VAISALA

USER'S GUIDE

Vaisala DRYCAP® Dewpoint and Temperature Transmitter Series DMT340

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PUBLISHED BY

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CHAPTER 1

GENERAL INFORMATION

Safety

General Safety Considerations

Throughout the manual, important safety considerations are highlighted as follows:

WARNING	Warning alerts you to a serious hazard. If you do not read and follow instructions very carefully at this point, there is a risk of injury or even death.

CAUTION	Caution warns you of a potential hazard. If you do not read and follow instructions carefully at this point, the product could be damaged or important data could be lost.

NOTE	Note highlights important information on using the product.

Product Related Safety Precautions

The DMT340 Dewpoint and Temperature Transmitter delivered to you has been tested for safety and approved as shipped from the factory. Note the following precautions:

WARNING	Ground the product, and verify outdoor installation grounding periodically to minimize shock hazard.

CAUTION	Do not modify the unit. Improper modification can damage the product or lead to malfunction.

ESD Protection

Electrostatic Discharge (ESD) can cause immediate or latent damage to electronic circuits. Vaisala products are adequately protected against ESD for their intended use. However, it is possible to damage the product by delivering electrostatic discharges when touching, removing, or inserting any objects inside the equipment housing.

To make sure you are not delivering high static voltages yourself:

- Handle ESD sensitive components on a properly grounded and protected ESD workbench. When this is not possible, ground yourself to the equipment chassis before touching the boards. Ground yourself with a wrist strap and a resistive connection cord. When neither of the above is possible, touch a conductive part of the equipment chassis with your other hand before touching the boards.
- Always hold the boards by the edges and avoid touching the component contacts.

Recycling

Recycle all applicable material.

Dispose of batteries and the unit according to statutory regulations. Do not dispose of with regular household refuse.

Feedback

Vaisala Customer Documentation Team welcomes your comments and suggestions on the quality and usefulness of this publication. If you find errors or have other suggestions for improvement, please indicate the chapter, section, and page number. You can send comments to us by e-mail: manuals@vaisala.com

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All rights to any software are held by Vaisala or third parties. The customer is allowed to use the software only to the extent that is provided by the applicable supply contract or Software License Agreement.

Warranty

Vaisala hereby represents and warrants all Products manufactured by Vaisala and sold hereunder to be free from defects in workmanship or material during a period of twelve (12) months from the date of delivery save for products for which a special warranty is given. If any Product proves however to be defective in workmanship or material within the period herein provided Vaisala undertakes to the exclusion of any other remedy to repair or at its own option replace the defective Product or part thereof free of charge and otherwise on the same conditions as for the original Product or part without extension to original warranty time. Defective parts replaced in accordance with this clause shall be placed at the disposal of Vaisala.

Vaisala also warrants the quality of all repair and service works performed by its employees to products sold by it. In case the repair or service works should appear inadequate or faulty and should this cause malfunction or nonfunction of the product to which the service was performed Vaisala shall at its free option either repair or have repaired or replace the product in question. The working hours used by employees of Vaisala for such repair or replacement shall be free of charge to the client. This service warranty shall be valid for a period of six (6) months from the date the service measures were completed.

This warranty is however subject to following conditions:

a) A substantiated written claim as to any alleged defects shall have been received by Vaisala within thirty (30) days after the defect or fault became known or occurred, and

b) The allegedly defective Product or part shall, should Vaisala so require, be sent to the works of Vaisala or to such other place as Vaisala may indicate in writing, freight and insurance prepaid and properly packed and labelled, unless Vaisala agrees to inspect and repair the Product or replace it on site.

This warranty does not however apply when the defect has been caused through

a) normal wear and tear or accident;

b) misuse or other unsuitable or unauthorized use of the Product or negligence or error in storing, maintaining or in handling the Product or any equipment thereof;

c) wrong installation or assembly or failure to service the Product or otherwise follow Vaisala's service instructions including any repairs or installation or assembly or service made by unauthorized personnel not approved by Vaisala or replacements with parts not manufactured or supplied by Vaisala;

d) modifications or changes of the Product as well as any adding to it without Vaisala's prior authorization;

e) other factors depending on the Customer or a third party.

Notwithstanding the aforesaid Vaisala's liability under this clause shall not apply to any defects arising out of materials, designs or instructions provided by the Customer.

This warranty is expressly in lieu of and excludes all other conditions, warranties and liabilities, express or implied, whether under law, statute or otherwise, including without limitation any implied warranties of merchantability or fitness for a particular purpose and all other obligations and liabilities of Vaisala or its representatives with respect to any defect or deficiency applicable to or resulting directly or indirectly from the Products supplied hereunder, which obligations and liabilities are hereby expressly cancelled and waived. Vaisala's liability shall under no circumstances exceed the invoice price of any Product for which a warranty claim is made, nor shall Vaisala in any circumstances be liable for lost profits or other consequential loss whether direct or indirect or for special damages.

CHAPTER 2
PRODUCT OVERVIEW

This manual provides information for installing, operating, and maintaining Vaisala DRYCAP® Dewpoint and Temperature Transmitter DMT340 Series for low dewpoint applications. DMT340 measures dewpoint temperature accurately in a measurement range from -60ºC to +80 ºC (-76 ... +176 ºF). The AutoCal feature provides excellent long term stability of the measurement. DMT340 incorporates the advanced DRYCAP® technology, which enables reliable and high-performance dewpoint measurement.

Apart from the extended dewpoint measurement range the optional modules provide for more flexibility. See Table 1 below for the quantities that DMT340 measures and calculates. See Table 2 below for the optional quantities measured by DMT340.

Table 1 Quantities and Their Abbreviations

Quantity	Abbreviation	Metric Unit	Non Metric Unit
Dewpoint/frost point temperature ($T_{d/f}$)	TDF	ºC	ºF
Mixing ratio (x)	X	g/kg	gr/lb
Parts per million	H2O	ppm_v/ ppm_w	ppm_v/ ppm_w

Table 2 Optional Quantities and Their Abbreviations

Quantity	Abbreviation	Metric Unit	Non Metric Unit
Relative humidity RH	RH	%RH	%RH
Temperature T	T	ºC	ºF
Dewpoint/frost point in the atmospheric pressure ($T_{d/f}$)	TDFA	ºC atm	ºF atm
Absolute humidity (a)	A	g/m^3	gr/ft^3
Absolute humidity in standard pressure and temperature (NTP)	ANTP	g/m^3	gr/ft^3
Wet bulb temperature (T_w)	TW	ºC	ºF
Water vapor pressure (P_w)	PW	hPa	lb/in^2
Water vapor saturation pressure (P_{ws})	PWS	hPa	lb/in^2
Enthalpy (h)	H	kJ/kg	Btu/lb
Difference of T and $T_{d/f}$ (ΔT)	DT	ºC	ºF
Dewpoint temperature (T_d)*	TD	ºC	ºF
Dewpoint in the atmospheric pressure (T_d)*	TDA	ºC atm	ºF atm

* use these parameters only if you need dewpoint over water below 0 ºC/32ºF and not over ice (industry standard)

Basic Features and Options

DMT340 has the following basic features and options:

- Dewpoint measurement with AutoCal and sensor purge features
- Sensor warming in high humidities
- Two analog outputs and a serial interface
- Several probes for different applications
- User friendly multilingual display option
- Calculated output quantities available.
- Different probe mounting kits, sensor protection options and probe cable lengts 2 m, 5 m or 10 m.
- Optional modules: galvanic isolation for outputs, AC mains power supply, RS-485 serial line, additional analog output module, alarm relay module.

Parts Description

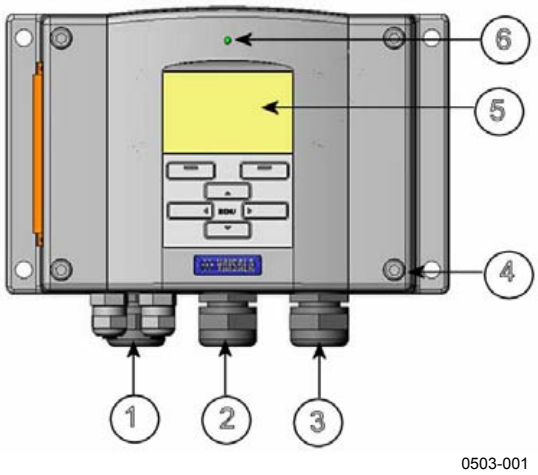

Figure 1 Transmitter Body

The numbers refer to figure 1 above:

1 = Signal + powering cable gland
2 = Cable gland for optional module
3 = Cable gland for optional module
4 = Cover screw (4 pcs)
5 = Display with keypad (optional)
6 = Cover LED

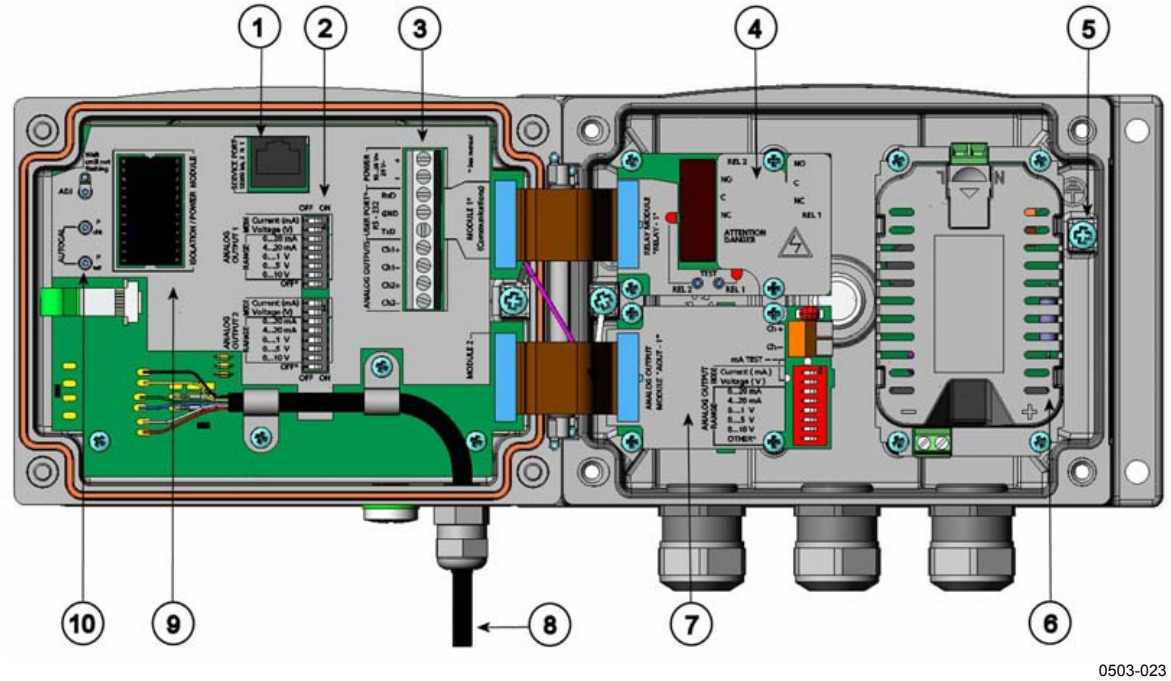

Figure 2 Inside of the Open Transmitter

Numbers refer to Figure 2 above:

1 = Service port (RS-232)
2 = Dip switches for analog output settings
3 = Power supply and signal wiring screw terminals
4 = Relay/RS-485 module (optional)
5 = Grounding connector
6 = Power supply module (optional)
7 = Analog output relay module (optional)
8 = Dewpoint probe
9 = Output isolation module (optional)
10 = Adjustment button (Purge button) with indicator led and pressure set buttons.

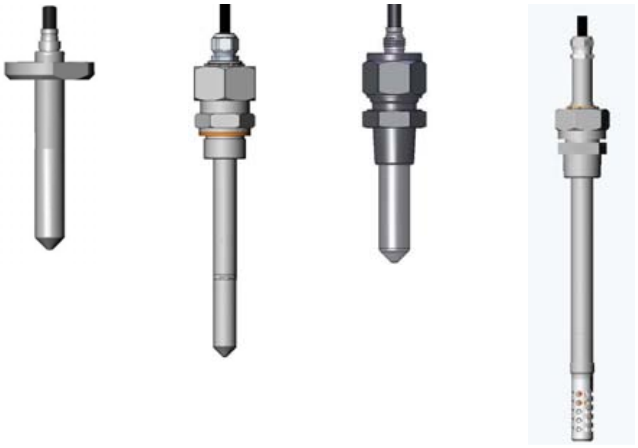

Figure 3 Probe Options

Probe cable lengths are 2 m, 5 m and 10 m.

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CHAPTER 3

INSTALLATION

Mounting the Housing

The housing can be mounted either without the mounting plate or with optional mounting plates.

Standard Mounting without Mounting Plate

Mount the housing without the mounting plate by fastening the transmitter to the wall with 4 screws, for example M6 (not provided).

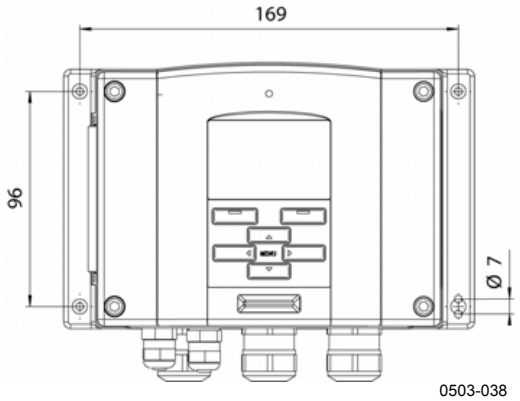

Figure 4 Standard Mounting

Wall Mounting with Wall Mounting Kit

When mounting with wall mounting kit the mounting plate (Vaisala order code 214829) can be installed directly on wall or onto a standard wall box (also US junction box). When wiring through back wall, remove the plastic plug from the wiring hole in the transmitter before mounting.

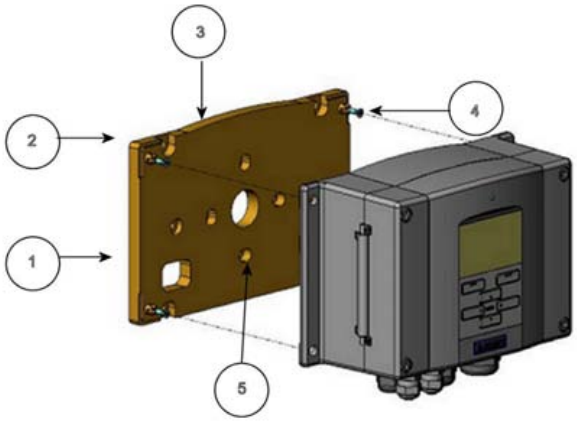

Figure 5 Mounting with Wall Mounting Kit

The numbers refer to Figure 5 above:

1 = Plastic mounting plate
2 = Mount the plate to wall with 4 screws M6 (not provided)
3 = The arched side up
4 = Fasten DMT340 to the mounting plate with 4 fixing screws M3 (provided)
5 = Holes for wall/junction box mounting

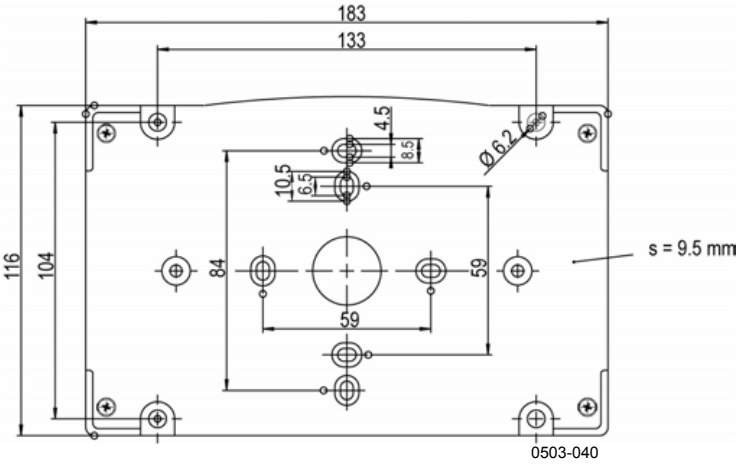

Figure 6 Dimensions of Plastic Mounting Plate

Metal mounting plate is included in rain shield with installation kit and installation kit for pole or pipeline.

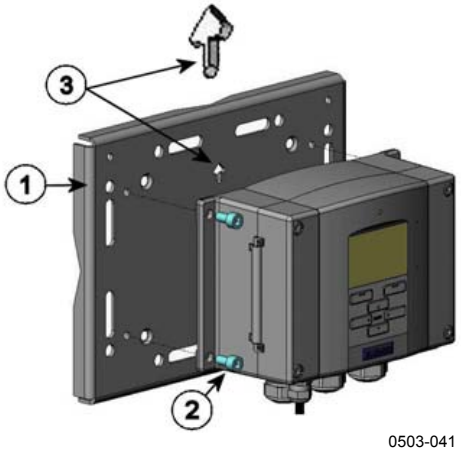

Figure 7 Mounting with Metal Wall Mounting Plate

Numbers refer to Figure 7 above:

1 = Mount the plate to wall with 4 screws M8 (not provided)
2 = Fasten DMT340 to the mounting plate with 4 fixing screws M6 (provided)
3 = Note the position of the arrow when mounting. This side must be up when mounting.

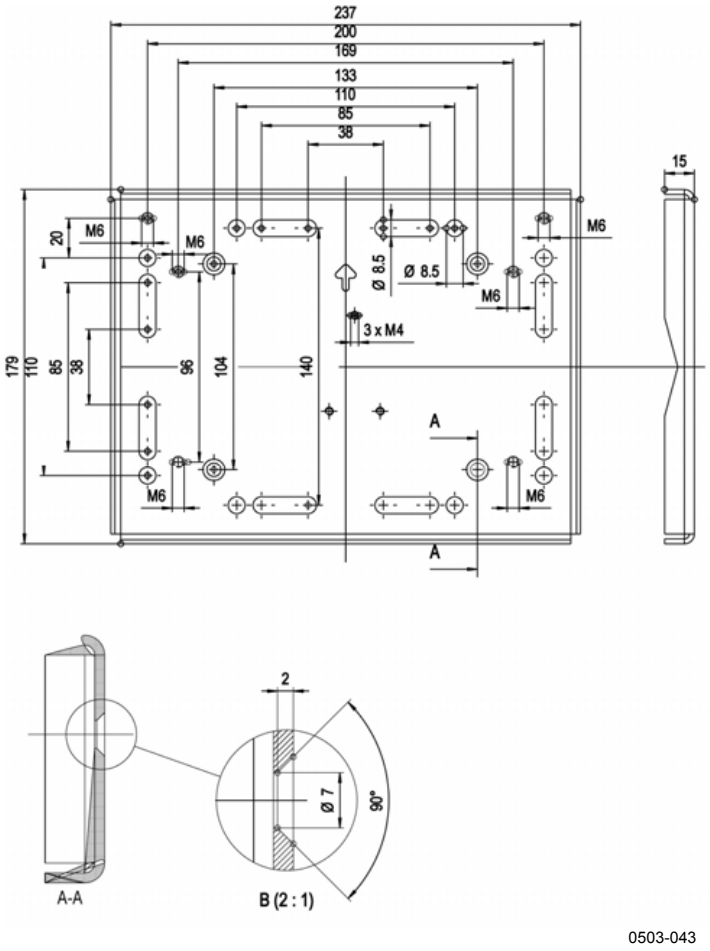

Figure 8 Dimensions of Metal Mounting Plate (mm)

Mounting with DIN Rail Installation Kit

DIN rail installation kit includes a wall mounting kit, 2 clip-fasteners and 2 screws M4 x 10 DIN 7985 (Vaisala order code 215094).

1. Attach two spring holders to the plastic mounting plate by using the screws provided in the installation kit.
2. Fasten DMT340 to the plastic mounting plate with 4 screws provided for that purpose.
3. Press the transmitter onto the DIN rail so that the clip-fasteners snap into the rail.

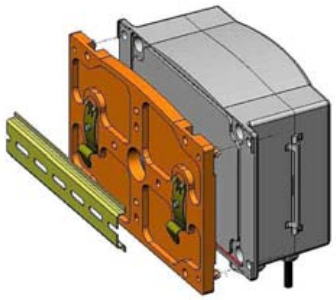

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Figure 9 Mounting with DIN Rail Installation Kit

Pole Installation with Installation Kit for Pole or Pipeline

Installation kit for pole or pipeline (Vaisala order code: 215108) includes the metal mounting plate and 4 mounting nuts for pole mounting. When mounting, the arrow in the metal mounting plate must point upwards**,** see Figure 7 on page 21.

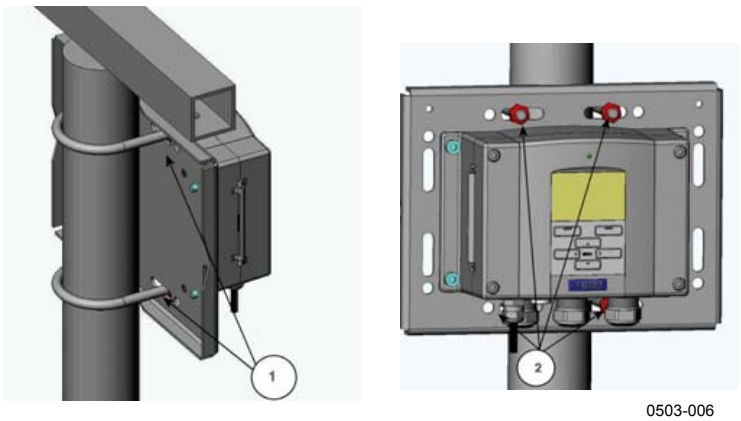

Figure 10 Vertical Pole

Numbers refer to Figure 10 above.

1 = Fixing brackets (2 pcs) M8 (provided) for 30 ... 102 mm poles.
2 = Mounting nuts M8 (4 pcs)

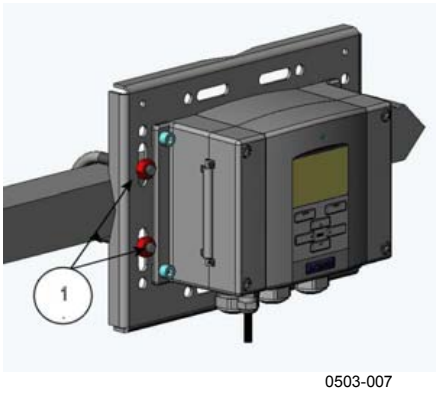

Figure 11 Horizontal Pole

Number refers to Figure 11 above.

