# Product Catalog

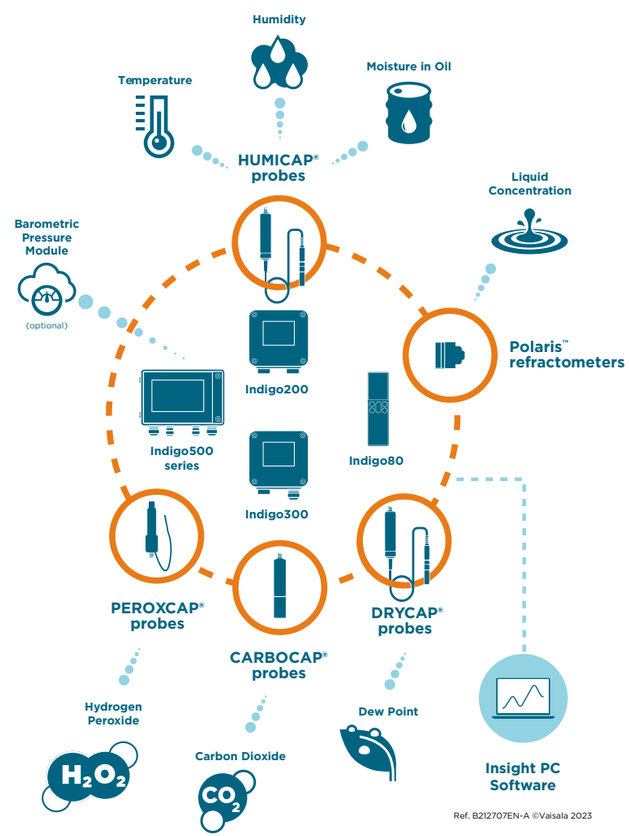
Probes · Transmitters · Software · Applications

**VAISALA INDIGO FAMILY**

VAISALA

# Modular measurement system to fit every need

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




## The Vaisala Indigo Family in brief

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

## Probes with high accuracy and stability

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

## Robust transmitters with value-adding functionalities

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

## Insight software for easy self-service and data visualization

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

**What combination is the best for you?**

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

# Indigo compatible probes

## Humidity and temperature probes

Indigo-compatible humidity and temperature probes are based on the space-proof Vaisala HUMICAP® technology, the world's first thin-film capacitive humidity sensor. Vaisala HUMICAP™ sensors guarantee quality and reliability, with a reputation for accuracy, excellent long-term stability, and negligible hysteresis.

Indigo-compatible humidity probes are suitable for a wide range of applications from industrial processes to life science and building automation. They provide a comprehensive list of output parameters, including relative humidity, temperature, dew point temperature, wet bulb temperature, absolute humidity, mixing ratio, water vapor pressure, and enthalpy. All probes are supplied with RS-485 non-isolated Modbus RTU output.

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

» Watch a video about Vaisala Indigo humidity and temperature probes and how to use them in different applications

# Dew point probes

Indigo-compatible dew point probes feature Vaisala's trusted DRYCAP® technology, specifically designed for humidity measurement in dry environments. The DRYCAP® sensor is particularly renowned for its reliable performance in hot and very dry environments. These probes excel in a range of applications, from drying processes to compressed air, dry chambers, and industrial ovens. All probes are supplied with RS-485 non-isolated Modbus RTU output.

| | DMP5<br>high temperatures | DMP6<br>very high temperatures | DMP7<br>leak-tight installation | DMP8<br>high-pressure or leak-tight installation |
|---|---|---|---|---|
| | | | | |
| MEASUREMENT RANGE | Dew point -40 … +100 °C<br>(-40 … +212 °F) Td/f<br>Temperature 0 … +180 °C<br>(+32 … +356 °F)<br>Mixing ratio 0 … 1000 g/kg<br>(0 … 7000 gr/lbs)<br>Absolute humidity 0 … 600 g/m3 | Dew point -25 … +100 °C<br>(-13 … +212 °F) Td/f<br>Mixing ratio 0 … 1000 g/kg<br>(0 … 7000 gr/lbs) | Dew point -70 … +80 °C<br>(-94 … +176 °F) Td/f<br>Temperature 0 … +80 °C<br>(+32 … +176 °F)<br>Relative humidity<br>0 … 70 %RH<br>Concentration by volume<br>10 … 2500 ppm | Dew point -70 … +80 °C<br>(-94 … +176 °F) Td/f<br>Temperature 0 … +80 °C<br>(+32 … +176 °F)<br>Relative humidity<br>0 … 70 %RH<br>Concentration by volume<br>10 … 2500 ppm |
| ACCURACY | Dew point ±2 °C<br>(±3.6 °F) Td/f<br>Temperature ±0.4 °C<br>(±0.72 °F) at +100 °C (+212 °F)<br>Mixing ratio ±12 % of reading<br>Absolute humidity ±10 % of reading (typical) | Dew point ±2 °C<br>(±3.6 °F) Td/f<br>Mixing ratio ±12 % of reading | Dew point Up to ±2 °C<br>(±3.6 °F) Td/f<br>Temperature ±0.2 °C at room temperature<br>Relative humidity ±0.004 %RH + 20% of reading<br>(RH <10 %RH, at + 20 °C)<br>Concentration by volume<br>1 ppm + 20% of reading<br>(at + 20 °C, 1 bar) | Dew point ±2 °C<br>(±3.6 °F) Td/f<br>Temperature ±0.2 °C at room temperature<br>Relative humidity ±0.004 %RH + 20% of reading<br>(RH <10 %RH, at + 20 °C)<br>Concentration by volume<br>1 ppm + 20% of reading<br>(at + 20 °C, 1 bar) |
| OPERATING ENVIRONMENT TEMPERATURE | probe head -40 … +180 °C<br>(-40 … +356 °F)<br>probe body -40 … +80 °C<br>(-40 … +176 °F) | probe head +100 … +350 °C<br>(+212 … +662 °F)<br>probe body -40 … +80 °C<br>(-40 … +176 °F) | probe head -40 … +80 °C<br>(-40 … +176 °F)<br>probe body -40 … +80 °C<br>(-40 … +176 °F) | probe head -40 … +80 °C<br>(-40 … +176 °F)<br>probe body -40 … +80 °C<br>(-40 … +176 °F) |
| OPERATIONAL PRESSURE | | | 0 … 10 bar (0 … 145 psia) | 0 … 40 bar (0 … 580 psia) |
| OUTPUT PARAMETERS | Absolute humidity<br>Relative humidity<br>Dew point temperature<br>Temperature<br>Dew/frost point temperature<br>Water concentration<br>Water mass fraction<br>Water vapor pressure<br>Enthalpy<br>Water vapor saturation pressure<br>Mixing ratio | Dew point temperature<br>Water concentration<br>Dew/frost point temperature<br>Water mass fraction<br>Water vapor pressure<br>Mixing ratio | Absolute humidity<br>Relative humidity<br>Dew point temperature<br>Temperature<br>Dew/frost point temperature<br>Water concentration<br>Water mass fraction<br>Water vapor pressure<br>Enthalpy<br>Water vapor saturation pressure<br>Mixing ratio | Absolute humidity<br>Relative humidity<br>Dew point temperature<br>Temperature<br>Dew/frost point temperature<br>Water concentration<br>Water mass fraction<br>Water vapor pressure<br>Enthalpy<br>Water vapor saturation pressure<br>Mixing ratio |
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# Carbon dioxide ($CO_2$) probes

Indigo-compatible carbon dioxide ($CO_2$) probes are based on Vaisala's unique CARBOCAP® technology that provides exceptional stability. They are ideal for applications such as incubators, greenhouses, food storage and transport, animal shelters, and demand-controlled ventilation. They can even be installed outdoors.

| | GMP251<br>%-level measurements | GMP252<br>ppm-level measurements |
|---|---|---|
| | | |
| MEASUREMENT RANGE | 0 … 20 % $CO_2$ | 0 … 10,000 ppm $CO_2$ (up to 30 000 ppm $CO_2$ with reduced accuracy) |
| ACCURACY | At 5 %$CO_2$ ±0.1 %$CO_2$<br>At 0 … 8 %$CO_2$ ±0.2 %$CO_2$<br>At 8 … 20 %$CO_2$ ±0.4 %$CO_2$ | 0 … 3000 ppm $CO_2$ ±40 ppm<br>$CO_2$ 3000 … 10 000 ppm $CO_2$ ±2 % of reading<br>Up to 30 000 ppm $CO_2$ ±3.5 % of reading |
| LONG-TERM STABILITY | At 0 … 8 %$CO_2$ ±0.3 %$CO_2$/year<br>At 8 … 12 %$CO_2$ ±0.5 %$CO_2$/year<br>at 12 … 20 %$CO_2$ ±1.0 %$CO_2$/year | 0 … 3000 ppm $CO_2$ ±60 ppm $CO_2$/year<br>3000 … 6000 ppm $CO_2$ ±150 ppm $CO_2$/year<br>6000 … 10 000 ppm $CO_2$ ±300 ppm $CO_2$/year |
| OPERATING ENVIRONMENT TEMPERATURE | -40 … +60 °C (-40 … +140 °F) | -40 … +60 °C (-40 … +140 °F) |
| OUTPUT OPTIONS | 0 … 5/10 V (scalable), min. load 10 kΩ<br>0/4 … 20 mA (scalable), max. load 500 Ω<br>RS-485: Modbus, Vaisala Industrial Protocol | 0 … 5/10 V (scalable), min. load 10 kΩ<br>0/4 … 20 mA (scalable), max. load 500 Ω<br>RS-485: Modbus, Vaisala Industrial Protocol |
| READ MORE | » DATASHEET<br>» VAISALA.COM | » DATASHEET<br>» VAISALA.COM |

» Watch a video on Vaisala CARBOCAP series GMP250 probes and how to use them in carbon dioxide measurements

# Vaporized hydrogen peroxide (H2O2) probes

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

| | HPP271<br>H2O2 vapor concentration | HPP272<br>H2O2 vapor concentration, relative saturation, humidity, and temperature |
|---|---|---|
| | | |
| MEASUREMENT RANGE | 0 … 2000 ppm<br>+5 … +50 °C (+41 … +122 °F) | 10...2000 ppm<br>+5 … +50 °C (+41 … +122 °F)<br>0 … 100 %RS<br>0 … 100 %RH |
| ACCURACY | At +10 … +25 °C (+50 … +77 °F) , 10 … 2000 ppm H2O2<br>±10 ppm or 5 % of reading (whichever is greater) | At +10 … +25 °C (+50 … +77 °F) , 10 … 2000 ppm H2O2 :<br>±10 ppm or 5 % of reading (whichever is greater)<br>±4 %RS<br>At +25 °C (77 °F), 0 ppm H2O2<br>0 … 90 %RH ±1 %RH |
| OPERATING ENVIRONMENT TEMPERATURE | +0 … +70 °C (+32 … +158 °F) | +0 … +70 °C (+32 … +158 °F) |
| OUTPUT PARAMETERS | Vaporized hydrogen peroxide concentration by volume<br><br>Water concentration by volume | Absolute H2O2 and H2O<br>H2O ppm by volume, water vapor saturation pressure (H2O and H2O+H2O2)<br>dew point temperature<br>vapor pressure (H2O and H2O2) |
| OUTPUT OPTIONS | RS-485, not isolated; do not use termination on the RS-485 line | RS-485, not isolated; do not use termination on the RS-485 line |
| READ MORE | » DATASHEET<br>» VAISALA.COM | » DATASHEET<br>» VAISALA.COM |

» Watch a video on how to connect a vaporized hydrogen peroxide probe to a Vaisala Indigo transmitter

# Moisture-in-oil probe

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

| | MMP8 |
|---|---|
| | |
| MEASUREMENT RANGE | Water activity 0 … 1 aw<br>Temperature -40 … +180 °C (-40 … +356 °F) |
| T90 RESPONSE TIME | 10 min |
| ACCURACY | Water activity ±0.01 aw (±1 %RS)<br>Water concentration in oil 10 % of the reading<br>Temperature ±0.2 °C (0.36 °F) at +20 °C (+68 °F) |
| OPERATING ENVIRONMENT TEMPERATURE | probe head -40 … +180 °C (-40 … +356 °F)<br>probe body -40 … +80 °C (-40 … +176 °F) |
| OPERATING PRESSURE RANGE | 0 … 40 bar (0 … 580 psia) |
| OUTPUT PARAMETERS | Relative saturation (%RS)<br>Temperature (°C)<br>Water activity<br>Water concentration in oil (ppmv ) |
| OUTPUT OPTIONS | RS-485, not isolated |
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» Watch an unboxing video on Vaisala Indigo520 Transmitter & MMP8 Probe

# Indigo Transmitters

## Host devices for Indigo smart probes

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

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

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

» Read more

# Software

## Vaisala Insight PC software

Vaisala Insight PC Software provides quick access to the configuration options and calibration data of Indigo-compatible probes. Probes can be detached from the process and connected to a PC with a USB cable to access Insight PC software. The software, which features an intuitive graphical user interface, also allows probe field calibration and adjustments. It also enables easy testing and evaluation – the 48-hour data logging functionality allows data to be recorded from up to six devices simultaneously, with easy export to an Excel-readable format.

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

» Download Insight PC software for free.

# Indigo80 handheld indicator

## For portable diagnostics

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

## Features

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

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

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

# Indigo for Vaisala's process refractometers

## Accurate liquid concentration measurements

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

| | PR53AC | PR53AP | PR53GC |
|---|---|---|---|
| | | | |
| MEASUREMENT | Measure Brix and other liquid concentrations | Measure Brix and other liquid concentrations | Measure concentrations of acids, alkaline solutions, alcohols, hydrocarbons, solvents, and various other solutions |
| BENEFIT | Inline measurement with instant productivity and material gains, and simplified process operation | Inline measurement with instant productivity and material gains, and simplified process operation | Inline measurement directly in pipeline, in production transport, and quality control |
| INDUSTRY | Food, beverage, dairy, and brewery | Food, beverage, dairy and brewery, including OEMs | Chemical, and other industries |
| READ MORE | » DATASHEET<br>» VAISALA.COM | » DATASHEET<br>» VAISALA.COM | » DATASHEET<br>» VAISALA.COM |

| | PR53GP | PR53SD | PR53W | PR53M |
|---|---|---|---|---|
| | | | | |
| MEASUREMENT | Measure concentrations of sugars/ Brix, acids, alkaline solutions, alcohols, hydrocarbons, solvents, and various other solutions | Measure TDS and other concentrations | Measure concentrations of aggressive chemicals: sulphuric acid ($H_2SO_4$), hydrochloric acid (HCl), sodium hydroxide (NaOH), and hydrofluoric acid (HF) | Measure concentrations of aggressive chemicals, including hydrochloric acid (HCl), sodium hydroxide (NaOH), sodium chloride (NaCl), sulphuric acid ($H_2SO_4$), and hydrofluoric acid (HF) |
| BENEFIT | Inline measurement directly in pipelines and tanks, in production transport and perform quality control | Process optimization, black liquor, green liquor, brown stock washing, and other liquid concentrations in fiber and chemical recovery lines | Durability in the harshest conditions. Measure safely and accurately in large pipelines and tanks, The PR53W process refractometer is mounted in a membrane-lined valve body, with no metallic wetted parts included. This allows convenient flange mounting to 1 and 2 inch ANSI and DN50 and DN25 flanges. | Durability in the harshest conditions. Measure safely and accurately, the integrated ultra-pure PTFE flow cell has no metallic wetted parts, making it fully suitable to be in contact with aggressive chemicals. The PR53M mounts into ½ inch process line with a standard NTP-threaded connection. |
| INDUSTRY | Sugar, chemical, petrochemical, and other industries | Pulp, paper | Chemical, biochemical, mining and metal refining | Chemical, semiconductor |
| READ MORE | » DATASHEET<br>» VAISALA.COM | » DATASHEET<br>» VAISALA.COM | » DATASHEET<br>» VAISALA.COM | » DATASHEET<br>» VAISALA.COM |

# Indigo for power transformers

## Real-time moisture measurement for power transformers

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

» Read more

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

# Indigo for outdoor measurement

## Outdoor weather kit for accurate measurement data

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

» Read more

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

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

# Sustainability in the heart of our business

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

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

» **Learn more about our sustainability.**

# Global coverage with local presence

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

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

» **Find your local contact.**

VAISALA

# HUMICAP® technology

## Pioneering technology innovation for modern humidity measurements

**HUMICAP sensor's unique benefits**

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

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

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

### We need to fix this

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

### HUMICAP is born

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

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

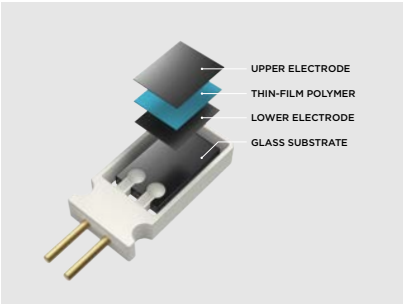
Since then, Vaisala has emerged as the market leader in relative humidity measurements, and thin-film capacitive humidity sensors have transcended being one company's invention to a global industry standard.

### How it works

HUMICAP is a capacitive thin-film polymer sensor consisting of a substrate on which a thin film of polymer is deposited between two conductive electrodes.

The electrode facing ambient air is made of porous metal to protect the sensor from contamination and exposure to condensation. The substrate is typically glass or ceramic. The thin-film polymer either absorbs or releases water vapor as the relative humidity of the ambient air rises or falls.

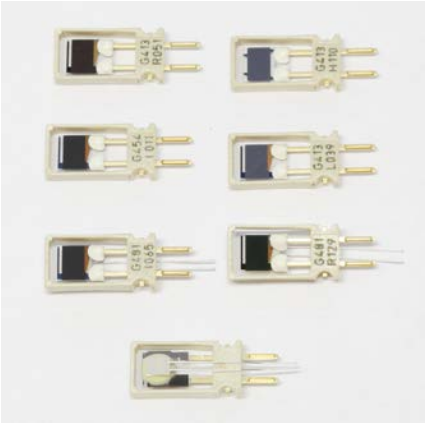
The dielectric properties of the polymer film depend on the amount of absorbed water. As the relative humidity around the sensor changes, the dielectric properties of the polymer film change, and so does the capacitance of the sensor. The instrument's electronics measure the capacitance of the sensor and convert it into a humidity reading.




Structure of the HUMICAP sensor

### Constantly evolving

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



Family of HUMICAP sensors

## Condensation prevention technology with warmed probe

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

## HUMICAP applications

Even though the HUMICAP innovation was originally designed for a new type of a radiosonde, the word got around about reliable humidity measurements, and created a growing demand in many industries and applications. Today we offer everything you need for measuring humidity, with a wide range of humidity instruments covering applications from HVAC to the most demanding industrial applications, both indoors and outdoors.

## If it works on Mars, it works anywhere

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

VAISALA

# HMP1 Wall-Mounted Humidity and Temperature Probe

Vaisala HUMICAP® Humidity and Temperature Probe HMP1 is designed for ambient measurement in indoor spaces. Its probe head and body are integrated into a single unit with no cable between them. HMP1 can be directly connected to Indigo300 and Indigo200 series transmitters to form a single wall-mounted unit.

**Features**

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

## Flexible connectivity

The probe can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight.

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

## Sensor purge minimizes effects of contaminants

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

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

## Mounting with probe holder

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

Probe holder

## Use with Indigo transmitters

With an Indigo300 or Indigo200 series transmitter, HMP1 forms a single wall-mounted unit with no probe cable or probe holder needed. Just push the probe directly into the connector on the transmitter and turn the locking wheel to hold the probe in place. Probe settings can be configured through the transmitter.

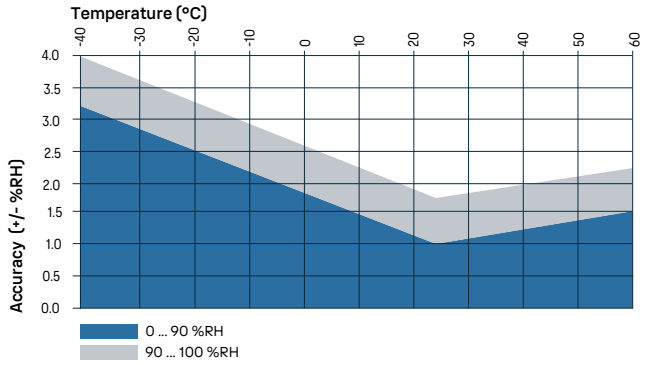
HMP1 with Indigo200 series

# Technical data

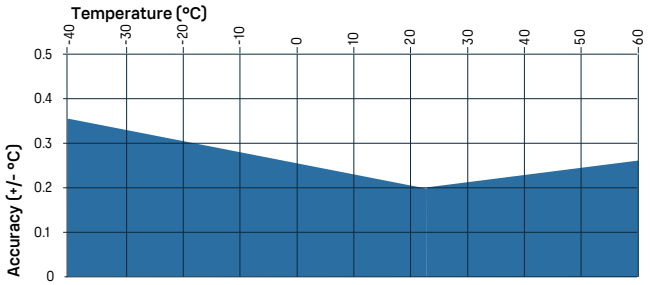
## Measurement performance

| | |
|---|---|
| **Relative humidity** | |
| Measurement range | 0–100 %RH |
| Accuracy at +23 °C (+73.4 °F) [1) 2)] | ±1.0 %RH (0–90 %RH) |
| Factory calibration uncertainty [3)] | ±0.7 %RH (0–40 %RH)<br>±1 %RH (40–95 %RH) |
| $T_{63}$ response time [4)] | 21 s |
| Sensor | HUMICAP® I |
| **Temperature** | |
| Measurement range | −40 ... +60 °C (−40 ... +140 °F) |
| Accuracy at +23 °C (+73.4 °F) [1) 2)] | ±0.2 °C (±0.36 °F) |
| Factory calibration uncertainty [3)] | ±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F) |
| $T_{63}$ response time [4)] | 70 s |

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




HMP1 humidity measurement accuracy as a function of temperature




HMP1 temperature measurement accuracy over full range

## Operating environment

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

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

## Accessories

| | |
|---|---|
| Indigo USB adapter [1)] | USB2 |

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

## Inputs and outputs

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

## Output parameters

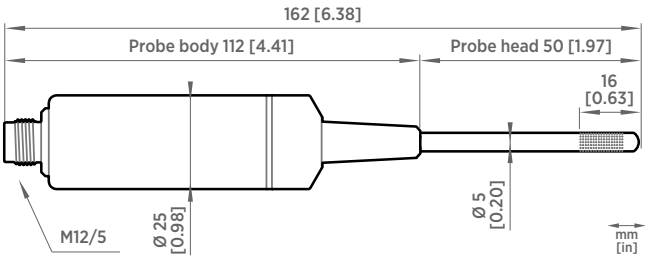
| | |
|---|---|
| Absolute humidity (g/m$^3$) | Relative humidity (%RH) |
| Absolute humidity at NTP (g/m$^3$) | Relative humidity (dew/frost) (%RH) |
| Dew point temperature (°C) | Temperature (°C) |
| Dew/frost point temperature (°C) | Water concentration (ppm$_v$) |
| Dew/frost point temperature at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

## Compliance

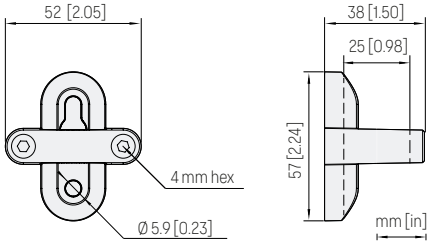
| | |
|---|---|
| EU directives and regulations | EMC Directive (2014/30/EU)<br>RoHS Directive (2011/65/EU) as amended by 2015/863 |
| Electromagnetic compatibility (EMC) | EN 61326-1, industrial environment |
| Compliance marks | CE, China RoHS, RCM |

## Mechanical specifications

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



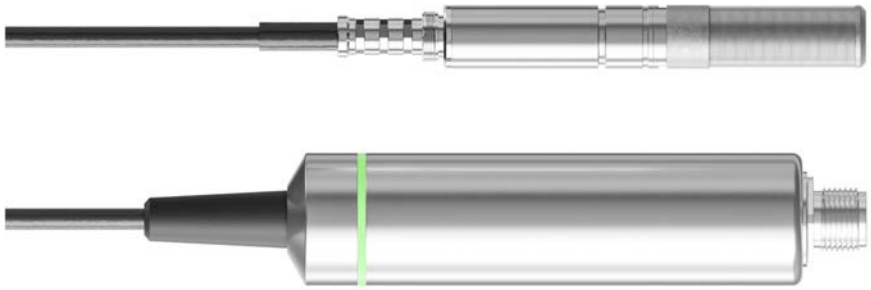

HMP1 probe dimensions




Probe holder ASM213582 dimensions

VAISALA

# HMP3 General Purpose Humidity and Temperature Probe



**Features**

- Available with field-replaceable HUMICAP® R2 sensor
- RH accuracy up to 0.8 %RH
- Temperature accuracy up to 0.1 °C (0.18 °F)
- Temperature measurement range −40 ... +120 °C (−40 ... +248 °F)
- Sensor purge improves long-term stability and chemical resistance
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products and Insight PC software

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

## Designed for field maintenance

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

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

## Sensor purge available with composite sensors

If purchased with a composite sensor instead of the field-replaceable HUMICAP® R2 sensor, HMP3 can use the sensor purge feature. In environments with high concentrations of chemicals and cleaning agents, sensor purge helps to maintain measurement accuracy between calibration intervals.

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

## Flexible connectivity

The probe can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight.

