Quick Guide

Vaisala Indigo Compatible
Dew Point and Temperature Probes

DMP5, DMP6, DMP7, DMP8

VAISALA

Table of Contents

Product Overview

DMP series probes are dew point and temperature measurement probes with a digital output (Modbus protocol). The probes are designed for demanding dew point measurement applications. The probes have a two-part structure, with measurement electronics contained in the probe body and sensor(s) in the probe head. The probe body and the probe head are connected by a cable. Length options for this connecting cable depend on the probe model.

The probes are compatible with Vaisala Indigo transmitters. They can also be connected to Vaisala Insight software for configuration, calibration, diagnostics, and temporary online monitoring.

Probe Structure
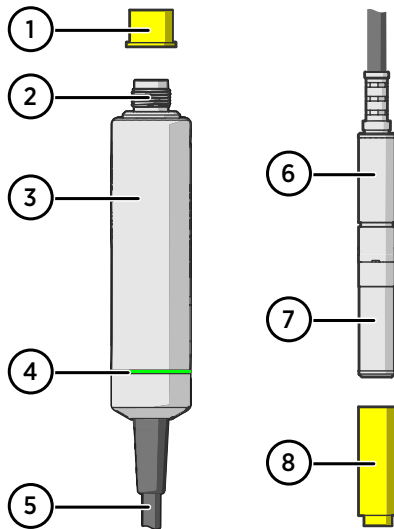
Figure 1   Probe Parts

1   Protection cap (remove before use)
2   5-pin M12 connector
3   Probe body with type label
4   Status indicator:

Green	Power on and probe online, flashes when communicating
Red	Error
Off	Power off or indicator disabled

5   Probe cable (do not cut)
6   Probe head (DMP7 model shown)
7   Location of sensors on the probe head. DMP series probes have a removable filter over the sensors that can be replaced if it gets dirty or damaged.
8   Protection cap (remove before use)

Basic Features and Options

- Comprehensive list of output parameters. For example: relative humidity, temperature, dew point temperature, wet-bulb temperature, absolute humidity, mixing ratio, water vapor pressure, enthalpy. See Output Parameters (page 4).
- Sensor purge provides superior chemical resistance
- Sensor warming function minimizes condensation on sensor
- Traceable calibration certificate
- Standalone Modbus RTU over RS-485
- Compatible with Indigo series of transmitters
- Can be connected to Vaisala Insight PC software for configuration, calibration, diagnostics, and temporary online monitoring

Output Parameters

> Values of all available output parameters are always locked (showing the latest valid value) when chemical purge, autocalibration, or extra heat functions are active.

● Output parameter is available
◐ Output parameter is unavailable during sensor warming unless temperature is written to register 0334_{hex} from an external source
– Output parameter is not available on this model

Table 1   Availability of Output Parameters

Output Parameter	Output Unit	DMP5	DMP6	DMP7	DMP8
Relative humidity	%RH	◐	–	◐	◐
Temperature	°C	◐	–	◐	◐
Dew point temperature	°C	●	●	●	●
Dew/frost point temperature	°C	●	●	●	●
Dew/frost point temperature at 1 atm	°C	●	●	●	●
Dew point temperature at 1 atm	°C	●	●	●	●
Absolute humidity	g/m^3	◐	–	◐	◐
Mixing ratio	g/kg	●	●	●	●
Water concentration	ppm_v	●	●	●	●
Water vapor pressure	hPa	●	●	●	●
Water vapor saturation pressure	hPa	◐	–	◐	◐
Enthalpy	kJ/kg	◐	–	◐	◐
Dew point temperature difference	°C	◐	–	◐	◐
Absolute humidity at NTP	g/m^3	◐	–	◐	◐
Water mass fraction	ppm_w	●	●	●	●

Installation

When you choose the installation location for the probe, consider the following:

- Verify the operating environment specification of the probe model. The probe head typically has a much wider operating temperature range than the probe body.
- If the temperature of the measured environment differs greatly from ambient temperature, the entire probe head and preferably plenty of cable must be inside the measured environment. This prevents measurement inaccuracy caused by heat conduction along the cable.
- Probe mounting options are model-specific.
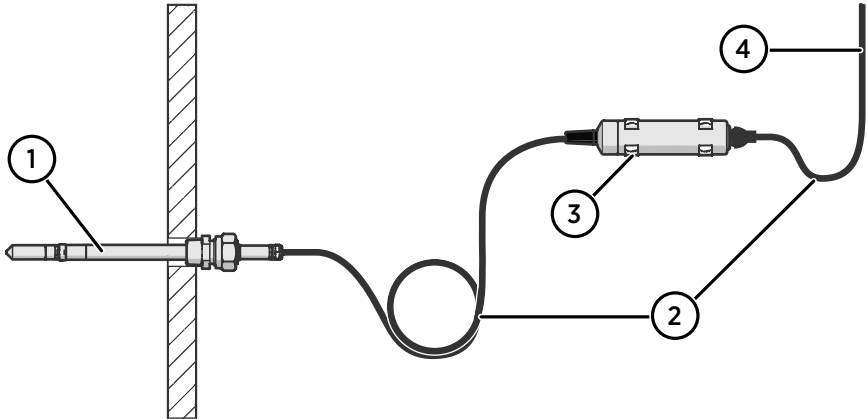
Figure 2   Example Installation

1   Mount the probe head horizontally to prevent any water condensing on the probe head from running to the sensors.
2   Let the cable hang loosely to prevent condensed water from running along the cable to the probe body or probe head.
3   Attach the probe body to a wall or other surface using the two mounting clips (Vaisala item 243257SP) supplied with the probe. Each clip attaches to the installation surface with one screw (screw hole Ø 4.2 mm).
4   Cable to Modbus master or Indigo transmitter.

