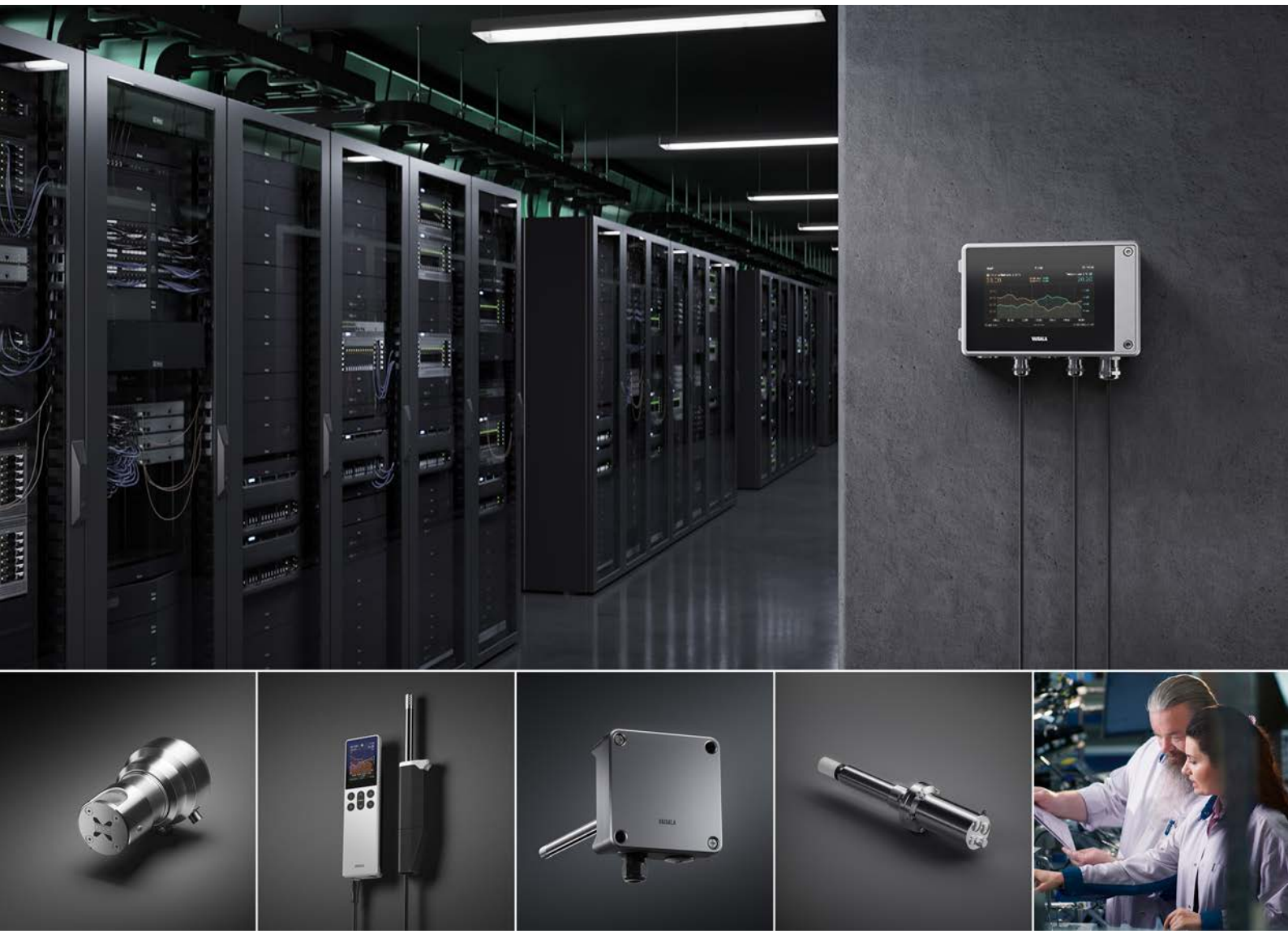
Product Catalog

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.

Table of contents

INSIGHT PC SOFTWARE

INDIGO TRANSMITTERS FOR SMART PROBES

HANDHELDS FOR SPOT-CHECKING AND CALIBRATION

HUMIDITY AND TEMPERATURE

DEW POINT

CARBON DIOXIDE

BIOGAS QUALITY

MOISTURE IN OIL

HYDROGEN PEROXIDE

PRESSURE

LIQUID CONCENTRATION

WEATHER

VAISALA SERVICE OFFERING

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

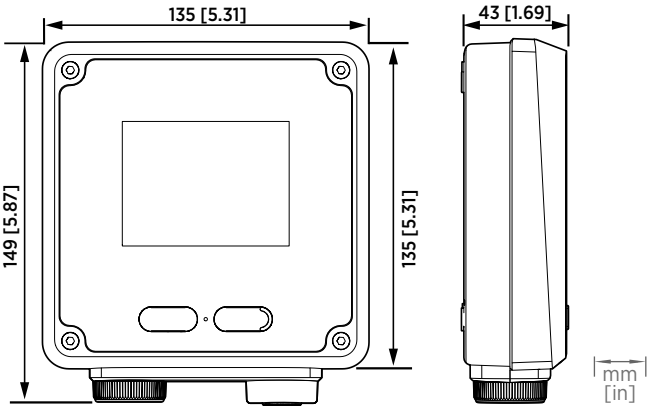
Mechanical specifications

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)