## Vaisala Indigo product family

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

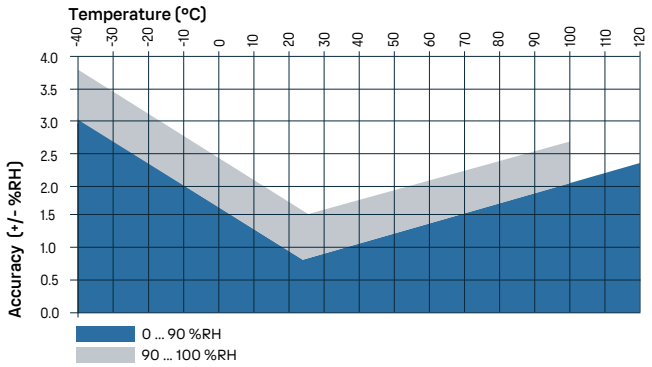
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see www.vaisala.com/indigo.

# Technical data

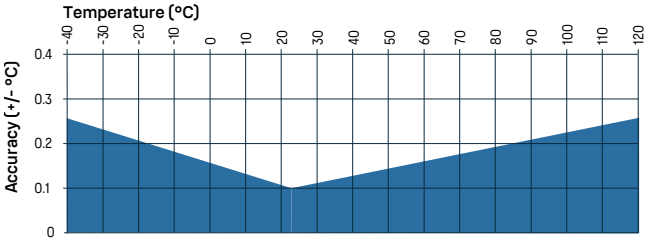
## Measurement performance

| | |
|---|---|
| **Relative humidity** | |
| Measurement range | 0–100 %RH, at max. +95 °C (203 °F) $T_d$ |
| Accuracy at +23 °C (+73.4 °F) [1] | ±0.8 %RH (0–90 %RH) |
| Factory calibration uncertainty [2] | ±0.5 %RH (0–40 %RH)<br>±0.8 %RH (40–95 %RH) |
| $T_{63}$ response time | 15 s |
| Sensor options | HUMICAP® R2<br>HUMICAP® R2C [3]<br>HUMICAP® 180VC [3] [4] |
| **Temperature** | |
| Sensor | Pt100 RTD Class F0.1 IEC 60751 |
| Measurement range | −40 ... +120 °C (−40 ... +248 °F) |
| Accuracy [1] | ±0.1 °C (±0.18 °F) |
| Factory calibration uncertainty [2] | ±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F) |

*1) Defined against calibration reference. Including non-linearity, hysteresis, and repeatability.*
*2) Defined as ±2 standard deviation limits. Small variations possible; see calibration certificate.*
*3) Sensor purge feature available with this sensor.*
*4) $H_2O_2$ resistant. With HUMICAP® 180VC sensor, accuracy is not specified below −20 °C (−4 °F) operating temperature.*




HMP3 humidity measurement accuracy as a function of temperature




HMP3 temperature measurement accuracy over full range

## Operating environment

| | |
|---|---|
| Operating temperature of probe body | −40 ... +80 °C (−40 ... +176 °F) |
| Operating temperature of probe head | −40 ... +120 °C (−40 ... +248 °F) |
| Operating humidity of probe head | Max. +100 °C (212 °F) $T_d$ |
| Storage temperature | −40 ... +80 °C (−40 ... +176 °F) |
| Operating environment | Suitable for outdoor use |
| Measurement environment | For air, nitrogen, hydrogen, argon, helium, and oxygen [1] |
| IP rating of probe body | IP66 |

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

## Inputs and outputs

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

## Output parameters

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

## Compliance

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

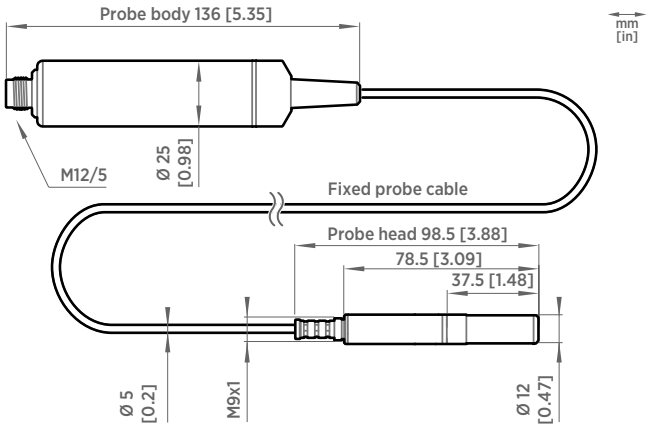
## Mechanical specifications

| | |
|---|---|
| Connector | M12 5-pin A-coded male |
| Weight (with a 2-m cable) | 302 g (10.65 oz) |
| Probe cable length | 0.15 m (0.49 ft), 2 m (6.56 ft), 5 m (16.40 ft) or 10 m (32.80 ft) |
| **Materials** | |
| Probe | AISI 316L |
| Probe body | AISI 316L |
| Cable jacket | FEP |

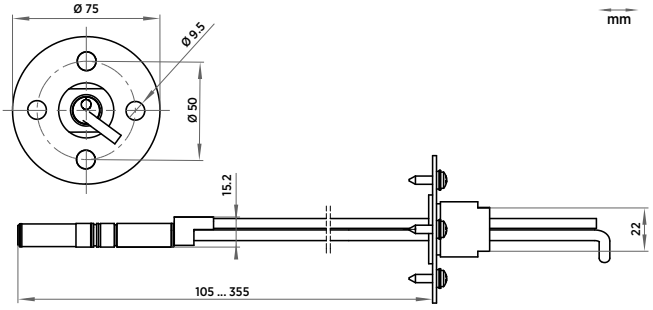
## Accessories

| | |
|---|---|
| Duct installation kit for humidity probe | 210697 |
| Solar radiation shield DTR502B | DTR502B |
| Cable gland M20×1.5 with split seal | HMP247CG |
| Magnetic probe holder for Ø 12 mm probe heads [1] | ASM213382SP |
| Indigo USB adapter [2] | USB2 |

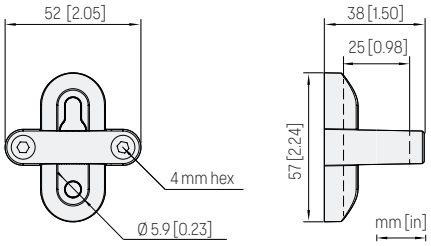
*1) Not suitable for use at extreme temperatures.*
*2) Vaisala Insight software for Windows available at www.vaisala.com/insight.*




HMP3 probe dimensions




Duct installation kit 210697 dimensions with probe

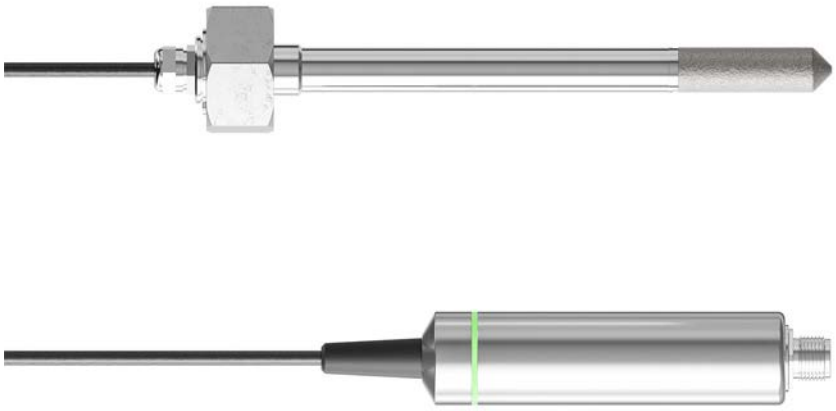



Probe holder ASM213582 dimensions

VAISALA

# 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 0–100 bar
- Sensor purge improves long-term stability and chemical resistance
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products and Insight PC software
- Traceable calibration certificate: 6 points for humidity, 1 point for temperature

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

### Proven Vaisala HUMICAP® performance

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

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

### Sensor purge minimizes effects of contaminants

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

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

### Flexible connectivity

The probe can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight.

### Vaisala Indigo product family

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

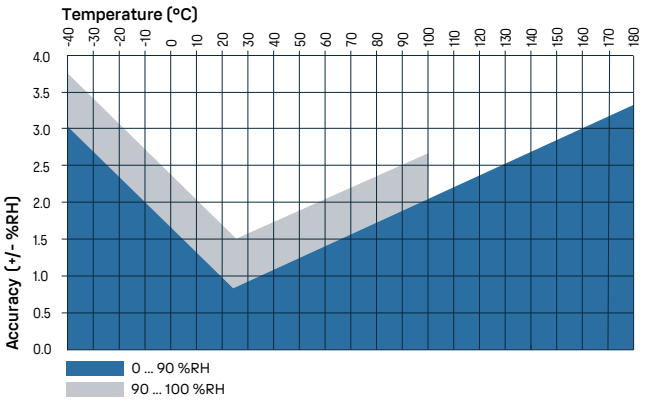
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see www.vaisala.com/indigo.

# Technical data

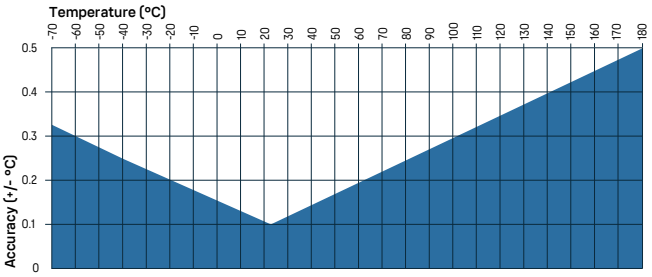
## Measurement performance

| | |
|---|---|
| **Relative humidity** | |
| Measurement range | 0–100 %RH, at max. +95 °C (203 °F) $T_d$ |
| Accuracy at +23 °C (+73.4 °F) [1] | ±0.8 %RH (0–90 %RH) |
| Factory calibration uncertainty [2] | ±0.5 %RH (0–40 %RH)<br>±0.8 %RH (40–95 %RH) |
| $T_{63}$ response time | 15 s |
| Sensor options | HUMICAP® R2<br>HUMICAP® R2C [3] |
| **Temperature** | |
| Measurement range | −70 ... +180 °C (−94 ... +356 °F) |
| Accuracy [1] | ±0.1 °C (±0.18 °F) |
| Factory calibration uncertainty [2] | ±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F) |
| Sensor | Pt100 RTD Class F0.1 IEC 60751 |

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




HMP4 humidity measurement accuracy as a function of temperature




HMP4 temperature measurement accuracy over full range

## Operating environment

| | |
|---|---|
| Operating temperature of probe body | −40 ... +80 °C (−40 ... +176 °F) |
| Operating temperature of probe head | −70 ... +180 °C (−94 ... +356 °F) |
| Operating humidity of probe head | Max. +100 °C (212 °F) $T_d$ |
| Storage temperature | −40 ... +80 °C (−40 ... +176 °F) |
| Operational pressure | < 100 bar |
| Operating environment | Suitable for outdoor use |
| Measurement environment | For air, nitrogen, hydrogen, argon, helium, oxygen, and vacuum [1] |
| IP rating of probe body | IP66 |

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

## Inputs and outputs

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

## Output parameters

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

## Compliance

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

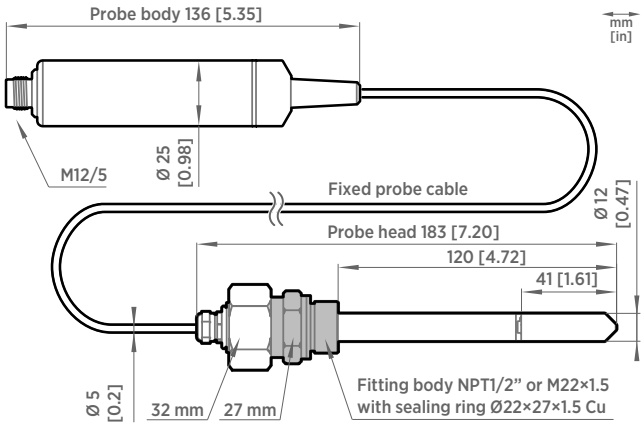
## Mechanical specifications

| | |
|---|---|
| Connector | M12 5-pin A-coded male |
| Fitting body | M22×1.5 or NPT1/2" |
| Weight (with a 2-m cable) | 530 g (18.7 oz) |
| Probe cable length | 2 m (6.56 ft) |
| **Materials** | |
| Probe | AISI 316 |
| Probe body | AISI 316 |
| Cable jacket | FEP |

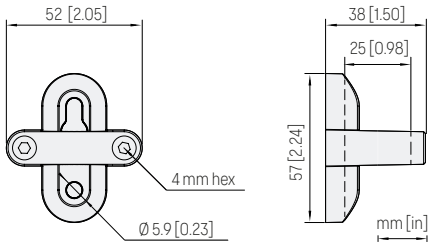
## Accessories

| | |
|---|---|
| Indigo USB adapter [1] | USB2 |
| Calibration adapter for HMK15 | 211302SP |

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




HMP4 probe dimensions

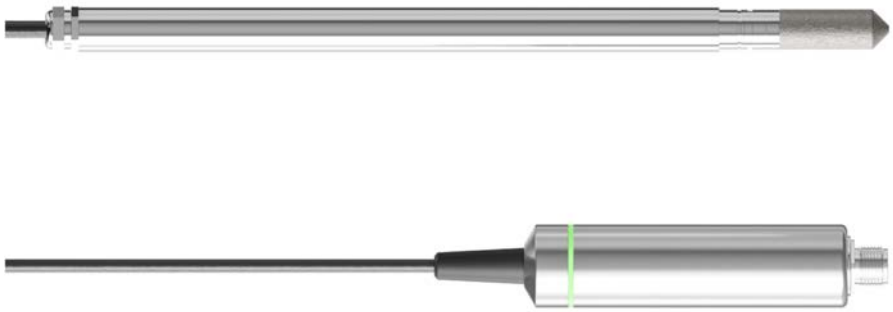



Probe holder ASM213582 dimensions

VAISALA

# HMP5 Relative Humidity and Temperature Probe

## For high temperatures



**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 of probe body −40 ... +80 °C (−40 ... +176 °F)
- Sensor purge improves long-term stability and chemical resistance
- Modbus® RTU over RS-485
- 250-mm (9.84 in) probe allows easy process installation through insulation
- Compatible with Vaisala Indigo products and Insight PC software
- Traceable calibration certificate: 6 points for humidity, 1 point for temperature

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

### Proven Vaisala HUMICAP® performance

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

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

### Sensor purge minimizes effects of contaminants

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

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

### Flexible connectivity

The probe can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight.

### Vaisala Indigo product family

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

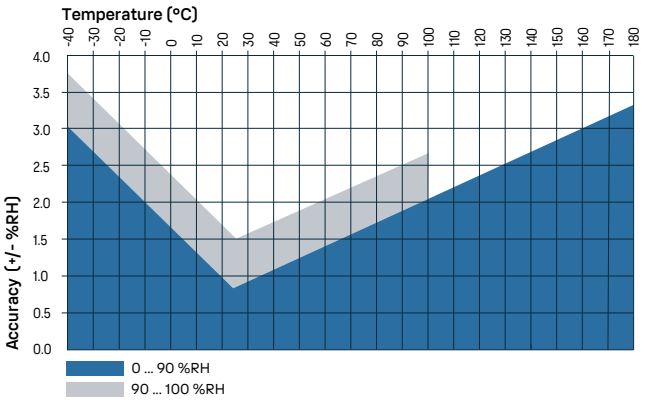
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see www.vaisala.com/indigo.

# Technical data

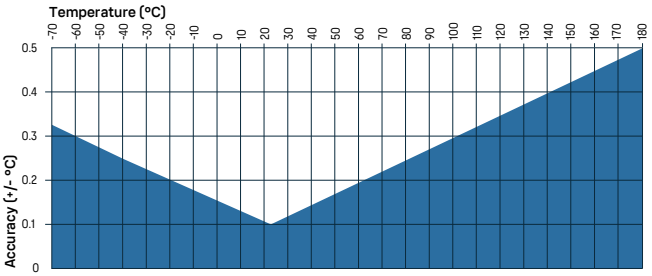
## Measurement performance

| | |
|---|---|
| **Relative humidity** | |
| Measurement range | 0–100 %RH, at max. +95 °C (203 °F) $T_d$ |
| Accuracy at +23 °C (+73.4 °F) [1] | ±0.8 %RH (0–90 %RH) |
| Factory calibration uncertainty [2] | ±0.5 %RH (0–40 %RH)<br>±0.8 %RH (40–95 %RH) |
| $T_{63}$ response time | 15 s |
| Sensor options | HUMICAP® R2<br>HUMICAP® R2C [3] |
| **Temperature** | |
| Measurement range | −70 ... +180 °C (−94 ... +356 °F) |
| Accuracy at +23 °C (+73.4 °F) [1] | ±0.1 °C (±0.18 °F) |
| Factory calibration uncertainty [2] | ±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F) |
| Sensor | Pt100 RTD Class F0.1 IEC 60751 |

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




HMP5 humidity measurement accuracy as a function of temperature




HMP5 temperature measurement accuracy over full range

## Operating environment

| | |
|---|---|
| Operating temperature of probe body | −40 ... +80 °C (−40 ... +176 °F) |
| Operating temperature of probe head | −70 ... +180 °C (−94 ... +356 °F) |
| Operating humidity of probe head | Max. +100 °C (212 °F) $T_d$ |
| Storage temperature | −40 ... +80 °C (−40 ... +176 °F) |
| Operating environment | Suitable for outdoor use |
| IP rating of probe body | IP66 |

## Inputs and outputs

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

## Output parameters

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

## Compliance

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

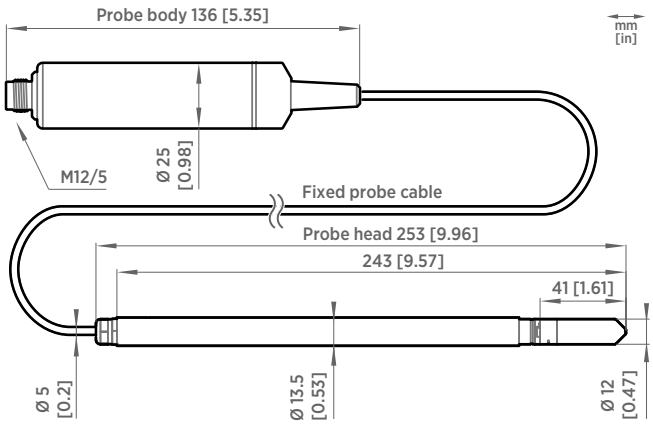
## Mechanical specifications

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

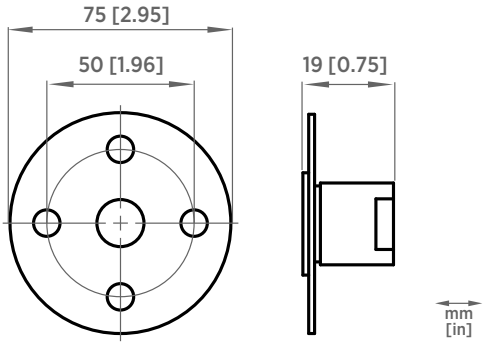
## Accessories

| | |
|---|---|
| Mounting flange | 210696 |
| Indigo USB adapter [1] | USB2 |
| Calibration adapter for HMK15 | 211302SP |

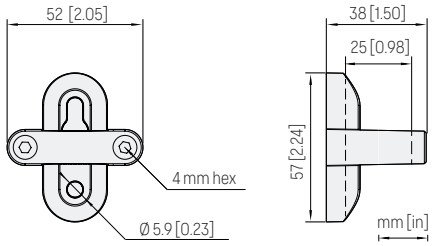
*1) Vaisala Insight software for Windows available at www.vaisala.com/insight.*




HMP5 probe dimensions




Mounting flange 210696 dimensions

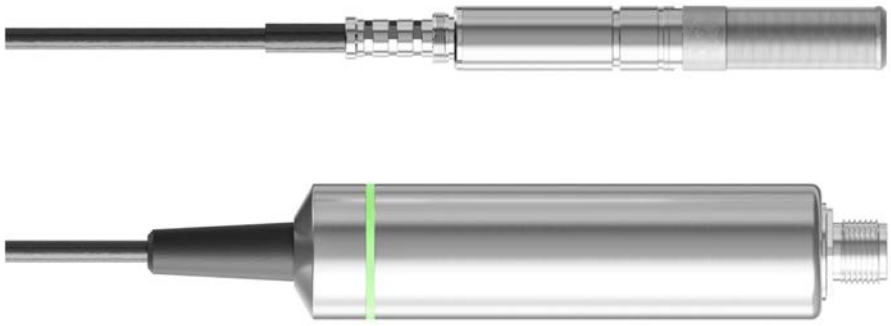



Probe holder ASM213582 dimensions

VAISALA

# HMP7 Relative Humidity and Temperature Probe

## For high humidities



**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
- Condensation prevention with probe heating
- Sensor purge improves long-term stability and chemical resistance
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products and Insight PC software
- Traceable calibration certificate: 6 points for humidity, 1 point for temperature

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

### Proven Vaisala HUMICAP® performance

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

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

### Avoiding condensation at extreme humidity

Probe heating functionality heats up not only the sensor, but the whole probe head. When probe temperature is heated above dew point temperature, condensation on the probe can be avoided while measuring the dew point temperature of the process. By setting the temperature compensation value obtained, for example, with the TMP1 temperature probe, true relative humidity at process temperature can be measured while avoiding condensation by elevated probe temperature.

### Flexible connectivity

The probe can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight.

### Vaisala Indigo product family

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

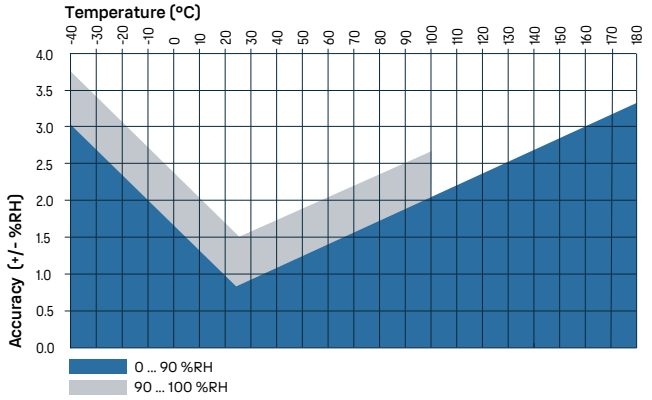
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see www.vaisala.com/indigo.

# Technical data

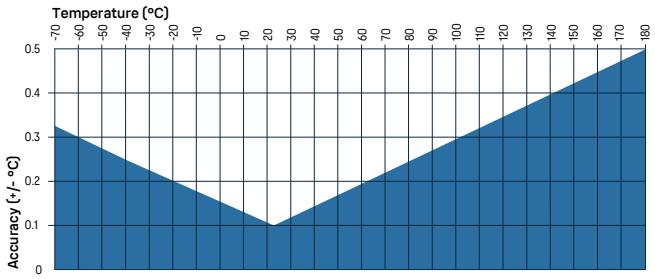
## Measurement performance

| | |
|---|---|
| **Relative humidity** | |
| Measurement range | 0–100 %RH, at max. +95 °C (203 °F) $T_d$ |
| Accuracy at +23 °C (+73.4 °F) [1] | ±0.8 %RH (0–90 %RH) |
| Factory calibration uncertainty [2] | ±0.5 %RH (0–40 %RH)<br>±0.8 %RH (40–95 %RH) |
| $T_{63}$ response time | 15 s |
| Sensor options | HUMICAP® R2<br>HUMICAP® R2C [3]<br>HUMICAP® 180VC [3] [4] |
| **Temperature** | |
| Measurement range | –70 ... +180 °C (–94 ... +356 °F) |
| Accuracy at +23 °C (+73.4 °F) [1] | ±0.1 °C (±0.18 °F) |
| Factory calibration uncertainty [2] | ±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F) |
| Sensor | Pt100 RTD Class F0.1 IEC 60751 |

1) *Defined against calibration reference. Including non-linearity, hysteresis, and repeatability.*
2) *Defined as ±2 standard deviation limits. Small variations possible; see calibration certificate.*
3) *Sensor purge feature available with this sensor.*
4) *$H_2O_2$ resistant. With HUMICAP® 180VC sensor, accuracy is not specified below –20 °C (–4 °F) operating temperature.*




HMP7 humidity measurement accuracy as a function of temperature




HMP7 temperature measurement accuracy over full range

## Operating environment

| | |
|---|---|
| Operating temperature of probe body | –40 ... +80 °C (–40 ... +176 °F) |
| Operating temperature of probe head | –70 ... +180 °C (–94 ... +356 °F) |
| Operating humidity of probe head | Max. +100 °C (212 °F) $T_d$ |
| Storage temperature | –40 ... +80 °C (–40 ... +176 °F) |
| Operational pressure | < 10 bar |
| Operating environment | Suitable for outdoor use |
| Measurement environment | For air, nitrogen, hydrogen, argon, helium, oxygen, and vacuum [1] |
| IP rating of probe body | IP66 |

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

## Inputs and outputs

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

## Output parameters

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

## Compliance

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

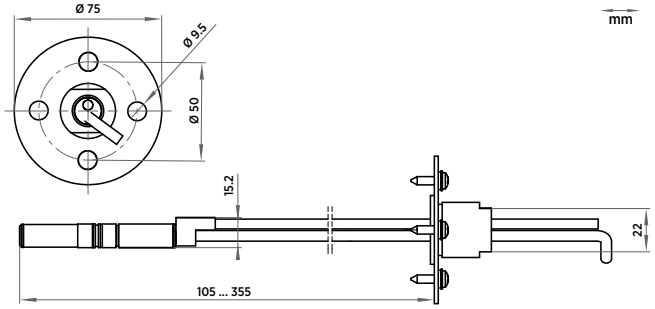
## Mechanical specifications

| | |
|---|---|
| Connector | M12 5-pin A-coded male |
| Weight (with a 2-m cable) | 310 g (10.9 oz) |
| Probe cable length | 0.15 m (0.49 ft), 2 m (6.56 ft) or 10 m (32.80 ft) |
| **Materials** | |
| Probe | AISI 316L |
| Probe body | AISI 316L |
| Cable jacket | FEP |

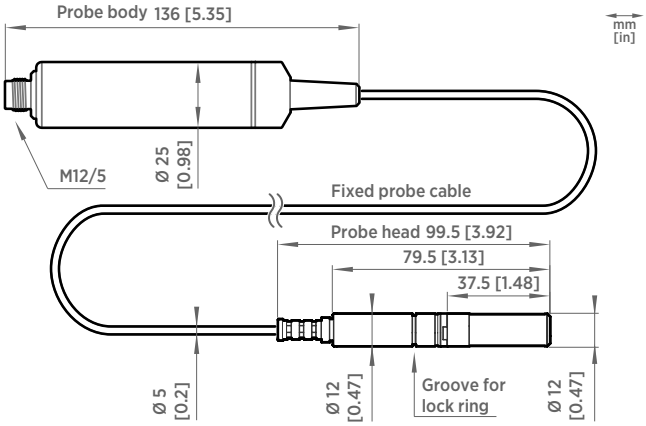
## Accessories

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

*1) Not suitable for use at extreme temperatures.*
*2) Vaisala Insight software for Windows available at www.vaisala.com/insight.*




Duct installation kit 210697 dimensions with probe

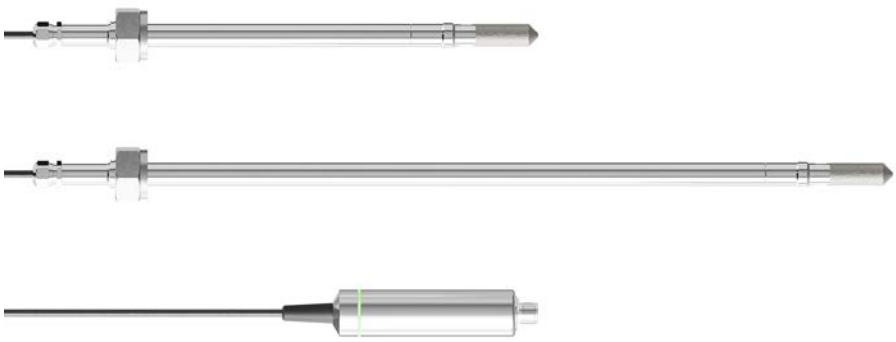



HMP7 probe dimensions

VAISALA

# 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 0–40 bar
- Temperature measurement range −70 ... +180 °C (−94 ... +356 °F)
- Sensor purge improves long-term stability and chemical resistance
- Two lengths available for the probe head: 268 mm and 454 mm
- Probe installation depth can be freely adjusted and probe can be hot-swapped from pressurized pipelines with an optional ball valve kit
- Modbus® RTU over RS-485
- Compatible with Vaisala Indigo products and Insight PC software
- Traceable calibration certificate: 6 points for humidity, 1 point for temperature

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

### Proven Vaisala HUMICAP® performance

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

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

### Sensor purge minimizes effects of contaminants

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

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

### Flexible connectivity

The probe can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight.

