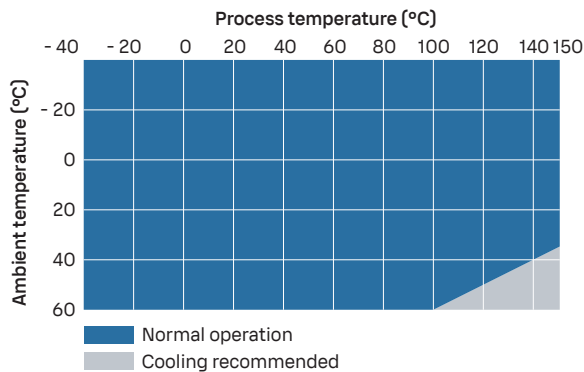
Accuracy at 20 °C (68 °F) ±0.3 °C (0.54 °F) <sup>1)</sup>

Sensor class F0.15 IEC 60751

Temperature coefficient ±0.002 °C / C



PR53AP, depth 170 mm process temperature (indicative)



PR53AP, depth 42 mm and 66 mm process temperature (indicative)

## Operating environment

### Process parameters

Process temperature -40 ... +150 °C (-40 ... +302 °F) <sup>1)</sup>

Design temperature +180 °C (356 °F) <sup>2)</sup>

Design pressure 40 bar <sup>3)</sup>

### Operating environment

Storage temperature -40 ... +65 °C (-40 ... +149 °F)

Operating temperature -40 ... +60 °C (-40 ... +140 °F)

Maximum operating altitude 2000 m (approx. 6500 ft)

Operating humidity 0-100 %RH

Storage humidity 0-100 %RH, non-condensing

UL 50E/NEMA rating Type 4X

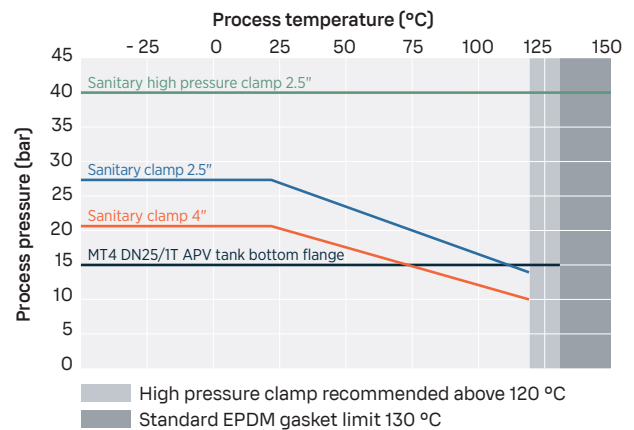
IP rating IP66

IP67

<sup>1)</sup> -40 ... +130 °C (-40 ... 266 °F) EPDM gasket, -40... +150 °C (-40 ... +302 °F) PTFE gasket

<sup>2)</sup> Maximum momentary temperature peak.

<sup>3)</sup> Maximum at +20 °C (68 °F), operating pressure to the clamp rating pressure.



PR53AP process pressure

## Inputs and outputs

### Supply

Operating voltage 24 V DC nominal (9-30 V DC)

Power consumption Less than 1 W

Protection class 3, PELV

### Outputs

Output parameters RI, temperature, concentration, quality factor

### Analog outputs

mA Sourcing, isolated, NAMUR NE 43, configurable

mA range 3.8-20.5 mA

Loop impedance Max. 600 Ω

Accuracy of analog outputs at +20 °C ±0.1 % of full scale (±0.00002 RI)

### Digital outputs

Digital output RS-485, non-isolated

Maximum cable run 300 m (approx. 1000 ft) (digital)

Supported protocol Modbus RTU

### Connectors

External connectors 1 × M12 M 4 pins, A-coded <sup>1)</sup>  
2 × M16×1.5 cable gland, Cable D 5-10 mm / Adapter for conduit entry M16×1.5 <sup>2)</sup> / NPT ½"

## Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Safety	IEC/EN/UL 61010-1
Pressure	CRN all territories, ASME BPVC Sec VIII Div. 1 Ed. 2021
Material compliance	FDA 21 CFR 177.150, 177.2600, 177.1550 EC 1935/2004 EC 2023/2006, GMP EU 10/2011
Compliance marks	CE, China RoHS, RCM, UKCA
Vibration and shock	Tested according to IEC 60068-2
Listing marks	MET listed (US and Canada)

## Sanitary compliance

Hygienic design	3-A 46-04 EHEDG <sup>1)</sup>
Compliance marks	3-A, EHEDG <sup>2)</sup>
Biocompatibility	USP Class VI <88>, 70 °C
ADI free (Animal Derived Ingredients)	Yes

<sup>1)</sup> Excluding tank bottom flange.

<sup>2)</sup> For EHEDG compliant installation, use 2.5" / 4" sanitary gasket.

## Calibration accessories

Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

## Mechanical specifications

Wetted parts	
Sensor head	EN 1.4435 BN2 (AISI 316L) <sup>1)</sup>
Wash nozzle	EN 1.4404 (AISI316L) <sup>1)</sup> EPDM gasket <sup>2)</sup>
Surface roughness	Ra 0.8 µm
Prism	Sapphire monocrystalline, 99.996 % Al <sub>2</sub> O <sub>3</sub> <sup>2)</sup>
Prism gasket	Modified PTFE <sup>3)</sup>
Sanitary gasket 2.5" / 4"	EPDM <sup>2)</sup>
Tank bottom gasket MT4 DN25/1T for tank bottom flange	EPDM <sup>2)</sup>
Tank bottom flange	AISI316L <sup>1)</sup>
Welding ferrule	EN 1.4435 (AISI 316L) <sup>1) 4)</sup>
Non-wetted parts	
Housing	EN 1.4404 (AISI 316L)
Screws, TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable gland	EN 1.4305 (AISI 303) HUMMEL 1.693.1600.50
Dummy plug	EN 1.4305 (AISI 303) AGRO 8717.96.08.70
Conduit hub	EN 1.4404 (AISI 316L) Vaisala, DRW257718, M16×1.5 / NPT ½ in
M12 connector	Gland, EN 1.4305 (AISI 303) Contacts, CuZn with Ni/Au plating Phoenix Contact, 1405233, M12/4(M), A, 4×0.34 mm <sup>2</sup> , TPE, 0.5 m Carrier, PA 6.6
Sanitary clamp 2.5" / 4"	EN 1.4301 (AISI 304) <sup>2)</sup>
Cable	2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, black 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
<b>Weight</b>	3.6–4.2 kg (7.94–9.26 lb)

<sup>1)</sup> Material certificate included.

<sup>2)</sup> Manufacturer's declaration included.

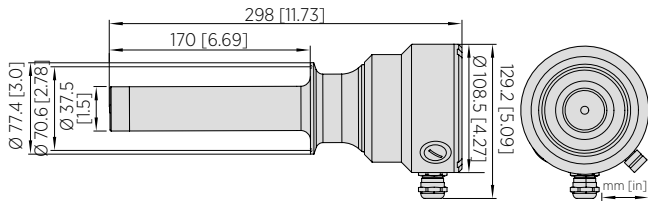
<sup>3)</sup> ADI free, FDA 21 C.F.R. 177.1550, 3A Sanitary Standard, USP Class VI <88>, 70 °C.

<sup>4)</sup> 3-A certificate, EHEDG certificate.

## Accessories

Item	Item code
USB adapter for service port, for Insight service software (see <a href="http://www.vaisala.com/insight">www.vaisala.com/insight</a> )	USB2
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Cooling cover	ASM214675SP

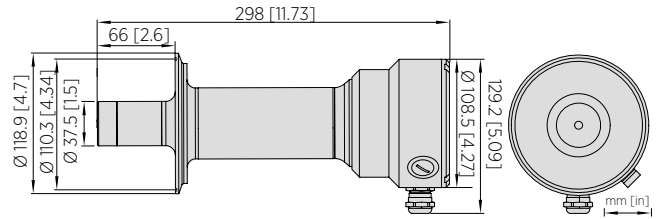
# Options for PR53AP



Dimensions of PR53AP Sanitary 2.5", depth 170 mm

## Mounting accessories for PR53AP Sanitary 2.5", depth 170 mm

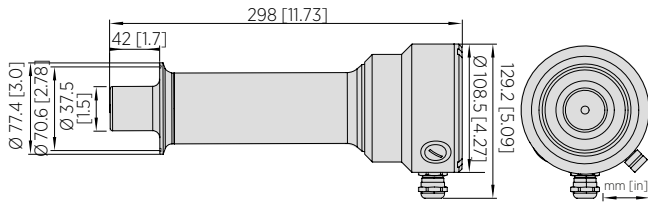
- Item**
- Welding ferrule, 2.5"
- Sanitary clamp 2.5"
- Blind flange 2.5"
- Sanitary gasket 2.5", EPDM
- Sanitary gasket 2.5", PTFE/steel, Combifit VOE-2034 (EHEDG)



Dimensions of PR53AP Sanitary 4", depth 66 mm

## Mounting accessories for PR53AP Sanitary 4", depth 66 mm

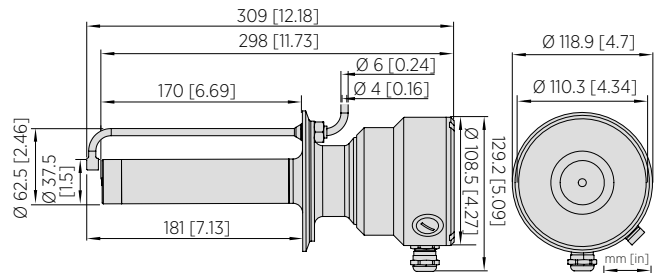
- Item**
- Welding ferrule, 4"
- Sanitary clamp 4"
- Blind flange 4"
- Sanitary gasket 4", EPDM
- Sanitary gasket 4", PTFE/steel, Combifit VOE-2036 (EHEDG)



Dimensions of PR53AP Sanitary 2.5", depth 42 mm

## Mounting accessories for PR53AP Sanitary 2.5", depth 42 mm

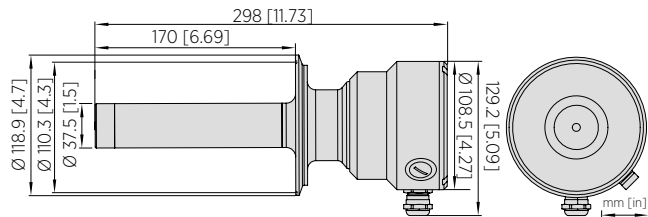
- Item**
- Welding ferrule, 2.5"
- Sanitary clamp 2.5"
- Blind flange 2.5"
- Sanitary gasket 2.5", EPDM
- Sanitary gasket 2.5", PTFE/steel, Combifit VOE-2034 (EHEDG)



Dimensions of PR53AP Sanitary 4", depth 170 mm, with wash nozzle

## Mounting accessories for PR53AP Sanitary 4", depth 170 mm, with wash nozzle

- Item**
- Welding ferrule, 4"
- Sanitary clamp 4"
- Blind flange 4"
- Sanitary gasket 4", EPDM
- Sanitary gasket 4", PTFE/steel, Combifit VOE-2036 (EHEDG)