1 = Mounting nuts M8 (4 pcs)

Mounting the Rain Shield with Installation Kit

Vaisala order code: 215109

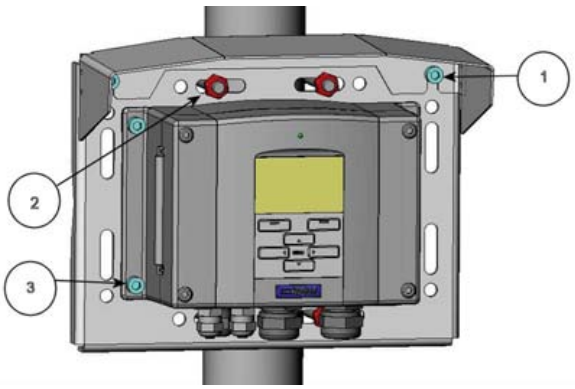

Figure 12 Mounting the Rain Shield with Installation Kit

Numbers refer to Figure 12 above.

1 = Fasten the rain shield with installation kit to the metal mounting plate with 2 (M6) mounting screws (provided).
2 = Fasten the mounting plate with rain shield with installation kit to the wall or to the pole (see pole installation).
3 = Fasten DMT340 to the mounting plate with 4 fixing screws (provided).

Panel Mounting Frame

A panel mounting frame with adhesive tape is available as an option (Vaisala order code: 216038). After the DMT340 has been installed through the panel, a frame can be used to finish off the sawed surface of the panel.

1. Mount the DMT340 to the panel.
2. The frame is attached to the panel with an adhesive tape attached to the frame. Remove the paper protecting the tape before attaching.
3. Attach the frame to the panel around the DMT340 to finish off the panel mounting as illustrated, see Figure 13 below.

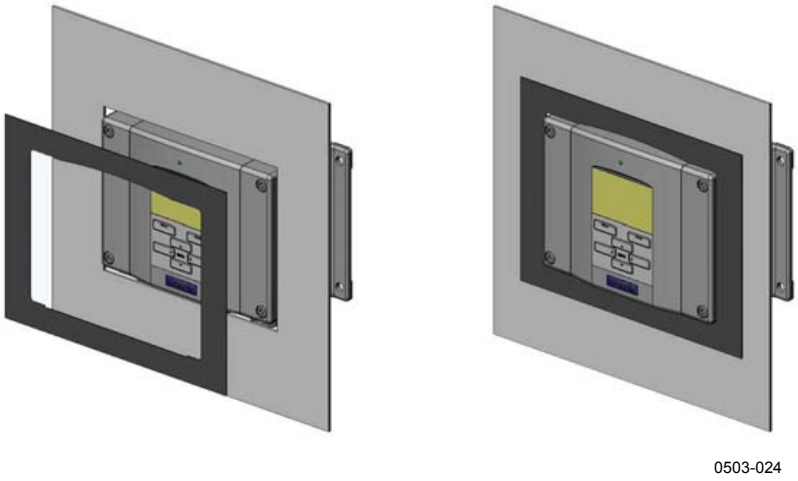

Figure 13 Panel Mounting with Frame

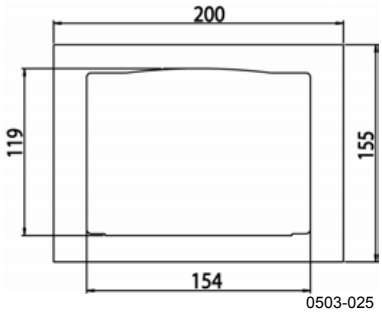

Figure 14 Panel Mounting Dimensions

Wiring

Cable Bushings

A single electrical cable with a screen and three to ten wires is recommended for power and analog/serial connections. The cable diameter should be 8...11 mm. The number of cable bushings depends on the transmitter options. See the following recommendations for the cable bushings:

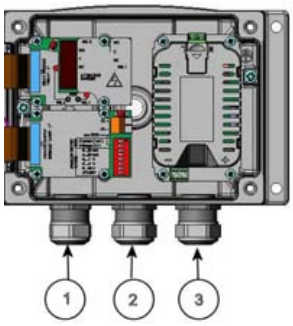

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Figure 15 Cable Bushings

Numbers refer to Figure 15 above:

1 = Cable for signal/powering Ø8 ... 11 mm
2 = Cable for optional module Ø8 ... 11 mm
3 = Cable for optional power module Ø8 ... 11 mm

NOTE	When there is high electric noise level (for example near powerful electric motor) in the operating environment it is recommended to use shielded cable or take care that the signal cables are separated from other cables.

Grounding The Cables

Ground the screen of the electrical cable properly to achieve the best possible EMC performance.

Fig. 1

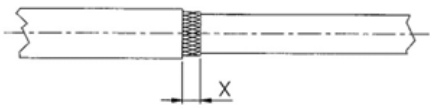

Fig. 2

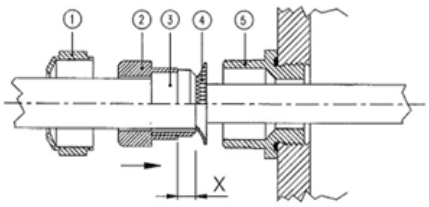

Fig. 3

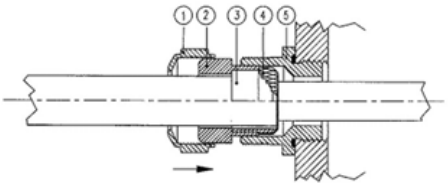

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Figure 16 Grounding the Screen of Electrical Cable

1. Cut back outer sheath to desired length.
2. Cut back screen braiding or screen foil to dimension X (see figure 3).
3. Push the domed cap nut (item 1) and the seal insert with contact socket of the gland (item 2+3) onto the cable as shown in the diagram
4. Bend over the screen braiding or screen foil by about 90º (item 4).
5. Push the seal insert with the contact socket of the gland (item 2+3) up to the screen braiding or screen foil.
6. Mount lower part (item 5) on the housing
7. Push the seal with the contact socket of the gland and (item 2+3) flush into the lower part (item 5).
8. Screw the domed cap nut (item 1) onto the lower part (item 5).

Transmitter Housing Grounding

In case you need to ground the transmitter housing, the grounding connector is found inside the housing (see Figure 1 on page 15) Note anyhow that the probe head is connected to the same potential as the housing. Make sure that different groundings are made to the same potential. Otherwise harmful ground currents may be generated.

If it is needed to have galvanic isolation of the power supply line from the output signals, DMT340 can be ordered with optional output isolation module.This module prevents harmful grounding loops.

Signal and Power Supply Wiring

When connecting transmitter with 8-pin connector, see section 8-pin Connector on page 61.

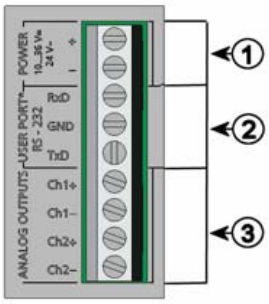

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Figure 17 Screw Terminal Block on the Motherboard

Numbers refer to Figure 17 above:

1 = Power supply terminals 10 ... 35 VDC, 24 VAC
2 = User port (RS-232 terminals)
3 = Analog signal terminals

WARNING Make sure that you connect only de-energized wires.

1. Open the transmitter cover by taking out the four cover screws.
2. Insert the power supply wires and signal wires through the cable bushing in the bottom of the transmitter; see the grounding instructions in the previous sections.

3. Connect the analog output cables to terminals: **Ch1 +, Ch1-, Ch2+, Ch2-**. Connect the RS-232 user port cables to terminals RxD, GND and TxD, more about the RS-232 connection in Section Serial Line Communication on page 70.
4. When wiring RS-485 module, relay module or additional analog output module, see Appendices 4, 5 and 6. (korjaa viite)
5. Connect the power supply wires to the connectors: **POWER 10...35V+ 24V~(+)** and **(-)** terminals. (If using AC voltage, connect **always** phase to power supply **(+)** and 0 to power supply **(-)**). When wiring the power supply module, see section Power Supply Module on page 50 below.
6. Turn on the power. The indicator led on the cover lit continuously during normal operation.
7. Close the cover and replace the cover screws. The transmitter is ready for use.

Connections to a 24 VAC Power Supply

Separate floating supply for each transmitter is recommended (see upper Figure 18 below). If you have to connect several transmitters to one AC supply, the phase (-) must always be connected to (+) connector of each transmitter (see lower Figure 18 below).

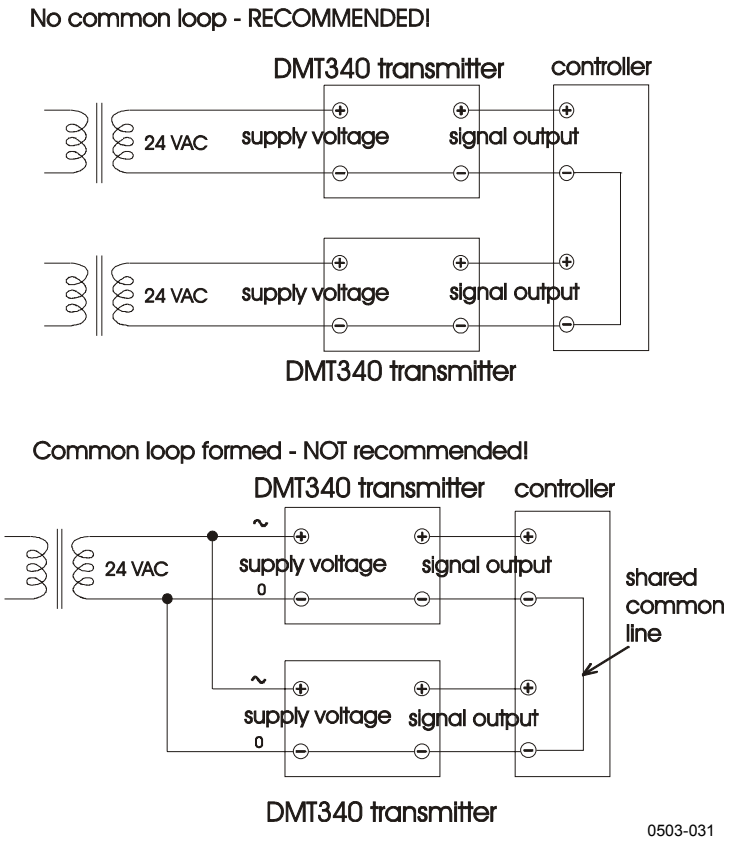


Figure 18 Connections to a 24 VAC Power Supply

CAUTION	In case you have only one AC supply, never connect same wire to the + connector of a transmitter and to the - connector of another one. This will short-circuit the transformer.

Probe Mounting

NOTE	When measuring temperature dependent quantities make sure that the temperature at the measurement point is equal to that of the process, otherwise the moisture reading may be incorrect.

DMT342 Small-size Flanged Probe for Use with Sampling Cell

The DMT342 probe is a small pressure-tight probe equipped with installation flange. When sampling in pressurized processes, the sampling cell HMP302SC is available as an optional accessory. It may be necessary to use the sampling cell if the process (for example a pipe) is too small for the DMT342 sensor head. Furthermore, if the process is very hot (>80 °C) or particularly dirty, the probe is installed in a sampling cell behind a cooling coil and/or filter. In this case, the ambient temperature must be at least 10 °C warmer than the process dewpoint in order to avoid condensation in the sample tubing.

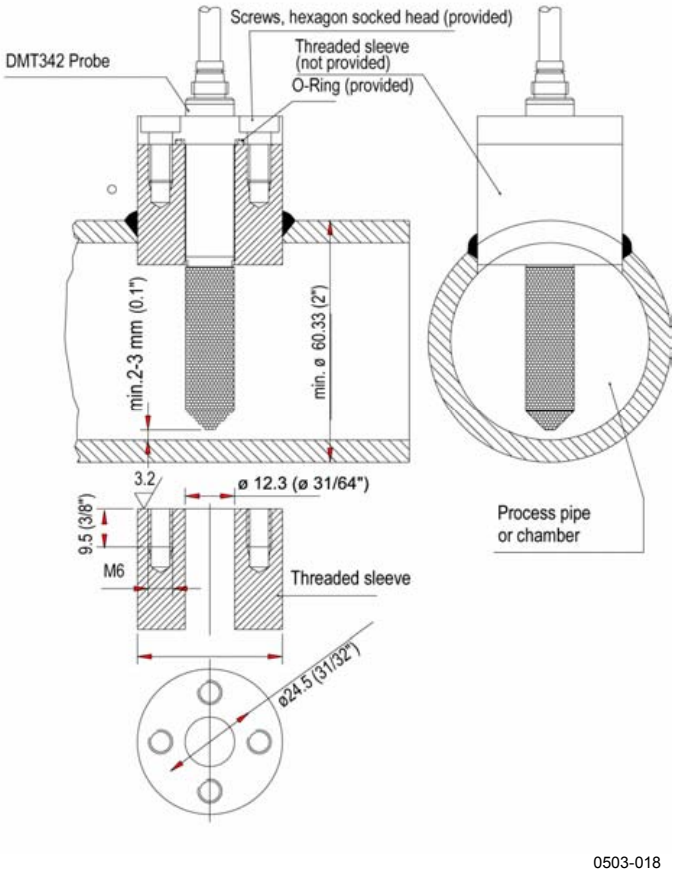


Figure 19 DMT342 Installation (without the Sampling Cell)

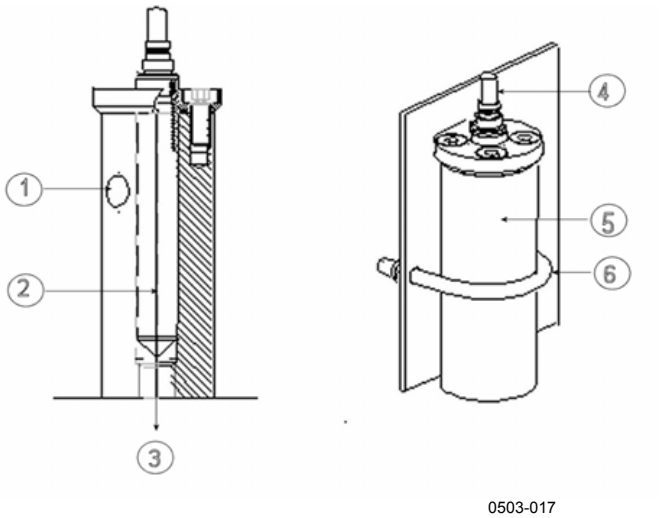


Figure 20 HMP302SC Optional Sampling Cell

Numbers refer to Figure 20 above.

1 = Gas in
2 = Probe
3 = Gas out
4 = Probe
5 = Sampling cell
6 = Clamp (not needed if sampling cell is supported on the piping)

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.

NOTE	When the DMT340 is installed in a process with a pressure differing from the selected operating pressure at the time of ordering, please enter the pressure value of the process into the transmitter memory, see section Pressure Compensation Setting on page 84. Use the serial line commands XPRES and PRES or the display/keypad. The pressure set buttons on the motherboard inside the transmitter can also be used to set pressure compensation.

DMT344 For High-pressure Applications

The DMT344 probe is for the dewpoint measurements in pressurized rooms and industrial processes. The probe is provided with a nut, a fitting screw and a sealing washer. Keep the fitting screw and the nut in place on the body of the sensor head during handling to prevent damage to the highly polished surface of the probe. Follow the instructions below to achieve a leak-tight assembly:

1. Unscrew the fitting screw from the nut and the sensor head.
2. Fasten the fitting screw to the chamber wall with a sealing washer. Tighten the fitting screw into the threaded sleeve with a torque spanner. The tightening torque is 150 ± 10 Nm (110 ± 7 ft-lbs).
3. Insert the body of the sensor head into the fitting screw and screw the nut manually to the fitting screw until the connection feels tight.
4. Mark both the fitting screw and the nut hex.

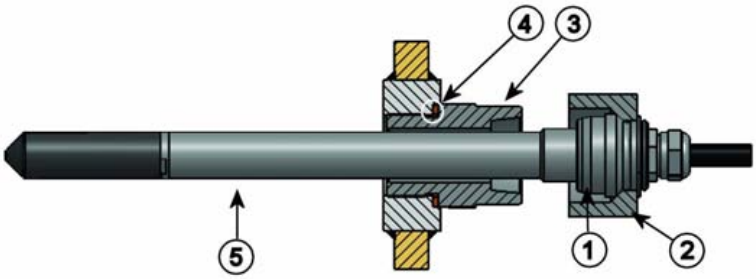
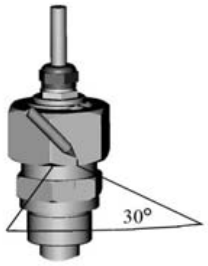


Figure 21 DMT344 Probe

Numbers refer to Figure 21 above:

1 = Tightening cone
2 = Nut
3 = Fitting screw, M22x1.5 or NPT 1/2"
4 = Sealing washer
5 = Sensor head; Ø12 mm.

5. Tighten the nut a further 30º (1/12) turn or if you have a torque spanner tighten it with a torque of 80 ± 10 Nm (60 ± 7 ft-lbs).

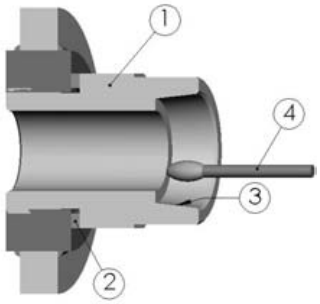


0503-034

Figure 22 Tightening the Nut

NOTE	When re-tightening the nut after detachment the nut must be tightened without increased effort.

6. Clean and grease the tightening cone of the fitting screw after every tenth detachment. Change the sealing washer every time the fitting screw is detached. Use high-vacuum grease (for example Dow Corning) or a similar grease.



0503-033

Figure 23 Cleaning of the Tightening Cone

Numbers refer to Figure 23 above:

1 = Fitting screw
2 = Sealing washer
3 = Tightening cone
4 = Clean cotton stick

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.

NOTE	When the DMT340 is installed in a process with a pressure differing from the selected operating pressure at the time of ordering, please enter the pressure value of the process into the transmitter memory, see section Pressure Compensation Setting on page 84. Use the serial line commands XPRES and PRES or the display/keypad. The pressure set buttons on the motherboard inside the transmitter can also be used to set pressure compensation.

DMT347 Small Pressure-tight Probe

The DMT347 is ideal for tight spaces with threaded connection. The small probe is installed using the threaded fitting bodies, see below.

Pressure-Tight Swagelok Installation Kits for DMT347

Swagelok installation kit for the dewpoint probe includes Swagelok connector with ISO3/8" thread (Vaisala order code: SWG12ISO38) or NPT1/2" thread (Vaisala order code:SWG12NPT12).

Figure 24 DMT347 Probe with Swagelok Installation Kit

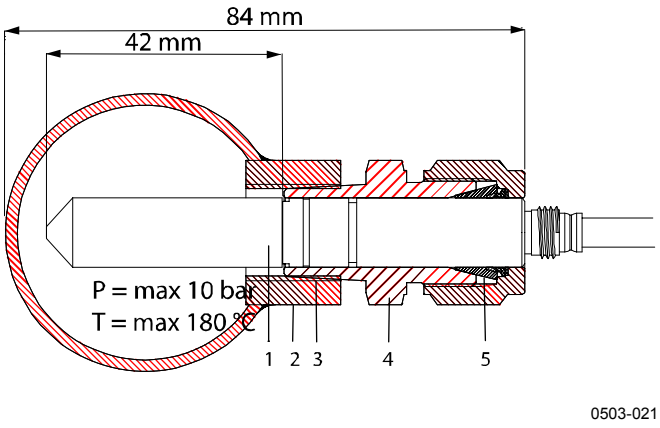


Figure 25 DMT347 Probe Installation to Pipeline with Swagelok Installation Kit

Numbers refer to Figure 25 above:

1 = Probe
2 = Duct connector
3 = ISO3/8" or NPT1/2" thread
4 = Swagelok connector
5 = Ferrules

1. Preparing Installation. The connector options are the following:
   a. R3/8" ISO (Swagelok code SS-12M0-1-6RTBT)
   b. 1/2" NPT (Swagelok code SS-12M0-1-8BT)

Note that the connector inner diameters extend for Ø12 mm probe.

2. Probe position. Before the final tightening check that the upper edge of the connector nut is in line with the upper edge of the probe. Otherwise the sealing may not be gas tight.
3. Gas tight sealing
   a. Turn the connector nut finger tight and draw a vertical mark on the nut and the fitting body.
   b. Be sure that the probe position follows step 2.
   c. Tighten the connector nut with a wrench 1 and 1/4 turns (360º +90º) with the help of marks you drew. The connector has now a gas tight connection to the probe. Excess tightening can damage the probe.
   d. Connector can be disconnected and re-installed. In re-installation first turn the connector nut finger tight and then with wrench 1/4 turn (90º).

Use teflon tape or thread sealant to seal the connection between the Swagelok connector and the process, see Figure 28 on page 40.

NOTE If the Swagelok connector is tightened at an incorrect position, it is possible that the probe will not fit the calibration station. Be sure that the probe position follows step 2 above.

DMT348 For Pressurized Pipelines

Due to the sliding fit the DMT348 is easy to install into and remove from the pressurized process. The probe is especially suitable for the measurements in pipelines. See section Ball Valve Installation Kit for DMT348 below.

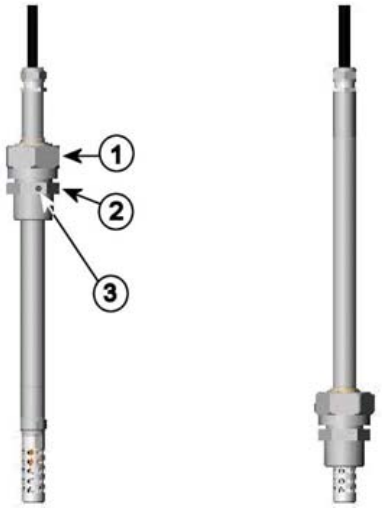


Figure 26 DMT348 Probe

Numbers refer to Figure 26 above.

