

Product Catalog

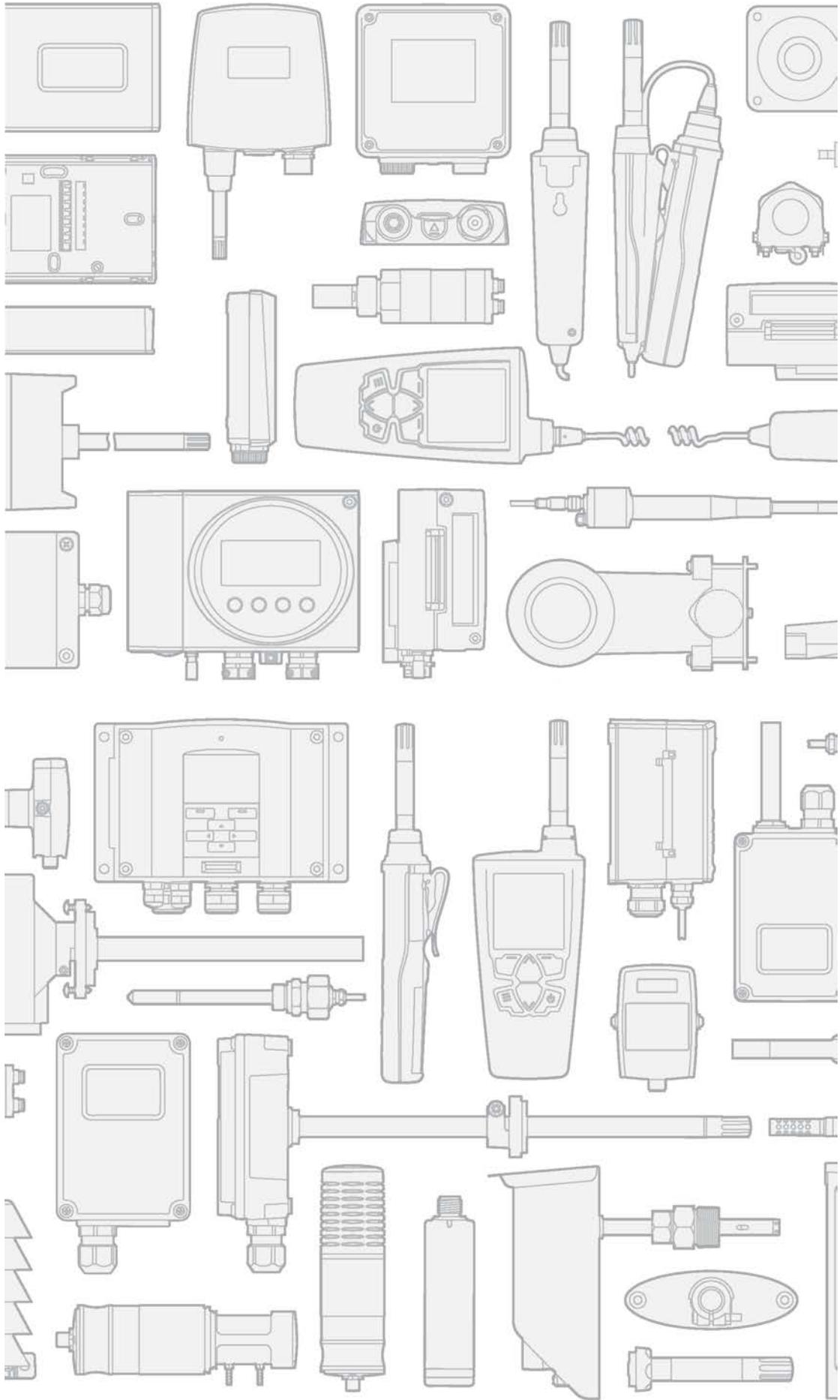
Humidity, Temperature, Dew Point, Carbon Dioxide, Moisture in Oil, Continuous Monitoring, Dissolved Gas Analysis, Hydrogen Peroxide, Pressure, Weather, Service Offering

Industrial Measurements



VAISALA

| | |
|--|--|
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Observations for a Better World

Vaisala Industrial Measurements business area serves customers in multiple industries with over 40 years of industry knowledge. Our products improve quality, productivity, energy efficiency, and help our customers fulfill regulatory compliance. Our customers operate in different types of environments - from semi-conductor factories and high-rise buildings to power plants and small incubators - where reliable measuring and monitoring of the conditions are a prerequisite for successful operations.

Industrial Measurement Solutions

Vaisala's measurement products are used by a variety of industries, such as pharmaceutical, electronics, automotive, maritime, lithium battery manufacturing and food processing. Accurate and reliable real-time measurements extend equipment lifetime, and improve processes, productivity and end-product quality.

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.

Life Science and GxP Regulated Environments

Vaisala provides measurement devices and monitoring systems for continuous records, reports and alarms. These solutions are used to monitor for example 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.

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 gives an overview of our products to help you select what suits your needs best. For more information, visit us at www.vaisala.com or contact us at www.vaisala.com/requestinfo.



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Features

- Plug-and-play probe connection for Vaisala Indigo-compatible probes:
 - CO₂ probes GMP251 and GMP252
 - Vaporized hydrogen peroxide probe HPP272
 - Humidity and temperature probes HMP4, HMP5, HMP7 and HMP8
 - Temperature probe TMP1
- Wireless interface for configuration and temporary use
- Operating temperature: -40 ... +60 °C, with display -20 ... +60 °C
- LCD color display (optional non-display version for analog model)
- IP65 enclosure
- 24 V power supply input
- Indigo 201: 3 analog outputs (mA or V)
- Indigo 202: RS-485 with Modbus RTU
- 2 configurable relays

Vaisala Indigo 200 series transmitters are host devices for displaying measurement values from Vaisala Indigo compatible probes and/or transmitting them to automation systems through analog signals, Modbus RTU communication or relays.

These probe hosts are plug-and-play devices for current and future Vaisala Indigo compatible probes. The host device has a color LCD display; Indigo 201 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 Indigo 200 and the probe.

Indigo 200 has a browser-based wireless configuration interface for mobile devices and computers that support a wireless connection (IEEE 802.11 b/g/n WLAN). The host device and the probes connected to it can be configured using the wireless user interface. It also allows for temporary viewing of the measurement data.

The surface of the Indigo 200 enclosure is smooth, which makes it easy to clean. It is also resistant to dust and most chemicals, such as, H₂O₂ and alcohol-based cleaning agents.



Wireless Configuration Interface Example (Desktop and Mobile Views)

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

Technical Data

General

- Supports Indigo compatible probes:
 - CO₂ probes GMP251 and GMP252
 - Vaporized hydrogen peroxide probe HPP272
 - Humidity and temperature probes HMP4, HMP5, HMP7 and HMP8
 - Temperature probe TMP1
- LCD color display version (Indigo 201: optional non-display)
- Wireless (WLAN) configuration interface: connect to the Indigo 200 and use the browser-based user interface for device configuration and measurement data viewing.

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"> • H₂O₂ (6000 ppm, non-condensing) • Alcohol-based cleaning agents such as ethanol and IPA (max. 70 % concentrate) |

Inputs and Outputs

| | |
|--------------------|---|
| Relay contacts x 2 | Max. switching power 30 W Max. switching current 1 A Max. switching voltage 40 VDC / 28 VAC |
|--------------------|---|

Indigo 201 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 |
|-------------------------------------|---|

Indigo 202 Model

| | |
|------------------------|--------------------|
| Digital communications | RS-485, Modbus RTU |
|------------------------|--------------------|

Mechanical Specifications

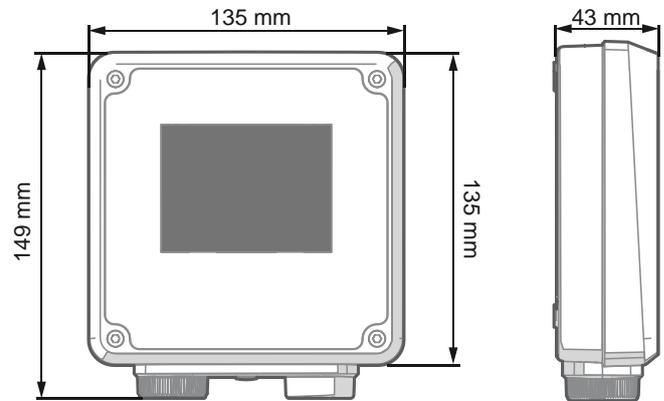
| | |
|----------------------------|------------------------------------|
| Housing classification | IP65 |
| Housing material | PC/ABS plastic |
| Display window material | PMMA plastic |
| Connection screw terminals | 26 AWG ... 20 AWG |
| Weight | 402 g (14.2 oz) |
| Dimensions (H×W×D) | 149×135×43 mm (5.87×5.31×1.7 inch) |

Compliance

| | |
|---|---|
| Safety standard | IEC/UL/EN 61010-1 |
| Networking standards (wireless configuration interface WLAN access point) | IEEE 802.11 b/g/n compliant |
| EMC compliance | EN61326-1, Generic Environment |
| Contains | FCC ID QOQ-WGM110, IC 5123A-WGM110, MIC 209-J00197, MSIP-CRM-BGT-WGM110 |

Spare Parts and Accessories

| | |
|------------------------------|----------------|
| Probe connection cable, 1 m | INDIGOCABLE1M |
| Probe connection cable, 3 m | INDIGOCABLE3M |
| Probe connection cable, 5 m | INDIGOCABLE5M |
| Probe connection cable, 10 m | INDIGOCABLE10M |



Product Dimensions

Note: All GMP251 and GMP252 probes manufactured from 2017 onwards (serial numbers starting with the letter N or latter in alphabetical order) have full Indigo compatibility.

HMP4 Relative Humidity and Temperature Probe

For Pressurized and Vacuum Processes



Features

- RH accuracy up to 0.8 %RH
- Temperature accuracy up to 0.1 °C (0.18 °F)
- Temperature measurement range -70 ... +180 °C (-94 ... +356 °F)
- Operating pressure 0 ... 10 MPa (0 ... 100 bar)
- Sensor purge provides superior chemical resistance
- Modbus RTU over RS-485
- Plug & play compatible with Indigo series of transmitters
- Traceable calibration certificate: 5 points for humidity, 1 point for temperature

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

Proven Vaisala HUMICAP® Performance

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

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

Chemical Purge Minimizes Effects of Contaminants

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

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

Flexible Connectivity

The probe is plug and play compatible with Vaisala Indigo series of transmitters, or it can be used as a standalone digital Modbus RTU transmitter over RS-485 serial bus. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software (for Windows® 7, 8.1 and 10: see www.vaisala.com/insight).

Vaisala Indigo Product Family

Indigo transmitters offer a variety of connectivity options through analog signals or digital outputs, configurable relays, and wireless (WLAN) configuration interface, providing a suitable solution for all industrial humidity measurements. The cable length between the probe and transmitter can be extended to up to 30 meters. For more information, see www.vaisala.com/indigo.

Technical Data

Measurement Performance

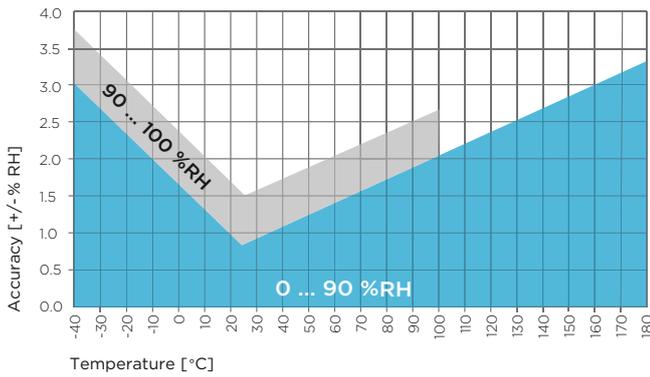
Relative Humidity

| | |
|---|-------------------------|
| Sensor | HUMICAP R2 Composite |
| Measurement range | 0 ... 100 %RH |
| Accuracy at +23 °C (+73.4 °F) ¹⁾ | ±0.8 %RH (0 ... 90 %RH) |
| T ₆₃ response time | 15 s |

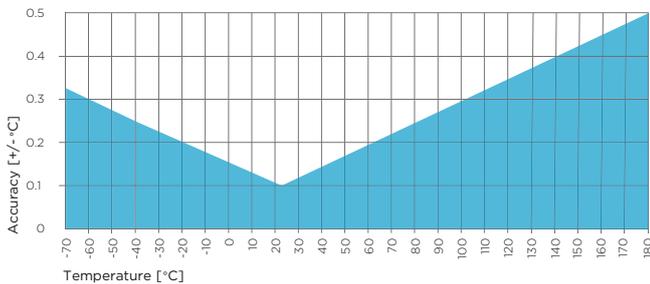
Temperature

| | |
|------------------------|-----------------------------------|
| Sensor | Pt100 RTD Class F0.1 IEC 60751 |
| Measurement range | -70 ... +180 °C (-94 ... +356 °F) |
| Accuracy ¹⁾ | ±0.1 °C (±0.18 °F) |

¹⁾ Defined against calibration reference



HMP4 Humidity Measurement Accuracy as a Function of Temperature (Including Non-Linearity and Repeatability)



HMP4 Temperature Measurement Accuracy over Full Range (Including Non-Linearity and Repeatability)

Operating Environment

| | |
|--|-----------------------------------|
| Operating temperature range for probe body | -40 ... +80 °C (-40 ... +176 °F) |
| Operating temperature range for probe head | -70 ... +180 °C (-94 ... +356 °F) |
| Operating environment | Suitable for outdoor use |
| IP rating | IP66 |
| Electromagnetic compatibility | EN61326-1, industrial environment |
| Operational pressure | < 100 bar |

Inputs and Outputs

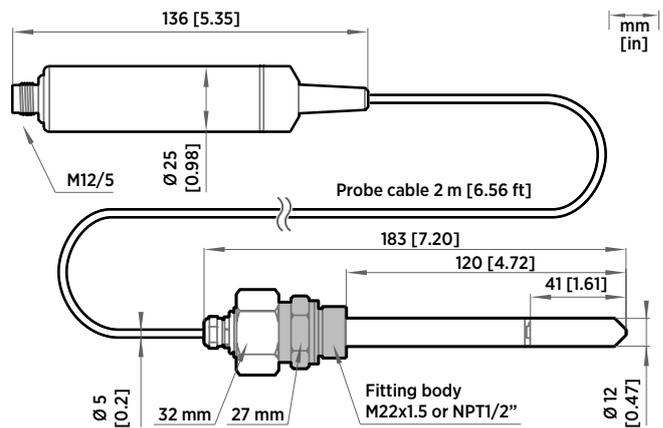
| | |
|-------------------------|----------------------------|
| Operating voltage | 15 ... 30 VDC |
| Current consumption | 10 mA typical, 500 mA max. |
| Digital output | RS-485, non-isolated |
| Default serial settings | 19200 bps N 8 2 |
| Protocols | Modbus RTU |

Output Parameters

Relative humidity, temperature, dew point temperature, wet-bulb temperature, absolute humidity, mixing ratio, water concentration, water mass fraction, water vapor pressure, enthalpy

Mechanical Specifications

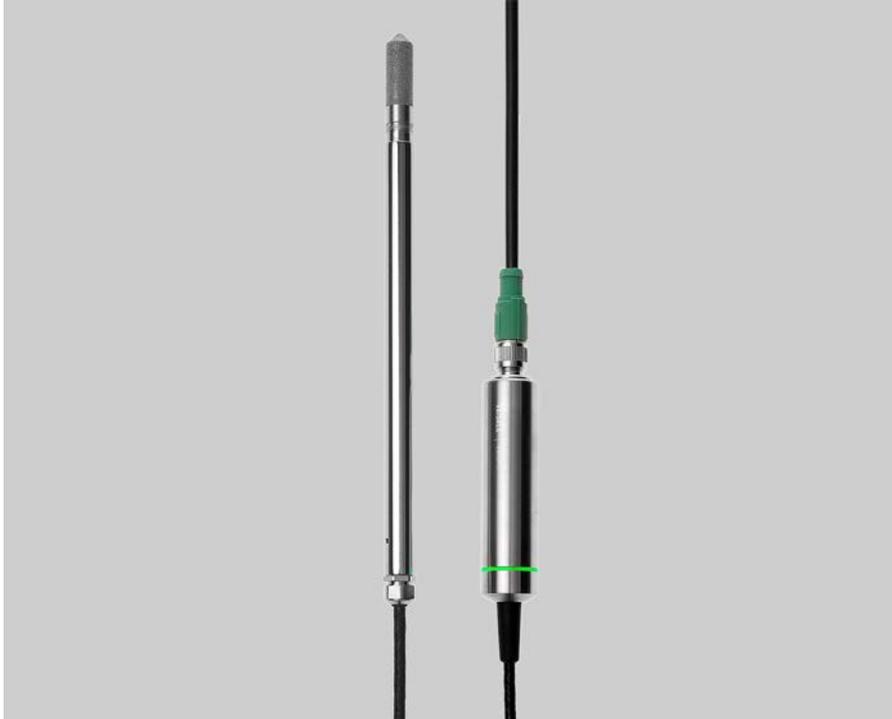
| | |
|------------------|---------------------------------------|
| Probe fitting | M22x1.5 and NPT1/2" fittings included |
| Connector | M12/5 |
| Weight | 530 g (18.7 oz) |
| Materials | |
| Probe | AISI316 |
| Probe body | AISI316 |
| Cable jacket | FEP |



HMP4 Probe Dimensions

SI Traceable Calibration

| | |
|--|---|
| Uncertainty of relative humidity calibration ($k = 2$) | ±0.5 %RH (0 ... 40 %RH) ±0.8 %RH (40 ... 95 %RH) |
| Uncertainty of temperature calibration ($k = 2$) | ±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F) |



Features

- RH accuracy up to 0.8 %RH
- Temperature accuracy up to 0.1 °C (0.18 °F)
- Temperature measurement range -70 ... +180 °C (-94 ... +356 °F)
- Operating temperature range for probe body -40 ... +80 °C (-40 ... +176 °F)
- Sensor purge provides superior chemical resistance
- Modbus RTU over RS-485
- 250-mm (9.84 in) probe allows easy process installation through insulation
- Plug & play compatible with Indigo series of transmitters
- Traceable calibration certificate: 5 points for humidity, 1 point for temperature

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

Proven Vaisala HUMICAP® Performance

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

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

Chemical Purge Minimizes Effects of Contaminants

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

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

Flexible Connectivity

The probe is plug and play compatible with Vaisala Indigo series of transmitters, or it can be used as a standalone digital Modbus RTU transmitter over RS-485 serial bus. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software (for Windows® 7, 8.1 and 10: see www.vaisala.com/insight).

Vaisala Indigo Product Family

Indigo transmitters offer a variety of connectivity options through analog signals or digital outputs, configurable relays, and wireless (WLAN) configuration interface, providing a suitable solution for all industrial humidity measurements. The cable length between the probe and transmitter can be extended to up to 30 meters. For more information, see www.vaisala.com/indigo.

Technical Data

Measurement Performance

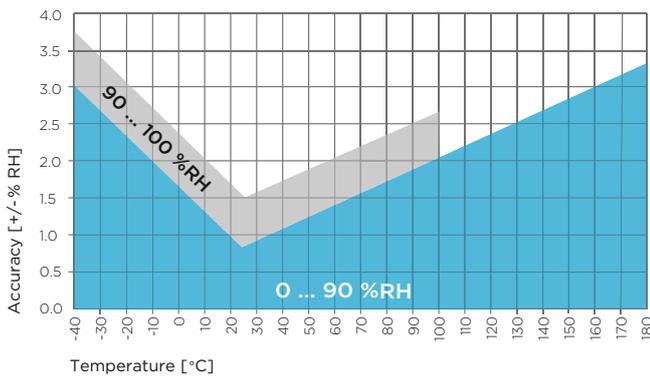
Relative Humidity

| | |
|---|-------------------------|
| Sensor | HUMICAP R2 Composite |
| Measurement range | 0 ... 100 %RH |
| Accuracy at +23 °C (+73.4 °F) ¹⁾ | ±0.8 %RH (0 ... 90 %RH) |
| T ₆₃ response time | 15 s |

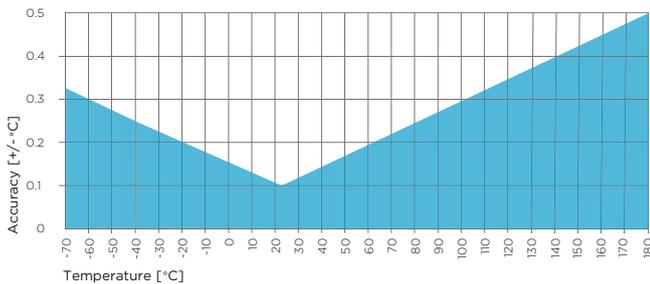
Temperature

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

¹⁾ Defined against calibration reference



HMP5 Humidity Measurement Accuracy as a Function of Temperature (Including Non-Linearity and Repeatability)



HMP5 Temperature Measurement Accuracy over Full Range (Including Non-Linearity and Repeatability)

Operating Environment

| | |
|--|--|
| Operating temperature range for probe body | -40 ... +80 °C (-40 ... +176 °F) |
| Operating temperature range for probe head | -70 ... +180 °C (-94 ... +356 °F) |
| Operating environment | Suitable for outdoor use |
| IP rating | IP66 |
| Electromagnetic compatibility | Complies with EMC standard EN61326-1, Electrical equipment for measurement, control and laboratory use - EMC requirements - Industrial environment |

Inputs and Outputs

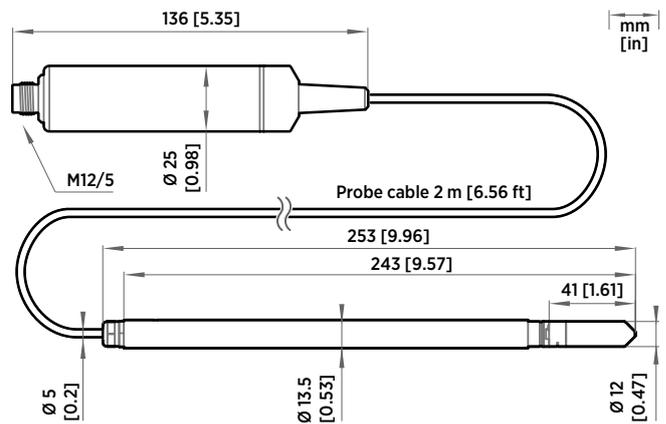
| | |
|-------------------------|------------------------------|
| Operating voltage | 15 ... 30 VDC |
| Current consumption | 10 mA typical 500 mA max. |
| Digital output | RS-485, non-isolated |
| Default serial settings | 19200 bps N 8 2 |
| Protocols | Modbus RTU |

Output Parameters

Relative humidity, temperature, dew point temperature, wet-bulb temperature, absolute humidity, mixing ratio, water concentration, water mass fraction, water vapor pressure, enthalpy

Mechanical Specifications

| | |
|------------------|------------------|
| Connector | M12/5 |
| Weight | 436 g (15.37 oz) |
| Materials | |
| Probe | AISI316L |
| Probe body | AISI316L |
| Cable jacket | FEP |



HMP5 Probe Dimensions

SI Traceable Calibration

| | |
|--|---|
| Uncertainty of relative humidity calibration ($k = 2$) | ±0.5 %RH (0 ... 40 %RH) ±0.8 %RH (40 ... 95 %RH) |
| Uncertainty of temperature calibration ($k = 2$) | ±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F) |



Features

- RH accuracy up to 0.8 %RH
- Temperature accuracy up to 0.1 °C (0.18 °F)
- Temperature measurement range -70 ... +180 °C (-94 ... +356 °F)
- Vapor and pressure proof construction
- Probe and sensor warming functions minimize condensation on probe
- Sensor purge provides superior chemical resistance
- Modbus RTU over RS-485
- Plug & play compatible with Indigo series of transmitters
- Traceable calibration certificate: 5 points for humidity, 1 point for temperature

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

Proven Vaisala HUMICAP® Performance

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

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

Avoiding Condensation at Extreme Humidity

Probe heating functionality heats up not only the sensor, but the whole probe head. When probe temperature is heated above dew point temperature,

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

Vaisala Indigo Product Family

Indigo transmitters offer a variety of connectivity options through analog signals or digital outputs, configurable relays, and wireless (WLAN) configuration interface, providing a suitable solution for all industrial humidity measurements. The cable

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

Flexible Connectivity

The probe is plug and play compatible with Vaisala Indigo series of transmitters, or it can be used as a standalone digital Modbus RTU transmitter over RS-485 serial bus. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software (for Windows® 7, 8.1 and 10: see www.vaisala.com/insight).

Technical Data

Measurement Performance

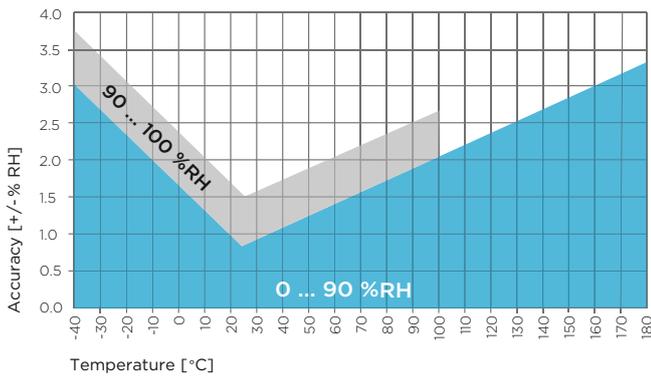
Relative Humidity

| | |
|---|-------------------------|
| Sensor | HUMICAP R2 Composite |
| Measurement range | 0 ... 100 %RH |
| Accuracy at +23 °C (+73.4 °F) ¹⁾ | ±0.8 %RH (0 ... 90 %RH) |
| T ₆₃ response time | 15 s |

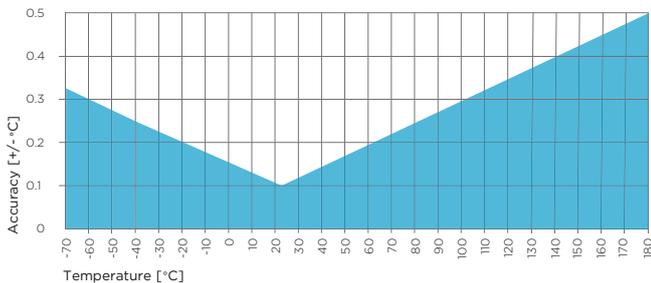
Temperature

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

¹⁾ Defined against calibration reference



HMP7 Humidity Measurement Accuracy as Function of Temperature (Including Non-Linearity and Repeatability).



HMP7 Temperature Measurement Accuracy over Full Range (Including Non-Linearity and Repeatability)

Operating Environment

| | |
|--|---|
| Operating temperature range for probe body | -40 ... +80 °C (-40 ... +176 °F) |
| Operating temperature range for probe head | -70 ... +180 °C (-94 ... +356 °F) |
| Operating environment | Suitable for outdoor use |
| IP rating | IP66 |
| Electromagnetic compatibility | EN61326-1, Electrical equipment for measurement, control and laboratory use - EMC requirements - Industrial environment |

Inputs and Outputs

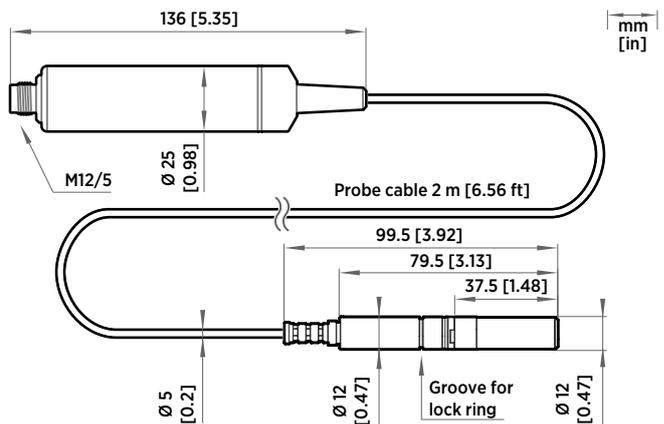
| | |
|-------------------------|------------------------------|
| Operating voltage | 18 ... 30 VDC |
| Current consumption | 10 mA typical 500 mA max. |
| Digital output | RS-485, non-isolated |
| Default serial settings | 19200 bps N 8 2 |
| Protocols | Modbus RTU |

Output Parameters

Relative humidity, temperature, dew point temperature, wet-bulb temperature, absolute humidity, mixing ratio, water concentration, water mass fraction, water vapor pressure, enthalpy

Mechanical Specifications

| | |
|------------------|-----------------|
| Connector | M12/5 |
| Weight | 310 g (10.9 oz) |
| Materials | |
| Probe | AlSi316L |
| Probe body | AlSi316L |
| Cable jacket | FEP |



HMP7 Probe Dimensions

SI Traceable Calibration

| | |
|--|---|
| Uncertainty of relative humidity calibration ($k = 2$) | ±0.5 %RH (0 ... 40 %RH) ±0.8 %RH (40 ... 95 %RH) |
| Uncertainty of temperature calibration ($k = 2$) | ±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F) |

HMP8 Relative Humidity and Temperature Probe

For Pressurized and Vacuum Processes



Features

- RH accuracy up to 0.8 %RH
- Temperature accuracy up to 0.1 °C (0.18 °F)
- Operating pressure 0 ... 4 MPa (0 ... 40 bar)
- Temperature measurement range -70 ... +180 °C (-94 ... +356 °F)
- Sensor purge provides superior chemical resistance
- Probe installation depth can be freely adjusted and probe can be hot-swapped from pressurized pipelines with an installation valve
- Modbus RTU over RS-485
- Plug & play compatible with Indigo series of transmitters
- Traceable calibration certificate: 5 points for humidity, 1 point for temperature

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

Proven Vaisala HUMICAP® Performance

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

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

Chemical Purge Minimizes Effects of Contaminants

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

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

Flexible Connectivity

The probe is plug and play compatible with Vaisala Indigo series of transmitters, or it can be used as a standalone digital Modbus RTU transmitter over RS-485 serial bus. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight™ Software (see www.vaisala.com/insight).

Vaisala Indigo Product Family

Indigo transmitters offer a variety of connectivity options through analog signals or digital outputs, configurable relays, and wireless (WLAN)

configuration interface, providing a suitable solution for all industrial humidity measurements. The cable length between the probe and transmitter can be extended to up to 30 meters. For more information, see www.vaisala.com/indigo.

Technical Data

Measurement Performance

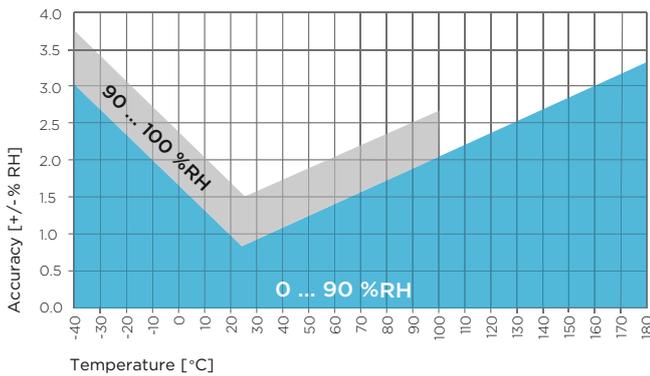
Relative Humidity

| | |
|---|-------------------------|
| Sensor | HUMICAP R2 Composite |
| Measurement range | 0 ... 100 %RH |
| Accuracy at +23 °C (+73.4 °F) ¹⁾ | ±0.8 %RH (0 ... 90 %RH) |
| T ₆₃ response time | 15 s |

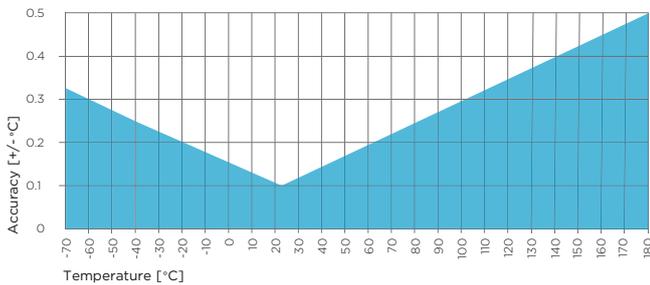
Temperature

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

¹⁾ Defined against calibration reference



HMP8 Humidity Measurement Accuracy as a Function of Temperature (Including Non-Linearity and Repeatability)



HMP8 Temperature Measurement Accuracy over Full Range (Including Non-Linearity and Repeatability)

Operating Environment

| | |
|--|--|
| Operating temperature range for probe body | -40 ... +80 °C (-40 ... +176 °F) |
| Operating temperature range for probe head | -70 ... +180 °C (-94 ... +356 °F) |
| Operating environment | Suitable for outdoor use |
| IP rating | IP66 |
| Electromagnetic compatibility | Complies with EMC standard EN61326-1, Electrical equipment for measurement, control and laboratory use - EMC requirements - Industrial environment |
| Operational pressure | < 40 bar |

Inputs and Outputs

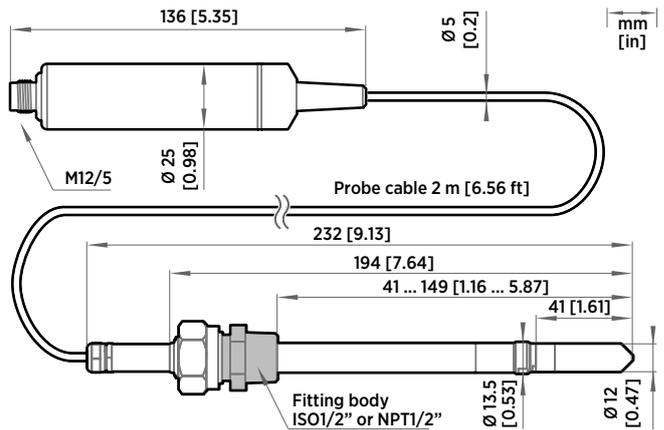
| | |
|-------------------------|------------------------------|
| Operating voltage | 15 ... 30 VDC |
| Current consumption | 10 mA typical 500 mA max. |
| Digital output | RS-485, non-isolated |
| Default serial settings | 19200 bps N 8 2 |
| Protocols | Modbus RTU |

Output Parameters

Relative humidity, temperature, dew point temperature, wet-bulb temperature, absolute humidity, mixing ratio, water concentration, water mass fraction, water vapor pressure, enthalpy

Mechanical Specifications

| | |
|------------------|---------------------------------------|
| Probe fitting | ISO1/2" and NPT1/2" fittings included |
| Connector | M12/5 |
| Weight | 570 g (20.1 oz) |
| Materials | |
| Probe | AISI316L |
| Probe body | AISI316L |
| Cable jacket | FEP |



HMP8 Probe Dimensions

SI Traceable Calibration

| | |
|--|---|
| Uncertainty of relative humidity calibration ($k = 2$) | ±0.5 %RH (0 ... 40 %RH) ±0.8 %RH (40 ... 95 %RH) |
| Uncertainty of temperature calibration ($k = 2$) | ±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F) |



Features

- Temperature accuracy up to 0.1 °C (0.18 °F)
- Temperature measurement range -70 ... +180 °C (-94 ... +356 °F)
- Modbus RTU over RS-485
- Plug & play compatible with Indigo series of transmitters
- Traceable 2-point calibration certificate (calibration points at +20 and +70 °C (+68 and +158 °F))

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

Flexible Connectivity

The probe is plug and play compatible with Vaisala Indigo series of transmitters, or it can be used as a standalone digital Modbus RTU transmitter over RS-485 serial bus. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software (for Windows® 7, 8.1 and 10: see www.vaisala.com/insight).

Vaisala Indigo Product Family

Indigo transmitters offer a variety of connectivity options through analog signals or digital outputs, configurable relays, and wireless (WLAN)

configuration interface, providing a suitable solution for all industrial humidity measurements. The cable length between the probe and transmitter can be extended to up to 30 meters. For more information, see www.vaisala.com/indigo.

Relative Humidity Measurements in High Humidities

When the TMP1 probe is connected to a control system in parallel with HMP7 Relative Humidity and Temperature Probe, it is possible to have relative humidity measurement in actual process temperature while using probe heating in

the relative humidity probe. Probe heating helps to avoid condensation in situations where the dew point temperature of the process is close to the ambient temperature.

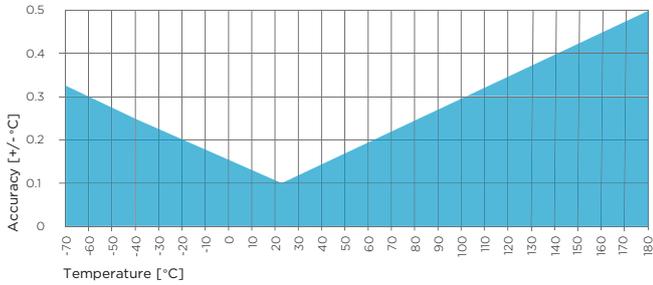
When the humidity probe is heated above dew point temperature, condensation can be avoided and the relative humidity in the actual process temperature can be back-calculated based on the true process temperature measurement received from TMP1.

Technical Data

Measurement Performance

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

1) Defined against calibration reference



TMP1 Temperature Measurement Accuracy over Full Range (Including Non-Linearity and Repeatability)

SI Traceable Calibration

Uncertainty of temperature calibration ±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F) (k = 2)

Operating Environment

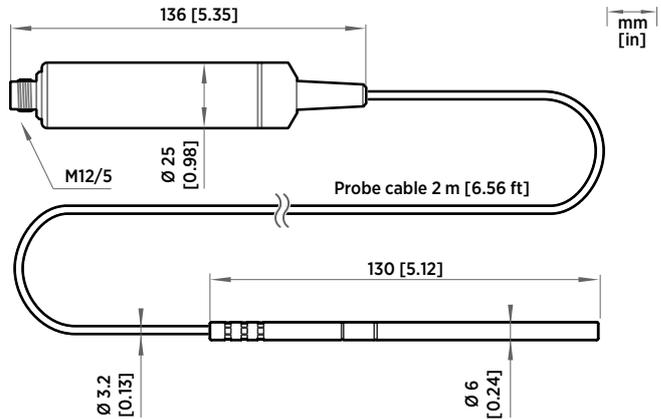
| | |
|--|--|
| Operating temperature range for probe body | -40 ... +80 °C (-40 ... +176 °F) |
| Operating temperature range for probe head | -70 ... +180 °C (-94 ... +356 °F) |
| Operating environment | Suitable for outdoor use |
| IP rating | IP66 |
| Electromagnetic compatibility | Complies with EMC standard EN61326-1, Industrial Environment |

Inputs and Outputs

| | |
|-------------------------|--|
| Operating voltage | 15 ... 30 VDC |
| Current consumption | 10 mA typical |
| Digital output | RS-485, non-isolated |
| Default serial settings | 19200 bps N 8 2 |
| Protocols | Modbus RTU |
| Output parameters | Temperature, water vapor saturation pressure |

Mechanical Specifications

| | |
|------------------|----------------|
| Connector | M12/5 |
| Weight | 224 g (7.9 oz) |
| Materials | |
| Probe | AISI316L |
| Probe body | AISI316L |
| Cable jacket | FEP |



TMP1 Probe Dimensions



HMT330 Series Humidity and Temperature Transmitters

For Demanding Humidity Measurement



Features

- Full 0 ... 100 %RH measurement, temperature range up to +180 °C (+356 °F) depending on model
- Pressure tolerance up to 100 bar depending on model
- 4th generation Vaisala HUMICAP® sensor for superior accuracy and stability
- Corrosion-resistant IP65/IP66 housing
- Excellent performance in harsh conditions; good chemical tolerance
- Traceable calibration for measurement and analog outputs (certificates included)
- 10-year warranty when annually calibrated at the Vaisala Service Center

Vaisala HMT330 Series HUMICAP® Humidity and Temperature Transmitters are designed for demanding industrial applications where stable measurements and extensive customization are essential. With multiple options to choose from, the instrument can be tailored to meet the specific needs of each individual application and is pre-configured for each delivery.

Proven Vaisala HUMICAP Performance

The HMT330 series incorporates Vaisala's 40 years of experience in industrial humidity measurement. The updated fourth-generation HUMICAP® sensor provides accurate and stable measurement even in environments with high humidity or chemical contaminants.

Wide Range of Installation Options

The wide variety of measurement probes, several installation accessories, and universal mains and DC power options make the instruments easy to install in various locations and kinds of environment; walls, poles, pipelines, and

ducts, for example. The input/output cable can be fed through the back of the transmitter, which is a useful feature, especially for cleanroom installations.

The HMT330 series includes six models:

- HMT331 for wall-mounted applications
- HMT333 for ducts and tight spaces
- HMT334 for high-pressure and vacuum applications
- HMT335 for high-temperature applications
- HMT337 for high-humidity applications
- HMT338 for pressurized pipelines

With multiple options to choose from, including local display, the HMT330 series can be tailored to meet the specific needs of each individual

application and is preconfigured for each delivery. Also the HUMICAP® sensor itself can be selected according to specific measurement application needs.

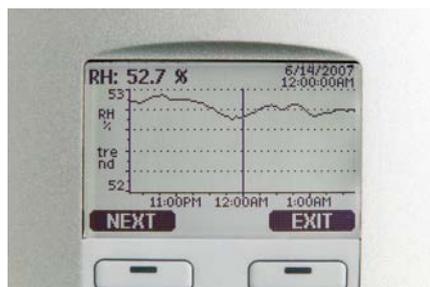
Connectivity

- RS-232/485/422 LAN
- Modbus protocol support (RTU/TCP)
- Optional graphical display and keypad for convenient operation
- Multilingual user interface
- Compatible with Vaisala viewLinc software

HMT330 Series Humidity and Temperature Transmitters

Graphical Display of Measurement Data and Trends for Convenient Operation

The HMT330 series features an optional numerical and graphical display with a multilingual menu and keypad. It allows users to easily monitor operational data, measurement trends, and access measurement history of up to 4 years.



The display shows measurement trends and over four years of real-time measurement history.

The display alarm allows any measured parameter to be tracked, with freely configurable low and high limits.

Versatile Outputs and Data Collection

The HMT330 can support up to three analog outputs; an isolated galvanic power supply and up to four relay outputs are also available.

For serial interface the USB service cable, RS-232, and RS-485/422 can be used.

HMT330 is also capable of applying the Modbus communication protocol and, together with an appropriate connection option, provides either Modbus RTU (RS-485) or Modbus TCP/IP (Ethernet) communication.

The data logger, with real-time clock and battery backup, guarantees reliable logging of measurement data for over four years. The recorded data can be viewed on the local display or transferred to a PC with Microsoft Windows® software. The transmitter can also be connected to a network with an optional LAN interface, which enables an Ethernet connection. A USB service cable makes it easy to connect the HMT330 to a PC via the service port.

Flexible Calibration

The HMT330 instruments are calibrated at five humidity points at the factory and come with a calibration certificate that meets all the relevant traceability and compliance requirements.

A quick, one-point field calibration can be performed with the handheld HM70 meter. A two-point field calibration can be performed, for example, with the

HMK15 salt bath calibrator in a controlled environment. The transmitter can also be sent to Vaisala for recalibration, and accredited ISO/IEC17025 calibrations and special calibrations are available.

Chemical Purge Minimizes Effects of Contaminant

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

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

| | HMT331 | HMT333 | HMT334 | HMT335 | HMT337 | HMT338 |
|--------------------------------------|-------------------------------------|--|---------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| For | Measurement within rooms | General purposes | High pressure and vacuum applications | High temperatures | High humidity applications | Pressurized pipelines |
| Temperature Measurement Range | -40 ... +60 °C (-40 ... +140 °F) | -40 ... +80 °C (-40 ... +176 °F) or -40 ... +120 °C (-40 ... +248 °F) | -70 ... +180 °C (-94 ... +356 °F) | -70 ... +180 °C (-94 ... +356 °F) | -70 ... +180 °C (-94 ... +356 °F) | -70 ... +180 °C (-94 ... +356 °F) |
| Operating Pressure | | | 0 ... 10 MPa (0 ... 100 bar) | | 0 ... 1 MPa (0 ... 10 bar) | 0 ... 4MPa (0 ... 40 bar) |

HMT330 Series Technical Data

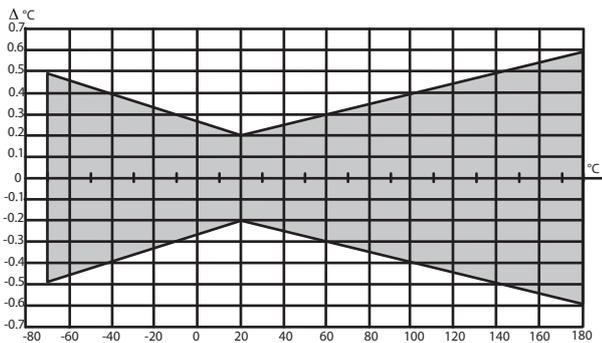
Measurement Performance

Relative Humidity

| | |
|---|--|
| Measurement range | 0 ... 100 %RH |
| Accuracy (including non-linearity, hysteresis, and repeatability) | |
| at +15 ... +25 °C (59 ... +77 °F) | ±1 %RH (0 ... 90 %) ±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 |
| Factory calibration uncertainty (+20 °C) | ±0.6 %RH (0 ... 40 %RH) ±1.0 %RH (40 ... 97 %RH) (Defined as ±2 standard deviation limits. Small variations possible; see also calibration certificate.) |
| Response time (90%) at +20 °C (+68 °F) in still air / in 0.1 m/s air flow | 8 s / 17 s with grid filter ¹⁾ 20 s / 50 s with grid + steel netting filter ¹⁾ 40 s / 60 s with sintered filter ¹⁾ |

Temperature

| | |
|--|----------------------|
| Accuracy at +20 °C (+68 °F) | ± 0.2 °C (± 0.36 °F) |
| Accuracy over temperature range (measurement range depends on model) | |



Temperature sensor Pt100 RTD Class F0.1 IEC 60751

Other Available Variables (Model-Dependent)

dew point temperature, mixing ratio, absolute humidity, wet bulb temperature, enthalpy, water vapor pressure

¹⁾ With HUMICAP 180R or 180RC or 180VC sensor

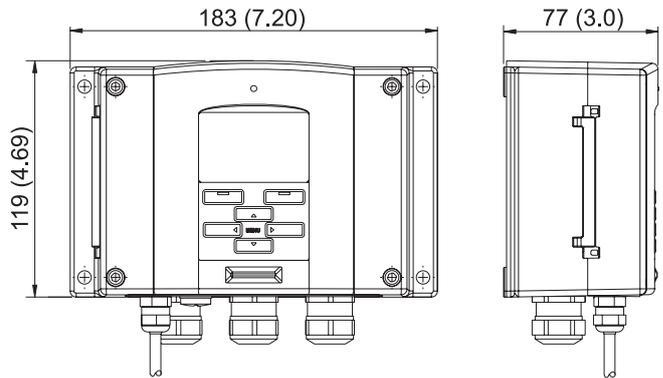
Operating Environment

Operating Temperature

| | |
|----------------------|---|
| for probe | same as measurement range |
| for transmitter body | -40 ... +60 °C (-40 ... 140 °F) |
| with display | 0 ... +60 °C (32 ... 140 °F) |
| Storage temperature | -55 ... +80 °C (-67 ... 176 °F) |
| EMC compliance | EN61326-1, Industrial Environment Note: Transmitter with display test impedance of 40 Ω is used in IEC61000-4-5 (Surge immunity) |

Mechanical Specifications

| | |
|---------------------------------|---|
| Cable bushing | M20 x 1.5 for cable diameter 8 ... 11 mm / 0.31 ... 0.43" |
| Conduit fitting | 1/2" NPT |
| User cable connector (optional) | M12 series 8-pin (male) |
| option 1 | female plug with 5 m (16.4 ft.) black cable |
| option 2 | female plug with screw terminals |
| Probe Cable Diameter | |
| HMT333 (+80 °C) | 6.0 mm |
| other probes | 5.5 mm |
| Standard probe cable lengths | 2 m, 5 m or 10 m (Additional lengths available, see order forms for details) |
| Housing material | G-AlSi 10 Mg (DIN1725) |
| IP rating | IP66 IP65 (NEMA4X) with local display |
| Weight | 1.0 - 3.0 kgs depending on selected probe, cable and modules |



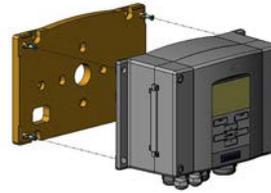
Dimensions in mm (inches)

Inputs and Outputs

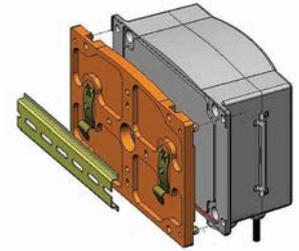
| | |
|--|--|
| Operating Voltage | 10 ... 35 VDC, 24 VAC ±20% |
| with optional power supply module | 100 ... 240 VAC, 50/60 HZ |
| Power Consumption at +20 °C (U_{in} 24 VDC) | |
| RS-232 | max. 25 mA |
| U _{out} 2 x 0 ... 1 V/0 ... 5 V/0 ... 10 V | max. 25 mA |
| I _{out} 2 x 0 ... 20 mA | max. 60 mA |
| display and backlight | + 20 mA |
| during chemical purge | max. 110 mA |
| during probe heating (HMT337) | + 120 mA |
| Analog Outputs (2 standard, 3rd optional) | |
| current output | 0 ... 20 mA, 4 ... 20 mA |
| voltage output | 0... 1 V, 0... 5 V, 0... 10 V |
| Accuracy of analog outputs at +20 °C | ±0.05% full scale |
| Temperature dependence of the analog outputs | ±0.005%/°C full scale |
| External loads: | |
| current outputs | R _L < 500 Ω |
| 0 ... 1 V output | R _L > 2 kΩ |
| 0 ... 5 V and 0 ... 10 V outputs | R _L > 10 kΩ |
| Max. Wire Size | 0.5 mm ² (AWG 20) |
| | stranded wires recommended |
| Digital outputs | RS-232, RS-485 (optional) |
| Protocols | ASCII commands, Modbus RTU |
| Service Connection | RS-232, USB |
| Relay Outputs (Optional) | 0.5 A, 250 VAC |
| Ethernet Interface (Optional) | |
| Supported standards | 10BASE-T, 100BASE-TX |
| Connector | 8P8C (RJ45) |
| IPv4 address assignment | DHCP (automatic), static |
| Protocols | Telnet, Modbus TCP/IP |
| Optional Data Logger with Real-Time Clock | |
| Logged parameters | max. four with trend/min/max values |
| Logging interval | 10 sec. (fixed) |
| Max. logging period with max. temporal resolution | 4 years, 5 months |
| Logged points | 13.7 million points per parameter |
| Battery lifetime | min. 5 years |
| Display | LCD with backlight, graphical trend display of any parameter |
| Menu languages | English, Chinese, Finnish, French, German, Japanese, Russian, Spanish, Swedish |

Mounting Options

Mounting with Wall Mounting Kit (not mandatory for wall installations)



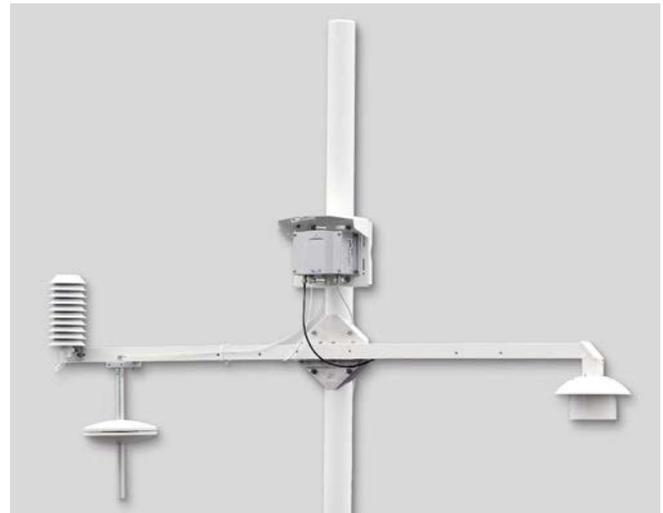
Mounting with DIN Rail Installation Kit



Pole Installation with Installation Kit for Pole or Pipeline



Mounting Rain Shield with Installation Kit



Vaisala Meteorological Installation Kit HMT330MIK enables HMT337 to be installed outdoors to obtain reliable measurements for meteorological purposes

HMT331 Humidity and Temperature Transmitter for Demanding Wall-Mounted Applications



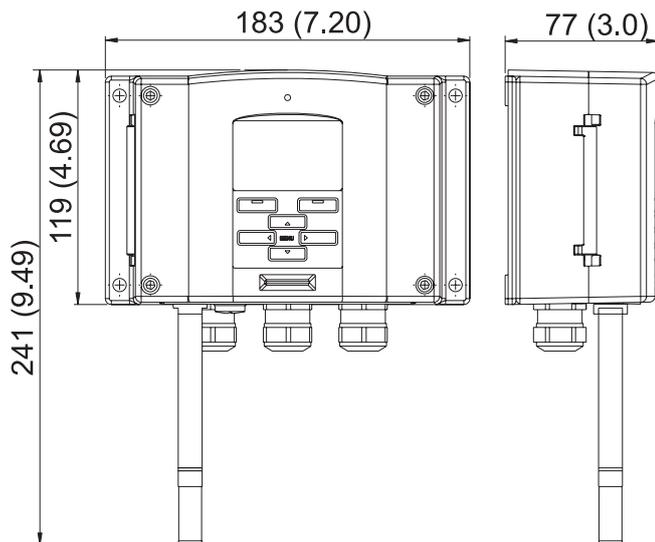
Typical Applications

- Cleanrooms
- Pharmaceutical processes
- Swimming halls
- Data centers
- Archives

Vaisala HUMICAP® Humidity and Temperature Transmitter HMT331 is a high-quality wall-mounted transmitter for demanding HVAC and condition-monitoring applications.

Technical Data

Temperature measurement range -40 ... +60 °C (-40 ... +140 °F)



Dimensions in mm (inches)



HMT331 with short cable probe

Accessories

| | |
|--|-------------|
| USB service port cable with PC software | 219916 |
| Connection cable for HM70 | 211339 |
| Wall-mounting plate (plastic) | 214829 |
| Pole installation kit with rain shield | 215109 |
| DIN rail installation set | 215094 |
| PPS plastic grid filter with stainless steel net | DRW010281SP |
| Stainless steel sintered filter | HM47280SP |

HMT334 Humidity and Temperature Transmitter for High Pressure and Vacuum Applications



Typical Applications

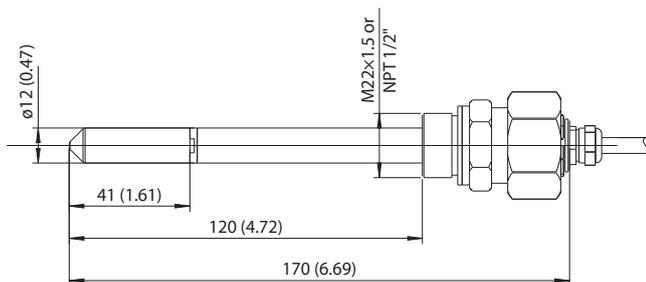
- Test chambers
- High-pressure and vacuum processes

Vaisala HUMICAP® Humidity and Temperature Transmitter HMT334 is designed for humidity measurement in pressurized spaces or vacuum chambers.

Every probe is tested for gas and vacuum-tight installation.

Technical Data

| | |
|-------------------------------|-----------------------------------|
| Temperature measurement range | -70 ... +180 °C (-94 ... +356 °F) |
| Operating pressure | 0 ... 10 MPa (0 ... 100 bar) |



Dimensions in mm (inches)

Accessories

| | |
|--|-------------|
| Fitting body NPT 1/2" | 17225SP |
| USB service port cable with PC software | 219916 |
| Connection cable for HM70 | 211339 |
| Wall-mounting plate (plastic) | 214829 |
| Pole installation kit with rain shield | 215109 |
| DIN rail installation set | 215094 |
| PPS plastic grid filter with stainless steel net | DRW010281SP |
| PPS plastic grid filter | DRW010276SP |
| Stainless steel sintered filter | HM47280SP |
| Stainless steel grid filter | HM47453SP |
| Fitting body ISO M22 x 1.5 | 17223SP |

HMT335 Humidity and Temperature Transmitter for High Temperatures



Typical Applications

- Hot drying processes
- Food processes, e.g. baking ovens

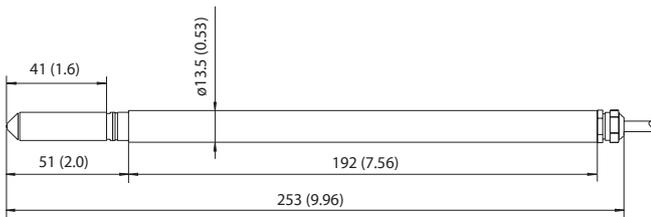
Robust Probe Ideal for High Flow Rates

The Vaisala HUMICAP® Humidity and Temperature Transmitter HMT335 has a long stainless steel probe designed for high temperatures.

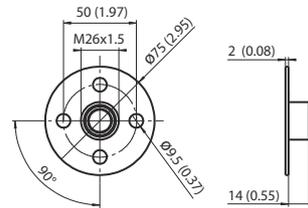
With high tolerance for mechanical stress and high flow rates, HMT335 is ideal for duct measurements. The stainless steel installation flange allows easy adjustment of the probe's installation depth. Long, robust probe allows easy installation through insulation in ovens and similar applications.

Technical Data

Temperature measurement range -70 ... +180 °C (-94 ... +356 °F)



Dimensions in mm (inches)



Installation flange dimensions in mm (inches)

Accessories

| | |
|--|-------------|
| Mounting flange | 210696 |
| USB service port cable with PC software | 219916 |
| Connection cable for HM70 | 211339 |
| Wall-mounting plate (plastic) | 214829 |
| Pole installation kit with rain shield | 215109 |
| DIN rail installation set | 215094 |
| PPS plastic grid filter with stainless steel net | DRW010281SP |
| PPS plastic grid filter | DRW010276SP |
| Stainless steel sintered filter | HM47280SP |
| Stainless steel grid filter | HM47453SP |



Flange installation kit for HMT335

HMT337 Humidity and Temperature Transmitter for High Humidity Applications



Typical Applications

- Professional meteorology
- Intake air monitoring of engines and gas turbines
- Timber drying kilns

HMT337 Configurations

Vaisala HUMICAP® Humidity and Temperature Transmitter HMT337 is ideal for the most demanding process and meteorological measurements in high-humidity condensing environments.

HMT337 is delivered in one of three configurations:

1. Basic HMT337, with a non-warmed probe for applications where humidity levels are not constantly near condensation

2. HMT337 with a warmed probe, for dew point temperature measurement under constant near-condensing conditions
3. HMT337 with a warmed probe and an additional temperature sensor, for relative humidity measurement under constant near-condensing conditions

True Humidity Readings in Condensation Conditions

Vaisala's unique warmed probe provides fast and reliable measurement in environments where humidity is near saturation. The heating prevents condensation from forming on the sensor.

As the probe is heated, the relative humidity level inside it stays below the ambient level. With accurate temperature measurement, the ambient dew point temperature can be calculated precisely.

If the relative humidity value is needed, an optional temperature sensor is used (configuration option 3). The measured ambient temperature provides the compensation for calculating relative humidity and other temperature-dependent humidity parameters.

Installation Options

A pressure and vapor tight installation up to 10 bars through a process wall can be achieved by sealing with Swagelok® fittings from the probe, or sealing from the cable with a gland. The optional HMT330MIK Installation Kit is available for outdoor installations; duct installation kits are also available.

Technical Data

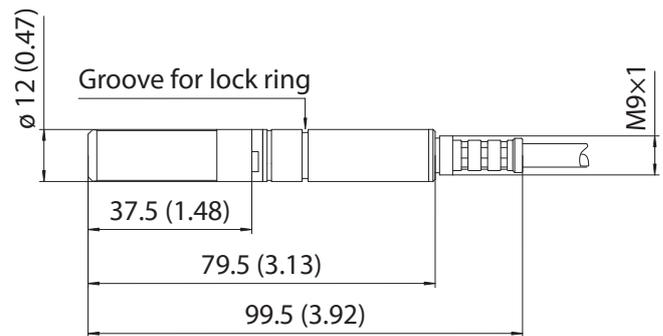
Temperature measurement range -70 ... +180 °C (-94 ... +356 °F)

Accessories

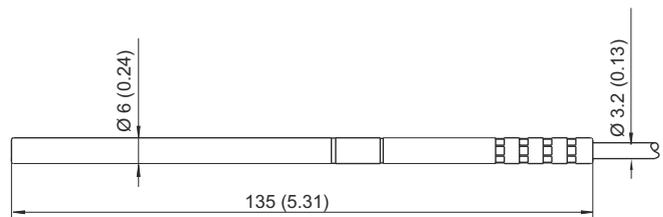
| | |
|---|-------------|
| Cable gland for probe cable | HMP247CG |
| Duct installation kit (RH probe) ¹⁾ | 210697 |
| Duct installation kit (T probe) ¹⁾ | 215003 |
| Swagelok fittings (NPT and ISO) for both RH and T probes (up to 10 bar) | |
| Solar radiation shield | DTR502B |
| Meteorological installation kit | HMT330MIK |
| USB service port cable with PC software | 219916 |
| Connection cable for HM70 | 211339 |
| Wall-mounting plate (plastic) | 214829 |
| Pole installation kit with rain shield | 215109 |
| DIN rail installation set | 215094 |
| Warmed probe accessory | HMT330WPA |
| PPS plastic grid filter with stainless steel net | DRW010281SP |
| PPS plastic grid filter | DRW010276SP |
| Stainless steel sintered filter | HM4728OSP |
| Stainless steel grid filter | HM47453SP |

For more installation accessories, check the order form.

¹⁾ For an image of the duct installation kit, see HMT333 page.



HMT337 RH Dimensions in mm (inches)



HMT337 T Dimensions in mm (inches)

HMT338 Humidity and Temperature Transmitter for Pressurized Pipelines

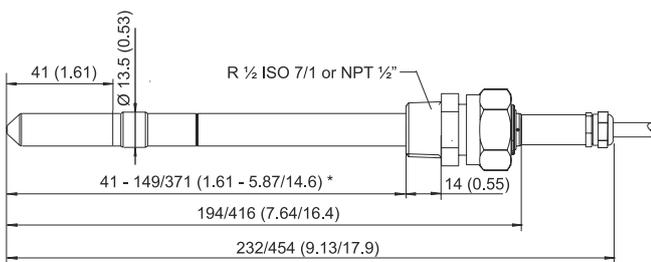


Insert or Remove the Probe while the Process is Running

With “hot tapping”, the probe is inserted directly into the process while it is running, without the need for venting or lowering the process pressure. The probe is tightened to a ball-valve assembly fixed to the process pipe or wall. The adjustable hex nut is hand-tightened to hold the probe in place temporarily.

Technical Data

| | |
|-------------------------------|-----------------------------------|
| Temperature measurement range | -70 ... +180 °C (-94 ... +356 °F) |
| Operating pressure | 0 ... 4MPa (0 ... 40 bar) |



Lengths for standard / optional probes
* freely user-adjustable length

Dimensions in mm (inches)

Typical Applications

- Process lines
- Environmental chambers
- Vacuum-drying processes
- Compressed air lines with refrigerant dryers

Vaisala HUMICAP® Humidity and Temperature Transmitter HMT338 is ideal for installations in pressurized processes where the probe needs to be removed while the process is running.

The probe is then pushed down to the appropriate depth. The hex nut is then tightened with a wrench to lock the probe in place. Hot tapping is possible in pressures up to 10 bar.

