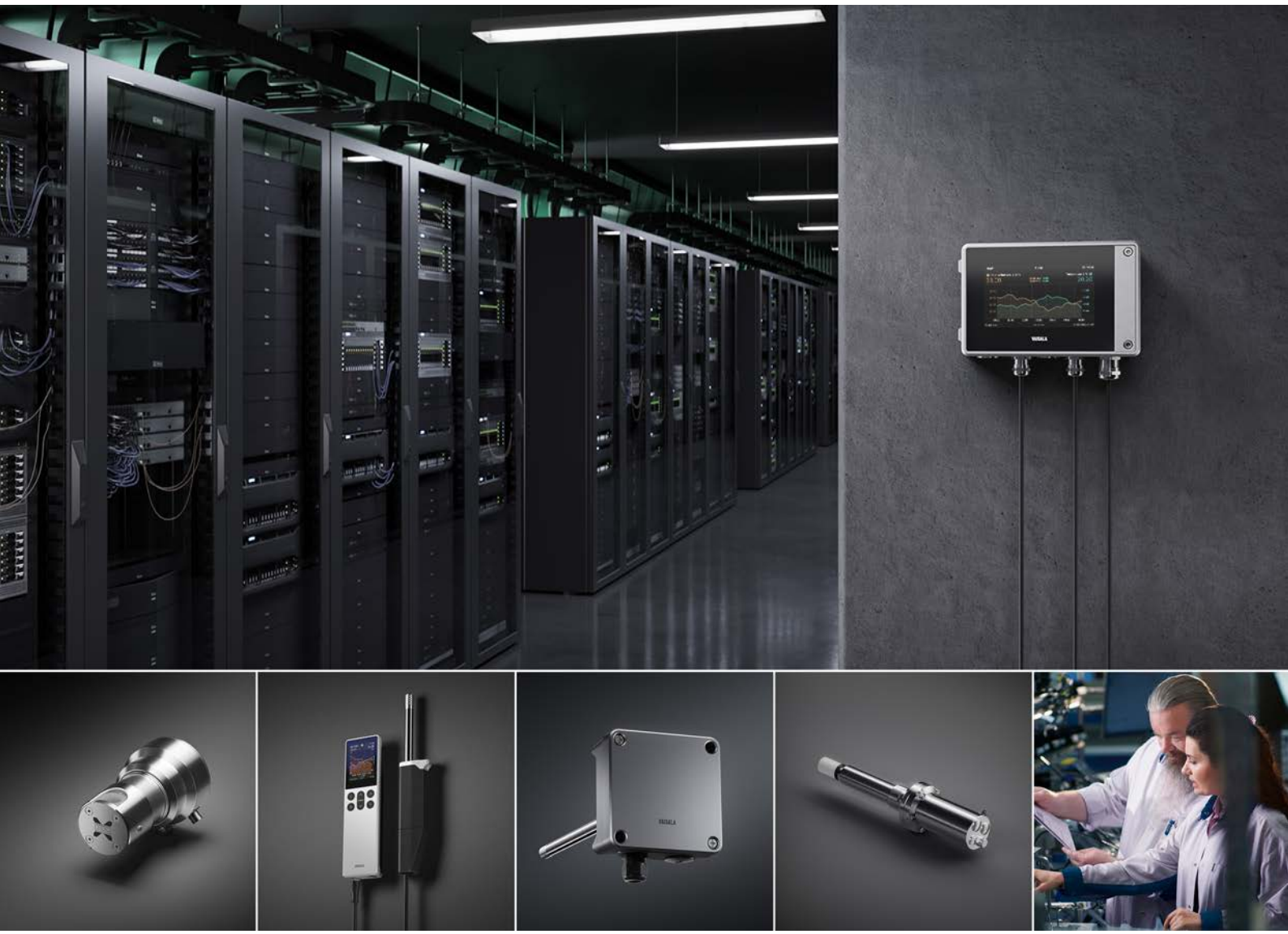
Product Catalog

Humidity · Temperature · Dew point · Carbon dioxide
Biogas quality · Moisture in oil · Hydrogen peroxide
Pressure · Liquid concentration · Weather · Service offering

INDUSTRIAL INSTRUMENTS



VAISALA

Instruments and intelligence for industrial needs

Vaisala Industrial Measurements

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

Heating, ventilation, and air-conditioning (HVAC)

Vaisala offers industry benchmark HVAC transmitters for measuring humidity, temperature, and carbon dioxide indoors and outdoors. Customers use these instruments to optimize heating ventilation and air conditioning controls, for example, in offices, hospitals, data centers, factories, and cooling towers. Our transmitters help in maintaining good indoor air quality and saving costs through improved efficiency.

Liquid measurements

Vaisala's cutting-edge Polaris™ process refractometers offer unparalleled reliability and performance in liquid concentration and density measurements for industrial manufacturing. Designed for seamless inline process control, our solutions are trusted across a wide range of demanding sectors, including pulp and paper, food and sugar production, semiconductors, pharmaceuticals, chemicals, oil refining, and petrochemicals.

Life Cycle Services

Our Life Cycle Services provide comprehensive care through the life cycle of our measurement instruments. As a trusted partner to our global customers, we enable sustainable decisions by maintaining the most accurate measurement data throughout the entire product and system life cycle.

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



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VAISALA

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

VAISALA

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 −20 … +60 °C (−4 … +140 °F) Without display −40 … +60 °C (−40 … +140 °F)
Storage temperature	−40 … +70 °C (−40 … +158 °F)
Chemical tolerance	Temporary exposure during cleaning: • H_2O_2 (6000 ppm, non-condensing) • 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] 24 V AC ±10 % 50/60 Hz
Relay contacts x 2	Max. switching current 1 A Max. switching voltage 40 V DC / 28 V AC
Indigo201 model	
Three analog outputs (voltage or current)	Voltage: 0–1 V, 0–5 V, 0–10 V, 1–5 V, scalable, min. load 1 kΩ Current: 4–20 mA, 0–20 mA, scalable, max. load 500 Ω
Accuracy of analog outputs at 20 °C	±0.1 % full scale for 0–10 V and 0–20 mA
Indigo202 model	
Digital communications	RS-485, Modbus RTU

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

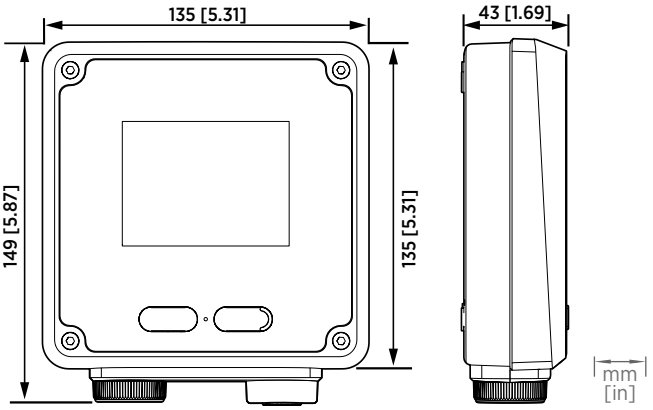
Mechanical specifications

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

VAISALA

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

Inputs and outputs

Power supply input	15–30 V DC [1] 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] • 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) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN IEC 61326-1, industrial environment
EMC emissions	CISPR 32 / EN 55032, Class A FCC part 15 B, Class A ICES-3 / NMB-3 (Class A)
Compliance marks	CE, China RoHS, FCC, 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″ • 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)

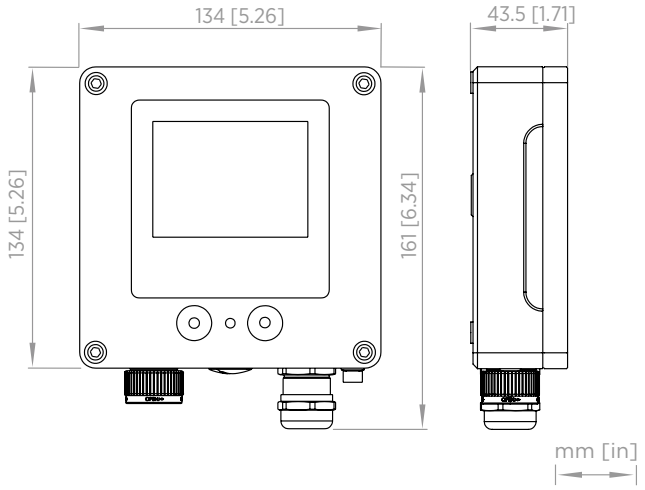
Probe connection cables

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

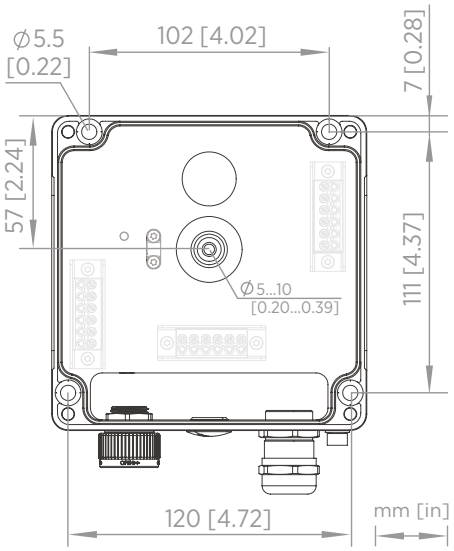
1) *The usable length outside of the transmitter enclosure is approx. 0.1 m (4 in) shorter than the total length of the cable.*

Spare parts and accessories

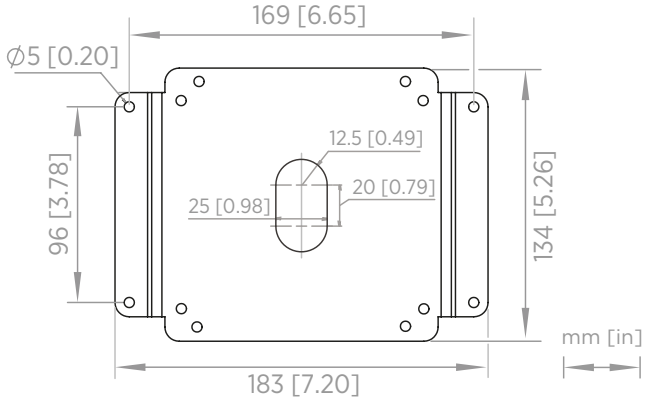
Adapter plate for replacing a Vaisala 330 series transmitter	DRW257715SP
DIN rail installation kit for 35 mm (0.11 in) wide DIN rail	ASM215071SP
Vaisala Indigo USB adapter and M12 - M8 service cable, for connecting to Insight	USB2 and 262195SP
M12 - M8 service cable 1.5 m (4.9 ft), for connecting to 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

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 • 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] Fuse size for power supply: 3 A Isolation voltage: 500 V AC, 1000 V DC
PELV power cable temp. rating	≥ +80 °C (+176 °F)
Typical current consumption at +20 °C (+68 °F) (U_{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] • 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

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

Compliance

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

Spare parts

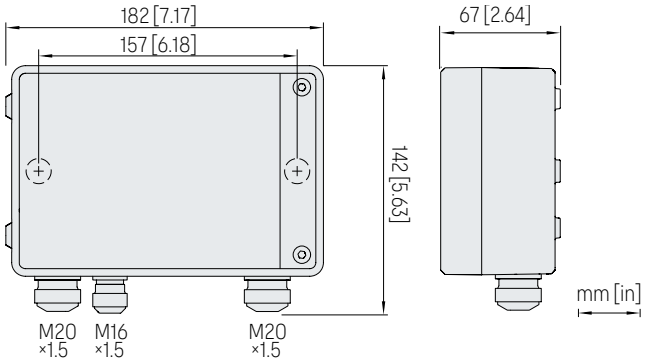
Cable gland, M20×1.5, 5.0–9.0 mm (0.20–0.35 in)	ASM213670SP
Cable gland with split bushing, M20×1.5 [1]	262632SP
Cable gland, M16×1.5, 2.0–6.0 mm (0.08–0.24 in)	ASM213671SP
Conduit fitting, M20×1.5 for NPT1/2″ conduit	214780SP

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

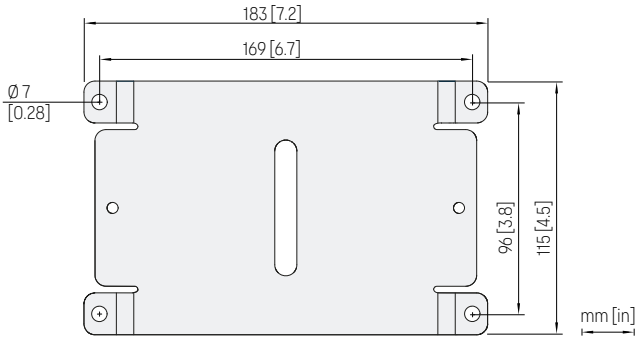
Accessories

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

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 • No display (indicator LED) [1]
Powering	• Protective extra-low voltage (15–35 V DC, 24 V AC ± 20%) • AC (mains) power (100–240 V AC 50/60 Hz) • 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) Fuse size for power supply: 3 A Isolation voltage: 500 V AC, 1000 V DC
PELV power cable temp. rating	≥ +80 °C (+176 °F)
AC (mains) power version	100–240 V AC 50/60 Hz, max. current 1 A (power supply is galvanically isolated) Fuse size for power supply: 10 A Isolation voltage: 1500 V AC
AC (mains) power cable length	2.5 m (approx. 8 ft 2 in)
Power over Ethernet version	Power over Ethernet (PoE) IEEE 802.3at Type 2 Class 4 Max. current 600 mA, max. power consumption 25.5 W Isolation voltage: 500 V AC, 1000 V DC
Typical current consumption at +20 °C (+68 °F) (U_{in} 24 V DC) [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

Inputs and outputs

Transmitter service port connection	• Connection to Insight software with USB2 and cable 262195SP or with cable 219690 [1] • 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) Low Voltage Directive (2014/35/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B
Electrical safety	IEC/EN 61010-1
Type approvals	DNV GL certificate no. TAA000032M EU RO Mutual Recognition certificate no. MRA000004F
Compliance marks	CE, China RoHS, FCC, RCM, UKCA
Listing marks	UL Listed (USA and Canada)
FCC compliance	FCC Part 15, Class B

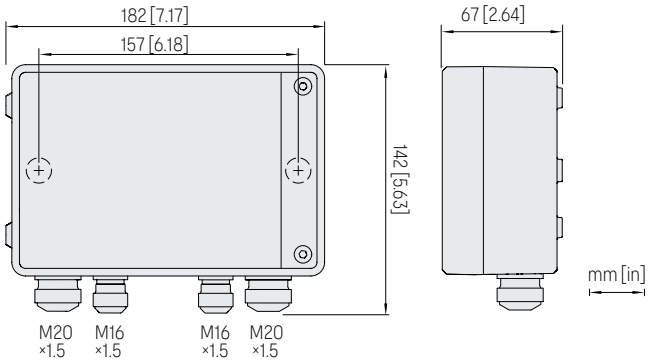
Spare parts

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

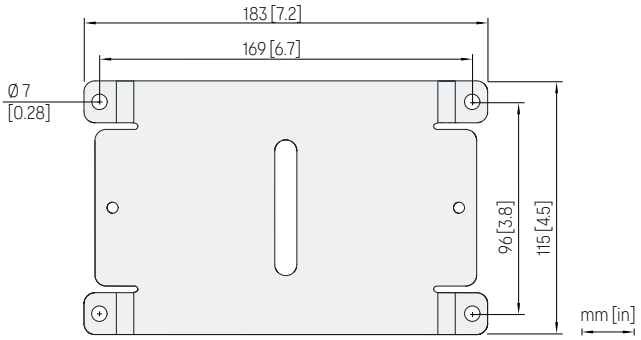
Accessories

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

Indigo500MIK Meteorological Installation Kit



Features

- Outdoor installation kit for Indigo500 Series transmitters
- Supports wall and pole mounting
- Delivered pre-assembled according to selected options
- DTR502 Solar Radiation Shield option prevents temperature measurement error
- DTS1 Weather Shield option prevents a microclimate from forming around a heated probe
- SPH10 Static Pressure Head option eliminates pressure variations caused by wind

The Indigo500MIK Meteorological Installation Kit enables Vaisala Indigo500 Series transmitters to obtain professional grade outdoor measurements of environmental parameters. The kit is delivered pre-assembled with the selected options, with or without measurement equipment.

Essential for critical weather measurements

Outdoor installation of measurement instruments must be done properly to avoid common sources of measurement error, and to ensure long service life. The Indigo500MIK Meteorological Installation Kit is designed to enable Indigo500 Series transmitters and compatible measurement probes to obtain reliable measurements in challenging weather conditions. The kit is recommended for use with the HMP3 and HMP7 humidity and temperature probes, and the TMP1 temperature probe.

True humidity readings in condensing conditions

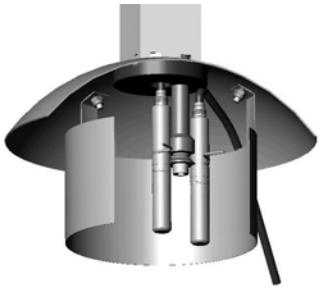
In weather observations dew formation makes reliable humidity measurement difficult. When dew has formed on the humidity sensor, it is impossible to obtain a true reading until the dew evaporates. Obtaining a true humidity reading is particularly important in traffic safety, at airports, and at sea. It is essential, for example, in fog and frost prediction.

Combining an Indigo500 Series transmitter with a HMP7 and TMP1 probes provides a solution to the problem. HMP7 utilizes probe heating for condensation prevention. When the probe head is heated, risk of dew formation on the sensor is greatly reduced. When combined with accurate temperature measurement from TMP1 probe, the Indigo500 transmitter can calculate the ambient relative humidity precisely in all conditions.

Open shield prevents microclimates

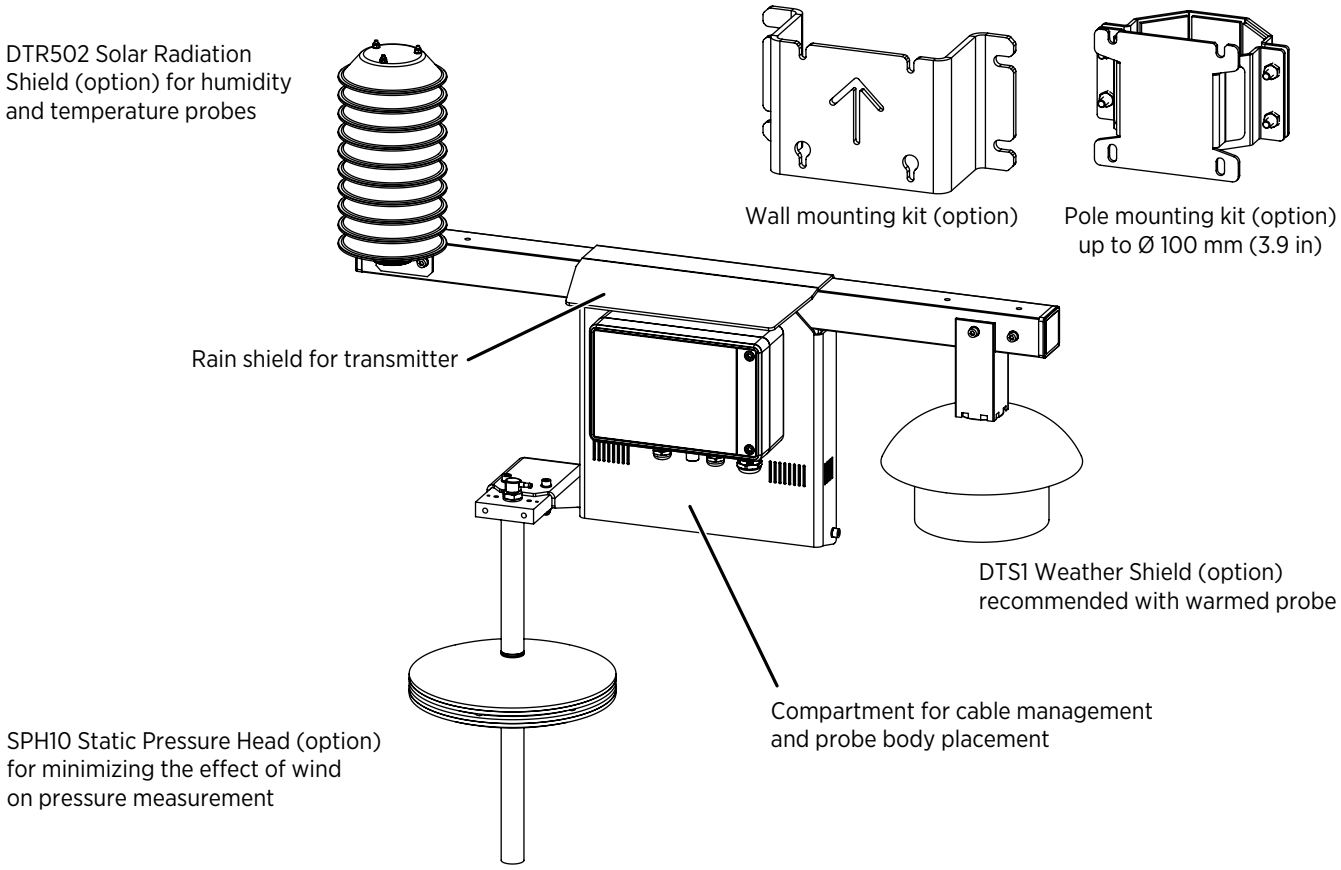
Traditional solar radiation shields are not optimal for use with heated probes, as sleet or snow can accumulate on the shield. This may prevent proper air circulation and create a humid microclimate around the probe head until the snow melts.

DTS1 Weather Shield option provides the heated HMP7 probe with appropriate protection that prevents the formation of a microclimate. The shield is open at the bottom to ensure steady air circulation to the sensor even in calm weather.



For calibration, a portable HMP77 reference probe is easy to attach beside the HMP7 probe head.

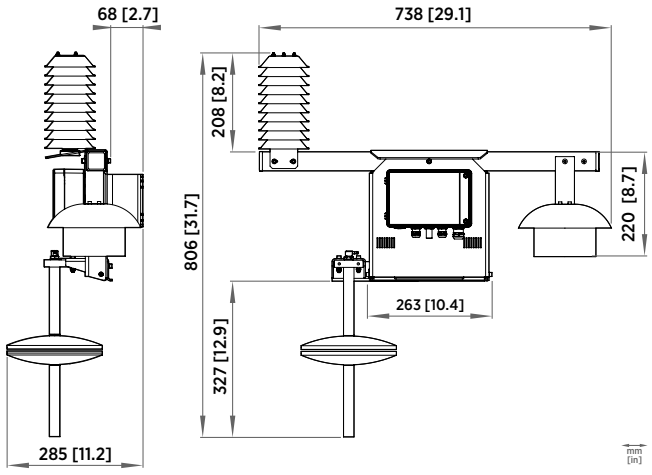
Technical data



Specifications

Compatible transmitters	Indigo510, Indigo520, HMT370EX
Compatible solar radiation shields	DTR502, DTR13, DTR250
Weather shield for heated probe	DTS1 [1)]
Static pressure head	SPH10 [1)]
Weight of mounting plate, probe compartment, and support bar	1.5 kg (3.3 lb)
Material of mounting plate, probe compartment, and support bar	Anodized marine grade aluminum

1) Attachment requires an adapter that is included when ordering the mounting kit with this option.



Indigo500MIK dimensions with wall mounting kit

VAISALA

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 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 Flammability rating UL94 V-1
Display	Strengthened glass with anti-fingerprint (AF) and anti-reflection (AR) coatings

Compliance

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

Inputs and outputs

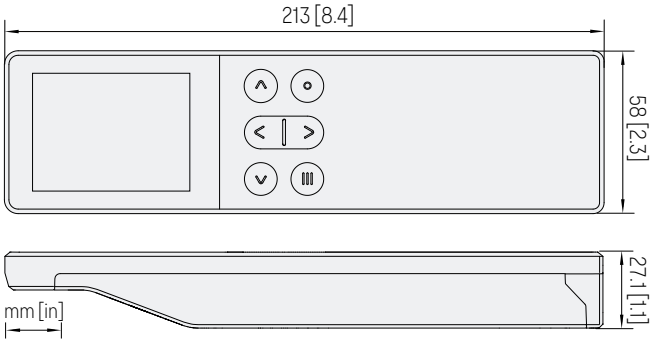
Max. number of connected devices	2
Connector type	M12 5-pin female (2 pcs)
Battery [1]	
Type	Rechargeable lithium-ion battery
Nominal voltage	7.2 V
Rated capacity	2900 mAh / 20.88 Wh
Charge limit voltage	8.4 V
AC adapter [2]	
Type	45 W USB-C AC adapter [3]
Connector type	USB-C
AC input	100-240 V AC, 1.2 A, 50-60 Hz
DC output	5.0 V/9.0 V/12.0 V/15.0 V DC, 3.0 A 20.0 V DC, 2.25 A 45 W
Insulation	Double or reinforced, indicated with the following symbol: ⧈
PC interface	Vaisala Insight PC software with USB-C cable (Windows OS). [4] 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) ±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) 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) 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

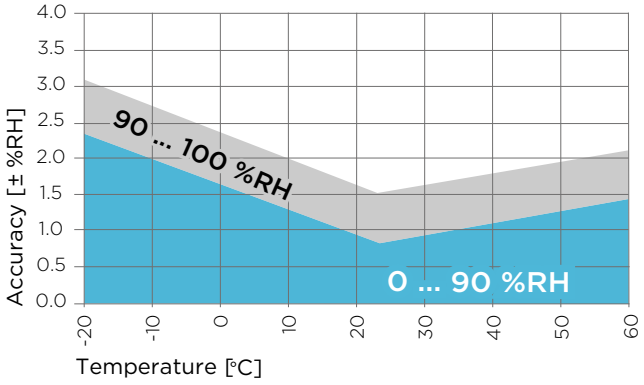
1) *Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases.*

HMP80 series inputs and outputs

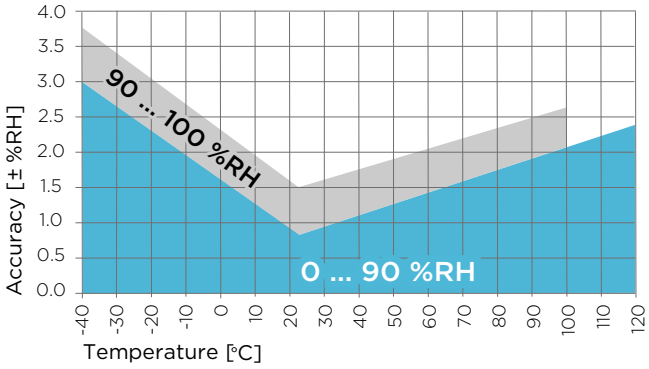
Operating voltage	15–30 V DC
Current consumption	10 mA typical, 500 mA max.
Digital output	RS-485, non-isolated

HMP80 series compliance

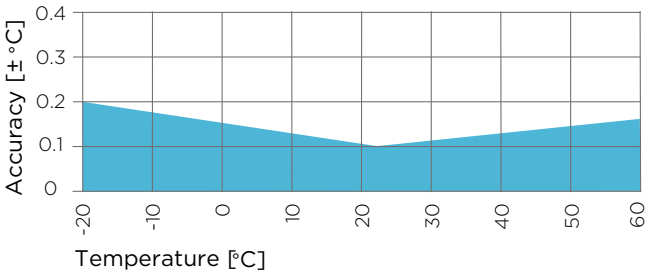
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Rough handling (excluding sensor inside probe head)	IEC 60068-2-31
Compliance marks	CE, China RoHS, RCM, UKCA



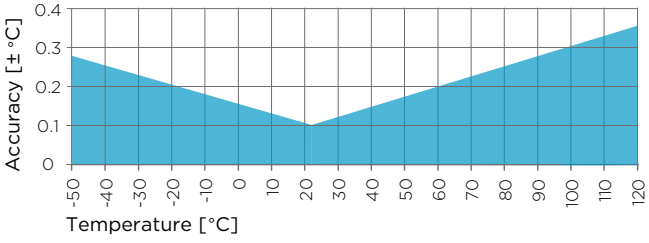
HMP80N humidity measurement accuracy as a function of temperature



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)

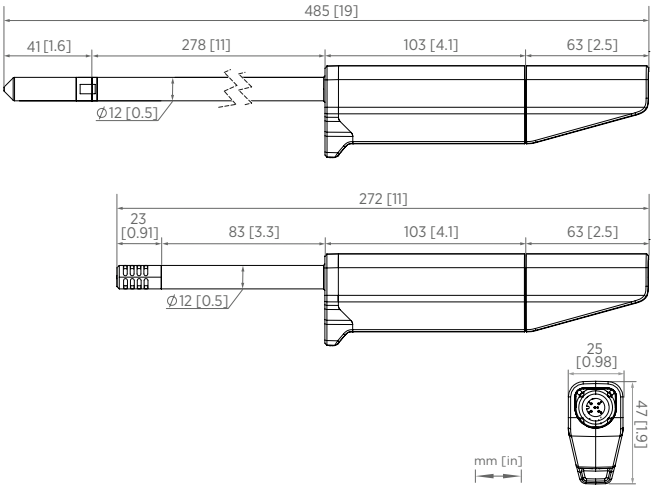
HMP80 series mechanical specifications

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

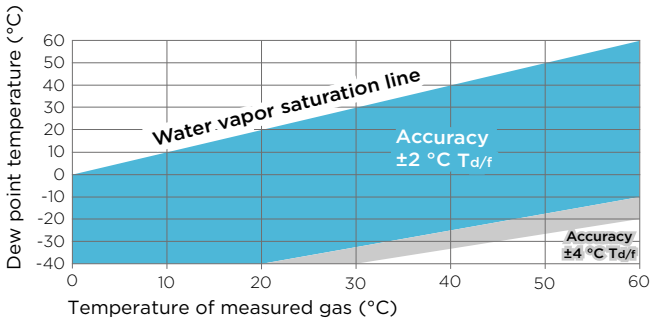
DMP80 probes are optimized for portable spot-checking, field calibration, and data logging use with the Indigo80 handheld indicator. For easy-to-use access to device analytics and configuration, DMP80 probes can be connected to Vaisala Insight software for Windows®.

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

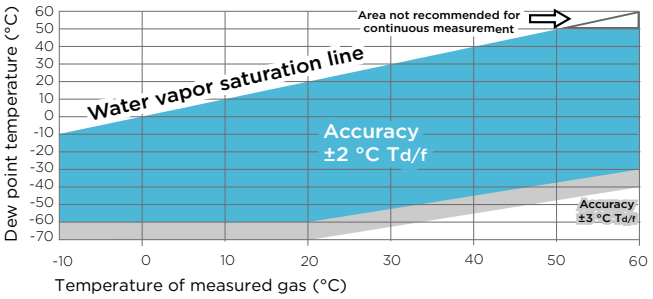
1) Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases.

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 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

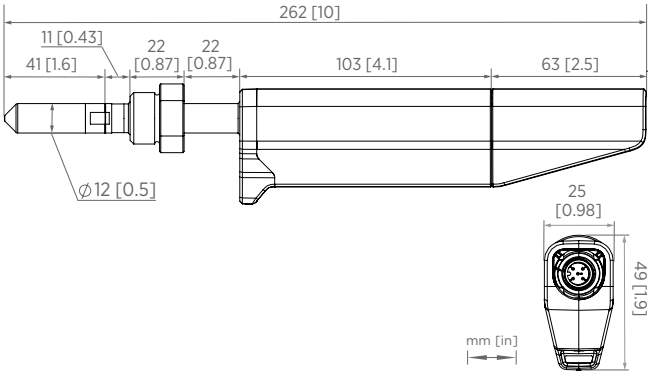
Absolute humidity (g/m³)	Relative humidity (%RH)
Absolute humidity at NTP (g/m³)	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm_v)
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
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

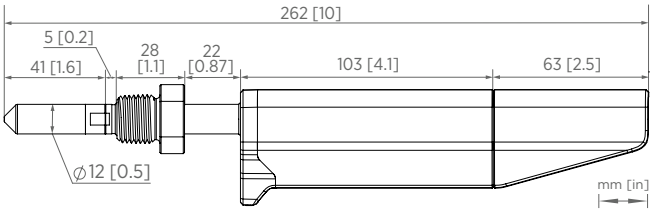
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Rough handling (excluding sensor inside probe head)	IEC 60068-2-31
Compliance marks	CE, China RoHS, RCM, UKCA

DMP80 series spare parts and accessories

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



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



Dimensions of DMP80 series probes with NPT1/2" thread

VAISALA

HM40 Series Handheld Humidity and Temperature Meter



Features

- Humidity measurement range 0 ... 100 %RH
- Temperature measurement ranges -40 ... +100 °C (-40 ... +212 °F), depending on probe model. The HM46 model can measure up to +180 °C (+356 °F) for a short period of time.
- Incorporates proven Vaisala HUMICAP® sensor technology
- Calibration reminder function
- Probes can be user calibrated using an on-site reference
- Graphical display indicates when measurement has stabilized
- Hold-button to freeze the screen and save the reading
- Multilingual user interface available in 10 languages (EN, DE, FR, JA, ZH, PT, ES, RU, FI, SV)

The easy-to-use HM40 is a compact and portable humidity meter that provides reliable measurements in a wide range of applications. It is the ideal spot-checking tool for everything from structural moisture measurement and air conditioning systems to humidity measurement in industrial production processes and life science applications. There are four different models available: HM41, HM42, HM45, and HM46.

Benefits

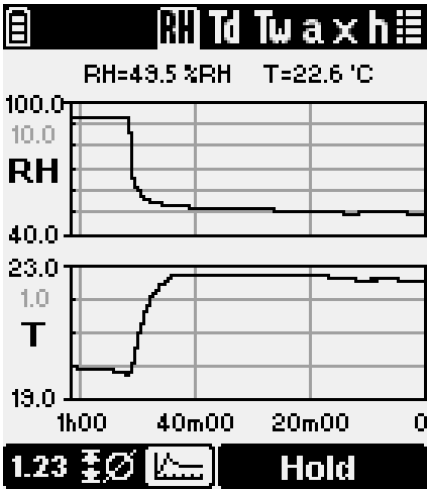
- Compact, portable, and easy to use
- Versatile meter with wide measurement range and multiple calculated parameters
- Ideal for spot-checking in a wide variety of applications

Simple and Easy to Use

HM40 has a large, user-friendly graphical display and easy-to-use push buttons. The user interface is simple and intuitive, and available in 10 languages. Also, many settings can be modified to meet users' individual needs. In addition to relative humidity and temperature, HM40 provides five calculated humidity parameters, all of which are available in metric and non-metric units. HM40 is powered by 2 AA batteries. An external USB-charger and rechargeable AA sized NiMH batteries are available as an option. Each model also comes with a handy belt clip and case.

Easy Recalibration

Calibrating HM40 is easy. The meter or the probe can be sent to a Vaisala Service Center for recalibration. Alternatively, calibration can be completed on site by users with a humidity reference such as another hand-held meter or Vaisala Humidity Calibrator HMK15. The indicator includes a calibration reminder function that can be activated by the user.



The Graph Clearly Indicates When Readings Have Stabilized.

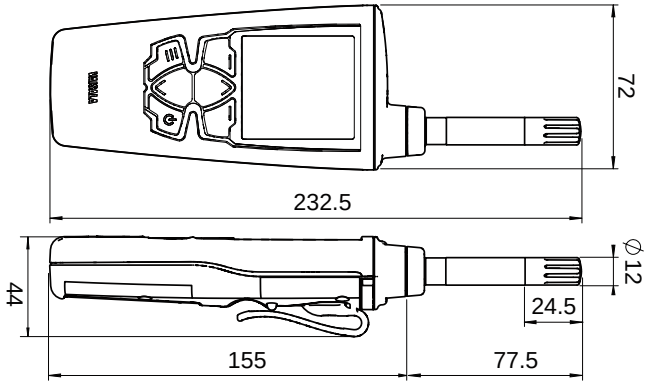
HM40 Handheld Humidity and Temperature Meter Series





HM41 Technical Data

Humidity Measurement Accuracy (Including Non-linearity, Hysteresis, and Repeatability):	
At 0 ... +40 °C	±1.5 %RH (0 ... 90 %RH)
	±2.5 %RH (90 ... 100 %RH)
At -10 ... 0 °C and +40 ... +60 °C	±3.0 %RH (0 ... 90 %RH)
	±4.0 %RH (90 ... 100 %RH)
Humidity sensor	HUMICAP® 180R
Temperature measurement range	-10 ... +60 °C (+14 ... +140 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Measurement probe	Interchangeable HMP113 probe
Probe material	PC/ABS plastic blend (white)
IP rating	IP54
Weight (with alkaline batteries)	230 g (8.1 oz)
Filter material	PC (glass-reinforced)

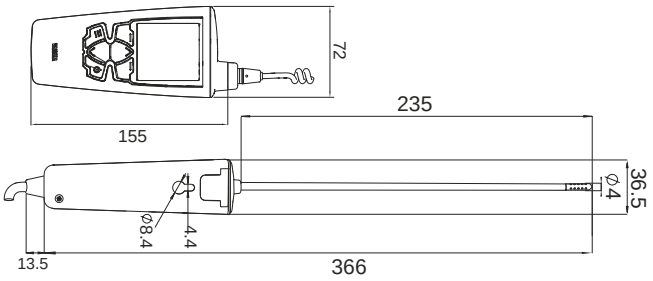


HM41 dimensions in mm

HM42 Technical Data

Humidity Measurement Accuracy (including Non-linearity, Hysteresis, and Repeatability):	
At 0 ... +40 °C	±1.5 %RH (0 ... 90 %RH)
	±2.5 %RH (90 ... 100 %RH)
At -40 ... 0 °C and +40 ... +80 °C	±3.0 %RH (0 ... 90 %RH)
	±4.0 %RH (90 ... 100 %RH)
At +80 ... +100 °C	±4.0 %RH[1)]
Humidity sensor	HUMICAP® 100R-Mini
Temperature measurement range	-40 ... +100 °C (-40 ... +212 °F)
Temperature sensor	Pt1000 RTD Class F0.3 IEC60751
Measurement probe	HM42PROBE
Probe head material	Stainless steel
IP rating	IP40 (probe), IP54 (indicator)
Weight (with alkaline batteries)	370 g (13.1 oz)
Filter material	Stainless steel and PTFE membrane
Probe cable length	1500 mm (59 in)

1) Not recommended for T_d > 85 °C



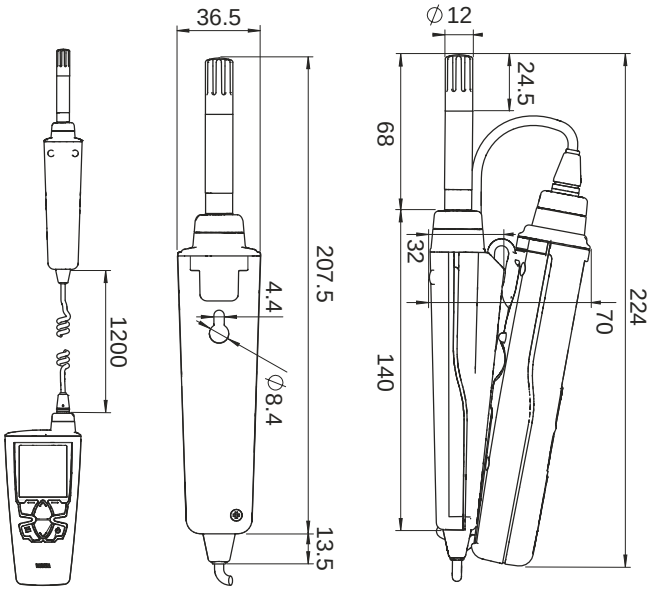
HM42 dimensions in mm





HM45 Technical Data

Humidity Measurement Accuracy (Including Non-linearity, Hysteresis, and Repeatability):	
At 0 ... +40 °C	±1.5 %RH (0 ... 90 %RH) ±2.5 %RH (90 ... 100 %RH)
At -40 ... 0 °C and +40 ... +60 °C	±3.0 %RH (0 ... 90 %RH) ±4.0 %RH (90 ... 100 %RH)
Humidity sensor	HUMICAP® 180R
Temperature measurement range	-40 ... +60 °C (-40 ... +140 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Measurement probe	Interchangeable HMP113 with HM40HANDLE
Probe material	PC/ABS plastic blend (white)
IP rating	IP54
Weight (with alkaline batteries)	330 g (11.6 oz)
Filter material	PC (glass-reinforced)
Probe cable length	1200 mm (47 in)

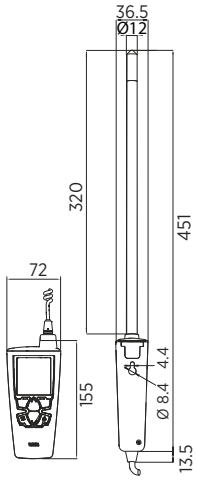


HM45 dimensions in mm

HM46 Technical Data

Humidity Measurement Accuracy (Including Non-linearity, Hysteresis, and Repeatability):	
At 0 ... +40 °C	±1.5 %RH (0 ... 90 %RH) ±2.5 %RH (90 ... 100 %RH)
At -40 ... 0 °C and +40 ... +80 °C	±3.0 %RH (0 ... 90 %RH) ±4.0 %RH (90 ... 100 %RH)
At +80 ... +100 °C	±4.0 %RH [1]
Humidity sensor	HUMICAP® 180R
Temperature measurement range	-40 ... +100 °C (-40 ... +212 °F), short-term up to +180 °C (+356 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Measurement probe	HM46PROBE
Probe head material	Stainless steel, brass filter
IP rating	IP40 (probe), IP54 (indicator)
Weight (with alkaline batteries)	490 g (17.3 oz))
Filter material	Sintered brass
Probe cable length	1500 mm (59 in)

1) Not recommended for T_d > 85 °C



HM46 dimensions in mm

HM40 Series Technical Data

Measurement Performance

Calculated parameters	Dew point, wet bulb temperature, absolute humidity, mixing ratio, enthalpy
Relative Humidity	
Measurement range	0 ... 100 %RH
Accuracy (including non-linearity, hysteresis, and repeatability) for different models at 0 ... +40 °C (+32 ... +104 °F)	±1.5 %RH (0 ... 90 %RH) ±2.5 %RH (90 ... 100 %RH)
Factory calibration uncertainty at +20 °C (+68 °F):	
HM42 and HM46	±1.5 %RH
HM41 and HM45	±1.1 %RH (0 ... 90 %RH) ±1.8 %RH (90 ... 100 %RH)
Stability	±2 %RH over 2 years
Humidity Measurement Response Time:	
(90 %) with plastic grid filter (HM41 and HM45)	17 s
(90 %) with membrane filter and steel grid (HM42)	26 s
(90 %) with brass sintered filter (HM46)	40 s
Temperature	
Accuracy over temperature range:	
At 0 ... +40 °C (+32 ... +104 °F)	±0.2 °C (0.36 °F)
At -40 ... 0 °C and +40 ... +100 °C (-40 ... +32 °F and +104 ... +212 °F)	±0.4 °C (0.72 °F)

Operating Environment

Operating temperature	
Indicator	-10 ... +60 °C (+14 ... +140 °F)
Probe handle	-40 ... +60 °C (-40 ... +140 °F)
Probe head	Range -40 ... +180 °C (-40 ... +356 °F) See probe specifications
Storage temperature	-30 ... +70 °C (-22 ... +158 °F)
EMC compliance	EN61326-1, Portable Equipment

Mechanical Specifications

Materials	
Indicator body	PC/ABS blend, acrylic display lens
Probe holder	PC/ABS blend (gray)
Probe handle	PC/ABS blend (white), PC/ABS blend (gray, HM45) or PBT (gray, HM42/46)
HMP113 probe or probe measurement head	PC/ABS blend (white, HM41/45) or stainless steel (HM42/46)
IP rating, HM40	IP54

Indicator

Display	LCD (140 x 160 pixels)
Power-up time	< 3 s
Batteries	2 × AA, 1.5 V
Operation time (typical)	100 hours (without backlight)
Menu languages	English, Chinese (simplified), Finnish, French, German, Japanese, Portuguese, Russian, Spanish, Swedish

Spare Parts and Accessories

Indicator	
Spare HM40 indicator	HM40INDI
Belt clip (3 pcs)	227710SP
Battery cover (3 pcs)	225688SP
NiMH rechargeable batteries (4 pcs)	229247SP
External battery recharger with USB connection and 4 batteries	229249SP
Case for short HM40 probes	235849SP
Case for long HM40 probes	DRW242351SP
Standard Probe (HM41)	
HMP113 probe for HM40	HMP113 (configuration: V00B2C1A0)
Plastic locking bushing (3 pcs) for attaching HMP113 probe to HM40 indicator	DRW238590SP
Plastic grid filter for HMP113 probe	DRW236214SP
Plastic grid with membrane filter for HMP113 probe	230727SP
HM42 Probe (HM42)	
Thin 4 mm diameter probe for HM40	HM42PROBE
Steel grid filter for HM42PROBE	19867HM
Membrane tube set (5 pcs) for HM42PROBE	19858HM
Rubber sleeve set (10 pcs) for HM42PROBE	19809HM
Calibration adapter for HM42PROBE	HM37067
Remote Probe (HM45)	
HMP113 probe for HM40	HMP113 (configuration: V00B2C1A0)
Plastic locking bushing (3 pcs) for attaching HMP113 probe to HM40 indicator	DRW238590SP
HM40 handle and cable	HM40HANDLE
Plastic grid filter for HMP113 probe	DRW236214SP
Plastic grid with membrane filter for HMP113 probe	230727SP
HM46 Probe (HM46)	
Stainless steel 12 mm diameter probe for HM40	HM46PROBE
Sintered filter for HM46PROBE	0195
Optional membrane filter for HM46PROBE (up to +80 °C)	10159HM
Plastic grid filter for HM46PROBE (up to +80 °C)	6221
Disposable sleeve, 50 pcs set	1558
Probe holder	HM36915

VAISALA

HUMICAP® humidity sensor for measuring relative humidity






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

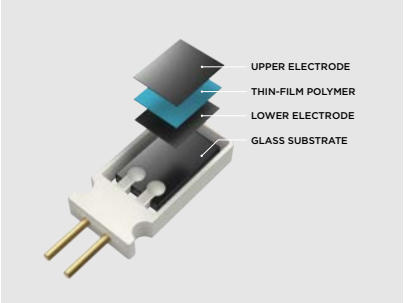
Since then, Vaisala has emerged as the market leader in relative humidity measurements, and thin-film capacitive humidity sensors have transcended being one company's invention to a global industry standard.

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.

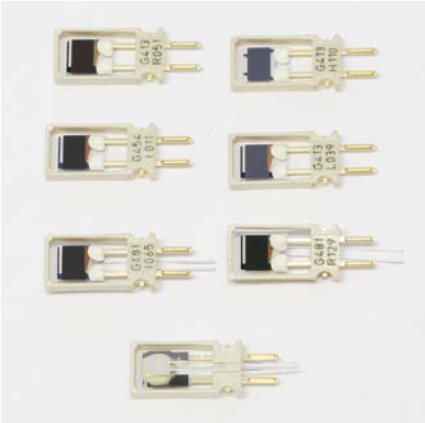
The dielectric properties of the polymer film depend on the amount of absorbed water. As the relative humidity around the sensor changes, the dielectric properties of the polymer film change, and so does the capacitance of the sensor. The instrument's electronics measure the capacitance of the sensor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

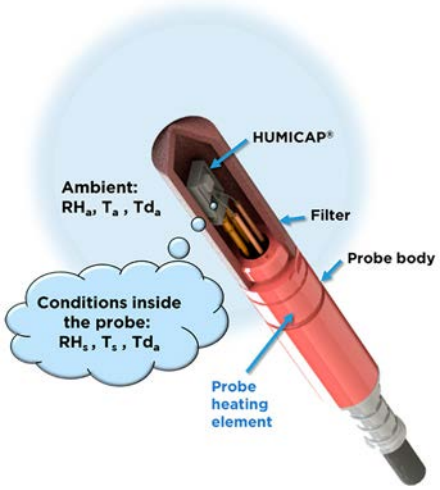
If it works on Mars, it works anywhere

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

How to select the right humidity instrument for your high-humidity application





High-humidity environments are tough for humidity measurement. Saturation in the environment causes condensation to form on all surfaces including measurement sensors, which can be fatal for some technologies. While Vaisala HUMICAP® technology can withstand condensation, it still needs time to recover from the effects of moisture before it can once again provide reliable measurements. Typical applications where high humidity or occasional condensing are expected include drying processes, test chambers, combustion air humidifiers, meteorological measurements, and fuel cells.

Keeping measurements accurate and reliable even in condensing environments calls for Vaisala's condensation prevention technology. A warmed probe keeps the sensor continuously above the ambient temperature, ensuring condensation never forms. The disadvantage of probe heating is that relative humidity can no longer be measured because the sensor is heated up above the ambient temperature. In this state, independent humidity parameters can be measured, such as dew point or mixing ratio. However, it is also possible to measure relative humidity using an additional temperature sensor with our Indigo520 transmitter.

Operating principle

The heating element inside the probe body heats the entire probe. In the illustration above, the probe and filter are glowing red to illustrate how the probe warming keeps the microclimate inside the filter at an elevated temperature. The actual temperature is only a few degrees above the ambient temperature, as seen in the following example:

Ambient conditions:

- T_a = 14 °C
- RH_a = 97 %RH
- Td_a = 13 °C

HMP7 warmed probe:

- T_s = 16 °C
- RH_s = 83 %RH
- Td_a = 13 °C (calculated)

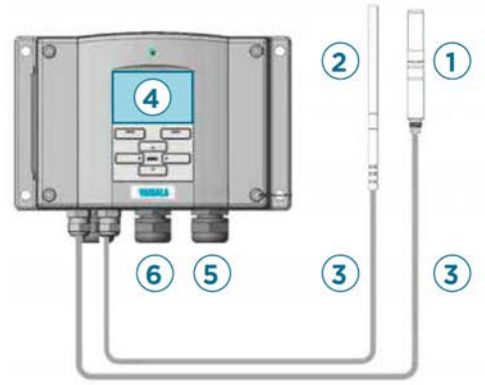
As shown in this example, heating does not affect dew point.

Dew point is the temperature where condensation begins, or where the relative humidity would be 100 %, if the air was cooled.

The 'relative' in relative humidity expresses the relation between the amount of water vapor present and the maximum amount that is physically possible at that temperature.

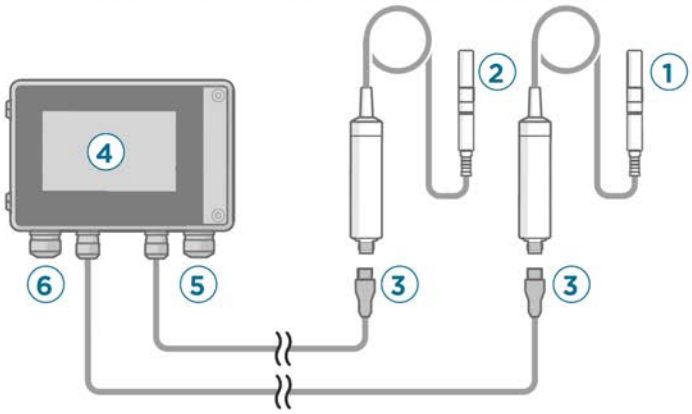
Note: The HMP7 warm probe mode when used by itself will only output dew point temperature digitally (Modbus RTU over RS-485) or offer analog outputs when combined with any Indigo Transmitter. If relative humidity and temperature are desired, then the separate ambient temperature probe (TMP1) must be ordered with the Indigo520 transmitter to calculate humidity from the dew point and temperature readings.

HMT337 Transmitter Components



1. Warmed Humidity Probe (Dew point output)
2. Temperature Probe
3. Fixed Cables from Probe to Transmitter
   - Options for 2,5,10 and 20m lengths
4. Transmitter
   - Options for display or no display
5. Input Power Cable Gland
   - Options for 24Vac/dc, 100-240 Vac
6. Output Signals Cable Gland
   - 2 or 3 Analog outputs
   - RS-232 or RS-485 or LAN
   - 2 Relays
   - HM70 Compatible service port

INDIGO520 Transmitter Components



1. HMP7 Warmed Humidity Probe (Dew point output)
2. TMP1 Temperature Probe
3. Fixed Cables from Probe to Transmitter
   - Options for 1,3,5 and 10m lengths
4. Transmitter
   - Options for display or no display
5. Input Power Cable Gland
   - Options for 24Vac/dc, 100-240 Vac, PoE+
6. Output Signals Cable Gland
   - 4 Analog outputs
   - Ethernet Modbus TCP/IP
   - 2 Relays
   - Built in Webserver
   - Service port**
   - Analog input**
   - **To be added

Conversion from HMT337WP (Warmed Probe) to an INDIGO solution

For current high humidity applications using the HMT337WP, we recommend using our Indigo520 transmitter with the TMP1 and HMP7 probes with condensation prevention mode turned on. The new Indigo platform is built on the same measurement technology as its predecessor. The most significant and widely desired feature of the Indigo platform is the interchangeability of the smart probes. Many functionalities that were traditionally inside the transmitter are now built into the smart probe instead, allowing for field swapping and cross-functional located configurations. The following pictures illustrate the basic components of the previous and new instruments. The probe head dimensions, filters, and installation accessories are identical, which means that, the measurement HMP7 humidity probe fits the same process connection as the HMT337 probe.

History of warm probe technology

Warmed probe technology was first developed by Vaisala over 25 years ago to address difficult outdoor humidity measurements for meteorological applications and then modified for industrial applications. In industrial applications with high-humidity, the temperature can change faster resulting in condensing conditions. The warmed probe technology eliminates downtime due to condensation and provides continuous measurement at condensing or saturating conditions.

Products

The Indigo520 transmitter is an industrial-grade, robust transmitter that accommodates 1 or 2 Vaisala Indigo-compatible probes for humidity, temperature, dew point, carbon dioxide, hydrogen peroxide, and moisture in oil measurements. The transmitter can measure barometric pressure with an additional module. TMP1 is designed for demanding temperature measurements in industrial applications, where accuracy and robustness are essential. HMP7 is designed for applications that involve constant high humidity or rapid changes in humidity, where measurement performance and chemical tolerance are essential. Together, this system can provide you with consistently accurate readings that you can trust. Please reference the below table that highlights their features.

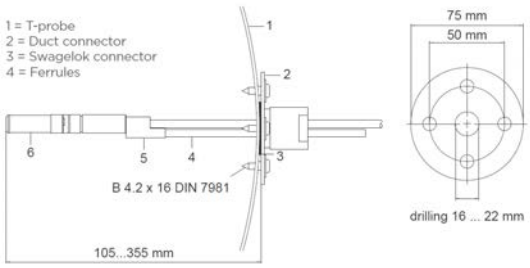
Product	HMP7 probe	TMP1 probe	Indigo201 + HMP7	Indigo520 + TMP1 & HMP7	HMT317 probe	HMM170 module
Probe warming	Yes	Used for temp. compensation	Configurable	Configurable	Configurable	Configurable
IP rating	IP66	IP66	IP65	IP66	IP66	N/A
Ambient temperature sensor allows RH calculation	[1] Possible with external temperature measurement	No	No	[2] Configurable	No	[1] Possible with external temperature measurement
Available measurement parameters	T_d, T_{df}, x, ppm, p_w [1] (RH, T, a, T_w, P_{ws}, h, dT)	T	[2] T_d, T_{df}, x, P_w	T_d, T_{df}, x, P_w [2] (RH, T, a, T_w, P_{ws}, h, dT)	T_d, T_{df}, x, p_w	T_d, T_{df}, x, ppm, p_w [1] (RH, T, a, T_w, P_{ws}, h, dT)
Supply voltage	18 … 30 V DC	10 … 35 V DC	Configurable: 10 … 35 V DC, 24 V AC	Configurable: 10 … 35 V DC, 24 V AC, 100 … 240 V AC, 50/60 Hz	10 … 35 V DC	15 … 35 V DC
Digital output	RS-485: Modbus RTU	RS-485: Modbus RTU	None	Modbus TCP/IP, web based interface	RS-232: serial ASCII	RS-485: Modbus RTU
Analog output	None	None	3 × assignable analog outputs	4 × assignable analog outputs	2 ×	3 ×
Display	No	No	Optional	Optional	No	No
Parametrization	Insight software	Insight software	273956 or USB-C	Touch screen or LAN	Terminal program (e.g. PuTTY)	Insight software
USB cable (sold separately)	242659 or USB2	242659 or USB2	None, USB-C	219690 or USB2	238607	219690

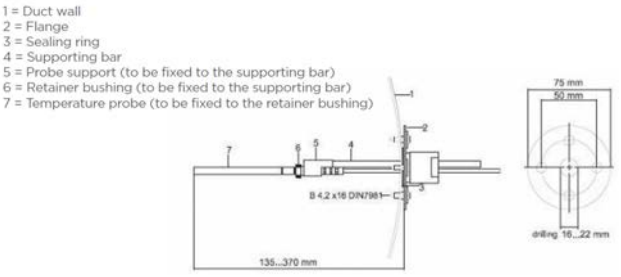
1) Relative humidity calculation is possible by writing external temperature information on a Modbus register.
2) Configurable: additional temperature probe needed.

Probe installation

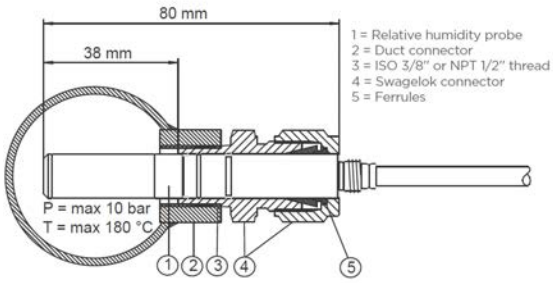
Depending on the application, there are different mounting accessories available:

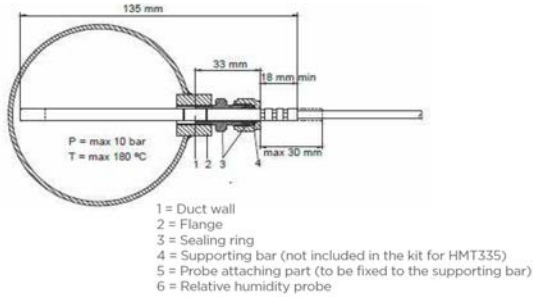
Duct Mount





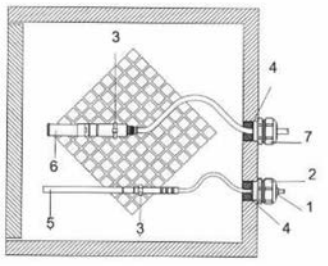
Duct installation kit 210697 (215003 for HMT337 temperature probe)



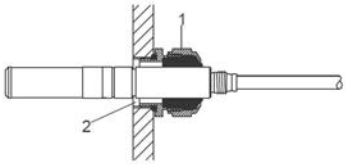


Pressure-tight Swagelok installation kits **SWG12ISO38** with ISO3/8" or **SWG12NPT12** with NPT1/2" thread (SWG6ISO18 with ISO1/8" or SWG6NPT18 with NPT1/8" thread for HMT337 temperature probe).

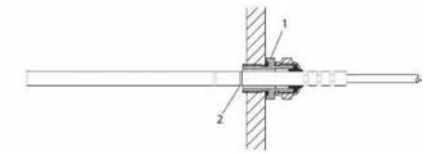
Example of Climate Chamber Installation



1 = PTFE sleeve
2 = Cable gland, example: AGRO 1100.12.91.065
3 = Stainless steel cable tie or similar fastener
4 = To be sealed (silicone)
5 = Temperature probe
6 = Relative humidity probe
7 = HMP247CG, Cable gland AGRO (available from Vaisala)



1 = AGRO 1160.20.145 (T = -40... +100 C) Not available from Vaisala
2 = In pressurized places, use a locking ring, example: 11 x 1 DIN471



HMP247CG: Vapor-tight installation with cable gland.

1 = Cable gland, for example: AGRO 1100.12.91.065
2 = In pressurized processes, use a locking ring, example: 6 x 0.7 DIN471

Insulation and leak-proof process connections

Choosing where to install a humidity probe can be challenging when there is high humidity combined with temperature variation.

For example, in a drying application where the exhaust air humidity is close to saturation (95 %RH) and the temperature is 40 °C, what happens when the sensor head is installed so that the filter is in the process and half of the sensor is in the 25 °C ambient temperature? In this situation even probe warming may not be able to compensate for the heat loss caused by thermal conduction through the metallic probe body; the heat loss will form a cold spot on the process side and condensation will result in inaccurate measurement. The solution here is to thoroughly insulate the probe.

If the process gas is colder than the ambient air it is critical to have a tight process connection for the probe. A leaking connection will allow warm and possibly humid air into the system, which can condensate near the sensor and cause measurement problems.

Extreme conditions, such as PEM fuel cell applications

There are also extreme applications where warming just few degrees above the ambient temperature is just not enough. One example of such application is a Polymer Electrode Membrane (PEM) Fuel cell. Application specific configurations can be found in the order forms of the HMP7 and HMT310 series. These configuration versions are designed to withstand the extreme conditions by heating the probe head at a higher power. It is also possible to use HMP7 and HMM170 in these applications, since the heating functionalities are freely configurable with the Insight PC software.

Summary

Sensor saturation can be avoided in high-humidity and condensing conditions by using an instrument that has probe warming technology. In addition to this, proper insulation and leak-free installation guarantees the best possible environment for reliable humidity measurement.

The comparison table in this document will help you to choose the right product for your application. More detailed product information and features can be found in datasheets, user manuals, and order forms.

VAISALA

Selecting the right filter for humidity instruments



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

Particulate protection

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

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

Mechanical protection

Capacitive thin film sensor is a sensitive component and it does not withstand severe mechanical stress, such as physical shocks. For this reason, it needs a protective element around it. Another cause of mechanical stress is high flow speed in the measurement environment, where a simple grid is not enough to protect the sensor. Sintered filter is a good choice for high wind speeds, because the environment inside the filter stays calm.



Response time

There are two factors in a filter affecting the response time of the sensor. First, the diffusion rate. Steel mesh has much faster diffusion rate than a sintered filter, meaning that the humidity level inside the filter stabilizes faster to the same level with the surrounding environment. Another factor is thermal mass. A heavier filter will add more mass to the sensor head and thus it takes longer for the sensor to adapt into changes in temperature.

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

When is it time to replace the filter?

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

GENERAL PURPOSE FILTERS FOR HUMIDITY AND DEW POINT APPLICATIONS [1)]

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

1) Recommended filter marked in bold.

OTHER FILTERS [1)]

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

1) Recommended filter marked in bold.

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.



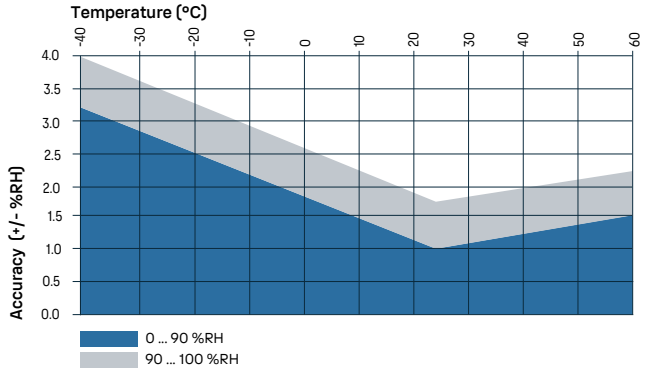
HMP1 with Indigo200 series

Technical data

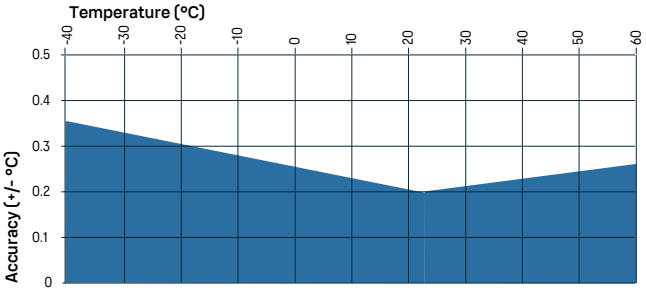
Measurement performance

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) ±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) For
Measurement environment	air, nitrogen, hydrogen, argon, helium, and oxygen [1)]
IP rating	IP50

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

Inputs and outputs

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

Output parameters

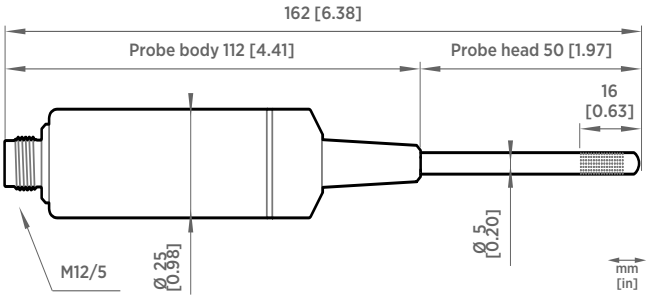
Absolute humidity (g/m^3)	Relative humidity (%RH)
Absolute humidity at NTP (g/m^3)	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm_v)
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
Dew point temperature at 1 atm (°C)	Water mass fraction (ppm_w)
Dew/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

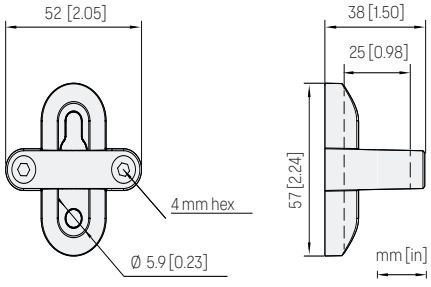
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, RCM

Mechanical specifications

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



HMP1 probe dimensions



Probe holder ASM213582 dimensions

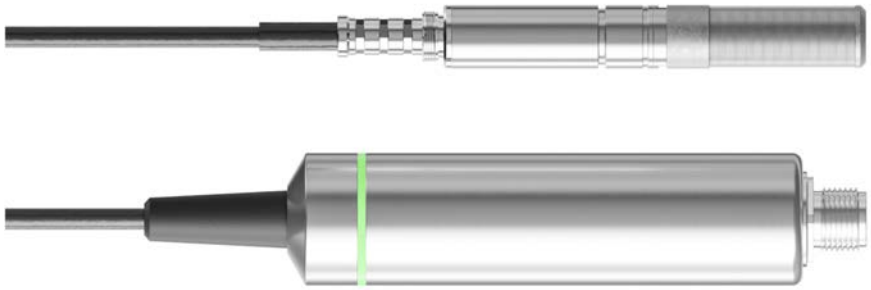
Accessories

Indigo USB adapter [1)]	USB2

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

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.

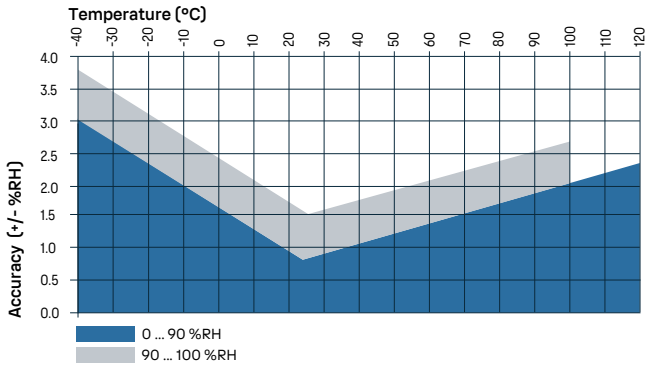
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see www.vaisala.com/indigo.

Technical data

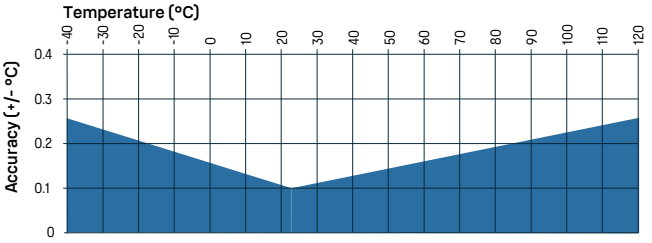
Measurement performance

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) ±0.8 %RH (40–95 %RH)
T_{63} response time	15 s
Sensor options	HUMICAP® R2 HUMICAP® R2C [3] HUMICAP® 180VC [3] [4]
Temperature	
Sensor	Pt100 RTD Class F0.1 IEC 60751
Measurement range	−40 ... +120 °C (−40 ... +248 °F)
Accuracy [1]	±0.1 °C (±0.18 °F)
Factory calibration uncertainty [2]	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)

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

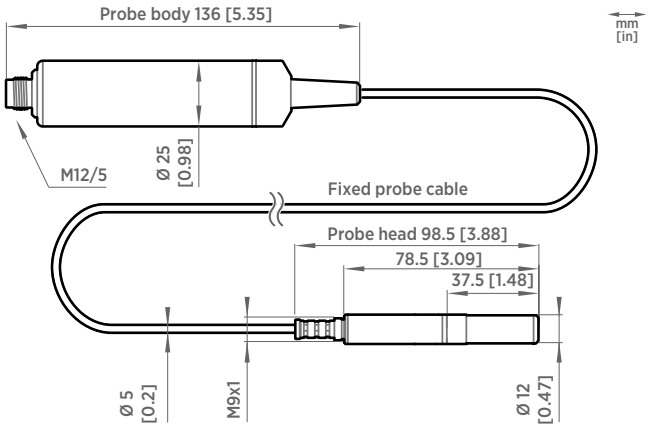
Mechanical specifications

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

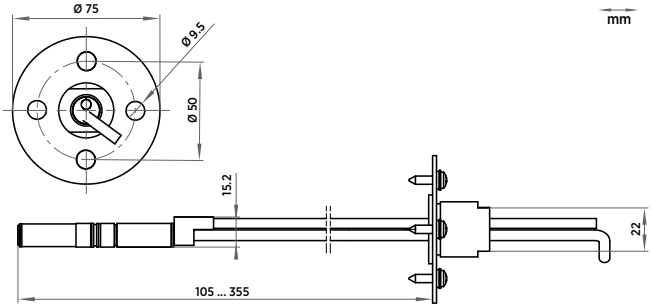
Accessories

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

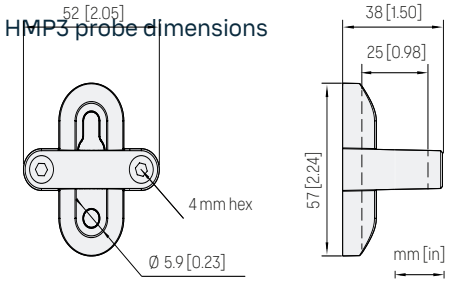
1) Not suitable for use at extreme temperatures.
2) Vaisala Insight software for Windows available at www.vaisala.com/insight.



HMP3 probe dimensions



Duct installation kit 210697 dimensions with probe

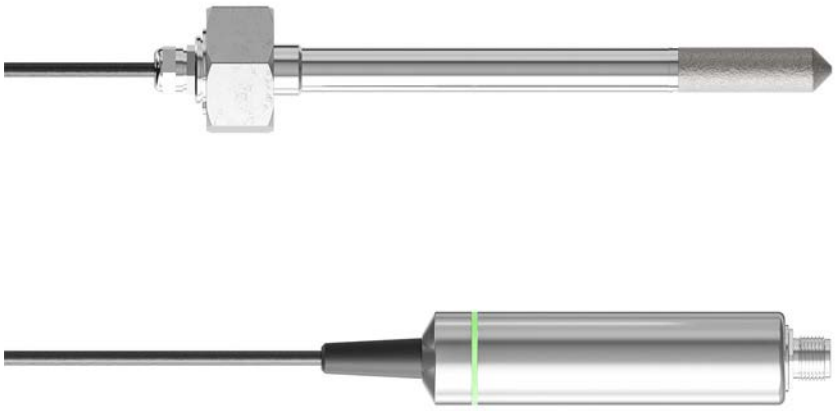


Probe holder ASM213582 dimensions

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.

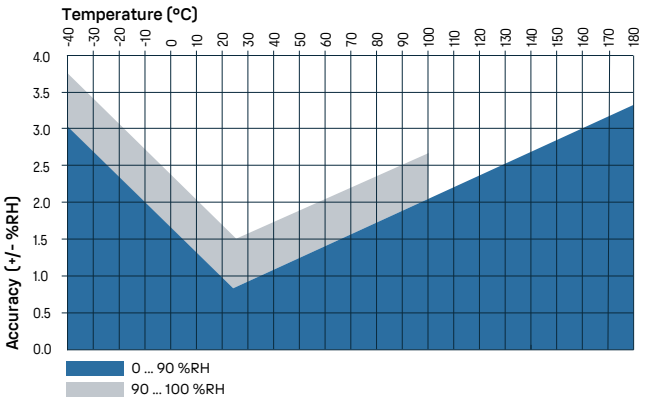
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see www.vaisala.com/indigo.

Technical data

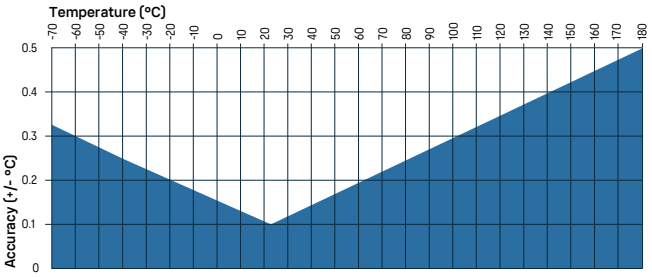
Measurement performance

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) ±0.8 %RH (40–95 %RH)
T_{63} response time	15 s
Sensor options	HUMICAP® R2 HUMICAP® R2C [3]
Temperature	
Measurement range	−70 ... +180 °C (−94 ... +356 °F)
Accuracy [1]	±0.1 °C (±0.18 °F)
Factory calibration uncertainty [2]	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)
Sensor	Pt100 RTD Class F0.1 IEC 60751

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

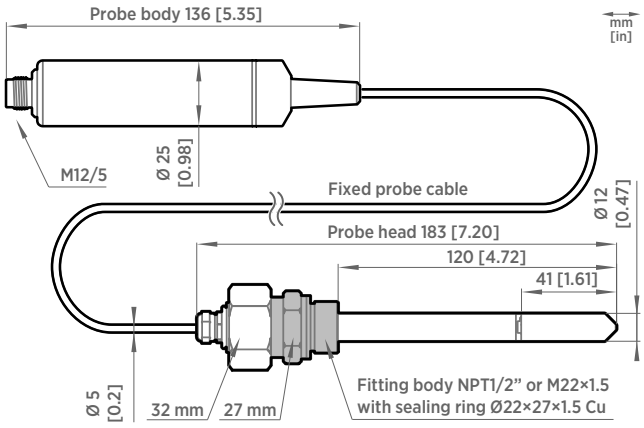
Mechanical specifications

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

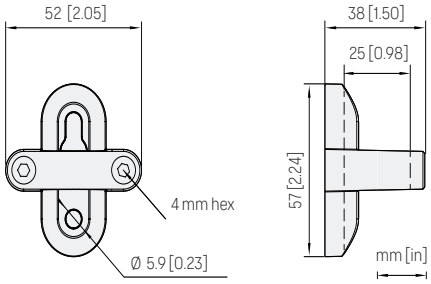
Accessories

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

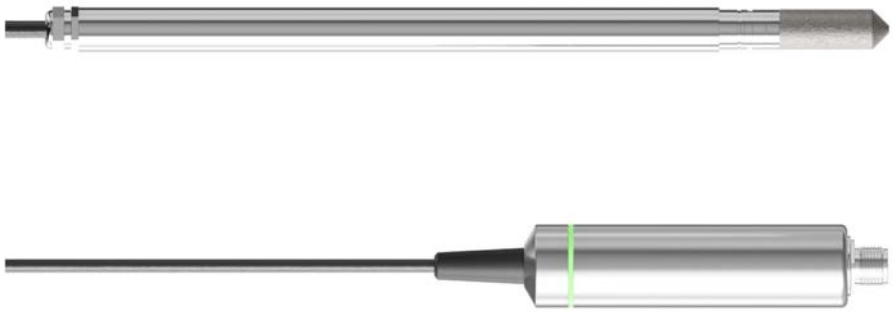


Probe holder ASM213582 dimensions

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.

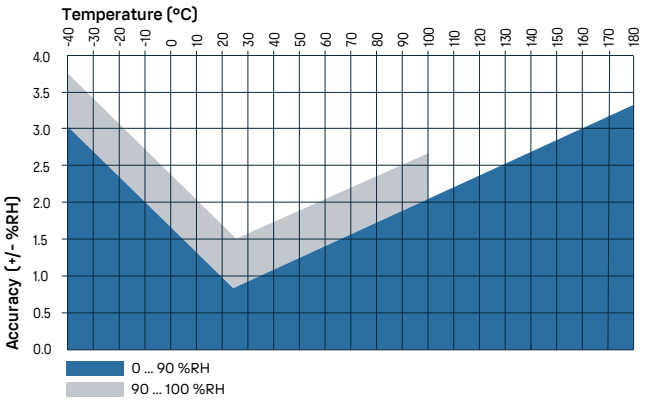
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see www.vaisala.com/indigo.

Technical data

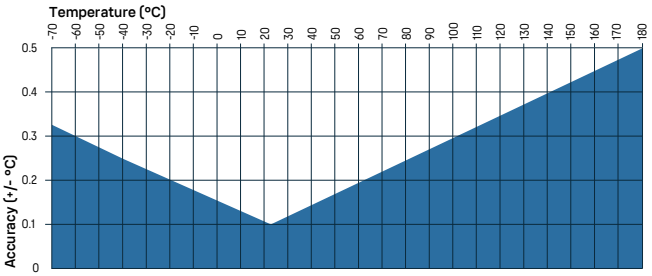
Measurement performance

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) ±0.8 %RH (40–95 %RH)
T_{63} response time	15 s
Sensor options	HUMICAP® R2 HUMICAP® R2C [3]
Temperature	
Measurement range	−70 ... +180 °C (−94 ... +356 °F)
Accuracy at +23 °C (+73.4 °F) [1]	±0.1 °C (±0.18 °F)
Factory calibration uncertainty [2]	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)
Sensor	Pt100 RTD Class F0.1 IEC 60751

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

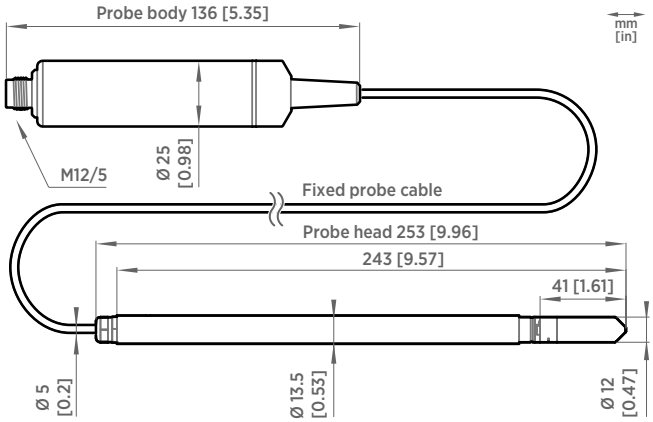
Mechanical specifications

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

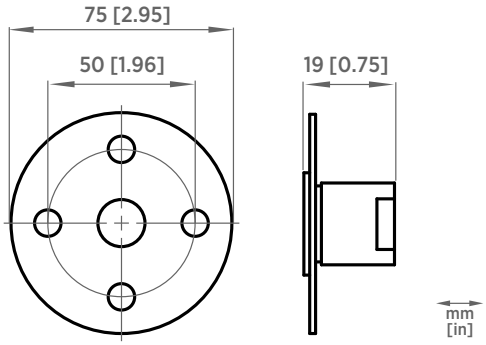
Accessories

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

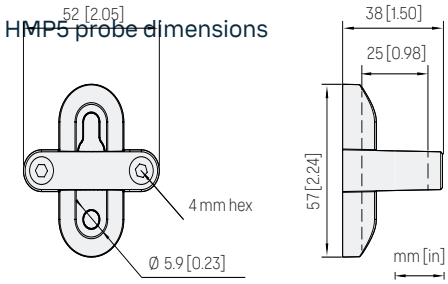
1) Vaisala Insight software for Windows available at www.vaisala.com/insight.



HMP5 probe dimensions



Mounting flange 210696 dimensions

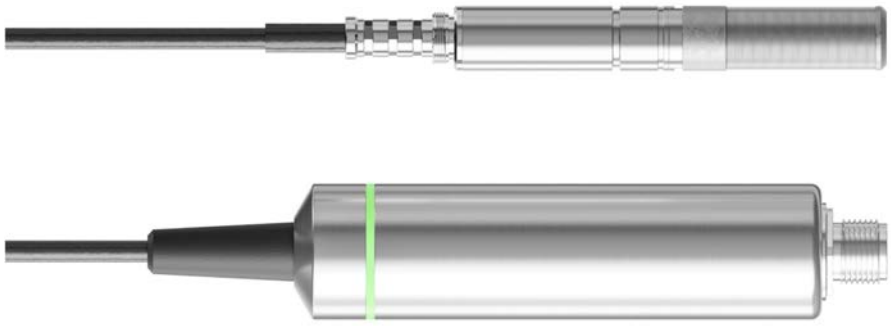


Probe holder ASM213582 dimensions

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.

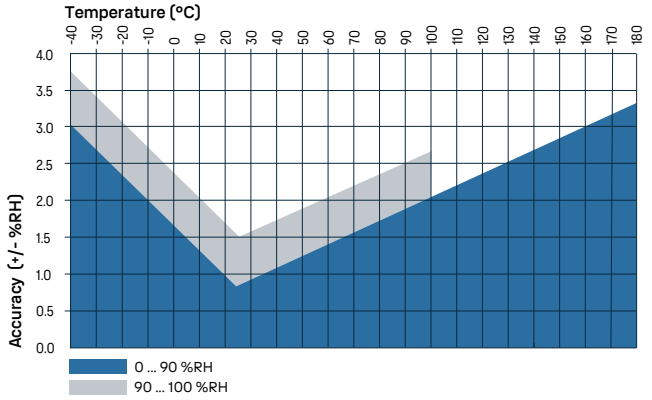
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see www.vaisala.com/indigo.