> ⚠️ **CAUTION!** The supplied mounting clips are not designed to withstand strong vibration. Use other methods to secure the probe body if necessary. For example, attach the probe body using a cable tie.

DMP5 Probe
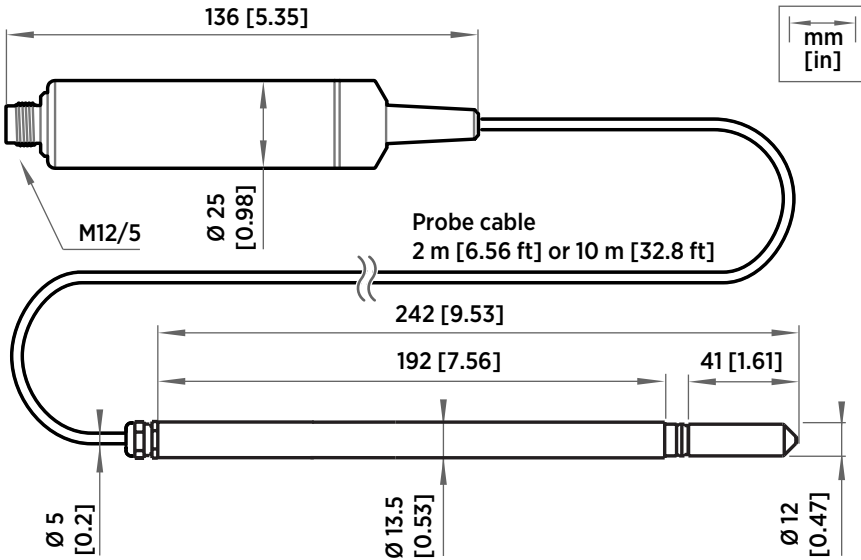
Figure 3   DMP5 Dimensions

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

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

- Operating temperature of probe body −40 ... +80 °C (−40 ... +176 °F)
- Operating temperature of probe head −40 ... +180 °C (−40 ... +356 °F)

Installing with Mounting Flange 210696

Mounting flange 210696 is designed for attaching Ø13.5 mm probe heads through the wall of a process chamber or duct. The flange kit includes a flange, a sealing ring, and screws.
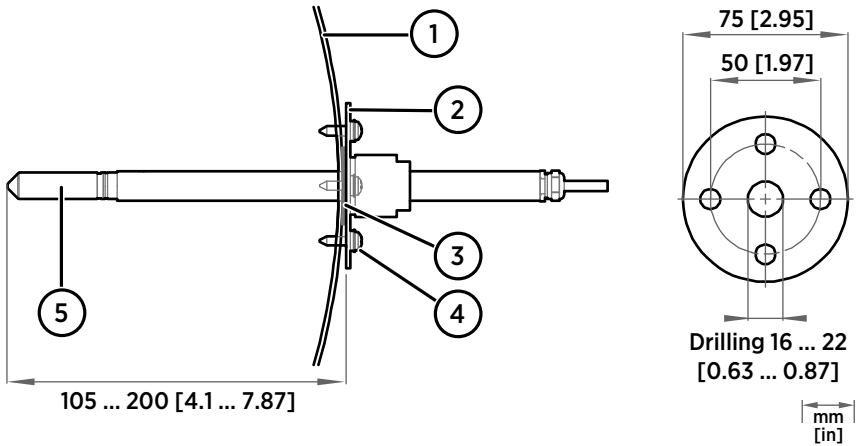
1 Wall of chamber or duct
2 Flange
3 Sealing ring
4 Self-tapping screws (B 4.2×16 DIN 7981)
5 Probe

> When the temperature difference between the process or duct and the surroundings is large, insert the probe head as deep in the process or duct as possible. This prevents errors caused by heat conduction along the probe cable.