Accessories

| | |
|--|-------------|
| Ball-valve set | BALLVALVE-1 |
| Pressure fitting ISO 1/2 to NPT 1/2 | 210662 |
| USB service port cable with PC software | 219916 |
| Connection cable for HM70 | 211339 |
| Wall-mounting plate (plastic) | 214829 |
| Pole installation kit with rain shield | 215109 |
| DIN rail installation set | 215094 |
| PPS plastic grid filter with stainless steel net | DRW010281SP |
| PPS plastic grid filter | DRW010276SP |
| Stainless steel sintered filter | HM47280SP |
| Stainless steel grid filter | HM47453SP |





HMT360 Series Intrinsically Safe Humidity and Temperature Transmitters

For Operation in up to Zone 0 / 20



Features

- Measures humidity and temperature, outputs also dew point, mixing ratio, absolute humidity and wet bulb temperature
- Intrinsically safe
- Vaisala HUMICAP® Sensor features high accuracy, excellent long-term stability, and negligible hysteresis
- Six probe options
- Traceable calibration (certificate included)



Vaisala HUMICAP® Humidity and Temperature Transmitter Series HMT360 are the ideal solution for measuring humidity in hazardous areas. They operate safely and reliably even in the most hazardous classifications, such as zone 0. The HMT360 transmitters' proven performance and technology conform with rigorous international standards.

Operating Conditions

- Safe operation with the entire transmitter in hazardous areas: Division 1 and 2 (USA, Canada), Categories 1G / Zone 0 and 1D / Zone 20 with protection cover (EU)
- Designed for harsh conditions
- Temperature range between -70 ... +180 °C (-94 ... +356 °F) depending on the probe option

Intrinsically Safe

The entire HMT360 transmitter can be installed directly in explosive areas. It can withstand continuous exposure to potentially explosive environments that contain flammable gases or dust.

Customized Configuration

Due to the options and accessories, the HMT360 series is truly flexible.

Customers may specify the transmitter configuration when ordering the instrument. However, changes in configuration can also easily be made in the field.

Interchangeable Probes

HMT360 offers six probe options for various applications:

- HMT361 - wall mount
- HMT363 - confined spaces
- HMT364 - pressurized spaces
- HMT365 - high temperature
- HMT367 - high humidity
- HMT368 - pressurized pipelines

The interchangeable probes enable fast and easy removal or re-installation when required. Calibration, for example, is easy to perform due to the modular structure. All calibration coefficients are included in

the probe unit itself, which means that probes can be switched between transmitter bodies without losing the accuracy.

Optimized Sensors

In addition to the standard Vaisala HUMICAP® Sensor, an application-specific, very chemically durable sensor is also available.

Long-term Solution

The HMT360 transmitters are an investment: their rugged design, combined with trouble-free operation, ensure a long-term solution for monitoring humidity and dew point in explosive environments.

Customized calibration and maintenance contracts for the HMT360 series are available on request.

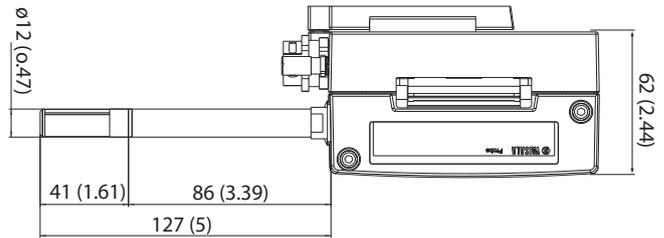
Interchangeable Probes for HMT360 Intrinsically Safe Humidity and Temperature Transmitter

HMT361 for Wall Mounting

| | |
|-------------------|----------------------------------|
| Temperature range | -40 ... +60 °C (-40 ... +140 °F) |
| Probe diameter | 12 mm (0.47 in) |



The HMT361 probe in this picture has a stainless steel netting filter.



Dimensions in mm (inches)

HMT363 for Confined Spaces

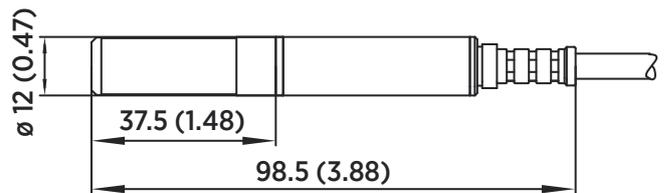
| | |
|-------------------------------------|--|
| Temperature range with teflon cable | -40 ... +120 °C (-40 ... +248 °F) |
| Temperature range with rubber cable | -40 ... +80 °C (-40 ... +176 °F) |
| Probe cable length | 2, 5 or 10 meters (6 ft 7 in, 16 ft 5 in, 32 ft 10 in) |
| Probe diameter | 12 mm (0.47 in) |

Installation

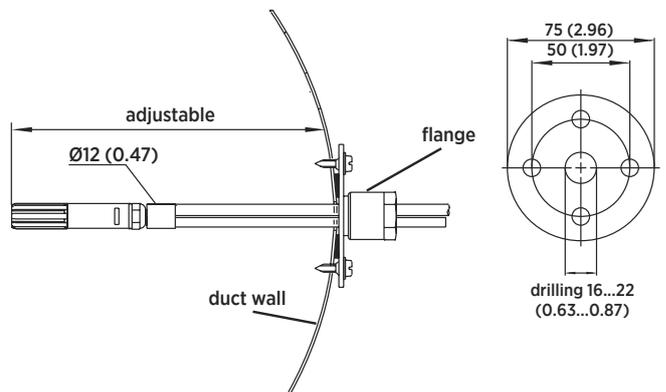
| | |
|--|------------|
| Duct installation kit | 210697 |
| Cable gland M20x1.5 with splitting seal | HMP247CG |
| Swagelok for 12mm probe, 1/2" NPT thread | SWG12NPT12 |



The HMT363 probe is small and fits into tight spaces. This one is connected with a teflon cable.



Dimensions in mm (inches)



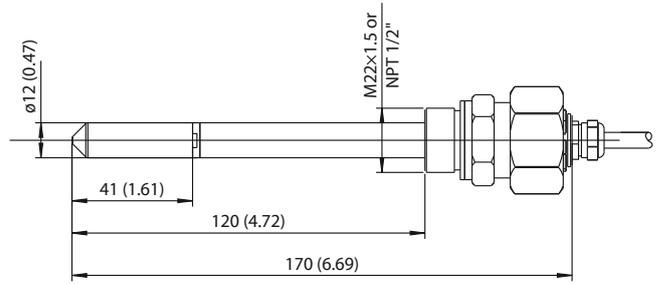
Left: Installation kit for duct mounting. Right: Installation flange. Aluminum or stainless steel.

HMT364 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 |



The HMT364 probe is designed for measurement in pressurized spaces or vacuum chambers.



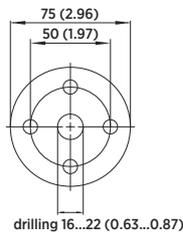
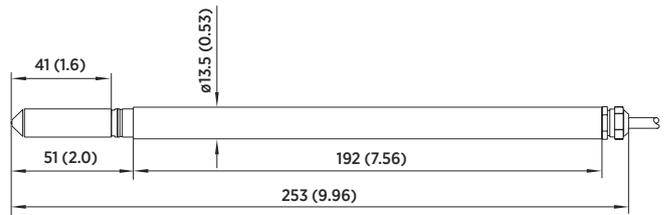
Dimensions in mm (inches)

HMT365 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) |
| Installation | |
| Mounting flange | 210696 |
| Cable gland M20x1.5 with splitting seal | HMP247CG |



The HMT365 probe is designed for high temperature environments.



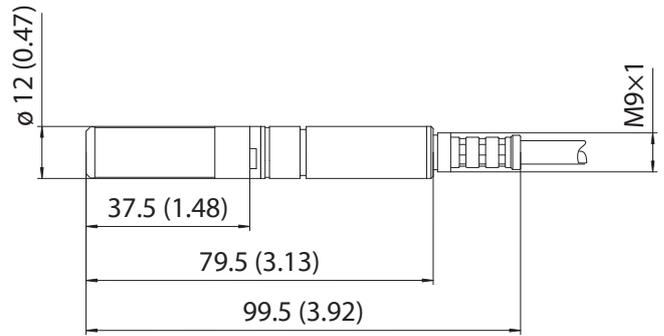
HMT365 probe and stainless steel installation flange. Dimensions in mm (inches).

HMT367 for High Humidities

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



The HMT367 probe is constructed to be installed in environments with high humidities.



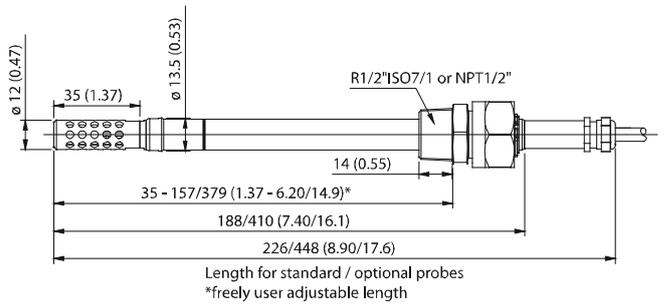
Dimensions in mm (inches)

HMT368 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 | 226 mm/448 mm (8.90 in/17.6 in) |
| Installation | |
| Fitting body ISO1/2 solid structure | DRW212076SP |
| Fitting body NPT1/2 solid structure | NPTFITBODASP |
| Ball valve ISO 1/2 with welding joint | BALLVALVE-1 |



The HMT368 probe enables flexible installation in pressurized pipelines.



Dimensions in mm (inches)

HMT360 Series Technical Data

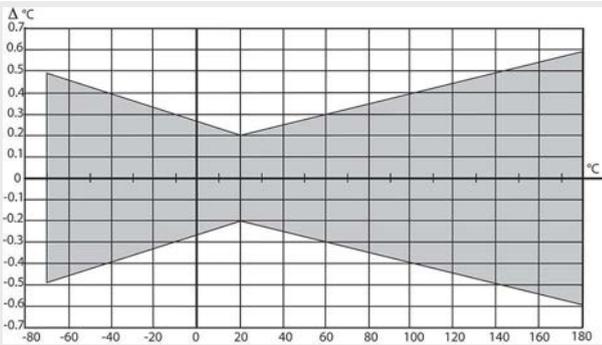
Measurement Performance

Relative Humidity

| | |
|---|--|
| Measurement range | 0 ... 100 %RH |
| Accuracy (Including Non-linearity, Hysteresis, and Repeatability): | |
| With Vaisala HUMICAP® 180R | For typical applications |
| At +15 ... +25 °C (59 ... +77 °F) | ± 1.0 %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 |
| Factory calibration uncertainty (+20 °C) | ± 0.6 %RH (0 ... 40 %RH) ± 1.0 %RH (40 ... 97 %RH) |
| (Defined as ±2 standard deviation limits. Small variations possible, see also calibration certificate.) | |
| Response Time (90 %) at +20 °C (+68 °F) in Still Air: | |
| With grid filter | 17 s |
| With grid + steel netting filter | 50 s |
| With sintered filter | 60 s |

Temperature

| | |
|--|--|
| Measurement range | -70 ... +180 °C (-94 ... +356 °F) (depends on selected probe) |
| Typical accuracy of electronics at +20 °C (+68 °F) | ±0.2 °C (0.36 °F) |
| Typical temperature dependence of electronics | 0.005 °C/°C (0.005 °F/°F) |
| Sensor | Pt1000 RTD Class F0.1 IEC 60751 |



Accuracy over Temperature Range

Other Variables

| | |
|----------------------|--|
| Optionally available | Dew point temperature, mixing ratio, absolute humidity, wet bulb temperature |
|----------------------|--|

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 |
| EMC compliance | EN61326-1, Industrial Environment Note 1 HMT360 complies with IEC 61000-4-5 only when using external EXi approved surge arrester in the safe area. Note 2 Compliance with IEC 61000-4-3: <ul style="list-style-type: none"> • Within frequency range 80 ... 200 MHz immunity is 4 V/m • At 10 V/m RF field test within frequency range 80 ... 200 MHz may cause additional deviation of 1.5 %RH |

Inputs and Outputs

| | |
|--|--|
| Operating voltage | 12 ... 28 V |
| With serial port (service mode) | 15 ... 28 V |
| Analog outputs | Two-wire 4 ... 20 mA, one standard, one optional Connection via safety barriers |
| Typical accuracy of analog outputs at +20 °C | ±0.05 % full scale |
| Typical temperature dependence of analog outputs | 0.005 % / °C (0.005 % / °F) full scale |
| RS-232C serial output for service use (requires cable accessory 25905ZZ) | Connector type RJ45 |
| Display | Two-line LCD |

Mechanical Specifications

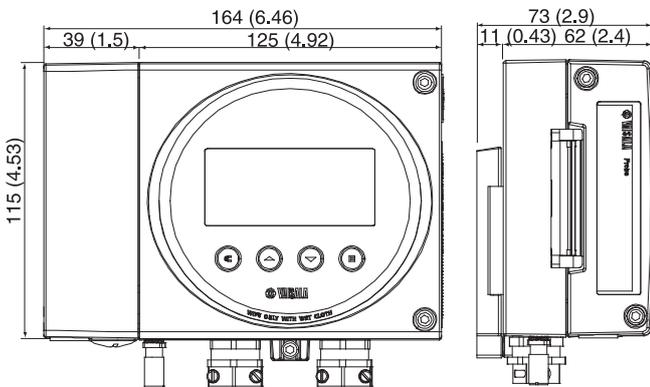
| | |
|------------------|---|
| Connections | Screw terminals, 0.33 ... 2.0 mm ² wires (AWG 14-22) |
| Cable bushings | For 7.5 ... 12 mm or 10 ... 15 mm cable diameters (M20) |
| Conduit fitting | NPT 1/2" |
| Housing material | G-ALSi10Mg (DIN 1725) |
| Housing weight | 950 g (2.1 lb) |

Compliance

| | |
|-----------|---------------|
| IP rating | IP66 (NEMA4X) |
|-----------|---------------|

Accessory Availability

| Accessory | Part number | Models |
|--|-------------------------|--------------------------------|
| Ball valve ISO 1/2 with welding joint | BALLVALVE-1 | HMT368 |
| <ul style="list-style-type: none"> Pressure range at +20 °C (+68 °F) 0 ... 20 bar (0 ... 290 psia) (during installation max. 10 bar (145 psia)) | | |
| Cable gland M20 x 1.5 with splitting seal | HMP247CG | HMT363, HMT365, HMT367 |
| Duct installation kit | 210697 | HMT363, HMT367 |
| Fitting body ISO1/2 solid structure | DRW212076SP | HMT368 |
| Fitting body M22 x 1.5 | 17223 | HMT364 |
| Fitting body NPT1/2 | 17225 | HMT364 |
| Fitting body NPT1/2 solid structure | NPTFITBODASP | HMT368 |
| Mounting flange | 210696 | HMT365 |
| Swagelok for 12mm probe, 1/2" NPT thread | SWG12NPT12 | HMT363, HMT367 |
| Swagelok for 12mm probe, 3/8" ISO thread | SWG12ISO38 | HMT363, HMT367 |
| Galvanic isolator | 212483 | All models |
| Zener barrier | 210664 | All models |
| Calibration adapter for HMK15 | 211302 | HMT361, HMT363, HMT364, HMT367 |
| Serial interface cable for PC connectors RJ45 - D9 female | 25905ZZ | All models |
| Protection cover (for use in the presence of combustible dust, ATEX) | 214101 | All models |
| | II 1 D (IP65 T = 80 °C) | |



Dimensions in mm (inches)

Classification with Current Outputs

Europe / VTT

| | |
|------------------------|---|
| EU (94/9/EC, ATEX100a) | II 1 G Ex ia IIC T4 Ga Certificate No. VTT 09 ATEX 028 X |
| Safety factors | $U_i = 28 \text{ V}$, $I_i = 100 \text{ mA}$, $P_i = 700 \text{ mW}$ $C_i = 1 \text{ nF}$, L_i negligibly low |

Environmental specifications

| | |
|--|--|
| T_{amb} | -40 ... +60 °C (-40 ... +140 °F) |
| P_{amb} | 0.8 ... 1.1 bar |
| Dust classification (with protection cover 214101) | II 1 D (IP65 T=+80 °C (+176 °F)) VTT 04 ATEX 023X |

USA (FM)

| | |
|----------|--|
| USA (FM) | Classes I, II, III, Division 1, Groups A-G and Division 2, Groups A-D, F and G FM Project ID: 3010615 |
|----------|--|

| | |
|----------------|--|
| Safety factors | $V_{max} = 28 \text{ VDC}$, $I_{max} = 100 \text{ mA}$, $C_i = 1 \text{ nF}$, $L_i = 0$, $P_i = 0.7 \text{ W}$, $T_{amb} = +60 \text{ °C (+140 °F)}$, T5 |
|----------------|--|

Japan (TIIS)

| | |
|--------------|--------------------------------------|
| Japan (TIIS) | Ex ia IIC T4 Code number: TC20238 |
|--------------|--------------------------------------|

| | |
|----------------|--|
| Safety factors | $U_i = 28 \text{ VDC}$, $I_i = 100 \text{ mA}$, $C_i = 1 \text{ nF}$, $P_i = 0.7 \text{ W}$, $L_i = 0$, $T_{amb} = +60 \text{ °C (+140 °F)}$ |
|----------------|--|

Canada (CSA)

| | |
|---------|--|
| Class I | Division 1 and Division 2, Groups A, B, C, D |
|---------|--|

| | |
|----------|---|
| Class II | Division 1 and Division 2, Groups G and Coal Dust |
|----------|---|

| | |
|-----------|--|
| Class III | CSA File No: 213862 0 000, CSA Report: 1300863 |
|-----------|--|

| | |
|----------------|---|
| Safety factors | $T_{amb} = +60 \text{ °C (+140 °F)}$, T4 Intrinsically safe when connected as per Installation Drawing DRW213478. |
|----------------|---|

China (PCEC)

| | |
|--------------|--|
| China (PCEC) | Ex ia II CT4 Certificate No. CE092145 Standard GB3836.1-2000 and GB3836.4-2000 |
|--------------|--|

IECEx (VTT)

| | |
|-------------|---|
| IECEx (VTT) | Ex ia IIC T4 Ga Certificate No. IECEx VTT 09.0002x |
|-------------|---|

| | |
|----------------|---|
| Safety factors | $U_i = 28 \text{ V}$, $I_i = 100 \text{ mA}$, $P_i = 700 \text{ mW}$ $C_i = 1 \text{ nF}$, L_i negligibly low |
|----------------|---|

Environmental specifications

| | |
|--|---|
| T_{amb} | -40 ... +60 °C (-40 ... +140 °F) |
| P_{amb} | 0.8 ... 1.1 bar |
| Dust classification (with protection cover 214101) | Ex ta IIC T500 80 °C Da IECEx VTT 12.0016X |

EAC (Russia, Kazakhstan, Belarus) (TRCU)

| | |
|--|---|
| EAC (Russia, Kazakhstan, Belarus) (TRCU) | 0Ex ia IIC T4 Ga X Certificate No. RU C- FI.MLJ06.B.00068 |
|--|---|

Environmental specifications

| | |
|-----------|----------------------------------|
| T_{amb} | -40 ... +60 °C (-40 ... +140 °F) |
| P_{amb} | 0.8 ... 1.1 bar |

Korea (KOSHA)

| | |
|---------------|--|
| Korea (KOSHA) | Ex ia IIC T4 Certificate No. 17-AV4BO-0419X |
|---------------|--|

| | |
|----------------|---|
| Safety factors | $U_i = 28 \text{ V}$, $I_i = 100 \text{ mA}$, $P_i = 700 \text{ mW}$ $C_i = 1 \text{ nF}$, $L_i =$ negligibly low |
|----------------|---|

Environmental specifications

| | |
|-----------|----------------------------------|
| T_{amb} | -40 ... +60 °C (-40 ... +140 °F) |
| P_{amb} | 0.8 ... 1.1 bar |





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.

Optional Functions

The following optional functions are available: several probes for various applications, calculated humidity quantities, variety of mounting kits, rain shield, sensor protection options and probe cable lengths, warmed probe and sensor heating for high humidity conditions, and chemical purge for applications risking an interference with chemicals in the measuring environment.

The HMT310 series includes six models for demanding applications:

- 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

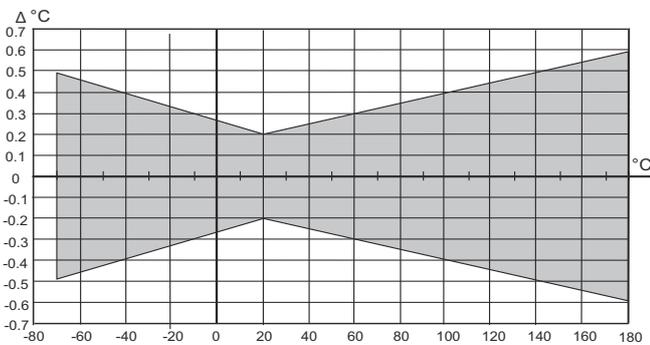
Relative Humidity

| | |
|--|--|
| Measurement range | 0 ... 100 %RH |
| Sensor: | |
| Vaisala HUMICAP180R | Typical applications |
| Vaisala HUMICAP180RC | Applications with chemical purge/warmed probe |
| Vaisala HUMICAP180V | Catalytic sensor for H ₂ O ₂ environments |
| Vaisala HUMICAP180VC | Catalytic sensor with chemical purge for H ₂ O ₂ environments |
| 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) ¹⁾ ±1.0 %RH (40 ... 97 %RH) ¹⁾ |
| Accuracy (Including Non-Linearity, Hysteresis, and Repeatability) at a Temperature Range of: | |
| +15 ... +25 °C (+59 ... +77 °F) | ±1 %RH (0 ... 90 %RH) ±1.7 %RH (90 ... 100 %RH) |
| -20 ... +40 °C (-4 ... +104 °F) | ±(1.0 + 0.008 x reading) %RH |
| -40 ... +180 °C (-40 ... +356 °F) | ±(1.5 + 0.015 x reading) %RH |

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.



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 | vapor tight |
| 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 | RS232C |
| Connections | M12 8-pole connector with RS232C, current/voltage outputs (two channels) and U _{in} |
| Operating voltage | 10 ... 35 VDC |
| External load | R _L < 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 _{out} 10 V (10 kΩ) channel 1 & channel 2 | 12 mA |
| I _{out} 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 |

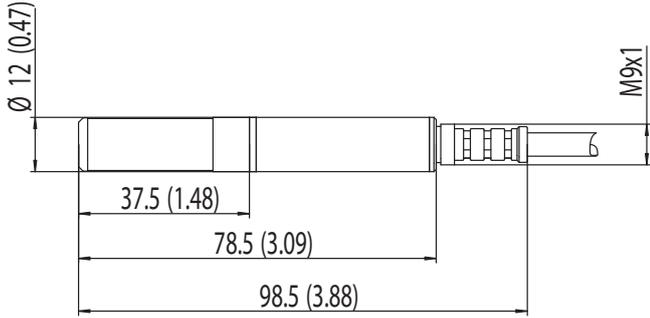
Mechanical Specifications

| | |
|---------------------------------|---|
| Transmitter housing material | G-AISI10Mg |
| Transmitter base material | PPS |
| IP rating | IP66 |
| Probe cable length | 2 m, 5 m, or 10 m |
| 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 | PPS grid with stainless steel net, PPS grid, Sintered filter, Membrane stainless steel filter, H ₂ O ₂ filter |

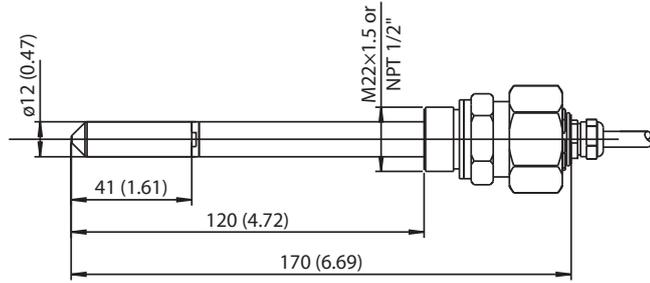
Spare Parts and Accessories

| | |
|--|-------------|
| 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 ₂ O ₂ Filter | 231865 |

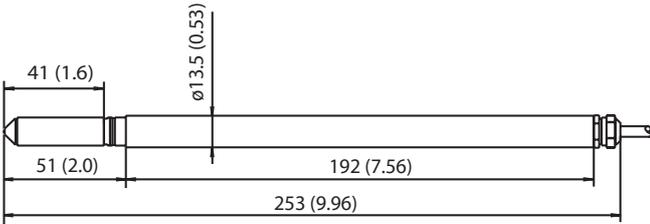
Probe dimensions in mm (inches)



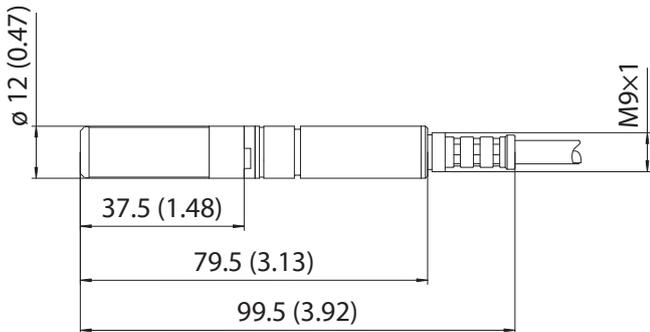
HMT313 Probe



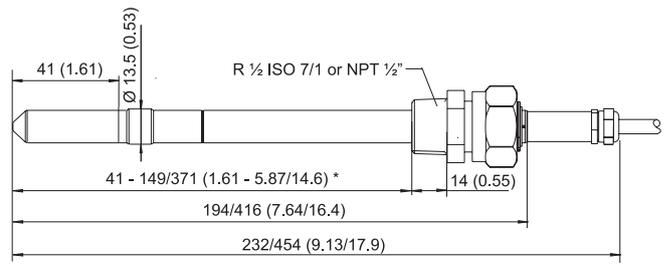
HMT314 Probe



HMT315 Probe



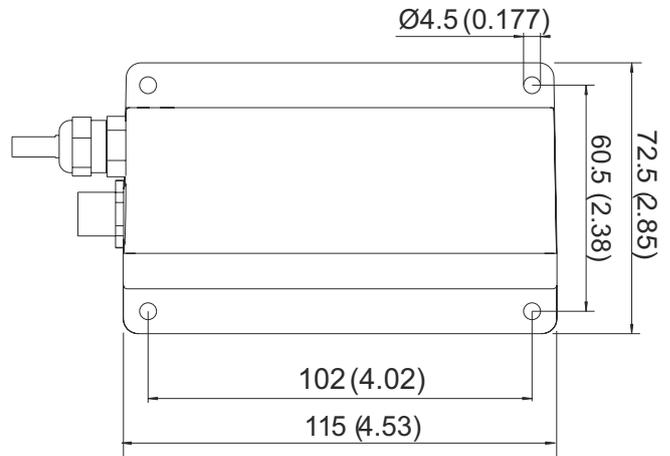
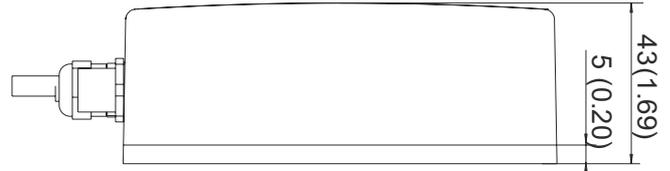
HMT317 Probe



Lengths for standard / optional probes
* freely user-adjustable length

HMT318 Probe

Transmitter body dimensions in mm (inches)





Features

- Vaisala HUMICAP® technology with humidity sensor HUMICAP® 180R
- Interchangeable probe (easy field calibration)
- Accurate and reliable
- Resistant to dust and most chemicals
- Enclosure IP65
- 3-point traceable calibration (certificate included)
- 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 the Vaisala Radiation Shield DTR504A

Performance

HMT120/130 incorporates Vaisala HUMICAP® technology that measures relative humidity accurately and reliably. Vaisala HUMICAP® is resistant to dust and most chemicals.

The 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, the cabling can be done through the back wall of the transmitter.

Interchangeable Probe

The HMT120/130 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 portable 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 at two separate rows on the display.

Technical Data

Measurement Performance

Relative Humidity

| | |
|---|-----------------------|
| Measurement range | 0 ... 100 %RH |
| Accuracy (including non-linearity, hysteresis, and repeatability) at 0 ... +40 °C (+32 ... +104 °F): | |
| 0 ... 90 %RH | ±1.5 %RH |
| 90 ... 100 %RH | ±2.5 %RH |
| Accuracy (including non-linearity, hysteresis, and repeatability) at -40 ... 0 °C, +40 ... +80 °C (-40 ... +32 °F, +104 ... +176 °F): | |
| 0 ... 90 %RH | ±3.0 %RH |
| 90 ... 100 %RH | ±4.0 %RH |
| Factory calibration uncertainty at +20 °C (+68 °F): | |
| 0 ... 90 %RH | ±1.1 %RH |
| 90 ... 100 %RH | ±1.8 %RH |
| Humidity sensor | Vaisala HUMICAP® 180R |
| Stability | ±2 %RH over 2 years |
| Stability in typical HVAC applications | ±0.5 %RH per year |

Temperature

| | |
|--|---------------------------------|
| Measurement range | -40 ... +80 °C (-40 ... 176 °F) |
| Accuracy over Temperature Range: | |
| At +15 ... +25 °C (+59 ... +77 °F) | ±0.1 °C (±0.18 °F) |
| At 0 ... +15 °C and at +25 ... +40 °C (+32 ... +59 °F and +77 ... +104 °F) | ±0.15 °C (±0.27 °F) |
| At -40 ... +0 °C and at +40 ... +80 °C (-40 ... +32 °F and +104 ... +176 °F) | ±0.4 °C (±0.72 °F) |
| Temperature sensor | Pt1000 RTD Class F0.1 IEC 60751 |

Other Variables (Optional)

Dew point/frost point, wet bulb temperature, enthalpy, absolute humidity, mixing ratio, vapor pressure, and saturation vapor pressure

Inputs and Outputs

HMT120 Two-wire Transmitter (Loop Powered)

| | |
|------------------------|--|
| Current output signals | 4 ... 20 mA |
| External loop voltage | 10 ... 30 VDC ($R_L = 0 \Omega$) 20 ... 30 VDC ($R_L < 500 \Omega$) |

HMT130 Three-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 VDC, 200 mA) |
| Supply voltage | 10 ... 35 VDC 15 ... 35 VDC (when output 0 ... 10 V) 24 VAC (±20 %) |
| Current consumption at 24 VDC | 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 |

Operating Environment

| | |
|--|----------------------------------|
| 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, HMP110 probe | -40 ... +80 °C (-40 ... +176 °F) |
| Storage temperature | -50 ... +70 °C (-58 ... +158 °F) |
| EMC compliance | EN 61326-1 and EN 55022 |

Mechanical Specifications

| | |
|---------------------|--|
| IP rating | IP65 |
| 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 | Stainless steel (AISI 316) |
| Probe grid filter | Chrome coated ABS plastic |
| Connections | |
| Inputs and outputs | Screw terminals 0.5 ... 1.5 mm ² (AWG 20 ... AWG 15) |
| Probe interface | 4-pin M8 female panel connector |

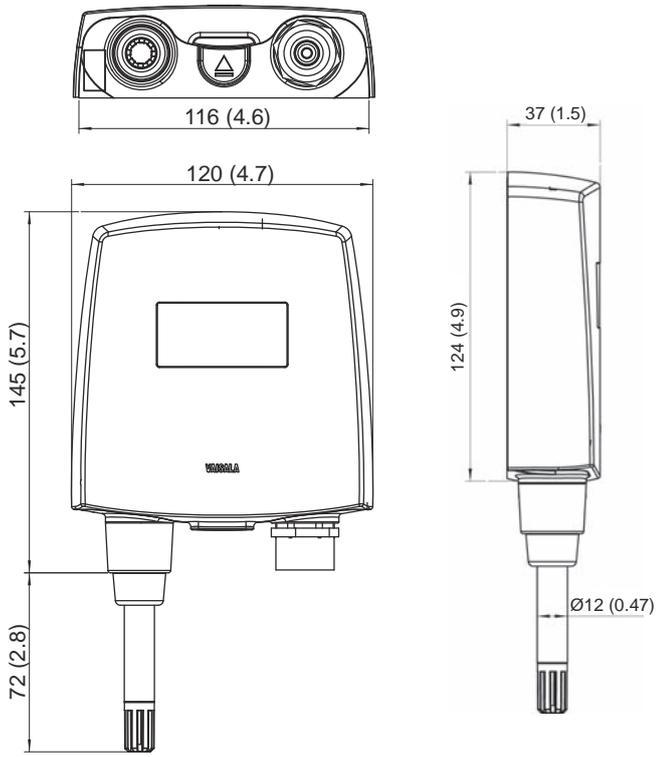
Spare Parts and Accessories

| | |
|---|-------------------------|
| Humidity and temperature probe | HMP110 ¹⁾ |
| Humidity and temperature replacement probe | HMP110R ¹⁾ |
| Constant output probe | HMP110REF ¹⁾ |
| Standard humidity sensor | HUMICAP180R |
| Catalytic humidity sensor for H ₂ O ₂ | HUMICAP180V |
| Probe mounting flange | 226061 |
| Probe mounting clamps, 10 pcs | 226067 |
| 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 |
| Radiation shield | DTR504A |
| Rain shield with installation kit | 215109 |
| Duct installation kit | 215619 |
| HM70 connection cable | 211339 |
| USB serial interface cable | 219685 |

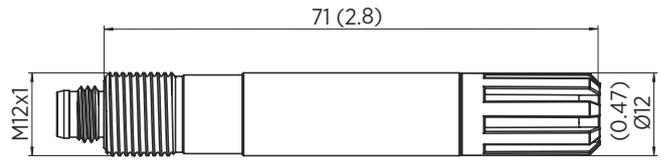
HMP110 Sensor Protection

| | |
|-----------------------------------|-------------|
| Plastic grid filter | DRW010522SP |
| Plastic grid with membrane filter | DRW010525SP |
| Stainless steel sintered filter | HM46670SP |
| Teflon sintered filter | DRW244938SP |

¹⁾ See separate order form



Transmitter dimensions in mm (inches)



Remote probe dimensions in mm (inches)



HMW90 Series Humidity and Temperature Transmitters

For High-performance HVAC Applications



Features

- Both analog and digital output
- 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 digital output 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 digital (BACnet/Modbus) 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.

| Model | Measurements | Output |
|--------------|---------------------|---|
| TMW92 | T-only | 2-wire, current output |
| TMW93 | T-only | 3-wire, voltage output |
| TMW90 | T-only | Configurable analog output model |
| HMW92 | RH+T | 2-wire, current output |
| HMW92D | RH+T | 2-wire, current output with display |
| HMW93 | RH+T | 3-wire, voltage output |
| HMW93D | RH+T | 3-wire, voltage output with display |
| HMW90 | RH+T | Configurable analog/digital model |
| HMW95 | RH+T | Digital (BACnet, Modbus) model |
| HMW95D | RH+T | Digital (BACnet, Modbus) 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 | Vaisala 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 |

Operating Environment

| | |
|-----------------------|-----------------------------------|
| Operating temperature | -5 ... +55 °C (+23 ... +131 °F) |
| Storage temperature | -30 ... +60 °C (-22 ... +140 °F) |
| EMC compliance | EN61326-1, Industrial Environment |

Mechanical Specifications

| | |
|---|---|
| IP rating | IP30 |
| Weight | 155 g (5.5 oz) |
| Standard housing color | White (RAL9003 ¹⁾) |
| Optional housing color (configurable models only) | Black (RAL9005 ¹⁾) |
| Housing material | ABS/PC, UL-V0 approved |
| Output connector | Screw terminals Max. wire size 2 mm ² (AWG14) |
| Service port connector | 4-pin M8 |

¹⁾ 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 hand-held meter | 219980 |
| USB cable for PC connection | 219690 |

Inputs and Outputs

Service port RS-485 line for temporary service use

Current Output Models

| | |
|-----------------------------------|--|
| Outputs | 2 x 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 |

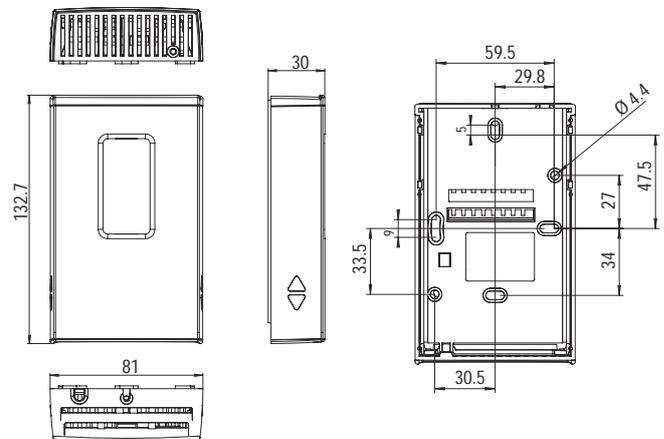
Voltage Output Models

| | |
|--------------------------|--------------------------------------|
| Outputs | 2 x 0 ... 5 V or 2 x 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)

Digital 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 protocols | BACnet MS/TP or Modbus RTU (selectable by DIP switch) |
| BACnet MS/TP Operating mode | Selectable Master/Slave |
| Address range, master mode | 0 ... 127 |
| Address range, slave mode | 128 ... 255 |
| Modbus RTU address range | 0 ... 247 |



Dimensions in mm



Features

- Measurement accuracy up to ± 1.5 %RH and ± 0.1 °C (± 0.18 °F)
- Analog output transmitter model options: HMD62 (RH and T) and TMD62 (T-only)
- All common humidity parameters available, including RH, dew point, enthalpy, and wet bulb temperature
- 4 ... 20 mA analog output
- Resistant to chemicals and dust
- IP66-rated body
- Traceable calibration certificate
- Easy field adjustment and output configuration with quick access to transmitter electronics also when installed
- Compatible with Vaisala Insight PC software

The duct mounted HMD60 series HUMICAP® transmitters are designed for light industrial applications and demanding HVAC applications such as museums, cleanrooms, and laboratories.

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.

Traceable Accuracy

HMD60 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 output. The analog outputs are field configurable with easy 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).

When required, HMD60 can also be intuitively field adjusted using trimmers or with the Vaisala HM70 hand-held meter.

Technical Data

Relative Humidity Measurement Performance

| | |
|--|--|
| Humidity sensor | Vaisala HUMICAP®R2 |
| Measurement range | 0 ... 100 %RH |
| Stability | ±2.5 %RH over 2 years |
| Accuracy at 0 ... +40 °C (+32 ... +104 °F) (Incl. Non-Linearity, Hysteresis and Repeatability) | |
| 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) (Incl. Non-Linearity, Hysteresis and Repeatability) | |
| 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 ³ (0 ... 131.1 gr/ft ³) |
| 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) |

Temperature Measurement Performance

| | |
|--|----------------------------------|
| Measurement range | -40 ... +80 °C (-40 ... +176 °F) |
| Default analog output scale | -20 ... +80 °C (-4 ... +176 °C) |
| 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 |

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 |

Mechanical Specification

| | |
|------------------|-----------------|
| Housing material | Cast aluminium |
| Probe material | Stainless steel |
| IP rating | IP66 (NEMA 4X) |
| Weight | 511 g (18 oz) |

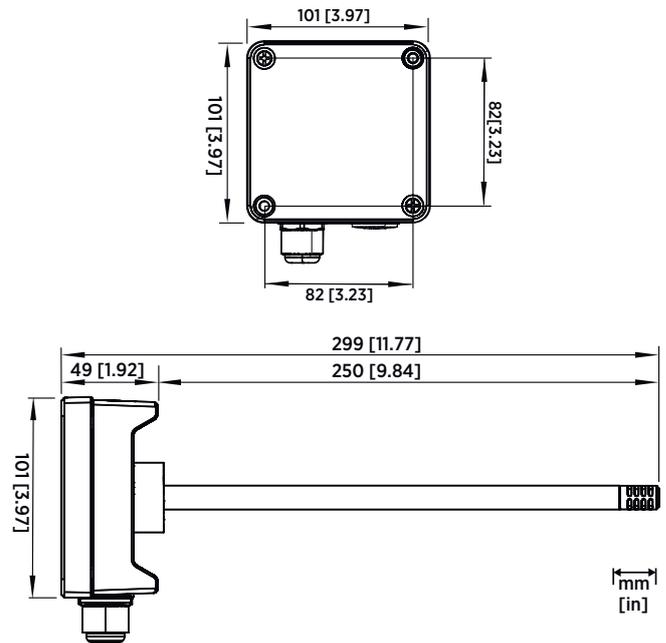
Inputs and Outputs

| | |
|--------------------------|--|
| Power supply input | 10 ... 35 VDC (RL = 0 Ω) 20 ... 35 VDC (RL = 600 Ω) |
| Analog outputs | <ul style="list-style-type: none"> TMD62: 1 x T output 4 ... 20 mA HMD62: 1 x RH output 4 ... 20 mA, 1 x T output 4 ... 20 mA Calculated output parameters for HMD62 include T_d, T_{df}, A, X, T_w, and H. |
| Service port | M8 4-pin male connector: <ul style="list-style-type: none"> MI70 hand-held indicator (requires cable 219980SP) Vaisala Insight PC software¹⁾ (requires USB cable 219690) |
| Screw terminal wire size | 0.5 ... 2.5 mm ² |

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

Spare Parts and Accessories

| | |
|---|-------------|
| USB cable for PC operation (Vaisala Insight software) | 219690 |
| Connection cable for HM70 (MI70) hand-held meter | 219980SP |
| Membrane filter | ASM212652SP |
| Sintered filter | HM46670SP |
| Conduit fitting and O-ring (M16x1.5 / NPT1/2") | 210675SP |



HMD60 Dimensions (Front and Side)



HMDW110 Series Humidity and Temperature Transmitters

For High-accuracy Measurements in HVAC Applications



Features

- Accurate humidity and temperature transmitters for measurements in HVAC and cleanroom applications
- Outdoor transmitter with professional-grade radiation shield
- Proven HUMICAP® 180R sensor for superior long-term stability
- ± 2 %RH accuracy
- 3-point traceable calibration (certificate included)
- On-site calibration with HM70 Hand-Held Meter or Vaisala Insight PC software
- Current (4 ... 20 mA) or Modbus RTU output variants
- Default output parameters are relative humidity and temperature. Dew point temperature, wet bulb temperature, and enthalpy outputs selectable with Vaisala Insight PC software.

Vaisala HUMICAP® Humidity and Temperature Transmitter Series HMDW110 measure relative humidity and temperature in multiple HVAC applications. The series includes transmitters for duct mounting, IP65-classified wall transmitters, and outdoor transmitters with integrated radiation shields.

Proven Vaisala HUMICAP® Performance

The cost-efficient HMDW110 series transmitters are equipped with trusted HUMICAP® 180R sensors. The sensor's superior long-term stability minimizes maintenance needs throughout the transmitter's lifetime. If necessary, the transmitter can be field-calibrated using either an HM70 Hand-Held Humidity and Temperature Meter, or Vaisala Insight PC software. HMDW110 series instruments are individually adjusted and delivered with a traceable calibration certificate.

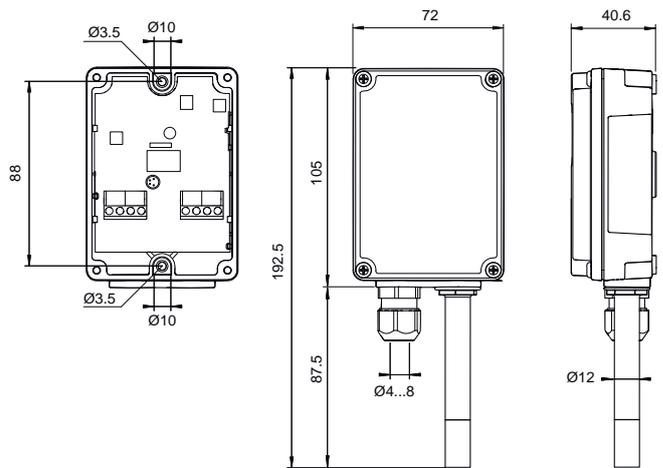
Unrivaled Outdoor Humidity Measurements

The integrated radiation shield of the outdoor models HMS110 and HMS112 enables unrivaled measurement performance. It reduces the impact of sunshine on temperature and humidity measurements, and ensures measurement accuracy in outdoor conditions. The most popular control parameters in free cooling – dew point temperature, wet bulb temperature, and enthalpy – are available as output parameters.

Well-suited for Cleanroom Monitoring

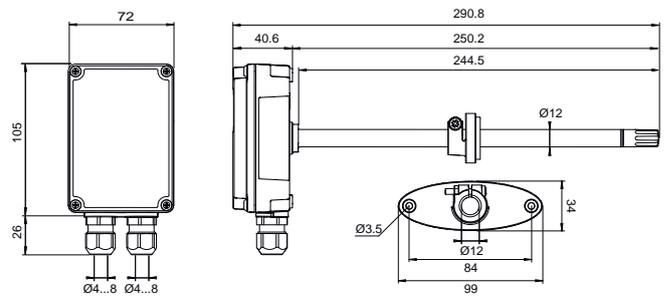
The HMD110 and HMW110 transmitters can be ordered with the catalytic HUMICAP® sensor HUMICAP® 180V. The catalytic sensor improves stability especially in hydrogen peroxide sterilized environments where repeated condensation is expected. An optional panel display can be added for remote monitoring. Transmitters can be installed into difficult-to-reach locations, while measurement data can be read from a more convenient spot.

Technical Data



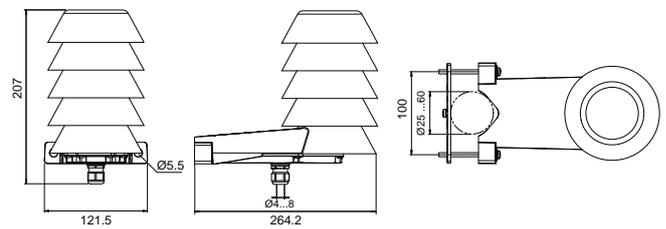
Dimensions in mm

HMW110/112 RH+T transmitters for measurements in wet areas



Dimensions in mm

HMD110/112 RH+T transmitters for ducts



Dimensions in mm

HMS110/112 RH+T transmitters for outdoor measurements

Models

| Model Number | Type | Output | Special Features | Ingress Protection |
|--------------|------------------|-------------------------------------|--|--------------------|
| HMW110 | Wall-mount, RH+T | 2-wire current or Modbus RTU output | Configurable model ¹⁾ | IP65 |
| HMW112 | Wall-mount, RH+T | 2-wire current output | | IP65 |
| HMD110 | Duct-mount, RH+T | 2-wire current or Modbus RTU output | Configurable model ¹⁾ | IP65 |
| HMD112 | Duct-mount, RH+T | 2-wire current output | | IP65 |
| HMS110 | Outdoor, RH+T | 2-wire current or Modbus RTU output | Radiation shield, configurable model ¹⁾ | IP65 |
| HMS112 | Outdoor, RH+T | 2-wire current output | Radiation shield | IP65 |

¹⁾ Delivered with customer specific output settings, including calculated humidity parameters and special scaling of outputs.

Measurement Performance

Relative Humidity

| | |
|---|-----------------------|
| Measurement range | 0 ... 100 %RH |
| 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 |
| Stability in typical HVAC applications | ±0.5 %RH/year |
| Humidity sensor | Vaisala HUMICAP® 180R |

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

| | |
|--|---|
| 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 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) |
| Factory calibration uncertainty at 20 °C (+68 °F) | ±1.5 %RH/±0.2 °C |

Operating Environment (All Models)

| | |
|----------------------------|-----------------------------------|
| Operating temperature | -40 ... +60 °C (-40 ... +140 °F) |
| Operating humidity | 0 ... 100 %RH |
| Maximum wind/flow speed | 30 m/s |
| Storage temperature | -40 ... +60 °C (-40 ... +140 °F) |
| Electromagnetic compliance | EN61326-1, Industrial Environment |

Inputs and Outputs

Devices Ordered With Analog Output

| | |
|---|--|
| Outputs | 4 ... 20 mA, loop powered |
| Loop resistance | 0 ... 600 Ω |
| Supply voltage | 20 ... 28VDC at 600 Ω load 10 ... 28VDC at 0 Ω load |
| Interface for RDP100 Remote Display Panel | Power and data supplied from transmitter |

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 ... 28VDC |

Spare Parts and Accessories

| | |
|--|-------------|
| Remote Display Panel | RDP100 |
| Conduit fitting + O-ring (M16x1.5 / NPT1/2 Inch) | 210675SP |
| Conduit fitting + O-ring (M16x1.5 / PG9, RE-MS) | 210674SP |
| Fastening set HMS110 | 237805 |
| 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 for HM70 hand-held meter | 219980SP |
| HUMICAP® 180R sensor | HUMICAP180R |
| Catalytic HUMICAP® sensor | HUMICAP180V |

Mechanical Specifications

| | |
|------------------------|------------------------------|
| Maximum wire size | 1.5 mm ² (AWG 16) |
| Standard housing color | White (RAL9003) |
| Housing material | PC + 10 %GF (UL-V0 approved) |

HMS110 Series Humidity and Temperature Transmitters

For High-accuracy Outdoor Measurements in Building Automation Applications



Features

- Reliable outdoor transmitters with integrated radiation shields
- ± 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)
- On-site calibration with HM70 Hand-Held Meter or PC connection
- Ingress protection IP65

Vaisala HMS110 Series HUMICAP® Humidity and Temperature Transmitters are designed for demanding outdoor measurements in building automation applications. These ± 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.

Technical Data

Models

| Model | Type | Output | IP Rating |
|--------|---------------|------------------------|-----------|
| HMS110 | Outdoor, RH+T | 2-wire, current output | IP65 |
| HMS112 | Outdoor, RH+T | 2-wire, current output | IP65 |

HMS110 is delivered with customer specific output settings, including calculated humidity parameters and special scaling of outputs.

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)

| | |
|--|---|
| 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 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) |
| EMC compliance | EN61326-1, Industrial Environment |

Inputs and Outputs

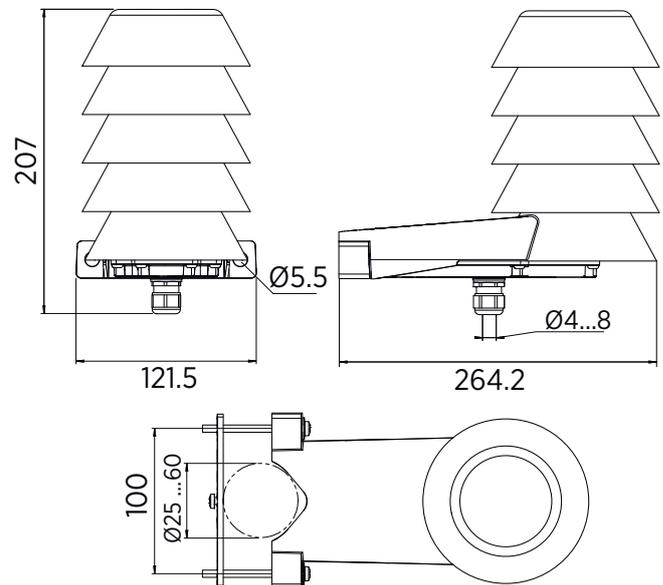
| | |
|--|--|
| Analog outputs | 4 ... 20 mA, loop powered |
| Loop resistance | 0 ... 600 Ω |
| Supply voltage | 20 ... 28VDC at 600 Ω load 10 ... 28VDC at 0 Ω load |
| Data input for RDP100 Remote Panel Display | RS-485 Vaisala proprietary protocol |

Mechanical Specifications

| | |
|------------------------|------------------------------|
| Max. wire size | 1.5 mm ² (AWG 16) |
| Standard housing color | White (RAL9003) |
| Housing material | PC + 10 %GF (UL-V0 approved) |

Spare Parts and Accessories

| | |
|--|-------------|
| Remote Panel Display | RDP100 |
| 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 |
| Connection cable for HM70 hand-held meter | 219980SP |
| HUMICAP® 180R sensor | HUMICAP180R |





HMDW80 Series Humidity and Temperature Transmitters

For Building Automation Applications



Features

- Reliable transmitters for basic HVAC humidity measurements
- ± 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

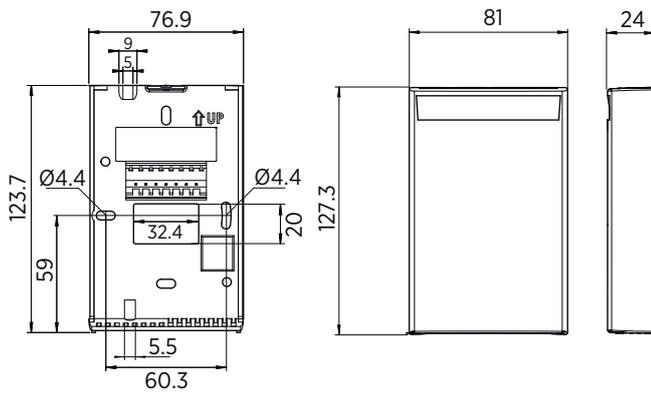
HMDW80 series transmitters require minimal maintenance thanks to their excellent sensor stability and high-quality materials. If necessary, the INTERCAP® sensor can be easily exchanged in the field with minimum downtime.

| Model number | Type | Output | Special Features | IP rating |
|---------------------|--------------------|------------------------|---|------------------|
| TMW82 | Wall-mount, T-only | 2-wire, current output | | IP30 |
| TMW83 | Wall-mount, T-only | 3-wire, voltage 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 ¹⁾ | IP65 |
| HMW88D | Wall-mount, RH+T | 2-wire, current output | Display, calculated parameters ¹⁾ | IP65 |
| HMW89 | Wall-mount, RH+T | 3-wire, voltage output | Calculated parameters ¹⁾ | IP65 |
| HMW89D | Wall-mount, RH+T | 3-wire, voltage output | Display, calculated parameters ¹⁾ | IP65 |
| TMD82 | Duct-mount, T-only | 2-wire, current output | | IP65 |
| TMD83 | Duct-mount, T-only | 3-wire, voltage output | | IP65 |
| HMD82 | Duct-mount, RH+T | 2-wire, current output | Calculated parameters ¹⁾ | IP65 |
| HMD82D | Duct-mount, RH+T | 2-wire, current output | Display, calculated parameters ¹⁾ | IP65 |
| HMD83 | Duct-mount, RH+T | 3-wire, voltage output | Calculated parameters ¹⁾ | IP65 |
| HMD83D | Duct-mount, RH+T | 3-wire, voltage output | Display, calculated parameters ¹⁾ | IP65 |
| HMS82 | Outdoor, RH+T | 2-wire, current output | Radiation shield, calculated parameters ¹⁾ | IP65 |
| HMS82C | Outdoor, RH+T | 2-wire, current output | HMS82 with NPT ½" conduit fitting ¹⁾ | IP65 |
| HMS83 | Outdoor, RH+T | 3-wire, voltage output | Radiation shield, calculated parameters ¹⁾ | IP65 |
| HMS83C | Outdoor, RH+T | 3-wire, voltage output | HMS83 with NPT ½" conduit fitting ¹⁾ | IP65 |

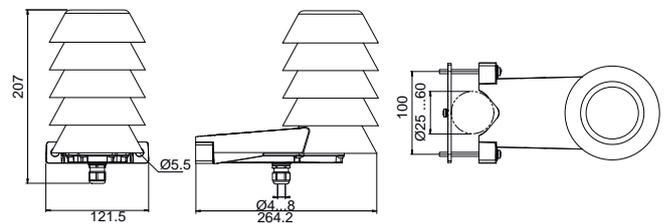
¹⁾ Output parameters for humidity: relative humidity, dew point temperature, wet bulb temperature, and enthalpy.

Dimensions

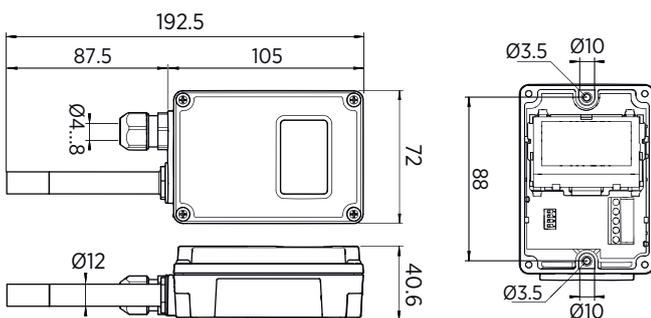
HMW82/83 RH+T and TMW82/83 T-only transmitters for wall-mounting



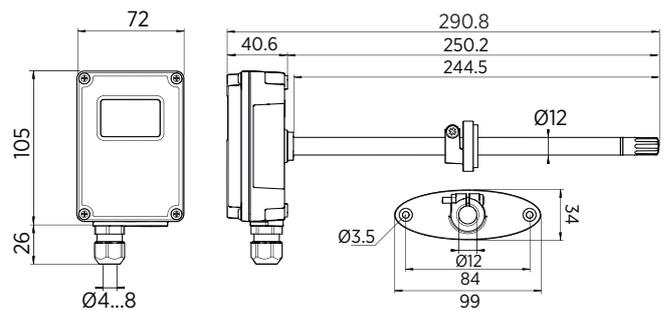
HMS82/83 RH+T transmitters for outdoor measurements



HMW88/89(D) and TMW88 RH+T transmitters for measurements in wet areas



HMD82/83(D) and TMD82/83 RH+T and T-only transmitters for ducts



Technical Data

Measurement Performance, Models HMW82/83 and TMW82/83

| 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, TMD82/83, HMW88/89, TMW88 and HMS82/83

| 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 TMW82/83 | -5 ... +55 °C (+23 ... +131 °F) |
| HMD82/83, TMD82/83, HMW88/89, TMW88 and HMS82/83 | -40 ... +60 °C (-40 ... +140 °F) |
| HMD82/83D and HMW88/89D | -5 ... +60 °C (+23 ... +140 °F) |
| Operating Humidity | |
| HMD82/83, TMD82/83, HMW88/89, TMW88 and HMS82/83 | 0 ... 100 %RH |
| HMW82/83, TMW82/83, 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 ² (AWG 16) |
|---|------------------------------|
| Standard housing color | White (RAL9003) |
| Housing material | |
| HMW82/83, TMW82/83 | ABS/PC (UL-V0 approved) |
| HMW88/89(D), HMD82/83(D), TMW88, TMD82/83, HMS82/83 | PC + 10 %GF (UL-V0 approved) |

Spare Parts and Accessories

| | |
|---|-------------------|
| INTERCAP sensor | 15778HM |
| 10 pcs of INTERCAP sensors | INTERCAPSET-10PCS |
| Conduit fitting + O-ring (M16x1.5 / NPT1/2 Inch) | 210675SP |
| Conduit fitting + O-ring (M16x1.5 / PG9, RE-MS) | 210674SP |
| Fastening set HMS80 | 237805 |
| Porous PTFE Filter | DRW239993SP |
| Membrane Filter | ASM210856SP |
| Terminal Block, Blue | 236620SP |
| HMD80 display lid | ASM210793SP |

VAISALA

www.vaisala.com

| | |
|---|------------------------|
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| | Ph 02 9481 7420 |
| | Fax 02 9481 7267 |
| | esis.enq@esis.com.au |



HMS80 Series Humidity and Temperature Transmitters

For Outdoor Measurements in Building Automation Applications



Features

- Reliable outdoor transmitters with integrated radiation shields
- ± 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 ± 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 ¹⁾

| | |
|--|--|
| 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) |

¹⁾ 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

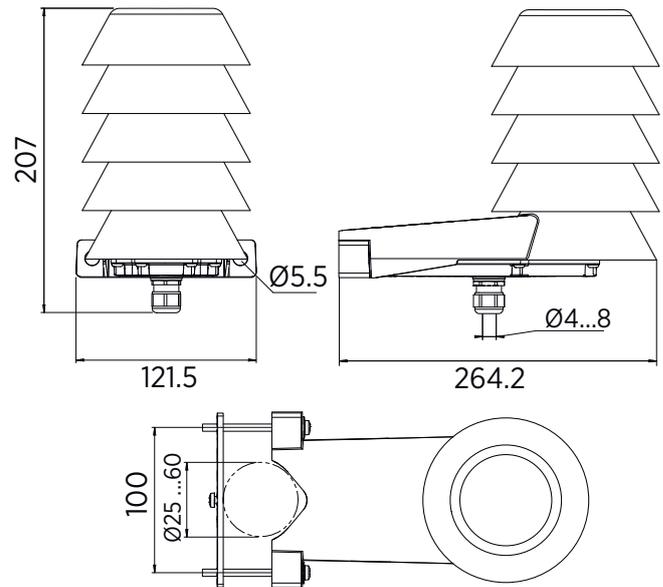
| | |
|-------------------------|-----------------------------------|
| Operating temperature | -40 ... +60 °C (-40 ... +140 °F) |
| Operating humidity | 0 ... 100 %RH |
| Maximum wind/flow speed | 30 m/s (67 mph) |
| Storage temperature | -40 ... +60 °C (-40 ... +140 °F) |
| EMC compliance | EN61326-1, Industrial Environment |

Mechanical Specifications

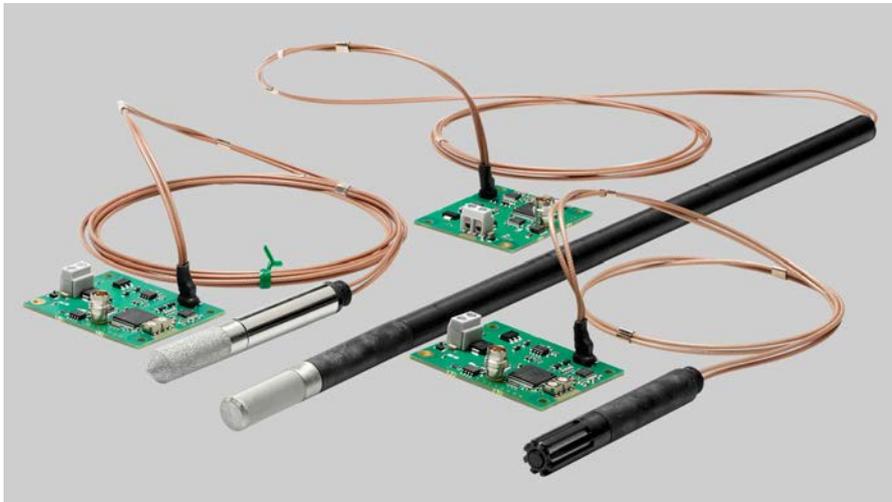
| | |
|------------------------|------------------------------|
| Max. wire size | 1.5 mm ² (AWG 16) |
| Standard housing color | White (RAL9003) |
| Housing material | PC + 10 %GF (UL-V0 approved) |

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



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® R2 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 modules provide 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® R2 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 | Vaisala HUMICAP® R2 Vaisala HUMICAP® 180V |

Accuracy at -20 ... +40 °C (-4 ... +104 °F) (Incl. Non-Linearity, Hysteresis and Repeatability):

| | |
|----------------|--------|
| 0 ... 90 %RH | ±2 %RH |
| 90 ... 100 %RH | ±3 %RH |

Accuracy at -40 ... -20 °C and +40 ... +180 °C (-40 ... -4 °F and +104 ... +356 °F) (Incl. Non-Linearity, Hysteresis and Repeatability):

| | |
|----------------|----------|
| 0 ... 90 %RH | ±2.5 %RH |
| 90 ... 100 %RH | ±3.5 %RH |

Dew Point Temperature

| | |
|-------------------|---|
| Measurement range | -20 ... +100 °C (-4 ... +212 °F) T _d |
|-------------------|---|

Accuracy (incl. non-linearity, hysteresis and repeatability) when dew point depression <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 series 4-pin (male) |
| Probe diameter | 12 mm (0.5 in) |

Probe Cable Lengths

| | |
|---|-------------------------------|
| Stainless steel probe | 1.55/2.9 m (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

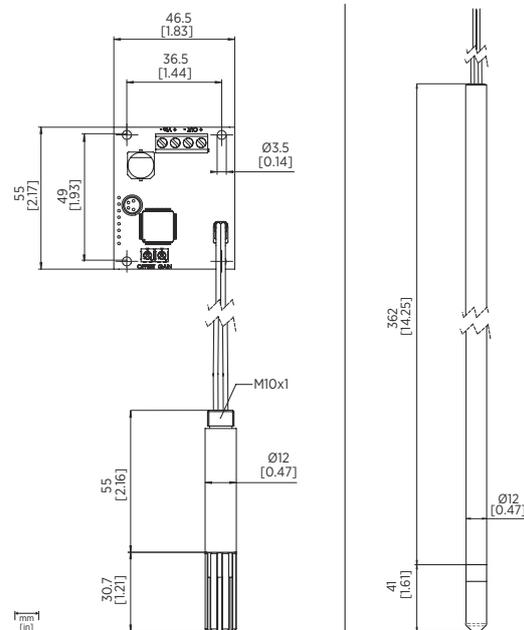
| | |
|-------------------------|----------------|
| Lid | ABS/PC |
| Bottom plate | Al |
| Module housing material | ABS/PC (cover) |

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 |
| Max. wire size | 0.5 ... 1.5 mm ² (AWG) |
| Service port | M8 connector for USB cable |

Spare Parts and Accessories

| | |
|---|-------------|
| Humidity sensor | HUMICAPR2 |
| Humidity sensor | HUMICAP180R |
| Humidity sensor | HUMICAP180V |
| 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 |





Features

- Digital I²C 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 I²C output for relative humidity (RH) or dew point (T_d).