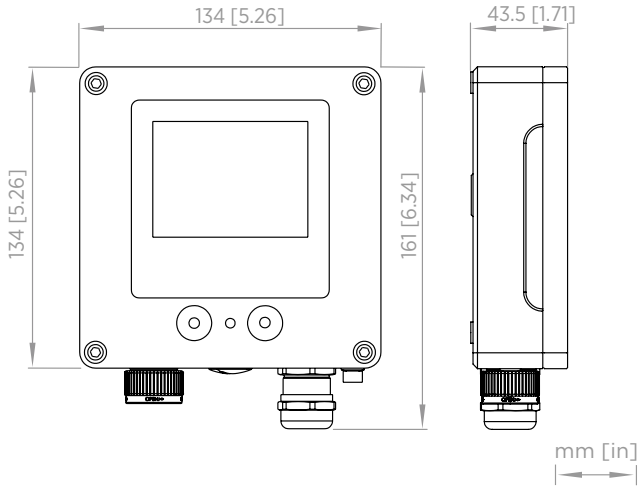
Probe connection cables

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

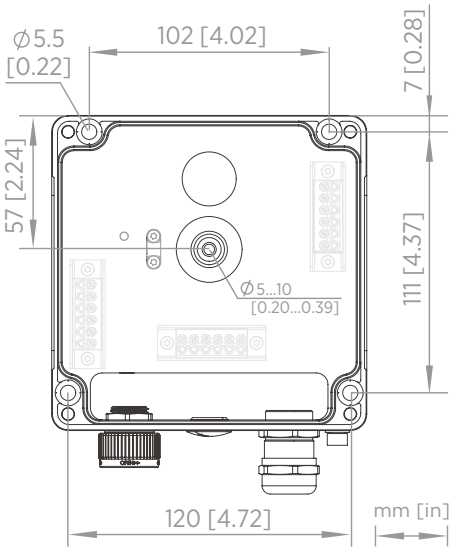
1) *The usable length outside of the transmitter enclosure is approx. 0.1 m (4 in) shorter than the total length of the cable.*

Spare parts and accessories

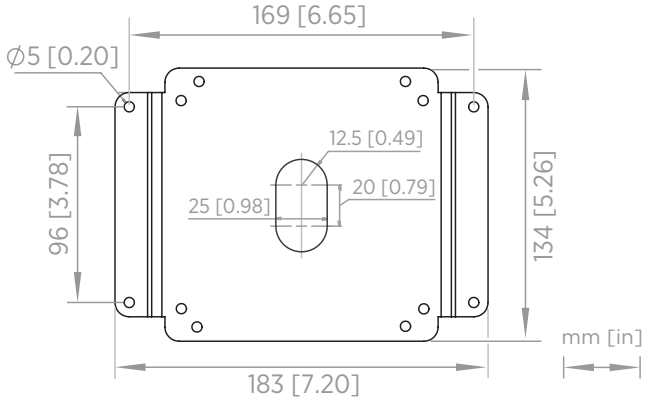
Adapter plate for replacing a Vaisala 330 series transmitter	DRW257715SP
DIN rail installation kit for 35 mm (0.11 in) wide DIN rail	ASM215071SP
Vaisala Indigo USB adapter and M12 - M8 service cable, for connecting to Insight	USB2 and 262195SP
M12 - M8 service cable 1.5 m (4.9 ft), for connecting to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

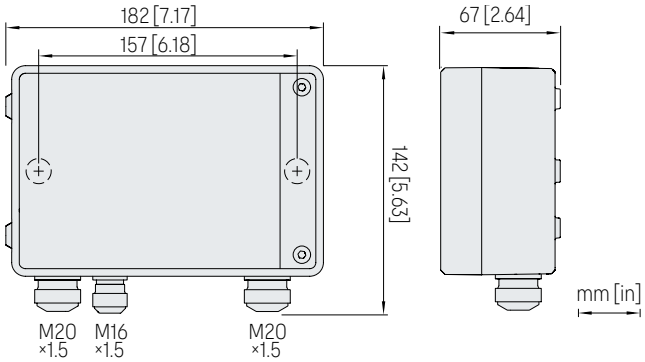
Cable gland, M20×1.5, 5.0–9.0 mm (0.20–0.35 in)	ASM213670SP
Cable gland with split bushing, M20×1.5 [1]	262632SP
Cable gland, M16×1.5, 2.0–6.0 mm (0.08–0.24 in)	ASM213671SP
Conduit fitting, M20×1.5 for NPT1/2″ conduit	214780SP