Technical data

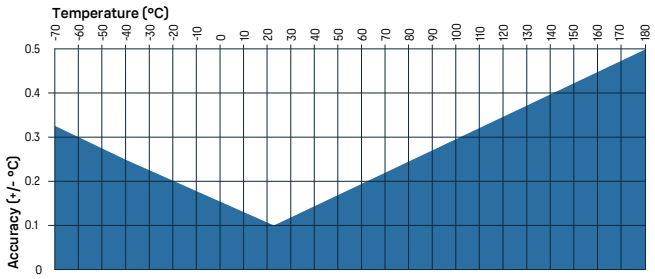
Measurement performance

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

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

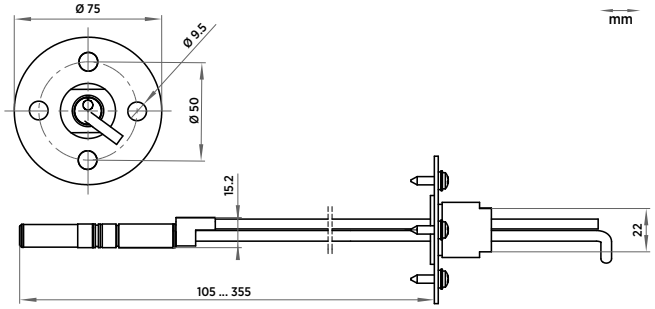
Mechanical specifications

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

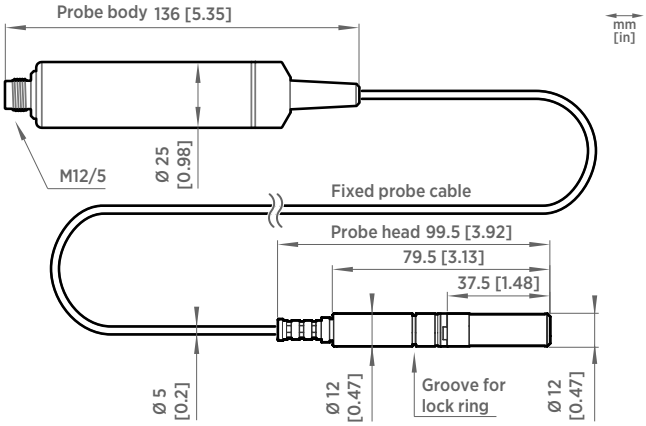
Accessories

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

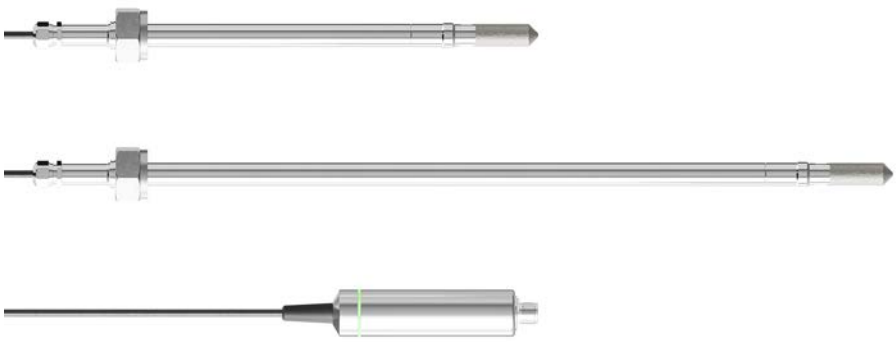


HMP7 probe dimensions

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.

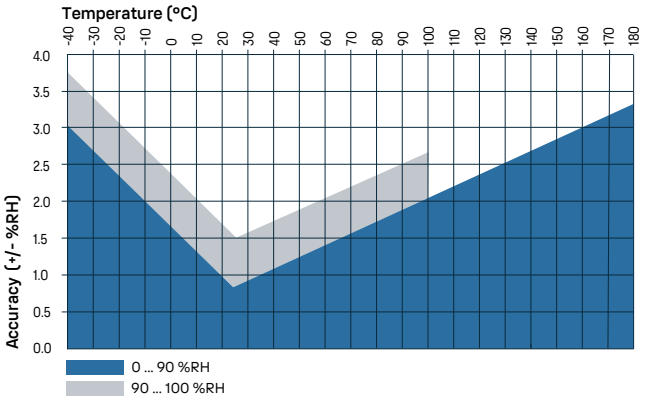
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring, troubleshooting, calibrating, and adjusting the probe. For more information, see www.vaisala.com/indigo.

Technical data

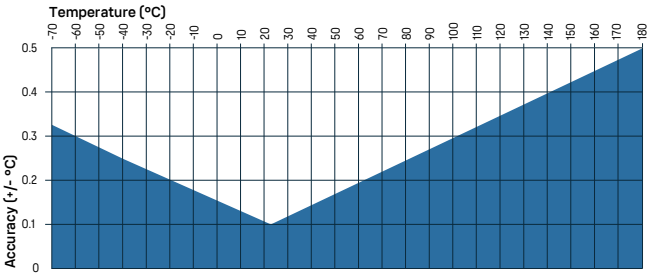
Measurement performance

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) ±0.8 %RH (40–95 %RH)
T_{63} response time	15 s
Sensor options	HUMICAP® R2 HUMICAP® R2C [3]
Temperature	
Measurement range	−70 ... +180 °C (−94 ... +356 °F)
Accuracy at +23 °C (+73.4 °F) [1]	±0.1 °C (±0.18 °F)
Factory calibration uncertainty [2]	±0.1 °C (±0.18 °F) at +23 °C (+73.4 °F)
Sensor	Pt100 RTD Class F0.1 IEC 60751

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

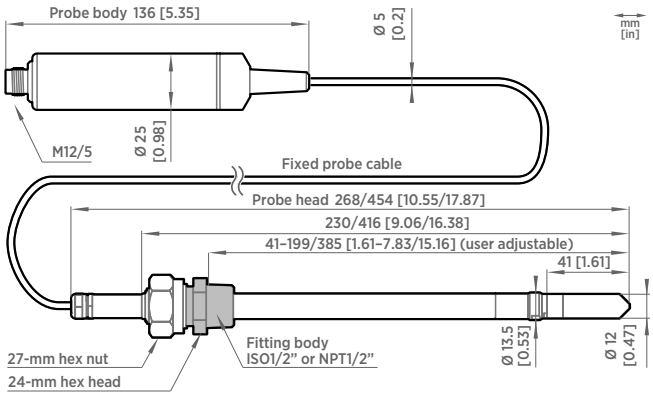
Mechanical specifications

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) 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) 454-mm-long HMP8: 41–385 mm (1.61–15.16 in)
Materials	
Probe	AISI 316L
Probe body	AISI 316L
Cable jacket	FEP

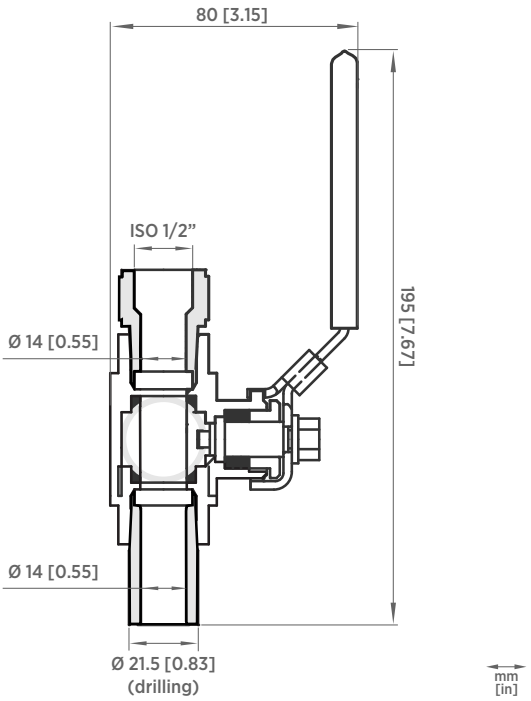
Accessories

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

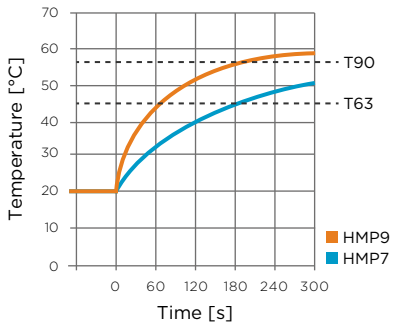
Vaisala HUMICAP® Humidity and Temperature Probe HMP9 is designed for easy installation into rapidly changing environments where fast response time, measurement performance, and chemical tolerance are essential.

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.

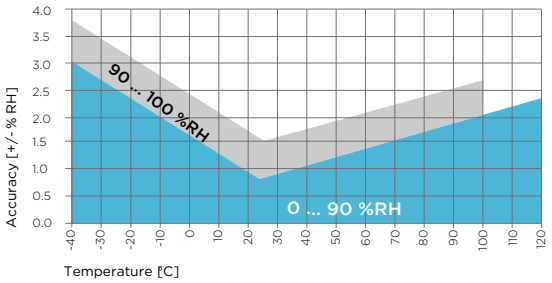
For more information on the Indigo product family, see www.vaisala.com/indigo.

Technical data

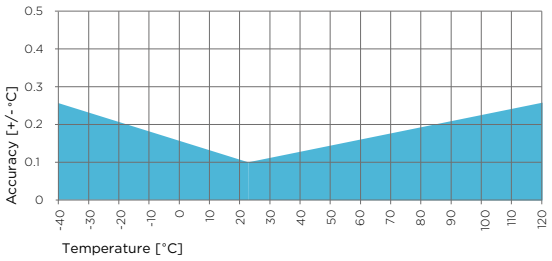
Measurement performance

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

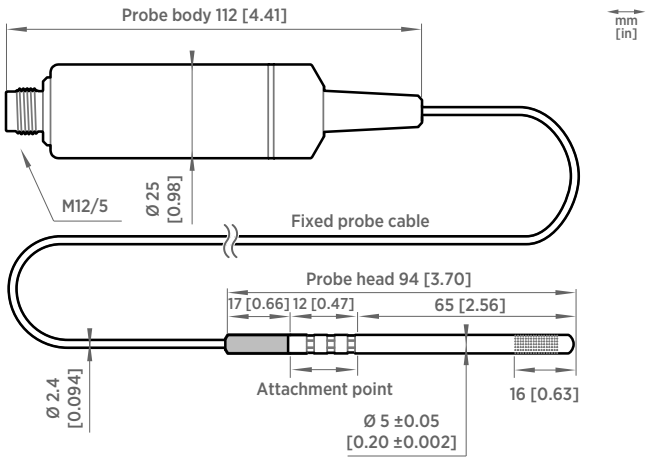
Mechanical specifications

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

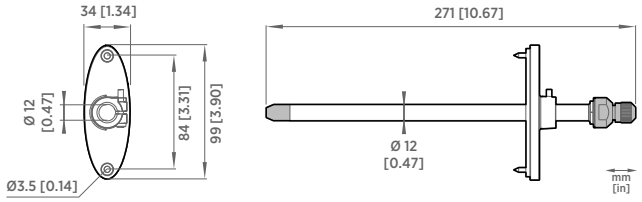
Accessories

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

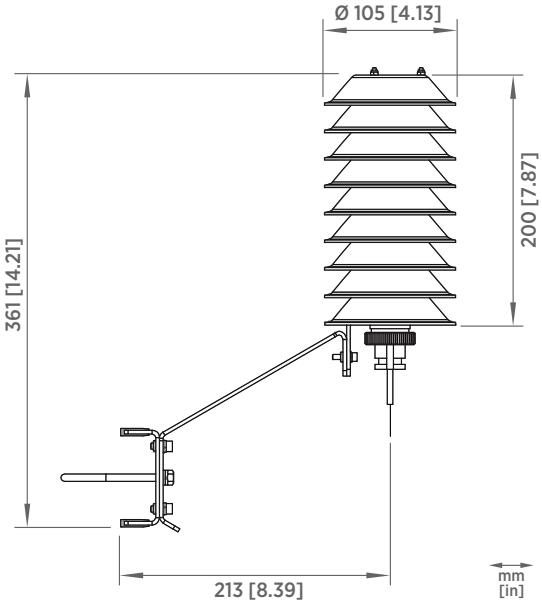
1) Vaisala Insight software for Windows available at www.vaisala.com/insight.



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.

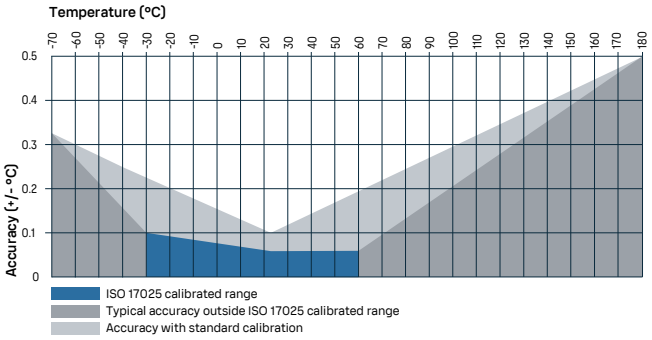
When the humidity probe is heated above dew point temperature, condensation can be avoided and the relative humidity in the actual process temperature can be back-calculated based on the true process temperature measurement received from TMP1.

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

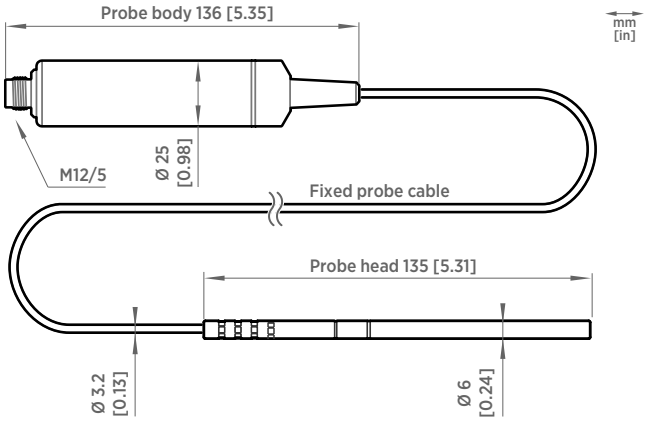
Operating voltage	15–30 V DC
Current consumption	10 mA typical
Digital output	RS-485, non-isolated
Protocols	Modbus RTU
Output parameters	Temperature (°C) Water vapor saturation pressure (hPa)

Compliance

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

Mechanical specifications

Connector	M12 5-pin A-coded male
Weight (with a 2-m cable)	224 g (7.9 oz)
Probe cable length	2 m (6.56 ft) or 10 m (32.8 ft)
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

HMT370EX Series Intrinsically Safe Humidity and Temperature Transmitters

For operation in up to Zone 0 / 20



Features

- Intrinsically safe (Ex i) for operation in up to Zone 0 / 20
- Measures RH and T, and outputs an extensive range of calculated parameters
- Designed for harsh conditions
- Temperature range between −70 ... +180 °C (−94 ... +356 °F) depending on the probe option
- Vaisala HUMICAP® sensor features high accuracy, excellent long-term stability, and negligible hysteresis
- Display options: graphical LCD display and non-display model
- Traceable calibration (certificate included)
- Compatible with Vaisala Insight PC software and Vaisala Indigo80 handheld indicator

Vaisala HMT370EX Series HUMICAP® Humidity and Temperature Transmitters are the ideal solution for measuring humidity in hazardous areas. The intrinsically safe and robust transmitter operates safely and reliably even in the most hazardous classifications, such as Zone 0. The HMT370EX transmitter series can be used as a replacement of the long-running HMT360 transmitter series.

Interchangeable probes and detachable probe module

HMT370EX offers several probe options for different applications:

- HMP371 — wall mount
- HMP373 — confined spaces
- HMP374 — pressurized spaces
- HMP375 — high temperature
- HMP377 — high humidity
- HMP378 — pressurized pipelines

For information on the HMP378F and HMP378H probe variants for oil and JET A-1 fuel moisture and temperature measurement, see HMP378F and HMP378H Datasheet (B212512EN). HMP371 and HMP373 can be ordered as temperature-only versions.

Thanks to the detachable probe module, probes can be easily replaced and removed for calibration outside the hazardous area without removing the entire transmitter. Attaching new probes involves minimal reconfiguration, as up-to-date settings can be restored from the transmitter.

Intrinsically safe and robust

The entire HMT370EX transmitter can be installed directly in hazardous areas. It can withstand continuous exposure to potentially explosive environments that contain flammable gases or dust. Operation in either gas or dust environments requires no additional protective enclosures. A rugged design, combined with trouble-free operation, ensures a long-term solution for monitoring humidity and dew point in potentially explosive environments.

Easy configuration access with local display and Insight PC software

Output configuration and measurement calibration and adjustment can be carried out directly on the local display interface. For additional configuration and monitoring options, you can connect the transmitter to Vaisala Insight PC software with an accessory USB cable. The probe and transmitter body can be connected to Insight for configuration either together as one unit or separately.

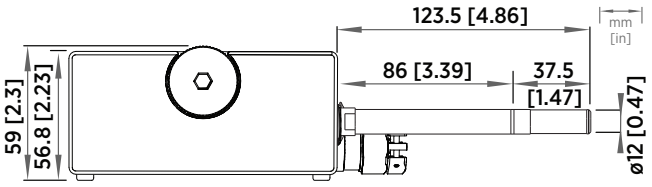
Interchangeable probes for HMT370EX intrinsically safe humidity and temperature transmitter

HMP371 for wall mounting

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



HMP371 probe shown with a stainless steel netting filter



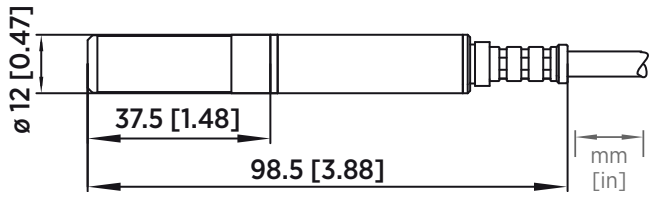
HMP371 dimensions

HMP373 for confined spaces

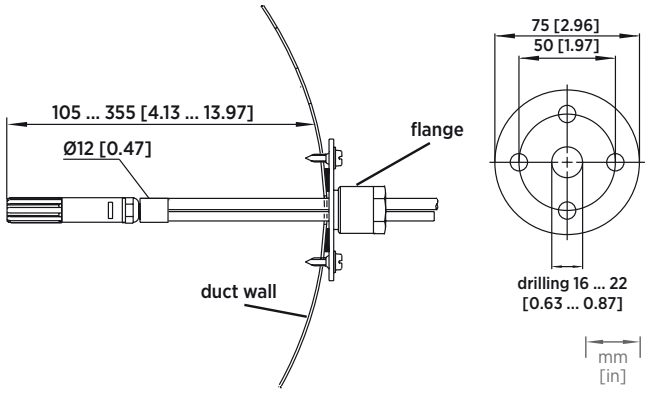
Temperature range with Teflon cable	-40 ... +120 °C (-40 ... +248 °F)
Temperature range with rubber cable	-40 ... +80 °C (-40 ... +176 °F)
Probe cable length	2, 5, or 10 meters (6 ft 7 in, 16 ft 5 in, 32 ft 10 in)
Probe diameter	12 mm (0.47 in)
Installation	
Duct installation kit	210697
Cable gland M20x1.5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



The small-sized HMP373 probe fits into tight spaces: shown connected with a Teflon cable



HMP373 dimensions



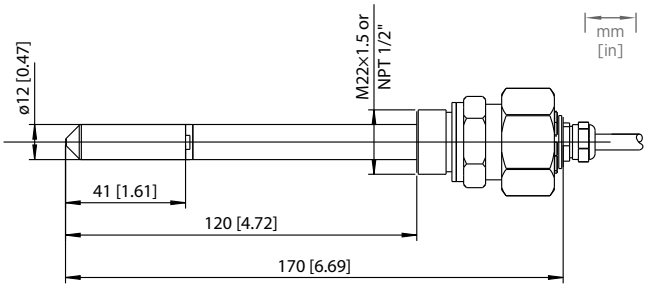
Left: Installation kit for duct mounting dimensions. Right: Installation flange dimensions. Aluminum or stainless steel.

HMP374 for high pressure

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



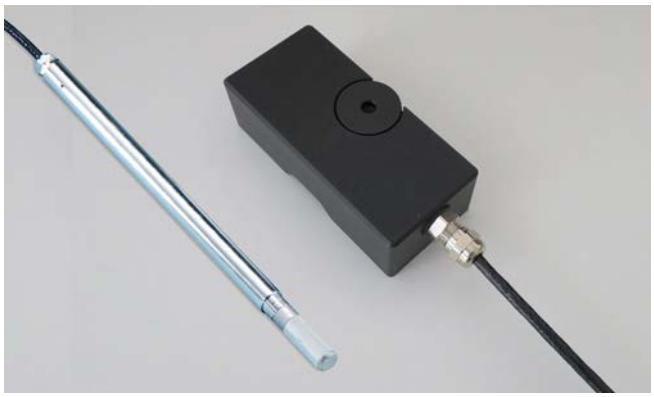
HMP374 is designed for measurement in pressurized spaces or vacuum chambers



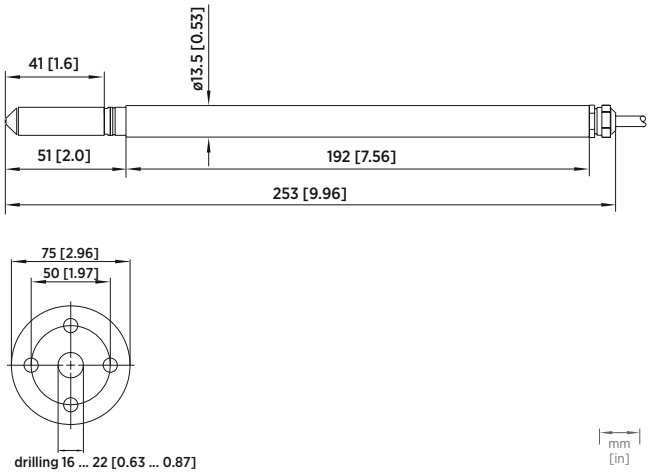
HMP374 dimensions

HMP375 for high temperature

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



HMP375 is designed for high temperature environments



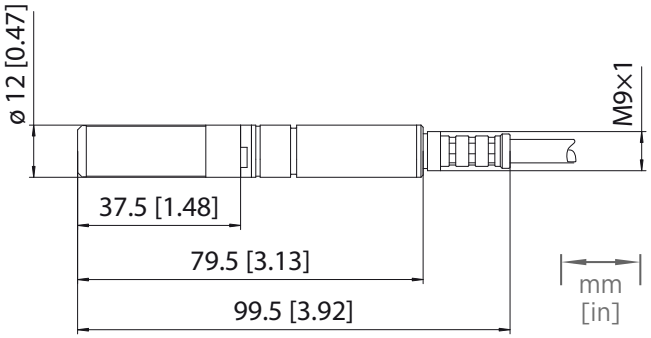
HMP375 probe and stainless steel installation flange dimensions

HMP377 for high humidities

Temperature range	-70 ... +180 °C (-94 ... +356 °F)
Pressure range	0–1 MPa
Probe cable length	2, 5, or 10 meters (6 ft 7 in, 16 ft 5 in, 32 ft 10 in)
Probe diameter	12 mm (0.47 in)
Installation	
Duct installation kit	210697
Cable gland M20x1.5 with splitting seal	HMP247CG
Swagelok for 12 mm probe, 3/8" ISO thread	SWG12ISO38
Swagelok for 12 mm probe, 1/2" NPT thread	SWG12NPT12



HMP377 is constructed to be installed in environments with high humidities



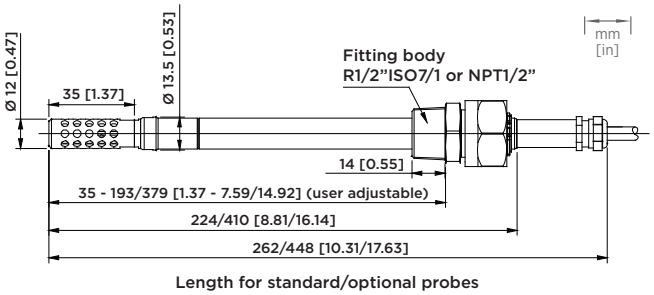
HMP377 dimensions

HMP378 for pressurized pipelines

Temperature range	-70 ... +180 °C (-94 ... +356 °F)
Pressure range	0–4 MPa
Probe cable length	2, 5, or 10 meters (6 ft 7 in, 16 ft 5 in, 32 ft 10 in)
Probe diameter	13.5 mm / 12 mm (0.53 in / 0.47 in)
Available probe lengths	262 mm / 448 mm (10.31 in / 17.6 in)
Installation	
Fitting body ISO1/2 solid structure	DRW212076SP
Fitting body NPT1/2 solid structure	NPTFITBODASP
Ball valve ISO 1/2 with welding joint	BALLVALVE-1



HMP378 enables flexible installation in pressurized pipelines



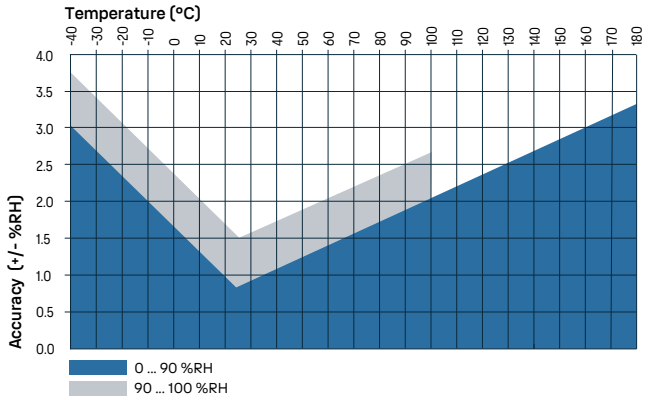
HMP378 dimensions

Technical data

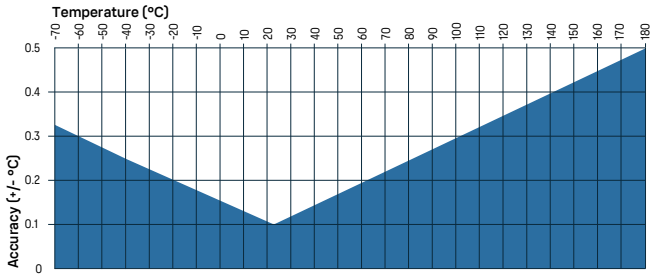
Measurement performance

Relative humidity	
Measurement range	0–100 %RH
Accuracy at +23 °C (+73.4 °F) [1]	±0.8 %RH (0–90 %RH)
Factory calibration uncertainty [2]	±0.5 %RH (0–40 %RH) ±0.8 %RH (40–95 %RH)
T_{63} response time	15 s
Sensor options	HUMICAP® R2
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	Pt1000 RTD Class F0.1 IEC 60751
Other available measurement parameters [3]	
Dew point temperature, dew point / frost point temperature, absolute humidity, mixing ratio, wet-bulb temperature, water concentration, water vapor pressure, water vapor saturation pressure, enthalpy, dew point temperature difference, absolute humidity at NTP, water mass fraction	

1) *Defined against calibration reference. Including non-linearity, hysteresis, and repeatability.*
2) *Defined as ±2 standard deviation limits. Small variations possible; see calibration certificate.*
3) *Parameter options depend on selected probe variant. For specifications, see HMT370EX User Guide (M212305EN).*



Humidity measurement accuracy as function of temperature



Temperature measurement accuracy over full range

Operating environment

Operating temperature for electronics	-40 ... +60 °C (-40 ... +140 °F)
Operating temperature with display	-20 ... +60 °C (-4 ... +140 °F)
Storage temperature	-40 ... +70 °C (-40 ... +158 °F)
Pressure range	See probe specifications
Note: Do not install the LCD display model in a location where the transmitter is exposed to direct sunlight.	

Compliance

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

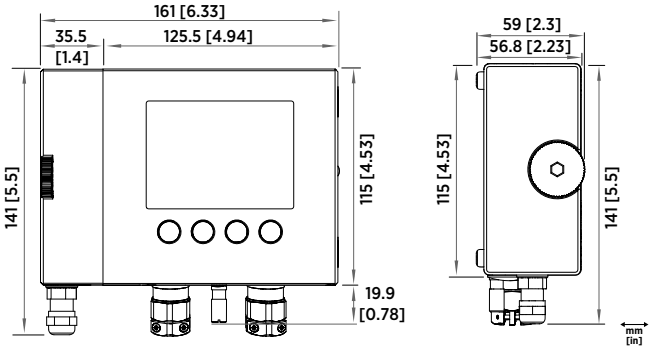
Inputs and outputs

Operating voltage	12–28 V
Analog outputs	2 outputs (two-wire, 4–20 mA) Connection via safety barriers
Typical accuracy of analog outputs at +20 °C	±0.0625 % full scale
Typical temperature dependence of analog outputs	0.005 % / °C (0.005 % / °F) full scale
Transmitter service port connection	USB cable *219690*
Probe service port connection	USB cable *USB2*
Display options	• Graphical LCD display • Model without display [1]

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

Mechanical specifications

Connections	Screw terminals, 0.33–2.0 mm² wires (AWG 14-22)
Cable glands	M20×1.5
Conduit fitting	NPT 1/2" and M16
Housing material	EN AW-6082
Housing weight	LCD transmitter: 1500 g (3.3 lb) LED transmitter: 1520 g (3.35 lb) HMP371 fixed probe: 320 g (0.7 lb)
IP rating	With probe connected to the transmitter: **IP66** With probe detached from the transmitter: **IP54**



HMT370EX transmitter dimensions

Ex classifications by region

NOTE: The Ex classifications show the highest level of compliance. Although lower compliance levels are not shown in the classification, they are also included in the classification. For example, compliance with Division 1 also means compliance with Division 2, and compliance with Zone 0 also means compliance with Zone 1 and Zone 2.	
Europe (ATEX)	
Gas classification EU (2014/34/EU)	II 1 G Ex ia IIC T4 Ga
Dust classification	II 1 D Ex ia IIIC T_{200} 85 °C Da
Safety factors	U_i = 28 VDC, I_i = 100 mA, C_i = 12.1 nF, P_i = 700 mW, L_i = 16 µH
Environmental specifications	
T_{amb}	-40 ... +60 °C (-40 ... +140 °F)
P_{amb}	0.8 ... 1.1 bar
International (IECEx)	
Gas classification	Ex ia IIC T4 Ga
Dust classification	II 1 D Ex ia IIIC T_{200} 85 °C Da
Safety factors	U_i = 28 VDC, I_i = 100 mA, C_i = 12.1 nF, P_i = 700 mW, L_i = 16 µH
Environmental specifications	
T_{amb}	-40 ... +60 °C (-40 ... +140 °F)
P_{amb}	0.8 ... 1.1 bar
Japan (CML)	
Ex classification	Ex ia IIC T4 Ga Ex ia IIIC T_{200} 85°C Da CML 21JPN2417X
China (NEPSI)	
Ex classification	Ex ia IIC T3-T6 Ga GYJ21.1325X
Korea (KCs)	
Ex classification	Ex ia IIC T4 Ga Ex ia IIIC T200 85 °C Da -40 °C ≤ Tamb ≤ +60 °C IECEx EESF 20.0044.X 21-KA4BO-0891X, 24-KA4BO-0509X
US (FM)	
Ex classification	Class I, Zone 0, AEx ia IIC T4 Ga Zone 20, AEx ia IIIC T85°C Da IS Class I, Division 1, Groups A, B, C, and D T4 IS Class II, III, Division 1, Groups E, F, and G T85°C
CAN (FM)	
HMT370EX equipment rating	Intrinsically safe for: Class I, II, III Division 1, Groups A, B, C, D, E, F, and G, T4 Class I, Zone 0, Ex ia IIC T4 Zone 20, Ex ia IIIC Temperature Code T85°C Ta: -40 °C to +60 °C; IP54 (transmitter alone) IP66 (transmitter with the probe body attached)
UK (UKEX)	
Ex classification	II 1 G Ex ia IIC T4 Ga II 1 D Ex ia IIIC T200 85 °C Da −40 °C ≤ Tamb ≤ +60 °C CML 21UKEX2316X

Transmitter accessory availability

Accessory	Item code	Compatible models
Cable lead-through accessories		
Cable gland M20 x 1.5 for Ø 5–11 mm cable	265207SP	All models
Cable gland M20 x 1.5 for Ø 10–14 mm cable	265208SP	All models
Conduit fitting M16	265243SP	All models
Conduit fitting NPT1/2"	265240SP	All models
Dummy plug (Ex, 2 pcs)	254931SP	All models
Mounting, wiring, cable, and adapter accessories		
HMT360 retrofit mounting plate	DRW253246SP	All models
Turbine mounting kit	HMT300TMK	All models
Outdoor installation kit (weather shield)	215109	All models
USB service cable for transmitter	219690	All models
Indigo80 handheld indicator connection cable (M12-M8) for transmitter	262195SP	All models
Zener barrier for 1 channel (with 2 channels, order 2 pcs)	210664	All models
Galvanic isolator for 1 channel	212483	All models
Galvanic isolator for 1 channel	272886SP	All models
Galvanic isolator for 2 channels	272887SP	All models
Calibration adapter for HMK15	211302	HMP371, HMP373, HMP374, HMP377

Probe spare parts and accessories

Accessory	Item code	Compatible models
M12 Indigo USB Adapter cable accessory for connecting HMT370EX probes to Insight	USB2	All models
Indigo80 handheld indicator connection cable (M12-M12) for probes	272075SP	All models
Ball valve ISO 1/2 with welding joint • Pressure range at +100 °C (+212 °F) 0–40 bar (0–580 psi absolute) (during installation max. 10 bar (145 psi absolute))	BALLVALVE-1	HMP378
Duct installation kit	210697	HMP373, HMP377
Mounting flange	210696	HMP375
Washer set for pressure-tight installation (3 pcs)	4PROBESETSP	HMP374
Cable gland M20×1.5 with split seal	HMP247CG	HMP373, HMP375, HMP377
Fitting body M22×1.5	17223SP	HMP374
Fitting body NPT1/2	17225SP	HMP374
Fitting body ISO1/2 solid structure	DRW212076SP	HMP378
Fitting body NPT1/2 solid structure	212810SP	HMP378
Swagelok fitting for 12 mm probe, 1/2" NPT thread	SWG12NPT12	HMP377
Swagelok fitting for 12 mm probe, 3/8" ISO thread	SWG12ISO38	HMP377
Swagelok fitting for 12 mm probe, 1/2" ISO thread	SWG12ISO12	HMP377
Thread adapter ISO 1/2" to NPT 1/2"	210662SP	All models
Manual press	HM36854SP	HMP378/F/H
Metallized PPS plastic filter grid with stainless steel mesh, for general use (pore size 15 µm)	DRW010281SP	All models
Stainless steel sintered filter, for general use (pore size 38 µm)	HM47280SP	All models
Metallized PPS plastic filter grid, for fast response in clean environments (6.5 mm gaps)	DRW010276SP	All models
Stainless steel filter for high oil flow applications	220752SP	HMP378/F/H
Stainless steel filter with PTFE membrane	214848SP	All models
Stainless steel filter for oil and vacuum environments	HM47453SP	All models

VAISALA

HMT310 Series Humidity and Temperature Transmitters

For demanding industrial applications



Features

- 4th generation Vaisala HUMICAP® sensor for superior accuracy and stability
- Full 0–100 %RH measurement, temperature range up to +180 °C (+356 °F), depending on model
- Small size, easy to integrate
- Insensitive to dust and most chemicals
- Two analog signals and RS-232 ASCII output
- Pressure tolerance up to 100 bar

HMT310 incorporates the latest generation Vaisala HUMICAP® sensor. The sensor is a capacitive thin-film polymer sensor providing high accuracy, excellent long-term stability, and negligible hysteresis. It is insensitive to dust, particulate dirt, and most chemicals. HMT310 has various options for different environments and measurements.

Several outputs, one connector

HMT310 is powered up with 10–35 VDC. It has two analog outputs and an RS-232 serial output in one M12 8-pin connector. The output signal and the supply power travel in the same cable, the only cable connected to the unit.

Chemical purge

Chemical purge helps to maintain measurement accuracy between calibration intervals. It involves heating the sensor to remove harmful chemicals. The function can be initiated manually or programmed to occur at set intervals.

A variety of features to choose from

The following optional features and accessories are available for the HMT310 series:

- Warmed probe and sensor heating for high humidity conditions
- Chemical purge for applications risking an interference with chemicals in the measuring environment
- Calculated humidity quantities
- Sensor protection options and probe cable lengths
- Mounting kits
- Rain shield

Six models for demanding applications

The HMT310 series includes:

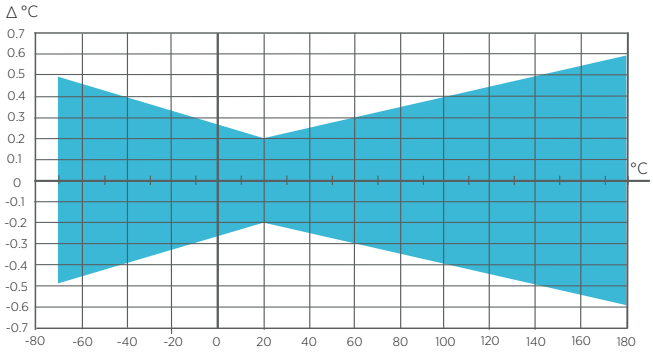
- HMT311 for wall mounting
- HMT313 for duct mounting and tight spaces
- HMT314 for high pressures up to 100 bar and vacuum conditions
- HMT315 for high temperatures
- HMT317 for high humidity applications, warmed probe option
- HMT318 for pressurized pipelines up to 40 bar

Technical data

Measurement performance

Relative humidity	
Measurement range	0–100 %RH
Response time (90 %) at +20 °C (+68 °F) in 0.1 m/s air flow	17 s with grid filter 50 s with grid and steel, netting filter 60 s with sintered filter
Factory calibration uncertainty (+20 °C)	±0.6 %RH (0–40 %RH)[1)] ±1.0 %RH (40–97 %RH)[1)]
Accuracy [2) 3)]	
at +15 ... +25 °C (+59 ... +77 °F)	±1 %RH (0–90 %RH) ±1.7 %RH (90–100 %RH)
at −20 ... +40 °C (−4 ... +104 °F)	±(1.0 + 0.008 x reading) %RH
at −40 ... +180 °C (−40 ... +356 °F)	±(1.5 + 0.015 x reading) %RH
Humidity sensor types	
HUMICAP® 180R	Typical applications
HUMICAP® 180RC	Applications with chemical purge/ warmed probe
HUMICAP® 180V	Catalytic sensor for H_2O_2 environments
HUMICAP® 180VC	Catalytic sensor with chemical purge for H_2O_2 environments
Temperature	
HMT311	−40 ... +60 °C (−40 ... +140 °F)
HMT313	−40 ... +80 °C (−40 ... +176 °F) or −40 ... +120 °C (−40 ... +248 °F)
HMT314, HMT315, HMT317, HMT318	−70 ... +180 °C (−94 ... +356 °F)
Typical accuracy at +20 °C (+68 °F)	±0.2 °C (±0.36 °F)
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751

1) Defined as ±2 standard deviation limits. Small variations possible, see also calibration certificate.
2) Including non-linearity, hysteresis, and repeatability.
3) With HUMICAP® 180V and 180VC sensors, accuracy is not specified below −20 °C (−4 °F) operating temperature.



Accuracy over temperature range

Operating environment

Operating temperature for electronics	−40 ... +60 °C (−40 ... +140 °F)
Storage temperature	−55 ... +80 °C (−67 ... +176 °F)
Operating pressure	
HMT314	0–100 bar
HMT318	0–40 bar
HMT315, HMT317	0–10 bar
EMC compliance	EN61326-1, Industrial environment

Inputs and outputs

Two analog outputs, selectable and scalable	0–20 mA or 4–20 mA 0–5 V or 0–10 V 1–5 V available through scaling
Typical accuracy of analog output at +20 °C	±0.05 % full scale
Typical temperature dependence of analog output	0.005 %/°C (0.003 %/°F) of full scale
Serial output	RS-232C
Connections	M12 8-pin male connector with RS-232C, current/voltage outputs (two channels) and U_{in}
Operating voltage	10–35 V DC
External load	R_L < 500 Ω
Startup time after power-up	3 s
Minimum operating voltage	
RS-232C output	10 V DC
Analog output	15 V DC
Probe heating and chemical purge	15 V DC
Pressures above 10 bara (145 psia)	24 V DC
Power consumption	
RS-232	12 mA
U_{out} 10 V (10 kΩ) channel 1 & channel 2	12 mA
I_{out} 20 mA (load 511 Ω) channel 1 & channel 2	50 mA
Chemical purge at 24 V DC	+ 220 mA
Warmed probe at 24 VDC	+ 240 mA

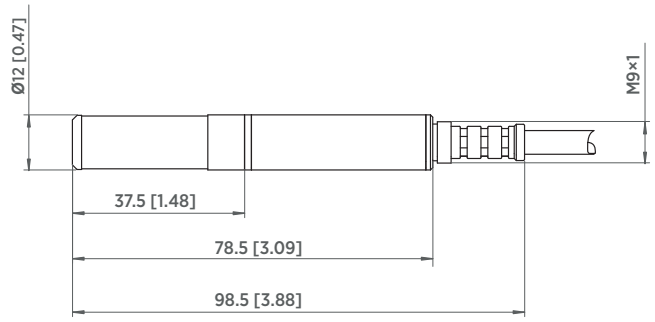
Mechanical specifications

Transmitter housing material	G-AlSi10Mg
Transmitter base material	PPS
IP rating	IP66
Probe cable length	2, 5, or 10 m (6 ft 7 in, 16 ft 5 in, 32 ft 10 in)
Cable feed through alternatives	M12 8-pin male connector with 5 m cable, or 8-pin female screw terminal connector for 4–8 mm cable diameter
Sensor protection	PPS grid with stainless steel net PPS grid Sintered filter Membrane stainless steel filter H_2O_2 filter

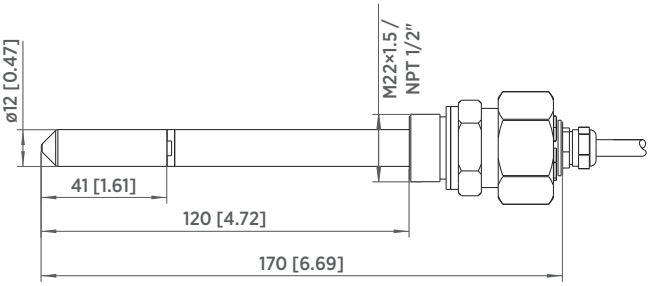
Spare parts and accessories

Rain shield	ASM211103
USB cable	238607
PPS plastic grid with stainless steel netting	DRW010281SP
PPS plastic grid filter	DRW010276SP
Sintered filter AISI 316L	HM47280SP
Stainless steel filter	HM47453SP
Stainless steel filter with membrane	214848SP
Catalytic H_2O_2 filter	231865

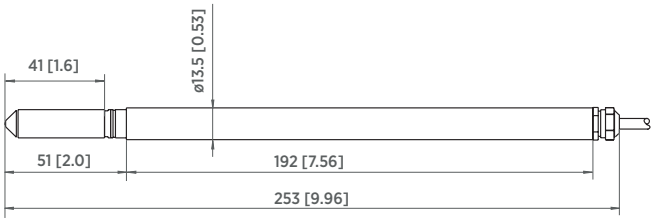
Dimensions in mm [in]



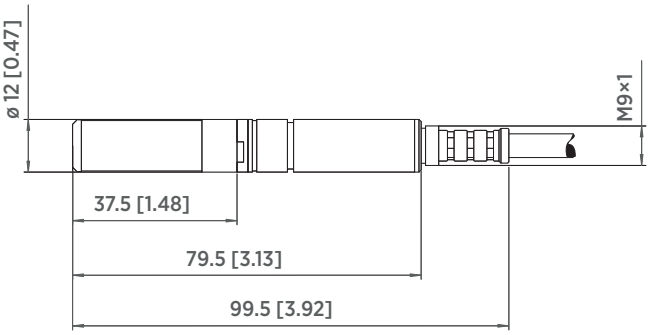
HMT313 probe



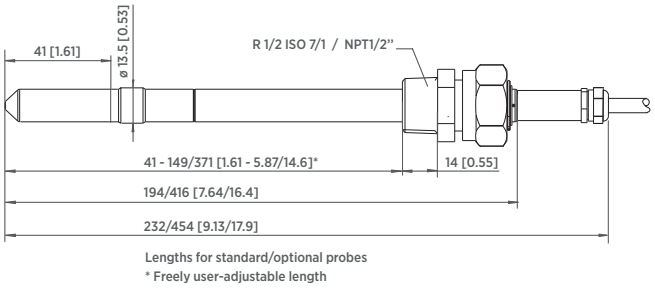
HMT314 probe



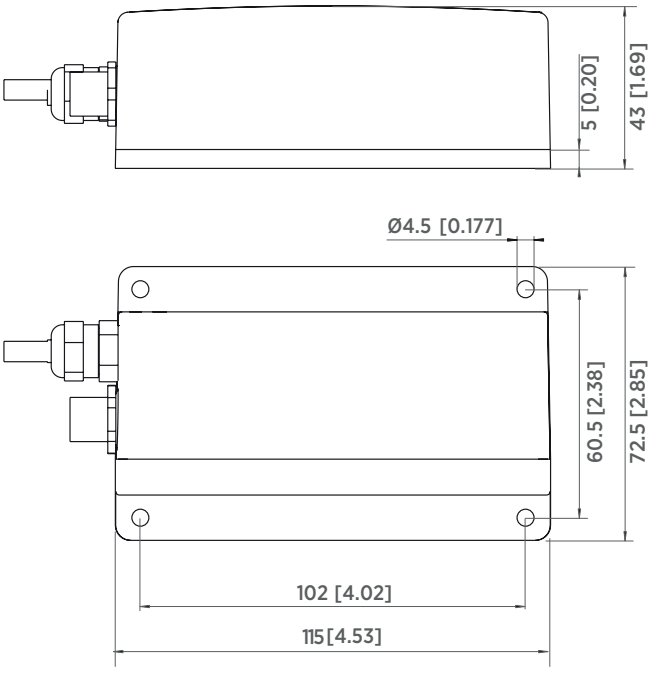
HMT315 probe



HMT317 probe



HMT318 probe



HMT310 transmitter body

VAISALA

HMT120 and HMT130 Humidity and Temperature Transmitters



Features

- Accurate and reliable measurement with Vaisala HUMICAP® humidity sensor technology
- Interchangeable probe, easy field calibration
- Resistant to dust and most chemicals
- Enclosure IP65
- Traceable calibration certificate: 3 points for humidity, 1 point for temperature
- Suitable for cleanrooms and other demanding HVAC and light industrial applications

Vaisala HUMICAP® Humidity and Temperature Transmitters HMT120 and HMT130 are designed for humidity and temperature monitoring in cleanrooms and are also suitable for other demanding HVAC and light industrial applications.

Options

- Humidity parameter options: relative humidity, dew point/frost point, wet bulb temperature, enthalpy, absolute humidity, mixing ratio, vapor pressure, and saturation vapor pressure
- 2-wire loop-powered or 3-wire voltage output configurations
- Optional LCD display
- Wall-mounted transmitter with a fixed or remote probe
- Constant output probe available
- Can be mounted outdoors using a Vaisala installation kit and Vaisala Radiation Shield DTR504A

Performance

The HMT120 and HMT130 transmitters incorporate Vaisala HUMICAP® humidity sensor technology that measures relative humidity accurately and reliably. Vaisala HUMICAP® sensors are resistant to dust and most chemicals.

The HMT120 and HMT130 transmitter enclosure is optimized for use in cleanrooms. The smooth surface of the enclosure makes it easy to clean and the enclosure material is chosen to tolerate cleaning agents. Furthermore, cabling can be done through the back wall of the transmitter.

Interchangeable probe

The HMT120 and HMT130 transmitters use a fully interchangeable relative humidity probe. The probe can be easily removed and replaced with a new one without having to adjust the transmitter, which allows for easy and quick recalibration of the transmitter. The probe can be adjusted using one of Vaisala's handheld meters as a reference.

Also available is a constant output probe with fixed RH and T output for convenient inspection of the monitoring system and signal transfer line.

Available options

The HMT120 and HMT130 transmitters are available as wall mounted with a fixed or remote probe. For high temperature applications or where space is limited, the remote probe is ideal.

The optional LCD display shows the measurement values of the selected parameters in selected units. The parameters are displayed simultaneously on two separate rows on the display.

Technical data

Models

Model	Measured parameters	Probe options	Output
HMT120	RH + T	HMP110, HMP113	2 analog outputs, 4–20 mA (loop-powered)
HMT130	RH + T	HMP110, HMP113	2 analog outputs, 0–1 V, 0–5 V, 0–10 V, or user-defined between 0–10 V

Measurement performance

Relative humidity	
Measurement range	0–100 %RH
Accuracy [1) 2)]	
At 0 … +40 °C (+32 … +104 °F)	±1.5 %RH (0–90 %RH) ±2.5 %RH (90–100 %RH)
With HMP110 probe: At −40 … 0 °C and +40 … +80 °C (−40 … +32 °F and +104 … +176 °F) With HMP113 probe: At −40 … 0 °C and +40 … +60 °C (−40 … +32 °F and +104 … +140 °F)	±3.0 %RH (0–90 %RH) ±4.0 %RH (90–100 %RH)
Factory calibration uncertainty at +20 °C (+68 °F)	±1.1 %RH (0–90 %RH) ±1.8 %RH (90–100 %RH)
Humidity sensor types	HUMICAP® 180R HUMICAP® 180V [3)]
Stability	±2 %RH over 2 years
Stability in typical HVAC applications	±0.5 %RH per year
Temperature	
Measurement range	HMP110: −40 … +80 °C (−40 … +176 °F) HMP113: −40 … +60 °C (−40 … +140 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Accuracy over temperature range:	
HMP110:	
At +15 … +25 °C (+59 … +77 °F)	±0.1 °C (±0.18 °F)
At 0 … +15 °C and +25 … +40 °C (+32 … +59 °F and +77 … +104 °F)	±0.15 °C (±0.27 °F)
At −40 … +0 °C and +40 … +80 °C (−40 … +32 °F and +104 … +176 °F)	±0.4 °C (±0.72 °F)
HMP113:	
At 0… +40 °C (+32 … +104 °F)	±0.2 °C (±0.36 °F)
At −40 … 0 °C and +40 … +60 °C (−40 … +32 °F and +104 … +140 °F)	±0.4 °C (±0.72 °F)
Other output parameters (optional)	
Dew point/frost point, wet bulb temperature, enthalpy, absolute humidity, mixing ratio, vapor pressure, saturation vapor pressure	

1) Including non-linearity, hysteresis, and repeatability.
2) With HUMICAP® 180V sensor, accuracy is specified only in operating temperature −20 … +80 °C (−4 … +176 °F).
3) Not available with HMP113.

Operating environment

IP rating (transmitter body)	IP65 [1)]
Operating temperature of transmitter body, no display	−40 … +60 °C (−40 … +140 °F)
Operating temperature of transmitter body with display	−20 … +60 °C (−4 … +140 °F)
Operating temperature, probe	HMP110: −40 … +80 °C (−40 … +176 °F) HMP113: −40 … +60 °C (−40 … +140 °F)
Storage temperature	−50 … +70 °C (−58 … +158 °F)

1) IP65 for the HMP110 probe only when using stainless steel sintered filter (HM46670SP) or PTFE sintered filter (item code DRW244938SP).

Inputs and outputs

HMT120 2-wire transmitter (loop-powered)	
Current output signals	4–20 mA
External loop voltage	10–30 V DC (R_L = 0 Ω) 20–30 V DC (R_L < 500 Ω)
HMT130 3-wire transmitter	
Voltage output signals	0–1 V, 0–5 V, 0–10 V or user-defined between 0–10 V
Min. output resistance	1 kΩ
Serial output	RS-485, non-isolated
Relay output	1 relay (max. 50 V DC, 200 mA)
Supply voltage	10–35 V DC 15–35 V DC (when output 0–10 V) 24 V AC (±20 %)
Current consumption at 24 V DC	8 mA, if relay closed 15 mA
Max. additional error caused by the analog outputs after calibration at +20 °C (+68 °F) ambient temperature	±0.1 % of FS output signal
Temperature dependence of the analog outputs	±0.005 % of FS output signal

Mechanical specifications

Weight	270 g (9.5 oz)
Probe connection cable lengths	3 m, 5 m, 10 m - up to 50 m (9.8 ft, 16 ft, 33 ft - up to 164 ft)
Display (optional)	128 × 64 resolution full graphics B&W display without backlight
Material	
Transmitter housing	PBT plastic
Display window	PC plastic
Probe body	HMP110: Stainless steel (AISI 316) HMP113: PC/ABS blend
Probe grid filter	HMP110: Chrome coated ABS plastic HMP113: PC (glass reinforced)
Connections	
Inputs and outputs	Screw terminals 0.5–1.5 mm^2 (AWG 20–AWG 15)
Probe interface	4-pin M8 female panel connector

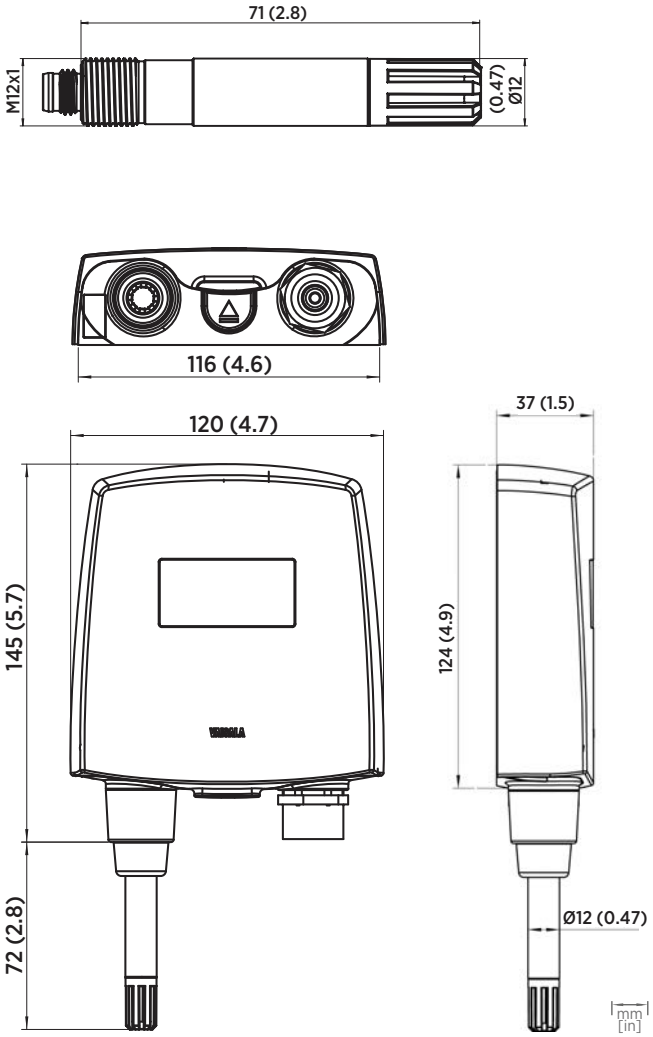
Compliance

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

Spare parts and accessories

Probes [1]	
Humidity and temperature probe	HMP110
Constant output probe	HMP110REF
Humidity and temperature probe	HMP113
Sensors	
HMP110 and HMP113 probes:	
Standard humidity sensor	HUMICAP180R
Catalytic humidity sensor for H_2O_2	HUMICAP180V [2]
Sensor protection	
HMP110 probe:	
Plastic grid filter	DRW010522SP
Plastic grid with membrane filter	DRW010525SP
Stainless steel sintered filter	HM46670SP
PTFE membrane filter with stainless steel grid	ASM212652SP
PTFE sintered filter	DRW244938SP
HMP113 probe:	
Plastic grid filter	DRW240185SP
Plastic grid with membrane filter	ASM210856SP
Stainless steel sintered filter	HM47280SP
Porous PTFE filter	219452SP
Probe installation	
HMP110 and HMP113 (remote probe models):	
Probe mounting clamp, 1 pc	225501
Probe mounting clamps, 10 pcs	226067
Probe mounting flange	226061
Probe holder, 5 pcs	ASM213382SP
Probe connection cables [3]	
Probe connection cable 3 m (9.8 ft)	HMT120Z300
Probe connection cable 5 m (16 ft)	HMT120Z500
Probe connection cable 10 m (33 ft)	HMT120Z1000
Probe connection cable 20 m (66 ft)	HMT120Z2000
Probe connection cable 5 m (16 ft), plenum-rated	HMT120Z500CMP
Probe connection cable 10 m (33 ft), plenum-rated	HMT120Z1000CMP
Probe connection cable 20 m (66 ft), plenum-rated	HMT120Z2000CMP
Other cables	
HM70 connection cable	211339
USB serial interface cable	219685
Transmitter protection and installation	
Radiation shield [3]	DTR504A
Rain shield with installation kit	215109
Duct installation kit [3]	215619

1) See the separate HMP110 and HMP113 order forms.
2) Not available with HMP113.
3) For use with remote probe models.



Dimensions of HMP110 remote probe (top image) and HMT120 and HMT130 transmitters

VAISALA

TMT120 and TMT130 Temperature Transmitters



Features

- Platinum RTD temperature sensor for outstanding measurement stability and accuracy
- Interchangeable probe, easy field calibration
- Resistant to dust and most chemicals
- Enclosure IP65
- Traceable calibration certificate: 1 point for temperature
- Suitable for cleanrooms and other demanding HVAC and light industrial applications

Vaisala Temperature Transmitters TMT120 and TMT130 are designed for temperature monitoring in cleanrooms and are also suitable for other demanding HVAC and light industrial applications.

Options

- 2-wire loop-powered or 3-wire voltage output configurations
- Extended temperature range with the TMP115 wide-range temperature probe
- Optional LCD display
- Wall-mounted transmitter with a fixed or remote probe
- Can be mounted outdoors using a Vaisala installation kit and Vaisala Radiation Shield DTR504A

Performance

The TMT120 and TMT130 transmitters incorporate platinum RTD temperature sensor technology for outstanding measurement stability and accuracy.

The TMT120 and TMT130 transmitter enclosure is optimized for use in cleanrooms. The smooth surface of the enclosure makes it easy to clean and the enclosure material is chosen to tolerate cleaning agents. Furthermore, cabling can be done through the back wall of the transmitter.

Interchangeable probe

The TMT120 and TMT130 transmitters use a fully interchangeable temperature probe. The probe can be easily removed and replaced with a new one without having to adjust the transmitter, which allows for easy and quick recalibration of the transmitter. The probe can be adjusted using one of Vaisala's handheld meters as a reference.

Available options

The TMT120 and TMT130 transmitters are available as wall mounted with a fixed or remote probe. For high temperature applications or where space is limited, the remote probe is ideal.

For an extended temperature range, the transmitter can be optionally ordered with TMP115, a wide-range temperature probe, which includes a 3-m (9.8 ft) sensor cable. The length includes the probe body and sensor tip.

The optional LCD display shows the measurement values in selected units.

Technical data

Models

Model	Measured parameters	Probe options	Output
TMT120	T	HMP110T, TMP115 [1)]	1 analog output, 4–20 mA (loop-powered)
TMT130	T	HMP110T, TMP115 [1)]	1 analog output, 0–1 V, 0–5 V, 0–10 V, or user-defined between 0–10 V

1) TMP115 with a 3 m (9.8 ft) cable. Length includes the TMP115 probe body and sensor tip.

Measurement performance

Temperature	
Measurement range	HMP110T: −40 ... +80 °C (−40 ... +176 °F) TMP115: −196 ... +150 °C (−320 ... +302 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Accuracy over temperature range:	
HMP110T:	
At +15 ... +25 °C (+59 ... +77 °F)	±0.1 °C (±0.18 °F)
At 0 ... +15 °C and +25 ... +40 °C (+32 ... +59 °F and +77 ... +104 °F)	±0.15 °C (±0.27 °F)
At −40 ... +0 °C and +40 ... +80 °C (−40 ... +32 °F and +104 ... +176 °F)	±0.4 °C (±0.72 °F)
TMP115:	
at −196 ... −90 °C (−320 ... −130 °F)	±2.5 °C (±4.5 °F)
at −90 ... −30 °C (−130 ... −22 °F)	±0.75 °C (±1.35 °F)
at −30 ... 0 °C (−22 ... +32 °F)	±0.5 °C (±0.9 °F)
at 0 ... +50 °C (+32 ... +122 °F)	±0.25 °C (±0.45 °F)
at +50 ... +90 °C (+122 ... +194 °F)	±0.75 °C (±1.35 °F)
at +90 ... +150 °C (+194 ... +302 °F)	±2.5 °C (±4.5 °F)

Operating environment

IP rating (transmitter body)	IP65 [1)]
Operating temperature of transmitter body, no display	−40 ... +60 °C (−40 ... +140 °F)
Operating temperature of transmitter body with display	−20 ... +60 °C (−4 ... +140 °F)
Operating temperature, probe	HMP110T: −40 ... +80 °C (−40 ... +176 °F) TMP115, sensor tip: −196 ... +150 °C (−320 ... +302 °F) TMP115, probe body: −40 ... +60 °C (−40 ... +140 °F)
Storage temperature	−50 ... +70 °C (−58 ... +158 °F)

1) IP65 for the HMP110T probe only when using stainless steel sintered filter (HM46670SP) or PTFE sintered filter (item code DRW244938SP).

Inputs and outputs

TMT120 2-wire transmitter (loop-powered)	
Current output signals	4–20 mA
External loop voltage	10–30 V DC (R_L = 0 Ω) 20–30 V DC (R_L < 500 Ω)
TMT130 3-wire transmitter	
Voltage output signals	0–1 V, 0–5 V, 0–10 V or user-defined between 0–10 V
Min. output resistance	1 kΩ
Serial output	RS-485, non-isolated
Relay output	1 relay (max. 50 V DC, 200 mA)
Supply voltage	10–35 V DC 15–35 V DC (when output 0–10 V) 24 V AC (±20 %)
Current consumption at 24 V DC	8 mA, if relay closed 15 mA
Max. additional error caused by the analog outputs after calibration at +20 °C (+68 °F) ambient temperature	±0.1 % of FS output signal
Temperature dependence of the analog outputs	±0.005 % of FS output signal

Mechanical specifications

Weight	270 g (9.5 oz)
Probe connection cable lengths	3 m, 5 m, 10 m - up to 50 m (9.8 ft, 16 ft, 33 ft - up to 164 ft)
Display (optional)	128 × 64 resolution full graphics B&W display without backlight
Material	
Transmitter housing	PBT plastic
Display window	PC plastic
HMP110T probe body	Stainless steel (AISI 316)
HMP110T probe grid filter	Chrome coated ABS plastic
TMP115 probe body	PC/ABS blend
TMP115 probe cable	FEP
TMP115 sensor tip	Stainless steel (AISI 316)
Connections	
Inputs and outputs	Screw terminals 0.5–1.5 mm^2 (AWG 20–AWG 15)
Probe interface	4-pin M8 female panel connector

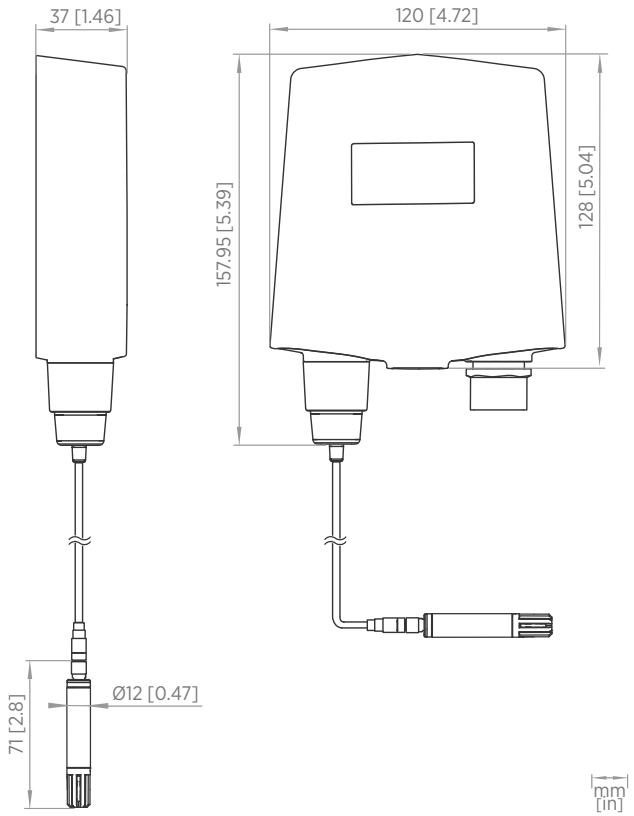
Compliance

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

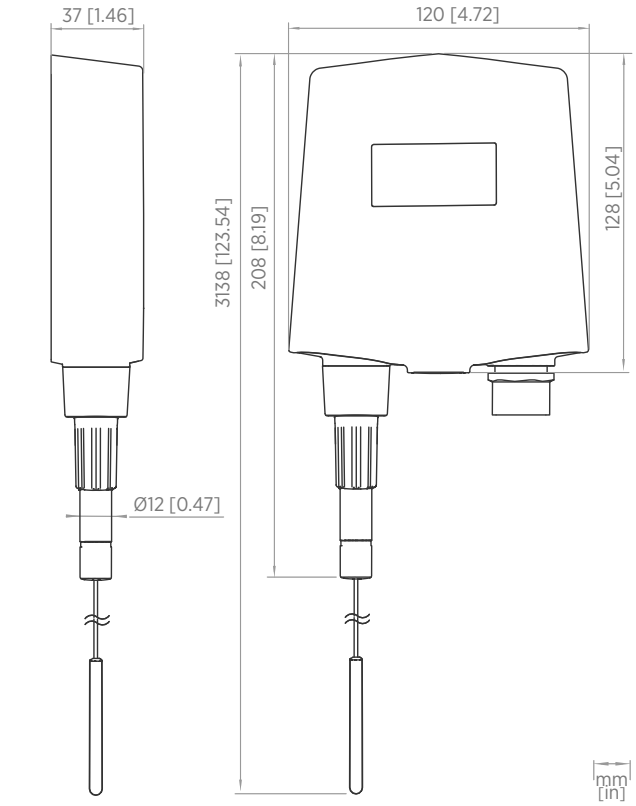
Spare parts and accessories

Probes [1]	
Temperature-only probe	HMP110T
Wide-range temperature probe	TMP115 with a 3 m (9.8 ft) cable [2]
Sensor protection	
HMP110T probe:	
Plastic grid filter	DRW010522SP
Plastic grid with membrane filter	DRW010525SP
Stainless steel sintered filter	HM46670SP
PTFE membrane filter with stainless steel grid	ASM212652SP
PTFE sintered filter	DRW244938SP
Probe installation	
Remote probe models with HMP110T:	
Probe mounting clamp, 1 pc	225501
Probe mounting clamps, 10 pcs	226067
Probe mounting flange	226061
Probe holder, 5 pcs	ASM213382SP
Fixed probe models with TMP115:	
Probe nut, 5 pcs	DRW257207SP
Thermal dampener block	236310SP
Probe connection cables [3]	
Probe connection cable 3 m (9.8 ft)	HMT120Z300
Probe connection cable 5 m (16 ft)	HMT120Z500
Probe connection cable 10 m (33 ft)	HMT120Z1000
Probe connection cable 20 m (66 ft)	HMT120Z2000
Other cables	
HM70 connection cable	211339
USB serial interface cable	219685
Transmitter protection and installation	
Radiation shield [3]	DTR504A
Rain shield with installation kit	215109
Duct installation kit [3]	215619

1) See the separate HMP110 and TMP115 order forms.
2) Length includes the TMP115 probe body and sensor tip.
3) For use with remote probe models.



Dimensions of TMT120 and TMT130 transmitter, remote probe model with HMP110T probe



Dimensions of TMT120 and TMT130 transmitter, fixed probe model with a TMP115 probe

VAISALA

HMW90 Series Humidity and Temperature Transmitters

For high-performance HVAC applications



Features

- Both analog and field bus communication (Modbus® RTU)
- Easy installation, configuration, and field adjustment
- Humidity parameter options: relative humidity, dew point, mixing ratio, enthalpy, wet bulb temperature, dew point depression, and absolute humidity
- Full 0 ... 100 %RH measurement range
- Up to ±1.7 %RH accuracy
- User exchangeable humidity and temperature module
- Traceable calibration (certificate included)
- Available in two colors

Wall-mounted Vaisala HMW90 Series HUMICAP® Humidity and Temperature Transmitters measure relative humidity and temperature in indoor HVAC applications, where high accuracy, stability, and reliable operation are required.

The flexible HMW90 series offers a variety of options and features. Transmitters include a display and a sliding cover with either an opening for the display or a solid front. Both analog and field bus communication options, including special scalings and calculated parameters, are available.

Quick and easy to install

HMW90 series transmitters are quick and easy to install. The wiring is connected through the back plate and the electronics with the sensors can be snapped on easily after the wiring is complete. The transmitter is configured using DIP switches, which are accessible when the enclosure is open.

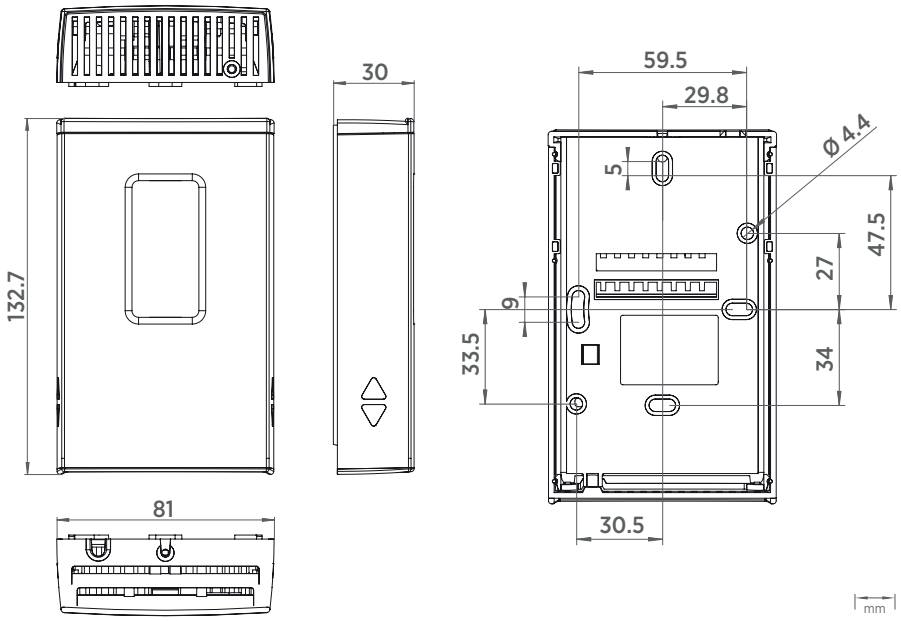
Digital communication brings benefits

The introduction of Modbus® RTU communication to field level devices brings many advantages. For example, all sensors can be centrally accessed and their performance can be easily monitored. Wiring is simple when multiple sensors are installed on the same bus. Sensors can be set up using standardized tools, and the system can be expanded with additional sensors quickly and conveniently. In addition, parameters influencing measurements, such as pressure or site elevation, can be centrally set and updated.

Choose from a wide variety of calibration options

On-site calibration and adjustment is exceptionally easy. The sliding cover exposes offset trimmers for one-point calibration without disturbing measurement. The display instantly indicates the effects of changes, making it clear and convenient to make adjustments. A service port enables two-point calibration, using either a PC or Vaisala HUMICAP® Handheld Humidity and Temperature Meter HM70. HMW90 series transmitters include a user-exchangeable measurement module, which can be ordered as a spare part.

HMW90 dimensions and models



Dimensions of HMW90 series transmitter cover (left) and mounting base (right)

Models

Model	Measurements	Output
TMW92	T-only	2-wire current output
TMW93	T-only	3-wire voltage output
TMW90	T-only	Analog output (configurable)
HMW92	RH+T	2-wire current output
HMW92D	RH+T	2-wire current output, model with display
HMW93	RH+T	3-wire voltage output
HMW93D	RH+T	3-wire voltage output, model with display
HMW90	RH+T	Analog/Modbus RTU output (configurable)
HMW95	RH+T	Modbus RTU output
HMW95D	RH+T	Modbus RTU output, model with display

Technical data

Measurement performance

Relative humidity	
Measurement range	0 ... 100 %RH, non-condensing
Accuracy at temperature range +10 ... +40 °C (+50 ... +104 °F):	
0 ... 90 %RH	±1.7 %RH
90 ... 100 %RH	±2.5 %RH
Accuracy at temperature range −5 ... +10 °C, +40 ... + 55 °C (+23 ... +50 °F, +104 ... +131 °F):	
0 ... 90 %RH	±3 %RH
90 ... 100 %RH	±4 %RH
Stability in typical HVAC applications	±0.5 %RH/year
Humidity sensor	HUMICAP® 180R
Temperature	
Measurement range	−5 ... +55 °C (+23 ... +131 ºF)
Accuracy at +20 ... +30 °C (+68 ... +86 °F)	±0.2 °C (± 0.36 °F)
Accuracy at +10 ... +20 °C, +30 ... +40 °C (+50 ... +68 °F, +86 ... +104 °F)	±0.3 °C (± 0.54 °F)
Accuracy at −5 ... +10 °C, +40 ... +55 °C (+23 ... +50 °F, +104 ... +131 °F)	±0.5 °C (± 0.90 °F)
Temperature sensor	Digital temperature sensor

Inputs and outputs

Service port	RS-485 line for temporary service use
Current output models	
Outputs	2 × 4 ... 20 mA, loop powered
Loop resistance	0 ... 600 Ω
Supply voltage	20 ... 28 VDC at 500 Ω load 10 ... 28 VDC at 0 Ω load
Isolation between output channels	500 VDC
Voltage output models	
Outputs	2 × 0 ... 5 V or 2 × 0 ... 10 V
Load resistance	10 kΩ min.
Supply voltage	18 ... 35 VDC, 24 VAC ±20 % 50/60 Hz
Max. current consumption	12 mA Max. with relay 25 mA
Relay	1 pc (max 50 VDC/50 VAC, 500 mA)
Field bus models	
Supply voltage	18 ... 35 VDC, 24 VAC ± 20 % 50/60 Hz
Max. current consumption (with 120 Ω termination)	30 mA at 24 VDC
Output type	RS-485 (galvanic isolation, 1.5 kV)
RS-485 end of line termination	Enable with jumper, 120 Ω
Supported protocol	Modbus RTU
Modbus RTU address range	1 ... 247

Operating environment

Operating temperature	−5 ... +55 °C (+23 ... +131 °F)
Storage temperature	−30 ... +60 °C (−22 ... +140 °F)
IP rating	IP30

Compliance

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

Mechanical specifications

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

1) RAL code is only indicative with potential small variations in color shade.

Spare parts and accessories

Humidity and temperature module	HTM10SP
Temperature module (for T-only models)	TM10SP
Decorative cover set (10 pcs)	236285
Connection cable for HM70 handheld meter	219980
USB cable for PC connection	219690

VAISALA

HMD60 Series Humidity and Temperature Transmitters

For demanding HVAC and light industrial applications



Features

- Measurement accuracy up to ±1.5 %RH and ±0.1 °C (±0.18 °F)
- 4 ... 20 mA analog outputs: HMD62 (RH and T) and TMD62 (T-only)
- 0 ... 10 V analog outputs: HMD65 (RH and T)
- BACnet MS/TP and Modbus RTU: HMD65
- All common humidity parameters available, including RH, dew point, enthalpy, and wet bulb temperature
- Resistant to chemicals and dust
- IP66-rated body
- Traceable calibration certificate
- Easy field adjustment and output configuration with quick access to electronics also when installed
- Compatible with Vaisala Insight PC software

The duct mounted HMD60 series HUMICAP® transmitters HMD62, TMD62, and HMD65 are designed for light industrial applications and demanding HVAC applications such as museums, cleanrooms, and laboratories.

Analog or Digital Output with 3 Transmitter Options

HMD60 series transmitter options:

- HMD62: RH and T measurement, 4 ... 20 mA analog output
- TMD62: T-only transmitter, 4 ... 20 mA analog output
- HMD65: RH and T measurement, 0 ... 10 V analog output, Modbus RTU, and BACnet MS/TP

Robust Design, Stability, and Reliability

The all-metal body is suitable for building sites and industrial settings. HMD60 series transmitters provide state-of-the-art stability and environmental resistance, thanks to the Vaisala HUMICAP® R2 sensor.

For applications where hydrogen peroxide disinfection is used, the HUMICAP® 180V catalytic sensor option provides improved stability during H_2O_2 exposure.

Traceable Accuracy

HMD60 series transmitters are always delivered with a traceable (ISO9001) calibration certificate. Upon request, accredited (ISO17025) calibration certificates can also be provided.

Field Configurable Outputs

The analog HMD62 and TMD62 transmitter models use floating 4 ... 20 mA loop powered outputs. The HMD65 model has two 0 ... 10 V outputs in addition to BACnet MS/TP and Modbus RTU interfaces (RS-485). The analog outputs are field configurable with easy humidity parameter selection using DIP switches.

For special scaling and other additional configuration and adjustment options, you can use the convenient Vaisala Insight PC software for Windows® (see www.vaisala.com/insight).

When required, HMD60 series transmitters can also be intuitively field adjusted using trimmers or with the Vaisala HM70 handheld meter.

Technical Data

Relative humidity measurement performance

Humidity sensor options	
HUMICAP® R2	Latest generation industrial sensor with improved corrosion resistance
HUMICAP® 180V	Humidity sensor with a catalytic surface for processes with H_2O_2
Measurement range	0 ... 100 %RH
Stability	±0.5 %RH/year in typical HVAC applications
Accuracy at 0 ... +40 °C (+32 ... +104 °F) [1]	
0 ... 90 %RH	±1.5 %RH
90 ... 100 %RH	±2.5 %RH
Accuracy at +40 ... +80 °C (+104 ... +176 °F) and −40 ... 0 °C (−40 ... +32 °F) [1] [2]	
0 ... 90 %RH	±2.5 %RH
90 ... 100 %RH	±3.5 %RH
Factory calibration uncertainty	±1.0 %RH
Start-up and response time	
Start-up time at +20 °C (+68 °F)	8 s
Response time (T63) at +20 °C (+68 °F)	15 s
Calculated humidity parameters (default analog output scale)	
Dew point	−40 ... +80 °C (−40 ... +176 °F)
Dew point / frost point	−40 ... +80 °C (−40 ... +176 °F)
Absolute humidity	0 ... 300 g/m³ (0 ... 131.1 gr/ft³)
Wet bulb temperature	−40 ... +80 °C (−40 ... +176 °F)
Enthalpy	−40 ... 1600 kJ/kg (−9.5 ... 695.6 Btu/lb)
Mixing ratio	0 ... 600 g/kg (0 ... 4200 gr/lb)

1) Including non-linearity, hysteresis, and repeatability
2) With HUMICAP® 180V sensor, accuracy is not specified below −20 °C (−4 °F) operating temperature

Temperature measurement performance

Temperature sensor	Pt1000 RTD Class F 0.1 IEC 60751
Measurement range	−40 ... +80 °C (−40 ... +176 °F)
Default analog output scale	−20 ... +80 °C (−4 ... +176 °F)
Accuracy at +20 °C (+68 °F)	±0.1 °C (0.18 °F)
Temperature dependence	±0.005 °C/°C
Factory calibration uncertainty	±0.1 °C (0.18 °F)
Response time (T63) with free convection	8 min

Analog output performance

Accuracy at +20 °C (68 °F):	±0.01 mA (HMD62 and TMD62) ±5 mV (HMD65)
Temperature dependence	±0.0008 mA/°C (HMD62 and TMD62) ±0.2 mV/°C (HMD65)

Operating environment

Operating temperature, electronics	−40 ... +60 °C (−40 ... +140 °F)
Operating temperature, probe	−40 ... +80 °C (−40 ... +176 °F)
Storage temperature range	−40 ... +80 °C (−40 ... +176 °F)
Maximum flow speed	50 m/s with sintered filter
Electromagnetic compatibility	EN61326-1, Industrial Environment

Inputs and outputs

Power supply input	HMD62 and TMD62: 10 ... 35 VDC (RL = 0 Ω) 20 ... 35 VDC (RL = 600 Ω) HMD65: 15 ... 35 VDC 16 ... 24 VAC
Power consumption (HMD65)	1.0 W (typical, for both AC and DC)
Analog outputs	TMD62: 1 × T output 4 ... 20 mA HMD62: 1 × RH output 4 ... 20 mA, 1 × T output 4 ... 20 mA [1] HMD65: 1 × RH output 0 ... 10 V, 1 × T output 0 ... 10 V [1] (load resistance: 10 kΩ min.)
Digital output (RS-485)	HMD65: Isolated, supports Modbus RTU and BACnet MS/TP protocols
BACnet MS/TP	Address range: 0 ... 127 (master mode only)
Modbus RTU	Address range: 1 ... 247
Service port	M8 4-pin male connector: • MI70 handheld indicator (requires cable 219980SP) • Vaisala Insight PC software [2] (requires USB cable 219690)
Screw terminal wire size	0.5 ... 2.5 mm²

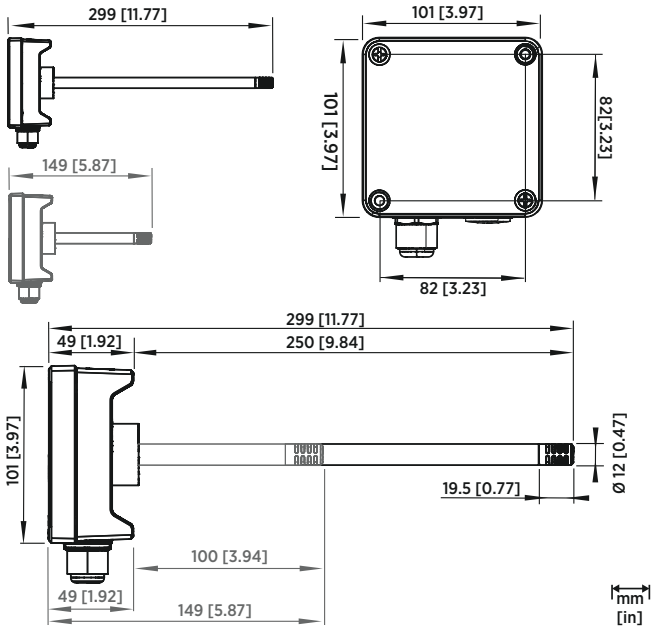
1) Calculated output parameters for HMD62 and HMD65 include T_d, T_{df}, A, X, T_w, and H.
2) Vaisala Insight software for Windows® available at www.vaisala.com/insight.