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.

I²C interface for better usability

HMM105 has an I²C interface for communicating with the incubator's controller. HMM105 implements I²C 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) _{T_d} |
| Accuracy (incl. non-linearity, hysteresis and repeatability) when dew point depression < 20 °C (Ambient temperature - dew point) | ±2 °C T _d |

Operating Environment

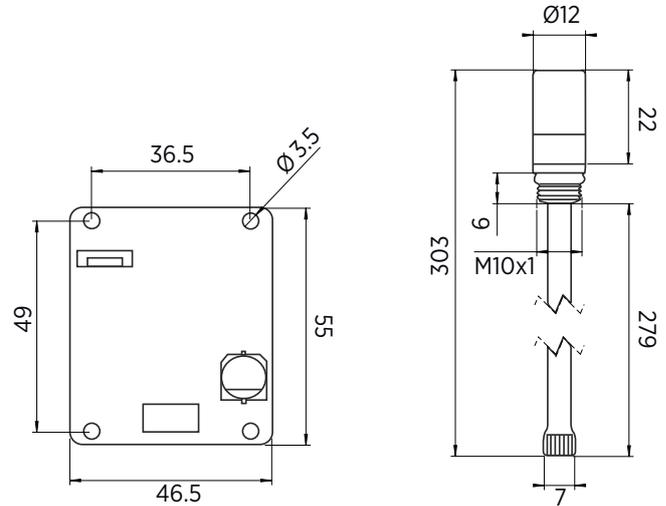
| | |
|--|---|
| EMC compliance | Applicable parts of EN61326-1, Industrial Environment |
| Storage temperature | -40 ... +75 °C (-40 ... +167 °F) |
| Operating Temperature | |
| Component board | -5 ... +55 °C (+23 ... +131 °F) |
| Probe (continuous use) | -40 ... +180 °C (-40 ... +356 °F) |
| Probe (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 ² C 5 V |
| Power consumption (DC/AC) | < 15/25 mA |
| Connector for supply voltage and I ² 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 |



Features

- Miniature-size humidity probe
- Low power consumption
- Measurement range: 0 ... 100 %RH; -40 ... +60 °C
- Cable detachable with standard M8 connector
- Rugged metal housing
- Interchangeable Vaisala INTERCAP® Sensor
- Optional RS-485 digital output supports Modbus RTU
- Optional dew point output

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

There are two configurable voltage outputs with relative humidity, temperature or dew point scaling. Four voltage output ranges are available. An optional RS-485 output with Modbus support is also available.

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: | |
| Temperature range | 0 ... +40 °C |
| 0 ... 90 %RH | ±3 %RH |
| 90 ... 100 %RH | ±5 %RH |
| Temperature range | -40 ... 0 °C, +40 ... +60 °C |
| 0 ... 90 %RH | ±5 %RH |
| 90 ... 100 %RH | ±7 %RH |
| Humidity sensor | Vaisala INTERCAP® |

Temperature

| | |
|----------------------------------|----------------|
| Measurement range | -40 ... +60 °C |
| Accuracy over Temperature Range: | |
| +10 ... +30 °C | ±0.5 °C |
| -40 ... +10, +30 ... +60 °C | ±0.6 °C |

Dew Point

| | |
|---|------------------------------|
| Measurement range | -40 ... +60 °C |
| Typical Accuracy: | |
| Temperature range | 0 ... +40 °C |
| When dew point depression ¹ < 15 °C | ±2 °C |
| Temperature range | -40 ... 0 °C, +40 ... +60 °C |
| When dew point depression < 10 °C ¹⁾ | ±3 °C |

Analog Outputs

| | |
|------------------------|------------------|
| Accuracy at 20 °C | ±0.2 % of FS |
| Temperature dependence | ±0.01 % of FS/°C |

¹⁾ Dew point depression = ambient temperature - dew point

Operating Environment

| | |
|-----------------------|------------------------------------|
| Operating temperature | -40 ... +60 °C |
| EMC compliance | EN 61326-1, industrial environment |

Mechanical Specifications

| | |
|------------------------|----------------------------|
| IP rating | IP65 |
| Body thread | M12x1 / 10 mm |
| 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 |
| Probe with 0.3 m cable | 28 g |

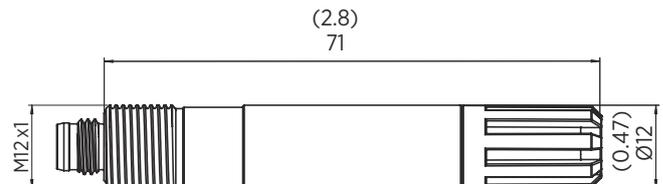
Inputs and Outputs

| | |
|--|--|
| Power consumption | 1 mA average, max. peak 5 mA |
| Operating Voltage¹⁾ | |
| With 1 V / 2.5 V output | 5 ... 28 VDC |
| With 5 V output | 8 ... 28 VDC |
| With loop power converter | 8 ... 28 VDC |
| With digital output | 5 ... 20 VDC |
| Start-Up Time | |
| Probes with analog output | 4 s at operating voltage 13.5 ... 16.5 VDC 2 s at other valid operating voltages |
| Probes with digital output | 1 s |
| Outputs | |
| 2 channels | 0 ... 1 VDC / 0 ... 2.5 VDC / 0 ... 5 VDC / 1 ... 5 VDC |
| 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 _L min. 10 kΩ |
| 0 ... 2.5 V / 0 ... 5 V | R _L min. 50 kΩ |

¹⁾ (Use Lowest Available Operating Voltage to Minimize Heating)

Spare Parts and Accessories

| | |
|-------------------------------------|-------------------|
| Vaisala INTERCAP® Sensor, 1 piece | 15778HM |
| Vaisala INTERCAP® Sensor, 10 pcs | INTERCAPSET-10PCS |
| 4 ... 20mA loop power converter | UI-CONVERTER-1CB |
| Mounting bracket for converter | 225979 |
| Plastic M12 installation nuts, pair | 18350SP |
| USB cable for PC connection | 219690 |
| Probe mounting clamp set, 10 pcs | 226067 |
| Probe mounting flange | 226061 |
| Sensor Protection | |
| Plastic grid | DRW010522 |
| Membrane filter | DRW010525 |
| Stainless steel sintered filter | HM46670SP |
| PTFE sintered filter | DRW244938SP |
| Connection Cables | |
| 0.3 m PU | HMP50Z032SP |
| 3 m PU | HMP50Z300SP |
| 180 °C 3 m FEP | 226902SP |



Dimensions in mm (inches)

VAISALA

www.vaisala.com

| | |
|--|--|
| | www.esis.com.au |
| | Ph 02 9481 7420 |
| | Fax 02 9481 7267 |
| | esis.enq@esis.com.au |



Features

- Fast thermal response time
- Low power consumption
- Start-up time < 2 s
- Measurement range: 0 ... 100 %RH; -40 ... +60 °C
- Detachable cable with standard 4-pin M8 connector
- Plastic enclosure with IP54 classification
- Interchangeable Vaisala INTERCAP® sensor
- Optional RS-485 digital output
- Optional dew point output

Vaisala INTERCAP® Humidity and Temperature Probe HMP63 is a cost-effective humidity probe with plastic enclosure. It is designed for noncondensing 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 Outputs

There are two configurable voltage outputs for relative humidity, temperature, or dew point output. An alternative RS-485 output with Modbus support is also available.

Fast Thermal Response Time

HMP63 has a PC/ABS plastic enclosure. It is ideal for conditions with fast temperature changes and when standard measurement accuracy is sufficient.

No Recalibration Required

HMP63 includes an interchangeable Vaisala INTERCAP® sensor. No recalibration is required – the humidity sensor can simply be replaced, even in the field.

Technical Data

Measurement Performance

Relative Humidity

| | |
|-------------------|------------------------------|
| Measurement range | 0 ... 100 %RH |
| Typical Accuracy: | |
| Temperature range | 0 ... +40 °C |
| 0 ... 90 %RH | ±3 %RH |
| 90 ... 100 %RH | ±5 %RH |
| Temperature range | -40 ... 0 °C, +40 ... +60 °C |
| 0 ... 90 %RH | ±5 %RH |
| 90 ... 100 %RH | ±7 %RH |
| Humidity sensor | Vaisala INTERCAP® |

Temperature

| | |
|----------------------------------|----------------|
| Measurement range | -40 ... +60 °C |
| Accuracy over Temperature Range: | |
| +10 ... +30 °C | ±0.5 °C |
| -40 ... +10, +30 ... +60 °C | ±0.6 °C |

Dew Point

| | |
|---|------------------------------|
| Measurement range | -40 ... +60 °C |
| Typical Accuracy: | |
| Temperature range | 0 ... +40 °C |
| When dew point depression ¹ < 15 °C | ±2 °C |
| Temperature range | -40 ... 0 °C, +40 ... +60 °C |
| When dew point depression < 10 °C ¹⁾ | ±3 °C |

Analog Outputs

| | |
|------------------------|------------------|
| Accuracy at 20 °C | ±0.2 % of FS |
| Temperature dependence | ±0.01 % of FS/°C |

Inputs and Outputs

| | |
|-------------------|------------------------------|
| Power consumption | 1 mA average, max. peak 5 mA |
|-------------------|------------------------------|

Operating Voltage¹⁾

| | |
|---------------------------|--------------|
| With 1 V / 2.5 V output | 5 ... 28 VDC |
| With 5 V output | 8 ... 28 VDC |
| With loop power converter | 8 ... 28 VDC |
| With digital output | 5 ... 20 VDC |

Start-Up Time

| | |
|----------------------------|---------------------------------------|
| Probes with analog output | 4 s at operating voltage |
| | 13.5 ... 16.5 VDC |
| Probes with digital output | 2 s at other valid operating voltages |
| | 1 s |

Outputs

| | |
|--|--|
| 2 channels | 0 ... 1 VDC / 0 ... 2.5 VDC / 0 ... 5 VDC / 1 ... 5 VDC |
| 1-channel loop-power converter (separate module, compatible with humidity accuracy only) | 4 ... 20 mA |
| Digital output (optional) | RS-485 2-wire half duplex |

External Loads

| | |
|-------------------------|---------------------------|
| 0 ... 1 V | R _L min. 10 kΩ |
| 0 ... 2.5 V / 0 ... 5 V | R _L min. 50 kΩ |

¹⁾ (Use Lowest Available Operating Voltage to Minimize Heating)

Operating Environment

| | |
|-----------------------|--|
| Operating temperature | -40 ... +60 °C |
| EMC compliance | EN 61326-1, basic immunity test requirements |

Mechanical Specifications

| | |
|------------------------|--------------------------|
| IP rating | IP54 |
| 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 |
| Probe with 0.3 m cable | 20 g |

Spare Parts and Accessories

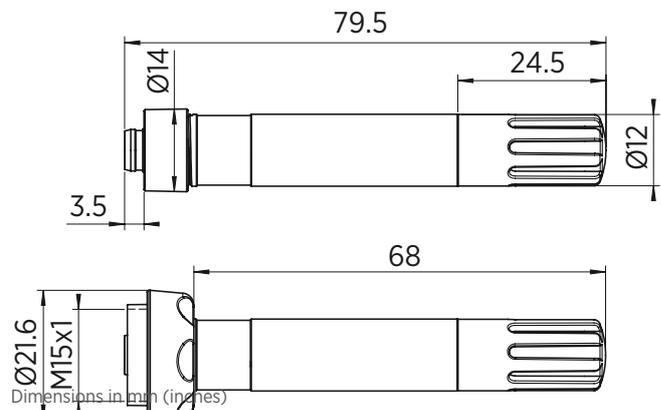
| | |
|-------------------------------------|-------------------|
| Vaisala INTERCAP® Sensor, 1 piece | 15778HM |
| Vaisala INTERCAP® Sensor, 10 pcs | INTERCAPSET-10PCS |
| 4 ... 20mA loop power converter | UI-CONVERTER-1CB |
| Mounting bracket for converter | 225979 |
| Plastic M12 installation nuts, pair | 18350SP |
| USB cable for PC connection | 219690 |
| Probe mounting clamp set, 10 pcs | 226067 |
| Probe mounting flange | 226061 |

Sensor Protection

| | |
|---------------------------------|-------------|
| Plastic grid for use with HM40 | DRW236214SP |
| Membrane filter | 230727SP |
| Stainless steel sintered filter | HM47280SP |
| Porous PTFE filter | 219452SP |

Connection Cables

| | |
|----------------|-------------|
| 0.3 m PU | HMP50Z032SP |
| 3 m PU | HMP50Z300SP |
| 180 °C 3 m FEP | 226902SP |





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
- Optional RS-485 digital output supports Modbus RTU
- ±1.5 %RH measurement accuracy (0 ... 90 %RH)

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
- HMP110R replacement probe service available for easy maintenance
- Comes with calibration certificate
- Optional dew point 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

The temperature measurement is a standard feature, dew point measurement is optional. Three standard voltage outputs are available. An optional RS-485 output with Modbus support is also available.

Robust Design

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

Easy Maintenance

Maintaining measurement traceability is easy using the HMP110R replacement probe. We send you a replacement probe, you detach the old probe and send it back to us. This way the measurement is available at all times without interruptions.

Technical Data

Measurement Performance

Relative Humidity

| | |
|--|-----------------------|
| Measurement range | 0 ... 100 %RH |
| Accuracy at 0 ... +40 °C (+32 ... +104 °F) (Incl. Non-Linearity, Hysteresis and Repeatability): | |
| 0 ... 90 %RH | ±1.5 %RH |
| 90 ... 100 %RH | ±2.5 %RH |
| Accuracy at -40 ... 0 °C, +40 ... +80 °C (-40 ... +32 °F, +104 ... +176 °F) (Incl. Non-Linearity, Hysteresis and Repeatability): | |
| 0 ... 90 %RH | ±3.0 %RH |
| 90 ... 100 %RH | ±4.0 %RH |
| Factory Calibration Uncertainty (+20 °C (+68 °F)): | |
| 0 ... 90 %RH | ±1.1 %RH |
| 90 ... 100 %RH | ±1.8 %RH |
| Humidity sensor | Vaisala HUMICAP® 180R |
| Stability | ±2 %RH over 2 years |

Temperature

| | |
|---|----------------------------------|
| Measurement range | -40 ... +80 °C (-40 ... +176 °F) |
| Accuracy over Temperature Range (Probes with Analog Output): | |
| 0 ... +40 °C (+32 ... +104 °F) | ±0.2 °C (±0.36 °F) |
| -40 ... 0 °C, +40 ... +80 °C (-40 ... +32 °F, +104 ... +176 °F) | ±0.4 °C (±0.72 °F) |
| Accuracy over Temperature Range (Probes with Digital Output): | |
| +15 ... +25 °C (+59 ... +77 °F) | ±0.1 °C (±0.18 °F) |
| 0 ... +15 °C, +25 ... +40 °C (+32 ... +59 °F, +77 ... +104 °F) | ±0.15 °C (±0.27 °F) |
| -40 ... 0 °C, +40 ... +80 °C (-40 ... +32 °F, +104 ... +176 °F) | ±0.4 °C (±0.72 °F) |
| Temperature sensor | Pt1000 RTD Class F0.1 IEC 60751 |

Dew Point

| | |
|--|----------------------------------|
| Measurement range | -40 ... +80 °C (-40 ... +176 °F) |
| Accuracy at 0 ... +40 °C (+32 ... +104 °F) (Incl. Non-Linearity, Hysteresis and Repeatability): | |
| When dew point depression < +15 °C (+59 °C) | ±1 °C (±33.8 °F) |
| When dew point depression +15 ... +25 °C (+59 ... +77 °F) | ±2 °C (±35.6 °F) |
| Accuracy at -40 ... 0 °C, +40 ... +80 °C (-40 ... +32 °F, +104 ... +176 °F) (Incl. Non-Linearity, Hysteresis and Repeatability): | |
| When dew point depression < +15 °C (+59 °F) ¹⁾ | ±2 °C (±35.6 °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) |

¹⁾ Dew point depression = ambient temperature - dew point

Mechanical Specifications

| | |
|-------------------------------|----------------------------|
| IP rating | IP65 |
| Body thread | M12x1 / 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) |

Operating Environment

| | |
|-----------------------|------------------------------------|
| Operating temperature | -40 ... +80 °C (-40 ... +176 °F) |
| EMC compliance | EN 61326-1, industrial environment |

Inputs and Outputs

| | |
|--|--|
| Power consumption | 1 mA average, max. peak 5 mA |
| Operating Voltage¹⁾ | |
| With 1 V / 2.5 V output | 5 ... 28 VDC |
| With 5 V output | 8 ... 28 VDC |
| With loop power converter | 8 ... 28 VDC |
| With digital output | 5 ... 28 VDC |
| Start-Up Time | |
| HMP110 probes with analog output | 4 s at operating voltage 13.5 ... 16.5 VDC 2 s at other valid operating voltages |
| HMP110 probes with digital output | 1 s |
| Outputs | |
| 2 channels | 0 ... 1 VDC / 0 ... 2.5 VDC / 0 ... 5 VDC / 1 ... 5 VDC |
| 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 _L min 10 kΩ |
| 0 ... 2.5 V / 0 ... 5 V | R _L min 50 kΩ |

¹⁾ Use lowest available operating voltage to minimize heating.

Spare Parts and Accessories

| | |
|-------------------------------------|------------------|
| 4 ... 20 mA loop power converter | UI-CONVERTER-1CB |
| Mounting bracket for converter | 225979 |
| Plastic M12 installation nuts, pair | 18350SP |
| USB cable for PC connection | 219690 |
| Probe mounting clamp set, 10 pcs | 226067 |
| Probe mounting flange | 226061 |

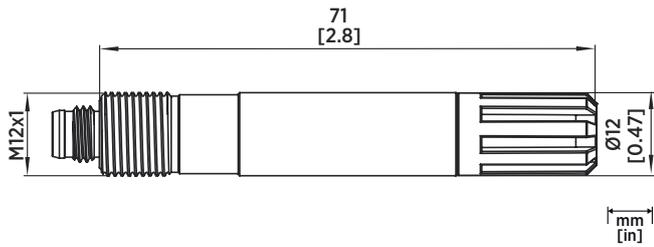
Sensor Protection

| | |
|---------------------------------|-------------|
| Plastic grid | DRW010522SP |
| Membrane filter | DRW010525SP |
| Stainless steel sintered filter | HM46670SP |
| PTFE sintered filter | DRW244938SP |

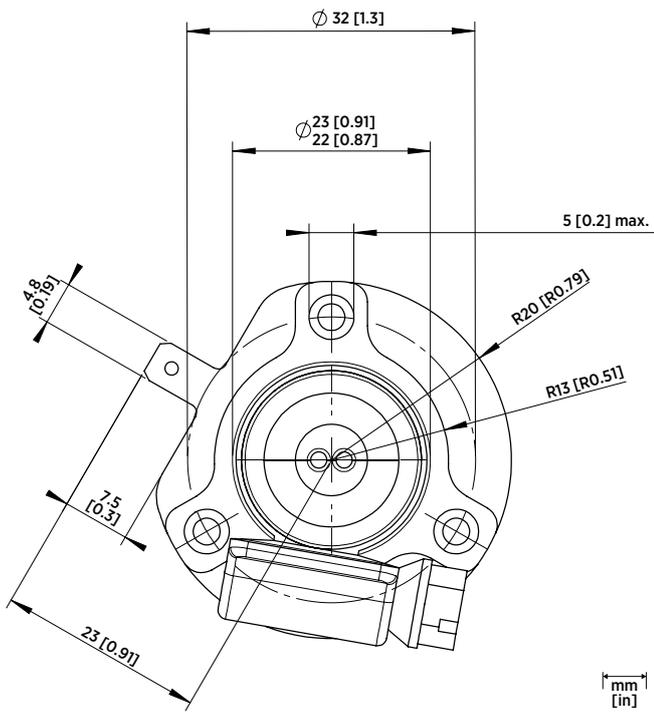
Connection Cables

| | |
|---|-------------|
| Standard 0.3 m (1 ft) | HMP50Z032SP |
| Standard 3 m (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 3 m (+356 °F 10 ft) FEP | 226902SP |
| Connection cable for HM70 | 219980SP |
| Flat extension cable 1 m (3 ft) ¹⁾ | CBL210649SP |

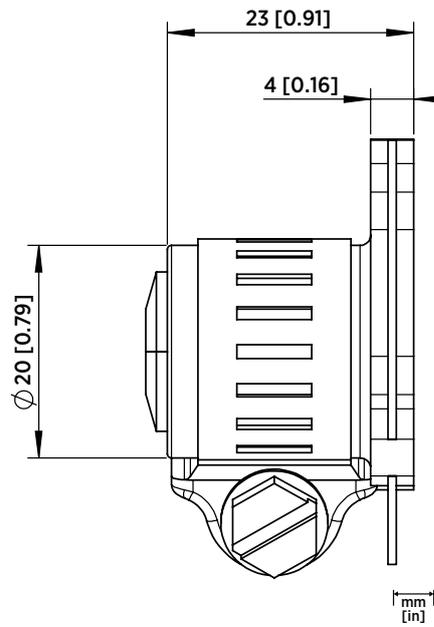
¹⁾ Connecting HMP110 to MI70 requires using both flat cable CBL210649SP and connection cable 219980SP.



HMP110 Probe



Probe Mounting Flange, Front View



Probe Mounting Flange, Side View



Features

- Fast thermal response time
- Low power consumption
- Start-up time < 2 s
- Measurement range: 0 ... 100 %RH; -40 ... +60 °C
- Detachable cable with standard 4-pin M8 connector
- Plastic enclosure with IP54 classification
- Proven Vaisala HUMICAP® 180R sensor for excellent stability
- Optional RS-485 digital output
- Optional dew point calculation
- 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® Hand-Held 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

There are two voltage outputs for relative humidity and temperature or dew point measurement. An optional RS-485 output with Modbus support is also available.

High Performance

HMP113 has a PC/ABS plastic enclosure and is suitable for noncondensing 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 hand-held meter, for example Vaisala Hand-Held Meter HM40. Alternatively, the probe can be calibrated using a PC with USB cable or sent to a Vaisala Service Center.

Technical Data

Measurement Performance

Relative Humidity

| | |
|---|------------------------------|
| Measurement range | 0 ... 100 %RH |
| Accuracy (incl. Non-Linearity, Hysteresis and Repeatability): | |
| Temperature range | 0 ... +40 °C |
| 0 ... 90 %RH | ±1.5 %RH |
| 90 ... 100 %RH | ±2.5 %RH |
| Temperature range | -40 ... 0 °C, +40 ... +60 °C |
| 0 ... 90 %RH | ±3.0 %RH |
| 90 ... 100 %RH | ±4.0 %RH |
| Factory Calibration Uncertainty (+20 °C): | |
| 0 ... 90 %RH | ±1.1 %RH |
| 90 ... 100 %RH | ±1.8 %RH |
| Humidity sensor | Vaisala HUMICAP® 180R |
| Stability | ±2 %RH over 2 years |

Temperature

| | |
|----------------------------------|---------------------------------|
| Measurement range | -40 ... +60 °C |
| Accuracy over Temperature Range: | |
| 0 ... +40 °C | ±0.2 °C |
| -40 ... 0 °C, +40 ... +60 °C | ±0.4 °C |
| Temperature sensor | Pt1000 RTD Class F0.1 IEC 60751 |

Dew Point

| | |
|---|------------------------------|
| Measurement range | -40 ... +60 °C |
| Accuracy (incl. Non-Linearity, Hysteresis and Repeatability): | |
| Temperature range | 0 ... +40 °C |
| When dew point depression < 15 °C | ±1 °C |
| When dew point depression 15 ... 25 °C | ±2 °C |
| Temperature range | -40 ... 0 °C, +40 ... +60 °C |
| When dew point depression < 15 °C ¹⁾ | ±2 °C |

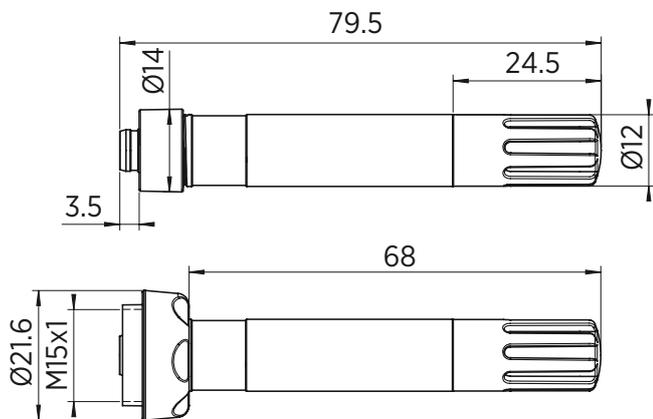
Analog Outputs

| | |
|------------------------|------------------|
| Accuracy at 20 °C | ±0.2 % of FS |
| Temperature dependence | ±0.01 % of FS/°C |

¹⁾ Dew point depression = ambient temperature - dew point

Operating Environment

| | |
|-----------------------|--|
| Operating temperature | -40 ... +60 °C |
| EMC compliance | EN 61326-1, basic immunity test requirements |



Dimensions in mm (inches)

Mechanical Specifications

| | |
|------------------------|--------------------------|
| IP rating | IP54 |
| 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 |
| Probe with 0.3 m cable | 20 g |

Inputs and Outputs

| | |
|-------------------|------------------------------|
| Power consumption | 1 mA average, max. peak 5 mA |
|-------------------|------------------------------|

Operating Voltage¹

| | |
|---------------------------|--------------|
| With 1 V / 2.5 V output | 5 ... 28 VDC |
| With 5 V output | 8 ... 28 VDC |
| With loop power converter | 8 ... 28 VDC |
| With digital output | 5 ... 20 VDC |

Start-Up Time

| | |
|----------------------------|--|
| Probes with analog output | 4 s at operating voltage 13.5 ... 16.5 VDC 2 s at other valid operating voltages |
| Probes with digital output | 1 s |

Outputs

| | |
|--|--|
| 2 channels | 0 ... 1 VDC / 0 ... 2.5 VDC / 0 ... 5 VDC / 1 ... 5 VDC |
| 1-channel loop-power converter (separate module, compatible with humidity accuracy only) | 4 ... 20 mA |
| Digital output (optional) | RS-485 2-wire half duplex |

External Loads

| | |
|-------------------------|--------------------------|
| 0 ... 1 V | R _L min 10 kΩ |
| 0 ... 2.5 V / 0 ... 5 V | R _L min 50 kΩ |

¹⁾ (Use Lowest Available Operating Voltage to Minimize Heating)

Spare Parts and Accessories

| | |
|----------------------------------|------------------|
| 4 ... 20 mA loop power converter | UI-CONVERTER-1CB |
| Mounting bracket for converter | 225979 |
| USB cable for PC connection | 219690 |
| Probe mounting clamp set, 10 pcs | 226067 |
| Probe mounting flange | 226061 |

Sensor Protection

| | |
|---------------------------------|-------------|
| Plastic grid for use with HM40 | DRW236214SP |
| Membrane filter | 230727SP |
| Stainless steel sintered filter | HM47280SP |
| Porous PTFE filter | 219452SP |

Connection Cables

| | |
|----------------|-------------|
| Standard 0.3 m | HMP50Z032SP |
| Standard 3 m | HMP50Z300SP |
| 80 °C 1.5 m | 225777SP |
| 80 °C 3 m | 225229SP |
| 180 °C 3 m FEP | 226902SP |



HM70 Handheld Humidity and Temperature Meter

For Spot-checking Applications



Features

- Designed for spot-checking and field calibration
- Multilingual user interface
- Shows measurement trends graphically
- Proven Vaisala HUMICAP® sensor technology
- 3 probe alternatives, temperature measurement ranges between -70 and +180 °C (-94 and +356 °F)
- 2 probes: also dew point and CO₂ probes can be connected simultaneously
- Displays various humidity parameters
- Sensor preheat and chemical purge options for demanding conditions
- 6-point traceable calibration (certificate included)

Vaisala HUMICAP® Handheld Humidity and Temperature Meter HM70 is designed for demanding humidity measurements in spot-checking applications. It is also ideal for field checking and calibration of Vaisala's fixed humidity instruments.

Vaisala HUMICAP® Technology

HM70 incorporates the world-class HUMICAP® sensor, one of the most reliable and stable sensors on the market. The HUMICAP® sensor copes well with chemical interference and provides accuracy that lasts in demanding conditions.

Chemical Purge

The chemical purge option maintains measurement accuracy in environments with high concentrations of chemicals. The sensor preheat option reduces measurement delays as it keeps the sensor dry when the probe is inserted into hot and humid processes.

Three Probes to Choose From

HMP75 is a general purpose probe, whereas HMP76 is a long, stainless steel probe especially suitable for spot-checking in ducts. HMP77 is a small probe at the end of a 5-meter cable. The probe is ideal for difficult-to-reach areas and for on-site calibration of Vaisala's process transmitters. In addition, HM70 supports the use of Vaisala's dew point, carbon dioxide, and moisture in oil probes, allowing measurements in several multiparameter applications.

MI70 Link

The optional MI70 Link Windows® software and the USB connection cable form a practical tool for transferring logged data and real time measurement data from HM70 to a computer.

Technical Data

Measurement Performance, HMP75, HMP76, and HMP77 Probes

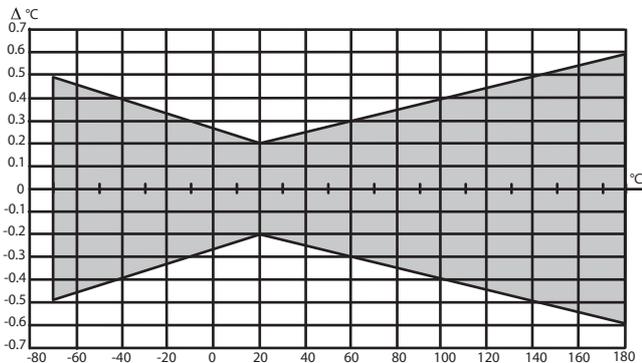
Relative Humidity

| | |
|---|--|
| Measurement range | 0 ... 100 %RH |
| Accuracy including non-linearity, hysteresis and repeatability. Defined as ± 2 standard deviation limits: | |
| At +15 ... +25 °C (+59 ... +77 °F) | ± 1.7 %RH (0 ... 90 %RH) ± 1.7 %RH (90 ... 100 %RH) |
| At -20 ... +40 °C (-4 ... +104 °F) | $\pm(1.0 + 0.008 \times \text{reading})$ %RH |
| At -40 ... +180 °C (-40 ... +356 °F) | $\pm(1.5 + 0.015 \times \text{reading})$ %RH |
| Factory calibration uncertainty (+20 °C / +68 °F) | ± 0.6 %RH (0 ... 40 %RH) ± 1.0 %RH (40 ... 97 %RH) |
| Response time (90%) at +20 °C (+68 °F) in still air: | |
| HMP75 (with standard plastic grid) | 17 s |
| HMP76 (with standard sintered bronze filter) | 60 s |
| HMP77 (with standard plastic grid and stainless steel netting) | 50 s |
| Typical long-term stability | Better than 1 %RH / year |

Temperature

| | |
|------------------------------------|-----------------------------------|
| HMP75 measurement range | -20 ... +60 °C (-4 ... +140 °F) |
| HMP76 measurement range | -50 ... +120 °C (-58 ... +248 °F) |
| HMP76 short time measurement range | -50 ... +180 °C (-58 ... +356 °F) |
| HMP77 measurement range | -70 ... +180 °C (-94 ... +356 °F) |
| Accuracy at +20 °C (+68 °F) | ± 0.2 °C (± 0.36 °F) |

Accuracy over temperature range:



Other Variables Available

dew point, frost point, absolute humidity, mixing ratio, wet bulb temperature, water content, vapor pressure, saturation vapor pressure, enthalpy, water activity

General, HMP75, HMP76, and HMP77 Probes

| | |
|---|--|
| Humidity sensor | HUMICAP® 180R HUMICAP® 180RC (chemical purge, sensor preheat) |
| Temperature sensor | Pt100 RTD Class FO.1 IEC 60751 |
| Operating temperature range for electronics | -40 ... +60 °C (-40 ... +140 °F) |
| Standard Sensor Protection | |
| HMP75 | Plastic grid |
| HMP76 | Sintered bronze filter |
| HMP77 | Grid with SS netting |

Mechanical Specifications, HMP75, HMP76, and HMP77 Probes

| | |
|--|---------------------------|
| Housing classification | IP65 (NEMA 4) |
| Housing material | ABS/PC blend |
| Probe material | Stainless steel (AIS316L) |
| Probe cable length (between indicator and probe handle) | 1.9 m (6.2 ft) |
| Probe cable length of HMP77 (from handle to the root of probe) | 5.0 m (16 ft) |
| Probe diameter | 12 mm (0.47 in) |
| Weight | |
| HMP75 | 250 g (8.8 oz) |
| HMP76 | 350 g (12 oz) |
| HMP77 | 500 g (18 oz) |

MI70 Measurement Indicator

Operating Environment

| | |
|-----------------------|----------------------------------|
| Operating temperature | -10 ... +40 °C (+14 ... +104 °F) |
| Operating humidity | 0 ... 100 %RH, non-condensing |
| Storage temperature | -40 ... +70 °C (-40 ... +158 °F) |

Inputs and Outputs

| | |
|-------------------|---|
| Max. no of probes | 2 |
| Power supply | Rechargeable NiMH battery pack with AC adapter or 4xAA size alkalines, type IEC LR6 |
| PC interface | MI70 Link software with USB or serial port cable |

| | |
|------------------------|-----------------------------------|
| Analog Output | |
| Scale | 0...1 VDC |
| Output resolution | 0.6 mV |
| Accuracy | 0.2 % full scale |
| Temperature dependence | 0.002 %/°C (0.01 %/°F) full scale |
| Minimum load resistor | 10 kΩ to ground |

Mechanical Specifications

| | |
|------------------------|---------------|
| Housing classification | IP54 |
| Housing materials | ABS/PC blend |
| Weight | 400 g (14 oz) |

Compatibility

| | |
|----------------|-------------------------------|
| EMC compliance | EN61326-1, Portable Equipment |
|----------------|-------------------------------|

Other

| | |
|-----------------------|--|
| Menu languages | English, Chinese, Spanish, Russian, French, Japanese, German, Swedish, Finnish |
| Display | <ul style="list-style-type: none"> LCD with backlight Graphic trend display of any parameter Character height up to 16 mm (0.63 in) |
| Alarm | Audible alarm function |
| Data logging capacity | 2700 real time data points |
| Logging interval | 1 s to 12 h |
| Logging duration | 1 min ... memory full |
| Resolution | 0.01 %RH, 0.01 °C/°F, 0.01 hPa, 0.01 a _w , 10 ppm / 0.01 %CO ₂ |

Battery Operation Time

Typical charging time 4 hours

Operation Times

| | |
|------------------|--------------------------------|
| Continuous use | 48 h typical at +20 °C (68 °F) |
| Data logging use | Up to a month |

Spare Parts and Accessories

Carrying Cases

| | |
|--|-----------|
| Weatherproof carrying case for MI70 and HMP75/77 probe | MI70CASE3 |
|--|-----------|

| | |
|---|-----------|
| Weatherproof carrying case for MI70 and HMP76 probe | MI70CASE4 |
|---|-----------|

| | |
|--|--------------|
| Soft carrying case for MI70 and HMP75/77 probe | MI70SOFTCASE |
|--|--------------|

Transmitter Connection Cables

| | |
|---------------------|--------|
| HMT330 & HMT120/130 | 211339 |
|---------------------|--------|

| | |
|--------|-------------|
| HMT310 | DRW216050SP |
|--------|-------------|

| | |
|--|----------|
| HMW90 Series, HMDW110 Series, HMP110 Series & GMW90 Series | 219980SP |
|--|----------|

| | |
|--|-------------|
| 1-m (3.3-ft) flat extension cable for 219980SP | CBL210649SP |
|--|-------------|

| | |
|-----------------|---------|
| HMD60/70 Series | HMA6070 |
|-----------------|---------|

Software

| | |
|-----------------------------------|--------|
| MI70 Link software with USB cable | 219687 |
|-----------------------------------|--------|

| | |
|---|----------|
| MI70 Link software with serial port cable | MI70LINK |
|---|----------|

Cables

| | |
|---------------------|---------|
| Analog output cable | 27168ZZ |
|---------------------|---------|

| | |
|---|----------|
| 10-m (32.81-ft) extension cable for probe | 213107SP |
|---|----------|

Sensor Protection HMP75

| | |
|----------------------------------|------|
| Plastic PC grid (HMP75 standard) | 6221 |
|----------------------------------|------|

| | |
|-----------------|---------|
| Membrane filter | 10159HM |
|-----------------|---------|

| | |
|------------------------|-------------|
| Sintered bronze filter | DRW212987SP |
|------------------------|-------------|

Sensor Protection HMP76/77

| | |
|------------------|-------------|
| Plastic PPS grid | DRW010276SP |
|------------------|-------------|

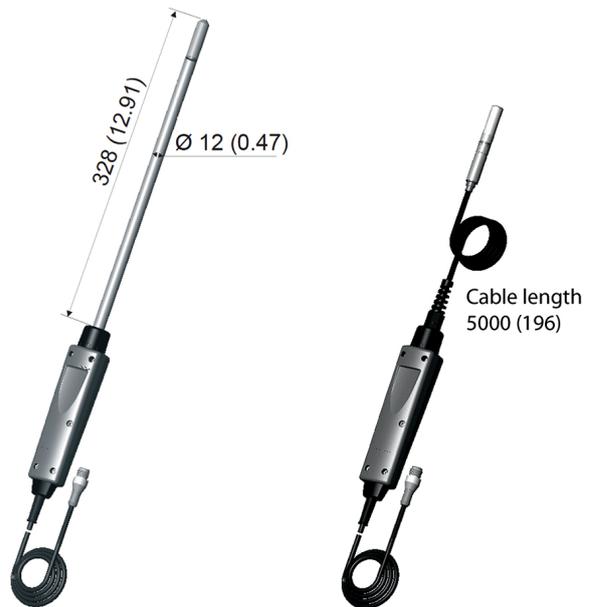
| | |
|---------------------------------|-----------|
| Sintered stainless steel filter | HM47280SP |
|---------------------------------|-----------|

| | |
|---|-------------|
| Sintered bronze filter (HMP76 standard) | DRW212987SP |
|---|-------------|

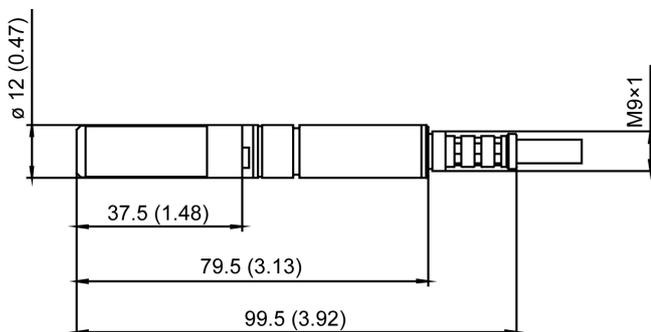
| | |
|---|-------------|
| PPS grid with SS netting (HMP77 standard) | DRW010281SP |
|---|-------------|



MI70 indicator and HMP75 probe dimensions in mm (inches)



HMP76 and HMP77 probe with cable, dimensions in mm (inches)



HMP77 probe dimensions in mm (inches)



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

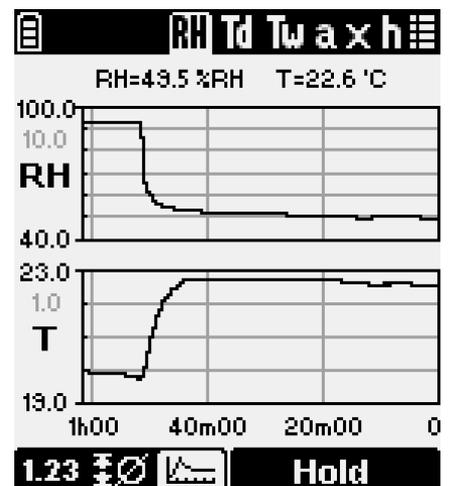
Simple and Easy to Use

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 Hand-Held Humidity and Temperature Meter Series



HM41 Technical Data

Humidity Measurement Accuracy (Including Non-linearity, Hysteresis, and Repeatability):

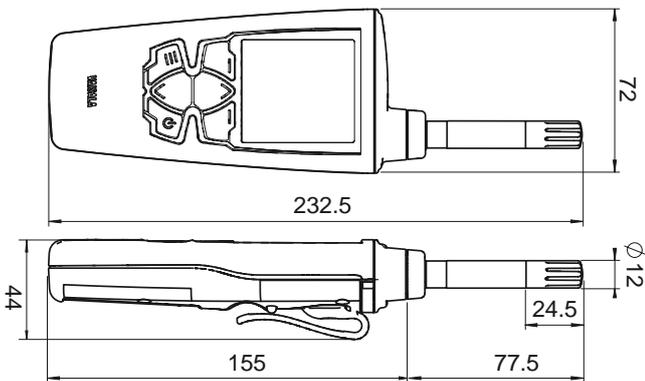
| | |
|------------------------------------|--|
| At 0 ... +40 °C | ±1.5 %RH (0 ... 90 %RH) ±2.5 %RH (90 ... 100 %RH) |
| At -10 ... 0 °C and +40 ... +60 °C | ±3.0 %RH (0 ... 90 %RH) ±4.0 %RH (90 ... 100 %RH) |
| Humidity sensor | HUMICAP® 180R |
| Temperature measurement range | -10 ... +60 °C (+14 ... +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) |

HM42 Technical Data

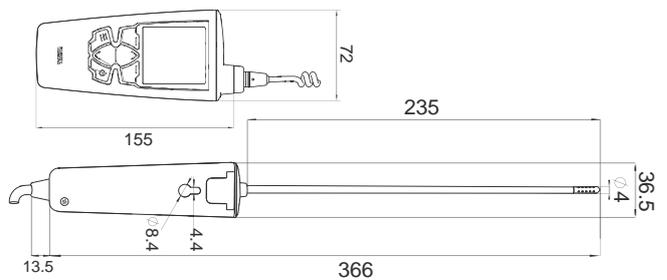
Humidity Measurement Accuracy (Including Non-linearity, Hysteresis, and Repeatability):

| | |
|------------------------------------|--|
| 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 ¹⁾ |
| 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



Dimensions in mm



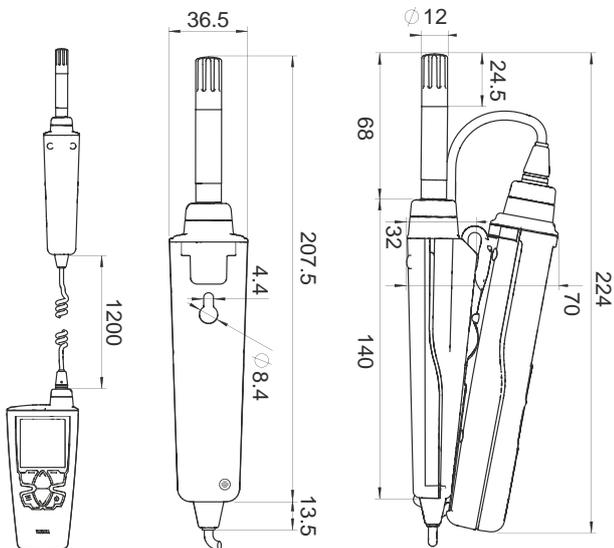
Dimensions in mm



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) |



Dimensions in mm

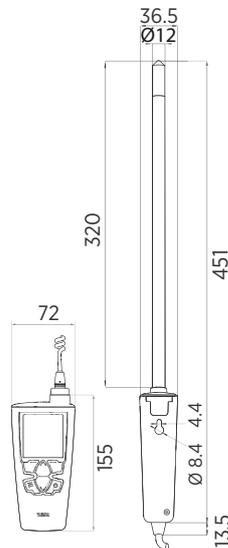


HM46 Technical Data

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 ¹⁾ |
| 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) |

¹⁾ Not recommended for $T_a > 85 °C$



Dimensions in mm

HM40 Series Technical Data

Measurement Performance

Calculated parameters Dew point, wet bulb temperature, absolute humidity, mixing ratio, enthalpy

Relative Humidity

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

Temperature

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

Operating temperature

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

Materials

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

Indicator

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

Standard Probe (HM41)

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

HM42 Probe (HM42)

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

Remote Probe (HM45)

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

HM46 Probe (HM46)

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

VAISALA

www.vaisala.com

| | |
|---|--|
|  | www.esis.com.au |
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Features

- Truly interchangeable measurement probes
- Accurate measurement data in numeric, statistic or graph views
- Conforms to ASTM standard F2170
- IP65 classified measurement probe and case

Vaisala HUMICAP® Structural Humidity Measurement Kit SHM40 offers an easy and reliable solution for humidity measurements in concrete and other structures.

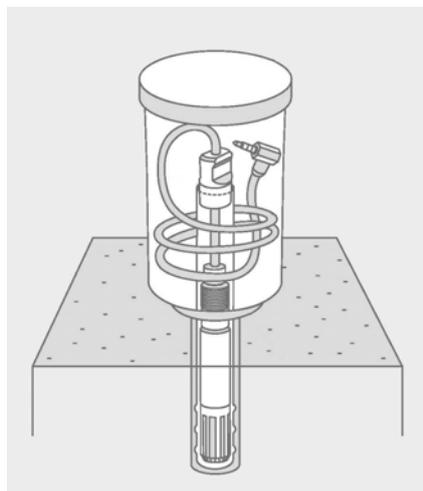
Measuring Humidity under the Surface

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.

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.



Borehole in concrete and a measurement probe HMP40S inserted in it.

Standard Contents of SHM40

- HM40 indicator with adapter
- 1 piece HMP40S RH&T probe with a cable
- 12 pcs plastic tubes (19266HM)
- 12 pcs rubber plugs (233976)
- 3 pcs protective covers with lid (19268HM)
- Traceable calibration certificate
- Weather-proof carrying case with a shoulder strap

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 indicator HM40 to read the measurement results.

Technical Data

HMP40S Probe Measurement Performance

Relative Humidity

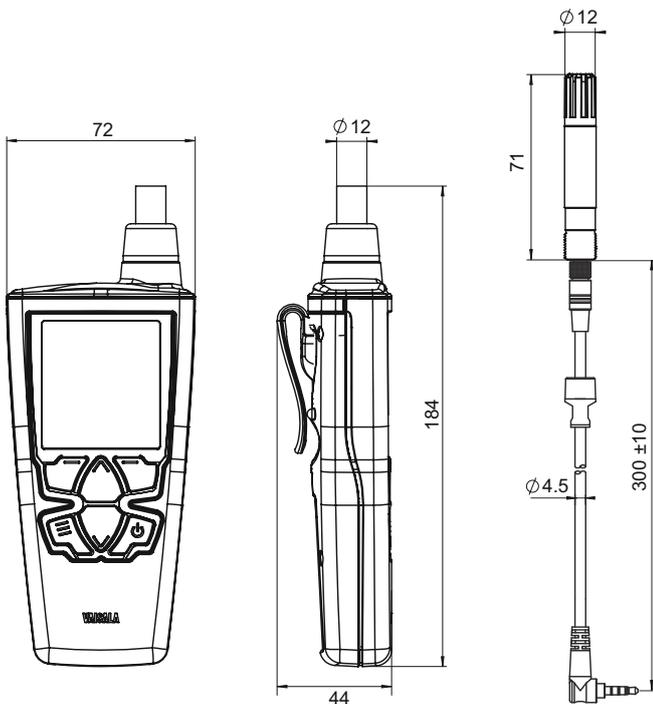
| | |
|---|--|
| Measurement range | 0 ... 100 %RH |
| Accuracy (incl. non-linearity, hysteresis, and repeatability) | |
| temperature range: 0 °C ... +40 °C | 0 ... 90 %RH: ± 1.5 %RH 90 ... 100 %RH: ± 2.5 %RH |
| temperature range: -40 °C...0 °C and +40 °C ... +80 °C | 0 ... 90 %RH: ± 3.0 %RH 90 ... 100 %RH: ± 4.0 %RH |
| Factory calibration uncertainty at +20 °C (68 °F) | |
| | 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 °C ... +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 classification | IP65 |
| Borehole diameter needed | 16 mm |
| Measurement depth with standard accessories | min. 30 mm, max. 90 mm |



Dimensions in mm

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Operating Environment

| | |
|---|-------------------|
| Operation temperature range for probe | -40 °C ... +80 °C |
| Operation 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 classification | IP54 |
| Mechanical drop endurance | 1.0 m without the probe |

HM40 Indicator - General

| | |
|-------------------------------------|---|
| Power-up time | < 3 s |
| Alkaline batteries | 2 x AA sized, 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 x 160 pixels) |
| Electromagnetic compatibility (EMC) | European Union directive EN61326-1 for portable equipment |

Spare Parts and Accessories

| | |
|--|--------------|
| HM40 indicator with adapter and cable | HM40S probe |
| 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 with SHM40 filling | 233815 |
| 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 |

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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 of HMK15

Method Used by Leading Laboratories

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 leading 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.

Certified Salts

HMK15 can be ordered with certified and pre-measured salts. A sample calibration is made from each 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

Accessories

| Certified and ready dosed salts: | Order code: | Total uncertainty ¹⁾ : |
|--|-------------|-----------------------------------|
| LiCl salt 11 %RH | 19729HM | (±1.3 %RH) |
| MgCl ₂ salt 33 %RH | 19730HM | (±1.2 %RH) |
| NaCl salt 75 %RH | 19731HM | (±1.5 %RH) |
| K ₂ SO ₄ salt 97 %RH | 19732HM | (±2.0 %RH) |
| Ion exchanged water | 19767HM | |
| Extra salt chambers | 19766HM | |
| Carrying bag | HM27032 | |
| Set of rubber plugs | 19746HM | |
| Cover for DMT132 and HMP110 with filter | 230914 | |
| Adapter for HMP42 probe | HM37067 | |

1) Uncertainties given at +20 °C

Parts

The standard HMK15 consists of the following:

Two salt chambers, chamber covers and transit covers

Base plate

Thermometer

Measurement cup and mixing spoon

HMP155 Humidity and Temperature Probe



HMP155 with an additional temperature probe and optional Stevenson screen installation kit.

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 to be used with 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.

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

Technical Data

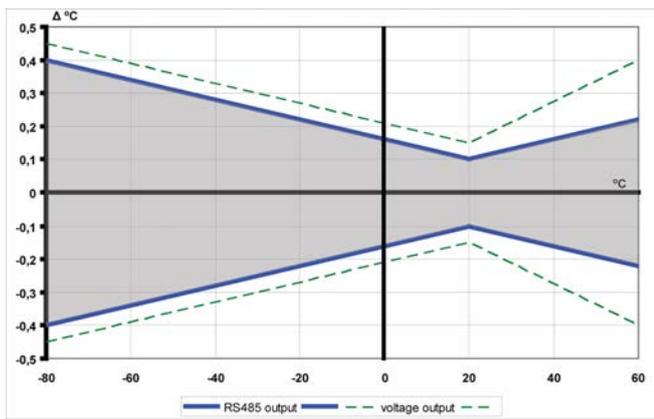
Humidity Measurement Performance

| | |
|---|--|
| Sensor | HUMICAP®180R for typical applications HUMICAP®180C 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) ¹⁾ | ±0.6 %RH (0 ... 40 %RH) ±1.0 %RH (40 ... 97 %RH) |
| Accuracy (Including Non-linearity, Hysteresis, and Repeatability) | |
| 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 |

¹⁾ Defined as ±2 standard deviation limits. Small variations possible (see also the calibration certificate).

Temperature Measurement Performance

| | |
|--|---|
| Sensor | Pt100 RTD Class F0.1 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 IEC 751 1/3 Class B | ±(0.1 + 0.00167 × temperature) °C |
| 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 |



HMP155 Accuracy over Temperature Range: Voltage and RS-485

Operating Environment

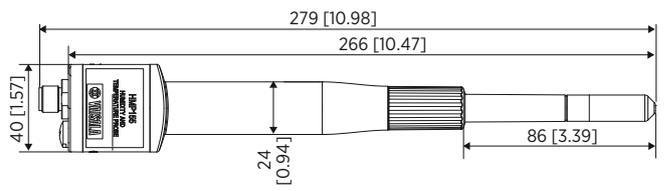
| | |
|--|-----------------------------------|
| Operating temperature for humidity measurement | -80 ... +60 °C (-112 ... +140 °F) |
| Storage temperature | -80 ... +60 °C (-112 ... +140 °F) |
| Operating humidity | 0 ... 100 %RH |
| EMC (industrial environment) | EN/IEC 61326-1, EN 55022 |

Inputs and Outputs

| | |
|--|----------------------------------|
| Operating voltage | 7 ... 28 VDC |
| Minimum Operating Voltage | |
| 0 ... 5 V output | 12 V |
| 0 ... 10 V output, probe heating, 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 VDC, Load 100 kΩ) | |
| 0 ... 1 V output | < 3 mA |
| 0 ... 10 V output | +0.5 mA |
| RS-485 | |
| During chemical purge | Maximum 110 mA |
| With warmed probe | Maximum 150 mA |
| Settling Time at Power-up | |
| Voltage output | 2 s |
| RS-485 | 3 s |

Mechanical Specifications

| | |
|---------------------------------|---|
| IP rating | IP66 |
| Dimensions (H × W) | 279 × 40 mm (10.9 × 1.6 in) |
| Weight | 86 g (3.0 oz) |
| Additional T probe cable length | 2 m |
| Connection | 8-pin male M12 connector |
| Connection cables | 3.5, 10, and 30 m |
| Wire size | AWG 26 (0.129 mm ²) |
| 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:

- **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, HMT363, and HMT367
- Vaisala HUMICAP® Humidity and Temperature Probe HMP7
- Vaisala Combined Pressure, Humidity and Temperature Transmitters PTU303 and PTU307
- **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

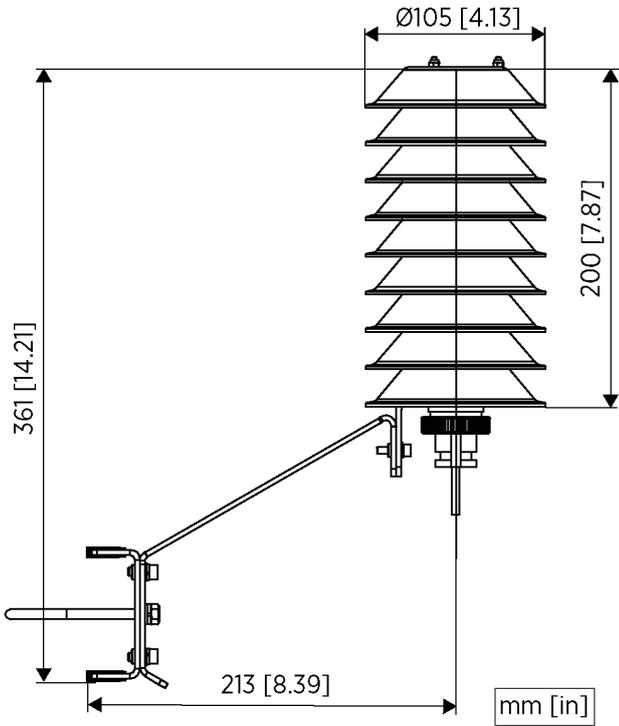
Features

- Protects temperature and humidity probes from both scattered and direct solar radiation and rain
- Maintenance-free
- Naturally ventilated
- Installs easily on a vertical pole, horizontal beam, or flat surface
- Suitable for a wide selection of applications
- Choice of shields and mounting accessories

Technical Data

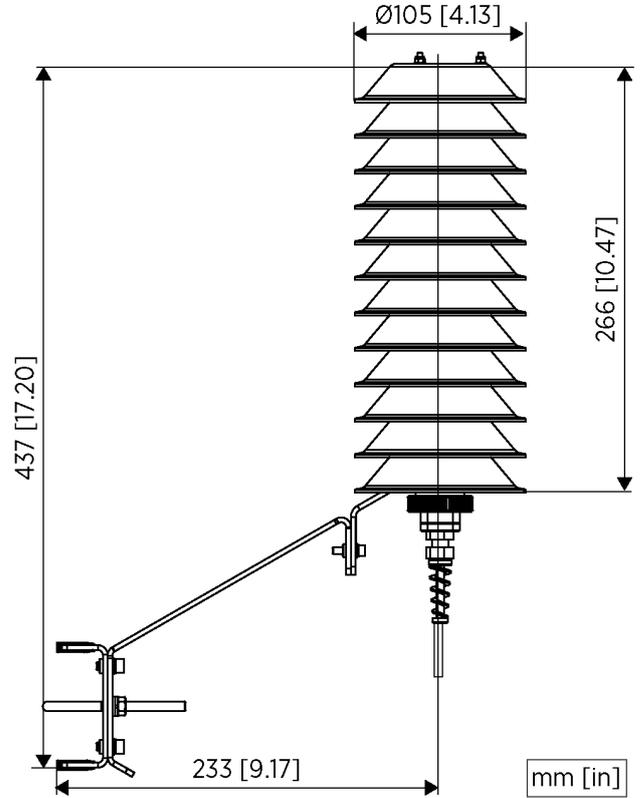
DTR502B for HMT333, HMT337, HMT363, HMT367, HMP7, PTU303, and PTU307

| | |
|--------------------|-------------------------------|
| Dimensions (H × W) | 200 × 105 mm (7.87 × 4.13 in) |
| Accessories | Product specific adapter |



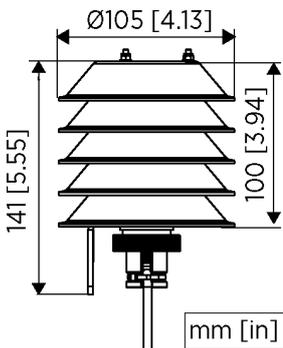
DTR503A for HMP155

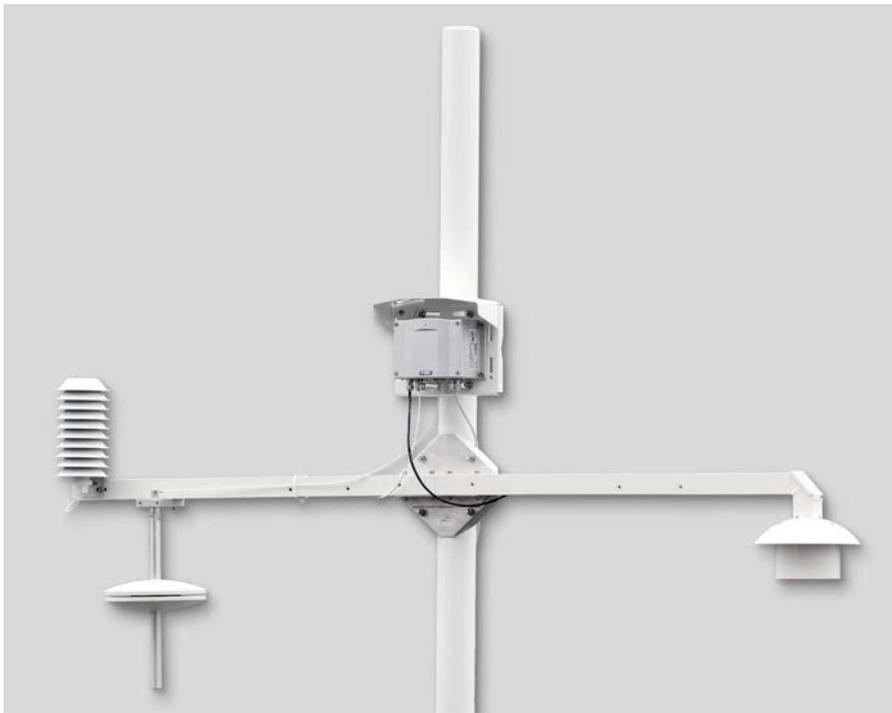
| | |
|--------------------|--|
| Dimensions (H × W) | 266 × 105 mm (10.47 × 4.13 in) |
| Accessories | Horizontal beam assembly Pole mast installation kit |



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 |





HMT337 and PTU307 feature warmed probe technology. Installed with the HMT330MIK kit either one forms the right choice for reliable humidity measurement in humid weather conditions.

Features

- For outdoor humidity and temperature measurements
- Can be ordered in a variety of configurations
- Used together with HMT337 transmitter or PTU307
- Vaisala SPH 10/20 Static Pressure Head eliminates effectively pressure variations in the barometer caused by wind

HMT337/PTU307 Features

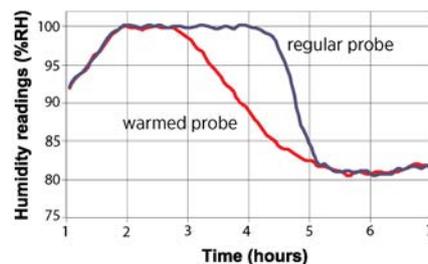
- Warmed probe provides true humidity readings in condensing conditions
- Humidity measurement expressed as relative humidity and/or dew point temperature
- Easy field calibration with HM70 hand-held meter

Vaisala Meteorological Installation Kit HMT330MIK enables Vaisala HUMICAP® Humidity and Temperature Transmitter HMT337 to be installed outdoors to obtain reliable measurements for meteorological purposes.

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 this dew evaporates.

Both PTU307 and HMT337 avoid this problem by warming the probe. When warmed, the relative humidity inside the probe stays below the ambient level. With an accurate temperature measurement, the ambient dew point can be calculated precisely. To obtain the ambient relative humidity, an additional probe measures the ambient temperature, and the transmitter calculates the relative humidity from the dew point and temperature values.



After a period of 100 % relative humidity, the warmed probe measures the true humidity, whereas the non-warmed probe takes time to recover from the condensation.

Open Shield Prevents Microclimates

The warmed probe of HMT337/PTU307 is mounted in a shield which is open at the bottom to ensure steady air circulation to the sensor even in calm weather.

In traditional radiation shields sleet or snow can accumulate on the shield and prevent the proper air circulation through the shield, and create a humid microclimate until the snow melts.