### Vaisala Indigo product family

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

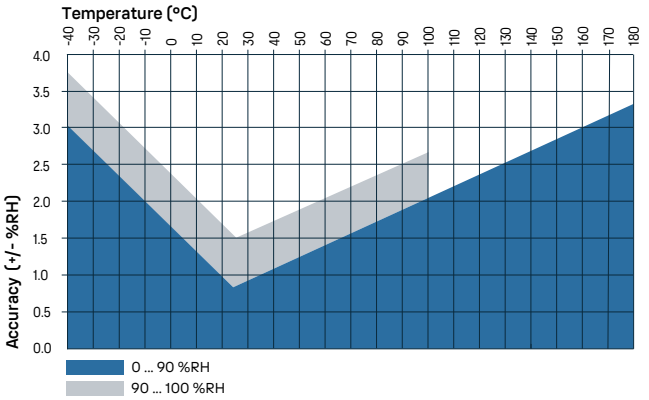
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see www.vaisala.com/indigo.

# Technical data

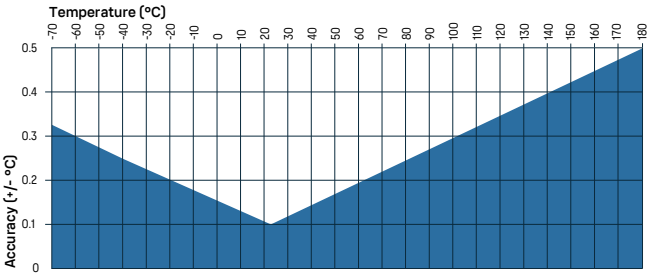
## Measurement performance

| | |
|---|---|
| **Relative humidity** | |
| Measurement range | 0–100 %RH, at max. +95 °C (203 °F) $T_d$ |
| Accuracy at +23 °C (+73.4 °F) [1] | ±0.8 %RH (0–90 %RH) |
| Factory calibration uncertainty [2] | ±0.5 %RH (0–40 %RH)<br>±0.8 %RH (40–95 %RH) |
| $T_{63}$ response time | 15 s |
| Sensor options | HUMICAP® R2<br>HUMICAP® R2C [3] |
| **Temperature** | |
| Measurement range | −70 ... +180 °C (−94 ... +356 °F) |
| Accuracy at +23 °C (+73.4 °F) [1] | ±0.1 °C (±0.18 °F) |
| Factory calibration uncertainty [2] | ±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F) |
| Sensor | Pt100 RTD Class F0.1 IEC 60751 |

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




HMP8 humidity measurement accuracy as a function of temperature




HMP8 temperature measurement accuracy over full range

## Operating environment

| | |
|---|---|
| Operating temperature of probe body | −40 ... +80 °C (−40 ... +176 °F) |
| Operating temperature of probe head | −70 ... +180 °C (−94 ... +356 °F) |
| Operating humidity of probe head | Max. +100 °C (212 °F) $T_d$ |
| Storage temperature | −40 ... +80 °C (−40 ... +176 °F) |
| Operational pressure | < 40 bar |
| Operating environment | Suitable for outdoor use |
| Measurement environment | For air, nitrogen, hydrogen, argon, helium, oxygen, and vacuum [1] |
| IP rating of probe body | IP66 |
| **Ball valve** | |
| Operating temperature | Up to +100 °C (+212 °F) |
| Operating pressure | Up to 40 bar (580 psi), absolute |

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

## Inputs and outputs

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

## Output parameters

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

## Compliance

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

*1) DNV GL certificate applies to the 268-mm-long HMP8 model only, not to the 454-mm-long model.*

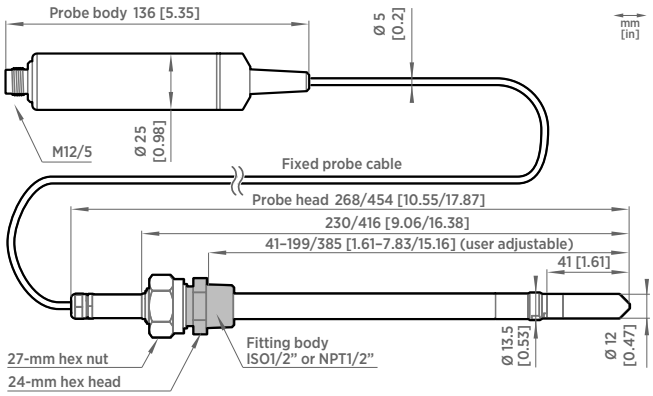
## Mechanical specifications

| | |
|---|---|
| Connector | M12 5-pin A-coded male |
| Probe fitting | ISO1/2" and NPT1/2" fittings included |
| Weight (with a 2-m cable) | 268-mm-long HMP8: 512 g (18.1 oz)<br>454-mm-long HMP8: 612 g (21.6 oz) |
| Probe cable length | 2 m (6.56 ft) or 10 m (32.80 ft) |
| Adjustable installation depth | 268-mm-long HMP8: 41–199 mm (1.61–7.83 in)<br>454-mm-long HMP8: 41–385 mm (1.61–15.16 in) |
| **Materials** | |
| Probe | AISI 316L |
| Probe body | AISI 316L |
| Cable jacket | FEP |

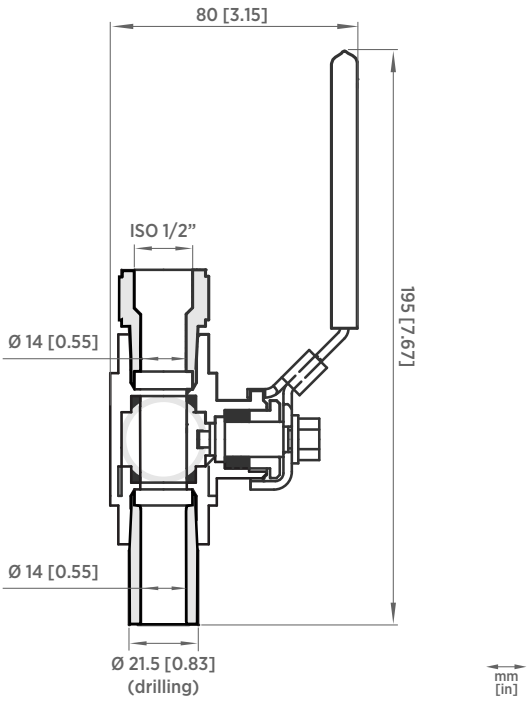
## Accessories

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

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




HMP8 probe dimensions




Ball valve kit dimensions

VAISALA

# HMP9 Compact Humidity and Temperature Probe

## Features

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

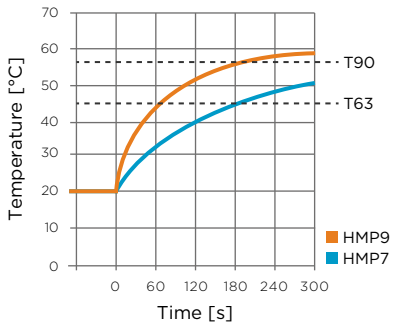
Vaisala HUMICAP® Humidity and Temperature Probe HMP9 is designed for easy installation into rapidly changing environments where fast response time, measurement performance, and chemical tolerance are essential.

## Miniature probe head with HUMICAP® performance

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

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

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




HMP9 T response time compared to HMP7

## Sensor purge minimizes effects of contaminants

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

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

## Flexible connectivity

The probe can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight.

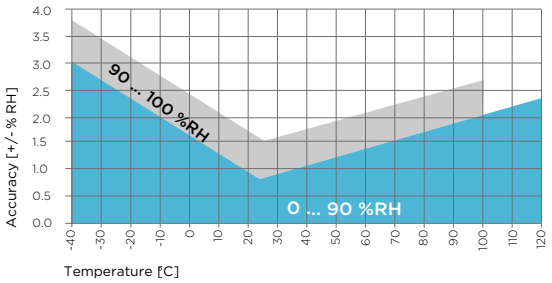
For more information on the Indigo product family, see www.vaisala.com/indigo.

# Technical data

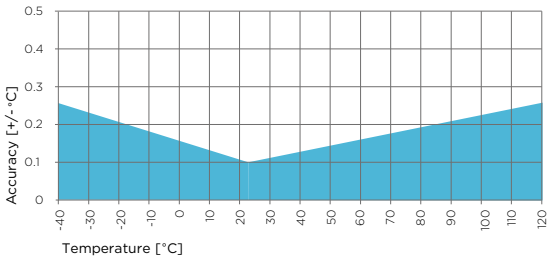
## Measurement performance

| | |
|---|---|
| **Relative humidity** | |
| Measurement range | 0–100 %RH, at max. +95 °C (203 °F) $T_d$ |
| Accuracy at +23 °C (+73.4 °F) [1] | ±0.8 %RH (0–90 %RH) |
| Factory calibration uncertainty [2] | ±0.7 %RH (0–40 %RH)<br>±1 %RH (40–95 %RH) |
| $T_{63}$ response time [3] | 15 s |
| Sensor | HUMICAP® I |
| **Temperature** | |
| Measurement range | −40 ... +120 °C (−40 ... +248 °F) |
| Accuracy at +23 °C (+73.4 °F) [1] | ±0.1 °C (±0.18 °F) |
| Factory calibration uncertainty [2] | ±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F) |
| $T_{63}$ response time [3] | 70 s |

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




HMP9 humidity measurement accuracy as a function of temperature




HMP9 temperature measurement accuracy over full range

## Operating environment

| | |
|---|---|
| Operating temperature of probe body | −40 ... +60 °C (−40 ... +140 °F) |
| Operating temperature of probe head | −40 ... +120 °C (−40 ... +248 °F) |
| Operating humidity of probe head | Max. +100 °C (212 °F) $T_d$ |
| Storage temperature | −40 ... +60 °C (−40 ... +140 °F) |
| Operating environment | Suitable for outdoor use when protected from rain |
| Measurement environment | For air, nitrogen, hydrogen, argon, helium, and oxygen [1] |
| IP rating of probe body | IP65 |

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

## Inputs and outputs

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

## Output parameters

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

## Compliance

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

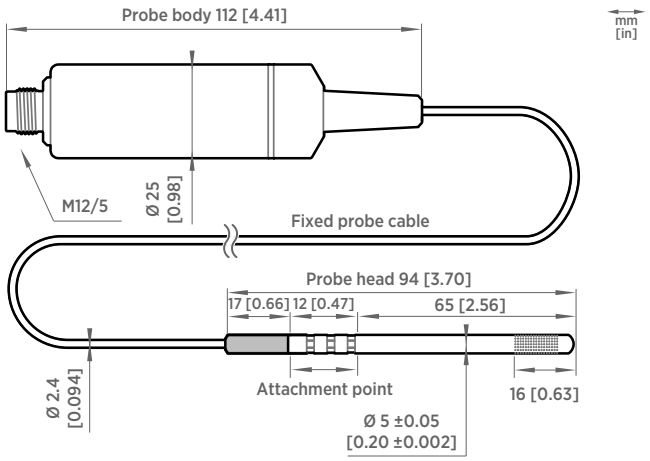
## Mechanical specifications

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

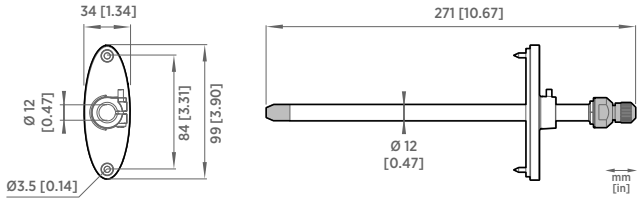
## Accessories

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

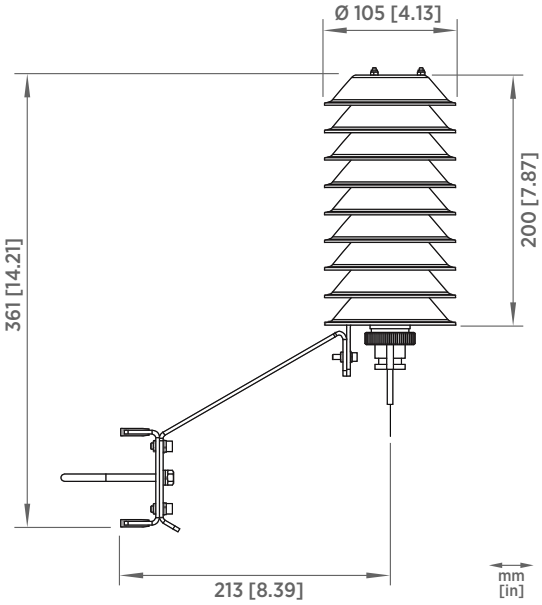
*1) Vaisala Insight software for Windows available at www.vaisala.com/insight.*




HMP9 probe dimensions




HMP9 Duct Installation Kit ASM214055 dimensions




Solar Radiation Shield DTR502B dimensions

VAISALA

# TMP1 Temperature Probe

**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
- Compatible with Vaisala Indigo products and Insight PC software
- Traceable 2-point calibration certificate with calibration points at +20 and +70 °C (+68 and +158 °F)

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

## Flexible connectivity

The probe can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight.

## Vaisala Indigo product family

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

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

## Relative humidity measurements in high humidities

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

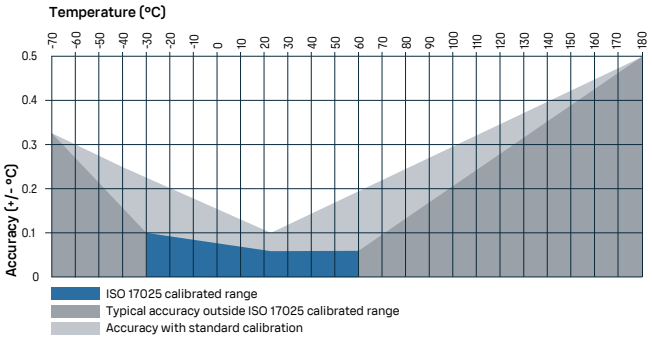
When the humidity probe is heated above dew point temperature, condensation can be avoided and the relative humidity in the actual process temperature can be back-calculated based on the true process temperature measurement received from TMP1.

# Technical data

## Measurement performance

| | |
|---|---|
| Measurement range | −70 ... +180 °C (−94 ... +356 °F) |
| Sensor | Pt100 RTD Class F0.1 IEC 60751 |
| **Standard calibration** [1] | |
| Accuracy at +23 °C (+73.4 °F) | ±0.1 °C (±0.18 °F) |
| Factory calibration uncertainty [2] | ±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F) |
| **Optional ISO 17025 calibration** [3] | |
| Accuracy at +23 °C (+73.4 °F) [1] | ±0.06 °C (±0.108 °F) |
| Calibration uncertainty [2] | ±0.03 °C (±0.054 °F) |

*1) Defined against calibration reference. Including non-linearity, hysteresis, and repeatability.*
*2) Defined as ±2 standard deviation limits. Small variations possible; see calibration certificate.*
*3) Accuracy depends on selected calibration points. Accuracy with ISO 17025 calibration is defined here using a 5-point calibration in the following points: −30, −10, 0, +30, and +60 °C. For more information on calibration services offered by Vaisala, see vaisala.com/calibration.*




TMP1 temperature measurement accuracy over full range

## Operating environment

| | |
|---|---|
| Operating temperature of probe body | −40 ... +80 °C (−40 ... +176 °F) |
| Operating temperature of probe head | −70 ... +180 °C (−94 ... +356 °F) |
| Storage temperature | −40 ... +80 °C (−40 ... +176 °F) |
| Operating environment | Suitable for outdoor use |
| **IP rating** | |
| Probe body | IP66 |
| Probe head and cable | IPX8/IPX9 |

## Inputs and outputs

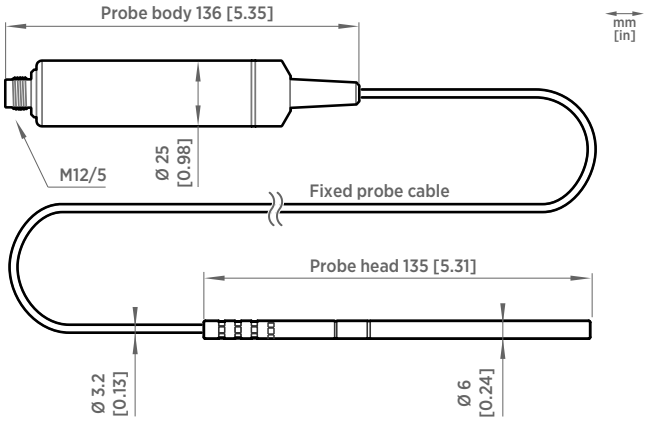
| | |
|---|---|
| Operating voltage | 15–30 V DC |
| Current consumption | 10 mA typical |
| Digital output | RS-485, non-isolated |
| Protocols | Modbus RTU |
| Output parameters | Temperature (°C)<br>Water vapor saturation pressure (hPa) |

## Compliance

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

## Mechanical specifications

| | |
|---|---|
| Connector | M12 5-pin A-coded male |
| Weight (with a 2-m cable) | 224 g (7.9 oz) |
| Probe cable length | 2 m (6.56 ft) or 10 m (32.8 ft) |
| **Materials** | |
| Probe | AISI 316L |
| Probe body | AISI 316L |
| Cable jacket | FEP |




TMP1 probe dimensions

## Accessories

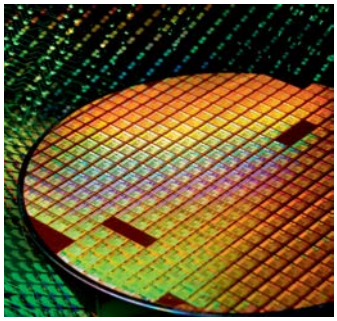
| | |
|---|---|
| Duct installation kit for temperature probe | 215003 |
| Swagelok® for 6 mm probe, 1/8" ISO thread | SWG6ISO18 |
| Swagelok® for 6 mm probe, 1/8" NPT thread | SWG6NPT18 |
| Indigo USB adapter [1] | USB2 |

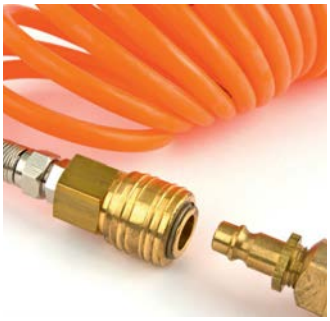
*1) Vaisala Insight software for Windows available at www.vaisala.com/insight.*

VAISALA

# DRYCAP® technology

## Compact intelligence for the driest conditions





**DRYCAP sensor's key benefits and features**

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

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

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

### Reliable data needed

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

### Taking every measure for the planet

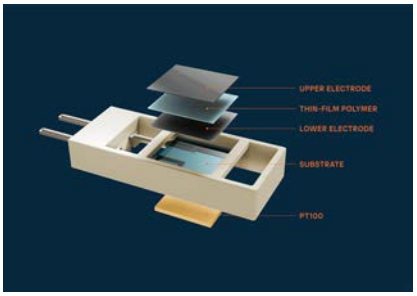
We took on the challenge by combining the highest quality polymer technology with a patented key feature – autocalibration – that would eliminate sensor drift in very dry conditions.

### The era of DRYCAP begins

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

### How Vaisala DRYCAP works

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




Structure of the DRYCAP sensor

### Autocalibration

Vaisala's patented autocalibration function optimizes the measurement stability in dry environments. The sensor is heated at regular intervals during the automated autocalibration procedure. The humidity and temperature readings are monitored as the sensor cools to ambient temperature, with offset correction compensating for any potential drift. This enables the DRYCAP sensor to deliver accurate measurements in the long term, dramatically reducing the need for maintenance.

### Sensor purge

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

## The parameter of high demand

Since its launch, the DRYCAP product family has grown to encompass a huge range of applications, from drying processes to compressed air and dry chambers. The DRYCAP sensor is particularly renowned for its reliable performance in hot and very dry environments and this highly successful innovation is continuously growing its demand.

## When process measurement truly matters

An example of the several demanding industrial applications where Vaisala DRYCAP technology is used today is battery manufacturing. Due to the ultra-low humidity requirement and highly controlled atmospheric conditions, reliable dew point measurement is a must. The accurate and stable data the instruments provide, enable controlling the moisture levels along any critical locations of the process, such as the electrode production.

## DRYCAP application examples

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

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

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

VAISALA

# DMP5 Dew Point and Temperature Probe

## For high temperature applications

**Features**

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

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

### Measure humidity directly in hot processes

DMP5 is built for direct measurement in hot and dry processes, up to +180 °C (+356 °F). As the probe can be directly placed in the process, there is no need for a sampling system or trace heating. As a result, high measurement accuracy and constancy are maintained. DMP5 provides unmatched dry-end measurement accuracy at temperatures up to 140 °C; however, it can operate safely at temperatures up to 180 °C.

DMP5 incorporates the Vaisala DRYCAP® sensor, which is accurate, reliable, and stable. The sensor is condensation-tolerant and immune to particulate contamination, oil vapor, and most chemicals. Sensor warming minimizes the risk of condensation accumulating on the sensor. If the DRYCAP® sensor does get wet, it will rapidly dry and recover its swift response time. In low humidity conditions, the sensor autocalibrates to ensure accurate measurement.

### Sensor purge minimizes effects of contaminants

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

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

### Flexible connectivity

The probe can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight.

### Vaisala Indigo product family

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

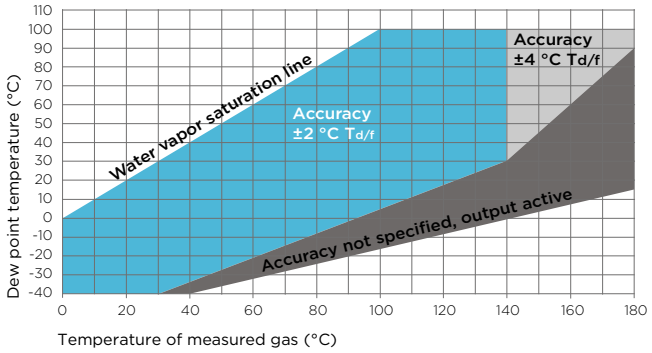
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring and troubleshooting the probe. For more information, see www.vaisala.com/indigo.