Spare parts and accessories

USB cable for PC operation (Vaisala Insight software)	219690
Connection cable for HM70 (MI70) handheld meter	219980SP
Membrane filter	ASM212652SP
Sintered filter	HM46670SP
Sintered teflon filter	DRW244938SP
Conduit fitting and O-ring (M16×1.5 / NPT1/2")	210675SP

Mechanical specification

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



HMD60 Dimensions (Long and Short Probe Options)

VAISALA

HMDW110 Series Humidity and Temperature Transmitters

For high-accuracy measurements in HVAC applications





Features

- Accurate humidity and temperature transmitters for measurements in HVAC applications
- Proven Vaisala HUMICAP® 180R humidity sensor for superior long-term stability
- ±2 %RH accuracy
- 3-point traceable calibration (%RH), 1-point traceable calibration (T), certificate included
- Analog (4–20 mA) and Modbus® RTU output options
- Display and non-display options
- M12 connector option

The high-accuracy transmitters HMD110/112 and HMW110/112 are designed for measuring humidity and temperature in HVAC applications. Calculated humidity parameters are also conveniently available, including dew point temperature, wet bulb temperature, and enthalpy. The measurement is highly accurate to enable precise and reliable control of HVAC systems. Options also include temperature transmitter models.

The transmitters belong to Vaisala HMDW110 Transmitter Series, which includes transmitters for duct mounting, IP65-rated wall transmitters, immersion temperature transmitters, and outdoor transmitters with integrated radiation shields. Display and non-display options are available.

Highly accurate, proven Vaisala HUMICAP performance

The highly accurate HMD110/112 and HMW110/112 transmitters are designed for measuring humidity and temperature in various HVAC applications. The high accuracy and reliability of the measurement enable precise and reliable controls of HVAC systems.

The transmitters are equipped with the trusted HUMICAP 180R humidity sensor, which is the robust sensor designed for industrial applications. The sensor's superior long-term stability allows for unbeatable long-term accuracy of the instrument and minimizes maintenance needs throughout the transmitter's lifetime.

Optional output parameters include dew point temperature, wet bulb temperature, and enthalpy, which are selectable with Vaisala Insight PC software.

Excellent choice for challenging conditions

The IP65-rated HMD110/112 and HMW110/112 transmitters are optimal for even challenging conditions, such as cleanrooms, data centers and other industrial settings. The transmitters can also be ordered with the catalytic HUMICAP 180V humidity sensor. The catalytic sensor improves stability especially in hydrogen peroxide sterilized environments where repeated condensation can be expected.

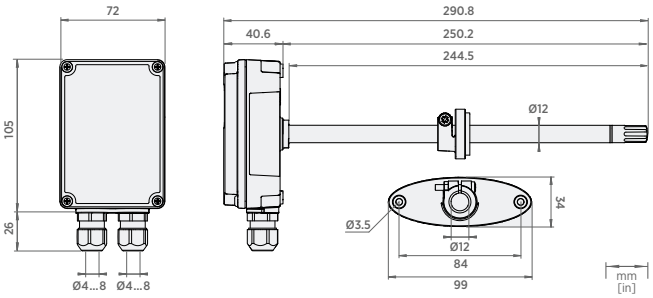
Traceable accuracy

The instruments are individually adjusted and delivered with a traceable (ISO 9001) calibration certificate. If required later on, the transmitter can be easily field-calibrated using Vaisala Handheld Humidity and Temperature Meter HM70 or Vaisala Insight PC software.

Technical data



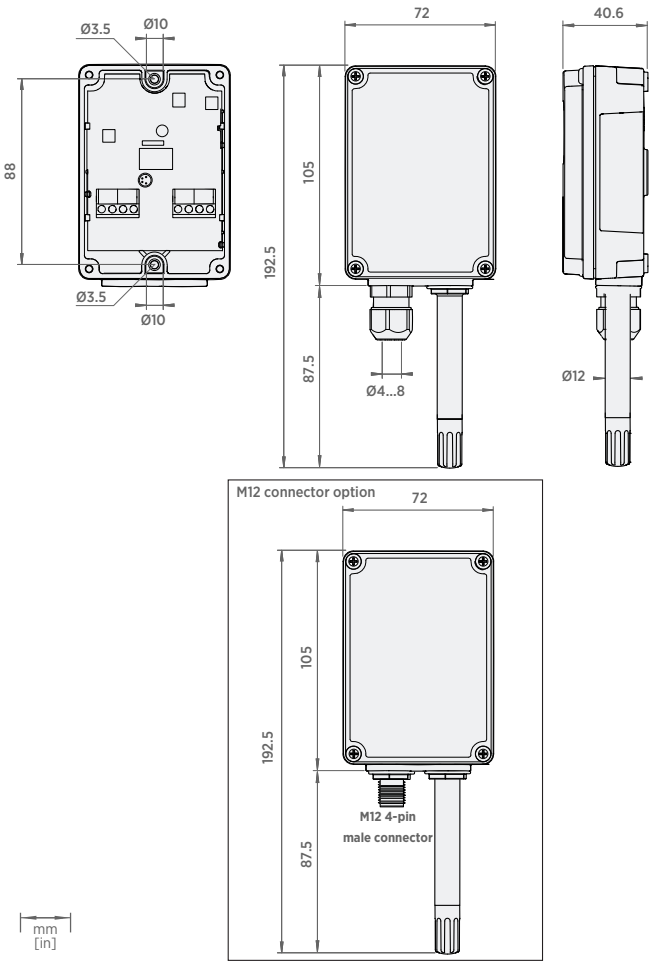
HMD110/112 RH+T transmitters for ducts. Model options also include a display version and the TMD110 temperature transmitter.



Dimensions in mm



HMW110/112 wall-mount RH+T transmitters with IP65 rating. Model options also include a display version and the TMW110 temperature transmitter. HMW110 and TMW110 transmitters can be ordered either with a cable gland and screw terminal wiring, or with an M12 connector.



Dimensions in mm

Models

Model	Type	Output	Special features
HMW110	Wall-mount, RH+T	2-wire current or Modbus RTU output	Configurable model [1] Optional display M12 connector option
HMW112	Wall-mount, RH+T	2-wire current output	
TMW110	Wall-mount, T	2-wire current output or Modbus RTU output	Configurable model [1] Optional display M12 connector option
HMD110	Duct-mount, RH+T	2-wire current or Modbus RTU output	Configurable model [1] Optional display
HMD112	Duct-mount, RH+T	2-wire current output	
TMD110	Duct-mount, T	2-wire current output or Modbus RTU output	Configurable model [1] Optional display

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

Measurement performance

Relative humidity	
Measurement range	0–100 %RH
Accuracy: [1]	
at +10 … +30 °C (+50 … +86 °F)	±2 %RH (0–90 %RH) ±3 %RH (90–100 %RH)
at −20 … +10 °C, +30 … +60 °C (−4 … +50 °F, +86 … +140 °F)	±3 %RH (0–90 %RH) ±4 %RH (90–100 %RH)
at −40 … −20 °C (−40 … −4 °F)	±4 %RH (0–100 %RH)
Stability in typical HVAC applications	±0.5 %RH/year
Humidity sensor types	HUMICAP® 180R HUMICAP® 180V
Temperature	
Measurement range	−40 … +60 °C (−40 … +140 °F)
Accuracy at +20 °C (+68 °F)	±0.2 °C (±0.36 °F)
Temperature dependence	±0.01 °C/°C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Factory calibration uncertainty at +20 °C (+68 °F)	±1.5 %RH/±0.2 °C

1) *With HUMICAP® 180V humidity sensor, accuracy is not specified below −20 °C (−4 °F) operating temperature.*

Calculated parameters

Measurement range	
Dew point temperature and wet bulb temperature	−40 … +80 °C (−40 … +176 °F)
Enthalpy	−40 … 1530 kJ/kg (−9.6 … 648 BTU/lb)
Accuracy [1] [2]	
Dew point	±0.7 °C (1.2 °F)
Wet bulb temperature	±0.5 °C (0.9 °F)
Enthalpy	±1.6 kJ/kg (0.7 BTU/lb)

1) *At +20 °C (+68 °F) and 80 %RH.*
2) *Accuracy of the calculated parameters should be calculated at the actual condition based on the RH and temperature specification.*

Inputs and outputs

Devices ordered with analog output	
Outputs	4–20 mA, loop powered
Loop resistance	0–600 Ω
Supply voltage	20–28 V DC at 600 Ω load 10–28 V DC at 0 Ω load
Devices ordered with Modbus output	
Interface	RS-485, not isolated, no line termination
Default serial settings	19200 bps N 8 2
Protocols	Modbus® RTU
Supply voltage	10–28 V DC

Mechanical specifications

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

Operating environment

Operating temperature:	
with display	−5 … +60 °C (+23 … +140 °F)
without display	−40 … +60 °C (−40 … +140 °F)
Operating humidity	0–100 %RH
Maximum wind / flow speed	30 m/s
Storage temperature	−40 … +60 °C (−40 … +140 °F)
Storage temperature:	
with display	−5 … +60 °C (+23 … +140 °F)
without display	−40 … +60 °C (−40 … +140 °F)
IP rating	IP65

Compliance

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

1) *HMDW110 series probes (HMD110/112, TMD110, HMW110/112, TMW110, and HMS110/112) fulfill the requirements for industrial electromagnetic environment, considering that a maximum permissible electrostatic air discharge of ±7 kV has been specified for this product.*

Spare parts and accessories

Conduit fitting + O-ring (M16 × 1.5 / NPT1/2")	210675SP
Conduit fitting + O-ring (M16 × 1.5 / PG9, RE-MS)	210674SP
Fastening flange assembly (screws included)	ASM210771SP
Porous PTFE filter	DRW239993SP
Membrane filter	ASM210856SP
Terminal block, blue	236620SP
USB cable for PC connection	219690
Connection cable (M12-4F / M8-4M), length 1.2 m	279222SP
Connection cable for HM70 handheld meter	219980SP
HUMICAP® 180R humidity sensor	HUMICAP180R
HUMICAP® 180V humidity sensor (catalytic)	HUMICAP180V

VAISALA

TMI110 Temperature Transmitter

For high-accuracy measurements in HVAC applications



Features

- Accurate temperature measurement of liquids and air
- Very fast response time
- 1-point traceable calibration (certificate included)
- Analog (4–20 mA) and Modbus® RTU output options
- Installed in a thermowell for measurement in liquids
- Optimized for building automation and HVAC process control
- Available with a display or as a non-display model
- Several probe length options

The high-accuracy immersion temperature transmitter TMI110 is designed for measuring cooling/heating water temperatures in HVAC automation systems. TMI110 can also be used for air temperature measurements in air ventilation ducts. The transmitter has a fast response time, enabling precise and reliable control of HVAC systems.

The TMI110 transmitter belongs to the Vaisala HUMICAP® Humidity and Temperature Transmitter Series HMDW110, which includes transmitters for duct mounting, IP65-rated wall transmitters, immersion temperature transmitters, and outdoor transmitters with integrated radiation shields.

Highly accurate

The highly accurate TMI110 measures the temperature of liquid in cooling/heating systems, and the temperature of air in ventilation ducts. When measuring the temperature of liquid, the transmitter is installed in a thermowell. For air temperature measurements, the transmitter can be installed in a duct.

Temperature is measured with a Pt1000 sensor element (class A). The high accuracy and quick response time of the measurement enable precise and reliable control of HVAC systems.

Fast response time

Fast response time of measurement is a top priority in the design of TMI110, enabling instant response in the control loop. Speed and reliability are key factors in the measurement of cooling and heating processes, thus the capabilities of TMI110 are a significant advantage. The transmitter is optimal for building automation and HVAC process control.

Traceable accuracy

All TMI110 transmitters are individually adjusted and delivered with a traceable (ISO 9001) calibration certificate. If required later on, the transmitter can also be field-calibrated using a Vaisala handheld meter or Vaisala Insight PC software.

Technical data

Measurement performance

Temperature	
Measurement range	−40 … +120 °C (−40 … +248 °F)
Accuracy at +20 °C (+68 °F)	±0.1 °C (±0.18 °F)
Temperature dependence	±0.01 °C/°C
Response time (T63) at +20 °C (+68 °F)	< 8 s typical
Temperature sensor	Pt1000 RTD Class A, IEC 60751
Factory calibration uncertainty at +20 °C (+68 °F)	±0.1 °C (±0.18 °F)

Operating environment

Operating environment, probe	−40 … +120 °C (−40 … +248 °F)
Operating environment, electronics	Without display: −40 … +60 °C (−40 … +140 °F) With display: −5 … +60 °C (+23 … +140 °F)
Storage temperature	Without display: −40 … +60 °C (−40 … +140 °F) With display: −5 … +60 °C (+23 … +140 °F)
IP rating	IP65
UL 50E/NEMA rating	Type 4

Spare parts and accessories

Conduit fitting + O-ring (M16×1.5 / NPT1/2")	210675SP
Conduit fitting + O-ring (M16×1.5 / PG9, RE-MS)	210674SP
Thermowell ISO 7 - R 1/2", for 50 mm probe	ASM216268
Thermowell ISO 7 - R 1/2", for 100 mm probe	ASM214691
Thermowell ISO 7 - R 1/2", for 150 mm probe	279722
Thermowell ISO 7 - R 1/2", for 200 mm probe	279723
Thermowell 1/2" - 14 NPT, for 50 mm probe	ASM216270
Thermowell 1/2" - 14 NPT, for 100 mm probe	ASM214707
Thermowell 1/2" - 14 NPT, for 150 mm probe	279724
Thermowell 1/2" - 14 NPT, for 200 mm probe	279725
Welded thermowell (no thread), for 50 mm probe	ASM216267
Welded thermowell (no thread), for 100 mm probe	ASM216119
Terminal block, blue	236620SP
USB cable for PC connection	219690
Connection cable for HM70 handheld meter	219980SP

Compliance

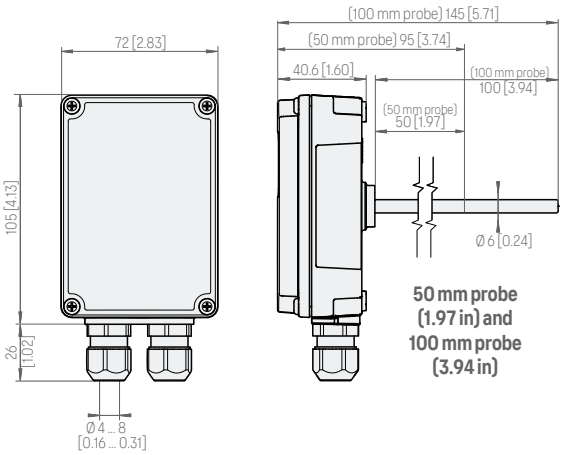
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electrical safety	EN 61326-1, industrial environment
EMC emissions	CISPR 22 / EN 55022, Class B
Compliance marks	CE, RCM

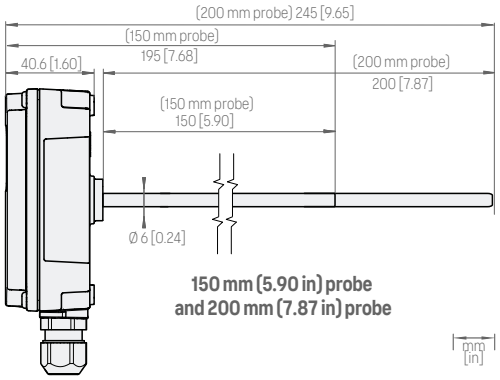
Mechanical specifications

Probe material	Stainless steel
Probe diameter	6 mm (0.24 in)
Probe length options	• 50 mm (1.97 in) • 100 mm (3.94 in) • 150 mm (5.91 in) • 200 mm (7.87 in)
Screw terminal wire size	Max. 1.5 mm^2 (AWG 16)
Standard housing color	White (RAL9003)
Housing material	PC + 10 %GF (UL-V0 approved)

Inputs and outputs

Devices ordered with analog output	
Outputs	4–20 mA, loop powered
Loop resistance	0–600 Ω
Supply voltage	20–28 V DC at 600 Ω load 10–28 V DC at 0 Ω load
Devices ordered with Modbus output	
Interface	RS-485, not isolated, no line termination
Default serial settings	19200 bps N 8 2
Protocol	Modbus RTU
Supply voltage	10–28 V DC





VAISALA

HMS110 Series Humidity and Temperature Transmitters

For high-accuracy outdoor measurements in building automation applications



Features

- Reliable outdoor transmitters with integrated radiation shields
- ±2 %RH accuracy
- Proven HUMICAP® 180R sensor for long-lasting accuracy
- 3-point traceable calibration (certificate included)
- Default output parameters are relative humidity and temperature. Dew point temperature, wet bulb temperature, and enthalpy outputs selectable with a PC connection
- Current output (4 ... 20 mA) and Modbus RTU
- On-site calibration with HM70 Hand-Held Meter or PC connection
- Ingress protection IP65
- Compatible with Vaisala Insight PC software

Vaisala HMS110 Series HUMICAP® Humidity and Temperature Transmitters are designed for demanding outdoor measurements in building automation applications. These ±2 % transmitters include an integrated radiation shield to reduce the influence of solar radiation on temperature and humidity measurements.

Proven Vaisala HUMICAP® performance for outdoor measurements

HMS110 transmitters are equipped with the trusted HUMICAP® 180R – a robust, general-purpose humidity sensor that functions well in high humidity. The sensor's superior stability ensures long-lasting accuracy and minimal maintenance throughout the transmitter's lifetime.

The integrated radiation shield allows unrivaled measurement performance, reducing the impact of sunshine on temperature and humidity measurements and ensuring measurement accuracy in outdoor conditions.

Easy installation and maintenance

HMS110 transmitters are easy to install. They can be mounted directly onto a wall or pole without any extra accessories. There are no loose parts, screws are retained in the enclosure, all connectors are clearly labeled, and the connectors are within easy reach.

The HUMICAP® sensor's excellent long-term stability and high-quality materials ensure minimal need for maintenance. If necessary, the transmitter can be field-calibrated using either HM70 Hand-Held Humidity and Temperature Meter, or a PC connection. For easy-to-use access to configuration and calibration options, the transmitter can be connected to Vaisala Insight PC software.

Technical data

Models

Model	Type	Output	IP rating
HMS110	Outdoor, RH+T	2-wire, current output Modbus RTU (configurable model)	IP65
HMS112	Outdoor, RH+T	2-wire, current output	IP65

Inputs and outputs

Devices ordered with analog output	
Analog outputs	4 ... 20 mA, loop powered
Loop resistance	0 ... 600 Ω
Supply voltage	20 ... 28V DC at 600 Ω load 10 ... 28V DC at 0 Ω load
Devices ordered with Modbus output	
Interface	RS-485, not isolated, no line termination
Default serial settings	19200 bps N 8 2
Protocols	Modbus® RTU
Supply voltage	10 ... 28 V DC

Measurement performance

Relative humidity	
Measurement range	0 ... 100 %RH
Stability in typical HVAC applications	±0.5 %RH/year
Humidity sensor	Vaisala HUMICAP® 180R
Accuracy at temperature range +10 ... +30 °C (+50 ... +86 °F):	
0 ... 90 %RH	±2 %RH
90 ... 100 %RH	±3 %RH
Accuracy at temperature range -20 ... +10 °C, +30 ... +60 °C (-4 ... +50 °F, +86 ... +140 °F):	
0 ... 90 %RH	±3 %RH
90 ... 100 %RH	±4 %RH
Accuracy at temperature range -40 ... -20 °C (-40 ... -4 °F):	
0 ... 100%RH	±4 %RH
Temperature	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy at +20 °C (+68 °F)	±0.2 °C (±0.36 °F)
Temperature dependence	±0.01 °C/°C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Calculated parameters	
Factory calibration uncertainty at 20 °C (+68 °F)	±1.5 %RH/±0.2 °C
Measurement range for dew point temperature and wet bulb temperature	-40 ... +60 °C (-40 ... +140 °F)
Measurement range for enthalpy	−40 ... 1530 kJ/kg (−9.6 ... 648 BTU/lb)
Accuracy of the calculated parameters should be calculated at the actual condition based on the RH and temperature specification.	
Accuracy at 20 °C (68 °F) and 80 %RH:	
Dew point	±0.7 °C (1.2 °F)
Wet bulb temperature	±0.5 °C (0.9 °F)
Enthalpy	±1.6 kJ/kg (0.7 BTU/lb)

Operating environment

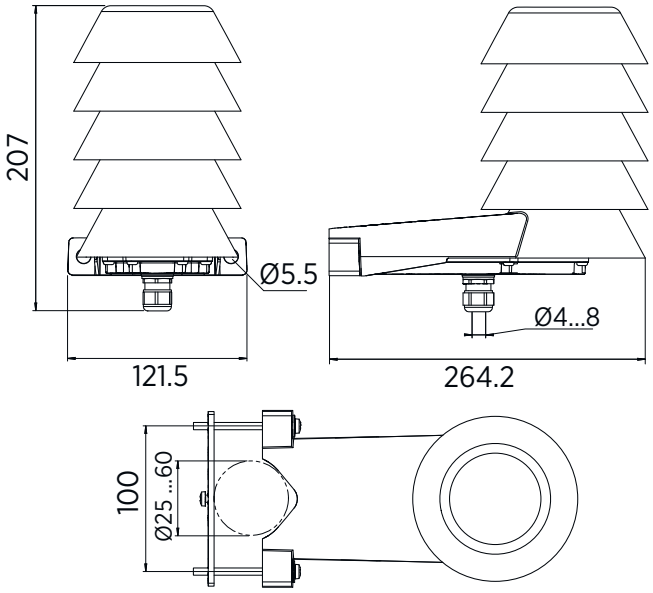
Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity	0 ... 100 %RH
Maximum wind/flow speed	30 m/s (67 mph)
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)

Compliance

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

Mechanical specifications

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



Dimensions (in mm)

Spare parts and accessories

Conduit fitting + O-ring (M16 × 1.5 / NPT1/2 Inch)	210675SP
Conduit fitting + O-ring (M16 × 1.5 / PG9, RE-MS)	210674SP
Fastening set HMS110	237805
Membrane filter	ASM210856SP
Terminal block, blue	236620SP
USB cable for PC connection	219690 [1)]
Connection cable for HM70 hand-held meter	219980SP
HUMICAP® 180R sensor	HUMICAP180R

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

VAISALA

HMDW80 Series Humidity and Temperature Transmitters

For building automation applications



Features

- Reliable transmitters for basic HVAC humidity measurements
- ±3.0 %RH accuracy
- Full 0–100 %RH measurement range
- Optimized for easy installation and low maintenance
- User exchangeable INTERCAP® sensor for easy field replacement
- UL-V0 flammability rating
- Output parameters: relative humidity and temperature with optional dew point temperature, wet bulb temperature and enthalpy parameters

Vaisala HMDW80 Series INTERCAP® Humidity and Temperature Transmitters measure relative humidity and temperature in various building automation applications. HMDW80 series transmitters combine easy installation and reliable operation with a low requirement for maintenance.

Typical installation locations

- Ventilation ducts
- Walls
- Wash-down areas
- Outdoor locations

The versatile HMDW80 series includes transmitters for wall and duct mounting, IP65-classified transmitters for humid areas, and transmitters with a radiation shield for outdoor use. It also includes temperature-only transmitters and transmitters with an optional display.

Calculated humidity parameters – dew point temperature, wet bulb temperature, and enthalpy – are also available.

Easy installation

HMDW80 series transmitters are optimized for easy installation. There are no loose parts, screws are retained in the enclosure, all connectors are clearly labeled, and the connectors are within easy reach.

The duct mount transmitters are well suited to a variety of duct sizes, the outdoor transmitters can be mounted directly onto a wall or pole without any extra accessories, and the wall mount transmitters can be installed without the need to make holes in the transmitter enclosure.

Reliable operation

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

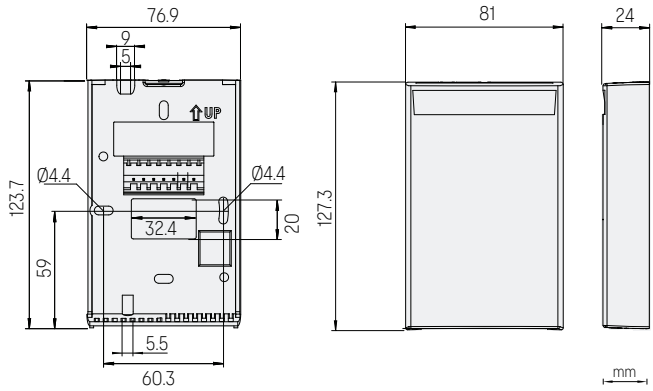
Model number	Type	Output	Special features	IP rating
TMW82	Wall-mount, T-only	2-wire, current output		IP30
HMW82	Wall-mount, RH+T	2-wire, current output		IP30
HMW82P100	Wall mount, RH+T	2-wire, current output	Additional Pt100 sensor	IP30
HMW83	Wall-mount, RH+T	3-wire, voltage output		IP30
XMW85 [1)]	Wall-mount, RH+T or RH+T+CO_2	Modbus® RTU output	Configurable model with own Order Form [2)] Optional display	IP30
TMW88	Wall-mount, T-only	2-wire, current output		IP65
HMW88	Wall-mount, RH+T	2-wire, current output	Calculated parameters [3)]	IP65
HMW88D	Wall-mount, RH+T	2-wire, current output	Display, calculated parameters [3)]	IP65
HMW89	Wall-mount, RH+T	3-wire, voltage output	Calculated parameters [3)]	IP65
HMW89D	Wall-mount, RH+T	3-wire, voltage output	Display, calculated parameters [3)]	IP65
TMD82	Duct-mount, T-only	2-wire, current output		IP65
HMD82	Duct-mount, RH+T	2-wire, current output	Calculated parameters [3)]	IP65
HMD82D	Duct-mount, RH+T	2-wire, current output	Display, calculated parameters [3)]	IP65
HMD83	Duct-mount, RH+T	3-wire, voltage output	Calculated parameters [3)]	IP65
HMD83D	Duct-mount, RH+T	3-wire, voltage output	Display, calculated parameters [3)]	IP65
HMS82	Outdoor, RH+T	2-wire, current output	Radiation shield, calculated parameters [3)]	IP65
HMS82C	Outdoor, RH+T	2-wire, current output	HMS82 with NPT ½" conduit fitting [3)]	IP65
HMS83	Outdoor, RH+T	3-wire, voltage output	Radiation shield, calculated parameters [3)]	IP65
HMS83C	Outdoor, RH+T	3-wire, voltage output	HMS83 with NPT ½" conduit fitting [3)]	IP65
TMS82	Outdoor, T-only	2-wire, current output	Radiation shield	IP65

1) For more information, see the XMW85 Series Datasheet, available at docs.vaisala.com.
2) XMW85 Order Form available at docs.vaisala.com.
3) Output parameters for humidity: relative humidity, dew point temperature, wet bulb temperature, and enthalpy.

Dimensions

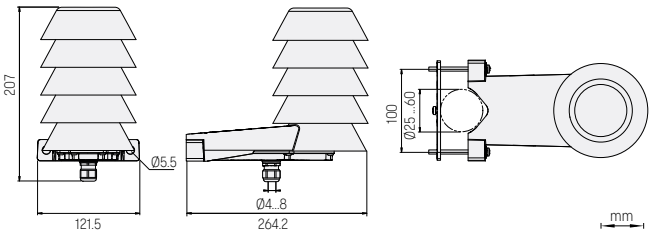
HMW82/83 RH+T and TMW82 T-only transmitters for wall-mounting





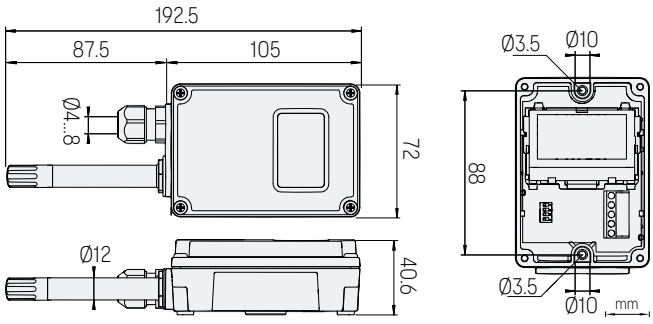
HMS82/83 RH+T and TMS82 T-only transmitters for outdoor measurements





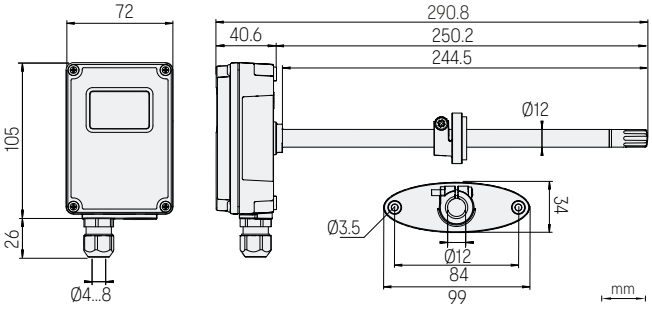
HMW88/89(D) RH+T and TMW88 T-only transmitters for measurements in wet areas





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





Technical data

Measurement performance, models HMW82/83 and TMW82

Relative humidity	
Measurement range	0–100 %RH
Accuracy in temperature range +10 … +30 °C (+50 … +86 °F)	±3 %RH (0–70 %RH) ±5 %RH (70–100 %RH)
Accuracy in temperature range −5 … +10 °C, +30 … +55 °C (+23 … +50 °F, +86 … +131 °F)	±7 %RH (0–100 %RH)
Stability in typical HVAC applications	±2 %RH over 2 years
Humidity sensor	Vaisala INTERCAP®
Temperature	
Measurement range	−5 … +55 °C (+23 … +131 °F)
Accuracy at +10 … +30 °C (+50 °F … +86 °F)	±0.5 °C (±0.9 °F)
Accuracy at −5 … +10 °C, +30 … +55 °C (+23 … +50 °F, +86 … +131 °F)	±1.0 °C (±1.8 °F)
Temperature sensor	Digital temperature sensor
Temperature sensor HMW82P100	Pt100 Class F 0.1 IEC 60751, 3-wire connection

Measurement performance, models HMD82/83, TMD82, HMW88/89, TMW88, HMS82/83, and TMS82

Relative humidity	
Measurement range	0–100 %RH
Accuracy in temperature range +10 … +30 °C (+50 … +86 °F)	±3 %RH (0–90 %RH) ±5 %RH (90–100 %RH)
Accuracy in temperature range −20 … +10 °C, +30 … +60 °C (−4 … +50 °F, +86 … +140 °F)	±5 %RH (0–90 %RH) ±7 %RH (90–100 %RH)
Accuracy in temperature range −40 … −20 °C (−40 … −4 °F)	±7 %RH (0–100 %RH)
Stability in typical HVAC applications	±2 %RH over 2 years
Humidity sensor	Vaisala INTERCAP®
Temperature	
Measurement range	−40 … +60 °C (−40 … +140 °F)
Accuracy at +20 °C (+68 °F)	±0.3 °C (±0.54 °F)
Temperature dependence	±0.01 °C/ °C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Calculated parameters Measurement range for dew point temperature and wet bulb temperature Measurement range for enthalpy	−40 … +60 °C (−40 … +140 °F) −40 … 460 kJ/kg (−10 … +190 BTU/lb)

Operating environment

Maximum wind/flow speed	30 m/s
Storage temperature	−40 … +60 °C (−40 … +140 °F)
IP rating	See the table on p. 2 of this document
Operating temperature	
HMW82/83 and TMW82	−5 … +55 °C (+23 … +131 °F)
HMD82/83, TMD82, HMW88/89, TMW88, HMS82/83, and TMS82	−40 … +60 °C (−40 … +140 °F)
HMD82/83D and HMW88/89D	−5 … +60 °C (+23 … +140 °F)
Operating humidity	
HMD82/83, TMD82, HMW88/89, TMW88, HMS82/83, and TMS82	0–100 %RH
HMW82/83, TMW82, HMD82/83D and HMW88/89D	0–100 %RH, non-condensing

Measurement performance, models HMD82/83D and HMW88/89D

Relative humidity	
Measurement range	0–100 %RH
Accuracy in temperature range +10 … +30 °C (+50 … +86 °F)	±3 %RH (0–90 %RH) ±5 %RH (90–100 %RH)
Accuracy in temperature range −5 … +10 °C, +30 … +60 °C (+23 … +50 °F, +86 … +140 °F)	±5 %RH (0–90 %RH) ±7 %RH (90–100 %RH)
Stability in typical HVAC applications	±2 %RH over 2 years
Humidity sensor	Vaisala INTERCAP®
Temperature	
Measurement range	(Analog output scaling) −40 … +60 °C (−40 … +140 °F)
Accuracy at +20 °C (+68 °F)	±0.3 °C (±0.54 °F)
Temperature dependence	±0.01 °C/ °C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Calculated parameters	
Measurement range for dew point temperature and wet bulb temperature	−40 … +60 °C (−40 … +140 °F) −40 … 460 kJ/kg (−10 … +190 BTU/lb)
Measurement range for enthalpy	

Inputs and outputs

Current output models (2-wire)	
Outputs	4–20 mA, loop powered
Loop resistance	0–600 Ω
Supply voltage	20–28 V DC at 600 Ω load 10–28 V DC at 0 Ω load
Voltage output models (3-wire)	
Outputs	0–10 V
Load resistance	10 kΩ min
Supply voltage	18–35 V DC 24 V AC ±20 % 50/60 Hz

Mechanical specifications

Max. wire size	1.5 mm^2 (AWG 16)
Standard housing color	White (RAL9003)
Housing material	
HMW82/83, TMW82	ABS/PC (UL-V0 approved)
HMW88/89(D), HMD82/83(D), TMW88, TMD82, HMS82/83, TMS82	PC + 10 %GF (UL-V0 approved)

Compliance

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

Spare parts and accessories

INTERCAP sensor	15778HM
10 pcs of INTERCAP sensors	INTERCAPSET-10PCS
Conduit fitting + O-ring (M16×1.5 / NPT ½")	210675SP
Conduit fitting + O-ring (M16×1.5 / PG9, RE-MS)	210674SP
Fastening set HMS80	237805
Porous PTFE filter	DRW239993SP
Membrane filter	ASM210856SP
Terminal block, blue	236620SP
HMD80 display lid	ASM210793SP

VAISALA

HMS80 Series Humidity and Temperature Transmitters

For outdoor measurements in building automation applications



Features

- Reliable outdoor transmitters with integrated radiation shields
- ±3 %RH accuracy
- User-exchangeable INTERCAP® sensor for easy field replacement
- Default output parameters are relative humidity and temperature. Dew point temperature, wet bulb temperature, and enthalpy outputs selectable using DIP switches
- Options for both current and voltage outputs
- Ingress protection IP65

Vaisala HMS80 Series INTERCAP® Humidity and Temperature Transmitters are designed for outdoor measurements in various building automation applications. These ±3 % transmitters include an integrated radiation shield to reduce the influence of solar radiation on temperature and humidity measurements.

Easy Installation

HMS80 transmitters are easy to install. They can be mounted directly onto a wall or pole without any extra accessories. There are no loose parts, screws are retained in the enclosure, all connectors are clearly labeled, and the connectors are within easy reach.

For fast and convenient configuration, the most popular control parameters in free cooling control – dew point temperature, wet bulb temperature, and enthalpy – are selectable using DIP switches.

Low Maintenance

HMS80 series transmitters require minimal maintenance thanks to their excellent sensor stability and high-quality materials. If necessary, the INTERCAP® sensor can easily be replaced in the field with minimum downtime.

Technical Data

Models

Model	Type	Output	IP Rating
HMS82	Outdoor, RH+T	2-wire, current output	IP65
HMS83	Outdoor, RH+T	3-wire, voltage output	IP65

Measurement Performance

Relative Humidity	
Measurement range	0 ... 100 %RH
Accuracy at temperature range +10 ... +30 °C (+50 ... +86 °F):	
0 ... 90 %RH	±3 %RH
90 ... 100 %RH	±5 %RH
Accuracy at temperature range -20 ... +10 °C, +30 ... +60 °C: (-4 ... +50 °F, +86 ... +140 °F)	
0 ... 90 %RH	±5 %RH
90 ... 100 %RH	±7 %RH
Accuracy in temperature range -40 ... -20 °C (-40 ... -4 °F):	
0 ... 100 %RH	±7 %RH
Stability in typical HVAC applications	±2 %RH over 2 years
Humidity sensor	Vaisala INTERCAP®
Temperature	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy at +20 °C (+68 °F)	±0.3 °C (±0.54 °F)
Temperature dependence	±0.01 °C/°C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Calculated Parameters [1]	
Measurement range for dew point temperature and wet bulb temperature	-40 ... +60 °C (-40 ... +140 °F)
Measurement range for enthalpy	-40 ... 460 kJ/kg (-10 ... +190 BTU/lb)
Accuracy at 20 °C (68 °F) and 80 %RH	Dew point: ±0.9 °C (1.6 °F) Wet bulb temperature: ±0.7 °C (1.3 °F) Enthalpy: ±2 kJ/kg (0.9 BTU/lb)

1) Accuracy of the calculated parameters should be calculated at the actual condition based on the relative humidity and temperature specification.

Inputs and Outputs

Current Output Model HMS82 (2-wire)	
Outputs	4 ... 20 mA, loop powered
Loop resistance	0 ... 600 Ω
Supply voltage	20 ... 28 VDC at 600 Ω load 10 ... 28 VDC at 0 Ω load
Voltage Output Model HMS83 (3-wire)	
Outputs	0 ... 10 V
Load resistance	10 kΩ min
Supply voltage	18 ... 35 VDC 24 VAC ±20 % 50/60 Hz

Operating Environment

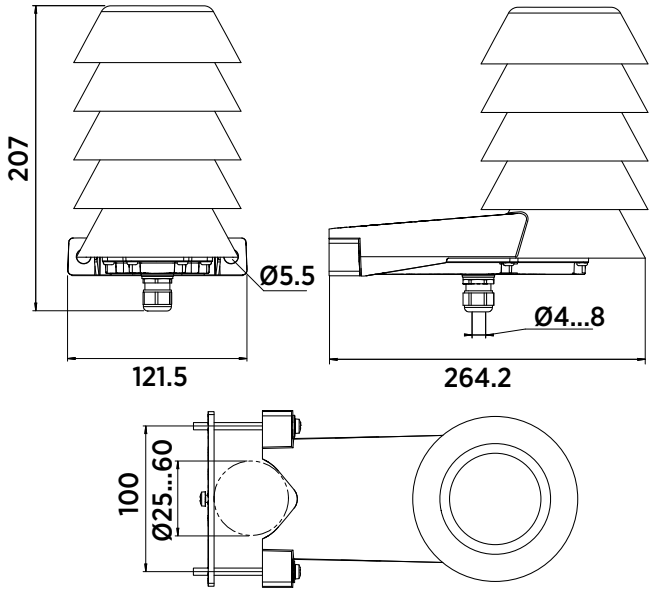
Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity	0 ... 100 %RH
Maximum wind/flow speed	30 m/s (67 mph)
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
EMC compliance	EN61326-1, Industrial Environment

Mechanical Specifications

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

Spare Parts and Accessories

INTERCAP® sensor	15778HM
10 pcs of INTERCAP® sensors	INTERCAPSET-10PCS
Conduit fitting + O-ring (M16 × 1.5 / NPT1/2 Inch)	210675SP
Conduit fitting + O-ring (M16 × 1.5 / PG9, RE-MS)	210674SP
Fastening set HMS80	237805
Membrane Filter	ASM210856SP
Terminal Block, Blue	236620SP



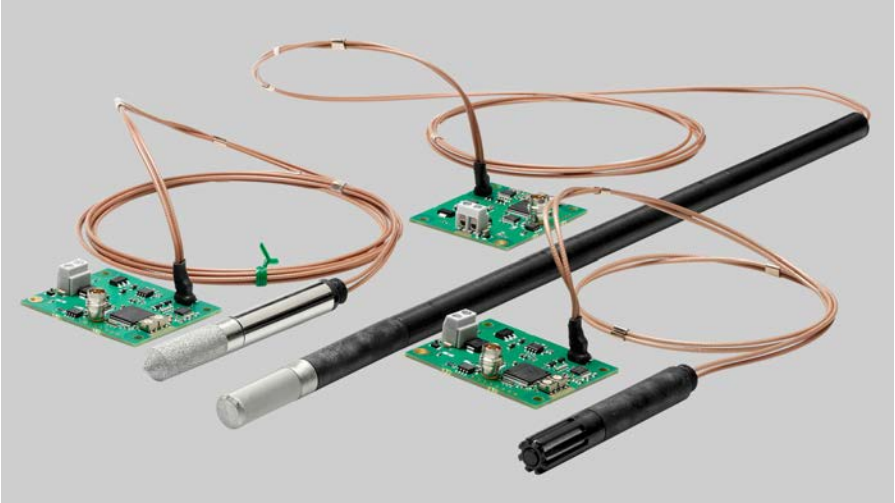
Dimensions in mm

CE

VAISALA

HMM100 Humidity Module

For environmental chambers



Features

- Full temperature compensation over the operating temperature range of -70 °C ... +180 °C (-94 °F ... +356 °F)
- High temperature tolerance, also suitable for heat sterilization
- Vaisala HUMICAP® 180R sensor
- Easy field calibration by trimmers
- Applications: test chambers, incubators

Vaisala HUMICAP® Humidity Module HMM100 is an open frame module for integration into environmental chambers. The module provides a single analog output channel for relative humidity (RH) or dew point (T_d).

Benefits

- Excellent measurement accuracy
- Low-maintenance
- Easy to install
- Durable

Two types of probes are available, one made of stainless steel, the other of plastics. The plastic probe comes in two sizes, a standard one and an extended 400-mm-long option. Several cable lengths up to 3 meters are available. Both probes use the Vaisala HUMICAP® 180R sensor which ensures excellent measurement accuracy.

Robust and Reliable

The HMM100 probe works in freezing conditions (-70 °C (-94 °F)) and also in temperatures up to +180 °C (+356 °F). HMM100 is easy to install and the probe can be freely placed in a test chamber as the speed of airflow does not affect the measurement.

Low-Maintenance

Compared to psychrometers, HMM100 requires very little maintenance. There is no wick that needs changing and there is no need for a water tank or water pump. Thus, environmental stress screening can be done reliably.

Accessories

The accessories available are a component board mounting bracket with a lid, probe clamp, USB cable for service use, a module housing, and a probe mounting flange.

Technical Data

Measurement Performance

Relative Humidity	
Measurement range	0 ... 100 %RH
Factory calibration uncertainty (+20 °C / +68 °F)	±1.5 %RH
Humidity sensor types	HUMICAP® 180R HUMICAP® 180
Accuracy [1]	
at −20 ... +40 °C (−4 ... +104 °F)	±2 %RH (0 ... 90 %RH) ±3 %RH (90 ... 100 %RH)
at −40 ... −20 °C and +40 ... +180 °C (−40 ... −4 °F and +104 ... +356 °F)	±2.5 %RH (0 ... 90 %RH) ±3.5 %RH (90 ... 100 %RH)
Dew Point Temperature	
Measurement range	−20 ... +100 °C (−4 ... +212 °F) T_d
Accuracy [2]	±2 °C (±3.6 °F) T_d

1) Including non-linearity, hysteresis, and repeatability.
2) Including non-linearity, hysteresis, and repeatability, when dew point depression is < +20 °C (+68 °F) (ambient temperature - dew point).

Operating Environment

EMC compliance	Applicable parts of EN61326-1, generic environment
Operating Temperature	
Component board	−5 ... +55 °C (+23 ... +131 °F)
Stainless steel probe	−70 ... +180 °C (−94 ... +356 °F)
Plastic probe (standard body)	−70 ... +180 °C (−94 ... +356 °F)
Plastic probe (extended 400-mm (16-in) body)	−70 ... +120 °C (−94 ... +248 °F)
Plastic grid and membrane filter	−20 ... +80 °C (−4 ... +176 °F)
Porous PTFE, stainless steel sintered, and PPS plastic grid with stainless steel net filter	−70 ... +180 °C (−94 ... +356 °F)

Mechanical Specifications

Service cable connector	M8 4-pin male
Probe diameter	12 mm (0.5 in)
Probe Cable Lengths	
Stainless steel probe	0.6/1.55/2.9 m (2/5.1/9.5 ft)
Plastic probe (standard body)	0.6/1.55/2.9 m (2/5.1/9.5 ft)
Plastic probe (extended 400-mm (16-in) body)	1.55 m (5.1 ft)
Probe Material	
Stainless steel probe	AISI316/PPS
Plastic probe	PPS
Extension tube for 400-mm probe	POM
Probe mounting clamp	AISI316
Mounting Bracket Material	
Lid	ABS/PC
Bottom plate	Al
Module housing material	ABS/PC (cover)

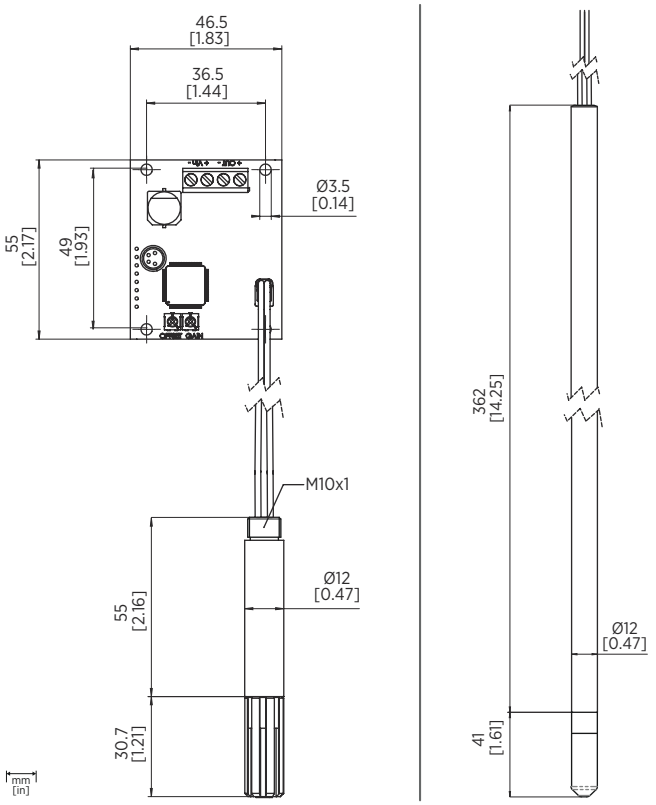
Inputs and Outputs

Power consumption	6 mA
Operating Voltage	
2-wire model	24 VDC
3-wire model	10 ... 35 VDC or 24 VAC ±20 % 15 ... 35 VDC or 24 VAC ±20 % when 0 ... 10 V output is used
Analog Output Types (1 Output Selectable)	
2-wire model	4 ... 20 mA (loop-powered)
3-wire model	0 ... 20 mA, 0 ... 1/5/10 V, 1 ... 5 V
Max. wire size	0.5 ... 1.5 mm² (AWG)
Service port	M8 connector for USB cable

Spare Parts and Accessories

HUMICAP® 180R sensor	HUMICAP180R
HUMICAP® 180 sensor [1]	15778HM
Plastic grid filter	6221
Membrane filter	10159HM
Porous PTFE filter	219452SP
Stainless steel sintered filter	HM47280SP
PPS plastic grid with stainless steel net filter	DRW010281SP
Mounting bracket with lid	225979
Module housing (IP65)	226060
Probe mounting flange	226061
Probe mounting clamp set (10 pcs)	226067
USB cable	226068

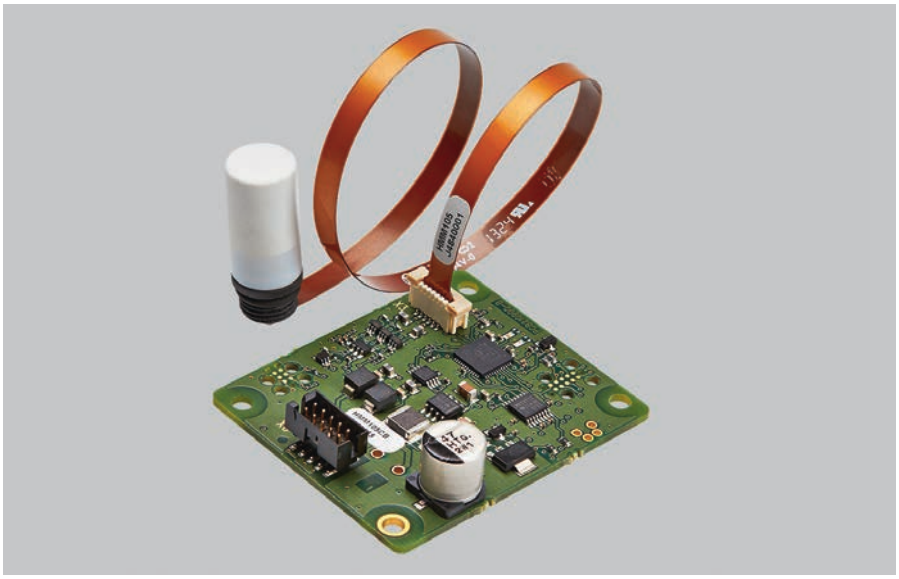
1) Spare part item name: Vaisala INTERCAP® humidity sensor.



VAISALA

HMM105 Digital Humidity Module

For OEM applications



Features

- Digital I²C communication interface available
- Full temperature compensation over the operating temperature range of -40 °C ... +180 °C
- High temperature tolerance, suitable for heat sterilization up to +200 °C
- Vaisala HUMICAP® 180R sensor
- Detachable probe assembly
- Probe head with M10x1 threads
- Applications: test chambers, incubators

Vaisala HUMICAP® Digital Humidity Module HMM105 is an open frame module for integration into environmental chambers. The modules provide an I²C output for relative humidity (RH) or dew point (T_d).

Benefits

- Easy installation
- Excellent measurement accuracy
- Maintenance-free

The module consists of a detachable probe assembly – a probe head with M10x1 threads and a flex cable – and the module circuit board. The probe assembly is 30 cm in length. The module incorporates the Vaisala HUMICAP® 180R sensor which ensures excellent measurement accuracy.

Reliable for OEM's

The HMM105 probe head works in freezing conditions (-40 °C) and also in temperatures up to +180 °C in continuous use. In short term use, the probe head can be exposed to temperatures up to +200 °C. HMM105 is intended for OEM chamber manufacturers for integration into test chambers and incubators.

Maintenance-free

Compared to psychrometers, HMM105 is practically maintenance free. There is no wick that needs changing and there is no need for a water tank or water pump. Thus, environmental stress screening can be done reliably.

I2C interface for better usability

HMM105 has an I²C interface for communicating with the incubator's controller. HMM105 implements I²C slave functionality, with the incubator's controller acting as the master. The interface can be used to read measurement values and status information, set operation parameters, and make adjustments.

Technical Data

Relative Humidity

Measurement range	0 ... 100 %RH
Factory calibration uncertainty (+20 °C)	±1.5 %RH
Humidity sensor	Vaisala HUMICAP® 180R
Accuracy (incl. Non-Linearity, Hysteresis and Repeatability)	
Temperature	-20 ... +40 °C
0 ... 90 %RH	±2 %RH
90 ... 100 %RH	±3 %RH
Temperature	-40 ... -20 °C, +40 ... +180 °C
0 ... 90 %RH	±2.5 %RH
90 ... 100 %RH	±3.5 %RH

Dew Point Temperature

Measurement range	-20 ... +100 °C (-4 ... +212 °F)T_d
Accuracy (incl. non-linearity, hysteresis and repeatability) when dew point depression < 20 °C (Ambient temperature - dew point)	±2 °C T_d

Operating Environment

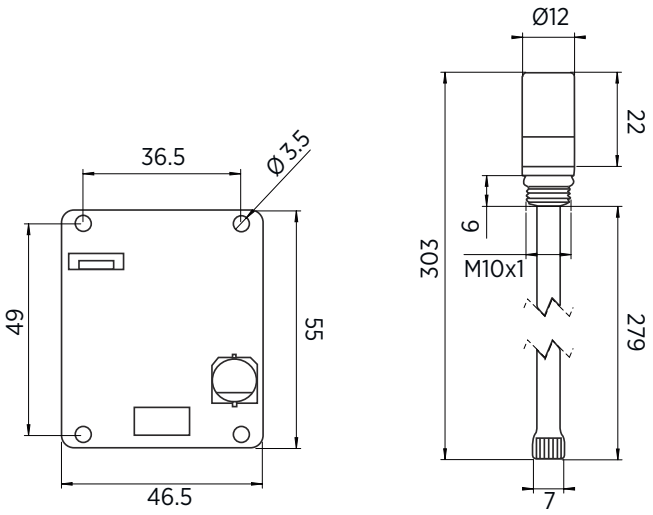
EMC compliance	Applicable parts of EN61326-1, Industrial Environment
Storage temperature	-40 ... +75 °C (-40 ... +167 °F)
Operating Temperature	
Component board	-5 ... +55 °C (+23 ... +131 °F)
Probe (continuous use)	-40 ... +180 °C (-40 ... +356 °F)
Probe (short term peak)	+200 °C (+392 °F)
Plastic grid, membrane filter	-20 ... +80 °C (-4 ... +176 °F)
PTFE sintered filters, stainless steel sintered filter	-40 ... +200 °C (-40 ... +392 °F)

Inputs and Outputs

Supply voltage	10 ... 35 VDC, 24 VAC (±20 %)
Output voltage	I^2C 5 V
Power consumption (DC/AC)	< 15/25 mA
Connector for supply voltage and I^2C bus	Molex 87832-1007, 10-pin header

Mechanical Specifications

Probe diameter	12 mm
Probe flex cable length	0.3 m
Probe lead-through material	PPS plastic



Dimensions in millimeters

Spare Parts and Accessories

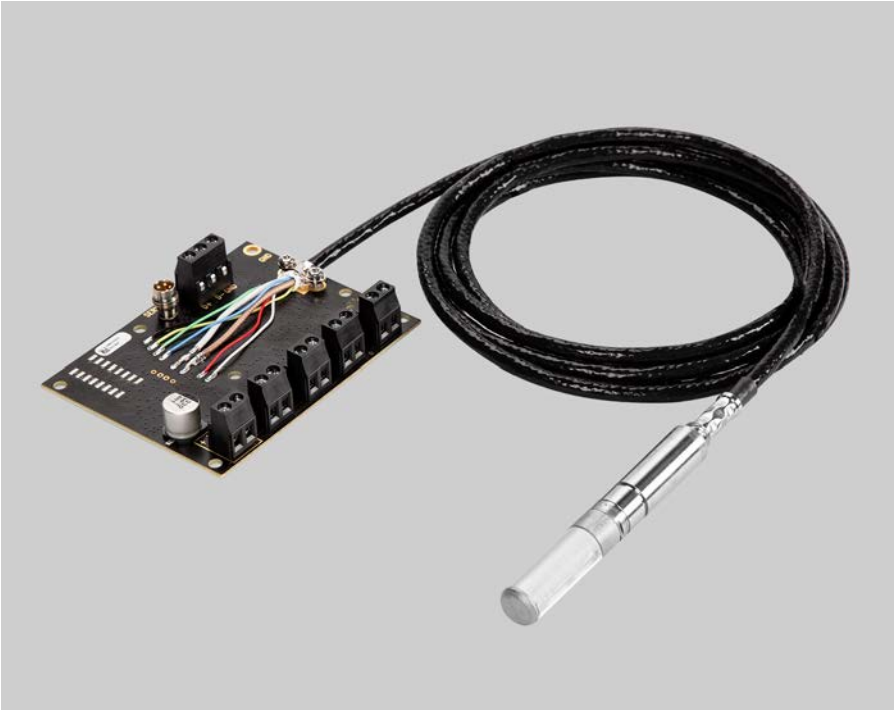
Humidity sensor	HUMICAP® 180R
Short PTFE sintered filter	DRW239993SP
Plastic grid filter	6221
Plastic grid and membrane filter	10159HM
PTFE sintered filter	219452SP
Stainless steel sintered filter	HM47280SP
0.6 m cable with Molex milli-grid connectors	ASM210962SP

CE

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HMM170 Humidity and Temperature Module

For environmental chambers



Features

- Warmed sensor and probe for condensation prevention
- Chemical purge for maintaining sensor performance
- Suitable for use in high humidity environments, vacuum, and pressurized chambers
- Temperature measurement range −70 … +180 °C (−94 … +356 °F)
- Sensor options for corrosion tolerance, H_2O_2 tolerance, and moisture-in-oil measurement
- 3 analog output channels
- Modbus RTU over RS-485
- Several output parameters available
- 3 probe cable length options
- Compatible with Insight PC software

Vaisala HUMICAP® Humidity and Temperature Module HMM170 is an open frame OEM module for integration into demanding environmental chambers and harsh conditions. The module provides a digital RS-485/Modbus RTU output and three freely configurable analog output channels. The module provides relative humidity, temperature, dew point, and other calculated parameters.

Designed for harsh environments

HMM170 probe covers the full temperature range −70 … +180 °C (−94 … +356 °F) used in climate chambers and the whole humidity range up to condensation. The small probe and compact component board offer easy and flexible installation. The probe cable options (2, 5, or 10 m (6.5, 16.4, or 32.8 ft)) offer excellent cost optimization and flexibility to any OEM application. By ordering HMM170 with the appropriate sensor, you can use the module in environments that are frequently sterilized with vaporized hydrogen peroxide (H_2O_2) or to measure humidity in oil medium, for example, for transformer and engine monitoring applications.

Robust sensor technology

The latest general purpose HUMICAP® R2 sensor has improved corrosion resistance. The sensor can tolerate typical chemicals, such as cleaning agents used in climate chambers. The automatic sensor chemical purge function keeps the sensor clean from typical chemical fumes and the additional probe warming function prevents condensation. In case HMM170 gets in contact with water, the automatic heating rapidly dries the sensor to enable fast and accurate humidity measurement.

Convenient to use

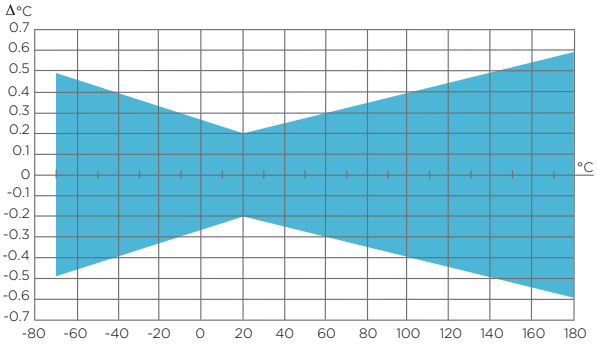
HMM170 is easy to install and convenient to use. It provides both digital and analog outputs for multiple needs. An integrated service port enables a quick and simple way to configure, check, and calibrate the module with the help of a USB cable and Vaisala Insight PC software. In addition, the footprint of the HMM170 component board enables easy update for Vaisala HMM100 users.

Technical data

Measurement performance

Relative humidity	
Measurement range	0 ... 100 %RH
Accuracy [1) 2)]	
at +15 ... +25 °C (59 ... +77 °F)	±1 %RH (0 ... 90 %RH) ±1.7 %RH (90 ... 100 %RH)
at −20 ... +40 °C (−4 ... +104 °F)	± (1.0 + 0.008 × reading) %RH
at −40 ... +180 °C (−40 ... +356 °F)	± (1.5 + 0.015 × reading) %RH
Factory calibration uncertainty at +20 °C (+68 °F) [3)]	±0.6 %RH (0 ... 40 %RH) ±1.0 %RH (40 ... 90 %RH) ±1.1 %RH (90 ... 95 %RH)
Humidity sensor types	HUMICAP® R2C HUMICAP® 180L2 HUMICAP® 180VC
T_{90} response time [4)]	50 s with steel mesh filter 60 s with sintered filter
Temperature	
Measurement range	−70 ... +180 °C (−94 ... +356 °F)
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751
Typical accuracy at +20 °C (+68 °F)	±0.2 °C (± 0.36 °F)

1) Including non-linearity, hysteresis and repeatability.
2) With HUMICAP® 180VC sensor, accuracy is not specified below −20 °C (−4 °F) operating temperature.
3) Defined as ±2 standard deviation limits. Small variations possible; see also calibration certificate.
4) At +20 °C (+68 °F) in 0.1 m/s air flow with Vaisala HUMICAP® R2C sensor.



Temperature measurement accuracy over temperature range

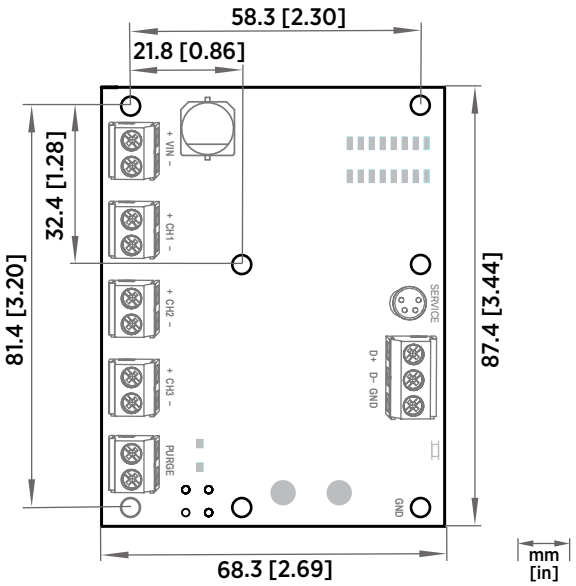
Operating environment

Operating temperature for component board	−40 ... +60 °C (−40 ... +140 °F)
Operating humidity for component board	0 ... 100 %RH, non-condensing
Storage temperature	−55 ... +80 °C (−67 ... +176 °F)
Operating pressure	0 ... 10 bar

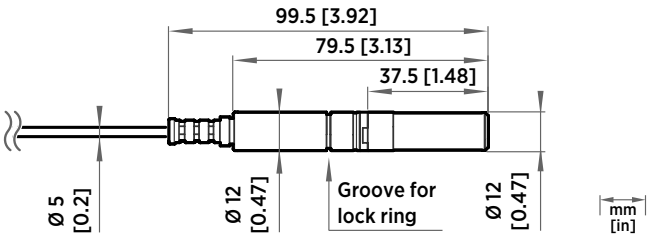
Accessories

USB cable for PC connection [1)]	219690
Cable gland M20×1.5 for probe cable	HMP247CG
Swagelok NPT 1/2" adapter for probe	SWG12NPT12
Swagelok ISO 1/2" adapter for probe	SWG12ISO12
Duct installation kit for probe	210697

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



HMM170 component board dimensions



HMM170 probe head dimensions

Inputs and outputs

Three analog outputs (selectable and scalable)	0 – 20 mA, 4 – 20 mA 0 – 1 V, 0 – 5 V, 1 – 5 V, or 0 – 10 V
Typical accuracy of analog output at +20 °C (+68 °F)	±0.05 % full scale
Typical temperature dependence of analog output	0.005 %/°C (0.003 %/°F) full scale
External load	R_L < 500 Ω
Digital output	RS-485 serial, Modbus
Service port	M8 connector for USB cable
Start-up time	3 s at power-up
Wire size	0.5 ... 1.5 mm² (20 ... 16 AWG)
Supply voltage	
when condensation prevention and chemical purge features are not used	12 – 35 V DC
all features available	18 – 35 V DC or 24 V AC ±10 %
Power consumption	
Analog outputs	12 mA (voltage), 50 mA (current)
Chemical purge at 24 V DC	+220 mA
Warmed probe at 24 V DC	+240 mA

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HMP60 Humidity and Temperature Probe



Features

- Miniature-size humidity probe
- Low power consumption
- Measurement range: 0–100 %RH; −40 ... +60 °C (−40 ... +140 °F)
- Cable detachable with standard M8 connector
- Rugged metal housing
- Interchangeable Vaisala INTERCAP® sensor
- Compatible with Vaisala Insight PC software and Vaisala Indigo80 Handheld Indicator
- Optional RS-485 digital output supports Modbus® RTU
- Optional dew/frost point, wet bulb temperature, absolute humidity, mixing ratio, and enthalpy output

Vaisala INTERCAP® Humidity and Temperature Probe HMP60 is a simple, durable and cost-effective humidity probe. It is suitable for volume applications, integration into other manufacturers' equipment, incubators, glove boxes, greenhouses, fermentation chambers, and data loggers.

Easy installation

The probe cable has a screw-on quick connector for easy installation. Different cable lengths are available. Also other compatible M8 series cables can be used. Accessories are available for different installation needs.

Low current consumption

HMP60 is suitable for battery-powered applications because of its very low current consumption.

Several outputs

Temperature measurement is a standard feature in HMP60, with dew point temperature, wet bulb temperature, absolute humidity, mixing ratio, and enthalpy as optional calculated parameters. Four voltage output ranges are available. An optional RS-485 output with Modbus support is also available.

Flexible connectivity

In addition to analog and digital (Modbus) output options, the probe can also be used with Vaisala Indigo80 Handheld Indicator. For easy-to-use access to configuration and device analytics functionalities, the probe can be connected to Vaisala Insight PC software for Windows®. For more information, see vaisala.com/indigo80 and vaisala.com/insight.

Rugged design

HMP60 is designed for extreme conditions. The stainless steel body of HMP60 is classified as IP65. The probe has a sealed structure and the sensor is protected by a membrane filter and a plastic grid, or optionally by a stainless steel filter.

Recalibration not needed

The Vaisala INTERCAP® sensor is interchangeable. No recalibration is required; the sensor can simply be replaced, also in the field.

Technical data

Measurement performance

Relative humidity	
Measurement range	0–100 %RH
Typical accuracy:	
at 0 ... +40 °C (+32 ... +140 °F)	±3 %RH (0–90 %RH) ±5 %RH (90–100 %RH)
at −40 ... 0 °C and +40 ... +60 °C (−40 ... +32 °F and +104 ... +140 °F)	±5 %RH (0–90 %RH) ±7 %RH (90–100 %RH)
Humidity sensor	Vaisala INTERCAP®
Temperature	
Measurement range	−40 ... +60 °C (−40 ... +140 °F)
Accuracy:	
at +10 ... +30 °C (+50 ... +86 °F)	±0.5 °C (±0.9 °F)
at −40 ... +10 and +30 ... +60 °C (−40 ... +50 and +86 ... +140 °F)	±0.6 °C (±1.08 °F)
Analog outputs	
Accuracy at +20 °C (+68 °F)	±0.2 % of FS
Temperature dependence	±0.01 % of FS/°C (±0.006 % of FS/°F)

Inputs and outputs

Power consumption	1 mA average, max. peak 5 mA
Operating voltage [1]	
With 1 V / 2.5 V output	5–28 V DC
With 5 V output	8–28 V DC
With loop power converter	8–28 V DC
With digital output	5–28 V DC
Start-up time	
Probes with analog output	4 s at operating voltage 13.5–16.5 V DC 2 s at other valid operating voltages
Probes with digital output	1 s
Outputs	
2 channels	0–1 V DC / 0–2.5 V DC / 0–5 V DC / 1–5 V DC
1-channel loop-power converter (separate module, compatible with humidity accuracy only)	4–20 mA
Digital output (optional)	RS-485 2-wire half duplex, supports Modbus RTU
External loads	
0–1 V	R_L min. 10 kΩ
Other voltage outputs	R_L min. 50 kΩ
Output parameters	
Relative humidity, temperature, dew/frost point temperature, wet bulb temperature, absolute humidity, mixing ratio, enthalpy	

1) Use lowest available operating voltage to minimize heating.

Operating environment

Operating temperature	−40 ... +60 °C (−40 ... +140 °F)
IP rating [1]	IP65

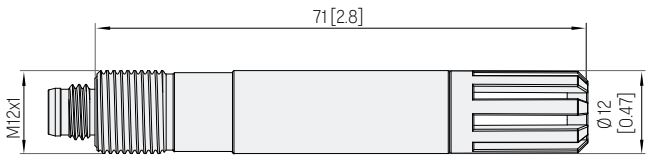
1) Not applicable with the plastic grid filter.

Mechanical specifications

Body thread	MI2×1 / 10 mm (0.4 in)
Cable connector	4-pin M8 (IEC 60947-5-2)
Materials	
Body	Stainless steel (AISI 316)
Grid filter	Chrome coated ABS plastic
Cable	Polyurethane or FEP
Weight	
Probe	17 g (0.6 oz)
Probe with 0.3 m (1 ft) cable	28 g (1 oz)

Compliance

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



Dimensions in mm (inches)

Spare parts and accessories

Sensors	
Vaisala INTERCAP® sensor, 1 pc	15778HM
Vaisala INTERCAP® sensor, 10 pcs	INTERCAPSET-10PCS
Sensor protection	
Plastic grid filter	DRW010522SP
Membrane filter	DRW010525SP
Stainless steel sintered filter	HM46670SP
PTFE membrane filter with stainless steel grid	ASM212652SP
PTFE sintered filter	DRW244938SP
Probe installation	
Duct installation kit	215619
Probe mounting clamp set, 10 pcs	226067
Probe mounting flange	226061
Probe holder, 5 pcs	ASM213382SP
Plastic M12 installation nuts, pair	18350SP
Flat extension cable 1 m (3 ft) [1)]	CBL210649SP
Connection adapters	
4–20 mA loop power converter	UI-CONVERTER-1CB
Mounting bracket for converter	225979
USB cable for PC connection	219690
Connection cable for Indigo80 handheld indicator	262195SP
Connection cable for MI70 indicator	219980SP
Connection cables with open wires	
+60 °C 0.3 m (+140 °F 1 ft)	HMP50Z032SP
+60 °C 1.2 m (+140 °F 4 ft)	HMP50Z120
+60 °C 3 m (+140 °F 9.8 ft)	HMP50Z300SP
+80 °C 1.5 m (+176 °F 5 ft)	225777SP
+80 °C 3 m (+176 °F 10 ft)	225229SP
+180 °C 1.5 m (+356 °F 5 ft) FEP	238025
+180 °C 3 m (+356 °F 10 ft) FEP	226902SP

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

VAISALA

HMP63 Humidity and Temperature Probe



Features

- Fast thermal response time
- Low power consumption
- Start-up time < 2 s
- Measurement range: 0–100 %RH; −40 ... +60 °C (−40 ... +140 °F)
- Cable detachable with standard M8 connector
- IP54-rated plastic housing
- Interchangeable Vaisala INTERCAP® humidity sensor
- Compatible with Vaisala Insight PC software and Vaisala Indigo80 Handheld Indicator
- Optional RS-485 digital output supports Modbus® RTU
- Optional dew/frost point, wet bulb temperature, absolute humidity, mixing ratio, and enthalpy output
- Temperature-only model HMP63T with digital output also available

Vaisala INTERCAP® Humidity and Temperature Probe HMP63 is a cost-effective humidity probe with a plastic housing. It is designed for non-condensing indoor environments or integration into other manufacturers' equipment.

Easy installation

The probe fits into tight spaces. The cable has a threaded M8 connector for easy installation. Different cable lengths are available and other compatible M8-series cables can also be used. Accessories are available for different installation needs.

Low power consumption

HMP63 is suitable for battery-powered applications thanks to its very low power consumption and fast start-up time.

Several output options

Temperature measurement is a standard feature in HMP63, with dew point temperature, wet bulb temperature, absolute humidity, mixing ratio, and enthalpy as optional calculated parameters. Four voltage output ranges are available. An alternative RS-485 output with Modbus support is also available.

Output type, channel assignment of measurement parameters, and other probe features are configured when the probe is ordered.

Flexible connectivity

In addition to analog and digital (Modbus) output options, the probe can also be used with Vaisala Indigo80 Handheld Indicator. For easy-to-use access to configuration and device analytics functionalities, the probe can be connected to Vaisala Insight PC software for Windows®. For more information, see vaisala.com/indigo80 and vaisala.com/insight.

Fast thermal response time

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

No recalibration required

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

Technical data

Models

Model	Measurement	Special features
HMP63	RH + T	INTERCAP® humidity sensor
HMP63T	T	Digital output only, for use with CWL100 data logger

Measurement performance

Relative humidity	
Measurement range	0–100 %RH
Typical accuracy:	
at 0 … +40 °C (+32 … +140 °F)	±3 %RH (0–90 %RH) ±5 %RH (90–100 %RH)
at −40 … 0 °C and +40 … +60 °C (−40 … +32 °F and +104 … +140 °F)	±5 %RH (0–90 %RH) ±7 %RH (90–100 %RH)
Humidity sensor	Vaisala INTERCAP®
Temperature	
Measurement range	−40 … +60 °C (−40 … +140 °F)
Accuracy:	
at +10 … +30 °C (+50 … +86 °F)	±0.5 °C (±0.9 °F)
at −40 … +10 and +30 … +60 °C (−40 … +50 and +86 … +140 °F)	±0.6 °C (±1.08 °F)
Analog outputs	
Accuracy at 20 °C (+68 °F)	±0.2 % of FS
Temperature dependence	±0.01 % of FS/°C (±0.006 % of FS/°F)

Inputs and outputs

Power consumption	1 mA average, max. peak 5 mA
Operating voltage[1)]	
With 1 V / 2.5 V output	5–28 V DC
With 5 V output	8–28 V DC
With loop-power converter	8–28 V DC
With digital output	5–28 V DC
Start-up time	
Probes with analog output	4 s at operating voltage 13.5–16.5 V DC 2 s at other valid operating voltages
Probes with digital output	1 s
Outputs	
2 channels	0–1 V DC / 0–2.5 V DC / 0–5 V DC / 1–5 V DC
1-channel loop-power converter (separate module, compatible with humidity accuracy only)	4–20 mA
Digital output (optional)	RS-485 2-wire half duplex, supports Modbus RTU
External loads	
0–1 V	R_L min. 10 kΩ
Other voltage outputs	R_L min. 50 kΩ
Output parameters	
Relative humidity, temperature, dew/frost point temperature, wet bulb temperature, absolute humidity, mixing ratio, enthalpy	

1) *Use lowest available operating voltage to minimize heating.*

Operating environment

Operating temperature	−40 … +60 °C (−40 … +140 °F)
IP rating [1)]	IP54

1) *Not applicable with the plastic grid filter.*

Mechanical specifications

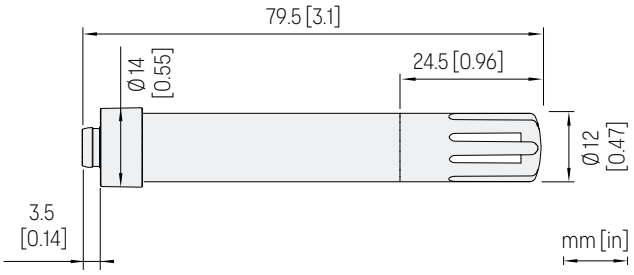
Cable connector	4-pin M8 (IEC 60947-5-2)
Materials	
Body	PC/ABS blend
Grid filter	PC (glass reinforced)
Cable	Polyurethane or FEP
Weight	
Probe	9 g (0.3 oz)
Probe with 0.3 m (1 ft) cable	20 g (0.7 oz)

Compliance

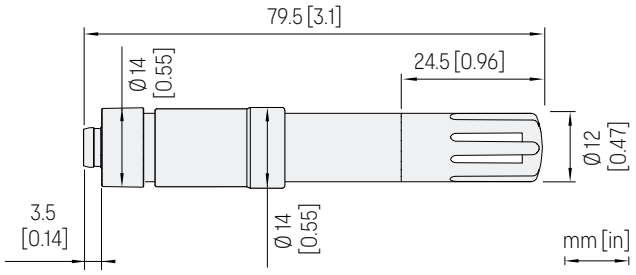
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, RCM, UKCA

Spare parts and accessories

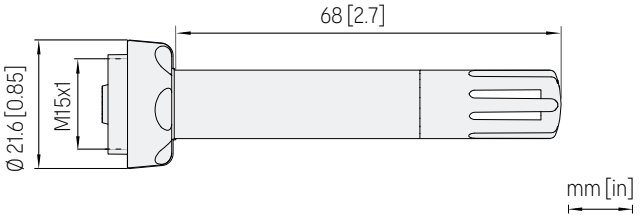
Sensors	
Vaisala INTERCAP® sensor, 1 pc	15778HM
Vaisala INTERCAP® sensor, 10 pcs	INTERCAPSET-10PCS
Sensor protection	
Plastic grid filter	DRW240185SP
Plastic grid with membrane filter	ASM210856SP
Stainless steel sintered filter	HM47280SP
Porous PTFE filter	219452SP
Probe installation	
Probe mounting clamp set, 10 pcs	226067
Probe mounting flange	226061
Probe holder, 5 pcs	ASM213382SP
Plastic locking bushing (3 pcs) for attaching probe to HM40	DRW238590SP
Connection adapters	
4–20 mA loop power converter	UI-CONVERTER-1CB
Mounting bracket for converter	225979
USB cable for PC connection	219690
Connection cable for Indigo80 handheld indicator	262195SP
Connection cable for HM70	219980SP
Connection cables with open wires	
+60 °C 0.3 m (+140 °F 1 ft)	HMP50Z032SP
+60 °C 1.2 m (+140 °F 4 ft)	HMP50Z120
+60 °C 3 m (+140 °F 9.8 ft)	HMP50Z300SP
+80 °C 1.5 m (+176 °F 5 ft)	225777SP
+80 °C 3 m (+176 °F 10 ft)	225229SP
+180 °C 1.5 m (+356 °F 5 ft) FEP	238025
+180 °C 3 m (+356 °F 10 ft) FEP	226902SP



HMP63 probe dimensions



HMP63 and HMP63T probe dimensions with sleeve for CWL100 data logger



HMP63 probe dimensions with plastic locking bushing

VAISALA

HMP110 Humidity and Temperature Probe



Features

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

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

Benefits

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

Easy installation

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

Low current consumption

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

Several outputs

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

Flexible connectivity

In addition to analog and digital (Modbus) output options, the probe can also be used with the Vaisala Indigo80 handheld indicator. For easy-to-use access to configuration and device analytics functionalities, the probe can be connected to Vaisala Insight software for Windows®. For more information, see www.vaisala.com/insight and www.vaisala.com/indigo80.

Robust design

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

Technical data

Models

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

Measurement performance

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

1) *Including non-linearity, hysteresis, and repeatability.*
2) *With HUMICAP® 180V sensor, accuracy is not specified below −20 °C (−4 °F) operating temperature.*

Operating environment

Operating temperature	−40 … +80 °C (−40 … +176 °F)
IP rating [1]	IP65

1) *Not applicable with the plastic grid filter.*

Compliance

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

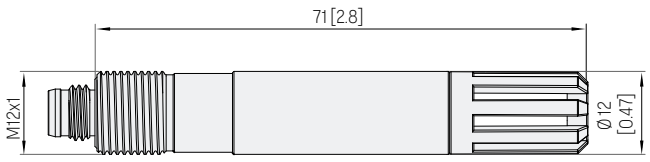
Inputs and outputs

Power consumption	1 mA average, max. peak 5 mA
Operating voltage [1]	
With 1 V / 2.5 V output	5–28 V DC
With 5 V output	8–28 V DC
With loop power converter	8–28 V DC
With digital output	5–28 V DC
Start-up time	
HMP110 probes with analog output	4 s at operating voltage 13.5–16.5 V DC 2 s at other valid operating voltages
HMP110 probes with digital output	1 s
Outputs	
2 channels	0–1 V DC / 0–2.5 V DC / 0–5 V DC / 1–5 V DC
1-channel loop-power converter (separate module, compatible with humidity accuracy only)	4–20 mA
Digital output (HMP110 probes with digital output)	RS-485 2-wire half duplex, supports Modbus RTU
External loads	
0–1 V	R_L min. 10 kΩ
Other voltage outputs	R_L min. 50 kΩ
Output parameters	
Relative humidity, temperature, dew/frost point temperature, wet bulb temperature, absolute humidity, mixing ratio, enthalpy	

1) *Use lowest available operating voltage to minimize heating.*

Mechanical specifications

Body thread	MI2×1 / 10 mm (0.4 in)
Cable connector	M8 4-pin female (IEC 60947-5-2)
Materials	
Body	Stainless steel (AISI 316)
Grid filter	Chrome coated ABS plastic
Cable	Polyurethane or FEP
Weight	
Probe	17 g (0.6 oz)
Probe with 0.3 m (1 ft) cable	28 g (1 oz)



HMP110 and HMP110T probe dimensions

Spare parts and accessories

Sensors	
Vaisala HUMICAP® 180R	HUMICAP180R
Vaisala HUMICAP® 180V	HUMICAP180V
Sensor protection	
Plastic grid filter	DRW010522SP
Membrane filter	DRW010525SP
Stainless steel sintered filter	HM46670SP
PTFE membrane filter with stainless steel grid	ASM212652SP
PTFE sintered filter	DRW244938SP
Probe installation	
Duct installation kit	215619
Probe mounting clamp set, 10-pcs	226067
Probe mounting flange	226061
Probe holder, 5 pcs	ASM213382SP
Plastic M12 installation nuts, pair	18350SP
Flat extension cable 1 m (3 ft) [1)]	CBL210649SP
Connection adapters	
4–20-mA loop power converter	UI-CONVERTER-1CB
Mounting bracket for converter	225979
USB cable for PC connection	219690
Connection cable for Indigo80 handheld indicator	262195SP
Connection cable for MI70 indicator	219980SP
Connection cables with open wires	
+60-°C 0.3-m (+140-°F 1-ft)	HMP50Z032SP
+60-°C 1.2-m (+140-°F 4-ft)	HMP50Z120
+60-°C 3-m (+140-°F 9.8-ft)	HMP50Z300SP
+80-°C 1.5-m (+176-°F 5-ft)	225777SP
+80-°C 3-m (+176-°F 10-ft)	225229SP
+180-°C 1.5-m (+356-°F 5-ft) FEP	238025
+180-°C 3-m (+356-°F 10-ft) FEP	226902SP

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

VAISALA

HMP113 Humidity and Temperature Probe



Features

- Fast thermal response time
- Low power consumption and fast start-up for battery-powered applications
- Measurement range: 0–100 %RH; −40 ... +60 °C (−40 ... +140 °F)
- Detachable cable with standard 4-pin M8 connector
- Plastic enclosure with IP54 classification
- Proven Vaisala HUMICAP® 180R sensor for excellent stability
- Compatible with Vaisala Insight PC software, Vaisala Indigo80 Handheld Indicator, and Vaisala HM40 Handheld Meter
- Optional RS-485 digital output supports Modbus® RTU
- Comes with calibration certificate: ±1.5 %RH measurement accuracy (0–90 %RH)

Vaisala HUMICAP® Humidity and Temperature Probe HMP113 is a highly accurate and cost-effective humidity probe with plastic enclosure. It is designed for indoor environments, integration into other manufacturers' equipment, or use with Vaisala HUMICAP® Handheld Humidity and Temperature Meter HM40.