Essential for Critical Weather Measurements

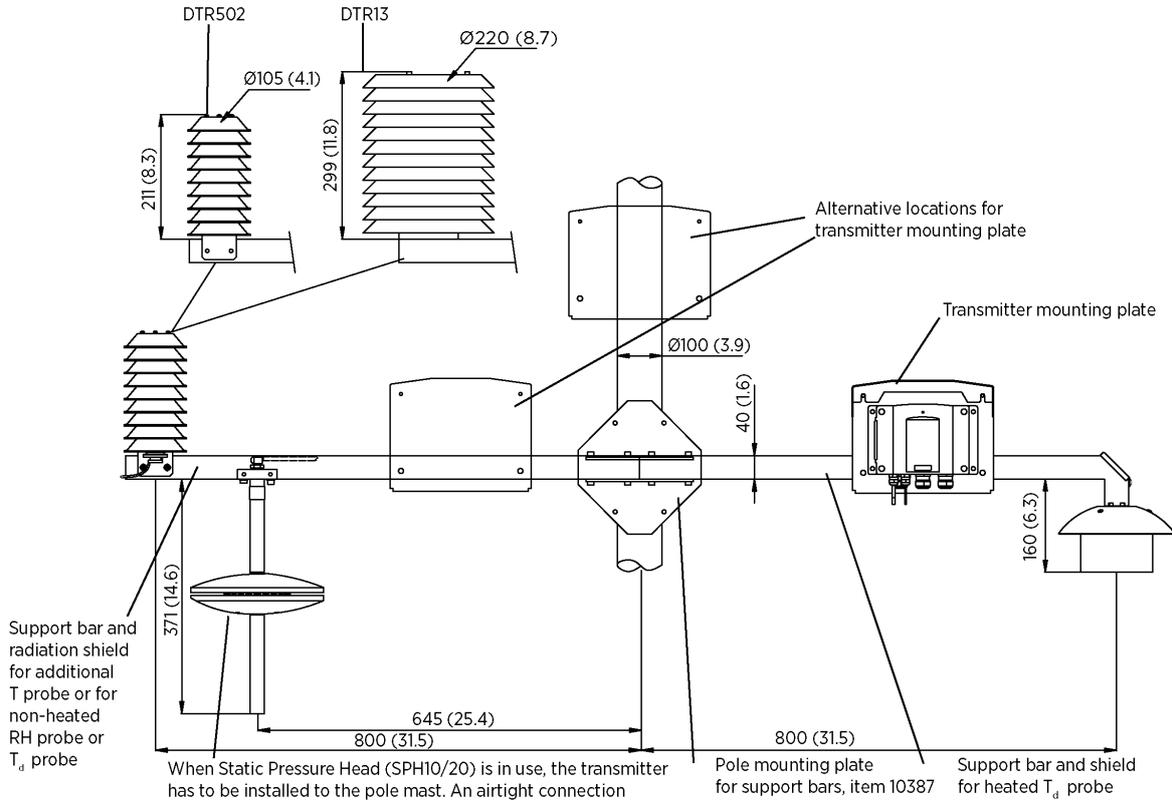
Obtaining a true humidity reading is particularly important e.g. in traffic safety: at airports and at sea as well as on the roads. It is essential, for example, in fog and frost prediction.



For calibration, a portable HMP77 reference probe is easy to attach beside HMT337 or PTU307 probe.

Technical Data

Radiation shield options:



When Static Pressure Head (SPH10/20) is in use, the transmitter has to be installed to the pole mast. An airtight connection between the transmitter and the Static Pressure Head is made with a pressure hose. To prevent the condensed water from blocking the hose as it freezes, make sure that the hose won't hang loose.

Dimensions in mm (inches)

| Vaisala Meteorological Installation Kit | | HMT330MIK | 1 | 2 | 3 | 4 | 5 | PRICE |
|---|--|---|---|---|---|---|-------------|-------|
| 1 | Support bar & shield for warmed Td probe | No support bar & shield for warmed Td probe <i>Support bar & shield for warmed Td probe</i> | 0 | | | | | |
| | | | 1 | | | | | |
| 2 | Support bar and radiation shield for additional T probe or for non-warmed RH or Td probe | No support bar or radiation shield <i>Support bar with DTR502 shield for T probe</i> <i>Support bar with DTR13 shield for T probe</i> <i>Support bar with DTR502 shield for non-warmed RH or Td probe</i> <i>Support bar with DTR13 shield for non-warmed RH or Td probe</i> | | A | | | | |
| | | | | B | | | | |
| | | | | C | | | | |
| | | | | D | | | | |
| | | | | E | | | | |
| 3 | Support bar mounting plate | No mounting plate <i>Pole mounting plate for support bar/bars (item 10387)</i> | 0 | | | | | |
| | | | 1 | | | | | |
| 4 | Additional transmitter mounting plate (incl. rain shield) | No additional transmitter mounting plate <i>Transmitter mounting plate for support bar assembly</i> <i>Transmitter mounting plate for pole assembly</i> | | A | | | | |
| | | | | B | | | | |
| | | | | C | | | | |
| 5 | Static Pressure Head | No Static Pressure Head <i>Static Pressure Head SPH10 Only for the PTU300</i> | | | | | 0 | |
| | | | | | | | 1 | |
| | | | | | | | TOTAL | |
| | | | | | | | QTY | |
| | | | | | | | TOTAL VALUE | |

Order form



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Features

- Designed for high humidity applications
- Dew point measurement range: -40 ... +100 °C
- Patented, warmed probe
- Incorporates Vaisala HUMICAP® Sensor for excellent accuracy and long-term stability and resistance to dust and most chemicals
- Low maintenance need
- Outer cover provides protection from rain and direct sunlight

Vaisala HUMICAP® Turbine Mounting Kit HMT300TMK is developed to monitor the air intake of gas and liquid fueled power turbines. HMT300TMK is used together with HMT337 Temperature and Humidity Transmitter (not included in the HMT300TMK).

HMT300TMK is ideal for measuring in water vapor injection applications because the sensor has been optimized for high humidity environments by utilizing a patented, warmed probe. Water vapor is added to the intake of the turbine to increase the mass flow which in turn increases compression and electrical power output.

Low Maintenance

Power turbines also require exact water vapor injection in the chamber to reduce pollutant emissions. Vaisala's warmed probe technology is ideal because of its reliability in the field. In fact, the only suggested scheduled maintenance is annual calibration.

Patented, Warmed Probe Prevents Condensation

HMT300TMK, with HMT337 installed, provides fast and reliable dewpoint measurement especially under high humidity conditions where dew would

normally form on the humidity sensor and thereby cause errors in measurement. The patented warmed probe prevents condensation from forming on the sensor.

Protective Enclosure

HMT300TMK includes a white, painted stainless steel enclosure with an installation kit for the probe. HMT337 Humidity and Temperature Transmitter is installed in the stainless steel enclosure at the factory, when ordered together with HMT300TMK. The instrument can be equipped to be powered with either 24 VDC/VAC or with an internal 110/230 volt power supply unit.

The outer cover protects the transmitter from direct sunlight and rain. The installation kit protects the probe from outer water splashes, keeps the sensor dry, and prevents any parts that could vibrate loose from entering the turbine.

HMT300TMK can be ordered separately for installation with the customer's existing HMT337.

HUMICAP® Performance

HMT330 Series Transmitters are fitted with the latest generation of the HUMICAP®, the polymer sensor known for its accuracy, reliability and long-term stability. The sensor has a high tolerance for particulate abrasion and chemical contamination.

Vaisala HUMICAP® Humidity and Temperature Transmitter HMT337

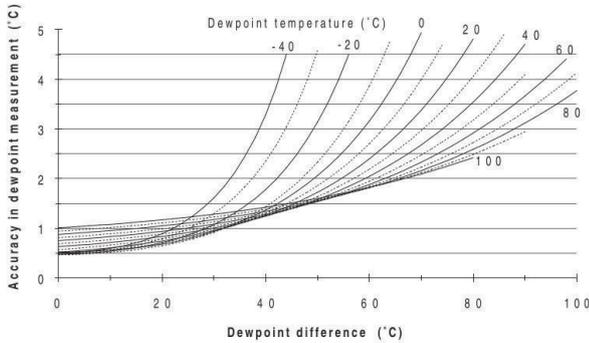
HMT337 is intended for demanding industrial humidity measurement applications with a risk of condensation. The stainless steel probe is mechanically durable and preferred for most industrial applications.

Technical Data

Measurement Performance

Dew point measurement range -40 ... +100 °C (-40 ... +212 °F)

Accuracy: find the intersection of the dewpoint temperature curve and the dewpoint difference reading (process temperature - dewpoint temperature) on the x-axis and read the accuracy in dewpoint measurement at the y-axis



Response time (90 %) at +20 °C (68 °F) 20 s
in still air (PPS grid with steel netting)

Inputs and Outputs

Operating voltage 24 VDC/VAC (20 ... 28 V) or 115/230 VAC
(Must be specified at time of order)

Two standard outputs, third optional 0 ... 20 mA, 4 ... 20 mA, 0 ... 1 V,
0 ... 5 V, 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 full scale

Serial output available RS-232C (optional RS-485)

Recommended external load for current outputs < 500 Ω

For 0 ... 1 V output > 2 kΩ (to ground)

For 0 ... 5 and 0 ... 10 V outputs > 10 kΩ (to ground)

Mechanical Specifications

Connections Screw terminals for 0.5 mm² wires (AWG 20), stranded wires recommended

Housing material G-AISI10 (DIN 1725)

Bushing 8 ... 11 mm diameter cables (0.31 ... 0.43 in)

Humidity sensor protection (Ø 12 mm) PPS grid with steel netting

Weight

HMT300TMK with HMT337 8.7 kg (19.2 lb)

HMT300TMK with HMT337, packed in a wooden shipping box 13.3 kg (29.3 lb)

Compliance

IP rating IP65

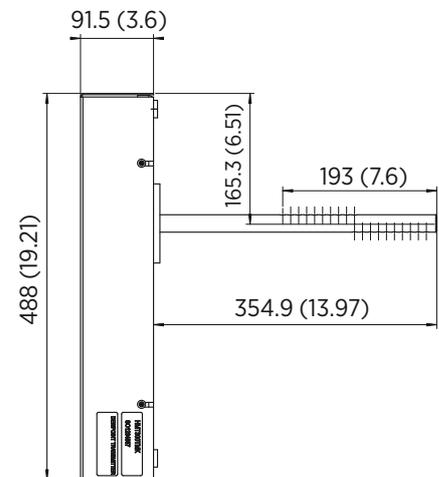
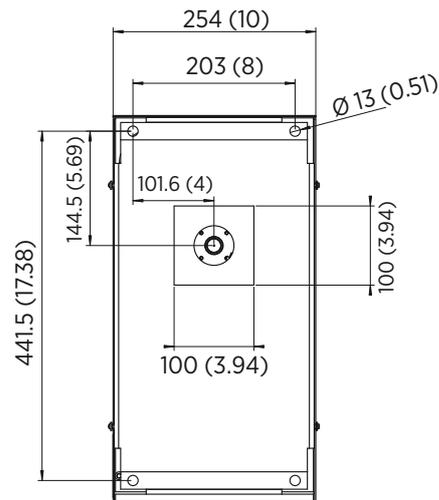
NEMA rating NEMA 4

Operating Environment

Operating temperature for electronics -40 ... +60 °C (-40 ... +140 °F)

Storage temperature -55 ... +80 °C (-67 ... +176 °F)

EMC compliance EN61326-1, Industrial Environment



Dimensions in mm (inches)



DMT340 Series Dew Point and Temperature Transmitters

For Very Dry Conditions



Features

- Measures dew point from -70 ... +80 °C (-94 ... +176 °F) with an accuracy of ± 2 °C (± 3.6 °F)
- Condensation-resistant
- Unique auto-calibration feature maintains accuracy over long term
- Compatible with Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70
- Traceable calibration to measurements and analog outputs (certificates included)
- Graphical display and keypad for convenient operation
- Optional alarm relays and mains power supply module
- Up to three analog outputs, RS-232/485, LAN
- Modbus protocol support (RTU/ TCP)

Vaisala DRYCAP® Dewpoint and Temperature Transmitter Series DMT340 is designed for industrial low-humidity applications such as industrial drying, compressed air systems, semiconductor industry, dry rooms, baking ovens, and metal heat treatment.

Vaisala DRYCAP® Sensor Benefits

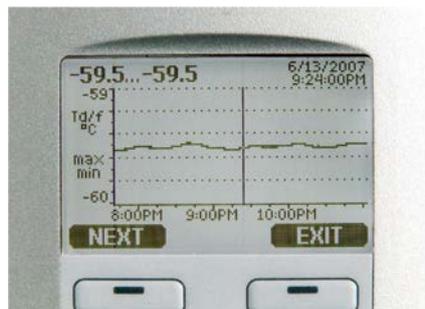
- Accurate and reliable measurement
- Excellent long-term stability
- Fast response time
- Resistant to environmental factors and condensation

Stability at Low Dew Points

The Vaisala DRYCAP® sensor is immune to particulate contamination, water condensation, oil vapor, and most chemicals. The sensor is condensation resistant 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.

Graphical Display of Measurement Data and Trends for Convenient Operation

The DMT340 features a large numerical and graphical display with a multilingual menu and keypad. It allows users to easily monitor operational data, measurement trends, and access measurement history for the past 12 months.



The display shows measurement trends, real-time data, and measurement history.

Versatile Outputs and Data Collection

The DMT340 can support up to three isolated analog outputs. Optional AC mains power and relay outputs are also available.

In addition to the analog outputs, the DMT340 supports Modbus RTU and TCP/IP communication protocol.

The data logger, with real-time clock and battery backup, guarantees reliable logging of measurement data for over four years. The display alarm allows tracking of any measured parameter, with freely configurable low and high limits. The recorded data can be viewed on the local display or transferred to a PC with Microsoft Windows® software. The transmitter can also be connected to a network with an optional LAN interface, which enables an Ethernet connection. A

USB service cable makes it easy to connect the DMT340 to a PC via the service port for modifying settings or reading logged data.

Easy Installation

With multiple options to choose from, the instrument can be tailored to meet the specific needs of each individual application and is delivered installation-ready and pre-configured for each delivery. Quick delivery time and global service network make DMT340 a perfect choice for any project.



The Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70 is ideal for fieldchecking DMT340 transmitters.

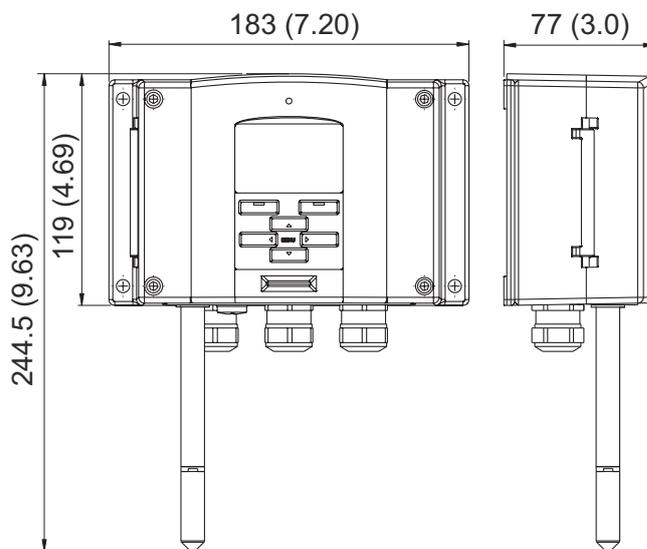
| | DMT342 | DMT344 | DMT347 | DMT348 |
|-----------------------|-----------------------------|---|--|---|
| Pressure range | 0 ... 50 bar/0 ... 725 psia | 0 ... 50 bar/0 ... 725 psia | 0 ... 10 bar/0 ... 145 psia | 0 ... 40 bar/0 ... 580 psia |
| Mechanical durability | up to 250 bar/ 3625 psia | up to 100 bar/1450 psia | up to 10 bar/145 psia | up to 70 bar/1015 psia |
| Probe diameter | 12 mm/0.5 in | 12 mm/0.5 in | 12 mm/0.5 in | 12 mm/0.5 in |
| Installation | Flange 36 mm/1.4 in | Fitting body M22 x 1.5 Fitting body NPT 1/2 in | Fitting body R 3/8 in ISO Fitting body G 1/2 in ISO Fitting body NPT 1/2 in | Fitting body R1/2 in ISO Fitting body NPT 1/2 in |
| Ball-valve set | | | | BALLVALVE-1 |
| Sampling cell | HMP302SC | | | DMT242SC or DMT242SC2 |

DMT340 Series Dewpoint and Temperature Transmitters for Very Dry Conditions

DMT341 for Installations in Dry Spaces



DMT341 display shows measurement trends, real-time data, and measurement history. DMT341 is made for installations in dry rooms where the entire dew point transmitter needs to be inside the dry space. The concept is easy to clean and suitable also for cleanrooms.

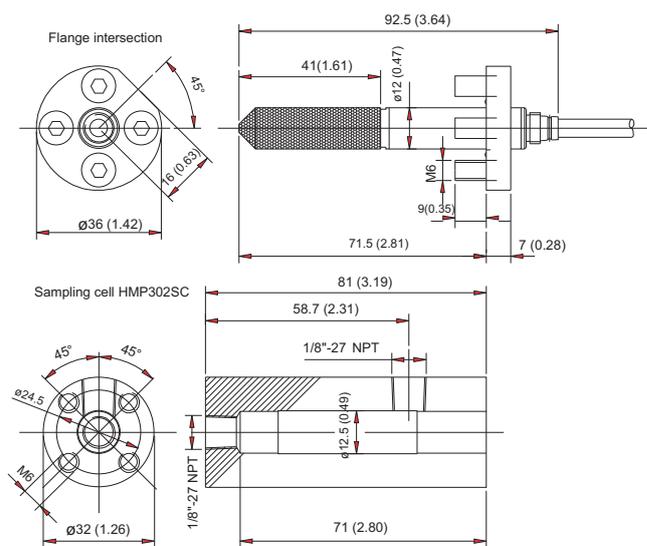


DMT341 dimensions in mm (inches)

DMT342 with Small Size Flanged Probe

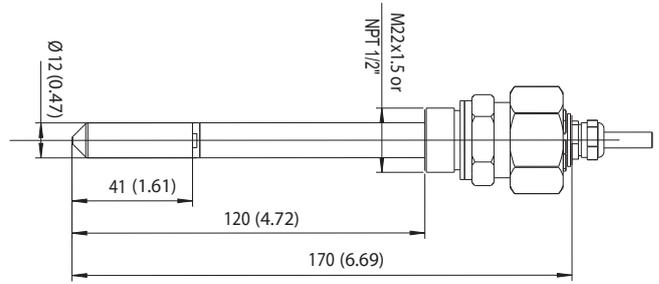


The DMT342 probe is installed using a flange or sampling cell. The small probe is ideal for integration into larger equipment or applications with high pressures.



DMT342 dimensions in mm (inches)

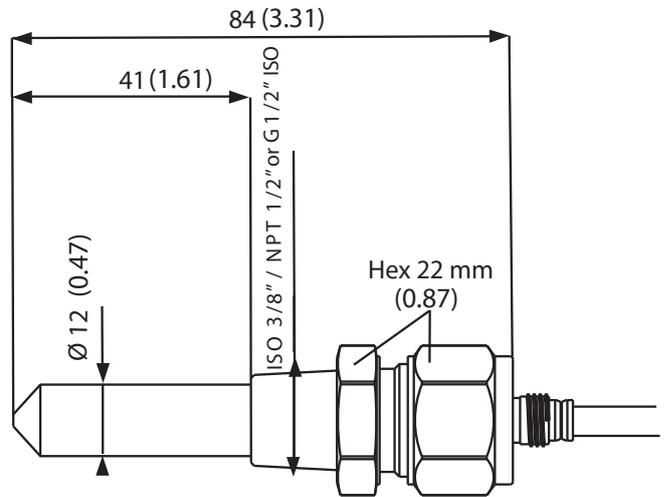
DMT344 with Probe for High Pressures



DMT344 dimensions in mm (inches)

The DMT344 features a threaded connection for extended pressures with different fitting-body options. It is ideal for permanent installation into pressurized or vacuum processes.

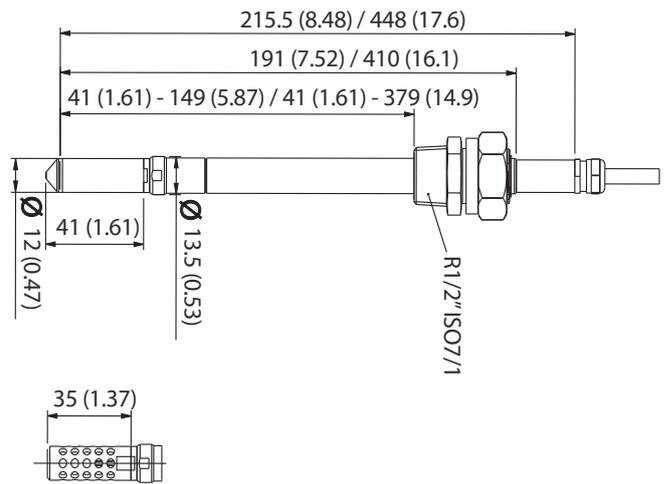
DMT347 with Small-Sized Probe



DMT347 dimensions in mm (inches)

The DMT347 probe is ideal for pressurized or vacuum applications in tight spaces. The small probe is installed using Swagelok® connectors.

DMT348 with Probe for Pipeline Installations



Optional filter for low pressures, suitable for all models, dimensions in mm (inches). Optional filter provides faster gas exchange to the sensor in applications where protection from particulates is not needed.

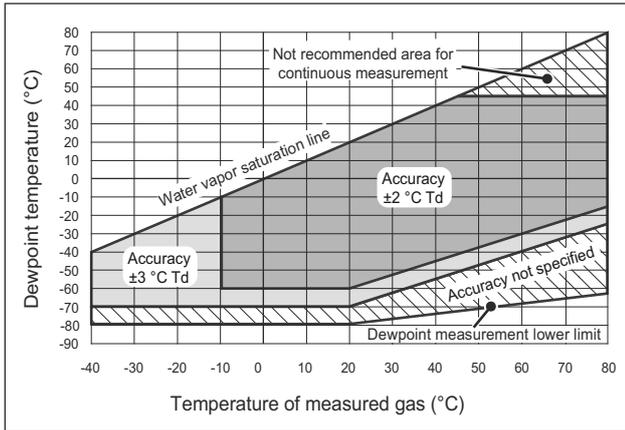
The DMT348 is ideal for installation into pressurized or vacuum processes where the probe needs to be able to be removed while the process is running. The probe depth is adjustable.

DMT340 Series Technical Data

Measurement Performance

Dew Point

| | |
|--|---|
| Sensor | Vaisala DRYCAP® 180M |
| Measurement range | -70 ... +80 °C (-94 ... +176 °F) T _d |
| Measurement range for continuous use | -70 ... +45 °C (-94 ... +113 °F) T _d |
| Accuracy up to 20 bar/290 psia | ±2 °C/±3.6 °F (see the accuracy graph below) |
| Accuracy, 20 ... 50 bar/290 ... 725 psia | additional inaccuracy +1 °C T _d |



Dew Point Accuracy vs. Measurement Conditions

| | |
|---|-------------------------------------|
| Response time | 63% [90%] at +20 °C gas temperature |
| T63 [T90] response times at 20 °C and 1 l/min flow: | |
| -60 ... -20 °C T _d (-76 ... -4 °F T _d) | 5 s [10 s] |
| -20 ... -60 °C T _d (-4 ... -76 °F T _d) | 45 s [10 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 |

Other measurement parameters available (model-dependent): mixing ratio, absolute humidity, pressure dew point calculated to 1 bar, temperature difference (T-T_d), water vapor pressure

Operating Environment

| | |
|---|--|
| Operating temperature for probes | -40 ... +80 °C (-40 ... +176 °F) |
| Mechanical durability | up to +180 °C (+356 °F) |
| Mechanical durability of transmitter body | 40 ... +60 °C (-40 ... +140 °F) |
| Mechanical durability with display | 0 ... +60 °C (+32 ... +140 °F) |
| Storage temperature range | -55 ... +80 °C (-67 ... +176 °F) |
| Pressure range for probes | see probe specifications |
| Sample flow rate | no effect |
| Measured gases | non-corrosive gases |
| Electromagnetic compatibility | Complies with EMC standard EN61326-1, Industrial environment |

Note: Transmitter with display test impedance of 40 Ω is used in IEC61000-4-5 (Surge immunity)

Inputs and Outputs

| | |
|-----------------------------------|-----------------------------|
| Operating voltage | 10 ... 35 VDC, 24 VAC ±20 % |
| with optional power supply module | 100 ... 240 VAC 50/60 Hz |

Power Consumption at 20 °C (U_{in} 24VDC)

| | |
|--|---------------|
| RS-232 | max. 25 mA |
| U _{out} 2 x 0 ... 1V / 0 ... 5 V / 0 ... 10 V | max. 25 mA |
| I _{out} 2 x 0 ... 20 mA | max. 60 mA |
| display and backlight | + 20 mA |
| during sensor purge | max. + 110 mA |

Analog Outputs (2 Standard, 3rd Optional)

| | |
|--|----------------------------------|
| current output | 0 ... 20 mA, 4 ... 20 mA |
| voltage output | 0 ... 1 V, 0 ... 5 V, 0 ... 10 V |
| Accuracy of analog outputs at 20 °C | 0.05% full scale |
| Temperature dependence of the analog outputs | ± 0.005%/°C full scale |

External Loads

| | |
|---------------------------------|---|
| current outputs | RL < 500 Ω |
| 0 ... 1 V output | RL > 2 kΩ |
| 0 ... 5 V and 0 ... 10V outputs | RL > 10 kΩ |
| Wire size | 0.5 ... 2.5 mm ² (AWG 20 ... 14) stranded wires recommended |

| | |
|--------------------|---------------------------------|
| Digital outputs | RS-232, RS-485 (optional) |
| Protocols | ASCII commands, Modbus RTU |
| Service connection | RS-232, USB |
| Relay outputs | 0.5 A, 250 VAC, SPDT (optional) |

Ethernet Interface (Optional)

| | |
|-------------------------|--------------------------|
| Supported standards | 10BASE-T, 100BASE-TX |
| Connector | 8P8C (RJ45) |
| IPv4 address assignment | DHCP (automatic), static |
| Protocols | Telnet, Modbus TCP/IP |

WLAN Interface (Optional)

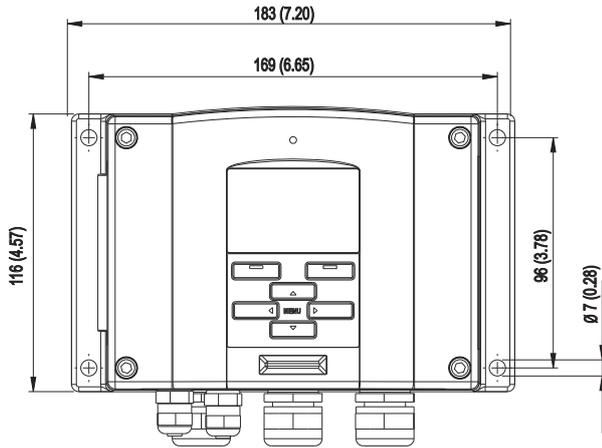
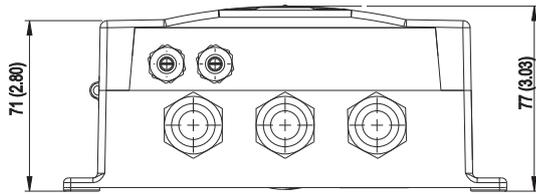
| | |
|-------------------------|---------------------------|
| Supported standards | 802.11b |
| Antenna connector type | RP-SMA |
| IPv4 address assignment | |
| Protocols | Telnet, Modbus TCP/IP |
| Security | WEP 64/128, WPA 2/802.11i |

Authentication / Encryption (WLAN)

| | |
|---|--|
| Open / no encryption | |
| Open / WEP | |
| WPA Pre-shared key / TKIP | |
| WPA Pre-shared key / CCMP (a.k.a. WPA2) | |

Optional Data Logger with Real-Time Clock

| | |
|---|--|
| Logged parameters | max. three with trend/min./max. values |
| Logging interval | 10 sec. (fixed) |
| Max. logging period with max. temporal resolution | 4 years, 5 months |
| Logged points | 13.7 million points per parameter |
| Battery lifetime | min. 5 years |
| Display | LCD with backlight, graphical trend display of any parameter |
| Menu languages | English, Chinese, Finnish, French, German, Japanese, Russian, Spanish, Swedish |



Dimensions in mm (inches)

Mechanical Specifications

Cable bushing M20x1.5 for cable diameter 8 ... 11mm/
0.31 ... 0.43"

Conduit fitting 1/2" NPT

User cable connector (optional) M12 series 8-pin (male)

option 1 female plug with 5 m (16.4 ft.) black cable

option 2 female plug with screw terminals

USB-RJ45 Serial Connection Cable 219685

Probe cable diameter 5.5 mm

Standard probe cable lengths 2 m, 5 m, or 10 m

(Additional cable lengths available, see order forms for details)

Housing material G-ALSi 10 Mg (DIN 1725)

Housing classification IP66

IP65 (NEMA4X) with local display

Weight (depending on selected probe, cable and modules) 1.0 - 3.0 kg



Features

- DMT345 measures humidity at temperatures up to 180 °C (356 °F)
- DMT346 measures humidity at temperatures up to 350 °C (+662 °F)
- Dew point accuracy ± 2 °C (± 3.6 °F)
- Condensation-resistant
- Unique auto-calibration feature
- Analog outputs, RS-232/485, WLAN/LAN
- Modbus protocol support (RTU/TCP)

Vaisala DRYCAP® Dewpoint Transmitters DMT345 and DMT346 are designed for humidity measurement in industrial drying applications with particularly high temperatures.

Benefits

- Vaisala DRYCAP® sensor provides accurate and reliable measurement with excellent long-term stability and fast response time
- Graphical display and keypad for convenient operation
- Optional alarm relays and mains power supply module

Both transmitters incorporate the Vaisala DRYCAP® sensor, which is accurate, reliable, and stable. The sensor is condensation-resistant and is immune to particulate contamination, oil vapor, and most chemicals. The DRYCAP® sensor is notable for its swift response time and rapid recovery after getting wet.

Measure Humidity Directly in Hot Processes

DMT345 and DMT346 are built for direct measurement in hot processes. Therefore, there is no need for sampling systems and trace heating. As a result, high measurement accuracy and constancy are maintained.

The accuracy and stability of DMT345 and the DMT346 are due to their unique auto-calibration function, developed by Vaisala. This feature allows the transmitter to perform calibration and adjustment by itself while the measured process is running. If the measurement accuracy is not confirmed, corrections are made automatically. The procedure is so quick and corrections so minor that it causes no disruption, ensuring easy maintenance and high performance.

DMT345: Accurate in Hot and Dry Environments

DMT345 is designed for accurate humidity measurement in hot and dry conditions. This model provides unmatched dry-end measurement accuracy at temperatures up to 140 °C; however, it can operate safely at temperatures up to 180 °C.

The long and robust steel probe and an optional installation flange allow easy, adjustable installation depth through insulation for example in ovens.

DMT346: Reliable in Very Hot Processes

DMT346 provides the best measurement performance at process temperatures between 140 °C and 350 °C.

DMT346 includes a cooling set as standard. The cooling set provides passive cooling by conducting heat away from the probe and thus reduces temperature to optimal range for the sensor.

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.

Additionally, sensor warming minimizes the risk of condensation accumulating on the sensor. In low humidity conditions the combination of auto-calibration and DRYCAP® ensures accurate measurement.

Graphical Display of Measurement Data and Trends for Convenient Operation

DMT345 and DMT346 transmitters feature a large numerical and graphical display with a multilingual menu and keypad. It allows users to easily monitor operational data, measurement trends, and access measurement history for the past 12 months.

The optional data logger, with real-time clock, makes it possible to generate over four years of measurement history and zoom in on any desired time or time frame.

The display alarm allows tracking of any measured parameter, with freely configurable low and high limits.

Versatile Outputs and Data Collection

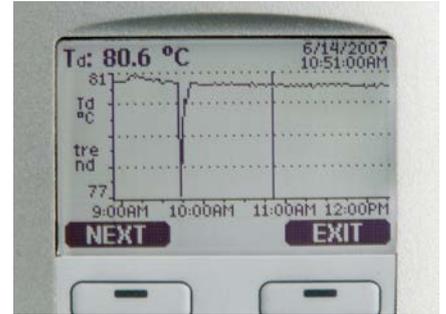
DMT345 and DMT346 transmitters can support up to three analog outputs; an isolated galvanic power supply and relay outputs are also available.

For serial interface the USB connection, RS-232, and RS-485 can be used. DMT345 and DMT346 are also capable of applying the Modbus communication protocol and, together with an appropriate connection option, provide either Modbus RTU (RS-485) or Modbus TCP/IP (Ethernet) communication.

The data logger, with real-time clock and battery backup, guarantees reliable logging of measurement data for over four years. The recorded data can be viewed on the local display or transferred to a PC with Microsoft Windows software. The transmitter can also be connected to a network with an optional LAN interface, which enables an Ethernet connection. A USB service cable makes it easy to connect DMT345/346 to a PC via the service port.

With multiple options to choose from, the instrument can be tailored to meet the specific needs of each individual application and is delivered

installation-ready and pre-configured for each delivery. Quick delivery time and global service network make DMT340 series a perfect choice for any project.



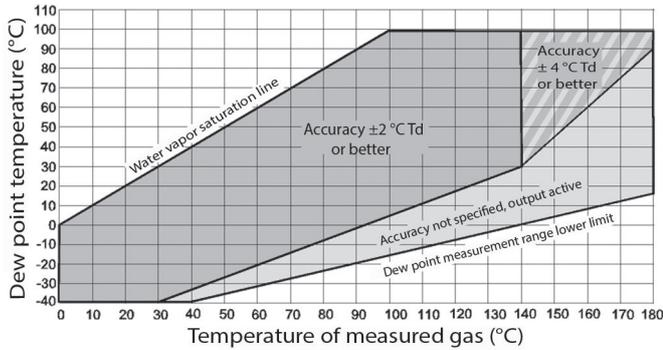
The large graphical display allows the user to check data at a glance.

Technical Data

Measurement Performance, DMT345

Dew Point

| | |
|-------------------|--|
| Sensor | Vaisala DRYCAP 180S |
| Measurement range | -40 ... +100 °C (-40 ... +212 °F) T _d |
| Accuracy | ±2 °C (±3.6 °F) T _d See the accuracy graph below |



Dew point accuracy vs. measurement conditions

| | |
|---|--|
| Response time 63 % [90 %] in flow rate 1 l/min and 1 bar pressure | From dry to wet: 5 s [10 s] From wet to dry including auto-calibration 45 s [5 min] |
|---|--|

Temperature

| | |
|---------------------------------------|---|
| Measurement range | 0 ... +180 °C (+32 ... +356 °F) |
| Measurement range with sensor warming | Upper range limited by humidity (at 80 %RH warming is switched on and T reading not actual process temperature) |
| Accuracy | ±0.4 °C at 100 °C |
| Temperature sensor | Pt100 RTD Class F0.1 IEC 60751 |

Relative Humidity

| | |
|---------------------------------------|-----------------------------|
| Measurement range | 0 ... 100 %RH |
| Measurement range with sensor warming | 0 ... 80 %RH |
| Accuracy below 10 %RH | ±10 % of reading |
| Accuracy above 10 %RH | ±1.5 %RH + 1.5 % of reading |

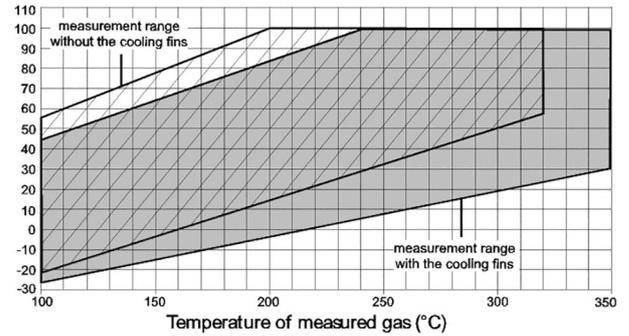
Mixing Ratio

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

Measurement Performance, DMT346

Dew Point

| | |
|-------------------|--|
| Sensor | Vaisala DRYCAP 180S |
| Measurement range | -25 ... +100 °C (-13 ... +212 °F) T _d |
| Accuracy | ±2 °C (±3.6 °F) T _d See the accuracy graph below |



Dew point accuracy vs. measurement conditions

| | |
|---|--|
| Response time 63 % [90 %] in flow rate 1 l/min and 1 bar pressure | From dry to wet: 5 s [10 s] From wet to dry including auto-calibration 45 s [5 min] |
|---|--|

Mixing Ratio

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

Inputs and Outputs, DMT345 and DMT346

| | |
|---|--|
| Accuracy of analog outputs at 20 °C | ± 0.05% full scale |
| Temperature dependence of analog outputs | ± 0.005%/°C full scale |
| Max. wire size | 0.5 mm2 (AWG 20) stranded wires recommended |
| Digital outputs | RS-232, RS-485 (optional) |
| Protocols | ASCII commands, Modbus RTU |
| Service connection | RS-232, USB |
| Relay outputs 2+2 pcs (optional) | 0.5 A, 250 VAC, SPDT |
| Operating voltage | 10 ... 35 VDC, 24 VAC ±20% |
| Operating voltage with optional power supply module | 100 ... 240 VAC 50/60 Hz |
| Default Start-up Time | |
| Initial reading after power-up | 3 s |
| Full operation after sensor purge and autocalibration | Approx. 6 min |
| Power Consumption at 20 °C (U_{in} 24 VDC) | |
| U _{out} 2x0 ... 1V/0 ... 5V/0 ... 10V | max. 25 mA |
| I _{out} 2x0 ... 20mA | max. 60 mA |
| RS-232 | max. 25 mA |
| Display and backlight | + 20 mA |
| During sensor purge | max. + 110 mA |
| Analog Outputs (2 Standard, 3rd Optional) | |
| Current output | 0 ... 20 mA, 4 ... 20 mA |
| Voltage output | 0 ... 1 V, 0 ... 5 V, 0 ... 10 V |
| External Loads | |
| Current outputs | R _L < 500 Ω |
| 0 ... 1V output | R _L > 2 kΩ |
| 0 ... 5V and 0 ... 10V outputs | R _L > 10 kΩ |
| Ethernet Interface (Optional) | |
| Supported standards | 10BASE-T, 100BASE-TX |
| Connector | 8P8C (RJ45) |
| IPv4 address assignment | DHCP (automatic), static |
| Protocols | Telnet, Modbus TCP/IP |
| WLAN Interface (Optional) | |
| Supported standards | 802.11b |
| Antenna connector type | RP-SMA |
| IPv4 address assignment | DHCP (automatic), static |
| Protocols | Telnet, Modbus TCP/IP |
| Security | WEP 64/128, WPA WPA2/802.11i |
| Authentication / Encryption (WLAN) | Open / no encryption Open / WEP WPA Pre-shared key / TKIP WPA Pre-shared key / CCMP (a.k.a. WPA2) |
| Optional Data Logger with Real-time Clock | |
| Logged parameters | Max. four with trend/min/max values |
| Logging interval | 10 sec. (fixed) |
| Max. logging period | 4 years, 5 months |
| Logged points | 13.7 million points per parameter |
| Battery lifetime | Min. 5 years |
| Display | LCD with backlight, graphical trend display |
| Menu languages | English, Chinese, Finnish, French, German, Japanese, Russian, Spanish, Swedish |

Operating Environment, DMT345 and DMT346

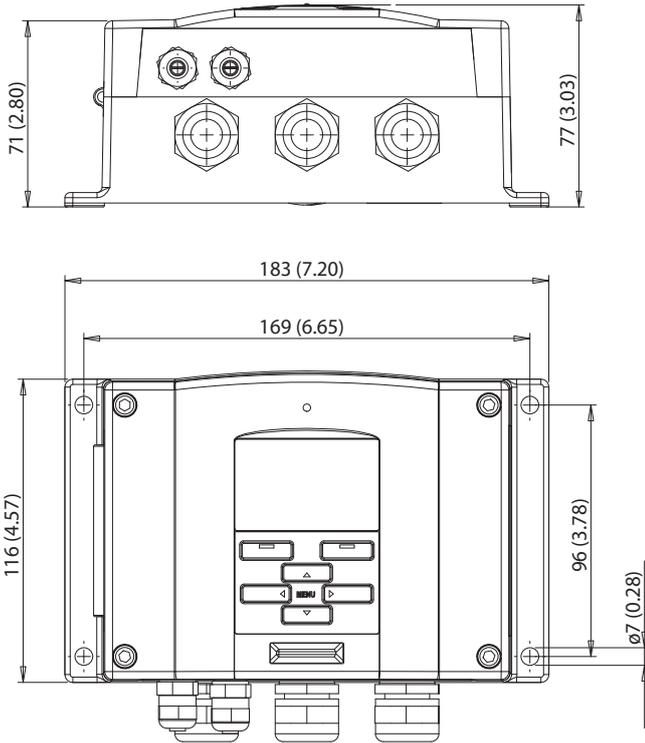
| | |
|------------------------------|--|
| Storage temperature | -55 ... +80 °C (-67 ... +176 °F) |
| Pressure range for probes | Slight pressure difference (- 200 mbar) |
| Measured gases | Non-corrosive gases |
| EMC compliance | EN61326-1, Industrial environment ¹⁾ |
| Mechanical Durability | |
| Of probes | Up to +180 °C (+356 °F) for DMT345 Up to +350 °C (+662 °F) for DMT346 |
| Of transmitter body | -40 ... +60 °C (-40 ... +140 °F) |
| With display | 0 ... +60 °C (32 ... +140 °F) |

¹⁾ Note: Transmitter with display test impedance of 40 ohm is used in IEC61000-4-5 (Surge immunity)

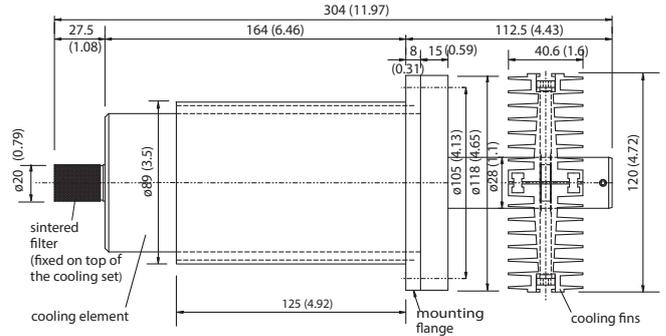
Mechanical Specifications, DMT345 and DMT346

| | |
|--|---|
| Cable bushing | M20 x 1.5 for cable diameter 8 ... 11 mm / 0.31 ... 0.43" |
| Conduit fitting (optional) | 1/2"NPT |
| Housing material | G-AISI 10 Mg (DIN 1725) |
| IP rating | IP66 IP65 (NEMA4X) with local display |
| Weight (depending on selected probe, cable, and modules) | 1.0 – 3.0 kgs (2.2-6.6 lbs) |
| USB-RJ45 Serial Connection Cable | 219685 |
| Probe cable diameter | 5.5 mm (0.2 in) |
| Standard probe cable lengths | 2 m, 5 m or 10 m (Additional cable lengths available, please see order forms for details) |
| User cable connector (optional) | M12 series 8-pin (male) |
| option 1 | female plug with 5 m (16.4 ft) black cable |
| option 2 | female plug with screw terminals |

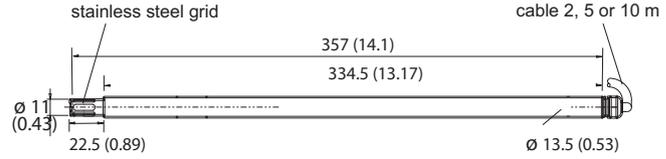
Dimensions in mm (inches)



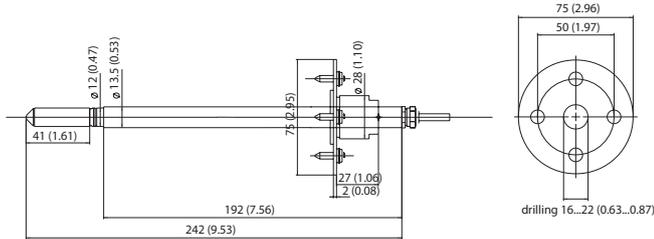
DMT345 and DMT346 Transmitter Housing



DMT346 Cooling Set



DMT346 Probe



DMT345 Probe and Mounting Flange

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 °C (-112 °F)
- Withstands condensation
- Traceable calibration (certificate included)
- Applications: dry chambers, dry gases, semiconductor manufacturing, research and testing, and compressed air

The Vaisala DRYCAP® Dewpoint Transmitter DMT152 is designed for measuring low dew point in OEM applications, even down to -80 °C . 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 and powerful
- 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

Dew Point Temperature

Measurement range -80 ... -10 °C (-112 ... +14 °F) T_d

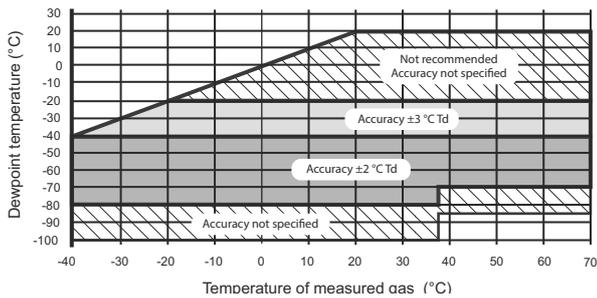
Accuracy

-80 ... -40 °C (-112 ... -40 °F) ±2 °C (3.6 °F) T_d

-40 ... -20 °C (-40 ... -4 °F) ±3 °C (5.4 °F) T_d

Non-calibrated range -100 ... +20 °C (-148 ... +68 °F) T_d

Accuracy over temperature range:



Typical response time 63 % [90 %] at a gas temperature of +20 °C (+68 °F) and pressure of 1 bar:

-10 ... -80 °C T_d 0.5 min [7.5 min]

-80 ... -10 °C T_d 2 s [5 s]

Typical long-term stability Better than 2 °C (3.6 °F) /year

Concentration by Volume (ppm)

Measurement range (typical) 0 ... 500 ppm

Accuracy at +20 °C (+68 °F), 1013 mbar ±(0.2 ppm + 20 % of reading)

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)

Measured gases Non-corrosive gases

Sample flow rate No effect on measurement accuracy

Accessories

Connection cable for MI70 hand-held indicator 219980

USB cable for pc connection 219690

NW40 flange 225220SP

Sampling cells (available for ISO G $\frac{1}{2}$ ")

basic sampling cell DMT242SC

with Swagelok 1/4" male connectors DMT242SC2

with a quick connector and leak screw DSC74

two-pressure sampling cell DSC74B

Inputs and Outputs

Two analog outputs (scalable) 4 ... 20 mA, 0 ... 20 mA (3 wire) 0 ... 5 V, 0 ... 10 V

Accuracy of analog outputs ±0.01 V / ±0.01 mA

Digital output RS-485 (2-wire)

Alarm-level indication by analog signal User selectable

Purge information 5 V, 10 V, 20 mA or LED

Operating Voltage

RS-485 output 11¹⁾... 28 VDC

voltage output 15¹⁾ ... 28 VDC

current output 21 ... 28 VDC

Supply Current

normal measurement 20 mA + load current

during self-diagnostics Max. 220 mA pulsed

Supply voltage fluctuation Max. 0.3 V

External Load

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.

Mechanical Specifications

Housing material (wetted parts) AISI316L

Stainless steel mesh filter Filter body AISI303, mesh AISI316L, grade 18 μm

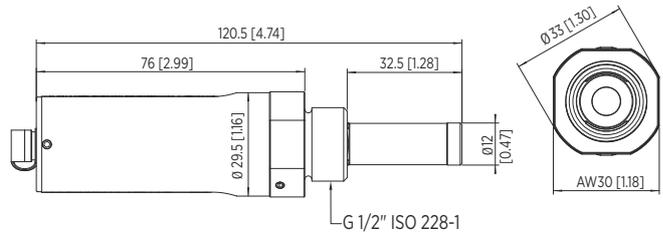
Mechanical connections ISO G $\frac{1}{2}$ ", NPT $\frac{1}{2}$ ", UNF 3/4"- 16"

Housing classification IP66

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

Weight (ISO G $\frac{1}{2}$ ") 190 g (6.70 oz)

Complies with EMC standard EN61326-1, Electrical equipment for measurement control and laboratory use - EMC requirements; Industrial environment



Dimensions in mm (inches)

VAISALA

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ESIS
Industrial Electronics



DMT143 Miniature Dew Point Transmitter

For OEM Applications



Features

- Miniature size dew point transmitter for e.g. small industrial dryer applications
- Vaisala DRYCAP® technology with auto-calibration
- Calibration interval of two years
- Dew point measurement range -70 ... +60 °C (-94 ... +140 °F)
- Accuracy ± 2 °C (± 3.6 °F)
- Withstands condensation
- Compatible with Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70
- Traceable calibration
- Easy servicing and data transfer via RS-485 user interface
- LED alarm for exceeded dew point level
- Fast response time

Vaisala DRYCAP® Dewpoint Transmitter DMT143 is an ideal choice for small compressed air dryers, plastic dryers and other OEM applications.

Vaisala DRYCAP®

Vaisala DRYCAP® Dewpoint 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 two years. Additionally, Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70 can be used to confirm the performance of DMT143 without disconnecting the transmitter. For any adjustment needs, the transmitter can be sent to Vaisala Service.

The auto-calibration software works on-line while the process is running. If the measurement accuracy is not confirmed, corrections are made automatically.

Easy Installation

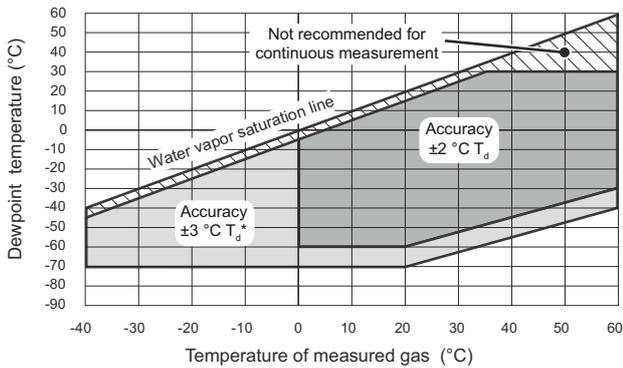
DMT143 has a variety of features to choose from, including different output, installation options and alarm LED.

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 Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70 or a computer.

Technical Data

Measurement Performance

| | |
|--|--|
| Sensor | Vaisala DRYCAP® 180D |
| Sensor protection | Stainless steel sintered filter |
| Recommended calibration interval to confirm the specified accuracy | 2 years |
| Dew Point Temperature | |
| Measurement range (typical) | -70 ... +60 °C (-94 ... +140 °F) T _d |
| Accuracy in air or N ₂ ¹⁾ | ±2 °C (±3.6 °F) T _d (see graph below) |



* > 12 bar, accuracy ±4 °C T_d

| | |
|--|--|
| Analog output scalings: | |
| Option 1 | -80 ... +20 °C (-112 ... +68 °F) T _d |
| Option 2 | -80 ... +20 °C (-112 ... +68 °F) T _d dew point at ambient pressure |
| Option 3 | Free scaling |
| Response time 63% [90%] at +20 °C gas temperature and 1 bar pressure: | |
| -60 → -20 °C T _d (-76 → -4 °F T _d) | 5 s [15 s] |
| -20 → -60 °C T _d (-4 → -76 °F T _d) | 45 s [10 min] |
| 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 |

¹⁾ When the dew point is below 0 °C (32 °F), the transmitter outputs frost point.

Operating Environment

| | |
|---------------------------|------------------------------------|
| Measured gases | Non-corrosive gases |
| Temperature ¹⁾ | -40 ... +60 °C (-40 ... +140 °F) |
| Relative humidity | 0 ... 100 % RH |
| Pressure ¹⁾ | 0 ... 50 bara (725 psia) |
| Sample flow rate | No effect for measurement accuracy |
| Storage temperature | -40 ... +60 °C (-40 ... +140 °F) |

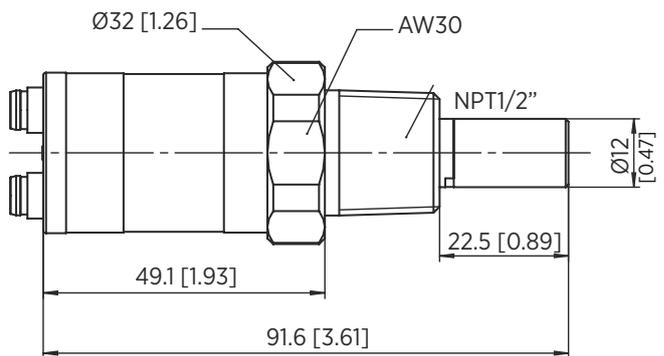
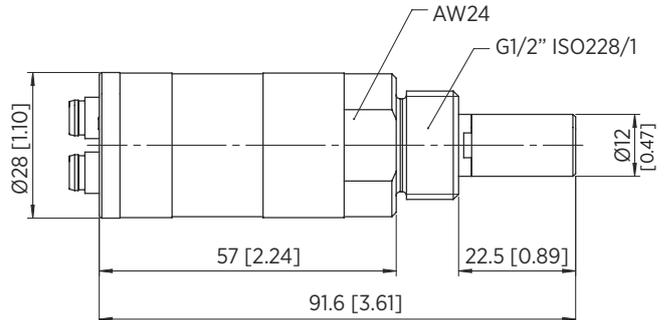
¹⁾ For extended temperature below 0 °C (+32 °F) or pressure above 20 bara (290 psia) the supply voltage must be 24 ... 28 VDC.

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 voltage output | 12 ... 28 VDC |
| Operating voltage with current output | 18 ... 28 VDC |
| 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 Vaisala Industrial Protocol |
| Connector | 4-pin M8 (IEC 60947-5-2) |
| Supply Current | |
| Normal measurement | Max. 10 mA + load current |
| During self-diagnostics | Max. 220 mA pulsed |

Mechanical Specifications

| | |
|-----------------------|---|
| Mechanical connection | ISO G1/2 in or NPT 1/2 |
| Housing material | Stainless steel (AISI316L) |
| Weight | G-thread version 90 g (3.2 oz) NPT-thread version 100 g (3.5 oz) |



Dimensions in mm (inches)

Spare Parts and Accessories

| | |
|---|----------|
| Connection cable for DM70 | 219980SP |
| USB connection cable | 219690 |
| Loop powered external display | 226476 |
| Loop powered external display with relays | 234759 |

Sampling Cells

| | |
|--------------------------------------|-----------|
| Basic sampling cell | DMT242SC |
| With Swagelok 1/4 in male connectors | DMT242SC2 |
| With quick connector and leak screw | DSC74SP |
| Two-pressure sampling cell | DSC74BSP |
| Cooling/venting coil | DMCOILSP |

See DM70/Portable Sampling Systems and Sampling Cells for further information about sampling cells available.

Compliance

| | |
|----------------|---|
| IP rating | IP66 |
| NEMA rating | NEMA 4 |
| EMC compliance | EN61326-1, Electrical equipment for measurement, control and laboratory use - EMC requirements - Industrial environment |

DMT143L Dew Point Transmitter

For OEM Applications (DMT242 Replacement)



Features

- Ideal choice for industrial dryer applications
- Incorporates advanced Vaisala DRYCAP® Sensor and enhanced auto-calibration software
- Long-term stability in low dew points
- Fast response time
- Two sensor options cover dew point measurement range of -60 ... +60 °C (-76 ... +140 °F) with an accuracy of ±2 °C (±3.6 °F)
- Withstands condensation
- Traceable calibration (certificate included)
- Compatible with Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70

Due to its wide measurement range and high long-term stability, 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® Dewpoint Transmitter DMT143L provides reliable and stable measurements for industrial dryer applications. 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 DRYCAP® 180M and for more humid applications such as refrigeration dryers, a DRYCAP® 180S sensor. Both sensors are immune to particulate contamination, water condensation, oil vapor, and most chemicals.

Because the sensor withstands condensation, its performance is suitable for low dew point applications that experience process water spikes, such as pipeline condensation during a system failure or start-up.

The auto-calibration software works online while the process is running. If the measurement accuracy is not confirmed, corrections are made automatically. DMT143L adjusts the measurement, corrects dry-end drifts and continues to function. Calibration occurs quickly, and with corrections so minor, it will go unnoticed.

Compact, Rugged and Intelligent

Due to its compact size, DMT143L is quickly and easily installed in tight spaces.

Users can perform a field-check by using Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70. The transmitter can be sent to Vaisala Service for traceable calibration. The recommended calibration interval is every two years.

Technical Data

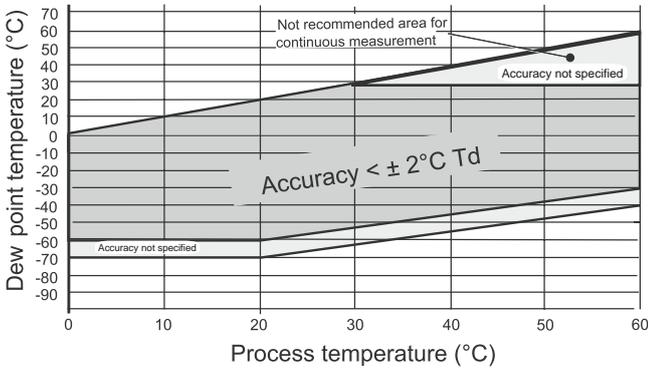
Dew Point Temperature

Measurement range (typical) -60 ... +60 °C (-76 ... +140 °F)

Different analog output scalings available.¹⁾

Accuracy with DRYCAP® 180M ±2 °C (±3.6 °F) (see graph below)

1) When the dew point is below 0 °C (32 °F), the transmitter outputs frost point.



Dew Point Accuracy vs. Measurement Conditions

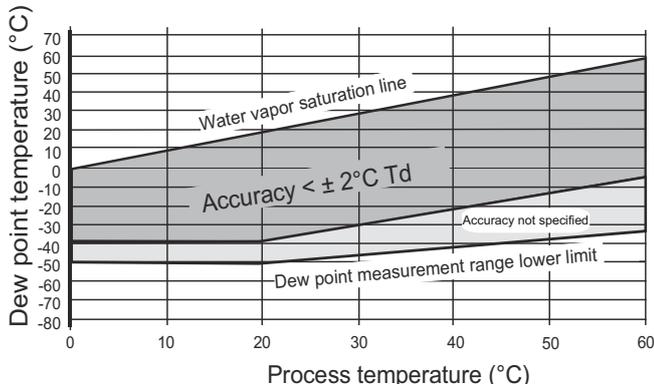
Response time 63% [90%] at +20 °C (+68 °F) gas temperature

Flow rate > 1 l/min and 1 bar pressure:

-60 → -20 °C T_d (-76 → -4 °F T_d) 5 s [10 s]

-20 → -60 °C T_d (-4 → -76 °F T_d) 45 s [10 min]

Accuracy with DRYCAP® 180S ±2 °C (±3.6 °F) (see graph below)



Operating Environment

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)

Inputs and Outputs

Analog output 4 ... 20 mA

Resolution for analog output ±0.002 mA

Accuracy for analog output at +20 °C +/- 0.05 mA

External load for analog output Max. 500 Ω

Typical temperature dependence 0.0008 mA/°C

Serial line for service use RS-485

Operating voltage 18 ... 28 VDC

Power consumption at 24 VDC Max. 220 mA

Mechanical Specifications

Probe material (wetted parts) Stainless steel (AISI 316L)

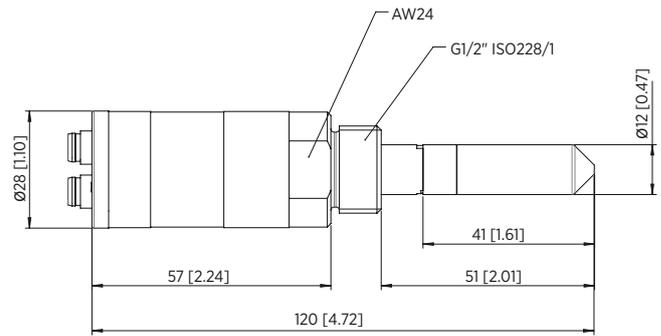
Sensor DRYCAP® 180M

Optimal sensor for refrigeration dryers DRYCAP® 180S

Sensor protection Stainless steel sintered filter (HM47280)

Electronics housing material Stainless steel

Mechanical connection G¹/₂ in ISO228-1 thread with bonded seal ring (U-seal)



Dimensions in mm (inches)

Compliance

IP rating IP66

EMC compliance EN61326-1, Electrical equipment for measurement, control and laboratory use - EMC requirements; Industrial environment



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 ¹⁾ ±2 °C for -15 ... -3 °C (+5 ... +26.6 °F) T_d ¹⁾ See accuracy graph below |

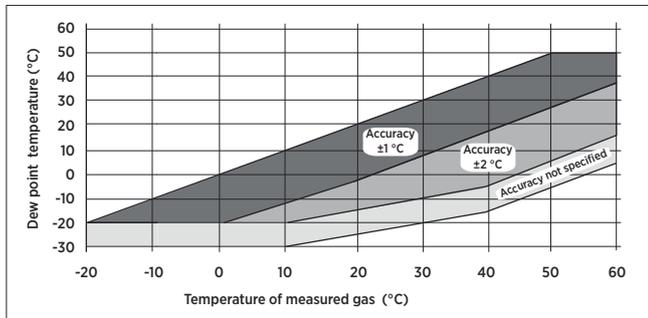
Typical Response Time at 20 °C (+68 °F) Gas Temperature and 1 Bar Pressure

| | |
|---------------------------------|----------------------------|
| -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 $T_{d/ft}$ 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

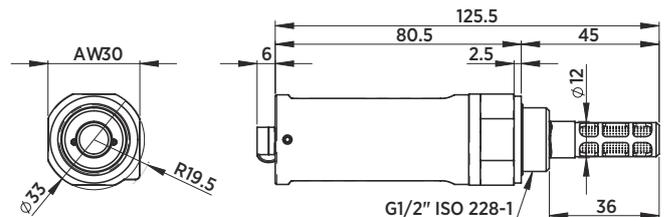
| | |
|---|----------------------------|
| Analog output (scalable) | 4 ... 20 mA, 2-wire |
| Resolution for current output | 0.002 mA |
| Accuracy of analog outputs at +20 °C | ±0.05 % full scale |
| Typical temperature dependence | ±0.005 % of full scale/ °C |
| Connector | 4-pin M8 (IEC 60947-5-2) |
| 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



Features

- Designed for industrial spot-checking and field calibration
- Three models: accurate measurement ranges from -60 to +60 °C (-76 ... +140 °F)
- Vaisala DRYCAP® Sensor with unique autocalibration function
- Sensor withstands condensation
- Data can be logged and transferred to a PC via MI70 Link software
- Traceable calibration (certificate included)
- Fast response, enhanced by Sensor Purge option

Vaisala DRYCAP® Handheld Dewpoint Meter DM70 offers accurate and fast measurement for industrial dew point applications, such as compressed air, metal treatment and plastics drying.

Benefits

- Compact, small and light
- Intuitive user interface
- Low maintenance need due to superior long-term stability
- Sensor withstands condensation and fully recovers from getting wet

DM70 measures dew point temperature accurately over a wide measurement range. The probe may be inserted directly into pressurized processes, and it responds rapidly from ambient to process conditions. The DM70 meter is suitable for direct process dew point measurement in a wide temperature and pressure range. For more demanding applications, DM70 can be used with Vaisala sampling cell adapters or with Vaisala DRYCAP® Sampling System DSS70A.