1 = Clasp nut, 27 mm hex nut
2 = Fitting body, 24 mm hex head
3 = Leak screw

The following three fitting body options are available:

- Fitting Body Set ISO1/2 with leak screw
- Fitting Body ISO1/2 solid structure (without leak screw)
- Fitting Body NPT1/2 solid structure (without leak screw)

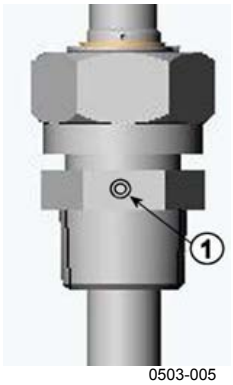


Figure 27 Leak Screw in the DMT348 Probe

Number refers to Figure 27 above:

1 = Non-leaking screw (A) (factory setting) or leak screw (B) (included in the package)

Table 3 DMT348 Probe Dimensions

Probe type	Probe Dimension	Adjustment Range
Standard	178 mm	120 mm
Optional	400 mm	340 mm

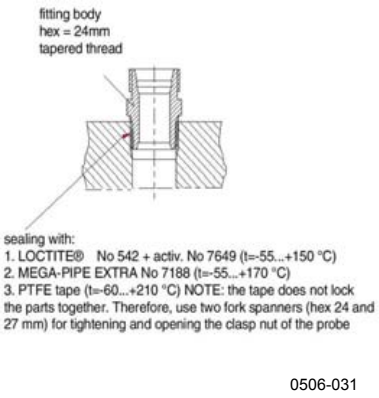
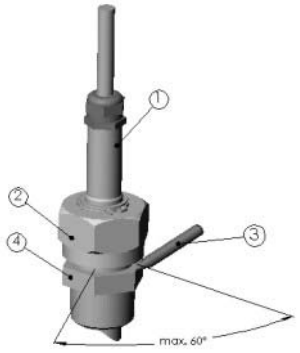


Figure 28 Sealing of Fitting Body into Process

Tightening the Clasp Nut

1. Adjust the probe to a suitable depth according to the type of installation.
2. Tighten the clasp nut first manually.
3. Mark the fitting screw and the clasp nut.
4. Tighten the nut a further 50 -60º (ca. 1/6 turn) with a wrench. If you have suitable torque spanner, tighten the nut to max 45 ± 5 Nm (33 ± 4 ft-lbs).



0503-032

Figure 29 Tightening the Clasp Nut

Numbers refer to Figure 29 above:

1 = Probe
2 = Clasp nut
3 = Pen
4 = Fitting screw

NOTE	Take care not to over tighten the clasp nut to avoid difficulties when opening it.

CAUTION	Take care not to damage the probe body. A damaged body makes the probe head 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.

NOTE	When the DMT340 is installed in a process with a pressure differing from the selected operating pressure at the time of ordering, please enter the pressure value of the process into the transmitter memory, see section Pressure Compensation Setting on page 84. Use the serial line commands XPRES and PRES or the display/keypad. The pressure set buttons on the motherboard inside the transmitter can also be used to set pressure compensation.

Ball Valve Installation Kit for DMT348

The ball valve installation kit (Vaisala order code: BALLVALVE-1) is preferred when connecting the probe to a pressurized process or pipeline. Use the ball valve set or a 1/2" ball valve assembly with a ball hole of Ø14 mm or more. If you install the sensor head (Ø 12 mm) in a process pipe, please note that the nominal size of the pipe must be at least 1 inch (2.54 cm). Use the manual press handle to press the sensor head into the pressurized (< 10 bar) process or pipeline.

NOTE	When measuring temperature dependent quantities make sure that the temperature at the measurement point is equal to that of the process, otherwise the moisture reading may be incorrect.

1. Shut down the process if the process pressure is more than 10 bars. If the pressure is lower there is no need to shut down the process.
2. Make the installation according to the figure below. Install the sensor head transversely against the direction of the process flow.

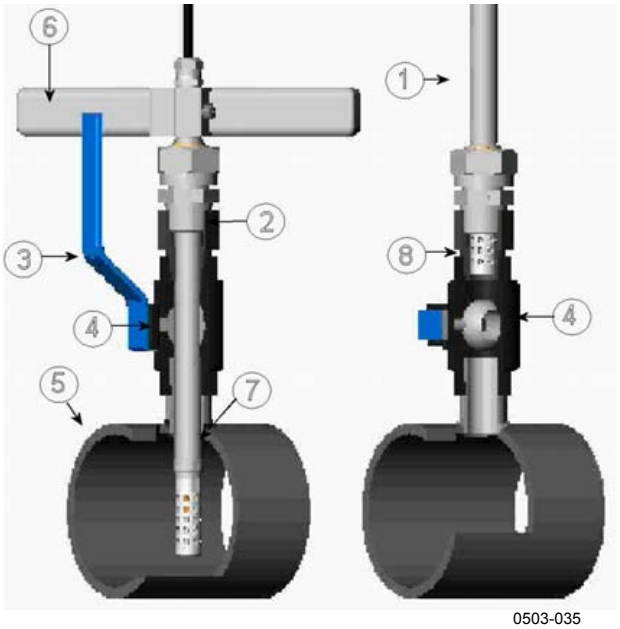


Figure 30 Installing the Sensor Head Through the DMT348 Ball Valve Assembly

Numbers refer to Figure 30 above:

1 = Probe
2 = Tighten clasp nut first manually; probe is then sliding easily. Finally tighten with a fork spanner about 60º to have a stable installation. Do not overtighten this nut.
3 = Handle of the ball valve
4 = Ball of the ball valve
5 = Process chamber/pipeline
6 = Manual press handle
7 = The groove on the sensor head indicates the upper adjustment limit
8 = Filter

You can not close the valve if the groove is not in sight. When installing the sensor head through the BALLVALVE-1 Ball Valve Assembly it is not necessary to empty or shut down the process for installing or removing the sensor head.

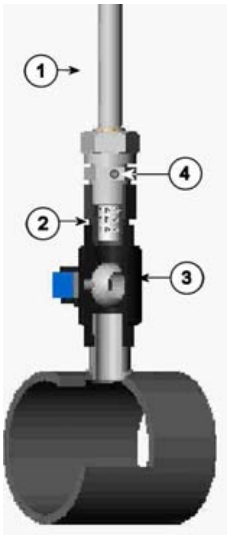
1. Mount the probe with the ball valve assembly closed; tighten the clasp nut manually.
2. Open the ball valve assembly.
3. Push the probe head through the ball valve assembly into the process. If the pressure is high, use a manual press handle. Note that the sensor head must be pushed so deep that the filter is completely inside the process flow.
4. Tighten the clasp nut a further 50-60º.

NOTE The probe can be installed in the process through the ball valve assembly provided that the process pressure is less than 10 bars. This way, the process does not have to be shut down when installing or removing the probe. However, if the process is shut down before removing the probe, the process pressure can be max. 20 bars.

Leak Screw Installation

When the probe head can't be installed directly in the pressurized process or process pipe, a leak screw installation can be used.

In this installation method, you must install the DMT348 probe head using a fitting body with leak screw, see Figure 27 on page 40. A small sample flow from the process goes through the probe head and via the leak screw out to atmospheric pressure enabling a fast response time although the probe is not installed in the process.



0503-036

Figure 31 Probe in Leak Screw Installation

Numbers refer toFigure 31 above:

1 = Probe
2 = Filter
3 = Ball of the ball valve
4 = Leak screw

Mounting the Probe Directly to the Process

Select a point, which gives a true picture of the process. The transmitter can be installed directly in the process wall, especially if the pressure of the process is 1 bar (atmospheric processes).

It may be necessary to use the sampling cell if the process (for example a pipe) is too small for the DMT348 sensor head. Furthermore, if the process is very hot (>80 °C) or particularly dirty, the probe is installed in a sampling cell behind a cooling coil and/or filter. In this case, the ambient temperature must be at least 10 °C warmer than the process dewpoint in order to avoid condensation in the sample tubing.

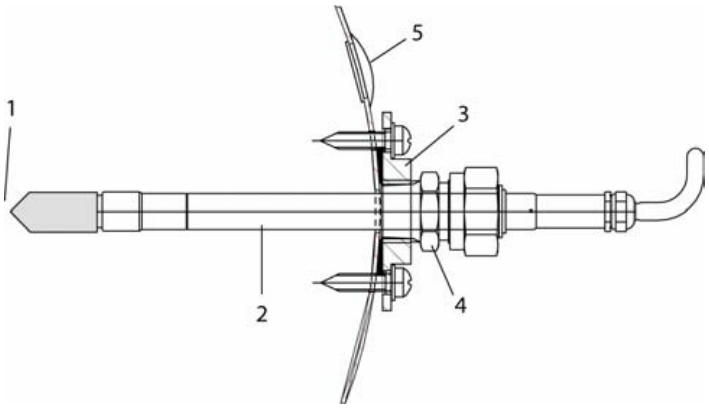


Figure 32 DM240FA with Probe

Numbers refer to Figure 32 above:

1 = measured gas
2 = probe
3 = DM240FA flange (thread G1/2" ISO)
4 = use R1/2" ISO fitting body for DMT348 probe with DM240FA flange
5 = recommended additional hole (plugged) for Td field check reference measurement probe (for example, Vaisala DM70)

If the probe is installed in process pipes where the water is likely to collect at the measurement point, take care to install the sensor head so that it will not be immersed in water.

When the probe is installed directly on the process wall or pipe, note that a closing valve may be needed on both sides of the installed probe so that the sensor head can be removed from the process for calibration or maintenance.

If the sensor head is installed in a pressurized chamber, always make sure that the pressure of the chamber is equalized with the ambient pressure prior to removing the probe. A plugging solution is available from Vaisala (order code 218370).

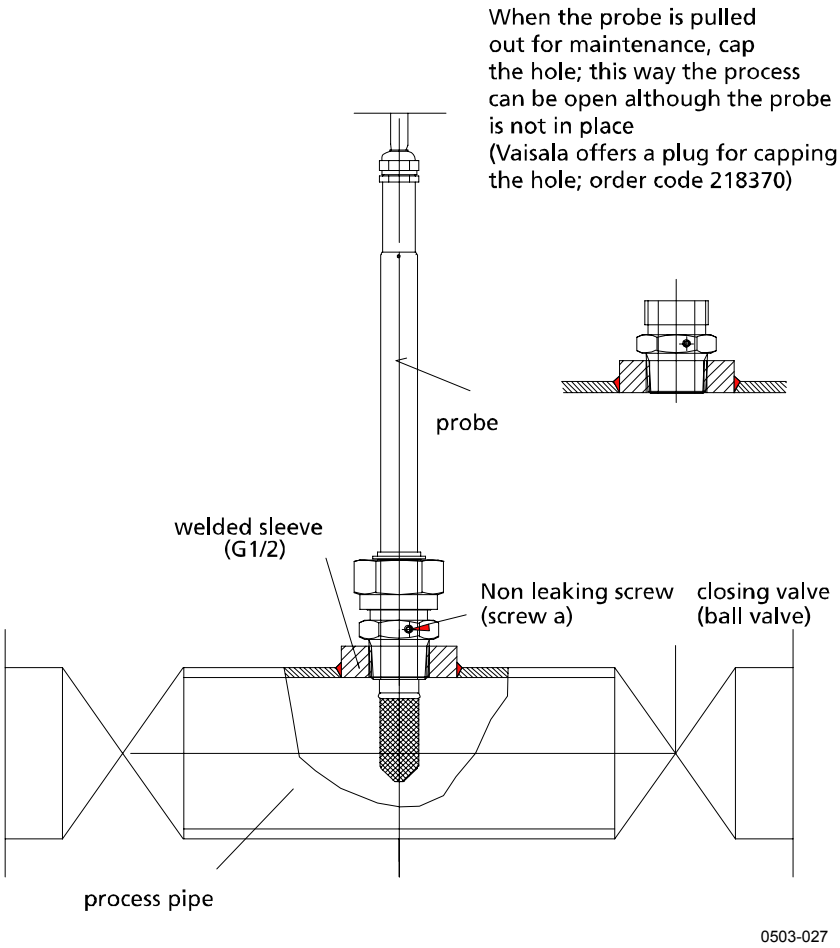


Figure 33 Example of Installing the Sensor Head Directly on the Process Pipe

Sampling Cell for DMT348

It may be necessary to use a sampling cell if the process (for example a pipe) is too small for the DMT348 sensor head. Furthermore, if the process is very hot (>80 °C) or particularly dirty, the probe is installed in a sampling cell behind a cooling coil and/or filter. In this case, the ambient temperature must be at least 10 °C warmer than the process dewpoint in order to avoid condensation in the sample tubing.

Sampling Cell with Swagelok Connectors (Vaisala order code: DMT242SC2) and Sampling Cell with Female Connectors (Vaisala order code: DMT242SC) are available as an option.

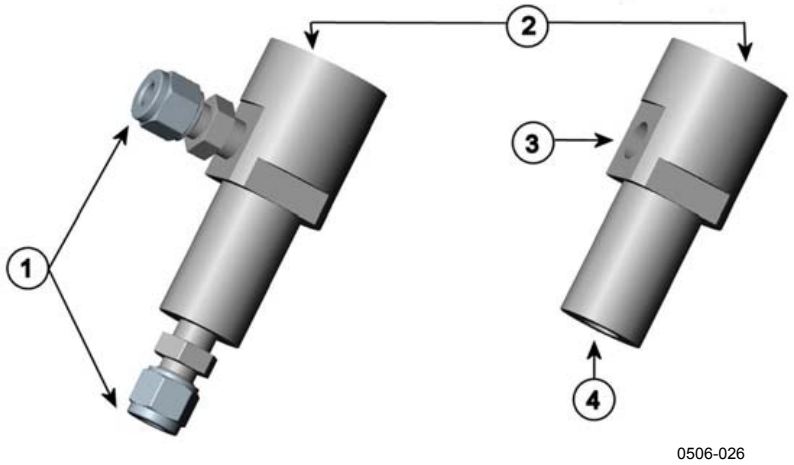


Figure 34 Sampling Cells DMT242SC2 and DMT242SC

Numbers refer to Figure 34 above:

1 = Male pipe weld connector Swagelok 1/4"
2 = G1/2"
3 = G1/4"
4 = G3/8"

An overpressure in the process is necessary to create a flow through the sampling cell. Note that the pressure of the sampling cell must not differ from that of the process because dewpoint temperature changes with pressure. In dirty processes, it may be necessary to use a filter between the cooling coil and the sampling cell. One more simple way of using the sampling cell with user provided accessories is shown in the figure below.The flow through the sampling cell is controlled with the needle valve and the pressure is kept equal to that of the process.

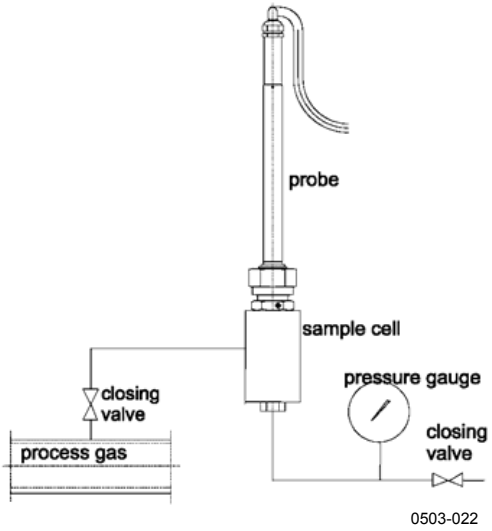


Figure 35 Installing the Probe in High Temperatures

Optional Modules

Power Supply Module

The mains power connection may be connected to the power supply module only by an authorized electrician. A readily accessible disconnect device shall be incorporated in the fixed wiring.

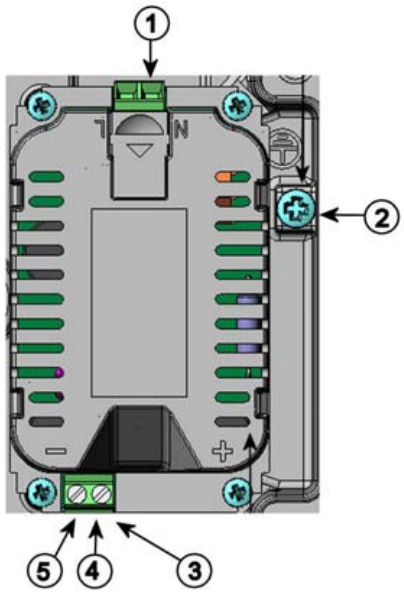


Figure 36 Power Supply Module

Numbers refer to Figure 36 above:

1 = Connect AC mains voltage wires to these terminals
2 = Grounding terminal
3 = In case the module is not installed in the factory: Connect wires from these terminals to the POWER 10...36V 24V terminals of the mother board.
4 = +
5 = -

Installation

1. Disconnect the power.
2. Remove the protective plug from the cable gland and thread the wires. In case the power supply module is installed in the factory, continue with the step 5.
3. To attach the module, open the transmitter cover and fasten the power module to the bottom of the housing with four screws. See the position on page 14.
4. Connect the wires from the terminals of the power supply module marked with + and - to the terminals **POWER 10 ... 35 V** 24V on the motherboard of the transmitter.
5. Connect the AC mains voltage wires to the power supply module terminals marked with **N** and **L**.
6. Attach the grounding wire to the grounding terminal on the right-hand side of the transmitter.
7. Connect the power. The LED on the cover of the transmitter is lit continuously during normal operation.

WARNING Do not detach the power supply module from the transmitter when the power is on.

WARNING Do not connect the mains power to power supply module when it is not installed in the transmitter.

WARNING Always connect protective ground terminal.

Warnings

Questo prodotto é conforme alla Direttiva sul basso voltaggio (73/23 CEE).

- La conduttura elettrica puó essere collegata al modulo di alimentazione elettrica soltanto da un elettricista autorizzato.
- Non staccare l´alimentazione elettrica dal trasmettitore quando é acceso.
- Non collegare la corrente elettrica al modulo di alimentazione elettrica se non é installato nel trasmettitore HMT330.
- Collegare sempre il morsetto protettivo a terra!

Dette produkt er i overensstemmelse med direktivet om lavspænding (73/23 EØS).

- Netstrømskoblingen til må kun tilsluttes strømforsyningsmodulet af en autoriseret elinstallatør
- Strømforsyningsmodulet må ikke løsgøres fra senderen, mens spændingen er sluttet til.
- Slut ikke netspændingen til strømforsyningsmodulet, når det ikke er installeret i HMT330-senderen
- Forbind altid den beskyttende jordklemme!

Dit product voldoet aan de eisen van de richtlijn 73/23 EEG (Laagspanningsrichtlijn).

- De stroom kan aan de stroomtoevoer module aangesloten worden alleen door een bevoegde monteur.
- Het is niet toegestaan de stroomtoevoer module van de transmitter los te koppelen wanneer de stroom aan is.
- Het is niet toegestaan de stroom aan de stroomtoevoer module aan te sluiten als deze niet in een HMT330-transmitter is gemonteerd.
- Altijd beschermend aardcontact aansluiten!

Este producto cumple con la directiva de bajo voltaje (72/23 EEC).

- La conexión de la alimentación principal al módulo de alimentación sólo puede realizarla un electricista autorizado.
- No desenchufe el módulo de alimentación del transmisor cuando esté encendido.
- No conecte la alimentación principal al módulo de alimentación cuando no esté instalado en el transmisor HMT330.
- Conecte siempre el terminal de protección de conexión a tierra.

See toode vastab madalpinge direktiivile(73/23 EEC).

- Voolukaabli võib vooluallika mooduli külge ühendada ainult volitatud elektrik.
- Ärge ühendage vooluallika moodulit saatja küljest lahti, kui vool on sisse lülitatud.
- Ärge ühendage voolukaablit vooluallika mooduli külge, kui seda pole HMT330-tüüpi saatjasse paigaldatud.
- Ühendage alati kaitsev maandusklemm!

Ez a termék megfelel a Kisfeszültségű villamos termékek irányelvnek (73/23/EGK).

- A hálózati feszültséget csak feljogosított elektrotechnikus csatlakoztathatja a tápegységmodulra.
- A bekapcsolt távadóról ne csatolja le a tápegységmodult.
- Ne csatlakoztassa a hálózati feszültséget a tápegységmodulhoz, ha az nincs beépítve a HMT330 távadóba.
- Feltétlenül csatlakoztasson földelő védőkapcsot!

Šis produktas atitinka direktyvą dėl žemos įtampos prietaisų (73/23/EB).

- Elektros tinklą su energijos tiekimo moduliu sujungti gali tik įgaliotas elektrikas.
- Niekada neišimkite energijos tiekimo modulio iš siųstuvo, kai maitinimas yra įjungtas.
- Jei energijos tiekimo modulis nėra įmontuotas HMT330 siųstuve, nejunkite jo į elektros tinklą.
- Visada prijunkite prie apsauginės įžeminimo jungties!

Šis produkts atbilst Zemsprieguma direktīvai (73/23 EEC).

- Strāvas pieslēgumu var pieslēgt pie barošanas avota moduļa tikai autorizēts elektriķis.
- Neatvienot barošanas avota moduli no raidītāja, kad pieslēgta strāva.
- Nepievienot strāvu barošanas avota modulim, ja tas nav uzstādēts HMT330 raidītājā
- Vienmēr pievienot aizsargājošu iezemētu terminālu !

Ten produkt spełnia wymogi Dyrektywy niskonapięciowej (73/23 EEC).

- Napięcie zasilające powinno zostać podłączone do modułu zasilacza tylko przez wykwalifikowanego elektryka.
- Nie wolno odłączać modułu zasilacza od nadajnika, kiedy zasilanie jest włączone.
- Nie wolno podłączać napięcia zasilającego do modułu zasilacza, kiedy nie jest on zamontowany w nadajniku HMT330.
- Zawsze należy podłączać zabezpieczający zacisk uziemiający!

Tento výrobek vyhovuje Směrnici pro nízké napětí (73/23 EEC).

- Připojení síťového napájení k napájecímu modulu smí provádět pouze oprávněný elektrikář.
- Neodpojujte napájecí modul od snímače při zapnutém napájení.
- Nepřipojujte síťové napájení k napájecímu modulu, pokud není instalován ve snímači HMT330.
- Vždy zapojte ochrannou zemnící svorku!

Galvanic Isolation for Output

If galvanic isolation of the power supply line from the output signals is needed, DMT340 can be ordered with optional output isolation module. This module prevents harmful grounding loops.

Installation

NOTE	Output isolation module is not needed when using the power supply module.