Easy installation

The compact probe fits into tight spaces. The cable has a threaded M8 connector for easy installation. Different cable lengths and a selection of accessories are available.

Low power consumption

HMP113 is suitable for battery powered applications due to its very low power consumption. It also has an extremely fast start-up time.

Several outputs

Temperature measurement is a standard feature in HMP113, with dew point temperature, wet bulb temperature, absolute humidity, mixing ratio, and enthalpy as optional calculated parameters. Four voltage output ranges are available. An optional RS-485 output with Modbus support is also available.

Flexible connectivity

In addition to analog and digital (Modbus) output options, the probe can also be used with the Vaisala Indigo80 Handheld Indicator and the Vaisala HM40 Handheld Meter. For easy-to-use access to configuration and device analytics functionalities, the probe can be connected to Vaisala Insight software for Windows®. For more information, see vaisala.com/insight and vaisala.com/indigo80.

High performance

HMP113 has a PC/ABS plastic enclosure and is suitable for non-condensing environments with fast temperature changes and a need for high-accuracy measurements with traceability. HMP113 also has a high chemical tolerance thanks to the proven Vaisala HUMICAP® 180R sensor.

Variety of calibration options

A quick field calibration can easily be carried out using a handheld device, for example the Indigo80 Handheld Indicator or the HM40 Handheld Meter. Alternatively, the probe can be calibrated using a PC with USB cable, or sent to a Vaisala Service Center.

Technical data

Measurement performance

Relative humidity	
Measurement range	0–100 %RH
Accuracy (incl. non-linearity, hysteresis, and repeatability):	
at 0 … +40 °C (+32 … +104 °F)	±1.5 %RH (0–90 %RH) ±2.5 %RH (90–100 %RH)
at −40 … 0 °C (−40 … +32 °F) and +40 … +60 °C (+104 … +140 °F)	±3.0 %RH (0–90 %RH) ±4.0 %RH (90–100 %RH)
Factory calibration uncertainty at +20 °C (+68 °F):	±1.1 %RH (0–90 %RH) ±1.8 %RH (90–100 %RH)
Humidity sensor	HUMICAP® 180R
Stability	±2 %RH over 2 years
Temperature	
Measurement range	−40 … +60 °C (−40 … +140 °F)
Accuracy (probes with analog output):	
at 0 … +40 °C (+32 … +104 °F)	±0.2 °C (±0.36 °F)
at −40 … 0 °C (−40 … +32 °F) and +40 … +60 °C (+104 … +140 °F)	±0.4 °C (±0.72 °F)
Accuracy (probes with digital output):	
at +15 … +25 °C (+59 … +77 °F)	±0.1 °C (±0.18 °F)
at 0 … +15 °C (+ 32 … +59 °F) and +25 … +40 °C (+77 … +104 °F)	±0.15 °C (±0.27 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
Analog outputs	
Accuracy at +20 °C (+68 °F)	±0.2 % of FS
Temperature dependence	±0.01 % of FS/°C (±0.006 % of FS/°F)

Operating environment

Operating temperature	−40 … +60 °C (−40 … +140 °F)
IP rating [1]	IP54

1) Not applicable with the plastic grid filter.

Compliance

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

Inputs and outputs

Power consumption	1 mA average, max. peak 5 mA
Operating voltage [1]	
With 1 V / 2.5 V output	5–28 V DC
With 5 V output	8–28 V DC
With loop power converter	8–28 V DC
With digital output	5–28 V DC
Start-up time	
Probes with analog output	4 s at operating voltage 13.5–16.5 V DC 2 s at other valid operating voltages
Probes with digital output	1 s
Outputs	
2 channels	0–1 V DC / 0–2.5 V DC / 0–5 V DC / 1–5 V DC
1-channel loop-power converter (separate module, compatible with humidity accuracy only)	4–20 mA
Digital output (optional)	RS-485 2-wire half duplex, supports Modbus RTU
External loads	
0–1 V	R_L min 10 kΩ
Other voltage outputs	R_L min 50 kΩ
Output parameters	
Relative humidity, temperature, dew/frost point temperature, wet bulb temperature, absolute humidity, mixing ratio, enthalpy	

1) Use lowest available operating voltage to minimize heating.

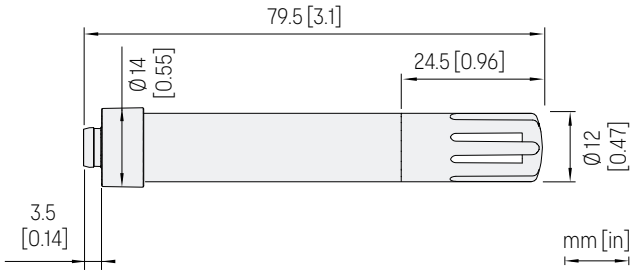
Mechanical specifications

Cable connector	4-pin M8 (IEC 60947-5-2)
Materials	
Body	PC/ABS blend
Grid filter	PC (glass reinforced)
Cable	Polyurethane or FEP
Weight	
Probe	9 g (0.3 oz)
Probe with 0.3 m (1 ft) cable	20 (0.7 oz)

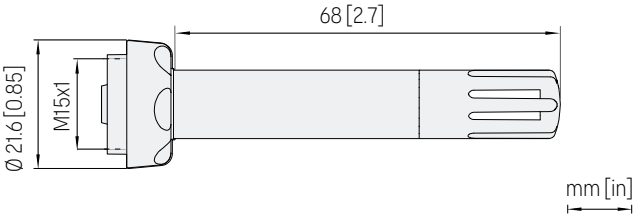
Spare parts and accessories

Sensors	
Vaisala HUMICAP® 180R	HUMICAP180R
Vaisala HUMICAP® 180V	HUMICAP180V
Sensor protection	
Plastic grid filter	DRW240185SP
Plastic grid with membrane filter	ASM210856SP
Stainless steel sintered filter	HM47280SP
Porous PTFE filter	219452SP
Probe installation	
Probe mounting clamp set, 10 pcs	226067
Probe mounting flange	226061
Probe holder, 5 pcs	ASM213382SP
Plastic locking bushing (3 pcs) for attaching probe to HM40	DRW238590SP
Connection adapters [1]	
4–20 mA loop power converter	UI-CONVERTER-1CB
Mounting bracket for converter	225979
USB cable for PC connection	219690
Connection cable for Indigo80 handheld indicator	262195SP
Connection cable for MI70 indicator	219980SP
Connection cables with open wires	
+60 °C 0.3 m (+140 °F 1 ft)	HMP50Z032SP
+60 °C 1.2 m (+140 °F 4 ft)	HMP50Z120
+60 °C 3 m (+140 °F 9.8 ft)	HMP50Z300SP
+80 °C 1.5 m (+176 °F 5 ft)	225777SP
+80 °C 3 m (+176 °F 10 ft)	225229SP
+180 °C 1.5 m (+356 °F 5 ft) FEP	238025
+180 °C 3 m (+356 °F 10 ft) FEP	226902SP

1) No separate adapter is needed for HM40 compatibility.



HMP113 dimensions



HMP113 dimensions with plastic locking bushing

VAISALA

SHM40 Structural Humidity Measurement Kit



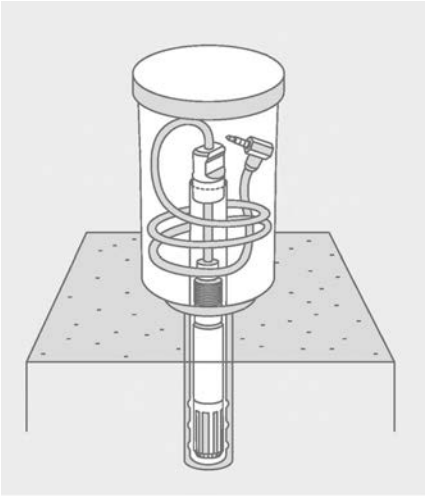
Features

- Truly interchangeable measurement probes
- Accurate measurement data in numeric, statistic, or graph views
- Conforms to ASTM standard F2170
- IP65-rated measurement probe and case
- Standard contents of SHM40:
  - HM40 indicator with adapter
  - 1 pc HMP40S RH&T probe with cable
  - 12 pcs plastic tubes
  - 12 pcs rubber plugs
  - 3 pcs protective covers with lid
  - Traceable calibration certificate
  - Weather-proof carrying case with shoulder strap

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

Measuring Humidity Under the Surface

Concrete dries unevenly and is usually drier on the surface. Consequently, it is important to measure beneath the surface conditions. The borehole method provides information about the humidity profile under the surface. In this method, a humidity probe is left in the borehole until the humidity in the hole has reached an equilibrium state and the stabilized values can be read.



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

SHM40 is All You Need for Borehole Humidity Measurement

The Vaisala HUMICAP® Structural Humidity Measurement Kit SHM40 is an ideal solution for the borehole method. The starter kit is comprised of an HMP40S probe, HM40 indicator, and accessories for the borehole method in a weather-proof case, optimized for use in harsh and humid construction sites.

Additional accessories for the SHM40 can be used to prepare a moisture measurement hole in fresh concrete. Pre-formed holes eliminate the need for drilling and the risk of damaging heating elements or tubing embedded in the concrete.

SHM40 Structural Humidity Measurement Kit

Easy Measurement with Multiple HMP40S Probes and Quick Connectors

HMP40S measurement probes are interchangeable. The probes connect easily to the HM40 indicator with a snap-on connector enabling convenient use of multiple probes with one indicator. The measurement data can be displayed in numeric, statistic, or graph views.



Snapping a connector to the HM40 indicator to read the measurement results.

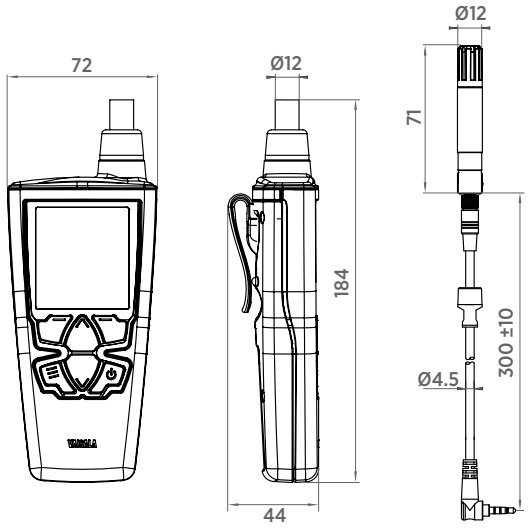
Technical Data

HMP40S Probe Measurement Performance

Relative Humidity	
Measurement range	0 ... 100 %RH
Accuracy (incl. non-linearity, hysteresis, and repeatability) over temperature range:	
0 ... +40 °C	0 ... 90 %RH: ±1.5 %RH 90 ... 100 %RH: ±2.5 %RH
−40 ... 0 °C and +40 ... +80 °C	0 ... 90 %RH: ±3.0 %RH 90 ... 100 %RH: ±4.0 %RH
Factory calibration uncertainty at +20 °C:	
0 ... 90 %RH	±1.1 %RH
90 ... 100 %RH	±1.8 %RH
Humidity sensor	HUMICAP® 180R
Stability	±2 %RH over 2 years
Temperature	
Measurement range	−40 ... +80 °C
Accuracy over temperature range:	
0 ... +40 °C	±0.2 °C
−40 ... 0 °C, +40 ... +80 °C	±0.4 °C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751

HMP40S Probe Mechanical Specifications

Probe weight with standard cable	31 g
Probe housing material	Stainless steel
Probe filter and sensor protection	Membrane filter with chrome coated ABS plastic
Cable material	Wire PVC / Jacket PU
Cable connector	TRRS male 3.5 mm
Probe housing IP rating	IP65
Borehole diameter needed	16 mm
Measurement depth with standard accessories	Min. 30 mm, max. 90 mm



Dimensions in mm

Operating Environment

Operating temperature range for probe	−40 ... +80 °C
Operating temperature range for indicator	−10 ... +60 °C
Storage temperature range	−30 ... +70 °C

HM40 Indicator Mechanical Specifications

Weight	
Indicator with adapter	240 g
SHM40 case with standard content	3.7 kg
Indicator materials	PC/ABS blend, acrylic display lens
Indicator adapter materials	Nickel plated brass and plastic overmolding
Indicator housing IP rating	IP54
Mechanical drop endurance	1.0 m without the probe

HM40 Indicator General Specifications

Power-up time	< 3 s
Alkaline batteries	2 × AA size, 1.5V (LR6)
Operation time (alkaline batteries)	Typical 100 hours (without backlight)
Calculated variables	Td, Tw, a, x, h
Menu languages	English, German, French, Finnish, Spanish, Swedish, Chinese (simplified), Russian, Japanese
Display	LCD (140 × 160 pixels)
Electromagnetic compatibility (EMC)	EN 61326-1, Portable equipment

Spare Parts and Accessories

HM40 indicator with adapter and cable probe	HM40S
RH&T probe with cable	HMP40S
HM40 indicator with adapter	HM40SINDI
Quick connection adapter	HM40SADAPTER
Cable for RH&T probe	HMP40SCABLE
Long cable (2.7 m) for RH&T probe	HMP40SCABLE2
Plastic tube set (12 pcs)	19266HM
Long (200 mm) plastic tube set (12 pcs)	245789
Rubber plugs (12 pcs)	233976
Protective cover with lid (3 pcs)	19268HM
Weather-proof carrying case for SHM40 kit	CASEFORSHM40SP
USB recharger for HM40 indicator batteries	229249SP
Plastic grid with membrane filter for HMP40S probe	DRW010525SP
Accessories for Wet Concrete	
Plastic flange set (12 pcs)	26529HM
Long rubber plug for wet concrete (12 pcs)	26530HM

CE

VAISALA

HMK15 Humidity Calibrator



Features

- Easy and reliable calibration of humidity probes and transmitters
- Based on saturated salt solutions
- Fast temperature equilibration
- No external power required
- Suitable for laboratory use and on-site checks
- Chambers and transit covers make HMK15 easy to transport
- Pre-measured certified salts available
- Vaisala Service Centers offer accredited calibrations for humidity, temperature, and barometric pressure

No measuring instrument stays accurate by itself. It is essential that the functioning of an instrument is periodically checked against a reference. Vaisala has developed Vaisala Humidity Calibrator HMK15 to make calibration and spot-checking of humidity probes and transmitters easy and reliable.

Benefits

- Easy to use
- Reliable calibration
- Certified and pre-measured salts available on order form of HMK15

Reliable calibration method

The operating principle of HMK15 is based on the fact that a saturated salt solution generates a certain relative humidity in the air above it. The reading of the humidity probe or transmitter can then be adjusted accordingly. Many calibration laboratories use this generally accepted and reliable method to calibrate humidity instruments. Usually two or three different salt solutions are used. Salts are chosen according to the application. Available salts and their reference humidities:

- Lithium chloride LiCl (11 %RH)
- Magnesium chloride $MgCl_2$ (33 %RH)
- Sodium chloride NaCl (75 %RH)
- Potassium chloride KCl (85 %RH)
- Potassium sulphate K_2SO_4 (97 %RH)

Certified salts

HMK15 can be ordered with certified and pre-measured salts. A sample calibration is made from each salt batch in Vaisala's Measurement Standards Laboratory (MSL).

FINAS accredited measurement standards laboratory

Vaisala's Measurement Standards Laboratory is a FINAS accredited calibration laboratory. FINAS is a member of the EA (the European Cooperation for Accreditation).

FINAS
Finnish Accreditation Service
K008 (EN ISO/IEC 17025)

Technical data

Operating environment

Operating temperature range	+0 ... +50 °C (+32 ... +122 °F)

Mechanical specifications

Dimensions (H × W × L)	90 × 230 × 200 mm (3.54 × 9.06 × 7.87 in)
Weight	1 kg (2.20 lb) without salt solutions
Material (metal parts)	Anodized aluminum

Parts

Standard contents of HMK15 calibrator
Base plate
Two salt chambers with basic lids and transit covers
Thermometer
Measurement cup and mixing spoon
Calibration adapter (Ø13.5 mm) for Ø12 mm probes with long sensor legs
Calibration adapter (Ø13.5 mm) for Ø12 mm probes with short sensor legs
Optional items
See table *Spare parts and accessories*

Spare parts and accessories

Rubber plug set	19746HM
O-ring set	218096
Ion exchanged water	19767HM
Thermometer with red capillary liquid	25130HM
Transit bag	HM27032
Salt chambers and lids	
HMK15 basic lid	271549
HMK15 universal lid	271550
HMK15 custom lid for 4 × HMP110 with filter on	253277SP
HMK15 custom lid for DMT132 and HMP60/HMP110 with filter on	230914
HMK15 salt chamber with basic lid and transit cover	DRW255417SP
HMK15 salt chamber with universal lid and transit cover	19766HM
Calibration adapters	
Calibration adapter for HMP9 probe	ASM213801
Calibration adapter (Ø13.5 mm) for Ø12 mm probes with long sensor legs	211302SP
Calibration adapter (Ø13.5 mm) for Ø12 mm probes with short sensor legs	218377SP
Calibration adapter for HMP42 probe	HM37067
Certified and ready-dosed salts [1]	
Ready-dosed LiCl salt package (LiCl salt 11 %RH, total uncertainty ±1.3 %RH) [2]	19729HM
Ready-dosed $MgCl_2$ salt package ($MgCl_2$ salt 33 %RH, total uncertainty ±1.2 %RH) [2]	19730HM
Ready-dosed NaCl salt package (NaCl salt 75 %RH, total uncertainty ±1.5 %RH) [2]	19731HM
Ready-dosed KCl salt package (KCl salt 85 %RH, total uncertainty ±2.0 %RH) [2]	251377HM
Ready-dosed K_2SO_4 salt package (K_2SO_4 salt 97 %RH, total uncertainty ±2.0 %RH) [2]	19732HM

1) Calibration certificate included with each salt package.
2) Uncertainties given at +20 °C (+68 °F).

VAISALA

HMP155 Humidity and Temperature Probe



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

Features

- Vaisala HUMICAP®180R sensor: superior long-term stability
- Optional warmed humidity probe and chemical purge
- Plug-and-play
- USB connection for service use
- Use with DTR13 and DTR503 radiation shields and a Stevenson screen
- Weather-proof housing IP66
- Optional, fast temperature probe
- Different output possibilities: voltage, RS-485, resistive Pt100
- Applications: meteorology, aviation and road weather, instrumentation

Vaisala HUMICAP® Humidity and Temperature Probe HMP155 provides reliable humidity and temperature measurement. It is designed especially for demanding outdoor applications.

Long-term stability

HMP155 uses the proven Vaisala HUMICAP®180R sensor that has excellent stability and withstands well harsh environments. The probe structure is solid and the sensor is protected by default with a sintered teflon filter, which gives maximum protection against water, dust, and dirt.

Warmed probe and high-humidity environment

Measuring humidity reliably is challenging in environments where humidity is near saturation. Measurements may be corrupted by fog, mist, rain, and heavy dew. A wet probe may not give an accurate measurement in the ambient air.

This is an environment to which Vaisala has designed this patented, warmed probe for reliable measurements. As the sensor head is warmed continuously, the humidity level inside it stays below the ambient level. Thus, it also reduces the risk of condensation forming on the probe.

Fast measurements

With its fast response time, the additional temperature probe for HMP155 is ideal for measuring in environments with changing temperatures. The membrane filter speeds up the relative humidity measurement.

Long lifetime

Protecting the sensor from precipitation, and scattered and direct solar radiation increases its lifetime. Thus, Vaisala recommends installing HMP155 in one of the following radiation shields: DTR503, DTR13, or Stevenson screen. For the additional temperature probe, an installation kit is available for Vaisala DTR502 Radiation Shield.

Calibration

The probe can be calibrated using a computer with a USB cable, with the push buttons, or with the MI70 indicator.

Technical Data

Humidity measurement performance

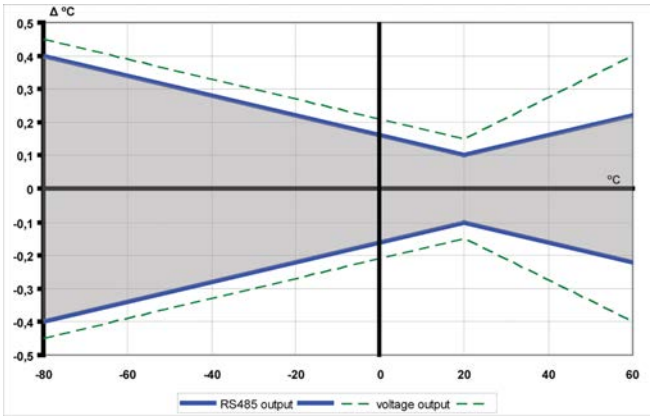
Sensor	HUMICAP®R2, 180R and INTERCAP for typical applications HUMICAP®R2C, 180RC, and INTERCAPC for applications with chemical purge and/or warmed probe
Observation range	0–100 %RH
Response time at +20 °C (+68 °F) in still air with sintered Teflon filter	63 %: 20 s 90 %: 60 s
Factory calibration uncertainty at +20 °C (+68 °F)[1)]	±0.6 %RH (0–40 %RH) ±1.0 %RH (40–95 %RH)
Accuracy (including non-linearity, hysteresis, and repeatability)	
At +15 … +25 °C (+59 … +77 °F)	±1 %RH (0–90 %RH) ±1.7 %RH (90–100 %RH)
At −20 … +40 °C (−4 … +104 °F)	±(1.0 + 0.008 × reading) %RH
At −40 … −20 °C (−40 … −4 °F)	±(1.2 + 0.012 × reading) %RH
At +40 … +60 °C (+104 … +140 °F)	±(1.2 + 0.012 × reading) %RH
At −60 … −40 °C (−76 … −40 °F)	±(1.4 + 0.032 × reading) %RH

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

Temperature measurement performance

Sensor	Pt100 RTD element, Class F 0.1 IEC 60751
Observation range	−80 … +60 °C (−112 … +140 °F)
Response time for additional temperature probe in 3 m/s (7 mph) air flow	63 %: < 20 s 90 %: < 35 s
Other measured variables	Dew point / Frost point temperature, wet bulb temperature, mixing ratio
Accuracy with voltage output	
At −80 … +20 °C (−112 … +68 °F)	±(0.226 − 0.0028 × temperature) °C
At +20 … +60 °C (+68 … +140 °F)	±(0.055 + 0.0057 × temperature) °C
Accuracy with passive (resistive) output	
According to Tolerance Class AA IEC 60751 [1)]	±(0.1 + 0.0017 × |temperature|) °C
Accuracy with RS-485 output	
At −80 … +20 °C (−112 … +68 °F)	±(0.176 − 0.0028 × temperature) °C
At +20 … +60 °C (+68 … +140 °F)	±(0.07 + 0.0025 × temperature) °C

1) Tolerance Class AA IEC 60751 corresponds to IEC 751 1/3 Class B.



HMP155 accuracy over temperature range: voltage and RS-485

Operating environment

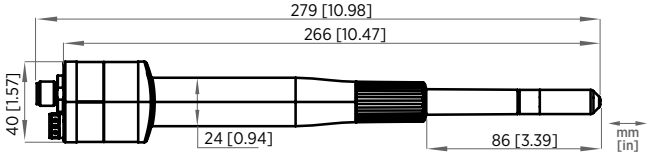
Operating temperature for humidity measurement	−80 … +60 °C (−112 … +140 °F)
Storage temperature	−80 … +60 °C (−112 … +140 °F)
Operating humidity	0–100 %RH
IP rating	IP66

Inputs and outputs

Operating voltage	7–28 V DC
Minimum operating voltage	0–1 V output or RS-485: 7 V 0–5 V output, or warmed probe: 12 V 0–10 V output, chemical purge, or XHEAT: 16 V
Outputs	Voltage output: 0–1 V, 0–5 V, 0–10 V Resistive Pt100 4-wire connection RS-485
Average power consumption (+15 V DC, load 100 kΩ)	0–1 V output: < 3 mA 0–10 V output: +0.5 mA RS-485: < 4 mA During chemical purge: Maximum 110 mA With warmed probe: Maximum 150 mA
Settling time at startup	Voltage output: 2 s RS-485: 3 s

Mechanical specifications

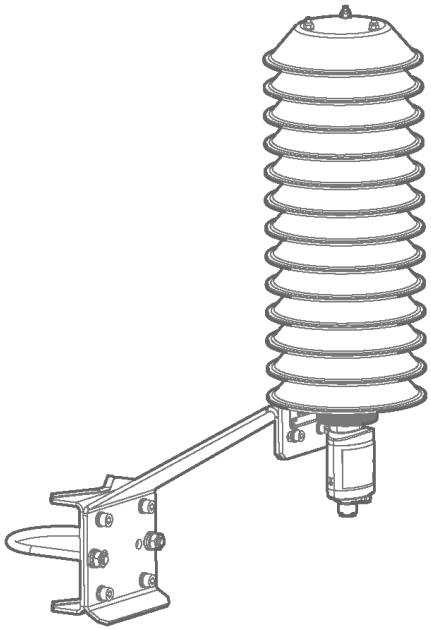
Dimensions (H × W)	279 × 40 mm (10.9 × 1.6 in)
Weight	93 g (3.25 oz)
Length of additional T-probe cable	2 m (6 ft 7 in)
Connection	8-pin male M12 connector
Connection cables	3.5 m (11 ft 6 in), 10 m (32 ft 10 in), 30 m (98 ft 5 in)
Maximum wire size	0.129 mm^2 (26 AWG)
Service cables	USB connection cable MI70 connection cable
Materials	
Filter	Sintered Teflon or membrane
Housing	Polycarbonate (PC)
Additional temperature probe	Stainless steel AISI 316L
Cable	PUR



Dimensions in mm (inches)

VAISALA

DTR500 Solar Radiation and Precipitation Shields



Vaisala Radiation Shield Series DTR500 are solar radiation and precipitation shields supporting humidity probe installations in outdoor applications.

Features

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

Sensor protection

The maintenance-free DTR500 series shields protect the humidity and temperature sensors from solar radiation and precipitation. They provide excellent ventilation while blocking both direct and reflected solar radiation.

The special plastic used in the plates has excellent thermal characteristics: the white outer surface reflects radiation, and the black inside absorbs accumulated heat. The shields can be easily installed on a vertical pole, horizontal beam, or flat surface.

The DTR shields can be used with the following Vaisala products:

DTR502(A) with adapter 221072

Vaisala HUMICAP® Humidity and Temperature Probe HMP155's additional temperature sensor

DTR502B

Vaisala HUMICAP® Humidity and Temperature Transmitters HMT333, HMT337, HMT373, and HMT377

Vaisala HUMICAP® Humidity and Temperature Probes HMP3 and HMP7

Vaisala Combined Pressure, Humidity and Temperature Transmitters PTU303 and PTU307

DTR503(A)

Vaisala HUMICAP® Humidity and Temperature Probe HMP155

DTR504(A)

Vaisala HUMICAP® Humidity and Temperature Transmitters HMT120/130

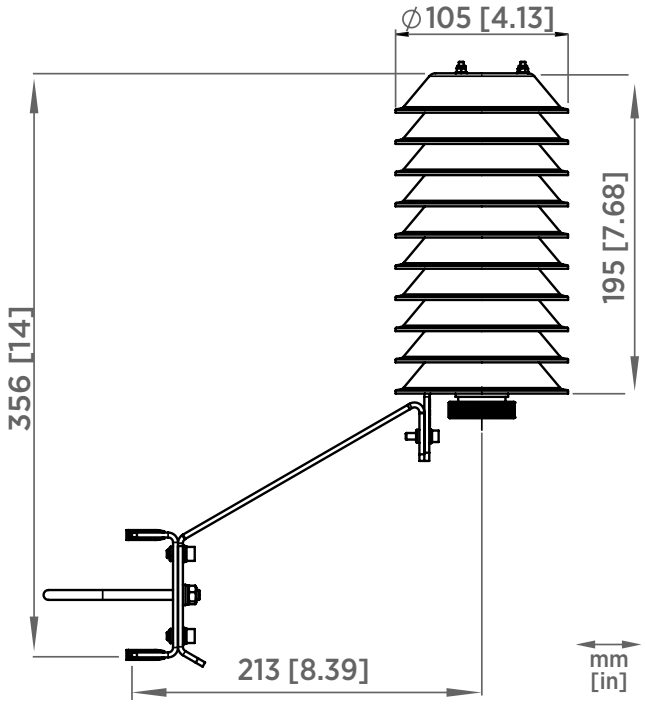
Vaisala HUMICAP® Humidity and Temperature Probe HMP110

Vaisala INTERCAP® Humidity and Temperature Probe HMP60

Technical data

DTR502B for HMT333, HMT337, HMT373, HMT377, HMP3, HMP7, PTU303, and PTU307

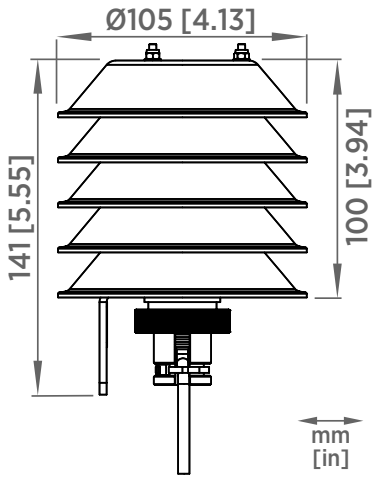
Dimensions (H × W)	195 × 105 mm (7.68 × 4.13 in)
Accessories	Product specific adapter



DTR502B dimensions

DTR504 for HMT120/130 remote probes, HMP110, and HMP60

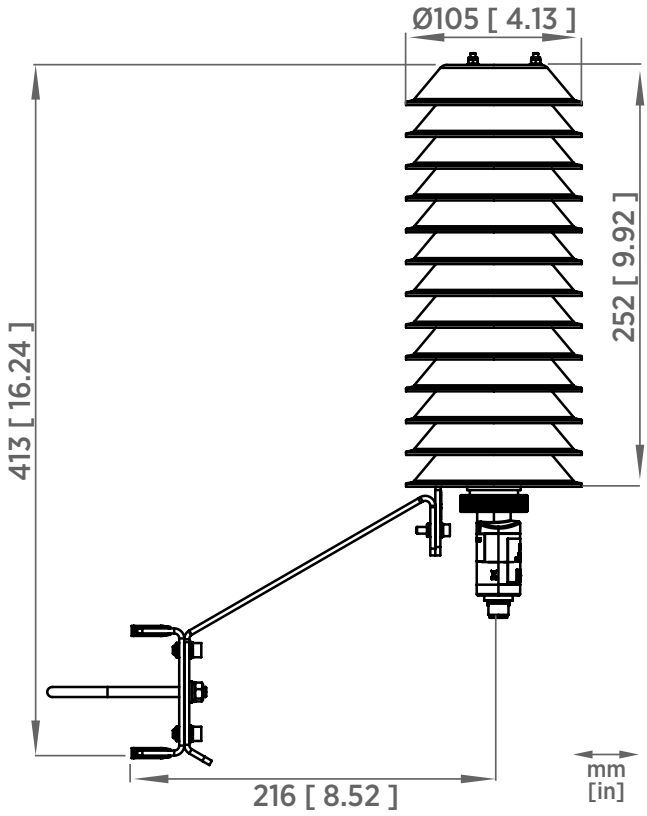
Dimensions (H × W)	141 × 105 mm (5.55 × 4.13 in)
Accessories	Horizontal beam assembly
	Pole mast installation kit



DTR504 dimensions

DTR503A for HMP155

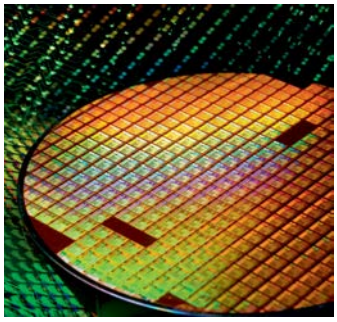
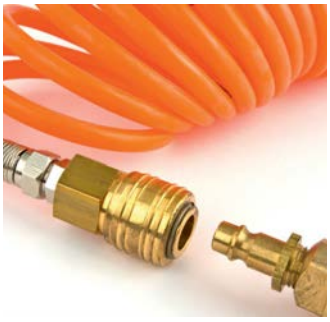
Dimensions (H × W)	252 × 105 mm (9.92 × 4.13 in)
Accessories	Horizontal beam assembly
	Pole mast installation kit



DTR503A dimensions

VAISALA

DRYCAP® sensor for measuring humidity in dry 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

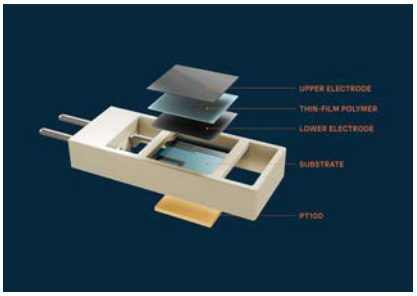
We took on the challenge by combining the highest quality polymer technology with a patented key feature – autocalibration – that would eliminate sensor drift in very dry conditions.

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

DMP1 Dew Point and Temperature Probe

For dry rooms and cleanrooms



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 DMP1 is designed for low-humidity applications, for example in dry room monitoring in battery manufacturing or cleanroom monitoring in semiconductor production facilities.

Benefits

DMP1 is optimal for maintaining process reliability and correct dryness levels in battery and semiconductor manufacturing with an optional Indigo300 local display. By placing the probes to critical spots and at adequate intervals, the entire dry-controlled facility can be reliably monitored. The Vaisala DRYCAP sensor is immune to particulate contamination, water condensation, oil vapor, and most chemicals.

Rapid response in minutes

Fast reaction time and stability make DMP1 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.

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 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.

The probe can be connected directly to the Indigo300 locking wheel without a cable to enable wall mounting, especially for installations in dry rooms where the entire dew point transmitter needs to be inside the dry space. The concept is easy to clean and suitable also for cleanrooms. When needed, the cable length between the probe and the 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 vaisala.com/indigo80.



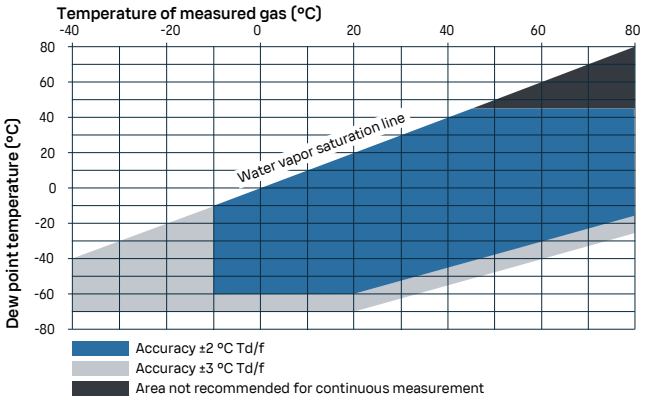
DMP1 with Indigo300

Technical data

Measurement performance [1]

Dew point	
Sensor	DRYCAP® 180M
Measurement range	−70 ... +80 °C (−94 ... +176 °F) $T_{d/f}$
Measurement range for continuous use	−70 ... +45 °C (−94 ... +113 °F) $T_{d/f}$
Accuracy	Up to ±2 °C (±3.6 °F) $T_{d/f}$ See accuracy graph
Response time 63 % [90 %] [2]	
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

1) *Specified for an air flow greater than 0.2 m/s.*
2) *Specified for the sintered filter HM47280.*



Dew point accuracy vs. measurement conditions

Operating environment

Operating temperature	−40 ... +80 °C (−40 ... +176 °F)
Storage temperature	−40 ... +80 °C (−40 ... +176 °F)
Measurement environment	For air, nitrogen, hydrogen, argon, helium, 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

Compliance

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

Output parameters

Absolute humidity (g/m^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)	

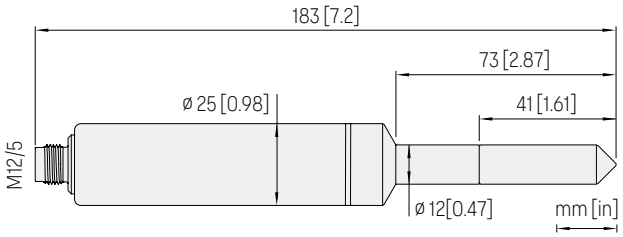
Mechanical specifications

Connector	M12 5-pin A-coded male
Weight	180 g
Materials	
Probe	AISI 316L
Probe body	AISI 316L

Accessories

Indigo USB adapter [1]	USB2
Sintered stainless steel filter	HM47280SP

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



Dimensions

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.

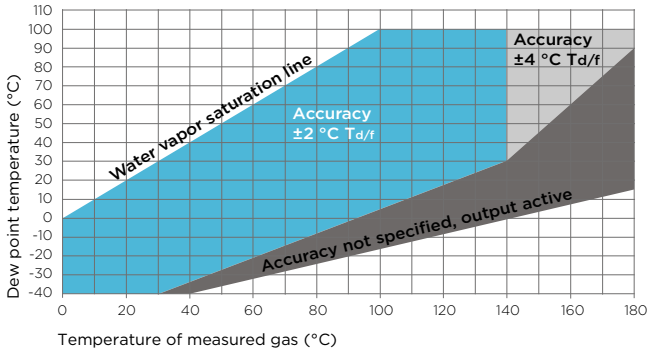
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring and troubleshooting the probe. For more information, see www.vaisala.com/indigo.

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) $T_{d/f}$ 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

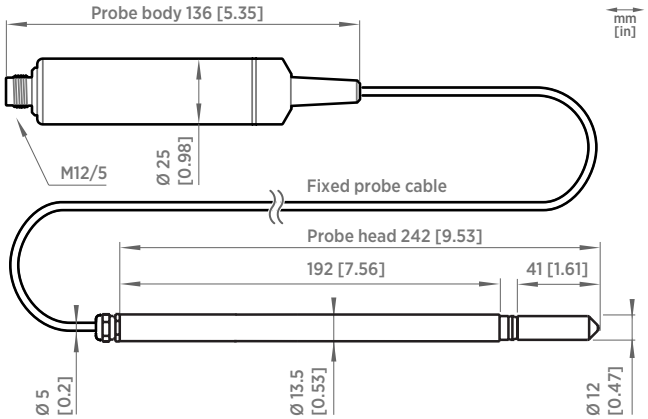
Absolute humidity (g/m³)	Relative humidity (%RH)
Absolute humidity at NTP (g/m³)	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm_v)
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
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

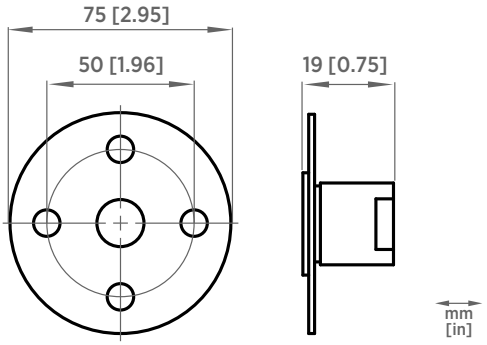
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Type approvals	DNV GL certificate no. TAA00002YT
Compliance marks	CE, China RoHS, RCM

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

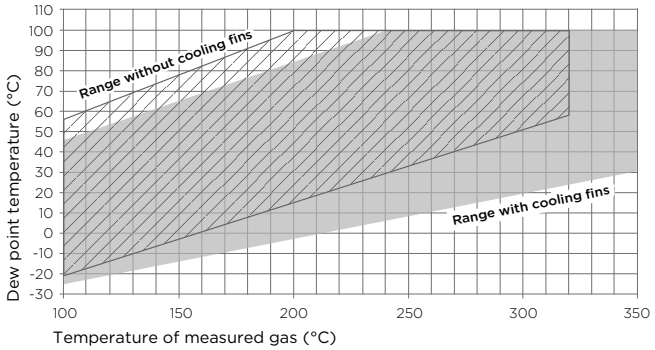
Measurement performance

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

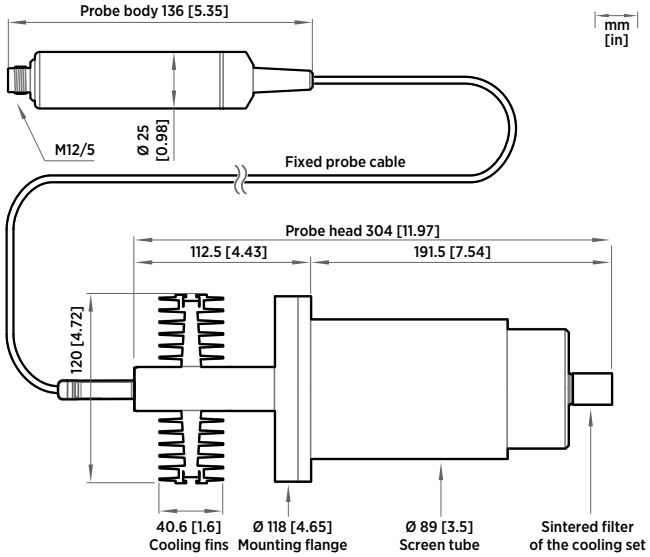
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Type approvals	DNV GL certificate no. TAA00002YT
Compliance marks	CE, China RoHS, RCM

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

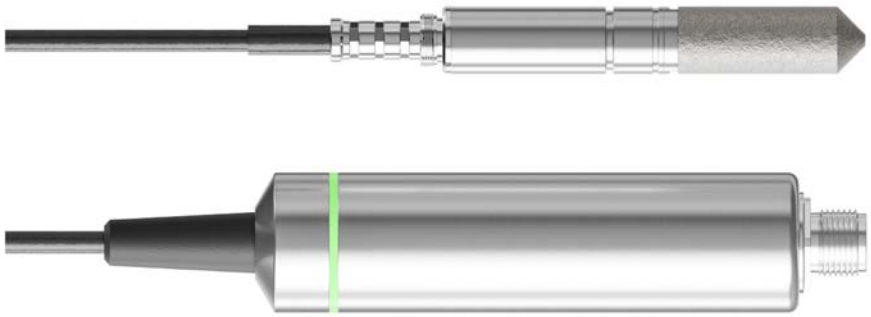
Cooling set	DMP246CS
Indigo USB adapter [1)]	USB2

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.

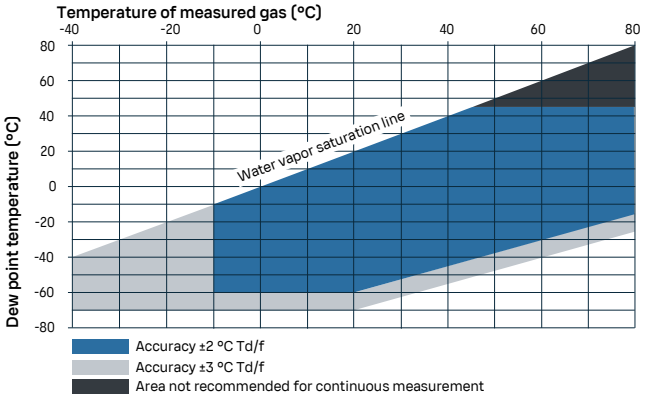
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring and troubleshooting the probe. For more information, see www.vaisala.com/indigo.

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) $T_{d/f}$ 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

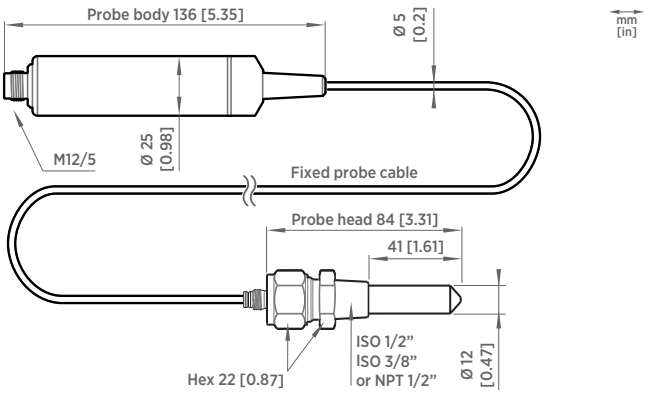
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, RCM

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

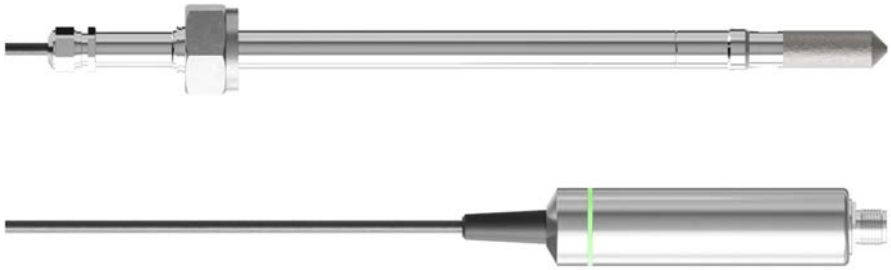
Swagelok ISO 3/8"	SWG12ISO38
Swagelok ISO 1/2"	SWG12ISO12
Swagelok NPT 1/2"	SWG12NPT12
Magnetic probe holder for Ø 12 mm probe heads [1]	ASM213382SP
Indigo USB adapter [2]	USB2

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.

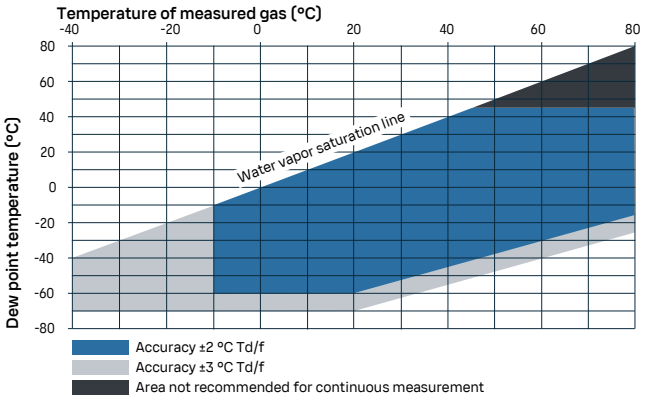
The Indigo80 handheld indicator is ideal for spot-checking and process monitoring, as well as for configuring and troubleshooting the probe. For more information, see www.vaisala.com/indigo.

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 $T_{d/f}$ 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) 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

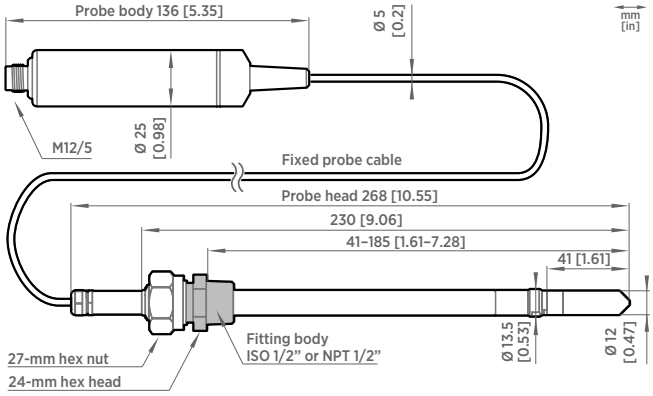
Absolute humidity (g/m^3)	Relative humidity (%RH)
Absolute humidity at NTP (g/m^3)	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm$_v$)
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)
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) 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

DMT152 Dew Point Transmitter

For low dew point measurement in OEM applications



Features

- Vaisala DRYCAP® technology with a polymer sensor
- Measures dew point down to −80 °C (−112 °F)
- Withstands condensation
- Traceable calibration (certificate included)
- Applications: dry chambers, dry gases, semiconductor manufacturing, research and testing, and compressed air

Vaisala DRYCAP® Dew Point Transmitter DMT152 is designed for measuring low dew point in OEM applications, even down to -80 °C (-112 °F). The excellent long-term stability and reliability of its performance is based on the latest DRYCAP polymer sensor technology.

Low maintenance

The DMT152 mechanics have been designed for harsh environments requiring protection against dust, dirt, and splashed water. The DRYCAP technology has a low maintenance need due to its excellent long-term stability and durability against condensation.

Applications

The DMT152 transmitter is an ideal choice for industrial applications where it is necessary to control very low humidity. Most typical areas of use are air and plastics dryers, dry chambers, dry gases, and high-voltage circuit breakers.

DMT152 measures accurately and reliably also in the challenging combination of low humidity and hot air, which is typical in plastics drying.

Benefits

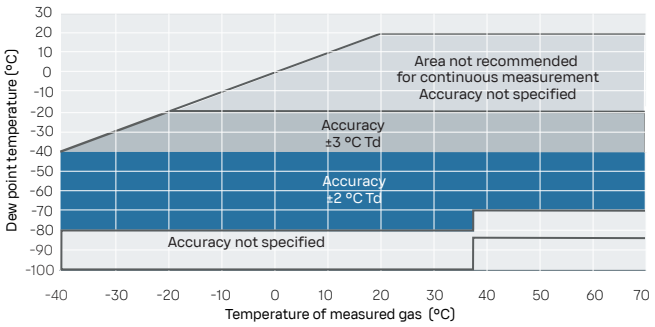
- Accurate
- Compact
- Fast response time
- Reduced maintenance costs due to long calibration interval

Technical data

Measurement performance

Sensor	Vaisala DRYCAP® 180U Thin-film capacitive polymer sensor
Dew point temperature [1]	
Measurement range	−80 … −20 °C (−112 … −4 °F) T_d
Accuracy	
−80 … −40 °C (−112 … −40 °F)	±2 °C (3.6 °F) T_d
−40 … −20 °C (−40 … −4 °F)	±3 °C (5.4 °F) T_d
Non-calibrated range	−100 … +20 °C (−148 … +68 °F) T_d
Typical response time 63 % [90 %] at a gas temperature of +20 °C (+68 °F) and pressure of 1 bar:	
−20 … −80 °C T_d	0.5 min [7.5 min]
−80 … −20 °C T_d	2 s [5 s]
Typical long-term stability	Better than 2 °C (3.6 °F) / year
Concentration by volume (ppm)	
Measurement range (typical)	0–500 ppm
Accuracy at +20 °C (+68 °F), 1013 mbar	±(0.2 ppm + 20 % of reading)

1) When the dew point is below 0 °C, the transmitter outputs frost point for T_d.



Accuracy over temperature range

Inputs and outputs

Two analog outputs (scalable)	4–20 mA, 0–20 mA (3-wire), 0–5 V, 0–10 V
Digital output	RS-485 (2-wire)
Alarm-level indication by analog signal	User selectable
Purge information	5 V, 10 V, 20 mA, or LED
Accuracy of analog outputs	±0.01 V / ±0.01 mA
Operating voltage	
RS-485 output	11–28 V DC [1]
Voltage output	15–28 V DC [1]
Current output	21–28 V DC
Supply current	
Normal measurement	20 mA + load current
During self-diagnostics	Max. 220 mA pulsed
Supply voltage fluctuation	Max. 0.3 V
External load	
Voltage output	Min. 10 kΩ
Current output	Max. 500 Ω

1) For extended temp. down to −40 °C (−40 °F) or pressure up to 50 bar (725 psia), the supply voltage is 21–28 V DC.

Operating environment

Temperature	−40 … +70 °C (−40 … +158 °F)
Relative humidity	0–100 %RH (up to +20 °C / +68 °F)
Pressure	0–50 bar (725 psi_a)
Measurement environment	For air, nitrogen, argon, helium, and oxygen [1] Not suitable for measurements in hydrogen or pure carbon dioxide
Sample flow rate	No effect on measurement accuracy

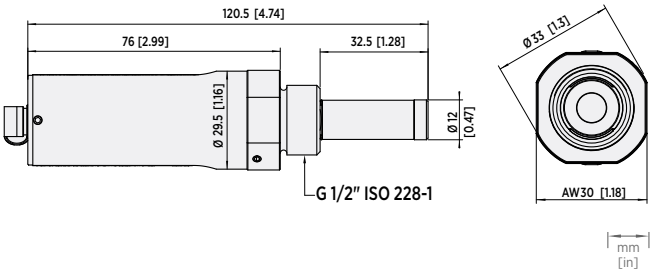
1) Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases.

Compliance

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

Mechanical specifications

Housing material (wetted parts)	AISI316L
Stainless steel mesh filter	Filter body AISI303, mesh AISI316L, grade 18 µm
Mechanical connections	ISO G1/2", NPT 1/2", UNF 3/4"- 16", UNF 5/8"-18"
IP rating	IP66
Storage temperature range	−40 … +80 °C (−40 … +176 °F)
Weight (ISO G1/2")	190 g (6.70 oz)



Accessories

Connection cable for MI70 handheld indicator	219980
USB cable for PC connection	219690
Loop-powered external display (Nokeval 301)	226476
Loop-powered external display with relays (Nokeval 302)	234759
NW40 flange	225220SP
Sampling cells (available for ISO G1/2")	
Basic sampling cell	DMT242SC
With Swagelok 1/4" male connectors	DMT242SC2
With a quick connector and leak screw	DSC74
Two-pressure sampling cell	DSC74B

VAISALA

DMT143 Dew Point Transmitter

For OEM applications



Features

- Vaisala DRYCAP® technology with a unique autocalibration function
- Calibration interval of 2 years
- Dew point measurement range −70 ... +60 °C (−94 ... +140 °F)
- Accuracy ±2 °C (±3.6 °F)
- Withstands condensation
- Compatible with Vaisala Indigo80 handheld indicator and Insight PC software
- Traceable calibration
- Voltage (V) or current (mA) analog output
- RS-485 digital output with Modbus® RTU support
- LED alarm for exceeded dew point level
- Fast response time

Due to its wide measurement range and excellent long-term stability, Vaisala DRYCAP® Dew Point Transmitter DMT143 is an ideal choice for small compressed air dryers, plastic dryers, and other OEM applications.

Vaisala DRYCAP® technology

Vaisala DRYCAP® Dew Point Transmitter DMT143 is a miniature dew point measurement instrument.
The transmitter can be installed directly into pressurized systems at 50 bar (725 psia) maximum pressure. The long-term high performance is achieved with Vaisala DRYCAP® technology.

The sensor fully withstands getting wet, and therefore, the transmitter performs exceptionally well in applications that occasionally experience process water spikes, such as pipeline condensation during a system failure or start-up.
The sensor is also highly resistant to particulate contamination, oil vapor, and most chemicals, and is insensitive to the flow rate.

Long calibration interval

The calibration interval of DMT143 is 2 years. For any adjustment needs, the transmitter can be sent to a Vaisala Service Center.

The unique autocalibration function, developed by Vaisala, detects possible measurement inaccuracies and automatically corrects dry-end drift in the calibration curve. This ensures accurate measurements and long calibration intervals.

Easy installation

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

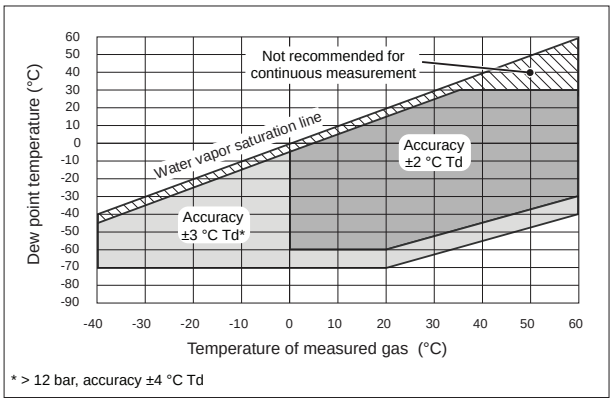
Due to its small size and light weight, DMT143 is quickly and easily installed in tight spaces or in small-size pipelines. The alarm LED indicates too high dew point in the process. The trigger point is preset at the factory. It can be later adjusted with the convenient Vaisala Insight PC software for Windows®.

Insight PC software and the Indigo80 handheld indicator can also be used for other configuration options, as well as for viewing and logging measurement data (for more information, see www.vaisala.com/insight and www.vaisala.com/indigo).

Technical data

Measurement performance

Sensor	DRYCAP® 180D
Sensor protection	Stainless steel sintered filter
Recommended calibration interval to confirm the specified accuracy	2 years
Dew point temperature	
Measurement range (typical)	−70 ... +60 °C (−94 ... +140 °F) T_d
Accuracy in air or N_2 [1]	±2 °C (±3.6 °F) T_d (see graph below)
Dew point accuracy vs. measurement conditions:	



* > 12 bar, accuracy ±4 °C Td

Analog output scalings:	
Option 1	−80 ... +20 °C (−112 ... +68 °F) T_d
Option 2	−80 ... +20 °C (−112 ... +68 °F) T_d dew point at ambient pressure
Option 3	Free scaling
Response time 63 % [90 %]: [2]	
−70 → −20 °C T_d (−94 → −4 °F T_d)	5 s [15 s] (typical)
−20 → −70 °C T_d (−4 → −94 °F T_d)	45 s [10 min] (typical)
Water concentration by volume (ppm)	
Measurement range (typical)	10 ... 40 000 ppm
Accuracy at +20 °C (+68 °F), 1 bar	1 ppm + 20 % of reading

1) When the dew point is below 0 °C (32 °F), the transmitter outputs frost point.
2) At +20 °C gas temperature and 1 bar pressure and 1 liter/min flow rate.

Operating environment

Measurement environment	For air, nitrogen, hydrogen, argon, helium, and oxygen [1] [2]
Temperature [3]	−40 ... +60 °C (−40 ... +140 °F)
Relative humidity	0 ... 100 % RH
Pressure [3]	0 ... 50 bar_a (725 psi_a)
Sample flow rate	No effect for measurement accuracy
Storage temperature	−40 ... +60 °C (−40 ... +140 °F)
IP rating	IP66

1) Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases. The transmitter is not certified for use in hazardous areas with potentially explosive atmospheres.
2) The transmitter not tested for leakages, which may occur especially with small-molecule gases such as hydrogen and helium.
3) For extended temperature below 0 °C (+32 °F) or pressure above 20 bar_a (290 psi_a) the supply voltage must be 24 ... 28 V DC.

Inputs and outputs

Analog output (scalable)	4 ... 20 mA (3-wire), 0 ... 1 V / 5 V, 1 ... 5 V
Resolution for current output	0.002 mA
Resolution for voltage output	0.3 mV
Accuracy for current output at +20 °C	±0.05 mA
Accuracy for voltage output at +20 °C	±0.01 V
Operating voltage with digital output	12 ... 28 V DC
Operating voltage with voltage output	12 ... 28 V DC
Operating voltage with current output	18 ... 28 V DC
Load for current output	Max. 500 Ω
Load for voltage output	Min. 10 kΩ
Typical temperature dependence	0.005 % of span/°C
Digital output	RS-485, non-isolated
Supported protocols	Vaisala industrial protocol Modbus RTU
Connector	4-pin M8 (IEC 60947-5-2)
Supply current at +20 °C (U_{in} 24 V DC)	
Normal measurement	10 mA + load current (typical)
During self-diagnostics	220 mA pulsed (typical)

Mechanical specifications

Mechanical connection	ISO 228-1 G1/2" 1/2" NPT 3/4"-16 UNF 5/8"-18 UNF
Housing material	Stainless steel (AISI316L)
Weight:	
G thread and UNF thread models	90 g (3.2 oz)
NPT thread model	100 g (3.5 oz)

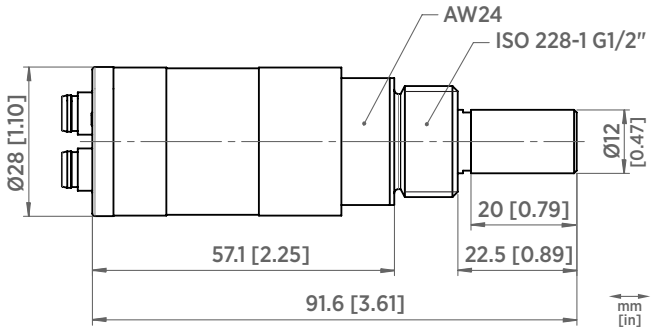
Compliance

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

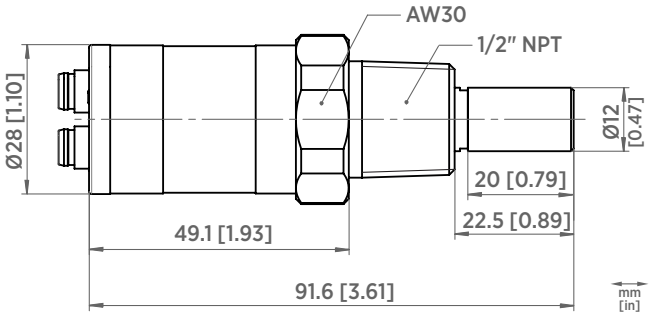
Spare parts and accessories

USB cable for PC connection [1)]	219690
M12 - M8 cable 1.5 m (4.9 ft), for connecting to Indigo80	262195SP
M12 - M8 cable 2 m (6.5 ft), for connecting to DM70	219980SP
Loop powered external display	226476
Loop powered external display with relays	234759
Sampling cells	
Basic sampling cell	DMT242SC
With Swagelok 1/4″ male connectors	DMT242SC2
With UNF5/8″-18 thread	DSC74UNF58SP
With quick connector and leak screw	DSC74SP
Two-pressure sampling cell	DSC74BSP
Cooling/venting coil	DMCOILSP
See the DSS70A product page at www.vaisala.com for further information about the sampling cells available for DM70.	

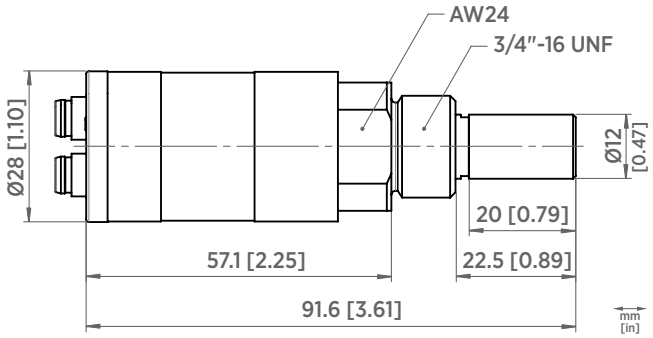
1) Vaisala Insight software for Windows is available at www.vaisala.com/insight.



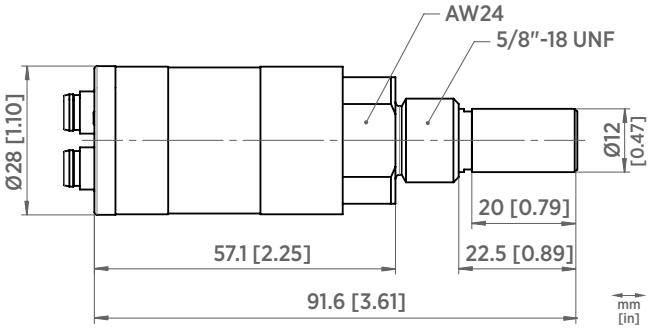
DMT143 with ISO 228-1 G1/2" thread



DMT143 with 1/2" NPT thread



DMT143 with 3/4"-16 UNF thread



DMT143 with 5/8"-18 UNF thread

VAISALA

DMT143L Dew Point Transmitter

For OEM applications (DMT242 replacement)



Features

- Vaisala DRYCAP® technology with auto-calibration
- Calibration interval of two years
- Two sensor options cover a dew point measurement range of −60 ... +60 °C (−76 ... +140 °F)
- Accuracy ±2 °C (±3.6 °F)
- Compatible with Vaisala Indigo80 handheld indicator and Insight PC software
- Traceable calibration (certificate included)
- Analog current (mA) output and RS-485 digital output with Modbus® RTU support
- LED alarm for exceeded dew point level
- Fast response time

Due to its wide measurement range and excellent long-term stability, Vaisala DRYCAP® Dew Point Transmitter DMT143L is an ideal choice for low dew point industrial applications, such as compressed air dryers, plastic dryers, and other OEM applications.

Vaisala DRYCAP®

Vaisala DRYCAP® Dew Point Transmitter DMT143L is a miniature dew point measurement instrument.
The transmitter can be installed directly into pressurized systems at 20 bar (290 psia) maximum pressure. It is designed for extreme conditions.

DMT143L incorporates Vaisala DRYCAP® thin film polymer sensor and auto-calibration software. The standard sensor choice for dry gases and desiccant dryers is the DRYCAP® 180M, and for more humid applications such as refrigeration dryers, the DRYCAP® 180S is optimal.

The sensors fully withstand getting wet, and therefore, the transmitter performs exceptionally well in applications that occasionally experience process water spikes, such as pipeline condensation during a system failure or start-up.
The sensors are also highly resistant to particulate contamination, oil vapor, and most chemicals, and insensitive to the flow rate.

Long calibration interval

The calibration interval of DMT143L is two years. For any adjustment needs, the transmitter can be sent to a Vaisala Service Center.

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

Easy installation

DMT143L has a variety of features to choose from, including different output and installation options, and alarm LED.

Due to its small size and light weight, DMT143L is quickly and easily installed in tight spaces or in small-size pipelines. The alarm LED indicates too high dew point in the process. The trigger point is preset at the factory. It can be later adjusted with the convenient Vaisala Insight PC software for Windows®.

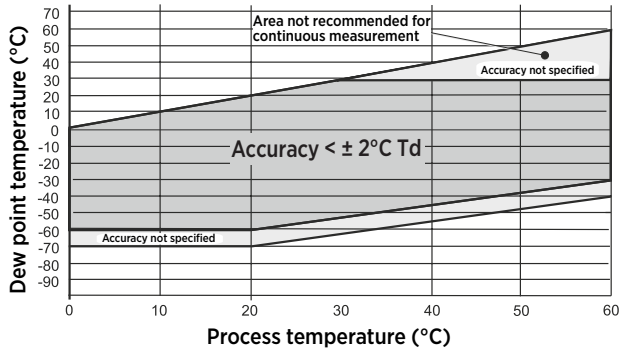
Insight PC software and the Indigo80 handheld indicator can also be used for other configuration options, as well as for viewing and logging measurement data (for more information, see www.vaisala.com/insight and www.vaisala.com/indigo).

Technical data

Measurement performance

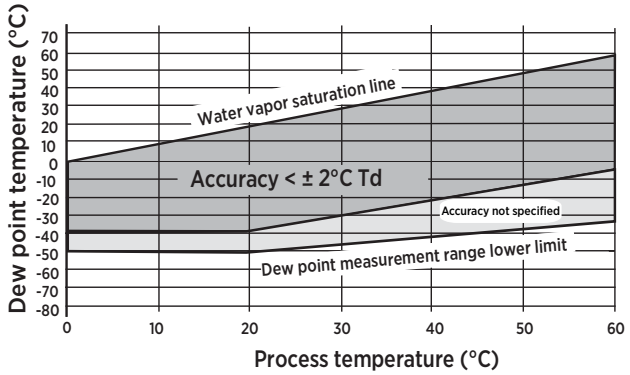
Sensors	DRYCAP® 180M DRYCAP® 180S (optimal for refrigeration dryers)
Sensor protection	Stainless steel sintered filter Stainless steel filter for vacuum
Recommended calibration interval to confirm the specified accuracy	2 years
Measurement range (typical)	−60 ... +60 °C (−76 ... +140 °F)
Different analog output scalings available. [1]	
Accuracy with DRYCAP® 180M	±2 °C (±3.6 °F) [2] (see the graph below)

1) *For more information, see the DMT143L order form.*
2) *When the dew point is below 0 °C (32 °F), the transmitter outputs frost point.*



Dew point accuracy vs. measurement conditions	
Response time 63 % [90 %] at +20 °C (+68 °F) gas temperature and 1 bar pressure and 1 liter/min flow rate:	
−60 → −20 °C T_d (−76 → −4 °F T_d)	5 s [10 s] (typical)
−20 → −60 °C T_d (−4 → −76 °F T_d)	45 s [10 min] (typical)
Accuracy with DRYCAP® 180S	±2 °C (±3.6 °F) [1] (see the graph below)

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



Compliance

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

Operating environment

Measurement environment	For air, nitrogen, hydrogen, argon, helium, and oxygen [1] [2]
Temperature	0 ... +60 °C (+32 ... +140 °F)
Higher temperature peaks	Short-term OK
Relative humidity	0 ... 100 %RH
Pressure	0 ... 20 bara (0 ... 290 psia)
Sample flow rate	No effect
Storage temperature	−40 ... +60 °C (−40 ... +140 °F)
IP rating	IP66

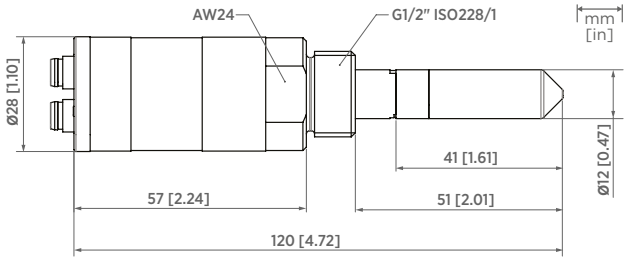
1) *Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases. The transmitter is not certified for use in hazardous areas with potentially explosive atmospheres.*
2) *The transmitter not tested for leakages, which may occur especially with small-molecule gases such as hydrogen and helium.*

Inputs and outputs

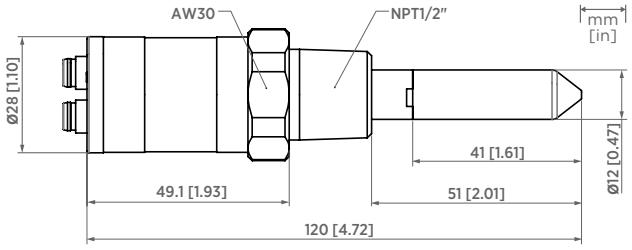
Analog current output	4 ... 20 mA (3-wire)
Digital output	RS-485, non-isolated
Supported protocols	Vaisala industrial protocol Modbus RTU
Resolution for current output	0.002 mA
Accuracy for current output at +20 °C	±0.05 mA
External load for current output	Max. 500 Ω
Operating voltage with current output	18 ... 28 V DC
Operating voltage with digital output	12 ... 28 V DC
Typical temperature dependence	0.0008 mA/°C
Power consumption at 24 V DC	Max. 220 mA

Mechanical specifications

Mechanical connection	G1/2" ISO228-1 with bonded seal ring (U-seal) or NPT1/2" thread
Housing material	Stainless steel (AISI 316L)
Weight	
G thread model	90 g (3.2 oz)
NPT thread model	100 g (3.5 oz)



DMT143L with G1/2" thread



DMT143L with NPT1/2" thread

VAISALA

DMT132 Dew Point Transmitter

For refrigerant dryers



Features

- High accuracy ±1 °C (±1.8 °F) in the measurement range of refrigerant dryers
- Excellent long-term stability - resistant to compressor oil and most other chemicals thanks to HUMICAP® technology
- Low power requirements, 10 ... 28 VDC
- Easy to verify functionality with compatible Vaisala DM70 or HM70 hand-held meters
- Optional LED warning light

Vaisala HUMICAP® Dew Point Transmitter DMT132 is an affordable dew point measurement instrument designed to verify the functionality of refrigerant dryers. It is especially well suited for OEM dryer manufacturers.

Direct Measurement Cuts Costs

Direct outlet air dew point measurement provides accurate information about dryer functionality and is more reliable than the traditional method of measuring refrigerator temperature only. Knowledge of the real dew point ensures high quality compressed air at all times and enables customers to optimize dryer capacity. This helps to prevent investment in redundant dryer capacity and avoid unnecessary maintenance and costly malfunctions.

High Accuracy and Long-Term Stability

DMT132 provides optimal performance in the operating range of refrigerant dryers. In the measurement range of -3 ... 20 °C (+26.6 ... +68 °F), where the refrigerator dryers typically operate, the T_d accuracy is ±1 °C (±1.8 °F). The instrument incorporates the proven Vaisala HUMICAP® sensor, which is resistant to compressor oil and most other chemicals, thereby providing excellent long-term stability.

Quick Installation and Easy Field Checking

It takes just a few minutes to install DMT132 directly into a dryer or compressed air line through a G1/2″ ISO thread. Vaisala sampling cells can also be used. The loop-powered electronics mean that wiring is easy and power requirements are low. DMT132 operating voltages can be as low as 10 VDC.

Verifying the performance of DMT132 is easy with the compatible Vaisala DM70 or HM70 hand-held meters. The user can perform possible adjustments with Vaisala HMK15 Humidity Calibrator.



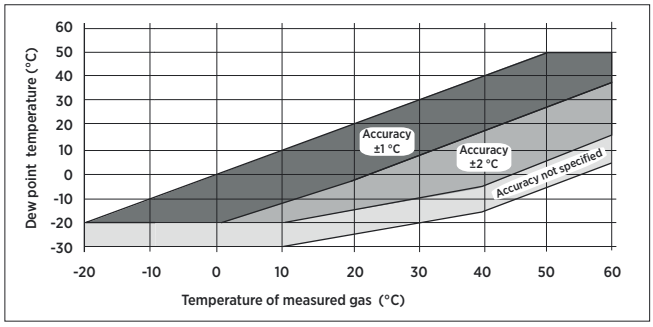
Demand for dew point sensors to verify refrigerant dryers is increasing. Direct dew point measurement enables energy savings and improved efficiency.

Technical Data

Measurement Performance

Measurement range	-30 ... +50 °C (-22 ... +122 °F) T_d
Accuracy at +20 °C (+68 °F)	±1 °C for -3 ... 20 °C (+26.6 ... +68 °F) T_d [1)] ±2 °C for -15 ... -3 °C (+5 ... +26.6 °F) T_d [1)] See accuracy graph below
Typical Response Time at 20 °C (+68 °F) Gas Temperature and 1 Bar Pressure	
-14 → +3 °C (+7 → +37 °F) T_d	17 s (63 %) 40 s (90 %)
+3 → -14 °C (+37 → +7 °F) T_d	33 s (63 %) 85 s (90 %)
Calculated Variables	
Dew point converted to atmospheric pressure	$T_{d/f}$ atm

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



Operating Environment

Operating temperature	-30 ... +50 °C (-22 ... +122 °F)
Operating pressure	0 ... 20 bar
Relative humidity	0 ... 100 %RH
Sample flow rate	No effect on measurement accuracy
Measured gases	Non-corrosive gases
EMC compliance	EN61326-1, Industrial Environment

Outputs

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

LED indication available for defined dew point limit/error state indication

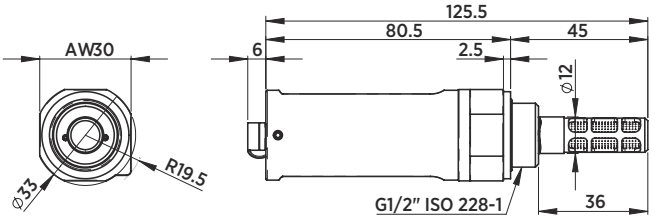
RS-485 serial line for service use

Mechanical Specifications

Sensor	Vaisala HUMICAP® 180R
Recommended calibration interval (in refrigerant dryer application)	2 years
Mechanical connection	G1/2" ISO
Operating voltage	10 .... 28 VDC
External load	Max. 100 Ω for supply voltages < 20 VDC Max. 500 Ω for supply voltages 20 ... 28 VDC
Weight	65 g (2.3 oz)
Housing material	PPS + 40 % GF
IP rating	IP65 (NEMA 4)
Storage temperature range	-40 ... +80 °C (-40 ... +176 °F)
Start-up time	3 s

Spare Parts and Accessories

Tube filter	230602
Special cover set for HMK15 (calibrator fitting DMT132 and HMP60)	230914
NPT Adapter	210662SP
Sample cells	DMT242SC, DMT242SC2, DSC74, DSC74B, DSC74C, DMCOIL
Duct installation flange	DM240FA
Cables (several lengths available)	HMP50Z032, HMP50Z300SP, HMP50Z500SP, HMP50Z1000SP
Loop powered external display	226476
USB service cable	219690
Connection cable to DM70/HM70	219980
LED plug	230388
ISO 1/2" plug	218773
NPT 1/2" plug	222507
Sealing ring set (3 pcs U-seal)	221525SP



Dimensions in mm

CE

VAISALA

CARBOCAP® sensor 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.

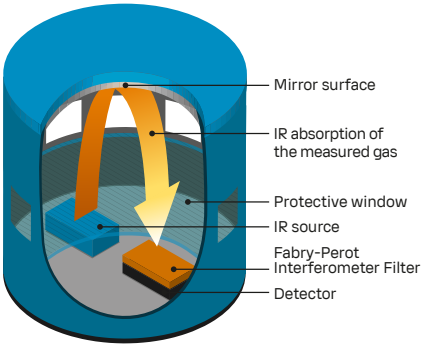
The Vaisala CARBOCAP sensor features an electrically tunable FPI filter. In addition to measuring gas absorption, the micromechanical FPI filter enables a reference measurement at a wavelength where no absorption occurs. When taking the reference measurement, the FPI filter is electrically adjusted to 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

MGP241 Multigas Probe

For carbon dioxide and humidity measurement



Features

- Continuous process monitoring for carbon capture, utilization and storage (CCUS) applications
- Direct installation into process: no moisture removal or other sample treatment needed
- Standalone probe with digital Modbus® RTU over RS-485 and 3 analog outputs (4–20 mA)
- Analog input (4–20 mA) for external temperature or pressure compensation for more accurate measurement
- Available measurement parameters: carbon dioxide (CO_2) and humidity (H_2O vapor)
- Compatible with Vaisala Insight PC software and Vaisala Indigo80, Indigo300, and Indigo520

Vaisala CARBOCAP® MGP241 Multigas Probe for Carbon Dioxide and Humidity Measurement is designed for continuous measurement of carbon dioxide (CO_2) and humidity (H_2O vapor) measurements in industrial processes, especially in carbon capture, utilization and storage (CCUS) applications. It is designed to be installed directly in the process gas pipeline, removing the need for sample treatment.

2-in-1 measurement probe

The MGP241 probe measures carbon dioxide (CO_2) and humidity (H_2O vapor) in demanding conditions. MGP241 measures carbon dioxide and humidity in vol-% or ppm by volume units, or alternatively dew point temperature (T_d) and frost point temperature (T_f). The patented CARBOCAP infrared technology enables simultaneous detection of multiple gases unlike the traditional non-dispersive infrared (NDIR) measurement technique. This allows compensation for sensor drift, sensor aging, and for any cross-interference effects between measured gases. Calibration gases are not needed for routine operation; a functional check and drift check every 12 months is recommended.

Continuous process monitoring

MGP241 measures gases directly in the process without a need for drying or other sample treatment. This simplifies the installation and minimizes the footprint of the measurement solution compared to traditional gas analyzers. The rapid measurement cycle takes only seconds, providing direct real time measurements for process control and monitoring. The CO_2 measurement can be shown either as wet basis or dry basis values. Thanks to the built in temperature and pressure compensation algorithms, and the CARBOCAP infrared technology, the measurement is stable and reliable across a wide range of process and environmental conditions.

Flexible connectivity

The MGP241 probe has 3 4–20 mA analog outputs for CO_2 and H_2O vapor concentrations and for retransmission of analog input, as well as a 4–20 mA analog input for external pressure or temperature signal used for compensation. The probe also offers Modbus RTU protocol for digital connectivity. For easy-to-use access to configuration, diagnostics, and calibration and adjustment functionalities, the MGP241 probe can be connected to Vaisala Insight PC software with a USB cable accessory, and it can also be connected to Indigo devices: Indigo80, Indigo300, and Indigo520.

Technical data

Measurement performance

Property	Carbon dioxide CO_2	Water vapor H_2O
Sensor	CARBOCAP®	CARBOCAP®
Measurement unit	Volume-%, ppm_v	Volume-%, ppm_v, dew point °C, dew point °F
Measurement range	0–100 vol-%	0–25 vol-%, −10 … +60 °C (+14 … +140 °F)
Accuracy at +25 °C (+77 °F) and 1013 mbar [1] [2]	0–90 vol-%: **±2 vol-%** 90–100 vol-%: **±1 vol-%**	0–25 vol-%: **±0.5 vol-%**
Repeatability [2]	±0.4 vol-% at 95 vol-%	±0.1 vol-% at 2.5 vol-%
Temperature dependence (typical)	Compensated, 0–100 vol-%: **±0.1 % of reading / °C**	Compensated, 0–25 vol-%: **±0.1 % of reading / °C**
	Uncompensated, 0–100 vol-%: **±0.6 % of reading / °C**	Uncompensated, 0–25 vol-%: **±0.4 % of reading / °C**
Pressure dependence (typical)	Compensated, 0–100 vol-%: **±0.015 % of reading / mbar**	Compensated, 0–25 vol-%: **±0.01 % of reading / mbar**
	Uncompensated, 0–100 vol-%: **±0.25 % of reading / mbar**	Uncompensated, 0–25 vol-%: **±0.20 % of reading / mbar**
Long-term stability	±2 vol-% / year	±2 vol-% / year
Startup time [3]	3 min	
Warm-up time [4]	30 s [5]	
Response time (T_{90})	90 s [6]	
Response time with flow-through adapter	90 s at ≥ 0.5 l/min [6] (recommended: 0.5–1 l/min)	

1) *Excluding cross-interferences to other gases.*
2) *Accuracy and repeatability specification at +25 °C (+77 °F) and 1013 mbar including non-linearity, calibration uncertainty, and repeatability; temperature and pressure compensated.*
3) *Time to first reading.*
4) *Time to specified accuracy.*
5) *At +20 °C (+68 °F) ambient temperature.*
6) *With standard PTFE filter.*

Powering

Operating voltage	19–30 V DC
Power consumption	Typical: 3 W Maximum: 6 W
Current consumption	100–300 mA

Inputs and outputs

Analog inputs	
Number of analog inputs	1
Input type	4–20 mA, isolated, for external pressure or temperature sensor [1]
Analog outputs	
Number of analog outputs	3
Output type	4–20 mA, scalable, isolated
Accuracy	±0.2 % F.S. at 25 °C
Temperature dependence	±0.005% / °C full scale
External loads	R_L: 0 Ω R_L: 500 Ω
Digital communication	
Serial communication	RS-485 (Modbus RTU)

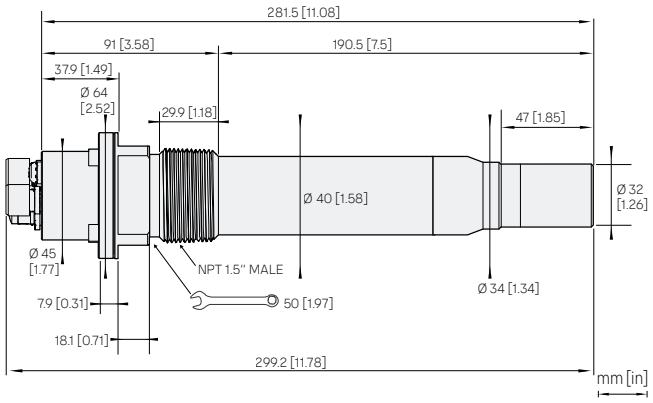
1) *The optional analog input is galvanically isolated and provides power for the connected external pressure sensor.*

Operating environment

Operating environment	Outdoor use
IP rating	IP65
Operating temperature	−40 … +60 °C (−40 … +140 °F)
Operating humidity	0–100 %RH
Operating pressure	−500 … +500 mbar (gauge)
Storage temperature	−40 … +60 °C (−40 … +140 °F)
Storage humidity	0–90 %RH
Process pressure	−500 … +500 mbar (gauge)
Process temperature	+0 … +60 °C (+32 … +140 °F)
Process flow	0–20 m/s

Mechanical specification

Weight	1.4 kg (3.09 lb)
Connectors	M12 5-pin male for digital output M12 8-pin male for analog output M12 4-pin female for analog input
Materials	
Probe body	AISI316L stainless steel, PPS
Filter cap	Sintered PTFE



MGP241 dimensions

Compatible devices

Device or series	Models
Indigo80 Handheld Indicator	Indigo80
Indigo300 Transmitter	Indigo300
Indigo500 Series Transmitters	Indigo520

Compliance

EU directives and regulations	EMC Directive (2014/30/EU) REACH Regulation (EC 1907/2006) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, FCC, ICES, RCM

Accessories and spare parts

Sintered PTFE filter (includes O-ring)	DRW249919SP
Flow-through adapter	258877
NPT 1.5 in thread test plug	257525SP
USB Service Cable M12-5F, RS-485	242659

VAISALA

GMP343 Carbon Dioxide Probe

For demanding measurements



Features

- Vaisala CARBOCAP® sensor, a silicon-based non-dispersive infrared (NDIR) sensor
- Single-beam, dual wavelength CO_2 measurement with no moving parts
- Compensation options for temperature, pressure, humidity, and oxygen
- Designed for outdoor use

Vaisala CARBOCAP® Carbon Dioxide Probe GMP343 is an accurate and rugged probe-type instrument for ecological measurements. Typical applications include CO_2 soil respiration, ambient CO_2 monitoring, plant growth chambers, and OEM applications.