Vaisala DRYCAP® Technology

DM70 is fitted with the Vaisala DRYCAP® Sensor. The sensor provides reliable, stable and high-performance dew point measurement. Autocalibration detects on-line possible measurement inaccuracies and automatically corrects dry-end drift in the calibration curve.

Three Probes to Choose From

Three probe models, all with autocalibration, are available. The A and B models are both general purpose probes. The C model is specifically developed for SF6 gas. The B and C probe models have an additional Sensor Purge feature that heats and dries the sensor, making the response from ambient to dry conditions exceptionally fast.

Intuitive User Interface

DM70 has a versatile and easy-to-use, menu-based user interface, a clear graphical LCD display, and datalogging capability. It can also be used as a tool for reading the output of fixed Vaisala dew point transmitters, such as DMT242, DMT132, DMT143, DMT152 and DMT340. DM70 displays one to three parameters at a time, either numerically or graphically. Several humidity units can be selected. In addition, DM70 includes conversion from gas pressure dew point to ambient pressure dew point. An analog output is also available.

MI70 Link

The optional MI70 Link Windows software and the USB connection cable form a practical tool for transferring logged data and real time measurement data from the DM70 to a PC.

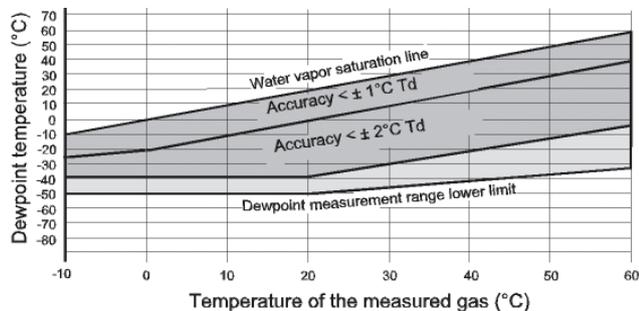
DM70 Technical Data

Measurement Performance, DMP74A Probe

Dew Point

Measurement range (typical) -50 ... +60 °C (-58 ... +140 °F)

Dew Point Accuracy vs. Measurement Conditions



Accuracy (A probe) -40 ... +60 °C ±2 °C (±3.6 °F)
(see graph)

Response Time

Flow rate 0.2 m/s, 1 bar pressure, +20 °C (+68 °F) 63% [90%]

0 → -40 °C T_d (32 → -40 °F T_d) 20 s [120 s]

-40 → 0 °C T_d (-40 → 32 °F T_d) 10 s [20 s]

Dew point sensor Vaisala DRYCAP® 180S

Temperature

Measurement range -10 ... +60 °C (+14 ... +140 °F)

Accuracy at +20 °C (+68 °F) ±0.2 °C (±0.36 °F)

Typical temperature dependence of electronics ±0.005 °C/°C (±0.005 °F/°F)

Temperature sensor Pt100 RTD Class F0.1 IEC 60751

Other Variables Available

Dew point converted to atmospheric pressure, ppm volume and ppm weight concentration, absolute humidity, mixing ratio, relative humidity

Operating Environment, All Probe Models

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

Operating pressure for DMP74A, DMP74B 0 ... 20 bara (0 ... 290 psia)

Operating pressure for DMP74C 0 ... 10 bara (0 ... 150 psia)

Sample flow rate No effect for measurement accuracy

Measured gases Non-corrosive gases

EMC compliance EN61326-1, Generic Environment

Mechanical Specifications

Probe material (wetted parts) Stainless steel (AISI 316L)

Sensor protection Sintered filter (AISI 316L)

Mechanical connection G1/2" ISO228-1 thread with bonded seal ring (U-seal)

IP rating IP65 (NEMA 4)

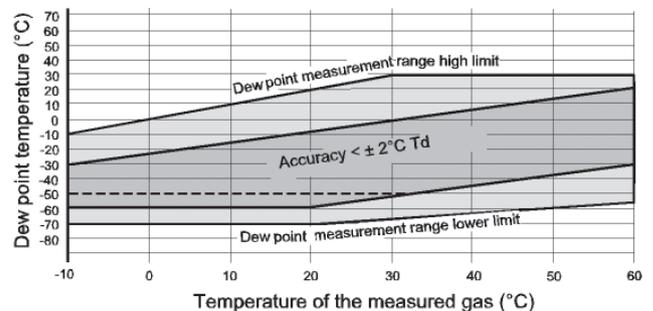
Weight 350 g

Measurement Performance, DMP74B and DMP74C (for SF6 gas) Probes

Dew Point

Measurement range (typical) -70 ... +30 °C (-94 ... +86 °F)

Dew Point Accuracy vs. Measurement Conditions



Dotted line:

For DMP74C the ±2 °C accuracy range is limited to -50 °C T_d when used in SF6 gas.

Accuracy (B and C probe) -60 ... +20 °C ±2 °C (±3.6 °F)
(see graph)

Response Time

Flow rate 0.2 m/s, 1 bar pressure, +20 °C (+68 °F) 63% [90%]

0 → -60 °C T_d (32 → -76 °F T_d) 50 s [340 s]

-60 → 0 °C T_d (-76 → 32 °F T_d) 10 s [20 s]

Dew point sensor Vaisala DRYCAP® 180M

Temperature

Measurement range -10 ... +60 °C (+14 ... +140 °F)

Accuracy at +20 °C (+68 °F) ±0.2 °C (±0.36 °F)

Typical temperature dependence of electronics ±0.005 °C/°C (±0.005 °F/°F)

Temperature sensor Pt100 RTD Class F0.1 IEC 60751

Other Variables Available

Dew point converted to atmospheric pressure, ppm volume and ppm weight concentration

MI70 Measurement Indicator

Operating Environment

| | |
|-----------------------|----------------------------------|
| Operating temperature | -10 ... +40 °C (+14 ... +104 °F) |
| Operating humidity | 0 ... 100 %RH, non-condensing |
| Storage temperature | -40 ... +70 °C (-40 ... +158 °F) |

Inputs and Outputs

| | |
|-------------------|---|
| Max. no of probes | 2 |
| Power supply | Rechargeable NiMH battery pack with AC adapter or 4xAA size alkalines, type IEC LR6 |
| PC interface | MI70 Link software with USB or serial port cable |

Analog Output

| | |
|------------------------|-----------------------------------|
| Scale | 0...1 VDC |
| Output resolution | 0.6 mV |
| Accuracy | 0.2 % full scale |
| Temperature dependence | 0.002 %/°C (0.01 %/°F) full scale |
| Minimum load resistor | 10 kΩ to ground |

Mechanical Specifications

| | |
|------------------------|---------------|
| Housing classification | IP54 |
| Housing materials | ABS/PC blend |
| Weight | 400 g (14 oz) |

Compatibility

| | |
|----------------|-------------------------------|
| EMC compliance | EN61326-1, Portable Equipment |
|----------------|-------------------------------|

Other

| | |
|----------------|--|
| Menu languages | English, Chinese, Spanish, Russian, French, Japanese, German, Swedish, Finnish |
|----------------|--|

| | |
|---------|--|
| Display | <ul style="list-style-type: none"> LCD with backlight Graphic trend display of any parameter Character height up to 16 mm (0.63 in) |
|---------|--|

| | |
|-----------------------|--|
| Alarm | Audible alarm function |
| Data logging capacity | 2700 real time data points |
| Logging interval | 1 s to 12 h |
| Logging duration | 1 min ... memory full |
| Resolution | 0.01 %RH, 0.01 °C/°F, 0.01 hPa, 0.01 a _w , 10 ppm / 0.01 %CO ₂ |

Spare Parts and Accessories

| | |
|--|--------------|
| Weatherproof Carrying Case | MI70CASE3 |
| Soft Carrying Case | MI70SOFTCASE |
| MI70 Link software with USB cable | 219687 |
| MI70 Link software with serial port cable | MI70LINK |
| Analog output cable | 27168ZZ |
| 10 m (32.81 ft) extension cable for probe | 213107SP |
| Portable Sampling System (see separate data sheet) | DSS70A |

Connection Cables for Fixed Vaisala Dew Point Transmitters

| | |
|---|----------|
| For DMT242 transmitter | 27160ZZ |
| For DMT340 series | 211339 |
| For DMT152, DMT143, and DMT132 transmitters | 219980SP |

Battery Operation Time

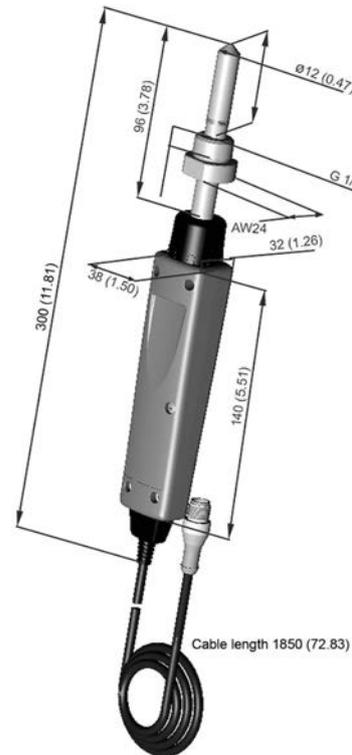
Typical charging time 4 hours

Operation Times

| | |
|------------------|--------------------------------|
| Continuous use | 48 h typical at +20 °C (68 °F) |
| Data logging use | Up to a month |



MI70 dimensions in millimeters (inches)



Probe dimensions in millimeters (inches)

VAISALA

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Features

- Battery-powered pump for extracting gas samples
- Five sampling cell options for gas sampling
- Filter for removing particulate contamination before measurement
- Needle valve and flow meter for controlling and monitoring flow through the system
- Connectable to pressurized processes

DSS70A provides a compact solution for field checking dew point where direct measurement is difficult. Typical applications for the sampling system are metal treatment and plastics drying processes.

DSS70A Portable Sampling System

DSS70A is designed to provide dew point sampling flexibility for the DM70 hand-held dew point meter. For processes at atmospheric pressure, a battery powered pump is used to extract a gas sample. For pressurized processes up to 20 bar, the sample is measured at process pressure and then reduced to atmospheric pressure for venting or re-direction, bypassing the pump. In all cases, the sample gas passes through a filter to remove particulate contamination before measurement. Flow through the system is controlled and monitored with a needle valve and flow meter. DSS70A is easily connected to an appropriate sample point with tubing (typically 1/4" or 6 mm). The measured dew point must be below ambient temperature to avoid condensation in the system. Gas temperatures higher

than +40 °C (+104 °F) should be cooled with a short PTFE (included in the DSS70A system) or stainless steel tube prior to entering DSS70A. DSS70A is an accessory for DM70 Dewpoint Handheld Meter.

Sampling Cells for Pressurized Processes

DM70 can easily be connected to pressurized processes. In addition to direct pipeline installation, a variety of sampling cell options are available for gas sampling.

DSC74 sampling cell is the recommended choice. It has a variety of connection adapters that allow several different ways of installation. The quick connector with a leak screw allows a very fast connection for compressed air lines. Additionally, two thread adapters are available for the inlet port.

DSC74B is a two-pressure sampling cell, which enables measurements in both process and ambient pressure. This sampling cell is especially suitable for dew point measurements in SF6 gas with the DMP74C probe.

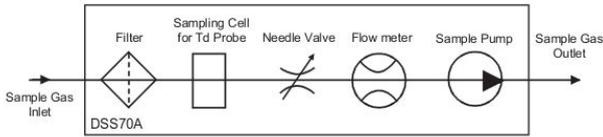
DMT242SC is a basic sampling cell. DMT242SC2 is a sampling cell supplied with welded Swagelok connectors for sampling in a 1/4" pipeline.



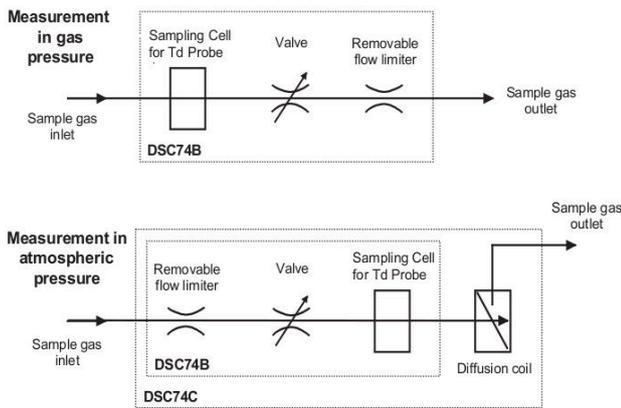
The sampling cells (from the left) DMT242SC2, DMT242SC and DSC74 can be used to connect the DM70 to sample gas flow. The DSC74B (right) is a two-pressure sampling cell that can be used for measurements in either pressurized or ambient pressure. The cooling/venting coil is included in the DSC74C sample cell, but is an option for all sampling cells.

Technical Data

DSS70A Sampling System and DSC74B/C Sampling Cells



The DSS70A sampling system includes a filter to clean the dirty sample gas and a needle valve to control the sample flow rate with the flow meter. A sample pump is used to generate a sample flow from processes at ambient pressure.



The DSC74B sampling cell enables the measurement of the sampled gas either in gas pressure up to 10 bar or in atmospheric pressure depending on the gas inlet and outlet. DSC74C is like DSC74B but with an additional coil to avoid back diffusion, the effect of surrounding moisture, in dew point measurements in atmospheric pressure.

DSS70A Operating Environment

| | |
|--|---|
| Operating gases | Air, N ₂ , and other non-toxic, inert gases |
| Sampled gas dew point | Below Tamb |
| Inlet/outlet connection | 1/4" Swagelok |
| Operating ambient temperature | 0 ... +40 °C (+32 ... +104 °F) |
| Operating process gas temperature with PTFE tube at +20 °C (+68 °F) (included in the DSS70A) | Max. +200 °C (+392 °F) |
| Operating temperature with stainless steel tube | Specification according to stainless steel tube specification |
| Maximum gas temperature at inlet | +40 °C (+104 °F) |
| Operating pressure with pump | 0.6 ... 1.2 bara (8.7 ... 17.4 psia) |
| Operating pressure with pump disconnected | 0 ... 20 bara (0 ... 290 psia) |

Mechanical Specifications

| | |
|---------------------------------|--|
| Battery operation time for pump | 8 h continuous use (battery can be recharged using DM70 charger) |
| Filter | 7 mm inline filter cartridge 1/4" Swagelok SS-4F-7 (spare part order no. 210801) |
| Case dimensions (W × D × H) | 430 × 330 × 100 mm |
| Weight | 5.5 kg (12 lbs) |
| Materials | |
| Wetted parts | Stainless steel |
| Carrying case | ABS plastic |

Sampling Cell Options

| | |
|---------------------------------|---|
| DSC74 | Sampling cell for pressurized gases |
| DSC74 pressure limit | 1 MPa (10 barg, 145 psig) |
| DSC74B | Two pressure sampling cell |
| DSC74B pressure limit | 1 MPa (10 barg, 145 psig) |
| DSC74C | DSC74B with DMCOIL cooling/venting coil |
| DMCOIL | Cooling/venting coil |
| DMT242SC | Sampling cell |
| DMT242SC pressure limit | 10 MPa (100 barg, 1450 psig) |
| DMT242SC2 | Sampling cell with Swagelok connectors |
| DMT242SC2 pressure limit | 4 MPa (40 barg, 580 psig) |
| Material for all sampling cells | Stainless steel AISI316 |

Compliance

| | |
|-----|--------------------------------|
| EMC | EN61326-1, Generic Environment |
|-----|--------------------------------|

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 Hand-Held Meter DM70 for easy spot checking, local display and data logging

Vaisala Dewpoint 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® Hand-Held Dewpoint 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

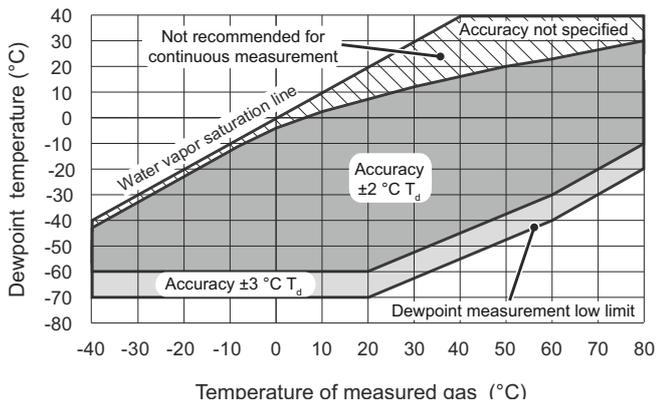
| | |
|--|----------------------------------|
| Dew point | -70 ... +30 °C (-94 ... +86 °F) |
| Pressure, absolute | 1 ... 12 bar (14.5 ... 174 psi) |
| Temperature (available if output RS-485 only selected) | -40 ... +80 °C (-40 ... +176 °F) |

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 | 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 |
| Electromagnetic compatibility | EMC standard EN61326-1, Electrical equipment for measurement, control and laboratory use - EMC requirements; Industrial 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 | 4-pin M8 |

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

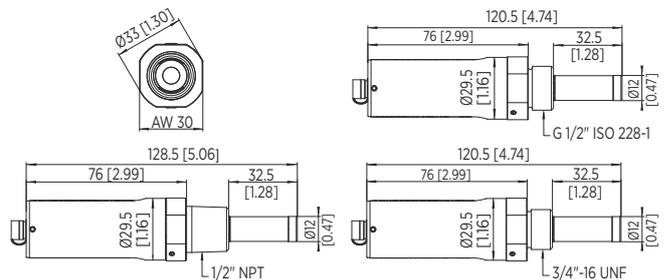
| | |
|---------------------------|-----------------------|
| During normal measurement | 20 mA + load current |
| During self-diagnostics | 300 mA + load current |

External Load for

| | |
|----------------|------------|
| Current output | Max. 500 Ω |
| Voltage output | Min. 10 kΩ |

Mechanical Specifications

| | |
|----------------------------------|--|
| Housing material | AISI316L |
| Mechanical connection | ISO G1/2 in, NPT 1/2 in, UNF 3/4 in-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 |
| ISO1/2 in plug | 218773 |
| NPT 1/2 in plug | 222507 |

VAISALA

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ESIS
 Industrial Electronics



The Vaisala Multiparameter Transmitter DPT145 with the DILO DN20 connector

Features

- First transmitter to offer online measurement of seven SF6 parameters in one unit
- Measured parameters: dew point, pressure, temperature
- Calculated parameters: SF6 density, normalized pressure, dew point in atmospheric pressure, ppm
- More reliable assessment of the condition of SF6 insulation due to online measurement
- Digital output: RS-485 with Modbus®
- Long calibration interval of years

Vaisala Multiparameter Transmitter DPT145 for SF6 Gas is a unique innovation that enables online measurement of dew point, pressure, and temperature. It also calculates four other values, including SF6 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 the SF6 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 SF6 and cause rapid deterioration. With the 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 SF6 gas is released into the atmosphere.



The DPT145 with the weather shield

The Fruit of Experience

Vaisala has over 70 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 SF6 gas.

Technical Data

Measured Parameters

| | |
|--------------------|----------------------------------|
| Dew point | -50 ... +30 °C (-58 ... +86 °F) |
| Pressure, absolute | 1 ... 12 bar (14.5 ... 174 psi) |
| Temperature | -40 ... +80 °C (-40 ... +176 °F) |

Calculated Parameters

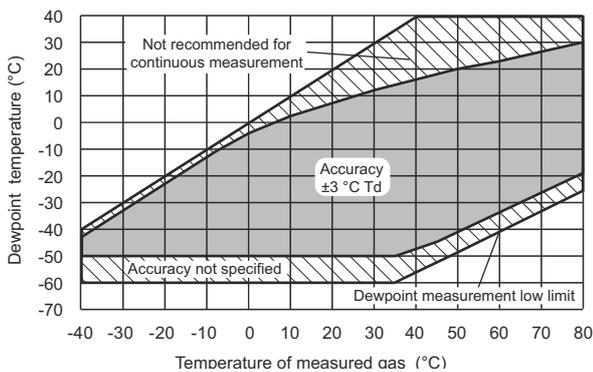
| | |
|--|---------------------------------|
| Pressure, normalized to +20 °C (+68 °F) | 1 ... 12 bar (14.5 ... 174 psi) |
| SF6 or SF6/N2 mixture density | 0 ... 100 kg/m ³ |
| Moisture by volume, ppm | 40 ... 40 000 ppm |
| Dew point, converted to atmospheric pressure | -65 ... +30 °C (-85 ... +86 °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 SF6, 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 |

Sensor Response Time

| | |
|---------------------------------------|--|
| Pressure response time | < 1 s |
| Dew point response time ¹⁾ | -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 inputs | RS-485, non-isolated, Vaisala protocol Modbus® RTU protocol |
| Connector | 4-pin M8 |
| 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 | 0 ... 50 bar (0 ... 725 psi) |
| Relative humidity | 0 ... 100 % |
| Measured gases | SF ₆ , SF ₆ /N ₂ 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 |
| Weather shield to be used for continuous outdoor installations | |
| Mechanical connection | DILO DN20, DILO DN8, ABB Malmkvist, or Alstom G1/2 in compatible connector Every connection is helium leak tested at the factory. |
| Weight (with DILO adapter) | 765 g (27.0 oz) |

Compliance

| | |
|----------------|--|
| IP rating | IP66 |
| EMC compliance | EN61326-1, Electrical equipment for measurement, control and laboratory use - EMC requirements |

Industrial Environment, Tested Levels

| | |
|---|--|
| EN/IEC 61000-4-2, Electrostatic Discharge | 8 kV con / 15 kV air |
| EN/IEC 61000-4-3, RF field immunity | 10 V/m (80MHz-4.2GHz) |
| EN/IEC 61000-4-4, Electric Fast Transient | ±2 kV power and signal |
| EN/IEC 61000-4-5, Surge | ±2 kV power line to ground / ±1kV signal line to ground and power line to line |

| | |
|---|---------------------------------------|
| EN/IEC 61000-4-6, Conducted RF Immunity | 10 Vemf power line and digital output |
|---|---------------------------------------|

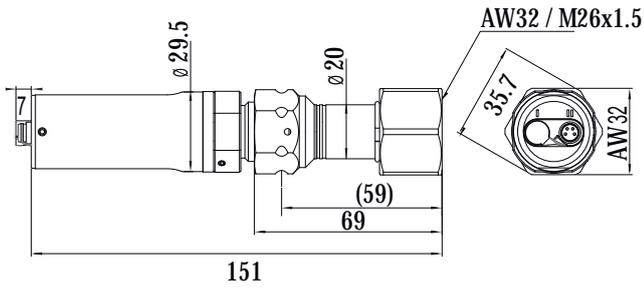
Mechanical Vibration

| | |
|---|---|
| EN/IEC 60068-2-6, Fc Sinusoidal vibration | ±6 g, 5-500 Hz sweep 60 min/axis, 3-axis |
|---|---|

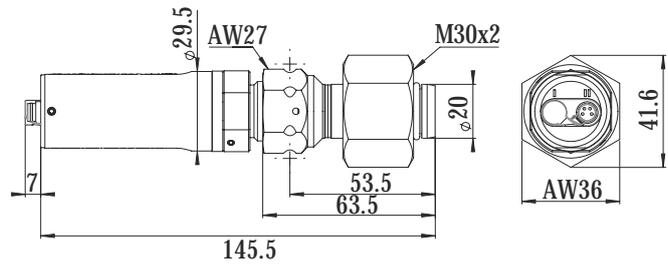
Spare Parts and Accessories

| | |
|--|-------------|
| Connection cable for the MI70/DM70 hand-held | 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 |
| 3.0 m shielded FEP cable with straight connector | 226902SP |
| Weather shield | ASM210326SP |

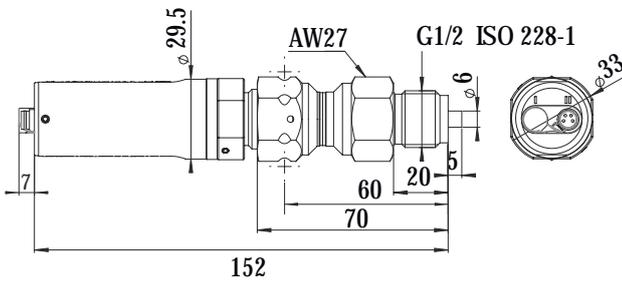
Technical Data



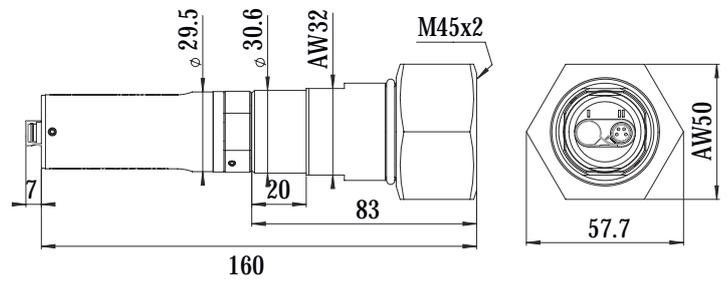
DPT145 with DILO DN8 connector



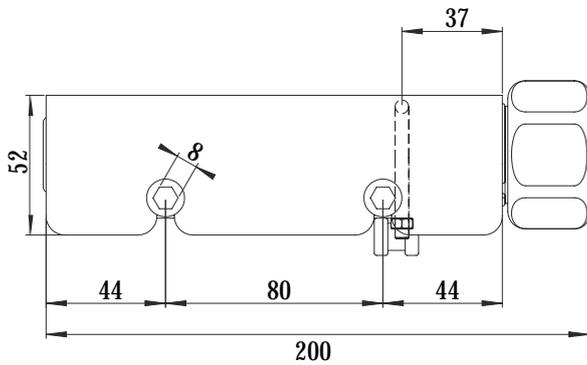
DPT145 with the ABB Malmkvist connector



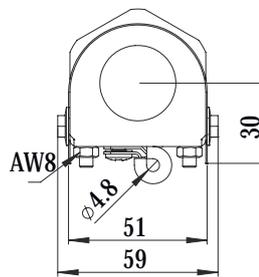
DPT145 with the Alstom connector



DPT145 with the DILO DN20 connector



DPT145 with the weather shield





Features

- Vaisala CARBOCAP® Sensor, a silicon-based non-dispersive infrared (NDIR) sensor
- Single-beam, dual wavelength CO₂ 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 CO₂ soil respiration, ambient CO₂ 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 °C, 0 °C, 25 °C and 50 °C. 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 % |
|---------------------------|---|

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 % ¹⁾ | ±(5 ppm + 2 % of reading) |

Noise (Repeatability) at 370 ppmCO₂

| | |
|----------------------------|-----------------------|
| With no output averaging | ±3 ppmCO ₂ |
| With 30 s output averaging | ±1 ppmCO ₂ |

Long-term Stability (See Graph 'GMP343 Operating Conditions')

| | |
|----------|---|
| Easy | ±2 % of reading ^{2)/} year |
| Moderate | ±2 % of reading ^{2)/} 6 months |
| Harsh | ±2 % of reading ^{2)/} 3 months |

Warm-up Time

| | |
|-------------------------|--------|
| To full accuracy ±0.5 % | 10 min |
| To full accuracy | 30 min |

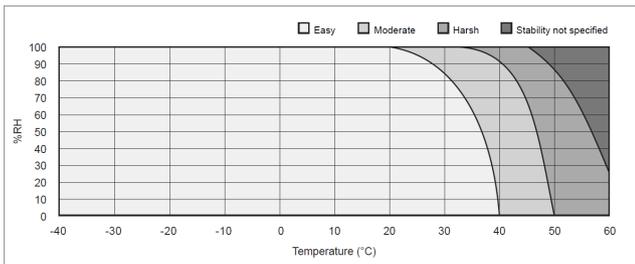
- 1) Accuracy below 200 ppmCO₂ not specified for 2 % range option
2) Always at least ±10 ppmCO₂.

Effect on Accuracy with Temperature Compensation

| | | | |
|-------------------------------|----------------|------------------------|-----------|
| CO ₂ range options | 0 ... 1000 ppm | 0 ... 2 000 - 5000 ppm | 0 ... 2 % |
|-------------------------------|----------------|------------------------|-----------|

| Temperature °C (°F) | Accuracy (% of reading) ¹⁾ | | |
|-----------------------------|---------------------------------------|----|----|
| +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 ppmCO₂.
Temperature compensation is performed by an integrated Pt1000 element.



GMP343 Operating Conditions

Effect on Accuracy with Pressure Compensation

| | | |
|-------------------------------|----------------|------------------|
| CO ₂ 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 | <2 |
| 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 | EN61326, Generic Environment |

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 |

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 |
| Probe cables | |
| PC connection cable, 2 m (6 ft 7 in) | 213379 |
| MI70 connection cable, 2 m (6 ft 7 in) | DRW216050SP |
| USB adapter (USB-D9 Serial connection cable) | 219686 |
| Soil adapter kit for horizontal positioning | 215519 |
| Soil adapter kit for vertical positioning | 215520 |
| Cable Options | |
| 2 m (6 ft 7 in) | GMP343Z200SP |
| 6 m (19 ft 8 in) | GMP343Z600SP |
| 10 m (32 ft 10 in) | GMP343Z1000SP |



Features

- Probe durable during heat sterilization up to +180 °C (+356 °F)
- Incubator can be sterilized with probe in place, saving time and reducing risk of cross-contamination
- Heat durability and superior long-term stability with next generation CARBOCAP® sensor
- Designed for OEM use in CO₂ incubators – installation options available
- CO₂ sensor measurement optimized for 5 % CO₂, measurement range up to 20 % CO₂
- 4-point traceable calibration for CO₂

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 sterilization temperatures of up to 180 °C (+356 °F), enabling easier and more complete sterilization without the risk of cross-contamination.

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 %CO₂, but the sensor measures CO₂ up to 20 % with high accuracy. In addition, GMP231 can measure pressure and temperature for CO₂ measurement compensation purposes, ensuring the product remains stable and accurate in all CO₂ 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 CO₂ 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 ₂ |
| Calibration uncertainty at 5 %CO ₂ | ±0.1 %CO ₂ |
| Start-up time | < 20 s |
| Warm-up time for full spec. | < 3 min |

Response Time

| | |
|-----|--------|
| T63 | < 30 s |
| T90 | < 50 s |

Accuracy at 37 °C, 1013 hPa

| | |
|--|-----------------------|
| Repeatability at: | |
| 0 ... 8 %CO ₂ | ±0.1 %CO ₂ |
| 8 ... 12 %CO ₂ | ±0.2 %CO ₂ |
| 12 ... 20 %CO ₂ | ±0.4 %CO ₂ |
| Non-linearity at 0 ... 20 %CO ₂ | |
| | ±0.1 %CO ₂ |

Temperature Dependence

| | |
|---|-----------------------|
| With compensation at 3 ... 12 %CO ₂ , 20 ... 60 °C | ±0.1 %CO ₂ |
| Without compensation (typical) | -0.4 % of reading/°C |

Pressure Dependence

| | |
|---|-------------------------|
| With compensation at 3 ... 12 %CO ₂ , 700 ... 1100 hPa | ±0.015 % of reading/hPa |
| Without compensation (typical) | +0.15 % of reading/hPa |

Humidity Dependence

| | |
|--|------------------------------|
| With compensation at 0 ... 20 %CO ₂ , 0 ... 100 %RH | ±0.9 % of reading (at 37 °C) |
| Without compensation (typical) | +0.05 % of reading/%RH |

O₂ dependence

| | |
|---|------------------------------------|
| With compensation at 0 ... 20 %CO ₂ , 0 ... 90 %O ₂ | ±0.6 % of reading |
| Without compensation (typical) | -0.08 % of reading/%O ₂ |

Long-term Stability

| | |
|------------------------------|-------------------------------|
| 0 ... 8 %CO ₂ | < ±0.2 %CO ₂ /year |
| 8 % ... 12 %CO ₂ | < ±0.5 %CO ₂ /year |
| 12 % ... 20 %CO ₂ | < ±1.0 %CO ₂ /year |

Mechanical Specifications

| | |
|-----------|--|
| Connector | M12/8 pin |
| Weight | 150 g (5.29 oz) without cable |
| IP rating | IP54 (sensor head) IP20 (electronics housing) |

Materials

| | |
|------------|-----------------------------|
| Housing | Metal coated plastic ABS+PC |
| Inner tube | Aluminum |
| Probe tube | PPSU |
| Filter | PTFE |

Dimensions

| | |
|--------------------------|--------------------|
| 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

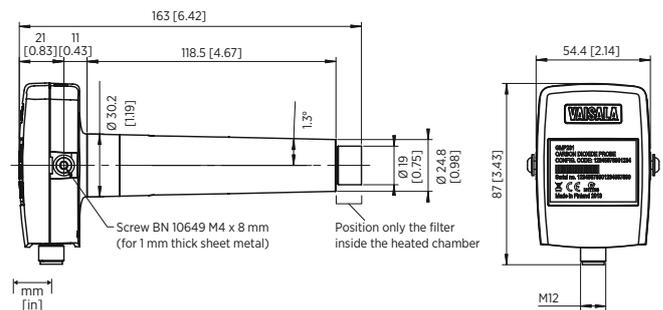
| | |
|--|--|
| Operating temperature for CO ₂ measurement | 0 ... +70 °C (+32 ... +158 °C) |
| Max. temperature durability in standby mode (sensor head only) | Max. +195 °C (Max. +383 °C) |
| Heat sterilization 180 °C durability | At least 120 cycles |
| Storage temperature | -40 ... +75 °C (-40 ... +167 °C) |
| 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 ₂ O ₂ (2000 ppm, non-condensing), ethanol, acetic acid |
| Electromagnetic compatibility | EN61326-1, Generic Environment |

Inputs and Outputs

| | |
|-------------------|--|
| Digital outputs | I ² 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 |
| Service cable for MI70 | 221801 |
| Silicone plug | DRW240015SP |
| Attachment bracket | DRW240247SP |
| PTFE filter | DRW240494SP |
| USB PC connection cable | DRW240494SP |
| Calibration adapter for GMP231 | 239523 |



Dimensions



Features

- Measurement range 0 ... 20 %CO₂
- Intelligent, stand-alone probe with analog and digital outputs
- Compatible with Indigo 200 transmitters and Vaisala Insight
- Wide operating temperature range -40 ... +60 °C
- IP65-classified housing
- Full temperature and pressure compensations
- 2nd-gen proprietary CARBOCAP® technology
- Integrated temperature measurement for CO₂ compensation purposes
- Compensations for background gases, O₂, and humidity
- Sensor head heated to prevent condensation

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

Benefits

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

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

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

The operating temperature range of the probe is wide (-40 ... +60 °C (-40 ... +140 °F)), and the probe housing is classified as IP65. Condensation is prevented as the internal sensor head is heated.

GMP251 is resistant to dust and most chemicals, such as, H₂O₂ and alcohol-based cleaning agents.

Ease of Use

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

GMP251 can be connected to Indigo 200 series transmitters for an extended range of output and configuration options. See www.vaisala.com/indigo.

For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight PC Software (for Windows® 7, 8.1 and 10: see www.vaisala.com/insight).

Applications

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

Technical Data

Measurement Performance

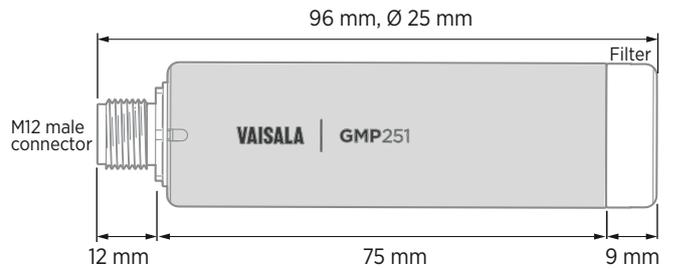
| | |
|---|--|
| Measurement range | 0 ... 20 %CO ₂ |
| Accuracy at 25 °C (77 °F) and 1013 hPa (incl. Repeatability and Non-linearity) | |
| At 5 %CO ₂ | ±0.1 %CO ₂ |
| 0 ... 8 %CO ₂ | ±0.2 %CO ₂ |
| 8 ... 20 %CO ₂ | ±0.4 %CO ₂ |
| Calibration Uncertainty | |
| At 5 %CO ₂ | ±0.12 %CO ₂ |
| At 20 %CO ₂ | ±0.32 %CO ₂ |
| Long-Term Stability | |
| 0 ... 8 %CO ₂ | ±0.3 %CO ₂ /year |
| 8 ... 12 %CO ₂ | ±0.5 %CO ₂ /year |
| 12 ... 20 %CO ₂ | ±1.0 %CO ₂ /year |
| Temperature Dependence | |
| With compensation at 5 %CO ₂ , 0 ... +50 °C (+32 ... +122 °F) | < ±0.05 %CO ₂ |
| With compensation, 0 ... 20 %CO ₂ , -40 ... +60 °C (-40 ... +140 °F) | ±0.045 % of reading/°C |
| Without temperature compensation at 5 %CO ₂ (typical) | -0.25 % of reading/°C |
| Pressure Dependence | |
| With compensation at 5 %CO ₂ 700 ... 1100 hPa | ±0.05 %CO ₂ |
| With compensation, 0 ... 20 %CO ₂ 500 ... 1200 hPa | ±0.015 % of reading/hPa |
| Without compensation (typical) | +0.15 % of reading/hPa |
| Humidity Dependence | |
| With compensation, 0 ... 20 %CO ₂ , 0 ... 100 %RH | ±0.7 % of reading (at +25 °C (+77 °F)) |
| Without compensation (typical) | +0.05 % of reading / %RH |
| O₂ Dependence | |
| With compensation, 0 ... 20 %CO ₂ , 0 ... 90 %O ₂ | ±0.6 % of reading (at +25 °C (+77 °F)) |
| Without compensation (typical) | -0.08 % of reading / %O ₂ |
| Flow Rate Dependence (for Flow-Through Model Option) | |
| < 1 l/min flow | No effect |
| 1 ... 10 l/min flow | < 0.6 % of reading/ l/min |
| 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 model with > 0.1 l/min | < 1 min |
| With spray shield | < 2 min |

Operating Environment

| | |
|--|--|
| Operating temperature of CO ₂ measurement | -40 ... +60 °C (-40 ... +140 °F) |
| Storage temperature | -40 ... +70 °C (-40 ... +158 °F) |
| Pressure | |
| Compensated | 500 ... 1100 hPa |
| Operating | < 1.5 bar |
| Humidity | 0 ... 100 %RH, non-condensing |
| Gas Flow (for Flow-Through Option) | |
| Operating range | < 10 l/min |
| Recommended range | 0.1 ... 0.8 l/min |
| Condensation prevention | Sensor head heating, when power on |
| EMC compliance | EN61326-1, Generic Environment |
| Chemical tolerance (temporary exposure during cleaning) | <ul style="list-style-type: none"> • H₂O₂ (2000 ppm, non-condensing) • Alcohol-based cleaning agents (for example ethanol and IPA) • Acetone • Acetic acid |

Mechanical Specifications

| | |
|-----------------------|----------------------------------|
| Weight, probe | 45 g (1.59 oz) |
| Materials | |
| Probe housing | PET plastic |
| Filter | PTFE membrane, PET plastic grid |
| Connector | Nickel plated brass, M12 / 5 pin |
| IP rating, probe body | IP65 |
| Connector | M12 5-pin male |
| Dimensions | |
| Probe diameter | 25 mm (0.98 in) |
| Probe length | 96 mm (3.78 in) |



Inputs and Outputs

| | |
|----------------|--|
| Analog outputs | <ul style="list-style-type: none">• 0 ... 5/10 V (scalable), min load 10 kΩ• 0/4 ... 20 mA (scalable), max load 500 Ω |
| Digital output | Over RS-485: <ul style="list-style-type: none">• Modbus• Vaisala Industrial Protocol |

Operating Voltage

| | |
|----------------------------|---------------|
| With digital output in use | 12 ... 30 VDC |
| With voltage output in use | 12 ... 30 VDC |
| With current output in use | 20 ... 30 VDC |

Power Consumption

| | |
|--------------------------------|-------|
| Typical (continuous operation) | 0.4 W |
| Maximum | 0.5 W |

Spare Parts and Accessories

| | |
|--|-------------|
| Standard membrane filter | ASM211650SP |
| Porous sintered PTFE filter (extra protection) | DRW243649SP |
| Probe cable with open wires (1.5 m) | 223263SP |
| Probe cable with open wires and 90° plug (0.6 m) | 244669SP |
| Probe cable with open wires (10 m) | 216546SP |
| Flow-through adapter with gas ports | ASM211697SP |
| USB cable for PC connection ¹⁾ | 242659 |
| M170 connection cable for probe | CBL210472 |
| Flat cable for GMP250 probes, M12 5-pin | CBL210493SP |
| Probe mounting clips (2 pcs) | 243257SP |
| Probe mounting flange | 243261SP |
| Calibration adapter | DRW244827SP |
| Spray shield | ASM212017SP |

Transmitters

| | |
|-------------------|--|
| Indigo 200 series | See www.vaisala.com/indigo |
|-------------------|--|

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





Features

- Measurement range
0 ... 10 000 ppmCO₂
- Intelligent, stand-alone probe with analog and digital outputs
- Compatible with Indigo 200 transmitters and Vaisala Insight
- Wide operating temperature range -40 ... +60 °C
- IP65-classified housing
- 2nd-gen proprietary CARBOCAP® technology
- Full temperature and pressure compensations
- Integrated temperature measurement for CO₂ compensation purposes
- Compensations for background gases, O₂, and humidity
- Sensor head heated to prevent condensation

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

Benefits

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

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

GMP252 incorporates an internal temperature sensor for compensation of the CO₂ measurement according to ambient temperature. The effects of

pressure and background gas can also be compensated for. The measurement range is 0 ... 10 000 ppmCO₂ (measurements up to 30 000 ppmCO₂ are available with reduced accuracy). The operating temperature range of the probe is wide (-40 ... +60 °C (-40 ... +140 °F)), and the probe housing is classified as IP65. Condensation is prevented as the internal sensor head is heated.

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

Ease of Use

GMP252 is a compact probe with easy and fast plug-in, plug-out installation. The surface of the probe is smooth, which makes it easy to clean. The probe

provides several output options, including analog current and voltage outputs and digital RS-485 output with Modbus protocol.

GMP252 can be connected to Indigo 200 series transmitters for an extended selection of outputs and configuration options. See www.vaisala.com/indigo.

For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight PC Software (for Windows® 7, 8.1 and 10: see www.vaisala.com/insight).

Applications

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

Technical Data

Measurement Performance

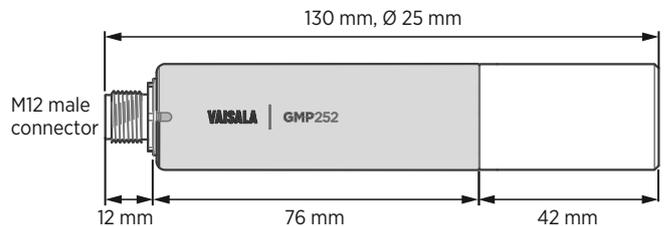
| | |
|---|--|
| Measurement range | 0 ... 10 000 ppmCO ₂ (up to 30 000 ppmCO ₂ with reduced accuracy) |
| Accuracy at 25 °C and 1013 hPa (incl. Repeatability and Non-Linearity) | |
| 0 ... 3000 ppmCO ₂ | ±40 ppmCO ₂ |
| 3000 ... 10 000 ppmCO ₂ | ±2 % of reading |
| Up to 30 000 ppmCO ₂ | ±3.5 % of reading |
| Calibration Uncertainty | |
| at 2000 ppmCO ₂ | ±38 ppmCO ₂ |
| at 10 000 ppmCO ₂ | ±105 ppmCO ₂ |
| Long-Term Stability | |
| 0 ... 3000 ppmCO ₂ | ±60 ppmCO ₂ /year |
| 3000 ... 6000 ppmCO ₂ | ±150 ppmCO ₂ /year |
| 6000 ... 10 000 ppmCO ₂ | ±300 ppmCO ₂ /year |
| Temperature Dependence 0 ... 10 000 ppmCO₂ | |
| 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 ppmCO ₂ (typical) | -0.5 % of reading/°C |
| Pressure Dependence | |
| with compensation at 0 ... 10 000 ppmCO ₂ , 500 ... 1100 hPa | ±0.015 % of reading/hPa |
| without compensation (typical) | +0.15 % of reading/hPa |
| Humidity Dependence | |
| with compensation, 0 ... 10 000 ppmCO ₂ , 0 ... 100 %RH | ±0.7 % of reading (at +25 °C (+77 °F)) |
| without compensation (typical) | +0.05 % of reading/%RH |
| O₂ Dependence | |
| with compensation, 0 ... 10 000 ppmCO ₂ , 0 ... 90 %O ₂ | ±0.6 % of reading (at +25 °C (+77 °F)) |
| without compensation (typical) | -0.08 % of reading/%O ₂ |
| Start-Up, Warm-Up and Response Time | |
| Start-up time at +25 °C | < 12 s |
| Warm-up time for full spec. | < 2 min |
| Response time (T90) with standard filter | < 1 min |
| Response time (T90) with spray shield | < 3 min |
| Flow-Through Option | |
| Response time (T90) with > 0.1 l/min | 30 s |
| Flow rate dependence < 1 l/min flow | no effect |
| Flow rate dependence 1 ... 10 l/min flow | < 0.6% of reading l/min |
| Gas flow operating range | < 10 l/min |
| Gas flow recommended range | 0.1 ... 0.8 l/min |

Operating Environment

| | |
|---|--|
| Operating temperature of CO ₂ measurement | -40 ... +60 °C (-40 ... +140 °F) |
| Storage temperature | -40 ... +70 °C (-40 ... +158 °F) |
| Humidity | 0 ... 100 %RH, non-condensing |
| Condensation prevention | Sensor head heating when power on |
| EMC compliance | EN61326-1, Generic Environment |
| Chemical tolerance (temporary exposure during cleaning) | <ul style="list-style-type: none"> H₂O₂ (2000 ppm, non-condensing) Alcohol-based cleaning agents (for example ethanol and IPA) Acetone Acetic acid |
| Pressure | |
| Compensated | 500 ... 1100 hPa |
| Operating | < 1.5 bar |

Mechanical Specifications

| | |
|------------------------|---------------------|
| Weight, probe | 58 g (2.05 oz) |
| Connector type | M12 5-pin male |
| IP rating, probe body | IP65 |
| Materials | |
| Probe housing material | PBT plastic |
| Filter | PTFE |
| Connector | Nickel plated brass |
| Dimensions | |
| Probe diameter | 25 mm (0.98 in) |
| Probe length | 130 mm (5.12 in) |



Inputs and Outputs

| | |
|---|--|
| Digital output | Over RS-485: <ul style="list-style-type: none"> • Modbus • Vaisala Industrial Protocol |
| Analog output | <ul style="list-style-type: none"> • 0 ... 5/10 V (scalable), min load 10 kΩ • 0/4 ... 20 mA (scalable), max load 500 Ω |
| Operating voltage | |
| With digital output in use | 12 ... 30 VDC |
| With voltage output in use | 12 ... 30 VDC |
| With current output in use | 20 ... 30 VDC |
| Power consumption | |
| Typical (continuous operation) | 0.4 W |
| Maximum | 0.5 W |
| When connected to Indigo 200 transmitter | |
| Analog output | 3 voltage (V) or current (mA) outputs: <ul style="list-style-type: none"> • 0 ... 10 VDC / 0 ... 5 VDC / 0 ... 1 VDC / 1 ... 5 VDC (min load 1kΩ) • 0 ... 20 mA / 4 ... 20 mA (max load 500 Ω) |
| Relays | 2 configurable relays |
| Power supply input | Nominal 24 V, range: <ul style="list-style-type: none"> • 15 ... 40 VDC • 20 ... 28 VAC |
| Power consumption | Max. 3.5 W (transmitter + probe total max. consumption) |

Spare Parts and Accessories

| | |
|--|--|
| Porous sintered PTFE filter for GMP252 | DRW244221SP |
| Probe cable with open wires (1.5 m) | 223263SP |
| Probe cable with open wires and 90° plug (0.6 m) | 244669SP |
| Probe cable with open wires (10 m) | 216546SP |
| Flow-through adapter with gas ports | ASM212011SP |
| USB cable for PC connection ¹⁾ | 242659 |
| M170 connection cable for probe | CBL210472 |
| Flat cable for GMP250 probes, M12 5-pin | CBL210493SP |
| Probe mounting clips (2 pcs) | 243257SP |
| Probe mounting flange | 243261SP |
| Calibration adapter | DRW244827SP |
| Spray shield | ASM212017SP |
| Radiation shield DTR250 | DTR250 |
| Radiation shield DTR250 with pole mounting kit | DTR250A |
| Transmitters | |
| Indigo 200 series | See www.vaisala.com/indigo |

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



Features

- Two optional sampling methods: diffusion or pump aspiration
- User-friendly meter with multilingual user interface
- Numerical and graphical display of measurements
- Data can be logged and transferred to PC via MI70 Link software

The Vaisala CARBOCAP® Handheld Carbon Dioxide Meter GM70 is the demanding professional's choice for hand-held carbon dioxide measurement. The meter consists of the indicator (center) and probe, used either with the handle (left) or pump (right).

GM70 is a user-friendly meter for demanding spot measurements in laboratories, greenhouses and mushroom farms. The meter can also be used in HVAC and industrial applications, and as a tool for checking fixed CO₂ instruments.

GM70 has a short warm-up time and is ready for use almost immediately. It has a menu-based interface, a graphical LCD display and data logging capability.

Vaisala CARBOCAP® Technology

GM70 incorporates the advanced CARBOCAP sensor that has unique reference measurement capabilities. The measurement accuracy is not affected by dust, water vapor or most chemicals. The meter has a two-year recommended calibration interval.

Two Sampling Methods

The handle is for hand-held diffusion sampling. GM70 pump enables pump-aspirated sampling from locations difficult to access otherwise. It is also ideal for comparisons with fixed CO₂ transmitters.

Interchangeable Probes

GM70 uses the same probes as Vaisala CARBOCAP Carbon Dioxide Transmitter Series GMT220. By plugging different probes into the handle or pump, the user can easily change the measurement range of the GM70.

The meter can also be used as a calibration check instrument for Vaisala's fixed CO₂ instruments. GMW90 and GMP220 probes can also be adjusted by using the GM70 meter. GM70 has two probe inputs. Vaisala's relative humidity and dewpoint probes can also be used simultaneously with CO₂ measurement.

MI70 Link

The optional MI70 Link Windows® software and the USB connection cable form a practical tool for transferring logged data and real time measurement data from GM70 to a PC.

Benefits

- Proven Vaisala CARBOCAP® reliability
- Wide selection of measurement ranges
- Easy recalibration using the interchangeable probes
- Suitable for field checking of fixed CO₂ instruments
- Short warm-up time
- Compact and versatile

Technical Data

CO₂ Volume Concentration Measurement Performance, GMH70 Probe

| Response Time (63 %) | |
|--|--|
| GMP221 | 20 s |
| GMP222 | 30 s |
| Measurement Ranges | |
| High concentrations, short probe (GMP221) | 0 ... 2 % 0 ... 3 % 0 ... 5 %, 0 ... 10 %, 0 ... 20 % |
| Low concentrations, long probe (GMP222) | 0 ... 2000 ppm, 0 ... 3000 ppm, 0 ... 5000 ppm, 0 ... 7000 ppm, 0 ... 10 000 ppm |
| Accuracy at 25 °C and 1013 hPa ¹⁾ | |
| GMP221 | ±(1.5 % of range + 2 % of reading) ²⁾ |
| GMP222 | ±(1.5 % of range + 2 % of reading) |
| Temperature dependence, typical | -0.3 % of reading/°C |
| Pressure dependence, typical | +0.15 % of reading/hPa |
| Long-term stability | < ±5 %FS / 2 years |
| Warm-up time | 30 s, 15 min full specifications |

1) Including repeatability, non-linearity and calibration uncertainty.

2) Applies for concentrations above 2 % of full scale.

Measurement Environment

| | |
|---------------------------------|---------------------------------|
| Temperature | -20 ... +60 °C (-4 ... +140 °F) |
| Relative humidity | 0 ... 100 %RH, non-condensing |
| Operation pressure | 700 ... 1300 hPa |
| Flow range (diffusion sampling) | 0 ... 10 m/s |

Probe, Handle & Pump Mechanical Specifications

| Sensor | Vaisala CARBOCAP® |
|---------------------------------|-------------------|
| Housing Material | |
| GMP221/222 probe | PC plastic |
| GMH70 handle | ABS/PC blend |
| GM70 Pump | Aluminium casing |
| Weight | |
| GMH70 with GMP221/222 probe | 230 g |
| GM70 Pump with GMP221/222 probe | 700 g |

Probe, Handle & Pump Operating Environment

| | |
|---------------------|----------------------------------|
| Storage temperature | -30 ... +70 °C (-22 ... +158 °F) |
| Storage humidity | 0 ... 100 %RH, non-condensing |

MI70 Measurement Indicator

Operating Environment

| | |
|-----------------------|----------------------------------|
| Operating temperature | -10 ... +40 °C (+14 ... +104 °F) |
| Operating humidity | 0 ... 100 %RH, non-condensing |
| Storage temperature | -40 ... +70 °C (-40 ... +158 °F) |

Inputs and Outputs

| | |
|-------------------|---|
| Max. no of probes | 2 |
| Power supply | Rechargeable NiMH battery pack with AC adapter or 4xAA size alkalines, type IEC LR6 |
| PC interface | MI70 Link software with USB or serial port cable |

| | |
|------------------------|-----------------------------------|
| Analog Output | |
| Scale | 0...1 VDC |
| Output resolution | 0.6 mV |
| Accuracy | 0.2 % full scale |
| Temperature dependence | 0.002 %/°C (0.01 %/°F) full scale |
| Minimum load resistor | 10 kΩ to ground |

Mechanical Specifications

| | |
|------------------------|---------------|
| Housing classification | IP54 |
| Housing materials | ABS/PC blend |
| Weight | 400 g (14 oz) |

Compatibility

| | |
|----------------|-------------------------------|
| EMC compliance | EN61326-1, Portable Equipment |
|----------------|-------------------------------|

Other

| | |
|-----------------------|--|
| Menu languages | English, Chinese, Spanish, Russian, French, Japanese, German, Swedish, Finnish |
| Display | <ul style="list-style-type: none"> LCD with backlight Graphic trend display of any parameter Character height up to 16 mm (0.63 in) |
| Alarm | Audible alarm function |
| Data logging capacity | 2700 real time data points |
| Logging interval | 1 s to 12 h |
| Logging duration | 1 min ... memory full |
| Resolution | 0.01 %RH, 0.01 °C/°F, 0.01 hPa, 0.01 a _w , 10 ppm / 0.01 %CO ₂ |

Battery Operation Time

| Typical charging time | 4 hours |
|------------------------------|--|
| Operation Times | |
| Continuous use (with handle) | Better than 8 h at +20 °C (68 °F) |
| Continuous use (with pump) | Better than 5 h at +20 °C (68 °F) without load |
| Data logging use (one probe) | Up to 30 days depending on logging interval |



Dimensions in mm (inches)

Spare Parts and Accessories

| | |
|---|----------------|
| MI70 Link software with USB cable | 219687 |
| MI70 Link software with serial port cable | MI70LINK |
| Analog output cable for 0 ... 1 VDC | 27168ZZ |
| Calibration adapter | 26150GM |
| Weatherproof carrying case | MI70CASE3 |
| Soft carrying case for diffusion handle and probe | MI70SOFTCASE |
| Battery, NiMH 4.8 V | 26755 |
| Spare probe (use the order form to define measurement range etc.) | GMP221, GMP222 |
| Nafion Membrane Tubing | 212807GM |
| Connection Cable for Fixed CO₂ Instruments | |
| GMT220, GMD20 | GMA70 |
| GMP343 | DRW216050SP |
| GMW90 series | 219980SP |

GMW90 Series Carbon Dioxide, Humidity, and Temperature Transmitters for DCV



Features

- Measured parameters: carbon dioxide, temperature, and humidity (optional)
- Superior long-term stability with the next 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 CO₂ calibration (certification included)
- Both analog and digital communication (BACnet®/Modbus®)

GMW90 Series Carbon Dioxide, Temperature and Humidity Transmitters for HVAC are available with either a display opening or a solid front. An optional traffic light indication can also be selected.

GMW90 Series CARBOCAP® Carbon Dioxide, Temperature, and Humidity Transmitters 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, these 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 new 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

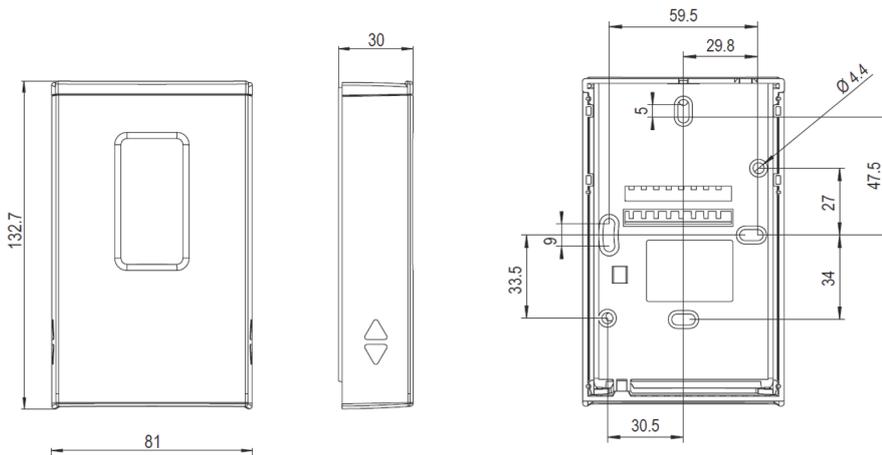
GMW90 series transmitters have been designed for quick and easy installation and maintenance. Every model includes a display for easy startup and convenient maintenance. To protect the sensor from dust and dirt during construction and installation, the units can be cabled with

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 hand-held meter or reference gas CO₂ 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 a top-quality final result.

Technical Data



Dimensions in mm

Models

| Model | Measurements | Output |
|---------|-----------------------|--|
| GMW93 | CO ₂ +T | 3-wire, voltage output |
| GMW93D | CO ₂ +T | 3-wire, voltage output with display |
| GMW94 | CO ₂ +T | 3-wire, current output |
| GMW94D | CO ₂ +T | 3-wire, current output with display |
| GMW93R | CO ₂ +T+RH | 3-wire, voltage output |
| GMW93RD | CO ₂ +T+RH | 3-wire, voltage output with display |
| GMW93RA | CO ₂ +T+RH | 3-wire, voltage output with display and CO ₂ indicator LEDs |
| GMW94R | CO ₂ +T+RH | 3-wire, current output |
| GMW94RD | CO ₂ +T+RH | 3-wire, current output with display |
| GMW95 | CO ₂ +T | Digital (BACnet/Modbus) model |
| GMW95D | CO ₂ +T | Digital (BACnet/Modbus) model with display |
| GMW95R | CO ₂ +T+RH | Digital (BACnet/Modbus) model |
| GMW95RD | CO ₂ +T+RH | Digital (BACnet/Modbus) model with display |
| GMW90 | CO ₂ +T | Configurable analog/digital models |
| GMW90R | CO ₂ +T+RH | Configurable analog/digital models |

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 | Vaisala 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) |

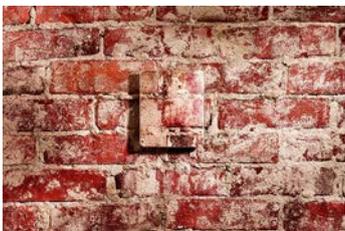
Relative Humidity

| | |
|---|-----------------------|
| Measurement range | 0 ... 95 %RH |
| Stability in typical HVAC applications | ±0.5 %RH/year |
| Humidity sensor | Vaisala 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) |



Optional decorative cover blends the transmitter into your interior design.

Inputs and Outputs

| | |
|----------------|---------------------------------------|
| Supply voltage | 18 ... 35 VDC, 24 VAC ± 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 ₂ | 0 ... 2000 ppm |
| T | -5 ... +55 °C |
| RH | 0 ... 100 %RH |

Digital 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 |

Supported protocols (selectable by DIP switch):

| | |
|---|---|
| BACnet® MS/TP (selectable Master/Slave) | Address range, master mode: 0 ... 127 Address range, slave mode: 128 ... 255 |
| 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 ² (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 ₂ module | GM10SP |
| Temperature Module (CO ₂ +T models) | TM10SP |
| Humidity and Temperature Module (CO ₂ +T+RH models) | HTM10SP |
| Decorative cover set (10 pcs) | 236285 |
| Connection cable for MI70 | 219980 |
| USB cable for PC connection | 219690 |

Compliance

| | |
|----------------|-----------------------------------|
| EMC compliance | EN61326-1, Industrial Environment |
| IP rating | IP30 |

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GMW80 Series Carbon Dioxide, Humidity, and Temperature Transmitters for DCV



Features

- Superior stability due to 2nd-generation proprietary CARBOCAP® technology
- Improved accuracy due to low self-heating of microglow light source

Vaisala CARBOCAP® Carbon Dioxide, Humidity and Temperature Transmitter Series GMW80 is based on 2nd-generation technology for improved reliability and stability.

GMW80 series transmitters are designed to fulfill the needs for CO₂ measurements in standard demand-controlled ventilation applications. Temperature measurement is always included in the GMW80 series transmitters. Combined with humidity measurement, relay, and LED CO₂ level indication, GMW80 series provides you the flexibility needed for a variety of projects.

The CARBOCAP sensors measure CO₂ 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 GMW88 model provides an IP64-rated enclosure with a cable gland.