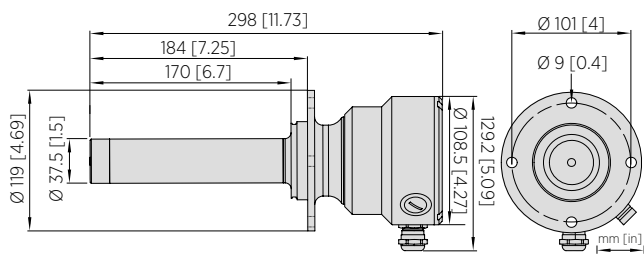


Dimensions of PR53AP Sanitary 4", depth 170 mm

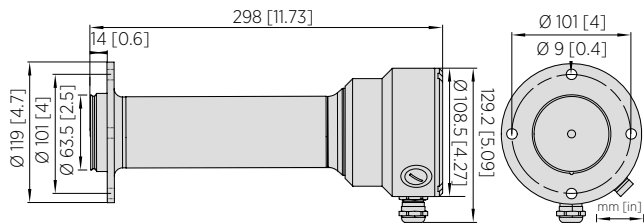
## Mounting accessories for PR53AP Sanitary 4", depth 170 mm

- Item**
- Welding ferrule, 4"
- Sanitary clamp 4"
- Blind flange 4"
- Sanitary gasket 4", EPDM
- Sanitary gasket 4", PTFE/steel, Combifit VOE-2036 (EHEDG)

# Options for PR53AP



Dimensions of PR53AP tank bottom flange, depth 170 mm



Dimensions of PR53AP tank bottom flange, flush mounted

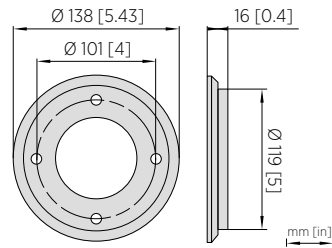
## Mounting accessories for PR53AP tank bottom flange, depth 170 mm and tank bottom flange, flush mounted

**Item**

Tank bottom welding flange

Tank bottom blind flange

Gasket MT4 DN25/1T EPDM



Dimensions of PR53AP tank bottom welding flange

## Polaris™ PR53GC Compact Process Refractometer



### Features

- Reliable optical concentration measurements with refractive index
- Sulfuric acid, sodium hydroxide, and more than 500 concentration curves
- Special alloy materials available for demanding environments
- Type L coupling
- Measurement not affected by bubbles, particles, suspended solids, or color
- Various flow cells available
- Indigo520-compatible
- Built-in 4–20 mA and Modbus RTU outputs

### Benefits

The optical measurement is based on the refractive index (RI). The RI can be measured from practically any liquid or slurry, and it responds to dissolved material. Bubbles, particles, or fibers in the process do not affect measurement.

The outstanding long-term stability provides years of accurate, continuous, fast, and stable concentration measurement directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

The PR53GC continues the success of the Vaisala K-PATENTS® process refractometer series. Based on 40 years of experience and continuous development, the PR53 family is the latest generation in the digital process refractometers.

### Accurate and reliable

The optical measurement principle offers accurate and drift-free measurement. Because temperature measurement is incorporated inside the process refractometer, the changing process temperature does not affect the concentration measurement.

### Easy mounting

Type L clamp connections allow easy installation directly into the process line. The unit can also be installed into a flange-mounted flow cell, which enables the use of an additional wash system for applications where prism wash is required.

Selected alloy materials provide durability under challenging process conditions. Other special materials and engineered solutions are available upon request.

### Plug and play to Indigo

The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. It provides access to features such as data storage, graphical interface, and analog and digital interface. The Indigo520 transmitter is required when the application or the installation position requires washing, to control the process. Changing settings, measurement parameters, or other servicing updates can be done directly from the Indigo520, or through a USB cable using Vaisala software.



# Technical data

## Measurement performance

### Refractive index

Measurement range 1.32–1.53 nD  
(Corresponds to 0–100 °Bx)

Accuracy ±0.00014 nD (0.1 °Bx) <sup>1)</sup>

Repeatability ±0.00002 nD <sup>2)</sup>

Resolution ±0.000015 nD

Response time T<sub>63</sub> with default damping 10 s <sup>3)</sup>

Measurement cycle 1 / s

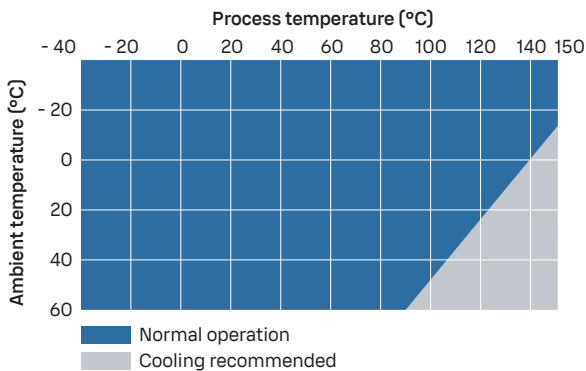
Long-term stability Max. 0.1 % full scale / a

### Temperature

Accuracy at 20 °C (68 °F) ±0.3 °C (0.54 °F) <sup>1)</sup>

Sensor class F0.15 IEC 60751

Temperature coefficient ±0.002 °C / C



PR53GC process temperature (indicative)

## Operating environment

### Process parameters

Process temperature -40 ... +150 °C (-40 ... +302 °F)

Design temperature +180 °C (356 °F) <sup>1)</sup>

### Operating environment

Storage temperature -40 ... +65 °C (-40 ... +149 °F)

Operating temperature -40 ... +60 °C (-40 ... +140 °F)

Maximum operating altitude 2000 m (approx. 6500 ft)

Operating humidity 0–100 %RH

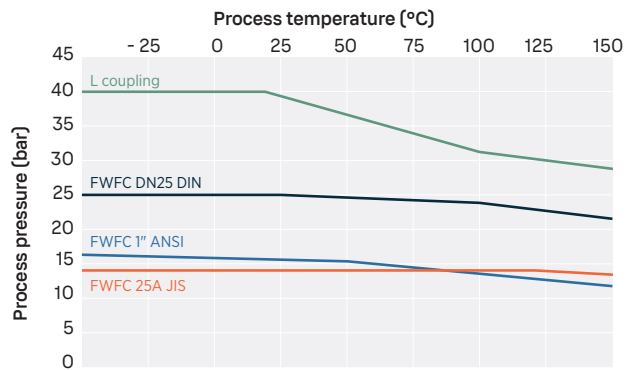
Storage humidity 0–100 %RH, non-condensing

UL 50E/NEMA rating Type 4X

IP rating IP66

IP67

<sup>1)</sup> Maximum momentary temperature peak.



PR53GC process pressure

## Inputs and outputs

### Supply

Operating voltage 24 V DC nominal (9–30 V DC)

Power consumption Less than 1 W

Protection class 3, PELV

### Outputs

Output parameters RI, temperature, concentration, quality factor

### Analog outputs

mA Sourcing, isolated, NAMUR NE 43, configurable

mA range 3.8–20.5 mA

Loop impedance Max. 600 Ω

Accuracy of analog outputs at +20 °C ±0.1 % of full scale (±0.00002 RI)

### Digital outputs

Digital output RS-485, non-isolated

Maximum cable run 300 m (approx. 1000 ft) (digital)

Supported protocol Modbus RTU

### Connectors

External connectors 1 × M12 M 4 pins, A-coded <sup>1)</sup>  
 2 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5 <sup>2)</sup> / NPT ½"

<sup>1)</sup> For USB2 adapter and Insight software, see [www.valisala.com/insight](http://www.valisala.com/insight).

<sup>2)</sup> Conduit hub is not compatible with SD/IS Safe-Drive system.

## Compliance

Electromagnetic compatibility (EMC) EN 61326-1, industrial environment

Safety IEC/EN/UL 61010-1

Pressure CRN all territories, ASME BPVC Sec VIII Div. 1 Ed. 2021

Compliance marks CE, China RoHS, RCM, UKCA

Vibration and shock Tested according to

IEC 60068-2

## Mechanical specifications

Wetted parts	
Sensor head	EN 1.4404 (AISI 316L) EN 2.4660 (Alloy 20) EN 2.4819 (Alloy C276) 1)
Surface roughness	Ra 0.8 µm
Prism	Sapphire monocrystalline, 99.996 % Al <sub>2</sub> O <sub>3</sub> 2)
Prism gasket	Modified PTFE 2)
L coupling gasket	PTFE 2)
Welding ferrule	EN 1.4404 (AISI 316L) EN 2.4660 (Alloy 20) EN 2.4819 (Alloy C276) 2)
Non-wetted parts	
Housing	EN 1.4404 (AISI 316L)
Screws, TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable gland	EN 1.4305 (AISI 303) HUMMEL 1.693.1600.50
Dummy plug	EN 1.4305 (AISI 303) AGRO 8717.96.08.70
Conduit hub	EN 1.4404 (AISI 316L) Vaisala, DRW257718, M16×1.5 / NPT ½ in
M12 connector	Gland, EN 1.4305 (AISI 303) Contacts, CuZn with Ni/Au plating Phoenix Contact, 1405233, M12/4(M), A, 4×0.34 mm <sup>2</sup> , TPE, 0.5 m Carrier, PA 6.6
L coupling clamp (60.3 mm)	EN 1.4301 (AISI 304) 2)
Cable	2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
<b>Weight</b>	2.7 kg (5.95 lb)

1) Material certificate included.  
2) Manufacturer's declaration included.

## Mounting accessories

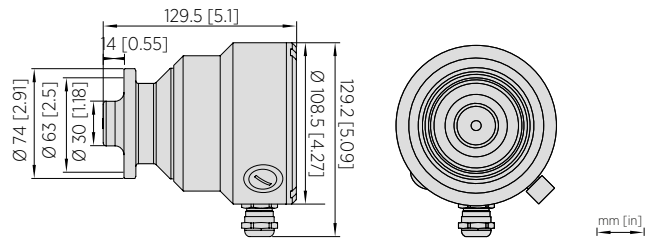
Item
L coupling clamp 60.3 mm (23.7 in)
L coupling ferrule 60.3 mm (23.7 in)
L coupling blind flange 60.3 mm (23.7 in)
L coupling gasket 60.3 mm (23.7 in)

## Accessories

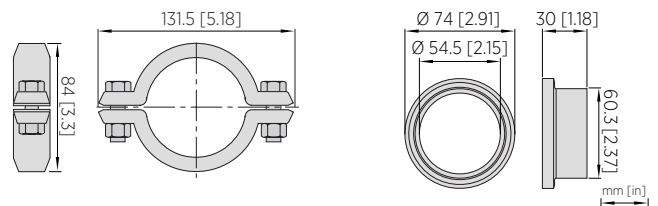
Item	Item code
USB adapter for service port, for Insight service software (see <a href="http://www.vaisala.com/insight">www.vaisala.com/insight</a> )	USB2
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Cooling cover	ASM214675SP

## Calibration accessories

Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

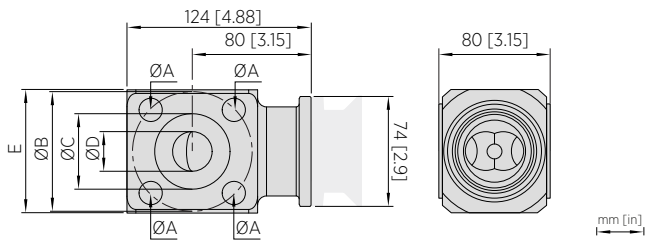


## Dimensions of PR53GC



## Dimensions of PR53GC L coupling clamp

# Flow cells for PR53GC



FWFC Flange Wafer Flow Cell

## Dimensions FWFC Flange Wafer Flow Cell

Dimension	ANSI	DIN	JIS
ØA	15.7 mm (0.62 in)	14 mm (0.55 in)	19 mm (0.75 in)
ØB	79.2 mm (3.12 in)	85 mm (3.35 in)	90 mm (3.54 in)
ØC	50.8 mm (2 in)	68 mm (2.68 in)	68 mm (2.68 in)
ØD	26.7 mm (1.05 in)	28.5 mm (1.12 in)	28.5 mm (1.12 in)
E	83 mm (3.27 in)	83 mm (3.27 in)	89 mm (3.50 in)

## FWFC Flange Wafer Flow Cell

### Item

#### Wetted parts

DIN flange DN25

ANSI flange 1"

JIS flange DN25

#### Length

Length 84 mm (3.3 in)

#### Wash nozzle

No wash nozzle, plugged

Steam wash nozzle

Water wash nozzle

Pressurized water wash nozzle

#### Documentation

Material EN 1024 3.1 certificate included

Material: EN 1.4404 <sup>1)</sup>

Other variants, surface treatments and special materials available on request.