Benefits

- Low power consumption and heat emission
- Compact and lightweight
- Excellent accuracy and stability

GMP343 can output both numerically filtered and raw measurement data, and it can also compensate the measurement with an internal temperature measurement and user-set relative humidity, pressure, and oxygen values.

In combination with an MI70 indicator, GMP343 provides a tool for accurate in-situ measurement. MI70 can be used as a display, communication, and data logging device.

Each GMP343 is calibrated using ±0.5 % accurate gases at 0 ppm, 200 ppm, 370 ppm, 600 ppm, 1000 ppm, 4000 ppm, and 2 %. Calibration is also done at temperature points of −30 °C (−22 °F), 0 °C (32 °F), 25 °C (77 °F), and 50 °C (122 °F).

If needed, the customer can recalibrate the instrument using the multipoint calibration (MPC) feature allowing up to 8 user-defined calibration points.

Technical data

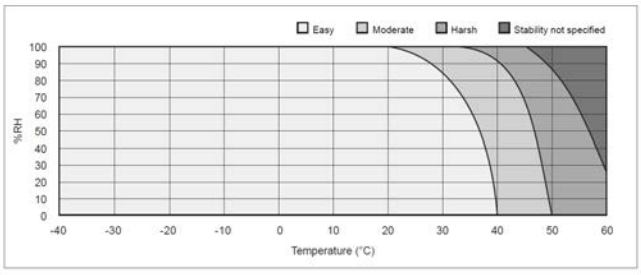
Measurement performance

Measurement range options	0 ... 1000 ppm, 0 ... 2000 ppm, 0 ... 3000 ppm, 0 ... 4000 ppm, 0 ... 5000 ppm, 0 ... 2 %
Accuracy (excluding noise) at 25 °C (77 °F) and 1013 hPa after factory calibration with 0.5 % accurate gases with different range options	
0 ... 1000 ppm	±(3 ppm + 1 % of reading)
0 ... 2000 ppm - 0 ... 2 %[1]	±(5 ppm + 2 % of reading)
Noise (repeatability) at 370 ppmCO_2	
With no output averaging	±3 ppmCO_2
With 30 s output averaging	±1 ppmCO_2
Long-term stability (see graph 'GMP343 operating conditions')	
Easy	±2 % of reading [2]/ year
Moderate	±2 % of reading [2]/ 6 months
Harsh	±2 % of reading [2]/ 3 months
Warm-up time	
To full accuracy ±0.5 %	10 min
To full accuracy	30 min

1) *Accuracy below 200 ppmCO_2 not specified for 2 % range option.*
2) *Always at least ±10 ppmCO_2.*

Effect on accuracy with temperature compensation			
CO_2 range options	0 ... 1000 ppm	0 ... 2 000 - 5000 ppm	0 ... 2 %
Temperature °C (°F)	Accuracy (% of reading)[1]		
+10 ... +40 (+50 ... +104)	±1	±1	±2
+40 ... +60 (+104 ... +140)	±2	±3	±4
−40 ... +10 (−40 ... +50)	±3	±3	±5

1) *Always at least ±10 ppmCO_2.*
Temperature compensation is performed by an integrated Pt1000 element.



GMP343 operating conditions

Effect on accuracy with pressure compensation		
CO_2 range options	0 ... 1000 ppm	0 ... 2000 - 2 %
Pressure (hPa)	Accuracy (% of reading)	
900 ... 1050	±0.5	±1
700 ... 1300	±1	±2

Integrated pressure sensor **not** included in GMP343.

Response time (90 %)

Diffusion model		
Filter attached	Averaging (s)	Response (s)
Yes	0	75
Yes	30	82
No	0	4
No	30	30
Flow-through model		
Gas flow (l/min)	Averaging (s)	Response (s)
0.3	0	26
0.3	30	44
1.2	0	8
1.2	30	23

Operating environment

Operating temperature	−40 ... +60 °C (−40 ... +140 °F)
Storage temperature	−40 ... +70 °C (−40 ... 158 °F)
Operating humidity	See graph 'GMP343 operating conditions'
Compensated pressure range	700 ... 1300 hPa
Operating pressure	< 5 bar
Gas flow for flow-through model	0 ... 10 liters/min
EMC compliance	IEC/EN 61326-1, Basic environment [1]

1) *Compliance with IEC/EN 61000-4-3: At 3 V/m RF field test within frequency range 300 ... 400 MHz may cause additional deviation of 150 ppmCO_2.*

Inputs and outputs

Operating voltage	11 ... 36 VDC
Power consumption	Without optics heating : < 1 W With optics heating : < 3.5 W
Digital outputs	RS-485, RS-232
Analog outputs	
Current output range	4 ... 20 mA
Current output resolution	14 bits
Current output maximum load	800 Ω at 24 VDC, 150 Ω at 10 VDC
Voltage output range	0 ... 2.5 V, 0 ... 5 V
Voltage output resolution	14 bits (13 bits with 0 ... 2.5 V)
Voltage output minimum load	5 kΩ

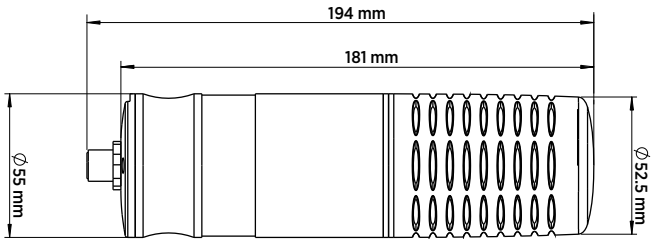
Mechanical specifications

Housing	Anodized aluminium
Filter cover	PC
Cable connector type	8-pin M12
Weight (probe only)	360 g (12.7 oz)
IP rating	
Housing (cable attached)	IP67
Diffusion filter (weather protection)	IP65
Diffusion filter (sintered PTFE)	IP66

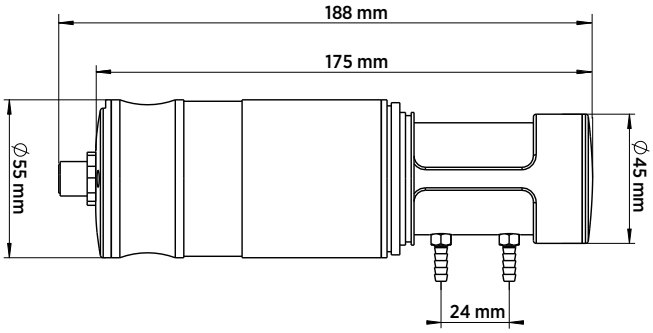
Spare parts and accessories

Wall mount bracket	GMP343BRACKET
Mounting flange	GMP343FLANGE
Standard diffusion filter (weather protection, IP65) with filter cover	GMP343FILTER
Diffusion filter (sintered PTFE filter, IP66) with filter cover	215521
Calibration adapter (for the diffusion model)	GMP343ADAPTER
Junction box	JUNCTIONBOX-8
Probe cables	
PC connection cable, 2 m (6 ft 7 in)	219687
Interface cable for MI70, 2 m (6 ft 7 in)	DRW216050SP
Soil adapter kit for horizontal positioning	215519
Soil adapter kit for vertical positioning	215520
Cable options	
2 m (6 ft 7 in)	GMP343Z200SP
6 m (19 ft 8 in)	GMP343Z600SP
10 m (32 ft 10 in)	GMP343Z1000SP

CE



GMP343 dimensions (diffusion model)



GMP343 dimensions (flow-through model)

VAISALA

GMP231 Carbon Dioxide Probe

For CO_2 incubators



Features

- Maximum temperature durability +195 °C (+383 °F)
- Incubator can be heat sterilized with probe in place, saving time and reducing risk of cross-contamination
- Heat durability and excellent long-term stability with next generation CARBOCAP® sensor
- Designed for OEM use in CO_2 incubators – installation options available
- CO_2 sensor measurement optimized for 5 % CO_2, measurement range up to 20 % CO_2
- 4-point traceable calibration for CO_2

Vaisala CARBOCAP® Carbon Dioxide Probe GMP231 withstands high temperature sterilization.

GMP231 is designed to provide incubator manufacturers with accurate and reliable carbon dioxide measurements and sterilization durability at high temperatures. The probe is based on Vaisala's patented CARBOCAP® technology and a new type of infrared (IR) light source. These technologies allow for continuous sterilization temperatures of up to 180 °C (+356 °F), enabling easier and more complete sterilization without the risk of cross-contamination. Maximum temperature durability of +195 °C (+383 °F) provides a comfortable operating margin.

The probe is installed through the incubator wall, ensuring that only the IR sensor and optical components are exposed to the incubation environment. This allows the incubator to be sterilized with the probe in place, removing the need to decontaminate the probe separately. This saves time and reduces the risk of contamination.

The probe's sensor performance is optimized at 5 %CO_2, but the sensor measures CO_2 up to 20 % with high accuracy. In addition, GMP231 can measure pressure and temperature for CO_2 measurement compensation purposes, ensuring the product remains stable and accurate in all CO_2 incubation conditions. The sensor is made of highly durable materials to achieve outstanding stability over both time and temperature.

Since water vapor, dust, and most chemicals do not affect measurements, GMP231 module is ideal for CO_2 incubator environments.

Benefits

- Internal pressure and temperature measurement improves accuracy and stability
- Full temperature and pressure compensations available
- Sensor head heating for condensation prevention

Technical Data

Measurement performance

Measurement range	0 ... 20 %CO_2
Calibration uncertainty at 5 %CO_2	±0.1 %CO_2
Start-up time	< 20 s
Warm-up time for full spec.	< 3 min
Response time	
T63	< 30 s
T90	< 50 s
Accuracy at 37 °C, 1013 hPa	
Repeatability at:	
0 ... 8 %CO_2	±0.1 %CO_2
8 ... 12 %CO_2	±0.2 %CO_2
12 ... 20 %CO_2	±0.4 %CO_2
Non-linearity at 0 ... 20 %CO_2	±0.1 %CO_2
Temperature dependence	
With compensation at 3 ... 12 %CO_2, 20 ... 60 °C	±0.1 %CO_2
Without compensation (typical)	-0.4 % of reading/°C
Pressure dependence	
With compensation at 3 ... 12 %CO_2, 700 ... 1100 hPa	±0.015 % of reading/hPa
Without compensation (typical)	+0.15 % of reading/hPa
Humidity dependence	
With compensation at 0 ... 20 %CO_2, 0 ... 100 %RH	±0.9 % of reading (at 37 °C)
Without compensation (typical)	+0.05 % of reading/%RH
O_2 dependence	
With compensation at 0 ... 20 %CO_2, 0 ... 90 %O_2	±0.6 % of reading
Without compensation (typical)	-0.08 % of reading/%O_2
Long-term stability	
0 ... 8 %CO_2	< ±0.2 %CO_2/year
8 % ... 12 %CO_2	< ±0.5 %CO_2/year
12 % ... 20 %CO_2	< ±1.0 %CO_2/year

Mechanical specifications

Connector	M12/8 pin
Weight	150 g (5.29 oz) without cable
IP rating	IP54 (sensor head) IP20 (electronics housing)
Materials	
Housing	Metal coated plastic ABS+PC
Inner tube	Aluminum
Probe tube	PPSU
Filter	PTFE
Dimensions	
Probe tube max. diameter	30.2 mm (1.19 in)
Probe tube length	118.5 mm (4.67 in)
Sensor filter length	12 mm (0.47 in)

Operating environment

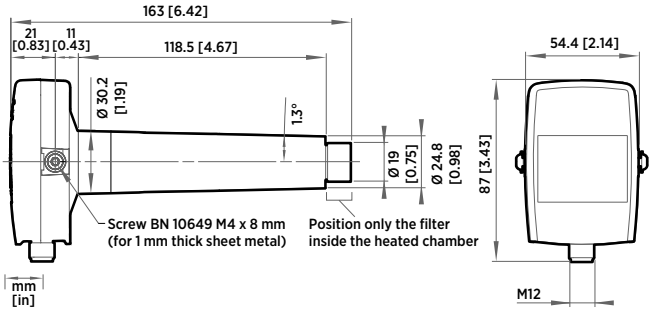
Operating temperature for CO_2 measurement	0 ... +70 °C (+32 ... +158 °F)
Max. temperature durability in standby mode (sensor head only)	Max. +195 °C (+383 °F)
Heat sterilization 180 °C durability	At least 120 cycles
Storage temperature	-40 ... +75 °C (-40 ... +167 °F)
Pressure (compensated)	500 ... 1100 hPa
Pressure (operating)	< 1500 hPa
Humidity	0 ... 100 %, non-condensing
Condensation prevention	Sensor head heating when power on
Chemical tolerance	DMSO, IPA (70 %), H_2O_2 (2000 ppm, non-condensing), ethanol, acetic acid
Electromagnetic compatibility	EN61326-1, Generic Environment

Inputs and outputs

Digital outputs	I^2C 5 V, RS-485 (2-wire with Vaisala Industrial Protocol)
Analog output	0 ... 20 mA (scalable) max. load 600 Ω
Power consumption	< 1 W (pulsed)
Operating voltage	11 ... 30 VDC 20 ... 30 VDC (with analog output)

Accessories

M12 Connection Cable 0.9 m with open ends	DRW240977SP
M12 Connection Cable 0.6 m with Milli-Grid connector	ASM210903SP
Silicone plug	DRW240015SP
Attachment bracket	DRW240247SP
PTFE filter	DRW240494SP
USB PC connection cable	221040
MI70 connection cable	221801
Calibration adapter for GMP231	239523



GMP231 dimensions

CE

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

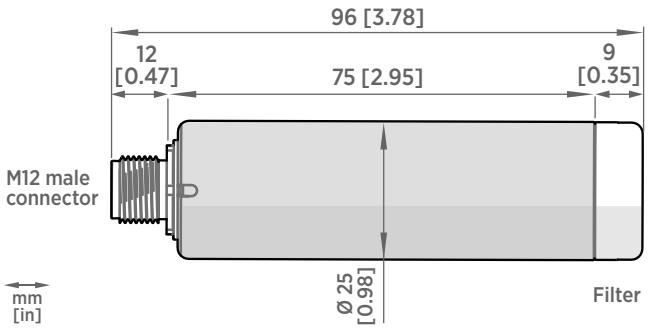
Operating environment

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) • Alcohol-based cleaning agents (for example ethanol and IPA) • Acetone • Acetic acid
Pressure	
Compensated	500–1100 hPa
Operating	< 1.5 bar
Gas flow (for flow-through option)	
Operating range	< 10 l/min
Recommended range	0.1–0.8 l/min

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

Mechanical specifications

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



GMP251 dimensions

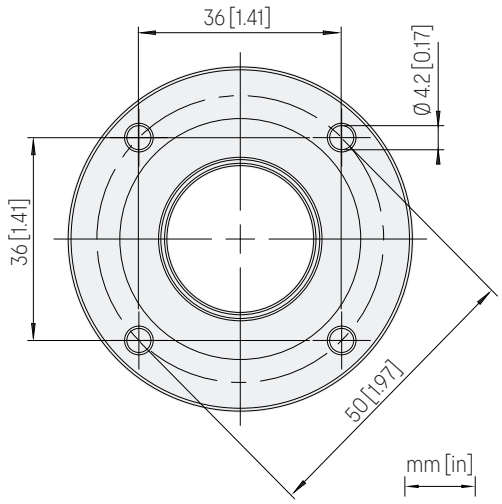
Inputs and outputs

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

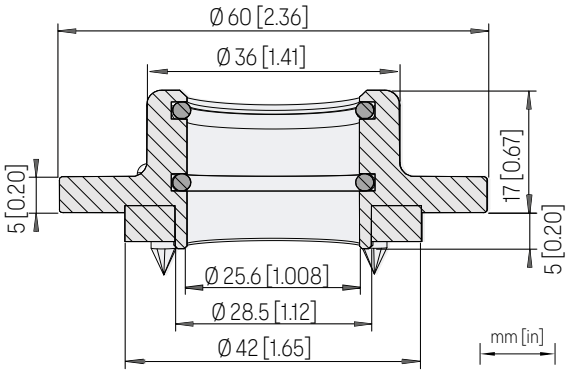
Spare parts and accessories

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

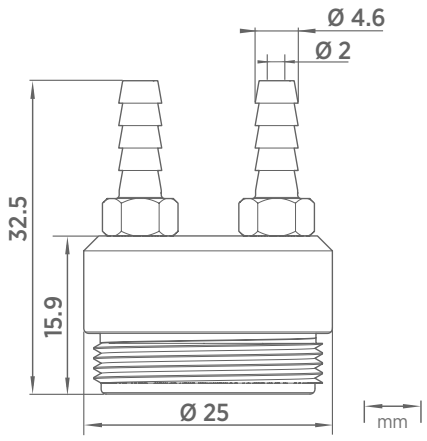
1) Vaisala Insight software for Windows available at vaisala.com/insight



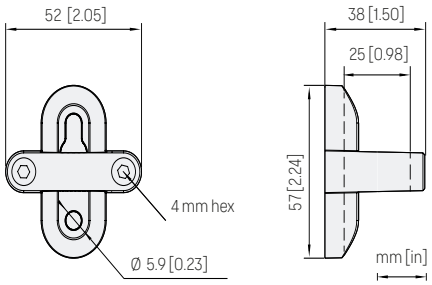
Probe mounting flange 243261SP dimensions



Probe mounting flange 243261SP dimensions, cross section



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



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

Operating environment

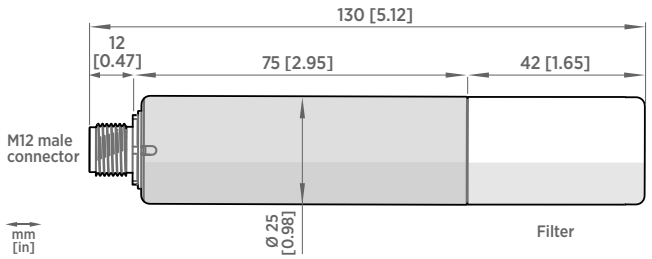
Operating temperature of CO_2 measurement	–40 … +60 °C (–40 … +140 °F)
Storage temperature	–40 … +70 °C (–40 … +158 °F)
Operating humidity	0–100 %RH, non-condensing
Condensation prevention	Sensor head heating when power on
IP rating, probe body	IP65
Chemical tolerance (temporary exposure during cleaning)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

Compliance

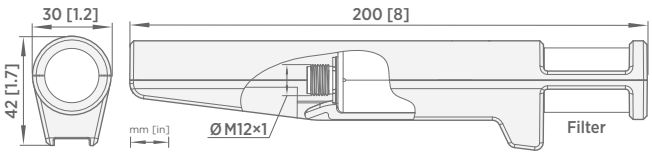
EU directives and regulations	EMC, RoHS
Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment
EMC emissions	CISPR 32 / EN 55032, Class B
Compliance marks	CE, RCM

Mechanical specifications

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



GMP252 probe dimensions

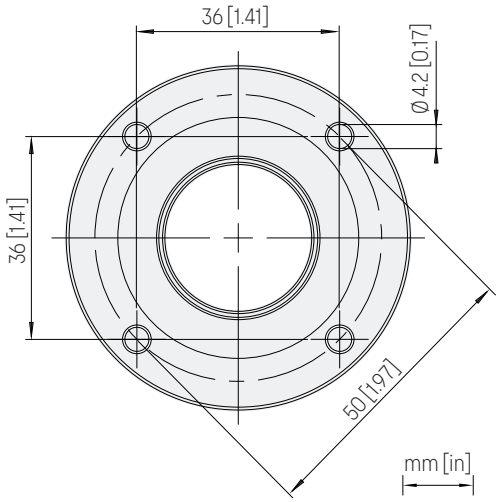


GMP252 probe handle dimensions

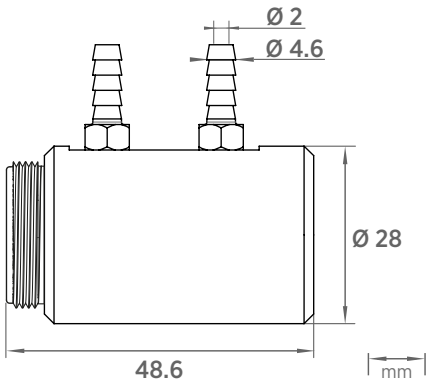
Spare parts and accessories

Porous sintered PTFE filter for GMP252	DRW244221SP
Probe connection cable with open wires (1.5 m), shielded	223263SP
Probe connection cable with open wires (1.5 m), shielded	254294SP
Probe connection cable with open wires (3 m), shielded	26719SP
Probe connection cable with open wires (10 m), shielded	216546SP
Probe connection cable with open wires and 90° plug (0.6 m), shielded	244669SP
Probe connection cable with open wires and 90° plug (1.5 m), shielded	255102
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

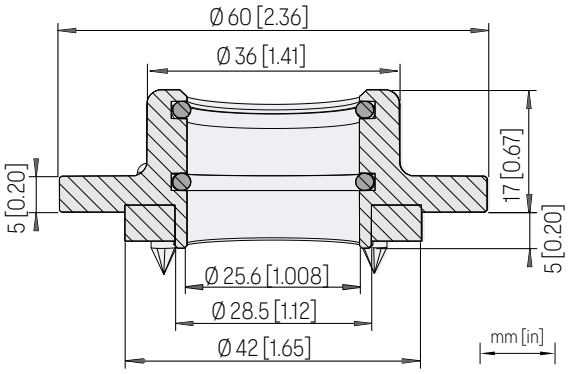
1) Vaisala Insight software for Windows is available at www.vaisala.com/insight.



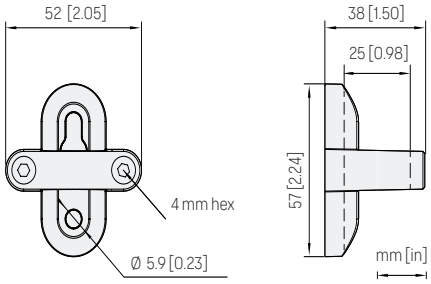
Probe mounting flange 243261SP dimensions



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

GMP80P Portable Carbon Dioxide Probe

With pump sampling



Features

- Measurement range 0–20 %CO_2
- Operating temperature range +15 … +40 °C (+59 … +104 °F)
- Easy CO_2 sampling through standard incubator sampling ports
- Stainless steel pipe and plastic tube options for sampling
- Compatible with Vaisala Indigo80 Handheld Indicator and Insight PC software
- Excellent long-term stability
- Reliable and accurate
- Calibration certificate included

Vaisala CARBOCAP® Portable Carbon Dioxide Probe with Pump Sampling GMP80P combines intelligent CO_2 measurement with pump-aspirated sampling functionality.

This robust and portable measurement device is designed for use in demanding applications, such as life science incubators, where stable, reliable, and accurate performance is required.

GMP80P is ideal for:

- CO_2 sampling from incubators
- Spot-checking fixed CO_2 transmitters
- Sampling from areas otherwise difficult to access

Ease of use with Indigo80

CO_2 measurement data can be monitored with the compact Vaisala Indigo80 Handheld Indicator connected to GMP80P. Indigo80 can be used for short-time logging of measurement data, as well as for calibrating and adjusting GMP80P.

Indigo80 has two cable ports for connecting Vaisala probes or transmitters to the indicator for measuring a wide range of parameters.

GMP80P is powered by Indigo80, which can supply power for up to two GMP80P probes.

For more information on Indigo80, see vaisala.com/indigo80.

Flexible connectivity

For easy access to field calibration, device analytics, configuration functionality, and powering, GMP80P can also be connected to a PC running Vaisala Insight PC software for Windows®. For more information on Insight, see vaisala.com/insight.

Applications

GMP80P is ideal for life science incubators and for all demanding applications where stable and accurate percentage-level measurements are needed.



Technical data

Measurement performance

Measurement range	0–20 %CO_2
Accuracy [1) 2)]	
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
Start-up, warm-up, and response time	
Start-up time at +25 °C (+77 °F)	< 10 s
Warm-up time to full specification	< 4 min
Response time (T90)	< 1 min
Other	
Sampling frequency	1 s

1) *At 25 °C (77 °F) and 1013 hPa (incl. repeatability and non-linearity).*
2) *As the gas sample dries during the sampling process, the CO_2 concentration of the dry sample will be higher than in the wet sample taken in the measurement environment. This is due to water condensing off the warm gas sample as it cools down. To determine the most accurate measurement values in your sampling environment, see GMP251 and GMP80P User Guide (M211799EN) at docs.vaisala.com for a table listing the dilution coefficients for gas samples taken at different temperatures.*

Operating environment

Operating environment	Indoor use
Operating temperature	+15 … +40 °C (+59 … +104 °F)
Storage temperature	−20 … +60 °C (−4 … +140 °F)
Operating humidity	0–95 %RH
Storage humidity	20–85 %RH
IP rating	IP4X
Flow rate of sampled/aspirated gas	0.3 l/min

Powering

Operating voltage	12–30 V DC
Power consumption	Typical: 0.7 W
	Maximum: 0.9 W
Current consumption	60 mA typical at minimum voltage

Digital communication

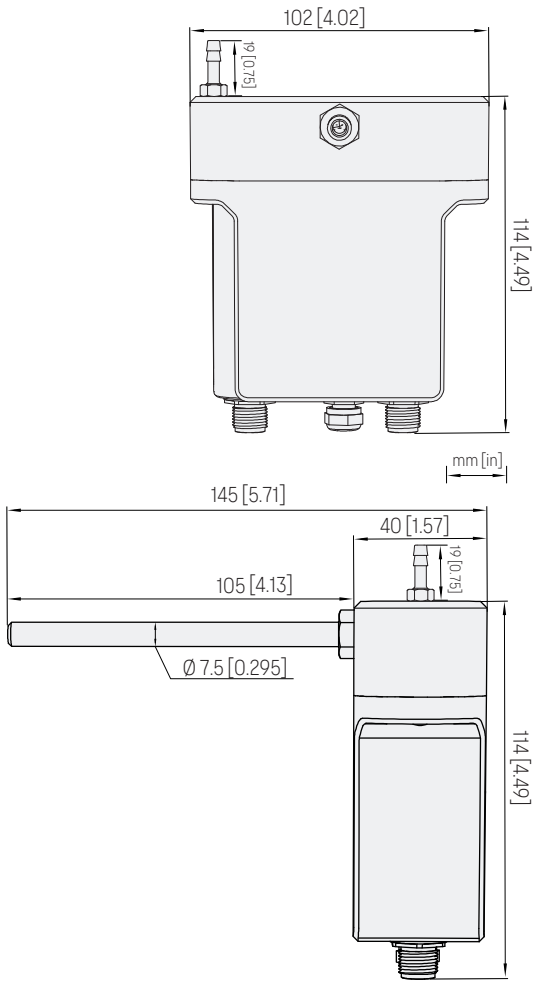
Digital output	RS-485

Compliance

EU directives and regulations	EMC Directive (2014/30/EU)
	RoHS Directive (2011/65/EU) as amended by 2015/863
	REACH Regulation (EC 1907/2006)
Electromagnetic compatibility (EMC)	EN 61326-1, basic electromagnetic environment
	FCC part 15 B, Class B
	ICES-3 / NMB-3 (Class B)
Compliance marks	CE, China RoHS, RCM

Mechanical specifications

Cable connector type	M12 5-pin A-coded male
Barbed fitting for gas outlet (optional)	For tube with ID 4 mm (approx. 5/32 in)
Dimensions (H × W × D)	
Probe body (incl. cable connectors), without sampling pipe:	114 × 102 × 40 mm (4.49 × 4.02 × 1.57 in)
Depth with sampling pipe:	145 mm (5.71 in)
Weight	410 g (14.46 oz)
Materials	
GMP80P (excluding GMP251 probe):	
Housing	Aluminum and polyamide
Sampling pipe	Stainless steel
Barbed fitting for gas outlet	Nickel-plated brass
Connectors (on the bottom)	Nickel-plated brass
GMP251 probe:	
Housing	PBT polymer
Filter	PTFE membrane, PBT polymer grid
Connector	Nickel-plated brass



GMP80P dimensions, front and side

Spare parts and accessories

GMP251 CO_2 probe	Configuration code A1C0C0N1 [1]
Cable for probes (M12-M12), 1.5 m (4 ft 11 in)	272075SP
Sampling pipe (stainless steel), 100 mm (3.94 in)	DRW259158SP
Sampling tube (Nafion™ membrane and PUR), 2.1 m (6 ft 11 in) [2]	GMTUBESP
Sampling tube (Nafion membrane), 0.6 m (1 ft 12 in)	212807SP
Sampling tube (PUR), 1.5 m (4 ft 11 in)	279471SP
Adapter for sampling tube	279473SP
Barbed fitting for gas outlet	279524SP
Magnetic hanger	ASM214318SP
Indigo USB adapter	USB2

1) See the GMP251 Order Form at docs.vaisala.com for more information.

2) Consists of a 0.6-m (1 ft 12 in) Nafion tube and a 1.5-m (4 ft 11 in) polyurethane tube.

VAISALA

GMW90 Series Carbon Dioxide, Temperature and Humidity Transmitters



Features

- Measured parameters: carbon dioxide, temperature, and humidity (optional)
- Superior long-term stability with the latest-generation Vaisala CARBOCAP® sensor
- Accurate temperature and humidity measurements due to the low-power microglow infrared source
- Quick and easy installation and maintenance
- Calibrated, user-exchangeable measurement modules
- 3-point traceable CO_2 calibration (certification included)
- Both analog and field bus communication (Modbus® RTU)

GMW90 series transmitters are available with either a display opening or a solid front. An optional traffic light indication is also available.

GMW90 Series CARBOCAP® Carbon Dioxide, Temperature and Humidity Transmitters for HVAC are based on new measurement technology for improved reliability and stability. With the new technology the transmitter's inspection interval is extended to five years.

Designed for demand controlled ventilation, GMW90 series transmitters measure carbon dioxide and temperature, with the option for humidity measurements. The instruments come with a calibration certificate that meets traceability and compliance requirements.

Reliability from unique measurement technology

GMW90 series transmitters use advanced Micro-Electro-Mechanical System (MEMS) technology for measuring carbon dioxide.
The CARBOCAP® carbon dioxide sensor's continuous reference measurement enables reliable and accurate readings and outstanding long-term stability also in buildings with round-the-clock occupancy.

The latest-generation CARBOCAP® sensor no longer uses an incandescent light bulb, which limits sensor lifetime. This unique sensor consumes very little power compared to other sensors on the market. As a result, instrument self-heating is low and humidity and temperature can be measured correctly.

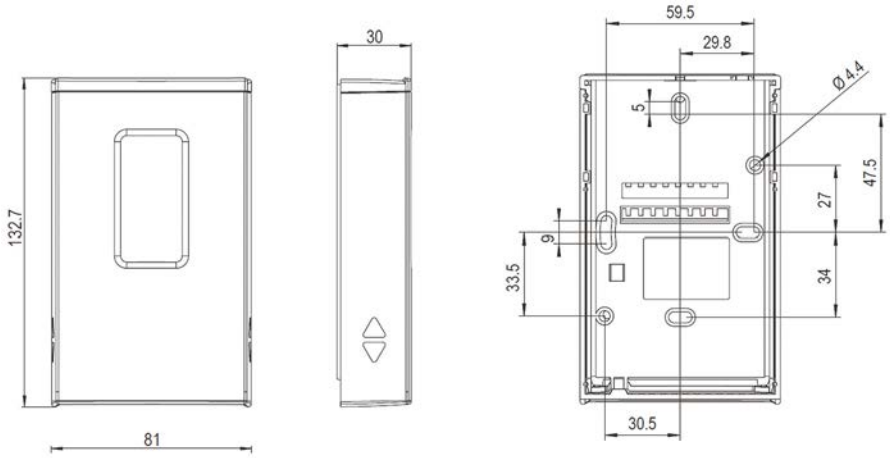
Convenient installation

GMW90 series transmitters have been designed for quick and easy installation and maintenance. Every model includes a display for easy startup and convenient maintenance. To protect the sensor from dust and dirt during construction and installation, the units can be cabled with back-plate only. Electronics can be snapped on later at an appropriate phase in the construction project. DIP switches make it quick and easy to configure the transmitters.

Easy calibration

Regular instrument maintenance guarantees a long product lifetime. Calibration is easiest done with the exchangeable measurement modules. Sensor traceability and measurement quality is easily maintained by snapping on a new module calibrated at Vaisala factory. The instrument can also be calibrated using a handheld meter or reference gas CO_2 bottle. The service interfaces are easy to reach by simply sliding the cover down. The closed cover keeps the measurement environment stable during calibration and ensures top-quality final result.

GMW90 dimensions and models



Dimensions (in mm) of GMW90 series transmitter cover (left) and mounting base (right)

Models

Model	Measurements	Output
GMW93	CO_2+T	3-wire voltage output
GMW93D	CO_2+T	3-wire voltage output, with display
GMW94	CO_2+T	3-wire current output
GMW94D	CO_2+T	3-wire current output, with display
GMW93R	CO_2+T+RH	3-wire voltage output
GMW93RD	CO_2+T+RH	3-wire voltage output, with display
GMW93RA	CO_2+T+RH	3-wire voltage output, with display and CO_2 indicator LEDs
GMW94R	CO_2+T+RH	3-wire current output
GMW94RD	CO_2+T+RH	3-wire current output, with display
GMW95	CO_2+T	Modbus RTU output
GMW95D	CO_2+T	Modbus RTU output, with display
GMW95R	CO_2+T+RH	Modbus RTU output
GMW95RD	CO_2+T+RH	Modbus RTU output, with display
GMW90	CO_2+T	Analog or Modbus RTU output (configurable)
GMW90R	CO_2+T+RH	Analog or Modbus RTU output (configurable)

Technical data

Measurement performance

Carbon dioxide	
Measurement range	0 ... 5000 ppm
Stability in typical HVAC applications	Total accuracy at room temperature ±75 ppm at 600 and 1000 ppm incl. 5 years drift
Carbon dioxide sensor	CARBOCAP® GM10
Accuracy:	
+20 ... +30 °C (+68 ... +86 °F)	±(30 ppm + 2 % of reading)
+10 ... +20 °C, +30 ... +40 °C (+50 ... +68 °F, +86 ... +104 °F)	±(35 ppm + 2.7 % of reading)
−5 ... +10 °C, +40 ... +55 °C (+23 ... +50 °F, +104 ... +131 °F)	±(45 ppm + 3.8 % of reading)
Temperature	
Measurement range	−5 ... +55 °C (+23 ... +131 °F)
Temperature sensor	Digital temperature sensor
Accuracy:	
+20 ... +30 °C (+68 ... +86 °F)	±0.5 °C (±0.9 °F)
+10 ... +20 °C, +30 ... +40 °C (+50 ... +68 °F, +86 ... +104 °F)	±0.6 °C (±1.08 °F)
−5 ... +10 °C, +40 ... +55 °C (+23 ... +50 °F, +104 ... +131 °F)	±0.8 °C (± 1.44 °F)
Relative humidity	
Measurement range	0 ... 95 %RH
Stability in typical HVAC applications	±0.5 %RH/year
Humidity sensor	HUMICAP® 180R
Accuracy at temperature range +10 ... +40 °C (+50 ... +104 °F):	
0 ... 60 %RH	±2.5 %RH
60 ... 80 %RH	±3.0 %RH
80 ... 95 %RH	±4.0 %RH
Accuracy at temperature range −5 ... +10 °C, +40 ... +55 °C (+23 ... +50 °F, +104 ... +131 °F):	
0 ... 60 %RH	±3.5 %RH
60 ... 80 %RH	±4.0 %RH
80 ... 95 %RH	±5.0 %RH

1) Complies with CEC-400-2008-001-CMF

Operating environment

Operating temperature	−5 ... +55 °C (+23 ... +131 °F)
Storage temperature	−30 ... +60 °C (−22 ... +140 °F)
Operating humidity	0 ... 95 %RH Dew point < +30 °C (+86 °F)
IP rating	IP30



Optional decorative cover blends the transmitter into your interior design.

Inputs and outputs

Supply voltage	18 ... 35 V DC, 24 V AC ± 20% 50/60 Hz
Service port	RS-485 line for temporary service use
Current output models	
Outputs	0/4 ... 20 mA, 2 and 3 channel models
Loop resistance	0 ... 600 Ω
Power consumption	< 2 W
Voltage output models	
Outputs	0 ... 5/10 V, 2 and 3 channel models
Load resistance	10 kΩ min.
Power consumption	< 1 W
Default analog scales	
CO_2	0 ... 2000 ppm
T	−5 ... +55 °C
RH	0 ... 100 %RH
Field bus models	
Power consumption	< 1.5 W
Output type	RS-485 (galvanic isolation, 1.5 kV)
RS-485 end of line termination	Enable with jumper, 120 Ω
Modbus RTU address range	0 ... 247

Mechanical specifications

Standard housing color	White (RAL9003)
Housing material	ABS/PC, UL-V0 approved
Output connector	Screw terminals Max. wire size 2 mm^2 (AWG14)
Service port connector	4-pin M8
Weight	163 g (5.75 oz)

1) RAL code is only indicative with potential small variations in color shade

Spare parts and accessories

CO_2 module	GM10SP
Temperature module (CO_2+T models)	TM10SP
Humidity and temperature module (CO_2+T+RH models)	HTM10SP
Decorative cover set (10 pcs)	236285
Connection cable for MI70	219980
USB cable for PC connection	219690
Universal AC power supply	245866

Compliance

EU directives and regulations	EMC, RoHS
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
EMC emissions	CISPR 22 / EN 55022, Class B
Compliance marks	CE, RCM

VAISALA

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



Features

- Superior stability with the advanced proprietary CARBOCAP® technology
- Improved accuracy due to low self-heating of microglow light source
- Modbus® RTU support over RS-485 with model GMW87

Vaisala CARBOCAP® Carbon Dioxide, Humidity, and Temperature Transmitter Series GMW80 is based on Vaisala's patented latest-generation CARBOCAP technology with improved reliability and stability.

The GMW80 series transmitters are designed to fulfill the needs for CO_2 measurements in standard demand-controlled ventilation applications. Temperature measurement is included in most GMW80 series transmitters. Combined with humidity measurement, relay, and LED CO_2 level indication, GMW80 series provides you the flexibility needed for a variety of projects.

The CARBOCAP sensors measure CO_2 accurately immediately when powered on. As they have a built-in reference measurement they do not need a lengthy learning phase before the measured values are correct. Proper operation can be verified immediately after snapping on the device cover.

Easy installation

With modern buildings often having hundreds of sensors, installation time per unit can be a significant cost factor. Returning to the building site to check sensor operation adds further costs.

The GMW80 series transmitters include a number of subtle design features that have been introduced to make installation and commissioning quick and easy.

The pull-out tab makes opening the transmitter faster than before, while also doubling as a quality check slip and holder for the anti-tamper screw. The backplate can be twisted onto pre-mounted screws, and the wiring can be done easily on the clearly marked backplate. The electronics can be snapped on later when the building automation system is commissioned.

For measurements in more demanding conditions (for example, dusty or humid installation locations), the GMW87 and GMW88 models provide an IP64-rated enclosure with a cable gland.

Reliable operation

The GMW80 series transmitters are optimized for low maintenance. The unique, low-power CARBOCAP technology enables a longer lifetime and better stability than ever before. As the power consumption is low, the heat generated by the electronics does not distort the temperature inside the sensor. The internal reference in the CO_2 sensor guarantees superior stability and flawless operation even in constantly occupied buildings, without the need for frequent readjustments.

The reliable operation and accurate measurement values of the GMW80 series transmitters contribute to the significant cost savings brought by demand-controlled ventilation.

Benefits

- Cost-efficient, affordable
- Reliable and maintenance-free operation for up to 15 years
- Easy to install, easy to use
- Versatile – works well in buildings occupied 24/7
- Ideal for demand-controlled ventilation

Technical data

Models

Model	Meas. parameters	Output	CO_2 range (ppm)
GMW86P	CO_2+T	Current and voltage output, Pt1000	0 ... 2000
GMW83RP [1)]	CO_2+RH+T	Voltage outputs, Pt1000	0 ... 2000
GMW83DRP [1)]	CO_2+RH+T	Voltage outputs, Pt1000, display with metric scale output	0 ... 2000
GMW83	CO_2+T	Voltage outputs	0 ... 2000
GMW83A	CO_2+T	Voltage outputs, CO_2 indicator LEDs	0 ... 2000
GMW83D	CO_2+T	Voltage outputs, display with metric scale output	0 ... 2000
GMW84	CO_2+T	Current output	0 ... 2000
GMW84S	CO_2+T	Current output, relay	0 ... 2000
GMW87	CO_2	RS-485 Modbus RTU output	0 ... 5000
GMW88	CO_2	Current and voltage output	0 ... 2000 / 0 ... 5000 [2)]

1) Models with calibration certificate available (GMW83RPC/GMW83DRPC).
2) Range user-selectable with dip switch. Default range 0 ... 5000 ppm.

Measurement performance

Carbon dioxide	
Measurement range	0 ... 2000/5000 ppm (see table *Models*)
Accuracy [1)]:	
at +20 ... +30 °C (+68 ... +86 °F)	±(30 ppm +3 % of reading)
at +10 ... +20 °C (+50 ... +68 °F) and +30 ... +40 °C (+86 ... +104 °F)	±(35 ppm +3.7 % of reading)
at +0 ... +10 °C (+32 ... +50 °F) and +40 ... +50 °C (+104 ... +122 °F)	±(40 ppm +4.8 % of reading)
Stability in typical HVAC applications	±(15 ppm + 2 % of reading) over 5 years
Warm-up time	1 min 10 min for full specification
Response time (63 %)	60 s 7 min (GMW87 and GMW88)
Carbon dioxide sensor	CARBOCAP® GM10
Temperature	
Measurement range	0 ... +50 °C (+32 ... +122 °F)
Temperature sensor	On P models: Pt1000 RTD Class F0.15 IEC 60751 For analog outputs: Digital temperature sensor
Accuracy (GMW83 and GMW84):	
at +10 ... +30 °C (+50 ... +86 °F)	±0.5 °C (0.9 °F)
at +0 ... +10 °C (+32 ... +50 °F) and +30 ... 50 °C (+86 ... +122 °F)	±1 °C (1.8 °F)
Humidity	
Measurement range	0 ... 95 %RH
Accuracy at temperature range +10 ... +30 °C (+50 ... +86 °F):	
0 ... 80 %RH	±3 %RH
80 ... 95 %RH	±5 %RH
Accuracy at temperature ranges 0 ... +10 °C (+32 ... +50 °F) and +30 ... +50 °C (+86 ... +122 °F):	
0 ... 95 %RH	±7 %RH
Stability in typical HVAC applications	±2 %RH over 2 years
Product lifetime	> 15 years

1) Accuracy applicable to 2000 ppm measurements at 1013 hPa pressure. Pressure or temperature dependencies not included in the values.

Compliance

EU directives and regulations	EMC, RoHS
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, RCM

Operating environment

Operating temperature	0 ... +50 °C (+32 ... +122 °F)
Operating humidity	0 ... 95 %RH Dew point < 30 °C (+86 °F)
Storage temperature	Models without display: −40 ... +70 °C (−40 ... +158 °F) Models with display: −30 ... +70 °C (−22 ... +158 °F)

Inputs and outputs

Supply voltage	18 ... 35 V DC 24 V AC ±20 % 50/60 Hz
Max. current consumption at 18 V DC	45 mA 70 mA (GMW84 models)
Max. power consumption at 30 V AC	0.7 W (GMW83 models) 1 W (GMW86 models, GMW87, and GMW88) 1.2 W (GMW84 models)

RS-485 interface
(in GMW87 only)
	Isolated, supports Modbus RTU protocol
	• Modbus RTU address range:
	  • 1 ... 247 (up to 255 possible, non-standard)
	• Bit rates:
	  • 4800, 9600, 19200, 38400, 57600, 76800, 115200
	• Parity:
	  • None or Even
	• Supports automatically both 1 and 2 stop bits

Outputs	4 ... 20 mA and/or 0 ... 10 V [1)]
Current loop resistance (4 ... 20 mA)	0 ... 600 Ω
Voltage output load resistance	Min. 10 kΩ
CO_2 output scale	0 ... 2000/5000 ppm
Temperature output scale	0 ... +50 °C (+32 ... +122 °F)
Humidity output scale	0 ... 100 %RH
Passive temperature sensor (P models)	Pt1000 RTD
Temperature setpoint (T models)	10 kΩ potentiometer
Relay (S models)	1 pc, SPST-NO Max. 50 V DC / 50 V AC, 500 mA
CO_2 indicator LED levels (A model)	Flashing red: > 2000 ppm Red: 1200 ... 2000 ppm Yellow: 800 ... 1200 ppm Green: < 800 ppm

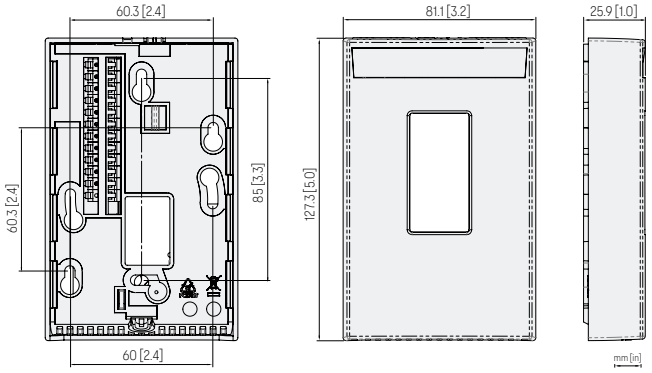
1) Analog outputs are not available in model GMW87.

Mechanical specifications

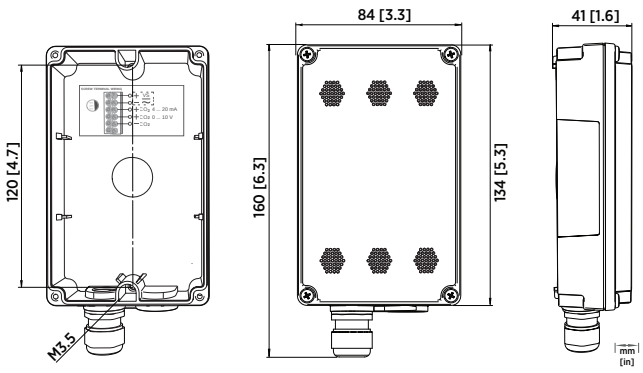
IP rating	IP30 IP64 (GMW87 and GMW88)
Housing material	ABS/PC UL-V0 approved PC (GMW87 and GMW88)
Housing color	White (RAL9003)
Output connector	Screw terminal
Max. wire size	2 mm^2 (AWG14)
Weight	Plain and LED version: 114 g (4.02 oz) Display version: 124 g (4.37 oz) GMW87 and GMW88: 160 g (5.64 oz)

Spare parts and accessories

CO_2 module	GM10SP80
INTERCAP® humidity sensor	15778HM
Universal AC power supply	245866



GMW83, GMW83A, GMW83RP, GMW84, GMW84S, GMW86P, GMW83D, and GMW83DRP dimensions (display in models with the letter D)



GMW87 and GMW88 dimensions

VAISALA

GMD110 Duct Carbon Dioxide Transmitter

For demanding ventilation applications



Features

- Designed for highly reliable CO_2 measurement in air ducts
- Vaisala CARBOCAP® sensor
- ± 40 ppm CO_2 accuracy
- Excellent long-term stability
- Analog and Modbus RTU output options
- IP65-rated housing
- Traceable calibration (certificate included)

GMD110 is a high-accuracy duct transmitter for measuring carbon dioxide in air-handling systems and ventilation ducts. The transmitter is equipped with the renowned CARBOCAP® sensor that has unique accuracy and measurement stability, which supports precise and reliable controls of HVAC systems even in demanding conditions and sites.

The transmitter belongs to Vaisala HMDW110 Transmitter Series, which include transmitters for duct mounting, IP65-rated wall transmitters, immersion temperature transmitters and outdoor transmitters with integrated radiation shields.

Highly accurate, highly reliable

The duct-mounted transmitter GMD110 is designed to measure carbon dioxide in demanding HVAC applications. With the outstanding accuracy of measurement, it is an ideal choice for demand-controlled ventilation systems even in challenging conditions.

CO_2 concentration is measured inside the duct without risks for leaks or wrong flow direction affecting the measurement. The temperature and flow dependencies of the sensor are negligible, and the measurement accuracy is not affected by dust, water vapor, or chemicals.

Stable measurement

The high quality and excellent stability of the measurement enables precise and reliable controls of HVAC systems, even in demanding conditions or sites. The transmitter is equipped with the renowned CARBOCAP® sensor that has unique capabilities in terms of precision and stability of the measurement. Its structure and reference measurement capabilities make this single-beam, dual-wavelength NDIR sensor extremely stable and reliable.

Traceable accuracy

All GMD110 transmitters are individually adjusted and delivered with a traceable (ISO9001) calibration certificate. If required later on, the transmitter can also be field-calibrated using a Vaisala handheld meter or Vaisala Insight PC software.

Technical data

Measurement performance

Measurement range	0 ... 10 000 ppm CO_2 Orderable with analog output scaled to 0 ... 2000 ppm, 0 ... 5000 ppm, or 0 ... 10 000 ppm
Accuracy [1]	
0 ... 3000 ppm CO_2	±40 ppm CO_2
3000 ... 10 000 ppm CO_2	±2 % of reading
Calibration uncertainty	
at 2000 ppm CO_2	±31 ppm CO_2 (typical)
at 10 000 ppm CO_2	±105 ppm CO_2 (typical)
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	
−10 ... +50 °C	±0.05 % of reading/°C
−40 ... +60 °C	< ±0.1 % of reading/°C
Pressure dependence	
Typical	+0.15 % of reading/hPa
Start-up, warm-up, and response time	
Start-up time at +25 °C	< 12 s
Warm-up time for full specification	< 2 min
Response time (T_{90})	< 1 min

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

Operating environment

Operating temperature	−20 ... +60 °C (−4 ... +140 °F)
Storage temperature	−40 ... +60 °C (−40 ... +140 °F)
Humidity	0 ... 95 %RH, non-condensing
Condensation prevention	Sensor head heating when power on
IP rating	IP65

Mechanical specifications

Probe diameter	25 mm (0.98 in)
Probe length	126 mm (4.96 in)
Weight	215 g (0.47 lb)
Screw terminal wire size	0.5 ... 2.5 mm^2 (AWG 24 ... 14)
Housing color	White (RAL9003)
Mounting methods	Screws or optional mounting flange 243261SP
Materials	
Probe	PBT polymer
Probe filter	PTFE
Housing	PC + 10 %GF (UL-V0 approved)

Inputs and outputs

Output parameter	Carbon dioxide (ppm)
Output modes	0/4 ... 20 mA, scalable, max. load 500 Ω 0 ... 5/10 V, scalable, min. load 10 kΩ RS-485 with Modbus RTU
Power consumption	0.5 W typical, 1.1 W max.
Supply voltage	
With current output	20 ... 30 V DC
With voltage output or RS-485	12 ... 30 V DC
Digital communication	
Interface	RS-485, non-isolated, no line termination
Default serial settings	19200 bps N 8 2
Protocol	Modbus RTU
Modbus device address	240
Service port	
Connector	M8 4-pin male
Compatibility	• Indigo80 handheld indicator [1] • MI70 handheld indicator [2] • Vaisala Insight PC software [3]

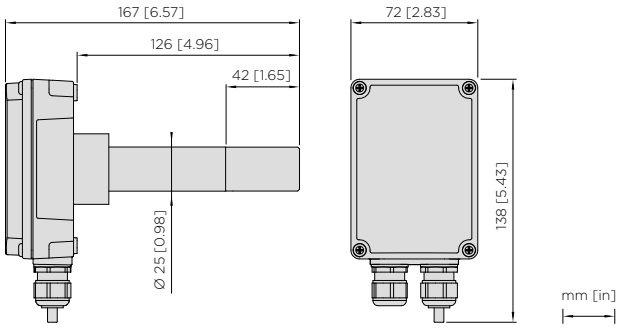
1) Requires M12-M8 cable 262195SP.
2) Requires connection cable 219980SP.
3) Requires USB adapter USB2 with M12-M8 cable 262195SP. Vaisala Insight software for Windows is available at www.vaisala.com/insight.

Compliance

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

Accessories and spare parts

Probe mounting flange	243261SP
Conduit fitting + O-ring (M16 × 1.5 / NPT1/2")	210675SP
Conduit fitting + O-ring (M16 × 1.5 / PG9, RE-MS)	210674SP
USB adapter for Insight and M12 - M8 cable	USB2 and 262195SP
Connection cable for GM70 (MI70) handheld meter	219980SP
Calibration adapter	DRW244827SP
Porous sintered PTFE filter	DRW244221SP



GMD110 dimensions

VAISALA

MGP261 Multigas Probe

For methane, carbon dioxide, and humidity measurement



Features

- Compact in situ probe with CH_4, CO_2, and H_2O vapor measurement
- Excellent long-term stability and repeatability with proprietary infrared technology — no calibration gases needed
- Direct installation into process: no sample treatment needed
- Certified for Ex Zone 0/1
- Probe heating eliminates condensation in wet processes
- Corrosion-resistant stainless steel housing (IP66)
- Standalone probe with digital Modbus RTU over RS-485 or 3 analog outputs (4–20 mA)
- Compatible with Vaisala Insight PC software

Vaisala CARBOCAP® MGP261 Multigas Probe for Methane, Carbon Dioxide, and Humidity Measurement is designed for in situ measurements in demanding biogas processing conditions where repeatable, stable, and accurate measurement is essential. MGP261 is Ex-certified for use in Ex Zone 0 (parts inserted into process) and Ex Zone 1 (parts outside the process). The probe belongs to the Vaisala MGP260 series product family.

Up to three measurements in one compact unit

MGP261 measures the main components of biogas and landfill gas: methane (CH_4), carbon dioxide (CO_2), and humidity. These gases make up the bulk of biogas, and measuring all three parameters gives you a 100 % picture of the process. MGP261 measures CH_4, CO_2, and humidity in vol-% units, or alternatively dewpoint temperature (T_d) in degrees Celsius.

Methane measurement for biogas quality and process control

Methane concentration measurement tells you the calorific value of the gas produced in real time. With internal temperature measurement for compensation purposes and an option for external pressure or temperature compensation input, the patented CARBOCAP® measurement gives unparalleled stability and reliability without calibration gases. Application areas include anaerobic digestion and landfill gas monitoring, activated carbon filter monitoring in biogas treatment process, and CHP engine feed gas monitoring.

Direct in situ measurement without sample treatment

MGP261 measures gases directly in the process pipeline without a need for moisture removal. This simplifies the measurement both in situ and as part of an extractive system with optional flow through cell accessory. The heated optical elements provide reliable measurements even in most demanding process conditions with condensate in the process gas.

MGP261 is Ex-certified for use in Ex Zone 0 (parts inserted into process) and Ex Zone 1 (parts outside the process). The electronics and optics of the IP66-rated instrument are protected by encapsulation in a potting compound to ensure maximum resistance to weather, dust, and ingress of process gases in the probe. Materials exposed to process gas are carefully selected for good chemical resistance against hydrogen sulfide: they include stainless 316L steel and polytetrafluoroethylene (PTFE).

Technical data

Measurement performance

Property	Methane CH_4	Carbon dioxide CO_2	Water vapor H_2O
Sensor	CARBOCAP®	CARBOCAP®	CARBOCAP®
Measurement unit	Volume-%	Volume-%	Volume-%, dew point °C
Measurement range	0–100 vol-%	0–100 vol-%	0–25 vol-%, −10 … +60 °C (14 … +140 °F)
Accuracy at +25 °C (+77 °F) and 1013 hPa [1] [2]	• 0–40 vol-%: **±2 vol-%** • 40–70 vol-%: **±1 vol-%** • 70–100 vol-%: **±2 vol-%**	• 0–30 vol-%: **±2 vol-%** • 30–50 vol-%: **±1 vol-%** • 50–100 vol-%: **±2 vol-%**	0–25 vol-%: **±0.5 vol-%**
Repeatability [2]	±0.5 vol-% at 60 vol-%	±0.3 vol-% at 40 vol-%	±0.1 vol-% at 2.5 vol-%
Temperature dependence, compensated	Compensated, 0–100 vol-%: ±0.1 % of reading/°C	Compensated, 0–100 vol-%: ±0.1 % of reading/°C	Compensated, 0–25 vol-%: ±0.1 % of reading/°C
Temperature dependence, uncompensated	Uncompensated, 0–100 vol-%: -0.9 % of reading/°C	Uncompensated, 0–100 vol-%: -0.9 % of reading/°C	Uncompensated, 0–25 vol-%: -0.4 % of reading/°C
Pressure dependence, compensated	Compensated, 0–100 vol-%: ±0.015 % of reading/hPa	Compensated, 0–100 vol-%: ±0.01 % of reading/hPa	Compensated, 0–25 vol-%: ±0.06 % of reading/hPa
Pressure dependence, uncompensated	Uncompensated, 0–100 vol-%: +0.2 % of reading/hPa	Uncompensated, 0–100 vol-%: +0.2 % of reading/hPa	Uncompensated, 0–25 vol-%: +0.2 % of reading/hPa
Long-term stability	±2 vol-%/year	±2 vol-%/year	±2 vol-%/year
Start-up time [3]			30 s
Warm-up time [4]			2 min [5]
Response time (T_{90})			90 s [6]
Response time with flow-through adapter			90 s at ≥ 0.5 l/min [6] (recommended: 0.5–1 l/min)

1) *Excluding cross-interferences to other gases.*
2) *Accuracy specification at 25 °C (+77 °F) and 1013 hPa including non-linearity, calibration uncertainty, and repeatability; temperature and pressure compensated.*
3) *Time to first reading*
4) *Time to specified accuracy*
5) *At +20 °C (+68 °F) ambient temperature*
6) *With standard PTFE filter*

Inputs and outputs

Operating voltage	18–30 V DC
Power consumption	Typical: 3 W Maximum: 6 W
Digital output	RS-485 (Modbus RTU)
Analog output	3 × 4–20 mA scalable, isolated
Analog output load	Minimum: 0 Ω Maximum: 500 Ω
Analog output accuracy	±0.2 % of full scale at 25 °C (77 °F)
Analog output temperature dependence	0.005 %/°C (0.003 %/°F) full scale
Analog input (optional)	1 × 4–20 mA (Ex ia) for external pressure or temperature sensor [1]

1) *The optional analog input is galvanically isolated and provides power for the connected external pressure sensor.*

Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, RCM
Ex approval marks	EU (ATEX), international (IECEx), US/CAN (cMETus), Japan (CML), UK(UKEX), Korea (KCs) [1]
Ex classification	Ex II 1/2 (1) G Ex eb mb [ia] IIB T3 Ga/Gb -40 °C ≤ Tamb ≤ +60 °C Class I, Division 2, Groups C, D; T3

1) *See product documentation for full Ex classifications for each region.*

Operating environment

Operating temperature range	−40 … +60 °C (−40 … +140 °F)
Operating humidity range	0–100 %RH
Storage temperature range	−40 … +60 °C (−40 … +140 °F)
Storage humidity range	0–90 %RH
Process pressure range	−500 … +500 hPa
Process temperature range	+0 … +60 °C (+32 … +140 °F)
Process flow range	0–20 m/s

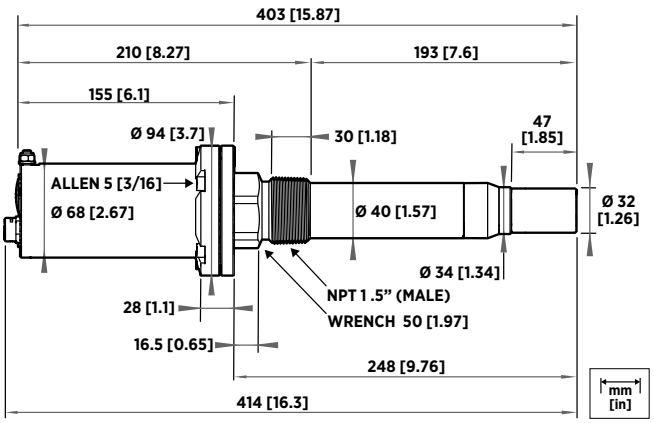
Mechanical specification

Weight	3 kg (6.6 lb)
Thread type	1.5″ male NPT
Mechanical pressure tolerance	20 bar(g)
Cable lead-throughs	1 × M16×1.5 2 × M20×1.5
IP rating	IP66
Materials	
Probe body	AISI316L stainless steel, PPS
Filter cap	Sintered PTFE

Options and accessories

Configuration cable (RS-485/USB) [1]	257295
Flow-through adapter	258877
Sintered PTFE filter (includes O-ring)	DRW249919SP
NPT 1.5″ thread test plug	257525SP

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



MGP261 dimensions

VAISALA

MGP262 Multigas Probe

For low concentration methane and high concentration carbon dioxide measurement



Features

- Compact in situ probe with low-% CH_4 and high-% CO_2 measurement
- Excellent long-term stability and repeatability with proprietary infrared technology — no calibration gases needed
- Direct installation into process: no sample treatment needed
- Certified for Ex Zone 0/1
- Probe heating eliminates condensation in wet processes
- Corrosion-resistant stainless steel housing (IP66)
- Standalone probe with digital Modbus RTU over RS-485 or 3 analog outputs (4–20 mA)
- Compatible with Vaisala Insight PC software

Vaisala CARBOCAP® MGP262 Multigas Probe for Methane and Carbon Dioxide Measurement is designed for demanding in situ measurement of the offgas in the biogas upgrading process, where low concentrations of methane need to be measured reliably and with high accuracy in the presence of high concentrations of carbon dioxide. The probe belongs to the Vaisala MGP260 series product family.

Direct view to process performance

MGP262 measures the concentrations of the main components in the offgas stream of a biogas upgrading process: methane and carbon dioxide. The methane concentration in the offgas is one of the direct indicators of the process performance. The lower the offgas methane concentration, the lower the methane loss, hence higher yield from the biogas and the smaller the environmental impact. Monitoring offgas composition reliably and accurately enables optimizing the upgrading process as well as determining the amount of greenhouse gases emitted from the process for environmental compliance purposes.

Outstanding methane measurement performance

MGP262 has been optimized for measuring methane concentrations below 5 vol-% with an accuracy of ±0.15 vol-%. Combined with a wide temperature range (-40 to +60 °C), MGP262 is ideal for a wide range of upgrading technologies and processes.

Ease of use

MGP262 is unique in being an in situ probe for demanding explosive environments. No sampling system is needed and there are no moving parts in the probe. Apart from an annual calibration check, MGP262 does not need any consumables or calibration gas cylinders, which makes its maintenance very easy.

Robust, weatherproof, and Ex-certified for Zones 0 and 1

MGP262 is internationally certified for Zone 0 inside the pipeline and Zone 1 on the outside, allowing installation in any Ex hazardous environment expected in the biogas and natural gas industry. The probe is IP66-rated and specified for ambient temperatures from -40 to +60°C for outdoor installation in harsh environments. Stainless-steel construction, hermetic sealing of optics, and encapsulated electronics provide the probe with maximum robustness and resilience to mechanical shocks, vibration, and corrosive chemicals.

Technical data

Measurement performance

Property	Methane CH_4	Carbon dioxide CO_2
Sensor	CARBOCAP®	CARBOCAP®
Measurement unit		Volume-%
Measurement range	0–5 vol-%	0–100 vol-%
Accuracy at +25 °C (+77 °F) and 1013 hPa [1) 2)]	0–2 vol-%: **±0.1 vol-%CH_4** 2–5 vol-%: **±5% of reading**	90–100 vol-%: **±1 vol-%** 0–90 vol-%: **±2 vol-%**
Repeatability [2)]	< ±0.1 vol-% at 1% CH_4	±0.4 vol-% at 95 vol-%
Temperature dependence (typical)	Compensated: 0–2 vol-%: **±0.05%CH_4** 2–5 vol-%: **±0.2%CH_4**	Compensated, 0–100 vol-%: **±0.4 vol-%**
	Uncompensated: **±0.7 % of reading / °C**	Uncompensated, 0–100 vol-%: **±0.1 % of reading / °C**
Pressure dependence (typical)	Compensated: 0–2 vol-%: **±0.05%CH_4** 2–5 vol-%: **±0.1%CH_4**	Compensated, 0–100 vol-%: **±1 vol-%CO_2**
	Uncompensated: **±0.2 % of reading / hPa**	Uncompensated, 0–100 vol-%: **±0.15 % of reading / hPa**
Long-term stability	0–2 vol-%: **±0.1 vol-%CH_4 / year** 2–5 vol-%: **±5% of reading / year**	±2 vol-%/year
Start-up time [3)]		30 s
Warm-up time [4)]		2 min [5)]
Response time (T_{90})		90 s [6)]
Response time with flow-through adapter		90 s at ≥ 0.5 l/min [6)] (recommended: 0.5–1 l/min)

1) *Excluding cross-references to other gases.*
2) *Accuracy specification at 25 °C (+77 °F) and 1013 hPa including non-linearity, calibration uncertainty, and repeatability; temperature and pressure compensated.*
3) *Time to first reading.*
4) *Time to specified accuracy.*
5) *At +20 °C (+68 °F) ambient temperature.*
6) *With standard PTFE filter.*

Operating environment

Operating temperature range	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity range	0–100 %RH
Storage temperature range	-40 ... +60 °C (-40 ... +140 °F)
Storage humidity range	0–90 %RH
Process pressure range	-500 ... +500 hPa
Process temperature range	+0 ... +60 °C (+32 ... +140 °F)
Process flow range	0–20 m/s

Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Compliance marks	CE, China RoHS, RCM
Ex approval marks	EU (ATEX), international (IECEx), US/CAN (cMETus), Japan (CML), UK (UKEX), Korea (KCs) [1)]
Ex classification	Ex II 1/2 (1) G Ex eb mb [ia] IIB T3 Ga/Gb -40 °C ≤ Tamb ≤ +60 °C
	Class I, Division 2, Groups C, D; T3

1) *See product documentation for full Ex classifications for each region.*

Inputs and outputs

Operating voltage	18–30 V DC
Power consumption	Typical: 3 W Maximum: 6 W
Digital output	RS-485 (Modbus RTU)
Analog output	3 × 4–20 mA scalable, isolated
Analog output load	Minimum: 0 Ω Maximum: 500 Ω
Analog output accuracy	±0.2 % of full scale at 25 °C (77 °F)
Analog output temperature dependence	0.005 %/°C (0.003 %/°F) full scale
Analog input (recommended)	1 × 4–20 mA (Ex ia) for external pressure or temperature sensor [1)]

1) *The optional analog input is galvanically isolated and provides power for the connected external pressure sensor.*

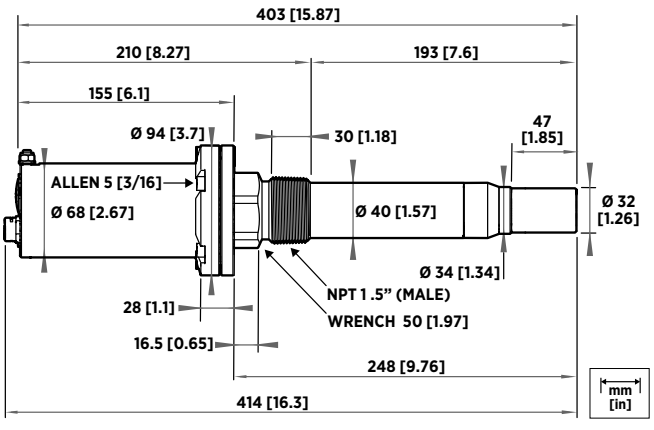
Mechanical specification

Weight	3 kg (6.6 lb)
Thread type	1.5" male NPT
Mechanical pressure tolerance	20 bar(g)
Cable lead-throughs	1 × M16x1.5 2 × M20x1.5
IP rating	IP66
Materials	
Probe body	AISI316L stainless steel, PPS
Filter cap	Sintered PTFE

Options and accessories

Configuration cable (RS485/USB) [1)]	257295
Flow-through adapter	258877
Sintered PTFE filter (includes O-ring)	DRW249919SP
MGP260 Series Ex e connector set	265897
NPT 1.5" thread test plug	257525SP

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

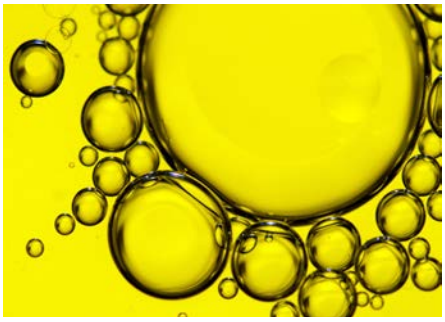


MGP262 dimensions

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.

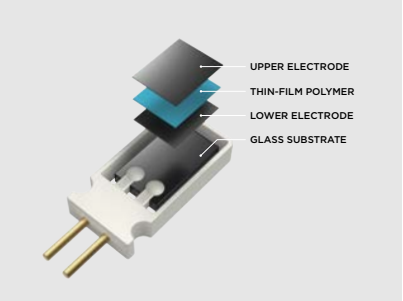
Oil molecules or additives do not penetrate the electrode. Thus the sensor output is independent of the oil type.

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.

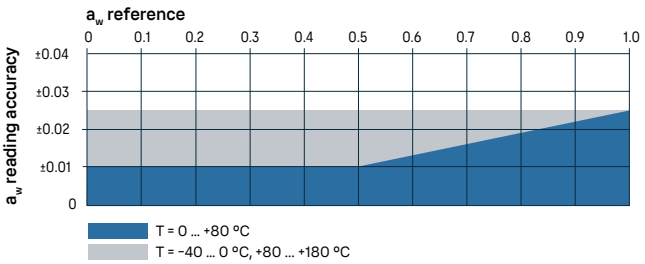
For more information on Indigo family products and Insight PC software that can be used with the probe, see www.vaisala.com/insight and www.vaisala.com/indigo.

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) Temperature (°C) Water activity Water concentration in oil (ppm_w)

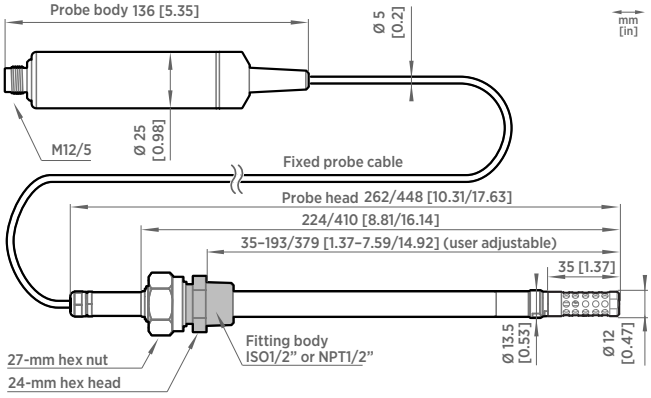
Mechanical specifications

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

Compliance

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

MMT310 Series Moisture and Temperature Transmitters for Oil



Features

- Continuous measurement of moisture in oil
- Proven Vaisala HUMICAP® sensor, over 15 years in oil applications
- Measurements in lubrication, hydraulic and transformer oils
- Excellent pressure and temperature tolerance
- Measuring water activity - ppm calculation for transformer oil
- Small size, easy to integrate
- Traceable calibration for measurement and analog outputs (certificates included)
- Applications: e.g. monitoring of transformer oil and of lubrication systems in marine and paper industry

Vaisala HUMICAP® Moisture and Temperature Transmitter Series for Oil MMT310 is a fast and reliable online detector for moisture in oil.

Reliable Vaisala HUMICAP® Technology

The MMT310 series incorporates the latest generation of the Vaisala HUMICAP® sensor, developed for demanding moisture measurement in liquid hydrocarbons. The sensor's excellent chemical tolerance provides accurate and reliable measurement over the wide measurement range.

Measuring Water Activity

MMT310 measures moisture in oil in terms of the water activity (a_w) and temperature (T). Water activity indicates directly whether there is a risk of free-water formation. The measurement is independent of oil type, age, and temperature.

Water Content as PPM Calculation for Transformer Oils

PPM units are traditionally used in transformer applications. They indicate the average mass concentration of water in oil. The ppm calculation for mineral oil based transformer oil is optional in the MMT310 series.

Diverse Applications and Demanding Conditions

MMT310 can be used in lubrication and hydraulic systems as well as in transformers. It can be used for on-line moisture monitoring and as a control function, allowing separators and oil purifiers to be started only when necessary.

Installation Options

MMT310 has two adjustable probe lengths. The transmitter can be ordered with a ball-valve set that enables the insertion and removal of the moisture probe for calibration, without the need to empty the oil system.

MMT317 has a small pressuretight probe with optional Swagelok fittings.

An optional rain shield is available for outdoor installations.

Several Outputs, One Connector

MMT310 transmitters have two analog outputs and an RS-232 serial output. The output signals and the supply power travel in the same cable, the only cable connected to the unit.

Technical Data

Measurement Performance

Water Activity	
Measurement range a_w (%RS)	0 ... 1 (0 ... 100 %)
Accuracy (Including Non-Linearity, Hysteresis, and Repeatability):	
0 ... 0.9 (0 ... 90 %)	±0.02
0.9 ... 1.0	±0.03
Response time (90 %) at +20 °C in still oil (with stainless steel filter)	10 min
Sensor	Vaisala HUMICAP® 180L2
Temperature	
Measurement range	-40 ... +180 °C (-40 ... +356 °F)
Typical accuracy at +20 °C (68 °F)	±0.2 °C (±0.36 °F)
Sensor	Pt100 RTD Class F0.1 IEC 60751

Mechanical Specifications

IP rating	IP66
Weight example: MMT317 with 2 m cable (Weight depends on selected probe and cable)	476 g
Cable feed through alternatives	8-pole connector with 5 m cable Female 8-pin connector screw joint for cable diameter 4 ... 8 mm
Sensor protection	Stainless steel grid standard filter Stainless steel grid filter for high flow rates (> 1 m/s)
Materials	
Transmitter housing	G-AlSi 10 Mg
Transmitter base	PPS
Probe Cable Length	
MMT317	2 m, 5 m, or 10 m
MMT318	2 m, 5 m, or 10 m
Probe installation MMT317	
Swagelok®	NPT 1/2", ISO 3/8" or ISO 1/2"
Probe installation MMT318	
Fitting bodies	ISO 1/2", NPT 1/2"

Spare Parts and Accessories

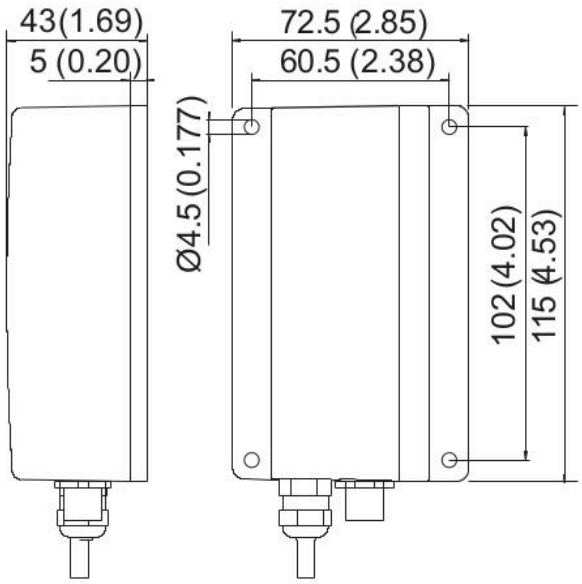
Rain shield	ASM211103
USB cable	238607
Stainless steel filter	HM47453SP
Stainless steel filter (high flow rate)	220752SP
Ball-Valve Set	BALLVALVE-1

Operating Environment

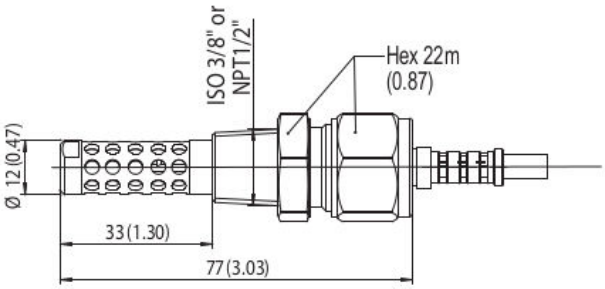
Operating temperature for electronics	-40 ... +60 °C (-40 ... +140 °F)
Storage temperature	-55 ... +80 °C (-67 ... +176 °F)
Pressure range for MMT318 with ball-valve up to 120 °C	0 ... 40 bar
Pressure range for MMT317	0 ... 10 bar
EMC compliance	EN61326-1, Industrial environment

Inputs and Outputs

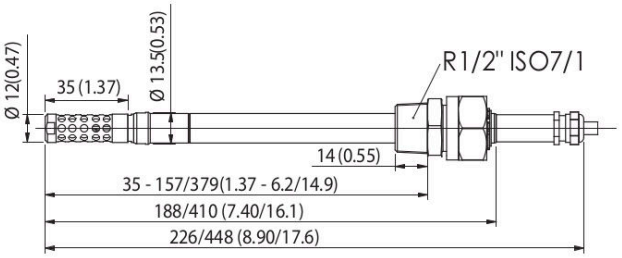
Two analog outputs, selectable and scalable	0 ... 20 mA or 4 ... 20 mA 0 ... 5 V or 0 ... 10 V 1 ... 5 V available through scaling
Typical accuracy of analog output at +20 °C	±0.05 % full scale
Typical temperature dependence of analog output	0.005 %/°C (0.003 %/°F) full scale
Serial output	RS-232C
Connections	8-pole connector with RS232C, current/ voltage outputs (two channels) and U_{in}
Operating voltage	10 ... 35 VDC
External load	R_L < 500 Ω
Startup time after power-up	3 s
Minimum Operating Voltage	
RS232C output	10 VDC
Analog output	15 VDC
Pressures above 10 bara (145 psia)	24 VDC
Power Consumption	
RS232C	12 mA
U_{out} 10 V (10 kΩ) Channel 1 & channel 2	12 mA
I_{out} 20 mA (load 511 Ω) Channel 1 & channel 2	50 mA



Transmitter body, dimensions in mm (inches)



MMT317 probe, dimensions in mm (inches)



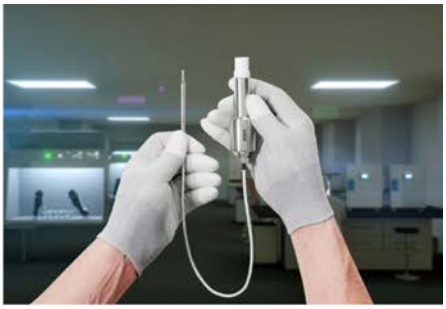
MMT318 probe, dimensions in mm (inches)

VAISALA

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







PEROXCAP's unique benefits

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

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

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

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

Intelligent PEROXCAP measurement technology

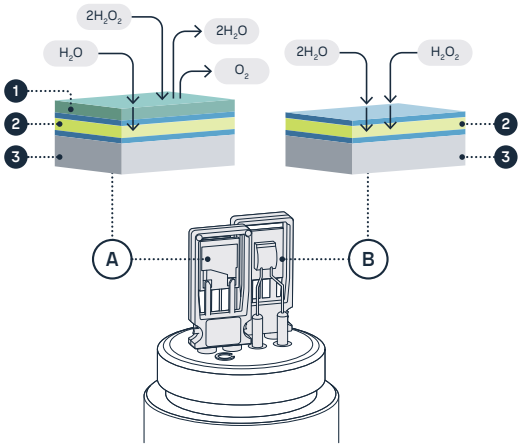
One unique feature of PEROXCAP is that it provides the critical **relative saturation** value. Water (H_2O) and hydrogen peroxide (H_2O_2) have similar molecular structures, however, while relative humidity (RH) indicates the level of water vapor in the air at a given temperature, relative saturation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

Multiple measurements for comprehensive bio-decontamination monitoring

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

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

Operating principle of PEROXCAP measurement



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

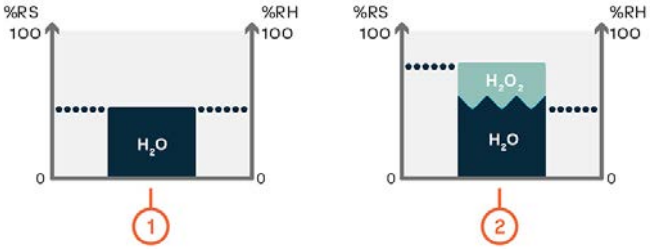
B HUMICAP sensor without a catalytic layer under the probe filter. This sensor senses the air mixture with both hydrogen peroxide vapor and water vapor.