# Technical data

## Measurement performance

| | |
|---|---|
| **Dew point** | |
| Sensor | DRYCAP® 180S |
| Measurement range | −40 ... +100 °C (−40 ... +212 °F) $T_{d/f}$ |
| Accuracy | ±2 °C (±3.6 °F) $T_{d/f}$<br>See accuracy graph |
| Response time 63 % [90 %] [1] | |
| From dry to wet | 5 s [10 s] |
| From wet to dry | 45 s [5 min] |
| **Temperature** | |
| Measurement range | 0 ... +180 °C (+32 ... +356 °F) |
| Accuracy at +100 °C (+212 °F) | ±0.4 °C (±0.72 °F) |
| Temperature sensor | Pt100 RTD Class F0.1 IEC 60751 |
| **Mixing ratio** | |
| Measurement range (typical) | 0–1000 g/kg (0–7000 gr/lbs) |
| Accuracy (typical) | ±12 % of reading |
| **Absolute humidity** | |
| Measurement range | 0–600 g/m³ |
| Accuracy | ±10 % of reading (typical) |

*1) Tested with sintered filter.*




Dew point accuracy vs. measurement conditions

## Operating environment

| | |
|---|---|
| Operating temperature range for probe head | −40 ... +180 °C (−40 ... +356 °F) |
| Operating temperature range for probe body | −40 ... +80 °C (−40 ... +176 °F) |
| Storage temperature | −40 ... +80 °C (−40 ... +176 °F) |
| Measurement environment | For air, nitrogen, hydrogen, argon, helium, and oxygen [1] |
| IP rating for probe body | IP66 |

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

## Inputs and outputs

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

## Output parameters

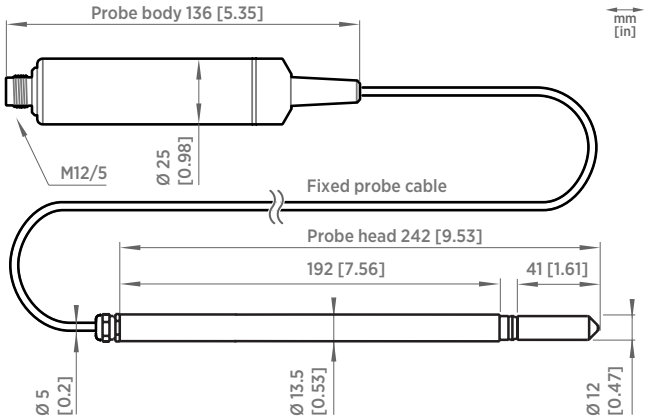
| | |
|---|---|
| Absolute humidity (g/m³) | Relative humidity (%RH) |
| Absolute humidity at NTP (g/m³) | Relative humidity (dew/frost) (%RH) |
| Dew point temperature (°C) | Temperature (°C) |
| Dew/frost point temperature (°C) | Water concentration ($ppm_v$) |
| Dew/frost point temperature at 1 atm (°C) | Water concentration (wet basis) (vol-%) |
| Dew point temperature at 1 atm (°C) | Water mass fraction ($ppm_w$) |
| Dew point temperature difference (°C) | Water vapor pressure (hPa) |
| Enthalpy (kJ/kg) | Water vapor saturation pressure (hPa) |
| Mixing ratio (g/kg) | |

## Compliance

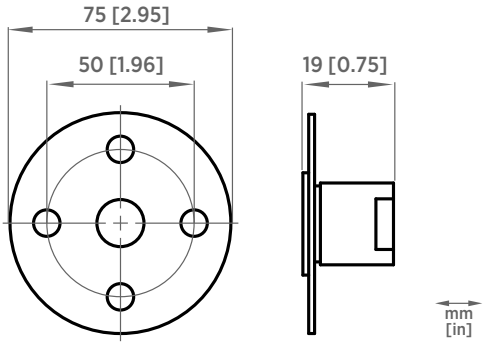
| | |
|---|---|
| EU directives and regulations | EMC Directive (2014/30/EU)<br>RoHS Directive (2011/65/EU) as amended by 2015/863 |
| Electromagnetic compatibility (EMC) | EN 61326-1, industrial environment |
| Type approvals | DNV GL certificate no. TAA00002YT |
| Compliance marks | CE, China RoHS,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

## Mechanical specifications

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




DMP5 dimensions




Optional mounting flange 210696 dimensions

## Accessories

| | |
|---|---|
| Mounting flange | 210696 |
| Indigo USB adapter [1)] | USB2 |

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

VAISALA

# DMP6 Dew Point Probe

## For very high temperature applications

**Features**

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

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

### Measure humidity directly in very hot processes

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

DMP6 incorporates the Vaisala DRYCAP® sensor, which is accurate, reliable, and stable. The sensor is condensation-tolerant and immune to particulate contamination, oil vapor, and most chemicals. Sensor warming minimizes the risk of condensation accumulating on the sensor. If the DRYCAP® sensor does get wet, it will rapidly dry and recover its swift response time.

### Sensor purge minimizes effects of contaminants

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

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

### Flexible connectivity

The probe can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight.

### Vaisala Indigo product family

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

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

# Technical data

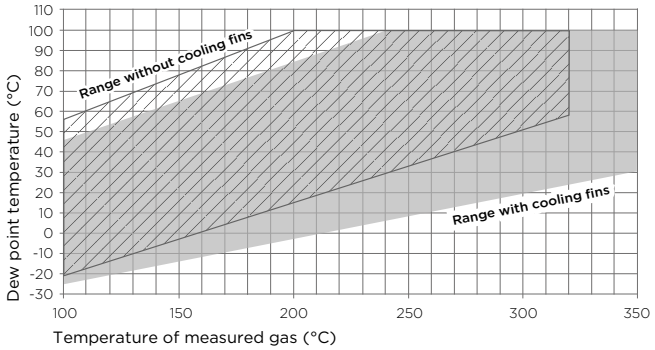
## Measurement performance

| | |
|---|---|
| **Dew point** | |
| Sensor | DRYCAP® 180S |
| Measurement range | –25 … +100 °C (–13 … +212 °F) $T_{d/f}$ |
| Accuracy | ±2 °C (±3.6 °F) $T_{d/f}$ |
| Response time 63 % [90 %]: | |
| From dry to wet | 5 s [10 s] |
| From wet to dry | 45 s [5 min] |
| **Mixing ratio** | |
| Measurement range (typical) | 0–1000 g/kg (0–7000 gr/lbs) |
| Accuracy (typical) | ±12 % of reading |

## Operating environment

| | |
|---|---|
| Operating temperature range of probe head [1) 2)] | +100 … +350 °C (+212 … +662 °F) |
| Operating temperature range of probe body | –40 … +80 °C (–40 … +176 °F) |
| Storage temperature | –40 … +80 °C (–40 … +176 °F) |
| Measurement environment | For air, nitrogen, hydrogen, argon, helium, and oxygen [3)] |
| IP rating | IP66 |

*1) Installation of cooling fins on the cooling set affects the operating temperature range. See the operating range graph.*
*2) The operating range specifications apply in stand-still air. High flow rates in the process may reduce the probe performance and cause damage to the equipment.*
*3) Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases.*




Operating range of DMP6 probe head

## Inputs and outputs

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

## Compliance

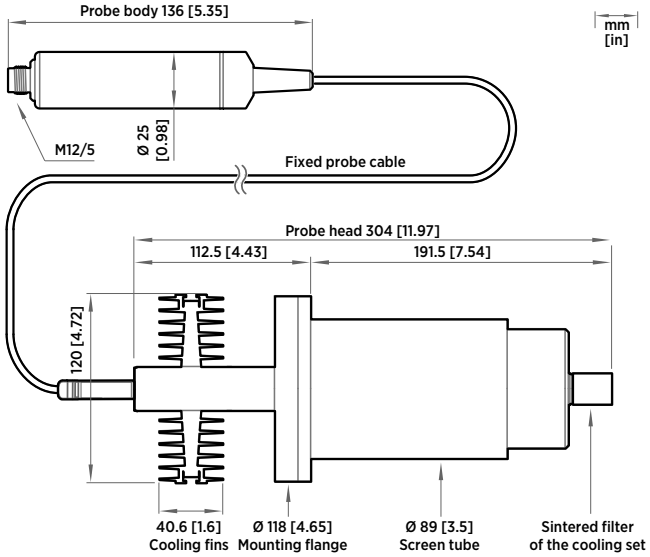
| | |
|---|---|
| EU directives and regulations | EMC Directive (2014/30/EU)<br>RoHS Directive (2011/65/EU) as amended by 2015/863 |
| Electromagnetic compatibility (EMC) | EN 61326-1, industrial environment |
| Type approvals | DNV GL certificate no. TAA00002YT |
| Compliance marks | CE, China RoHS,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

## Output parameters

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

## Mechanical specifications

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




DMP6 dimensions with Cooling Set DMP246CS

## Accessories

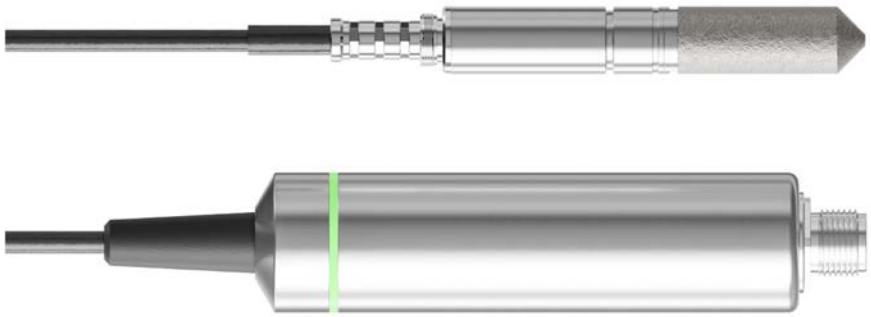
| | |
|---|---|
| Cooling set | DMP246CS |
| Indigo USB adapter [1)] | USB2 |

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

VAISALA

# DMP7 Dew Point and Temperature Probe

## For installations in tight spaces



**Features**

- Dew point measurement range −70 ... +80 °C (−94 ... +176 °F) $T_{d/f}$
- Dew point measurement accuracy up to ±2 °C (±3.6 °F) $T_{d/f}$
- Sensor purge improves long-term stability and chemical resistance
- Tolerates condensation, oils, dust, and most chemicals
- Modbus RTU over RS-485
- Compatible with Vaisala Indigo products and Insight PC software
- Traceable calibration certificate

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

### Stability at low dew points

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

### Sensor purge minimizes effects of contaminants

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

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

### Pressure-tight installation

An optional pressure-tight Swagelok fitting is available for DMP7. When installed using the fitting, DMP7 is suitable for installations with pressure in range 0 ... 10 bar (0 ... 145 psia).

### Flexible connectivity

The probe can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight.

### Vaisala Indigo product family

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

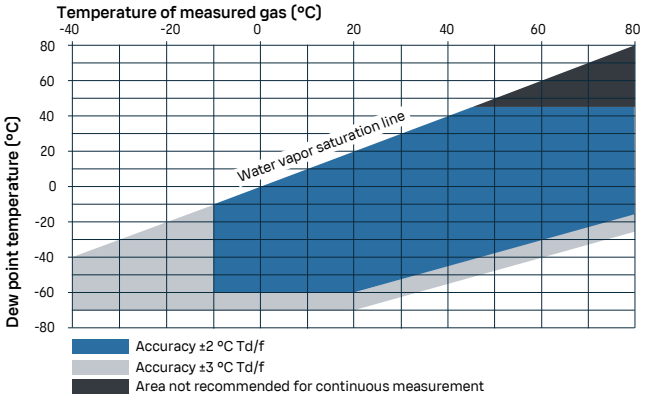
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring and troubleshooting the probe. For more information, see www.vaisala.com/indigo.

# Technical data

## Measurement performance

| | |
|---|---|
| **Dew point** | |
| Sensor | DRYCAP® 180M |
| Measurement range | −70 ... +80 °C (−94 ... +176 °F) $T_{d/f}$ |
| Measurement range for continuous use | −70 ... +45 °C (−94 ... +113 °F) $T_{d/f}$ |
| Accuracy | Up to ±2 °C (±3.6 °F) $T_{d/f}$<br>See accuracy graph |
| Response time 63 % [90 %] [1] | |
| From dry to wet | 5 s [15 s] |
| From wet to dry | 45 s [8 min] |
| **Temperature** | |
| Measurement range | 0 ... +80 °C (+32 ... +176 °F) |
| Accuracy | ±0.2 °C at room temperature |
| Temperature sensor | Pt100 RTD Class F0.1 IEC 60751 |
| **Relative humidity** | |
| Measurement range | 0–70 %RH |
| Accuracy (RH <10 %RH, at + 20 °C) | ±0.004 %RH + 20% of reading |
| **Concentration by volume (ppm)** | |
| Measurement range (typical) | 10–2500 ppm |
| Accuracy (at + 20 °C, 1 bar) | 1 ppm + 20% of reading |

*1) Tested with sintered filter.*




Dew point accuracy vs. measurement conditions

## Operating environment

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

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

## Inputs and outputs

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

## Compliance

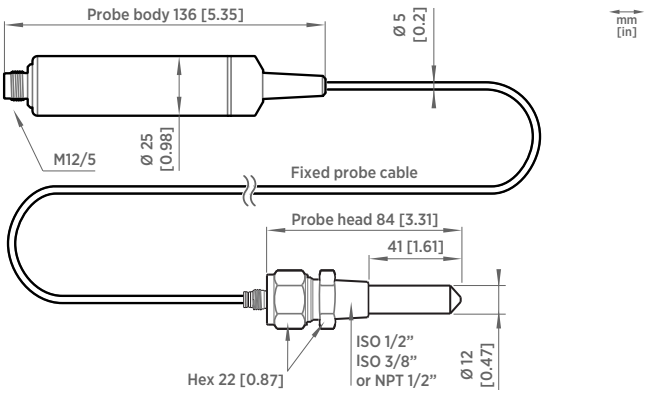
| | |
|---|---|
| EU directives and regulations | EMC Directive (2014/30/EU)<br>RoHS Directive (2011/65/EU) as amended by 2015/863 |
| Electromagnetic compatibility (EMC) | EN 61326-1, industrial environment |
| Compliance marks | CE, China RoHS, RCM |

## Output parameters

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

## Mechanical specifications

| | |
|---|---|
| Connector | M12 5-pin A-coded male |
| Weight | 310 g (10.9 oz) with 2-m (6.56-ft) cable |
| Probe cable length | 0.15 m (0.49 ft), 2 m (6.56 ft) or 10 m (32.80 ft) |
| **Materials** | |
| Probe | AISI 316L |
| Probe body | AISI 316L |
| Cable jacket | FEP |




DMP7 dimensions

## Accessories

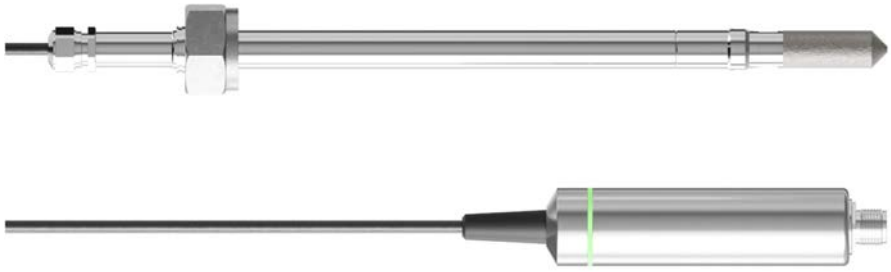
| | |
|---|---|
| Swagelok ISO 3/8" | SWG12ISO38 |
| Swagelok ISO 1/2" | SWG12ISO12 |
| Swagelok NPT 1/2" | SWG12NPT12 |
| Magnetic probe holder for Ø 12 mm probe heads [1] | ASM213382SP |
| Indigo USB adapter [2] | USB2 |

*1) Not suitable for use at extreme temperatures.*
*2) Vaisala Insight software for Windows available at www.vaisala.com/insight.*

VAISALA

# DMP8 Dew Point and Temperature Probe

## For pressurized pipelines



**Features**

- Dew point measurement range −70 ... +80 °C (−94 ... +176 °F) $T_{d/f}$
- Dew point measurement accuracy up to ±2 °C (±3.6 °F) $T_{d/f}$
- Operating pressure of probe head 0–40 bar (0–580 psi), absolute
- Adjustable installation depth
- Tolerates condensation, oils, dust, and most chemicals
- Sensor purge improves long-term stability and chemical resistance
- Modbus RTU over RS-485
- Compatible with Vaisala Indigo products and Insight PC software
- Traceable calibration certificate

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

### Stability at low dew points

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

### Sensor purge minimizes effects of contaminants

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

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

### Easy installation

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

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

### Flexible connectivity

The probe can be used as a standalone digital Modbus RTU transmitter over an RS-485 serial bus, and it can also be connected to Indigo transmitters and the Indigo80 handheld indicator. For easy-to-use access to field calibration, device analytics, and configuration functionality, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight.

### Vaisala Indigo product family

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

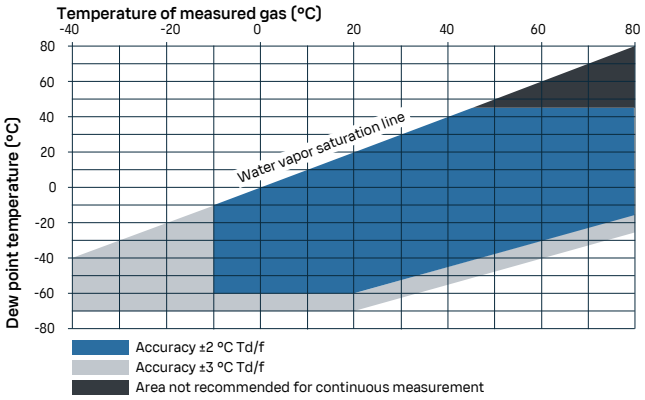
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring and troubleshooting the probe. For more information, see www.vaisala.com/indigo.

# Technical data

## Measurement performance

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

*1) Tested with sintered filter.*




Dew point accuracy vs. measurement conditions

## Operating environment

| | |
|---|---|
| Operating temperature for probe head | −40 … +80 °C (−40 … +176 °F) |
| Operating temperature for probe body | −40 … +80 °C (−40 … +176 °F) |
| Storage temperature | −40 … +80 °C (−40 … +176 °F) |
| Operating pressure for probe head | 0–40 bar (0–580 psi), absolute |
| Measurement environment | For air, nitrogen, hydrogen, argon, helium, oxygen [1], and vacuum |
| IP rating for probe body | IP66 |
| Mechanical durability of probe head | Up to +180 °C (+356 °F)<br>Up to 70 bar/1015 psi, absolute |
| **Ball valve** | |
| Operating temperature | Up to +100 °C (+212 °F) |
| Operating pressure | Up to 40 bar (580 psi), absolute |

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

## Inputs and outputs

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

## Output parameters

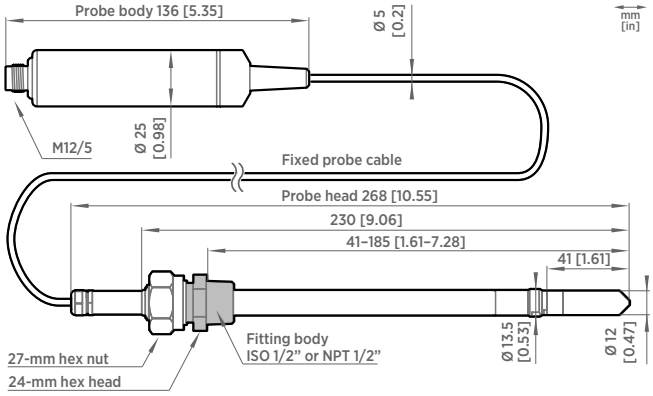
| | |
|---|---|
| Absolute humidity (g/m$^3$) | Relative humidity (%RH) |
| Absolute humidity at NTP (g/m$^3$) | Relative humidity (dew/frost) (%RH) |
| Dew point temperature (°C) | Temperature (°C) |
| Dew/frost point temperature (°C) | Water concentration (ppm$_v$) |
| Dew/frost point temperature at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

## Compliance

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

## Mechanical specifications

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




DMP8 dimensions

## Accessories

| | |
|---|---|
| Fitting body ISO R 1/2" with leak screw | ISOFITBODASP |
| Fitting body ISO R 1/2" (no leak screw) | DRW212076SP |
| Fitting body NPT 1/2" (no leak screw) | NPTFITBODASP |
| Sampling cell | DMT242SC |
| Sampling cell with Swagelok connectors | DMT242SC2 |
| Ball valve kit ISO 1/2" with welding joint | BALLVALVE-1 |
| Duct installation flange for ISO R 1/2" thread | DM240FASP |
| Thread adapter ISO 1/2" to NPT 1/2" | 210662SP |
| Blind plug ISO 1/2" | 218773 |
| Indigo USB adapter [1)] | 242659 |
| Weatherproof carrying case for Indigo80 and a series 8 probe [2)] | ASM215318 |

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

VAISALA

# CARBOCAP® technology

## For demanding environments

**CARBOCAP's unique benefits**

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

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

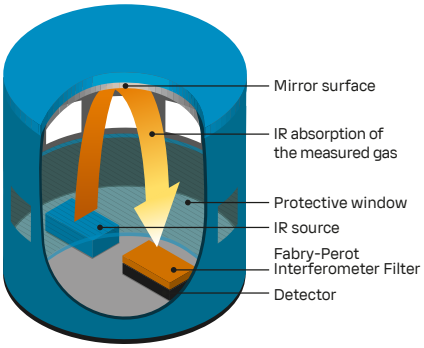
The Vaisala CARBOCAP sensor features an electrically tunable FPI filter. In addition to measuring gas absorption, the micromechanical FPI filter enables a reference measurement at a wavelength where no absorption occurs. When taking the reference measurement, the FPI filter is electrically adjusted to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

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

### How it works

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

Vaisala uses a single-beam and dual-wavelength NDIR (Non-dispersive infrared) technology for measuring $CO_2$, The patented CARBOCAP technology is used in all our $CO_2$ sensors. This technology incorporates a unique tunable band pass filter that was developed by Vaisala and is manufactured in our own state-of-the-art cleanroom. Learn more on our carbon dioxide page.




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

### Typical applications for carbon dioxide measurement

Vaisala CARBOCAP sensor technology is well suited to a wide range of applications, but since the final customer value for each industrial application is unique, it depends on the product line how the CARBOCAP sensor technology is implemented. In carbon dioxide measurement products, the technology is utilized for both ppm (parts per million) and percentage level measurements. Since $CO_2$ replaces oxygen, it can be harmful to people in very high concentrations. $CO_2$ is present at percentage levels only within closed processes such as fermentation and controlled atmosphere storage

environments. Percentage-level measurements are also typical in life-science applications such as $CO_2$ incubators.

Normal atmospheric air includes $CO_2$ at ppm levels. Typical CARBOCAP applications include ventilation control in buildings occupied by people, animal shelters, and greenhouses. In areas where large volumes of CO2 are handled, reliable CO2 measurement with alarm control is an important safety precaution. The CARBOCAP sensor is also a popular choice in ecological measurement applications such as biogas process lines, where excellent long-term stability and tolerance to harsh conditions are important requirements. For biogas applications, the technology is applied for multigas measurements, as it also helps improve the methane quality in the process.

## Product examples

Vaisala's instruments including the CARBOCAP sensor technology range from handheld meters, measurement modules, and industrial transmitters for $CO_2$ measurements to multigas measurement solutions.

VAISALA

# GMP251 Carbon Dioxide Probe

## For %-level measurements

**Features**

- Measurement range 0–20 %$CO_2$
- Intelligent, standalone probe with analog and digital outputs
- Compatible with Vaisala Indigo products, Insight PC software, and RFL100 data logger
- Wide operating temperature range (−40 ... +60 °C) (−40 ... +140 °F)
- IP65-classified housing
- Integrated temperature measurement for $CO_2$ compensation purposes
- Compensations also for pressure, oxygen, and humidity
- Sensor head heated to prevent condensation

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

**Benefits**

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

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

GMP251 incorporates an internal temperature sensor for compensation of the $CO_2$ measurement according to ambient temperature. The effects of pressure and background gas can also be compensated for. The measurement range is 0 ... 20 %$CO_2$ and the sensor performance is optimized at 5 %$CO_2$ measurement.

The operating temperature range of the probe is wide (−40 ... +60 °C (−40 ... +140 °F)), and the probe housing is classified as IP65. Condensation is prevented as the internal sensor head is heated. GMP251 is resistant to dust and most chemicals, such as $H_2O_2$ and alcohol-based cleaning agents.

### Ease of use

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

GMP251 can be connected to Indigo series transmitters and the Indigo80 handheld indicator for an extended range of output and configuration options. See www.vaisala.com/indigo.

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

### Applications

GMP251 is ideal for life science incubators, cold storages, fruit and vegetable transportation, and for all demanding applications where stable and accurate %-level $CO_2$ measurements are needed.