<sup>1)</sup> 3.1 material declaration included

## Polaris™ PR53GP Probe Process Refractometer



### Features

- Reliable optical concentration measurements with refractive index
- Sulfuric acid, sodium hydroxide, and more than 500 concentration curves
- Special alloy materials available for demanding environments
- Clamp and flange connections available
- Measurement not affected by bubbles, particles, suspended solids, or color
- Indigo520-compatible
- Built-in 4–20 mA and Modbus RTU outputs

### Benefits

The optical measurement is based on the refractive index (RI). The RI can be measured from practically any liquid, and it responds to dissolved material.

Because bubbles, particles, or crystals in the process do not affect measurement, the RI allows accurate measurement for different chemicals. Typical applications include crystallizers, wet scrubbers, reactors, transport pipelines, blending, and distillation operations.

The outstanding long-term stability provides years of accurate, continuous, fast, and stable concentration measurement directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance. The PR53GP continues the success of the Vaisala K-PATENTS® process refractometer series. Based on 40 years of experience and continuous development, the PR53 family is the latest generation of the digital process refractometers.

### Accurate and reliable

The optical measurement principle offers accurate and drift-free measurement. Because temperature measurement is incorporated inside the process refractometer, the changing process temperature does not affect the concentration measurement.

### Easy mounting

The PR53GP can be installed in standard flanges, making it easy to mount to process line. With the optional cooling cover accessory, the instrument tolerates

high process pressures and temperatures. The optional flange-mounted pipe flow cell installation accessory allows flange-mounted installation in a wide variety of pipe sizes. Selected alloy materials provide durability under challenging process conditions. Other special materials and engineered solutions are available upon request.

### Wash system

Most applications do not need wash systems due to the self-cleaning effect: the shear force of the process flow keeps the measurement point clean. For the most demanding applications, the powerful wash system ensures correct measurement when process conditions are sticky.

### Plug and play to Indigo

The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. It provides access to features such as data storage, graphical interface, and analog and digital interface. The Indigo520 transmitter is required when the application or the installation position requires washing, to control the process. Changing settings, measurement parameters, or other servicing updates can be done directly from the Indigo520, or through a USB cable using Vaisala software.

# Technical data

## Measurement performance

### Refractive index

Measurement range 1.32–1.53 nD  
(Corresponds to 0–100 °Bx)

Accuracy  $\pm 0.00014$  nD (0.1 °Bx)<sup>1) 2)</sup>

Repeatability  $\pm 0.00002$  nD<sup>3)</sup>

Resolution  $\pm 0.000015$  nD

Response time  $T_{63}$  with default damping 10 s<sup>4)</sup>

Measurement cycle 1 / s

Long-term stability Max. 0.1 % full scale / a

### Temperature

Accuracy at 20 °C (68 °F)  $\pm 0.3$  °C (0.54 °F)<sup>1)</sup>

Sensor class F0.15 IEC 60751

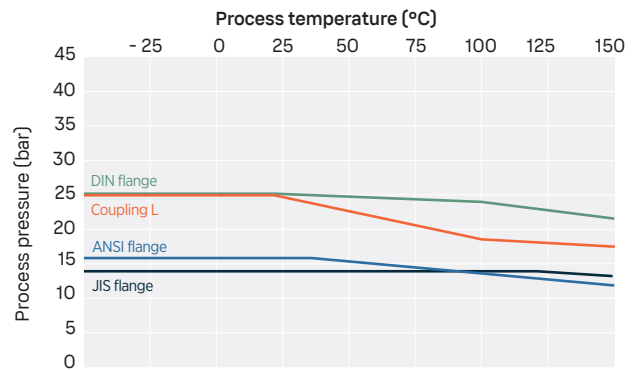
Temperature coefficient  $\pm 0.002$  °C / °C

1) Accuracy specified with respect to calibration reference, including non-linearity, hysteresis at +20 °C.

2) VD algorithm accuracy is 0.00030.

3) Repeatability, confidence level  $k=2$ , including random noise, at  $T_a = +20$  °C, with standard low-pass filtering.

4) With standard low-pass filtering.



PR53GP process pressure

## Inputs and outputs

### Supply

Operating voltage 24 V DC nominal (9–30 V DC)

Power consumption Less than 1 W

Protection class 3, PELV

### Outputs

Output parameters RI, temperature, concentration, quality factor

### Analog outputs

mA Sourcing, isolated, NAMUR NE 43, configurable

mA range 3.8–20.5 mA

Loop impedance Max. 600 Ω

Accuracy of analog outputs at +20 °C  $\pm 0.1$  % of full scale ( $\pm 0.00002$  RI)

### Digital outputs

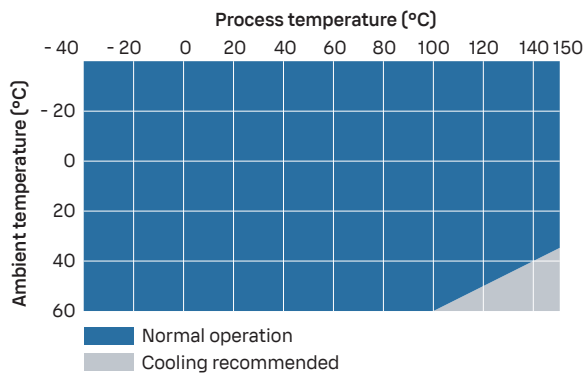
Digital output RS-485, non-isolated

Maximum cable run 300 m (approx. 1000 ft) (digital)

Supported protocol Modbus RTU

### Connectors

External connectors 1 × M12 M 4 pins, A-coded<sup>1)</sup>  
2 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5<sup>2)</sup> / NPT ½"



PR53GP process temperature (indicative)

## Operating environment

### Process parameters

Process temperature –40 ... +150 °C (–40 ... +302 °F)

Design temperature +180 °C (+356 °F)<sup>1)</sup>

Design pressure 40 bar<sup>2)</sup>

### Operating environment

Storage temperature –40 ... +65 °C (–40 ... +149 °F)

Operating temperature –40 ... +60 °C (–40 ... +140 °F)

Maximum operating altitude 2000 m (approx. 6500 ft)

Operating humidity 0–100 %RH

Storage humidity 0–100 %RH, non-condensing

UL 50E/NEMA rating Type 4X

IP rating IP66

IP67

1) Maximum momentary temperature peak.

2) Maximum at +20 °C, operating pressure to the process connection rating pressure.

## Compliance

Electromagnetic compatibility (EMC) EN 61326-1, industrial environment

Safety IEC/EN/UL 61010-1

Pressure CRN all territories, ASME BPVC Sec VIII Div. 1 Ed. 2021

Compliance marks CE, China RoHS, RCM, UKCA

Vibration and shock Tested according to

IEC 60068-2

## Mechanical specifications

Wetted parts	
Sensor head	EN 1.4404 (AISI 316L) <sup>1)</sup>
Surface roughness	Ra 0.8 µm
Prism	Sapphire monocrystalline, 99.996 % Al <sub>2</sub> O <sub>3</sub> <sup>2)</sup>
Prism gasket	Modified PTFE <sup>2)</sup>
L coupling gasket	PTFE <sup>2)</sup>
L coupling welding ferrule	EN 1.4404 (AISI 316L) <sup>1)</sup>
Wash nozzle parts	EN 1.4404 (AISI 316L) <sup>1)</sup>
Non-wetted parts	
Housing	EN 1.4404 (AISI 316L)
Screws TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable gland	EN 1.4305 (AISI 303) HUMMEL 1.693.1600.50
Dummy plug	EN 1.4305 (AISI 303) AGRO 8717.96.08.70
Conduit hub	EN 1.4404 (AISI 316L) Vaisala, DRW257718, M16×1.5 / NPT ½ in
M12 connector	Gland, EN 1.4305 (AISI 303) Contacts, CuZn with Ni/Au plating Phoenix Contact, 1405233, M12/4(M), A, 4×0.34 mm <sup>2</sup> , TPE, 0.5 m Carrier, PA 6.6
Flange	EN 1.4404 (AISI 316L) Dimensioning and tolerances as per ASME B16.5, DIN 2543, JIS B2220
L coupling clamp, 88.9 mm	EN 1.4301 (AISI 304)
Cable	2×2×0.5 mm <sup>2</sup> (21 AWG) PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
Weight	PR53GP 2" flange 7.2 kg (15.87 lb) - 7.7 kg (16.98 lb) PR53GP 3" flange 10.5 kg (23.15 lb) - 11.7 kg (25.79 lb) PR53 L coupling 5.1 kg (11.24 lb)

1) Material certificate included.

2) Manufacturer's declaration included.

## Mounting accessories

Item
L coupling clamp D 88.9 mm
L coupling ferrule 88.9 / 3.6 mm PN25
L coupling blind flange 88.9 mm
L coupling gasket 88.9 / 84 mm

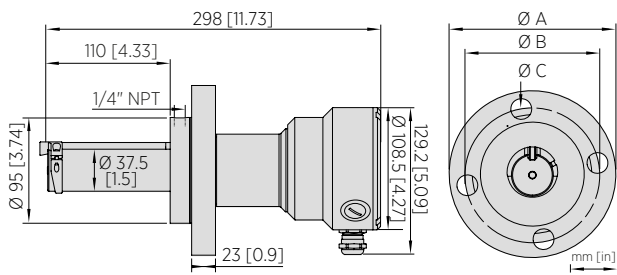
## Accessories

Item	Item code
USB adapter for service port, for Insight service software (see <a href="http://www.vaisala.com/insight">www.vaisala.com/insight</a> )	USB2
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Cooling cover	ASM214675SP

## Calibration accessories

Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

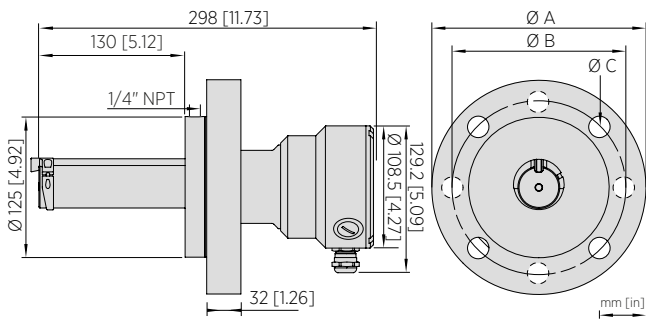
# PR53GP technical data



Dimensions of PR53GP 2" flange

## Dimensions of 2" flange, depth 110 mm

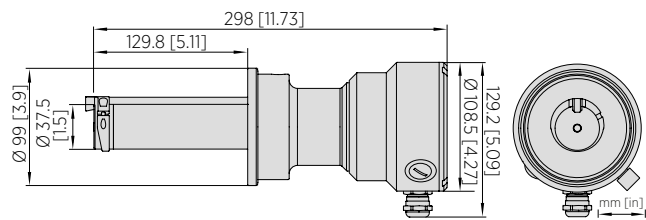
Dimension	ANSI 2"	DIN DN50	JIS 50A
ØA	152.4 mm (6 in)	165 mm (6.5 in)	155 mm (6.1 in)
ØB	120.7 mm (4.75 in)	125 mm (4.92 in)	120 mm (4.72 in)
ØC	19.1 mm (0.75 in)	18 mm (0.71 in)	19 mm (0.75 in)