DMP6 Probe

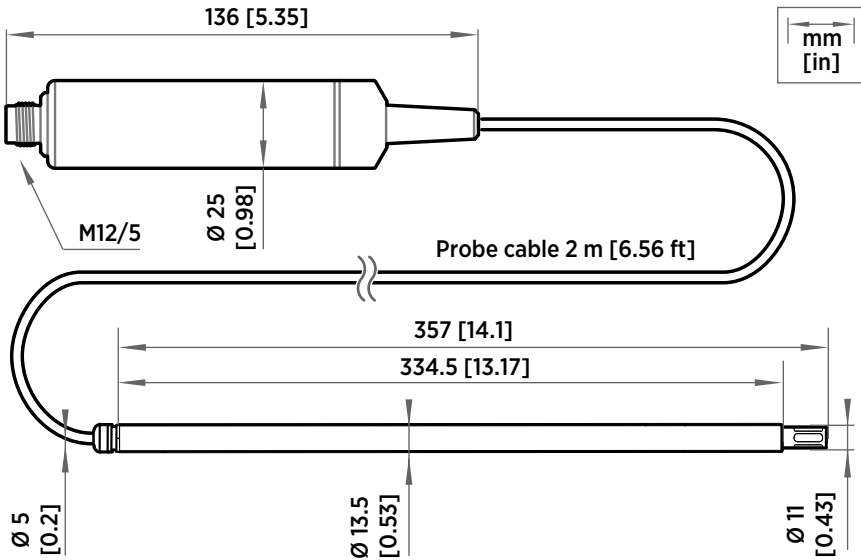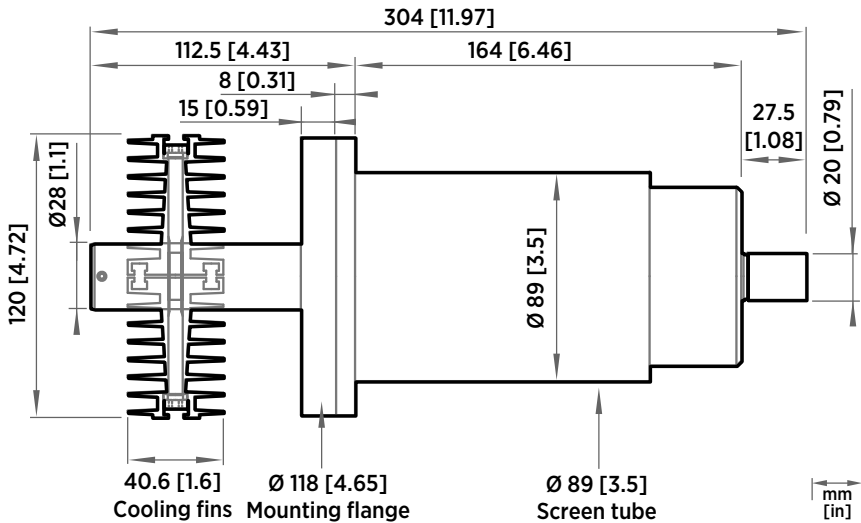Figure 4   DMP6 Probe Dimensions

Figure 5   Cooling Set DMP246CS Dimensions

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

- Operating temperature of probe head 0 ... +350 °C (+32 ... +662 °F)
- Operating temperature of probe body −40 ... +80 °C (−40 ... +176 °F)

DMP6 is built for direct measurement in temperature range 0 ... +350 °C (+32 ... +662 °F). There is no need for a sampling system or trace heating. To tolerate these high temperatures the probe head is inserted inside a cooling set that provides passive cooling. The cooling set has removable cooling fins that allow the operating temperature profile of the probe to be adjusted so that adequate cooling is provided for each application. The cooling system has no moving parts, and requires no additional power or cooling utilities, so there is no risk of sensor damage due to mechanical cooling failure.
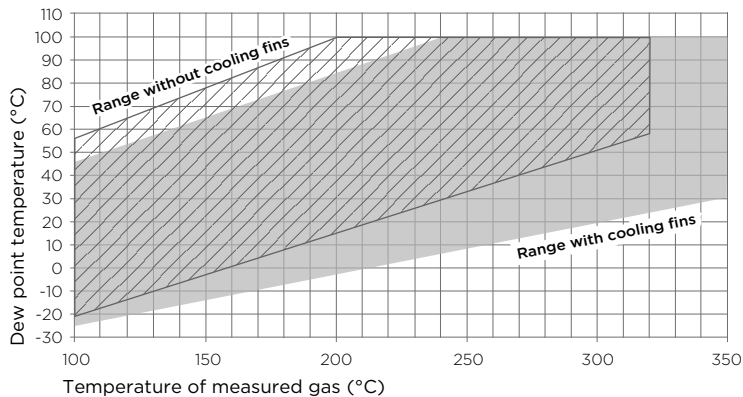
Figure 6   Operating Range of Probe Head

> Make sure that the upper limit of the dew point measurement range is not exceeded in low temperatures as this will lead to condensation.

> You can read diagnostic measurement data from the probe using Insight software (**Diagnostics** page) or Modbus protocol (diagnostic data registers) and use it to verify your installation:
>
> - **Sensor temperature** must never exceed +180 °C (+356 °F) even in exceptional process conditions.
> - Allow the probe to stabilize after installation in the cooling set, and check the **Sensor saturation ratio**. If the value is below 20 %, install the cooling fins on the cooling set (unless already installed).

Installing Probe Head with Cooling Set DMP246CS

- Welding equipment
- Equipment for making a hole to the process wall
- 5-mm Allen key
- 2-mm Allen key

Figure 7   DMP246CS Cooling Set Mounting Flange

1   Lengthening piece for thick walls (not included)
2   Welding point
3   Mounting tube
4   Mounting screws (4 pcs, M6×16 DIN 912)

Figure 8   DMP246CS Cooling Set without Mounting Flange

1   Cooling bush
2   Flange
3   Cooling bar
4   Locking screws (4 pcs, M4×6 DIN 916)
5   Mounting screws of the cooling fins (M6×60 DIN 912

▶ 1. Make a round 89.5 + 0.5 mm (3.52 + 0.02 in) hole in the process wall. Install the cooling set horizontally whenever possible to ensure the best possible cooling performance.