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

2 Thin-film polymer between two electrodes.

3 Alumina substrate.

PEROXCAP'S critical difference: relative saturation



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

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

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

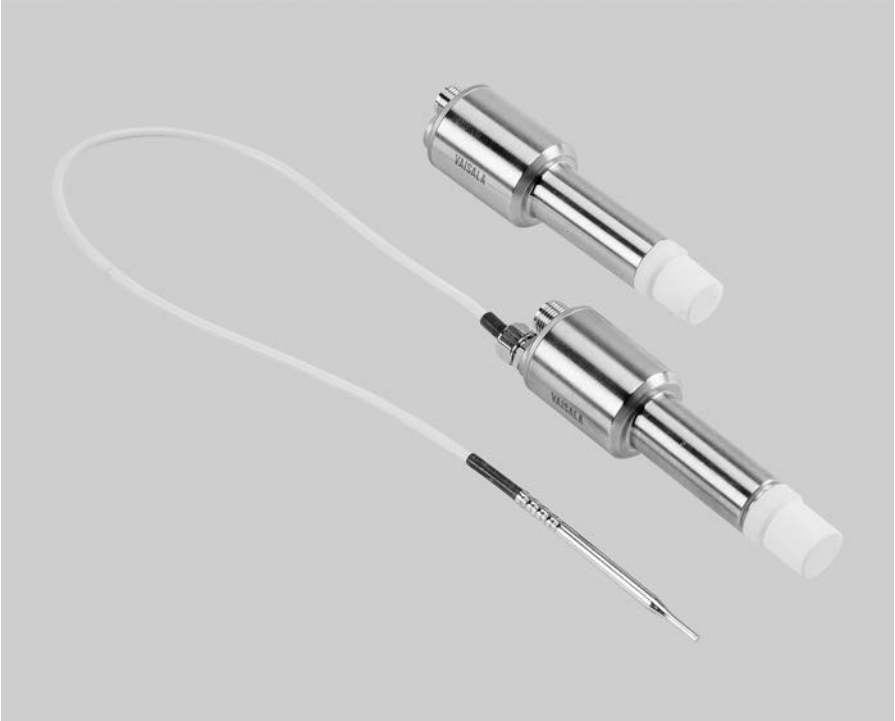
Traceable H_2O_2 factory calibration

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

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 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

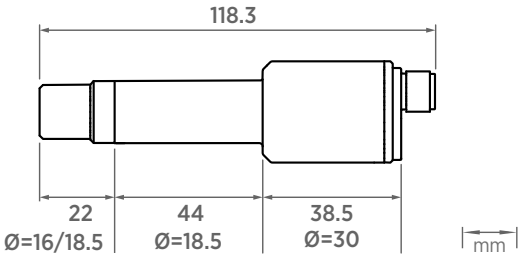
Operating temperature	+0 ... +70 °C (+32 ... +158 °F)
Storage temperature	−20 ... +70 °C (−4 ... +158 °F)
Ambient pressure	Normal atmospheric pressure
IP rating	IP65

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 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

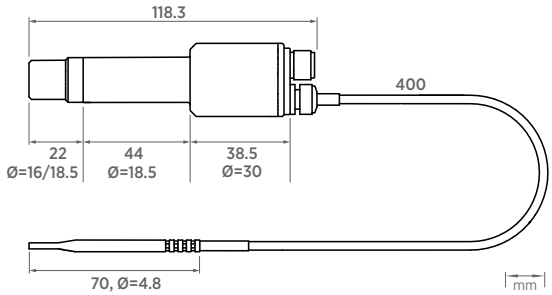
Operating temperature	+0 ... +70 °C (+32 ... +158 °F)
Storage temperature	−20 ... +70 °C (−4 ... +158 °F)
Ambient pressure	Normal atmospheric pressure
IP rating	IP65

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

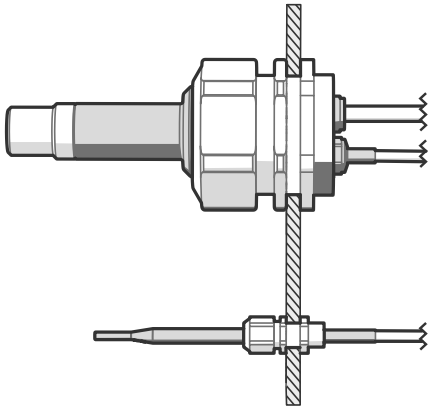
Spare parts and accessories

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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

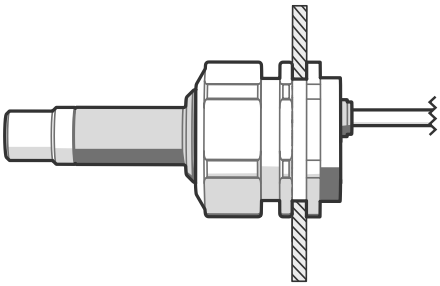
1) Vaisala Insight software for Windows available at www.vaisala.com/insight.

HPP271 and HPP272 installation accessories

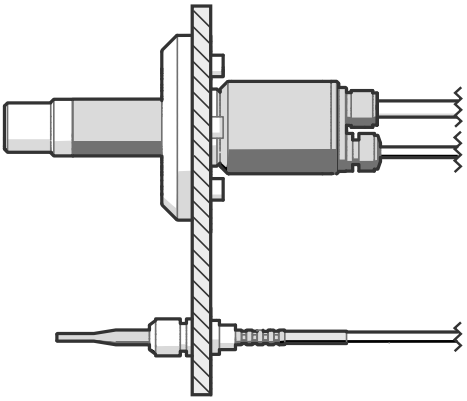
HPP272MOUNTINGSET1



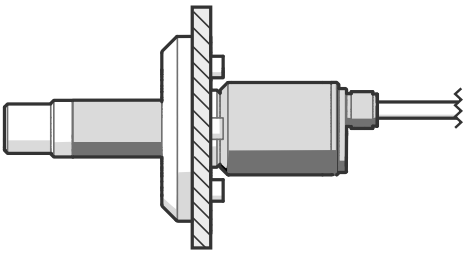
HPP271MOUNTINGSET1



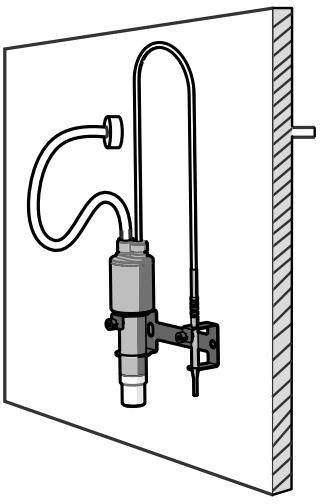
HPP272MOUNTINGSET2

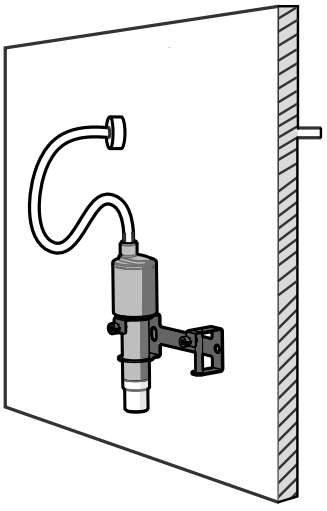


HPP271MOUNTINGSET2



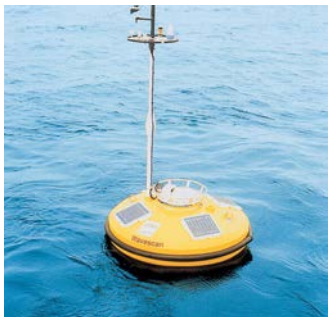
HPP272WALLMOUNT



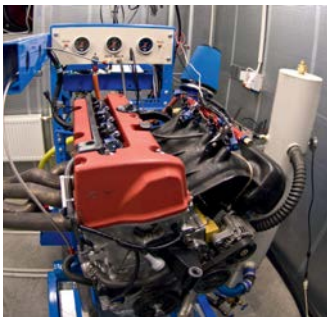


VAISALA

BAROCAP® sensor for measuring pressure









BAROCAP in brief

- Over 35 years of accurate pressure measurement
- Silicon-based capacitive sensor for absolute pressure measurement
- Barometric pressure range 500 ... 1100 hPa
- 50 ... 1100 hPa pressure range available for industrial applications
- Process pressure measurement range 1 ... 10 bar
- NIST-traceable pressure measurement

First introduced in 1985, Vaisala BAROCAP is a silicon-based micromechanical pressure sensor that offers reliable performance in a wide variety of applications, from meteorology to industrial measurements. Combining two powerful technologies – single-crystal silicon material and capacitive measurement – BAROCAP sensors feature low hysteresis combined with excellent accuracy and long-term stability.

How it works

BAROCAP is a micromechanical sensor that uses dimensional changes in its silicon membrane to measure pressure. As the surrounding pressure increases or decreases, the membrane bends, thereby increasing or decreasing the height of the vacuum gap inside the sensor. The opposite sides of the vacuum gap act as electrodes, and as the distance between the two electrodes changes, the sensor capacitance changes. The capacitance is measured and converted into a pressure reading.

The BAROCAP sensor's properties – good elasticity, low hysteresis, excellent repeatability, low temperature dependence, and superior long-term stability – are the result of its single-crystal silicon material. The capacitive structure gives the sensor its wide dynamic range and provides a built-in mechanism for overpressure blocking.

Typical applications for barometric pressure measurement

Barometric pressure measurement has a wide variety of applications within meteorology. Pressure data is required for estimating the amount of precipitable water vapor in the atmosphere. Typical applications include weather stations, data buoys, GPS meteorology, and environmental data logging. Barometric pressure measurement is also used in hydrology and agrology applications.

Barometric pressure data is also required in several industrial applications. It is measured in pressure-sensitive industrial equipment, such as laser interferometers and lithography systems, aviation applications, and in exhaust-gas analysis. Metrological applications include laboratory pressure standard measurements and environmental monitoring in calibration laboratories.

Vaisala offers a range of professional-grade barometers for both indoor and outdoor use. BAROCAP barometers operate over a wide temperature range and perform reliably even in highly demanding applications such as professional meteorology and aviation. View the complete range of Vaisala barometers at www.vaisala.com/pressure.

BAROCAP's unique benefits

- Low hysteresis, high repeatability
- Superior long-term stability
- Tolerates harsh conditions

BAROCAP applications for measurements in pressurized systems

Vaisala DRYCAP® dew point instruments have a long history of providing reliable and stable measurements in compressed air systems and SF6 insulation gas monitoring in high-voltage equipment. In addition to the need for dew point measurement, these two applications also share the need for accurate and stable pressure measurement. Vaisala has integrated its DRYCAP and BAROCAP technologies into a range of products that offer a unique combination of pressure and dew point measurement for pressurized systems.

In compressed air, combining dew point measurement with live process pressure data provides a unique advantage: The conversion of measured pressure dew point to atmospheric pressure or ppm unit is available online, eliminating the possibility of any ambiguity in the dew point data. This is important because changes in the pressure of the gas being monitored alter its dew point.

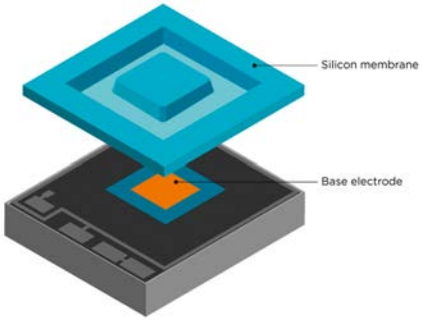
Combined dew point and pressure measurement in SF6 gas monitoring of high-voltage equipment provides a superior tool for assessing the condition of SF6 insulation. Leakages can be immediately detected and early warning is given for moisture issues. Measuring dew point, pressure, and temperature enables the calculation of SF6 gas density, normalized pressure, dew point at atmospheric pressure, and ppm – all essential elements in SF6 monitoring.

View the complete range of Vaisala products for combined pressure and dew point measurement at www.vaisala.com/pressure.

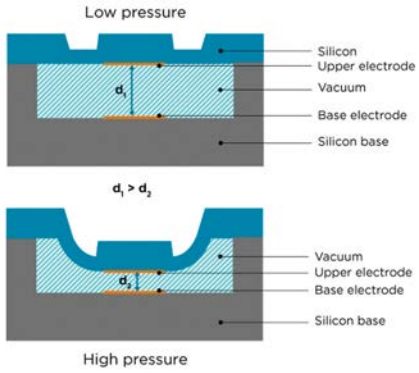
The BAROCAP story

The story of BAROCAP began in the late 1970s during preliminary micromechanical pressure sensor studies for the new-generation Vaisala Radiosonde RS80. Micromechanics proved to be challenging, and Vaisala worked in close cooperation with universities and research institutes in Finland and internationally to develop a new pressure-sensing technology based on silicon processing. The critical breakthrough came on the brink of the project deadline. The first BAROCAP sensors were delivered to two icebreakers and the Helsinki Telephone Company.

BAROCAP sensors have traveled to places where no human has ever set foot, including as part of several Mars exploration missions and the Cassini-Huygens mission to explore Saturn and its largest moon, Titan. BAROCAP's out-of-this-world journey continues with its inclusion in instruments that form part of NASA's Mars Science Laboratory, launched in November 2011.



BAROCAP sensor



Cross-section of the BAROCAP sensor

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 • No display (indicator LED) [1]
Powering	• Protective extra-low voltage (15–35 V DC, 24 V AC ± 20%) • AC (mains) power (100–240 V AC 50/60 Hz) • 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) Fuse size for power supply: 3 A Isolation voltage: 500 V AC, 1000 V DC
PELV power cable temp. rating	≥ +80 °C (+176 °F)
AC (mains) power version	100–240 V AC 50/60 Hz, max. current 1 A (power supply is galvanically isolated) Fuse size for power supply: 10 A Isolation voltage: 1500 V AC
AC (mains) power cable length	2.5 m (approx. 8 ft 2 in)
Power over Ethernet version	Power over Ethernet (PoE) IEEE 802.3at Type 2 Class 4 Max. current 600 mA, max. power consumption 25.5 W Isolation voltage: 500 V AC, 1000 V DC
Typical current consumption at +20 °C (+68 °F) (U_{in} 24 V DC) [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

Inputs and outputs

Transmitter service port connection	• Connection to Insight software with USB2 and cable 262195SP or with cable 219690 [1] • 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) Low Voltage Directive (2014/35/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B
Electrical safety	IEC/EN 61010-1
Type approvals	DNV GL certificate no. TAA000032M EU RO Mutual Recognition certificate no. MRA000004F
Compliance marks	CE, China RoHS, FCC, RCM, UKCA
Listing marks	UL Listed (USA and Canada)
FCC compliance	FCC Part 15, Class B

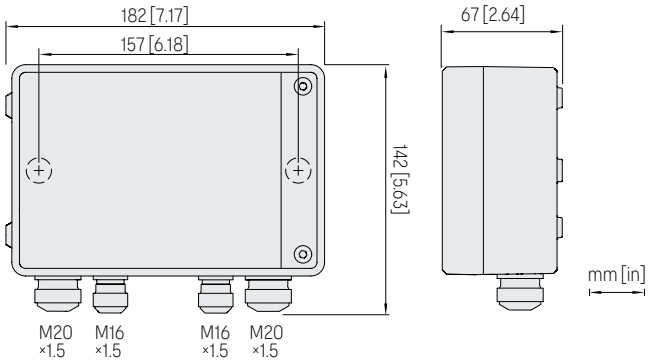
Spare parts

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

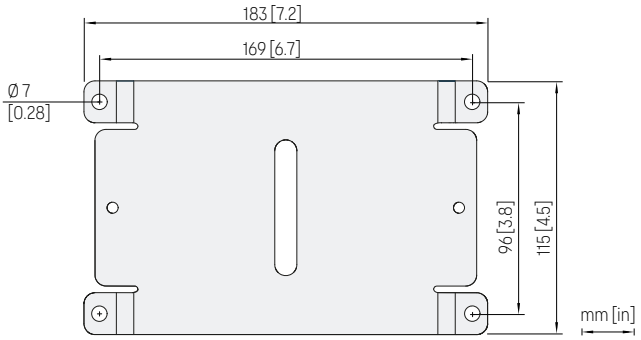
Accessories

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

PTB330 Digital Barometer

For professional meteorology, aviation, and industrial users



Features

- Vaisala BAROCAP sensor
- Accurate measurement
- Excellent long-term stability
- Added reliability through redundancy
- Graphical trend display with 1-year history data
- Height and altitude corrected pressure (QFE, QNH)
- For aviation, professional meteorology, laboratories, and demanding industrial applications
- Corrosion-resistant IP65/IP66 housing, suitable for outdoor and marine environment

Vaisala BAROCAP® Digital Barometer PTB330 is designed for a wide range of high-end atmospheric pressure measurements. The pressure measurement of PTB330 is based on the Vaisala silicon capacitive, absolute pressure sensor - the Vaisala BAROCAP sensor. It provides high measurement accuracy and excellent long-term stability.

Highly accurate

The PTB330 series is highly accurate. Class A barometers for the most demanding applications are fine-tuned and calibrated against a high-precision pressure calibrator. Class B barometers are adjusted and calibrated using an electronic working standard. All PTB330 barometers come with a traceable factory calibration certificate.

Reliability through redundancy

According to your choice, PTB330 can incorporate 1, 2, or 3 BAROCAP sensors. When 2 or 3 sensors are used, the barometer continuously compares the readings of the pressure sensors against one another and reports if they are within the set internal difference criteria. This unique feature provides redundancy in pressure measurement. Users also get a stable and reliable pressure reading at all times, as well as a pre-indication of when to service or recalibrate the barometer.

QNH and QFE

PTB330 can be set to compensate for the QNH and QFE pressure used especially in aviation. The QNH represents the pressure reduced to sea level, based on the altitude and temperature of the observation site. The QFE represents the height-corrected pressure of small differences in altitude, for example, the air pressure at the airfield elevation.

Graphical display

PTB330 features a multilingual, graphical display allowing users to monitor measurement trends. PTB330 updates the graph automatically during measurement and it provides a 1-year measurement history. In addition to instant pressure, PTB330 provides the WMO pressure trend and tendency codes.

Applications

PTB330 can be used successfully for aviation, professional meteorology, and for demanding industrial pressure measurement applications such as accurate laser interferometric measurement and exhaust gas analysis in engine test benches.

Technical data

Measurement performance

Property	Class A	Class B
Barometric pressure range 500–1100 hPA		
Linearity [1]	±0.05 hPa	±0.10 hPa
Hysteresis [1]	±0.03 hPa	±0.03 hPa
Repeatability [1]	±0.03 hPa	±0.03 hPa
Calibration uncertainty [2]	±0.07 hPa	±0.15 hPa
Accuracy at +20 °C (+68 °F) [3]	±0.10 hPa	±0.20 hPa
Barometric pressure range 50–1100 hPA		
Linearity [1]	–	±0.20 hPa
Hysteresis [1]	–	±0.08 hPa
Repeatability [1]	–	±0.08 hPa
Calibration uncertainty [2]	–	±0.15 hPa
Accuracy at +20 °C (+68 °F) [3]	–	±0.20 hPa
Temperature dependence [4]		
500–1100 hPa	±0.1 hPa	±0.1 hPa
50–1100 hPa	±0.3 hPa	±0.3 hPa
Total accuracy −40 … +60 °C (−40 … +140 °F)		
500–1100 hPa	±0.15 hPa	±0.25 hPa
50–1100 hPa	–	±0.45 hPa
Long-term stability		
500–1100 hPa	±0.1 hPa/year	±0.1 hPa/year
50–1100 hPa	±0.2 hPa/year	±0.2 hPa/year
Miscellaneous		
Pressure units	hPa, mbar, kPa, Pa inHg, mmH20, mmHg, torr, psia	hPa, mbar, kPa, Pa inHg, mmH20, mmHg, torr, psia
Resolution	0.01 hPa	0.1 hPa
Settling time at startup (1 sensor)	4 s	3 s
Response time (1 sensor)	2 s	1 s
Acceleration sensitivity	–	Negligible
Maximum pressure limit	–	5000 hPa absolute
Maximum measurement rate [5]	–	10 Hz

1) Defined as ±2 standard deviation limits of endpoint non-linearity, hysteresis, or repeatability error.
2) Defined as ±2 standard deviation limits of inaccuracy of the working standard including traceability to international standards.
3) Defined as the root sum of the squares (RSS) of endpoint non-linearity, hysteresis error, repeatability error, and calibration uncertainty at room temperature.
4) Defined as ±2 standard deviation limits of temperature dependence over the operating temperature range.
5) For class A you need a longer averaging time or measurement interval.

Operating environment

Operating pressure	500–1100 hPa, 50–1100 hPa
Operating temperature	PTB330 without display: −40 … +60 °C (−40 … +140 °F) PTB330 with display: +0 … +60 °C (+32 … +140 °F)
Operating humidity	0–100 %RH, non-condensing
Storage temperature	PTB330 without display: −55 … +80 °C (−67 … +176 °F) PTB330 with display: −40 … +80 °C (−40 … +176 °F)
IP rating	IP66 IP65 (NEMA 4) with local display [1]

1) IP rating of PTB330AWS is IP40.

Mechanical specifications

Pressure fitting	Barbed fitting for 1/8-inch (inside diameter) tubing or quick connector with shutoff valve for 1/8-inch hose
Pressure connector	M5 (10-32) internal thread
Housing material	G AlSi10 Mg (DIN 1725)
Weight	1–1.5 kg (2.2–3.3 lb)

Inputs and outputs

Supply voltage	10–35 V DC
Supply voltage sensitivity	Negligible
Typical power consumption at +20 °C (+68 °F) (voltage at 24 V DC with 1 pressure sensor)	RS-232: 25 mA RS-485: 40 mA Output voltage U_{out}: 25 mA Output current I_{out}: 40 mA Display and backlight: +20 mA
Serial communication	RS-232, RS-485, RS-422

Analog output (optional)

Current output	0–20 mA, 4–20 mA	
Voltage output	0–1 V, 0–5 V, 0–10 V	
Accuracy at pressure range	500–1100 hPa	50–1100 hPa
At +20 °C (+68 °F)	±0.30 hPa	±0.40 hPa
At −40 … +60 °C (−40 … 140 °F)	±0.60 hPa	±0.75 hPa

Data transfer software

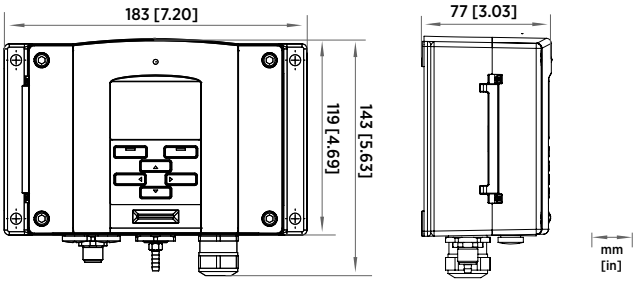
MI70 Link Interface software requirements	Microsoft® Windows OS Microsoft® Excel

Accessories

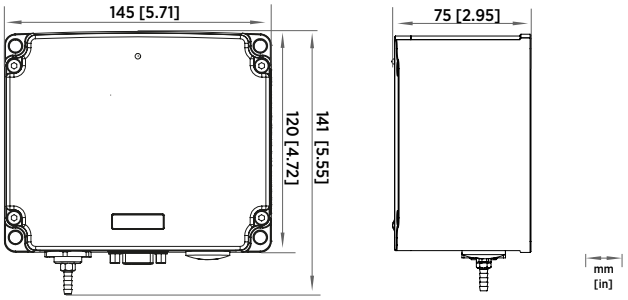
Modules	
Relay module	RELAY-1L
Temperature-compensated analog output module	AOUT-1T
Isolated RS-485 module	RS485-1
Power supply module	POWER-1
AC adapters for devices already equipped with an external AC adapter connector	
AC adapter, EU	MI70EUROADAPTER
AC adapter, USA	222340SP
AC adapter, UK	MI70UKADAPTER
AC adapter, AUS	MI70AUSADAPTER
Static pressure head	
Static pressure head	SPH10
Static pressure head with heating	SPH20
Barometer mounting accessories	
Junction box	ASM211113
Wall mounting kit	214829
Installation kit for pole or pipeline	215108
Outdoor installation kit (weather shield)	215109
DIN rail clips with installation plate	215094
Panel mounting frame	216038
Connection cables	
Connection cable for PTB330 and MI70 handheld meters for spot check or calibration and adjustment	211339
Service cables	
USB-RJ45 serial connection cable	219685
D9-RJ45 serial connection cable	215005
Output cables for 8-pin connector	
Connection cable 5 m with 8-pin M12 female, black	212142
Female connector 8-pin M12 with screw terminals	212416
Cable bushings	
PTB330/220/PTU200 DC adapter and RS-232 cable for PC	213019
PTB330/PTB220/PTU200 DC adapter cable	213026
Others	
Dust filter	237018SP
Barbed pressure fitting 1/8-inch	19498SP
Quick connector 1/8-inch	220186

Compliance

Property	Value
EU directives and regulations	RoHS Directive (2011/65/EU) as amended by 2015/863 EMC Directive (2014/30/EU) Low Voltage Directive (2014/35/EU), applies to units equipped with single-phase AC power supply Power-1
Electrical safety	EN 61010-1:2010 + A1:2019, applies to units equipped with single-phase AC power supply Power-1
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment EN 55011:2009 + A1:2010
Environmental	EN IEC 63000:2018



PTB330 dimensions



PTB330AWS dimensions

VAISALA

PTB330TS Barometric Pressure Transfer Standard

For portable use



Features

- PTB330 digital barometer for accurate pressure measurement
- Handheld MI70 indicator with a user-friendly, multilingual display
- Service port for MI70 Link software or computer
- Vaisala HUMICAP® humidity and temperature probe HMP155
- Weatherproof transport case

Barometric Pressure Transfer Standard PTB330TS combines a PTB330 digital barometer with a handheld MI70 indicator into a portable unit that can be used as a transfer standard.

Barometer for portable use

PTB330TS uses a PTB330 series digital barometer that is housed in a tabletop casing. PTB330TS is designed to be operated using the handheld MI70 indicator. The MI70 indicator also provides the operation power for the barometer. Optional HMP155 probe is available for accurate humidity and temperature measurement.

For measurements in industrial and meteorological areas

PTB330TS is suitable for reference measurements in industrial and meteorological areas. PTB330TS is housed in a durable and weatherproof transport case that can be easily carried and shipped. The components of the PTB330TS are placed in a foam interior with accessories and User Guide in the lid organizer. The case includes a shoulder strap.

Available options

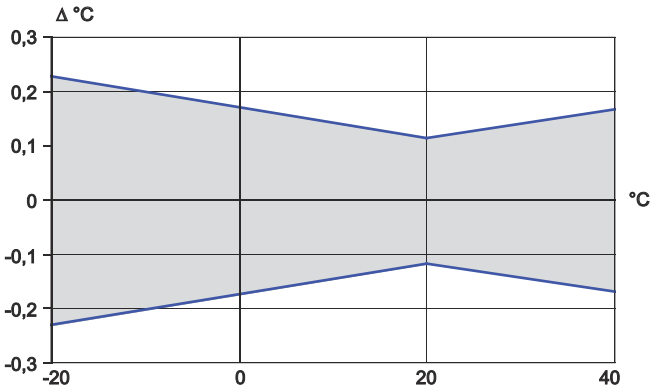
- ISO/IEC 17025 Accredited calibration for PTB330 and HMP155
- HMP155 options: additional temperature probe, manually controlled sensor purge feature
- MI70 Link software and USB or RS-232 cable for downloading measurement data to a computer
- USB service cable for connecting to PTB330 service port

Technical data

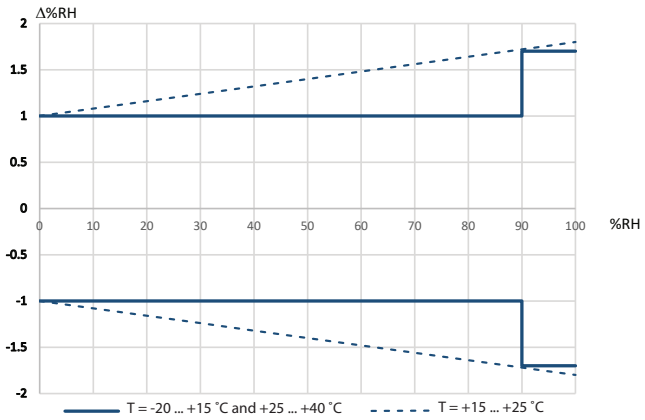
These specifications apply when MI70, PTB330, and HMP155 are used together in PTB330TS. For PTB330 and HMP155 specifications, see the product documentation.

Operating environment

Operating temperature	
MI70	–10 … +40 °C (+14 … +104 °F)
PTB330	–40 … +60 °C (–40 … +140 °F)
HMP155	–80 … +60 °C (–112 … +140 °F)
Storage without display	–55 … +80 °C (–67 … +176 °F)
Storage with display	–40 … +80 °C (–40 … +176 °F)
Operating humidity	0–100 %RH, non-condensing
Maximum pressure limit	5000 hPa absolute
Power supply	Rechargeable NiMH battery pack with AC adapter or 4 x AA size alkalines, type IEC LR6
Menu languages	English, Chinese, French, Spanish, German, Russian, Japanese, Swedish, Finnish
Display	LCD with backlight, graphic trend display of any parameter, character height up to 16 mm
Data logging capacity	2700 points
Alarm	Audible alarm function
Operation time (using rechargeable battery pack)	
Continuous use with PTB330	11 h typical at +20 °C (+68 °F)
Data logging use	Up to 30 days



Accuracy of HMP155 temperature measurement over temperature range



Accuracy of HMP155 humidity measurement over temperature range

Measurement performance

Barometric pressure (PTB330)	
Measurement range	500–1100 hPa
Linearity [1]	±0.05 hPa
Hysteresis [1]	±0.03 hPa
Repeatability [1]	±0.03 hPa
Calibration uncertainty [2]	±0.07 hPa
Accuracy at +20 °C (+68 °F) [3]	±0.10 hPa
Temperature dependence [4]	±0.1 hPa
Total accuracy -40 … +60 °C (-40 … +140 °F)	±0.15 hPa
Long-term stability	±0.1 hPa/year
Settling time at startup (1 sensor)	4 s
Response time (1 sensor)	2 s
Acceleration sensitivity	Negligible
Relative humidity (HMP155)	
Measurement range	0–100 %RH
Accuracy (including non-linearity, hysteresis, and repeatability)	
At +15 … +25 °C (+59 … +77 °F)	±1 %RH (0–90 %RH) ±1.7 %RH (90–100 %RH)
At −20 … +40 °C (−4 … +104 °F)	±(1.0 + 0.008 × reading) %RH
At −40 … −20 °C (−40 … −4 °F)	±(1.2 + 0.012 × reading) %RH
At +40 … +60 °C (+104 … +140 °F)	±(1.2 + 0.012 × reading) %RH
At −60 … −40 °C (−76 … −40 °F)	±(1.4 + 0.032 × reading) %RH
Factory calibration uncertainty at +20 °C (+68 °F) [5]	±0.6 %RH (0–40 %RH) ±1.0 %RH (40–95 %RH)
Humidity sensor	HUMICAP®R2, 180R and INTERCAP for typical applications HUMICAP®R2C, 180RC and INTERCAPC for applications with chemical purge and/or warmed probe
Response time at +20 °C (+68 °F) in still air with sintered Teflon filter	63 %: 20 s 90 %: 60 s
Temperature (HMP155)	
Measurement range	−80 … +60 °C (−112 … +140 °F)
Accuracy with RS-485 output	
At −80 … +20 °C (−112 … +68 °F)	±(0.176 − 0.0028 × temperature) °C
At +20 … +60 °C (+68 … +140 °F)	±(0.07 + 0.0025 × temperature) °C
Sensor	Pt100 RTD element, Class F 0.1 IEC 60751
Response time with additional temperature probe in 3 m/s air flow	
63%	< 20 s
90%	< 35 s

1) *Defined as ±2 standard deviation limits of endpoint non-linearity, hysteresis, or repeatability error.*
2) *Defined as ±2 standard deviation limits of inaccuracy of the working standard including traceability to NIST.*
3) *Defined as the root sum of the squares (RSS) of endpoint non-linearity, hysteresis error, repeatability error, and calibration uncertainty at room temperature.*
4) *Defined as ±2 standard deviation limits of temperature dependence over the operating temperature range.*
5) *Defined as ±2 standard deviation limits. Small variations possible (see also the calibration certificate).*

Available parameters

Pressure parameters	P, P3h, HCP, QFE, QNH
Humidity and temperature parameters	RH, T, T_{df}, T_d, x, T_w

Inputs and outputs

MI70 probe ports	2
MI70 data interface	RS-232 (accessible only with MI70 Link software)
PTB330 supply voltage	10–35 V DC (if not powered by MI70)
PTB330 data interface	RS-232C
PTB330 serial I/O connectors	RJ45 (service port) male 8-pin M12 (user port)
HMP155 data interface	RS-485
HMP155 serial I/O connector	Male 8-pin M12

Mechanical specifications

PTB330	
Housing material	G-AlSi 10 mg (DIN 1725)
IP rating	IP65
Pressure connector	M5 (10-32) internal thread
Pressure fitting	Barbed fitting for 1/8 inch I.D. tubing or quick connector with shutoff valve for 1/8 inch hose
HMP155	
Housing material	Polycarbonate, PC
IP rating	IP66
Additional T-probe cable length	2 m (6 ft 6 in)
Cable material	PUR
Sensor protection	Sintered polytetrafluoroethylene, PTFE
MI70 measurement indicator	
IP rating	IP54
Housing material	Acrylonitrile butadiene styrene / polycarbonte (ABS/PC) blend
Transport case	
IP rating (when closed)	IP67
Plastic parts	TTX01®, PP+SEBS, POM
Metal parts	Stainless steel AISI303
Interior foam material	Polyethylene and polyether
Weight with all instruments and typical accessories	5.9 kg (13 lb)
Exterior dimensions (L × W × H)	405 × 330 × 165 mm (15.94 × 12.99 × 6.50 in)

Compliance

Property	Value
EU directives and regulations	RoHS Directive (2011/65/EU) as amended by 2015/863 EMC Directive (2014/30/EU) Low Voltage Directive (2014/35/EU), applies to units equipped with single-phase AC power supply Power-1
Electrical safety	EN 61010-1:2010 + A1:2019, applies to units equipped with single-phase AC power supply Power-1
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment EN 55011:2009 + A1:2010
Environmental	EN IEC 63000:2018

Spare parts and accessories

PTB330	
MI70 – PTB330 spiral cable	223235SP
USB-RJ45 serial connection cable	219685
D9-RJ45 serial connection cable	215005
Barbed fitting 1/8 in	19498SP
Quick connector 1/8 in	220186
Transport case with interior foams and tabletop casing for PTB330	224068SP
MI70	
USB cable for MI70, includes MI70 Link software	219687
MI70 Link software	MI70LINK
MI70 connection cable to HMT330, MMT330, DMT340, HMT100, PTB330	211339
MI70 battery pack variety of AC adapters available	26755
AC adapters for devices already equipped with an external AC adapter connector	
AC adapter, EU	MI70EUROADAPTER
AC adapter, USA	MI70USADAPTER
AC adapter, UK	MI70UKADAPTER
AC adapter, AUS	MI70AUSADAPTER
All AC adapter	MI70ALLADAPTER
HMP155	
HMP155 - MI70 connection cable	221801
Protection set for HMP155 calibration buttons: protective cover, 2 O-rings and protective plug	221318
USB cable for HMP155	221040
Sintered Teflon filter + O-ring	219452SP
Humidity calibrator	HMK15
HMK15 adapter fitting for 12-mm probes	218377SP



VAISALA

PTB210 Digital Barometer



Features

- 500 ... 1100 hPa or 50 ... 1100 hPa pressure ranges with serial output
- Different scalings between 500 ... 1100 hPa with analog output
- Electronics housing IP65 protected against sprayed water
- Accurate and stable measurement
- Traceable calibration (certificate included)

Vaisala BAROCAP® Digital Barometer PTB210 is a reliable outdoor barometer for harsh conditions.

For harsh environments

PTB210 is ideal for outdoor installations and harsh environments. PTB210 is designed to operate in a wide temperature range, and the electronics housing provides IP65 (NEMA 4) standardized protection against sprayed water.

PTB210 is ideal for use in applications such as weather stations, data buoys, ships, airports, and agrology. It is also an excellent solution for monitoring barometric pressure in industrial equipment such as laser interferometers and engine test benches.

Several pressure ranges

PTB210 is designed for various pressure ranges. It is available in 2 pressure ranges in 3 configurations:

- Serial output for 500 ... 1100 hPa
- Serial output for 50 ... 1100 hPa
- Analog output with different scalings between 500 ... 1100 hPa

Accurate and stable measurement

PTB210 is digitally adjusted and calibrated by using electronic working standards. A higher accuracy barometer, which is fine-tuned and calibrated against a high-precision pressure calibrator, is available for the 500 ... 1100 hPa pressure range.

In addition, PTB210 integrates directly with Vaisala Static Pressure Head Series SPH10/20. This pairing offers accurate measurement in all wind conditions.

Vaisala BAROCAP technology

PTB210 uses the Vaisala BAROCAP sensor, a silicon capacitive absolute pressure sensor developed by Vaisala for barometric pressure applications. The Vaisala BAROCAP sensor provides excellent hysteresis and repeatability characteristics and outstanding temperature and long-term stability. PTB210 is delivered with a traceable factory calibration certificate.



PTB210 paired with SPH10 static pressure head

Technical Data

Measurement performance

Pressure range			
Serial output		500 ... 1100 hPa 50 ... 1100 hPa	
Analog output		500 ... 1100 hPa 600 ... 1060 hPa 800 ... 1060 hPa 900 ... 1100 hPa	
Serial output, accuracy (hPa)			
Pressure range	500 ... 1100		50 ... 1100
	Class A	**Class B**	
Non-linearity [1]	± 0.10	± 0.15	± 0.20
Hysteresis [1]	± 0.05	± 0.05	± 0.10
Repeatability [1]	± 0.05	± 0.05	± 0.10
Calibration uncertainty [2]	± 0.07	± 0.15	± 0.20
Accuracy at +20 °C (+68 °F) [3]	± 0.15	± 0.20	± 0.35
Temperature dependency [4]	± 0.20	± 0.20	± 0.40
Total accuracy -40 ... +60 °C (-40 ... +140 °F) [3]	± 0.25	± 0.30	± 0.50
Long-term stability (hPa/year)	± 0.10	± 0.10	± 0.20
Analog output, accuracy			
Non-linearity [1]		± 0.20 hPa	
Hysteresis [1]		± 0.05 hPa	
Repeatability [1]		± 0.05 hPa	
Calibration uncertainty [2]		± 0.15 hPa	
Accuracy at +20 °C (+68 °F) [3]		± 0.30 hPa	
Temperature dependency [4]		± 0.50 hPa	
Total accuracy -40 ... +60 °C (-40 ... +140 °F) [3]		± 0.60 hPa	
Long-term stability		± 0.10 hPa/year	

1) *Defined as the ±2 standard deviation limits of end point non-linearity, hysteresis error, or repeatability error.*
2) *Defined as ±2 standard deviation limits of inaccuracy of the working standard including traceability to international standards.*
3) *Defined as the root sum of the squares (RSS) of end point non-linearity, hysteresis error, repeatability error, and calibration uncertainty at room temperature.*
4) *Defined as ±2 standard deviation limits of temperature dependence over the operating temperature range.*

Operating environment

Operating temperature	−40 ... +60 °C (−40 ... +140 °F)
Operating humidity	0–100 %RH, non-condensing

Compliance

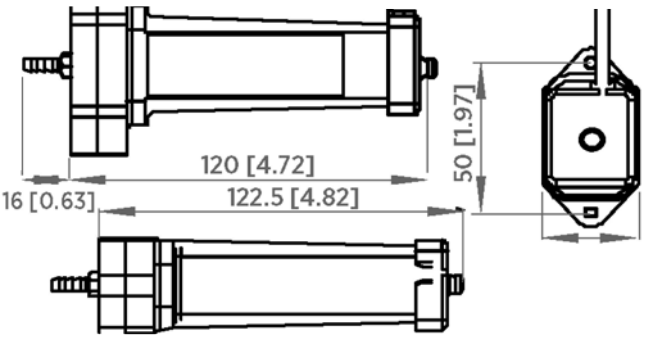
Directives	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU)
Electromagnetic compatibility (EMC)	EN / IEC 61326-1, Electrical equipment for measurement, control and laboratory use - EMC requirement; Basic environment CISPR 32 / EN 55032, Class B
Compliance	CE, FCC, UKCA

Mechanical specifications

Housing material	PC plastic
IP rating, electronics	IP65 (NEMA 4)
IP rating, sensor	IP53
Weight, sensor	110 g (3.9 oz)
Cable weight	28 g/m (1.0 oz)

Inputs and outputs

Serial output	
Shutdown	ON/OFF
Settling time at startup	2 s
Serial I/O	RS-232C RS-232C / TTL (optional) RS-485, non-isolated (optional)
Parity	None, even, odd
Data bits	7, 8
Stop bits	1, 2
Baud rate	1200, 2400, 4800, 9600, 19200
Response time	1 s
Resolution	0.01 hPa (1 measurement/s) 0.03 hPa (10 measurements/s)
Current consumption, normal mode	< 15 mA (factory setting)
Current consumption, shutdown mode	0.2 mA
Analog output	
Outputs	0 ... 5 V DC, 0 ... 2.5 V DC (order specified)
Shutdown	ON/OFF
Response time	500 ms
Resolution	300 µV
Measurement rate	3 measurements/s
Current consumption, normal mode	< 8 mA
Current consumption, shutdown mode	0.2 mA
All models	
Max. pressure	5 000 hPa absolute
Pressure connector	M5 (10-32) internal thread
Pressure fitting	Barbed fitting for 1/8 in I.D. tubing
Supply voltage (reverse polarity protected), with RS-232/TTL output	5 ... 28 V DC
Supply voltage (reverse polarity protected), with RS-485 or analog output	8 ... 18 V DC



VAISALA

PTB110 Barometer

For industrial use



Features

- Vaisala BAROCAP® sensor
- Several pressure ranges
- Accuracy ±0.3 hPa at +20 °C
- Long-term stability
- On/Off control with external trigger
- Output voltage 0 ... 2.5 or 0 ... 5 VDC
- Current consumption less than 4 mA
- Mountable on 35 mm wide DIN rail
- Traceable calibration (certificate included)

Vaisala BAROCAP® Barometer PTB110 is designed both for accurate barometric pressure measurements at room temperature and for general environmental pressure monitoring over a wide temperature range.

Vaisala BAROCAP Technology

PTB110 uses the Vaisala BAROCAP sensor, a silicon capacitive absolute pressure sensor developed by Vaisala for barometric pressure measurement applications. The sensor combines the outstanding elasticity characteristics and mechanical stability of single-crystal silicon with the proven capacitive detection principle.

Applications

PTB110 is suitable for a variety of applications, such as environmental pressure monitoring, data buoys, laser interferometers, and agriculture and hydrology. The compact PTB110 is ideal for data logger applications as it has low power consumption. The external On/Off control is practical when electricity supply is limited.

Accuracy and Stability

The excellent long-term stability of the barometer minimizes or even removes the need for field adjustment in many applications.

Technical Data

Measurement performance

Pressure range (1 hPa= 1 mbar)	500 ... 1 100 hPa 600 ... 1100 hPa 800 ... 1100 hPa 800 ... 1060 hPa 600 ... 1060 hPa
Resolution	0.1 hPa
Load resistance	10 000 Ω minimum
Load capacitance	47 nF maximum
Settling time to full accuracy after startup	1 s
Response time to full accuracy after a pressure step	500 ms
Acceleration sensitivity	Negligible
Accuracy	
Linearity [1)]	±0.25 hPa
Hysteresis [1)]	±0.03 hPa
Repeatability [1)]	±0.03 hPa
Pressure calibration uncertainty [2)]	±0.15 hPa
Voltage calibration uncertainty	±0.7 mV
Frequency calibration uncertainty	±0.3 Hz
Accuracy at +20 °C (+68 °F) [3)]	±0.3 hPa
Total accuracy at	
+15 ... +25 °C (+59 ... +77 °F)	±0.3 hPa
0 ... +40 °C (+32 ... +104 °F)	±0.6 hPa
−20 ... +45 °C (−4 ... +113 °F)	±1.0 hPa
−40 ... +60 °C (−40 ... +140 °F)	±1.5 hPa
Long-term stability	±0.1 hPa / year

1) *Defined as ±2 standard deviation limits of end-point non-linearity, hysteresis error, or repeatability error.*
2) *Defined as ±2 standard deviation limits of inaccuracy of the working standard including traceability to international standards.*
3) *Defined as the root sum of the squares (RSS) of end-point non-linearity, hysteresis error, repeatability error, and calibration uncertainty at room temperature.*

Operating environment

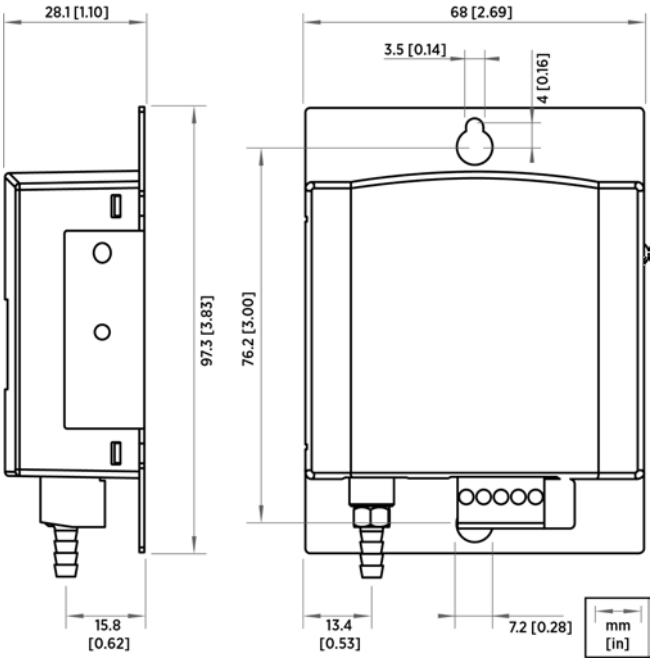
Operating temperature	−40 ... +60 °C (−40 ... +140 °F)
Storage temperature	−40 ... +60 °C (−40 ... +140 °F)
Operating humidity	Non-condensing
IP rating	IP32
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment

Mechanical specifications

Dimensions (H × W × D)	97.3 × 68.4 × 28.1 mm (3.83 × 2.69 × 1.10 in)
Weight	90 g (3.2 oz)
Materials	
Housing cover	Plastic ABS/PC blend
Mounting plate	Aluminum

Inputs and outputs

Supply voltage	10 ... 30 V DC
Supply voltage control	With TTL-level (Transistor-Transistor-Logic) trigger
Supply voltage sensitivity	Negligible
Average power consumption	0.10 W at 12 V
Output voltage	0 ... 2.5 V DC 0 ... 5 V DC
Output frequency	500 ... 1100 Hz
Pressure connector	M5 (10 ... 32) internal thread
Pressure fitting	Barbed fitting for ⅛ in
Minimum pressure limit	0 hPa abs
Maximum pressure limit	2000 hPa abs
Electrical connector	A removable connector for 5 wires (AWG 28 ... 16)
Terminals	Pin 1: External triggering Pin 2: Signal ground Pin 3: Supply ground Pin 4: Supply voltage Pin 5: Voltage/Frequency output



Dimensions

CE

VAISALA

SPH10/20 Static Pressure Heads

For minimizing wind induced error



SPH10/20 is easy to install and connect. In the picture, SPH10 is connected to PTB210.

Features

- Minimizes wind induced error
- Reliable barometric pressure measurement in all weather
- Wind tunnel tested structure
- Easy to clean
- Easy to install

SPH10/20 Static Pressure Heads Series products minimize the effects of wind on barometric pressure readings.

Wind induced effects are one of the main sources of error when measuring barometric pressure. Variations due to strong and gusty wind can be overcome by using a static pressure head to reduce the effect of dynamic pressure.

Vaisala Static Pressure Head Series SPH10/20 are designed to minimize the errors caused by wind. Their wind tunnel tested structure is both horizontally and vertically symmetrical. This design ensures reliable barometric pressure measurements in all weather.

Ideal for outdoor installations

Vaisala static pressure heads are available in 2 models: Vaisala Static Pressure Head SPH10 is a basic version, and Vaisala Static Pressure Head SPH20 is a heated version for reliable operation in snowy and icy conditions. SPH20 is available in 2 voltage variants: 12 V DC (SPH20) and 24 V DC (SPH20-24V). The heated SPH20 contains a thermostat that switches on the heating power at temperatures where the risk of icing may occur.

Composed of ultraviolet stabilized polycarbonate (PC) plastics and offshore aluminum, SPH10/20 static pressure heads are durable and weather resistant.

SPH10/20 protects against rain and condensed water. This prevents capillary condensation of a water column in the pressure channel resulting in a pressure error. The drain holes in the lower plate allow rain and water to flow out. The static pressure heads have internal netting that prevents insects and debris from blocking the pressure channel.

Carefree maintenance

SPH10/20 static pressure heads are easy to install and disassemble, service, and clean – even at the installation site. Vaisala BAROCAP® Digital Barometer PTB210 can be installed directly on top of SPH10/20 static pressure heads. Other barometers can be connected to the heads with pressure tubing.

SPH10 and SPH20 are a perfect pair for all Vaisala barometers. They ensure an accurate and reliable measurement in all weather conditions.

Technical data

Operating environment

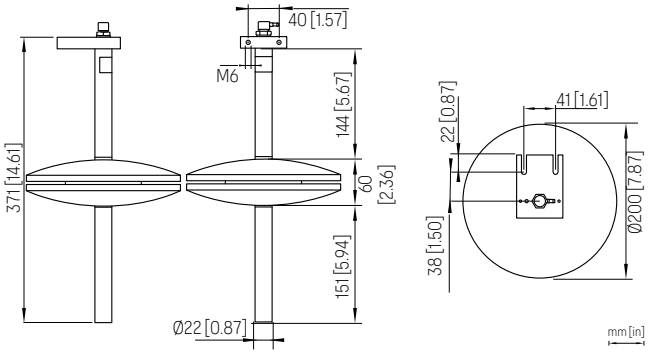
Operating temperature	−60 ... +80 °C (−76 ... +176 °F)

Mechanical specifications

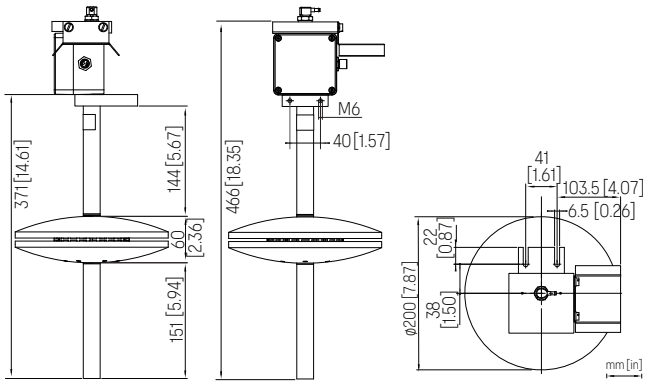
Weight	SPH10: 800 g (1.76 lb) SPH20, SPH20-24V: 1360 g (3.0 lb)
Materials	Polycarbonate (PC) plastic, offshore aluminum
Mounting	M6×30 DIN912 (2 pcs), M6x20 DIN912 (2 pcs), M6 spring lock washer DIN127 (2 pcs) M6 flat washer DIN125 (2 pcs)
Hose connection	Barbed fitting for 4 mm I.D. hose or Rp1/4 thread (parallel)

Inputs and outputs

Electrical connections	M12 connector
Power supply	SPH20: 12 V / 70 W SPH20-24V: 24 V / 35 W
Thermostat switching temperature	
On	+4 °C ±3 °C (+39.2 °F ±4.4 °F)
Off	+13 °C ±3 °C (+55.4 °F ±4.4 °F)



SPH10



SPH20 and SPH20-24V

VAISALA

PDT101 Differential Pressure Transmitter



Features

- Easy mounting on wall, DIN rail, or panel
- 3 pressure ranges (Pa and inH_2O)
- Unidirectional and bidirectional models
- Accessible zero and span adjustment potentiometers
- LED status indicator
- Dedicated models for critical and regulated environments and for air handling systems
- Euro style detachable connector
- Calibrations traceable to SI units through national metrology institutes or accredited calibration laboratories

Vaisala Differential Pressure Transmitter PDT101 offers precise measurement of differential air pressure. PDT101 offers dedicated models for critical and regulated environments with very low differential pressures and unidirectional models for air handling systems.

Operating environment

The highly accurate bidirectional models of PDT101 are designed especially for demanding life science and cleanroom applications, and are the perfect choice for any application requiring precise pressure differential measurement. The transmitter is ideal for incorporating into the Vaisala viewLinc Continuous Monitoring System to measure and monitor the critical environmental parameters as required in regulated environments.

The unidirectional models of PDT101 are optimal for air handling units to measure differential pressure over fans or filters, for example.

Zero and span adjustment screws are available on every PDT101 model. Both adjustments are accessible from the front of the unit.

Performance

PDT101 offers high accuracy, sensitivity, and stability, with models providing accuracies of either 0.40 or 1 % of span. The sensor uses a micro-machined, ultra-thin silicon diaphragm which provides inherent sensor repeatability and stability. The sensor enables precise measurement and control in high performance environments. The PDT101 transmitter is available with voltage output (3-wire) or current output (2-wire).

Applications

PDT101 is suitable for high performance environments in the life science, semiconductor, and electronics industries, as well as in building automation systems in data centers and other demanding buildings and environments.

When used in regulated environments as part of the viewLinc system, it is highly suitable for fulfilling the requirements of continuous, documented, and redundant data, to meet FDA, EMA and other international regulations.

The compact design is well suited for mounting in a cleanroom or in the adjacent corridor with LED indicator lights for quick and easy power status spot check.

Technical data

Models

Model	Measurement range	Output
PDT101-P4C	±60 Pa	4–20 mA
PDT101-P4V	±60 Pa	0–5 V
PDT101-P4C2	±125 Pa	4–20 mA
PDT101-P4V2	±125 Pa	0–5 V
PDT101-W4C	±0.25 inH_2O	4–20 mA
PDT101-W4V	±0.25 inH_2O	0–5 V
PDT101-W4C2	±0.5 inH_2O	4–20 mA
PDT101-W4V2	±0.5 inH_2O	0–5 V
PDT101-P10C	0–500 Pa	4–20 mA
PDT101-P10V	0–500 Pa	0–10 V
PDT101-W10C	0–2 inH_2O	4–20 mA
PDT101-W10V	0–2 inH_2O	0–10 V
PDT101-P10Cx [1)]	0–500 Pa	4–20 mA
PDT101-P10Vx [1)]	0–500 Pa	0–10 V
PDT101-W10Cx [1)]	0–2 inH_2O	4–20 mA
PDT101-W10Vx [1)]	0–2 inH_2O	0–10 V

1) The PDT101-P10Cx, PDT101-P10Vx, PDT101-W10Cx, and PDT101-W10Vx models do not include calibration certificate.

Measurement performance

Measurement ranges (bidirectional)	±60 Pa, ±125 Pa, ±0.25 inH_2O, or ±0.5 inH_2O
Measurement ranges (unidirectional)	0–500 Pa, or 0–2 inH_2O
Accuracy (incl. non-linearity, hysteresis, repeatability and zero/span calibration settings)	0.4 % of span (bidirectional models), 1% of span (unidirectional models)
Long-term stability	≤ 0.5 % span/year
Response time (10–90 %)	250 ms
Warm-up time	15 s
Compensated temperature range	+2 … +54 °C (+35.6 … +129.2 °F)
Temperature dependence	±(0.065 Pa + 0.054 % of reading) / °C or ±(0.00015 inH_2O + 0.03 % of reading) / °F (reference 21 °C or 70 °F)
Pressure type	Differential, gauge, vacuum and compound
Overpressure	
Proof pressure	1.0 bar
Burst pressure	1.7 bar
Static pressure	1.7 bar
Mounting position	
Error (zero adjustable)	≤ 1 %/g (calibration in vertical position is standard)
Adjustments (front accessible)	
Zero	±5 % span
Span	±3 % span

Compliance

EU directives and regulations	EMC
Electromagnetic compatibility (EMC)	EN 61326-1, basic immunity test requirements
Compliance marks	CE, RCM

Mechanical specifications

Medium (measured gas)	Clean and dry air, non-conducting and non-corrosive gases
Mounting	Threaded fastener for wall mounting or DIN rail type EN 50022
IP rating	IP40
Weight	0.07 kg
Material	
Process connection	Brass
Sensor element	Silicon, aluminum, glass
Case	NEMA type 1 fire-retardant ABS 1 (meets UL94-5VA)

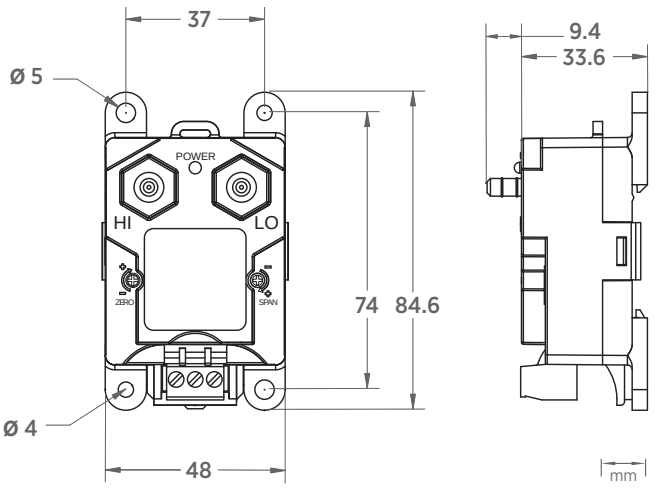
Inputs and outputs

Process connection	1/4" barbed fittings
Tubing outer and inner dimensions	Outer dimension (O.D): 1/4" (6.35 mm) Inner dimension (I.D): 1/8" (3.17 mm)
Max. loop resistance for 4 … 20 mA	≤ (Supply voltage - 12 V)/0.022 A
Supply current	Max. 20 mA for 4–20 mA output signal
Optical process diagnostics	LED visual indicator
Electrical connection	Euro style pluggable terminal block accepts 12–26 AWG wire (0.13 up to 3.31 mm^2)
Output signal	
2-wire	4–20 mA
3-wire	0–5 or 0–10 V DC (user selectable)
Operating voltage	
2-wire output 4–20 mA	12 … 36 V DC
3-wire output 0–5 V DC	11.5–36 V DC or 24 V AC
3-wire output 0–10 V DC	14–36 V DC or 24 V AC

Operating environment

Operating temperature	–18 … +70 °C (–0.4 … +158 °F)
Storage temperature	–40 … +82 °C (–40 … +179.6 °F)

Note: If used in an electromagnetic field of 3 V/m, with narrow frequency area of 80 … 120 MHz, it is possible that the current output of PDT101 can deviate max. 0.8 % (with accuracy specified 0.4 %)



PDT101 dimensions

VAISALA

PDT102 Differential Pressure Transmitter



Features

- In-place system calibration and online monitoring without disturbing process tubes with optional process valve actuator and test jacks
- Ultrathin profile ideally suited for DIN rail mount reduces installation and calibration costs
- High accuracy, two options; 0.25 % or 0.50 % of span
- Extremely robust MEMS silicon sensor technology provides very high accuracy, sensitivity, stability, and durability
- Calibrations traceable to SI units through national metrology institutes or accredited calibration laboratories
- Front side accessible zero and span adjustment potentiometers

Vaisala Differential Pressure Transmitter PDT102 offers ultra low pressure measurement for cleanroom control and monitoring applications.

Operating environment

Vaisala Differential Pressure Transmitter PDT102 is a high performance instrument designed primarily for life science and high technology cleanroom applications. The front panel includes zero and span adjustment potentiometers for convenient adjustment. The PDT102 transmitter is ideal for incorporating into the Vaisala viewLinc Continuous Monitoring System to measure and monitor the critical environmental parameters as required in regulated environments.

Performance

PDT102 offers very high accuracy, sensitivity and stability with two options for accuracy, 0.25% or 0.50% of span providing a highly reliable and repeatable measurement. The sensor uses a micro-machined, ultra-thin silicon diaphragm which provides inherent sensor repeatability and stability. The sensor enables precise measurement and control in high performance cleanrooms. The PDT102 transmitter is available with voltage output (3-wire) or current output (2-wire).

Available options

Online monitoring of PDT102 is simple using the optional process valve actuator and the front access test jacks. The front access test jacks provide online process reference signal or calibration signal without disconnecting power supply wiring. Measurements can be made using a standard multimeter.

Applications

PDT102 is designed for use in critical monitoring of cleanrooms for pharmaceutical, biotechnology, medical device, and semiconductor controlled manufacturing environments.

Technical data

Measurement performance

Measurement ranges (bidirectional)	±50 Pa ±0.25 in H_2O
Accuracy [1]	0.25 % span or 0.5 % span, depending on choice
Repeatability for 0.25 % span accuracy	0.03 %
Repeatability for 0.5 % span accuracy	0.05 %
Electrical resolution	1 x 10^{-4} span
Long-term stability	≤0.5 % span/year
Response time (10– 90 %)	250 ms
Warm-up time	15 s
Compensated temperature range	+2 ... +57 °C (+35.6 ... +134.6 °F)
Temperature dependence	±(0.036 Pa + 0.036 % of reading) / °C or ±(0.0001 in H_2O + 0.02 % of reading) / °F (reference 21 °C or 70 °F)
Pressure type	Differential, gauge, vacuum and compound
Overpressure	
Proof pressure	0.7 bar
Burst pressure	1.7 bar
Static pressure	1.7 bar
Mounting position	
Error (zero adjustable)	≤0.25 %
Adjustments (front accessible)	
Zero	±5 % span
Span	±3 % span

1) Incl. non-linearity, hysteresis, repeatability and zero/span calibration settings.

Inputs and outputs

Process connection	1/8 NPT female according to ANSI/ASME B1.20.1
Tubing dimensions	Outer dimension (O.D): 1/8" (3.17 mm)
Operating voltage	12–36 V DC
Max. loop resistance for 4–20 mA	≤ (Supply voltage - 12V)/0.022 A
Electrical connection	Screw terminals, 12– 22 AWG (0.33 up to 3.31 mm^2)
Output signal	
2-wire	4–20 mA
3-wire	0–5 V
Supply current	
For 0–5 V output	Max. 10 mA
For 4–20 mA output	Max. 20 mA

Mechanical specifications

Medium (measured gas)	Clean and dry air, non-conducting and non-corrosive gases
Mounting	DIN rail types EN 50022, EN 50035 and EN 50045
Weight	0.16 kg
Material	
Process connection	Brass
Sensor element	Silicon, aluminum, glass
Case	Polycarbonate, glass filled (UL94-V-1)

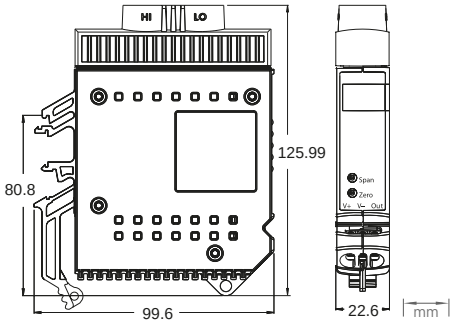
Operating environment

Operating temperature	–29 ... +70 °C (–20.2 ... +158 °F)
Storage temperature	–40 ... +82 °C (–40 ... +179.6 °F)
IP rating	IP30

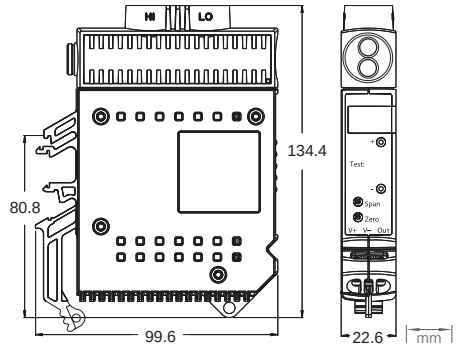
Note: If used in an electromagnetic field of 3 V/m, with narrow frequency area of 80 - 120 MHz, it is possible that the current output of PDT102 can deviate max. 0.3 % (with accuracy specified 0.25 %)

Compliance

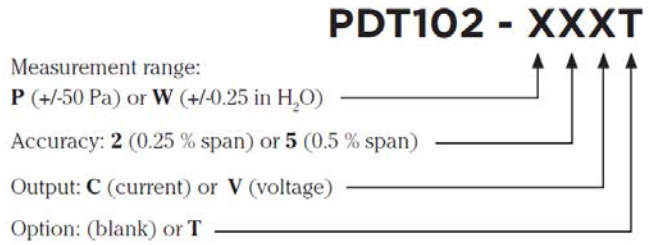
EU directives and regulations	EMC
Electromagnetic compatibility (EMC)	EN 61326-1, basic immunity test requirements
Compliance marks	CE, RCM



PDT102 transmitter dimensions



PDT102 dimensions with process valve actuator and test jacks



Order information for PDT102

VAISALA

Polaris™ PR53AC Sanitary Compact Process Refractometer



The Vaisala Polaris PR53AC sanitary compact process refractometer is designed to measure liquid concentrations, such as Brix, inline. Applications include food, beverage, dairy and brewery industry customers, and OEMs. 3-A and EHEDG certifications ensure that all hygienic demands and safety requirements are met. Easy to install directly in pipelines with a sanitary clamp and optional flow cells.

Features

- Reliable optical concentration measurements with refractive index
- Brix, Total Solids, Oechsle, Baume, Plato, and more than 500 concentration curves
- 3-A and EHEDG certified
- 3-A and Type N sanitary couplings
- Measurement not affected by bubbles, particles, suspended solids, or color
- Various flow cells available
- Indigo520 and Indigo80 compatible
- Built-in 4–20 mA, HART, and Modbus RTU outputs

Benefits

The optical measurement is based on the refractive index (RI). The RI can be measured from practically any liquid and it responds to dissolved material. Bubbles, particles, or fibers in the process do not affect measurement. The outstanding long-term stability provides years of accurate, continuous, fast, and stable measurement for concentration of sugar (Brix) and various other chemical concentrations directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

The PR53AC continues the success of the Vaisala K-PATENTS® process refractometer series. Based on 40 years of experience and continuous development, the PR53 family is the latest generation of digital process refractometers.

Safe for sanitary applications

The product is compatible with both clean-in-place (CIP) and sterilization-in-place (SIP) systems. The material offering, including stainless-steel wetted parts, PTFE, and sapphire, are all suitable for direct contact with the process with convenient installations directly to process lines with standard sanitary and Type N couplings, or with a sanitary flow cell. Stainless steel is easy to maintain and keep clean, and traceability ensures safety.

Brix and beyond

Brix is a common measurement unit in the food, dairy, and beverage processing industries. Measurements can also be shown in total solids, Oechsle, Baume, or Plato. Other measurement units include concentration of sucrose, gelatin, lactulose, and hydrogen peroxide. The refractometer comes pre-configured with the selected concentration curve.

Wash system

Most applications do not need wash systems due to the self-cleaning effect: the shear force of the process flow keeps the measurement point clean. For the most demanding applications, the powerful wash system ensures correct measurement when process conditions are sticky.

Plug and play to Indigo

The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. It provides access to features such as data storage, graphical interface, and analog and digital interface. The Indigo520 is required when the application or the installation position requires washing, to control the process. Changing settings, measurement parameters, or other servicing updates can be done directly from Indigo520, or through a USB cable using Vaisala software.

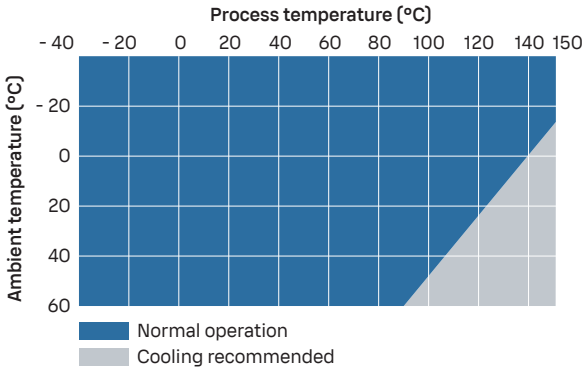
The refractometer can also be connected to the portable diagnostics tool Indigo80 handheld indicator.

Technical data

Measurement performance

Refractive index	
Measurement range	1.32–1.53 nD (Corresponds to 0–100 °Bx)
Accuracy	±0.00014 nD (0.1 °Bx) [1]
Repeatability	±0.00002 nD [2]
Resolution	±0.000015 nD
Response time T_{63} with default damping	10 s [3]
Measurement cycle	1 / s
Long-term stability	Max. 0.1 % full scale / a
Temperature	
Accuracy at 20 °C (68 °F)	±0.3 °C (0.54 °F) [1]
Sensor class	F0.15 IEC 60751
Temperature coefficient	±0.002 °C / C

1) Accuracy specified with respect to calibration reference, including non-linearity, hysteresis at +20 °C.
2) Repeatability, confidence level k=2, including random noise, at Ta = +20 °C, with standard low-pass filtering.
3) With standard low-pass filtering.

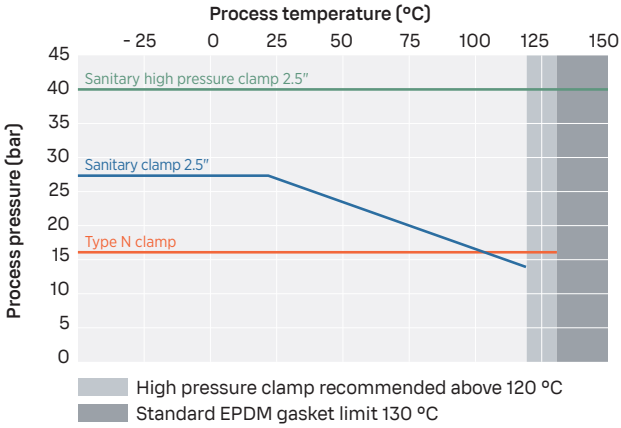


PR53AC process temperature (indicative)

Operating environment

Process parameters	
Process temperature	–40 ... +150 °C (–40 ... +302 °F) [1]
Design temperature	+180 °C (356 °F) [2]
Design pressure	40 bar [3]
Operating environment	
Storage temperature	–40 ... +65 °C (–40 ... +149 °F)
Operating temperature	–40 ... +60 °C (–40 ... +140 °F)
Maximum operating altitude	2000 m (approx. 6500 ft)
Operating humidity	0–100 %RH
Storage humidity	0–100 %RH, non-condensing
UL 50E/NEMA rating	Type 4X
IP rating	IP66 IP67

1) –40 ... +130 °C (-40 ... 266 °F) EPDM gasket, -40... +150 °C (–40 ... +302 °F) PTFE gasket.
2) Maximum momentary temperature peak.
3) Maximum at +20 °C (68 °F), operating pressure to the clamp rating pressure.



PR53AC process pressure

Inputs and outputs

Supply	
Operating voltage	24 V DC nominal (9–30 V DC)
Power consumption	Less than 1 W
Protection class	3, PELV
Outputs	
Output parameters	RI, temperature, concentration, quality factor
Analog outputs	
mA	Sourcing, isolated, NAMUR NE 43, configurable
mA range	3.8–20.5 mA
Maximum load	600 Ω
Accuracy of analog outputs at +20 °C	±0.1 % of full scale (±0.00002 RI)
Supported protocol	HART 7
Digital outputs	
Digital output	RS-485, non-isolated
Maximum cable run	300 m (approx. 1000 ft) (digital)
Supported protocol	Modbus RTU
Connectors	
External connectors	1 × M12 M 4 pins, A-coded [1] 1 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5 / NPT ½″

1) For USB2 adapter and Insight software, see vaisala.com/insight.

Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Safety	IEC/EN/UL 61010-1
Pressure	CRN all territories, ASME BPVC Sec VIII Div. 1 Ed. 2021
Material compliance	FDA 21 CFR 177.150, 177.2600, 177.1550 EC 1935/2004 EC 2023/2006, GMP EU 10/2011
Compliance marks	CE, China RoHS, RCM, UKCA
Vibration and shock	Tested according to IEC 60068-2
Listing marks	MET listed (US and Canada)

Sanitary compliance

Hygienic design	3-A 46-04 EHEDG
Compliance marks	3-A, EHEDG (for EHEDG compliant installation, use 2.5″ / 4″ sanitary gasket)
Biocompatibility	USP Class VI <88>, 70 °C
ADI free (Animal Derived Ingredients)	Yes

Mechanical specifications

Wetted parts	
Sensor head	EN 1.4435 BN2 (AISI 316L) [1]
Surface roughness	Ra 0.8 µm Ra 0.38 µm electropolished [1]
Prism	Sapphire monocrystalline, 99.996 % Al_2O_3 [2]
Prism gasket	Modified PTFE [3]
Sanitary 2.5″ gasket	EPDM [2]
Type N gasket	EPDM [2]
Welding ferrule	EN 1.4435 (AISI 316L) [1] [4] ASME BPE-2019 (DIN 32676-C)
Non-wetted parts	
Housing	EN 1.4404 (AISI 316L)
Screws TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable gland	EN 1.4305 (AISI 303) HUMMEL 1.693.1600.50
Dummy plug	EN 1.4305 (AISI 303) AGRO 8717.96.08.70
Thread adpter	EN 1.4404 (AISI 316L) Vaisala, DRW257718, M16×1.5 / NPT ½ in
M12 connector	Gland, EN 1.4305 (AISI 303) Contacts, CuZn with Ni/Au plating Phoenix Contact, 1405233, M12/4(M), A, 4×0.34 mm², TPE, 0.5 m Carrier, PA 6.6
Sanitary 2.5″ clamp	EN 1.4301 (AISI 304) [2]
Type N Clamp	EN 1.4301 (AISI 304) [2]
Cable	2×2×0.5 mm² (AWG 21), PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
Weight	2.7 kg (5.95 lb)

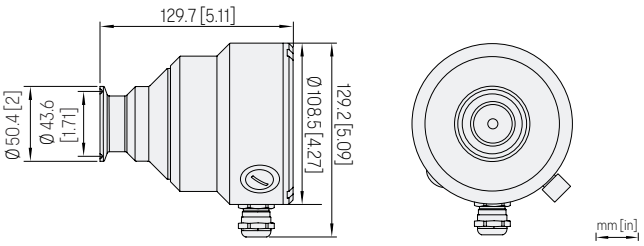
1) EN 10204 / 3.1 certificate included.
2) Manufacturer's declaration included.
3) ADI free, FDA 21 C.F.R 177.1550, 3A Sanitary Standard, USP Class VI <88>, 70 °C.
4) 3-A certificate, EHEDG certificate.

Calibration accessories

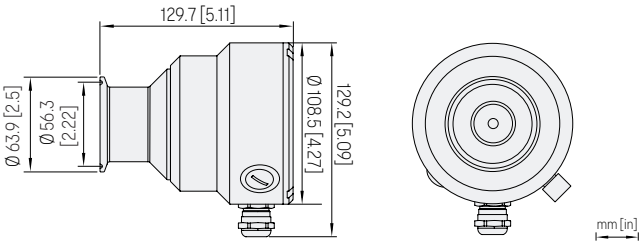
Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

Accessories

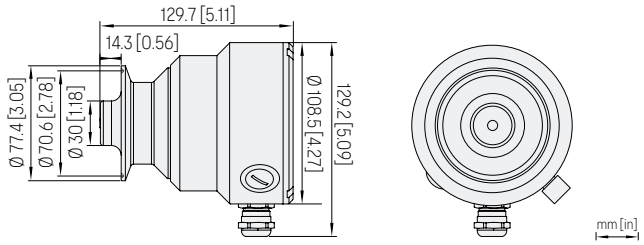
Item	Item code
USB adapter for service port, for Insight service software (see www.vaisala.com/insight)	USB2
Instrument cable, 2×2×0.5 mm² (AWG 21), PUR jacket, grey, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm² (AWG 21), PUR jacket, grey, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm² (AWG 21), PUR jacket, grey, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Cooling cover	ASM214675SP



Dimensions for PR53AC Sanitary 1.5"



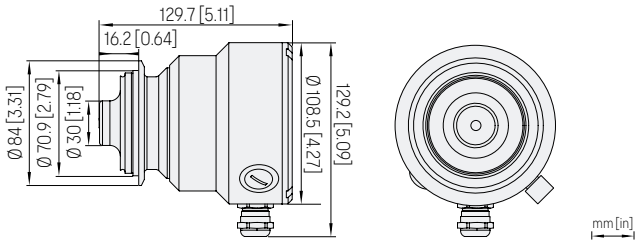
Dimensions for PR53AC Sanitary 2"



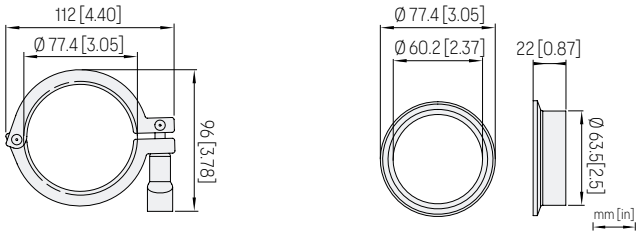
Dimensions for PR53AC Sanitary 2.5"

Sanitary 2.5" mounting accessories

Item
Welding ferrule, 2.5”
Sanitary clamp 2.5”
High-pressure clamp 2.5″
Blind flange 2.5”
Sanitary gasket, 2.5″, EPDM
Sanitary gasket, 2.5”, EHEDG compliant, PTFE/steel, Combifit VOE-2034 (optional)



Dimensions for PR53AC Type N



Mounting kit for PR53AC Sanitary 2.5"

Type N mounting accessories

Item
Type N clamp 2.5", DN 50/40
Type N blind flange
Gasket 59.5×3 mm, EPDM

Flow cells for PR53AC

Flow cells are only compatible with the PR53AC that has 2,5″ sanitary process connection.