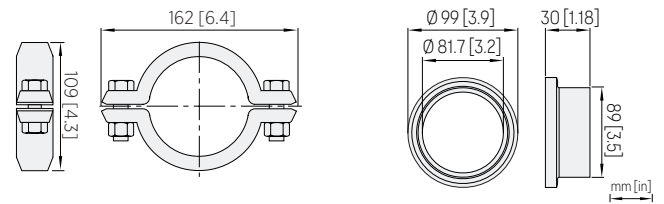
Dimensions of PR53GP 3" flange

## Dimensions of 3" flange, depth 130 mm

Dimension	ANSI 3"	DIN DN80	JIS 80A
ØA	190.5 mm (7.5 in)	200 mm (7.87 in)	185 mm (7.28 in)
ØB	152.4 mm (6 in)	160 mm (6.3 in)	150 mm (5.9 in)
ØC	19.1 mm (0.75 in)	18 mm (0.71 in)	19 mm (0.75 in)



Dimensions of PR53GP L coupling 88.9 mm (3.5 in)



Dimensions of PR53GP L coupling clamp

## Polaris™ PR53M PTFE-Body Process Refractometer



### Features

- Non-metallic wetted parts, integrated ultra-pure PTFE and sapphire flow cell for demanding environments
- Reliable optical concentration measurements with refractive index
- Potassium hydroxide, sodium hydroxide, hydrochloric acid, and more than 500 concentration curves
- Measurement not affected by bubbles, particles, suspended solids, or color
- Various fittings and connections available for ½ inch tubing
- Indigo520-compatible
- Built-in 4–20 mA and Modbus RTU outputs

### Benefits

The optical measurement is based on the refractive index (RI). The RI can be measured from practically any liquid, and it responds to dissolved material.

Because bubbles, particles, or crystals in the process do not affect measurement, the RI allows accurate measurement for different chemicals, also slurries. Typical applications include different chemical-mixing and monitoring installations in the fine chemical and semiconductor industries. In addition to a wide selection of product options, Vaisala offers the possibility to customize the product for specific needs. The outstanding long-term stability provides years of accurate, continuous, fast, and stable concentration measurement directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

The PR53M continues the success of the Vaisala K-PATENTS® process refractometer series. Based on 40 years of experience and continuous development, the PR53 family is the latest generation of digital process refractometers.

The Vaisala Polaris PR53M PTFE-body process refractometer is designed to measure concentrations of aggressive chemicals, such as hydrochloric acid (HCl), sodium hydroxide (NaOH), sodium chloride (NaCl), and sulfuric acid (H<sub>2</sub>SO<sub>4</sub>) in the chemical and semiconductor industries. The integrated ultra-pure PTFE flow cell has no metallic wetted parts, minimizing contamination risk and making it suitable for contact with aggressive chemicals. The PR53M can be mounted to ½ inch process lines with a standard NTP-threaded connection.

### Accurate and reliable

The optical measurement principle offers accurate and drift-free measurement. Because temperature measurement is incorporated inside the process refractometer, the changing process temperature does not affect the concentration measurement.

### Plug and play to Indigo

The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. It provides access to features such as data storage, graphical interface, and analog and digital interface. Changing settings, measurement parameters, or other servicing updates can be done directly from the Indigo520, or through a USB cable using Vaisala software.



# Technical data

## Measurement performance

### Refractive index

Measurement range 1.32–1.53 nD  
(Corresponds to 0–100 °Bx)

Accuracy  $\pm 0.00014$  nD (0.1 °Bx)<sup>1)</sup>

Repeatability  $\pm 0.00002$  nD<sup>2)</sup>

Resolution  $\pm 0.000015$  nD

Response time  $T_{63}$  with default damping 10 s<sup>3)</sup>

Measurement cycle 1 / s

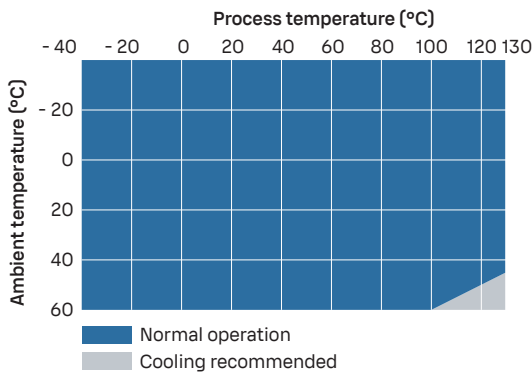
Long-term stability Max. 0.1 % full scale / a

### Temperature

Accuracy at 20 °C (68 °F)  $\pm 0.3$  °C (0.54 °F)<sup>1)</sup>

Sensor class F0.15 IEC 60751

Temperature coefficient  $\pm 0.002$  °C / °C



PR53M process temperature (indicative)

## Operating environment

### Process parameters

Process temperature -10 ... +130 °C (+14 ... +266 °F)

Pressure 10 bar at 20 °C, 4.5 bar at 130 °C  
(145 psi at 68 °F, 652 psi at 266 °F)

### Operating environment

Storage temperature -40 ... +65 °C (-40 ... +149 °F)

Operating temperature -40 ... +60 °C (-40 ... +140 °F)

Maximum operating altitude 2000 m (approx. 6500 ft)

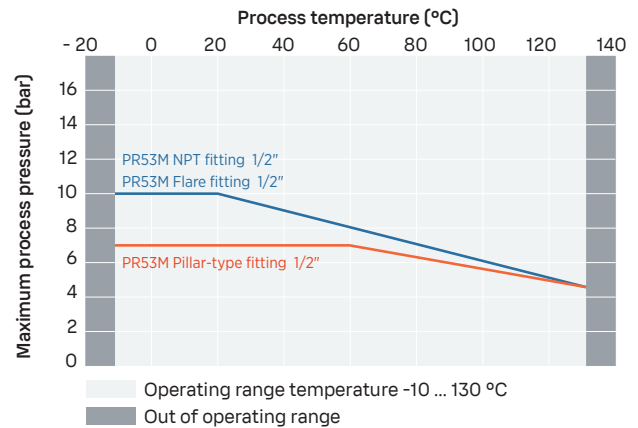
Operating humidity 0–100 %RH

Storage humidity 0–100 %RH, non-condensing

UL 50E/NEMA rating Type 4X

IP rating IP66

IP67



PR53M process pressure

## Inputs and outputs

### Supply

Operating voltage 24 V DC nominal (9–30 V DC)

Power consumption Less than 1 W

Protection class 3, PELV

### Outputs

Output parameters RI, temperature, concentration, quality factor

### Analog outputs

mA Sourcing, isolated, NAMUR NE 43, configurable

mA range 3.8–20.5 mA

Loop impedance Max. 600 Ω

Accuracy of analog outputs at +20 °C  $\pm 0.1$  % of full scale ( $\pm 0.00002$  RI)

### Digital outputs

Digital output RS-485, non-isolated

Maximum cable run 300 m (approx. 1000 ft) (digital)

Supported protocol Modbus RTU

### Connectors

External connectors 1 × M12 M 4 pins, A-coded<sup>1)</sup>  
2 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry  
M16×1.5<sup>2)</sup> / NPT 1/2"

<sup>1)</sup> For USB2 adapter and Insight software, see [www.vaisala.com/insight](http://www.vaisala.com/insight).

<sup>2)</sup> Conduit hub is not compatible with SD15 Safe-Drive system.

## Compliance

Electromagnetic compatibility (EMC) EN 61326-1, industrial environment

Safety IEC/EN/UL 61010-1

Compliance marks CE, China RoHS, RCM, UKCA

Vibration and shock Tested according to

IEC 60068-2

## Mechanical specifications

### Wetted parts

Prism and sapphire plate	Sapphire monocrystalline, 99.996 % Al <sub>2</sub> O <sub>3</sub> <sup>1)</sup>
Flow cell	Ultra pure PTFE <sup>1)</sup>
Prism gasket	Modified PTFE <sup>1)</sup>
Process gasket	Kalrez W240UP <sup>1)</sup>

### Non-wetted parts

Housing	Stainless steel (AISI 316)
Coating	Cerakote, white (PR53M with integrated fittings)
Screws TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable	2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1

<sup>1)</sup> Manufacturer's declaration included.

## Mounting accessories

### Item

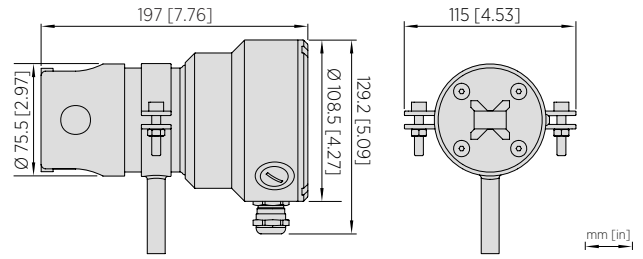
Flare fitting nut
Pillar nut and sleeve

## Calibration accessories

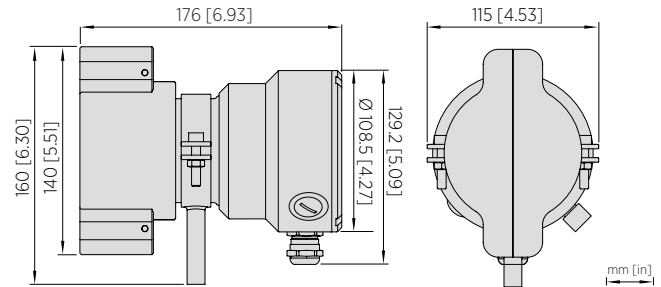
Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

## Accessories

Item	Item code
USB adapter for service port, for Insight service software (see <a href="http://www.vaisala.com/insight">www.vaisala.com/insight</a> )	USB2
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Cooling cover	ASM214675SP



Dimensions of PR53M flow cell end plate bolts (NPT fitting)



Dimensions of PR53M flow cell end plate bolts (integrated fittings, Flare and Pillar-type)

## Polaris™ PR53W Valve-Body Process Refractometer



### Features

- ETFE-lined valve-body flow cell with non-metallic wetted parts, for aggressive chemicals in pressurized pipelines
- Reliable optical concentration measurements with refractive index
- Hydrochloric acid, sulfuric acid, amino acid, potassium hydroxide, and more than 500 concentration curves
- Measurement not affected by bubbles, particles, suspended solids, or color
- ANSI, JIS, and DIN flanges for 2 inch process lines
- Indigo520-compatible
- Built-in 4–20 mA and Modbus RTU outputs

The Vaisala Polaris PR53W valve-body process refractometer is designed to measure concentrations of aggressive chemicals, such as sulfuric acid, hydrochloric acid (HCl), and sodium hydroxide (NaOH) in production pipelines such as in the chemical, biochemical, and pharmaceutical industries. The PR53W is mounted in a membrane-lined valve body that has no metallic wetted parts. This allows convenient flange mounting to 2 inch ANSI, JIS, and DN50 flanges.