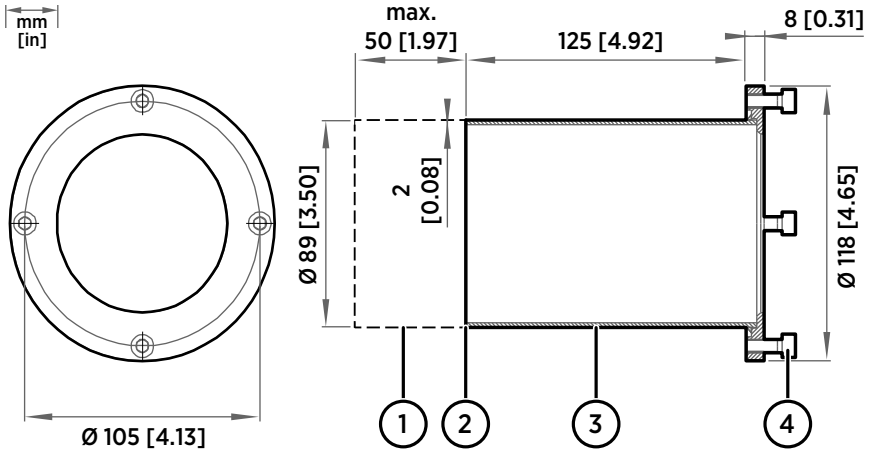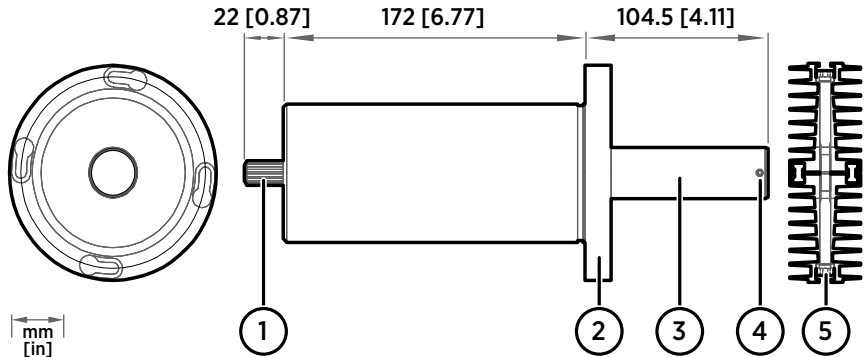2. If the process wall is more than 125 mm (4.92 in) thick, weld a lengthening piece (max. 50 mm (1.97 in)) to the mounting tube.

3. Weld the tube of the mounting flange tightly to the inner metal plate of the process wall.

4. Attach the cooling set to the mounting flange and use a 5-mm Allen key to tighten the mounting screws. Proper tightening of the mounting screws is important for good thermal contact.

5. If the process chamber is in use or otherwise warmer than ambient temperature, let the cooling set warm up before inserting the probe to avoid condensation:

    a. Plug the hole of the cooling bar tightly with the plug that is attached to the cooling set.

    b. If installation of the cooling fins is required, attach them at this point to let them warm up as well. See step 9.

    c. Wait for a few hours.

    d. Unplug the cooling bar and continue the installation.

6. Use a 2-mm Allen key to loosen the locking screws on the cooling bar.

7. Push the probe head into the cooling bar until it meets the other end and cannot be pushed farther. Approximately 7.5 cm (2.95 in) of the probe head will remain outside the cooling bar.

⚠ **CAUTION!** Do not push or pull from the probe cable.

8. Tighten the locking screws to lock the probe head in place.

9. If installation of cooling fins is required, attach them around the cooling bar using a 5-mm Allen key. Place the cooling fins so that the locking screws are not obstructed. Tighten the two mounting screws so that the fins have good thermal contact with the cooling bar.

Cooling Set Installation Example
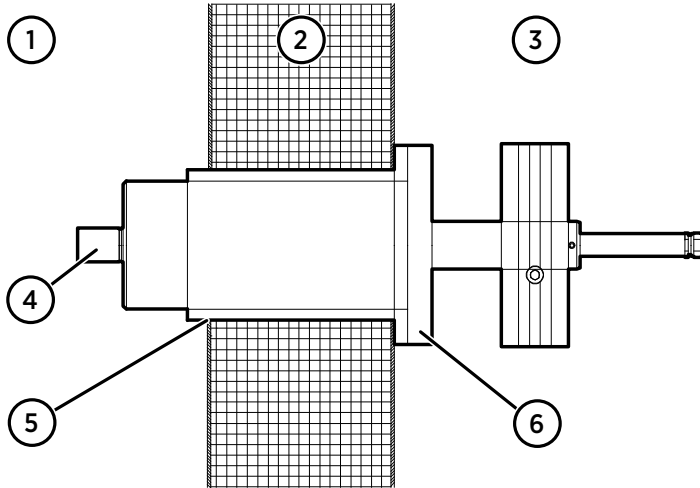
Figure 9   Example Installation with Cooling Set DMP246CS

1   Process chamber, maximum temperature +350 °C (+662 °F)
2   Mineral wool or other insulation, total wall thickness is < 125 mm (4.92 in) so no lengthening piece is welded to mounting tube
3   Space outside process chamber, in ambient temperature
4   Location of dew point sensor when probe head is installed in the cooling set (under sintered filter)
5   Tube of the mounting flange welded to inner plate of process wall
6   Cooling set attached to mounting flange using mounting screws (4 pcs)