Operating pressure

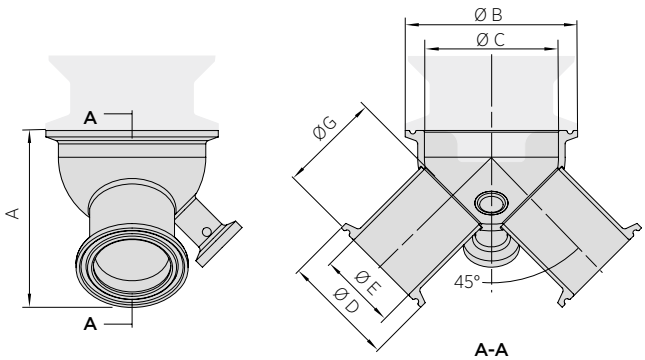
Flow cell model	Max. pressure
SEFC for 1″ pipelines	27 bar at 20 °C
	13.8 bar at 120 °C
SEFC for 1,5″ pipelines	25 bar
SEFC for 2″ pipelines	20 bar
SEFC for 2.5″ pipelines	15 bar
SEFCL for 3″ pipelines	12.5 bar
SEFCL for 4″ pipelines	10 bar
MFC	27 bar at 20 °C
	13.8 bar at 120 °C

SEFC Sanitary Elbow Flow Cell

Item
SEFC Sanitary Elbow Flow Cell, DIN 32676-C sanitary coupling
Wetted parts
Sanitary coupling 1”, reduced inlet for < 1.5 m/s flow rate
Sanitary coupling 1.5”, reduced inlet for < 1.5 m/s flow rate
Sanitary coupling 2.5”, reduced inlet for < 1.5 m/s flow rate
Sanitary coupling 1”
Sanitary coupling 1.5”
Sanitary coupling 2.5”
Wash nozzle
No wash nozzle option
Steam wash nozzle
Water wash nozzle
Pressurized water wash nozzle
Documentation
Flow cell: EN 1024 3.1 material certificate included
Sanitary gasket: Manufacturer’s declaration included
Material: EN 1.4435
Other variants, surface treatments and special materials available on request

SEFC Sanitary Elbow Flow Cell, dimensions

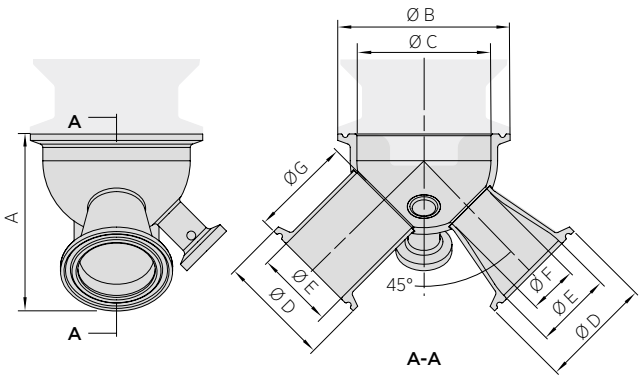
Dimension	1″	1½″	2″	2½″
A	65.7 mm (2.59 in)	79.6 mm (3.13 in)	97.5 mm (3.84 in)	115.7 mm (4.56 in)
ØB	77.4 mm (3.05 in)	77.4 mm (3.05 in)	77.4 mm (3.05 in)	77.4 mm (3.05 in)
ØC	60.2 mm (2.37 in)	60.2 mm (2.37 in)	60.2 mm (2.37 in)	60.2 mm (2.37 in)
ØD	50.4 mm (1.98 in)	50.4 mm (1.98 in)	63.9 mm (2.52 in)	77.4 mm (3.05 in)
ØE	22.1 mm (0.87 in)	34.8 mm (1.37 in)	47.5 mm (1.87 in)	60.2 mm (2.37 in)
ØG	21.7 mm (0.85 in)	44.9 mm (1.77 in)	41.9 mm (1.65 in)	64.8 mm (2.55 in)



SEFC Sanitary Elbow Flow Cell

SEFC Sanitary Elbow Flow Cell reduced inlet, dimensions

Dimension	1″	1½″	2″
A	65.7 mm (2.59 in)	79.6 mm (3.13 in)	97.5 mm (3.84 in)
ØB	77.4 mm (3.05 in)	77.4 mm (3.05 in)	77.4 mm (3.05 in)
ØC	60.2 mm (2.37 in)	60.2 mm (2.37 in)	60.2 mm (2.37 in)
ØD	50.4 mm (1.98 in)	50.4 mm (1.98 in)	63.9 mm (2.52 in)
ØE	22.1 mm (0.87 in)	34.8 mm (1.37 in)	47.5 mm (1.87 in)
ØF	16 mm (0.63 in)	22.1 mm (0.87 in)	34.8 mm (1.37 in)
ØG	21.7 mm (0.85 in)	44.9 mm (1.77 in)	41.9 mm (1.65 in)



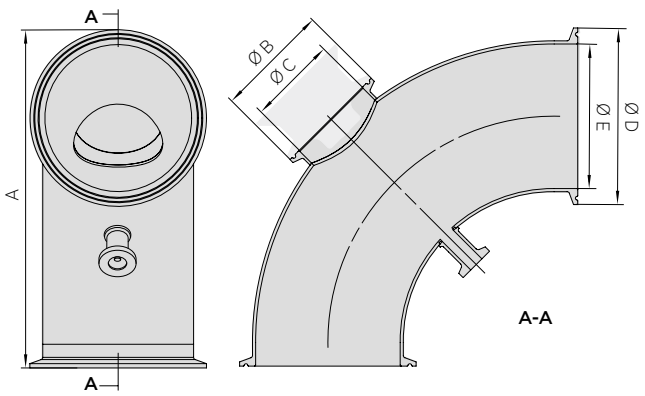
SEFC Sanitary Elbow Flow Cell, reduced inlet

SEFCL Sanitary Elbow Flow Cell, for Large Pipelines

Item
SEFCL Sanitary Elbow Flow Cell, for Large Pipelines
Wetted parts
Sanitary coupling 3”
Sanitary coupling 4”
Wash nozzle
No wash nozzle option
Steam wash nozzle
Water wash nozzle
Pressurized water wash nozzle
Documentation
Flow cell: Material certificate included
Sanitary gasket: Manufacturer’s declaration included
Material: AISI 316L
Other variants, surface treatments and special materials available on request

SEFCL Sanitary Elbow Flow Cell, for Large Pipelines, dimensions

Dimension	3”	4”
A	172.5 mm (6.79 in)	227.8 mm (8.97 in)
ØB	77.9 mm (3.07 in)	77.9 mm (3.07 in)
ØC	60.2 mm (2.37 in)	60.2 mm (2.37 in)
ØD	90.9 mm (3.58 in)	118.9 mm (4.68 in)
ØE	72.9 mm (2.87 in)	97.4 mm (3.83 in)



SEFCL Sanitary Elbow Flow cell, Large (3 in)

MFC Miniature Flow Cell

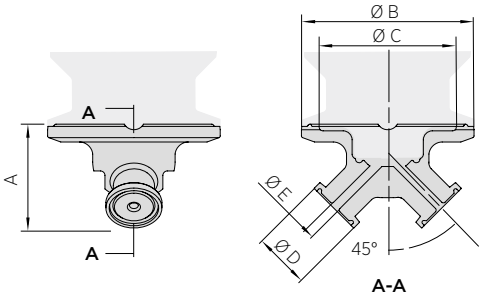
Item
MFC Miniature Flow Cell
Material: EN 1.4435, EN 1024 3.1 material certificate included
Wetted surface Ra: Electropolished 0.4 um, batch traceable, certificate included
Other variants, surface treatments and special materials available on request

Flow cell accessories for MFC

Item
Gasket 22.2×3.0 mm EPDM
Sanitary clamp 0.5”

MFC Miniature Flow Cell, dimensions

Dimension	4 mm	5 mm	6 mm
A	46.6 mm (1.83 in)	46.6 mm (1.83 in)	46.6 mm (1.83 in)
ØB	77.5 mm (3.05 in)	77.5 mm (3.05 in)	77.5 mm (3.05 in)
ØC	61.6 mm (2.43 in)	61.6 mm (2.43 in)	61.6 mm (2.43 in)
ØD	25 mm (0.98 in)	25 mm (0.98 in)	25 mm (0.98 in)
ØE	4 mm (0.16 in)	5 mm (0.2 in)	6 mm (0.24 in)



MFC Miniature Flow Cell

VAISALA

Polaris™ PR53AP Sanitary Probe Process Refractometer



The Vaisala Polaris PR53AP sanitary probe process refractometer is designed for food and beverage, dairy and brewery industry customers, and OEMs to measure liquid concentrations, such as Brix, in applications such as jam cookers and mixing tanks. 3-A and EHEDG certifications ensure that all hygienic demands and safety requirements are met. The long probe can withstand high process temperatures and its design enables flexible installations directly to kettles, cookers, vessels, and tanks.

Features

- Reliable optical concentration measurements with refractive index
- Brix, Total Solids, Oechsle, Baume, Plato, and more than 500 concentration curves
- 3-A and EHEDG certified
- Sanitary and tank bottom flange couplings
- Measurement not affected by bubbles, particles, suspended solids, or color
- Indigo520 and Indigo80 compatible
- Built-in 4–20 mA, HART, and Modbus RTU outputs

Benefits

The optical measurement is based on the refractive index (RI). The RI can be measured from practically any liquid, and it responds to dissolved material. The long probe allows representative measurement in tanks and hot processes, such as jam cooking.

The outstanding long-term stability provides years of accurate, continuous, fast, and stable measurement for concentration of sugar (Brix) and various other chemical concentrations directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

The PR53AP continues the success of the Vaisala K-PATENTS® process refractometer series. Based on 40 years of experience and continuous development, the PR53 family is the latest generation of digital process refractometers.

Safe for sanitary applications

The product design welcomes both cleaning-in-place (CIP) and sterilization-in-place (SIP) systems. Stainless-steel wetted parts, PTFE and sapphire, are suitable to be in direct contact with the process, and traceability ensures safety. Stainless steel is easy to maintain and keep clean. The long probe with common tank bottom flanges enables installation depths of up to 170 mm. The flush mount option allows installation in tanks with scrapers or mixers.

Brix and beyond

Brix is a common measurement unit in the food, dairy, and beverage processing industries. Measurements can also be shown in total solids, Oechsle, Baume, or Plato. Other measurement units include concentration of sucrose, gelatin, lactulose, and hydrogen peroxide. The refractometer comes pre-configured with the selected concentration curve.

Wash system

Most applications do not need wash systems due to the self-cleaning effect: the shear force of the process flow keeps the measurement point clean. For the most demanding applications, the powerful wash system ensures correct measurement when process conditions are sticky.

Plug and play to Indigo

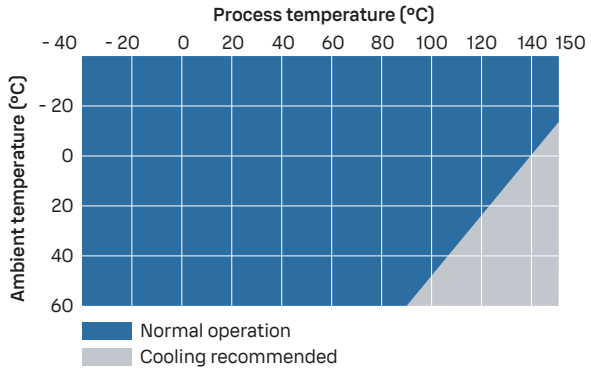
The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. It provides access to features such as data storage, graphical interface, and analog and digital interface. The Indigo520 is required when the application or the installation position requires washing, to control the process. Changing settings, measurement parameters, or other servicing updates can be done directly from Indigo520, or through a USB cable using Vaisala software.

The refractometer can also be connected to the portable diagnostics tool Indigo80 handheld indicator.

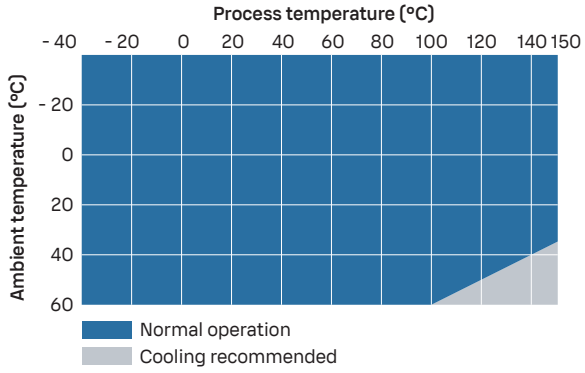
Technical data

Measurement performance

Refractive index	
Measurement range	1.32–1.53 nD (Corresponds to 0–100 °Bx)
Accuracy	±0.00014 nD (0.1 °Bx) [1]
Repeatability	±0.00002 nD [2]
Resolution	±0.000015 nD
Response time T_{63} with default damping	10 s [3]
Measurement cycle	1 / s
Long-term stability	Max. 0.1 % full scale / a
Temperature	
Accuracy at 20 °C (68 °F)	±0.3 °C (0.54 °F) [1]
Sensor class	F0.15 IEC 60751
Temperature coefficient	±0.002 °C / C



PR53AP, depth 170 mm process temperature (indicative)

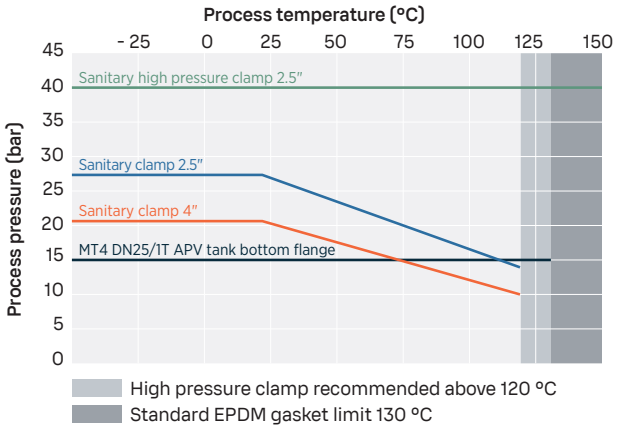


PR53AP, depth 42 mm and 66 mm process temperature (indicative)

Operating environment

Process parameters	
Process temperature	–40 … +150 °C (–40 … +302 °F) [1]
Design temperature	+180 °C (356 °F) [2]
Design pressure	40 bar [3]
Operating environment	
Storage temperature	–40 … +65 °C (–40 … +149 °F)
Operating temperature	–40 … +60 °C (–40 … +140 °F)
Maximum operating altitude	2000 m (approx. 6500 ft)
Operating humidity	0–100 %RH
Storage humidity	0–100 %RH, non-condensing
UL 50E/NEMA rating	Type 4X
IP rating	IP66 IP67

1) –40 … +130 °C (–40 … 266 °F) EPDM gasket, –40… +150 °C (–40 … +302 °F) PTFE gasket
2) Maximum momentary temperature peak.
3) Maximum at +20 °C (68 °F), operating pressure to the clamp rating pressure.



PR53AP process pressure

Inputs and outputs

Supply	
Operating voltage	24 V DC nominal (9–30 V DC)
Power consumption	Less than 1 W
Protection class	3, PELV
Outputs	
Output parameters	RI, temperature, concentration, quality factor
Analog outputs	
mA	Sourcing, isolated, NAMUR NE 43, configurable
mA range	3.8–20.5 mA
Maximum load	600 Ω
Accuracy of analog outputs at +20 °C	±0.1 % of full scale (±0.00002 RI)
Supported protocol	HART 7
Digital outputs	
Digital output	RS-485, non-isolated
Maximum cable run	300 m (approx. 1000 ft) (digital)
Supported protocol	Modbus RTU
Connectors	
External connectors	1 × M12 M 4 pins, A-coded [1] 1 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5 / NPT ½"

Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Safety	IEC/EN/UL 61010-1
Pressure	CRN all territories, ASME BPVC Sec VIII Div. 1 Ed. 2021
Material compliance	FDA 21 CFR 177.150, 177.2600, 177.1550 EC 1935/2004 EC 2023/2006, GMP EU 10/2011
Compliance marks	CE, China RoHS, RCM, UKCA
Vibration and shock	Tested according to IEC 60068-2
Listing marks	MET listed (US and Canada)

Sanitary compliance

Hygienic design	3-A 46-04 EHEDG [1]
Compliance marks	3-A, EHEDG [2]
Biocompatibility	USP Class VI <88>, 70 °C
ADI free (Animal Derived Ingredients)	Yes

1) *Excluding tank bottom flange.*
2) *For EHEDG compliant installation, use 2.5″ / 4″ sanitary gasket.*

Mechanical specifications

Wetted parts	
Sensor head	EN 1.4435 BN2 (AISI 316L) [1]
Wash nozzle	EN 1.4404 (AISI316L) [1] EPDM gasket [2]
Surface roughness	Ra 0.8 µm
Prism	Sapphire monocrystalline, 99.996 %Al_2O_3 [2]
Prism gasket	Modified PTFE [3]
Sanitary gasket 2.5″ / 4″	EPDM [2]
Tank bottom gasket MT4 DN25/1T for tank bottom flange	EPDM [2]
Tank bottom flange	AISI316L [1]
Welding ferrule	EN 1.4435 (AISI 316L) [1] [4]
Non-wetted parts	
Housing	EN 1.4404 (AISI 316L)
Screws, TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable gland	EN 1.4305 (AISI 303) HUMMEL 1.693.1600.50
Dummy plug	EN 1.4305 (AISI 303) AGRO 8717.96.08.70
Thread adapter	EN 1.4404 (AISI 316L) Vaisala, DRW257718, M16×1.5 /NPT ½ in
M12 connector	Gland, EN 1.4305 (AISI 303) Contacts, CuZn with Ni/Au plating Phoenix Contact, 1405233, M12/4(M), A, 4×0.34 mm², TPE, 0.5 m Carrier, PA 6.6
Sanitary clamp 2.5″ / 4″	EN 1.4301 (AISI 304) [2]
Cable	2×2×0.5 mm² (AWG 21), PUR jacket, black 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
Weight	3.6–4.2 kg (7.94–9.26 lb)

1) *Material certificate included.*
2) *Manufacturer's declaration included.*
3) *ADI free, FDA 21 C.F.R 177.1550, 3A Sanitary Standard, USP Class VI <88>, 70 °C.*
4) *3-A certificate, EHEDG certificate.*

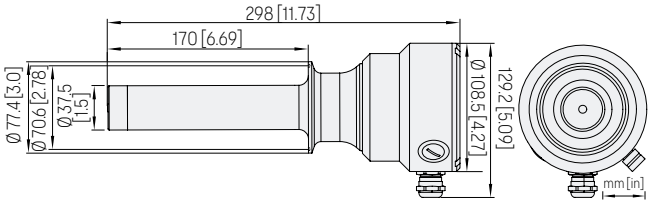
Calibration accessories

Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

Accessories

Item	Item code
USB adapter for service port, for Insight service software (see www.vaisala.com/insight)	USB2
Instrument cable, 2×2×0.5 mm² (AWG 21), PUR jacket, grey, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm² (AWG 21), PUR jacket, grey, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm² (AWG 21), PUR jacket, grey, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Cooling cover	ASM214675SP

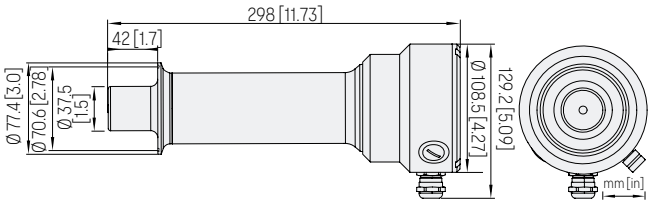
Options for PR53AP



Dimensions of PR53AP Sanitary 2.5", depth 170 mm

Mounting accessories for PR53AP Sanitary 2.5", depth 170 mm

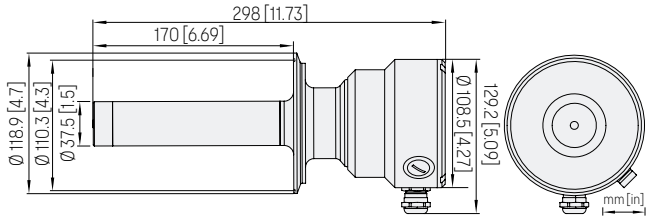
Item
Welding ferrule, 2.5”
Sanitary clamp 2.5”
Blind flange 2.5”
Sanitary gasket 2.5", EPDM
Sanitary gasket 2.5”, PTFE/steel, Combifit VOE-2034 (EHEDG)



Dimensions of PR53AP Sanitary 2.5", depth 42 mm

Mounting accessories for PR53AP Sanitary 2.5", depth 42 mm

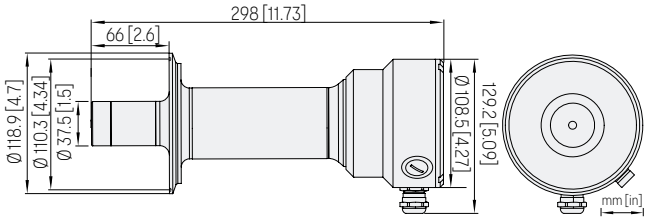
Item
Welding ferrule, 2.5”
Sanitary clamp 2.5”
Blind flange 2.5”
Sanitary gasket 2.5", EPDM
Sanitary gasket, 2.5”, PTFE/steel, Combifit VOE-2034 (EHEDG)



Dimensions of PR53AP Sanitary 4", depth 170 mm

Mounting accessories for PR53AP Sanitary 4", depth 170 mm

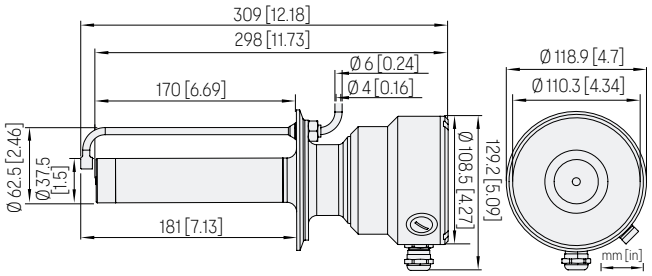
Item
Welding ferrule, 4”
Sanitary clamp 4”
Blind flange 4”
Sanitary gasket 4", EPDM
Sanitary gasket, 4”, PTFE/steel, Combifit VOE-2036 (EHEDG)



Dimensions of PR53AP Sanitary 4", depth 66 mm

Mounting accessories for PR53AP Sanitary 4", depth 66 mm

Item
Welding ferrule, 4”
Sanitary clamp 4”
Blind flange 4”
Sanitary gasket 4", EPDM
Sanitary gasket, 4”, PTFE/steel, Combifit VOE-2036 (EHEDG)

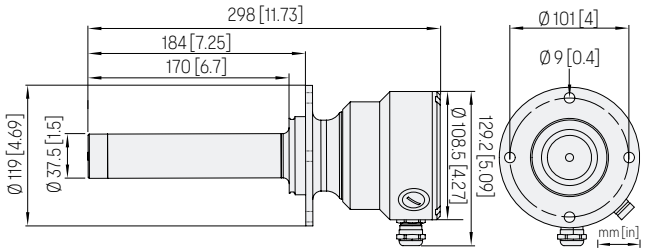


Dimensions of PR53AP Sanitary 4", depth 170 mm, with wash nozzle

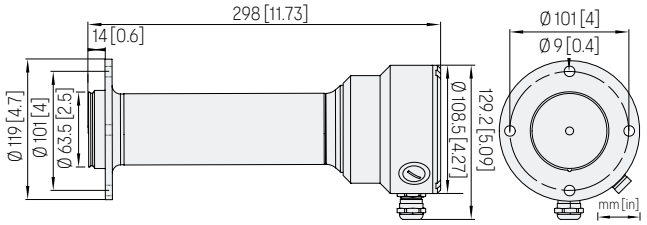
Mounting accessories for PR53AP Sanitary 4", depth 170 mm, with wash nozzle

Item
Welding ferrule, 4”
Sanitary clamp 4”
Blind flange 4”
Sanitary gasket 4", EPDM
Sanitary gasket, 4”, PTFE/steel, Combifit VOE-2036 (EHEDG)

Options for PR53AP



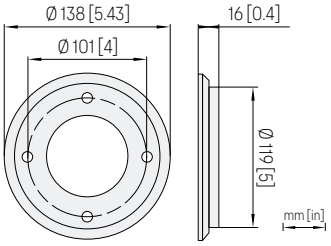
Dimensions of PR53AP tank bottom flange, depth 170 mm



Dimensions of PR53AP tank bottom flange, flush mounted

Mounting accessories for PR53AP tank bottom flange, depth 170 mm and tank bottom flange, flush mounted

Item
Tank bottom welding flange
Tank bottom blind flange
Gasket MT4 DN25/1T EPDM



Dimensions of PR53AP tank bottom welding flange

VAISALA

Polaris™ PR53GC Compact Process Refractometer



The Vaisala Polaris PR53GC general-purpose compact process refractometer is designed for measuring concentrations of acids, alkaline solutions, alcohols, hydrocarbons, solvents, and various other solutions. It can be installed directly in a pipeline and is suitable for production, transport, and quality-control applications in the chemical and other industries. Compact in size with over 500 different concentration curves, the PR53GC is suitable for a wide range of industrial applications.

Features

- Reliable optical concentration measurements with refractive index
- Sulfuric acid, sodium hydroxide, and more than 500 concentration curves
- Special alloy materials available for demanding environments
- Type L coupling
- Measurement not affected by bubbles, particles, suspended solids, or color
- Various flow cells available
- Indigo520 and Indigo80 compatible
- Built-in 4–20 mA, HART, and Modbus RTU outputs

Benefits

The optical measurement is based on the refractive index (RI). The RI can be measured from practically any liquid or slurry, and it responds to dissolved material. Bubbles, particles, or fibers in the process do not affect measurement.

The outstanding long-term stability provides years of accurate, continuous, fast, and stable concentration measurement directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

The PR53GC continues the success of the Vaisala K-PATENTS® process refractometer series. Based on 40 years of experience and continuous development, the PR53 family is the latest generation in the digital process refractometers.

Accurate and reliable

The optical measurement principle offers accurate and drift-free measurement. Because temperature measurement is incorporated inside the process refractometer, the changing process temperature does not affect the concentration measurement.

Easy mounting

Type L clamp connections allow easy installation directly into the process line. The unit can also be installed into a flange-mounted flow cell, which enables the use of an additional wash system for applications where prism wash is required.

Selected alloy materials provide durability under challenging process conditions. Other special materials and engineered solutions are available upon request.

Plug and play to Indigo

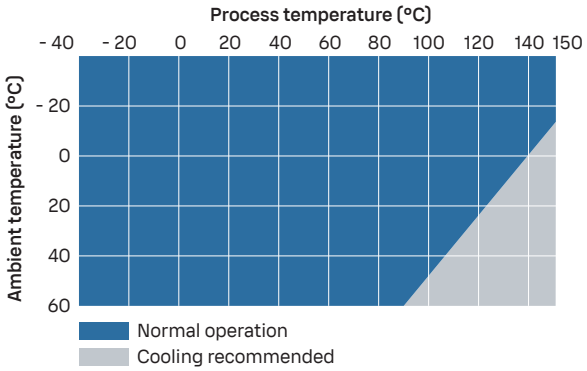
The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. It provides access to features such as data storage, graphical interface, and analog and digital interface. The Indigo520 is required when the application or the installation position requires washing, to control the process. Changing settings, measurement parameters, or other servicing updates can be done directly from Indigo520, or through a USB cable using Vaisala software.

The refractometer can also be connected to the portable diagnostics tool Indigo80 handheld indicator.

Technical data

Measurement performance

Refractive index	
Measurement range	1.32–1.53 nD (Corresponds to 0–100 °Bx)
Accuracy	±0.00014 nD (0.1 °Bx) [1]
Repeatability	±0.00002 nD [2]
Resolution	±0.000015 nD
Response time T_{63} with default damping	10 s [3]
Measurement cycle	1 / s
Long-term stability	Max. 0.1 % full scale / a
Temperature	
Accuracy at 20 °C (68 °F)	±0.3 °C (0.54 °F) [1]
Sensor class	F0.15 IEC 60751
Temperature coefficient	±0.002 °C / C

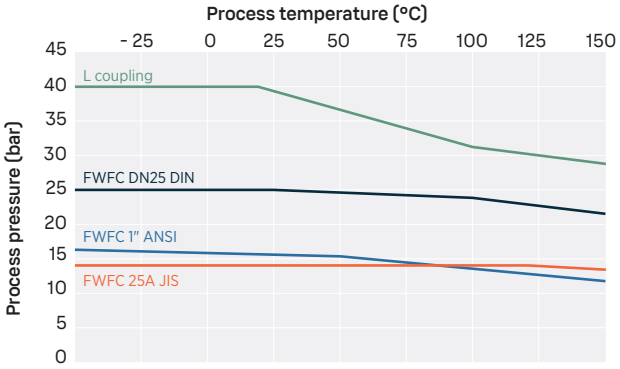


PR53GC process temperature (indicative)

Operating environment

Process parameters	
Process temperature	−40 ... +150 °C (−40 ... +302 °F)
Design temperature	+180 °C (356 °F) [1]
Operating environment	
Storage temperature	−40 ... +65 °C (−40 ... +149 °F)
Operating temperature	−40 ... +60 °C (−40 ... +140 °F)
Maximum operating altitude	2000 m (approx. 6500 ft)
Operating humidity	0–100 %RH
Storage humidity	0–100 %RH, non-condensing
UL 50E/NEMA rating	Type 4X
IP rating	IP66 IP67

1) Maximum momentary temperature peak.



PR53GC process pressure

Inputs and outputs

Supply	
Operating voltage	24 V DC nominal (9–30 V DC)
Power consumption	Less than 1 W
Protection class	3, PELV
Outputs	
Output parameters	RI, temperature, concentration, quality factor
Analog outputs	
mA	Sourcing, isolated, NAMUR NE 43, configurable
mA range	3.8–20.5 mA
Maximum load	600 Ω
Accuracy of analog outputs at +20 °C	±0.1 % of full scale (±0.00002 RI)
Supported protocol	HART 7
Digital outputs	
Digital output	RS-485, non-isolated
Maximum cable run	300 m (approx. 1000 ft) (digital)
Supported protocol	Modbus RTU
Connectors	
External connectors	1 × M12 M 4 pins, A-coded [1] 1 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5 / NPT ½″

1) For USB2 adapter and Insight software, see vaisala.com/insight.

Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Safety	IEC/EN/UL 61010-1
Pressure	CRN all territories, ASME BPVC Sec VIII Div. 1 Ed. 2021
Compliance marks	CE, China RoHS, RCM, UKCA
Vibration and shock	Tested according to IEC 60068-2

Mechanical specifications

Wetted parts	
Sensor head	EN 1.4404 (AISI 316L) EN 2.4660 (Alloy 20) EN 2.4819 (Alloy C276) 1)
Surface roughness	Ra 0.8 µm
Prism	Sapphire monocrystalline, 99.996 % Al_2O_3 2)
Prism gasket	Modified PTFE 2)
L coupling gasket	PTFE 2)
Welding ferrule	EN 1.4404 (AISI 316L) EN 2.4660 (Alloy 20) EN 2.4819 (Alloy C276) 2)
Non-wetted parts	
Housing	EN 1.4404 (AISI 316L)
Screws, TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable gland	EN 1.4305 (AISI 303) HUMMEL 1.693.1600.50
Dummy plug	EN 1.4305 (AISI 303) AGRO 8717.96.08.70
Thread adapter	EN 1.4404 (AISI 316L) Vaisala, DRW257718, M16×1.5 / NPT ½ in
M12 connector	Gland, EN 1.4305 (AISI 303) Contacts, CuZn with Ni/Au plating Phoenix Contact, 1405233, M12/4(M), A, 4×0.34 mm², TPE, 0.5 m Carrier, PA 6.6
L coupling clamp (60.3 mm)	EN 1.4301 (AISI 304) 2)
Cable	2×2×0.5 mm² (AWG 21), PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
Weight	2.7 kg (5.95 lb)

1) Material certificate included.
2) Manufacturer's declaration included.

Mounting accessories

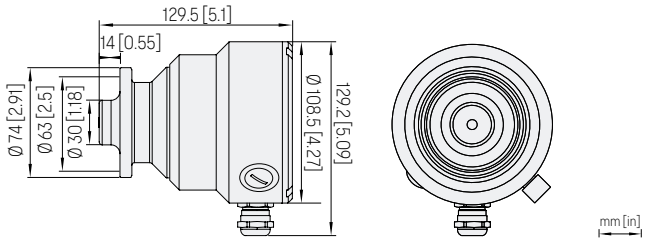
Item
L coupling clamp 60.3 mm (23.7 in)
L coupling ferrule 60.3 mm (23.7 in)
L coupling blind flange 60.3 mm (23.7 in)
L coupling gasket 60.3 mm (23.7 in)

Accessories

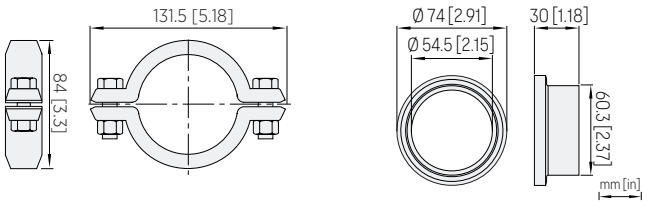
Item	Item code
USB adapter for service port, for Insight service software (see www.vaisala.com/insight)	USB2
Instrument cable, 2×2×0.5 mm² (AWG 21), PUR jacket, grey, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm² (AWG 21), PUR jacket, grey, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm² (AWG 21), PUR jacket, grey, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Cooling cover	ASM214675SP

Calibration accessories

Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

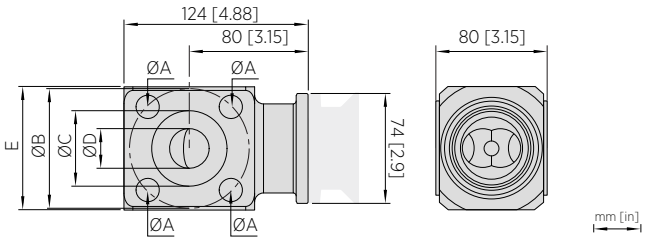


Dimensions of PR53GC



Dimensions of PR53GC L coupling clamp

Flow cells for PR53GC



FWFC Flange Wafer Flow Cell

Dimensions FWFC Flange Wafer Flow Cell

Dimension	ANSI	DIN	JIS
ØA	15.7 mm (0.62 in)	14 mm (0.55 in)	19 mm (0.75 in)
ØB	79.2 mm (3.12 in)	85 mm (3.35 in)	90 mm (3.54 in)
ØC	50.8 mm (2 in)	68 mm (2.68 in)	68 mm (2.68 in)
ØD	26.7 mm (1.05 in)	28.5 mm (1.12 in)	28.5 mm (1.12 in)
E	83 mm (3.27 in)	83 mm (3.27 in)	89 mm (3.50 in)

FWFC Flange Wafer Flow Cell

Item
Wetted parts
DIN flange DN25
ANSI flange 1"
JIS flange DN25
Length
Length 84 mm (3.3 in)
Wash nozzle
No wash nozzle, plugged
Steam wash nozzle
Water wash nozzle
Pressurized water wash nozzle
Documentation
Material EN 1024 3.1 certificate included
Material: EN 1.4404 [1]
Other variants, surface treatments and special materials available on request.

1) 3.1 material declaration included

VAISALA

Polaris™ PR53GP Probe Process Refractometer



The Vaisala Polaris PR53GP general-purpose probe process refractometer is designed for measuring concentrations of sugars/Brix, acids, alkaline solutions, hydrocarbons, solvents, and various other solutions. It can be installed directly in a pipeline or tank and is suitable for production and quality-control applications in the sugar, chemical, petrochemical, and other industries.

Features

- Reliable optical concentration measurements with refractive index
- Sulfuric acid, sodium hydroxide, and more than 500 concentration curves
- Special alloy materials available for demanding environments
- Clamp and flange connections available
- Measurement not affected by bubbles, particles, suspended solids, or color
- Indigo520 and Indigo80 compatible
- Built-in 4–20 mA, HART, and Modbus RTU outputs

Benefits

The optical measurement is based on the refractive index (RI). The RI can be measured from practically any liquid, and it responds to dissolved material. Because bubbles, particles, or crystals in the process do not affect measurement, the RI allows accurate measurement for different chemicals. Typical applications include crystallizers, wet scrubbers, reactors, transport pipelines, blending, and distillation operations.

The outstanding long-term stability provides years of accurate, continuous, fast, and stable concentration measurement directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance. The PR53GP continues the success of the Vaisala K-PATENTS® process refractometer series. Based on 40 years of experience and continuous development, the PR53 family is the latest generation of the digital process refractometers.

Accurate and reliable

The optical measurement principle offers accurate and drift-free measurement. Because temperature measurement is incorporated inside the process refractometer, the changing process temperature does not affect the concentration measurement.

Easy mounting

The PR53GP can be installed in standard flanges, making it easy to mount to process line. With the optional cooling cover accessory, the instrument tolerates high process pressures and temperatures. The optional flange-mounted pipe flow cell installation accessory allows flange-mounted installation in a wide variety of pipe sizes. Selected alloy materials provide durability under challenging process conditions. Other special materials and engineered solutions are available upon request.

Wash system

Most applications do not need wash systems due to the self-cleaning effect: the shear force of the process flow keeps the measurement point clean. For the most demanding applications, the powerful wash system ensures correct measurement when process conditions are sticky.

Plug and play to Indigo

The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. It provides access to features such as data storage, graphical interface, and analog and digital interface. The Indigo520 is required when the application or the installation position requires washing, to control the process. Changing settings, measurement parameters, or other servicing updates can be done directly from Indigo520, or through a USB cable using Vaisala software.

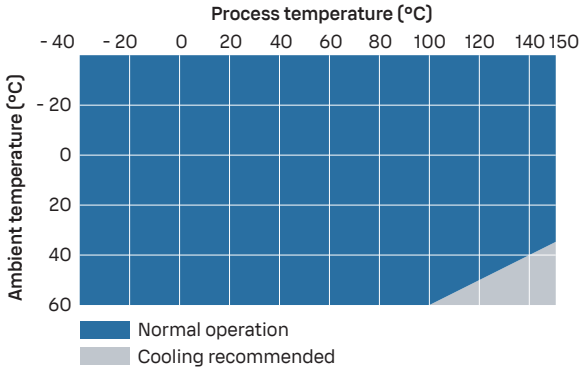
The refractometer can also be connected to the portable diagnostics tool Indigo80 handheld indicator.

Technical data

Measurement performance

Refractive index	
Measurement range	1.32–1.53 nD (Corresponds to 0–100 °Bx)
Accuracy	±0.00014 nD (0.1 °Bx) [1) 2)]
Repeatability	±0.00002 nD [3)]
Resolution	±0.000015 nD
Response time T_{63} with default damping	10 s [4)]
Measurement cycle	1 / s
Long-term stability	Max. 0.1 % full scale / a
Temperature	
Accuracy at 20 °C (68 °F)	±0.3 °C (0.54 °F) [1)]
Sensor class	F0.15 IEC 60751
Temperature coefficient	±0.002 °C / C

1) Accuracy specified with respect to calibration reference, including non-linearity, hysteresis at +20 °C.
2) VD algorithm accuracy is 0.00030.
3) Repeatability, confidence level k=2, including random noise, at Ta = +20 °C, with standard low-pass filtering.
4) With standard low-pass filtering.

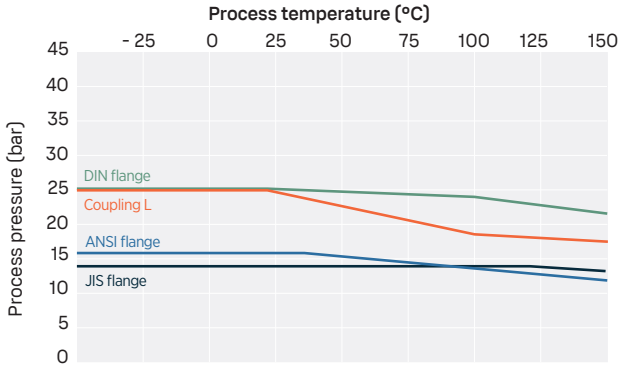


PR53GP process temperature (indicative)

Operating environment

Process parameters	
Process temperature	−40 ... +150 °C (−40 ... +302 °F)
Design temperature	+180 °C (+356 °F) [1)]
Design pressure	40 bar [2)]
Operating environment	
Storage temperature	−40 ... +65 °C (−40 ... +149 °F)
Operating temperature	−40 ... +60 °C (−40 ... +140 °F)
Maximum operating altitude	2000 m (approx. 6500 ft)
Operating humidity	0–100 %RH
Storage humidity	0–100 %RH, non-condensing
UL 50E/NEMA rating	Type 4X
IP rating	IP66 IP67

1) Maximum momentary temperature peak.
2) Maximum at +20 °C, operating pressure to the process connection rating pressure.



PR53GP process pressure

Inputs and outputs

Supply	
Operating voltage	24 V DC nominal (9–30 V DC)
Power consumption	Less than 1 W
Protection class	3, PELV
Outputs	
Output parameters	RI, temperature, concentration, quality factor
Analog outputs	
mA	Sourcing, isolated, NAMUR NE 43, configurable
mA range	3.8–20.5 mA
Maximum load	600 Ω
Accuracy of analog outputs at +20 °C	±0.1 % of full scale (±0.00002 RI)
Supported protocol	HART 7
Digital outputs	
Digital output	RS-485, non-isolated
Maximum cable run	300 m (approx. 1000 ft) (digital)
Supported protocol	Modbus RTU
Connectors	
External connectors	1 × M12 M 4 pins, A-coded [1)] 1 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5 / NPT ½"

Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Safety	IEC/EN/UL 61010-1
Pressure	CRN all territories, ASME BPVC Sec VIII Div. 1 Ed. 2021
Compliance marks	CE, China RoHS, RCM, UKCA
Vibration and shock	Tested according to IEC 60068-2

Mechanical specifications

Wetted parts	
Sensor head	EN 1.4404 (AISI 316L) [1]
Surface roughness	Ra 0.8 µm
Prism	Sapphire monocrystalline, 99.996 % Al_2O_3 [2]
Prism gasket	Modified PTFE [2]
L coupling gasket	PTFE [2]
L coupling welding ferrule	EN 1.4404 (AISI 316L)[1]
Wash nozzle parts	EN 1.4404 (AISI 316L) [1]
Non-wetted parts	
Housing	EN 1.4404 (AISI 316L)
Screws TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable gland	EN 1.4305 (AISI 303) HUMMEL 1.693.1600.50
Dummy plug	EN 1.4305 (AISI 303) AGRO 8717.96.08.70
Thread adapter	EN 1.4404 (AISI 316L) Vaisala, DRW257718, M16×1.5 / NPT ½ in
M12 connector	Gland, EN 1.4305 (AISI 303) Contacts, CuZn with Ni/Au plating Phoenix Contact, 1405233, M12/4(M), A, 4×0.34 mm^2, TPE, 0.5 m Carrier, PA 6.6
Flange	EN 1.4404 (AISI 316L) Dimensioning and tolerances as per ASME B16.5, DIN 2543, JIS B2220
L coupling clamp, 88.9 mm	EN 1.4301 (AISI 304)
Cable	2×2×0.5 mm^2 (21 AWG) PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
Weight	PR53GP 2″ flange 7.2 kg (15.87 lb) - 7.7 kg (16.98 lb) PR53GP 3″ flange 10.5 kg (23.15 lb) - 11.7 kg (25.79 lb) PR53 L coupling 5.1 kg (11.24 lb)

1) Material certificate included.
2) Manufacturer's declaration included.

Mounting accessories

Item
L coupling clamp D 88.9 mm
L coupling ferrule 88.9 / 3.6 mm PN25
L coupling gasket 88.9 / 84 mm
Note! These items only apply to the Sandvik L coupling process connection.

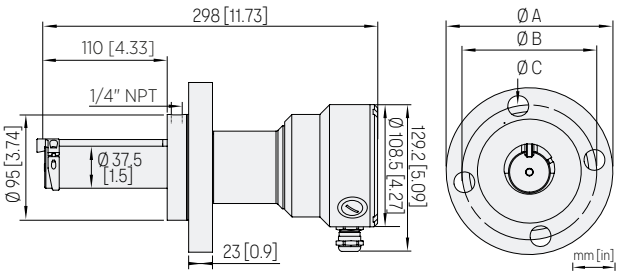
Accessories

Item	Item code
USB adapter for service port, for Insight service software (see www.vaisala.com/insight)	USB2
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, grey, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, grey, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, grey, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Cooling cover	ASM214675SP

Calibration accessories

Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

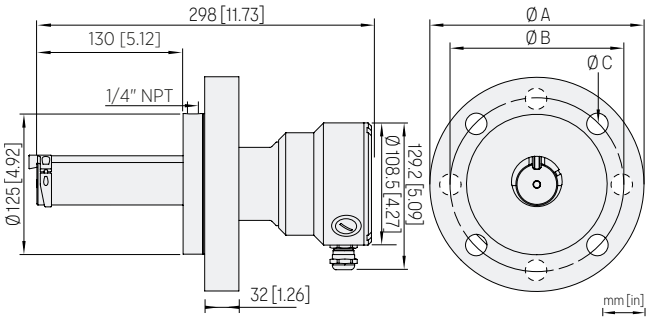
PR53GP technical data



Dimensions of PR53GP 2" flange

Dimensions of 2" flange, depth 110 mm

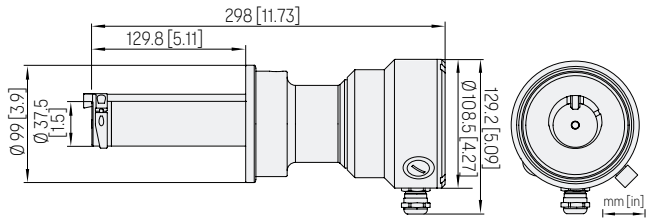
Dimension	ANSI 2”	DIN DN50	JIS 50A
ØA	152.4 mm (6 in)	165 mm (6.5 in)	155 mm (6.1 in)
ØB	120.7 mm (4.75 in)	125 mm (4.92 in)	120 mm (4.72 in)
ØC	19.1 mm (0.75 in)	18 mm (0.71 in)	19 mm (0.75 in)



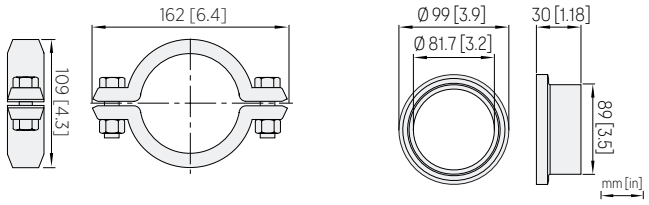
Dimensions of PR53GP 3" flange

Dimensions of 3" flange, depth 130 mm

Dimension	ANSI 3”	DIN DN80	JIS 80A
ØA	190.5 mm (7.5 in)	200 mm (7.87 in)	185 mm (7.28 in)
ØB	152.4 mm (6 in)	160 mm (6.3 in)	150 mm (5.9 in)
ØC	19.1 mm (0.75 in)	18 mm (0.71 in)	19 mm (0.75 in)



Dimensions of PR53GP L coupling 88.9 mm (3.5 in)



Dimensions of PR53GP L coupling clamp

VAISALA

Polaris™ PR53M PTFE-Body Process Refractometer



The Vaisala Polaris PR53M PTFE-body process refractometer is designed to measure concentrations of aggressive chemicals, such as hydrochloric acid (HCl), sodium hydroxide (NaOH), sodium chloride (NaCl), and sulfuric acid (H_2SO_4) in the chemical and semiconductor industries. The integrated ultra-pure PTFE flow cell has no metallic wetted parts, minimizing contamination risk and making it suitable for contact with aggressive chemicals. The PR53M can be mounted to ½ inch process lines with a standard NPT-threaded connection.

Features

- Non-metallic wetted parts, integrated ultra-pure PTFE and sapphire flow cell for demanding environments
- Reliable optical concentration measurements with refractive index
- Potassium hydroxide, sodium hydroxide, hydrochloric acid, and more than 500 concentration curves
- Measurement not affected by bubbles, particles, suspended solids, or color
- Various fittings and connections available for ½ inch tubing
- Indigo520 and Indigo80 compatible
- Built-in 4–20 mA, HART, and Modbus RTU outputs

Benefits

The optical measurement is based on the refractive index (RI). The RI can be measured from practically any liquid, and it responds to dissolved material. Because bubbles, particles, or crystals in the process do not affect measurement, the RI allows accurate measurement for different chemicals, also slurries. Typical applications include different chemical-mixing and monitoring installations in the fine chemical and semiconductor industries. In addition to a wide selection of product options, Vaisala offers the possibility to customize the product for specific needs. The outstanding long-term stability provides years of accurate, continuous, fast, and stable concentration measurement directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

The PR53M continues the success of the Vaisala K-PATENTS® process refractometer series. Based on 40 years of experience and continuous development, the PR53 family is the latest generation of digital process refractometers.

Accurate and reliable

The optical measurement principle offers accurate and drift-free measurement. Because temperature measurement is incorporated inside the process refractometer, the changing process temperature does not affect the concentration measurement.

Plug and play to Indigo

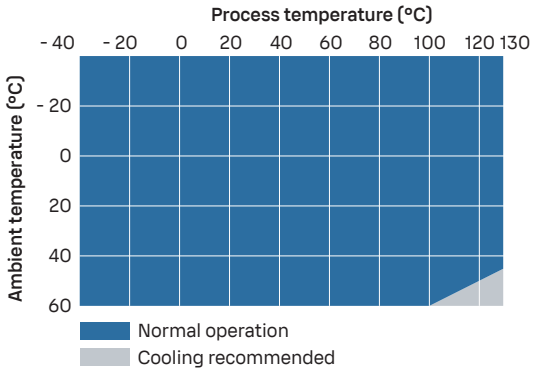
The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. It provides access to features such as data storage, graphical interface, and analog and digital interface. Changing settings, measurement parameters, or other servicing updates can be done directly from Indigo520, or through a USB cable using Vaisala software.

The refractometer can also be connected to the portable diagnostics tool Indigo80 handheld indicator.

Technical data

Measurement performance

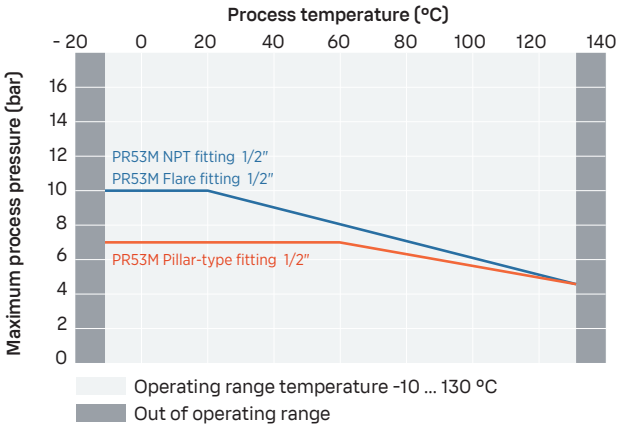
Refractive index	
Measurement range	1.32–1.53 nD (Corresponds to 0–100 °Bx)
Accuracy	±0.00014 nD (0.1 °Bx) [1]
Repeatability	±0.00002 nD [2]
Resolution	±0.000015 nD
Response time T_{63} with default damping	10 s [3]
Measurement cycle	1 / s
Long-term stability	Max. 0.1 % full scale / a
Temperature	
Accuracy at 20 °C (68 °F)	±0.3 °C (0.54 °F) [1]
Sensor class	F0.15 IEC 60751
Temperature coefficient	±0.002 °C / C



PR53M process temperature (indicative)

Operating environment

Process parameters	
Process temperature	–10 ... +130 °C (+14 ... +266 °F)
Pressure	10 bar at 20 °C, 4.5 bar at 130 °C (145 psi at 68 °F, 652 psi at 266 °F)
Operating environment	
Storage temperature	–40 ... +65 °C (–40 ... +149 °F)
Operating temperature	–40 ... +60 °C (–40 ... +140 °F)
Maximum operating altitude	2000 m (approx. 6500 ft)
Operating humidity	0–100 %RH
Storage humidity	0–100 %RH, non-condensing
UL 50E/NEMA rating	Type 4X
IP rating	IP66 IP67



PR53M process pressure

Inputs and outputs

Supply	
Operating voltage	24 V DC nominal (9–30 V DC)
Power consumption	Less than 1 W
Protection class	3, PELV
Outputs	
Output parameters	RI, temperature, concentration, quality factor
Analog outputs	
mA	Sourcing, isolated, NAMUR NE 43, configurable
mA range	3.8–20.5 mA
Maximum load	600 Ω
Accuracy of analog outputs at +20 °C	±0.1 % of full scale (±0.00002 RI)
Supported protocol	HART 7
Digital outputs	
Digital output	RS-485, non-isolated
Maximum cable run	300 m (approx. 1000 ft) (digital)
Supported protocol	Modbus RTU
Connectors	
External connectors	1 × M12 M 4 pins, A-coded [1] 1 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5 / NPT ½"

1) For USB2 adapter and Insight software, see vaisala.com/insight.

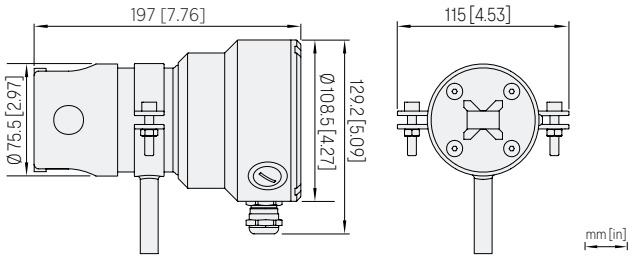
Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Safety	IEC/EN/UL 61010-1
Compliance marks	CE, China RoHS, RCM, UKCA
Vibration and shock	Tested according to IEC 60068-2

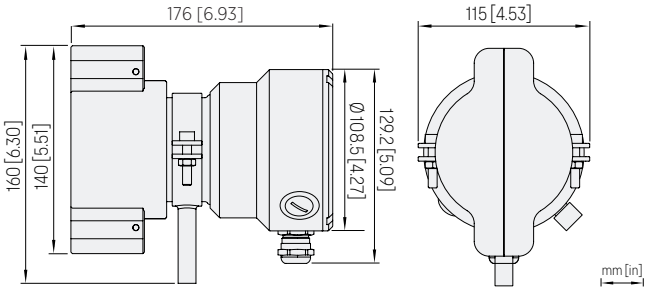
Mechanical specifications

Wetted parts	
Prism and sapphire plate	Sapphire monocrystalline, 99.996 % Al_2O_3 [1)]
Flow cell	Ultra pure PTFE [1)]
Prism gasket	Modified PTFE [1)]
Process gasket	Kalrez W240UP [1)]
Non-wetted parts	
Housing	Stainless steel (AISI 316)
Coating	Cerakote, white (PR53M with integrated fittings)
Screws TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable	2×2×0.5 mm^2 (AWG 21), PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1

1) Manufacturer's declaration included.



Dimensions of PR53M flow cell end plate bolts (NPT fitting)



Dimensions of PR53M flow cell end plate bolts (integrated fittings, Flare and Pillar-type)

Mounting accessories

Item
Flare fitting nut
Pillar nut and sleeve

Calibration accessories

Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

Accessories

Item	Item code
USB adapter for service port, for Insight service software (see www.vaisala.com/insight)	USB2
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, grey, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, grey, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, grey, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Cooling cover	ASM214675SP

VAISALA

Polaris™ PR53W Valve-Body Process Refractometer



The Vaisala Polaris PR53W valve-body process refractometer is designed to measure concentrations of aggressive chemicals, such as sulfuric acid, hydrochloric acid (HCl), and sodium hydroxide (NaOH) in production pipelines such as in the chemical, biochemical, and pharmaceutical industries. The PR53W is mounted in a membrane-lined valve body that has no metallic wetted parts. This allows convenient flange mounting to 2 inch ANSI, JIS, and DN50 flanges.

Features

- ETFE-lined valve-body flow cell with non-metallic wetted parts, for aggressive chemicals in pressurized pipelines
- Reliable optical concentration measurements with refractive index
- Hydrochloric acid, sulfuric acid, amino acid, potassium hydroxide, and more than 500 concentration curves
- Measurement not affected by bubbles, particles, suspended solids, or color
- ANSI, JIS, and DIN flanges for 2 inch process lines
- Indigo520 and Indigo80 compatible
- Built-in 4–20 mA, HART, and Modbus RTU outputs

Benefits

The optical measurement is based on the refractive index (RI). RI can be measured from practically any liquid and it responds to dissolved material. Because bubbles, particles, or crystals in the process do not affect measurement, RI allows accurate measurement for different chemicals, also slurries. Typical applications include different chemical-mixing and monitoring installations in the fine chemical and semiconductor industries. In addition to a wide selection of product options, it is possible to customize the product for specific needs. The outstanding long-term stability provides years of accurate, continuous, fast, and stable concentration measurement directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

The PR53W continues the success of the Vaisala K-PATENTS® process refractometer series. Based on 40 years of experience and continuous development, the PR53 family is the latest generation of digital process refractometers.

Accurate and reliable

The optical measurement principle offers accurate and drift-free measurement. Because temperature measurement is incorporated inside the process refractometer, the changing process temperature does not affect the concentration measurement.

Plug and play to Indigo

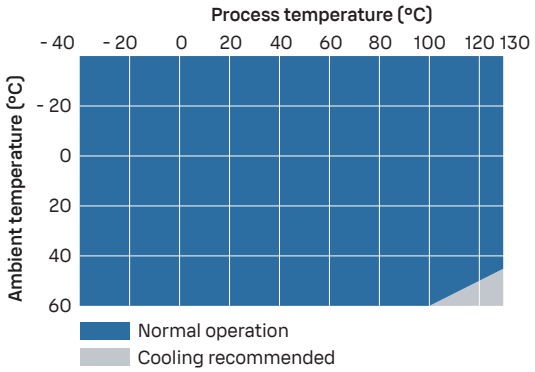
The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. It provides access to features such as data storage, graphical interface, and analog and digital interface. Changing settings, measurement parameters, or other servicing updates can be done directly from the Indigo520, or through a USB cable using Vaisala software.

The refractometer can also be connected to the portable diagnostics tool Indigo80 handheld indicator.

Technical data

Measurement performance

Refractive index	
Measurement range	1.32–1.53 nD (Corresponds to 0–100 °Bx)
Accuracy	±0.00014 nD (0.1 °Bx) [1]
Repeatability	±0.00002 nD [2]
Resolution	±0.000015 nD
Response time T_{63} with default damping	10 s [3]
Measurement cycle	1 / s
Long-term stability	Max. 0.1 % full scale / a
Temperature	
Accuracy at 20 °C (68 °F)	±0.3 °C (0.54 °F) [1]
Sensor class	F0.15 IEC 60751
Temperature coefficient	±0.002 °C / C



PR53W process temperature (indicative)

Operating environment

Process parameters	
Process temperature	–10 ... +130 °C (+14 ... +266 °F)
Operating pressure	10 bar (145 psi)
Operating environment	
Storage temperature	–40 ... +65 °C (–40 ... +149 °F)
Operating temperature	–40 ... +60 °C (–40 ... +140 °F)
Maximum operating altitude	2000 m (approx. 6500 ft)
Operating humidity	0–100 %RH
Storage humidity	0–100 %RH, non-condensing
UL 50E/NEMA rating	Type 4X
IP rating	IP66 IP67

Inputs and outputs

Supply	
Operating voltage	24 V DC nominal (9–30 V DC)
Power consumption	Less than 1 W
Protection class	3, PELV
Outputs	
Output parameters	RI, temperature, concentration, quality factor
Analog outputs	
mA	Sourcing, isolated, NAMUR NE 43, configurable
mA range	3.8–20.5 mA
Maximum load	600 Ω
Accuracy of analog outputs at +20 °C	±0.1 % of full scale (±0.00002 RI)
Supported protocol	HART 7
Digital outputs	
Digital output	RS-485, non-isolated
Maximum cable run	300 m (approx. 1000 ft) (digital)
Supported protocol	Modbus RTU
Connectors	
External connectors	1 × M12 M 4 pins, A-coded [1] 1 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5 / NPT ½"

Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Safety	IEC/EN/UL 61010-1
Compliance marks	CE, China RoHS, RCM, UKCA
Vibration and shock	Tested according to IEC 60068-2

Mechanical specifications

Wetted parts	
Prism and sapphire plate	Sapphire monocrystalline, 99.996 % Al_2O_3 [1]
Valve body lining	ETFE [1]
Prism gasket	Modified PTFE [1]
Valve body gasket	PTFE [1]
Process gasket	Kalrez W240UP [1]
Valve body M10 stud	EN 1.4404 (AISI 316L) [1]
Non-wetted parts	
Valve body	Cast iron [1]
Housing	EN 1.4404 (AISI 316L)
Screws TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable	2×2×0.5 mm² (AWG 21), PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1

1) Manufacturer's declaration included

Calibration accessories

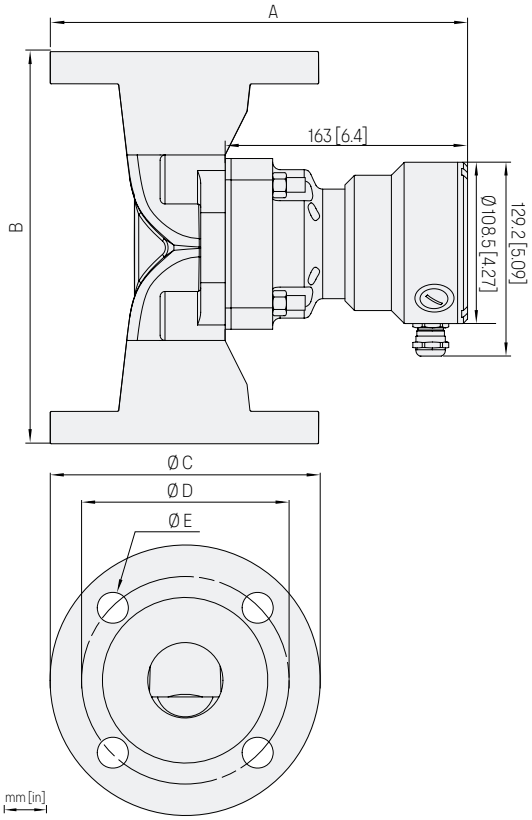
Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

Accessories

Item	Item code
USB adapter for service port, for Insight service software (see www.vaisala.com/insight)	USB2
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, grey, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, grey, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, grey, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Cooling cover	ASM214675SP

Dimensions

Dimension	ANSI 2"	DIN DN50	JIS 50A
A	268 mm (10.55 in)	275 mm (10.83 in)	270 mm (10.63 in)
B	196 mm (7.7 in)	230 mm (9.1 in)	196 mm (7.7 in)
ØA	152.4 mm (6 in)	165 mm (6.5 in)	155 mm (6.1 in)
ØB	120.7 mm (4.75 in)	125 mm (4.92 in)	120 mm (4.72 in)
ØC	19.1 mm (0.75 in)	18 mm (0.71 in)	19 mm (0.75 in)



Dimensions of PR53W valve body

VAISALA

Polaris™ PR53SD Safe-Drive Process Refractometer



Features

- Designed for safe and easy retraction from pressurized process lines
- Reliable optical concentration measurements with refractive index
- Black liquor, green liquor, filtrates, and other liquids in chemical recovery line and fiberline
- SAF 2205 material for demanding environments
- Measurement not affected by bubbles, particles, suspended solids, or color
- Indigo520 and Indigo80 compatible
- Built-in 4–20 mA, HART, and Modbus RTU outputs

The retractable Vaisala Polaris PR53SD Safe-Drive process refractometer is designed for safety-critical measurements in pulp mills, such as firing liquor concentration. The newest design of the Safe-Drive retractor system allows insertion and removal of the measurement instrument when the process is running, ensuring operator safety. Prism wash systems enable reliable measurements in various installation positions, from fiberline to brown stock washing, evaporation, black liquor firing, slaker, and lime operations. The design complies with the **BLRBAC** Recommended Good Practice Safe Firing of Black Liquor in Black Liquor Recovery Boilers.

Benefits

The optical measurement is based on the refractive index (RI). The outstanding long-term stability provides years of accurate, continuous, fast, and stable measurement for total dissolved solids and other concentration measurements, directly in the process stream. The PR53SD is designed for the critical safety measurements in pulp mills. The PR53SD measurement instrument can be retracted for maintenance without requiring process shutdown, minimizing measurement downtime. To ensure operator safety, the PR53SD and retractor prevents inadvertent errors in use: the Safe-Drive retractor tool is built into the isolation valve and ensures that the isolation valve is always closed when the refractometer is removed from the pressurized line. The PR53SD continues the success of the Vaisala K-PATENTS® process refractometer series. Based on 40 years of experience and continuous development, the PR53 family is the latest generation of digital process refractometers.

True dissolved solids measurement

Weak liquor and black liquor are a mixture of cooking chemicals and dissolved organic material. The RI measurement responds to all dissolved solids. Bubbles, foam, particles, suspended solids, or fibers do not affect measurement. The measurement enables process optimization through advanced process control: continuous and accurate optical measurement for true dissolved solids allows immediate reaction to process variations.

Fiberline and chemical recovery lines

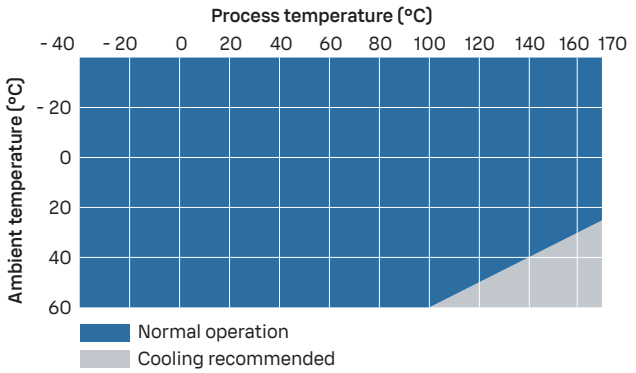
Measurement is suitable for low and medium consistency pulp, filtrates, and process liquids. In black liquor applications, total dissolved solids concentrations up to 90 % can be measured directly inline. Field-proven prism wash systems allow accurate measurement in challenging process media and conditions.

Technical data

Measurement performance

Refractive index	
Measurement range	1.32–1.53 nD (0–90 % total solids), normal-range prism 1.36–1.57 nD (20–100 % total solids), high-range prism
Accuracy	±0.00014 nD (0.1 °Bx) [1]
Repeatability	±0.00002 nD [2]
Resolution	±0.000015 nD
Response time T_{63} with default damping	10 s [3]
Measurement cycle	1 / s
Long-term stability	Max. 0.1 % full scale / a
Temperature	
Accuracy at 20 °C (68 °F)	±0.3 °C (0.54 °F) [1]
Sensor class	F0.15 IEC 60751
Temperature coefficient	±0.002 °C / C

1) *Accuracy specified with respect to calibration reference, including non-linearity, hysteresis at +20 °C.*
2) *Repeatability, confidence level k=2, including random noise, at Ta = +20 °C, with standard low-pass filtering.*
3) *At standard low-pass filtering.*



PR53SD process temperature (indicative)

Operating environment

Process parameters	
Process temperature	–40 ... +170 °C (–40 ... +338 °F)
Design temperature	+180 °C (+356 °F) [1]
Design pressure / maximum operating pressure	35 bar (507.6 psi)
Maximum retraction pressure	35 bar (507.6 psi)
Operating environment	
Storage temperature	–40 ... +65 °C (–40 ... +149 °F)
Operating temperature	–40 ... +60 °C (–40 ... +140 °F)
Maximum operating altitude	2000 m (approx. 6500 ft)
Operating humidity	0–100 %RH
Storage humidity	0–100 %RH, non-condensing
UL 50E/NEMA rating	Type 4X
IP rating	IP66 IP67

1) *Maximum momentary temperature peak.*

Inputs and outputs

Supply	
Operating voltage	24 V DC nominal (9–30 V DC)
Power consumption	Less than 1 W
Protection class	3, PELV
Outputs	
Output parameters	RI, temperature, concentration, quality factor
Analog outputs	
mA	Sourcing, isolated, NAMUR NE 43, configurable
mA range	3.8–20.5 mA
Maximum load	600 Ω
Accuracy of analog outputs at +20 °C	±0.1 % of full scale (±0.00002 RI)
Supported protocol	HART 7
Digital outputs	
Digital output	RS-485, non-isolated
Maximum cable run	300 m (approx. 1000 ft) (digital)
Supported protocol	Modbus RTU
Connectors	
External connectors	1 × M12 M 4 pins, A-coded 7 2 × M16×1.5 cable gland, Cable D 5–10 mm / 2 x adapter for conduit entry M16×1.5 [2]/ NPT ½"

1) *For USB2 adapter and Insight software, see vaisala.com/insight.*
2) *Thread adapter is not compatible with SDI5 Safe-Drive system.*

Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Safety	IEC/EN/UL 61010-1
Pressure	CRN all territories, ASME BPVC Sec VIII Div. 1 Ed. 2021
Compliance marks	CE, China RoHS, RCM, UKCA
Vibration and shock	Tested according to IEC 60068-2

Mechanical specifications

Wetted parts	
Sensor head	EN 1.4462 [1)]
Prism	Sapphire monocrystalline, 99.996 % Al_2O_3 [2)]
Process gasket	Co-Cr-Ni Alloy (AMS 5876) lined PTFE [2)]
Prism gasket	Modified PTFE [2)]
SD flange	EN 1.4462 [1)]
Wash nozzle	EN 1.4462 [2)]
Non-wetted parts	
Housing	EN 1.4404
Screws, TX20 torque 2.0 Nm	EN 1.4404 (AISI 316L)
Stud bolts, M12 torque 75 Nm, M10 torque 40 Nm	EN 1.4435 (AISI 316L), grade 8.8
Flanges (3 pcs)	EN 1.4462 (AISI 2205) ASME B16.5, DIN 2543
Cable	2×2×0.5 mm^2 (AWG 21), PUR jacket, grey 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
Weight	Retractor and wash connection 15 kg (33.07 lb) Refractometer 5.4 kg (11.9 lb)

1) EN 10204 / 3.1 certificate included.
2) Manufacturer's declaration included.

Mounting accessories

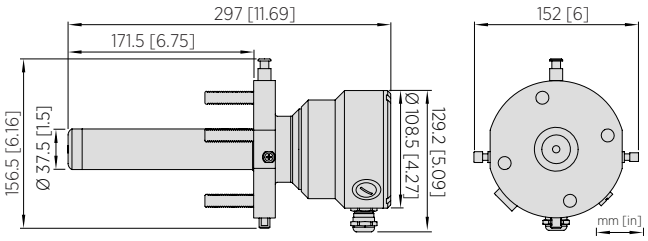
Item	Item code
Blind flanges for SDI5, spare kit	278299SP

Calibration accessories

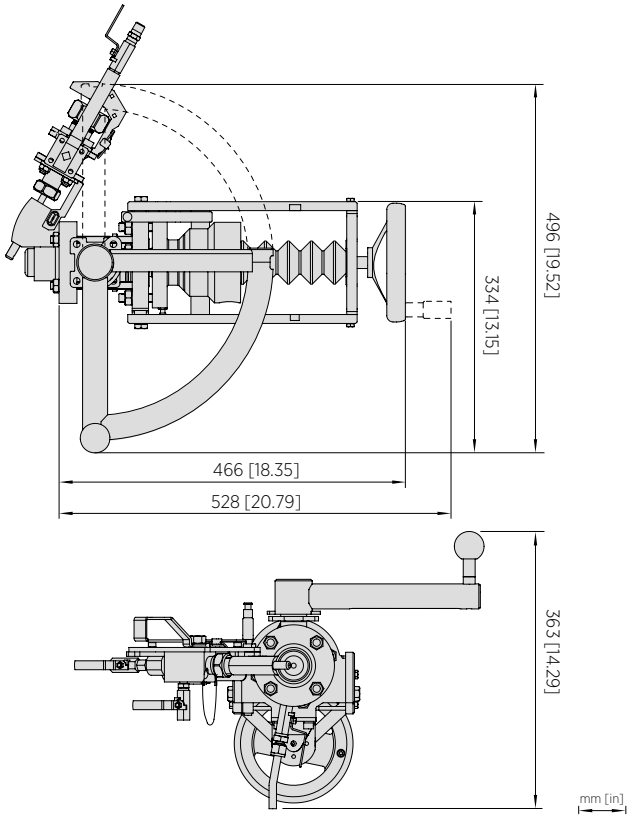
Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

Accessories

Item	Item code
USB adapter for service port, for Insight service software (see www.vaisala.com/insight)	USB2
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, grey, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, grey, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, grey, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Cooling cover	ASM214675SP



Dimensions of PR53SD



Dimensions of PR53 SDI5 Safe-Drive isolation valve and retractor

VAISALA

Polaris™ PR53ACEX Sanitary Compact Process Refractometer



Vaisala Polaris PR53ACEX sanitary compact process refractometer for potentially explosive environments is designed for measuring liquid concentrations, such as Brix, inline. Applications include life science, food, beverage, dairy and brewery industry customers, and OEMs. 3-A and EHEDG certifications ensure that all hygienic demands and safety requirements are met. Easy to install directly in pipelines with a sanitary clamp and optional flow cells.

Features

- Reliable optical concentration measurements with refractive index
- Options for Ex Zone 0 or Zone 2
- Compliant with ATEX and IECEx
- Brix, Total Solids, Oechsle, Baume, Plato, and more than 500 concentration curves
- 3-A and EHEDG certified
- 3-A and Type N sanitary couplings
- Measurement not affected by bubbles, particles, suspended solids, or color
- Various flow cells available
- Vaisala Indigo520 compatible
- Built-in 4–20 mA, HART, and Modbus® RTU outputs

Benefits

The optical measurement is based on the refractive index (RI). The RI can be measured from practically any liquid and it responds to dissolved material. Bubbles, particles, or fibers in the process do not affect measurement. The outstanding long-term stability provides years of accurate, continuous, fast, and stable measurement in potentially explosive environments directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

Safe for sanitary applications

The product is compatible with both clean-in-place (CIP) and sterilization-in-place (SIP) systems. The material offering, including stainless-steel wetted parts, PTFE, and sapphire, are all suitable for direct contact with the process with convenient installations directly to process lines with standard sanitary and Type N couplings, or with a sanitary flow cell. Stainless steel is easy to maintain and keep clean, and traceability ensures safety.

Safe in potentially explosive environments

The PR53EX series refractometers can be installed directly into hazardous areas. They are safe to use and can withstand continuous exposure to potentially explosive environments that contain flammable gas, vapor, or mist. Operation in these environments requires no additional protective enclosures. A robust design, combined with trouble-free operation, ensures a long-term solution for concentration measurement in potentially explosive environments. The PR53EX series refractometers have two Ex certified options for Zone 2 and Zone 0. For Zone 0 environments, a galvanic isolator is installed between the potentially explosive area and the refractometer to ensure safe operation.

Wash system

Most applications do not need wash systems due to the self-cleaning effect: the shear force of the process flow keeps the measurement point clean. For the most demanding applications, the powerful refractometer wash system ensures correct measurement when process conditions are sticky.

Plug and play to Indigo

The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. The transmitter provides access to features such as data storage, graphical interface, and analog and digital interface. Indigo520 is required when the application or the installation position requires washing to control the process. Changing settings, measurement parameters, or other servicing updates can be done directly from Indigo520, or through a USB cable using Vaisala software.

The refractometer can also be connected to the portable diagnostics tool Indigo80 handheld indicator.

Technical data

Measurement performance

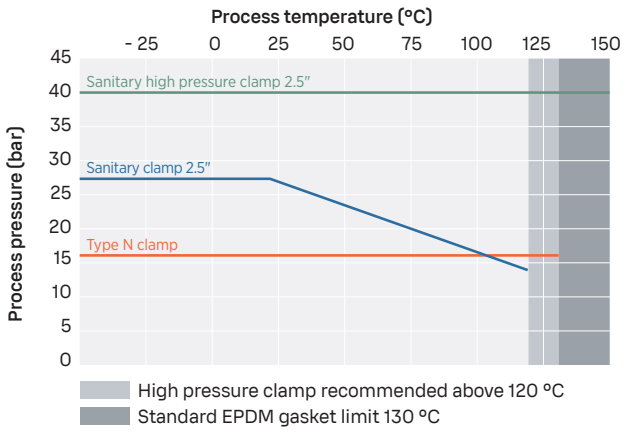
Refractive index	
Measurement range	1.32–1.53 nD (Corresponds to 0–100 °Bx)
Accuracy	±0.00014 nD (0.1 °Bx) [1]
Repeatability	±0.00002 nD [2]
Resolution	±0.000015 nD
Response time T_{63} with default damping	10 s [3]
Measurement cycle	1 / s
Long-term stability	Max. 0.1 % full scale / a
Temperature	
Accuracy at 20 °C (68 °F)	±0.3 °C (0.54 °F) [1]
Sensor class	F0.15 IEC 60751
Temperature coefficient	±0.002 °C / °C

1) Accuracy specified with respect to calibration reference, including non-linearity, hysteresis at +20 °C.
2) Repeatability, confidence level k=2, including random noise, at Ta = +20 °C, with standard low-pass filtering.
3) With standard low-pass filtering.

Operating environment

Process parameters	
Process temperature	–40 ... +150 °C (–40 ... +302 °F) [1] [2]
Design temperature	+180 °C (356 °F) [3]
Design pressure	40 bar [4]
Operating environment	
Storage temperature	–40 ... +65 °C (–40 ... +149 °F)
Operating temperature	–40 ... +60 °C (–40 ... +140 °F)
Maximum operating altitude	2000 m (approx. 6500 ft)
Operating humidity	0–100 %RH
Storage humidity	0–100 %RH, non-condensing
UL 50E/NEMA rating	Type 4X
IP rating	IP66

1) –40 ... +130 °C (-40 ... 266 °F) EPDM gasket, -40... +150 °C (–40 ... +302 °F) PTFE gasket.
2) The use of cooling cover is mandatory in certain conditions. See PR53EX Safety Guide in docs.vaisala.com.
3) Maximum momentary temperature peak.
4) Maximum at +20 °C (68 °F), operating pressure to the clamp rating pressure.



PR53ACEX process pressure

Inputs and outputs

Protection class	3, PELV
Supply (Zone 2 only)	
Operating voltage	24 V DC nominal (9–30 V DC)
Power consumption	Less than 1 W
Outputs	
Output parameters	RI, temperature, concentration, quality factor
Analog outputs	
mA	'ia' variant: Sinking, isolated, NAMUR NE 43, configurable 'ec' variant: Sourcing, isolated, NAMUR NE 43, configurable
mA range	3.8–20.5 mA
Maximum load	Max. 600 Ω
Accuracy of analog outputs at +20 °C	±0.1 % of full scale (±0.00002 RI)
Digital outputs	
Digital output	RS-485, non-isolated
Maximum cable run	300 m (approx. 1000 ft) (digital)
Supported protocol	Modbus RTU
Connectors	
External connectors	1 × M12-4M, A-coded [1] 2 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5 / NPT 1/2"

1) For USB2 adapter and Insight software, see vaisala.com/insight.

Intrinsically safe parameters for the 'ia' variant

Parameter	Value
Terminals VIN+ and VIN-	
Ui	28 V
Ii	100 mA
Pi	700 mW
Li	0 nH
Ci	1.1 nF
Terminals RS-485+ and RS-485-	
Ui	28 V
Pi	500 mW
Li	0 nH
Ci	1.1 nF
Uo	5 V
Io	50 mA
Po	62 mW
Terminals Analog out + and Analog out -	
Ui	28 V
Ii	100 mA
Pi	700 mW
Li	16 nH
Ci	11.6 nF
Service Port connector	
Um	250 V

Ex classification by region

Certification	Classification
Europe (ATEX, Zone 0) (Pending)	EESF 25 ATEX 014X I M1 Ex ia I Ma II 1G Ex ia IIC T4...150 °C (T3) Ga IP66
Europe (ATEX, Zone 2)	EESF 25 ATEX 013X II 3G Ex ec IIC T4...150 °C (T3) Gc IP66
International (IECEx, Zone 0) (Pending)	IECEx EESF 25.0019X Ex ia I Ma Ex ia IIC T4...150 °C (T3) Ga IP66
International (IECEx, Zone 2)	Ex ec IIC T4...150 °C (T3) Gc IP66

Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Safety	IEC/EN/UL 61010-1
Pressure	CRN all territories, ASME BPVC Sec VIII Div. 1 Ed. 2021
Material compliance	FDA 21 CFR 177.150, 177.2600, 177.1550 EC 1935/2004 EC 2023/2006, GMP EU 10/2011
Compliance marks	CE, China RoHS, RCM
Vibration and shock	Tested according to IEC 60068-2

Sanitary compliance

Hygienic design	3-A 46-04 EHEDG
Compliance marks	3-A, EHEDG (for EHEDG compliant installation, use 2.5″ / 4″ sanitary gasket)
Biocompatibility	USP Class VI <88>, 70 °C
ADI free (Animal Derived Ingredients)	Yes

Accessories

Item	Item code
USB adapter for service port, for Insight service software (see vaisala.com/insight)	USB2
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, gray, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, gray, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, gray, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, light blue, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211606-50M
Cooling cover	ASM215772SP

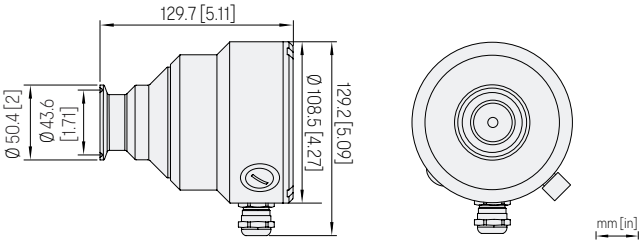
Mechanical specifications

Wetted parts	
Sensor head	EN 1.4435 BN2 (AISI 316L) [1]
Surface roughness	Ra 0.8 µm Ra 0.38 µm electropolished [1]
Prism	Sapphire monocrystalline, 99.996 % Al_2O_3 [2]
Prism gasket	Modified PTFE [3]
Sanitary 2.5″ gasket	EPDM [2]
Type N gasket	EPDM [2]
Welding ferrule	EN 1.4435 (AISI 316L) [1] [4] ASME BPE-2019 (DIN 32676-C)
Non-wetted parts	
Housing	EN 1.4404 (AISI 316L)
Screws TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable gland	EN 1.4305 (AISI 303)
Dummy plug	EN 1.4305 (AISI 303)
Thread adapter	EN 1.4404 (AISI 316L) Vaisala, DRW257718, M16×1.5 / NPT 1/2″
M12 connector	Gland, EN 1.4305 (AISI 303) Contacts, CuZn with Ni/Au plating Phoenix Contact, 1405233, M12-4M, A, 4×0.34 mm^2, TPE, 0.5 m (16.4′) Carrier, PA 6.6
Sanitary 2.5″ clamp	EN 1.4301 (AISI 304) [2]
Type N Clamp	EN 1.4301 (AISI 304) [2]
Cable (Zone 2)	2×2×0.5 mm^2 (AWG 21), PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
Cable (Zone 0)	2×2×0.5 mm^2 (AWG 21), PUR jacket, light blue 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, FT2
Weight	2.7 kg (5.95 lb)

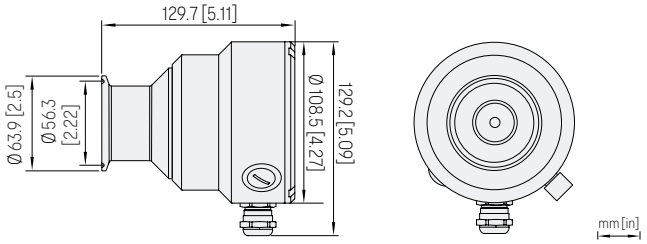
1) EN 10204 / 3.1 certificate included.
2) Manufacturer's declaration included.
3) ADI free, FDA 21 C.F.R 177.1550, 3A Sanitary Standard, USP Class VI <88>, 70 °C.
4) 3-A certificate, EHEDG certificate.

Calibration accessories

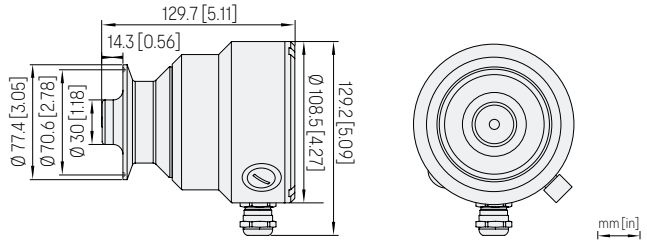
Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP



Dimensions for PR53ACEX Sanitary 1.5"



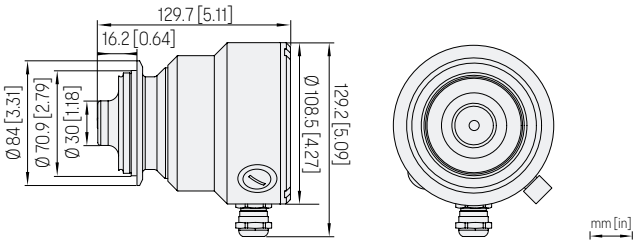
Dimensions for PR53ACEX Sanitary 2"



Dimensions for PR53ACEX Sanitary 2.5"

Sanitary 2.5" mounting accessories

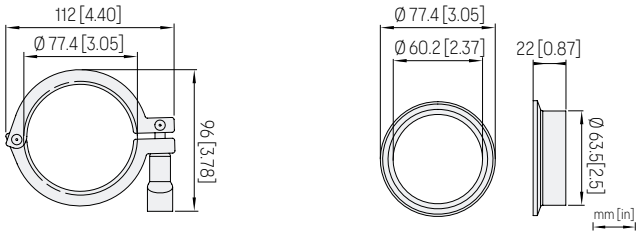
Item
Welding ferrule, 2.5”
Sanitary clamp 2.5”
High-pressure clamp 2.5”
Blind flange 2.5”
Sanitary gasket, 2.5”, EPDM
Sanitary gasket, 2.5”, EHEDG compliant, PTFE/steel, Combifit VOE-2034 (optional)



Dimensions for PR53ACEX Type N

Type N mounting accessories

Item
Type N clamp 2.5”, DN 50/40
Type N blind flange
Gasket 59.5×3 mm, EPDM



Mounting kit for PR53ACEX Sanitary 2.5"

VAISALA

Polaris™ PR53APEX Sanitary Compact Process Refractometer



Vaisala Polaris PR53APEX sanitary probe process refractometer for potentially hazardous environments is designed for life science, food and beverage, dairy and brewery industry customers, and OEMs to measure liquid concentrations, such as Brix, in applications such as jam cookers and mixing tanks. 3-A and EHEDG certifications ensure that all hygienic demands and safety requirements are met. The long probe can withstand high process temperatures and its design enables flexible installations directly to kettles, cookers, vessels, and tanks.