### Benefits

The optical measurement is based on the refractive index (RI). RI can be measured from practically any liquid and it responds to dissolved material. Because bubbles, particles, or crystals in the process do not affect measurement, RI allows accurate measurement for different chemicals, also slurries. Typical applications include different chemical-mixing and monitoring installations in the fine chemical and semiconductor industries. In addition to a wide selection of product options, it is possible to customize the product for specific needs. The outstanding long-term stability provides years of accurate, continuous, fast, and stable concentration measurement directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

The PR53W continues the success of the Vaisala K-PATENTS® process refractometer series. Based on 40 years of experience and continuous development, the PR53 family is the latest generation of digital process refractometers.

### Accurate and reliable

The optical measurement principle offers accurate and drift-free measurement. Because temperature measurement is incorporated inside the process refractometer, the changing process temperature does not affect the concentration measurement.

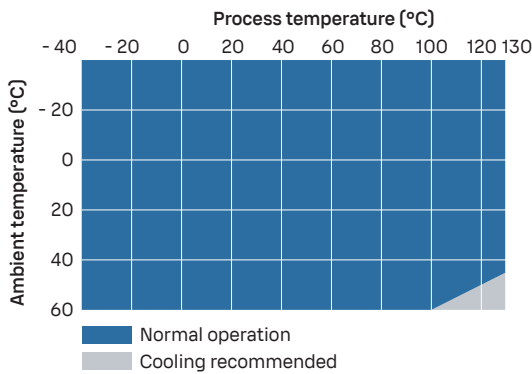
### Plug and play to Indigo

The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. It provides access to features such as data storage, graphical interface, and analog and digital interface. Changing settings, measurement parameters, or other servicing updates can be done directly from the Indigo520, or through a USB cable using Vaisala software.

# Technical data

## Measurement performance

Refractive index	
Measurement range	1.32–1.53 nD (Corresponds to 0–100 °Bx)
Accuracy	±0.00014 nD (0.1 °Bx) <sup>1)</sup>
Repeatability	±0.00002 nD <sup>2)</sup>
Resolution	±0.000015 nD
Response time T <sub>63</sub> with default damping	10 s <sup>3)</sup>
Measurement cycle	1 / s
Long-term stability	Max. 0.1 % full scale / a
Temperature	
Accuracy at 20 °C (68 °F)	±0.3 °C (0.54 °F) <sup>1)</sup>
Sensor class	F0.15 IEC 60751
Temperature coefficient	±0.002 °C / C



PR53W process temperature (indicative)

## Operating environment

Process parameters	
Process temperature	-10 ... +130 °C (+14 ... +266 °F)
Operating pressure	10 bar (145 psi)
Operating environment	
Storage temperature	-40 ... +65 °C (-40 ... +149 °F)
Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Maximum operating altitude	2000 m (approx. 6500 ft)
Operating humidity	0–100 %RH
Storage humidity	0–100 %RH, non-condensing
UL 50E/NEMA rating	Type 4X
IP rating	IP66 IP67

## Inputs and outputs

Supply	
Operating voltage	24 V DC nominal (9–30 V DC)
Power consumption	Less than 1 W
Protection class	3, PELV
Outputs	
Output parameters	RI, temperature, concentration, quality factor
Analog outputs	
mA	Sourcing, isolated, NAMUR NE 43, configurable
mA range	3.8–20.5 mA
Loop impedance	Max. 600 Ω
Accuracy of analog outputs at +20 °C	±0.1 % of full scale (±0.00002 RI)
Digital outputs	
Digital output	RS-485, non-isolated
Maximum cable run	300 m (approx. 1000 ft) (digital)
Supported protocol	Modbus RTU
Connectors	
External connectors	1 × M12 M 4 pins, A-coded <sup>1)</sup> 2 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5 <sup>2)</sup> / NPT ½"

## Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Safety	IEC/EN/UL 61010-1
Compliance marks	CE, China RoHS, RCM, UKCA
Vibration and shock	Tested according to IEC 60068-2

## Mechanical specifications

Wetted parts	
Prism and sapphire plate	Sapphire monocrystalline, 99.996 % Al <sub>2</sub> O <sub>3</sub> <sup>1)</sup>
Valve body lining	ETFE <sup>1)</sup>
Prism gasket	Modified PTFE <sup>1)</sup>
Valve body gasket	PTFE <sup>1)</sup>
Process gasket	Kalrez W240UP <sup>1)</sup>
Valve body M10 stud	EN 1.4404 (AISI 316L) <sup>1)</sup>
Non-wetted parts	
Valve body	Cast iron <sup>1)</sup>
Housing	EN 1.4404 (AISI 316L)
Screws TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable	2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1

<sup>1)</sup> Manufacturer's declaration included

## Calibration accessories

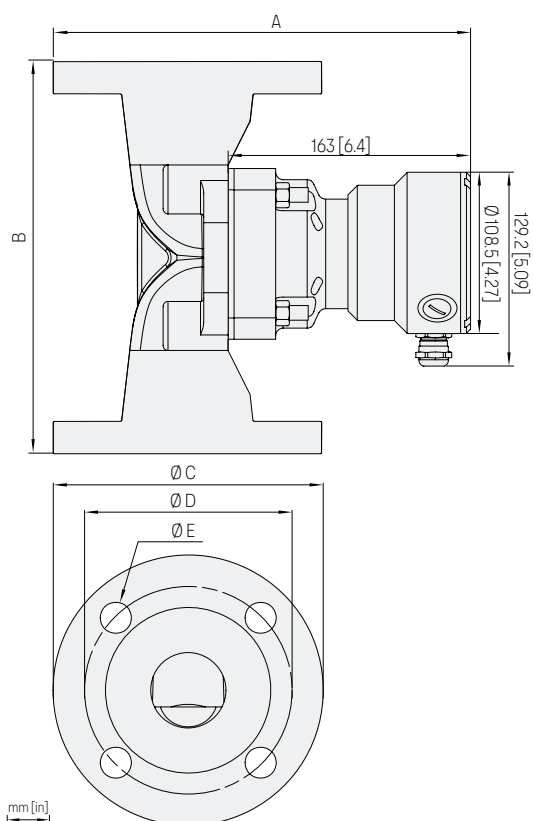
Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

## Dimensions

Dimension	ANSI 2"	DIN DN50	JIS 50A
A	268 mm (10.55 in)	275 mm (10.83 in)	270 mm (10.63 in)
B	196 mm (7.7 in)	230 mm (9.1 in)	196 mm (7.7 in)
ØA	152.4 mm (6 in)	165 mm (6.5 in)	155 mm (6.1 in)
ØB	120.7 mm (4.75 in)	125 mm (4.92 in)	120 mm (4.72 in)
ØC	19.1 mm (0.75 in)	18 mm (0.71 in)	19 mm (0.75 in)

## Accessories

Item	Item code
USB adapter for service port, for Insight service software (see <a href="http://www.vaisala.com/insight">www.vaisala.com/insight</a> )	USB2
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Cooling cover	ASM214675SP



Dimensions of PR53W valve body

## Polaris™ PR53SD Safe-Drive Process Refractometer



### Features

- Designed for safe and easy retraction from pressurized process lines
- Reliable optical concentration measurements with refractive index
- Black liquor, green liquor, filtrates, and other liquids in chemical recovery line and fiberline
- SAF 2205 material for demanding environments
- Measurement not affected by bubbles, particles, suspended solids, or color
- Indigo520-compatible
- Built-in 4–20 mA and Modbus RTU outputs

The retractable Vaisala Polaris PR53SD Safe-Drive process refractometer is designed for safety-critical measurements in pulp mills, such as firing liquor concentration. The newest design of the Safe-Drive retractor system allows insertion and removal of the measurement instrument when the process is running, ensuring operator safety. Prism wash systems enable reliable measurements in various installation positions, from fiberline to brown stock washing, evaporation, black liquor firing, slaker, and lime operations. The design complies with the **BLRBAC** Recommended Good Practice Safe Firing of Black Liquor in Black Liquor Recovery Boilers.

### Benefits

The optical measurement is based on the refractive index (RI). The outstanding long-term stability provides years of accurate, continuous, fast, and stable measurement for total dissolved solids and other concentration measurements, directly in the process stream. The PR53SD is designed for the critical safety measurements in pulp mills. The PR53SD measurement instrument can be retracted for maintenance without requiring process shutdown, minimizing measurement downtime. To ensure operator safety, the PR53SD and retractor prevents inadvertent errors in use: the Safe-Drive retractor tool is built into the isolation valve and ensures that

the isolation valve is always closed when the refractometer is removed from the pressurized line. The PR53SD continues the success of the Vaisala K-PATENTS® process refractometer series. Based on 40 years of experience and continuous development, the PR53 family is the latest generation of digital process refractometers.

### True dissolved solids measurement

Weak liquor and black liquor are a mixture of cooking chemicals and dissolved organic material. The RI measurement responds to all dissolved solids. Bubbles, foam, particles, suspended solids, or fibers do not affect

measurement. The measurement enables process optimization through advanced process control: continuous and accurate optical measurement for true dissolved solids allows immediate reaction to process variations.

### Fiberline and chemical recovery lines

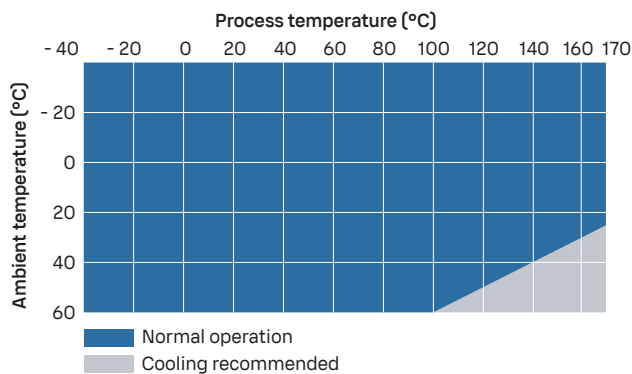
Measurement is suitable for low and medium consistency pulp, filtrates, and process liquids. In black liquor applications, total dissolved solids concentrations up to 90 % can be measured directly inline. Field-proven prism wash systems allow accurate measurement in challenging process media and conditions.

# Technical data

## Measurement performance

Refractive index	
Measurement range	1.32–1.53 nD (0–90 % total solids), normal-range prism 1.36–1.57 nD (20–100 % total solids), high-range prism
Accuracy	±0.00014 nD (0.1 °Bx) <sup>1)</sup>
Repeatability	±0.00002 nD <sup>2)</sup>
Resolution	±0.000015 nD
Response time T <sub>63</sub> with default damping	10 s <sup>3)</sup>
Measurement cycle	1 / s
Long-term stability	Max. 0.1 % full scale / a
Temperature	
Accuracy at 20 °C (68 °F)	±0.3 °C (0.54 °F) <sup>1)</sup>
Sensor class	F0.15 IEC 60751
Temperature coefficient	±0.002 °C / C

- 1) Accuracy specified with respect to calibration reference, including non-linearity, hysteresis at +20 °C.  
2) Repeatability, confidence level k=2, including random noise, at T<sub>a</sub> = +20 °C, with standard low-pass filtering.  
3) At standard low-pass filtering.



PR53SD process temperature (indicative)

## Operating environment

Process parameters	
Process temperature	-40 ... +170 °C (-40 ... +338 °F)
Design temperature	+180 °C (+356 °F) <sup>1)</sup>
Design pressure / maximum operating pressure	35 bar (507.6 psi)
Maximum retraction pressure	35 bar (507.6 psi)
Operating environment	
Storage temperature	-40 ... +65 °C (-40 ... +149 °F)
Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Maximum operating altitude	2000 m (approx. 6500 ft)
Operating humidity	0–100 %RH
Storage humidity	0–100 %RH, non-condensing
UL 50E/NEMA rating	Type 4X
IP rating	IP66 IP67

1) Maximum momentary temperature peak.