DMP7 Probe
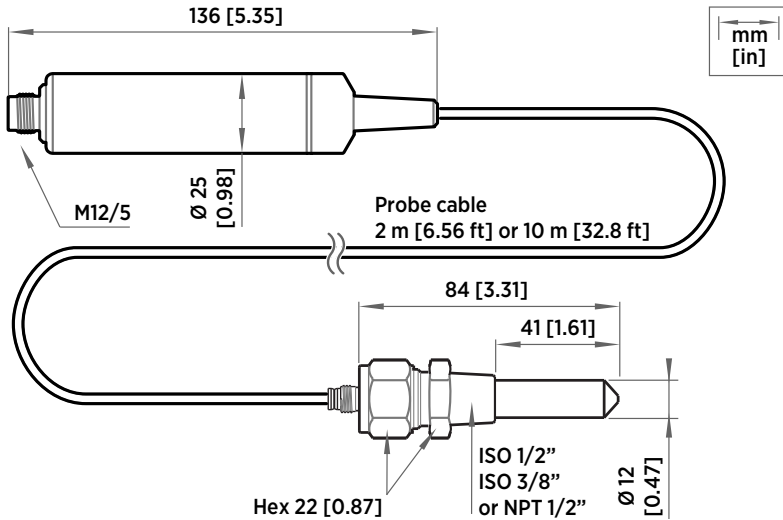
Figure 10   DMP7 Dimensions

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

- Operating temperature of probe head −40 ... +80 °C (−40 ... +176 °F)
- Operating temperature of probe body −40 ... +80 °C (−40 ... +176 °F)
- Operating pressure of probe head 0 ... 10 bar (0 ... 145 psia)

See installation instructions provided with the Swagelok installation kit.
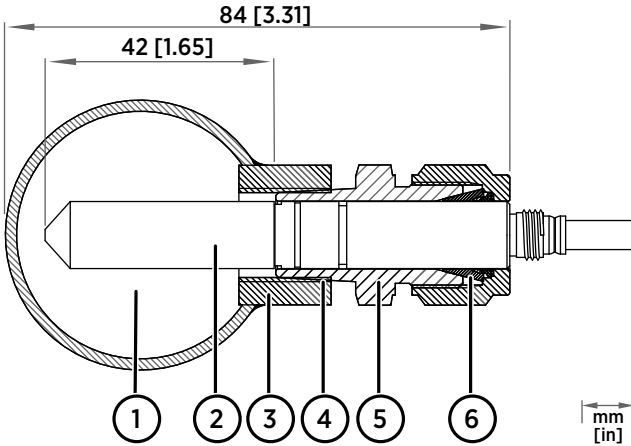
Figure 11   DMP7 Installation to Pipeline Using a Swagelok Installation Kit

1   Max. process pressure 10 bar (145 psi), max temperature +80 °C (+176 °F)
2   Probe head
3   Duct connector
4   ISO1/2″, ISO3/8″ or NPT1/2″ thread
5   Swagelok connector
6   Ferrules

> When installed in a process with a pressure differing from normal atmospheric pressure, input the correct pressure into the pressure compensation setpoint register of the probe. This allows the probe to apply the appropriate pressure compensation into its measurement results.

More Information

‣ Configuration Registers (page 25)

DMP8 Probe
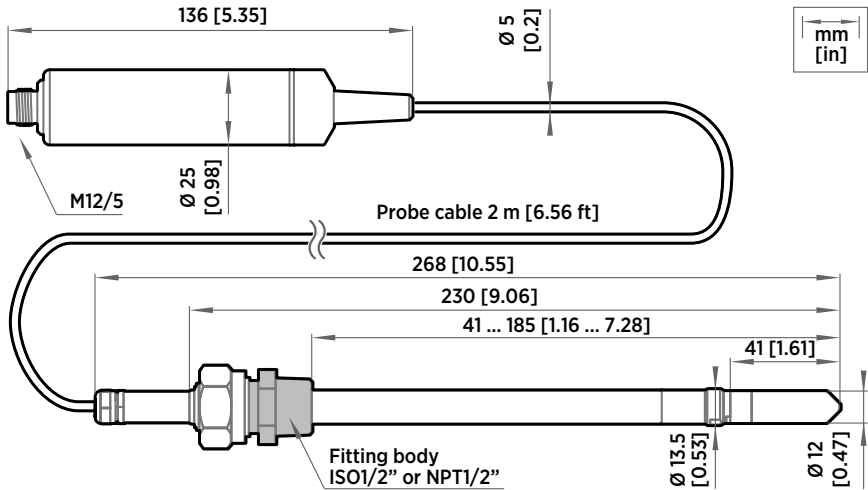
Figure 12   DMP8 Dimensions

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

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

- Operating temperature of probe head −40 ... +80 °C (−40 ... +176 °F)
- Operating temperature of probe body −40 ... +80 °C (−40 ... +176 °F)
- Operating pressure of probe head 0 ... 4 MPa (0 ... 40 bar)
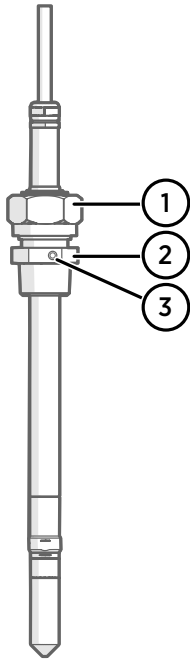
Figure 13   DMP8 Probe Head