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

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

# Technical data

## Measurement performance

| | |
|---|---|
| Measurement range | 0–20 %$CO_2$ |
| **Accuracy** [1] | |
| At 5 %$CO_2$ | ±0.1 %$CO_2$ |
| At 0–8 %$CO_2$ | ±0.2 %$CO_2$ |
| At 8–20 %$CO_2$ | ±0.4 %$CO_2$ |
| **Calibration uncertainty** | |
| At 5 %$CO_2$ | ±0.07 %$CO_2$ |
| At 20 %$CO_2$ | ±0.27 %$CO_2$ |
| **Long-term stability** | |
| At 0–8 %$CO_2$ | ±0.3 %$CO_2$/year |
| At 8–12 %$CO_2$ | ±0.5 %$CO_2$/year |
| at 12–20 %$CO_2$ | ±1.0 %$CO_2$/year |
| **Temperature dependence** | |
| With compensation at 5 %$CO_2$, 0 … +50 °C (+32 … +122 °F) | < ±0.05 %$CO_2$ |
| With compensation, 0–20 %$CO_2$, −40 … +60 °C (−40 … +140 °F) | ±0.045 % of reading/°C |
| without temperature compensation at 5 %$CO_2$ (typical) | -0.25 % of reading/°C |
| **Pressure dependence** | |
| With compensation at 5 %$CO_2$ 700–1100 hPa | ±0.05 %$CO_2$ |
| With compensation, 0–20 %$CO_2$ 500–1100 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 |
| **$O_2$ dependence** | |
| With compensation, 0–20 %$CO_2$, 0–90 %$O_2$ | ±0.6 % of reading (at +25 °C (+77 °F)) |
| Without compensation (typical) | -0.08 % of reading / %$O_2$ |
| **Start-up, warm-up, and response time** | |
| Start-up time at +25 °C (+77 °F) | < 10 s |
| Warm-up time for full spec. | < 4 min |
| Response time (T90): | |
| With standard filter | < 1 min |
| Flow-through option with > 0.1 l/min | < 1 min |
| With spray shield | < 2 min |
| **Flow rate dependence (for flow-through option)** | |
| Flow rate dependence: | |
| < 1 l/min flow | No effect |
| 1–10 l/min flow | < 0.6 % of reading/ l/min |

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

## Compliance

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

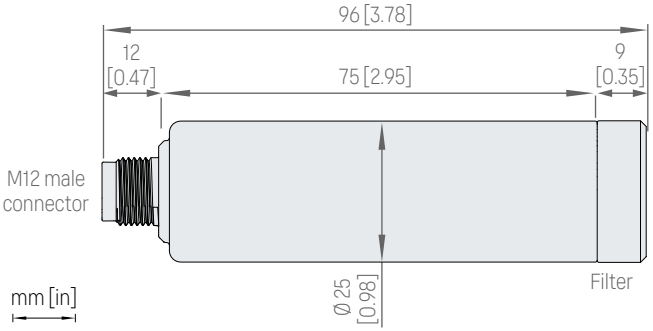
## Operating environment

| | |
|---|---|
| Operating temperature of $CO_2$ measurement | −40 … +60 °C (−40 … +140 °F) [1] |
| Storage temperature | −40 … +70 °C (−40 … +158 °F) |
| Humidity | 0–100 %RH, non-condensing |
| Condensation prevention | Sensor head heating, when power on |
| IP rating, probe body | IP65 |
| Chemical tolerance (temporary exposure during cleaning) | • $H_2O_2$ (2000 ppm, non-condensing)<br>• Alcohol-based cleaning agents (for example ethanol and IPA)<br>• Acetone<br>• Acetic acid |
| **Pressure** | |
| Compensated | 500–1100 hPa |
| Operating | < 1.5 bar |
| **Gas flow (for flow-through option)** | |
| Operating range | < 10 l/min |
| Recommended range | 0.1–0.8 l/min |

*1) Occasional heat decontamination up to +90 °C (+194 °F) with up to 9 hours of dwell time is allowed, provided that the probe is fully installed inside the heated environment and power is switched on. Accuracy specification not applicable if used in temperatures above +60 °C (+140 °F).*

## Mechanical specifications

| | |
|---|---|
| Weight, probe | 42 g (1.48 oz) |
| Connector type | M12 5-pin male |
| **Materials** | |
| Probe housing | PBT polymer |
| Filter | PTFE membrane, PBT polymer grid |
| **Dimensions** | |
| Probe diameter | 25 mm (0.98 in) |
| Probe length | 96 mm (3.78 in) |




GMP251 dimensions

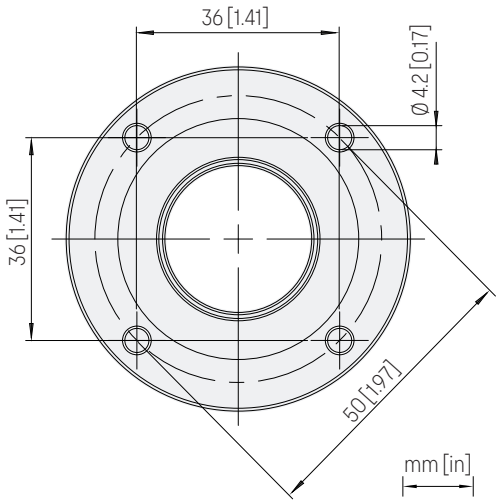
## Inputs and outputs

| | |
|---|---|
| Analog outputs | • 0–5/10 V (scalable), min. load 10 kΩ<br>• 0/4–20 mA (scalable), max. load 500 Ω |
| Digital output | Over RS-485:<br>• Modbus<br>• Vaisala Industrial Protocol |
| **Operating voltage** | |
| With digital output in use | 12–30 V DC |
| With voltage output in use | 12–30 V DC |
| With current output in use | 20–30 V DC |
| **Power consumption** | |
| Typical (continuous operation) | 0.4 W |
| Maximum | 0.5 W |

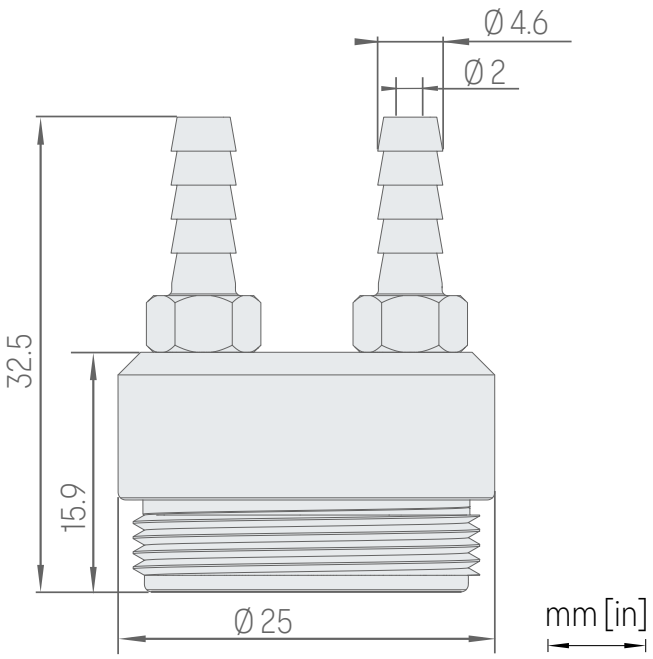
## Spare parts and accessories

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

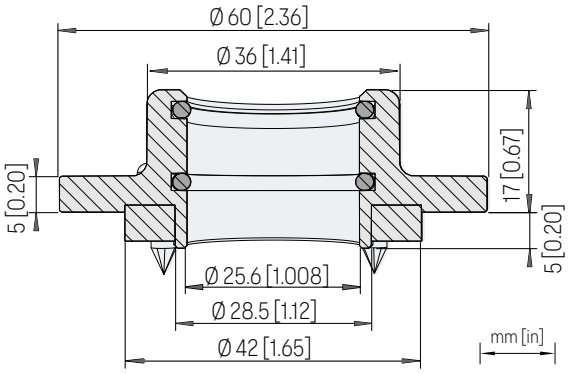
*1) Vaisala Insight software for Windows available at vaisala.com/insight*



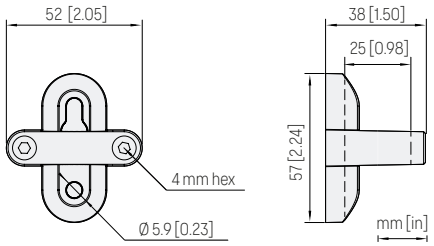

Probe mounting flange 243261SP dimensions




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




Probe mounting flange 243261SP dimensions, cross section




Probe holder ASM213582 dimensions

VAISALA

# GMP252 Carbon Dioxide Probe

## For ppm-level measurements

**Features**

- Measurement range 0 ... 10 000 ppm $CO_2$
- Intelligent, standalone probe with analog and digital outputs
- Compatible with Vaisala Indigo products and Insight PC software
- Wide operating temperature range, −40 ... +60 °C (−40 ... +140 °F)
- IP65-classified housing
- Integrated temperature measurement for $CO_2$ compensation purposes
- Compensations also for pressure, oxygen, and humidity
- Sensor head heated to prevent condensation

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

**Benefits**

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

GMP252 is suitable for harsh and humid $CO_2$ measurement environments where stable and accurate ppm-level $CO_2$ measurements are needed. GMP252 is based on Vaisala's patented, latest-generation CARBOCAP technology that enables exceptional stability. A new type of infrared (IR) light source is used instead of the traditional incandescent light bulb, which extends the lifetime of GMP252.

GMP252 incorporates an internal temperature sensor for compensation of the $CO_2$ measurement according to ambient temperature. The effects of pressure and background gas can also be compensated for. The measurement range is 0 ... 10 000 ppm $CO_2$ (measurements up to 30 000 ppm $CO_2$ are available with reduced accuracy). The operating temperature range of the probe is wide (−40 ... +60 °C (−40 ... +140 °F)), and the probe housing is classified as IP65. Condensation is prevented as the internal sensor head is heated.

GMP252 is resistant to dust and most chemicals, such as $H_2O_2$ and alcohol-based cleaning agents.

### Ease of use

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

GMP252 can be connected to Indigo series transmitters and the Indigo80 handheld indicator for an extended range of outputs and configuration options. See www.vaisala.com/indigo.

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

### Applications

GMP252 is ideal for agriculture, refrigeration, greenhouses, and demanding HVAC applications where stable and accurate ppm-level $CO_2$ measurements are needed.

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

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

# Technical data

## Measurement performance

| | |
|---|---|
| Measurement range | 0–10 000 ppm $CO_2$<br>(up to 30 000 ppm $CO_2$ with reduced accuracy) |
| **Accuracy** [1] | |
| 0–3000 ppm $CO_2$ | ±40 ppm $CO_2$ |
| 3000–10 000 ppm $CO_2$ | ±2 % of reading |
| Up to 30 000 ppm $CO_2$ | ±3.5 % of reading |
| **Calibration uncertainty** | |
| at 2000 ppm $CO_2$ | ±31 ppm $CO_2$ |
| at 10 000 ppm $CO_2$ | ±105 ppm $CO_2$ |
| **Long-term stability** | |
| 0–3000 ppm $CO_2$ | ±60 ppm $CO_2$/year |
| 3000–6000 ppm $CO_2$ | ±150 ppm $CO_2$/year |
| 6000–10 000 ppm $CO_2$ | ±300 ppm $CO_2$/year |
| **Temperature dependence 0–10 000 ppm $CO_2$** | |
| With compensation, –10 … +50 °C | ±0.05 % of reading/°C |
| With compensation, –40 … +60 °C | < ±0.1 % of reading/°C |
| Without temperature compensation at 2000 ppm $CO_2$ (typical) | –0.5 % of reading/°C |
| **Pressure dependence** | |
| With compensation at 0–10 000 ppm $CO_2$, 500–1100 hPa | ±0.015 % of reading/hPa |
| Without compensation (typical) | +0.15 % of reading/hPa |
| **Humidity dependence** | |
| With compensation, 0–10 000 ppm $CO_2$, 0–100 %RH | ±0.7 % of reading (at +25 °C (+77 °F)) |
| Without compensation (typical) | +0.05 % of reading/%RH |
| **$O_2$ dependence** | |
| With compensation, 0–10 000 ppm $\%CO_2$, 0–90 $\%O_2$ | ±0.6 % of reading (at +25 °C (+77 °F)) |
| Without compensation (typical) | –0.08 % of reading/$\%O_2$ |
| **Start-up, warm-up, and response time** | |
| Start-up time at +25 °C | < 12 s |
| Warm-up time for full spec. | < 2 min |
| Response time (T90): | |
| With standard filter | < 1 min |
| Flow-through option with > 0.1 l/min | 30 s |
| With spray shield | < 3 min |
| **Flow rate dependence (for flow-through option)** | |
| < 1 l/min flow | No effect |
| 1–10 l/min flow | < 0.6 % of reading l/min |

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

## Inputs and outputs

| | |
|---|---|
| Analog outputs | • 0–5/10 V (scalable), min. load 10 kΩ<br>• 0/4–20 mA (scalable), max. load 500 Ω |
| Digital output | Over RS-485:<br>• Modbus<br>• Vaisala Industrial Protocol |
| **Operating voltage** | |
| With digital output in use | 12–30 V DC |
| With voltage output in use | 12–30 V DC |
| With current output in use | 20–30 V DC |
| **Power consumption** | |
| Typical (continuous operation) | 0.4 W |
| Maximum | 0.5 W |

## Operating environment

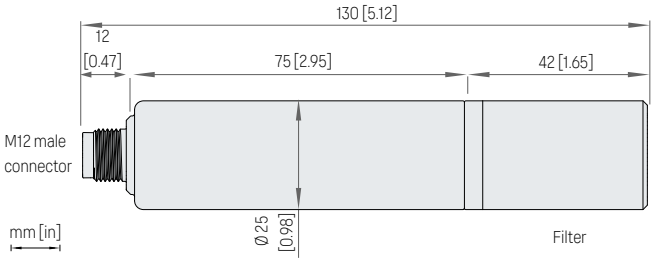
| | |
|---|---|
| Operating temperature of $CO_2$ measurement | –40 … +60 °C (–40 … +140 °F) |
| Storage temperature | –40 … +70 °C (–40 … +158 °F) |
| Operating humidity | 0–100 %RH, non-condensing |
| Condensation prevention | Sensor head heating when power on |
| IP rating, probe body | IP65 |
| Chemical tolerance (temporary exposure during cleaning) | • $H_2O_2$ (2000 ppm, non-condensing)<br>• Alcohol-based cleaning agents (for example ethanol and IPA)<br>• Acetone<br>• Acetic acid |
| **Pressure** | |
| Compensated | 500–1100 hPa |
| Operating | < 1.5 bar |
| **Gas flow (for flow-through option)** | |
| Operating range | < 10 l/min |
| Recommended range | 0.1–0.8 l/min |

## Compliance

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

## Mechanical specifications

| | |
|---|---|
| Weight, probe | 55 g (1.94 oz) |
| Connector type | M12 5-pin male |
| **Materials** | |
| Probe housing | PBT polymer |
| Filter | PTFE |
| **Dimensions** | |
| Probe diameter | 25 mm (0.98 in) |
| Probe length | 130 mm (5.12 in) |

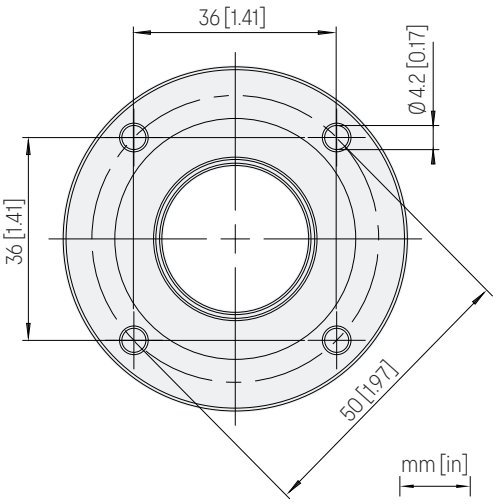



GMP252 probe dimensions

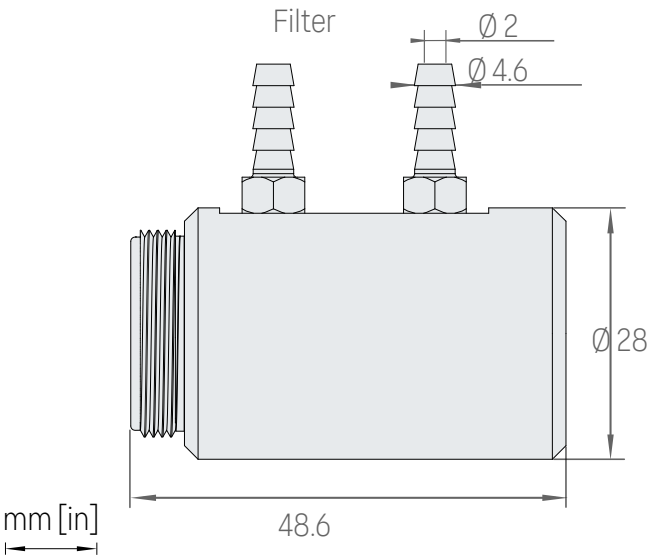
## Spare parts and accessories

| | |
|---|---|
| Porous sintered PTFE filter for GMP252 | DRW244221SP |
| Probe connection cable with open wires (1.5 m), shielded | 223263SP |
| Probe connection cable with open wires (1.5 m), shielded | 254294SP |
| Probe connection cable with open wires (3 m), shielded | 26719SP |
| Probe connection cable with open wires (10 m), shielded | 216546SP |
| Probe connection cable with open wires and 90° plug (0.6 m), shielded | 244669SP |
| Probe connection cable with open wires and 90° plug (1.5 m), shielded | 255102 |
| MI70 connection cable, M12 5-pin | CBL210472 |
| Connection cable for Indigo80, M12-5F - M12-5M, 1.5 m | 272075SP |
| Flat cable for GMP250 probes, M12 5-pin | CBL210493SP |
| Indigo USB adapter [1)] | USB2 |
| Probe mounting clips (2 pcs) | 243257SP |
| Probe mounting flange | 243261SP |
| Probe holder assembly | ASM213582 |
| Probe handle with magnetic hanger | GMP252HANDLESP |
| Probe handle | ASM214342SP |
| Flow-through adapter with gas ports | ASM212011SP |
| Calibration adapter | DRW244827SP |
| Spray shield | ASM212017SP |
| Radiation shield DTR250 | DTR250 |
| Radiation shield DTR250 with pole mounting kit | DTR250A |

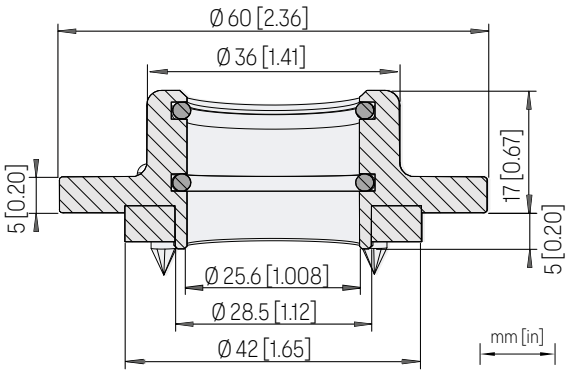
*1) Vaisala Insight software for Windows is available at www.vaisala.com/insight.*



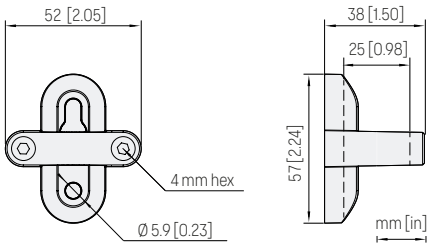

Probe mounting flange 243261SP dimensions




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




Probe mounting flange 243261SP dimensions, cross section

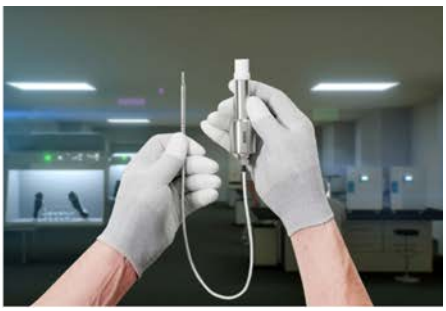



Probe holder ASM213582 dimensions

VAISALA

# PEROXCAP® technology

## Innovative technology designed for bio-decontamination applications



**PEROXCAP's unique benefits**

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

The unique PEROXCAP technology enables accurate measurement of multiple parameters in vaporized hydrogen peroxide bio-decontamination. Probes use two capacitive thin-film polymer HUMICAP® sensors to provide high accuracy, excellent long-term stability, and negligible hysteresis in demanding high-concentration v$H_2O_2$ applications in atmospheric pressure.

The HUMICAP sensor, used in PEROXCAP technology, is a capacitive thin-film polymer sensor consisting of a substrate on which a thin polymer film is deposited between two electrodes. The polymer film absorbs or releases vapor according to humidity changes in the environment. As the humidity changes, the dielectric properties of the polymer film change, as does the capacitance of the sensor. The probe's electronics measure the capacitance of the sensor and convert it to a humidity reading.

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

### Intelligent PEROXCAP measurement technology

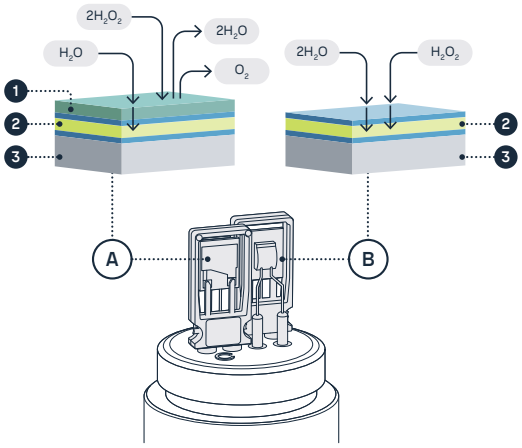
One unique feature of PEROXCAP is that it provides the critical **relative saturation** value. Water ($H_2O$) and hydrogen peroxide ($H_2O_2$) have similar molecular structures, however, while relative humidity (RH) indicates the level of water vapor in the air at a given temperature, relative saturation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

### Multiple measurements for comprehensive bio-decontamination monitoring

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

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

### Operating principle of PEROXCAP measurement




**A** HUMICAP sensor with a catalytic layer under the probe filter. This sensor only senses water vapor.

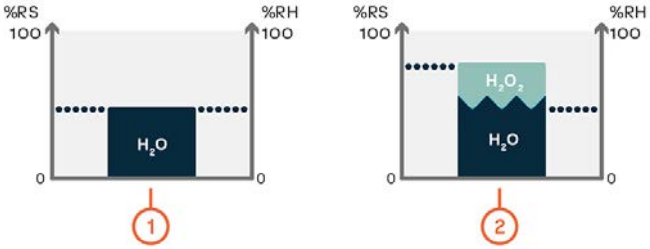
**B** HUMICAP sensor without a catalytic layer under the probe filter. This sensor senses the air mixture with both hydrogen peroxide vapor and water vapor.

**1** Catalytic layer over the thin-film polymer decomposes hydrogen peroxide into water and oxygen and prevents it from entering the sensing polymer.

**2** Thin-film polymer between two electrodes.

**3** Alumina substrate.

### PEROXCAP'S critical difference: relative saturation




**1** Space without $H_2O_2$ vapor. When $H_2O_2$ vapor is not present, relative saturation equals relative humidity.

**2** Same space with $H_2O_2$ vapor introduced. Relative saturation is higher than relative humidity.

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

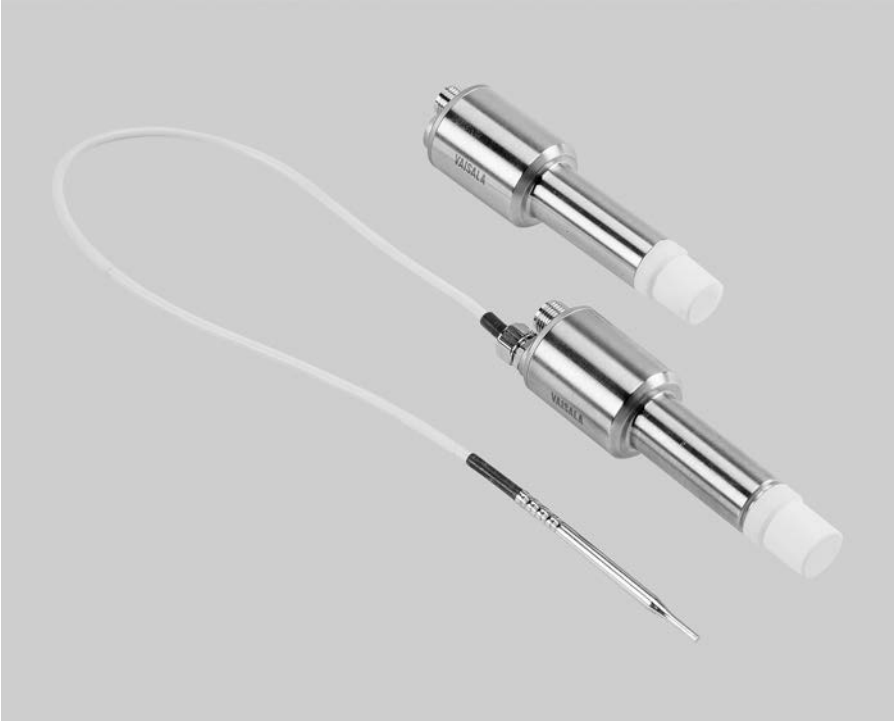
### Traceable $H_2O_2$ factory calibration

Every PEROXCAP sensor is manufactured in Vaisala's own cleanrooms and individually calibrated at the Vaisala factory. Both $H_2O_2$ and RH calibrations are traceable to international SI units which ensures that the measured values represent the real environment. You can also calibrate your own HPP270 series probes.

VAISALA

# HPP270 Series Probes

## For hydrogen peroxide, humidity, and temperature measurement



**Features**

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

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

### Up to three measurements in one compact unit

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

### Relative saturation for comprehensive humidity monitoring

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

### Repeatable measurement for highly condensing environments

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

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

### Indigo and Insight compatible

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

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

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

### Traceable calibration at Vaisala

Every probe and sensor is manufactured and individually calibrated at Vaisala world-class facilities. Available traceable calibration certificates: 2 points for $H_2O_2$, 3 points for humidity, 1 point for temperature.