## Inputs and outputs

Supply	
Operating voltage	24 V DC nominal (9–30 V DC)
Power consumption	Less than 1 W
Protection class	3, PELV
Outputs	
Output parameters	RI, temperature, concentration, quality factor
Analog outputs	
mA	Sourcing, isolated, NAMUR NE 43, configurable
mA range	3.8–20.5 mA
Loop impedance	Max. 600 Ω
Accuracy of analog outputs at +20 °C	±0.1 % of full scale (±0.00002 RI)
Digital outputs	
Digital output	RS-485, non-isolated
Maximum cable run	300 m (approx. 1000 ft) (digital)
Supported protocol	Modbus RTU
Connectors	
External connectors	1 × M12 M 4 pins, A-coded <sup>1)</sup> 2 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5 <sup>2)</sup> / NPT ½"

## Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Safety	IEC/EN/UL 61010-1
Pressure	CRN all territories, ASME BPVC Sec VIII Div. 1 Ed. 2021
Compliance marks	CE, China RoHS, RCM, UKCA
Vibration and shock	Tested according to IEC 60068-2

## Mechanical specifications

Wetted parts	
Sensor head	EN 1.4462 <sup>1)</sup>
Prism	Sapphire monocrystalline, 99.996 % Al <sub>2</sub> O <sub>3</sub> <sup>2)</sup>
Process gasket	Co-Cr-Ni Alloy (AMS 5876) lined PTFE <sup>2)</sup>
Prism gasket	Modified PTFE <sup>2)</sup>
SD flange	EN 1.4462 <sup>1)</sup>
Wash nozzle	EN 1.4462 <sup>2)</sup>
Non-wetted parts	
Housing	EN 1.4404
Screws, TX20 torque 2.0 Nm	EN 1.4404 (AISI 316L)
Stud bolts, M12 torque 75 Nm, M10 torque 40 Nm	EN 1.4435 (AISI 316L), grade 8.8
Flanges (3 pcs)	EN 1.4462 (AISI 2205) ASME B16.5, DIN 2543
Cable	2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
<b>Weight</b>	Retractor and wash connection 15 kg (33.07 lb) Refractometer 5.4 kg (11.9 lb)

1) EN 10204 / 3.1 certificate included.  
2) Manufacturer's declaration included.

## Mounting accessories

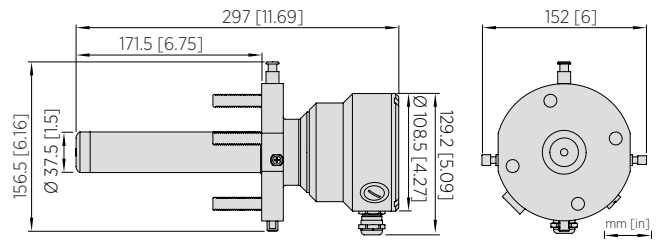
Item	Item code
Blind flanges for SDI5, spare kit	278299SP

## Calibration accessories

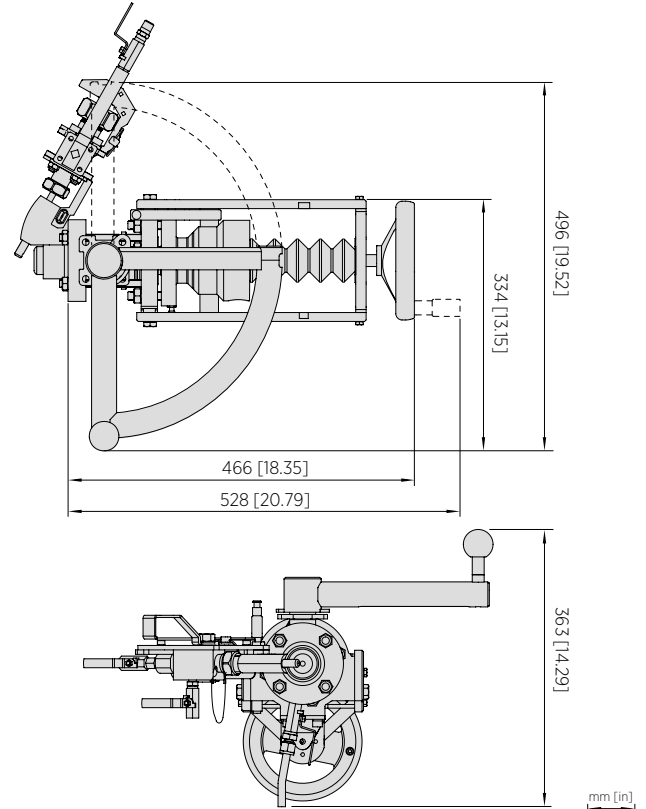
Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

## Accessories

Item	Item code
USB adapter for service port, for Insight service software (see <a href="http://www.vaisala.com/insight">www.vaisala.com/insight</a> )	USB2
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm <sup>2</sup> (AWG 21), PUR jacket, grey, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Cooling cover	ASM214675SP



Dimensions of PR53SD



Dimensions of PR53 SDI5 Safe-Drive isolation valve and retractor



## Wind and weather sensor technologies for measurements in industrial applications



### Wind and weather sensors

#### Vaisala ultrasonic wind sensors:

- Wind sensor with no moving parts
- Unique triangular design for accurate measurements from all directions
- Optional sensor heating available
- Maintenance free, no field calibration required
- Measurement range up to 90 m/s

#### Vaisala mechanical wind sensors:

- Accurate wind speed and direction sensors
- Fast and linear response
- Low measurement starting threshold
- Sensors with heating elements available for cold climates

#### Vaisala weather sensor:

- Measurement of the six essential weather parameters: wind speed and direction, liquid precipitation, barometric pressure, temperature, and relative humidity
- Feature proprietary Vaisala sensor technologies: WINDCAP®, RAINCAP®, HUMICAP®, and BAROCAP®

Vaisala's long history in wind and weather measurements started already in the 1930s from the development of a radiosonde to measure the conditions in the upper atmosphere. Today, Vaisala wind and weather instruments are used in dozens of applications and industries all over the world.

### Industrial applications for wind and weather measurements

Wind and weather data are required in many activities across industries. For example, in power industry, the efficiency of power lines is a function of wind speed and direction.

Nuclear power plants require wind data for safety reasons to be able to model the dispersion of potentially radioactive leakages. In addition to nuclear power plants, also chemical factories need to gather wind data for dispersion monitoring.

Accurate outdoor measurements are essential in operating modern buildings. Processes such as free cooling, natural ventilation, and automated shading are dependent on real-time weather data.

Ventilation control in greenhouses also relies on localized weather data to ensure an optimized environment for plant growth.

### Vaisala wind and weather instruments

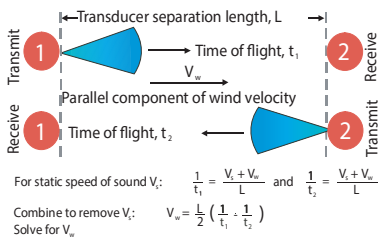
Vaisala manufactures wind and weather instruments for different applications, requirements and budgets. The wind sensor portfolio for industrial applications includes both mechanical and ultrasonic sensors. View the complete range of wind products at [www.vaisala.com/wind](http://www.vaisala.com/wind). Have a look at the multiparameter Vaisala Weather Transmitter WXT530 at [www.vaisala.com/wxt530](http://www.vaisala.com/wxt530).

# Vaisala sensor technologies for wind and rain measurements

## Vaisala WINDCAP Sensor

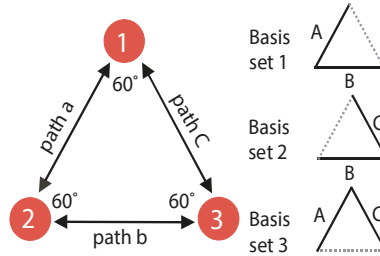
Vaisala WINDCAP Ultrasonic Wind Sensor uses ultrasound to determine wind speed and direction. The sensor has no moving parts, which makes it independent of the limitations of mechanical wind sensors such as friction, inertia, time constant, over-speeding, and starting threshold.

WINDCAP sensor features an array of three ultrasonic transducers oriented to form an equilateral triangle. Wind measurement is based on time of flight (TOF) of the sonic impulse – the time it takes for the signal to travel from one transducer to another. TOF is measured in both directions for each pair of transducer heads. Simple algebra allows solving for the parallel component of wind velocity independently of the static speed of sound.



The equilateral triangle configuration of the three transducers provides three possible sets of basis vectors. The combinations yield bi-directional

measurements on the paths labeled A, B, and C. These measurements are used to determine the wind velocity components parallel to each of the three paths.



## Vaisala RAINCAP Sensor

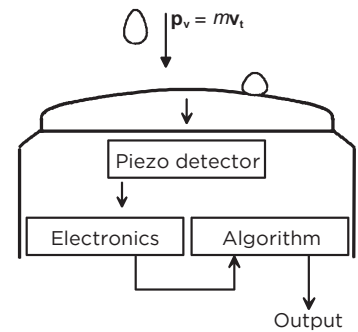
Vaisala RAINCAP Sensor is an acoustic sensor that measures the impact of individual raindrops on a smooth stainless steel surface using a piezoelectric detector. The sensor provides real time information on rain intensity, duration, and accumulated rainfall.

The RAINCAP sensor consists of a round stainless steel cover, approximately 90 mm in diameter mounted to a rigid frame. A piezoelectric detector is located beneath the cover.

Raindrops hit the RAINCAP sensor surface at terminal velocity, which is a function of the raindrop diameter. Rain measurement is based on acoustic

detection of each individual rain drop as it impacts the sensor cover. Larger drops create a larger acoustic signal than smaller drops.

The piezoelectric detector converts the acoustic signals into voltages. Total rain is calculated from the sum of the individual voltage signals per unit time and the known surface area of the RAINCAP sensor. In addition, the intensity and duration of rain can be calculated.



- $P_v$  = vertical momentum
- $m$  = mass of drop
- $v_t$  = terminal velocity of drop

## WA15 Wind Set

For high-performance wind measurement



### Features

- High-performance wind measurement set
- Long and successful track record in meteorological applications
- Accurate wind speed and direction measurement
- Low measurement starting threshold
- Conical anemometer cups provide excellent linearity
- Heated shaft prevents bearings from freezing

WA15 is based on accurate sensors installed on a cross-arm. It is designed for demanding wind measurement applications.

With a proven track record of successful installations, Vaisala Wind Set WA15 has earned its reputation as the industry standard in the wind sensor market.

WA15 consists of Vaisala Anemometer WAA151, Vaisala Wind Vane WAV151, an optional cross-arm, a power supply, and cabling.

### Anemometer with excellent linearity

WAA151 is a fast-response, low-threshold anemometer. Three lightweight, conical cups mounted on the cup wheel provide excellent linearity over the entire operating range, up to 75 m/s (168 mph). A wind-rotated chopper disc attached to the shaft of the cup wheel cuts an infrared light beam 14 times per revolution. This generates a pulse output from the phototransistor.

The output pulse rate is directly proportional to wind speed, for example, 246 Hz = 24.6 m/s (55 mph). However, for the highest accuracy, the characteristic transfer function must be used to compensate for starting inertia.

### Sensitive wind vane

WAV151 is a counter-balanced, low-threshold, optoelectronic wind vane. Infrared LEDs and phototransistors are mounted on 6 orbits on each side of a 6-bit GRAY-coded disc. Turned by the vane, the disc creates changes in the code received by the phototransistors. The output code resolution is  $\pm 2.8^\circ$ .