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

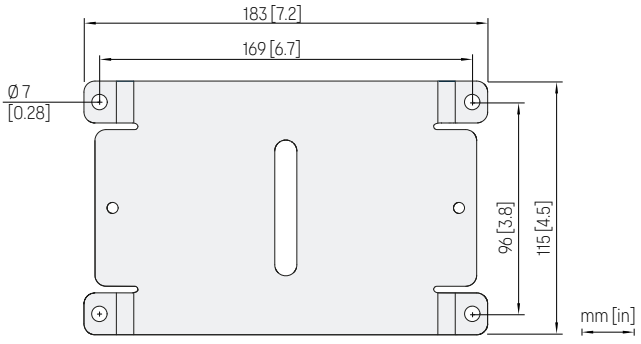
Accessories

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

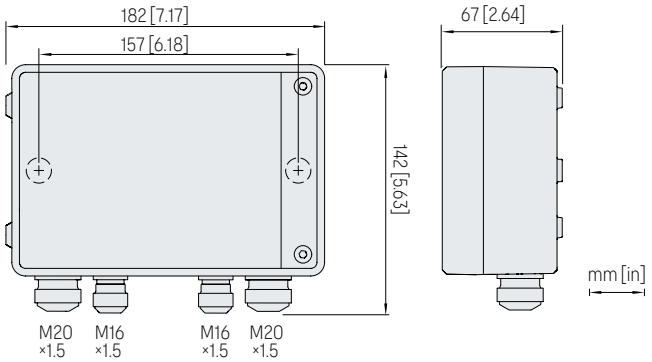
Spare parts

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

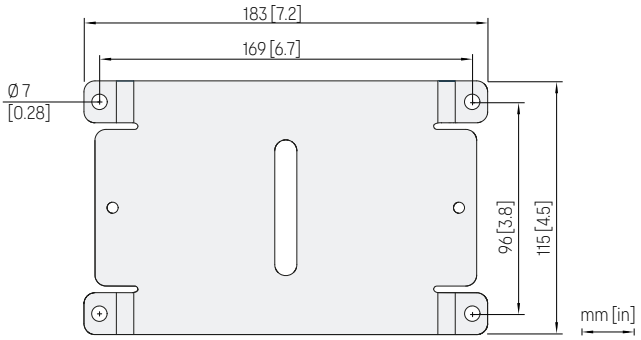
Accessories

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

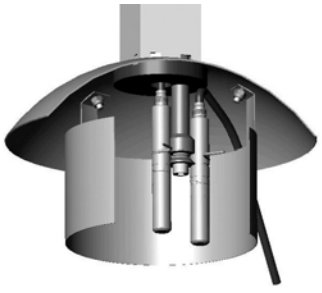
In weather observations dew formation makes reliable humidity measurement difficult. When dew has formed on the humidity sensor, it is impossible to obtain a true reading until the dew evaporates. Obtaining a true humidity reading is particularly important in traffic safety, at airports, and at sea.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

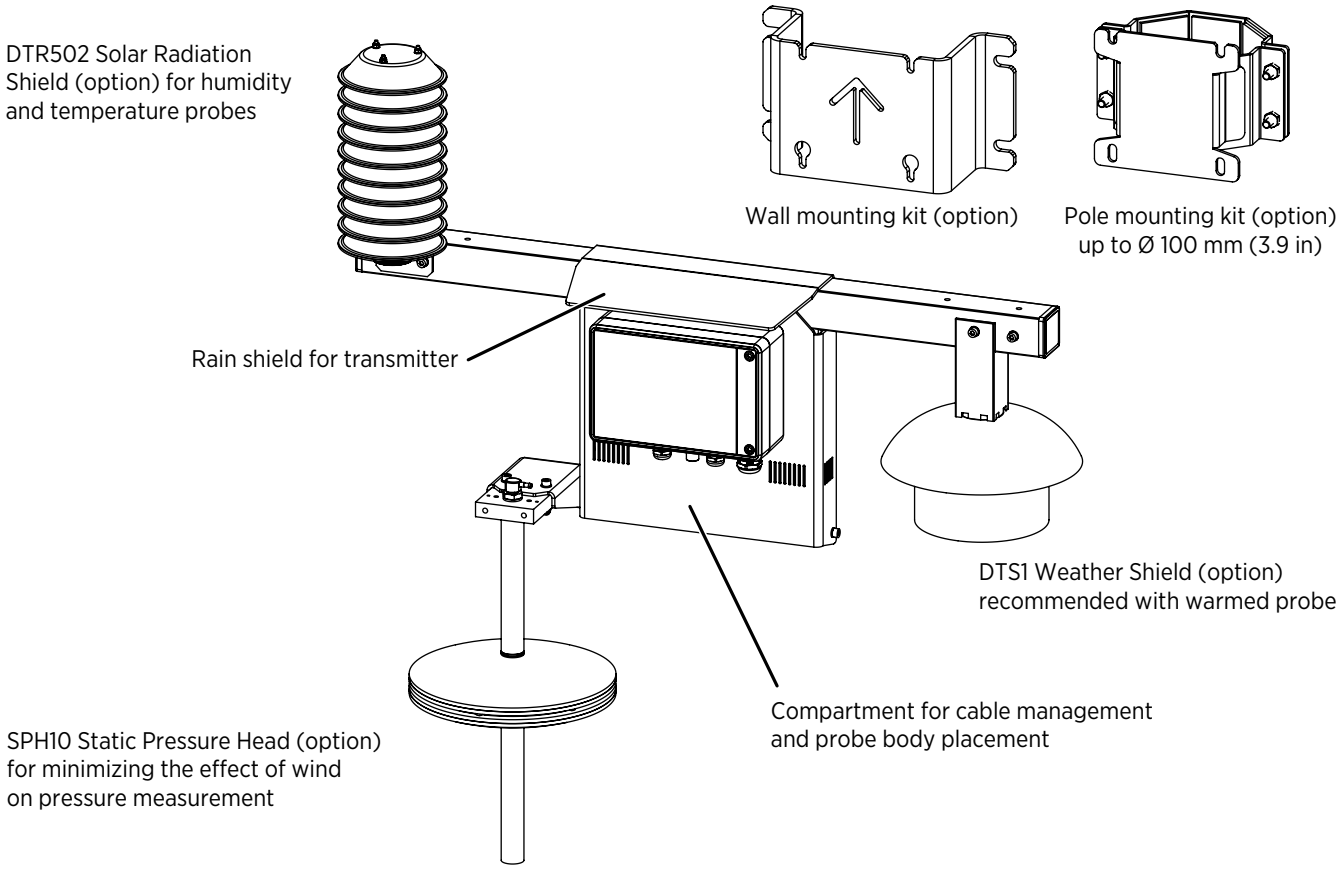
Traditional solar radiation shields are not optimal for use with heated probes, as sleet or snow can accumulate on the shield. This may prevent proper air circulation and create a humid microclimate around the probe head until the snow melts.