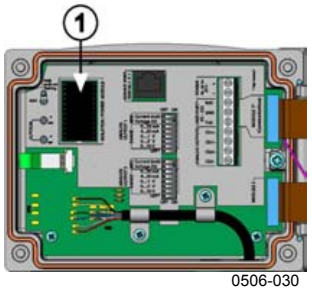


Figure 37 Galvanic Output Isolation Module

Number refers to Figure 37 above:

1 = Output isolation module

To install the output isolation module, follow the instructions below:

Third Analog Output

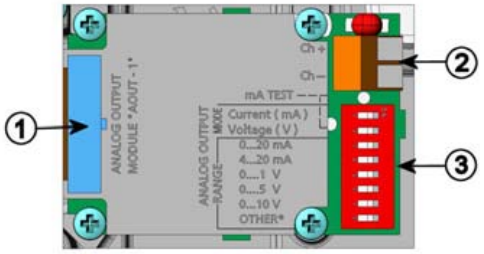


Figure 38 Third Analog Output

Numbers refer to Figure 38 above

1 = Flat cable pins
2 = Screw terminals for signal line
3 = Dip switches to select the output mode and range

Installation and Wiring

1. Disconnect the power. In case the analog output module is installed in the factory, continue with the step 4.
2. To attach the module, open the transmitter cover and fasten the analog output module to the bottom of the housing with four screws. See the position from Figure 2 on page 16.
3. Connect the flat cable between the analog output module and the motherboard's pins MODULE 2.
4. Take out the protective plug from the cable gland and thread the wires.
5. Connect the wires to the screw terminals marked with **Ch+** and **Ch-** .
6. Select the current/voltage output by setting ON either of the switches 1 or 2.
7. Select the range by setting ON one of the switches 3 ... 7.

NOTE

Only one of the switches 1 and 2 can be ON at a time.

Only one of the switches 3 ... 7 can be ON at a time.

Channel 3

	OFF	ON	Selection
1			Current output selection, ON=Current output selected
2			Voltage output selection, ON=Voltage output selected
3			0...20 mA selection, ON= 0...20 mA selected
4			4... 20 mA selection, ON= 4... 20 mA selected
5			0...1 V selection, ON=0...1 V selected
6			0...5 V selection, ON=0...5 V selected
7			0...10 V selection, ON= 0...10 V selected.
8			For service use only, keep always in OFF position.

8. Connect the power.
9. Select the quantity and scale the channel via the serial line or display/keypad, see section Analog Output Quantities on page 98. For testing the analog output, see Section Analog Output Tests on page 100. For fault indication setting, see section Analog Output Fault Indication Setting on page 101.

Alarm Relays

DMT340 can be equipped with one or two configurable relay modules. Each module contains two configurable relays. See the contact ratings in section Technical Specifications of the Optional Modules on page 136.

Installation and Wiring

1. Disconnect the power. In case the relay-module is installed in the factory, continue with the step 5.
2. To attach the module, open the transmitter cover and fasten the relay module to the bottom of the housing with four screws. See the position in Figure 2 on page 16.
3. When the mains power is in use attach the grounding wire to the grounding terminal.
4. Connect the flat cable between the relay module and the motherboard's pins **MODULE 2** or **MODULE 1.**
5. Take out the protective plug from the cable gland and thread the relay wires.
6. Connect the wires to the screw terminals: NO, C, NC.

Selecting the Activation State of the Relay

The middlemost C terminal and either one of the terminals NO/NC shall be connected. The polarity can be freely selected.

NO	Normally open
C	Common relay
NC	Normally closed

Relay NOT activated: C and NC outputs are closed, NO is open
Relay IS activated: C and NO outputs are closed, NC is open.

Connect the power and close the cover.For instructions on how to operate the relay (for example, select quantity for the relay output and set the relay setpoints) see section Operation of the Relays on page 102.

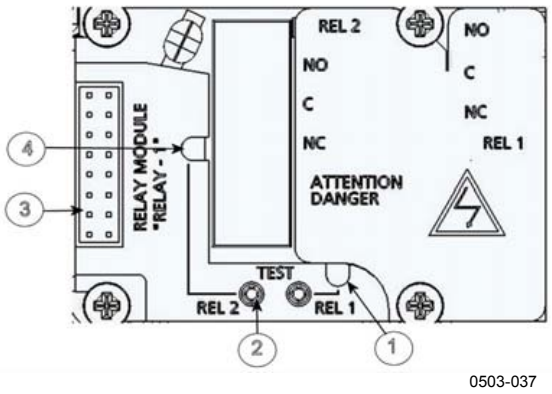


Figure 39 Relay Module

Numbers refer to Figure 39 above:

1 = Indication led for the relay 1 or 3
2 = Relay test buttons
3 = Flat cable pins
4 = Indication led for relay 2 or 4

WARNING The relay module may contain dangerous voltages even if the transmitter power has been disconnected. Before working on the relay module you must switch off **both** the transmitter **and** the voltage connected to the relay terminals.

WARNING Do not connect the mains power to relay unit without grounding the transmitter.

RS-422/485 Interface

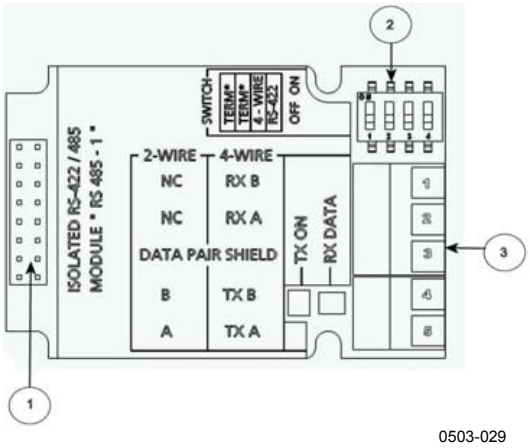


Figure 40 RS-485-Module

Numbers refer to Figure 40 above:

1 = Flat cable pins
2 = Selection switches
3 = Screw terminals for wiring

Installation and Wiring

1. Disconnect the power. In case the RS-485-module is installed in the factory, continue with the item 4.
2. To attach the module, open the transmitter cover and fasten the RS-485 module to the bottom of the housing with four screws.
3. Connect the flat cable between the RS-485 module and the motherboard's pins **MODULE1 (Communications).**
4. Pull the network wirings through the cable gland.
5. Connect the twisted pair wires (1 or 2 pairs) to the screw terminals as presented in Table 4 below:

Table 4 Connecting the Twisted Pair Wires to the Screw Terminals

Screw terminal	Data line (2-wire RS-485)	Data line (4-wire RS-485/422)
1	(not connected)	RxB
2	(not connected)	RxA

Screw terminal	Data line (2-wire RS-485)	Data line (4-wire RS-485/422)
3	Data pair shield	Data pair shield
4	B	TxB
5	A	TxA

6. If you use RS-485 (or RS-422) to connect just one DMT340 to a master computer,enable the internal termination of DMT340 by switching switches 1 and 2 ON. Make sure that the master's end of the line is also terminated (by using master's internal termination or with a separate terminator).

   If you are connecting many transmitters to the same RS-485 bus, make sure that switches 1 and 2 are OFF and terminate the bus with separate terminators at both ends. This allows removing any transmitter without blocking the bus operation.

NOTE If you use the internal termination of the transmitter at the end of the RS-485 bus (instead of using separate terminators) removing that transmitter will block the bus operation.

7. Use the bus type (4-wire/2-wire) to select the selection switch 3.

   In 4-wire mode RS-485 master sends data to the DMT340 through terminals RxA and RxB and receives data from DMT340 through terminals TxA and TxB.

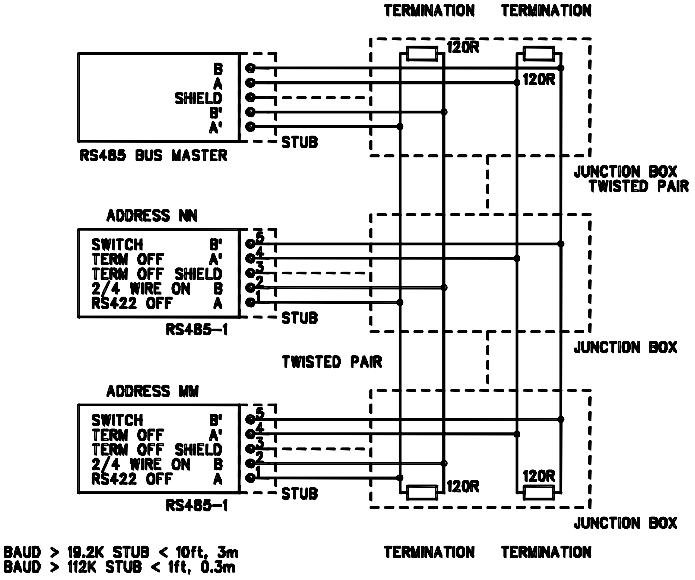


Figure 41 4-Wire RS-485 Bus

Table 5 4-Wire (Switch 3:On)

RS-485 master	Data	DMT340
TxA	→	RxA
TxB	→	RxB
RxA	←	TxA
RxB	←	TxB

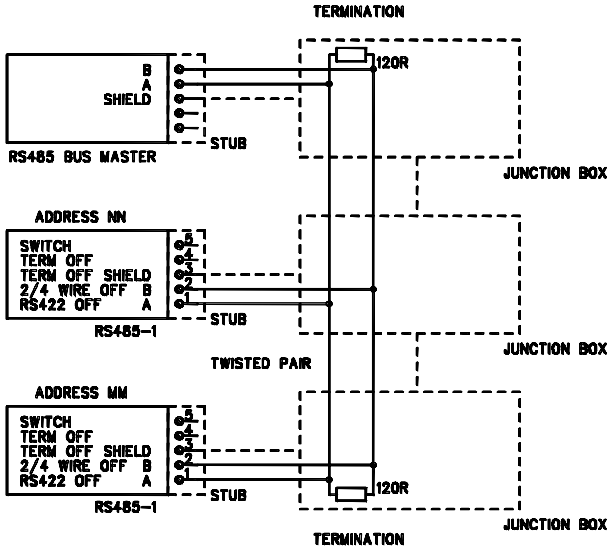


Table 6 2-Wire (Switch 3:Off)

RS-485 master	Data	DMT340
A	↔	A
B	↔	B

8. When operating in communication mode RS-422, set both switches 3 and 4 to ON position (4-wire wiring is required for RS-422 mode).
9. Connect the power and close the cover.

8-pin Connector

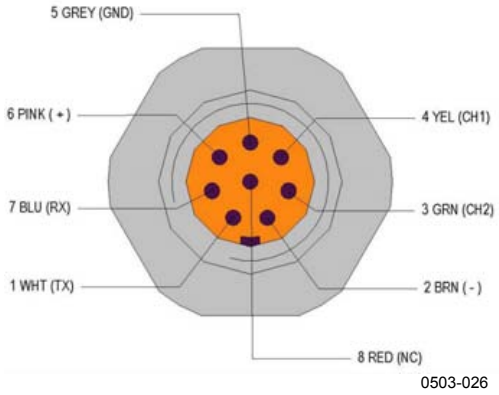


Figure 42 Wiring of the Optional 8-pin Connector

Table 7 Wiring of the 8-pin connector

PIN/Terminal	Wire	Serial Signal		Analog Signal
		RS-232 (EIA-232)	RS-485 (EIA-485)	
1	White	Data out TX	A -	-
2	Brown	(serial GND)	(serial GND)	Signal GND (for both channels)
3	Green	-	-	Ch 2+
4	Yellow	-	-	Ch 1 +
5	Grey	Supply -	Supply -	Supply -
6	Pink	Supply +	Supply +	Supply +
7	Blue	Data in RX	B -	-
8	Shield/Red	Cable shield	Cable shield	Cable shield

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CHAPTER 4

OPERATION

This chapter contains information that is needed to operate this product.

Getting Started

Within a few seconds after power-up the led on the cover of the transmitter is lit continuously indicating normal operation. When the transmitter is turned on the first time, the language selection window opens: Select the language with ▼▲ arrow buttons and press the **SELECT** button.

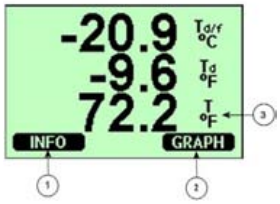
The pressure has an effect on humidity calculations and accuracy. Therefore, accurate calculations can be achieved only when the ambient pressure is taken into consideration. See page 84 for instructions on how to set the pressure.

Start-up time for DMT340 transmitter is in total about 6 minutes. The ouputs (serial and analog) are activated 3 seconds after powering up the DMT340. In addition, 10 seconds after the measurement the outputs will freeze for about 6 minutes due to the sensor self diagnostics procedure (Sensor Purge and Autocal). The frozen output value will be the value the DMT340 transmitter reached during the 10 seconds of measurement. After the self diagnostics procedure the outputs are operational again.

Display/Keypad

Basic Display

Display shows you the measurement values of the selected quantities in the selected units. You can select 1... 3 quantities for the numerical basic display (see section Changing the Quantities and Units on page 81).



0503-003

Figure 43 Basic Display

The numbers refer to Figure 43 above:

1 = The Info shorcut button
2 = The Graph shortcut button changes the display into a curve mode
3 = Selected quantities

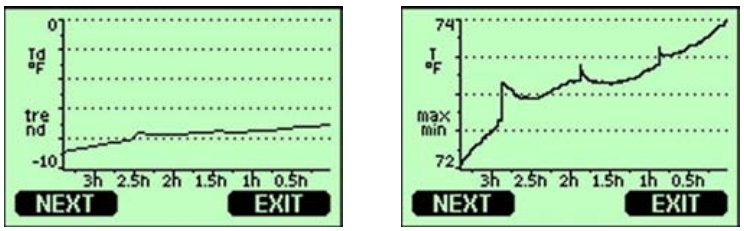
Press the **INFO** button (in the basic display) to see the device information views, see section Device Information on page *89*

NOTE	From any view, in the absence of an **EXIT** button, a four-second press on the right-hand function button takes you directly to the basic display.

Graphic History

The graphical display shows the data trend of the selected quantities, one at a time. The graph is updated automatically while measuring. Use the following functions in the graphical display:

- Press the **NEXT** button to have the trend graph and max/min graph in turns.
- Press the **EXIT** button to get back the basic display.



0503-011

Figure 44 Graphical Display

Trend graph: Shows you a curve of average values. Each value is a calculated average over a period. See Table 8 below.

Max/min graph: Shows you the minimum and maximum values in a form of curve. Each value is max/min over a time period. See Table 8 below. The period for the trend and max/min calculations depends on the selected graph window as follows:

Table 8 Periods for Trend and Max/Min Calculations

Observation Period	Period for Trend/Max/Min Calculations (Resolution)
3 hours	1,5 minutes
1 day	12 minutes
10 days	2 hours
2 months	12 hours
1 year	3 days

- Press the ▲▼ arrow buttons to zoom in and out the time in the graph window.
- Press the arrow ◄► buttons to have a cursor mode where you can observe an individual measuring point. Press an arrow button to move a cursor (vertical bar) along the time axis. The numerical value at the cursor position is shown at the left upper corner. Time from the present to the chosen moment is shown at the right upper corner.

Table 9 Graph Information Messages

Failure Message	Interpretation
Power outage	Power failure (marked also with dashed vertical line)
No data	Quantity has not been selected for the display
Device failure	General device failure.
T meas. failure	Temperature measurement/sensor failure
RH meas. failure	Humidity measurement/sensor failure
Adj. mode active	Adjustment mode active (data recorded in the adjustment mode is not displayed)
Autocal	Autocal performed (only shown in 3 h graphs)

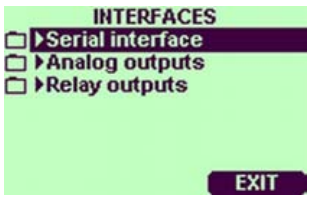
A question mark after time tells you that at least one power failure (dashed vertical line) has occurred after the chosen moment. In this case, the actual time difference between the present and the cursor position is not exactly known.

Menus and Navigation

You can change settings and select functions in the menus.

1. Open the **MAIN MENU** by pressing any of the ▲▼◄► arrow buttons in the basic (numeric) display mode.
2. Move in the menus by using the ◄► arrow buttons.
3. Open a submenu with ► button.
4. Press ◄ to return to the previous level.
5. Function button **EXIT** returns you back to the basic display.

Adjustment menu is displayed only when **ADJ** button (on the motherboard inside the transmitter) is pressed.



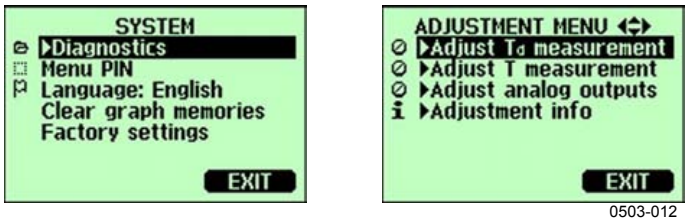


Figure 45 Main Views

Changing the Language Setting

1. Go back to the basic display by keeping the right-hand button pressed for four seconds.
2. Open the **MAIN MENU** by pressing any of the buttons.
3. Select ►**System** (the lowest row), press button.
4. Select **Language: ...** (the third row marked with a flag icon), press **SELECT** button (left-hand button).
5. Select the language with buttons and press **SELECT** button (left-hand button).
6. Press **EXIT** to return to the basic display.

Rounding Setting

Round off one decimal by using the Rounding function . The default setting is rounding on. Rounding has no effect on quantities without decimals.

1. Open the **MAIN MENU** by pressing any of the ▲▼◄► arrow buttons.
2. Select ►**Display** and confirm by pressing the ► arrow button.
3. Select **Rounding** and press **ON/OFF** button.
4. Press **EXIT** to return to the basic display.

Display Backlight Setting

As a default the display backlight is always on. In the automatic mode the backlight stays on for 30 seconds from the last press of the button. When pressing any button, the light turns on again.

1. Open the **MAIN MENU** by pressing any of the ▲▼◄► arrow buttons
2. Select ►**Display**, press the arrow button.
3. Select **Backlight**, press the **CHANGE** button.
4. Select **On/Off/ Automatic**, press the **SELECT** button.
5. Press **EXIT** to return to the basic display.

Display Contrast Setting

1. Open the **MAIN MENU** by pressing any of the ▲▼◄► arrow buttons.
2. Select ►**Display**, press the arrow button.
3. Select **Contrast**, press the **ADJUST** button.
4. Adjust the contrast by pressing the ◄► arrow buttons.
5. Press **OK** and **EXIT** to return to the basic display.

Keypad Lock (Keyguard)

This function locks the keypad and prevents unintentional key presses.

1. Keep pressing the left-hand function button for 4 seconds to lock the keypad (at any display).
2. To unlock the keypad, press the **OPEN** button for 4 seconds.

Menu PIN Lock

You can prevent unauthorized changes of the device settings by activating the menu PIN lock. When this function is activated, the basic display and graphical view are available but access to the menus is locked. The key symbol indicates the activation of this feature.

1. Open the **MAIN MENU** by pressing any of the ▲▼◄► arrow buttons.
2. Select ►**System**, press the ► arrow button.

3. Select **Menu PIN**, press the **ON** button.
4. Enter a PIN code by using the ▲▼ arrow buttons. Press **OK** to confirm the setting. Now the PIN lock is on and a key symbol is shown in a display.
5. Press **EXIT** to return to the basic display. Returning to the menu is possible only by entering the correct PIN code.

When you want to turn off the PIN lock, go to the menu by giving the PIN code and select ►**System, Menu PIN,** press **OFF** button.

In case you have forgotten the PIN code, open the transmitter cover and press the **ADJ** button once. Wait for a few seconds and the adjustment menu opens. Select **Clear menu PIN**, press **CLEAR.**

NOTE	You can also disable the keypad completely with serial command **LOCK**.

Factory Settings

Use the display/keypad to restore the factory settings. This operation does not affect the adjustments. Only settings available in the menus are restored.

1. Press any of the arrow buttons to open the **MAIN MENU**.
2. Select **System** by pressing the ► arrow button.
3. Select **Factory settings** and press the **REVERT** button to confirm your selection. Press the **YES** button to reset all settings to the factory defaults.

See section General Settings on page 81 below for a description of the other menu options.

MI70 Link Program for Data Handling

The recorded data can be transferred to a PC by using MI70 Link program. You can examine the recorded data easily in Windows ® environment and transfer it further to a spreadsheet program (such as Microsoft® Excel) or virtually to any Windows® program in numeric or graphical format. MI70 Link program allows you also to monitor transmitter readings directly with a PC (real-time window function).

MI70 Link program is available from Vaisala, see list of accessories Table 32 on page 142.

1. Connect the connection cable between the serial port of your PC and the Service Port of DMT340, see Figure 46 on page 70 below.
2. Check that the DMT340 is powered and start using the MI70 Link program.

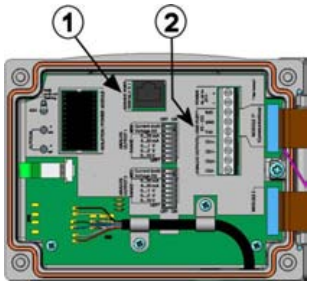
Use a MI70 Link version 1.07, or a newer one, to be able to utilize all the functions of DMT340.

Serial Line Communication

Connect the serial interface by using either the user port or the service port.

For permanent interfacing to host system, use the user port.You can change the serial settings and operate in RUN, STOP and POLL modes.

For temporary RS-232 connections use the service port. Service port is always available with fixed serial settings.



0506-030

Figure 46 Service Port Connector and User Port Terminal on the Mother Board

Numbers refer to Figure 46 on page 70:

1 = Service port connector
2 = User Port Terminals

User Port Connection

Use suitable serial cable between the user port RxD, GND and TxD screw terminals and the PC serial port.

Table 10 Default Serial Communication Settings for the User Port

Parameter	Value
Bauds	4800
Parity	Even
Data bits	7
Stop bits	1
Flow control	None

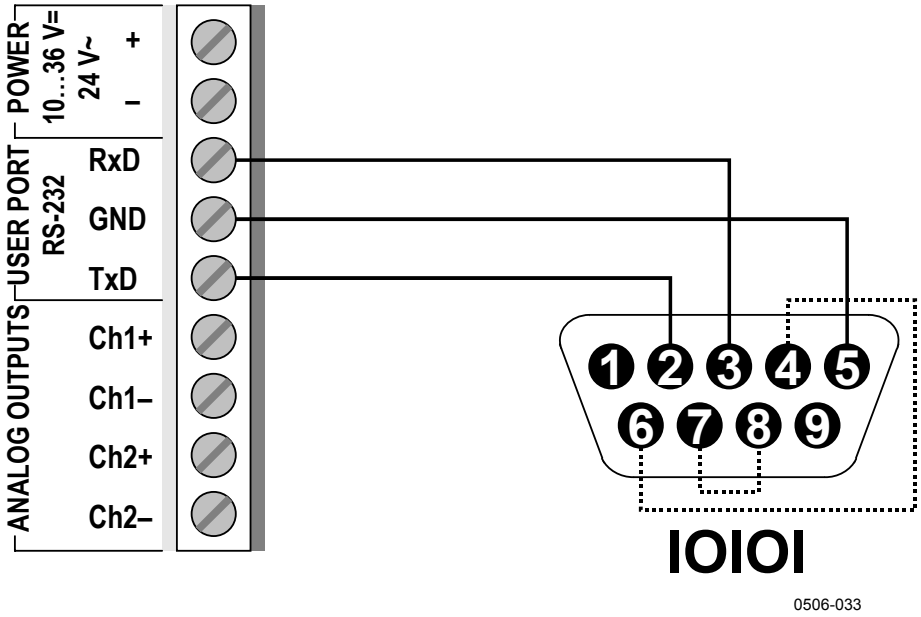


Figure 47 Connection Example Between PC Serial Port and User Port

Connections to pins 4,6,7 and 8 are required only if your software requires hardware handshaking.