### Heated bearings withstand cold weather

Heating elements in the shaft tunnels of both the anemometer and vane keep the bearings above freezing temperatures in cold climates.

### Complete package available

The anemometer and vane are designed to be mounted on Vaisala cross-arms.

# Technical Data

## WAA151 measurement performance

Sensor/Transducer type	Cup anemometer/opto-chopper
Observation range	0.4 ... 75 m/s (0.9 ... 168 mph)
Starting threshold <sup>1)</sup>	< 0.5 m/s (1.1 mph)
Distance constant	4.0 m (13 ft 1 in)
<b>Transducer output</b>	
0 ... 75 m/s (0 ... 168 mph)	0 ... 750 Hz square wave
Characteristic transfer function	$U_f$ (wind speed) = $0.328 + 0.101 \times R$ (output pulse rate)
<b>Transducer output level</b>	
( $I_{out} < +5$ mA)	High state > $U_{in} -1.5$ V
( $I_{out} > -5$ mA)	Low state < 2.0 V
<b>Accuracy within 0.4 ... 60 m/s (0.9 ... 134 mph)</b>	
With characteristic transfer function (standard deviation)	$\pm 0.17$ m/s (0.38 mph)
With simple transfer function $U_f = 0.1 \times R$	$\pm 0.5$ m/s (1.12 mph) <sup>2)</sup>

<sup>1)</sup> Measured with the cup wheel in position least favored by flow direction. The optimum position yields a < 0.35 m/s (0.8 mph) starting threshold.

<sup>2)</sup> Typical error vs. speed with the simple transfer function used.

RANGE (m/s)	0-3	3-10	10-17	17-24	24-31	31-37	37-44	44-51	51-58	58-65
ERROR (m/s)	-0.4	-0.3	-0.2	-0.1	0.0	+0.1	+0.2	+0.3	+0.4	+0.5

## WAA151 inputs and outputs

Electrical connections	MIL-C-26482 type, 6-wire cable
Cabling	6-wire cable through cross-arm
Recommended connector at cable end	Souriau UTS6JCI0E6P
Operating power supply	$U_{in} = 9.5 \dots 15.5$ V DC, 20 mA, typical
Heating power supply	AC or DC 20 V, 500 mA, nominal
Settling time after power-up	< 30 $\mu$ s

## WAA151 operating environment

Operating temperature <sup>1)</sup>	-50 ... +55 °C (-58 ... +131 °F)
Storage temperature	-60 ... +70 °C (-76 ... +158 °F)
Operating humidity	0-100 %RH
IP rating	IP65

<sup>1)</sup> With shaft heating.

## WAA151 mechanical specifications

Dimensions (H $\times$ $\emptyset$ )	240 $\times$ 90 mm (9.45 $\times$ 3.54 in)
Swept radius of cup wheel	91 mm (3.58 in)
Weight	570 g (1.26 lb)
<b>Materials</b>	
Housing	AlMgSi, gray anodized
Cup	PA, reinforced with carbon fiber

## WAV151 measurement performance

Sensor/Transducer type	Optical code disc
Observation range at wind speed 0.4-75 m/s (0.9-168 mph)	0-360°
Starting threshold	< 0.4 m/s (0.9 mph)
Resolution	$\pm 2.8^\circ$
Damping ratio	0.19
Overshoot ratio	0.55
Delay distance	0.4 m (1 ft 4 in)
Accuracy	Better than $\pm 3^\circ$
Output	6-bit parallel GRAY code
<b>Transducer output level</b>	
( $I_{out} < +5$ mA)	High state > $U_{in} -1.5$ V
( $I_{out} > -5$ mA)	Low state < 1.5 V

## WAV151 inputs and outputs

Electrical connections	MIL-C-26482 type, 10-wire cable
Cabling	10-wire cable through cross-arm
Recommended connector at cable end	Souriau UTS6JCI2E10P
Operating power supply	$U_{in} = 9.5-15.5$ V DC, 20 mA typical
Heating power supply	20 V AC or DC, 500 mA nominal
Settling time after power turn-on	< 100 $\mu$ s

## WAV151 operating environment

Operating temperature <sup>1)</sup>	-50 ... +55 °C (-58 ... +131 °F)
Storage temperature	-60 ... +70 °C (-76 ... +158 °F)
Operating humidity	0-100 %RH
IP rating	IP65

<sup>1)</sup> With shaft heating.

## WAV151 mechanical specifications

Dimensions (H $\times$ $\emptyset$ )	300 $\times$ 90 mm (11.81 $\times$ 3.54 in)
Swept radius of vane	172 mm (6.77 in)
Weight	660 g (1.46 lb)
<b>Materials</b>	
Housing	AlMgSi, gray anodized
Vane	AISI 12, anodized

## WAA151 mechanical specifications

Junction box	125 $\times$ 80 $\times$ 57 mm (4.92 $\times$ 3.15 $\times$ 2.24 in)
Cross-arm length	800 mm (31.50 in)
Mounting to a pole mast with a nominal outside diameter	60 mm (2.36 in)

## WA15 compliance

Compliance marks	CE, China RoHS
EU directives and regulations	RoHS Directive (2011/65/EU) as amended by 2015/863 EMC Directive (2014/30/EU)
Electromagnetic compatibility (EMC)	EM 55032:2015, Electromagnetic compatibility of multimedia equipment - Emission requirements. Class B. EN 61326-1:2013, Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements.
Environmental	IEC/EN 63000:2018

## WA15 spare parts and accessories

Service kit for one WA15/25 sensor (a set of bearings and gasket)	16644WA
Cup assembly for WAA151	7150WA
Tail assembly for WAV151	6389WA
Sensor board for WAA151	1433WA
Sensor board for WAV151	1434WA
Attachment hardware for WAA151/252 and WAV151/252	16546WA
Cross-arm and serial RS-485 transmitter	WAC155
Component board for WAC155	WAC155CB
Cross-arm and termination box	WAC151
16-lead signal cable 10 m for WA15/25, open leads on both ends	ZZ45048
6-lead heating power cable 10 m for WA15/25, open leads on both ends	ZZ45049
Special length 16-lead signal cable for WA15/25, open leads on both ends	ZZ45048SPEC
Special length 6-lead heating power cable for WA15/25, open leads on both ends	ZZ45049SPEC
Sensor cable for WAA151/252 0.8 m (31.5 in) , open lead on one end (6 wires), connector 230118 on another end	ZZ45036
Sensor cable for WAV151/252 0.8 m (31.5 in), open lead on one end (10 wires), connector 230119 on another end	ZZ45037
Special length sensor cable for WAA151/252, open lead in one end (6 wires), connector 230118 on another end	ZZ45036SPEC
Special length sensor cable for WAV151/252, open lead in one end (10 wires), connector 230119 on another end	ZZ45037SPEC
Connector for WAA151, WAA252	230118
Connector for WAV151, WAV252	230119
Cross-arm and analog transmitter	WAT12
Component board for WAT12	16637WA
Power supply for WA15	WHP151
Power board for WHP151 power supply	WA35120



### Features

- WMO and ICAO compliant
- Data output rate 4 Hz and 8 Hz
- Stainless steel structure
- Maintenance-free
- 3-transducer layout provides accurate data
- Data format outputs: polar coordinates and vectors
- Fully compensates effects of temperature, humidity, and pressure
- Measurement range up to 90 m/s (201 mph)
- Heating up to 250 W
- IP66 and IP67
- Large transducers provide high ultrasound power
- Optional bird prevention kit
- Wind gust calculated according to WMO guidelines
- US National Weather Service and the FAA rely on Vaisala WINDCAP® technology

WMT700 Series has been designed for professional use in meteorology, aviation, maritime, wind energy, and many other applications.

Vaisala WINDCAP® Ultrasonic Wind Sensor WMT700 Series is a robust and reliable ultrasonic anemometer. It measures surface wind, which is one of the key parameters for meteorology and aviation.

WMT700 series meets WMO CIMO Guide (WMO-No.8) and ICAO requirements.

### Accurate and maintenance-free

WMT700 series has a durable full steel structure with welded arms, clear North indication, and one-point, quick bayonet-style mounting. It has no moving parts, and it is resistant to contamination and corrosion.

It measures accurately and produces reliable data in demanding wind conditions and climates without periodic or on-demand maintenance. Self-diagnostics and measurement validation are standard features. The 60-minute average is available for polar coordinates and vectors.

### Measurement based on ultrasound

WMT700 series uses ultrasound to determine the horizontal wind speed and direction. The measurement is based on transit time, the time it takes for the ultrasound to travel from one transducer to another, depending on the wind speed.

The transit time is measured in both directions for a pair of transducer heads. Using 2 measurements for each of the 3 ultrasonic paths at 60° angles to each other, WMT700 computes the wind speed and direction.

The wind measurement is calculated in a way that completely eliminates the effects of altitude, temperature, and humidity.

### Standard and heated models

WMT700 series operates with a power supply of 9 ... 36 V DC. For the heated model, an additional heating power supply of 24 ... 36 V DC is required.

Thermostatically controlled heaters in the transducer heads and arms of the heated model prevent build-up of freezing rain and snow. A model with a heated transducer, arms, and body is available for operation in the harshest and coldest environments.

In addition, accessories are available for mounting and connecting WMT700. To minimize interference from birds, a bird prevention kit is available.



DNV GL TYPE EXAMINATION  
CERTIFICATE No. TAA00000U5



# Technical data

## Wind speed measurement performance

Observation range	WMT701: 0 ... 40 m/s (89 mph) WMT702: 0 ... 65 m/s (145 mph) WMT703: 0 ... 75 m/s (168 mph) WMT704: 0 ... 90 m/s (201 mph)
Starting threshold	0.01 m/s (0.0223 mph)
Resolution	0.01 m/s (0.0223 mph)
Response time	250 ms
Accuracy	0 ... 75 m/s (168 mph): ±0.1 m/s (0.2 mph) or 2 % of reading, whichever is greater 75 ... 90 m/s (201 mph): ±5 % of reading

## Wind direction measurement performance

Observation range	0 ... 360°
Starting threshold	0.1 m/s (0.2 mph)
Resolution	0.01°
Response time	250 ms
Accuracy	±2°

## Powering specifications

Operating voltage	9 ... 36 V DC (absolute max. 40 V DC) <sup>1)</sup>
Heating voltage	24 ... 36 V DC (absolute max. 40 V DC) <sup>1)</sup>

### Heating power supply requirement <sup>2)</sup>

Heated transducers	Average 32 W Peak 40 W
Heated transducers and arms	Average 152 W Peak 200 W
Heated transducers, arms, and body	Average 252 W Peak 350 W at 24 V DC

<sup>1)</sup> In maritime environments, the normal input voltage ranges are: operating voltage 10 ... 30 V DC (-10 ... +30 %) and heating voltage 24 ... 30 V DC (-10 ... +30 %), as defined in the maritime standard IEC 60945.

<sup>2)</sup> The actual power consumption depends on the temperature.

## Messaging specifications

Readout update interval	4 Hz (default) and 8 Hz (optional)
Units available	m/s, knots, mph, km/h, V, mA, Hz
Operating mode	Automatic message or poll mode
Sonic temperature	Celsius degrees

## Mechanical specifications

Dimensions (H × W × Ø <sup>1)</sup> )	348 × 250 × 285 mm (13.70 × 9.84 × 11.22 in)
Weight	1.8 kg (4.0 lb)

### Materials

Body and arms, mounting kit	Stainless steel AISI 316
Transducers	Silicone
Connector housing surface	Nickel-plated brass

<sup>1)</sup> Diameter of area covered by transducers.