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.

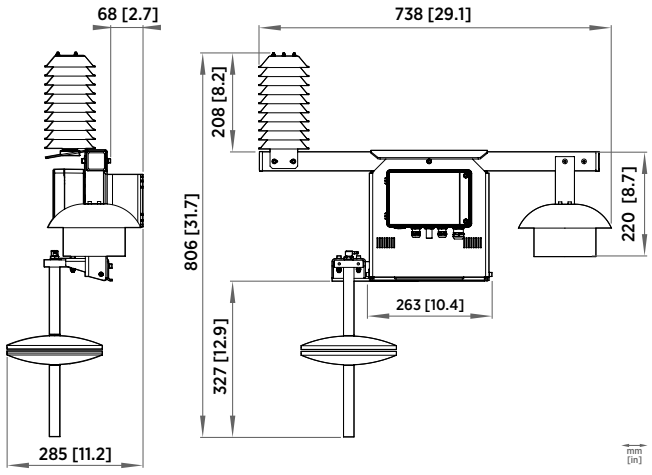
Technical data



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

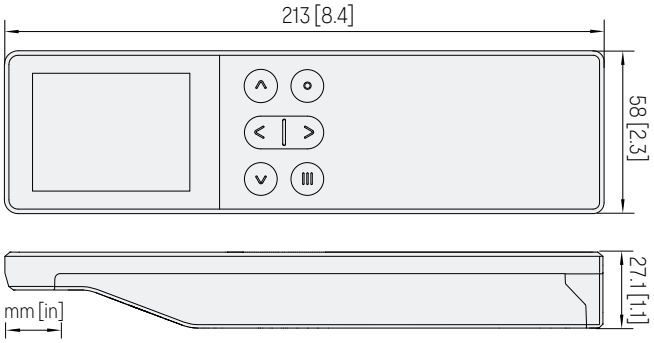
Max. number of connected devices	2
Connector type	M12 5-pin female (2 pcs)
Battery [1]	
Type	Rechargeable lithium-ion battery
Nominal voltage	7.2 V
Rated capacity	2900 mAh / 20.88 Wh
Charge limit voltage	8.4 V
AC adapter [2]	
Type	45 W USB-C AC adapter [3]
Connector type	USB-C
AC input	100-240 V AC, 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

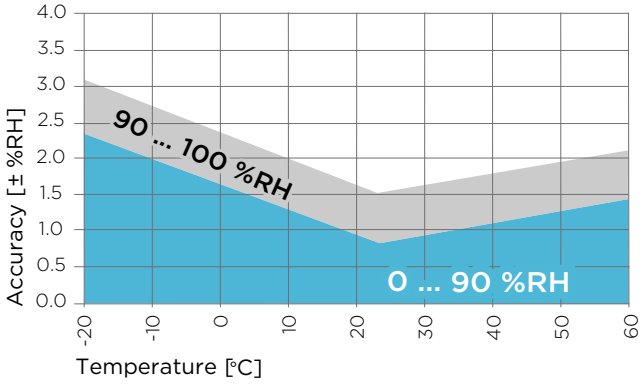
1) Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases.

HMP80 series inputs and outputs

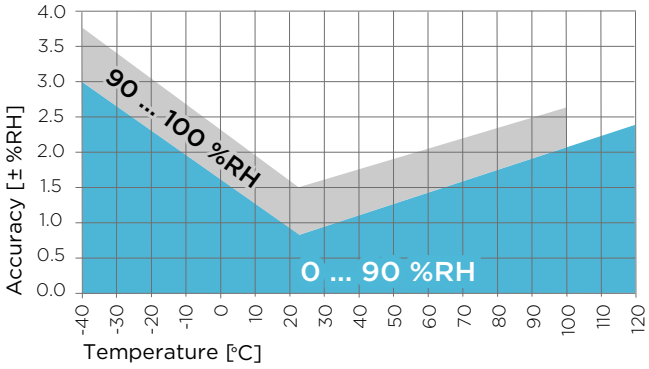
Operating voltage	15–30 V DC
Current consumption	10 mA typical, 500 mA max.
Digital output	RS-485, non-isolated