Features

- Reliable optical concentration measurements with refractive index
- Options for Ex Zone 0 or Zone 2
- Compliant with ATEX and IECEx
- Brix, Total Solids, Oechsle, Baume, Plato, and more than 500 concentration curves
- 3-A and EHEDG certified
- Sanitary and tank bottom flange couplings
- Measurement not affected by bubbles, particles, suspended solids, or color
- Vaisala Indigo520 compatible
- Built-in 4–20 mA, HART, and Modbus® RTU outputs

Benefits

The optical measurement is based on the refractive index (RI). The RI can be measured from practically any liquid and it responds to dissolved material. Bubbles, particles, or fibers in the process do not affect measurement. The outstanding long-term stability provides years of accurate, continuous, fast, and stable measurement in potentially explosive environments directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

Safe for sanitary applications

The product design welcomes both cleaning-in-place (CIP) and sterilization-in-place (SIP) systems. Stainless-steel wetted parts, PTFE, and sapphire are suitable for direct contact with the process, and traceability ensures safety. Stainless steel is easy to maintain and keep clean. The long probe with standard tank bottom flanges enables installation depths of up to 170 mm (6.7 in). The flush mount option allows installation in tanks with scrapers or mixers.

Safe in potentially explosive environments

The PR53EX series refractometers can be installed directly into hazardous areas. They are safe to use and can withstand continuous exposure to potentially explosive environments that contain flammable gas, vapor, or mist. Operation in these environments requires no additional protective enclosures. A robust design, combined with trouble-free operation, ensures a long-term solution for concentration measurement in potentially explosive environments. The PR53EX series refractometers have two Ex certified options for Zone 2 and Zone 0. For Zone 0 environments, a galvanic isolator is installed between the potentially explosive area and the refractometer to ensure safe operation.

Wash system

Most applications do not need wash systems due to the self-cleaning effect: the shear force of the process flow keeps the measurement point clean. For the most demanding applications, the powerful refractometer wash system ensures correct measurement when process conditions are sticky.

Plug and play to Indigo

The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. The transmitter provides access to features such as data storage, graphical interface, and analog and digital interface. Indigo520 is required when the application or the installation position requires washing to control the process. Changing settings, measurement parameters, or other servicing updates can be done directly from Indigo520, or through a USB cable using Vaisala software.

The refractometer can also be connected to the portable diagnostics tool Indigo80 handheld indicator.

Technical data

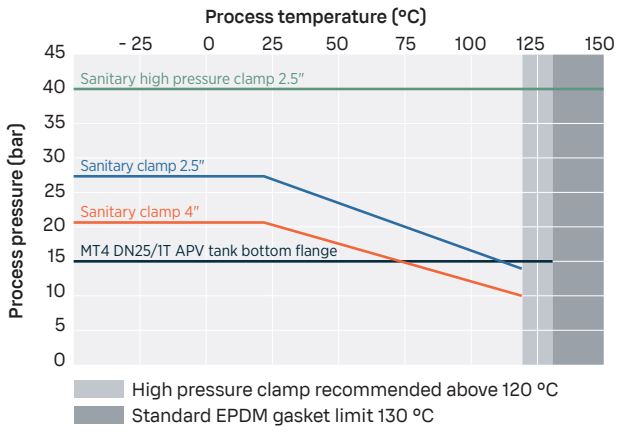
Measurement performance

Refractive index	
Measurement range	1.32–1.53 nD (Corresponds to 0–100 °Bx)
Accuracy	±0.00014 nD (0.1 °Bx) [1]
Repeatability	±0.00002 nD [2]
Resolution	±0.000015 nD
Response time T_{63} with default damping	10 s [3]
Measurement cycle	1 / s
Long-term stability	Max. 0.1 % full scale / a
Temperature	
Accuracy at 20 °C (68 °F)	±0.3 °C (0.54 °F) [1]
Sensor class	F0.15 IEC 60751
Temperature coefficient	±0.002 °C / °C

Operating environment

Process parameters	
Process temperature	–40 ... +150 °C (–40 ... +302 °F) [1] [2]
Design temperature	+180 °C (356 °F) [3]
Design pressure	40 bar [4]
Operating environment	
Storage temperature	–40 ... +65 °C (–40 ... +149 °F)
Operating temperature	–40 ... +60 °C (–40 ... +140 °F)
Maximum operating altitude	2000 m (approx. 6500 ft)
Operating humidity	0–100 %RH
Storage humidity	0–100 %RH, non-condensing
UL 50E/NEMA rating	Type 4X
IP rating	IP66

1) –40 ... +130 °C (–40 ... 266 °F) EPDM gasket, –40... +150 °C (–40 ... +302 °F) PTFE gasket
2) The use of cooling cover is mandatory in certain conditions. See PR53EX Safety Guide in docs.vaisala.com.
3) Maximum momentary temperature peak.
4) Maximum at +20 °C (68 °F), operating pressure to the clamp rating pressure.



PR53APEX process pressure

Inputs and outputs

Protection class	3, PELV
Supply (Zone 2 only)	
Operating voltage	24 V DC nominal (9–30 V DC)
Power consumption	Less than 1 W
Outputs	
Output parameters	RI, temperature, concentration, quality factor
Analog outputs	
mA	'ia' variant: Sinking, isolated, NAMUR NE 43, configurable 'ec' variant: Sourcing, isolated, NAMUR NE 43, configurable
mA range	3.8–20.5 mA
Maximum load	Max. 600 Ω
Accuracy of analog outputs at +20 °C	±0.1 % of full scale (±0.00002 RI)
Digital outputs	
Digital output	RS-485, non-isolated
Maximum cable run	300 m (approx. 1000 ft) (digital)
Supported protocol	Modbus RTU
Connectors	
External connectors	1 × M12-4M, A-coded [1] 2 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5 / NPT 1/2"

Intrinsically safe parameters for the 'ia' variant

Parameter	Value
Terminals VIN+ and VIN-	
Ui	28 V
Ii	100 mA
Pi	700 mW
Li	0 nH
Ci	1.1 nF
Terminals RS-485+ and RS-485-	
Ui	28 V
Pi	500 mW
Li	0 nH
Ci	1.1 nF
Uo	5 V
Io	50 mA
Po	62 mW
Terminals Analog out + and Analog out -	
Ui	28 V
Ii	100 mA
Pi	700 mW
Li	16 nH
Ci	11.6 nF
Service Port connector	
Um	250 V

Ex classification by region

Certification	Classification
Europe (ATEX, Zone 0) (Pending)	EESF 25 ATEX 014X I M1 Ex ia I Ma II 1G Ex ia IIC T4...150 °C (T3) Ga IP66
Europe (ATEX, Zone 2)	EESF 25 ATEX 013X II 3G Ex ec IIC T4...150 °C (T3) Gc IP66
International (IECEx, Zone 0) (Pending)	IECEx EESF 25.0019X Ex ia I Ma Ex ia IIC T4...150 °C (T3) Ga IP66
International (IECEx, Zone 2)	Ex ec IIC T4...150 °C (T3) Gc IP66

Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Safety	IEC/EN/UL 61010-1
Pressure	CRN all territories, ASME BPVC Sec VIII Div. 1 Ed. 2021
Material compliance	FDA 21 CFR 177.150, 177.2600, 177.1550 EC 1935/2004 EC 2023/2006, GMP EU 10/2011
Compliance marks	CE, China RoHS, RCM
Vibration and shock	Tested according to IEC 60068-2

Sanitary compliance

Hygienic design	3-A 46-04 EHEDG [1]
Compliance marks	3-A, EHEDG [2]
Biocompatibility	USP Class VI <88>, 70 °C
ADI free (Animal Derived Ingredients)	Yes

1) Excluding tank bottom flange.
2) For EHEDG compliant installation, use 2.5" / 4" sanitary gasket.

Calibration accessories

Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

Mechanical specifications

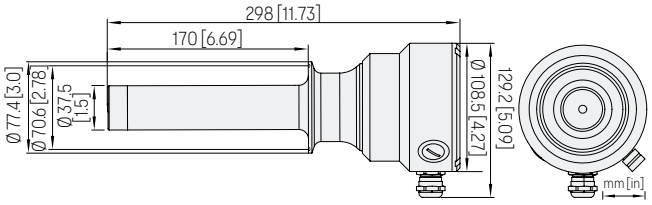
Wetted parts	
Sensor head	EN 1.4435 BN2 (AISI 316L) [1]
Wash nozzle	EN 1.4404 (AISI316L) [1] EPDM gasket [2]
Surface roughness	Ra 0.8 µm
Prism	Sapphire monocrystalline, 99.996 % Al_2O_3 [2]
Prism gasket	Modified PTFE [3]
Sanitary gasket 2.5" / 4"	EPDM [2]
Tank bottom gasket MT4 DN25/1T for tank bottom flange	EPDM [2]
Tank bottom flange	AISI316L [1]
Welding ferrule	EN 1.4435 (AISI 316L) [1] [4]
Non-wetted parts	
Housing	EN 1.4404 (AISI 316L)
Screws, TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable gland	EN 1.4305 (AISI 303)
Dummy plug	EN 1.4305 (AISI 303)
Thread adapter	EN 1.4404 (AISI 316L) Vaisala, DRW257718, M16×1.5 / NPT 1/2"
M12 connector	Gland, EN 1.4305 (AISI 303) Contacts, CuZn with Ni/Au plating Phoenix Contact, 1405233, M12-4M, A, 4×0.34 mm2, TPE, 0.5 m (16.4') Carrier, PA 6.6
Sanitary clamp 2.5" / 4"	EN 1.4301 (AISI 304) [2]
Cable (Zone 2)	2×2×0.5 mm^2 (AWG 21), PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
Cable (Zone 0)	2×2×0.5 mm^2 (AWG 21), PUR jacket, light blue 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, FT2
Weight	3.6–4.2 kg (7.94–9.26 lb)

1) Material certificate included.
2) Manufacturer's declaration included.
3) ADI free, FDA 21 C.F.R 177.1550, 3A Sanitary Standard, USP Class VI <88>, 70 °C.
4) 3-A certificate, EHEDG certificate.

Accessories

Item	Item code
USB adapter for service port, for Insight service software (see vaisala.com/insight)	USB2
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, gray, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, gray, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, gray, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, light blue, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211606-50M
Cooling cover	ASM215772SP

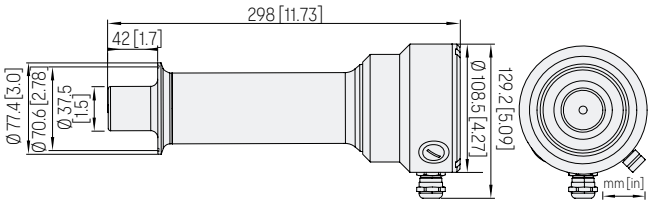
Options for PR53APEX



Dimensions of PR53AP Sanitary 2.5", depth 170 mm

Mounting accessories for PR53AP Sanitary 2.5", depth 170 mm

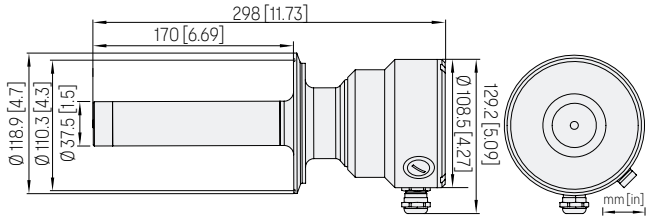
Item
Welding ferrule, 2.5”
Sanitary clamp 2.5”
Blind flange 2.5”
Sanitary gasket 2.5", EPDM
Sanitary gasket 2.5”, PTFE/steel, Combifit VOE-2034 (EHEDG)



Dimensions of PR53AP Sanitary 2.5", depth 42 mm

Mounting accessories for PR53AP Sanitary 2.5", depth 42 mm

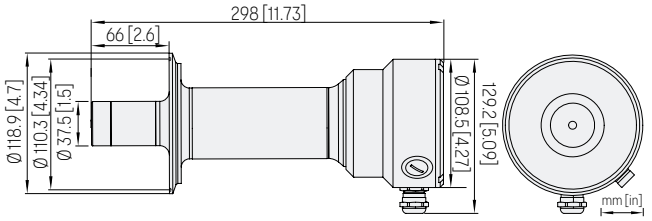
Item
Welding ferrule, 2.5”
Sanitary clamp 2.5”
Blind flange 2.5”
Sanitary gasket 2.5", EPDM
Sanitary gasket, 2.5”, PTFE/steel, Combifit VOE-2034 (EHEDG)



Dimensions of PR53AP Sanitary 4", depth 170 mm

Mounting accessories for PR53AP Sanitary 4", depth 170 mm

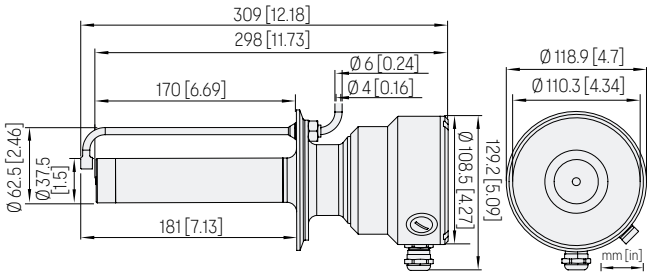
Item
Welding ferrule, 4”
Sanitary clamp 4”
Blind flange 4”
Sanitary gasket 4", EPDM
Sanitary gasket, 4”, PTFE/steel, Combifit VOE-2036 (EHEDG)



Dimensions of PR53AP Sanitary 4", depth 66 mm

Mounting accessories for PR53AP Sanitary 4", depth 66 mm

Item
Welding ferrule, 4”
Sanitary clamp 4”
Blind flange 4”
Sanitary gasket 4", EPDM
Sanitary gasket, 4”, PTFE/steel, Combifit VOE-2036 (EHEDG)

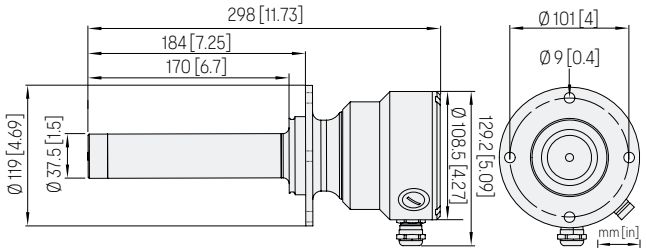


Dimensions of PR53AP Sanitary 4", depth 170 mm, with wash nozzle

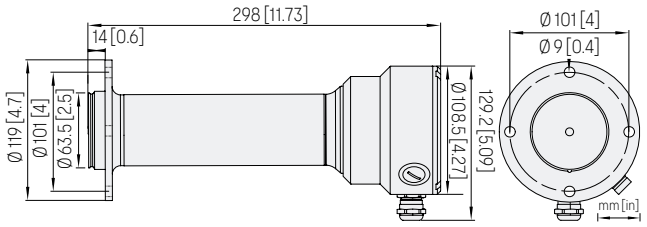
Mounting accessories for PR53AP Sanitary 4", depth 170 mm, with wash nozzle

Item
Welding ferrule, 4”
Sanitary clamp 4”
Blind flange 4”
Sanitary gasket 4", EPDM
Sanitary gasket, 4”, PTFE/steel, Combifit VOE-2036 (EHEDG)

Options for PR53APEX



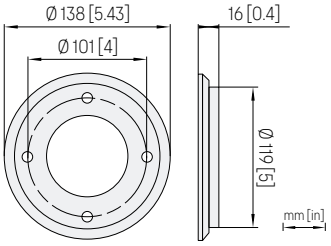
Dimensions of PR53APEX tank bottom flange, depth 170 mm



Dimensions of PR53APEX tank bottom flange, flush-mounted

Mounting accessories for PR53APEX tank bottom flange, depth 170 mm and tank bottom flange, flush-mounted

Item
Tank bottom welding flange
Tank bottom blind flange
Gasket MT4 DN25/1T EPDM



Dimensions of PR53APEX tank bottom welding flange

VAISALA

Polaris™ PR53GCEX Compact Process Refractometer



Vaisala Polaris PR53GCEX general-purpose compact process refractometer for potentially hazardous environments is designed for measuring concentrations of acids, alkaline solutions, alcohols, hydrocarbons, solvents, and various other solutions. It can be installed directly in a pipeline and is suitable for production, transport, and quality-control applications in the chemical and other industries. Compact in size with over 500 different concentration curves, PR53GCEX is suitable for a wide range of industrial applications.

Features

- Reliable optical concentration measurements with refractive index
- Options for Ex Zone 0 or Zone 2
- Compliant with ATEX and IECEx
- Sulfuric acid, sodium hydroxide, and more than 500 other concentration curves
- Special alloy materials available for demanding environments
- Type L coupling
- Measurement not affected by bubbles, particles, suspended solids, or color
- Various flow cells available
- Vaisala Indigo520 compatible
- Built-in 4–20 mA, HART, and Modbus® RTU outputs

Benefits

The optical measurement is based on the refractive index (RI). The RI can be measured from practically any liquid and it responds to dissolved material. Bubbles, particles, or fibers in the process do not affect measurement. The outstanding long-term stability provides years of accurate, continuous, fast, and stable measurement in potentially explosive environments directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

Safe in potentially explosive environments

The PR53EX series refractometers can be installed directly into hazardous areas. They are safe to use and can withstand continuous exposure to potentially explosive environments that contain flammable gas, vapor, or mist. Operation in these environments requires no additional protective enclosures. A robust design, combined with trouble-free operation, ensures a long-term solution for concentration measurement in potentially explosive environments. The PR53EX series refractometers have two Ex certified options for Zone 2 and Zone 0. For Zone 0 environments, a galvanic isolator is installed between the potentially explosive area and the refractometer to ensure safe operation.

Accurate and reliable

The optical measurement principle offers accurate and drift-free measurement. Because temperature measurement is incorporated inside the process refractometer, the changing process temperature does not affect the concentration measurement.

Easy mounting

Type L clamp connections allow easy installation directly into the process line. The unit can also be installed into a flange-mounted flow cell, which enables the use of an additional wash system for applications where prism wash is required.

Selected alloy materials provide durability under challenging process conditions. Other special materials and engineered solutions are available upon request.

Plug and play to Indigo

The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. The transmitter provides access to features such as data storage, graphical interface, and analog and digital interface. Indigo520 is required when the application or the installation position requires washing to control the process. Changing settings, measurement parameters, or other servicing updates can be done directly from Indigo520, or through a USB cable using Vaisala software.

The refractometer can also be connected to the portable diagnostics tool Indigo80 handheld indicator.

Technical data

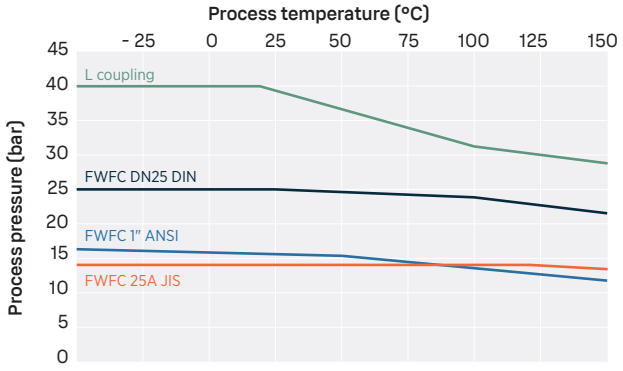
Measurement performance

Refractive index	
Measurement range	1.32–1.53 nD (Corresponds to 0–100 °Bx)
Accuracy	±0.00014 nD (0.1 °Bx) [1]
Repeatability	±0.00002 nD [2]
Resolution	±0.000015 nD
Response time T_{63} with default damping	10 s [3]
Measurement cycle	1 / s
Long-term stability	Max. 0.1 % full scale / a
Temperature	
Accuracy at 20 °C (68 °F)	±0.3 °C (0.54 °F) [1]
Sensor class	F0.15 IEC 60751
Temperature coefficient	±0.002 °C / °C

Operating environment

Process parameters	
Process temperature	–40 ... +150 °C (–40 ... +302 °F) [1]
Design temperature	+180 °C (356 °F) [2]
Operating environment	
Storage temperature	–40 ... +65 °C (–40 ... +149 °F)
Operating temperature	–40 ... +60 °C (–40 ... +140 °F)
Maximum operating altitude	2000 m (approx. 6500 ft)
Operating humidity	0–100 %RH
Storage humidity	0–100 %RH, non-condensing
UL 50E/NEMA rating	Type 4X
IP rating	IP66

1) *The use of cooling cover is mandatory in certain conditions. See PR53EX Safety Guide in docs.vaisala.com.*
2) *Maximum momentary temperature peak.*



PR53GC process pressure

Inputs and outputs

Protection class	3, PELV
Supply (Zone 2 only)	
Operating voltage	24 V DC nominal (9–30 V DC)
Power consumption	Less than 1 W
Outputs	
Output parameters	RI, temperature, concentration, quality factor
Analog outputs	
mA	'ia' variant: Sinking, isolated, NAMUR NE 43, configurable 'ec' variant: Sourcing, isolated, NAMUR NE 43, configurable
mA range	3.8–20.5 mA
Maximum load	Max. 600 Ω
Accuracy of analog outputs at +20 °C	±0.1 % of full scale (±0.00002 RI)
Digital outputs	
Digital output	RS-485, non-isolated
Maximum cable run	300 m (approx. 1000 ft) (digital)
Supported protocol	Modbus RTU
Connectors	
External connectors	1 × M12-4M, A-coded [1] 2 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5 / NPT 1/2"

1) *For USB2 adapter and Insight software, see vaisala.com/insight.*

Intrinsically safe parameters for the 'ia' variant

Parameter	Value
Terminals VIN+ and VIN-	
Ui	28 V
Ii	100 mA
Pi	700 mW
Li	0 nH
Ci	1.1 nF
Terminals RS-485+ and RS-485-	
Ui	28 V
Pi	500 mW
Li	0 nH
Ci	1.1 nF
Uo	5 V
Io	50 mA
Po	62 mW
Terminals Analog out + and Analog out -	
Ui	28 V
Ii	100 mA
Pi	700 mW
Li	16 nH
Ci	11.6 nF
Service Port connector	
Um	250 V

Ex classification by region

Certification	Classification
Europe (ATEX, Zone 0) (Pending)	EESF 25 ATEX 014X I M1 Ex ia I Ma II 1G Ex ia IIC T4...150 °C (T3) Ga IP66
Europe (ATEX, Zone 2)	EESF 25 ATEX 013X II 3G Ex ec IIC T4...150 °C (T3) Gc IP66
International (IECEx, Zone 0) (Pending)	IECEx EESF 25.0019X Ex ia I Ma Ex ia IIC T4...150 °C (T3) Ga IP66
International (IECEx, Zone 2)	Ex ec IIC T4...150 °C (T3) Gc IP66

Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Safety	IEC/EN/UL 61010-1
Pressure	CRN all territories, ASME BPVC Sec VIII Div. 1 Ed. 2021
Compliance marks	CE, China RoHS, RCM
Vibration and shock	Tested according to IEC 60068-2

Accessories

Item	Item code
USB adapter for service port, for Insight service software (see vaisala.com/insight)	USB2
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, gray, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, gray, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, gray, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, light blue, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211606-50M
Cooling cover	ASM215772SP

Mechanical specifications

Wetted parts	
Sensor head	EN 1.4404 (AISI 316L) EN 2.4660 (Alloy 20) EN 2.4819 (Alloy C276) [1]
Surface roughness	Ra 0.8 µm
Prism	Sapphire monocrystalline, 99.996 % Al_2O_3 [2]
Prism gasket	Modified PTFE [2]
L coupling gasket	PTFE [2]
Welding ferrule	EN 1.4404 (AISI 316L) EN 2.4660 (Alloy 20) EN 2.4819 (Alloy C276) [2]
Non-wetted parts	
Housing	EN 1.4404 (AISI 316L)
Screws, TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable gland	EN 1.4305 (AISI 303)
Dummy plug	EN 1.4305 (AISI 303)
Thread adapter	EN 1.4404 (AISI 316L) Vaisala, DRW257718, M16×1.5 / NPT 1/2"
M12 connector	Gland, EN 1.4305 (AISI 303) Contacts, CuZn with Ni/Au plating Phoenix Contact, 1405233, M12-4M, A, 4×0.34 mm^2, TPE, 0.5 m (16.4') Carrier, PA 6.6
L coupling clamp (60.3 mm)	EN 1.4301 (AISI 304) [2]
Cable (Zone 2)	2×2×0.5 mm^2 (AWG 21), PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
Cable (Zone 0)	2×2×0.5 mm^2 (AWG 21), PUR jacket, light blue 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, FT2
Weight	2.7 kg (5.95 lb)

1) Material certificate included.
2) Manufacturer's declaration included.

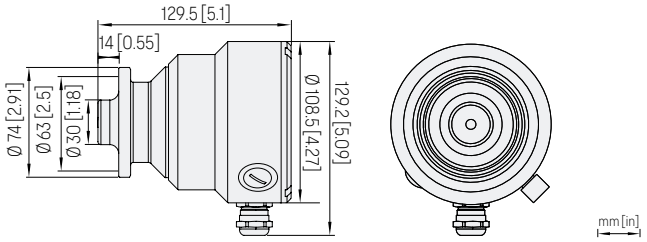
Mounting accessories

Item
L coupling clamp 60.3 mm (23.7 in)
L coupling ferrule 60.3 mm (23.7 in)
L coupling blind flange 60.3 mm (23.7 in)
L coupling gasket 60.3 mm (23.7 in)

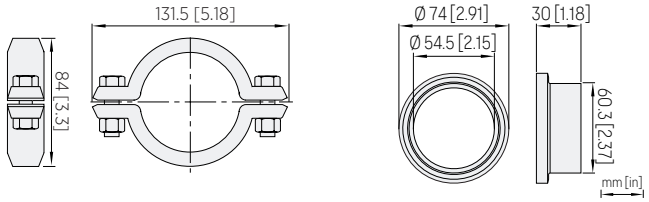
Calibration accessories

Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

Dimensions



Dimensions of PR53GCEX



Dimensions of PR53GCEX L coupling clamp

VAISALA

Polaris™ PR53GPEX Probe Process Refractometer



Vaisala Polaris PR53GPEX general-purpose probe process refractometer for potentially explosive environments is designed for measuring concentrations of sugars/Brix, acids, alkaline solutions, hydrocarbons, solvents, and various other solutions. It can be installed directly in a pipeline or tank and is suitable for production and quality-control applications in the sugar, chemical, petrochemical, and other industries.

Features

- Reliable optical concentration measurements with refractive index
- Compliant with ATEX and IECEx
- Options for Ex Zone 0 or Zone 2
- Sulfuric acid, sodium hydroxide, and more than 500 concentration curves
- Special alloy materials available for demanding environments
- Refinery probe head option available
- Clamp and flange connections available
- Measurement not affected by bubbles, particles, suspended solids, or color
- Vaisala Indigo520 compatible
- Built-in 4–20 mA, HART, and Modbus® RTU outputs

Benefits

The optical measurement is based on the refractive index (RI). The RI can be measured from practically any liquid and it responds to dissolved material. Bubbles, particles, or fibers in the process do not affect measurement. The outstanding long-term stability provides years of accurate, continuous, fast, and stable measurement in potentially explosive environments directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

Safe in potentially explosive environments

The PR53EX series refractometers can be installed directly into hazardous areas. They are safe to use and can withstand continuous exposure to potentially explosive environments that contain flammable gas, vapor, or mist. Operation in these environments requires no additional protective enclosures. A robust design, combined with trouble-free operation, ensures a long-term solution for concentration measurement in potentially explosive environments. The PR53EX series refractometers have two Ex certified options for Zone 2 and Zone 0. For Zone 0 environments, a galvanic isolator is installed between the potentially explosive area and the refractometer to ensure safe operation.

Refinery probe head option

The PR53GPEX can be ordered with a refinery probe head option that is designed to support the unique requirements of the refining and petroleum industries. Typical applications are, for example, acid in alkylation, glycol or amines in gas processing, and multi-product (crude oil, fuel oil, diesel) interfaces in transfer operations. The refinery probe head is machined from a single piece of metal allowing weld-free pressure bearing components.

Plug and play to Indigo

The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. The transmitter provides access to features such as data storage, graphical interface, and analog and digital interface. Indigo520 is required when the application or the installation position requires washing to control the process. Changing settings, measurement parameters, or other servicing updates can be done directly from Indigo520, or through a USB cable using Vaisala software.

The refractometer can also be connected to the portable diagnostics tool Indigo80 handheld indicator.

Technical data

Measurement performance

Refractive index	
Measurement range	1.32–1.53 nD (Corresponds to 0–100 °Bx)
Accuracy	±0.00014 nD (0.1 °Bx) [1) 2)]
Repeatability	±0.00002 nD [3)]
Resolution	±0.000015 nD
Response time T_{63} with default damping	10 s [4)]
Measurement cycle	1 / s
Long-term stability	Max. 0.1 % full scale / a
Temperature	
Accuracy at 20 °C (68 °F)	±0.3 °C (0.54 °F) [1)]
Sensor class	F0.15 IEC 60751
Temperature coefficient	±0.002 °C / C

1) Accuracy specified with respect to calibration reference, including non-linearity, hysteresis at +20 °C.
2) VD algorithm accuracy is 0.00030.
3) Repeatability, confidence level k=2, including random noise, at Ta = +20 °C, with standard low-pass filtering.
4) With standard low-pass filtering.

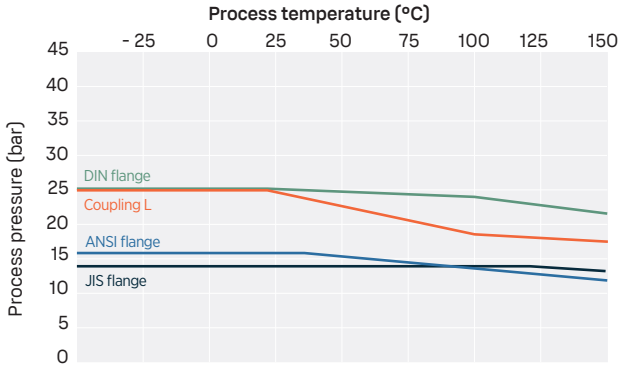
Operating environment

Process parameters	
Process temperature	−40 … +150 °C (−40 … +302 °F)
Design temperature	+180 °C (+356 °F) [1) 2)]
Design pressure	40 bar [3)]
Operating environment	
Storage temperature	−40 … +65 °C (−40 … +149 °F)
Operating temperature	−40 … +60 °C (−40 … +140 °F)
Maximum operating altitude	2000 m (approx. 6500 ft)
Operating humidity	0–100 %RH
Storage humidity	0–100 %RH, non-condensing
UL 50E/NEMA rating	Type 4X
IP rating	IP66

1) Maximum momentary temperature peak.
2) The use of cooling cover is mandatory in certain conditions. See PR53EX Safety Guide in docs.vaisala.com.
3) Maximum at +20 °C, operating pressure to the process connection rating pressure.

Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Safety	IEC/EN/UL 61010-1
Pressure	CRN all territories, ASME BPVC Sec VIII Div. 1 Ed. 2021
Compliance marks	CE, China RoHS, RCM
Vibration and shock	Tested according to IEC 60068-2



PR53GP process pressure

Ex classification by region

Certification	Classification
Europe (ATEX, Zone 0) (Pending)	EESF 25 ATEX 014X I M1 Ex ia I Ma II 1G Ex ia IIC T4...150 °C (T3) Ga IP66
Europe (ATEX, Zone 2)	EESF 25 ATEX 013X II 3G Ex ec IIC T4...150 °C (T3) Gc IP66
International (IECEx, Zone 0) (Pending)	IECEx EESF 25.0019X Ex ia I Ma Ex ia IIC T4...150 °C (T3) Ga IP66
International (IECEx, Zone 2)	Ex ec IIC T4...150 °C (T3) Gc IP66

Inputs and outputs

Protection class	3, PELV
Supply (Zone 2 only)	
Operating voltage	24 V DC nominal (9–30 V DC)
Power consumption	Less than 1 W
Outputs	
Output parameters	RI, temperature, concentration, quality factor
Analog outputs	
mA	'ia' variant: Sinking, isolated, NAMUR NE 43, configurable 'ec' variant: Sourcing, isolated, NAMUR NE 43, configurable
mA range	3.8–20.5 mA
Maximum load	Max. 600 Ω
Accuracy of analog outputs at +20 °C	±0.1 % of full scale (±0.00002 RI)
Digital outputs	
Digital output	RS-485, non-isolated
Maximum cable run	300 m (approx. 1000 ft) (digital)
Supported protocol	Modbus RTU
Connectors	
External connectors	1 × M12-4M, A-coded [1)] 2 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5 / NPT 1/2"

Intrinsically safe parameters for the 'ia' variant

Parameter	Value
Terminals VIN+ and VIN-	
Ui	28 V
Ii	100 mA
Pi	700 mW
Li	0 nH
Ci	1.1 nF
Terminals RS-485+ and RS-485-	
Ui	28 V
Pi	500 mW
Li	0 nH
Ci	1.1 nF
Uo	5 V
Io	50 mA
Po	62 mW
Terminals Analog out + and Analog out -	
Ui	28 V
Ii	100 mA
Pi	700 mW
Li	16 nH
Ci	11.6 nF
Service Port connector	
Um	250 V

Mounting accessories

Item
L coupling clamp D 88.9 mm
L coupling ferrule 88.9 / 3.6 mm PN25
L coupling blind flange 88.9 mm
L coupling gasket 88.9 / 84 mm

Accessories

Item	Item code
USB adapter for service port, for Insight service software (see vaisala.com/insight)	USB2
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, gray, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, gray, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, gray, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, light blue, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211606-50M
Cooling cover	ASM215772SP

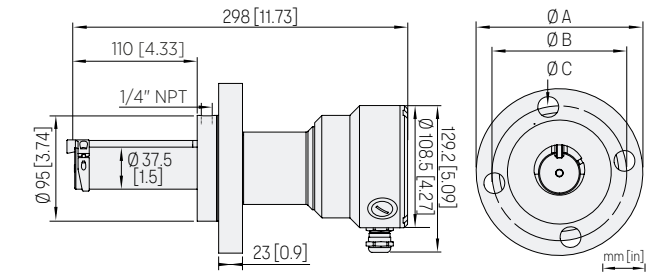
Mechanical specifications

Wetted parts	
Sensor head	EN 1.4404 (AISI 316L) [1]
Surface roughness	Ra 0.8 µm
Prism	Sapphire monocrystalline, 99.996 % Al_2O_3 [2]
Prism gasket	Modified PTFE [2]
L coupling gasket	PTFE [2]
L coupling welding ferrule	EN 1.4404 (AISI 316L) [1]
Wash nozzle parts	EN 1.4404 (AISI 316L) [1]
Non-wetted parts	
Housing	EN 1.4404 (AISI 316L)
Screws TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable gland	EN 1.4305 (AISI 303)
Dummy plug	EN 1.4305 (AISI 303)
Thread adapter	EN 1.4404 (AISI 316L) Vaisala, DRW257718, M16×1.5 / NPT ½ in
M12 connector	Gland, EN 1.4305 (AISI 303) Contacts, CuZn with Ni/Au plating Phoenix Contact, 1405233, M12/4(M), A, 4×0.34 mm^2, TPE, 0.5 m Carrier, PA 6.6
Flange	EN 1.4404 (AISI 316L) Dimensioning and tolerances as per ASME B16.5, DIN 2543, JIS B2220
L coupling clamp, 88.9 mm	EN 1.4301 (AISI 304)
Cable (Zone 2)	2×2×0.5 mm^2 (21 AWG) PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
Cable (Zone 0)	2×2×0.5 mm^2 (AWG 21), PUR jacket, light blue 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, FT2
Weight	PR53GP 2″ flange 7.2 kg (15.87 lb) - 7.7 kg (16.98 lb) PR53GP 3″ flange 10.5 kg (23.15 lb) - 11.7 kg (25.79 lb) PR53 L coupling 5.1 kg (11.24 lb)

1) Material certificate included.
2) Manufacturer's declaration included.

Calibration accessories

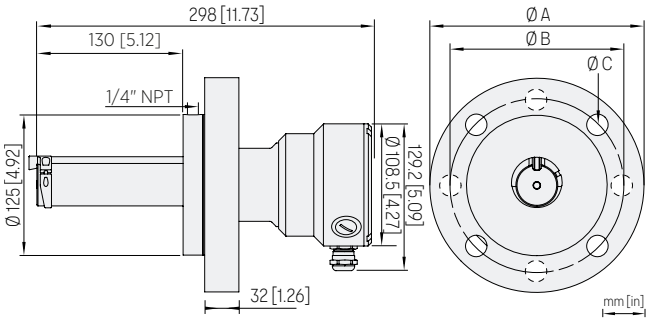
Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP



Dimensions of PR53GPEX 2" flange

Dimensions of 2" flange, depth 110 mm

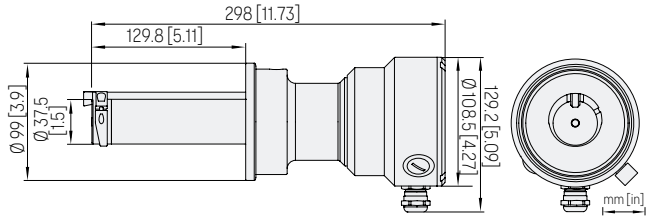
Dimension	ANSI 2”	DIN DN50	JIS 50A
ØA	152.4 mm (6 in)	165 mm (6.5 in)	155 mm (6.1 in)
ØB	120.7 mm (4.75 in)	125 mm (4.92 in)	120 mm (4.72 in)
ØC	19.1 mm (0.75 in)	18 mm (0.71 in)	19 mm (0.75 in)



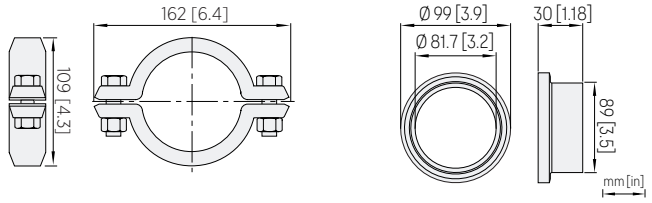
Dimensions of PR53GPEX 3" flange

Dimensions of 3" flange, depth 130 mm

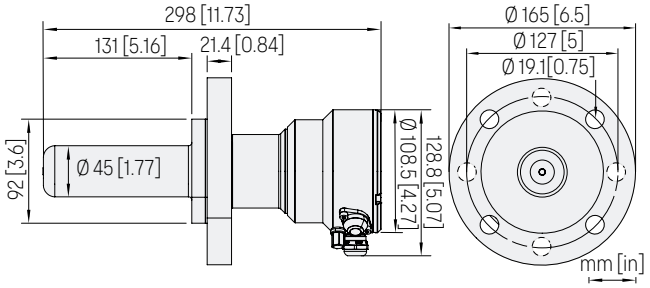
Dimension	ANSI 3”	DIN DN80	JIS 80A
ØA	190.5 mm (7.5 in)	200 mm (7.87 in)	185 mm (7.28 in)
ØB	152.4 mm (6 in)	160 mm (6.3 in)	150 mm (5.9 in)
ØC	19.1 mm (0.75 in)	18 mm (0.71 in)	19 mm (0.75 in)



Dimensions of PR53GPEX L coupling 88.9 mm (3.5 in)



Dimensions of PR53GPEX L coupling clamp



Dimensions of PR53GPEX refinery probe head

VAISALA

Polaris™ PR53MEX PTFE-Body Process Refractometer



Vaisala Polaris PR53MEX PTFE-body process refractometer for potentially explosive environments is designed for measuring concentrations of aggressive chemicals, such as hydrochloric acid (HCl), sulfuric acid (H_2SO_4), N-Methylpyrrolidone (NMP), and ammonia (NH_3) in the chemical and semiconductor industries. The integrated ultra-pure PTFE flow cell has no metallic wetted parts, minimizing contamination risk and making it suitable for contact with aggressive chemicals. The PR53MEX can be mounted to ½ inch process lines with a standard NTP-threaded connection, or a Flare or Pillar type fitting.

Features

- Non-metallic wetted parts, integrated ultra-pure PTFE and sapphire flow cell for demanding environments
- Reliable optical concentration measurements with refractive index
- Potassium hydroxide, sodium hydroxide, hydrochloric acid, and more than 500 concentration curves
- Compliant with ATEX and IECEx
- Options for Ex Zone 0 or Zone 2
- Measurement not affected by bubbles, particles, suspended solids, or color
- Various fittings and connections available for ½ inch tubing
- Vaisala Indigo520 compatible
- Built-in 4–20 mA, HART, and Modbus® RTU outputs

Benefits

The optical measurement is based on the refractive index (RI). The RI can be measured from practically any liquid, and it responds to dissolved material. Because bubbles, particles, or crystals in the process do not affect measurement, the RI allows accurate measurement for different chemicals, also slurries. Typical applications include different chemical-mixing and monitoring installations in the fine chemical and semiconductor industries. In addition to a wide selection of product options, Vaisala offers the possibility to customize the product for specific needs. The outstanding long-term stability provides years of accurate, continuous, fast, and stable concentration measurement directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

Safe in potentially explosive environments

The PR53EX series refractometers can be installed directly into hazardous areas. They are safe to use and can withstand continuous exposure to potentially explosive environments that contain flammable gas, vapor, or mist. Operation in these environments requires no additional protective enclosures. A robust design, combined with trouble-free operation, ensures a long-term solution for concentration measurement in potentially explosive environments. The PR53EX series refractometers have two Ex certified options for Zone 2 and Zone 0. For Zone 0 environments, a galvanic isolator is installed between the potentially explosive area and the refractometer to ensure safe operation.

Accurate and reliable

The optical measurement principle offers accurate and drift-free measurement. Because temperature measurement is incorporated inside the process refractometer, the changing process temperature does not affect the concentration measurement.

Plug and play to Indigo

The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. The transmitter provides access to features such as data storage, graphical interface, and analog and digital interface. Changing settings, measurement parameters, or other servicing updates can be done directly from Indigo520, or through a USB cable using Vaisala software.

The refractometer can also be connected to the portable diagnostics tool Indigo80 handheld indicator.

Technical data

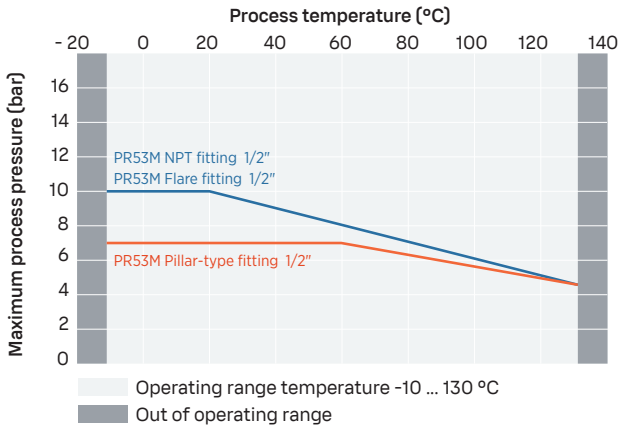
Measurement performance

Refractive index	
Measurement range	1.32–1.53 nD (Corresponds to 0–100 °Bx)
Accuracy	±0.00014 nD (0.1 °Bx) [1]
Repeatability	±0.00002 nD [2]
Resolution	±0.000015 nD
Response time T_{63} with default damping	10 s [3]
Measurement cycle	1 / s
Long-term stability	Max. 0.1 % full scale / a
Temperature	
Accuracy at 20 °C (68 °F)	±0.3 °C (0.54 °F) [1]
Sensor class	F0.15 IEC 60751
Temperature coefficient	±0.002 °C / °C

Operating environment

Process parameters	
Process temperature	–10 ... +130 °C (+14 ... +266 °F) [1]
Pressure	10 bar at 20 °C, 4.5 bar at 130 °C (145 psi at 68 °F, 652 psi at 266 °F)
Operating environment	
Storage temperature	–40 ... +65 °C (–40 ... +149 °F)
Operating temperature	–40 ... +60 °C (–40 ... +140 °F)
Maximum operating altitude	2000 m (approx. 6500 ft)
Operating humidity	0–100 %RH
Storage humidity	0–100 %RH, non-condensing
UL 50E/NEMA rating	Type 4X
IP rating	IP66

1) *The use of cooling cover is mandatory in certain conditions. See PR53EX Safety Guide in docs.vaisala.com.*



PR53MEX process pressure

Mechanical specifications

Wetted parts	
Prism and sapphire plate	Sapphire monocrystalline, 99.996 % Al_2O_3 [1]
Flow cell	Ultra pure PTFE [1]
Prism gasket	Modified PTFE [1]
Process gasket	Kalrez W240UP [1]
Non-wetted parts	
Housing	Stainless steel (AISI 316)
Coating	Cerakote, white (PR53M with integrated fittings)
Screws TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable (Zone 2)	2×2×0.5 mm² (AWG 21), PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
Cable (Zone 0)	2×2×0.5 mm² (AWG 21), PUR jacket, light blue 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, FT2

1) *Manufacturer's declaration included.*

Inputs and outputs

Protection class	3, PELV
Supply (Zone 2 only)	
Operating voltage	24 V DC nominal (9–30 V DC)
Power consumption	Less than 1 W
Outputs	
Output parameters	RI, temperature, concentration, quality factor
Analog outputs	
mA	'ia' variant: Sinking, isolated, NAMUR NE 43, configurable 'ec' variant: Sourcing, isolated, NAMUR NE 43, configurable
mA range	3.8–20.5 mA
Maximum load	Max. 600 Ω
Accuracy of analog outputs at +20 °C	±0.1 % of full scale (±0.00002 RI)
Digital outputs	
Digital output	RS-485, non-isolated
Maximum cable run	300 m (approx. 1000 ft) (digital)
Supported protocol	Modbus RTU
Connectors	
External connectors	1 × M12-4M, A-coded [1] 2 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5 / NPT 1/2"

Ex classification by region

Certification	Classification
Europe (ATEX, Zone 0) (Pending)	EESF 25 ATEX 014X
	I M1 Ex ia I Ma
	II 1G Ex ia IIC T4 Ga
	IP66
Europe (ATEX, Zone 2)	EESF 25 ATEX 013X
	II 3G Ex ec IIC T4 Gc
	IP66
International (IECEx, Zone 0) (Pending)	IECEx EESF 25.0019X
	Ex ia I Ma
	Ex ia IIC T4 Ga
	IP66
International (IECEx, Zone 2)	Ex ec IIC T4 Gc
	IP66

Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Safety	IEC/EN/UL 61010-1
Compliance marks	CE, China RoHS, RCM
Vibration and shock	Tested according to
	IEC 60068-2

Intrinsically safe parameters for the 'ia' variant

Parameter	Value
Terminals VIN+ and VIN-	
Ui	28 V
Ii	100 mA
Pi	700 mW
Li	0 nH
Ci	1.1 nF
Terminals RS-485+ and RS-485-	
Ui	28 V
Pi	500 mW
Li	0 nH
Ci	1.1 nF
Uo	5 V
Io	50 mA
Po	62 mW
Terminals Analog out + and Analog out -	
Ui	28 V
Ii	100 mA
Pi	700 mW
Li	16 nH
Ci	11.6 nF
Service Port connector	
Um	250 V

Mounting accessories

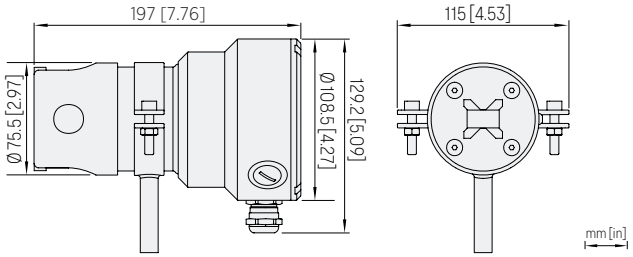
Item
Flare fitting nut
Pillar nut and sleeve

Calibration accessories

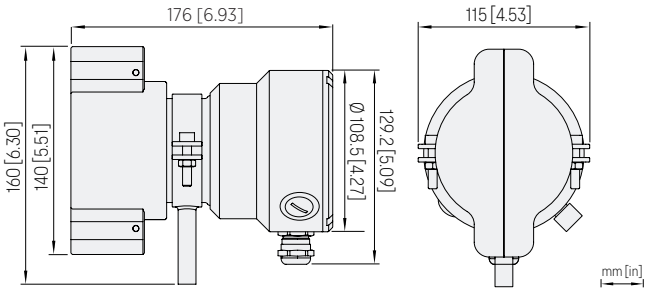
Item	Item code
Verification kit	280380SP
1.33, 1.37, 1.42, 1.47, 1.52	
Calibration kit	278292SP
1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	
High-range special kit	278293SP
1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	
Sample holder and cover	278295SP

Accessories

Item	Item code
USB adapter for service port, for Insight service software (see vaisala.com/insight)	USB2
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, gray, open ends, 10 m (33 ft)	CBL211266-10M
Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, gray, open ends, 30 m (98 ft)	CBL211266-30M
Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, gray, open ends, 50 m (164 ft)	CBL211266-50M
Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, light blue, open ends, 50 m (164 ft)	CBL211606-50M
Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	
Cooling cover	ASM215772SP



Dimensions of PR53MEX flow cell end plate bolts (NPT fitting)



Dimensions of PR53MEX flow cell end plate bolts (integrated fittings, Flare and Pillar-type)

VAISALA

Polaris™ PR53WEX Valve-Body Process Refractometer



Vaisala Polaris PR53WEX valve-body process refractometer for potentially explosive environments is designed for measuring concentrations of aggressive chemicals, such as sulfuric acid (H_2SO_4), hydrochloric acid (HCl), and potassium hydroxide (KOH) in production pipelines such as in the chemical, biochemical, and pharmaceutical industries. PR53WEX is mounted in a membrane-lined valve body that has no metallic wetted parts. This allows convenient flange mounting to 2 inch ANSI, JIS, and DN50 flanges.

Features

- ETFE-lined valve-body flow cell with non-metallic wetted parts, for aggressive chemicals in pressurized pipelines
- Reliable optical concentration measurements with refractive index
- Compliant with ATEX and IECEx
- Options for Ex Zone 0 or Zone 2
- Hydrochloric acid, sulfuric acid, amino acid, potassium hydroxide, and more than 500 concentration curves
- Measurement not affected by bubbles, particles, suspended solids, or color
- ANSI, JIS, and DIN flanges for 2 inch process lines
- Vaisala Indigo520 compatible
- Built-in 4–20 mA, HART, and Modbus® RTU outputs

Benefits

The optical measurement is based on the refractive index (RI). RI can be measured from practically any liquid and it responds to dissolved material. Because bubbles, particles, or crystals in the process do not affect measurement, RI allows accurate measurement for different chemicals, also slurries. Typical applications include different chemical-mixing and monitoring installations in the fine chemical and semiconductor industries. In addition to a wide selection of product options, it is possible to customize the product for specific needs. The outstanding long-term stability provides years of accurate, continuous, fast, and stable concentration measurement directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

Safe in potentially explosive environments

The PR53EX series refractometers can be installed directly into hazardous areas. They are safe to use and can withstand continuous exposure to potentially explosive environments that contain flammable gas, vapor, or mist. Operation in these environments requires no additional protective enclosures. A robust design, combined with trouble-free operation, ensures a long-term solution for concentration measurement in potentially explosive environments. The PR53EX series refractometers have two Ex certified options for Zone 2 and Zone 0. For Zone 0 environments, a galvanic isolator is installed between the potentially explosive area and the refractometer to ensure safe operation.

Accurate and reliable

The optical measurement principle offers accurate and drift-free measurement. Because temperature measurement is incorporated inside the process refractometer, the changing process temperature does not affect the concentration measurement.

Plug and play to Indigo

The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. The transmitter provides access to features such as data storage, graphical interface, and analog and digital interface. Changing settings, measurement parameters, or other servicing updates can be done directly from Indigo520, or through a USB cable using Vaisala software.

The refractometer can also be connected to the portable diagnostics tool Indigo80 handheld indicator.

Technical data

Measurement performance

Refractive index	
Measurement range	1.32–1.53 nD (Corresponds to 0–100 °Bx)
Accuracy	±0.00014 nD (0.1 °Bx) [1]
Repeatability	±0.00002 nD [2]
Resolution	±0.000015 nD
Response time T_{63} with default damping	10 s [3]
Measurement cycle	1 / s
Long-term stability	Max. 0.1 % full scale / a
Temperature	
Accuracy at 20 °C (68 °F)	±0.3 °C (0.54 °F) [1]
Sensor class	F0.15 IEC 60751
Temperature coefficient	±0.002 °C / °C

Operating environment

Process parameters	
Process temperature	–10 ... +130 °C (+14 ... +266 °F) [1]
Operating pressure	10 bar (145 psi)
Operating environment	
Storage temperature	–40 ... +65 °C (–40 ... +149 °F)
Operating temperature	–40 ... +60 °C (–40 ... +140 °F)
Maximum operating altitude	2000 m (approx. 6500 ft)
Operating humidity	0–100 %RH
Storage humidity	0–100 %RH, non-condensing
UL 50E/NEMA rating	Type 4X
IP rating	IP66

1) *The use of cooling cover is mandatory in certain conditions. See PR53EX Safety Guide in docs.vaisala.com.*

Mechanical specifications

Wetted parts	
Prism and sapphire plate	Sapphire monocrystalline, 99.996 % Al_2O_3 [1]
Valve body lining	ETFE [1]
Prism gasket	Modified PTFE [1]
Valve body gasket	PTFE [1]
Process gasket	Kalrez W240UP [1]
Valve body M10 stud	EN 1.4404 (AISI 316L) [1]
Non-wetted parts	
Valve body	Cast iron [1]
Housing	EN 1.4404 (AISI 316L)
Screws TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable (Zone 2)	2×2×0.5 mm^2 (AWG 21), PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
Cable (Zone 0)	2×2×0.5 mm^2 (AWG 21), PUR jacket, light blue 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, FT2

1) *Manufacturer's declaration included*

Inputs and outputs

Protection class	3, PELV
Supply (Zone 2 only)	
Operating voltage	24 V DC nominal (9–30 V DC)
Power consumption	Less than 1 W
Outputs	
Output parameters	RI, temperature, concentration, quality factor
Analog outputs	
mA	'ia' variant: Sinking, isolated, NAMUR NE 43, configurable 'ec' variant: Sourcing, isolated, NAMUR NE 43, configurable
mA range	3.8–20.5 mA
Maximum load	Max. 600 Ω
Accuracy of analog outputs at +20 °C	±0.1 % of full scale (±0.00002 RI)
Digital outputs	
Digital output	RS-485, non-isolated
Maximum cable run	300 m (approx. 1000 ft) (digital)
Supported protocol	Modbus RTU
Connectors	
External connectors	1 × M12-4M, A-coded [1] 2 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5 / NPT 1/2"

Intrinsically safe parameters for the 'ia' variant

Parameter	Value
Terminals VIN+ and VIN-	
Ui	28 V
Ii	100 mA
Pi	700 mW
Li	0 nH
Ci	1.1 nF
Terminals RS-485+ and RS-485-	
Ui	28 V
Pi	500 mW
Li	0 nH
Ci	1.1 nF
Uo	5 V
Io	50 mA
Po	62 mW
Terminals Analog out + and Analog out -	
Ui	28 V
Ii	100 mA
Pi	700 mW
Li	16 nH
Ci	11.6 nF
Service Port connector	
Um	250 V

Ex classification by region

Certification	Classification
Europe (ATEX, Zone 0) (Pending)	EESF 25 ATEX 014X I M1 Ex ia I Ma II 1G Ex ia IIC T4 Ga IP66
Europe (ATEX, Zone 2)	EESF 25 ATEX 013X II 3G Ex ec IIC T4 Gc IP66
International (IECEx, Zone 0) (Pending)	IECEx EESF 25.0019X Ex ia I Ma Ex ia IIC T4 Ga IP66
International (IECEx, Zone 2)	Ex ec IIC T4 Gc IP66

Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Safety	IEC/EN/UL 61010-1
Compliance marks	CE, China RoHS, RCM
Vibration and shock	Tested according to IEC 60068-2

Calibration accessories

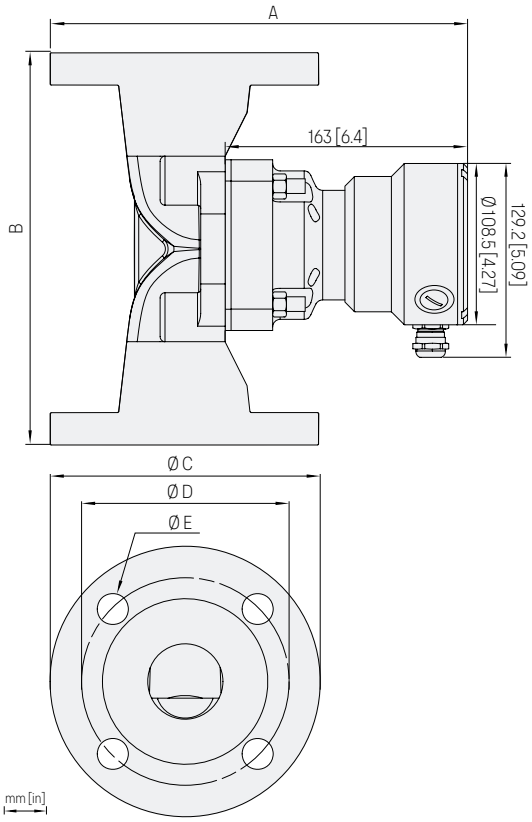
Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

Accessories

Item	Item code
USB adapter for service port, for Insight service software (see vaisala.com/insight)	USB2
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, gray, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, gray, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, gray, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Instrument cable, 2×2×0.5 mm^2 (AWG 21), PUR jacket, light blue, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211606-50M
Cooling cover	ASM215772SP

Dimensions

Dimension	ANSI 2″	DIN DN50	JIS 50A
A	268 mm (10.55 in)	275 mm (10.83 in)	270 mm (10.63 in)
B	196 mm (7.7 in)	230 mm (9.1 in)	196 mm (7.7 in)
ØC	152.4 mm (6 in)	165 mm (6.5 in)	155 mm (6.1 in)
ØD	120.7 mm (4.75 in)	125 mm (4.92 in)	120 mm (4.72 in)
ØE	19.1 mm (0.75 in)	18 mm (0.71 in)	19 mm (0.75 in)



Dimensions of PR53WEX valve body

VAISALA

Wind and weather sensor technologies for measurements in industrial applications







Wind and weather sensors

Vaisala ultrasonic wind sensors:

- Wind sensor with no moving parts
- Unique triangular design for accurate measurements from all directions
- Optional sensor heating available
- Maintenance free, no field calibration required
- Measurement range up to 90 m/s

Vaisala mechanical wind sensors:

- Accurate wind speed and direction sensors
- Fast and linear response
- Low measurement starting threshold
- Sensors with heating elements available for cold climates

Vaisala weather sensor:

- Measurement of the six essential weather parameters: wind speed and direction, liquid precipitation, barometric pressure, temperature, and relative humidity
- Feature proprietary Vaisala sensor technologies: WINDCAP®, RAINCAP®, HUMICAP®, and BAROCAP®

Vaisala's long history in wind and weather measurements started already in the 1930s from the development of a radiosonde to measure the conditions in the upper atmosphere. Today, Vaisala wind and weather instruments are used in dozens of applications and industries all over the world.

Industrial applications for wind and weather measurements

Wind and weather data are required in many activities across industries. For example, in power industry, the efficiency of power lines is a function of wind speed and direction.

Nuclear power plants require wind data for safety reasons to be able to model the dispersion of potentially radioactive leakages. In addition to nuclear power plants, also chemical factories need to gather wind data for dispersion monitoring.

Accurate outdoor measurements are essential in operating modern buildings. Processes such as free cooling, natural ventilation, and automated shading are dependent on real-time weather data.

Ventilation control in greenhouses also relies on localized weather data to ensure an optimized environment for plant growth.

Vaisala wind and weather instruments

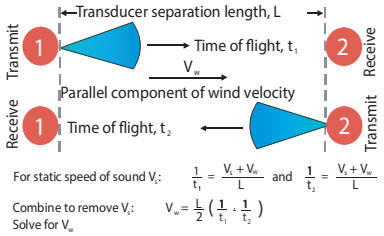
Vaisala manufactures wind and weather instruments for different applications, requirements and budgets. The wind sensor portfolio for industrial applications includes both mechanical and ultrasonic sensors. View the complete range of wind products at vaisala.com/en/products/weather-environmental-sensors/wind. Have a look at the multiparameter Vaisala Weather Transmitter WXT530 at vaisala.com/wxt530.

Vaisala sensor technologies for wind and rain measurements

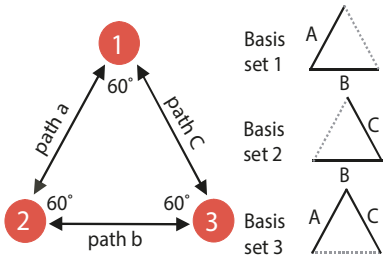
Vaisala WINDCAP Sensor

Vaisala WINDCAP Ultrasonic Wind Sensor uses ultrasound to determine wind speed and direction. The sensor has no moving parts, which makes it independent of the limitations of mechanical wind sensors such as friction, inertia, time constant, over-speeding, and starting threshold.

WINDCAP sensor features an array of three ultrasonic transducers oriented to form an equilateral triangle. Wind measurement is based on time of flight (TOF) of the sonic impulse – the time it takes for the signal to travel from one transducer to another. TOF is measured in both directions for each pair of transducer heads. Simple algebra allows solving for the parallel component of wind velocity independently of the static speed of sound.



The equilateral triangle configuration of the three transducers provides three possible sets of basis vectors. The combinations yield bi-directional measurements on the paths labeled A, B, and C. These measurements are used to determine the wind velocity components parallel to each of the three paths.



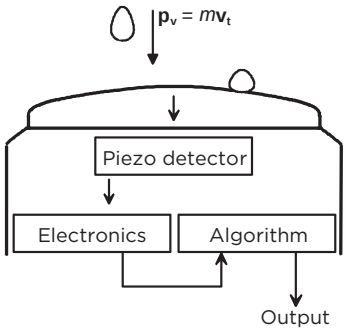
Vaisala RAINCAP Sensor

Vaisala RAINCAP Sensor is an acoustic sensor that measures the impact of individual raindrops on a smooth stainless steel surface using a piezoelectric detector. The sensor provides real time information on rain intensity, duration, and accumulated rainfall.

The RAINCAP sensor consists of a round stainless steel cover, approximately 90 mm in diameter mounted to a rigid frame. A piezoelectric detector is located beneath the cover.

Raindrops hit the RAINCAP sensor surface at terminal velocity, which is a function of the raindrop diameter. Rain measurement is based on acoustic detection of each individual rain drop as it impacts the sensor cover. Larger drops create a larger acoustic signal than smaller drops.

The piezoelectric detector converts the acoustic signals into voltages. Total rain is calculated from the sum of the individual voltage signals per unit time and the known surface area of the RAINCAP sensor. In addition, the intensity and duration of rain can be calculated.



Pv = vertical momentum
m = mass of drop
v_t = terminal velocity of drop

VAISALA

WA15 Wind Set

For high-performance wind measurement



Features

- High-performance wind measurement set
- Long and successful track record in meteorological applications
- Accurate wind speed and direction measurement
- Low measurement starting threshold
- Conical anemometer cups provide excellent linearity
- Heated shaft prevents bearings from freezing

WA15 is based on accurate sensors installed on a cross-arm. It is designed for demanding wind measurement applications.

With a proven track record of successful installations, Vaisala Wind Set WA15 has earned its reputation as the industry standard in the wind sensor market.

WA15 consists of Vaisala Anemometer WAA151, Vaisala Wind Vane WAV151, an optional cross-arm, and cabling.

Anemometer with excellent linearity

WAA151 is a fast-response, low-threshold anemometer. Three lightweight, conical cups mounted on the cup wheel provide excellent linearity over the entire operating range, up to 75 m/s (168 mph).

A wind-rotated chopper disc attached to the shaft of the cup wheel cuts an infrared light beam 14 times per revolution. This generates a pulse output from the phototransistor.

The output pulse rate is directly proportional to wind speed, for example, 246 Hz = 24.6 m/s (55 mph). For the highest accuracy, the characteristic transfer function must be used to compensate for starting inertia.

Sensitive wind vane

WAV151 is a counter-balanced, low-threshold, optoelectronic wind vane. Infrared LEDs and phototransistors are mounted on 6 orbits on each side of a 6-bit GRAY-coded disc. Turned by the vane, the disc creates changes in the code received by the phototransistors. The output code resolution is ±2.8°.

Heated bearings withstand cold weather

Heating elements in the shaft tunnels of both the anemometer and vane keep the bearings above freezing temperatures in cold climates.

Complete package available

The anemometer and vane are designed to be mounted on Vaisala cross-arms.

Technical Data

WAA151 measurement performance

Sensor/Transducer type	Cup anemometer/opto-chopper
Observation range	0.4–75 m/s (0.9–168 mph)
Starting threshold [1]	< 0.5 m/s (1.1 mph)
Distance constant	4.0 m (13 ft 1 in)
Transducer output	
0–75 m/s (0–168 mph)	0–750 Hz square wave
Characteristic transfer function	Uf (wind speed) = 0.328 + 0.101 × R (output pulse rate)
Transducer output level	
(I_{out} < +5 mA)	High state > U_{in} –1.5 V
(I_{out} > -5 mA)	Low state < 2.0 V
Accuracy within 0.4–60 m/s (0.9–134 mph)	
With characteristic transfer function (standard deviation)	±0.17 m/s (0.38 mph)
With simple transfer function U_f = 0.1 × R	±0.5 m/s (1.12 mph) [2]

1) *Measured with the cup wheel in position least favored by flow direction. The optimum position yields a < 0.35 m/s (0.8 mph) starting threshold.*
2) *Typical error vs. speed with the simple transfer function used.*

RANGE (m/s)	0-3	3-10	10-17	17-24	24-31	31-37	37-44	44-51	51-58	58-65
ERROR (m/s)	-0.4	-0.3	-0.2	-0.1	0.0	+0.1	+0.2	+0.3	+0.4	+0.5

WAA151 inputs and outputs

Electrical connections	MIL-C-26482 type, 6-wire cable
Cabling	6-wire cable through cross-arm
Recommended connector at cable end	Souriau UTS6JC10E6P
Operating power supply	U_{in} = 9.5–15.5 V DC, 20 mA, typical
Heating power supply	AC or DC 20 V, 500 mA, nominal
Settling time after power-up	< 30 µs

WAA151 operating environment

Operating temperature [1]	–50 ... +60 °C (–58 ... +140 °F)
Storage temperature	–60 ... +70 °C (–76 ... +158 °F)
Operating humidity	0–100 %RH
IP rating	IP65

1) *With shaft heating.*

WAA151 mechanical specifications

Dimensions (H × Ø)	240 × 90 mm (9.45 × 3.54 in)
Swept radius of cup wheel	91 mm (3.58 in)
Weight	570 g (1.26 lb)
Materials	
Housing	AlMgSi, gray anodized
Cup	PA, reinforced with carbon fiber

WA15 mechanical specifications

Junction box	125 × 80 × 57 mm (4.92 × 3.15 × 2.24 in)
Cross-arm length	800 mm (31.50 in)
Mounting to a pole mast with a nominal outside diameter	60 mm (2.36 in)

WAV151 measurement performance

Sensor/Transducer type	Optical code disc
Observation range at wind speed 0.4–75 m/s (0.9–168 mph)	0–360°
Starting threshold	< 0.4 m/s (0.9 mph)
Resolution	±2.8°
Damping ratio	0.19
Overshoot ratio	0.55
Delay distance	0.4 m (1 ft 4 in)
Accuracy	Better than ±3°
Output	6-bit parallel GRAY code
Transducer output level	
(I_{out} < +5 mA)	High state > U_{in} –1.5 V
(I_{out} > -5 mA)	Low state < 1.5 V

WAV151 inputs and outputs

Electrical connections	MIL-C-26482 type, 10-wire cable
Cabling	10-wire cable through cross-arm
Recommended connector at cable end	Souriau UTS6JC12E10P
Operating power supply	U_{in} = 9.5–15.5 V DC, 20 mA typical
Heating power supply	20 V AC or DC, 500 mA nominal
Settling time after power turn-on	< 100 µs

WAV151 operating environment

Operating temperature [1]	–50 ... +60 °C (–58 ... +140 °F)
Storage temperature	–60 ... +70 °C (–76 ... +158 °F)
Operating humidity	0–100 %RH
IP rating	IP65

1) *With shaft heating.*

WAV151 mechanical specifications

Dimensions (H × Ø)	300 × 90 mm (11.81 × 3.54 in)
Swept radius of vane	172 mm (6.77 in)
Weight	660 g (1.46 lb)
Materials	
Housing	AlMgSi, gray anodized
Vane	AISI 12, anodized

WA15 compliance

Compliance marks	CE, China RoHS
EU directives and regulations	RoHS Directive (2011/65/EU) as amended by 2015/863 EMC Directive (2014/30/EU)
Electromagnetic compatibility (EMC)	EMC 55032:2015, Electromagnetic compatibility of multimedia equipment - Emission requirements. Class B. EN 61326-1:2013, Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements.
Environmental	IEC/EN 63000:2018

VAISALA

WMT700 Ultrasonic Wind Sensor Series



WMT700 Series has been designed for professional use in meteorology, aviation, maritime, wind energy, and many other applications.

Vaisala WINDCAP® Ultrasonic Wind Sensor WMT700 Series is a robust and reliable ultrasonic anemometer. It measures surface wind, which is one of the key parameters for meteorology and aviation.

WMT700 series meets WMO CIMO Guide (WMO-No.8) and ICAO requirements.

Accurate and maintenance-free

WMT700 series has a durable full steel structure with welded arms, clear North indication, and one-point, quick bayonet-style mounting. It has no moving parts, and it is resistant to contamination and corrosion.

It measures accurately and produces reliable data in demanding wind conditions and climates without periodic or on-demand maintenance. Self-diagnostics and measurement validation are standard features. The 60-minute average is available for polar coordinates and vectors.

Measurement based on ultrasound

WMT700 series uses ultrasound to determine the horizontal wind speed and direction. The measurement is based on transit time, the time it takes for the ultrasound to travel from one transducer to another, depending on the wind speed.

The transit time is measured in both directions for a pair of transducer heads. Using 2 measurements for each of the 3 ultrasonic paths at 60° angles to each other, WMT700 computes the wind speed and direction.

The wind measurement is calculated in a way that completely eliminates the effects of altitude, temperature, and humidity.

Standard and heated models

WMT700 series operates with a power supply of 9 ... 36 V DC. For the heated model, an additional heating power supply of 24 ... 36 V DC is required.

Thermostatically controlled heaters in the transducer heads and arms of the heated model prevent build-up of freezing rain and snow. A model with a heated transducer, arms, and body is available for operation in the harshest and coldest environments.

In addition, accessories are available for mounting and connecting WMT700. To minimize interference from birds, a bird prevention kit is available.

TYPE APPROVED PRODUCT
DNV·GL
DNVGL.COM/AF

DNV GL TYPE EXAMINATION CERTIFICATE No. TAA00000U5

SGS C US
800226

Features

- WMO and ICAO compliant
- Data output rate 4 Hz and 8 Hz
- Stainless steel structure
- Maintenance-free
- 3-transducer layout provides accurate data
- Data format outputs: polar coordinates and vectors
- Fully compensates effects of temperature, humidity, and pressure
- Measurement range up to 90 m/s (201 mph)
- Heating up to 250 W
- IP66 and IP67
- Large transducers provide high ultrasound power
- Optional bird prevention kit
- Wind gust calculated according to WMO guidelines
- US National Weather Service and the FAA rely on Vaisala WINDCAP® technology

Technical data

Wind speed measurement performance

Observation range	WMT701: 0–40 m/s (89 mph) WMT702: 0–65 m/s (145 mph) WMT703: 0–75 m/s (168 mph) WMT704: 0–90 m/s (201 mph)
Starting threshold	0.01 m/s (0.0223 mph)
Resolution	0.01 m/s (0.0223 mph)
Response time	250 ms
Accuracy	0–75 m/s (168 mph): ±0.1 m/s (0.2 mph) or 2 % of reading, whichever is greater 75–90 m/s (201 mph): ±5 % of reading

Wind direction measurement performance

Observation range	0–360°
Starting threshold	0.1 m/s (0.2 mph)
Resolution	0.01°
Response time	250 ms
Accuracy	±2°

Powering specifications

Operating voltage	9–36 V DC (absolute max. 40 V DC) [1]
Heating voltage	24–36 V DC (absolute max. 40 V DC) [1]
Heating power supply requirement [2]	
Heated transducers	Average 32 W Peak 40 W
Heated transducers and arms	Average 152 W Peak 200 W
Heated transducers, arms, and body	Average 252 W Peak 350 W at 24 V DC

1) *In maritime environments, the normal input voltage ranges are: operating voltage 12–30 V DC (−25 … +30 %) and heating voltage 24–30 V DC (−10 … +30 %), as defined in the maritime standard IEC 60945.*
2) *The actual power consumption depends on the temperature.*

Messaging specifications

Readout update interval	4 Hz (default) and 8 Hz (optional)
Units available	m/s, knots, mph, km/h, V, mA, Hz
Operating mode	Automatic message or poll mode
Sonic temperature	Celsius degrees

Mechanical specifications

Dimensions (H × W × Ø [1])	348 × 250 × 285 mm (13.70 × 9.84 × 11.22 in)
Weight	1.8 kg (4.0 lb)
Materials	
Body and arms, mounting kit	Stainless steel AISI 316
Transducers	Silicone
Connector housing surface	Nickel-plated brass

1) *Diameter of area covered by transducers.*

Analog outputs

Wind speed	Voltage, current, frequency
Wind direction	Voltage, current, potentiometer

Operating environment

Heating [1]	0 W, 30 W, 150 W, or 250 W
Operating temperature [1]	−10 … +60 °C (+14 … +140 °F) −40 … +60 °C (−40 … +140 °F) −55 …+70 °C (−67 …+158 °F)
Storage temperature	−60 … +80 °C (−76 … +176 °F)
IP rating	IP66 IP67

1) *For freezing conditions, select appropriate combination of heating and temperature ranges.*

Digital outputs

Communication interfaces	COM1: RS-485 COM2: RS-485, RS-422, RS-232, SDI-12
Communication profiles	WMT700, WS425 ASCII, NMEA Standard and Extended (version 0183), SDI-12 (version 1.3), WS425 ASOS, ROSA MES 12, customized
Bit rate	300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200
Available averages	Max. 3600 s

Compliance

EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863 REACH Regulation (EC 1907/2006)
EMC immunity	IEC 61326-1:2013, IEC 60945
EMC emissions	CISPR 32 / EN 55032, Class B
Environmental	IEC 60068-2-1, 2, 6/34, 30, 31, 67, 78, IEC 60529 VDA 621-415
Maritime	IEC 60945:2002 + IEC 60945/ Cor1:2008, DNVGL-CG-0339
Electrical safety	UL 61010-1 CAN/CSA C22.2 No. 61010-1-12
Application standards	EN 15518-3:2023, Winter maintenance equipment - Road weather information systems - Part 3: Requirements on measured values of stationary equipment
Compliance marks	CE, China RoHS, RCM, UKCA
Listing marks	SGS (USA and Canada)

VAISALA

WXT530 Weather Transmitter Series



Features

- Right parameter combination
- Easy to use and integrate
- Weather parameter hub
- Analog sensors can be added
- Compact, lightweight
- Low power consumption
- mA output suitable for industrial applications
- Cost-effective
- DNV GL Type Examination

Vaisala Weather Transmitter WXT530 is a unique series of sensors with parameter combinations that allow you to choose what is right for your application. WXT530 is a flexible, integrated building block for weather applications. WXT530 series improves your grip on weather.

Flexibility

WXT530 is a series of weather instruments that provides 6 of the most important weather parameters: air pressure, temperature, humidity, rainfall, wind speed and direction through various combinations. You can select the transmitter with the needed parameter(s) into your weather application, with a large variety of digital communication modes and wide range of voltages. A heated option is available. Low power consumption enables solar panel applications. WXT530 Series focuses on maintenance-free operations in a cost-effective manner.

Integration

The series offers analog input options for additional third-party analog sensors. With the help of the built-in analog-to-digital converters, you can turn WXT530 into a small, cost-effective weather parameter hub.

Additional parameters include solar radiation and external temperature sensor. Further, the analog mA output for wind speed and wind direction enables a wide variety of industrial applications. WXT530 exceeds IEC60945 maritime standard.

Solid performance

WXT530 Series has a unique Vaisala solid-state sensor technology. To measure wind, Vaisala WINDCAP® ultrasonic wind sensors are applied to determine horizontal wind speed and direction. Barometric pressure, temperature, and humidity measurements are combined in the PTU module. The PTU module is easy to change without any contact with the sensors. The precipitation measurement is based on the unique acoustic Vaisala RAINCAP® Sensor without flooding, clogging, wetting, and evaporation losses.

Option	Rain	Wind	PTU 1)
WXT531	✔		
WXT532		✔	
WXT533	✔	✔	
WXT534			✔
WXT535	✔		✔
WXT536	✔	✔	✔

1) *PTU is a compact changeable module. Vaisala recommends changing it every 2 years.*

TYPE APPROVED PRODUCT
DNV·GL
DNVGL.COM/AF

DNV GL TYPE EXAMINATION CERTIFICATE No. TAA00000VF

Technical data

Barometric pressure measurement performance

Observation range	500–1100 hPa
Accuracy (for sensor element) at 600–1100 hPa	±0.5 hPa at 0 … +30 °C (+32 … +86 °F) ±1 hPa at −52 … +60 °C (−60 … +140 °F)
Output resolution	0.1 hPa / 10 Pa / 0.001 bar / 0.1 mmHg / 0.01 inHg

Air temperature measurement performance

Observation range	−52 … +60 °C (−60 … +140 °F)
Accuracy (for sensor element) at +20 °C (+68 °F)	±0.3 °C (±0.54 °F)
Output resolution	0.1 °C (0.1 °F)

Relative humidity measurement performance

Observation range	0–100 %RH
Accuracy (for sensor element)	±3 %RH at 0–90 %RH ±5 %RH at 90–100 %RH
Output resolution	0.1 %RH

Wind measurement performance

Wind speed	
Observation range	0–60 m/s (134 mph)
Reporting range	0–75 m/s (168 mph)
Response time	0.25 s
Available variables	Average, maximum, and minimum
Accuracy	±3 % at 10 m/s (22 mph)
Output resolution	0.1 m/s (km/h, mph, knots)
Wind direction	
Azimuth	0–360°
Response time	0.25 s
Available variables	Average, maximum, and minimum
Accuracy	±3.0° at 10 m/s (22 mph)
Output resolution	1°
Averaging time	1–3600 s, sample rate 1, 2, or 4 Hz (configurable)

Mechanical specifications

Weight	
WXT534, WXT535, WXT536	0.7 kg (1.54 lb)
WXT531, WXT532, WXT533	0.5 kg (1.1 lb)

Operating environment

Operating environment	Outdoor use
Operating temperature	−52 … +60 °C (−60 … +140 °F)
Storage temperature	−60 … +70 °C (−76 … +158 °F)
Operating humidity	0–100 %RH
Operating pressure	500–1100 hPa
Wind [1]	0–60 m/s (0–134 mph)
IP rating	Without mounting kit: IP65 With mounting kit: IP66

1) *Due to the measurement frequency used in the sonic transducers, RF interference in the 200–400 kHz range can disturb wind measurement.*

Precipitation measurement performance

Collecting area	60 cm^2 (9.3 in^2)
Rainfall [1]	
Output resolution	0.01 mm (0.001 in)
Field accuracy for daily accumulation	Better than 5 %, weather-dependent
Duration	Counting each 10-second increment whenever droplet detected
Duration output resolution	10 s
Intensity	Running 1-minute average, 10 s steps
Intensity observation range	0–200 mm/h (0–7.87 in/h) (broader with reduced accuracy)
Intensity output resolution	0.1 mm/h (0.01 in/h)
Hail [2]	
Output resolution	0.1 hits/cm^2 (1 hits/in^2), 1 hit
Intensity output resolution	0.1 hits/cm^2h (1 hits/in^2h), 1 hit/h

1) *Cumulative accumulation after the latest automatic or manual reset.*
2) *Cumulative number of hits against collecting surface.*

Inputs and outputs

Operating voltage	6–24 V DC (−10 … +30 %)
Average power consumption	Minimum: 0.1 mA at 12 V DC (SDI-12 standby) Typical: 3.5 mA at 12 V DC (typical measuring intervals) Maximum: 15 mA at 6 V DC (constant measurement of all parameters)
Heating voltage	DC, AC, or full-wave rectified AC 12–24 V DC (−10 … +30 %) 12–17 V AC_{rms} (−10 … +30 %)
Typical heating current	12 V DC: 800 mA, 24 V DC: 400 mA
Digital outputs	SDI-12, RS-232, RS-485, RS-422
Communication protocols	SDI-12 v1.3, Modbus RTU, ASCII automatic and polled, NMEA 0183 v3.0 with query option

WXT536 analog input options

Solar radiation	0–25 mV
Voltage input	0–2.5 V , 0–5 V, 0–10 V
Tipping bucket rain gauge	0–100 Hz
Temperature (Pt1000)	800–1330 Ω

WXT532 analog mA output options

When the analog output option is applied, digital communication is not available.	
Wind speed	0–20 mA or 4–20 mA
Wind direction	0–20 mA or 4–20 mA

Compliance

EU directives and regulations	EMC, RoHS
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B
Environmental	IEC 60068-2-1, 2, 6, 14, 30, 31, 78 IEC 60529, VDA 621-415
Maritime	IEC 60945 (Exposed) DNV GL Type Examination Certificate No. TAA00000VF
Compliance marks	CE, RCM, RoHS, China RoHS, UKCA

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