# HPP271 technical data

## Measurement performance

| | |
|---|---|
| **Hydrogen peroxide** | |
| Sensor | PEROXCAP® |
| Measurement range | 0 ... 2000 ppm |
| Measurement temperature range | +5 ... +50 °C (+41 ... +122 °F) |
| Repeatability at +25 °C (+77 °F) up to 500 ppm $H_2O_2$ | ±10 ppm |
| Accuracy at +10 ... +25 °C (+50 ... +77 °F) , 10 ... 2000 ppm $H_2O_2$ [1)] | ±10 ppm or 5 % of reading (whichever is greater) |
| Factory calibration uncertainty at +25 °C (+77 °F), 500 ppm $H_2O_2$ [2)] | ±10 ppm |
| Response time ($T_{63}$) | 70 s |
| **Other parameters** | |
| $H_2O$ ppm by volume, dew point temperature | |

*1) Including non-linearity, hysteresis, and repeatability.*
*2) Defined as ±2 standard deviation limits. See also calibration certificate.*

## Inputs and outputs

| | |
|---|---|
| Operating voltage | Digital output: 15 ... 30 V DC<br>Analog output: 15 ... 25 V DC |
| **Current consumption at +25 °C (+77 °F)** | |
| In digital mode | Max. 10 mA |
| In analog mode | Max. 50 mA |
| During sensor purge | Max. 250 mA |
| **Digital output** | |
| Interface | RS-485, not isolated; do not use termination on the RS-485 line |
| Communication protocol | Modbus RTU v.1.02 |
| **Analog output** | |
| Outputs | 2 × 4 ... 20 mA 3-wire current outputs |
| Max. load | 500 Ω |
| Accuracy (typical) | ±0.1 % of full scale |
| Analog output temperature dependence | 0.005 %/°C (0.003 %/°F) full scale |

## Operating environment

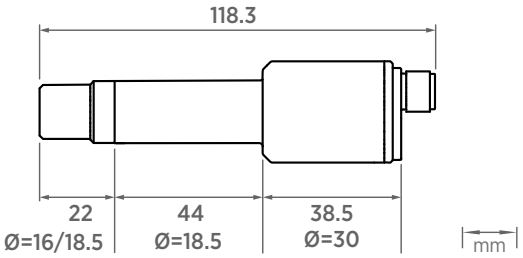
| | |
|---|---|
| Operating temperature | +0 ... +70 °C (+32 ... +158 °F) |
| Storage temperature | −20 ... +70 °C (−4 ... +158 °F) |
| Ambient pressure | Normal atmospheric pressure |
| IP rating | IP65 |

## Compliance

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

## Mechanical specifications

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




HPP271 dimensions

## Spare parts and accessories

| | |
|---|---|
| Indigo USB adapter [1)] | USB2 |
| Probe connection cable with open wires, 1.5 m (4.9 ft) | 254294SP |
| Probe connection cable with open wires, 3 m (9.8 ft) | 254295SP |
| Probe connection cable with open wires, 5 m (16 ft) | 254296SP |
| Probe connection cable with open wires, 10 m (33 ft) | 254297SP |
| Flat cable, M12-5F - M12-5M, 1 m (3.3 ft) | CBL210493SP |
| Filter | DRW246363SP |
| Gland set for through-wall installation, HPP271 | HPP271MOUNTINGSET1 |
| Flange for through-wall installation, HPP271 | HPP271MOUNTINGSET2 |
| Wall mount for HPP271 and HPP272 | HPP272WALLMOUNT |
| Indigo transmitters | See www.vaisala.com/indigo |
| Indigo80 handheld indicator | See www.vaisala.com/indigo80 |

*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 $H_2O_2$ | ±10 ppm |
| Accuracy at +10 ... +25 °C (+50 ... +77 °F) , 10 ... 2000 ppm $H_2O_2$ [1)] | ±10 ppm or 5 % of reading (whichever is greater) |
| Factory calibration uncertainty at +25 °C (+77 °F), 500 ppm $H_2O_2$ [2)] | ±10 ppm |
| Response time ($T_{63}$) | 70 s |
| **Relative saturation** | |
| Measurement range | 0 ... 100 %RS |
| Measurement temperature range | +5 ... +50 °C (+41 ... +122 °F) |
| Repeatability at +25 °C (+77 °F), 500 ppm $H_2O_2$ | ±0.5 %RS |
| Accuracy at +25 °C (+77 °F) [1)] | ±4 %RS |
| Factory calibration uncertainty at +25 °C (+77 °F), 500 ppm $H_2O_2$ [2)] | ±2 %RS |
| **Relative humidity** | |
| Measurement range | 0 ... 100 %RH |
| Measurement temperature range | +5 ... +70 °C (+41 ... +158 °F) |
| Accuracy: [1)] | |
| at +25 °C (77 °F), 0 ppm $H_2O_2$, 0 ... 90 %RH | ±1 %RH |
| over full temperature measurement and $H_2O_2$ range | ±2 %RH |
| Response time ($T_{63}$) | 20 s |
| Factory calibration uncertainty at +25 °C (77 °F), 0 ppm $H_2O_2$, 0 ... 95 %RH [2)] | ±1 %RH |
| **Temperature** | |
| Sensor | Pt1000 RTD Class F0.1 |
| Accuracy over temperature range | ±0.2 °C (±0.36 °F) |
| **Other parameters** | |
| Absolute $H_2O_2$ and $H_2O$, $H_2O$ ppm by volume, water vapor saturation pressure ($H_2O$ and $H_2O$+$H_2O_2$), dew point temperature, vapor pressure ($H_2O$ and $H_2O_2$) | |

1) *Including non-linearity, hysteresis, and repeatability.*
2) *Defined as ±2 standard deviation limits. See also calibration certificate.*

## Inputs and outputs

| | |
|---|---|
| Operating voltage | Digital output: 15 ... 30 V DC<br>Analog output: 15 ... 25 V DC |
| **Current consumption at +25 °C (+77 °F)** | |
| In digital mode | Max. 10 mA |
| In analog mode | Max. 50 mA |
| During sensor purge | Max. 250 mA |
| **Digital output** | |
| Interface | RS-485, not isolated; do not use termination on the RS-485 line |
| Communication protocol | Modbus RTU v.1.02 |
| **Analog output** | |
| Outputs | 2 × 4 ... 20 mA 3-wire current outputs |
| Max. load | 500 Ω |
| Accuracy (typical) | ±0.1 % of full scale |
| Analog output temperature dependence | 0.005 %/°C (0.003 %/°F) full scale |

## Operating environment

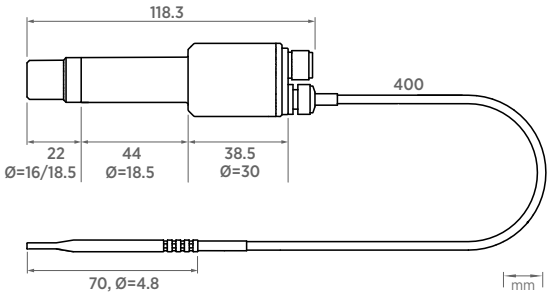
| | |
|---|---|
| Operating temperature | +0 ... +70 °C (+32 ... +158 °F) |
| Storage temperature | −20 ... +70 °C (−4 ... +158 °F) |
| Ambient pressure | Normal atmospheric pressure |
| IP rating | IP65 |

## Compliance

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

## Mechanical specifications

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




HPP272 dimensions

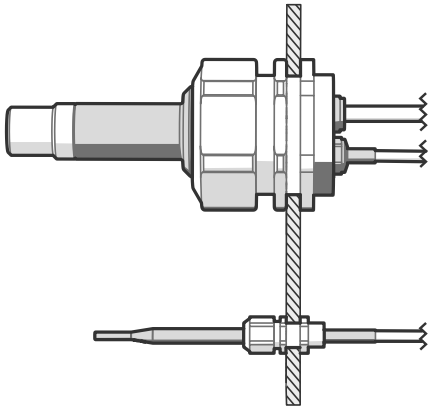
## Spare parts and accessories

| | |
|---|---|
| Indigo USB adapter [1)] | USB2 |
| Probe connection cable with open wires, 1.5 m (4.9 ft) | 254294SP |
| Probe connection cable with open wires, 3 m (9.8 ft) | 254295SP |
| Probe connection cable with open wires, 5 m (16 ft) | 254296SP |
| Probe connection cable with open wires, 10 m (33 ft) | 254297SP |
| Flat cable, M12-5F - M12-5M, 1 m (3.3 ft) | CBL210493SP |
| Filter | DRW246363SP |
| Gland set for through-wall installation, HPP272 | HPP272MOUNTINGSET1 |
| Flange for through-wall installation, HPP272 | HPP272MOUNTINGSET2 |
| Wall mount for HPP271 and HPP272 | HPP272WALLMOUNT |
| Indigo transmitters | See www.vaisala.com/indigo |
| Indigo80 handheld indicator | See www.vaisala.com/indigo80 |

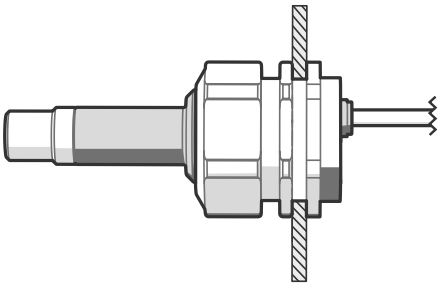
1) *Vaisala Insight software for Windows available at www.vaisala.com/insight.*

# HPP271 and HPP272 installation accessories

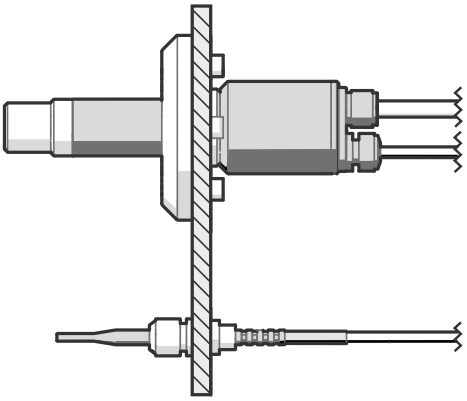
HPP272MOUNTINGSET1



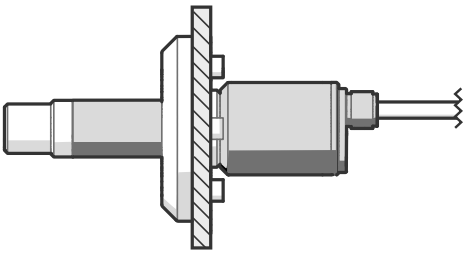
HPP271MOUNTINGSET1



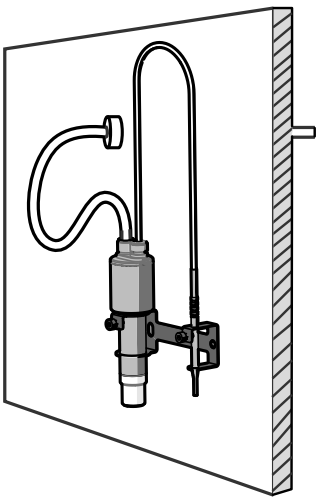
HPP272MOUNTINGSET2

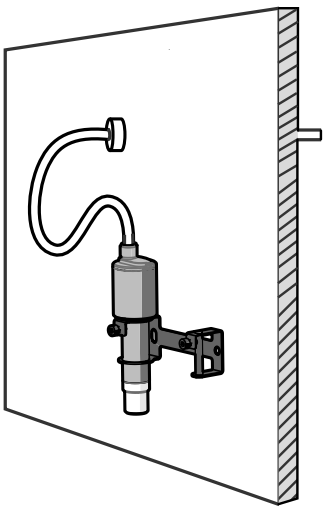


HPP271MOUNTINGSET2



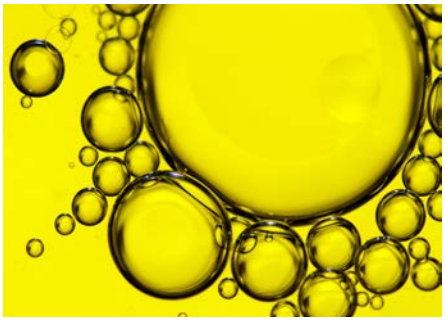
HPP272WALLMOUNT





VAISALA

# HUMICAP® sensor for measuring moisture in oil



**HUMICAP in brief**

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

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

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

## Free water formation – the critical point

Water can dissolve in oil. When the water content of the oil increases, it eventually reaches the saturation point of the oil. Once the fluid has reached its saturation point, any additional water introduced will separate out as free water by forming a distinct layer. Alternatively, the oil can form dispersion with water, which turns the oil cloudy. Since most oils are less dense than water, the water layer will usually settle below the oil with time.

Free water formation is critical in terms of problems related to water in oil. When water is no longer dissolved in the oil, corrosion and wearing of equipment increase rapidly. Therefore it is important to keep the moisture content safely below the saturation point.

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

## Water activity ($a_w$) – a direct measure of oil quality

The conventional measure for water content in oil is ppm (parts per million), which describes the absolute amount of water in the oil. Ppm measurement has, however, a major limitation. It does not account for any variations in the oil's saturation point. In other words, ppm measurement provides no indication of how close the moisture level is to the saturation point in a dynamic system with fluctuating saturation point. By measuring water activity instead of ppm, the risk of actually exceeding the saturation point can be avoided.

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

**Unique benefits of HUMICAP in oil moisture measurements**

- Fast, online, real-time detection of moisture in oil without sampling.
- Our sensor technology tells the true margin to water saturation point in all changing conditions, taking into account, for example, temperature changes and aging of oil.
- Highly stable pressure and temperature tolerances.
- Easy to install through ball valve – no need to shut down the process.
- Enables predictive maintenance work and quick identification of damaging trends.

In contrast to traditional measurement techniques, water activity measurement is independent of oil type. Regardless of the saturation point of the fluid, water

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

## Vaisala HUMICAP for measuring water activity

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

The HUMICAP sensor consists of four functional layers: glass substrate, lower electrode, water-active polymer layer, and porous upper electrode. The thin-film polymer either absorbs or releases water as the surrounding moisture level changes. Water molecules move to/from the polymer layer until there is moisture equilibrium between the polymer and the oil. The dielectric properties of the polymer depend on the moisture level. As the moisture level changes, the dielectric properties of the polymer film change, and so does the capacitance of the sensor. The instrument's electronics measure the capacitance of the sensor and convert it into water activity.

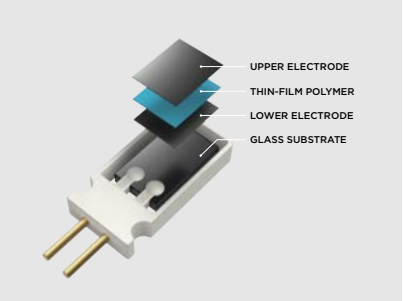
Oil molecules or additives do not penetrate the electrode. Thus the sensor output is independent of the oil type.

## Online measurement

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

## Typical applications for moisture in oil measurement

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




Structure of the HUMICAP sensor

VAISALA

# MMP8 Moisture in Oil Probe

**Features**

- Continuous online measurement of moisture in oil and temperature
- Temperature measurement range −40 ... +180 °C (−40 ... +356 °F)
- Measurement accuracy up to ±0.01 $a_w$ (±1 %RS)
- Incorporates the proven Vaisala HUMICAP® sensor
- Modbus® RTU over RS-485
- Two lengths available for the probe head: 262 mm and 448 mm
- Traceable calibration certificate
- Compatible with Vaisala Indigo products and Insight PC software

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

## Reliable Vaisala HUMICAP® technology

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

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

## Measure the margin to water saturation

MMP8 measures dissolved moisture in oil in terms of water activity ($a_w$), relative saturation (%RS), and temperature (T). Water activity or relative saturation indicate directly whether there is a risk of free water formation. This data is relevant in lubrication oil applications where detecting water ingress and preventing free water formation is crucial. The measurement is independent of oil type and age.

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

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

## Easy installation

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

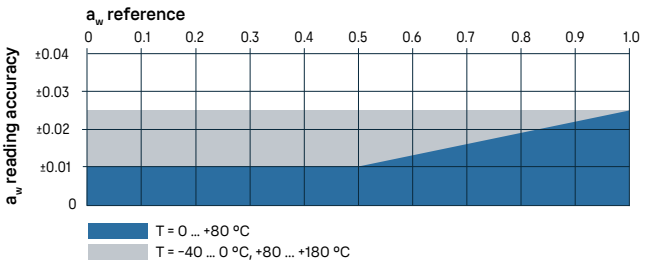
For more information on Indigo family products and Insight PC software that can be used with the probe, see www.vaisala.com/insight and www.vaisala.com/indigo.

# Technical data

## Measurement performance

| | |
|---|---|
| **Water activity** | |
| Measurement range | 0–1 $a_w$ |
| $T_{90}$ response time [1] | 10 min |
| Sensor | HUMICAP® 180L2 |
| Accuracy [2] | ±0.01 $a_w$ (±1 %RS) |
| **Water concentration in oil** | |
| Typical accuracy | 10 % of the reading |
| **Temperature** | |
| Measurement range | −40 … +180 °C (−40 … +356 °F) |
| Accuracy at +20 °C (+68 °F) | ±0.2 °C (0.36 °F) |

*1) At +20 °C (+68 °F) in still oil.*
*2) In range 0–0.5 $a_w$, including non-linearity, hysteresis, and repeatability. See accuracy graph below.*




MMP8 $A_W$ measurement accuracy

## Operating environment

| | |
|---|---|
| Operating temperature of probe head | −40 … +180 °C (−40 … +356 °F) |
| Operating temperature of probe body | −40 … +80 °C (−40 … +176 °F) |
| Storage temperature range | −40 … +80 °C (−40 … +176 °F) |
| Operating pressure range | 0–40 bar (0–580 psi), absolute |
| Installation pressure | Up to 10 bar (145 psi), absolute |
| IP rating of probe body | IP66 |
| **Ball valve** | |
| Operating temperature | Up to +100 °C (+212 °F) |
| Operating pressure | Up to 40 bar (580 psi), absolute |

## Inputs and outputs

| | |
|---|---|
| Operating voltage | 15–30 V DC |
| Current consumption | 10 mA typical |
| Digital output | RS-485, non-isolated |
| Protocols | Modbus RTU |
| Output parameters | Relative saturation (%RS)<br>Temperature (°C)<br>Water activity<br>Water concentration in oil ($ppm_w$) |

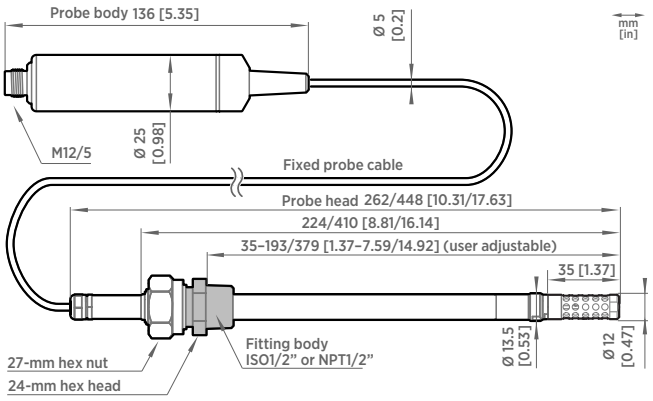
## Mechanical specifications

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

## Compliance

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

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




MMP8 dimensions

## Accessories

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

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

VAISALA

# Indigo520 Transmitter

## For Vaisala Indigo-compatible probes

**Features**

- Supports 2 detachable measurement devices simultaneously
- Data logging of all measurement parameters
- IP66 rated metal enclosure
- 4 configurable galvanically isolated analog outputs
- 2-wire current loop analog input
- 2 relays
- Ethernet connection with web interface and optional Vaisala cloud connectivity for remote monitoring
- Displays measurements on the spot and transmits them to automation systems through analog signals, relays, or Modbus TCP/IP protocol

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

**Options**

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

### Variety of probe options

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

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

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

The Indigo500 series transmitters can be connected to the MHT410 transmitter for display of measurement data and automation system connectivity. Through the transmitter service port, the Indigo500 series transmitters can also be connected to the free Vaisala Insight PC Software or Indigo80 Handheld Indicator.

The Indigo520 transmitter can be connected to Polaris™ PR53 Process Refractometers for measuring liquid concentrations.

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

### Analog and digital interfaces

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

The digital output protocol is Modbus TCP/IP over Ethernet. The Ethernet connection also provides a web interface and cybersecurity that meets modern standards. The Indigo500 series transmitters can be ordered with a possibility for Vaisala cloud connection for remote monitoring.

# Technical data

## Indigo-compatible probes

| Measurement type | Probe models |
|---|---|
| Humidity and temperature | HMP1, HMP3, HMP4, HMP5, HMP7, HMP8, HMP9 |
| Temperature | TMP1 |
| Dew point | DMP1, DMP5, DMP6, DMP7, DMP8 |
| Carbon dioxide | GMP251, GMP252 |
| Vaporized hydrogen peroxide | HPP271, HPP272 |
| Moisture in oil | MMP8 |

## Other compatible devices

| Device or series | Models |
|---|---|
| Moisture, Hydrogen and Temperature Transmitter MHT410 | MHT410 |
| Polaris™ Process Refractometers [1] | PR53AC, PR53AP, PR53GC, PR53GP, PR53M, PR53SD, PR53W |
| Indigo80 Handheld Indicator | Indigo80 |
| MGP241 Multigas Probe | MGP241 |
| MGP260 Series Multigas Probes | MGP261, MGP262 |
| Differential Pressure Transmitters [2] | PDT101, PDT102 |

*1) Compatible with transmitters ordered with software configuration "L" for process refractometers.*
*2) PDT101 and PDT102 can be used through analog input.*

## Transmitter options

| | |
|---|---|
| Display | • Capacitive touchscreen display<br>• No display (indicator LED) [1] |
| Powering | • Protective extra-low voltage (15–35 V DC, 24 V AC ± 20%)<br>• AC (mains) power (100–240 V AC 50/60 Hz)<br>• Power over Ethernet (no analog outputs, analog input, or relays) |

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

## Measurement performance

| | |
|---|---|
| **Barometric pressure** (optional module) | |
| Pressure range | 500–1100 hPa |
| Class A: | |
| Linearity | ±0.05 hPa |
| Hysteresis | ±0.03 hPa |
| Repeatability | ±0.03 hPa |
| Calibration uncertainty | ±0.07 hPa |
| Accuracy at +20 °C / +68 °F | ±0.10 hPa |
| Temperature dependence | ±0.1 hPa |
| Total accuracy (-40 … +60 °C / -40 … +140 °F) | ±0.15 hPa |
| Long-term stability/year | ±0.1 hPa |
| Response time (100 % response): | |
| One sensor | 2 s |
| Pressure units | hPa, mbar, kPa, Pa, inHg, mmH20, mmHg, torr, psia |

## Mechanical specifications

| | |
|---|---|
| Housing classification | IK08, DIN EN ISO 11997-1: Cycle B (VDA 621-415) |
| Housing material | AlSi10Mg (DIN 1725) |
| Display window material | Strengthened glass (IK08) |
| Weight | 1.5 kg (3.3 lb) |
| Dimensions (H × W × D) | 142 × 182 × 67 mm (5.63 × 7.17 × 2.64 in) |
| **Cable diameters for cable glands** | |
| M20×1.5 glands | 5.0–9.0 mm (0.20–0.35 in) |
| M20×1.5 glands with split bushing | 7 mm (0.28 in) |
| M16×1.5 glands | 2.0–6.0 mm (0.08–0.24 in) |

## Operating environment

| | |
|---|---|
| Operating environment | Outdoor use |
| Use in wet location | Yes |
| Operating humidity | 0–100 %RH |
| Maximum operating altitude, AC (mains) power | 3000 m (approx. 9800 ft) |
| Maximum operating altitude, protective extra-low voltage (PELV) and Power over Ethernet (PoE) | 4000 m (approx. 13 100 ft) |
| IP rating | IP66 [1] |
| UL 50E rating | Type 4 |
| **Operating temperature** | |
| With display | −20 … +55 °C (−4 … +131 °F) |
| Without display | −40 … +60 °C (−40 … +140 °F) |
| Without display with barometer module | −40 … +55 °C (−40 … +131 °F) |
| **Storage temperature** | |
| With display | −30 … +60 °C (−22 … +140 °F) |
| Without display | −40 … +60 °C (−40 … +140 °F) |

*1) Evaluated by Eurofins, not by UL.*

## Powering

| **Operating power** [1] | |
|---|---|
| Protective extra-low voltage (PELV) version | 15–35 V DC, 24 V AC ±20 % 50/60 Hz, max. current 2 A (power supply is galvanically isolated)<br>Fuse size for power supply: 3 A<br>Isolation voltage: 500 V AC, 1000 V DC |
| PELV power cable temp. rating | ≥ +80 °C (+176 °F) |
| AC (mains) power version | 100–240 V AC 50/60 Hz, max. current 1 A (power supply is galvanically isolated)<br>Fuse size for power supply: 10 A<br>Isolation voltage: 1500 V AC |
| AC (mains) power cable length | 2.5 m (approx. 8 ft 2 in) |
| Power over Ethernet version | Power over Ethernet (PoE) IEEE 802.3at Type 2 Class 4<br>Max. current 600 mA, max. power consumption 25.5 W<br>Isolation voltage: 500 V AC, 1000 V DC |
| **Typical current consumption at +20 °C (+68 °F) ($U_{in}$ 24 V DC)** [2] | |
| Base consumption (no display, analog outputs, or communication) | 50 mA |
| With display | + 60 mA |
| With voltage analog output | < 2 mA per channel |
| With current analog output | + 21 mA per channel |
| With relays | + 9 mA per relay |
| With Ethernet cable connected | + 15 mA |
| With barometer module | + 5 mA |

1) *The power supply option is selected when ordering the transmitter.*
2) *For the current consumption of the connected measurement device, see the device's documentation, available at docs.vaisala.com.*

## User interfaces

| | |
|---|---|
| User interfaces | Web interface, optional touchscreen display, optional Vaisala cloud connectivity for remote monitoring [1] |
| Supported languages | English, Chinese (simplified), Chinese (traditional), French, German, Japanese, Spanish |
| Optional display | 5″ capacitive touchscreen |
| Integrated data logging capabilities | Non-volatile memory, at least 10 years' storage with 24 h interval logging |

1) *Available only for transmitters ordered with software configuration for Vaisala cloud connectivity.*