HMP80 series compliance

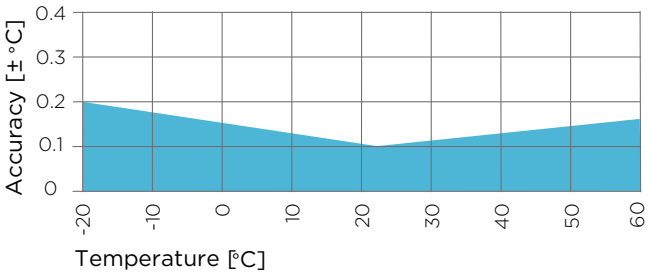
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Rough handling (excluding sensor inside probe head)	IEC 60068-2-31
Compliance marks	CE, China RoHS, RCM, UKCA



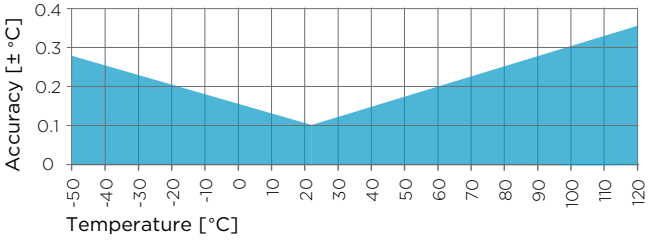
HMP80N humidity measurement accuracy as a function of temperature



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)

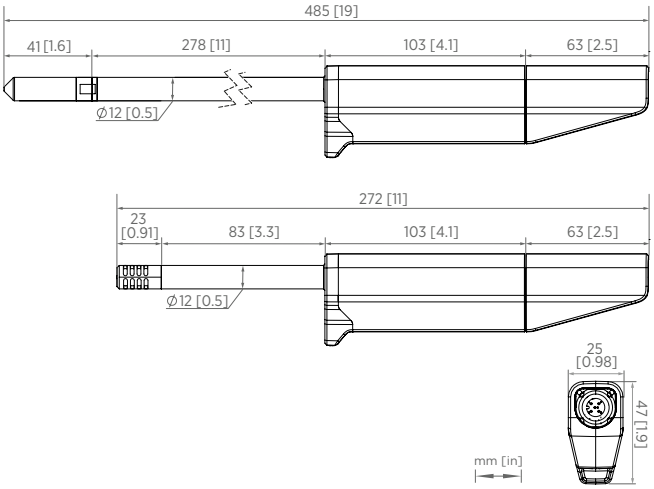
HMP80 series mechanical specifications

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

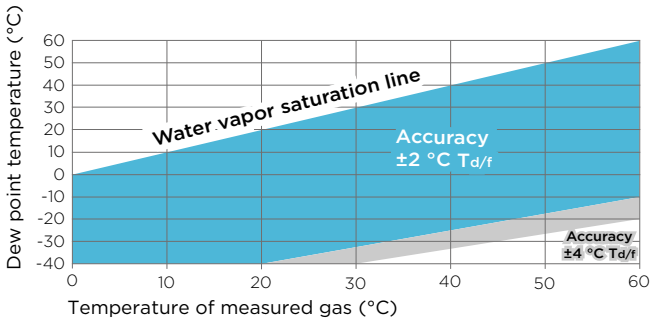
DMP80 probes are optimized for portable spot-checking, field calibration, and data logging use with the Indigo80 handheld indicator. For easy-to-use access to device analytics and configuration, DMP80 probes can be connected to Vaisala Insight software for Windows®.

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

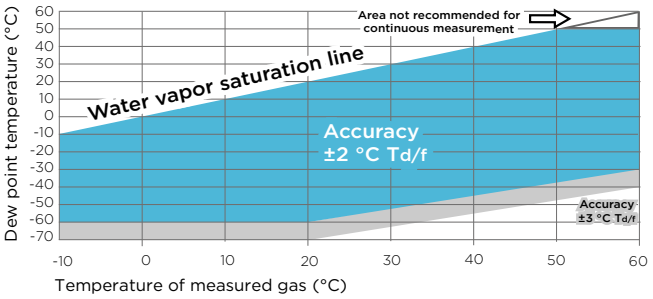
1) Consult Vaisala if other chemicals are present. Consider safety regulations with flammable gases.

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

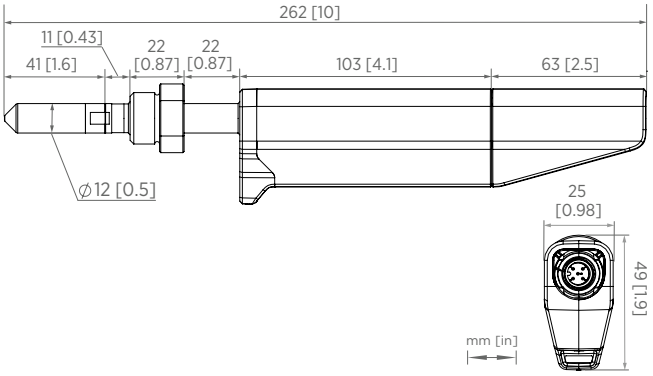
Absolute humidity (g/m³)	Relative humidity (%RH)
Absolute humidity at NTP (g/m³)	Relative humidity (dew/frost) (%RH)
Dew point temperature (°C)	Temperature (°C)
Dew/frost point temperature (°C)	Water concentration (ppm_v)
Dew/frost point temperature at 1 atm (°C)	Water concentration (wet basis) (vol-%)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