## Analog outputs

Wind speed	Voltage, current, frequency
Wind direction	Voltage, current, potentiometer

## Operating environment

Heating <sup>1)</sup>	0 W, 30 W, 150 W, or 250 W
Operating temperature <sup>1)</sup>	-10 ... +60 °C (+14 ... +140 °F) -40 ... +60 °C (-40 ... +140 °F) -55 ... +70 °C (-67 ... +158 °F)
Storage temperature	-60 ... +80 °C (-76 ... +176 °F)
IP rating	IP66 and IP67

<sup>1)</sup> For freezing conditions, select appropriate combination of heating and temperature ranges.

## Digital outputs

Communication interfaces	COM1: RS-485 COM2: RS-485, RS-422, RS-232, SDI-12
Communication profiles	WMT700, WS425 ASCII, NMEA Standard and Extended (version 0183), SDI-12 (version 1.3), WS425 ASOS, ROSA MES 12, customized
Bit rate	300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200
Available averages	Max. 3600 s

## Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863 REACH Regulation (EC 1907/2006)
EMC immunity	IEC 61326-1:2013, IEC 60945
EMC emissions	CISPR 32 / EN 55032, Class B
Environmental	IEC 60068-2-1, 2, 6/34, 30, 31, 67, 78, IEC 60529 VDA 621-415
Maritime	IEC 60945:2002 + IEC 60945/Cor1:2008, DNVGL-CG-0339
Electrical safety	UL 61010-1 CAN/CSA C22.2 No. 61010-1-12
Compliance marks	CE, China RoHS, RCM, UKCA
Listing marks	SGS (USA and Canada)



### Features

- Right parameter combination
- Easy to use and integrate
- Weather parameter hub
- Analog sensors can be added
- Compact, lightweight
- Low power consumption
- mA output suitable for industrial applications
- Cost-effective
- DNV GL Type Examination

Vaisala Weather Transmitter WXT530 is a unique series of sensors with parameter combinations that allow you to choose what is right for your application. WXT530 is a flexible, integrated building block for weather applications. WXT530 series improves your grip on weather.

### Flexibility

WXT530 is a series of weather instruments that provides 6 of the most important weather parameters: air pressure, temperature, humidity, rainfall, wind speed and direction through various combinations. You can select the transmitter with the needed parameter(s) into your weather application, with a large variety of digital communication modes and wide range of voltages. A heated option is available. Low power consumption enables solar panel applications. WXT530 Series focuses on maintenance-free operations in a cost-effective manner.

### Integration

The series offers analog input options for additional third-party analog sensors. With the help of the built-in analog-to-digital converters, you can turn WXT530 into a small, cost-effective weather parameter hub.

Additional parameters include solar radiation and external temperature sensor. Further, the analog mA output for wind speed and wind direction enables a wide variety of industrial applications. WXT530 exceeds IEC60945 maritime standard.

### Solid performance

WXT530 Series has a unique Vaisala solid-state sensor technology. To measure wind, Vaisala WINDCAP® ultrasonic wind sensors are applied to determine horizontal wind speed and direction. Barometric pressure, temperature, and humidity measurements are combined in the PTU module. The PTU module is easy to change without any contact with the sensors. The precipitation measurement is based on the unique acoustic Vaisala RAINCAP® Sensor without flooding, clogging, wetting, and evaporation losses.

Option	Rain	Wind	PTU <sup>1)</sup>
WXT531	✓		
WXT532		✓	
WXT533	✓	✓	
WXT534			✓
WXT535	✓		✓
WXT536	✓	✓	✓

1) PTU is a compact changeable module. Vaisala recommends changing it every 2 years.



DNV GL TYPE EXAMINATION  
CERTIFICATE No. TAA00000VF



# Technical data

## Barometric pressure measurement performance

Observation range	500–1100 hPa
Accuracy (for sensor element) at 600–1100 hPa	±0.5 hPa at 0 ... +30 °C (+32 ... +86 °F) ±1 hPa at –52 ... +60 °C (–60 ... +140 °F)
Output resolution	0.1 hPa / 10 Pa / 0.001 bar / 0.1 mmHg / 0.01 inHg

## Air temperature measurement performance

Observation range	–52 ... +60 °C (–60 ... +140 °F)
Accuracy (for sensor element) at +20 °C (+68 °F)	±0.3 °C (±0.54 °F)
Output resolution	0.1 °C (0.1 °F)

## Relative humidity measurement performance

Observation range	0–100 %RH
Accuracy (for sensor element)	±3 %RH at 0–90 %RH ±5 %RH at 90–100 %RH
Output resolution	0.1 %RH

## Wind measurement performance

Wind speed	
Observation range	0–60 m/s (134 mph)
Reporting range	0–75 m/s (168 mph)
Response time	0.25 s
Available variables	Average, maximum, and minimum
Accuracy	±3 % at 10 m/s (22 mph)
Output resolution	0.1 m/s (km/h, mph, knots)
Wind direction	
Azimuth	0–360°
Response time	0.25 s
Available variables	Average, maximum, and minimum
Accuracy	±3.0° at 10 m/s (22 mph)
Output resolution	1°
Averaging time	1–3600 s, sample rate 1, 2, or 4 Hz (configurable)

## Mechanical specifications

Weight	
WXT534, WXT535, WXT536	0.7 kg (1.54 lb)
WXT531, WXT532, WXT533	0.5 kg (1.1 lb)

## Operating environment

Operating environment	Outdoor use
Operating temperature	–52 ... +60 °C (–60 ... +140 °F)
Storage temperature	–60 ... +70 °C (–76 ... +158 °F)
Operating humidity	0–100 %RH
Operating pressure	500–1100 hPa
Wind <sup>1)</sup>	0–60 m/s (0–134 mph)
IP rating	Without mounting kit: IP65 With mounting kit: IP66

<sup>1)</sup> Due to the measurement frequency used in the sonic transducers, RF interference in the 200–400 kHz range can disturb wind measurement.

## Precipitation measurement performance

Collecting area	60 cm <sup>2</sup> (9.3 in <sup>2</sup> )
<b>Rainfall</b> <sup>1)</sup>	
Output resolution	0.01 mm (0.001 in)
Field accuracy for daily accumulation	Better than 5 %, weather-dependent
Duration	Counting each 10-second increment whenever droplet detected
Duration output resolution	10 s
Intensity	Running 1-minute average, 10 s steps
Intensity observation range	0–200 mm/h (0–7.87 in/h) (broader with reduced accuracy)
Intensity output resolution	0.1 mm/h (0.01 in/h)
<b>Hail</b> <sup>2)</sup>	
Output resolution	0.1 hits/cm <sup>2</sup> (1 hits/in <sup>2</sup> ), 1 hit
Intensity output resolution	0.1 hits/cm <sup>2</sup> h (1 hits/in <sup>2</sup> h), 1 hit/h

<sup>1)</sup> Cumulative accumulation after the latest automatic or manual reset.  
<sup>2)</sup> Cumulative number of hits against collecting surface.

## Inputs and outputs

Operating voltage	6–24 V DC (–10 ... +30 %)
Average power consumption	Minimum: 0.1 mA at 12 V DC (SDI-12 standby) Typical: 3.5 mA at 12 V DC (typical measuring intervals) Maximum: 15 mA at 6 V DC (constant measurement of all parameters)
Heating voltage	DC, AC, or full-wave rectified AC 12–24 V DC (–10 ... +30 %) 12–17 V AC <sub>rms</sub> (–10 ... +30 %)
Typical heating current	12 V DC: 800 mA, 24 V DC: 400 mA
Digital outputs	SDI-12, RS-232, RS-485, RS-422
Communication protocols	SDI-12 v1.3, Modbus RTU, ASCII automatic and polled, NMEA 0183 v3.0 with query option

## WXT536 analog input options

Solar radiation	0–25 mV
Voltage input	0–2.5 V, 0–5 V, 0–10 V
Tipping bucket rain gauge	0–100 Hz
Temperature (Pt1000)	800–1330 Ω

## WXT532 analog mA output options

When the analog output option is applied, digital communication is not available.	
Wind speed	0–20 mA or 4–20 mA
Wind direction	0–20 mA or 4–20 mA

## Compliance

EU directives and regulations	EMC, RoHS
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B
Environmental	IEC 60068-2-1, 2, 6, 14, 30, 31, 78 IEC 60529, VDA 621-415
Maritime	IEC 60945 (Exposed) DNV GL Type Examination Certificate No. TAA00000VF
Compliance marks	CE, RCM, RoHS, China RoHS, UKCA



### Much more than just a calibration

#### The calibration services include:

- Traceable multi-point calibration
- Instrument adjustment to meet its original specifications
- Filter replacement as needed
- Calibration certificate with as-found and as-left results
- Software updates
- Service report
- Calibration dates update
- Visit [store.vaisala.com](https://store.vaisala.com) to order calibrations and repairs online 24/7 or read more at [vaisala.com/calibration](https://vaisala.com/calibration)

Regular calibration of measurement instruments ensures continuous accuracy and regulatory compliance for your Vaisala products. As a manufacturer, Vaisala offers high-quality calibration services to ensure your instrument will meet its original accuracy and performance after the service. Order on-demand or through a multi-year Calibration Care Agreement.

## Service Center calibration options

### Standard

Matches the original factory calibration performed on new instruments

In compliance with  
**ISO 9001**  
quality requirements

### Accredited

Calibration especially for regulated industries and reference instruments

In compliance with  
**ISO/IEC 17025**  
quality requirements

Available from Online store 24/7



Our service centers are **accredited** according ISO/IEC 17025 meeting the tightest quality requirements



## Selecting the right filter for humidity instruments



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 or 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 <sup>1)</sup>**

	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
<b>Example image</b>					
<b>Particulate protection</b>	★★★★☆	★★★★☆	★★★★☆	★★★★★	★★★★☆
<b>Mechanical protection</b>	★★★★☆	★★★★☆	★★★★★	★★★★★	★★★★★
<b>Response time</b>	★★★★☆	★★★★☆	★★☆☆☆	★☆☆☆☆	★★★★☆
<b>Typical use / Features</b>	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
<b>High-end probes</b>					
HMP series, HMT330, HMT310, HMT360, HMT370EX, HMM170	<b>DRW010281SP</b>	—	—	HM47280SP	—
DMP series, DMT340	DRW010281SP	—	—	<b>HM47280SP</b>	—
<b>Compact humidity probes</b>					
HMP110, HMP60, HMT120, HMT130	—	<b>DRW010525SP</b>	ASM212652SP	HM46670SP	—
HMP113, HMP63, RFL100	—	<b>ASM210856SP</b>	—	HM47280SP	—
<b>Handhelds</b>					
HM40	—	For HM41 and HM45: ASM210856SP For HM46: 10159HM	For HMP42: 19867HM, 19858HM	For HM46: 0195 (brass)	—
HM70	For HMP77: DRW010281SP	10159HM	—	<b>DRW212987SP</b> (brass) HM47280SP	—
DM70	DRW010281SP	—	—	<b>HM47280SP</b>	—
<b>OEM models</b>					
DMT143	—	—	—	<b>DRW010335SP</b>	—
DMT143L	—	—	—	<b>HM47280SP</b>	—
DMT152	—	—	—	—	<b>220957SP</b>
DPT146	—	—	—	—	<b>220957SP</b>

1) Recommended filter marked in bold.

**OTHER FILTERS <sup>1)</sup>**

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

1) Recommended filter marked in bold.

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