## Inputs and outputs

| | |
|---|---|
| Transmitter service port connection | • Connection to Insight software with USB2 and cable 262195SP or with cable 219690 [1]<br>• Connection to Indigo80 with cable 262195SP |
| **Analog input** [2] | |
| Available ranges | 4–20 mA |
| Resolution | 6 µA |
| Display resolution | 0.01 mA |
| Accuracy | ±0.05 mA |
| Input impedances | 200 Ω |
| Isolation | Isolated from power supply |
| Overload protection | 40 mA max. (reverse polarity protected) |
| **Analog outputs** [2] | |
| Number of analog outputs | 4 |
| Isolation | Isolated from power supply |
| Selectable voltage output types | 0–1 V, 0–5 V, 0–10 V, scalable |
| Selectable current output types | 4–20 mA, 0–20 mA, scalable |
| Max. wire size | 2.5 $mm^2$ (14 AWG) |
| Accuracy of analog outputs at +20 °C (+68 °F) | ±0.05 % full scale |
| Temperature dependence | ±0.005 % / °C full scale |
| External loads: | |
| Current outputs | $R_L$ < 500 Ω |
| 0–1 V output | $R_L$ > 2 kΩ |
| 0–5 V and 0–10 V outputs | $R_L$ > 10 kΩ |
| **Relay outputs** [2] | |
| Number and type of relays | 2 pcs, SPDT |
| Max. switching power, current, voltage | 30 W, 1 A, 40 V DC / 28 V AC |
| Max. wire size in PELV version | 2.5 $mm^2$ (14 AWG) |
| Max. wire size in AC (mains) version | 1.5 $mm^2$ (16 AWG) |
| **Ethernet interface** | |
| Supported standards | 10BASE-T, 100BASE-TX |
| Connector | 8P8C (RJ45) |
| Supported protocols | Modbus TCP/IP (port 502), HTTPS (port 8443) |
| Vaisala cloud connectivity [3] | Requires outbound TCP port 443 and UDP port 123 |

1) *Vaisala Insight PC Software for Windows® available at vaisala.com/insight.*
2) *Not available in transmitters that are powered with Power over Ethernet (PoE).*
3) *Available only for transmitters ordered with software configuration for Vaisala cloud connectivity.*

## Compliance

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

## Spare parts

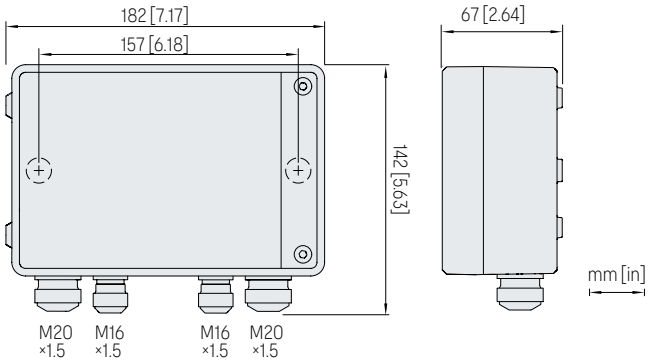
| | |
|---|---|
| Cable gland, M20×1.5, 5.0–9.0 mm (0.20–0.35 in) | ASM213670SP |
| Cable gland, M20×1.5, 10.0–14.0 mm (0.39–0.55 in) | ASM215414 |
| Cable gland with split bushing, M20×1.5 [1] | 262632SP |
| Cable gland, M16×1.5, 2.0–6.0 mm (0.08–0.24 in) | ASM213671SP |
| Conduit fitting, M20×1.5 for NPT1/2" conduit | 214780SP |
| Sintered filter (for barometer module) | DRW010335SP |

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

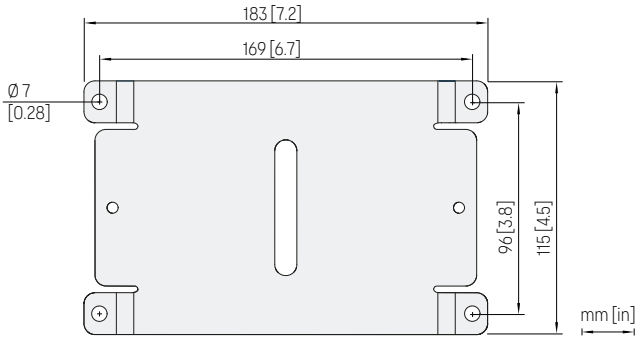
## Accessories

| | |
|---|---|
| Retrofit mounting plate | DRW252186SP |
| Installation kit for pole or pipeline | 215108 |
| Installation kit with weather shield | 215109 |
| Indigo500 spatter guard | ASM214526 |
| M12 - M8 service cable 1.5 m (4.9 ft), for connecting to Indigo80 | 262195SP |
| Vaisala Indigo USB adapter and M12 - M8 service cable, for connecting to Insight software | USB2 and 262195SP |
| M8 - USB service cable, for connecting to Insight software | 219690 |
| **Probe connection cables** | |
| Probe connection cable, 0.3 m (approx. 12 in), open end [1] | CBL210896-03MSP |
| Probe connection cable, 1 m (approx. 3 ft 3 in), open end [1] | CBL210896-1MSP |
| Probe connection cable, 3 m (approx. 9 ft 10 in), open end [1] | CBL210896-3MSP |
| Probe connection cable, 5 m (approx. 16 ft 5 in), open end [1] | CBL210896-5MSP |
| Probe connection cable, 10 m (approx. 32 ft 10 in), open end [1] | CBL210896-10MSP |

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




Indigo520 dimensions and lead-through sizes




Indigo500 retrofit mounting plate dimensions

VAISALA

# Indigo510 Transmitter

## For Vaisala Indigo-compatible probes

**Features**

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

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

### Variety of probe options

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

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

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

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

Through the transmitter service port, the Indigo500 series transmitters can also be connected to the free Vaisala Insight PC Software or Indigo80 Handheld Indicator.

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

### Analog and digital interfaces

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

The digital output protocol is Modbus TCP/IP over Ethernet. The Ethernet connection also provides a web interface and cybersecurity that meets modern standards. The Indigo500 series transmitters can be ordered with a possibility for Vaisala cloud connection for remote monitoring.

### Robust design

The transmitter has a wide operating temperature range, an IP66-rated corrosion-resistant metal enclosure, and an optional touchscreen display made of strengthened (IK08) glass.

The transmitter withstands commonly used cleaning chemicals, such as isopropanol and liquid $H_2O_2$ (30 %), and performs even in the harshest conditions.

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

# Technical data

## Indigo-compatible probes

| Measurement type | Probe models |
|---|---|
| Humidity and temperature | HMP1, HMP3, HMP4, HMP5, HMP7, HMP8, HMP9 |
| Temperature | TMP1 |
| Dew point | DMP1, DMP5, DMP6, DMP7, DMP8 |
| Carbon dioxide | GMP251, GMP252 |
| Vaporized hydrogen peroxide | HPP271, HPP272 |
| Moisture in oil | MMP8 |

## Other compatible devices

| Device or series | Models |
|---|---|
| Moisture, Hydrogen and Temperature Transmitter MHT410 | MHT410 |
| Indigo80 Handheld Indicator | Indigo80 |

## Transmitter options

| | |
|---|---|
| Display | • Capacitive touchscreen display<br>• No display (indicator LED) [1] |
| Powering | Protective extra-low voltage (11–35 V DC, 24 V AC ± 20 % 50/60 Hz) |

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

## Mechanical specifications

| | |
|---|---|
| Housing classification | IK08, DIN EN ISO 11997-1: Cycle B (VDA 621-415) |
| Housing material | AlSi10Mg (DIN 1725) |
| Display window material | Strengthened glass (IK08) |
| Weight | 1.5 kg (3.3 lb) |
| Dimensions (H × W × D) | 142 × 182 × 67 mm (5.63 × 7.17 × 2.64 in) |
| **Cable diameters for cable glands** | |
| M20×1.5 glands | 5.0–9.0 mm (0.20–0.35 in) |
| M20×1.5 glands with split bushing | 7 mm (0.28 in) |
| M16×1.5 glands | 2.0–6.0 mm (0.08–0.24 in) |

## Operating environment

| | |
|---|---|
| Operating environment | Outdoor use |
| Use in wet location | Yes |
| Operating humidity | 0–100 %RH |
| Maximum operating altitude | 4000 m (approx. 13 100 ft) |
| IP rating | IP66 [1] |
| UL 50E rating | Type 4 |
| **Operating temperature** | |
| With display | −20 … +60 °C (−4 … +140 °F) |
| Without display | −40 … +60 °C (−40 … +140 °F) |
| **Storage temperature** | |
| With display | −30 … +60 °C (−22 … +140 °F) |
| Without display | −40 … +60 °C (−40 … +140 °F) |

1) *Evaluated by Eurofins, not by UL.*

## Powering

| | |
|---|---|
| **Operating power** | |
| Protective extra-low voltage (PELV) | 11–35 V DC, 24 V AC ±20 % 50/60 Hz, max. current 2 A (power supply is galvanically isolated) [1]<br>Fuse size for power supply: 3 A<br>Isolation voltage: 500 V AC, 1000 V DC |
| PELV power cable temp. rating | ≥ +80 °C (+176 °F) |
| **Typical current consumption at +20 °C (+68 °F) ($U_{in}$ 24 V DC) [2]** | |
| Base consumption (no display, analog outputs, or communication) | 50 mA |
| With display | + 60 mA |
| With voltage analog output | < 2 mA per channel |
| With current analog output | + 21 mA per channel |
| With Ethernet cable connected | + 15 mA |

1) *The DNV type approval is valid in operating voltage range 15–35 V DC.*
2) *For the current consumption of the connected measurement device, see the device's documentation, available at docs.vaisala.com.*

## Inputs and outputs

| | |
|---|---|
| Transmitter service port connection | • Connection to Insight software with USB2 and cable 262195SP or with cable 219690 [1]<br>• Connection to Indigo80 with cable 262195SP |
| **Analog outputs** | |
| Number of analog outputs | 2 |
| Isolation | Isolated from power supply |
| Selectable voltage output types | 0–1 V, 0–5 V, 0–10 V, scalable |
| Selectable current output types | 4–20 mA, 0–20 mA, scalable |
| Max. wire size | 2.5 $mm^2$ (14 AWG) |
| Accuracy of analog outputs at +20 °C (+68 °F) | ±0.05 % full scale |
| Temperature dependence | ±0.005 % / °C full scale |
| External loads: | |
| Current outputs | $R_L$ < 500 Ω |
| 0–1 V output | $R_L$ > 2 kΩ |
| 0–5 V and 0–10 V outputs | $R_L$ > 10 kΩ |
| **Ethernet interface** | |
| Supported standards | 10BASE-T, 100BASE-TX |
| Connector | 8P8C (RJ45) |
| Supported protocols | Modbus TCP/IP (port 502), HTTPS (port 8443) |
| Vaisala cloud connectivity [2] | Requires outbound TCP port 443 and UDP port 123 |

1) *Vaisala Insight PC Software for Windows® available at vaisala.com/insight.*
2) *Available only for transmitters ordered with software configuration for Vaisala cloud connectivity.*

## User interfaces

| | |
|---|---|
| User interfaces | Web interface, optional touchscreen display, optional Vaisala cloud connectivity for remote monitoring [1] |
| Supported languages | English, Chinese (simplified), Chinese (traditional), French, German, Japanese, Spanish |
| Optional display | 5″ capacitive touchscreen |
| Integrated data logging capabilities | Non-volatile memory, at least 10 years' storage with 24 h interval logging |

## Compliance

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

## Spare parts

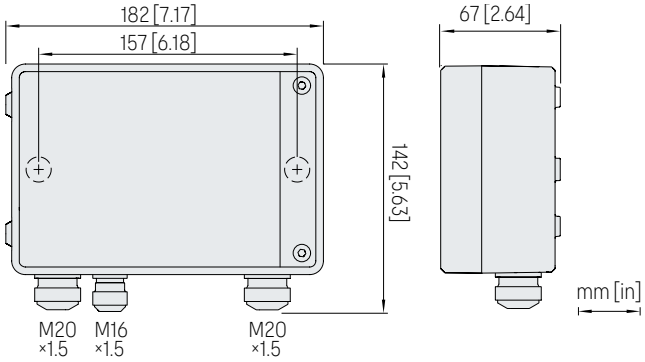
| | |
|---|---|
| Cable gland, M20×1.5, 5.0–9.0 mm (0.20–0.35 in) | ASM213670SP |
| Cable gland with split bushing, M20×1.5 [1] | 262632SP |
| Cable gland, M16×1.5, 2.0–6.0 mm (0.08–0.24 in) | ASM213671SP |
| Conduit fitting, M20×1.5 for NPT1/2" conduit | 214780SP |

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

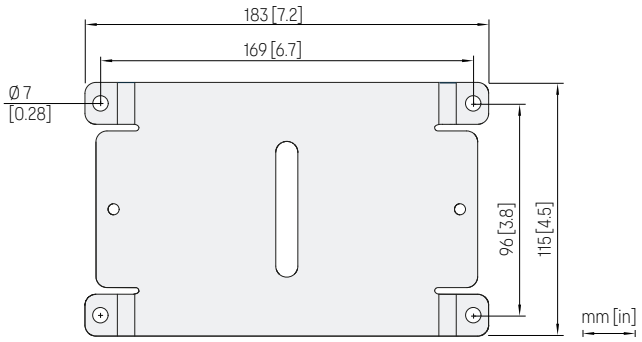
## Accessories

| | |
|---|---|
| Retrofit mounting plate | DRW252186SP |
| Installation kit for pole or pipeline | 215108 |
| Installation kit with weather shield | 215109 |
| Indigo500 spatter guard | ASM214526 |
| M12 - M8 service cable 1.5 m (4.9 ft), for connecting to Indigo80 | 262195SP |
| Vaisala Indigo USB adapter and M12 - M8 service cable, for connecting to Insight software | USB2 and 262195SP |
| M8 - USB service cable, for connecting to Insight software | 219690 |
| **Probe connection cables** | |
| Probe connection cable, 0.3 m (approx. 12 in), open end [1] | CBL210896-03MSP |
| Probe connection cable, 1 m (approx. 3 ft 3 in), open end [1] | CBL210896-1MSP |
| Probe connection cable, 3 m (approx. 9 ft 10 in), open end [1] | CBL210896-3MSP |
| Probe connection cable, 5 m (approx. 16 ft 5 in), open end [1] | CBL210896-5MSP |
| Probe connection cable, 10 m (approx. 32 ft 10 in), open end [1] | CBL210896-10MSP |

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




Indigo510 dimensions and lead-through sizes




Indigo500 retrofit mounting plate dimensions

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# Indigo300 Transmitter

## For Vaisala Indigo-compatible probes

**Features**

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

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

**Transmitter for Vaisala Indigo-compatible probes**

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

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

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

### Simple to connect and service

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

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

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

### Robust design

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

### Versatile installation options

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

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

For more information on the Indigo300 transmitter and the Indigo product family, see www.vaisala.com/indigo.

# Technical data

## Indigo-compatible probes

| Measurement type | Probe models |
|---|---|
| Humidity and temperature | HMP1, HMP3, HMP4, HMP5, HMP7, HMP8, HMP9 |
| Temperature | TMP1 |
| Dew point | DMP1, DMP5, DMP6, DMP7, DMP8 |
| Carbon dioxide | GMP251, GMP252 |
| Vaporized hydrogen peroxide | HPP271, HPP272 |
| Moisture in oil | MMP8 |

## Operating environment

| | |
|---|---|
| Operating temperature | With display: −20 ... +60 °C (−4 ... +140 °F)<br>Without display: −40 ... +60 °C (−40 ... +140 °F) |
| Storage temperature | With display: −30 ... +70 °C (−22 ... +158 °F)<br>Without display: −40 ... +70 °C (−40 ... +158 °F) |
| Operating humidity | 0–100 %RH |
| Maximum operating altitude | 5000 m (approx. 16 400 ft) |
| IP rating | IP66 |

## Inputs and outputs

| | |
|---|---|
| Power supply input | 15–30 V DC [1]<br>24 V AC ±10 % 50/60 Hz |
| Fuse size for power supply | 2.5 A |
| Transmitter service port connection | • Connection to Insight with USB2 and cable 262195SP [2]<br>• Connection to Indigo80 with cable 262195SP |
| **Analog outputs** | Current or voltage |
| Number of analog outputs | 3 |
| Isolation | Not galvanically isolated |
| Selectable voltage output types | 0–1 V, 0–5 V, 0–10 V, 1– 5 V, scalable, $R_L \geq 10$ kΩ |
| Selectable current output types | 4–20 mA, 0–20 mA, scalable, $R_L \leq 500$ Ω |
| Accuracy of analog outputs at 20 °C (+68 °F) | ±0.1 % full scale [3] |
| Temperature dependence | ±0.005 % / °C full scale |
| **Current consumption at 20 °C (+68 °F) ($U_{in}$ 24 V DC)** | |
| Minimum consumption with display off, no analog outputs active, no probe connected [4] | 13 mA |
| Minimum consumption with display on, brightness normal mode, no analog outputs active, no probe connected | 18 mA |
| $U_{out}$ 0–1 V, 0–5 V, 0–10 V, 1–5 V | + 1.8 mA per connected channel at maximum load |
| $I_{out}$ 4–20 mA, 0–20 mA | + 12.3 mA max. per connected channel |

1) *When used with the HMP7 probe, the minimum required power supply input is 18 V DC.*
2) *Vaisala Insight software for Windows® available at vaisala.com/insight.*
3) *For the voltage outputs, small variation is possible around true zero.*
4) *For the current consumption of the connected probe, see the probe's user documentation at docs.vaisala.com.*

## Compliance

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

## Mechanical specifications

| | |
|---|---|
| Housing material | EN AW-6082 |
| Connection screw terminals | Max. 1.5 $mm^2$ wire (16 AWG) |
| Cable lead-throughs for output and power cables | • M20×1.5 cable gland / conduit fitting NPT 1/2″<br>• M16×1.5 cable gland / conduit fitting NPT 1/2″ |
| Cable diameter for M20×1.5 gland | 7–13 mm (0.26–0.51 in) |
| Cable diameter for M16×1.5 gland | 2–6 mm (0.08–0.24 in) |
| Dimensions | 161 × 134 × 43.5 mm (6.34 × 5.26 × 1.71 in) |
| Weight | 1200 g (2.65 lb) |

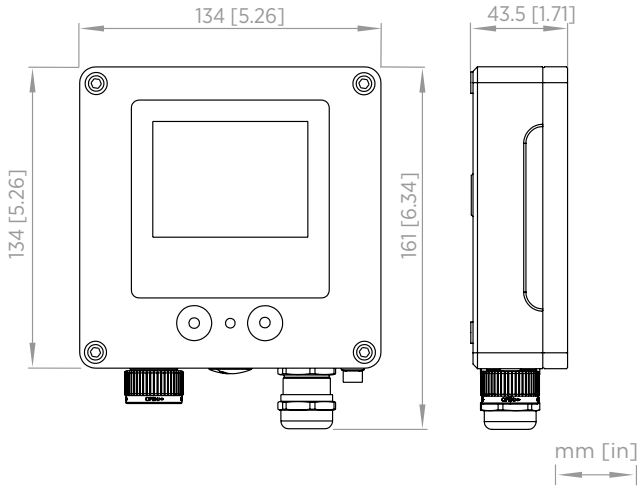
## Probe connection cables

| | |
|---|---|
| **Detachable cables for use with locking wheel** | |
| Probe connection cable, 1 m (3 ft 3 in) | INDIGOCABLE1M |
| Probe connection cable, $H_2O_2$ compatible, 1 m (3 ft 3 in) | INDIGOCABLEHD1M5 |
| Probe connection cable, 3 m (9 ft 11 in) | INDIGOCABLE3M |
| Probe connection cable, $H_2O_2$ compatible, 3 m (9 ft 11 in) | INDIGOCABLEHD3M |
| Probe connection cable, 5 m (16 ft 5 in) | INDIGOCABLE5M |
| Probe connection cable, $H_2O_2$ compatible, 5 m (16 ft 5 in) | INDIGOCABLEHD5M |
| Probe connection cable, 10 m (32 ft 10 in) | INDIGOCABLE10M |
| Probe connection cable, $H_2O_2$ compatible, 10 m (32 ft 10 in) | INDIGOCABLEHD10M |
| **Fixed cables for use with cable gland** | |
| Probe connection cable, 0.3 m (12 in), open end [1] | CBL210896-03MSP |
| Probe connection cable, 1 m (3 ft 3 in), open end | CBL210896-1MSP |
| Probe connection cable, 3 m (9 ft 11 in), open end | CBL210896-3MSP |
| Probe connection cable, 5 m (16 ft 5 in), open end | CBL210896-5MSP |
| Probe connection cable, 10 m (32 ft 10 in), open end | CBL210896-10MSP |

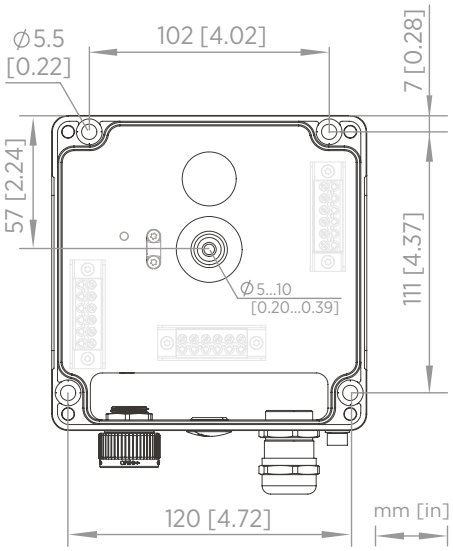
1) *The usable length outside of the transmitter enclosure is approx. 0.1 m (4 in) shorter than the total length of the cable.*

## Spare parts and accessories

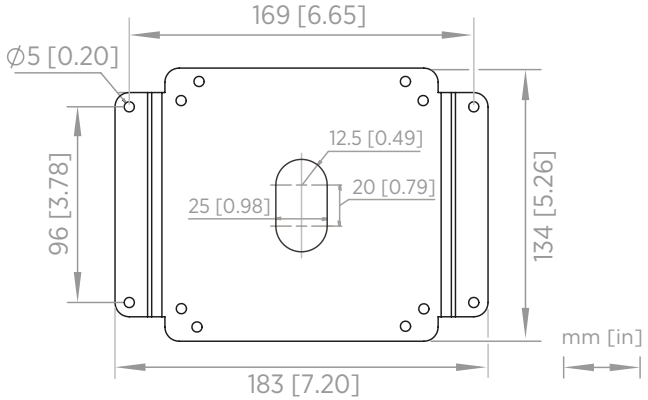
| | |
|---|---|
| Adapter plate for replacing a Vaisala 330 series transmitter | DRW257715SP |
| DIN rail installation kit for 35 mm (0.11 in) wide DIN rail | ASM215071SP |
| Vaisala Indigo USB adapter and M12 - M8 service cable, for connecting to Insight | USB2 and 262195SP |
| M12 - M8 service cable 1.5 m (4.9 ft), for connecting to Indigo80 | 262195SP |
| Cable gland M20×1.5 for 7.0–13.0 mm (0.26–0.51 in) cable | 253993SP |
| Conduit fitting M20×1.5 for NPT1/2" conduit | 214780SP |
| Cable gland M16×1.5 for 2.0–6.0 mm (0.08–0.24 in) cable | ASM213671SP |
| Conduit fitting M16×1.5 for NPT1/2" conduit | 210675SP |
| Plug for M20 lead-through | ASM213672SP |
| Plug for M16 lead-through | 210369SP |
| Service port plug | DRW257660SP |




Indigo300 transmitter dimensions




Indigo300 transmitter body mounting dimensions




Indigo300 adapter plate (DRW257715SP) mounting dimensions

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# Indigo200 Series Transmitters

## For Vaisala Indigo-compatible probes

**Features**

- Transmitter USB-C port allows connecting to Vaisala Insight PC software with a generic USB cable
- Numerical and graphical color display (optional non-display version for analog model)
- IP65 enclosure
- 24 V AC/DC power supply input
- Indigo201: 3 analog outputs (mA or V)
- Indigo202: RS-485 with Modbus® RTU
- 2 configurable relays

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

**Transmitter for Vaisala Indigo-compatible probes**

- HMP series humidity and temperature probes HMP1, HMP3, HMP4, HMP5, HMP7, HMP8, HMP9
- TMP1 temperature probe
- DMP series dew point probes DMP5, DMP6, DMP7, DMP8
- GMP250 series $CO_2$ probes GMP251, GMP252
- HPP270 series vaporized hydrogen peroxide probes HPP271, HPP272
- MMP8 moisture in oil probe

Indigo200 series transmitters are plug-and-play probe host devices for current and future Vaisala Indigo-compatible probes. The host device has a color display with numeric and graph measurement viewing options; Indigo201 is also available as a non-display version that uses an LED indicator for notifications.

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

The surface of the Indigo200 enclosure is smooth, which makes it easy to clean. It is also resistant to dust and most chemicals, such as $H_2O_2$ and alcohol-based cleaning agents.