Reliable Operation

The GMW80 series transmitters are optimized for low maintenance. The 2nd-generation, low-power CARBOCAP technology enables a longer lifetime and superior 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 CO₂ sensor guarantees the best stability and operation even in constantly occupied buildings without 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

| | | |
|------------------------|-----------------------|--|
| GMW86P | CO ₂ | CO ₂ current and voltage output, Pt1000 |
| GMW83RP ¹⁾ | CO ₂ +RH+T | Voltage outputs, Pt1000 |
| GMW83DRP ¹⁾ | CO ₂ +RH+T | Voltage outputs, Pt1000, Display |
| GMW83 | CO ₂ | Voltage outputs |
| GMW83A | CO ₂ | Voltage outputs, CO ₂ indicator LEDs |
| GMW83D | CO ₂ | Voltage outputs, Display |
| GMW84 | CO ₂ | CO ₂ current output |
| GMW84S | CO ₂ | CO ₂ current output, Relay |
| GMW88 | CO ₂ | CO ₂ current and voltage output |

¹⁾ Models with calibration certificate available (GMW83RPC/GMW83DRPC)

Measurement Performance

Carbon Dioxide

| | |
|--|--|
| Measurement range | 0 ... 2000 ppm |
| Accuracy across temperature range | |
| +20 ... +30 °C (+68 ... +86 °F) | ±(30 ppm +3 % of reading) |
| +10 ... +20 °C (+50 ... +68 °F), +30 ... +40 °C (+86 ... +104 °F) | ±(35 ppm +3.7 % of reading) |
| +0 ... +10 °C (+32 ... +50 °F), +40 ... +50 °C (+104 ... +122 °F) | ±(40 ppm +4.8 % of reading) |
| Stability in typical HVAC applications | ±(15 ppm + 2 % of reading) over five years |
| Warm-up time | 1 min 10 min for full specification |
| Response time (63 %) | 60 s GMW88 model: 7 min |
| Carbon dioxide sensor | Vaisala 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, GMW84) | |
| +10 ... +30 °C (+50 ... +86 °F) | ±0.5 °C (0.9 °F) |
| +0 ... +10 °C (+32 ... +50 °F), +30 ... 50 °C (+86 ... +122 °F) | ±1 °C (1.8 °F) |

Humidity

| | |
|---|---------------------|
| Measurement range | 0 ... 95 %RH |
| Accuracy for temperature range +10 ... +30 °C (+50 ... +86 °F) | |
| 0 ... 80 %RH | ±3 %RH |
| 80 ... 95 %RH | ±5 %RH |
| Accuracy for temperature ranges 0 ... +10 °C (+32 ... +50 °F), +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 |

Operating Environment

| | |
|-----------------------|---|
| Operating temperature | 0 ... +50 °C (+32 ... +122 °F) |
| Operating humidity | 0 ... 95 %RH Dewpoint < 30 °C (+86 °F) |
| Storage temperature | Models without display: -40 ... +70 °C (-40 ... +158 °F) Models with display: -30 ... +70 °C (-22 ... +158 °F) |
| EMC compliance | EN61326-1, Industrial environment |

Inputs and Outputs

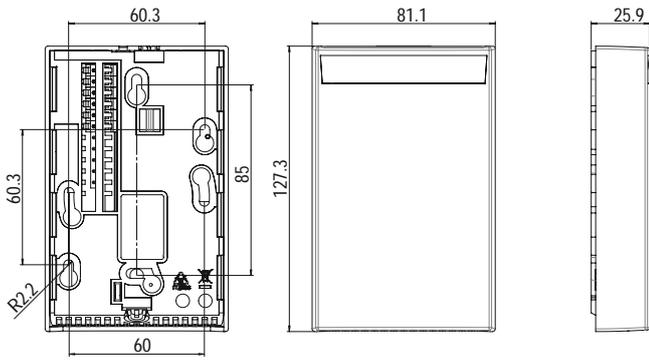
| | |
|--|--|
| Supply voltage | 18 ... 35 VDC 24 VAC ±20 % 50/60 Hz |
| Max. current consumption at 18 VDC | GMW84 models: 70 mA Other models: 45 mA |
| Max. power consumption at 30 VAC | GMW83 models: 0.7 W GMW86 models and GMW88: 1 W GMW84 models: 1.2 W |
| Outputs | 4 ... 20 mA and/or 0 ... 10 V |
| Current loop resistance (4 ... 20 mA) | 0 ... 600 Ω |
| Voltage output load resistance | Min. 10 kΩ |
| CO ₂ output scale | 0 ... 2000 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 kΩ potentiometer |
| Relay (S models) | 1 pc, SPST-NO Max. 50 VDC / 50 VAC, 500 mA |
| CO ₂ indicator LED levels (A model) | Flashing red: > 2000 ppm Red: 1200 ... 2000 ppm Yellow: 800 ... 1200 ppm Green: < 800 ppm |

Mechanical Specifications

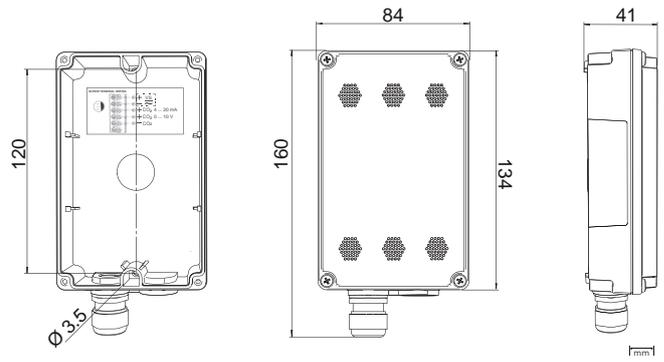
| | |
|------------------|--|
| IP rating | IP30 GMW88 model: IP64 |
| Housing material | ABS/PC UL-V0 approved GMW88 model: PC |
| Housing color | White (RAL9003) |
| Output connector | Screw terminal |
| Max. wire size | 2 mm ² (AWG14) |
| Weight | Plain and LED version: 114 g (4.02 oz) Display version: 124 g (4.37 oz) GMW88: 160 g (5.64 oz) |

Spare Parts and Accessories

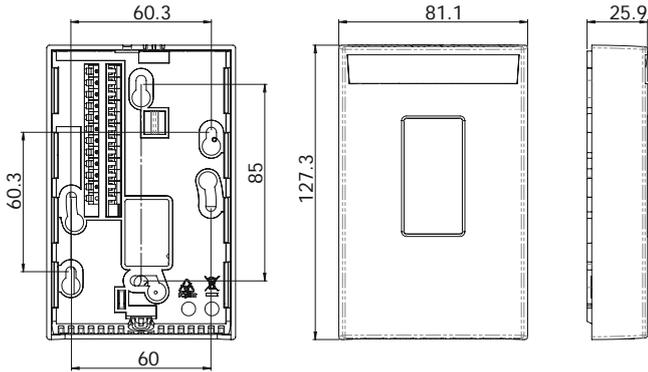
| | |
|------------------------|----------|
| CO ₂ module | GM10SP80 |
| INTERCAP® sensor | 15778HM |



GMW83, GMW83A, GMW83RP, GMW84, GMW84S and GMW86P Dimensions (in mm)



GMW88 Dimensions (in mm)



GMW83D and GMW83DRP Dimensions (in mm)





GMD20 Series Carbon Dioxide Transmitters

For Demand-controlled Ventilation Applications



Features

- Versatile transmitters
- Reliable measurement with sensor inside the duct
- Incorporates Vaisala CARBOCAP® sensor - the silicon-based NDIR sensor
- Excellent long-term stability
- Negligible temperature dependence
- Ease of installation

The duct mounted Vaisala CARBOCAP® Carbon Dioxide Transmitter Series GMD20 is specially designed for demand controlled ventilation (DCV). The transmitters are easy to install and require no maintenance. The recommended calibration interval is five years.

Vaisala CARBOCAP® Technology

The GMD20 series transmitters use the silicon-based Vaisala CARBOCAP® sensor. The simple structure and reference measurement capabilities make this single-beam, dual-wavelength NDIR sensor extremely stable and reliable.

The temperature and flow dependencies of the sensor are negligible. In addition, the measurement accuracy is not affected by dust, water vapor, and most chemicals.

Versatile Transmitters

The GMD20 series transmitters can be used independently, or incorporated into building energy management systems. The series consists of duct mount units GMD20 and GMD20D. Version D is equipped with a display.

The compact sensor head design of the duct units fits inside the ventilation duct, eliminating the risk of leaking gaskets and measurement errors.

In addition to the standard 0 ... 20 mA, 4 ... 20 mA, and 0 ... 10 V outputs, there are two other options: one LonWorks® interface and a relay output. The relay output is standard with the display units.

Improve Indoor Air at Minimal Energy Costs

The use of GMD20 series transmitters ensures the best possible control of air quality and results in considerable savings in energy consumption, maintenance, and recalibration costs.

Technical Data

Measurement Performance

Carbon Dioxide

| | |
|---|---|
| Measurement range | 0 ... 2000 ppm (Nominal; can be calibrated for other ranges: 0 ... 5000 ppm, 0 ... 10 000 ppm, 0 ... 20 000 ppm) |
| Accuracy (including repeatability, non-linearity and calibration uncertainty) | ± (2 % of range + 2 % of reading) |
| Long-term stability | < ±5 % of range / 5 years |
| Response time (63 %) | 1 minute |
| Warm-up time | 1 minute, 15 minutes full specifications |

Operating Environment

| | |
|-------------------------------|---------------------------------|
| Operating temperature | -5 ... +45 °C (-23 ... +113 °F) |
| Operating humidity | 0 ... 85 %RH, non-condensing |
| Flow velocity | 0 ... 10 m/s |
| Electromagnetic compatibility | EN61326-1, Generic Environment |

Inputs and Outputs

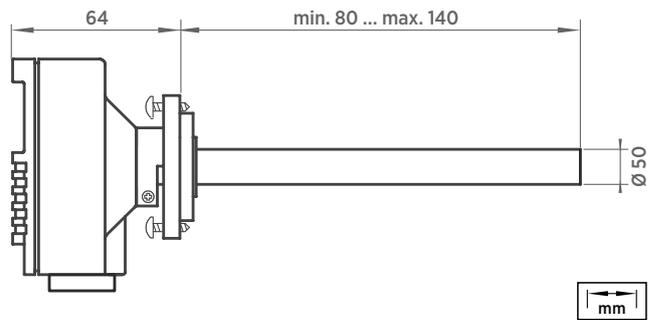
| | |
|------------------------------|---|
| Outputs | 0 ... 20 or 4 ... 20 mA and 0 ... 10 V |
| Optional outputs | <ul style="list-style-type: none"> Relay LonWorks® interface |
| Resolution of analog outputs | 8 bits |
| Recommended external load | <ul style="list-style-type: none"> Current output: max. 500 Ω Voltage output: min. 1 kΩ |
| Operating voltage | Nominal 24 VAC/DC (18 ... 30 VDC) |
| Connections | Screw terminals, wire size 0.5 ... 1.5 mm ² |
| Power consumption | < 2.5 W |

Mechanical Specifications

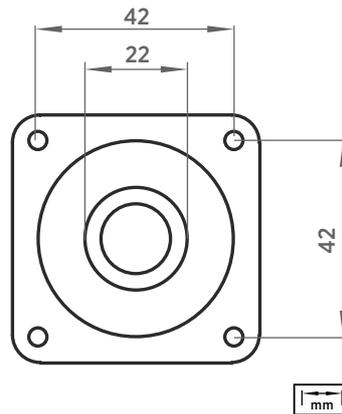
| | |
|------------------------|--------------|
| Housing material | ABS plastic |
| Housing classification | IP65 |
| Weight | |
| GMD20 | 140 g (5 oz) |
| GMD20D | 170 g (6 oz) |

Spare Parts and Accessories

| | |
|---|---------|
| Display and relay option for GMD20 | GMI21 |
| Relay output option | GMR20 |
| LonWorks® module with CO ₂ signal (not available when display option is added) | GML20 |
| Serial COM adapter | 19040GM |
| Hand-held meter for field verification | GM70 |



GMD20 Dimensions



GMD20 Mounting Plate Dimensions



Features

- Continuous online measurement of moisture in oil
- Ball-valve installation – no need to shut down the process or drain the oil
- Proven Vaisala HUMICAP® sensor, used for over 15 years in oil applications
- Analog outputs, RS-232/485, LAN
- Modbus protocol support (RTU/ TCP)

Vaisala HUMICAP® Moisture and Temperature Transmitter Series for Oil MMT330 enables the fast and reliable detection of moisture in oil. MMT330 series transmitters can be used in online moisture monitoring and as control devices, allowing separators and oil driers to be started only when needed.

Benefits

- Easy field calibration and maintenance – compatible with Vaisala HUMICAP® Hand-Held Moisture Meter for Oil MM70
- Approved for installation in MAN Diesel & Turbo Two-Stroke Diesel Engines lubrication systems

Proper monitoring saves both oil and the environment. With the MMT330 series it is easy and economical to monitor the changes of moisture in oil.

Reliable Vaisala HUMICAP® Technology

The MMT330 series incorporates the latest-generation Vaisala HUMICAP® sensor, which is the result of over 15 years of field experience. It was developed for demanding moisture measurement in liquid hydrocarbons. The sensor's excellent chemical tolerance provides accurate and reliable measurement over a wide measurement range.

For Diverse Applications and Demanding Conditions

With a wide variety of probes, the transmitter can be used in lubrication systems, hydraulic systems, and transformers.

Indicates the Margin to Water Saturation

MMT330 measures moisture in oil in terms of the water activity (a_w), relative saturation (%RS), and temperature (T). Water activity or relative saturation indicate directly whether there is a risk of free-water formation. The measurement is independent of oil type and age.

Water Content as ppm Conversion

In addition to water activity, MMT330 can output ppm, the average mass concentration of water in oil. Vaisala has this conversion readily available for mineral transformer oil.

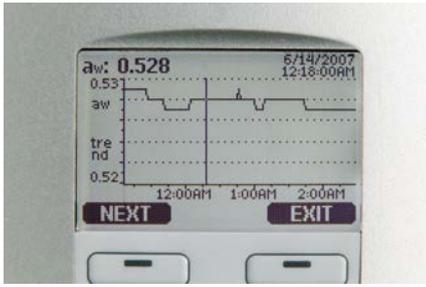
For other oils, the oil-specific conversion coefficients can be programmed into the transmitter if the water solubility of the oil is known.

Graphical Display of Measurement Data and Trends for Convenient Operation

MMT330 features a large numerical and graphical display with a multilingual menu and keypad. It allows users to easily monitor operational data, measurement trends, and access measurement history for the past 12 months.

The optional data logger, with real-time clock, makes it possible to generate over four years of measurement history and zoom in on any desired time or time frame.

The display alarm allows any measured parameter to be tracked, with freely configurable low and high limits.



The display shows measurement trends, real-time data, and measurement history.

Versatile Outputs and Data Collection

MMT330 can support up to three analog outputs; an isolated galvanic power supply and relay outputs are also available.

For serial interface the USB connection, RS-232, and RS-485 can be used.

In addition to the analog outputs, MMT330 provides Modbus RTU and TCP/IP communication protocol.

The data recorded by the data logger can be viewed on the local display or transferred to a PC with Microsoft Windows® software. The transmitter can also be connected to a network with an optional LAN interface, which enables a Ethernet connection. A USB service cable makes it easy to connect the MMT330 to a PC via the service port.

Easy Installation

With multiple options to choose from, the instrument can be tailored to meet the specific needs of each individual application and is delivered installation-ready and pre-configured for each delivery. Quick delivery time and global service network make MMT330 a perfect choice for any project.



Vaisala HUMICAP Hand-Held Moisture for Oil Meter MM70 is designed for field-checking MMT330 transmitters.

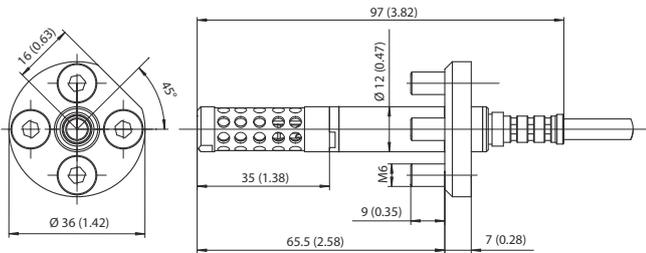
Installation Options



The MMT332 probe is installed using a flange. It is designed for high-pressure applications.

MMT332 for High Pressure Installations

| | |
|-------------------------------|----------------------------------|
| Pressure range | 0 ... 250 bar / 0 ... 3625 psia |
| Probe diameter | 12 mm (0.5") |
| Installation flange | 36 mm (1.4") |
| Temperature measurement range | -40 ... +180 °C (-40 ... 356 °F) |



MMT332 Dimensions in mm (inches)



The MMT338 is ideal for installation into pressurized processes where the probe needs to be able to be removed while the process is running. The probe depth is adjustable.

MMT338 with Probe for Pipeline Installations

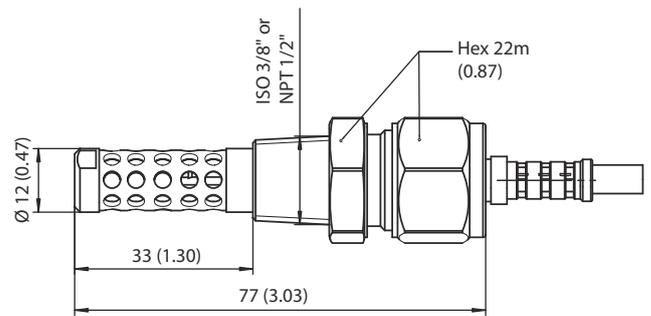
| | |
|--------------------------------|---|
| Pressure range with ball-valve | 0 ... 40 bar / 0 ... 580 psia Up to 120 °C (248 °F) and 40 bar |
| Adjustable length | 35 ... 157/379 mm (1.37 ... 6.2 /14.9") |
| Temperature measurement range | -40 ... +180 °C (-40 ... 356 °F) |
| Installation | |
| Fitting body | R1/2" ISO |
| Fitting body | NPT 1/2" |
| Ball-valve set | BALLVALVE-1 |
| Sampling cell | DMT242SC2 |



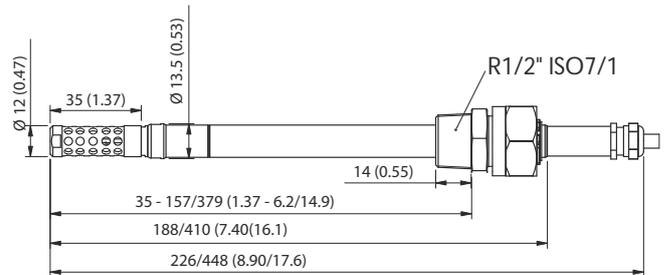
The MMT337 probe, with optional Swagelok connector, is ideal for tight spaces with a thread connection. The small probe is designed for integration into small diameter lines.

MMT337 with Small-Sized Probe

| | |
|-------------------------------|----------------------------------|
| Pressure range | 0 ... 10 bar / 0 ... 145 psia |
| Probe diameter | 12 mm (0.5") |
| Temperature measurement range | -40 ... +180 °C (-40 ... 356 °F) |
| Installation | |
| Fitting body | R 3/8" ISO |
| Fitting body | 1/2" ISO |
| Fitting body | NPT 1/2" |



MMT337 Dimensions in mm (inches)



MMT338 Dimensions in mm (inches)

Technical Data

Measurement Performance

Water Activity

| | |
|--|----------------------------|
| Measurement range a_w | 0 ... 1 |
| Response time (90%) at +20 °C in still oil (with stainless steel filter) | 10 min. |
| Sensor | HUMICAP® 180 _{L2} |
| Accuracy (Including Non-linearity, Hysteresis and Repeatability): | |
| 0 ... 0.9 | ±0.02 |
| 0.9 ... 1.0 | ±0.03 |

Temperature

| | |
|-----------------------------|-----------------------------------|
| Measurement range | -40 ... +180 °C (-40 ... +356 °F) |
| Accuracy at +20 °C (+68 °F) | ± 0.2 °C (0.36 °F) |

Operating Environment

| | |
|---------------------------|---|
| EMC compliance | EN61326-1, Industrial environment ¹⁾ |
| Pressure range for probes | See probe specifications |

Operating Temperature

| | |
|----------------------|----------------------------------|
| For probes | Same as measurement ranges |
| For transmitter body | -40 ... +60 °C (-40 ... +140 °F) |
| With display | 0 ... +60 °C (+32 ... +140 °F) |

¹⁾ Note: Transmitter with display test impedance of 40 Ω is used in IEC61000-4-5 (Surge immunity)

General

| | |
|----------------|--|
| Display | LCD with backlight, graphical trend display of any parameter |
| Menu languages | English, Chinese, Finnish, French, German, Japanese, Russian, Spanish, Swedish |

Optional Data Logger with Real-time Clock

| | |
|---------------------|-------------------------------------|
| Logged parameters | Max. four with trend/min/max values |
| Logging interval | 10 sec. (fixed) |
| Max. logging period | 4 years, 5 months |
| Logged points | 13.7 million points per parameter |
| Battery lifetime | Min. 5 years |

Inputs and Outputs

| | |
|---|------------------------------|
| Operating voltage | 10 ... 35 VDC, 24 VAC ± 20 % |
| Operating voltage with optional power supply module | 100 ... 240 VAC 50/60 Hz |

Power Consumption at 20 °C (U_{in} 24 VDC)

| | |
|--|------------|
| RS-232 | Max. 25 mA |
| U_{out} 2 x 0 ... 1 V / 0 ... 5 V / 0 ... 10 V | Max. 25 mA |
| I_{out} 2 x 0 ... 20 mA | Max. 60 mA |
| Display and backlight | + 20 mA |

Analog Outputs (2 Standard, 3rd Optional)

| | |
|--|----------------------------------|
| Current output | 0 ... 20 mA, 4 ... 20 mA |
| Voltage output | 0 ... 1 V, 0 ... 5 V, 0 ... 10 V |
| Accuracy of analog outputs at 20 °C | ± 0.05 % full scale |
| Temperature dependence of the analog outputs | ± 0.005 %/°C full scale |

External Loads

| | |
|--------------------------------|---|
| Current outputs | $R_L < 500 \Omega$ |
| 0 ... 1V output | $R_L > 2 \text{ k}\Omega$ |
| 0 ... 5V and 0 ... 10V outputs | $R_L > 10 \text{ k}\Omega$ |
| Max. wire size | 0.5 mm ² (AWG 20) stranded wires recommended |

| | |
|------------------------|---|
| Digital outputs | RS-232, RS-485 (optional) |
| Protocols | ASCII commands, Modbus RTU |
| Service connection | RS-232, USB |
| Relay outputs | 0.5 A, 250 VAC, SPDT, potential-free (optional) |

Ethernet Interface (Optional)

| | |
|-------------------------|--------------------------|
| Supported standards | 10BASE-T, 100BASE-TX |
| Connector | 8P8C (RJ45) |
| IPv4 address assignment | DHCP (automatic), static |
| Protocols | Telnet, Modbus TCP/IP |

WLAN Interface (Optional)

| | |
|-------------------------|--------------------------|
| Supported standards | 802.11b |
| Antenna connector type | RP-SMA |
| IPv4 address assignment | DHCP (automatic), static |
| Protocols | Telnet, Modbus TCP/IP |
| Security | WEP 64/128, WPA |

Authentication / Encryption

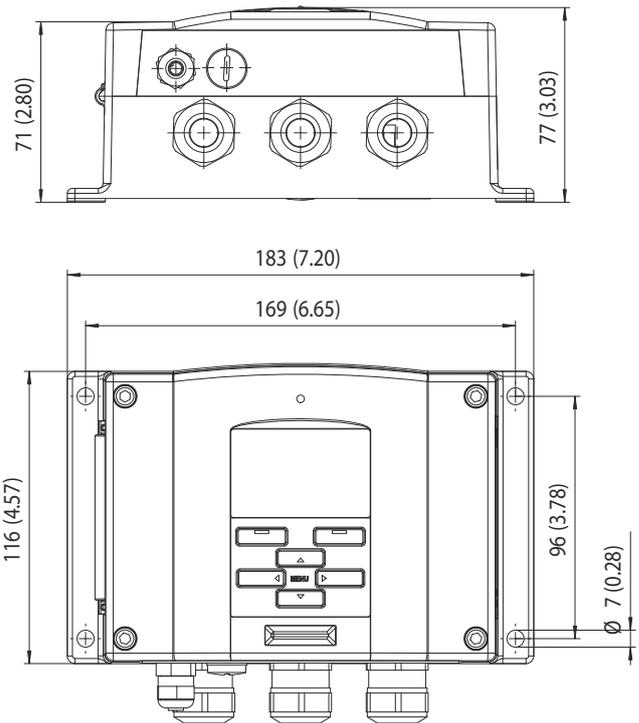
- Open / no encryption
- Open / WEP WPA
- Pre-shared key / TKIP WPA
- Pre-shared key / CCMP (a.k.a. WPA2)

Mechanical Specifications

| | |
|--|---|
| Weight | 1.0 - 3.0 kgs (depends on selected probe, cable, and modules) |
| Sensor protection | Stainless steel grid standard filter/ Stainless steel grid filter for high flow rates (> 1 m/s) |
| Cable bushing | M20x1.5 for cable diameter 8 ... 11 mm (0.31 ... 0.43") |
| Conduit fitting | 1/2" NPT |
| USB-RJ45 Serial Connection Cable (incl. MI70 Link software) | 219685 |
| Probe cable diameter | 5.5 mm (0.2 in) |
| Standard probe cable lengths | 2 m, 5 m or 10 m (6.6 ft, 16.4 ft, 32.8 ft) (Additional cable lengths available, please see order forms for details) |
| Housing material | G-AlSi 10 Mg (DIN 1725) |
| Interface cable connector (optional) | M12 series 8-pin (male) |
| Option 1 | Female plug with 5 m (16.4 ft) black cable |
| Option 2 | Female plug with screw terminals |

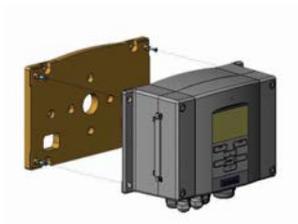
Compliance

| | |
|--------------------------------|------|
| IP rating | IP66 |
| IP rating with local display | IP65 |
| NEMA rating with local display | 4X |

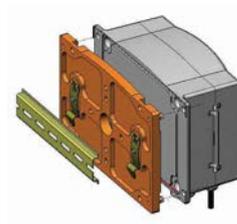


Dimensions in mm (inches)

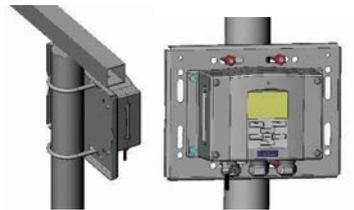
Mounting Options



Mounting with Wall Mounting Kit



Mounting with DIN Rail Installation Kit



Pole Installation with Installation Kit for Pole or Pipeline



Mounting Rain Shield with Installation Kit





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 (Weight depends on selected probe and cable) | 476 g |
| 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-AISI 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 | $R_L < 500 \Omega$ |
|---------------|--------------------|

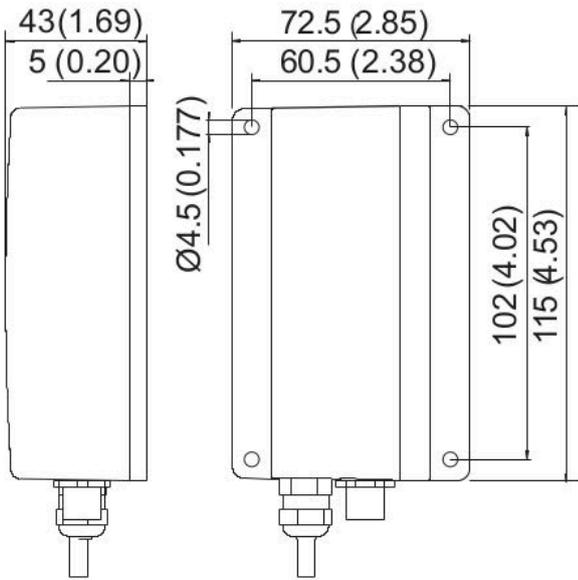
| | |
|-----------------------------|-----|
| Startup time after power-up | 3 s |
|-----------------------------|-----|

Minimum Operating Voltage

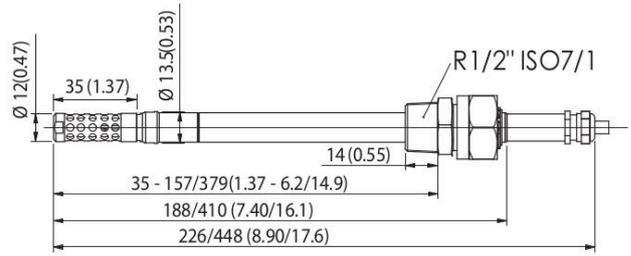
| | |
|------------------------------------|--------|
| RS232C output | 10 VDC |
| Analog output | 15 VDC |
| Pressures above 10 bara (145 psia) | 24 VDC |

Power Consumption

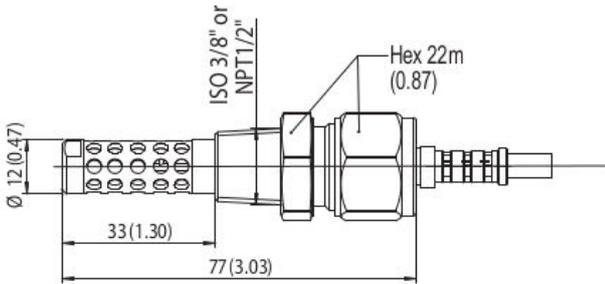
| | |
|--------------------------------------|-------|
| RS232C | 12 mA |
| U_{out} 10 V (10 k Ω) | 12 mA |
| Channel 1 & channel 2 | |
| I_{out} 20 mA (load 511 Ω) | 50 mA |
| Channel 1 & channel 2 | |



Transmitter body, dimensions in mm (inches)



MMT318 probe, dimensions in mm (inches)



MMT317 probe, dimensions in mm (inches)



MMT162 Moisture in Oil and Temperature Transmitters

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 hand-held moisture and temperature meter, the MMT162 provides an ideal tool for on-site calibration. The MI70 hand-held indicator (included in the MM70 package) can be used as a display, communication, and datalogging device 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 | ± 0.02 a _w |
| 0.9 ... 1.0 a _w | ± 0.03 a _w |
| Response time in oil flow (typical) | < 1 min (dry-wet) |

Temperature

| | |
|-----------------------------|--------------------|
| Accuracy at +20 °C (+68 °F) | ± 0.2 °C (0.36 °F) |
|-----------------------------|--------------------|

Moisture

Calculated moisture content in ppm for mineral transformer oil

Operating Environment

| | |
|---------------------------------|-----------------------------------|
| EMC compliance | EN61326-1, Industrial 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, metal version | Up to 200 bar |
| Pressure range, plastic version | Up to 40 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 |

Spare Parts and Accessories

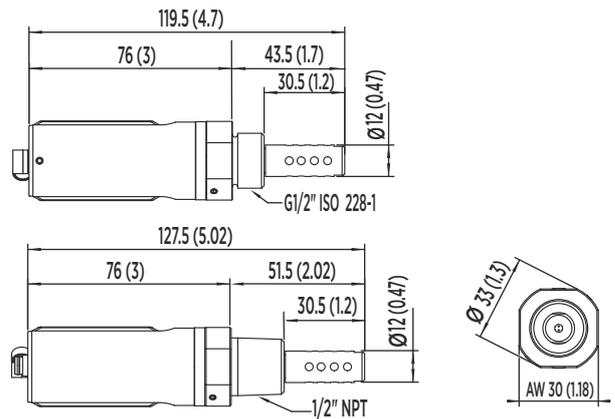
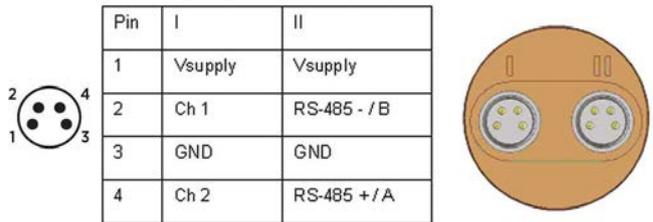
| | |
|--|-----------|
| Stainless steel filter (standard) | 225356SP |
| Stainless steel filter for high flow (> 1 m/s) | 221494SP |
| Connection cable for MM70 hand-held meter | 219980 |
| USB serial interface cable | 219690 |
| Sealing ring set (U-seal) ISO G1/2, 3 pcs | 221525SP |
| Sealing ring 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 |

Mechanical Specifications

| | |
|--|----------------------------------|
| Sensor | HUMICAP® |
| Cable connections (2 ports) | M8, 4-pin |
| Minimum Operating Voltage with | |
| RS-485 output | 14 ... 28 VDC |
| Voltage output | 16 ... 28 VDC |
| Current output | 22 ... 28 VDC |
| Supply Current | |
| Normal measurement | 20 mA + load current |
| External Load for | |
| Voltage output | Min. 10 kΩ |
| Current output | Max. 500 Ω |
| Housing Material | |
| Metal | AISI 316L |
| Plastic | PPS + 40 % GF |
| IP rating | IP66 (IP65 with plastic housing) |
| Mechanical Connections with Bonded Seal Ring (Washer) | |
| Metal version | G 1/2" ISO or NPT 1/2" |
| Plastic version | G 1/2" ISO |
| Weight | |
| With plastic housing | 65 g (2.3 oz) |
| With metal housing | 200 g (7 oz) |



Dimensions in millimeters (inches)



MM70 Handheld Moisture and Temperature Meter

For Spot-checking in Oil



Features

- Measurement independent of oil type, age and temperature
- In-line process checking through ball valve, no need to drain the oil
- Rugged and reliable construction
- Excellent pressure and temperature tolerance
- Data can be logged and transferred to a PC
- Proven Vaisala HUMICAP® Sensor: over 15 years in oil applications
- Compatible with Vaisala's fixed oil moisture instruments
- No reference oil needed for recalibration
- Traceable calibration (certificate included)

Vaisala HUMICAP® Handheld Moisture Meter for Oil MM70 enables reliable detection of moisture in oil. The probe can be inserted directly into the process pipe through a ball valve without draining the oil in the system.

MM70 measures moisture in oil in terms of the water activity (aw) and temperature (T). Water activity directly indicates whether there is a risk of free water formation. The measurement is independent of oil type, age and temperature.

PPM Calculation Included

MM70 has an embedded model for expressing moisture as ppm in mineral transformer oil. The customer can enter up to three other oil models into the meter's memory.

Numerical and Graphical Display

MM70 features a multilingual, menu-based user interface and a backlit LCD display. The measurement parameters can be numerically and graphically displayed and logged into the meter's memory at the same time. An analog output option is also available.

Vaisala HUMICAP® Technology

MM70 incorporates the latest generation of the Vaisala HUMICAP® Sensor, developed for demanding moisture measurements in liquid hydrocarbons. The sensor's excellent chemical tolerance provides accurate and reliable measurement over the measurement range.

Speedy Service - Once a Year

The meter can be recalibrated by sending the probe to Vaisala Service, or customers can calibrate the instrument themselves using a standard relative humidity calibration.

Multi-Probe Operation

One or two probes can be connected simultaneously. Maintenance teams can use additional Vaisala dew point or relative humidity probes for other tasks. For example, a dew point probe is ideal for checking the moisture inside washed and dried oil tanks.

Connection to PC

The optional MI70 Link Windows® software in combination with a USB connection cable is used to transfer logged data and real time measurement data from the MM70 to a PC.

Technical Data

Measurement Performance, MMP78 Probe

Water Activity

| | |
|-------------------------|---------|
| Measurement range a_w | 0 ... 1 |
|-------------------------|---------|

Accuracy (including nonlinearity, hysteresis and repeatability) when calibrated against salt solutions (ASTM E104-85):

| | |
|-------------|------------|
| 0 ... 0.9 | ± 0.02 |
| 0.9 ... 1.0 | ± 0.03 |

Maximum achievable accuracy (including nonlinearity, hysteresis and repeatability) when calibrated against high-quality, certified humidity standards:

| | |
|-------------|------------|
| 0 ... 0.9 | ± 0.01 |
| 0.9 ... 1.0 | ± 0.02 |

Response time (90%) at +20 °C (+68 °F) in still oil (with stainless steel filter)

| | |
|--------|------------------------|
| Sensor | Vaisala HUMICAP® 180L2 |
|--------|------------------------|

Recommended recalibration interval

| | |
|-----------------------------|-------------------------------|
| Typical long-term stability | better than 0.01 a_w / year |
|-----------------------------|-------------------------------|

Temperature

| | |
|-------------------|-----------------------------------|
| Measurement range | -40 ... +100 °C (-40 ... +212 °F) |
|-------------------|-----------------------------------|

Typical accuracy at +20 °C

| | |
|--------|--------------------------------|
| Sensor | Pt100 RTD Class F0.1 IEC 60751 |
|--------|--------------------------------|

Probe Operating Environment

Operating temperature for electronics

| | |
|--------------------------|-------------|
| Operating pressure range | max. 20 bar |
|--------------------------|-------------|

Operating pressure range during installation through ball valve

| | |
|----------------|------------|
| Oil flow range | max. 1 m/s |
|----------------|------------|

Typical temperature dependence of electronics

| | |
|----------------|-------------------------------|
| EMC compliance | EN61326-1, Portable Equipment |
|----------------|-------------------------------|

Probe Mechanical Specifications

Housing classification

| | |
|----------------|----------------------------|
| Probe material | Stainless steel (AISI316L) |
|----------------|----------------------------|

Housing material

| | |
|--|---------------------------------|
| Cable length between probe and indicator | 1.9 m, 10 m extension available |
|--|---------------------------------|

Weight

| | |
|--------|-------|
| Weight | 506 g |
|--------|-------|

MI70 Measurement Indicator

Operating Environment

Operating temperature

| | |
|--------------------|-------------------------------|
| Operating humidity | 0 ... 100 %RH, non-condensing |
|--------------------|-------------------------------|

Storage temperature

| | |
|--------------------|--|
| Inputs and Outputs | |
|--------------------|--|

Max. no of probes

| | |
|--------------|---|
| Power supply | Rechargeable NiMH battery pack with AC adapter or 4xAA size alkalines, type IEC LR6 |
|--------------|---|

PC interface

| | |
|---------------|--|
| Analog Output | |
|---------------|--|

Scale

| | |
|-------------------|--------|
| Output resolution | 0.6 mV |
|-------------------|--------|

Accuracy

| | |
|------------------------|-----------------------------------|
| Temperature dependence | 0.002 %/°C (0.01 %/°F) full scale |
|------------------------|-----------------------------------|

Minimum load resistor

| | |
|---------------------------|--|
| Mechanical Specifications | |
|---------------------------|--|

Housing classification

| | |
|-------------------|--------------|
| Housing materials | ABS/PC blend |
|-------------------|--------------|

Weight

| | |
|---------------|--|
| Compatibility | |
|---------------|--|

EMC compliance

| | |
|-------|--|
| Other | |
|-------|--|

Menu languages

| | |
|---------|--|
| Display | <ul style="list-style-type: none"> LCD with backlight Graphic trend display of any parameter Character height up to 16 mm (0.63 in) |
|---------|--|

Alarm

| | |
|-----------------------|----------------------------|
| Data logging capacity | 2700 real time data points |
|-----------------------|----------------------------|

Logging interval

| | |
|------------------|-----------------------|
| Logging duration | 1 min ... memory full |
|------------------|-----------------------|

Resolution

| | |
|------------------------|--|
| Battery Operation Time | |
|------------------------|--|

Typical charging time

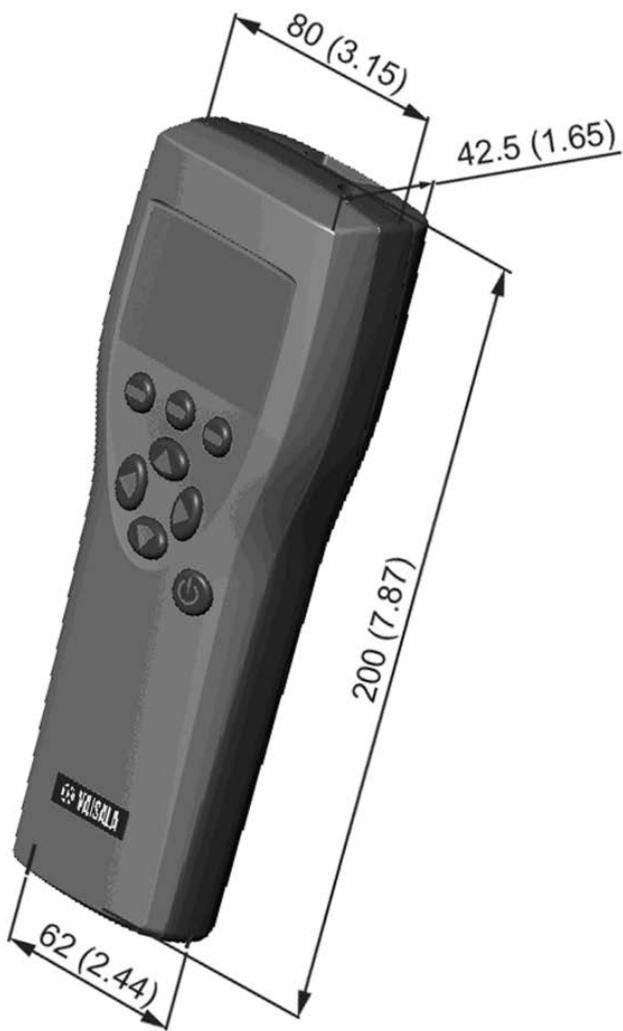
| | |
|-----------------|--|
| Operation Times | |
|-----------------|--|

Continuous use

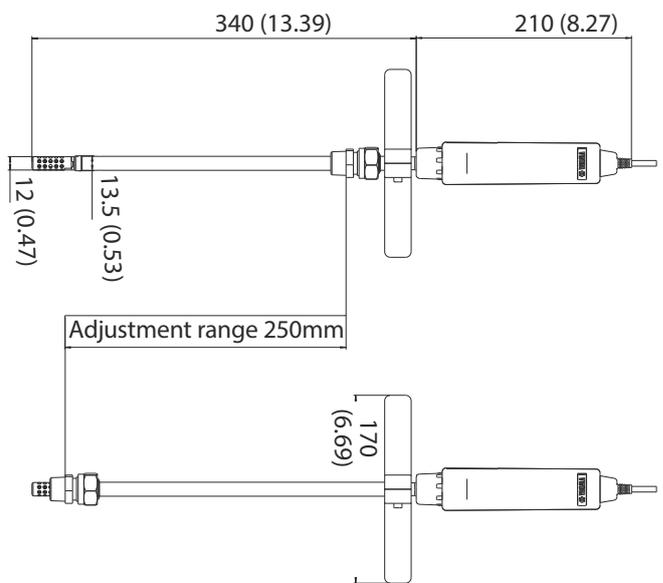
| | |
|------------------|---------------|
| Data logging use | Up to a month |
|------------------|---------------|

Spare Parts and Accessories

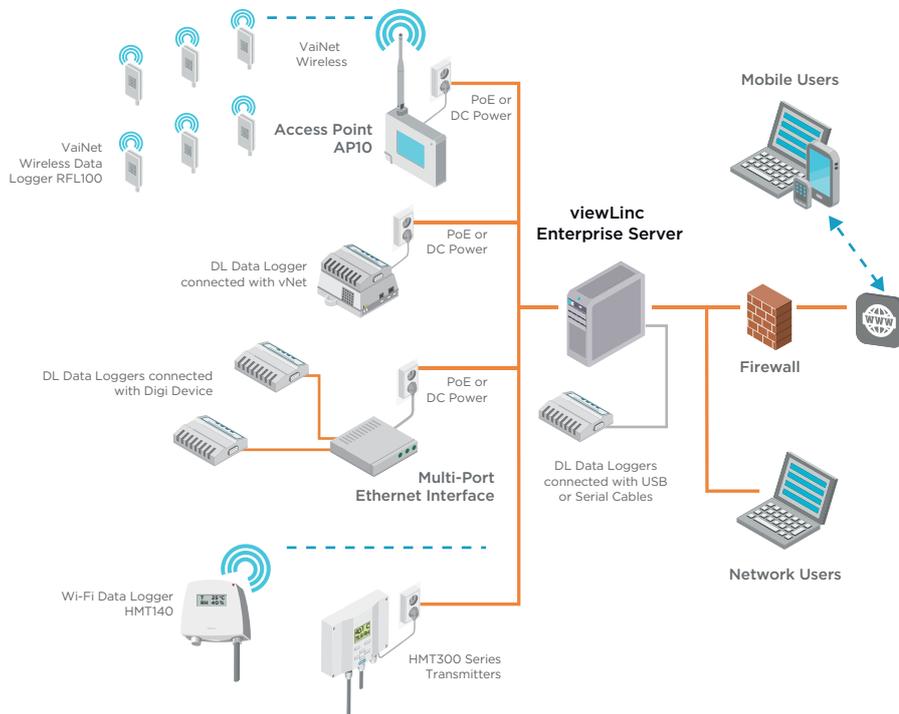
| | |
|---|---------------------|
| Weatherproof Carrying Case | MI70CASE4 |
| Ball valve set (incl. fitting body & blanking plug) | HMP228BVS |
| Probe cable extension, 10 m | 213107SP |
| MI70 Link software with USB cable | 219687 |
| MI70 Link software with serial port cable | MI70LINK |
| Analog output cable | 27168ZZ |
| Sensor protection | HM47453SP |
| Dew point measurement probes | DMP74A/B |
| Relative humidity measurement probes | HMP75, HMP76, HMP77 |
| Transmitter Connection Cables | |
| MMT162 | 219980SP |
| MMT310 | DRW216050SP |
| MMT330 | 211339 |



Indicator dimensions in mm (inches)



Probe dimensions in mm (inches)



Features

- Software for continuous monitoring of temperature, humidity and other parameters
- Eight language versions, ideal for multi-site use and global monitoring
- Preconfigured and custom reports
- Configurable alarm notifications by email, SMS, or visual and audible alarms
- Scheduled threshold alarming and alarm notification delivery times to accommodate maintenance periods or work shifts
- Interactive tours — built-in guidance for first-time users

Vaisala viewLinc Enterprise Server allows you to network several types of Vaisala data loggers using a combination of wired and wireless connections. It supports small installations of one or two measurement points, or large systems that monitor thousands of locations. Designed for regulated and critical environmental monitoring, viewLinc ensures data integrity with a secure audit trail, access controls, encryption, and authorization levels that fulfill regulatory requirements.

Continuous Reliability

viewLinc runs as a Microsoft® Windows® service. If you are required to reboot your server, the viewLinc service restarts automatically. Users log in to viewLinc on any network computer or mobile device with a supported browser and can display viewLinc in several languages: English, German, French, Portuguese, Spanish, Swedish, Chinese, and Japanese. viewLinc supports UTF-8 compliant multi-byte character sets.

Licensing

A license key is required for each viewLinc Enterprise Server or Device Host installation (the number of devices permitted is defined by the license key).

Upgrading

Previous versions of viewLinc, 3.6.1 and higher, can upgrade to 5.0 directly. Depending on the server/database size, upgrade may take a few minutes or several hours (4 to 6).

System Requirements

- A dedicated server continuously available 24/7 to run viewLinc Enterprise Server software.
- One or more Vaisala data loggers, Vaisala wireless data loggers, or Vaisala HMT300 series transmitters.
- Vaisala cables, for connecting data loggers and setting up wireless transmitters.

- (optional) Additional dedicated or shared servers if you plan to manage devices at multiple sites (running viewLinc Device Host software).
- (optional) Remote display terminals, if you plan to provide monitoring in sites without user PCs.
- (optional) vNet and multi-port Ethernet devices, for connecting Vaisala data loggers to viewLinc through Ethernet.

Technical Data

Server Requirements

| | |
|--|--|
| Availability | 24 hours a day, 7 days a week |
| Server management | Connected to an uninterruptible power supply (UPS) Backup solution with support for open file backup |
| | Synchronizes time with a Network Time Protocol (NTP) server |
| Operating System | Windows Server® 2016 Windows Server® 2012 R2 (64-bit) Windows Server® 2008 R2 (64-bit) Windows® 10 (64-bit) |
| Virtual server support | VMWare |
| Application disk space | 350 MB |
| Database disk space ¹⁾ | 200 KB/data point ^{2)/day} |
| Network traffic ³⁾ | Approx. 100 KB/minute/device |
| Web interface protocol | TLS 1.2 |
| Security certificate for web interface | Authorized TLS certificate and key ⁴⁾ |
| Email encoding | RFC 2047 |
| Secure email protocol | TLS 1.2 |

¹⁾ Not applicable to Device Host installation.

²⁾ Data points are device channels monitoring and recording data.

³⁾ Depends on number of devices, system configuration and type of communication devices used.

⁴⁾ Self-signed certificate and key can be generated during installation.

Requirements Based on System Size

| System Size in Data Points | < 20 | 21 ... 399 | 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 | 1.5 GB/year for 20 data points | 15 GB/year for 200 data points | 73 GB/year for 1000 data points |

Client Requirements

| | |
|----------------------------|---|
| Internet browser | Google Chrome™ Microsoft® Internet Explorer® 11 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. |

Device Connection Requirements

Wireless Devices

| | |
|------------------------|---|
| RFL100 series | Connects using Vaisala VaiNet protocol. Requires installation of an AP10 access point. |
| HMT140 series | Connects using Wi-Fi protocol. Requires configuration with an HMT140 configuration cable. |
| 300-series transmitter | Connects using WLAN or LAN interface. |

Wired Devices

| | |
|-----------------------------|--|
| 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. Power usage: Class 1 (0.75 to 1W, lowest power class) ¹⁾ Requires vNet device drivers (provided). |
|-----------------------------|--|

DL series using multi-port Ethernet device

Power usage: Class 2 (4 to 6 W). 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.

DL series using serial cable

Connect devices directly to viewLinc Enterprise Server or viewLinc Device Host using a serial-to-logger cable. Requires serial COM ports. ²⁾

DL series using USB cable

Connect devices directly to viewLinc Enterprise Server or viewLinc Device Host using a USB-to-logger cable. Requires USB ports. ²⁾

¹⁾ 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).

²⁾ If the viewLinc Enterprise Server is installed on a virtual machine (VM), note that only VMWare® has been tested with viewLinc-supported modems. Please contact Vaisala technical support for list of currently supported modems.

Network Ports

| Port | Port Type | Used By |
|-------|-----------|--|
| 443 | TCP | Client connections to user interface |
| 771 | TCP | vNet and multi-port Ethernet devices |
| 950 | TCP | Moxa serial-to-WiFi devices |
| 6767 | UDP | HMT140 |
| 12600 | TCP/UDP | VaiNet access points, viewLinc Enterprise Server connection with vNet or Device Host |

viewLinc 5.0 includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit. (<http://www.openssl.org/>)



Features

- One AP10 supports up to 32 VaiNet data loggers
- Powered by Power over Ethernet (PoE) or DC adapter
- Minimal infrastructure and no signal amplifiers needed
- Uses HTTPS communication and encryption to ensure secure data transmission
- Chirp Spread Spectrum wireless modulation is resistant to multi-path fading
- 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 can connect up to 32 VaiNet wireless data loggers (such as the RFL100) to Vaisala viewLinc Monitoring System.

AP10 in the viewLinc Monitoring System

AP10 access point transfers measurement data from wireless VaiNet data loggers to the viewLinc Enterprise Server, and enables the remote configuration and management of VaiNet data loggers by the viewLinc administrator. A wired Ethernet network connection between AP10 and viewLinc Enterprise Server is required.

Registration of new data loggers is handled by viewLinc Enterprise Server software. Whenever a new data logger is added to the system, AP10 automatically

identifies it and forwards its information to viewLinc. Once accepted in viewLinc, VaiNet data loggers stay synchronized, even in situations where other nearby VaiNet networks overlap.

Data Integrity

Data is encrypted during VaiNet transfers to protect against eavesdropping, data tampering, and transfer errors. Both the access point and the viewLinc Enterprise Server software verify that the data has been received correctly. Once the data is verified, it is stored to viewLinc'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 two access points with free capacity are needed for failover to function.

Technical Data

Wireless

| | |
|--|---|
| Networking standards | Vaisala VaiNet |
| Modulation | LoRa™ chirp spread spectrum modulation |
| Output power | 14 dBm (25 mW) |
| Antenna | Non-removable external antenna |
| Typical range (indoors) | At least 100 m (328 ft) |
| Maximum number of access points in an area | 8 |
| Frequency Bands | |
| Model AP10E | 868 MHz (Europe) |
| Model AP10A | 915 MHz (North America, Australia, and New Zealand) |
| Safety | |
| Electrical safety | EN/UL/IEC 61010-1 |
| RF exposure | KDB 447498 (United States) RSS-102 Issue 5 (Canada) |
| EMC and Radio Standards | |
| EMC compliance | EN/IEC 61326-1, industrial environment |
| Model AP10E | ETSI EN 300 220-2 EN 301 489-1 EN 301 489-3 |
| Model AP10A | FCC title 47 part 15.247 (FCC ID: 2AO39-AP10A) ICE RSS-247 (IC: 23830-AP10A) AS/NZS 4268 |

Operating Environment

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

Mechanical Specifications

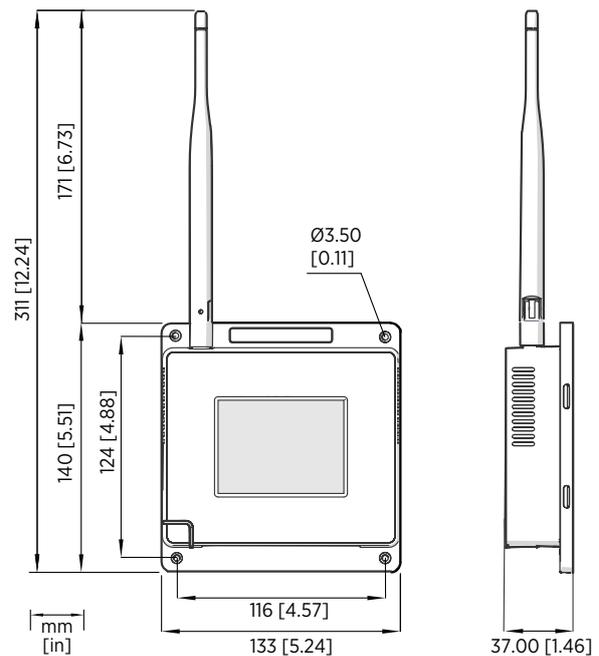
| | |
|------------------------|---|
| IP rating | IP30 |
| Housing color | White |
| Mounting methods | Screws, tie-wrap |
| Weight | 350 g (12.3 oz) |
| Dimensions (H × W × D) | 311 × 133 × 37 mm (12.24 × 5.24 × 1.46 in) |
| Materials | |
| Housing | PC/ABS blend |
| Display window | Polyester |
| Antenna | ABS |

Spare Parts and Accessories

| | |
|-----------------------|----------|
| Power supply for AP10 | 244784SP |
| Mounting kit | 245679SP |

Inputs and Outputs

| | |
|--|--|
| Operating voltage using dedicated power supply connector | 10 ... 30 VDC |
| PoE power class | Class 0 |
| Power consumption | Max. 13 W |
| Internal clock | Synchronizes with Network Time Protocol (NTP) server |
| Supported devices | Up to 32 VaiNet compatible data loggers |
| Compatible viewLinc versions | 5.0 and above |
| User interfaces | Web browser interface Local touchscreen interface |
| User interface languages | English, German, French, Portuguese, Spanish, Swedish, Chinese, Japanese |
| Ethernet Interface | |
| Supported standards | 10BASE-T, 100BASE-TX |
| IPv4 address assignment | DHCP (automatic), static |
| Connectors | |
| 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) |



AP10 Access Point Dimensions



Features

- Industry-leading temperature and relative humidity measurement precision
- Detachable high-accuracy RH and temperature probes
- 30-day First In First Out (FIFO) memory buffer
- Optional magnetic mounting bracket available
- Typical battery life of 18 months
- Uses standard alkaline batteries
- Traceable to SI units through national metrology institutes ¹⁾
- Cost-effective alternative to chart recorders

¹⁾ Measurement results are traceable to the International System of Units (SI) through national metrology institutes (NIST USA, MIKES Finland, or an equivalent) or accredited calibration laboratories.

RFL100 Data Logger uses Vaisala's proprietary VaiNet wireless technology. It can be used to monitor temperature and humidity in a wide range of environments: warehouses, production areas, cleanrooms, laboratories, fridges, cold storage areas, and freezers down to -196 °C (-320.8 °F).

VaiNet Wireless

RFL100 connects wirelessly to Vaisala viewLinc Monitoring System, which provides real-time trends, alarms, and historical reporting. VaiNet wireless technology is based on the LoRa[®] modulation technique to provide 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 (328 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 four minutes. In case of temporary network disruptions, the data logger can record up to 30 days of

measurements that are automatically transmitted to the viewLinc Enterprise Server software 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). There is no need for costly battery replacements between recommended calibrations.

Detachable Probe

RFL100 supports several probe types for humidity and temperature measurement. The 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.

The probe is detachable, and easy to switch out for calibration. viewLinc Enterprise Server detects the changed probe information automatically and maintains accurate and complete historical records.

Probe Options

HMP115 Probe



Probe for general purpose humidity and temperature measurement. Ideal choice for ambient measurement. Designed to be integrated with RFL100 housing for minimum footprint, but can be connected using a cable as well.

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

HMP110 Probe



Robust stainless steel probe for humidity and temperature measurement in demanding conditions. Suitable for measurement inside chambers, fridges, and freezers. Cable probe option only. Probe diameter 12 mm (0.47 in).

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

TMP115 Probe



Wide-range temperature-only probe for measurement in extreme conditions. Can be integrated with the RFL100 housing or connected using a cable.

Available as 50 cm (1 ft 7.7 in) and 3 m (9.8 ft) long versions. Length includes probe body and sensor tip. Sensor tip withstands immersion in glycol and liquid nitrogen. Sensor tip diameter 4.8 mm (0.19 in).

| Probe Model | Measurement | Measurement Temperature Range | IP Rating | Typical Mounting Accessories |
|-------------|-------------|---|--|---|
| HMP115 | RH + T | -40 ... +60 °C (-40 ... +140 °F) | IP54 | No accessories needed when integrated to RFL100 |
| HMP115T | T | -40 ... +60 °C (-40 ... +140 °F) | IP54 | |
| HMP110 | RH + T | -40 ... +80 °C (-40 ... +176 °F) | IP65 | <ul style="list-style-type: none"> • Duct installation kit • Mounting clamps • Mounting nuts |
| HMP110T | T | -40 ... +80 °C (-40 ... +176 °F) | IP65 | |
| TMP115 | T | -196 ... +90 °C (-320.8 ... +194 °F) | IP67 (sensor tip) IP65 (probe body) | <ul style="list-style-type: none"> • Thermal dampener block • Flat cable for insertion to chambers and freezers via door seal |

Technical Data

Wireless

| | |
|--------------------------------|---|
| Networking standards | Vaisala VaiNet |
| Modulation | LoRa™ chirp spread spectrum modulation |
| Output power | 14 dBm (25 mW) |
| Antenna | Internal |
| Typical range (indoors) | At least 100 m (328 ft) |
| Range with line-of-sight | Over 500 m (1640 ft) |
| Frequency bands | 868 MHz (Europe) 915 MHz (North America, Australia, and New Zealand) |
| Safety | |
| Electrical safety | EN/UL/IEC 61010-1 |
| RF exposure | KDB 447498 (United States) RSS-102 Issue 5 (Canada) |
| EMC and Radio Standards | |
| EMC compliance | EN/IEC 61326-1, industrial environment |
| 868 MHz model | ETSI EN 300 220-2 EN 301 489-1 EN 301 489-3 |
| 915 MHz model | FCC title 47 part 15.247 (FCC ID: 2AO39-RFL100A) ICE RSS-247 (IC: 23830-RFL100A) AS/NZS 4268 |

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 (nonchangeable) |

Operating Environment

| | |
|--|-----------------------------------|
| Storage temperature | -40 ... +60 °C (-40 ... +140 °F) |
| Operating humidity | 0 ... 100 %RH, non-condensing |
| Operating Temperature ¹⁾ | |
| with alkaline batteries | +2 ... +60 °C (+35.6 ... +140 °F) |
| with lithium batteries | -20 ... +60 °C (-4 ... +140 °F) |

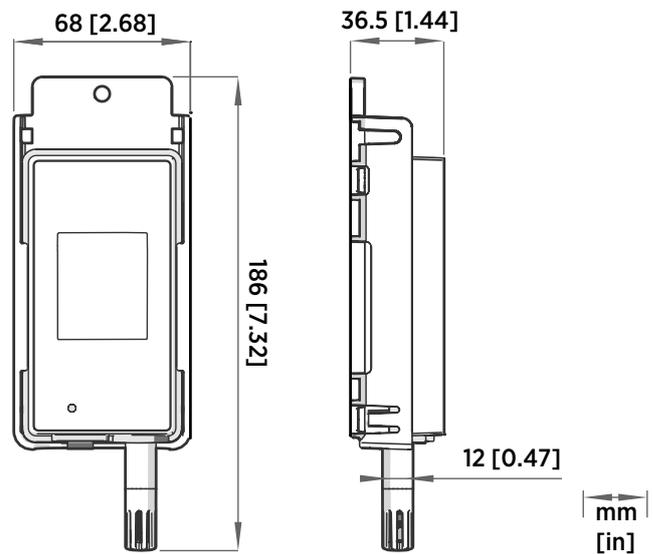
¹⁾ For both alkaline and lithium, battery temperature operating specifications apply.

General

| | |
|---|---|
| Compatible probes | HMP115, HMP115T HMP110, HMP110T (cabled only) TMP115 |
| Compatible viewLinc versions | 5.0 and above |
| Batteries | 2 × AA sized, 1.5 V (LR6 or FR6) |
| Clock battery | CR 1/3N (3 V lithium button cell) |
| Operation time at 20 °C (without external power supply) | 18 months |
| Internal clock accuracy | ±30 s/month Synchronizes with Network Time Protocol (NTP) server |

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 |
| IP rating | IP54 |
| Dimensions (H × W × D) with HMP115 Probe | |
| 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) |
| Weight | |
| With batteries (2 pcs alkaline), HMP115 probe, and magnetic mounting bracket | 254 g (8.96 oz) |
| Materials | |
| Housing | PC/ABS blend |
| Display window | PMMA (acrylic) |
| Sealings | TPE |



RFL100 Dimensions with HMP115 Probe

HMP110/T Probe Measurement Performance

Relative Humidity

| | |
|-------------------|---------------|
| Measurement range | 0 ... 100 %RH |
|-------------------|---------------|

Accuracy in Temperature Range 0 ... +40 °C (+32 ... +104 °F) ¹⁾

| | |
|----------------|----------|
| 0 ... 90 %RH | ±1.5 %RH |
| 90 ... 100 %RH | ±2.5 %RH |

Accuracy in Temperature Range -40 ... 0 °C, +40 ... +80 °C (-40 ... +32 °F, +104 ... +176 °F) ¹⁾

| | |
|----------------|----------|
| 0 ... 90 %RH | ±3.0 %RH |
| 90 ... 100 %RH | ±4.0 %RH |

Factory Calibration Uncertainty at +20 °C (68 °F) ²⁾

| | |
|----------------|----------|
| 0 ... 90 %RH | ±1.1 %RH |
| 90 ... 100 %RH | ±1.8 %RH |

| | |
|-----------------|-----------------------|
| Humidity sensor | Vaisala HUMICAP® 180R |
|-----------------|-----------------------|

| | |
|-----------|---------------------|
| Stability | ±2 %RH over 2 years |
|-----------|---------------------|

Temperature

| | |
|-------------------|-------------------------------------|
| Measurement range | -40 ... +80 °C (-40 °F ... +176 °F) |
|-------------------|-------------------------------------|

Accuracy over Temperature Range

| | |
|--|--------------------|
| at 0 ... +40 °C (+32 °F ... +104 °F) | ± 0.2 °C (0.36 °F) |
| at -40 ... 0 °C, +40 ... +80 °C (-40 ... +32 °F, +104 ... +176 °F) | ± 0.4 °C (0.72 °F) |

| | |
|---|--------------------|
| Factory calibration uncertainty ²⁾ | ± 0.2 °C (0.36 °F) |
|---|--------------------|

| | |
|--------------------|---------------------------------|
| Temperature sensor | Pt1000 RTD Class F0.1 IEC 60751 |
|--------------------|---------------------------------|

1) Includes non-linearity, hysteresis, and repeatability.
2) Small variations possible; see also calibration certificate.

HMP115/T Probe Measurement Performance

Relative Humidity

| | |
|-------------------|---------------|
| Measurement range | 0 ... 100 %RH |
|-------------------|---------------|

Accuracy in Temperature Range 0 ... +40 °C (+32 ... +104 °F) ¹⁾

| | |
|----------------|----------|
| 0 ... 90 %RH | ±1.5 %RH |
| 90 ... 100 %RH | ±2.5 %RH |

Accuracy in Temperature Range -40 ... 0 °C, +40 ... +60 °C (-40 ... +32 °F, +104 ... +140 °F) ¹⁾

| | |
|----------------|----------|
| 0 ... 90 %RH | ±3.0 %RH |
| 90 ... 100 %RH | ±4.0 %RH |

Factory Calibration Uncertainty at +20 °C (68 °F) ²⁾

| | |
|---------------|----------|
| 0 ... 40 %RH | ±0.6 %RH |
| 40 ... 75 %RH | ±1.0 %RH |

| | |
|-----------------|-----------------------|
| Humidity sensor | Vaisala HUMICAP® 180R |
|-----------------|-----------------------|

| | |
|-----------|---------------------|
| Stability | ±2 %RH over 2 years |
|-----------|---------------------|

Temperature

| | |
|-------------------|-------------------------------------|
| Measurement range | -40 ... +60 °C (-40 °F ... +140 °F) |
|-------------------|-------------------------------------|

Accuracy over Temperature Range

| | |
|--|--------------------|
| at 0 ... +40 °C (+32 ... +104 °F) | ± 0.2 °C (0.36 °F) |
| at -40 ... 0 °C, +40 ... +60 °C (-40 ... +32 °F, +104 ... +140 °F) | ± 0.4 °C (0.72 °F) |

| | |
|---|--------------------|
| Factory calibration uncertainty ²⁾ | ± 0.1 °C (0.18 °F) |
|---|--------------------|

| | |
|--------------------|---------------------------------|
| Temperature sensor | Pt1000 RTD Class F0.1 IEC 60751 |
|--------------------|---------------------------------|

1) Includes non-linearity, hysteresis, and repeatability.
2) Small variations possible; see also calibration certificate.