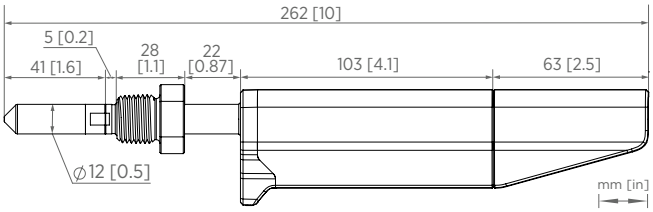
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Rough handling (excluding sensor inside probe head)	IEC 60068-2-31
Compliance marks	CE, China RoHS, RCM, UKCA

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

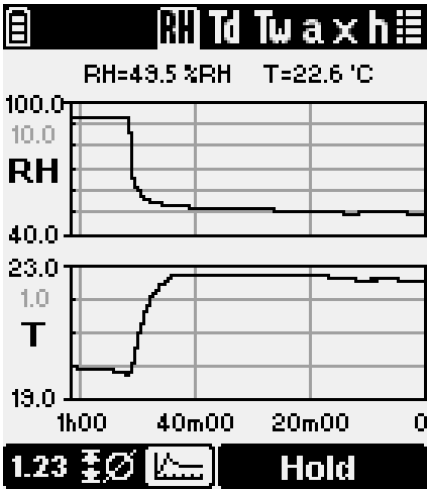
- Compact, portable, and easy to use
- Versatile meter with wide measurement range and multiple calculated parameters
- Ideal for spot-checking in a wide variety of applications

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.

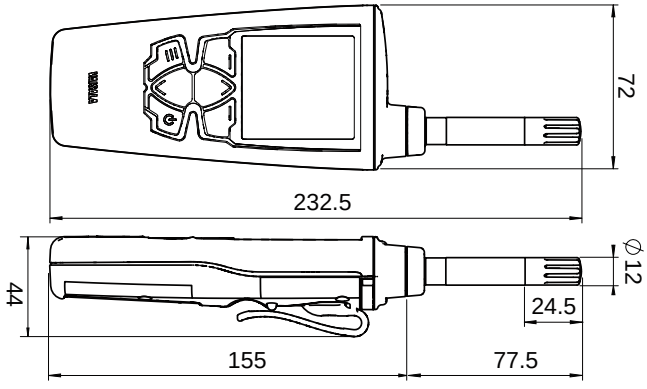


The Graph Clearly Indicates When Readings Have Stabilized.

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)

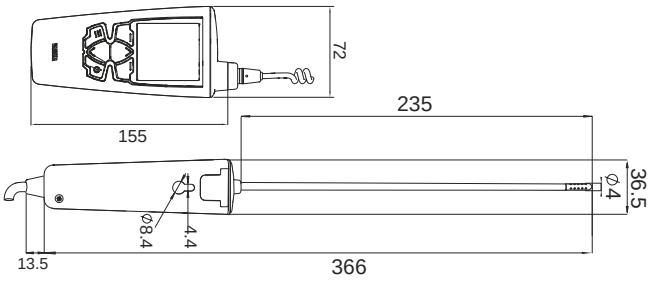


HM41 dimensions in mm

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)

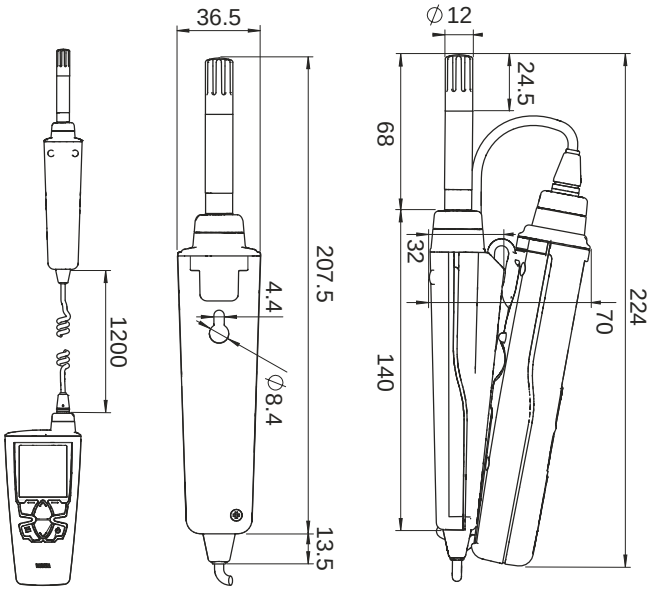
1) Not recommended for T_d > 85 °C



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)

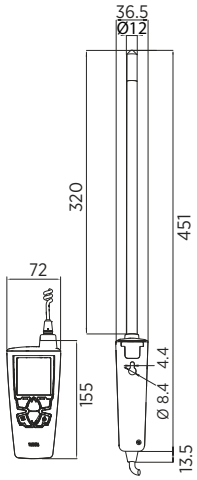


HM45 dimensions in mm

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

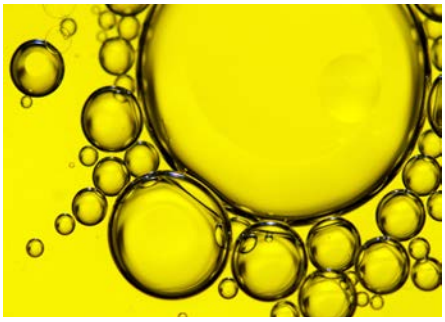
Display	LCD (140 x 160 pixels)
Power-up time	< 3 s
Batteries	2 × AA, 1.5 V
Operation time (typical)	100 hours (without backlight)
Menu languages	English, Chinese (simplified), Finnish, French, German, Japanese, Portuguese, Russian, Spanish, Swedish

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® 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.