NOTE	User port cannot be used when RS-485 module is connected.

Service Port Connection

1. Connect the serial interface cable (optional accessory, order code: 19446ZZ) between the serial port of your PC and the service port connector on the motherboard, see Figure 46 on page 70.
2. Power-up the DMT340.
3. Open a terminal program and set the communication settings (see the following section for more detailed instructions).

Table 11 Fixed Communication Settings for the Service Port

Parameter	Value
Bauds	19200
Parity	No
Data bits	8
Stop bits	1
Flow control	None

Terminal Program Settings

The following instructions show a connection example with HyperTerminal program (included in the Microsoft® Windows®).

Follow the instructions below to open a HyperTerminal program:

1. Start HyperTerminal. To get help for starting HyperTerminal, click "Start", select "Help" to open Windows® help, and search for "HyperTerminal".

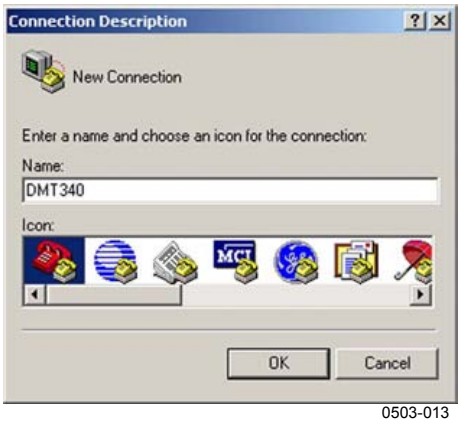


Figure 48 Starting the Hyper Terminal Connection

2. In the "New Connection"window of the HyperTerminal, define a name for DMT340 serial connection, for example "DMT340". Click OK.
3. In "Connect using" box, select the PC communications port where the serial cable is connected. (If your computer has only one COM port, it is called "COM1".) Click OK.

Figure 49 Connecting to the Hyper Terminal

4. Set the port settings in the "Properties" window to match the settings of your DMT340 *user port*/*service port*. For DMT340, "Flow control" must always be set to "None". Finally click OK to start using the serial connection.

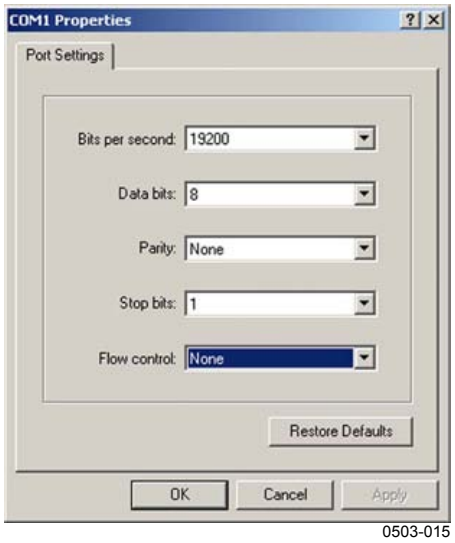


Figure 50 Hyper Terminal Serial Port Settings

5. Select "File" → "Save" in the HyperTerminal main window to save the serial port settings. To use the saved settings later, start HyperTerminal, click cancel in the "New Connection" window, and select "File" → "Open".

After power-up transmitter (in STOP-mode) outputs a prompt message:

```
DMT340/2.01
>
```

In RUN mode a measurement output starts immediately after power-up.

List of Serial Commands

The bold text in the brackets is the default setting. Enter commands by typing them on your computer and pressing the Enter key.

Table 12 Measurement Commands

Command	Description
R	Start the Continuous Outputting
S	Stop the Continuous Outputting
INTV [**0** ... 255 **S**/MIN/H]	Set the Continuos Output Interval (for RUN mode)
SEND [0 ... 99]	Output the Reading once
SMODE [**STOP**/RUN/POLL]	Set the Serial Interface mode
SERI [baud p d s]	User Port Settings (Default: 4800 E 7 1)
ADDR [**0** ... 99]	Set the Transmitter Address (for POLL Mode)
OPEN [**0** ... 99]	Open Temporarily Connection to a POLL Mode Device
CLOSE	Close the Temporary Connection (Back to POLL Mode)

Table 13 Formatting Commands

Command	Description
FORM	Set the output format of SEND and R commands
FST	Add the state of Autocal, purge and sensor warming in connection with SEND and R commands
FDATE	Add date to R and SEND outputs
FTIME	Add time to output to SEND and R outputs

Table 14 Data Recording Commands

Command	Description
DIR	Lists trend log files
PLAY [-1 ... 14]	Outputs log file
DSEL	Select logged (and displayed) quantities

Table 15 Purge Commands

Command	Description
PUR	Purge settings
PURGE	Start manual purge

Table 16 Autocalibration Commands

Command	Description
AUTO	Autocal settings
AUTOCAL	Start manual autocal

Table 17 Calibration and Adjustment Commands

Command	Description
FCRH	RH 2-point-adjustment
IKØ	Td/f 1-point-adjustment
CT	T 1/2-point-adjustment
ACAL	Perform analog output adjustment

Table 18 Setting and Testing the Analog Outputs

Command	Description
ASEL	Configure analog output quantities and scales
ITEST	Test analog outputs
AMODE	Display analog output mode
AERR	Change the error output
ASCL	Analog output scaling

Table 19 Setting and Testing the Relays

Command	Description
RSEL	Configure relay settings
RTEST	Test relays

Table 20 Other Commands

Command	Description
?	Output the information about the device
??	Output the information about the device in POLL-state
CDATE	Adjust the output date/set date when adjustment enabled
CODE	Display the order configuration code of the transmitter
CTEXT	Display the adjustment information text/set information text when adjustment enabled
DATE	Set date.
DELETE	Clear/delete trend log data
DSEND	Output the reading, also in poll mode.
ECHO	Turn the serial interface echo ON/OFF
ERRS	Display transmitter error messages
HELP	List the most common commands
LOCK	Lock the menu/keypad
MODS	Display module status
PRES	Set the value for pressure compensation
RESET	Reset the device
TEST	Self-diagnostics information
TIME	Set time.
UNDELETE	Restore data
UNIT	Display output units
VERS	Display the software version information
XPRES	Set pressure (temporarily)
MOL/MOLI	View/set molecular weight parameter

Getting the Measurement Message from Serial Line

Press **R** to start output of measurements. Press **S**, the Esc button or reset the transmitter to stop outputting. See command **SMODE** to change the default (power-up) operation mode.

Format the output by using the following commands:

- resulting interval can be changed with a command **INTV**.
- output string format can be changed with a command **FORM**.
- status of purge, sensor warming and autocalibration can be added with a command **FST**.
- date and time information can be added with commands **FDATE** and **FTIME**.

Example:

```
>r
Tdf=-20.6 'C H2O=   958 ppmV x=   0.6 g/kg

>r
Tdf=-20.7 'C H2O=   958 ppmV T= 23.8 'C RH=  3.3 %RH
```

To end the RUN mode enter the **S** command. After this, all other commands can be used.

To output the reading once in STOP mode press **SEND**.

If value is too long to fit to the allocated space or if there is an error in outputting the quantity, value is displayed with stars '*'.

The output mode can be changed with the commands: **FORM, FST, FDATE, TIME.**

TIME and DATE

You can format the serial line message by using the **TIME** and **DATE** commands. To set time enter the **TIME** command. To set date enter the **DATE** command.

These time and date settings are shown on the timestamps of **PLAY** command. When you want to include time and date in the **R** and **SEND** commands, use the **FTIME** and **FDATE** commands.

TIME

DATE

Example:

```
>TIME
Current time is 04:12:39
Enter new time (hh:mm:ss) ? 12:24:00
>DATE
Current date is 2000-01-01
Enter new date (yyyy-mm-dd) ? 2004-07-05
>
```

NOTE	Time and date are cleared to 2000-01-01 00:00:00 at reset or at power failure.

FTIME and FDATE

FTIME and **FDATE** commands will enable/disable output of time and date to the serial line. To add time to R and SEND outputs press **FTIME** [*x*].

FTIME

To add date to **R** and **SEND** outputs press **FDATE** [*x*]

FDATE

where

x = ON or OFF

Example:

```
>send
Tdf=-20.6 'C H2O=   959 ppmV T= 23.9 'C RH=  3.3 %RH
>ftime on
Form. time     : ON
>send
23:08:27 Tdf=-20.6 'C H2O=   959 ppmV T= 23.9 'C RH=
3.3 %RH
>fdate on
Form. date     : ON
>send
2000-01-31 23:08:46 Tdf=-20.6 'C H2O=   960 ppmV T= 23.9
'C RH=  3.3 %RH
>
```

FST

To output the state of purge, sensor warming and AutoCal in connections with SEND and R commands press **FST** [*x*].

Where

x = ON or OFF (default)

Example:

```
>fst on
Form. status   : ON
>send
N    0 RH= 40.1 %RH T= 24.0 'C Td=  9.7 'C Tdf=  9.7 'C
a=  8.7 g/m3   x=   7.5
```

```
g/kg  Tw= 15.6 'C ppm= 11980 pw=  12.00 hPa pws=  29.91
hPa h=  43.2 kJ/kg
>purge
Purge started, press any key to abort.
>send
S  134 RH= 40.2 %RH T= 24.1 'C Td=  9.8 'C Tdf=  9.8 'C
a=  8.8 g/m3   x=   7.5
g/kg  Tw= 15.7 'C ppm= 12084 pw=  12.10 hPa pws=  30.11
hPa h=  43.5 kJ/kg
>
```

Where the state of the probe is indicated by the following letters and values:

N...xxx	=	Normal operation	where xxx	=	Probe heat power
H...xxx	=	Purge	where xxx	=	Sensor temperature (ºC)
S...xxx	=	Sensor cooling after purge	where xxx	=	Sensor temperature (ºC)
A...xxx	=	AutoCal	where xxx	=	Sensor temperature (ºC)
w...xxx	=	Sensor warming	where xxx	=	Sensor heat power

Resetting the Device

Use the serial line to reset the device. Use the command **RESET** to reset the device. The user port switches to start-up output mode selected with command **SMODE**.

Keypad/Menu Locks

LOCK

Use the **LOCK** [*x*] command to turn on the menu lock.

LOCK [*x*]

where

x = 1 (Menu locked)

Example:

```
>lock 1
Keyboard lock  : 1
>
```

Use the **LOCK** [*x yyyy*] command to turn on the menu lock with 4-digit PIN code, for example 4444.

LOCK [*x yyyy*]

where

x = 1 (Menu locked)
yyyy = 4-digit PIN code

Example:

```
>lock 1 4444
Keyboard lock  : 1 [4444]
>
```

Use the **LOCK** [*x*] command to disable the keypad completely.

LOCK [*x*]

where

x = 2 (Keypad disabled)

Example:

```
>lock 2
Keyboard lock  : 2
>
```

NOTE Open the locks with the serial command **LOCK 0**. You can open the menu lock also by using the keypad, provided a PIN code has been set.

See section General Settings on page 81 below for a description of the other serial commands.

General Settings

Changing the Quantities and Units

To change quantities and units use serial commands or the optional display/keypad. See Table 1 on page 13 for available quantities and Table 2 on page 14 for optional quantities.

NOTE	Only the quantities selected when ordering the device can be selected as an output quantity.

Use display/keypad to select the display output quantities.

1. Press any of the arrow buttons to open the **MAIN MENU**.
2. Press the ► arrow button to select **Display**.
3. Press ► arrow button to select **Quantities**.
4. Select the quantity by using the ▲▼ arrow buttons. Confirm the selection by pressing **SELECT**. You can select 1 ... 3 display quantities at a time.
5. Press **EXIT** to return to the basic display.

To select display units:.

1. Press any of the arrow buttons to open the MAIN MENU.
2. Press the ► arrow button to select **Display**.
3. Use the ▲▼arrow buttons to select Units. Confirm the selection by pressing the right-hand arrow button.
4. Use the ▲▼ arrow buttons to select display units. Confirm the selection by pressing **CHANGE**. The unit changes from metric to non-metric or the other way round.
5. Press **EXIT** to return to the basic display.

NOTE	Changing the units by using the display/keypad has no effect on the serial output units.

FORM

Use the serial line command **FORM** to change the format or select a certain quantities for the output commands **SEND** and **R**.

FORM [*x*]

where

x = Formatter string

Formatter string consists of quantities and modifiers.

When entering the command, use the abbreviations of the quantities. For more information on quantities, see Table 1 on page 13 and Table 2 on page 14.

The modifiers are presented in Table 21 below.

Table 21 FORM Command Modifiers

Modifier	Description
x.y	Length modifier (number of digits and decimal places)
#t	Tabulator
#r	Carriage-return
#n	Line feed
“"	String constant
#xxx	Special character, code "xxx" (decimal), for example #027 for ESC
U5	Unit field and length
ADDR	Transmitter address with two characters [00...99]
ERR	Error flags for P, T, Ta, RH [0000 ... 1111], 0 = no error
STAT	Transmitter status in 7 character field, for example: N 0 no heating h 115 probe heating active, power 115/255 H 159.0 purge heating active, temperature 159ºC S 115.0 purge cooling active, temperature 115ºC X 95.0 sensor heating active, temperature 95ºC
SN	Transmitter serial number
TIME	Time [hh:mm:ss]
DATE	Date [yyyy-mm-dd]
OK	Pressure stability indicator, two characters [OK or " "]
CS2	Modulus-256 checksum of message sent so far, ascii encoded hexadecimal notation
CS4	Modulus-65536 checksum of message sent so far, ascii encoded hexadecimal notation
CSX	NMEA xor-checksum of message sent so far, ascii encoded hexadecimal notation
A3H	Pressure tendency [* or 0...8]

Example:

```
>form "Td=" 4.2 rh U5 #t "T=" t U3 #r #n
Td=   3.30ºC       T=  22.18'C
>send
Td=   3.30ºC       T=  22.18'C

>form "Tfrost=" tdf U3 #t "Temp=" t U3 #r#n
Tfrost=  -21.6'C   Temp=   22.2'C
>
```

Command '**FORM /**' will return the default output format. The default output format depends on the device configuration.

```
>form /
Tdf=-21.6 'C H2O=   874 ppmV T= 22.2 'C RH=  3.3 %RH
>
```

UNIT

Use the command **UNIT** [*x*] to select metric or non-metric output units.

where

x = M or N

where

M = Metric units
N = Non-metric units

NOTE	This command changes both the serial output and display units to either metric or non-metric units. When you want to output both metric and non-metric units simultaneously on the display, select the display units by using the display/keypad.

Use **UNIT** H_2O [ppmv/ppmw] to change H_2O units.

Use the **MOL/MOLI** command to view/set mole weight parameter that will be used in calculating H_2O $ppm_{w.}$

Pressure Compensation Setting

The pressure has an effect on humidity calculations and accuracy. Therefore, accurate calculations can be achieved only when the process pressure is taken into consideration.

Note that conversions from mmHg and inHg are defined at 0°C and for mmH_2O and inH_2O at 4°C.

NOTE Pressure compensation is intended to be used in normal air only. When measuring in other gases, please contact Vaisala for further information.

NOTE Fixed pressure compensation value of 1013.25 hPa is used when in adjustment mode.

Using Display/Keypad

Use display/keypad to set the pressure compensation. To select the pressure unit using display/keypad see section Changing the Quantities and Units on page 81.

1. Press any of the arrow buttons to open the MAIN MENU.
2. Select **Measuring** and press the ►arrow button to confirm your selection.
3. Select Pressure compensation and press the ►arrow button to confirm you selection.
4. Press **SET** and enter the pressure value by using the arrow buttons.
5. Press **OK** and **EXIT** to return to the basic display.

Using Buttons on the Motherboard

Pressure set buttons (P_{chk} and P_{set}) can be used to set the process pressure.

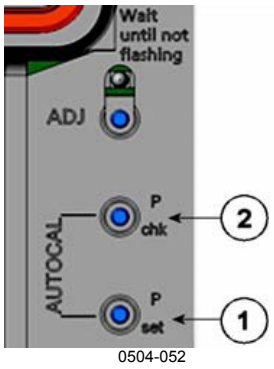


Figure 51 Pressure Set Buttons on the Motherboard

Numbers refer to Figure 51 above:

1 = Pressure set button
2 = Pressure check button

Press check button (P_{chk}) and a red led will flash the current pressure setting in bar_a.

Press the set button (P_{set}) to set the pressure value. The number of presses equals the number of bar_a to be set (for example, three presses = three bar_a). After a few seconds, the red led will confirm the setting by flashing the new pressure value.

Using Serial Line

XPRES and PRES

Command **XPRES** should be used if the value is changed frequently. Its value is not retained at reset, and when set to 0, last value set with **PRES** is used instead. Use the serial line and do the following:

PRES [*aaaa.a*]

XPRES [*aaaa.a*]

where

aaaa.a =Absolute process pressure (hPa)

Example:

```
>pres
Pressure       : 1013.00 hPa ?
>pres 2000
Pressure       : 2000.00 hPa
>
```

Table 22 Multiplication Factors

From	To: hPa
mbar	1
PaN/m2	0.01
mmHg torr	1.333224
inHg	33.86388
mmH_2O	0.09806650
inH_2O	2.490889
atm	1013.25
at	980.665
bar	1000
psia [1)]	68.94757

1) Psia = psi absolute.

Example:

29.9213 inHg = 29.9213 x 33.86388 hPa = 1013.25 hPa

User Port Serial Settings

The communication settings for the user port can be changed via the serial line or by using the optional display/keypad. The communication settings for the service port are fixed and not changeable.

1. Press any of the arrow buttons to open the MAIN MENU.
2. Select **Interfaces** and press the ►arrow button to confirm your selection.
3. Select **Serial interface** and press the ►arrow button to confirm your selection.
4. Select **Bit rate/Serial format/Comm. mode** by pressing the **CHANGE** button. Use the ▲▼ arrow buttons to select and press **SELECT** to confirm your selection.
5. Select **RUN** interval for RUN communication mode and press **SET** to confirm your selection.
6. Use the arrow buttons to set the measuring interval and the unit. Press OK to confirm your settings.

7. Select **POLL** address for **POLL** communication mode. Press **SET** to confirm your selection.
8. Use the arrow buttons to set the transmitter address. Press **OK** to confirm the setting.
9. Use the arrow buttons to select **ECHO**. Press ON to turn to it on. Press OFF to turn it off.
10. Press **EXIT** to return to the basic display.

SERI

Use the serial line command **SERI** [*b p d s*] to set communication settings for the user port.

SERI [*b p d s*]

where

b = Bauds (110, 150, 300, 600, 1200, 2400, 4800, 9600,19200, 38400, 57600, 115200)
p = Parity (n = none, e = even, o = odd)
d = Data bits (7 or 8)
s = Stop bits (1 or 2)

Example:

```
>SERI 600 N 8 1
600 N 8 1
```

SMODE

Use the command **SMODE** [*xxxx*] to set the user port start-up operating mode.

SMODE [*xxxx*]

where

xxx = STOP, RUN or POLL

Table 23 Selection of Output Modes

Mode	Output	Commands used
STOP	Only by command	All (default mode)
RUN	Automatic output	Only command S
POLL	Only with command **SEND** [*addr*]	Use with RS-485 buses, see RS-422/485 Interface on page 58.

Selected output mode will be activated after power outages.

INTV

Use the command **INTV**[*xxx yyy*] to set the outputting interval for the RUN mode.

where

xxx = Output inverval (0 ... 255). 0: the fastest possible output rate.
yyy = Unit (s, min or h)

Example:

```
>INTV 10 min
Output intrv. :  10 min
```

ECHO

Use the command **ECHO** [*x*] to set the user port echo. The command either enables or disables echo of characters received.

ECHO [*x*]

where

x = ON (default) or
= OFF

NOTE You can use the SERI, SMODE, INTV and ECHO commands to change/view the user port settings even if you are currently connected to the service port.

Data Filtering

The averaging data filter calculates a average over a certain period of time. The lowest measurement noise is achieved with the extended filtering. There are three filtering levels available.

Table 24 Filtering Levels

Setting	Filtering level
OFF	No filtering
ON (default)	Standard = short filtering (about 15 s moving average)
EXTENDED	Extended filtering (default: 1 min average)

Use display/keypad to set the filtering level.

1. Press any of the arrow buttons to open the **MAIN MENU**.
2. Select **Measuring** by pressing the ► arrow button.
3. Select **Filtering** and press **CHANGE** to confirm your selection.
4. Select **Off/Standard/Extended** and press **SELECT** to confirm your selection.
5. Press **EXIT** to return to the basic display.

FILT

Use the serial line to set the filtering level. Use the **FILT** [*xxx*] command

where

xxx = OFF, ON or EXT (default = ON)

Device Information

Use the display/keypad or the serial line to display the device information.

Press the **INFO** button in the basic display to see the following information:

- current sensor operation (for example, AutoCal or Purge) in progress
- present or past unacknowledged errors
- device information

- adjustment information fed by the user
- measuring settings
- information on Purge settings
- serial interface information
- analog output information
- relay output information

Figure 52 Following Device Information on the Display

Proceed in the information views by pressing the **MORE** button as many times as you get the desired information. You can browse through the information displays also with arrow buttons. Press **OK** to return to the basic display.

?