1   Clasp nut, 24 mm hex nut
2   Fitting body, 27 mm hex head
3   Leak screw (on ISO 1/2″ fitting body HM47432 only)

Fitting body with a leak screw can be useful when the probe head cannot be installed directly in the pressurized process or process pipe. The leak screw allows a small sample flow to escape from the process out to atmospheric pressure, enabling a fast response time although the probe is not installed in the process.
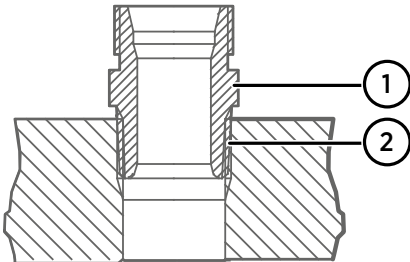
Figure 14   Sealing of Fitting Body into Process

1   Fitting body with 24 mm hex nut and tapered thread
2   Seal with a suitable thread sealant. For example, LOCTITE® No. 542 with activator No. 7649, MEGA-PIPE EXTRA No. 7188, or PTFE tape.

Follow the instructions of the sealant manufacturer.
PTFE tape does not lock the parts together. Use two fork wrenches (24 mm and 27 mm) when tightening and opening the clasp nut of the probe.

Tightening the Clasp Nut

▶ 1. Adjust the probe to a suitable depth according to the type of installation.

2. Tighten the clasp nut to finger tightness.

3. Draw a line on the fitting screw and the clasp nut to mark their position.

4. Tighten the nut a further 50 ... 60º (1/6 turn) with a wrench. If you have a suitable torque wrench, tighten the nut to max 45 ±5 Nm (33 ±4 ft-lbs).
Do not overtighten the clasp nut.

> ⚠ **CAUTION!** Take care not to damage the probe body. A damaged body makes the probe less tight and may prevent it from going through the clasp nut.

> ⚠ **CAUTION!** In pressurized processes it is essential to tighten the supporting nuts and screws very carefully to prevent loosening of the probe by the action of pressure.

> ℹ When installed in a process with a pressure differing from normal atmospheric pressure, input the correct pressure into the pressure compensation setpoint register of the probe. This allows the probe to apply the appropriate pressure compensation into its measurement results.

More Information

‣ Configuration Registers (page 25)

Attaching Ball Valve Kit to Process
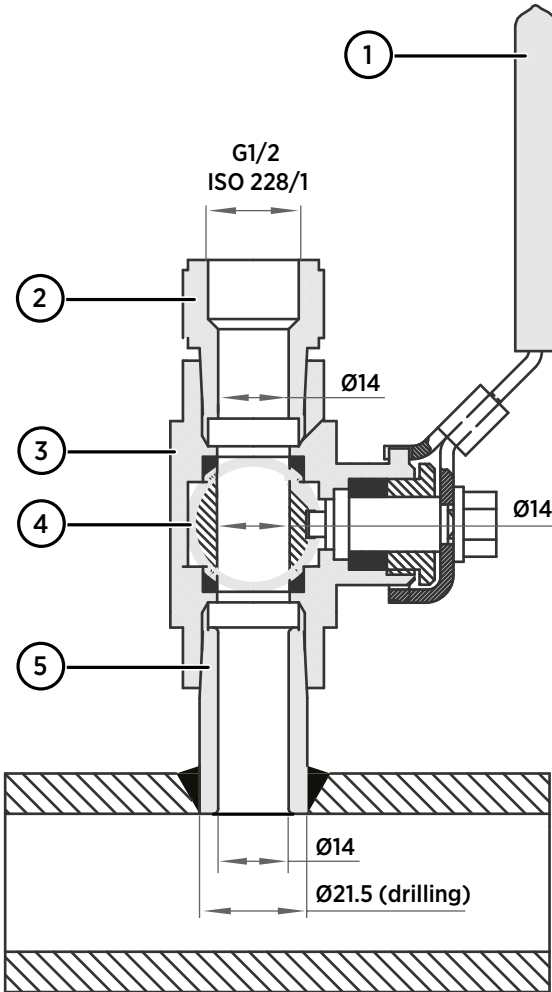
1 Ball valve handle: must point to the same direction as the ball valve body when installing.
2 Extension nipple, threads G1/2 ISO228/1 and R1/2 ISO7/1.
3 Ball valve body. When tightening the assembly, turn only from the ball valve body.
4 Ball of the ball valve.
5 Welding joint, threads R1/2 ISO7/1.

▶ 1. Attach the welding joint to the process pipe or chamber.

   2. Apply a sealant (MEGA-PIPE EXTRA No. 7188 or LOCTITE® No. 542 with activator No. 7649) on the threads of the welding joint and screw the bottom of the ball valve onto the welding joint.

3. Tighten the ball valve assembly by turning from the ball valve body.

> ⚠️ **CAUTION!** Tightening the ball valve kit by turning the extension nipple can break the sealing. Tighten the ball valve assembly only from the ball valve body.