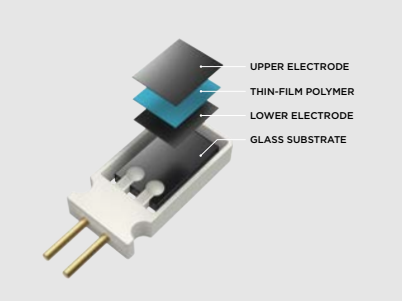
Oil molecules or additives do not penetrate the electrode. Thus the sensor output is independent of the oil type.

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.

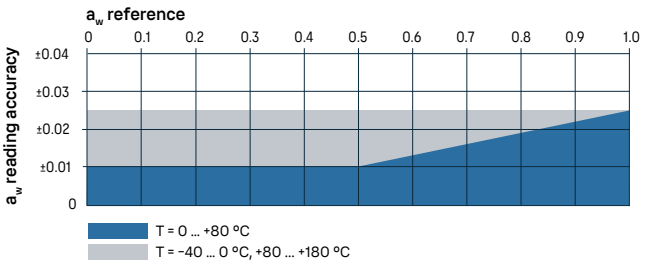
For more information on Indigo family products and Insight PC software that can be used with the probe, see www.vaisala.com/insight and www.vaisala.com/indigo.

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)

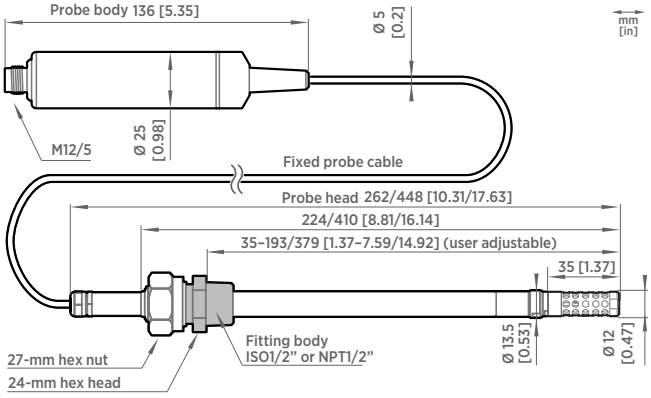
Mechanical specifications

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

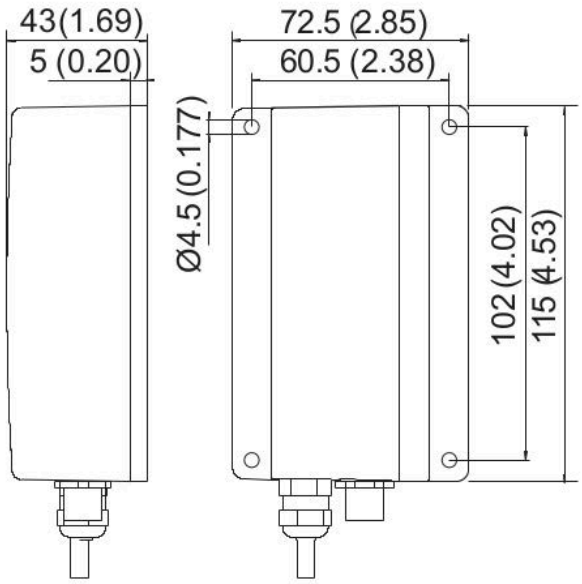
Rain shield	ASM211103
USB cable	238607
Stainless steel filter	HM47453SP
Stainless steel filter (high flow rate)	220752SP
Ball-Valve Set	BALLVALVE-1

Operating Environment

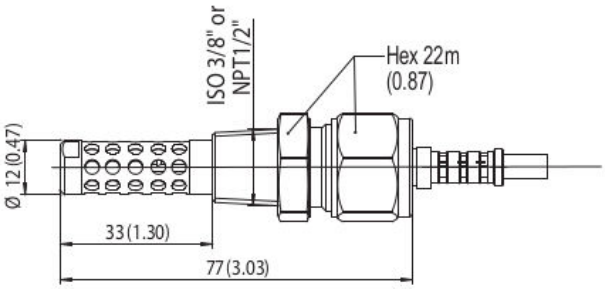
Operating temperature for electronics	-40 ... +60 °C (-40 ... +140 °F)
Storage temperature	-55 ... +80 °C (-67 ... +176 °F)
Pressure range for MMT318 with ball-valve up to 120 °C	0 ... 40 bar
Pressure range for MMT317	0 ... 10 bar
EMC compliance	EN61326-1, Industrial environment