Use the serial line command **?** to check the current transmitter configuration. Command **??** is similar but can also be used if the transmitter is in POLL mode.

```
>?
DMT340 / 2.02
Serial number  : A2150004
Batch number   : A1450004
Adjust. date   : 2005-06-20
Adjust. info   : Vaisala/HEL
Date           : 2000-01-01
Time           : 00:00:23
Serial mode    : STOP
Baud P D S     : 4800 E 7 1
Output interval: 0 s
Address        : 0
Echo           : ON
Pressure       : 1000.00 hPa
Filter         : ON
Ch1 output     : 4...20mA
Ch2 output     : 4...20mA
Ch1 RH    low  : 0.00 %RH
Ch1 RH    high : 100.00 %RH
Ch2 T     low  : -40.00 'C
Ch2 T     high : 180.00 'C
Module 1       : not installed
Module 2       : not installed
>
```

HELP

Use the command **HELP** to list the commands.

```
>help
?          ACAL       ADDR       AERR       ASCL
ASEL       CDATE      CLOSE      CODE       CRH
CT         CTA        CTEXT      DATE       DELETE
DIR        DSEL       DSEND      ECHO       ERRS
FCRH       FDATE      FILT       FORM       FST
FTIME      HELP       INTV       ITEST      MODS
OPEN       PLAY       PRES       R          RESET
SEND       SERI       SMODE      TEST       TIME
UNDELETE   UNIT       VERS       XPRES
>
```

ERRS

Use the command **ERRS** to display transmitter error messages, see Table 25 on page 119 below.

Example:

```
>ERRS
NO ERRORS
>
```

Example:

```
>ERRS
FAIL
Error: Temperature measurement malfunction
Error: Humidity sensor open circuit
>
```

VERS

Use the command **VERS** to display software version information.

Example:

```
>vers
DMT340 / 1.01
>
```

Data Recording

Data recording function is always on and collects data automatically into the memory of the device. Recorded data do not disappear from the memory when the power is switched off. Collected data can be observed in a form of a graph in the graphical view of the display or it can be listed out by using the serial line or MI70 Link program.

Selecting the Data Recording Quantities

If the device is provided with the optional display, the recorded quantities are always those selected for the display. Up to three quantities can be recorded at a time. See section Changing the Quantities and Units on page 81 for instructions on how to select the display quantities with the keypad.

DSEL

Use the serial line command **DSEL** [*xxx*] to select the quantities to be recorded if the transmitter is not equipped with display/keypad.

You may also dump the logged data to the serial line in numeric form with the following commands.

DSEL [*xxx*]

where

xxx = Data recording quantity. See Table 1 and Table 2 on page 13 for the quantities.

Enter the command without parameters and press **ENTER** to display current recording parameters.

Example:

```
>dsel rh t tdf
 RH T Tdf
```

View Recorded Data

If the device is provided with the optional display, the graphical display shows the data of the selected quantities, one at a time. See section *Graphic History* on page 65 for details about graphical display.

DIR

Use the serial line and enter the **DIR** command to check the available files.

The device records five files (five observation periods) for each selected quantity. Thus, total amount of the files depends on the amount of the selected quantities being at minimum 5 and at maximum 15. See Table 8 on page 65.

Select, for example, two quantities (TDF and T). The last two colums illustrate software information that is not essential for the user.

```
>dir
0  Tdf latest 3 hours       00-02-01 19:22:10  135  025A
1  Tdf latest 1 day         00-01-31 19:44:40  135  040C
2  Tdf latest 10 days       00-01-21 16:44:40  135  0802
3  Tdf latest 2 months      99-11-26 10:44:40  135  080C
4  Tdf latest 1 year        98-12-23 22:44:40  135  1003
5  T   latest 3 hours       00-02-01 19:22:10  135  025A
6  T   latest 1 day         00-01-31 19:44:40  135  040C
7  T   latest 10 days       00-01-21 16:44:41  135  0802
8  T   latest 2 months      99-11-26 10:44:41  135  080C
9  T   latest 1 year        98-12-23 22:44:41  135  1003
```

PLAY

Use the **PLAY** [*x*] command to output the selected file to the serial line. Before giving the command, set the correct date and time with **TIME** and **DATE** commands, if needed.

PLAY [*x*]

where

x = 0 ... 14

Example:

```
>play 2
Tdf latest 1 day        00-01-14 21:13:58
Date     Time      trend    min      max
yy-mm-dd hh:mm:ss  'C       'C       'C
00-01-14 21:13:58  -22.60   -22.63   -22.57
00-01-14 21:25:58  -22.55   -22.58   -22.53
00-01-14 21:37:58  -22.50   -22.53   -22.45
00-01-14 21:49:58  -22.43   -22.45   -22.41
00-01-14 22:01:58  -22.35   -22.41   -22.32
00-01-14 22:13:58  -22.31   -22.33   -22.29
```

The <**ESC**> key can be used to interrupt the output listing.

The **PLAY** -1 command can be used to output all files.

NOTE	Output of large amounts of recorded data can take a long time. If you are using the user port, select the highest serial baud supported to reduce the time required for output.

Deleting the Recorded Files

Use the keypad/display to delete the recorded files. Note that the transmitter automatically overwrites the old data when the memory gets full, so manual deletion of the recorded files is not necessary.

1. Press any of the arrow buttons to open the **MAIN MENU.**
2. Select **System** by pressing the ► arrow button.
3. Select **Clear graph memories** by pressing the **CLEAR** button. Press the **YES** button to confirm the selection.

CAUTION	This function clears all the data history from the memory, all graphs included.

DELETE/UNDELETE

Use the serial line to delete or undelete data files.

Use the **DELETE** command to delete all data files.Use the **UNDELETE** command to recover the deleted files.

NOTE	The **UNDELETE** command will only recover the part of the deleted data that has not been recorded over yet.

Analog Output Settings

The analog outputs are set in the factory according to the order form. In case you want to change the settings, follow these instructions. See section Third Analog Output on page 55.

Changing the Output Mode and Range

Both output channels have their own dip switch module with 8 switches, see the position in Figure 2 on page 16 (dip switches for analog output settings).

1. Select the current/voltage output, switch ON either of the switches, 1 or 2.
2. Select the range,switch ON one of the switches from 3 to 7.

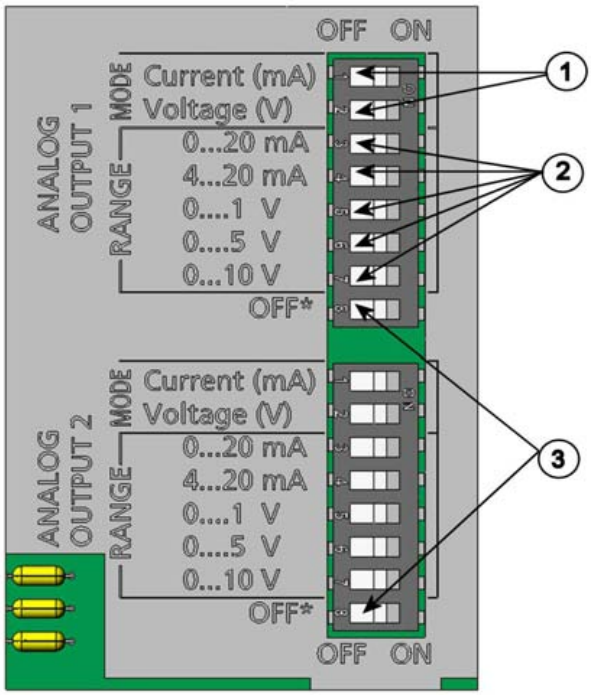


Figure 53 Current/Voltage Switches of Output Modules

Numbers refer to Figure 53 above:

1 = Current/voltage selection output switches (from 1 to 2)
2 = Current/voltage range selection switches (from 3 to 7) in analog output 1 and 2.
3 = Switches for service use only. Keep in OFF position always.

NOTE

Only one of the switches, 1 or 2, must be ON at a time.

Only one of the switches, 3 to 7, must be ON at a time.

Example: 0 ... 5 V voltage output selected for channel 1 and 4...20 mA selected for channel 2.

	OFF	ON	Selection
1			
2			Voltage output selected
3			
4			
5			
6			0...5 V selected
7			
8			

1			Current output selected
2			
3			
4			4... 20 mA selected
5			
6			
7			
8			

NOTE

If you have customized the error output setting (**AERR**), check that the set error values are still valid after changing the output mode/range, see section Analog Output Fault Indication Setting on page 101.

Analog Output Quantities

Use the display/keypad to change and scale the analog output quantities.

1. Press any of the arrow buttons to open the **MAIN MENU.**
2. Select **Interfaces** by pressing the ► arrow button.
3. Select **Analog outputs** by pressing the ► arrow button.
4. Select **Output 1/2/3** by pressing the ► arrow button.
5. Select **Quantity** by pressing the ▲▼ arrow buttons. Confirm your selection by pressing **CHANGE**.
6. Select **the quantity** by using the arrow buttons. Press **SELECT** to confirm your selection.
7. Select **Scale,** lower limit, by pressing the ▲▼arrow buttons. Press **SET** to confirm your selection. Press **OK** to confirm your setting.
8. Select the upper limit by pressing the ▲▼arrow buttons. Use the arrow buttons to set the upper limit value. Press **SET** to confirm your selection. Press **OK** to confirm your setting.
9. Press **EXIT** to return to the basic display.

AMODE/ASEL

Use the serial line to select and scale the analog output quantities. Connect the transmitter to the PC. Open the terminal connection between your PC and the transmitter.

1. Check the analog outputs with the **AMODE** command.

Example:

```
>amode
Ch1 output      : 0...1V
Ch2 output      : 0...1V
>
```

2. Select and scale the quantities for the analog outputs with the command **ASEL** [*xxx yyy zzz*]. Note that the optional quantities can be selected only if they have been selected when ordering the device.

where

xxx = Quantity of channel 1
yyy = Quantity of channel 2
zzz = Quantity of the optional analog output channel 3

Enter always all the quantities for all outputs. For quantities and their abbreviations see Table 1 on page 13.

Use the command **ASEL** [*xxx yyy*] as shown in the example below when using a device with two analog outputs.

Example:

```
>asel td t
Ch1 Td    low  : -20.00 'C ?
Ch1 Td    high : 100.00 'C ?
Ch2 T     low  : -40.00 'C ?
Ch2 T     high : 180.00 'C ?
>
```

Analog Output Tests

Use the display/keypad for testing to test the operation of the analog by forcing the outputs to known values. Measure then the values with a current/voltage meter.

Use the display/keypad for testing.

1. Press any of the arrow buttons to open the **MAIN MENU.**
2. Select **System** by pressing the ► arrow button.
3. Select **Diagnostics** by pressing the ► arrow button.
4. Select **Analog output tests** by pressing the ► arrow button.
5. Select one of the testing options **Force 0 %/50%/100% of scale.** Press **TEST** to confirm your selection. All outputs are tested simultaneously. The actual output value depends on the selected range.
6. Press **OK** to stop testing. Press **EXIT** to return to the basic display.

ITEST

Use the serial line to test the operation of the analog outputs. Use the command **ITEST** [*aa.aaa bb.bbb*] to force the analog outputs to entered values. The set values remain valid until you enter the command ITEST without parameters or RESET the transmitter.

ITEST [*aa.aaa bb.bbb*]

where

aa.aaa = Current or voltage value to be set for channel 1 (mA or V)
bb.bbb = Current or voltage value to be set for channel 2 (mA or V)

Example:

```
>itest 20 5
Ch1 (Td )      :          *        20.000 mA   H'672A
Ch2 (T  )      :          *         5.000 mA   H'34F9
>itest
Ch1 (Td )      :    -23.204 'C     16.238 mA   H'FFFE
Ch2 (T  )      :     22.889 'C      8.573 mA   H'5950
>
```

Analog Output Fault Indication Setting

Factory default state for analog outputs during error condition is 0 V/ 0mA. Please be careful when selecting the new error value. The error state of the transmitter should not cause unexpected problems in process monitoring.

Use the display/keypad to set the analog output fault indication.

1. Press any of the arrow buttons to open the **MAIN MENU.**
2. Select **Interfaces** by pressing the ► arrow button.
3. Select **Analog Outputs** by pressing the ► arrow button.
4. Select **Output 1/2/3** by pressing the ► arrow button.
5. Select Fault indication. Press **SET** to confirm your selection. Enter the fault indication value by using the arrow buttons. Press **OK** to confirm your setting. This value is outputted if a transmitter error occurs.
6. Press **EXIT** to return to the basic display.

AERR

Use the serial line **AERR** command to change the error output.

AERR

Example:

```
>aerr
Ch1 error out  : 0.000V ? 5.0
Ch2 error out  : 0.000V ? 5.0
>
```

NOTE The error output value must be within a valid range for the output type.

NOTE The error output value is displayed only when there are minor electrical faults such as a humidity sensor damage. When there is a severe device malfunction, the error output value is not necessarily shown.

Operation of the Relays

Quantity for the Relay Output

A relay monitors the quantity chosen for the relay output. Any of the quantities available can be chosen.

Relay Setpoints

When the measured value is in between the "above" and "below" values, the relay is passive. When choosing lower value as "above" value and higher value as "below" value, the relay is passive when the measured value is not between the setpoints.

You can also set only one setpoint.

Hysteresis

Hysteresis function is to prevent the relay switching back and forth when measured value is near to the setpoint values.

Relay is activated when the measured value passes the exact value of the setpoint. When returning and passing the setpoint again relay is released only until the value reaches the setpoint increased/decreased by the hysteresis value.

Hysteresis should be smaller than difference of the setpoints.

Example: When the 'active above' value is -30 ºC and the hysteresis value is 2 ºC, relay activates when the dewpoint reaches -30 ºC. As the dewpoint then decreases, relay releases at -32 ºC.

```
>rsel tdf t
Rel1 Tdf  above: - ? -30
Rel1 Tdf  below: -30.00 'C ? -
Rel1 Tdf  hyst : 5.00 'C ? 2
Rel1 Tdf  enabl: ON ?
Rel2 T    above: 30.00 'C ?
Rel2 T    below: 20.00 'C ?
Rel2 T    hyst : 1.00 'C ?
Rel2 T    enabl: ON ?
>
```

NOTE	If both setpoints are specified and "above" setpoint is lower than "below" setpoint, the hysteresis works in the opposite direction, that is, relay is **released** when the measured value passes the exact value of the setpoint.

Relay Indicating Transmitter Error Status

You can set a relay to follow the operation status of the device. By selecting FAULT/ONLINE STATUS for output quantity a relay changes state on the basis of the operation status as follows:

FAULT STATUS

Normal operation : relay active (C and NO outputs are closed)
Not measuring state (error state or power off): relay released (C and NC outputs are closed)

ONLINE STATUS

Live measurement (data available) : relay active (C and NO outputs are closed)
No live data (for example, error, autocal, purge or adjustment mode) : relay released (C and NC outputs are closed)

Enabling/Disabling the Relays

You can deactivate the relay outputs for example for service purposes of your system.

Operation of the Indication Leds

Relay is activated: led is lit.

Relay is not activated: led is not lit.

Setting the Relay Outputs

NOTE

When having only one relay module installed, its relays are called 'relay 1' and 'relay 2'.

When having two relay modules, the relays of the the module connected to slot **MODULE 1** (communications) are called 'relay 1' and relay 2' and relays connected to slot **MODULE 2** are called 'relay 3' and 'relay 4'

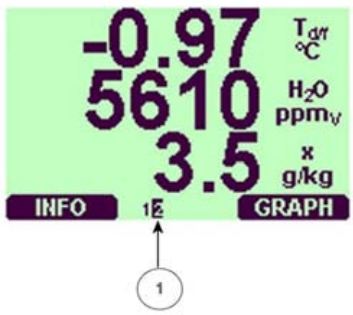


Figure 54 Relay Availability

Number refers to Figure 54 above:

1 = Lists enabled relays. Activation state shown in black. Disabled relays are not shown.

Use the display/keypad to set the relay outputs.

1. Press any of the arrow buttons to open the **MAIN MENU**.
2. Select **Interfaces**, confirm by pressing the ►arrow button.
3. Select **Relay outputs**, confirm by pressing the ►arrow button.
4. Select **Relay 1/2/3/4**, confirm by pressing the ►arrow button.
5. Select the **Quantity**, confirm by pressing **Change**. Select the Quantity by using the arrow buttons. Confirm your selection by pressing **Select**. (Press **Fault Status** when the relay follows the transmitter error.) Press **Change** to to set the value.
6. Select **Act. above / Act**. below. Press **SET** to confirm your selection. If asked, select **MODIFY** if you want to set the setpoint by using the arrow buttons. Select **REMOVE** if you want to remove the setpoint.

7. Select Hysteresis Press **SET**. Set the hysteresis by using the arrow buttons. Press **OK**.
8. Select Relay enable, press **ON/OFF** to enable/disable the relay.

RSEL

Use the serial line to select the quantity, setpoints and hysteresis or enable/disable the relay outputs. Enter the **RSEL** command.

RSEL [*q1 q2 q3 q4*]

where

q1 = quantity for the relay 1 or Fault/Online
q2 = quantity for the relay 2 or Fault/Online
q3 = quantity for the relay 3 or Fault/Online
q4 quantity for the relay 4 or Fault/Online

Factory setting: all relays disabled.

Use the quantity abbreviations presented above. See Table 1 on page 13 and Table 2 on page 14.

Example of window limit switch (upper and lower setpoints for control parameter): Selecting relay 1 to follow dewpoint/frost point temperature measurement and relay 2 to follow temperature measurement. Two relay setpoints are set for both relays.

```
>rsel tdf t
Rel1 Tdf  above: - ? -10
Rel1 Tdf  below: - ? -30
Rel1 Tdf  hyst : 0.00 'C ? 5
Rel1 Tdf  enabl: OFF ? on
Rel2 T    above: - ? 30
Rel2 T    below: - ? 20
Rel2 T    hyst : 0.00 'C ? 1
Rel2 T    enabl: OFF ? on
>
```

Example of normal limit switch (one setpoint for relay activation/deactivation): Selecting relay 1 to follow relative humidity, relay 2 to follow temperature, relay 3 to follow dewpoint and relay 4 to follow dewpoint. One setpoint is chosen for all the outputs.

```
>rsel rh t td td
Rel1 RH   above: 60.00 %RH ? 70
Rel1 RH   below: 70.00 %RH ? -
Rel1 RH   hyst : 2.00 %RH ? 2
Rel1 RH   enabl: ON ? on
Rel2 T    above: 50.00 'C ? 60
Rel2 T    below: 40.00 'C ? -
Rel2 T    hyst : 2.00 'C ? 2
Rel2 T    enabl: ON ? on
Rel3 Td   above: 5.00 'C ? 10
Rel3 Td   below: 0.00 'C ? -
Rel3 Td   hyst : 1.00 'C ? 1
Rel3 Td   enabl: OFF ? on
Rel4 Td   above: 0.00 'C ? 20
Rel4 Td   below: 0.00 'C ? -
Rel4 Td   hyst : 0.00 'C ? 2
Rel4 Td   enabl: OFF ? on
>
```

Example of using relay 1 as fault alarm: selecting relay 1 to follow the fault status and relay 2 to follow the temperature measurement.

```
>rsel fault t
Rel1 FAUL above: -
Rel1 FAUL below: -
Rel1 FAUL hyst : -
Rel1 FAUL enabl: ON ?
Rel2 T    above: 0.00 'C ? 30
Rel2 T    below: 0.00 'C ? -
Rel2 T    hyst : 0.00 'C ? 2
Rel2 T    enabl: OFF ? ON
```

Testing the Operation of Relays

Testing activates relays even if they are disabled.

Use the module push buttons to activate the relays. Press the **REL 1** or **REL 2** button to activate the corresponding relay.

Use the display/keydpad to test the operation of relays.

1. Open the **MAIN MENU** by pressing any of the arrow buttons.
2. Select **System**, press the ►arrow button.
3. Select **Diagnostics**, press the ►arrow button.
4. Select **Relay tests**, press the ►arrow button.
5. Select **Invert relay 1...** , press **TEST**. Now the selected relay output is forced to opposite state. Press **OK** to return to normal operation.
6. Press **EXIT** to return to the basic display.

RTEST

Use the serial line command **RTEST** [ON/OFF ON/OFF] to test the operation of the relays.

Example: Testing all four relays.

```
>rtest on on on on
 ON ON ON ON
>
>rtest off off off off
 OFF OFF OFF OFF
```

Enter the command **RTEST** to stop testing.

Operation of the RS-485 Module

RS-485 interface enables communication between RS-485 network and DMT340 transmitter. The RS-485 interface is isolated and offers a maximum communications rate of 115 200 bits/s. (For maximum bus length of 1 km, use bit rate 19200 b/s or less.)

When selecting an RS-232-RS-485 converters for the network, avoid self powered converters as they don't necessarily support the needed power consumption.

Echo function shall be always disabled (OFF) when using the 2-wire connection. When using the 4-wire connection you can disable/enable the echo setting.

NOTE User port on DMT340 main board cannot be used and connected when RS-485 module is connected. Service port is operating normally.

Networking Commands

Set the RS-422/485 interface by using the following commands. The other serial line commands are presented in section List of Serial Commands on page 74.

RS-485 configuration commands **SERI; ECHO; SMODE; INTV** and **ADDR** may be entered by using either the service port or RS-422/485 port. Also the optional display/keypad can be used, see section Display/Keypad on page 64.

SERI

Use the **SERI** [*b p d s*] command to input RS-485 bus settings.

where

b = baud rate (300, 600, 1200, 2400, 4800, 9600,19200, 38400, 57600, 115200)
p = parity (n = none, e = even, o = odd)
d = data bits (7 or 8)
s = stop bits (1 or 2)

ECHO

Use the **ECHO** [*x*] command to enable/disable echo of characters received over the serial line.

where

x = ON/OFF (default = OFF)
When using 2-wire connection, echo must be always disabled.

SMODE

Use the **SMODE** [*xxxx*] command to set the serial interface mode.

where

xxxx = STOP, RUN or POLL
In STOP mode: measurements output only by command, all commands can be used
In RUN mode: outputting automatically, only command S can be used to stop, see command INTV below.
In POLL mode: measurements output only with command SEND. See command ADDR on page 110.

When several transmitters are connected to the same line, each transmitter must be entered an own address in the initial configuration, and POLL mode must be used.

INTV

Use the **INTV** [*n xxx*] command to set the RUN mode output interval.

where

n = 1 - 255
xxx = S, MIN or H

Sets the RUN mode output interval. The time interval is used only when the RUN mode is active. For example, the output interval is set to 10 minutes.

```
>INTV 10 min
Output intrv. :    10 min
>
```

Setting RUN output interval to zero enables the fastest possible output rate.

ADDR

Addresses are required only for POLL mode (see serial line command SMODE on page 87). Use the **ADDR** [*aa*] command to input the RS-485 transmitter address.

where

aa = address (0 ... 99) (default = 0)

Example: the transmitter is entered the address 99.

```
>ADDR <cr>
Address : 2 ?  99
```

OPEN [*nn*]

When all transmitters on the RS-485 bus are in POLL mode the **OPEN** [*nn*] command sets one transmitter temporarily to STOP mode so that other commands can be entered.

where

nn = address of the transmitter (0 ... 99)

CLOSE

The **CLOSE** command switches the transmitter back to the POLL mode.