4. If you need to cap the ball valve assembly before installing or after removing the probe, attach a blanking nut to close the top of the valve.

Wiring
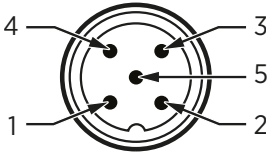
Figure 15   M12 5-pin A-coded Male Connector Pinout

Pin #	Function	Notes	Wire Colors in Vaisala Cables
1	Power supply	Operating voltage: 15 ... 30 VDC Current consumption: 10 mA typical, 500 mA max.	Brown
2	RS-485 -		White
3	Power GND and RS-485 common		Blue
4	RS-485 +		Black
5	Not connected		Gray
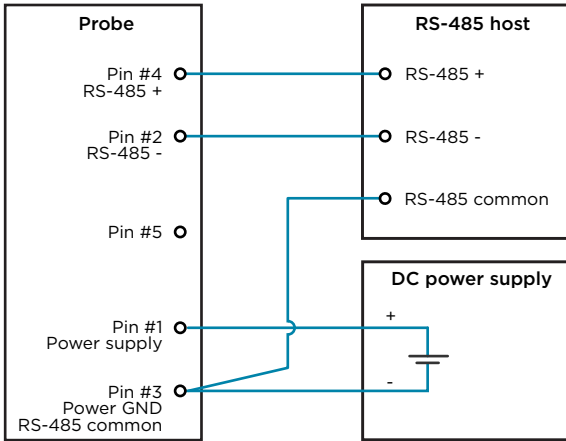
Figure 16   RS-485 Wiring

Recommended maximum length of the RS-485 line is 30 m (98 ft).

Attaching Probe to Indigo 200 Series Transmitter
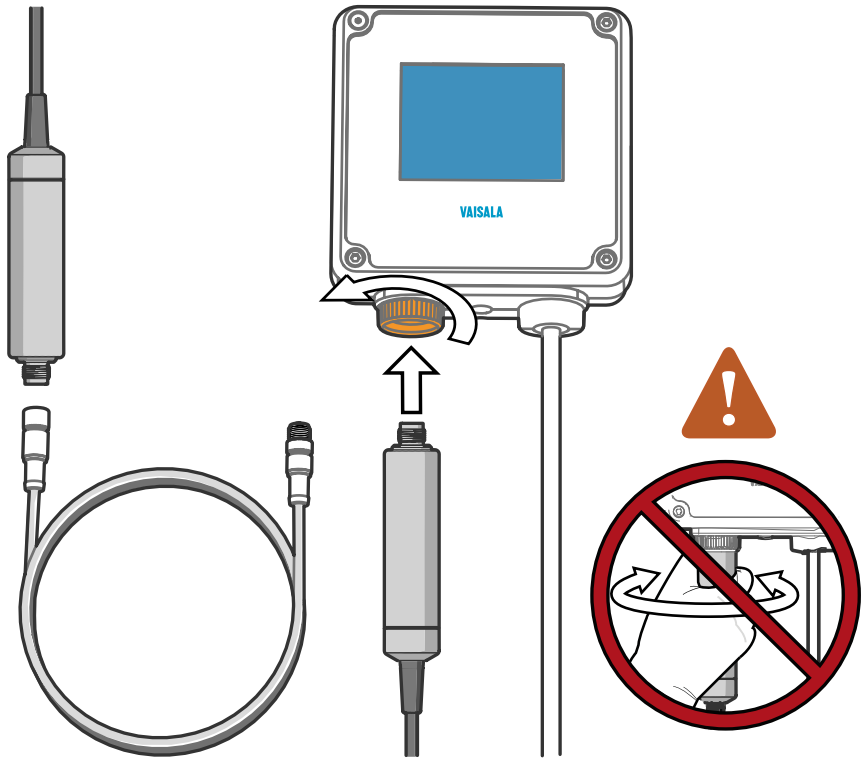
Figure 17   Attaching the Probe to Indigo 200 Series

1. Insert the probe or the connection cable into the transmitter's connector. Use of connection cable is recommended for strain relief.

2. Turn the locking wheel of the transmitter to lock the probe or cable in place. **Do not turn the probe or the cable itself**, as that will damage the connectors.

3. If you are using a connection cable, connect the probe to the cable.

4. When the transmitter recognizes the connected probe, it shows a notification message on the display.

Vaisala Insight Software

Vaisala Insight software is a configuration software for Indigo-compatible devices. With the Insight software, you can:

- See probe information and status
- See real-time measurement
- Record data up to 48 hours and export in CSV format
- Calibrate and adjust the probe
- Configure probe features such as measurement filtering, chemical purge, and serial communication

Microsoft Windows® operating system and Vaisala USB cable (no. 242659) required.

Download Vaisala Insight software at www.vaisala.com/insight.