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

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

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

# Technical data

## General

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

## Indigo-compatible probes

| Measurement type | Probe models |
|---|---|
| Humidity and temperature | HMP1, HMP3, HMP4, HMP5, HMP7, HMP8, HMP9 |
| Temperature | TMP1 |
| Dew point | DMP1, DMP5, DMP6, DMP7, DMP8 |
| Carbon dioxide | GMP251, GMP252 |
| Vaporized hydrogen peroxide | HPP271, HPP272 |
| Moisture in oil | MMP8 |

## Operating environment

| | |
|---|---|
| Operating temperature | With display<br>−20 … +60 °C (−4 … +140 °F)<br>Without display<br>−40 … +60 °C (−40 … +140 °F) |
| Storage temperature | −40 … +70 °C (−40 … +158 °F) |
| Chemical tolerance | Temporary exposure during cleaning:<br>• $H_2O_2$ (6000 ppm, non-condensing)<br>• Alcohol-based cleaning agents such as ethanol and IPA (max. 70 % concentrate) |
| IP rating | IP65 [1] |
| Indoor/outdoor use | Indoor use |

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

## Inputs and outputs

| | |
|---|---|
| Insight PC software configuration access [1] | USB-C port on transmitter (compatible with generic USB cables) |
| Power supply input | 15–30 V DC [2]<br>24 V AC ±10 % 50/60 Hz |
| Relay contacts x 2 | Max. switching current 1 A<br>Max. switching voltage 40 V DC / 28 V AC |
| **Indigo201 model** | |
| Three analog outputs (voltage or current) | Voltage: 0–1 V, 0–5 V, 0–10 V, 1–5 V, scalable, min. load 1 kΩ<br>Current: 4–20 mA, 0–20 mA, scalable, max. load 500 Ω |
| Accuracy of analog outputs at 20 °C | ±0.1 % full scale for 0–10 V and 0–20 mA |
| **Indigo202 model** | |
| Digital communications | RS-485, Modbus RTU |

1) *Vaisala Insight software for Windows® available at www.vaisala.com/insight.*
2) *When used with the HMP7 probe, the minimum required power supply input is 18 V DC.*

## Compliance

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

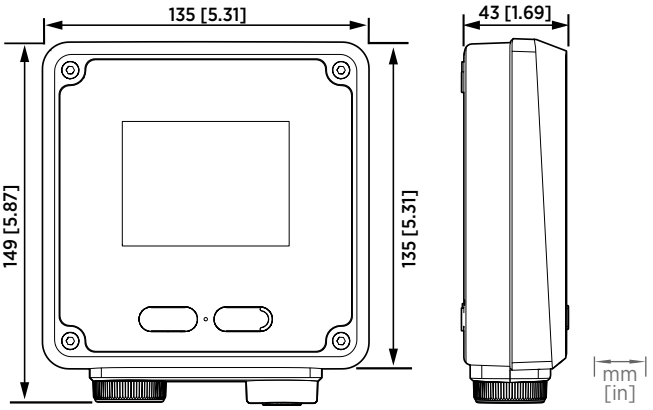
## Mechanical specifications

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

## Spare parts and accessories

| | |
|---|---|
| USB-C connection cable (2 m, type C to A, for Insight PC software access) [1] | 273956 |
| Probe connection cable, 1 m (3 ft 3 in) | INDIGOCABLE1M |
| Probe connection cable, $H_2O_2$ compatible, 1 m (3 ft 3 in) | INDIGOCABLEHD1M5 |
| Probe connection cable, 3 m (9 ft 11 in) | INDIGOCABLE3M |
| Probe connection cable, $H_2O_2$ compatible, 3 m (9 ft 11 in) | INDIGOCABLEHD3M |
| Probe connection cable, 5 m (16 ft 5 in) | INDIGOCABLE5M |
| Probe connection cable, $H_2O_2$ compatible, 5 m (16 ft 5 in) | INDIGOCABLEHD5M |
| Probe connection cable, 10 m (32 ft 10 in) | INDIGOCABLE10M |
| Probe connection cable, $H_2O_2$ compatible, 10 m (32 ft 10 in) | INDIGOCABLEHD10M |
| Universal mains power supply with EU/US/UK/AUS plugs | INDIGOPOWER24VSP |

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




Indigo200 series dimensions

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# Insight PC software

## For easy access to Indigo-compatible probes

**Features**

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

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

### Indigo product family

Vaisala Indigo-compatible probes are self-contained, interchangeable measurement probes. The probes can be used as standalone digital Modbus® RTU devices, or together with Indigo series transmitters or the Indigo80 indicator, which provide flexibility in terms of system interface: display, service interface, and powering options.

The Indigo product family provides various ways to interact with the device. The probe settings and calibration can be done through the local display of an Indigo transmitter or the Indigo80 indicator. Alternatively, the probes can be detached from the process and connected to a PC with a USB cable for setup and field calibration using Insight PC software.

### High-quality field calibration

Field calibration is a quick way to check and validate the measurement. The simplest form of field calibration is comparison with a portable instrument. However, when more accuracy is needed or more than one point has to be calibrated, the calibration should be made using a calibrator in the controlled environment of a laboratory or a workshop.

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

### Diagnostics and more

Vaisala Insight PC software provides access to diagnostics data and device specific advanced features, such as event logs, parameter backup copy, and electronic copy of the calibration certificate. It also allows easy testing and evaluation – the 48-hour data logging functionality allows recording data from up to 6 devices simultaneously, with easy export to Excel readable format.

### Technical requirements

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

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

# Devices supported by Insight software

## Indigo-compatible probes

| Measurement type | Probe models |
|---|---|
| Humidity and temperature | HMP1, HMP3, HMP4, HMP5, HMP7, HMP8, HMP9 |
| Temperature | TMP1 |
| Dew point | DMP1, DMP5, DMP6, DMP7, DMP8 |
| Carbon dioxide | GMP251, GMP252 |
| Vaporized hydrogen peroxide | HPP271, HPP272 |
| Moisture in oil | MMP8 |

## Indigo transmitters and handheld devices

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

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

## Other supported devices

| Device or series | Models |
|---|---|
| DMT143 Miniature Dew Point Transmitters | DMT143, DMT143L |
| GMD110 Duct Carbon Dioxide Transmitter | GMD110 |
| HMD60 Series Humidity and Temperature Transmitters | HMD62, HMD65, TMD62 |
| HMDW110 Series Humidity and Temperature Transmitters | HMW110, HMW112, HMD110, HMD112, HMS110, HMS112, TMI110 |
| HMM170 Humidity Measurement Module | HMM170 |
| HMP110 Series Humidity and Temperature Probes | HMP110, HMP110T, HMP113, HMP115, HMP115T, TMP115 |
| HMP60 Series Humidity and Temperature Probes | HMP60, HMP63 |
| HMT370EX Series Intrinsically Safe Humidity and Temperature Transmitters | HMT370EX, HMP371, HMP373, HMP374, HMP375, HMP377, HMP378 |
| MGP260 Series Multigas Probes | MGP261, MGP262 |
| Polaris™ Refractometers | PR53AC, PR53AP, PR53GC, PR53GP, PR53M, PR53W, PR53SD |
| VDL200 Data Logger | VDL200 |
| Ultrasonic Wind Sensor WM80 | WM80 |

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# Indigo80 Handheld Indicator

## For portable diagnostics

**Features**

- Flexible operation with Vaisala Indigo family measurement probes and other supported Vaisala devices
- Complemented by the HMP80 and DMP80 handheld probes and the GMP80P probe with pump sampling, which are optimized for portable use cases
- Intuitive user interface available in 10 languages
- Rechargeable battery
- Robust design and modern appearance
- Logged measurement data can be transferred to PC via Vaisala Insight software

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

### Seamless compatibility for varied measurements

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

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

For the full set of Vaisala devices currently compatible with Indigo80, see the following page. For more information on the Indigo product family, see vaisala.com/indigo.

### Robust and reliable

The sturdy aluminum body of Indigo80 is resistant to chemicals and dust.

Indigo80 is powered by a rechargeable lithium-ion battery with a typical operation time of 10 h. During long-term logging Indigo80 can be powered by using an AC adapter.

### Easy to use

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

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

### Multilingual user interface

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

View live measurement data as numbers or graphs

# Vaisala devices compatible with Indigo80

Vaisala devices with older firmware versions may have limited compatibility with the Indigo80 indicator. For the most up-to-date version compatibility information, see Firmware version compatibility of Indigo80-compatible devices Technical Note (M212901EN), available at docs.vaisala.com.

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

| **Vaisala Indigo transmitters (host devices)** |
|---|
| Indigo300, Indigo510, Indigo520 |

| **Other Vaisala devices** | |
|---|---|
| HMP60, HMP63, HMP110, HMP113, HMP115 probes<br>HMM170 module | Humidity and temperature |
| HMP110T, HMP115T, TMP115 probes | Temperature |
| DMT143, DMT143L transmitters | Dew point |
| GMW90 and HMW90 series transmitters | Humidity, temperature, and carbon dioxide |
| MGP241 probe | Carbon dioxide |
| HMT370EX series transmitters | Humidity and temperature |
| PR53 series refractometers | Liquid concentration |

# Technical data

## Operating environment

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

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

## Data logging and user interface specifications

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

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

## Battery operation time

| | |
|---|---|
| Operation time (continuous use) | 10 h at +20 °C (+68 °F) [1] |
| Charging time | 2 hours [1] |

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

## Mechanical specifications

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

## Compliance

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

## Inputs and outputs

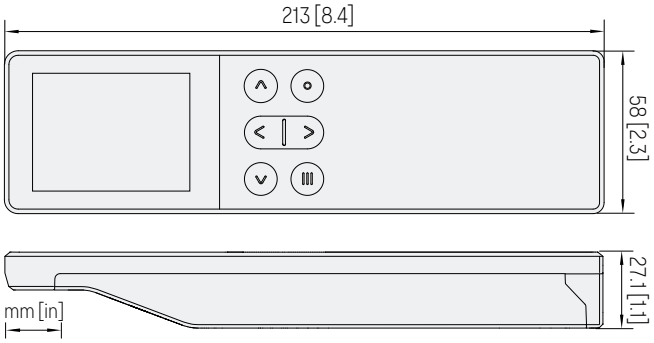
| | |
|---|---|
| Max. number of connected devices | 2 |
| Connector type | M12 5-pin female (2 pcs) |
| **Battery** [1] | |
| Type | Rechargeable lithium-ion battery |
| Nominal voltage | 7.2 V |
| Rated capacity | 2900 mAh / 20.88 Wh |
| Charge limit voltage | 8.4 V |
| **AC adapter** [2] | |
| Type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

1) *The battery is not user-replaceable. Contact Vaisala Service Center for any battery-related maintenance needs.*
2) *The AC adapter is an optional accessory. If using an AC adapter not provided by Vaisala, make sure it fulfills the specifications given in this table and the safety requirements listed in Indigo80 Safety Guide (M212872EN), available at docs.vaisala.com.*
3) *45 W AC adapter recommended for optimal performance of Indigo80. An AC adapter with a lower power rating can also be used.*
4) *Insight software is available for download at vaisala.com/insight.*

## Spare parts and accessories

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

1) *For example, MMP8, HMP8, or DMP8 with a max. 2-m (6 ft 7 in) probe connection cable.*
2) *For example, DMP80, HMP80N, or GMP252 probe with handle accessory and a max. 1.5-m (4 ft 11 in) probe connection cable.*




Indigo80 dimensions (front and side view)

VAISALA

# HMP80 Series Handheld Humidity and Temperature Probes

## For spot-checking applications

**Features**

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

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

### Proven Vaisala HUMICAP performance

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

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

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

### Robust design for handheld measurements

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

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

### Flexible connectivity

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

For more information, see www.vaisala.com/indigo and www.vaisala.com/insight.

# Technical data

## HMP80 series measurement performance

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

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

## HMP80 series operating environment

| | |
|---|---|
| Operating temperature of probe handle | −10 ... +60 °C (−14 ... +140 °F) |
| Operating temperature of probe head | HMP80N: −20 ... +60 °C (−4 ... +140 °F)<br>HMP80L: −50 ... +120 °C (−58 ... +248 °F) |
| Storage temperature | −20 ... +60 °C (−4 ... +140 °F) |
| Measurement environment | For air, nitrogen, hydrogen, argon, helium, oxygen, and vacuum [1] |
| IP rating of probe handle: | |
| with probe connection cable connected to the probe | IP66 |
| without cable | IP55 |

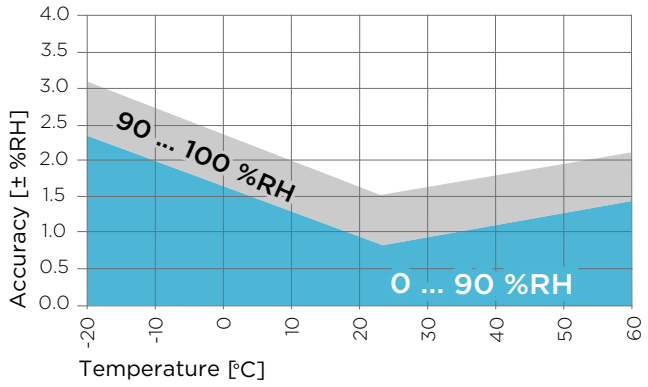
*1) Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases.*

## HMP80 series inputs and outputs

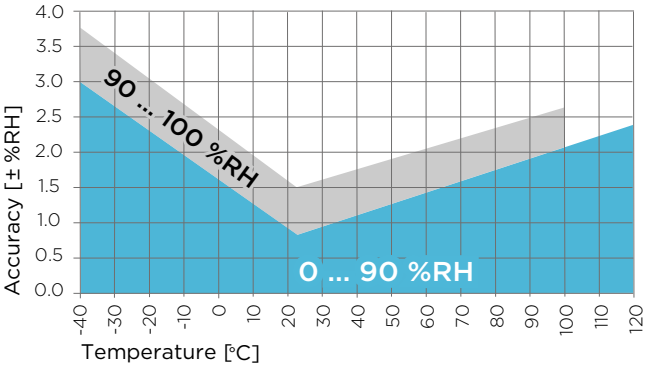
| | |
|---|---|
| Operating voltage | 15–30 V DC |
| Current consumption | 10 mA typical, 500 mA max. |
| Digital output | RS-485, non-isolated |

## HMP80 series compliance

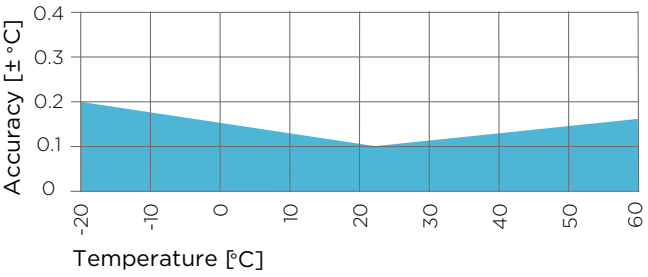
| | |
|---|---|
| EU directives and regulations | EMC Directive (2014/30/EU)<br>RoHS Directive (2011/65/EU) as amended by 2015/863 |
| Electromagnetic compatibility (EMC) | EN 61326-1, industrial environment |
| Rough handling (excluding sensor inside probe head) | IEC 60068-2-31 |
| Compliance marks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



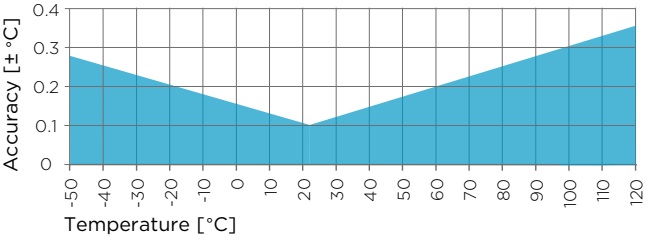

HMP80N humidity measurement accuracy as a function of temperature




HMP80L humidity measurement accuracy as a function of temperature




HMP80N temperature measurement accuracy over full range




HMP80L temperature measurement accuracy over full range

## HMP80 series output parameters

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

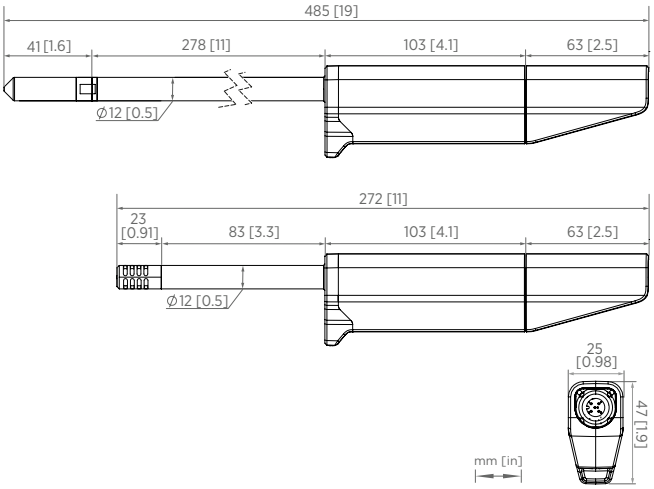
## HMP80 series mechanical specifications

| | |
|---|---|
| Connector type | M12 5-pin A-coded male |
| Weight | HMP80N: 200 g (7 oz)<br>HMP80L: 300 g (10 oz) |
| **Materials** | |
| Probe handle | Polyamide (PA) and thermoplastic elastomer (TPE) |
| Probe shaft | Stainless steel (AISI 316L) |
| Filters | HMP80N: Stainless steel (AISI 316L) [1)]<br>HMP80L: Porous stainless steel (AISI 316L) [2)] |

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

## HMP80 series spare parts and accessories

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




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

VAISALA

# DMP80 Series Handheld Dew Point and Temperature Probes

## For spot-checking applications

**Features**

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

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

### Reliable measurements with the Vaisala DRYCAP sensor

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

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

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

### Sensor purge minimizes effects of contaminants

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

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

### Robust design for handheld measurements

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

### Flexible connectivity

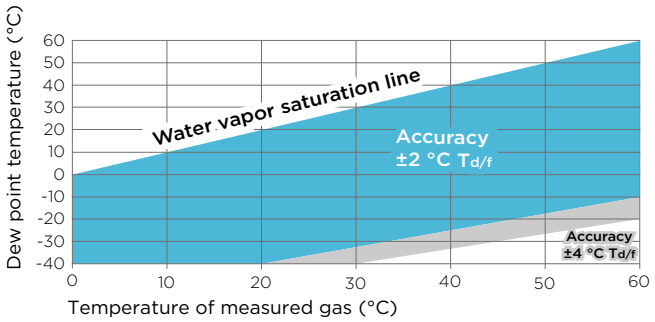
DMP80 probes are optimized for portable spot-checking, field calibration, and data logging use with the Indigo80 handheld indicator. For easy-to-use access to device analytics and configuration, DMP80 probes can be connected to Vaisala Insight software for Windows®.

For more information, see www.vaisala.com/indigo and www.vaisala.com/insight.

# Technical data

## DMP80A measurement performance

| | |
|---|---|
| **Dew point** | |
| Sensor | DRYCAP® 180S |
| Measurement range | −40 ... +60 °C (−40 ... +140 °F) $T_{d/f}$ |
| Accuracy | Up to ±2 °C (±3.6 °F) $T_{d/f}$ |
| Response time 63 % [90 %]: | |
| From dry to wet | 5 s [10 s] |
| From wet to dry | 45 s [5 min] |
| **Temperature** | |
| Measurement range | 0 ... +60 °C (+32 ... +140 °F) |
| Accuracy | ±0.2 °C (±0.36 °F) at room temperature |
| Temperature sensor | Pt100 RTD Class F0.1 IEC 60751 |
| **Mixing ratio** | |
| Measurement range (typical) | 0–150 g/kg (0–1050 gr/lbs) |
| Accuracy (typical) | ±12 % of reading |
| **Absolute humidity** | |
| Measurement range | 0–130 g/m³ |
| Accuracy (typical) | ±10 % of reading |




Dew point accuracy vs. measurement conditions (DMP80A)

## DMP80 series operating environment

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

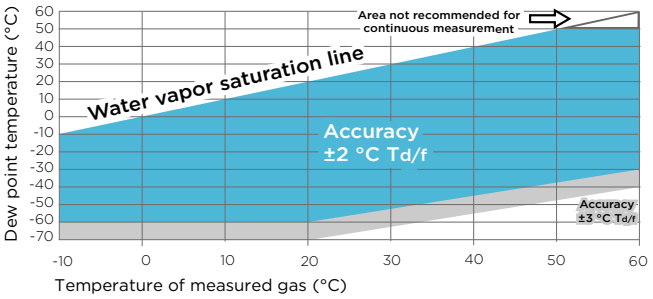
*1) Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases.*

## DMP80 series inputs and outputs

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

## DMP80B measurement performance

| | |
|---|---|
| **Dew point** | |
| Sensor | DRYCAP® 180M |
| Measurement range | −70 ... +60 °C (−94 ... +140 °F) $T_{d/f}$ |
| Accuracy | Up to ±2 °C (±3.6 °F) $T_{d/f}$ |
| Response time 63 % [90 %]: | |
| From dry to wet | 5 s [15 s] |
| From wet to dry | 45 s [8 min] |
| **Temperature** | |
| Measurement range | 0 ... +60 °C (+32 ... +140 °F) |
| Accuracy | ±0.2 °C (±0.36 °F) at room temperature |
| Temperature sensor | Pt100 RTD Class F0.1 IEC 60751 |
| **Relative humidity** | |
| Measurement range | 0–70 %RH |
| Accuracy (RH <10 %RH, at +20 °C) | ±0.004 %RH + 20 % of reading |
| **Concentration by volume (ppm)** | |
| Measurement range (typical) | 10–2500 ppm |
| Accuracy (at + 20 °C, 1 bar) | 1 ppm + 20 % of reading |




Dew point accuracy vs. measurement conditions (DMP80B)

## DMP80 series mechanical specifications

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

*1) Vaisala item code: HM47280SP*

## DMP80 series output parameters

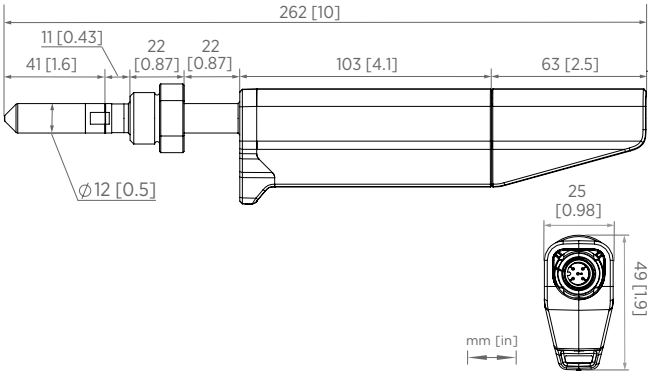
| | |
|---|---|
| Absolute humidity (g/m³) | Relative humidity (%RH) |
| Absolute humidity at NTP (g/m³) | Relative humidity (dew/frost) (%RH) |
| Dew point temperature (°C) | Temperature (°C) |
| Dew/frost point temperature (°C) | Water concentration ($ppm_v$) |
| Dew/frost point temperature at 1 atm (°C) | Water concentration (wet basis) (vol-%) |
| Dew point temperature at 1 atm (°C) | Water mass fraction ($ppm_w$) |
| Dew point temperature difference (°C) | Water vapor pressure (hPa) |
| Enthalpy (kJ/kg) | Water vapor saturation pressure (hPa) |
| Mixing ratio (g/kg) | |

## DMP80 series compliance

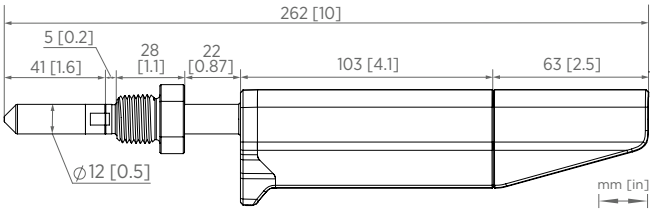
| | |
|---|---|
| EU directives and regulations | EMC Directive (2014/30/EU)<br>RoHS Directive (2011/65/EU) as amended by 2015/863 |
| Electromagnetic compatibility (EMC) | EN 61326-1, industrial environment |
| Rough handling<br>(excluding sensor inside probe head) | IEC 60068-2-31 |
| Compliance marks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

## DMP80 series spare parts and accessories

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




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




Dimensions of DMP80 series probes with NPT1/2" thread

# More information

Visit docs.vaisala.com for product documentation, including datasheets, order forms, and user guides.

| Humidity measurement | Product documentation |
|---|---|
| HMP1 Humidity and Temperature Probe | HMP1 at docs.vaisala.com |
| HMP3 Humidity and Temperature Probe | HMP3 at docs.vaisala.com |
| HMP4 Relative Humidity and Temperature Probe | HMP4 at docs.vaisala.com |
| HMP5 Relative Humidity and Temperature Probe | HMP5 at docs.vaisala.com |
| HMP7 Relative Humidity and Temperature Probe | HMP7 at docs.vaisala.com |
| HMP8 Relative Humidity and Temperature Probe | HMP8 at docs.vaisala.com |
| HMP9 Compact Humidity and Temperature Probe | HMP9 at docs.vaisala.com |
| TMP1 Temperature Probe | TMP1 at docs.vaisala.com |

| Dew point measurement | Product documentation |
|---|---|
| DMP5 Dew Point and Temperature Probe | DMP5 at docs.vaisala.com |
| DMP6 Dew Point Probe | DMP6 at docs.vaisala.com |
| DMP7 Dew Point and Temperature Probe | DMP7 at docs.vaisala.com |
| DMP8 Dew Point and Temperature Probe | DMP8 at docs.vaisala.com |

| Carbon dioxide measurement | Product documentation |
|---|---|
| GMP251 Carbon Dioxide Probe | GMP251 at docs.vaisala.com |
| GMP252 Carbon Dioxide Probe | GMP252 at docs.vaisala.com |

| Hydrogen peroxide measurement | Product documentation |
|---|---|
| HPP270 Series Probes | HPP270 Series at docs.vaisala.com |

| Moisture in oil measurement | Product documentation |
|---|---|
| MMP8 Moisture in Oil Probe | MMP8 at docs.vaisala.com |

| Portable diagnostics | Product documentation | Software download |
|---|---|---|
| Indigo80 Handheld Indicator | Indigo80 at docs.vaisala.com | vaisala.com/indigo80 |
| HMP80 Series Humidity and Temperature Probes | HMP80 Series at docs.vaisala.com | |
| DMP80 Series Dew Point and Temperature Probes | DMP80 Series at docs.vaisala.com | |

| Indigo transmitters and Insight software | Product documentation | Software download |
|---|---|---|
| Indigo500 Series Transmitters | Indigo500 Series at docs.vaisala.com | vaisala.com/indigo500 |
| Indigo300 Transmitters | Indigo300 Series at docs.vaisala.com | |
| Indigo200 Series Transmitters | Indigo200 Series at docs.vaisala.com | |
| Insight PC software | Insight software at docs.vaisala.com | vaisala.com/insight |

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