Example:

```
>OPEN 2 (opens the line to transmitter 2, other
transmitters stay in POLL mode)
>CRH(for example, calibration performed)
...
>CLOSE (line closed)
```

Sensor Functions

AutoCal

To obtain the best possible accuracy in measurements taken in dry environments, DMT340 has a built-in AutoCal. During the AutoCal, DMT340 adjusts the dry-end reading to correspond to the calibrated values. This is a unique and patented method to avoid errors in accuracy when monitoring low dewpoints.

The AutoCal is carried out if the following criteria for the measurement environment are fulfilled:

- Relative humidity must be <2 % (DMT340 M-sensor).
- Temperature must be 0<T<80 ºC (or sensor warming activated for -40<T<80 ºC).
- Humidity environment must be stable. The maximum change in the dewpoint can be 2 ºC in 15 seconds.

NOTE	AutoCal cannot operate if the above conditions are not fulfilled.

If the adjustment in the AutoCal reaches a preset maximum value or if the AutoCal correction fails, for example, because of unstable conditions, a new AutoCal will take place later (if the automatic AutoCal is turned on).

Automatic AutoCal

As a default, the automatic AutoCal in DMT340 is turned on. In this mode, the calibration takes place automatically if the dewpoint or temperature changes significantly, typically more than 10 ºC. However, if there are no changes in the conditions, the AutoCal will take place repeatedly after one hour from the last AutoCal.

Manual AutoCal

To check that AutoCal has taken place for obtaining the most accurate measurement in a very dry environment, you can perform Autocal manually before measuring as follows:

1. Open the **MAIN MENU** by pressing any of the arrow buttons.
2. Select **Measuring**, press the ►arrow button.
3. Select **Manual AutoCal**, press the ►arrow button.
4. Press **START** to start AutoCal. If the AutoCal conditions are not fulfilled, a note appears on the display informing that the calibration cannot be made.

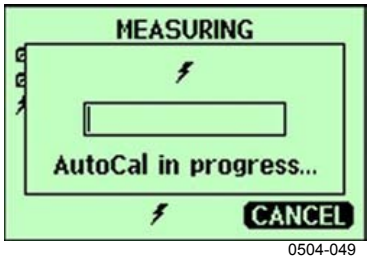


Figure 55 Following AutoCal on the Display

5. Press **EXIT** to return to the basic display.

Sensor Purge

Sensor Purge is a feature available for the DMT340 M-sensor. The Purge should be carried out to achieve the shortest response times and the best long-term stability.

Sensor Purge is an automatic procedure, in which the sensor is dried. Thus, the sensor will response very fast when installing the probe from an ambient to a dry gas. This will also ensure together with AutoCal the best measurement accuracy and long-term stability.

As a default, the interval Purge and power-up Purge are turned on automatically in DMT340. It is recommended not to turn them off. The automatic sensor Purge can also be started manually. If enabled, power-up Purge will start always about 10 seconds after reset. If the power is continuously turned on in DMT340, the automatic sensor Purge will be performed at an interval of 24 hours.

Manual Sensor Purge

The Purge should be performed always before calibration (see the calibration instructions) or when there is a reason to believe that a sensor has become exposed to an interfering chemical.

1. Open the **MAIN MENU** by pressing any of the arrow buttons.
2. Select **Measuring**, press the ►arrow button.
3. Select **Purge**, press the ►arrow button.
4. Select Manual Purge using the arrow buttons.

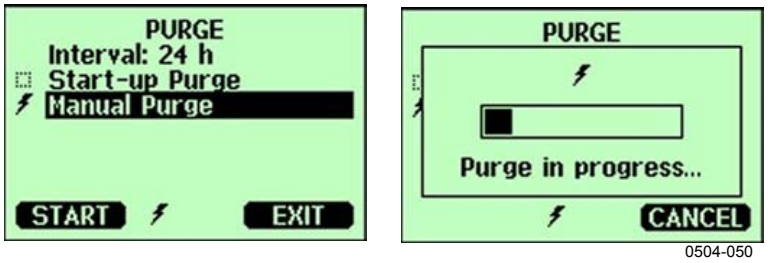


Figure 56 Performing Manual Purge

5. Press **START** to start manual Purge. Press **CANCEL** to interrupt the manual sensor Purge.
6. Press **EXIT** to return to the basic display.

Interval Purge

When the DMT340 leaves the factory the interval Purge takes place repeatedly with the time intervals set in the factory. The user can change the interval in which the purge takes place by using serial commands or with the optional display/keypad. This can be needed if the measuring environment contains high concentrations of interfering chemicals.

Power-up Purge

Purge can be set to start within 10 seconds from the power-up of the device. This function can be enabled by using the serial line or the display/keypad.

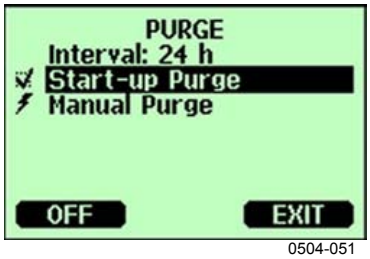


Figure 57 Activating Start-up Purge

1. Press ON to activate Start-up Purge. Pressing OFF disables the function.
2. Press EXIT to return to the basic display.

PUR

With the PUR command you can enable or disable interval and power-up Purge and set the interval for interval purge. The default purge interval is 24 hours.

It is not recommended to change these settings.

Type **PUR** and press ENTER to proceed.

Example:

```
>pur
Interval Purge : OFF ?
Interval       : 1440 min ?
Power-up Purge : OFF ?
Duration       : 60 s ?
Settling       : 240 s ?
Temperature    : 180 'C ?
Temp. diff.    : 0.5 'C ?
Trigger Purge  : OFF ?
RH trigger     : 0 %RH ?
>
```

NOTE When Purge in power up is enabled, wait about 5 min after power up before taking measurements. The output channels are locked for the first operation minutes to the initial measured values.

PURGE

Use the command **PURGE** to start the manual Purge. Enter **PURGE** to start Purge immediately.

Example:

```
>purge
Purge started, press any key to abort.
>
```

The prompt '>' appears when the heating period is over. However, the transmitter outputs are locked to values measured before purge until the settling time is over.

Sensor Warming

DMT340 contains a sensor warming function, that is, when humidity reaches a set limit (default: 70%RH), sensor warming operation is activated automatically. Sensor warming continues as long as the humidity is above that limit.

When the warming starts, the sensor operation indicator is displayed on the optional display and relays configured as "online status" (if any) will be released. Warming does not affect $T_{d/f}$,$T_{d/f\ atm}$, T_d,$T_{d\ atm}$, x, H2O and Pw quantities, all others will be frozen.

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CHAPTER 5

MAINTENANCE

Periodic Maintenance

Cleaning

Clean the transmitter enclosure with a soft, lint-free cloth moistened with mild detergent.

Changing the Probe Filter

1. Unscrew the filter from the probe head.
2. Screw a new filter on the probe head. When using the stainless steel filter, take care to tighten the filter properly (recommended force 130 Ncm).

New filters can be ordered from Vaisala, see Available Options and Accessories Table 32 on page 142.

Calibration and Adjustment

The DMT340 is fully calibrated and adjusted as shipped from factory. Typical calibration interval is two years. Depending on the application it may be good to make more frequent checks. Calibration must be done always when there is a reason to believe that the device is not within the accuracy specifications.

It is recommended that calibration and adjustment should be carried out in Vaisala Service CentersVaisala Service Centers (contact information on page 145).

Error States

In error state the quantity is not measured and the output is shown as follows:

- analog channel outputs 0 mA or 0 V (you can use the serial line command **AERR** or display/keypad to change this fault indication value, see section Analog Output Fault Indication Setting on page 101)
- the serial port outputs stars (***)
- the cover LED is blinking
- optional display: error indicator is lit.
- The error indicator disappears when the error state is over and you have checked the error message. Press the **INFO** button to display the error message.

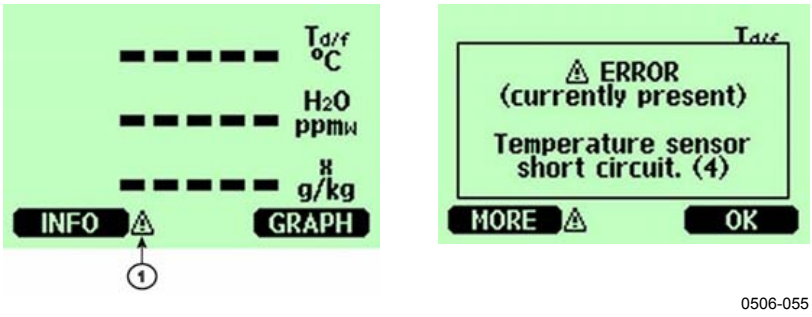

Figure 58 Error Indicator and Error Message

Number refers to Figure 58 above:

1 = Error Indicator

You can also check the error message via the serial interface by using the command **ERRS**. In case of constant error, please contact the Vaisala Service Centers (contact information on page 145).

Table 25 Error Messages

Error Message	Action
Humidity sensor measurement malfunction.	Check the integrity of the humidity probe and the probe cable. Clean the probe from dirt, water, ice or other contaminants.
Humidity sensor short circuit	Check the integrity of the humidity probe and the probe cable. Clean the probe from dirt, water, ice or other contaminants.
Humidity sensor open circuit	Check the integrity of the humidity probe and the probe cable.
Temperature sensor open circuit.	Check the integrity of the humidity probe and the probe cable.
Temperature sensor short circuit.	Check the integrity of the humidity probe and the probe cable. Clean the probe from dirt water, ice or other contaminants.
Temperature measurement malfunction	Check the integrity of the humidity probe and the probe cable. Clean the probe from dirt water, ice or other contaminants.
Temperature sensor current leak.	Check the integrity of the humidity probe and the probe cables. Clean the probes from dirt, water, ice or other contaminants.
Internal ADC read error	Internal transmitter failure. Remove the transmitter and return the faulty unit to Vaisala Service.
Internal EEPROM read error	Internal transmitter failure. Remove the transmitter and return the faulty unit to Vaisala Service.
Internal EEPROM write error	Internal transmitter failure. Remove the transmitter and return the faulty unit to Vaisala Service.
Add-on module 1 (or 2) connection failure	Turn off the power and check the module connection. Turn on the power.
Device internal temperature out of range	Ensure that the operating temperature is within the valid range.
Operating voltage out of range	Ensure that the operating voltage is within the valid range.
Internal analog voltage out of range	Internal transmitter failure. Remove the transmitter and return the faulty unit to Vaisala Service.
Internal system voltage out of range	Internal transmitter failure. Remove the transmitter and return the faulty unit to Vaisala Service.
Internal ADC reference voltage out of range	Internal transmitter failure. Remove the transmitter and return the faulty unit to Vaisala Service.
Internal analog output reference voltage out of range	Internal transmitter failure. Remove the transmitter and return the faulty unit to Vaisala Service.
Configuration switches for analog output 1/2/3 set incorrectly	Check and re-set the switches, see Analog Output Settings on page 96.
EEPROM failure on add-on module 1 (or 2)	Disconnect the power and check the analog output module connection.
Communication module installed in incorrect add-on module slot	Disconnect the power and change the communication module to another module slot.
Unknown/incompatible module installed in add-on module slot 1(or 2)	Ensure that the module is compatible with the DMT340.

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CHAPTER 6

CALIBRATION AND ADJUSTMENT

Calibration

DMT340 is fully calibrated and adjusted as shipped from the factory. The typical calibration interval is two years. Calibration must always be done when there is reason to believe that the device is not within the accuracy specifications.

It is recommended that the device should be sent toVaisala Service Centers for calibration and adjustment, see contact information on page 145.

(Vaisala hand-held dewpoint meter DM70 can also be used).

User Calibration and Adjustment

When adjusting DMT340, the reading is changed to correspond to the reference value. After the adjustment, the original calibration certificate shipped with the product is no longer valid.

NOTE	Dewpoint calibration should be carried out in Vaisala or in other laboratory conditions.

The reference condition of the dewpoint must be traceable to the appropriate standards. The user adjustment requires a stable humidity generator capable of producing the required humidities and a calibrated reference dewpoint meter. For adjustment, the probe and the reference dewpoint meter are connected to the humidity generator output, the reference condition is adjusted and let to stabilize. After

the probe and the reference dewpoint meter are stabilized, the DMT340 reading is adjusted to correspond the reference value.

For the adjustment of DMT340 equipped with DRYCAP®180M-sensor, the reference low dewpoint temperature should be between -57 °C and -67 °C (-70.6 °F ... -88.6 °F) in the gas temperature of approx. +20 °C.

To ensure the correctness of the adjustment, the reference dewpoint meter must be calibrated at a recognized laboratory with a known uncertainty and traceability to national or international standards.

To see when the adjustment was made last, select **Adjustment information** (with keypad **INFO** button in the main view, or with serial commands **?** and **CDATE**) or check the date from the **Device information**. See section Device Information on page 89.

Opening and Closing the Adjustment Mode

Open the transmitter cover. The buttons needed in the adjustment are on the left-hand side of the motherboard, see Figure 2 on page 16.

Press the **ADJ** button to enable the adjustment mode. The indicator led indicates the adjustment availability.

Table 26 Indicator Led Functions

Indicator Led Function	Description
LED off	adjustment locked
LED on	adjustment available
LED blinking evenly	measurement not stabilized
LED blinking with short pulses	performing Purge/Autocal

Press the **ADJ** key again to disable the adjustment mode.

NOTE Fixed pressure compensation of 1013.25 hPa is used when in adjustment mode. Adjustments should be performed at ambient pressures.

Adjustment Information

These data are shown on the device information. (see section Device Information on page 89. Use the display/keypad to feed the adjustment information.

1. If you are not in the adjustment menu, press the ADJ button on the motherboard to open the **ADJUSTMENT MENU**.
2. Press the ► arrow button to select **Adjustment info.**
3. Select **Date**, press **SET**. Enter the date by using the arrow buttons. Press **OK**.
4. Select **i**, press **CHANGE**. Enter information text including 17 characters at maximum by using the arrow buttons. Press **OK**.
5. Press **EXIT** to return to the basic display.

CTEXT and CDATE

Use the serial line command **CTEXT** to enter text in to the adjustment information field. First press the adjustment button on the motherboard inside the transmitter.

Example:

```
>ctext
Adjust. info   : (not set) ? -60ºC IKØ
>
```

Use the command **CDATE** to input date to the adjustment information field. Set the adjustment date in format YYYY-MM-DD.

Example:

```
>cdate
Adjust. date   : (not set) ? 2004-05-21
>
```

Press the adjustment button on the motherboard inside the transmitter to disable the adjustment function.

Adjusting Dewpoint $T_{d/f}$

Before adjusting dewpoint, first carry out the two-point relative humidity adjustment, which will ensure the basic adjustment level. After that, continue with the actual $T_{d/f}$ adjustment.

Two-point Relative Humidity Adjustment using Display/Keypad

For DMT340 M-sensor, the humidity references of 0 % (for example Nitrogen) and 10 ... 20 % are required.

NOTE	For the DMT340 M-sensor both reference humidities must be below 20% RH.

To make the adjustment, follow the instructions below. Use preferably the display keypad and let the display information guide you through the two-point RH adjustment process.

1. Press the Adjustment button ADJ on the motherboard inside the transmitter to enable adjustments.
2. Select Adjust Td measurement, press the ►arrow button.
3. Select 2-point RH adjustment, press Start. Press OK to perform purge of point 1.

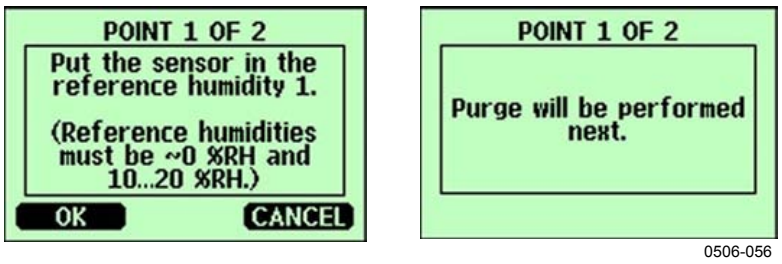

Figure 59 Starting the Adjustment

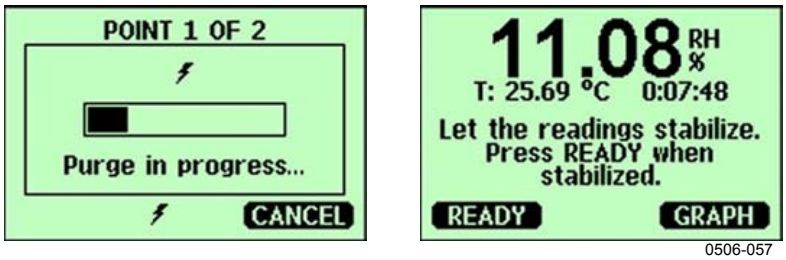

Figure 60 Performing Purge

4. Press GRAPH to follow the RH and T stabilization on graphical display:

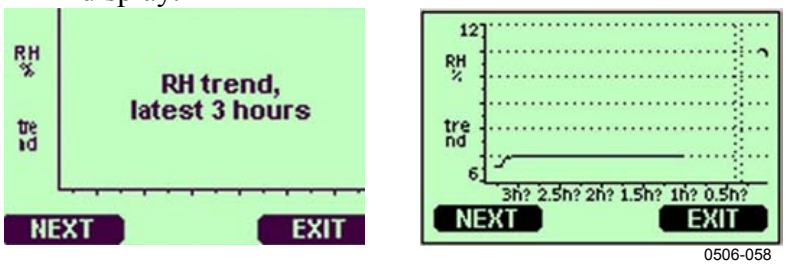

Figure 61 Following the RH Trend on Graphical Display

5. Follow the instructions on the display. Use the arrow buttons to enter the actual humidity of the reference used.

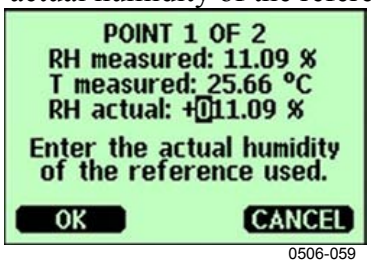

Figure 62 Ending Adjustment of Point 1

6. Continue adjustment of point 2 as instructed by the display:

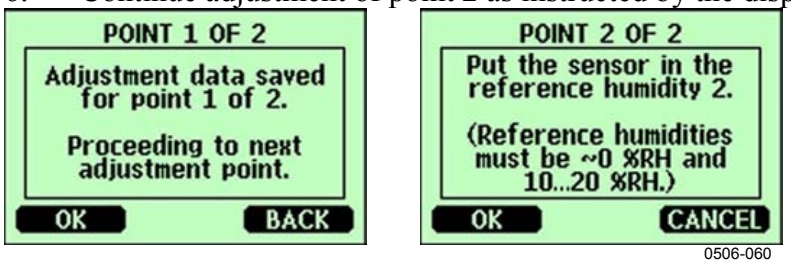

Figure 63 Proceeding to Adjustment of Point 2

7. Follow the purge progress and wait for stabilization of Point 2 as in Figure 60 on page 124. Press READY when stabilized.
8. Use the arrow buttons to enter the actual humidity of the reference used. Follow the instructions on the display to complete the RH adjustment.

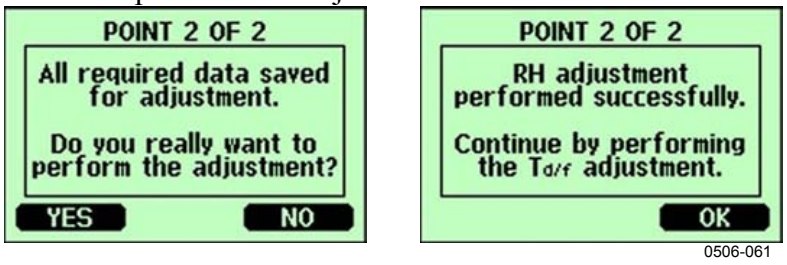

Figure 64 Completing Adjustment of Point 2

Two-point Relative Humidity Adjustment Using Serial Line

Perform purge before adjustment. Use the PURGE command. See section PURGE on page 115.

Then press adjustment button on the motherboard inside the transmitter to enable adjustments

Perform adjustment with the **FCRH** command. Wait at least 1 hour before adjusting each point.

FCRH

Example:

```
>fcrh
 RH :      3.90  Ref1 ? 0
 Press any key when ready ...
 RH :      3.90  Ref2 ? 15
OK
>
```

One-point Dewpoint Adjustment Using Display/Keypad

Before proceeding with the $T_{d/f}$ adjustment you must perform the RH adjustment. For DMT340 M-sensor, the reference temperature of the dewpoint should be -57 ˚C ... -67 ˚C (-70.6 ˚F ... -88.6 ˚F).

Use preferably the display/keypad to perform one-point dewpoint $T_{d/f}$ adjustment. To adjust the dewpoint, follow the instructions below:

1. Press the **ADJ** button on the motherboard to open the **ADJUSTMENT MENU**.
2. Press the ► arrow button to select **Adjust T_d measurement**.
3. Select by pressing **1-point T_d adjustment**. Press **START** to start adjusting.
4. Leave the sensor to stabilize for at least 5 hours. Follow the instructions on the display.

Figure 65 Following Stabilization

5. Purge will be performed next. Follow the purge progress on the display.
6. Let the sensor stabilize for at least 1 hour after the purge before proceeding with the adjustment. Press READY when stabilized.

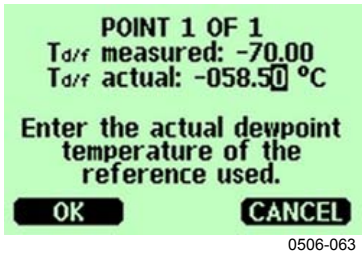

Figure 66 Proceeding with $T_{d/f}$ Adjustment

7. Enter the actual reference frostpoint temperature.
8. The transmitter performs $T_{d/f}$ adjustment. This may take up to one minute.

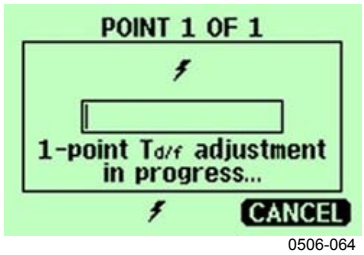

Figure 67 Completing $T_{d/f}$ Adjustment

9. After adjustment wait for sensor to cool down which will take 2 minutes at the maximum. The adjustment is now completed.