Connecting to Insight Software

- Computer with Microsoft Windows® operating system and Vaisala Insight software installed
- USB connection cable (no. 242659)

CAUTION! When connecting several devices at the same time, note that your computer may not be able to supply enough power through its USB ports. Use an externally powered USB hub that can supply >2 W for each port.
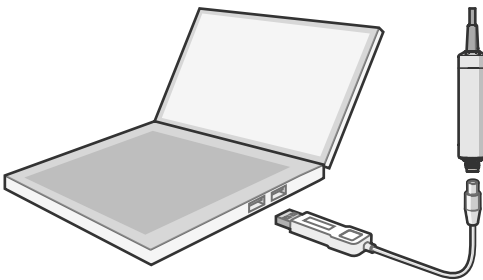
Figure 18   Connecting Probe to Insight

1. Open Insight software.
2. Connect the USB cable to a free USB port on the PC or USB hub.
3. Connect the probe to the USB cable.
4. Wait for Insight software to detect the probe.

Modbus

Default Communication Settings

Property	Description/Value
Serial bit rate	19200
Parity	None
Number of data bits	8
Number of stop bits	2
Flow control	None
Modbus device address	240

You can use up to ten probes on the same RS-485 line. You must configure each probe on the line to have a different Modbus address.

Measurement Data Registers

Measurement data is also available as integer registers. See *DMP Series User Guide (M212357EN)* available at www.vaisala.com.

Register Number (Decimal)	Address (Hexadecimal)	Register Description	Data Format	Unit
1	0000_{hex}	Relative humidity	32-bit float	%RH
	0001_{hex}			
3	0002_{hex}	Temperature	32-bit float	°C
	0003_{hex}			
7	0006_{hex}	Dew point temperature	32-bit float	°C
	0007_{hex}			
9	0008_{hex}	Dew/frost point temperature	32-bit float	°C
	0009_{hex}			
11	$000A_{hex}$	Dew/frost point temperature at 1 atm	32-bit float	°C
	$000B_{hex}$			

Register Number (Decimal)	Address (Hexadecimal)	Register Description	Data Format	Unit
13	000C_hex	Dew point temperature at 1 atm	32-bit float	°C
	000D_hex			
15	000E_hex	Absolute humidity	32-bit float	g/m^3
	000F_hex			
17	0010_hex	Mixing ratio	32-bit float	g/kg
	0011_hex			
21	0014_hex	Water concentration	32-bit float	ppm_v
	0015_hex			
23	0016_hex	Water vapor pressure	32-bit float	hPa
	0017_hex			
25	0018_hex	Water vapor saturation pressure	32-bit float	hPa
	0019_hex			
27	001A_hex	Enthalpy	32-bit float	kJ/kg
	001B_hex			
31	001E_hex	Dew point temperature difference	32-bit float	°C
	001F_hex			
33	0020_hex	Absolute humidity at NTP	32-bit float	g/m^3
	0021_hex			
65	0040_hex	Water mass fraction	32-bit float	ppm_w
	0041_hex			

Diagnostic Data Registers

Table 4   Floating Point Diagnostic Data Registers (Read-Only)

Register Number (Decimal)	Address (Hexadecimal)	Register Description	Data Format	Unit
37	0024_hex	Sensor saturation ratio	32-bit float	%
	0025_hex			
39	0026_hex	Sensor temperature	32-bit float	°C
	0027_hex			

Configuration Registers

The configuration registers listed here are the most important for typical users. For more information on available configuration registers, see *DMP Series User Guide (M212357EN)* available at www.vaisala.com.

Table 5   Modbus Configuration Data Registers (Writable)

Register Number (Decimal)	Register Address (Hexadecimal)	Register Description	Data Format	Unit / Valid Range
Compensation Setpoints				
769	0300_{hex}	Pressure compensation setpoint	32-bit float	Unit: hPA
	0301_{hex}			Default: 1013.25 hPa
821	0334_{hex}	Temperature compensation setpoint. If a value is written to this register, probe uses it instead of its own temperature measurement.	32-bit float	Unit: °C
	0335_{hex}			
Communication				
1537	0600_{hex}	Modbus address	16-bit integer	1 ... 247
				Default: 240

Test Value Registers

Read the known test values from the test registers to verify the functionality of your Modbus implementation.

Table 6   Modbus Test Registers (Read-Only)

Register Number (Decimal)	Register Address (Hexadecimal)	Register Description	Data Format	Test Value
7937	$1F00_{hex}$	Signed integer test	16-bit integer	-12345
7938	$1F01_{hex}$	Floating point test	32-bit float	-123.45
	$1F02_{hex}$			
7940	$1F03_{hex}$	Text string test	text	Text string "-123.45"
	$1F04_{hex}$			
	$1F05_{hex}$			
	$1F06_{hex}$			

Technical Support

Contact Vaisala technical support at helpdesk@vaisala.com. Provide at least the following supporting information as applicable:

- Product name, model, and serial number
- Software/Firmware version
- Name and location of the installation site
- Name and contact information of a technical person who can provide further information on the problem

For more information, see www.vaisala.com/support.

More Information

For detailed instructions for installing, configuring, and maintaining the probes, see *DMP Series User Guide (M212357EN)* available at www.vaisala.com.

Warranty

For standard warranty terms and conditions, see www.vaisala.com/warranty.

Please observe that any such warranty may not be valid in case of damage due to normal wear and tear, exceptional operating conditions, negligent handling or installation, or unauthorized modifications. Please see the applicable supply contract or Conditions of Sale for details of the warranty for each product.

Recycling

Recycle all applicable material.

Follow the statutory regulations for disposing of the product and packaging.

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