TMP115 Probe Measurement Performance

Temperature

| | |
|-------------------|--------------------------------------|
| Measurement range | -196 ... +90 °C (-320.8 ... +194 °F) |
|-------------------|--------------------------------------|

Accuracy over Temperature Range ¹⁾

| | |
|---|-------------------|
| at -196 ... -90 °C (-320.8 ... -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) |
|----------------------------------|-------------------|

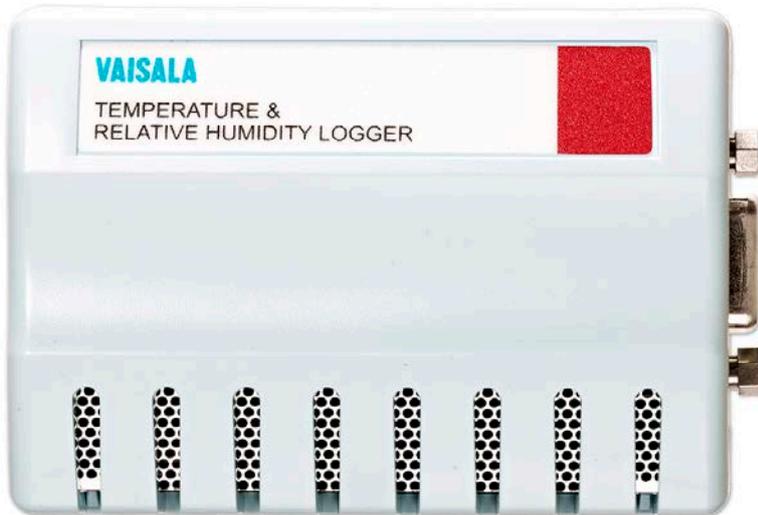
| | |
|-----------------------------------|---------------------|
| at 0 ... +50 °C (+32 ... +122 °F) | ± 0.25 °C (0.45 °F) |
|-----------------------------------|---------------------|

| | |
|--------------------------------------|---------------------|
| at +50 ... +90 °C (+122 ... +194 °F) | ± 0.75 °C (1.35 °F) |
|--------------------------------------|---------------------|

| | |
|---|----------------------|
| Factory calibration uncertainty ²⁾ | ± 0.08 °C (0.128 °F) |
|---|----------------------|

| | |
|--------------------|---------------------------|
| Temperature sensor | Pt100 RTD Class A IEC 751 |
|--------------------|---------------------------|

1) Includes non-linearity, hysteresis, and repeatability.
2) Small variations possible; see also calibration certificate.



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, CO₂, 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.¹⁾

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.

1) 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 |
| PC Software | |
| 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 |

Number of Channels Enabled¹⁾

| 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. |

Internal Sensors

Internal Temperature Sensor

| | |
|--|--|
| Calibrated measurement range ¹⁾ | -25 ... +70 °C (-13 ... +158 °F) |
| Operating range | -35 ... +85 °C (-31 ... +185 °F) |
| Initial accuracy ²⁾ | ± 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 ³⁾ | ± 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 ¹⁾ | 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 ²⁾ | ± 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 ³⁾ | ± 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.

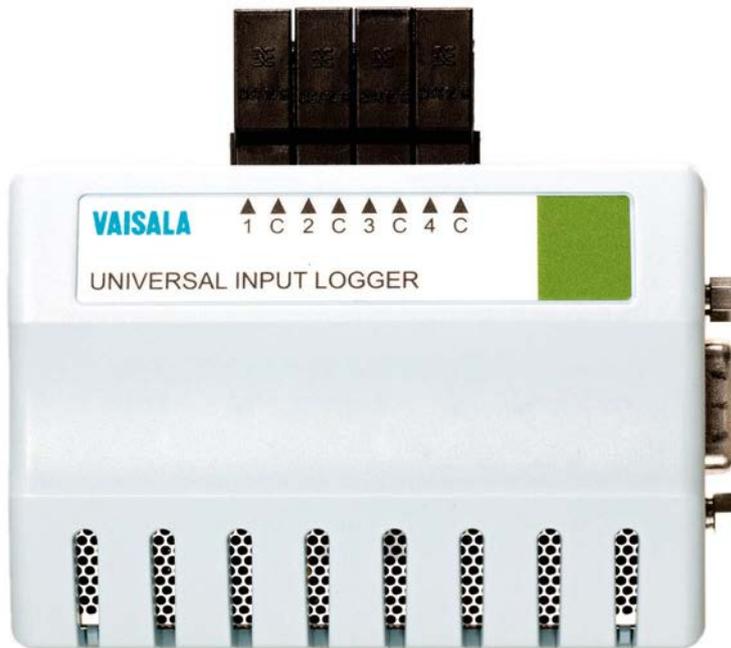
²⁾ Initial accuracy includes all known influence quantities present at the time of calibration including calibration uncertainty, mathematical fit, data logger resolution, hysteresis and reproducibility.

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.

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 ¹⁾ | >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.



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.²⁾

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.

²⁾ 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

| | |
|-------------------------------|--|
| 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

| | |
|----------------------|--|
| 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

| Sample Interval | Number of Channels | | | |
|-----------------|--------------------|------------|------------|-------------|
| | 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

| Input Type | Current Loop | Analog Voltage |
|---------------------|---|---|
| Available ranges | 0 ... 20mA | 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 | > 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) |

Channel Configurations

| Model | 1, 2 or 4 Channels |
|----------|--------------------|
| 4000-405 | 0 ... 5 VDC |
| 4000-40A | 0 ... 10 VDC |
| 4000-40C | 0 ... 20 mA |



Features

- Industry-leading precision and accuracy
- Printed reports for any time period
- 10-year battery
- Validation and continuous monitoring with the same model
- Two 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 °C to +70 °C
- Traceable to SI units through national metrology institutes.

The 1000/1400 temperature data loggers include the VL series for regulated environments and the SP series for non FDA/GxP regulated industries.

VL series and SP series dataloggers

The VL series of data loggers, together with vLog VL software, 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 1000/1400 temperature data loggers include calibrations traceable to SI units through national metrology institutes.³⁾

The SP-series provides a compact, easily deployable, highly accurate measurement and recording device. Coupled with vLog SP software for

downloading, displaying, analyzing and reporting of recorded environmental data, the SP-series was designed for use in non FDA/GxP regulated environments.

Optional browser-based viewLinc software provides 24/7 multi-stage alarm notification and remote monitoring for both the VL and SP series of data loggers.

Applications

The 1000/1400 temperature data loggers are ideal for monitoring and validation of:

- Refrigerators and freezers (to -90 °C)
- Incubators

- Stability Chambers
- Warehouses
- Ambient conditions

Autonomous Power and Recording Capacity

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.

³⁾ 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, PoE network interface available |
| PC software | Graphing & Reporting Software vLog SP for SP series vLog VL for VL series viewLinc for continuous monitoring and alarming OPC Server to add on to existing OPC compatible monitoring systems |
| 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 10-year lithium battery (Battery life specified with sample interval of 1 min or longer) |
| 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 |



VL-1000-21x

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 |
|-----------------|---|

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. |



VL-1000-22x

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 |

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 |



VL-1400-44x

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 Series Temperature Probes

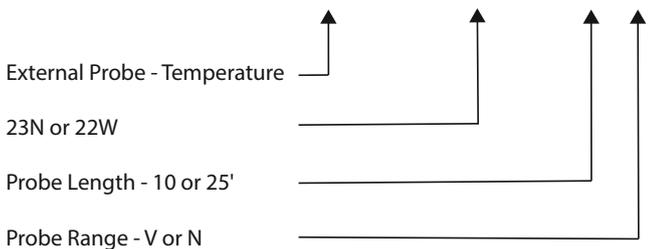
Sensor Models

| | |
|---------------------------|--------------------------------------|
| "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 |

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 | ±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) |
| One year accuracy | ±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 ¹⁾ | ±0.10 °C over +20 ... +30 °C (±0.18 °F over +68 ... +86 °F) ±0.15 °C over -25 ... +70 °C (±0.27 °F over -13 ... +158 °F) |
| One year accuracy ¹⁾ | ±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) |

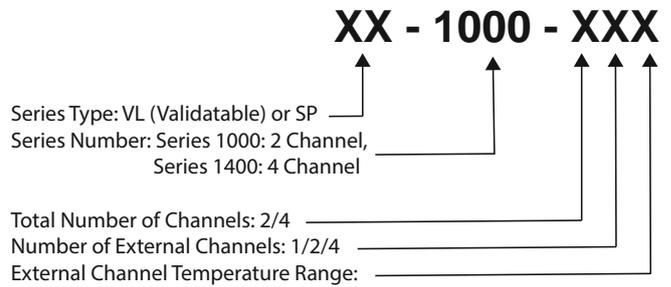
"V" Range External Probe

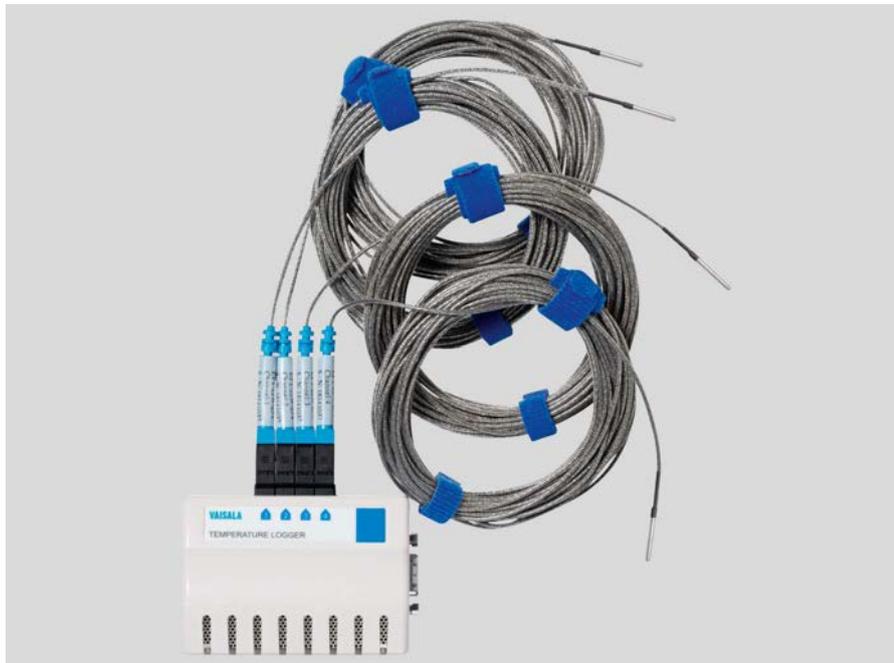
| | |
|---------------------------------|---|
| Operating/storage range | -95 ... +95 °C (-139 ... +203 °F) |
| Initial accuracy ¹⁾ | ±0.20 °C over -90 ... -40 °C (±0.36 °F over -130 ... -40 °F) |
| One year accuracy ¹⁾ | ±0.25 °C over -90 ... -40 °C (±0.45 °F over -130 ... -40 °F) |
| Resolution | 0.02 °C at -80 °C (0.04 °F at -112 °F) |
| Calibrated measurement range | -90 ... -40 °C (-130 ... -40 °F) |

¹⁾ 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.

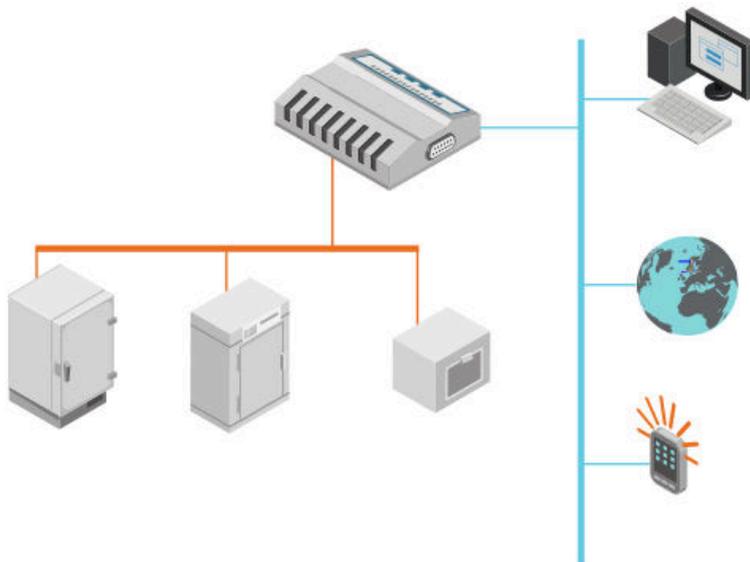




Features

- Industry-leading precision and accuracy
- Real-time monitoring & alarming with viewLinc
- Reliable validation/mapping with vLog
- 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.



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.

DL1016-1416 data loggers include calibrations traceable to SI units through national metrology institutes.⁴⁾

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.

⁴⁾ 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, PoE network interface available |
| PC software | vLog Graphing & Reporting Software viewLinc for continuous monitoring & alarming OPC Server to add Vaisala recorders to any OPC-compatible monitoring system |
| Internal clock | Accuracy ± 1 min/month 0 ... +50 °C (+32 ... +122 °F) |
| Power source | Internal 10-year lithium battery (with sample interval of ≥ 1 min.) |
| 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 |

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 | ± 0.25 °C over -90 ... +50 °C (± 0.45 °F over -130 ... +122 °F) |
| One year accuracy | ± 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) |

Data Logger 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 |

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 |

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.) |

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) |

Spare Parts and Accessories

| Immersion/Dry Probes | |
|--|----------|
| Thermistor V Range probe 25' | 235139SP |
| Thermistor V Range probe 10' | 235218SP |
| Thermistor immersion V Range probe 25' | 235140SP |
| Thermistor immersion V Range probe 10' | 235217SP |

| Temperature Probe Accessories | |
|--|-----------|
| Thermal Damping Block | EPT-TDB-2 |
| For use in refrigerators and freezers. Simulates a glycol bottle to reduce alarms generated by opening and closing a door. | |



Designed for Controlled Environments

- Extreme temperatures
- Liquid nitrogen (LN₂)
- 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.⁵⁾

⁵⁾ 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: ± 1 min./month at -25 ... +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 ... +1370 °C (-364 ... +2498 °F) | ± 1.3 °C (± 2.3 °F) | 0.37 °C (0.67 °F) |
| Type J | -130 ... +900 °C (-202 ... +1652 °F) | ± 1.0 °C (± 1.8 °F) | 0.29 °C (0.52 °F) |
| Type T | -240 ... +350 °C (-400 ... +662 °F) | ± 1.2 °C (± 2.2 °F) | 0.34 °C (0.61 °F) |
| Type E | -110 ... +740 °C (-166 ... +1364 °F) | ± 0.70 °C (± 1.3 °F) | 0.20 °C (0.36 °F) |
| Type R | -50 ... +1760 °C (-58 ... +3200 °F) | ± 4.4 °C (± 7.9 °F) | 1.3 °C (2.3 °F) |
| Type S | -50 ... +1700 °C (-58 ... +3092 °F) | ± 5.1 °C (± 9.2 °F) | 1.5 °C (2.7 °F) |

Operating Environment

| | |
|-----------------------|---|
| Operating temperature | -40 ... +85 °C (-40 ... +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 ... +85 °C (-40 ... +185 °F) |
| Accuracy | ± 0.25 °C over +20 ... +30 °C (± 0.45 °F over +68 ... +86 °F) ± 0.35 °C over -25 ... +70 °C (± 0.63 °F over -13 ... +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

Compatible Thermocouple Types: J, K, T, E, R, S

Initial Accuracy

| | |
|------------------|-----------------------------------|
| Input range | -7.2 ... +55.4 mV |
| Resolution | 0.016 mV |
| Initial Accuracy | ± 0.042 mV at +25 °C (+77 °F) |

Input Impedance: 10M Ω

| | |
|-----------------|-----------------------------------|
| Input range | -7.2 ... +55.4 mV |
| Resolution | 0.016 mV |
| 1-Year Accuracy | ± 0.055 mV at +25 °C (+77 °F) |

Additional Error

| | |
|---|----------------|
| At 3 V/m RF field from 450 MHz ... 580 MHz | ± 0.350 mV |
| At 3 V conducted RF from 3 MHz ... 80 MHz | ± 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. |

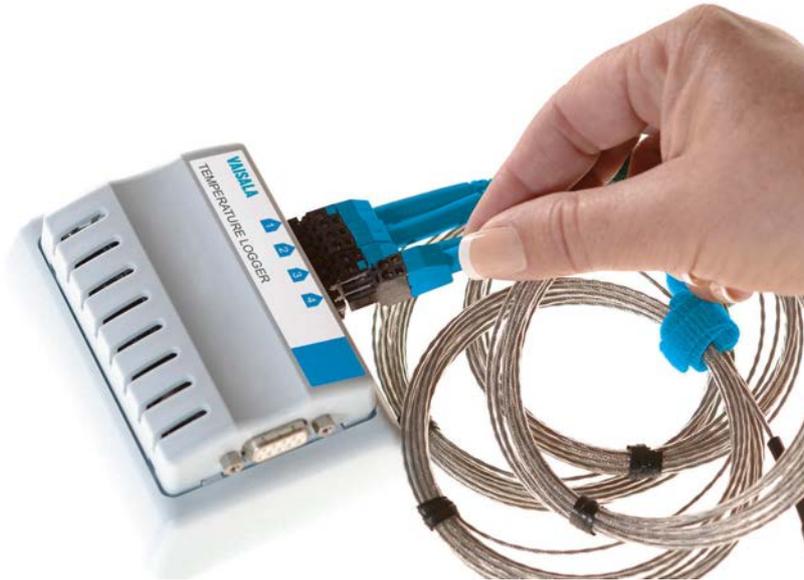
Spare Parts and Accessories

| | |
|---------------------------|-------------------------------------|
| Thermocouple probe | EPT-22T-20T |
| Type | T |
| Conductors | Copper/Constantan |
| Operating range | -200 ... +200 °C (-328 ... +392 °F) |
| Length | 6.096 m (20 ft) |
| Error | ± 1 °C ... ± 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's 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 °C to +50 °C. The MR loggers include calibrations traceable to SI units through national metrology institutes.⁶⁾ To ensure cGMP, ISO 9000 and HACCP quality standards. Optional services are available, including extended warranties and onsite calibration.

Easy Configuration

Connectivity options include USB, wireless, and Power over Ethernet with a vNet PoE network interface. When MR loggers are used with 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. See information on IQOQ documents under "Accessories" on page 3.

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

⁶⁾ 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, WiFi, vNet PoE network interface |
| Software | <ul style="list-style-type: none"> vLog Validation/Mapping viewLinc Continuous Monitoring & Alarming OPC Server to add Vaisala loggers to any OPC compatible monitoring system |
| Internal clock accuracy | ±1 min. /month 0 to +50 °C (+32 to +122 °F) |
| Power source | Internal 10-year lithium battery ¹⁾ |
| 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 |

¹⁾ 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 (Battery life specified with sample interval of 1 min. or longer) |
| Data Sample Capacity | |
| 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") 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) |

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 ¹⁾ at -25 ... +70 °C (-13 ... +122 °F) | ±0.5 °C (±0.9 °F) |

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. 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 ¹⁾ at -25 ... +70 °C (-13 ... +122 °F) | ±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"> 45 %RH at +10 °C (+50 °F) 10 %RH and 80 %RH at +25 °C (+77 °F) 45 %RH at +25 °C (+77 °F) 45 %RH at +45 °C (+113 °F) |
| 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 | Vaisala HUMICAP® 180R |
| Stability | ±2 %RH over 2 years |

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. 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 ¹⁾ at -55 ... +50 °C (-67 ... +122 °F) | ±0.5 °C (±0.9 °F) |

¹⁾ 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

Temperature Probe

EPT-TDB: Thermal Dampening Block, for use in refrigerators and freezers. The block simulates a glycol bottle to reduce alarms generated by opening and closing doors.

Boolean Contact Cables

EPT-DS-25 Available cable with magnetic contact switch – 7.6 m (25') for use with MRB loggers.

Validation Documents

| | |
|-----------------------------------|---|
| VL-VPE-VLNC-43 Express Validation | IQ is eight tests, OQ is eleven tests. Testing includes security testing for users. |
|-----------------------------------|---|



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 data loggers at a lower cost than alternative networking devices.

The snap-in design streamlines logger connectivity into a small footprint, eliminating wires between normally separate 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 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, CO₂, 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 loggers with internal sensors): < 0.05 °C as seen by the logger sensor |
| CDL-VNET-LP and CDL-VNET-LPC | Not to be used for 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, 10Base-T |
| Connectivity cable | Category 5/5e RJ-45 connector 1.83 m (6 ft) |
| Operating voltage ¹⁾ | 12-30 VDC 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 VDC 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 ²⁾

| | |
|---------------|--|
| North America | 12 VDC / 0.5 A max. out 120 VAC in |
| International | 12 VDC / 1.66 A max. out 100-240 VAC in |

¹⁾ Optional for use without PoE.
²⁾ Included but not required when using PoE.

Mechanical Specifications

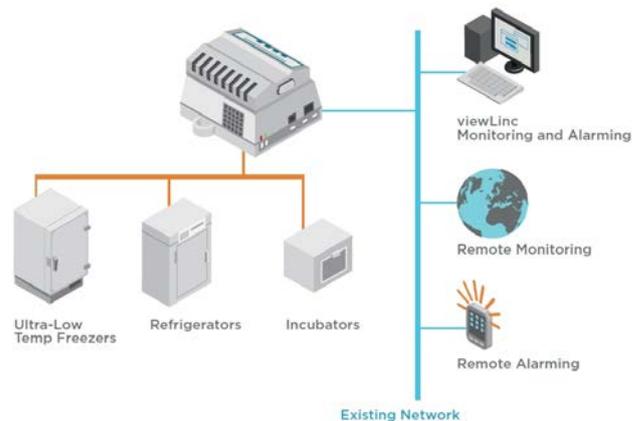
| | |
|------------------------|---|
| Dimensions (H × W × L) | 4.3 × 10.2 × 10.2 cm (1.7 × 4.0 × 4.0 in) |
| Weight | 180 g (6.3 oz) |

General

| | |
|----------------------|---|
| 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, 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 sub-net will automatically self-configure. |
| Addressing | DHCP/RARP ARP-Ping Static IP for IP address assignment Net BIOS name |
| Firmware | Field upgradable firmware |

Compliance

| | |
|--------------------|---|
| 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 |



HMT140 Wi-Fi Data Logger

For Multiple Environmental Parameters



Vaisala HMT140 wireless data logger is designed for humidity, temperature, and analog signal monitoring in warehouses, freezer and cryogenic farms, laboratories, blood banks, and many other applications.

Performance

HMT140 incorporates Vaisala HUMICAP® technology to measure relative humidity and temperature accurately and reliably. The HUMICAP® sensor is resistant to dust and most chemicals. Alternatively, HMT140 can connect to Resistance Temperature Detectors (RTDs) or Voltage, Current, and Door Contact sensors, making HMT140 an extremely versatile Wi-Fi data logger. Combining RTD and contact inputs, HMT140 is ideal for monitoring chamber / door contact excursions.

Using Wi-Fi connectivity, HMT140 can connect through any wireless access point. The battery-powered logger can operate for 18 months continuously. Optional local display allows HMT140 to indicate process parameter values and any limit warnings. The LCD display is operated using a power-saving infrared sensor that is motion-activated. When activated, the display indicates the current measurements. All data is logged locally and uploaded to the Vaisala viewLinc monitoring system software at preset intervals and during any parameter excursions.

Autonomous operation with audible and visual alarming (beep and flashing LED) ensures that local alerts are indicated independent of active network or server connection.

The data logger's enclosure is optimized for use in cleanrooms with a surface that is easy to clean and tolerates purifying agents.

Interchangeable Probe

HMT140 data logger uses an easily replaceable relative humidity and temperature probe. This allows for quick recalibration of the data logger. The probe can be adjusted using one of Vaisala's portable meters as a reference.

Available Options

HMT140 data logger is available as wall mounted or with remote probes. For extreme temperature applications or where space is limited, the remote probe is ideal.

Features

- Wi-Fi connectivity to Vaisala viewLinc environmental monitoring system software
- Connectivity provided through existing Wi-Fi Access Points
- Autonomous operation and local alarms ensure alerting capability regardless of network connectivity
- Local data storage provides continuous fail-safe operation
- 18-month battery operation
- Vaisala HUMICAP® technology with humidity sensor HUMICAP® 180R
- Interchangeable relative humidity and temperature probe for easy field calibration
- Accurate and reliable multi-signal measurements
- Resistant to dust and most chemicals
- Traceable to SI units through national metrology institutes ¹⁾
- Ideal for cleanrooms and other life science applications

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.

Options

- Two inputs available: voltage, current, door contact, RTDs, or relative humidity and temperature
- Optional LCD display
- Wall-mounted or with remote probes

Technical Data

HUMICAP® Humidity and Temperature Probe HMP110

Relative Humidity

| | |
|---|-----------------------|
| Measurement range | 0 ... 100 %RH |
| Accuracy (incl. Non-Linearity, Hysteresis and Repeatability): | |
| At temperature range 0 ... +40 °C (+32 ... +104 °F): | |
| 0 ... 90 %RH | ±1.5 %RH |
| 90 ... 100 %RH | ±2.5 %RH |
| At temperature range -40 ... 0 °C, +40 ... +80 °C (-40 ... +32 °F, +104 ... +176 °F): | |
| 0 ... 90 %RH | ±3.0 %RH |
| 90 ... 100 %RH | ±4.0 %RH |
| Factory calibration uncertainty at +20 °C (+68 °F) | ±1.5 %RH |
| Humidity sensor | Vaisala HUMICAP® 180R |
| Stability | ±2 %RH over 2 years |

Temperature

| | |
|---|----------------------------------|
| Measurement range | -40 ... +80 °C (-40 ... +176 °F) |
| Accuracy over Temperature Range: | |
| +15 ... +25 °C (+59 ... +77 °F) | ±0.2 °C (±0.36 °F) |
| 0 ... +15 °C, +25 ... +40 °C (+32 ... 59 °F, +77 ... +104 °F) | ±0.25 °C (±0.45 °F) |
| -40 ... 0 °C, +40 ... +80 °C (-40 ... +32 °F, +104 ... +176 °F) | ±0.4 °C (±0.72 °F) |
| Temperature sensor | Pt1000 RTD 1/3 Class B IEC 751 |
| HMP110 probe | -40 ... +80 °C (-40 ... +176 °F) |
| Storage temperature | -50 ... +70 °C (-58 ... +158 °F) |

Temperature Probes

Resistive Temperature Input Signals

| | |
|--------------------------------------|--------------------------------------|
| Temperature sensor | Pt100 RTD / 4 wire, Class A IEC 751 |
| Input impedance | 5.1K Ω |
| Measurement range | -196 ... +90 °C (-320.8 ... +194 °F) |
| Accuracy over Temperature Range: | |
| -196 ... -90 °C (-320.8 ... -130 °F) | ±2.5 °C (±4.5 °F) |
| -90 ... -30 °C (-130 ... -22 °F) | ±0.75 °C (±1.35 °F) |
| -30 ... 0 °C (-22 ... +32 °F) | ±0.5 °C (±0.9 °F) |
| 0 ... +50 °C (+32 ... +122 °F) | ±0.25 °C (±0.45 °F) |
| +50 ... +90 °C (+122 ... +194 °F) | ±0.75 °C (±1.35 °F) |

Analog Inputs

Current Input Signals

| | |
|-----------------------|---------------------------------|
| Current Input Signals | 0 ... 22 mA |
| Resolution | 0.67 μA |
| Accuracy | ±0.15 % F.S. at +25 °C (+77 °F) |
| Input impedance | 62 Ω |
| Overload protection | 40 mA |

Voltage Input Signals

| | |
|-----------------------|---------------------------------|
| Voltage Input Signals | 0 ... 5 V, 0 ... 10 V |
| Resolution | 0.0034 % F.S. |
| Accuracy | ±0.15 % F.S. at +25 °C (+77 °F) |
| Input impedance | 37K Ω |
| Overload protection | 50 V max. |
| Isolation | One common per logger |

Contact Inputs

| | |
|----------------|---|
| Contact Inputs | Open/Closed with magnetic reed switch cable connections (Dry Contact) |
|----------------|---|

Measurement Variants

| | |
|--------|--|
| HMT141 | 1 Temperature and 1 Humidity Channel |
| HMT143 | 2 RTD Temperature Channels |
| HMT144 | 2 Voltage Inputs (0 ... 5 VDC) |
| HMT145 | 2 Voltage Inputs (0 ... 10 VDC) |
| HMT146 | 2 Current Inputs (0 ... 20 mA) |
| HMT147 | 2 Door Contacts |
| HMT148 | 1 RTD Temperature and 1 Door Contact |
| HMT14D | 1 RTD Temperature and 1 Current Input (0 ... 20 mA) |
| HMT14E | 1 RTD Temperature and 1 Voltage Input (0 ... 5 VDC) |
| HMT14F | 1 RTD Temperature and 1 Voltage Input (0 ... 10 VDC) |

Operating Environment

Operating Temperature

| | |
|--------------------------------|----------------------------------|
| Data logger body, no display | -40 ... +60 °C (-40 ... +140 °F) |
| Data logger body, with display | -20 ... +60 °C (-4 ... +140 °F) |
| IP rating | IP65 |
| Maximum operating altitude | 2000 m (6 500 ft) |

General Specifications

| | |
|--------------------|---|
| Memory | 3,060 samples |
| Sample rate | User selectable (interval: 2 ... 60 minutes) |
| Display (optional) | 128 x 64 resolution full graphics B&W display without backlight |

Mechanical Specifications

| | |
|--|--|
| Weight (with battery/without probe) | 300 g (10.6 oz) |
| Screw terminals | 26 AWG ... 20 AWG |
| HMP110 probe interface | 4-pin M8 female panel connector |
| HMP110 probe cable lengths | 3 m, 5 m, and 10 m (9 ft 10 in, 16 ft 5 in, and 32 ft 10 in) |
| Hermetic Door Switch Sensor cable length | 7.6 m (24 ft 11 in) |

Material

| | |
|--------------------------|----------------------------|
| Data logger housing | PBT plastic |
| Display window | PC plastic |
| HMP110 probe body | Stainless steel (AISI 316) |
| HMP110 probe grid filter | Chrome coated ABS plastic |

RTD Temperature Sensor

| | |
|---------------------|----------------------------|
| Sensor tip material | Stainless steel (AISI 316) |
| Sensor tip length | 50.8 mm (2 in) |
| Sensor tip diameter | 4.76 mm (0.19 in) |
| Cable length | 5 m (16 ft 5 in) |

Wireless

| | |
|----------------------|---|
| Networking standards | IEEE 802.11 b/g |
| Data rates | 802.11 b: up to 11 Mbps 802.11 g: up to 54 Mbps |
| Frequency band | 2402 - 2480 MHz |
| Wi-Fi Security | WEP (128-bit), WPA, WPA2 (Personal) |
| Output power | +18 dBm (63 mW) |
| Receiver Sensitivity | -85 dBm typical |
| Antenna | Onboard whip |
| Contains | MIC R 201-125765 FCC ID: U30-G2M5477 IC ID: 8169A-G2M5477 NCC ID: CCAF11LP0240T6 CMIIT ID: 2013DJ7129 |

Standards

| | |
|-------------------------------|--------------------------------------|
| Electromagnetic compatibility | EN 61326-1, EN 301 489-1, EN 300 328 |
| Safety | EN 61010-1 |

Spare Parts and Accessories

HMP110

| | |
|--|-----------------------|
| Humidity and temperature probe | HMP110 ¹⁾ |
| Humidity and temperature replacement probe | HMP110R ¹⁾ |
| Humidity sensor | HUMICAP® 180R |
| Probe mounting flange | 226061 |
| Probe mounting clamps, 10 pcs | 226067 |
| Probe cable 3 m | HMT120Z300 |
| Probe cable 5 m | HMT120Z500 |
| Probe cable 10 m | HMT120Z1000 |
| Duct installation kit | 215619 |
| Sensor Protection | |
| Plastic grid filter | DRW010522SP |
| Plastic grid with membrane filter | DRW010525SP |
| Stainless steel sintered filter | HM46670SP |

Other Accessories

| | |
|-------------------------------------|-------------|
| RTD Temperature Probe 5 m | ASM210644SP |
| Hermetic Door Switch Sensor Kit | 236319SP |
| Thermal Dampener Blocks | 236310SP |
| Four Dual Lock™ Strips (3 in/76 mm) | 237217SP |

¹⁾ See separate order form



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"> • DL1000 • DL1016 • DL1400 • DL1416 • DL2000 • HMT140 |
| 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"> • DL1000 • DL1016 • DL1400 • DL1416 • HMT143 • HMT148 |
| 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 |

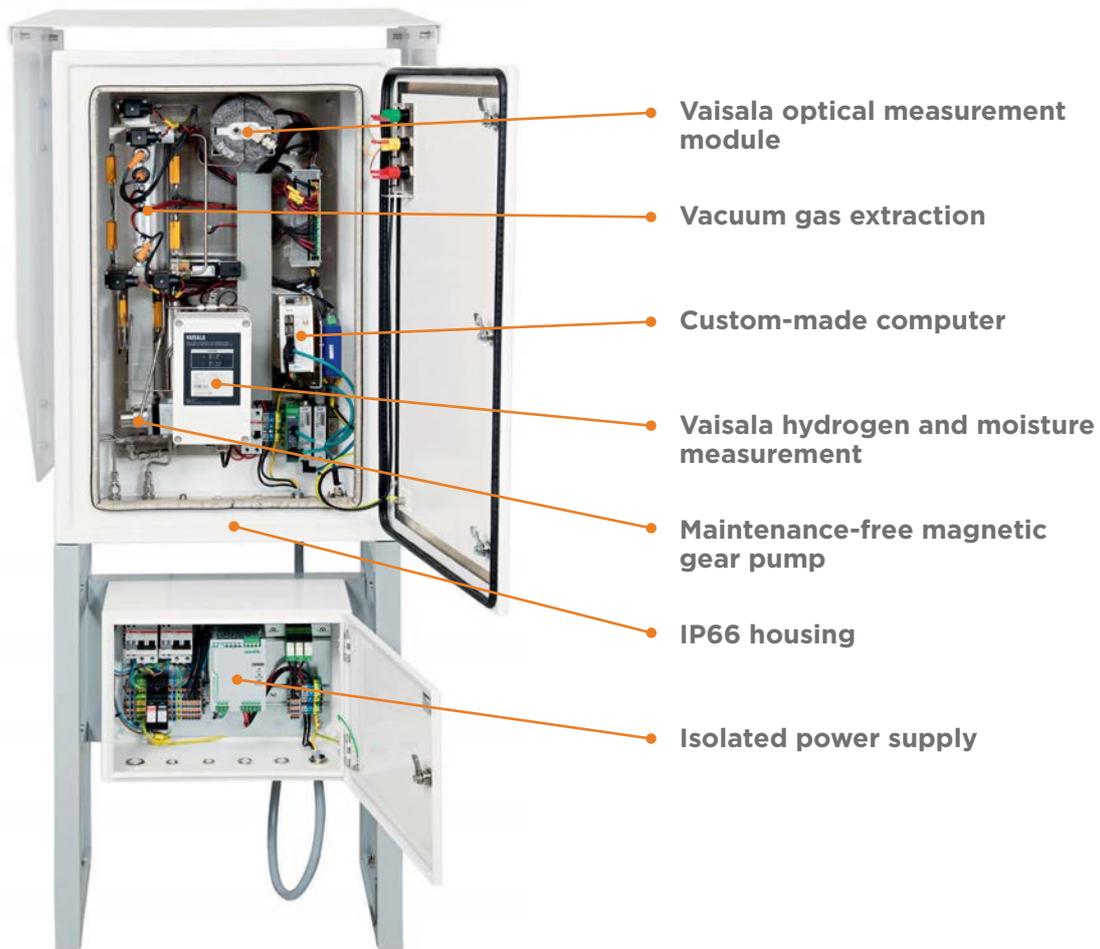
Current and Voltage

| | |
|-------------------------------------|---|
| 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 |



www.vaisala.com

| | |
|---|------------------------|
|  | www.esis.com.au |
| | Ph 02 9481 7420 |
| | Fax 02 9481 7267 |
| | esis.enq@esis.com.au |



Better Measurement Performance

- Optical IR sensors designed and manufactured in Vaisala cleanrooms
- Spectral scanning provides selective gas measurement
- Vacuum gas extraction independent of oil temperature and pressure
- Unique auto-calibration eliminates long-term drifts – no need to recalibrate

More Robust Design

- Hermetically sealed structure tolerates vacuum and pressure variation
- Stainless steel and aluminum components and piping in contact with oil
- No consumables means no regular maintenance
- Magnetic drive gear pump and high quality valves for durability

Simplified Installation and Operation

- Installation and commissioning in as little as two hours
- Continuous operation with roughly one-hour output interval – no data averaging needed
- Browser-based user interface to easily view and share data, and change settings
- Self-diagnostics with self-recovery after disturbances



Optimus DGA Monitor is the right solution for safeguarding critical transformers in harsh environments

Prevent Power Transformer Failure

There's nothing worse than an unplanned outage, in terms of both lost revenue and the incalculable costs to your reputation and brand. The good news is that over 50 percent of power transformer faults can be detected with the right online monitoring tools, meaning that severe failures can be prevented. But monitors that give false alarms or require regular maintenance can end up wasting considerable amounts of your time and money.

That's why we created the Vaisala Optimus™ DGA Monitor. It provides real-time, trouble free fault gas monitoring for your power transformers – with no false alarms or maintenance.

The two key design drivers have been safety and reliability in demanding operating environments. This is the culmination of decades of listening to customers' needs and researching

existing devices, as well as leveraging our 80 years of experience making sensors and measuring equipment for safety-critical industries and harsh environments.

Dependable Data with No False Alarms

The IR sensor is based on Vaisala core measurement technology and components manufactured in our own cleanroom. Vacuum gas extraction means no data fluctuation due to oil temperature or pressure, while hermetically sealed and protected optics prevent sensor contamination. Moisture is measured directly in the oil with our capacitive thin-film polymer HUMICAP® sensor, which has been used for transformer monitoring for 20 years. Hydrogen is also measured directly in the oil with the same solid-state sensor technology used in the Vaisala MHT410.

Robust Construction

Stainless steel pipes, IP66-rated and temperature-controlled housing, as well as a magnetic drive gear pump and valves mean superb performance and durability – from the arctic to the tropics. What's more, there are no consumables to service or replace.

Smart Design

Vaisala Optimus™ DGA Monitor has a web-based user interface that completely eliminates the need for additional software. The device is designed to be installed in less than two hours – just connect the oil, power, and data connections, and it's ready to go. It can be connected to an existing control and monitoring system via digital communication and relays, or used as a standalone monitoring device. And in case of a disturbance such as a power outage, self-diagnostics allow for self-recovery.

Technical Data

Measured Parameters in Oil

| Parameter | Range | Accuracy ^{1) 2)} | Repeatability ²⁾ |
|--|--|--|--|
| Methane (CH ₄) | 0 ... 10 000 ppm _v | 10 ppm or 10 % of reading | 10 ppm or 5 % of reading |
| Ethane (C ₂ H ₆) | 0 ... 10 000 ppm _v | 10 ppm or 10 % of reading | 10 ppm or 5 % of reading ³⁾ |
| Ethylene (C ₂ H ₄) | 0 ... 10 000 ppm _v | 10 ppm or 10 % of reading | 10 ppm or 5 % of reading |
| Acetylene (C ₂ H ₂) | 0 ... 5000 ppm _v | 2 ppm or 10 % of reading | 1 ppm or 10 % of reading |
| Carbon monoxide (CO) | 0 ... 10 000 ppm _v | 10 ppm or 10 % of reading | 10 ppm or 5 % of reading |
| Carbon dioxide (CO ₂) | 0 ... 10 000 ppm _v | 10 ppm or 10 % of reading | 10 ppm or 5 % of reading |
| Hydrogen (H ₂) | 0 ... 5000 ppm _v | 25 ppm or 20 % of reading | 15 ppm or 10 % of reading |
| Moisture ⁴⁾ (H ₂ O) | 0 ... 100 ppm _w ⁵⁾ | ±2 ppm ⁶⁾ or ±10 % of reading | Included in accuracy |

1) Accuracy specified is the accuracy of the sensors during calibration gas measurements. Accuracy of the gas-in-oil measurement may also be affected by oil properties and other chemical compounds dissolved in oil.

2) Whichever is greater.

3) Repeatability of ethane measurement is specified with averaging of five measurements.

4) Measured as relative saturation (%RS).

5) Upper range limited to saturation.

6) Calculated ppm value is based on average solubility of mineral oils.

Measurement Performance

| | |
|---|-------------------------------------|
| Measurement cycle duration | 1 ... 1.5 h (typical) |
| Response time (T63) | One measurement cycle ¹⁾ |
| Warm-up time until first measurement data available | Two measurement cycles |
| Initialization time to full accuracy | Two days |
| Data storage | At least 10 years |
| Expected operating life | > 15 years |

1) Three cycles for ethane and hydrogen.

Calculated Parameters

| | |
|--|---|
| Total dissolved combustible gases (TDCG) | Combined total of H ₂ , CO, CH ₄ , C ₂ H ₆ , C ₂ H ₄ , and C ₂ H ₂ |
| Rate of change (ROC) | Available for single gases and TDCG for 24 h, 7 d, and 30 d periods |
| Gas ratios ¹⁾ | Available ratios: <ul style="list-style-type: none"> • CH₄/H₂ • C₂H₂/C₂H₄ • C₂H₂/CH₄ • C₂H₆/C₂H₂ • C₂H₄/C₂H₆ • CO₂/CO |

1) Calculated from 24 h average values. See standard IEC 60599.

Operating Environment

| | |
|--|--|
| Transformer oil type | Mineral oil |
| Required minimum fire point ¹⁾ of transformer oil | +125 °C (+257 °F) |
| Transformer oil pressure at oil inlet | Max. 2 bar _{abs} continuous Burst pressure 20 bar _{abs} |
| Transformer oil temperature at oil inlet | Max. +100 °C (+212 °F) |
| 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) |

1) The fire point [of transformer oil] is normally approximately 10 °C [18 °F] higher than the closed flash point. See, for example, Heathcote, Martin J. *The J & P Transformer Book*. 13th ed. Elsevier, 2007.

Power Supply

| | |
|--|--------------------------------------|
| Operating voltage | 100 ... 240 VAC, 50 ... 60 Hz, ±10 % |
| Overvoltage category | III |
| Maximum current consumption | 10 A |
| Maximum power consumption | 500 W |
| Typical power consumption at +25 °C (+77 °F) | 100 W |

Outputs

| | |
|---------------------------|--|
| RS-485 Interface | |
| Supported protocols | Modbus RTU |
| Galvanic isolation | 2 kV RMS, 1 min |
| Ethernet Interface | |
| Supported protocols | DNP3 (Distributed Network Protocol), Modbus TCP, HTTP |
| Galvanic isolation | 4 kV AC (50 Hz, 1 min) |
| Relay Outputs | |
| 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 VAC) 2 A (at 24 VDC) 0.2 A (at 250 VDC) |
| User Interface | |
| 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 pipe. For 3/8 inch pipe, use adapter SS-600-R-10M. |
| Max. length of oil pipe to transformer | Max. 10 m (33 ft) with 7 mm (0.28 in) inner diameter pipe Max. 5 m (16 ft) with 4 mm (0.15 in) inner diameter pipe |
| Material | Marine aluminum (EN AW-5754), stainless steel AISI 316 |

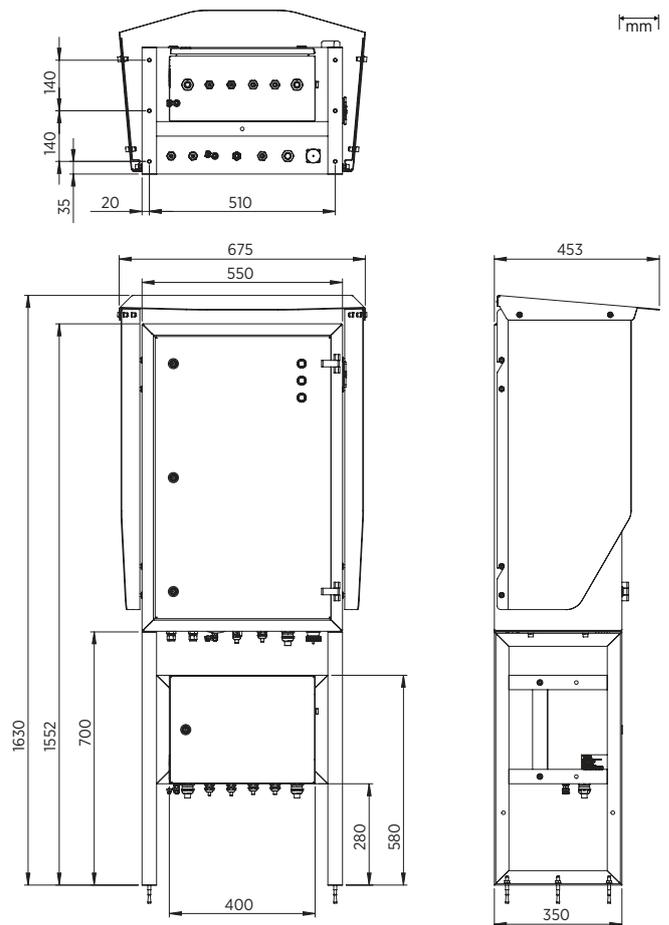
Type Tests

| Category | Standard | Class/Level | Test |
|----------------|---|------------------------------------|--|
| EMC compliance | IEC61000-6-5 | Class 4 (interface type 4) | Immunity for Power Station and Substation Environments |
| | IEC61326-1 | Industrial | Electrical equipment for measurement, control, and laboratory use - EMC requirements |
| Environmental | IEC60529 | IP66 (equivalent to NEMA 4 rating) | Ingress protection |
| Safety | IEC/EN61010-1, 3rd edition UL 61010-1:2012 CSA C22.2 No. 61010-1-12 | Compliant | Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements |

Compliance

CE marking

EMC directive, Low voltage directive, RoHS directive, WEEE directive



Dimensions

You Can Count on Vaisala

Vaisala has been creating measurement devices for 80 years. Our instruments and systems are used in over 150 countries in industries where failure is not an option, including airports, pharmaceuticals, and power generation. In fact, over 10,000 companies in safety and quality-critical sectors already rely on Vaisala.

Vaisala sensors are so reliable they are used in the harshest places on earth - like arctic, maritime, and tropical environments - 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.

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MHT410 Moisture, Hydrogen, and Temperature Transmitter

For Online Transformer Condition Monitoring



Features and Benefits

- Measures moisture and hydrogen directly in representative oil
- Compatible with mineral oil, natural ester oil, and synthetic ester oil
- Monitors health of the transformer in real time
- Real-time warning on transformer faults
- Unique probe design, robust and easy to install
- 5-year standard warranty
- Reliable device operation, no false alarms
- Maintenance-free design
- No cross-sensitivity to other gases

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 without delay. 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

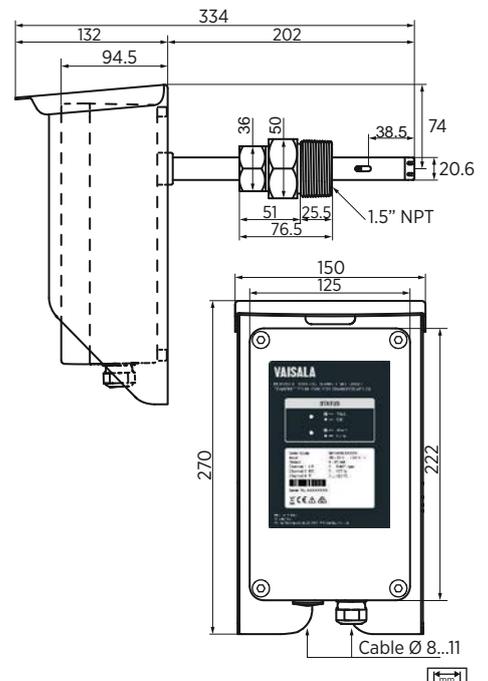
All of the transmitter's measured parameters are available through digital and analog outputs, providing information on transformer fault situations and enabling timely, proactive maintenance decisions to minimize expensive service shutdowns and outages.

Robust and Maintenance-Free Design

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 also been given to EMC tolerance: for example, all electrical connections are isolated. MHT410 can also tolerate short-term power outages.

Dimensions



Technical Data

Measurement Performance

Hydrogen

| | |
|---|---|
| Measurement range (in oil) | 0 ... 5000 ppm _v |
| Accuracy (in oil temperature range -20 ... +60 °C (-4 ... +140 °F)) ¹⁾ | ±20 % of reading or ±25 ppm _v (whichever is greater) |
| Repeatability | ±10 % of reading or ±15 ppm _v (whichever is greater) |
| Minimum detection limit | 25 ppm _v |
| Typical long-term stability | 3 % of reading / year |
| Cross sensitivity to other gases | < 2 % (CO ₂ , C ₂ H ₂ , C ₂ H ₄ , CO) |
| Response time | 63 % of full response: 2.5 h (when sensor is not in reference cycle) 90 % of full response: 17 h |
| 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 _w 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 _w ± 0.02) |
| 90 ... 100 %RS | ±3 %RS (a _w ± 0.03) |
| Temperature | |
| Measurement range | -40 ... +120 °C (-40 ... +248 °F) ¹⁾ |
| Accuracy at +20 °C (+68 °F) | ±0.2 °C (0.36 °F) |
| Sensor | Pt1000 RTD Class F0.1 IEC 60751 |

¹⁾ Note that the temperature range for specified measurement accuracy differs between measurement parameters. Measuring a parameter outside its temperature range does not damage the sensor, but results in reduced accuracy for that parameter.

Inputs And Outputs

| | |
|-------------------|---|
| Operating voltage | 15 ... 30 VDC, 24 VAC (±15 %) (power supply input is galvanically isolated) ¹⁾ |
| Power consumption | Typical 4 W, maximum 12 W |

Analog Output (Current)¹⁾

| | |
|---|--|
| 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 Outputs¹⁾

| | |
|-----------------|---|
| 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 ² Stranded wire (flex.) 1.0 mm ² Recommended wire torque 0.4 Nm |

¹⁾ Max. isolation voltage 1.5 kV DC.

Mechanical Specifications

| | |
|---|---|
| Mechanical connection on transmitter | 1.5 in NPT (male) |
| Cable bushing (optional) | M20 × 1.5 for cable diameter 8 ... 11 mm (0.31 ... 0.43 in) |
| Conduit fitting (optional) | 1/2 in NPT |
| Interface cable (optional, pre-assembled) | 5 m (16 ft 5 in), 9.2 mm (0.36 in) outer diameter |
| Housing material | AlSi 10 Mg |
| IP rating | IP66 |
| 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

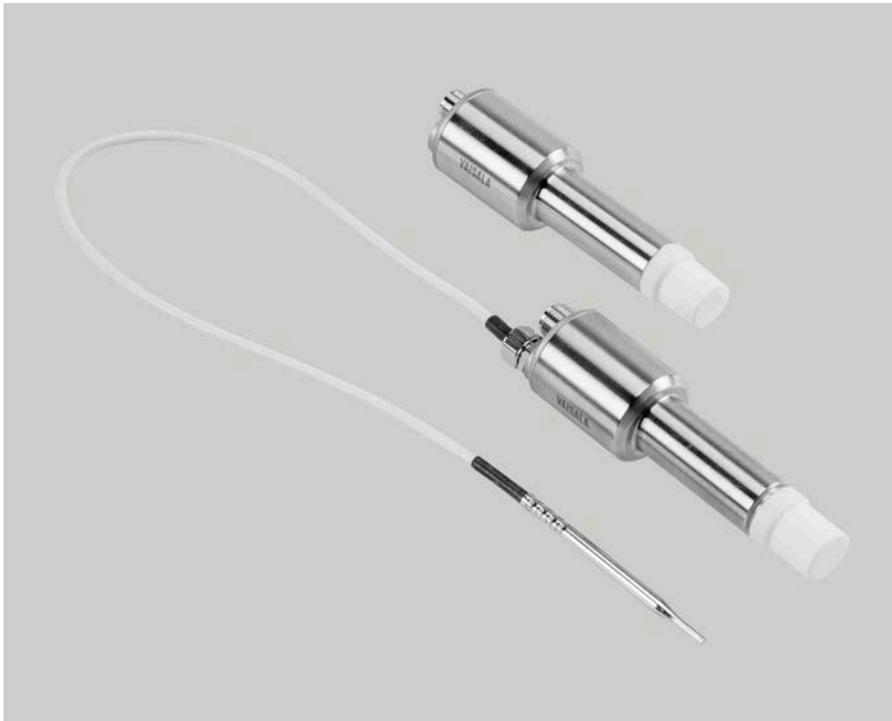
| | |
|--|---|
| Oil type | Mineral oil / Natural ester oil / Synthetic ester oil |
| Operating temperature (electronics) | -40 ... +60 °C (-40 ... +140 °F) |
| Storage temperature | -40 ... +60 °C (-40 ... +140 °F) |
| Operating humidity | 0 ... 100 %RH, condensing |
| Pressure tolerance (probe, short-term) | Max. 10 bara |
| Pressure tolerance (probe, continuous) | Max. 4 bara |
| Temperature tolerance, sensor head | -40 ... +120 °C (-40 ... +248 °F) |
| Integrated protection for short power outages | > 3 s |
| EMC standard EN61326-1, Industrial environment; CISPR22 class B emission limits when DC powered | Fulfills the requirements of IEC 61000-6-5 in the following tests: IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8, IEC 61000-4-11, IEC 61000-4-12, IEC 61000-4-16, IEC 61000-4-17. |

Display with Relays (External Option)

| | |
|---|---|
| Pre-configured range for hydrogen | 0 ... 5000 ppm _v |
| Pre-configured alarm relays (user-reconfigurable) | Relay 1 trigger limit 200 ppm _v (hi) Relay 2 trigger limit 1500 ppm _v (hihi) |
| Input | 4 ... 20 mA, loop-powered |
| Accuracy | 0.05 % of span (-10 ... +60 °C (-14 ... +140 °F)) |
| Relays | 2 × solid state (SSR) Max. 250 VAC, 150 mA |
| Display | 4-digit red LED, 14.5 mm |
| Dimensions (H × W × D) | 100 × 100 × 57 mm (3.94 × 3.94 × 2.24 in) |
| Case protection | IP65 |
| Case material and color | ABS plastic, grey |
| Cable glands | 2 × M16×1.5 |

HPP270 Series Probes

For Hydrogen Peroxide, Humidity, and Temperature Measurement



Features

- Basic probe option HPP271 for H₂O₂ vapor concentration measurement
- Advanced probe option HPP272: compact 3-in-1 probe with real-time measurement of H₂O₂ vapor concentration, humidity, and temperature
- Superior long-term stability and repeatability with proprietary PEROXCAP® technology
- Corrosion-resistant stainless steel housing (IP65)
- Traceable calibration certificate
- Standalone probe with digital Modbus RTU over RS-485 or 2 analog outputs
- Compatible with Vaisala Insight PC software and Indigo transmitters

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

Up to Three Measurements in One Compact Unit

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

Repeatable Measurement for Highly Condensing Environments

Intelligent measurement technology including the chemical purge function helps to maintain accuracy between calibrations in challenging H₂O₂ environments. The purging process involves rapid heating of the sensor to remove possible contamination.

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

Relative Saturation for Comprehensive Humidity Monitoring

Similar to water, H₂O₂ vapor affects the humidity level of the decontaminated air. The advanced HPP272 probe option enables the measurement of relative saturation, which indicates the total humidity level caused by water vapor and H₂O₂ vapor together. This tells you reliably when the bio-decontaminated air starts to condense.

Indigo and Insight Compatible

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

Traceable Calibration at Vaisala

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

Available traceable calibration certificates: 2 points for H₂O₂, 3 points for humidity, 1 point for temperature.

HPP271 Technical Data

Measurement Performance

Hydrogen Peroxide

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

Other Parameters

H₂O ppm by volume

¹⁾ Defined as ±2 standard deviation limits. See also calibration certificate.

Inputs and Outputs

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

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

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

Digital Output

| | |
|------------------------|---|
| Interface | RS-485, not isolated; do not use termination on the RS-485 line |
| Communication protocol | Modbus RTU v.1.02 |

Analog Output

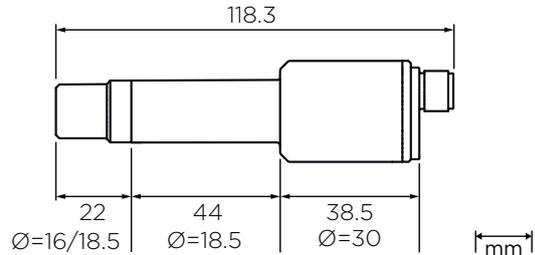
| | |
|-----------|--|
| Outputs | 2 × 4 ... 20 mA 3-wire current outputs |
| Max. load | 500 Ω |

Operating Environment

| | |
|-----------------------|--|
| Operating temperature | +0 ... +70 °C (+32 ... +158 °F) |
| Storage temperature | -20 ... +70 °C (-4 ... +158 °F) |
| Ambient pressure | Normal atmospheric pressure |
| EMC compliance | EN/IEC 61326-1, Industrial Environment |

Mechanical Specifications

| | |
|------------------|--------------------------|
| IP rating | IP65 |
| Connector | M12/5 male |
| Materials | |
| Probe body | AISI316L stainless steel |
| Filter cap | Porous PTFE |



HPP271 Dimensions

Spare Parts and Accessories

| | |
|---|--------------------|
| USB cable for PC connection ¹⁾ | 242659 |
| Probe cable with open wires (1.5 m) | 254294SP |
| Probe cable with open wires (3 m) | 254295SP |
| Probe cable with open wires (5 m) | 254296SP |
| Probe cable with open wires (10 m) | 254297SP |
| Filter | DRW246363SP |
| Gland set for through-wall installation, HPP271 | HPP271MOUNTINGSET1 |
| Flange for through-wall installation, HPP271 | HPP271MOUNTINGSET2 |
| Wall mount for HPP271 and HPP272 | HPP272WALLMOUNT |

Transmitters

Indigo transmitters See www.vaisala.com/indigo

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

HPP272 Technical Data

Measurement Performance

Hydrogen Peroxide

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

Relative Saturation

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

Relative Humidity

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

Temperature

| | |
|---------------------------------|------------------------|
| Sensor | Pt-1000 RTD Class F0.1 |
| Accuracy over temperature range | ±0.2 °C (±0.36 °F) |

Other Parameters

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

¹⁾ Defined as ±2 standard deviation limits. See also calibration certificate.

Operating Environment

| | |
|-----------------------|--|
| Operating temperature | +0 ... +70 °C (+32 ... +158 °F) |
| Storage temperature | -20 ... +70 °C (-4 ... +158 °F) |
| Ambient pressure | Normal atmospheric pressure |
| EMC compliance | EN/IEC 61326-1, Industrial Environment |

Inputs and Outputs

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

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

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

Digital Output

| | |
|-----------|---|
| Interface | RS-485, not isolated; do not use termination on the RS-485 line |
|-----------|---|

| | |
|------------------------|-------------------|
| Communication protocol | Modbus RTU v.1.02 |
|------------------------|-------------------|

Analog Output

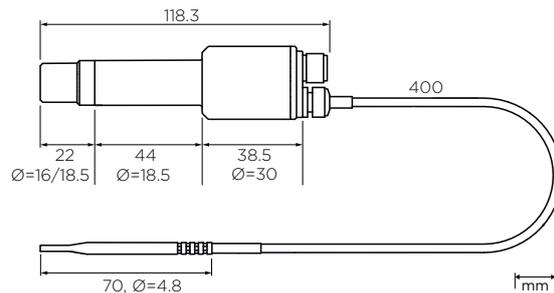
| | |
|-----------|--|
| Outputs | 2 × 4 ... 20 mA 3-wire current outputs |
| Max. load | 500 Ω |

Mechanical Specifications

| | |
|-----------|------------|
| IP rating | IP65 |
| Connector | M12/5 male |

Materials

| | |
|-------------------------|--------------------------|
| Probe body | AISI316L stainless steel |
| Filter cap | Porous PTFE |
| Temperature probe | AISI316L stainless steel |
| Temperature probe cable | PTFE |



HPP272 Dimensions

Spare Parts and Accessories

| | |
|---|--|
| USB cable for PC connection ¹⁾ | 242659 |
| Probe cable with open wires (1.5 m) | 254294SP |
| Probe cable with open wires (3 m) | 254295SP |
| Probe cable with open wires (5 m) | 254296SP |
| Probe cable with open wires (10 m) | 254297SP |
| Filter | DRW246363SP |
| Gland set for through-wall installation, HPP272 | HPP272MOUNTINGSET1 |
| Flange for through-wall installation, HPP272 | HPP272MOUNTINGSET2 |
| Wall mount for HPP271 and HPP272 | HPP272WALLMOUNT |
| Indigo transmitters | See www.vaisala.com/indigo |

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

VAISALA

www.vaisala.com

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PTU300 Combined Pressure, Humidity, and Temperature Transmitter

For Demanding Applications



Features

- Barometric pressure, humidity, and temperature measurement in one transmitter
- RS-232C serial interface with NMEA protocol for GPS use
- Graphical display and keypad for convenient operation
- Analog outputs, RS-232/485, LAN
- Modbus protocol support (RTU/TCP)
- Traceable to international standards

Vaisala Combined Pressure, Humidity and Temperature Transmitter PTU300 is a unique instrument measuring three parameters simultaneously.

Options

- Available with up to two barometric pressure sensors for added reliability
- Optional universal power supply module
- HMT330MIK installation kit for outdoor use

You can choose from the following probe options: PTU301 for wall mounting for example in laboratories or engine rooms, PTU303 for general use, PTU307 warmed probe for outdoor and demanding meteorology applications, and PTU30T for pressure and temperature measurement only.

Proven Vaisala Sensor Technology

PTU300 incorporates sensors known for their high accuracy and excellent long-term stability: Vaisala BAROCAP® for pressure measurement and Vaisala HUMICAP® for humidity measurement. The temperature sensor is a platinum RTD sensor.

Graphical Display of Measurement Data and Trends for Convenient Operation

PTU300 features a large numerical and graphical display with a multilingual menu and keypad. It allows users to easily monitor operational data, measurement trends, and access measurement history for the past 12 months.

The optional data logger, with real-time clock, makes it possible to generate over four years of measurement history and zoom in on any desired time or time frame.

The display alarm allows any measured parameter to be tracked, with freely configurable low and high limits.

Versatile Outputs and Data Collection

PTU300 comes with a standard RS-232 serial interface. The output format is compatible with major GPS receivers and NMEA-coded messages. An isolated RS-485 interface is available as an option.

PTU300 is also capable of applying the Modbus communication protocol and, together with an appropriate connection option, provides either Modbus RTU (RS-485) or Modbus TCP/IP (Ethernet) communication.