Inputs and Outputs

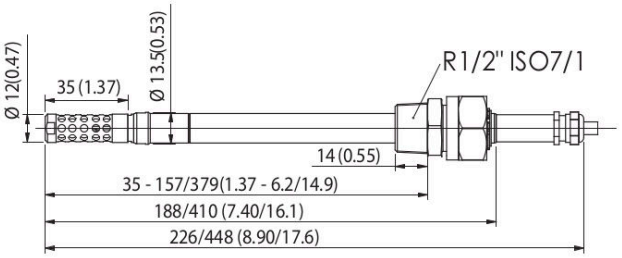
Two analog outputs, selectable and scalable	0 ... 20 mA or 4 ... 20 mA 0 ... 5 V or 0 ... 10 V 1 ... 5 V available through scaling
Typical accuracy of analog output at +20 °C	±0.05 % full scale
Typical temperature dependence of analog output	0.005 %/°C (0.003 %/°F) full scale
Serial output	RS-232C
Connections	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)



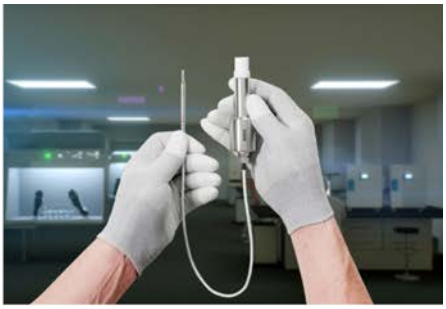
MMT317 probe, dimensions in mm (inches)



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

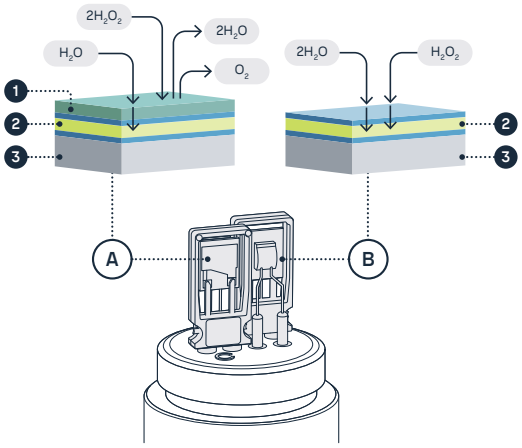
One unique feature of PEROXCAP is that it provides the critical **relative saturation** value. Water (H_2O) and hydrogen peroxide (H_2O_2) have similar molecular structures, however, while relative humidity (RH) indicates the level of water vapor in the air at a given temperature, relative saturation 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.

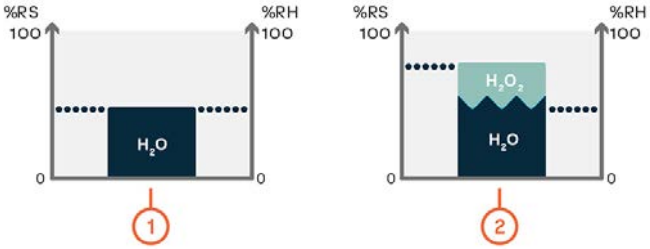
B HUMICAP sensor without a catalytic layer under the probe filter. This sensor senses the air mixture with both hydrogen peroxide vapor and water vapor.

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 %.

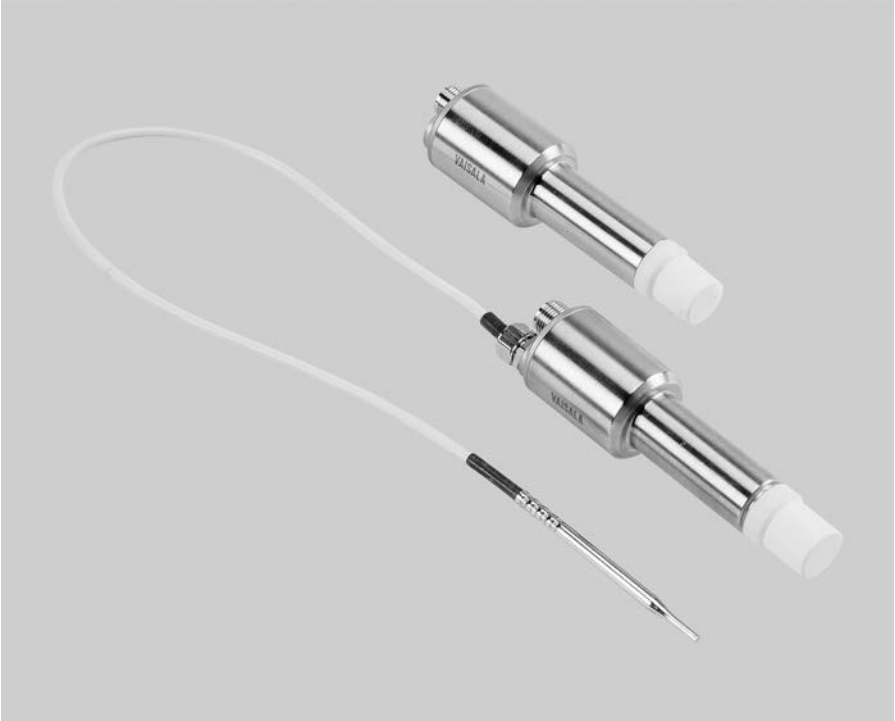
Traceable H_2O_2 factory calibration

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.