The data logger records data that can be viewed on the local display or transferred to a PC with Microsoft® Windows® software. The transmitter can also be connected to a network with an optional LAN interface, which enables an Ethernet connection. A USB service cable makes it easy to connect PTU300 to a PC via the service port.

Outdoor Installation Kit

Outdoor installation is possible using the optional HMT330MIK installation kit, for applications requiring reliable measurements for meteorological purposes.

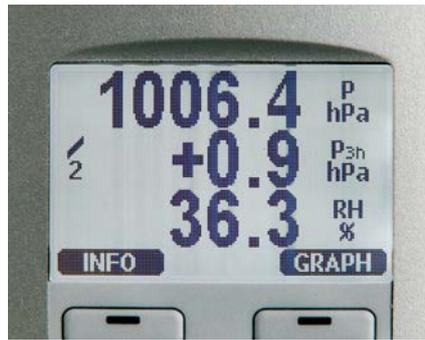
Flexible Calibration

Quick, one-point field calibration for humidity is easy using Vaisala Hand-Held Humidity Meter HM70.

With Vaisala Barometric Pressure Transfer Standard PTB330TS, including optional humidity and temperature probe, field check and calibration can be performed for all three parameters.

Applications

- Environmental monitoring in calibration laboratories
- Industrial applications in semiconductor industry, engine testing and maritime sector
- GPS meteorology: estimating precipitable water vapor in the atmosphere, weather stations



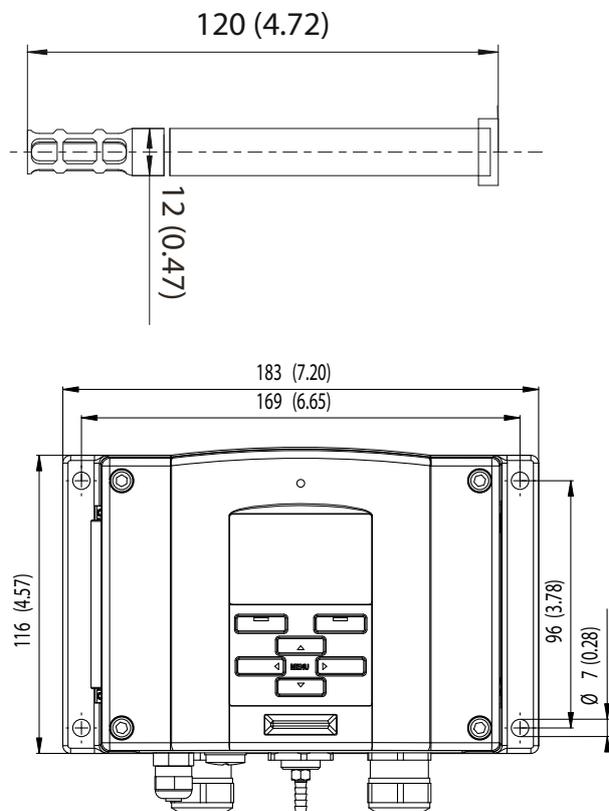
The display also shows the WMO pressure trend ΔP_{3h} and tendency of 0 ... 8.

Model

Dimensions in mm

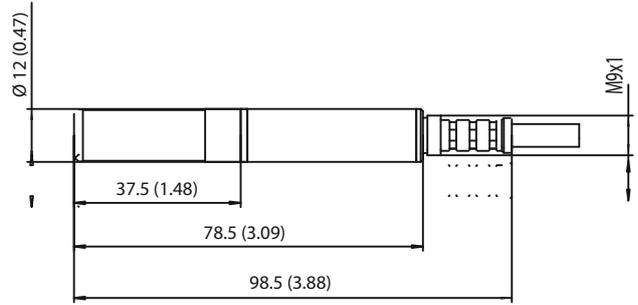


PTU301 for wall mounting

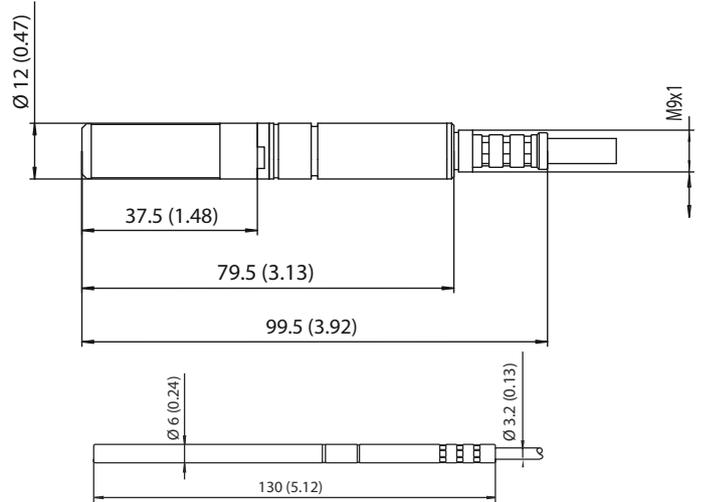


Model

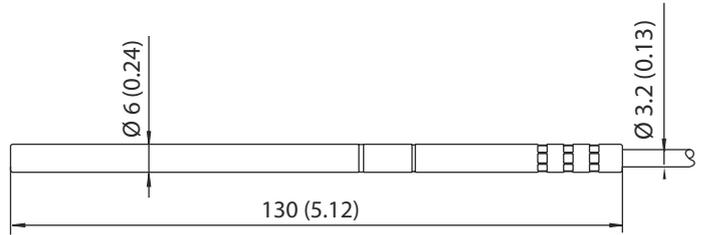
Dimensions in mm



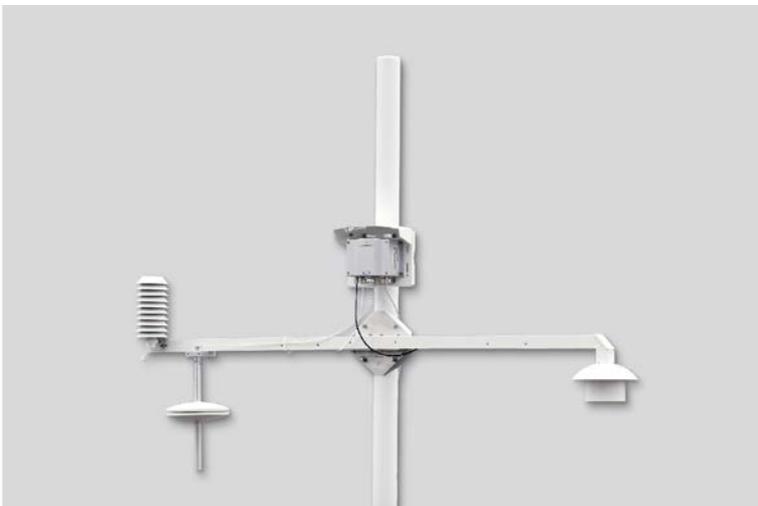
PTU303 probe for outdoor use



PTU307 warmed probe for demanding meteorological installations



PTU30T for pressure and temperature only measurement



HMT330MIK Meteorological Installation Kit enables PTU307 to be installed outdoors to obtain reliable measurements for meteorological purposes.

Technical Data

Measurement Performance

Barometric Pressure

| Pressure range | 500 ... 1100 hPa | 50 ... 1100 hPa | 50 ... 1100 hPa |
|---|---|------------------|-----------------|
| Accuracy | 500 ... 1100 hPa | 500 ... 1100 hPa | 50 ... 1100 hPa |
| | Class A | Class B | |
| Linearity | ±0.05 hPa | ±0.10 hPa | ±0.20 hPa |
| Hysteresis | ±0.03 hPa | ±0.03 hPa | ±0.08 hPa |
| Repeatability | ±0.03 hPa | ±0.03 hPa | ±0.08 hPa |
| Calibration uncertainty | ±0.07 hPa | ±0.15 hPa | ±0.20 hPa |
| Accuracy at +20 °C / +68 °F | ±0.10 hPa | ±0.20 hPa | ±0.30 hPa |
| Temperature dependence | ±0.1 hPa | ±0.1 hPa | ±0.3 hPa |
| Total accuracy (-40 ... +60 °C / -40 ... +140 °F) | ±0.15 hPa | ±0.25 hPa | ±0.45 hPa |
| Long-term stability/year | ±0.1 hPa | ±0.1 hPa | ±0.2 hPa |
| Response Time (100 % Response): | | | |
| One sensor | 2 s | 1s | 1 s |
| Pressure units | hPa, mbar, kPa, Pa, inHg, mmH20, mmHg, torr, psia | | |

Relative Humidity

| | | |
|--|---|--|
| Measurement range | 0 ... 100 %RH | |
| Accuracy (Including Non-linearity, Hysteresis, and Repeatability): | | |
| 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 ... +60 °C / -40 ... +140 °F | ±(1.5 + 0.015 x reading) %RH | |
| Factory calibration uncertainty (+20 °C / +68 °F) (Defined as ±2 standard deviation limits. Small variations possible, see also calibration certificate.) | ±0.6 %RH (0 ... 40 %RH) ±1.0 %RH (40 ... 97 %RH) | |
| Sensor for typical applications | Vaisala HUMICAP 180 or 180R | |
| Sensor for applications with chemical purge/warmed probe | Vaisala HUMICAP 180C or 180RC | |
| Response Time (90 %) at +20 °C (+68 °F) in Still Air: | | |
| With grid filter | 8 s / 17 s ¹⁾ | |
| With grid + steel netting filter | 20 s / 50 s ¹⁾ | |
| With sintered filter | 40 s / 60 s ¹⁾ | |

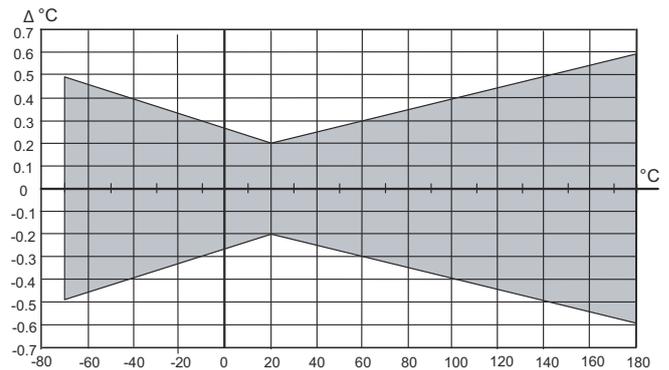
Temperature

| | |
|--|--|
| Measurement range, housing (barometric pressure measurement limit) ²⁾ | -40 ... +60 °C (-40 ... +140 °F) |
| Measurement range, probes (operational limit when measuring RH or T) | PTU301: -40 ... +60 °C (-40 ... +140 °F) PTU303: -40 ... +80 °C (-40 ... +176 °F) PTU307: -40 ... +180 °C (-40 ... +356 °F) PTU30T: -70 ... +180 °C (-94 ... +356 °F) ³⁾ |
| Accuracy at +20 °C (+68 °F) | PTU301, PTU303, PTU307: ±0.2 °C (±0.4 °F) PTU30T: ±0.1 °C (±0.18 °F) |
| Temperature units | °C, °F |
| Temperature sensor | Pt100 RTD Class F0.1 IEC 60751 |

1) With HUMICAP 180R or 180RC sensor

2) Note that the operational temperature limits of the PTU303, PTU307, and PTU30T probes are higher than for the PTU300 transmitter itself. The transmitter's temperature limit is based on the upper temperature limit for barometric pressure measurement, +60 °C (+140 °F)

3) PTU30T is used for T and P measurements only, RH measurement not in use.



Accuracy over Temperature Range

Operating Environment

| | |
|---|-----------------------------------|
| Operating temperature | -40 ... +60 °C (-40 ... +140 °F) |
| Operating temperature with optional display | 0 ... +60 °C (+32 ... +140 °F) |
| Humidity range | Non-condensing |
| EMC compliance | EN61326-1, Industrial Environment |
| Note: Transmitter with display test impedance of 40 Ω is used in IEC61000-4-5 (Surge immunity) | |

Mechanical Specifications

| | |
|--------------------------------------|--|
| Cable bushing | M20 x 1.5 for cable diameter 8 ... 11 mm / 0.31 ... 0.43" |
| Conduit fitting | 1/2" NPT |
| User cable connector (optional) | M12 series 8-pin (male) |
| Option 1 | Female plug with 5 m (16.4 ft) black cable |
| Option 2 | Female plug with screw terminals |
| Cable diameter, PTU303 | 6.0 mm |
| Cable diameter, other probes | 5.5 mm |
| Standard probe cable lengths | 2 m, 5 m or 10 m ¹⁾ |
| Housing material | G-AlSi 10 Mg (DIN 1725) |
| IP rating | IP66 IP65 (NEMA4X) with local display |
| Weight (depending on selected probe) | 1.0 - 3.0 kg / 2.2 - 6.6 lb |

1) Additional cable lengths available, please see order form for details.

Optional Data Logger with Real-time Clock

| | |
|---|-------------------------------------|
| Logged parameters | Max. four with trend/min/max values |
| Logging interval | 10 s (fixed) |
| Maximum logging period with maximum temporal resolution | 4 years 5 months |
| Logged points | 13.7 million points per parameter |
| Battery lifetime | Min. 5 years |

Display

| | |
|----------------|--|
| Material | LCD with backlight, graphical trend display of any parameter |
| Menu languages | English, Chinese, Finnish, French, German, Japanese, Russian, Spanish, Swedish |

Inputs and Outputs

| | |
|--|---|
| Operating voltage | 10 ... 35 VDC, 24 VAC ±20 % |
| With optional power supply module | 100 ... 240 VAC, 50/60 Hz |
| Settling time at power-up (one sensor) | Class A: 4 s Class B: 3 s |
| Recommended wire size | 0.5 mm ² (AWG 20) stranded wires |
| Digital outputs | RS-232, RS-485 (optional) |
| Protocols | ASCII commands, Modbus RTU |
| Service connection | RS-232, USB |
| Relay outputs (optional) | 0.5 A, 250 VAC |

Power Consumption at +20 °C (+68 °F) (U_{in} 24 VDC)

| | |
|---|--------------|
| RS-232 | Max. 28 mA |
| U _{out} 3 x 0 ... 1 V / 0 ... 5 V / 0 ... 10 V | Max. 33 mA |
| I _{out} 3 x 0 ... 20 mA | Max. 63 mA |
| Display and backlight | +20 mA |
| During chemical purge | Max. +110 mA |
| During probe heating | +120 mA |

External Loads

| | |
|----------------------------------|------------------------|
| Current outputs | R _L < 500 Ω |
| 0 ... 1 V output | R _L > 2 kΩ |
| 0 ... 5 V and 0 ... 10 V outputs | R _L > 10 kΩ |

Ethernet Interface (Optional)

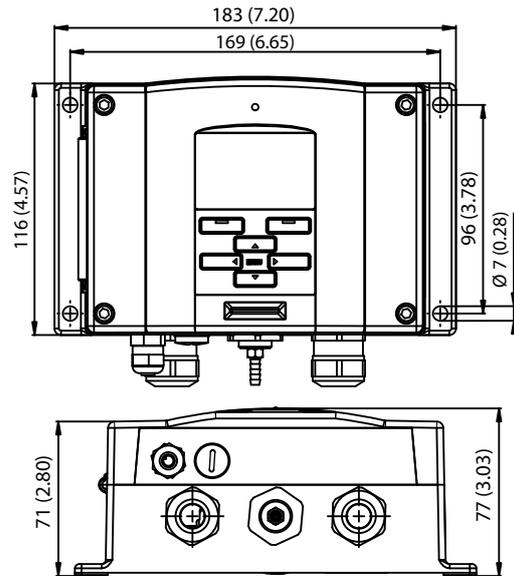
| | |
|-------------------------|--------------------------|
| Supported standards | 10BASE-T, 100BASE-TX |
| Connector | 8P8C (RJ45) |
| IPv4 address assignment | DHCP (automatic), static |
| Protocols | Telnet, Modbus TCP/IP |

Analog Outputs (Optional)

| | |
|--|---|
| Current output | 0 ... 20 mA, 4 ... 20 mA |
| Voltage output | 0 ... 1 V, 0 ... 5 V, 0 ... 10 V |
| Humidity and Temperature: | |
| Accuracy of analog outputs at +20 °C (+68 °F) | ±0.05 % full scale |
| Temperature dependence of analog outputs | ±0.005 %/°C (0.003 %/°F) full scale |
| Pressure: | |
| Accuracy of analog outputs at +20 °C (+68 °F) | ±0.30 hPa (500 ... 1100 hPa) ±0.40 hPa (50 ... 1100 hPa) |
| Accuracy of analog outputs at -40 ... +60 °C / -40 ... +140 °F | ±0.60 hPa (500 ... 1100 hPa) ±0.75 hPa (50 ... 1100 hPa) |

Spare Parts and Accessories

| | |
|--|-----------|
| PC software and cable | 215005 |
| USB-RJ45 Serial Connection Cable | 219685 |
| Connection cable for HM70 | 211339 |
| Wall mounting plate (plastic) | 214829 |
| Pole installation kit with rain shield | 215109 |
| DIN rail installation set | 211477 |
| Duct installation kit, PTU303/307 | 210697 |
| Cable gland and AGRO, PTU303/307 | HMP247CG |
| Solar radiation shield, PTU303/307/30T | DTR502B |
| Meteorological installation kit | HMT330MIK |
| Duct installation kit (T probe) | 215003 |



Dimensions in mm (inches)



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 professional meteorology and aviation, laboratories, demanding industrial applications

Vaisala BAROCAP® Digital Barometer PTB330 is a new-generation barometer, designed for a wide range of high-end atmospheric pressure measurement. 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. The 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 electronic working standard. All PTB330 barometers come with a traceable factory calibration certificate.

Reliability through Redundancy

According to your choice, PTB330 can incorporate one, two, or three BAROCAP sensors. When two or three 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 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 one-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

Barometric Pressure Range 500 ... 1100 hPa

| | Class A | Class B |
|---|-----------|-----------|
| Linearity ¹⁾ | ±0.05 hPa | ±0.10 hPa |
| Hysteresis ¹⁾ | ±0.03 hPa | ±0.03 hPa |
| Repeatability ¹⁾ | ±0.03 hPa | ±0.03 hPa |
| Calibration uncertainty ²⁾ | ±0.07 hPa | ±0.15 hPa |
| Accuracy at +20 °C (+68 °F) ³⁾ | ±0.10 hPa | ±0.20 hPa |

Barometric Pressure Range 50 ... 1100 hPa

| | Class B |
|---------------------------------------|-----------|
| Linearity ¹⁾ | ±0.20 hPa |
| Hysteresis ¹⁾ | ±0.08 hPa |
| Repeatability ¹⁾ | ±0.08 hPa |
| Calibration uncertainty ²⁾ | ±0.15 hPa |
| Accuracy at +20 °C ³⁾ | ±0.20 hPa |

Temperature Dependence ⁴⁾

| | |
|------------------|----------|
| 500 ... 1100 hPa | ±0.1 hPa |
| 50 ... 1100 hPa | ±0.3 hPa |

Total Accuracy -40 ... +60 °C (-40 ... +140 °F)

| | Class A | Class B |
|------------------|-----------|-----------|
| 500 ... 1100 hPa | ±0.15 hPa | ±0.25 hPa |
| 50 ... 1100 hPa | | ±0.45 hPa |

Long-term Stability

| | |
|------------------|---------------|
| 500 ... 1100 hPa | ±0.1 hPa/year |
| 50 ... 1100 hPa | ±0.1 hPa/year |

- 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.

Operating Environment

| | |
|--|---|
| Pressure range | 500 ... 1100 hPa, 50 ... 1100 hPa |
| Operating temperature | -40 ... +60 °C (-40 ... +140 °F) |
| Operating temperature with local display | 0 ... +60 °C (+32 ... +140 °F) |
| Compliance | EMC standard EN61326-1:1997 + Am1:1998 + Am2:2001: Industrial Environment |

Data Transfer Software

| | |
|---|---|
| M170 Link Interface software requirements | Microsoft® Windows OS Microsoft® Excel |
|---|---|

Mechanical Specifications

| | |
|------------------------|---|
| Housing material | G AISi10 Mg (DIN 1725) |
| Housing classification | IP66 IP65 (NEMA4) with local display |
| Weight | 1 - 1.5 kg (2.2 - 3.3 lbs) |

Inputs and Outputs

| | | |
|---|---|----------------|
| Supply voltage | 10 ... 35 VDC | |
| Supply voltage sensitivity | Negligible | |
| Typical power consumption at +20 °C (U _{in} 24 VDC, one pressure sensor) | | |
| RS-232 | 25 mA | |
| RS-485 | 40 mA | |
| U _{out} | 25 mA | |
| I _{out} | 40 mA | |
| Display and backlight | +20 mA | |
| Serial I/O | RS-232C, RS-485, RS-422 | |
| Pressure units | hPa, mbar, kPa, Pa inHg, mmH2O, mmHg, torr, psia | |
| | Class A | Class B |
| Resolution | 0.01 hPa | 0.1 hPa |
| Settling time at startup (one sensor) | 4 s | 3 s |
| Response time (one sensor) | 2 s | 1 s |
| Acceleration sensitivity | Negligible | |
| 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 | |
| Maximum pressure limit | 5000 hPa abs. | |

Analog Output (Optional)

| | | |
|------------------------------------|----------------------------------|-----------------|
| Current output | 0 ... 20 mA, 4 ... 20 mA | |
| Voltage output | 0 ... 1 V, 0 ... 5 V, 0 ... 10 V | |
| Accuracy at pressure range | 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 |

Accessories

| | |
|--|---------|
| Serial interface cable | 19446ZZ |
| USB-RJ45 serial connection cable | 219685 |
| Software interface kit | 215005 |
| Wall mounting kit | 214829 |
| Outdoor installation kit (weather shield) | 215109 |
| Installation kit for pole or pipeline | 215108 |
| Power supply module | POWER-1 |
| Temperature compensated analog output module | AOUT-IT |
| Isolated RS-485 module | RS485-1 |
| DIN Rail Kit | 215094 |



PTB330TS Barometric Pressure Transfer Standard

Take the Lab to the Field



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

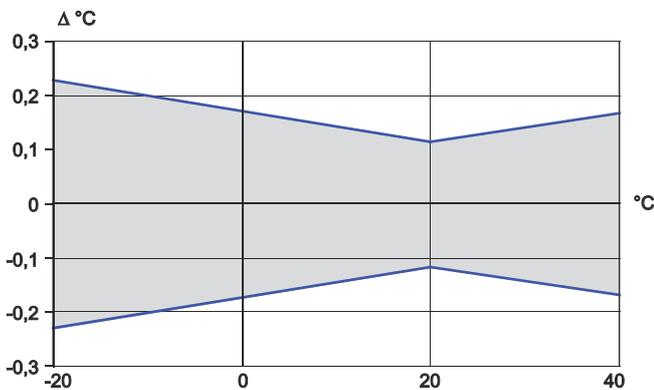
- ISO/IEC 17025 Accredited calibration for PTB330
- HMP155 options: additional temperature probe, manually controlled chemical purge feature
- MI70 Link software and USB or RS-232 cable for downloading measurement data to a computer
- USB service cable for connecting to PTB330 service port

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

| | |
|---|--|
| Operating temperature | -10 ... +40 °C (+14 ... +104 °F) |
| Operating humidity | Non-condensing |
| Maximum pressure limit | 5000 hPa abs. |
| Power supply | Rechargeable NiMH battery pack with AC-adaptor or 4xAA-size alkalines, type IEC LR6 |
| Menu languages | English, Chinese, French, Spanish, German, Russian, Japanese, Swedish, Finnish |
| Display | LCD with backlight, graphic trend display of any parameter, character height up to 16 mm |
| Data logging capacity | 2700 points |
| Alarm | Audible alarm function |
| Compliance | <ul style="list-style-type: none"> EMC Directive (2004/108/EC) Complies with the EMC product family standard EN61326-1 Electrical equipment for measurement control and laboratory use Basic immunity test requirements. Low Voltage Directive (2006/95/EC) ROHS Directive (2002/95/EC) |
| Operation Time (Using Rechargeable Battery Pack) | |
| 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 ¹⁾ | ±0.05 hPa |
| Hysteresis ¹⁾ | ±0.03 hPa |
| Repeatability ¹⁾ | ±0.03 hPa |
| Calibration uncertainty ²⁾ | ±0.07 hPa |
| Accuracy at +20 °C (+68 °F) ³⁾ | ±0.10 hPa |
| Temperature dependence ⁴⁾ | ±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 (9 ... 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) ⁵⁾ ±1.0 %RH (40 ... 97 %RH) ⁵⁾ |
| Humidity sensor | HUMICAP180R HUMICAP180RC |
| Response time at +20 °C 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 | ±(0.176 - 0.0028 x temperature) °C |
| +20 ... +40 °C | ±(0.07 + 0.0025 x temperature) °C |
| Temperature sensor | Pt100 RTD Class FO.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

PTB330

| | |
|--------------------|---|
| 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 |

HMP155

| | |
|---------------------------------|---------------|
| Housing material | PC |
| IP rating | IP66 |
| Additional T-probe cable length | 2 m |
| Cable material | PUR |
| Sensor protection | Sintered PTFE |

MI70 Measurement Indicator

| | |
|------------------|--------------|
| IP rating | IP54 |
| Housing material | ABS/PC blend |

Transport Case

| | |
|---|---|
| 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 lbs) |
| Exterior dimensions (L × W × H) | 405 × 330 × 165 mm (15.94 × 12.99 × 6.50 in) |

Spare Parts and Accessories

PTB330

| | |
|---|----------|
| 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 |

MI70

| | |
|---|----------|
| 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 |

HMP155

| | |
|--|-------------|
| 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 and ships, airports, and agrology. They are 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. They are available in two basic 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, that 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 (Units in hPa), Accuracy

| | | | |
|---|--------------|-------------|--------|
| Pressure range | 500 ... 1100 | 50 ... 1100 | |
| | Class A | Class B | |
| Non-linearity ¹⁾ | ± 0.10 | ± 0.15 | ± 0.20 |
| Hysteresis ¹⁾ | ± 0.05 | ± 0.05 | ± 0.10 |
| Repeatability ¹⁾ | ± 0.05 | ± 0.05 | ± 0.10 |
| Calibration uncertainty ²⁾ | ± 0.07 | ± 0.15 | ± 0.20 |
| Accuracy at +20 °C (+68 °F) ³⁾ | ± 0.15 | ± 0.20 | ± 0.35 |
| Temperature dependence ⁴⁾ | ± 0.20 | ± 0.20 | ± 0.40 |
| Total accuracy -40 ... +60 °C (-40 ... +140 °F) ³⁾ | ± 0.25 | ± 0.30 | ± 0.50 |
| Long term stability (hPa/year) | ± 0.10 | ± 0.10 | ± 0.20 |

Analog Output, Accuracy

| | |
|---|-----------------|
| Non-linearity ¹⁾ | ± 0.20 hPa |
| Hysteresis ¹⁾ | ± 0.05 hPa |
| Repeatability ¹⁾ | ± 0.05 hPa |
| Calibration uncertainty ²⁾ | ± 0.15 hPa |
| Accuracy at +20 °C (+68 °F) ³⁾ | ± 0.30 hPa |
| Temperature dependence ⁴⁾ | ± 0.50 hPa |
| Total accuracy -40 ... +60 °C (-40 ... +140 °F) ³⁾ | ± 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 | Non-condensing |
| EMC compliance | EN61326-1, Generic Environment |

Mechanical Specifications

| | |
|------------------------|-----------------|
| Housing material | PC Plastic |
| IP rating, electronics | IP65 (NEMA 4) |
| IP rating, sensor | IP53 |
| Instrument weight | 110 g (3.9 oz) |
| Cable weight | 28 g/m (1.0 oz) |

Inputs and Outputs

Serial Output

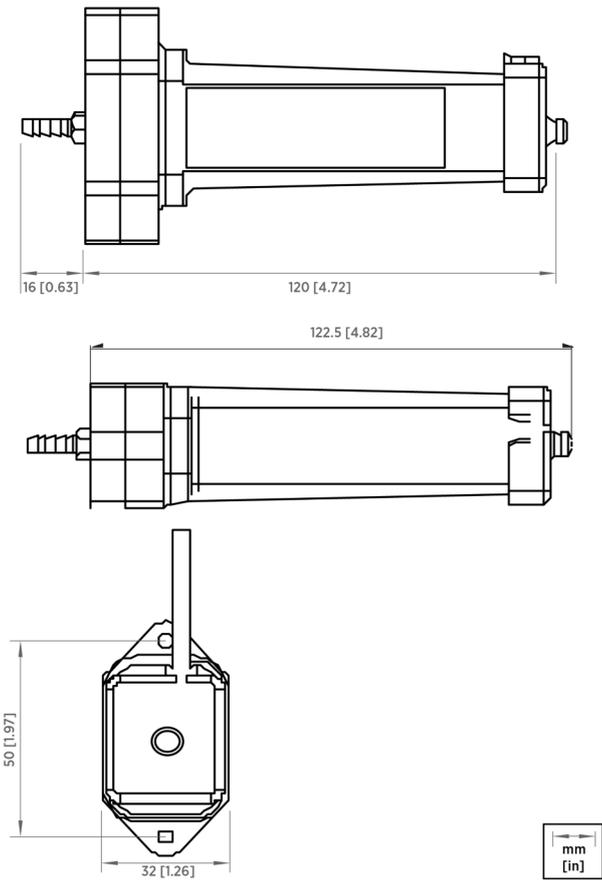
| | |
|--------------------------------------|---|
| Shutdown | ON/OFF |
| Settling time at startup | 2 s |
| Serial I/O | RS-232C RS-232C /TTL (optional) RS-485, non isolated (optional) |
| Parity | None, even, odd |
| Data bits | 7, 8 |
| Stop bits | 1, 2 |
| Baud rate | 1200, 2400, 4800, 9600, 19200 |
| 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, power down mode | < 0.8 mA |
| Current consumption, shutdown mode | 0.2 mA |

Analog Output

| | |
|------------------------------------|--|
| Outputs | 0 ... 5 VDC, 0 ... 2.5 VDC (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 abs. |
| 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 VDC |
| Supply voltage (reverse polarity protected), with RS-485 or analog output | 8 ... 18 VDC |





Features

- Vaisala BAROCAP® sensor
- Several pressure ranges
- Accuracy ± 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 ... 1 100 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 |
| Accuracy | |
| Linearity ¹⁾ | ±0.25 hPa |
| Hysteresis ¹⁾ | ±0.03 hPa |
| Repeatability ¹⁾ | ±0.03 hPa |
| Pressure calibration uncertainty ²⁾ | ±0.15 hPa |
| Voltage calibration uncertainty | ± 0.7 mV |
| Frequency calibration uncertainty | ± 0.3 Hz |
| Accuracy at +20 °C (+68 °F) ³⁾ | ±0.3 hPa |
| Total Accuracy at | |
| +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

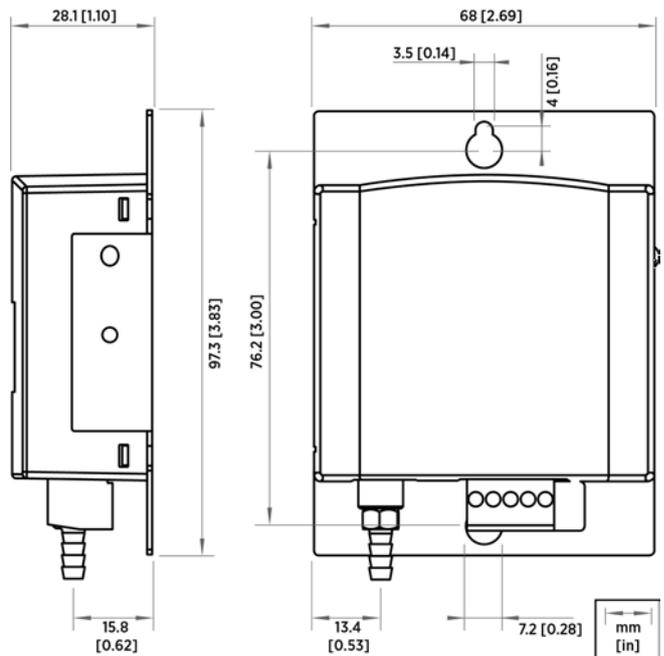
| | |
|-----------------------|---|
| Operating temperature | -40 ... +60 °C (-40 ... +140 °F) |
| Storage temperature | -40 ... +60 °C (-40 ... +140 °F) |
| Operating humidity | Non-condensing |
| EMC compliance | EN/IEC 61326-1, Electrical equipment for measurement, control and laboratory use - industrial environment |

Mechanical Specifications

| | |
|------------------------|--|
| IP rating | IP32 |
| Dimensions (H × W × D) | 97.3 × 68.4 × 28.1 mm (3.83 × 2.69 × 1.10 in) |
| Weight | 90 g (3.2 oz) |
| Materials | |
| Housing cover | Plastic ABS/PC blend |
| Mounting plate | Aluminum |

Inputs and Outputs

| | |
|----------------------------|--|
| Supply voltage | 10 ... 30 VDC |
| 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 VDC 0 ... 5 VDC |
| 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 |



SPH10/20 Static Pressure Heads

For Minimizing Wind Induced Error

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.



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

Technical Data

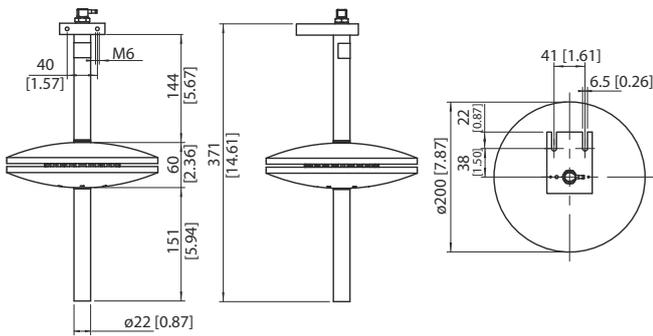
Operating Environment

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) |

Dimensions in mm (inches)



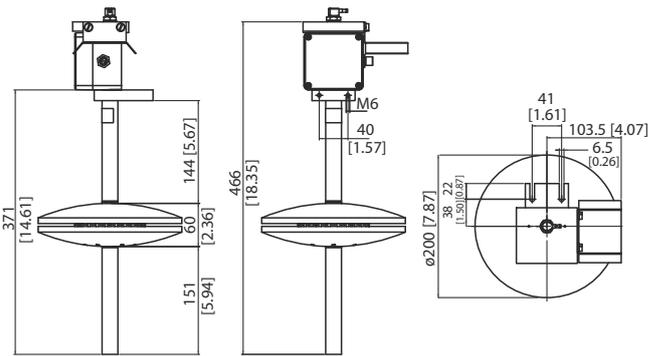
SPH10

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) |



SPH20



Features

- Easy mounting on wall, DIN rail or panel
- 2 pressure ranges (Pa and in H₂O)
- Accessible zero and span adjustment potentiometers
- ¼" brass tubing connections
- LED status indicator
- Specially designed for critical and regulated environments
- Euro style detachable connector
- NIST traceable (certificate included)

Vaisala Differential Pressure Transmitter PDT101 offers precise measurement and control of very low pressures.

Operating Environment

PDT101 is designed especially for demanding life science and high technology cleanroom applications. The transmitter is ideal for incorporating into the Vaisala Veriteq Continuous Monitoring System to measure and monitor the critical environmental parameters as required in regulated environments.

Performance

PDT101 offers high accuracy, sensitivity and stability with accuracy 0.40 % 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 PDT101 transmitter is available with voltage output (3-wire) or current output (2-wire).

Zero and span adjustment screws are available on every PDT101 model. Both adjustments are accessible from the front of the unit.

Applications

PDT101 is suitable for high performance cleanroom environments in the life science, semiconductor and electronics industries. As part of a continuous monitoring system, it is highly suitable for regulated environments where continuous, documented and redundant data is a requirement to meet FDA 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

Measurement Performance

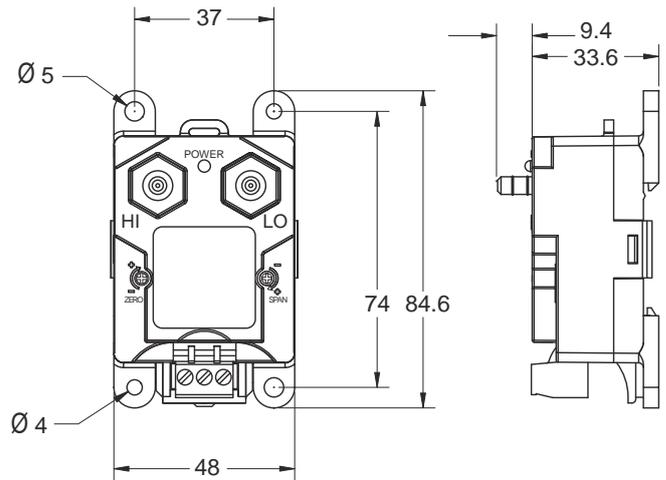
| | |
|--|---|
| Measurement ranges (bidirectional) | ±60 Pa ±0.25 in H ₂ O |
| Accuracy (incl. non-linearity, hysteresis, repeatability and zero/span calibration settings) | 0.4 % span |
| Long-term stability | ≤0.5 % span/year |
| Response time (10 ... 90 %) | 250 ms |
| Warm-up time | 15 s |
| Compensated temperature range | +2 ... +54 °C (+35.6 ... +129.2 °F) |
| Temperature dependence | ±(0.065 Pa + 0.054 % of reading) / °C or ±(0.00015 in H ₂ O + 0.03 % of reading) / °F (reference 21 °C or 70 °F) |
| Pressure type | Differential, gauge, vacuum and compound |
| Overpressure | |
| Proof pressure | 1.0 bar |
| Burst pressure | 1.7 bar |
| Static pressure | 1.7 bar |
| Mounting Position | |
| Error (zero adjustable) | ≤1 %/g (calibration in vertical position is standard) |
| Adjustments (Front Accessible) | |
| Zero | ±5 % span |
| Span | ±3 % span |

Operating Environment

| | |
|---|--|
| Operating temperature | -18 ... +70 °C (-0.4 ... +158 °F) |
| Storage temperature | -40 ... +82 °C (-40 ... +179.6 °F) |
| EMC compliance | EN 61326-1, Basic immunity test requirements |
| 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 %) | |

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 EN50022 |
| IP rating | IP40 |
| Weight | 0.07 kg |
| Material | |
| Process connection | Brass |
| Sensor element | Silicon, aluminium, glass |
| Case | NEMA type 1 fire-retardant ABS 1 (meets UL94-5VA) |

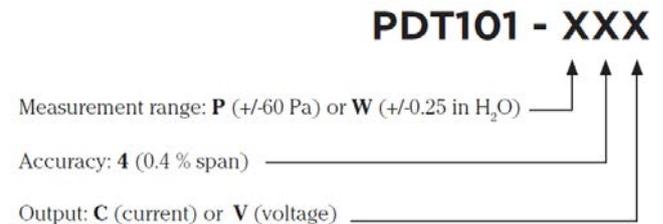


Dimensions in mm

Inputs and Outputs

| | |
|--------------------------------------|---|
| Process connection | 1/4" barbed fittings |
| Max. loop resistance for 4 ... 20 mA | ≤ (Supply voltage - 12V)/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 ²) |
| Output Signal | |
| 2-wire | 4 ... 20 mA |
| 3-wire | 0 ... 5 VDC (user selectable 0 ... 10 VDC) |
| Operating Voltage | |
| 2-wire output 4 ... 20 mA | 12 ... 36 VDC |
| 3-wire output 0 ... 5 VDC | 11.5 ... 36 VDC |
| 3-wire output 0 ... 10 VDC | 14 ... 36 VDC or 24 VAC |

Order Information for PDT101





Features

- In-place system calibration and on-line 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
- NIST traceable 9 point calibration with certificate
- 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 Veriteq 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 ₂ O |
| Accuracy (incl. non-linearity, hysteresis, repeatability and zero/span calibration settings) | 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 ⁻⁴ 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 ₂ O + 0.02 % of reading) / °F (reference 21 °C or 70 °F) |
| Pressure type | Differential, gauge, vacuum and compound |
| Overpressure | |
| Proof pressure | 0.7 bar |
| Burst pressure | 1.7 bar |
| Static pressure | 1.7 bar |
| Mounting Position | |
| Error (zero adjustable) | ≤0.25 % |
| Adjustments (Front Accessible) | |
| Zero | ±5 % span |
| Span | ±3 % span |

Operating Environment

| | |
|-----------------------|--|
| Operating temperature | -29 ... +70 °C (-20.2 ... +158 °F) |
| Storage temperature | -40 ... +82 °C (-40 ... +179.6 °F) |
| EMC compliance | EN 61326-1, Basic immunity test requirements |

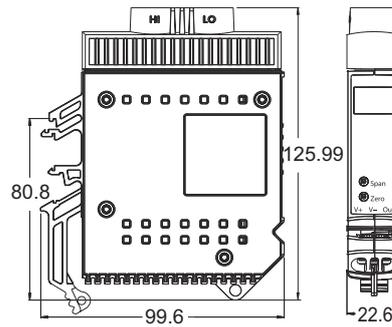
Note: If used in an electromagnetic field of 3 V/m, with narrow frequency area of 80 - 120 Mhz, it is possible that the current output of PDT101 can deviate max. 0.3 % (with accuracy specified 0.25 %)

Inputs and Outputs

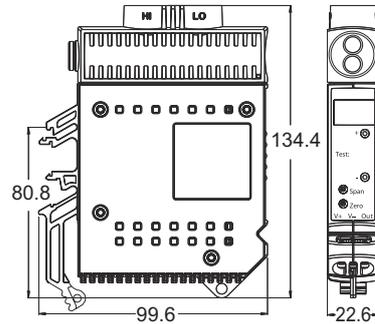
| | |
|--------------------------------------|---|
| Process connection | 1/8 NPT female according to ANSI/ASME B1.20.1 |
| Operating voltage | 12 ... 36 VDC |
| Max. loop resistance for 4 ... 20 mA | ≤ (Supply voltage - 12V)/0.022 A |
| Electrical connection | Screw terminals, 12 ... 22 AWG (0.33 up to 3.31 mm ²) |
| Output Signal | |
| 2-wire | 4 ... 20 mA |
| 3-wire | 0 ... 5 V |
| Supply Current | |
| 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 |
| IP rating | IP30 |
| Weight | 0.16 kg |
| Material | |
| Process connection | Brass |
| Sensor element | Silicon, aluminium, glass |
| Case | Polycarbonate, glass filled (UL94-V-1) |

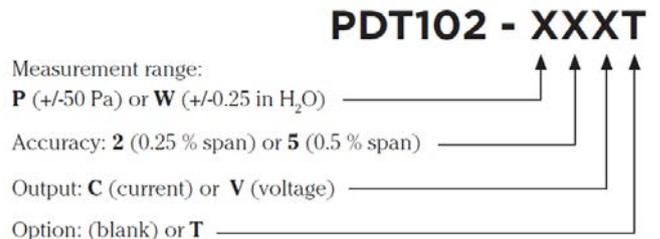


PDT102. Dimensions in mm.



PDT102 with Process Valve Actuator and Test Jacks. Dimensions in mm.

Order Information for PDT101





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 crossarm. 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 crossarm, 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 six 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 in cold climates.

Complete Package Available

The anemometer and vane are designed to be mounted on Vaisala crossarms. WHP151 power supply provides the operating and heating power needed for WA15. The power supply, as well as the signal and power cables are available as options.

Technical Data

Measurement Performance

| | |
|----------------------------------|----------------------------------|
| Sensor/Transducer type | Cup anemometer/opto-chopper |
| Observation range | 0.4 ... 75 m/s (0.9 ... 168 mph) |
| Starting threshold ¹⁾ | < 0.5 m/s (1.1 mph) |
| Distance constant | 2.0 m (6 ft 7 in) |

Transducer Output

| | |
|----------------------------------|--|
| 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) |

Transducer Output Level

| | |
|----------------------|------------------------------|
| ($I_{out} < +5$ mA) | High state > $U_{in} -1.5$ V |
| ($I_{out} > -5$ mA) | Low state < 2.0 V |

Accuracy Within 0.4 ... 60 m/s (0.9 ... 134 mph)

| | |
|---|--|
| With characteristic transfer function (standard deviation) | ± 0.17 m/s (0.38 mph) |
| With simple transfer function $U_f = 0.1 \times R$ | ± 0.5 m/s (1.12 mph) ²⁾ |

- 1) 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.
2) 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 |

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 | $U_{in} = 9.5 \dots 15.5$ VDC, 20 mA typical |
| Heating power supply | AC or DC 20 V, 500 mA nominal |
| Settling time after power-up | < 30 μ s |

Operating Environment

| | |
|-------------------------------------|----------------------------------|
| Operating temperature ¹⁾ | -50 ... +55 °C (-58 ... +131 °F) |
| Storage temperature | -60 ... +70 °C (-76 ... +158 °F) |
| Operating humidity | 0 ... 100 %RH |

- 1) With shaft heating.

Mechanical Specifications

| | |
|--|--|
| IP rating | IP65 |
| Dimensions (H \times \varnothing) | 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) |

Materials

| | |
|---------|----------------------------------|
| Housing | AlMgSi, gray anodized |
| Cup | PA, reinforced with carbon fiber |

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 |

Transducer Output Level

| | |
|----------------------|------------------------------|
| ($I_{out} < +5$ mA) | High state > $U_{in} -1.5$ V |
| ($I_{out} > -5$ mA) | Low state < 1.5 V |

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 | $U_{in} = 9.5 \dots 15.5$ VDC, 20 mA typical |
| Heating power supply | AC or DC 20 V, 500 mA nominal |
| Settling time after power turn-on | < 100 μ s |

Operating Environment

| | |
|-------------------------------------|----------------------------------|
| Operating temperature ¹⁾ | -50 ... +55 °C (-58 ... +131 °F) |
| Storage temperature | -60 ... +70 °C (-76 ... +158 °F) |
| Operating humidity | 0 ... 100 %RH |

Operating Environment

| | |
|-------------------------------------|----------------------------------|
| Operating temperature ¹⁾ | -50 ... +55 °C (-58 ... +131 °F) |
| Storage temperature | -60 ... +70 °C (-76 ... +158 °F) |
| Operating humidity | 0 ... 100 %RH |

- 1) With shaft heating.

Mechanical Specifications

| | |
|--|---|
| IP rating | IP65 |
| Dimensions (H \times \varnothing) | 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) |

Materials

| | |
|---------|-----------------------|
| Housing | AlMgSi, gray anodized |
| Vane | AISI 12, anodized |

WA15 Mechanical Specifications

Dimensions

| | |
|--|---|
| Junction box | 125 \times 80 \times 57 mm (4.92 \times 3.15 \times 2.24 in) |
| Crossarm length | 800 mm (31.50 in) |
| Mounting to a pole mast with a nominal outside diameter | 60 mm (2.36 in) |

WA15 Spare Parts and Accessories

| | |
|---|-------------|
| Service kit for one WA15/25 sensor (a set of bearings and gasket) | 16644WA |
| Cup assembly WAA151 | 7150WA |
| Tail assembly WAV151 | 6389WA |
| Sensor board WAA151 | 1433WA |
| Sensor board WAV151 | 1434WA |
| Attachment hardware for WAA151/252 and WAV151/252 | 16546WA |
| Crossarm and serial RS-485 transmitter | WAC155 |
| Component board for WAC155 | WAC155CB |
| Crossarm 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 WAA151, WAA252 | 230118 |
| Connector WAV151, WAV252 | 230119 |
| Crossarm and analog transmitter | WAT12 |
| Component board for WAT12 | 16637WA |
| Power supply for WA15 | WHP151 |
| Power board for WHP151 power supply | WA35120 |

VAISALA

www.vaisala.com

| | |
|---|------------------------|
|  | www.esis.com.au |
| | Ph 02 9481 7420 |
| | Fax 02 9481 7267 |
| | esis.enq@esis.com.au |

WMT700 Ultrasonic Wind Sensor Series



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 the updated - WMO-No.8 guide, 7th edition - and ICAO requirements.

Accurate and Maintenance-free

WMT700 series has a durable full steel structure with welded arms, clear North indication, and onepoint, 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 validation of measurement are standard features. The 60-minute average is available for polar coordinates and vectors.

Measurement Based on Ultrasound

WMT700 series uses ultrasound to determine 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 two measurements for each of the three 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 VDC. For the heated model, an additional heating power supply of 24 ... 36 VDC is required.

Thermostatically controlled heaters in the transducer heads and arms of the heated model prevent build-up of freezing rain or snow. A model with a heated transducer, arms, and body is also 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.

Features

- WMO and ICAO compliant
- Data output rate 4 Hz and 8 Hz
- Stainless steel structure
- Maintenance-free
- Three-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 the WMO guidelines
- US National Weather Service and the FAA rely on Vaisala WINDCAP® technology



DNV GL TYPE EXAMINATION CERTIFICATE No. TAA00000U5

Technical Data

Wind Speed Measurement Performance

| | |
|--------------------|---|
| Measurement 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 VDC (absolute max. 40 VDC) ¹⁾ |
| Heating voltage | 24 ... 36 VDC (absolute max. 40 VDC) ¹⁾ |
| Heating Power Supply Requirement ²⁾ | |
| Heated transducers | Average 32 W at 24 V Peak 40 W at 24 V |
| Heated transducers and arms | Average 152 W at 24 V Peak 200 W at 24 V |
| Heated transducers, arms, and body | Average 252 W at 24 V Peak 350 W at 24 V |

¹⁾ In maritime environments, the normal input voltage ranges are: operating voltage 10 ... 30 VDC (-10 ... +30 %) and heating voltage 24 ... 30 VDC (-10 ... +30 %), as defined in the maritime standard IEC 60945.

²⁾ The actual power consumption depends on the temperature.

Messaging Specifications

| | |
|-------------------------|-----------------------------------|
| Readout update interval | 4Hz (default) and 8 Hz (optional) |
| Units available | m/s, knots, mph, km/h, V, mA, Hz |
| Operating mode | Automatic message or poll mode |
| Virtual temperature | Celsius degrees |

Mechanical Specifications

| | |
|---------------------------------------|---|
| IP rating | IP66 and IP67 |
| Dimensions (H × W × Ø ¹⁾) | 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 |

¹⁾ Diameter of area covered by transducers.

Accessories

| | |
|---|-----------------|
| Verifier | WMT70Verifier |
| Bird cage | WMT70BirdKit |
| Bird perch | WS425BirdPerch |
| Cable tightener tool | 237888SP |
| Junction Box with Cable 2 m (connected) | ASM210719SP |
| Cable 2 m (connector and open leads) | 227567SP |
| Cable 10 m (connector and open leads) | 227568SP |
| Cable 15 m (connector and open leads) | 237890SP |
| RS485 Cable 2 m (connector and open leads) | 228259SP |
| RS485 Cable 10 m (connector and open leads) | 228260SP |
| MAWS cable 10 m | 227565SP |
| AWS520 cable 10 m, shield connected to PE pin | 229807SP |
| AWS520 cable 10 m, shield not connected to PE pin | 227566SP |
| Adapter cable for WS425 serial | 227569SP |
| Adapter cable for WS425 analog frequency output | 227570SP |
| Adapter cable for WS425 analog voltage output | 227571SP |
| Adapter for FIX70 | 228869 |
| Fix70 (suitable also for inverted mounting) | WMT70FSP |
| Mounting adapter 60 mm POM | WMT700FIX60-POM |
| Mounting adapter 60 mm RST | WMT700FIX60-RST |
| Adapter for FIX30/FIX60 | 228777 |
| FIX30 | WS425Fix30 |
| FIX60 | WS425Fix60 |

Operating Environment

| | |
|-------------------------------------|---|
| Heating ¹⁾ | 0 W, 30 W, 150 W, or 250 W |
| Operating temperature ¹⁾ | -10 ... +60 °C (+14 ... +140 °F) -40 °C ... +60 °C (-40 ... +140 °F) -55 ... +70 °C (-67 ... +158 °F) |
| Storage temperature | -60 ... +80 °C (-76 ... +176 °F) |

| | |
|-------------------|---|
| Compliance | |
| Wind | ISO16622; MEASNET |
| EMC | IEC 61000-4-2 ... 6 |
| Environmental | IEC 60068-2-1,2,6/34, 30, 31, 67, 78, IEC 60529 VDA 621-415 |
| Maritime | DNVGL-CG-0339; Lloyd's Register requirements; IEC 60945 |

¹⁾ 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 MES12, customized |
| Bit rate | 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200 |
| Available averages | Max. 3600 s |

Analog Outputs

| | |
|----------------|---------------------------------|
| Wind speed | Voltage, current, frequency |
| Wind direction | Voltage, current, potentiometer |





Features

- Right parameter combination
- Easy to use and integrate
- Weather parameter hub
- Analog sensors can be added
- Compact, light-weight
- 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 six 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 using capacitive measurement for each parameter. This 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.



DNV GL TYPE EXAMINATION CERTIFICATE No. TAA00000VF

Technical Data

| Available options | Rain | Wind speed, Wind direction | Pressure, Temperature, Relative Humidity | Analog inputs | 2 × mA outputs |
|-------------------|------|----------------------------|--|---------------|----------------|
| WXT531 | ✓ | | | | |
| WXT532 | | ✓ | | | ✓ |
| WXT533 | ✓ | ✓ | | | |
| WXT534 | | | ✓ | | |
| WXT535 | ✓ | | ✓ | | |
| WXT536 | ✓ | ✓ | ✓ | ✓ | |

Barometric Pressure Measurement Performance

| | |
|-------------------------------|---|
| Observation range | 600 ... 1100 hPa |
| Accuracy (for sensor element) | ±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 (±0.5 °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) |
| 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 (= 60 min), at 1 s steps, on the basis of samples taken at 4, 2, or 1 Hz rate (configurable) |

Precipitation Measurement Performance

| | |
|---------------------------------------|--|
| Rainfall | Cumulative accumulation after the latest automatic or manual reset |
| Collecting area | 60 cm ² (9.3 in ²) |
| Output resolution | 0.01 mm (0.001 in) |
| Field accuracy for daily accumulation | Better than 5 %, weather-dependent |
| Rain | |
| Duration | Counting each 10-second increment whenever droplet detected |
| Duration output resolution | 10 s |
| Intensity | Running 1-minute average in 10-second steps |
| Intensity observation range | 0 ... 200 mm/h (0 ... 7.87 in/h) (broader range with reduced accuracy) |
| Intensity output resolution | 0.1 mm/h (0.01 in/h) |
| Hail | |
| Duration | Counting each 10-second increment whenever hailstone detected |
| Output resolution | 0.1 hits/cm ² (1 hits/in ²), 1 hit |
| Intensity | 1-minute running average in 10-second steps |
| Duration output resolution | 10 s |
| Intensity output resolution | 0.1 hits/cm ² h (1 hits/in ² h), 1 hit/h |

Inputs and Outputs

| | |
|---------------------------|---|
| Operating voltage | 6 ... 24 VDC (-10 ... +30 %) |
| Average power consumption | Minimum: 0.1 mA at 12 VDC (SDI-12 standby) Typical: 3.5 mA at 12 VDC with typical measuring intervals Maximum: 15 mA at 6 VDC (with constant measurement of all parameters) |
| Heating voltage | Options: DC, AC, full-wave rectified AC 12 ... 24 VDC (-10 ... +30 %) 12 ... 17 VACrms (-10 ... +30 %) |
| Typical heating current | 12 VDC: 0.8 A 24 VDC: 0.4 A |
| Digital outputs | SDI-12, RS-232, RS-485, RS-422 |
| Communication protocols | SDI-12 v1.3 ASCII automatic and polled NMEA 0183 v3.0 with query option |

Analog Input Options

| | |
|---------------------------|-------------------------|
| Solar radiation | Kipp & Zonen CMP3 |
| Level measurement | IRU-9429 |
| Tipping bucket rain gauge | Vaisala Rain Gauge RG13 |
| Temperature | Pt1000 |

Analog mA Output Options

| | |
|----------------|----------------------------|
| Wind speed | 0 ... 20 mA or 4 ... 20 mA |
| Wind direction | 0 ... 20 mA or 4 ... 20 mA |
| Load impedance | Max. 200 Ω |

Operating Environment

| | |
|-----------------------|----------------------------------|
| Operating temperature | -52 ... +60 °C (-60 ... +140 °F) |
| Storage temperature | -60 ... +70 °C (-76 ... +158 °F) |
| Relative humidity | 0 ... 100 %RH |
| Pressure | 600 ... 1100 hPa |
| Wind | 0 ... 60 m/s (0 ... 134 mph) |

Compliance

| | |
|----------------|--|
| EMC compliance | IEC 61326-1 IEC 60945 IEC 55022:2010 Class B |
| Environmental | IEC 60068-2-1, 2, 6, 14, 30, 31, 52, 78 IEC60529 VDA 621-415 |
| Maritime | DNVGL-CG-0339 IEC 60945 |



Vaisala Calibration Includes

- Calibration at Vaisala preselected points or customer-selected points within the instrument's measurement range
- Instrument adjustment
- Traceability to industry recognized standards
- Calibration certificate
- Service report
- Wearing parts
- Functionality testing according to manufacturer specification

Even the best high-performance measurement instruments require regular calibration and maintenance to ensure they continue providing the most accurate data possible.



Why Calibrate

Vaisala's best-in-class measurement instruments provide the highest accuracy and precision across all types of applications. But even the highest performing measurement instruments drift over time. Drift can be caused by dirt and chemicals in the ambient air or simply by temperature changes. Regular calibration protects against incremental sensor drift and verifies that units are operating within the given specifications. Choosing the right calibration laboratory and service supplier can be as important for lifetime accuracy and reliability as the initial selection of the instrument. Our

high-performance calibration laboratories were established in 1958 and we are continually improving our technology, facilities, and capabilities to provide the high-quality services you expect from Vaisala.

Accredited Calibration

Many industries are required by regulatory bodies to comply with strict quality standards. We offer calibration services accredited by the world's leading accreditation authorities. ISO/IEC 17025 is the international standard used to accredit testing and calibration laboratories for measured quantities.

Standard Calibration

Standard calibration is regularly performed on our instruments before they leave the factory, with the selected calibration points varying by instrument. In order to maintain accuracy and avoid sensor drift over time, the equivalent calibration can also be purchased later. Our standard calibrations are traceable to national or international standards and meet ISO 9001 quality management standards. Calibration services in our laboratory in Boston, USA also meet ANSI/NSCL Z540.1 requirements.

Calibration Terminology

- **Calibration** – comparing the output of a measurement instrument against a reference instrument and reporting the result.
- **Adjustment** – changing the output to correspond to the output of a reference instrument.
- **Traceability** – a traceable measurement can be related to appropriate national or international standards through a documented, unbroken chain of comparisons.
- **Uncertainty** – a doubt that exists about the result of any measurement, calculated via three main sources: the reference used, the unit under calibration, and the calibration process used.
- **Calibration Interval** – the time between successive calibrations of an instrument.



Custom Calibration

If specific calibration points critical to your operation are needed, we also offer custom calibration. Calibrating and adjusting your instrument specifically for the critical points where the product is used will ensure reliable and accurate measurement in your application.

Let Us Care for and Protect Your Instruments!



Calibration as Part of Repair Services

If your instrument requires repairing, you can simply let us take care of it. The service includes repairing of the instrument with original parts, functionality testing, and the calibration you need. You can be sure to receive the instrument in its original specification.

Premium and Calibration Care Agreements

As your instrument provider, we want to make sure that your instruments get the best possible care and you get the best possible value from your investment.

For that reason we are offering two service options, Premium Care and Calibration Care.



Premium Care:

Premium Care protects your investment. If your product is damaged or broken for any reason, return it to us and we will repair or replace it free of charge. It's that simple.

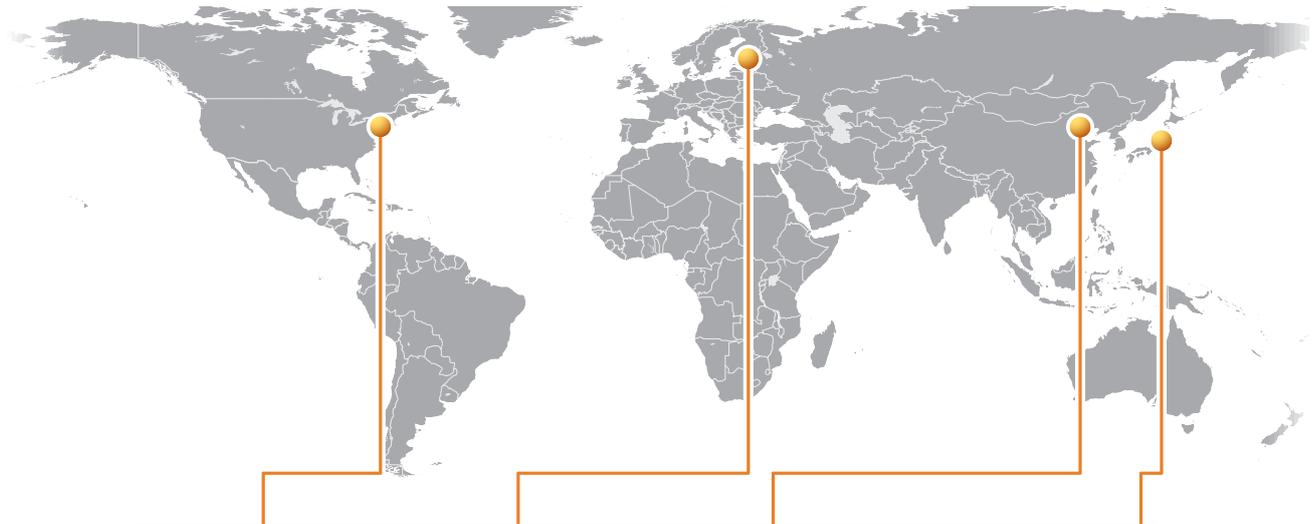


Calibration Care:

Calibration Care is a multiyear calibration agreement with several benefits compared to single purchases of services, from discounted cost to priority service.

| Benefits | Calibration Care | Premium Care |
|--|------------------|--------------|
| Customer loyalty discounted pricing | ✓ | ✓ |
| No price changes during the multiyear agreement | ✓ | ✓ |
| Calibration settings pre-registered for efficient processing of all service orders | ✓ | ✓ |
| Free shipping, both to and from Vaisala | ✓ | ✓ |
| Priority handling of your order | ✓ | ✓ |
| Non-standard or special calibration requirements available | ✓ | ✓ |
| Full service with repairs and maintenance included | | ✓ |

Vaisala Service Centers



| Boston, USA | Helsinki, Finland | Beijing, China | Tokyo, Japan |
|--|--|--|--|
| STANDARD CALIBRATION SERVICES | | | |
| Relative Humidity | Relative Humidity | Relative Humidity | Relative Humidity |
| Temperature | Temperature | Temperature | Temperature |
| Dew Point | Dew Point | Dew Point | Dew Point |
| Barometric Pressure | Barometric Pressure | Barometric Pressure | Barometric Pressure |
| Carbon Dioxide | Carbon Dioxide Hydrogen Peroxide | Carbon Dioxide | Carbon Dioxide |
| ACCREDITED CALIBRATION SERVICES | | | |
|  CALIBRATION LABORATORY CERTIFICATE # 2583.01 |  FINAS FINAS ACCREDITATION SERVICE K008 (EN ISO/IEC 17025) |  CNAS CALIBRATION SERVICE CNAS L10243 |  JCSS JCSS 0123 |
| Relative Humidity | Relative Humidity | Relative Humidity | Relative Humidity |
| Temperature | Temperature | Temperature | |
| Dew Point | Dew Point | | Dew Point |
| Barometric Pressure | Barometric Pressure | Barometric Pressure | |
| | Carbon Dioxide | | |

For more information about our services and how to order, please go to www.vaisala.com/calibration.

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