NOTE	Several AutoCals can be necessary after this adjustment has been performed until the transmitter reaches full accuracy.

One-point Dewpoint Adjustment Using Serial Line

1. Let the sensor stabilize for at least 5 hours.
2. Use the command **PURGE** to start the manual Purge. See section PURGE on page 115.
3. Wait at least 1 hour. Then press adjustment button on the motherboard inside the transmitter to enable adjustments.
4. Use the **IKØ** command to perform the adjustment.

IKØ

Example:

```
>ik0
Tf :   -19.74 'C  Ref ? -60
Wait for AutoCal data...OK
>
```

5. Press the adjustment button on the motherboard inside the transmitter to disable adjustments.

NOTE	Several AutoCals can be necessary after this adjustment has been performed until the transmitter reaches full accuracy.

Adjusting Temperature

Adjusting Temperature Using Display/Keypad

Use preferably the display/keypad to adjust the temperature.

1. Press the **ADJ** button on the motherboard to open the **ADJUSTMENT MENU**
2. Press the ► arrow button to select **Adjust T measurement**.
3. Select by pressing **1-point or 2-point adjustment**. Press **START** to start adjusting.
4. Remove the filter from the probe and insert the probe head into a reference temperature.
5. Wait at least 30 minutes for the sensor to stabilize. Follow the stabilization from the **GRAPH** display.
6. Press **READY** when stabilized. Enter the reference temperature by using the arrow buttons.

When carrying out the 2-point adjustment proceed to the next adjustment point and carry out the procedure as described in the previous item. Note that the difference between the two temperature references must be at least 30 ºC.

7. Press **OK**. Press **YES** to confirm the adjustment.
8. Press **OK** to return to the adjustment menu
9. Press **EXIT** to return to the basic display.

Adjusting Temperature Using Serial Line

CT

Use the serial line command **CT** to adjust the temperature.

1. Press the **ADJ** button on the motherboard to open the adjustment mode.
2. Remove the probe filter and insert the probe head into the reference temperature.
3. Use the command **CT** and press ENTER.

Type **C** and press **ENTER** to check if the reading is stabilized

4. Let the reading stabilize, enter the reference temperature after the question mark and press ENTER three times.

When having another reference temperature (2-point calibration) press ENTER twice and insert the probe to the second reference. When the reading is stabilized, enter the second reference temperature after the question mark and press **ENTER**. Please, note that the difference between the two temperature references must be at least 30 ºC.

Example (1-point adjustment):

```
>ct
T   :    16.06  Ref1 ? c
T   :    16.06  Ref1 ? c
T   :    16.06  Ref1 ? c
T   :    16.06  Ref1 ? c
T   :    16.06  Ref1 ? c
T   :    16.06  Ref1 ? 16.0
Press any key when ready ...
T   :    16.06  Ref2 ?
OK
>
```

OK indicates that the calibration has succeeded.

5. Press the **ADJ** button on the motherboard to close the adjustment mode.
6. Take the probe out of the reference conditions and replace the filter.

Adjusting Analog Outputs

In the analog output calibration the analog output is forced to the following values:

current output = 2 mA and 18 mA
voltage output = 10 % and 90 % of the range

Connect DMT340 to a calibrated current/voltage meter in order to measure either current or voltage depending on the selected output type. Use the display/keypad or the serial line to do this.

Adjusting Analog Outputs using Display/Keypad

1. Press the ADJ button on the motherboard to open the **ADJUSTMENT MENU**.
2. Press the ► arrow button to select **Adjust analog outputs**.
3. Select the output to be adjusted **Adjust analog output 1/2/3**, press **START**.
4. Measure the first analog output value with a multimeter. Enter the measured value by using the arrow buttons. Press **OK**.
5. Measure the second analog output value with a multimeter. Enter the measured value by using the arrow buttons. Press **OK**.
6. Press **OK** to return to the adjustment menu.
7. Press **EXIT** to close the adjustment and to return to the basic display.

Adjusting Analog Outputs using Serial Line

ACAL

Use the serial line to perform the analog output adjustment. Use the **ACAL** command and enter the multimeter reading.

Example (current outputs):

```
>ACAL
Ch1  I1   (mA) ?    2.046
Ch1  I2   (mA) ?    18.087
Ch2  I1   (mA) ?    2.036
Ch2  I2   (mA) ?    18.071
>
```

Press the adjustment button on the motherboard inside the transmitter again to disable the adjustment function.

CHAPTER 7

SPECIFICATIONS

Performance

Measured variables

Dewpoint

Sensor	Vaisala DRYCAP®180M
Measurement range	-70 ... +80 °C (-94 ... +176 °F Td
For continuous use	-70 ... +45 °C (-94 ... +113 °F) Td
Accuracy	
up to 20 bar / 290 psia	see the accuracy graph
20..50 bar / 290..725 psia	+1 °C Td

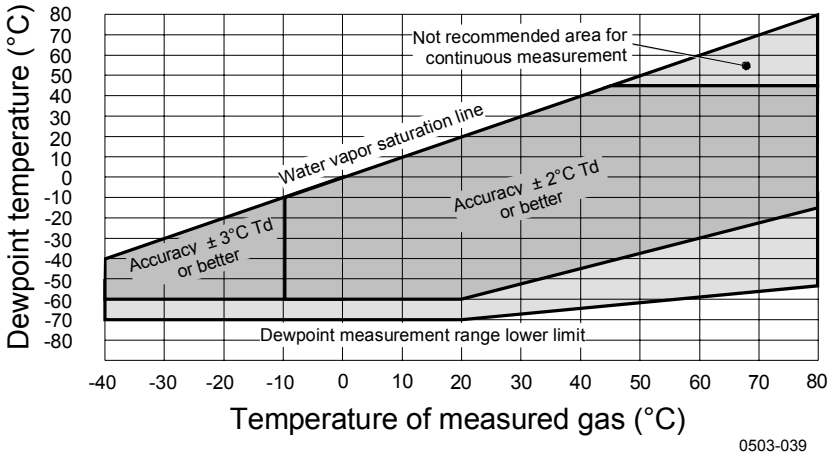

Figure 68 Dewpoint Accuracy Graph

Response time 63% [90%] at +20°C gas temperature
Flow rate 1 l/min and 1 bar pressure

-60 ->-20 °C Td (-76 ->-4 °F Td)	5s [10s]
-20 ->-60 °C Td (-4 -> -76 °F Td)	45s [10min]

Temperature	
Measurement range	0 ... +80 °C (+32 ... +176 °F)
Accuracy	±0.2°C at room temperature
Temperature sensor	Pt 100 IEC 751 1/3 class B
Relative humidity	
Measurement range	0..70%RH
Accuracy (RH <10 %RH, at + 20 °C)	±0.004 %RH + 20% of reading
ppmv (dry)	
Measurement range (typical)	10 ... 2500 ppm
Accuracy (at + 20 °C, 1 bar)	1 ppm + 20% of reading

Other measurement parameters available (depends on model)
mixing ratio, absolute humidity, pressure dewpoint calculated to 1 bar, temperature difference (T-Td), water vapor pressure

Operating environment

Mechanical durability	Up to +180 °C (+356 °F)
for transmitter body	-40 ... +60 °C (-40 ... +140 °F)
with display	0 ... +60 °C (32 ... +140 °F)
Storage temperature range	-55 ... +80 °C (-67 ... +176 °F)
Pressure and temperature range for probes	See probe specifications
Measured gases	non corrosive

Complies with EMC standard EN61326-1:1997 + Am1:1998 + Am2:2001
Industrial Environment

Inputs and outputs

Operating voltage	10 ... 35 VDC, 24 VAC
with optional power supply module	100 ... 240 VAC 50/60 Hz
Default start-up time after sensor Purge and Autocal	About 6 min
Start-up time after power-up	3 s
Power consumption @ 20 °C (Uin 24VDC)	
RS-232	max 25 mA
Uout 2 x 0 ... 1V / 0 ... 5V / 0 ... 10V	max 25 mA
Iout 2 x 0 ... 20 mA	max 60 mA
display and backlight	+ 20 mA
during sensor purge	+ 110 mA max
Analog outputs (2 standard, 3rd optional)	
current output	0 ... 20 mA, 4 ... 20 mA
voltage output	0 ... 1 V, 0 ... 5 V, 0 ... 10 V
Accuracy of analog outputs at 20 °C	± 0.05 % full scale
Temperature dependence of the analog outputs	± 0.005 %/°C full scale
External loads	
current ouputs	RL < 500 ohm
0 ... 1V output	RL > 2 kohm
0 ... 5V and 0 ... 10V outputs	RL > 10 kohm
Max wire size	0.5 mm2 (AWG 20) stranded wires recommended

Inputs and Outputs

Digital outputs	RS-232, RS-485 (optional)
Relay outputs (optional)	0.5 A, 250 VAC, SPDT
Display (optional)	LCD with backlight, graphic trend display
Menu languages	English, French, Spanish, German, Japanese, Russian, Swedish, Finnish,

Mechanics

Cable bushing	M20x1.5 For cable diameter 8 ... 11mm/0.31..0.43"
Conduit fitting	1/2"NPT
User cable connector (optional)	M12 series 8- pin (male)
option 1	with plug (female) with 5 m / 16.4 ft black cable
option 2	with plug (female) with screw terminals
Probe cable diameter	5.5 mm
Probe cable lengths	2 m, 5 m or 10 m
Housing material	G-AlSi 10 Mg (DIN 1725)
Housing classification	IP 65 (NEMA 4X)
Housing weight	1.2 kg

Probe specifications

Operating temperatures for probes*	-40 ... +80 °C (-40…+176 °F)
Pressure ranges for probes	
DMT342	0 … 50 bar / 0 ... 725 psia
DMT344	0 … 50 bar / 0 ... 725 psia
DMT347	0 … 10 bar / 0 ... 145 psia
DMT348	0 … 40 bar / 0 ... 580 psia
with Ball Valve	0 … 20 bar / 290 psia
* Mechanical durability	up to +180 °C (+356 °F)

Options and Accessories

Table 27 Available Options and Accessories

Description	Order code
Relay module	RELAY-1
Analog Output Module	AOUT-1
Isolated RS485 Module	RS485-1
Power Supply Module	POWER-1
Galvanic Isolation Module	DCDC-1

Technical Specifications of the Optional Modules

Table 28 Technical Specifications of the Power Supply Module

Description	Specification
Operating voltage	100 ... 240 VAC 50/60 Hz
Connections	screw terminals for 0.5 ... 2.5 mm^2 wire (AWG 20 ... 14)
Bushing	for 8 ... 11 mm diameter cable
Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Storage temperature	-40 ... +70 °C (-40 ... +158 °F)

Table 29 Technical Specifications of the Analog Output Module

Description	Specification
Outputs	0 … 20 mA, 4 … 20 mA, 0 … 1 V, 0 … 5 V, 0 … 10 V
Operating temperature range	-40 … +60 °C (-40 ... +140 °F)
Power consumption U_{out} 0 … 1 V U_{out} 0 … 5 V / 0 … 10 V I_{out} 0 … 20 mA	 max 30 mA max 30 mA max 60 mA
External loads Current outputs	 R_L< 500 ohms
Max load + cable loop resistance 0 … 1 V 0 … 5 V and 0 … 10 V	540 ohms R_L> 2000 ohms R_L> 10 000 ohms
Storage temperature range	-55...+80 °C (-67 ... +176 °F)
2-pole screw terminal Max wire size	 1.5 mm^2 (AWG16)

Table 30 Technical Specifications of the Relay Modules

Description	Specification
Operating temperature range	-40...+60 ºC (-40...+140 ºF)
Operating pressure range	500...1300 mHg
Power consumption @24 V	max 30 mA
Contacts SPDT (change over), for example, Contact arrangement Form C Imax Imax	 0.5 A 250 VAC 0.5 A 30 VDC
Safety standard for the relay component	IEC60950 UL1950
Storage temperature range	-55...+80 ºC (-67...+176 ºF)
3-pole screw terminal / relay Max wire size	 2.5 mm2 (AWG14)

Table 31 Technical Specifications of the RS-485 Module

Description	Specification
Operating temperature range	-40...+60 ºC (-40...+140 ºF)
Operating modes	2-wire (1-pair) half duplex 4-wire (2-pair) full duplex
Operating speed max	115.2 kbaud
Bus isolation	300VDC
Power consumption	
@ 24V	max 50 mA
External loads Standard loads	 32 RL> 10kohm
Storage temperature range	-55...+80 ºC (-67...+176 ºF)
Max wire size	1.5 mm2 (AWG16)

Dimensions in mm (inches)

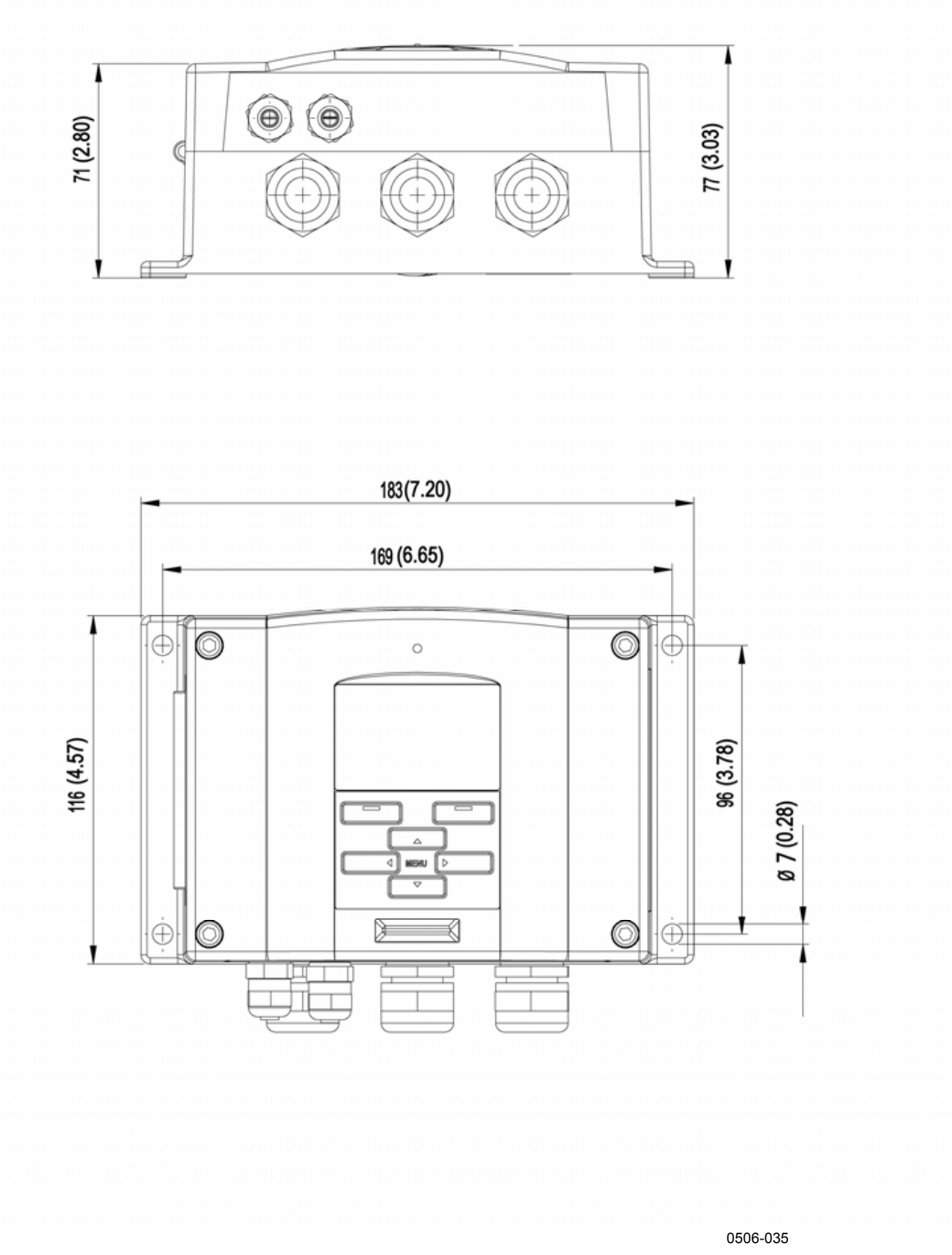

Figure 69 DMT340 Transmitter Body Dimensions

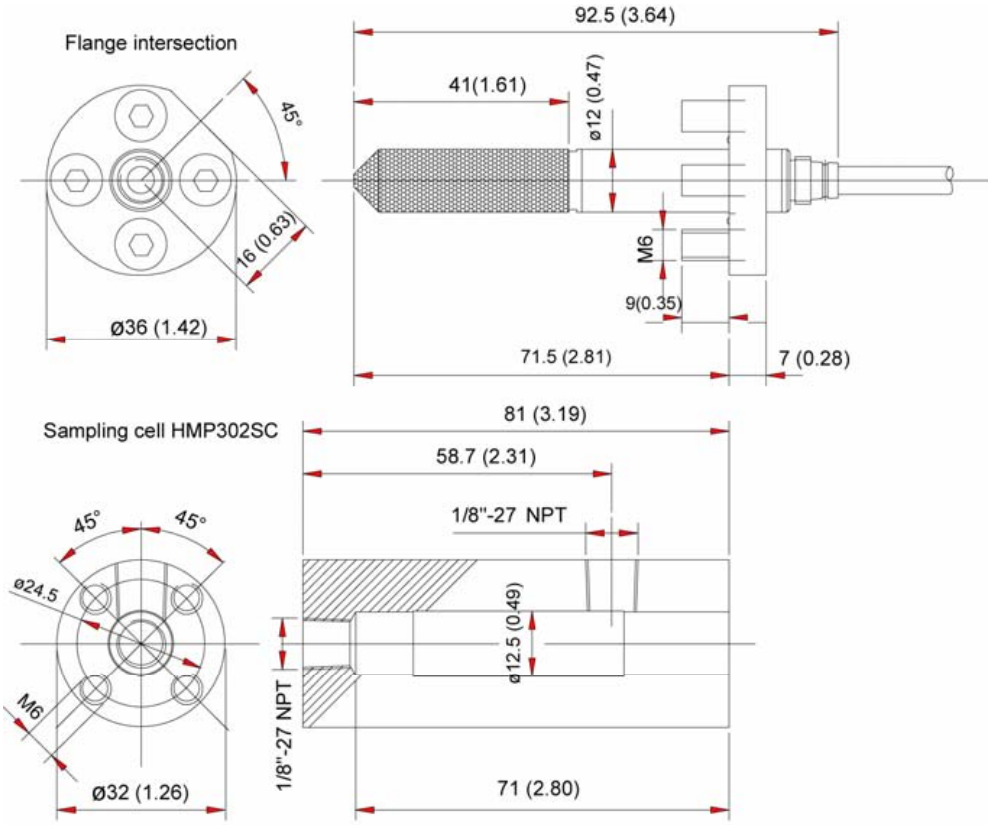

Figure 70 DMT342 Probe Dimensions

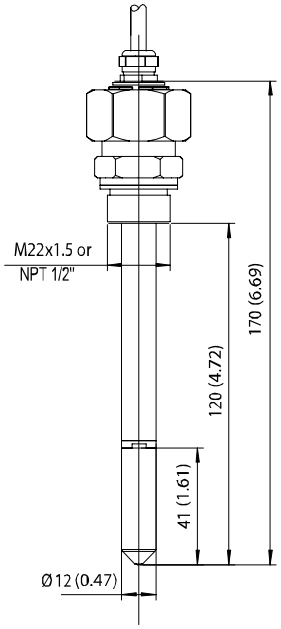

Figure 71 DMT344 Probe Dimensions

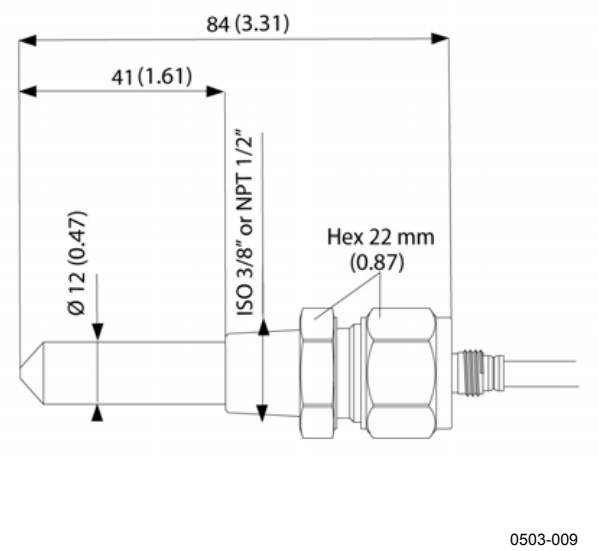

Figure 72 DMT347 Probe Dimensions

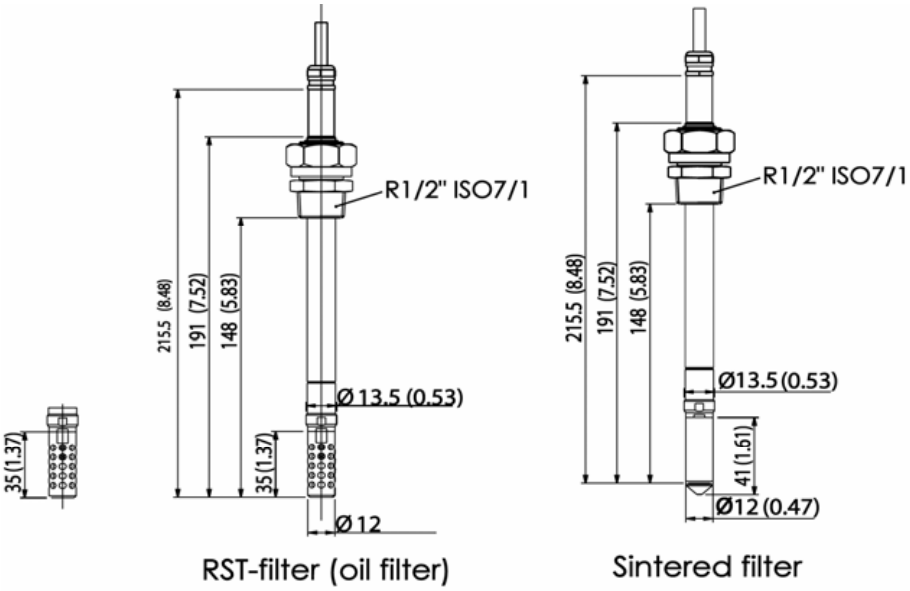

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Figure 73 DMT348 Probe Dimensions

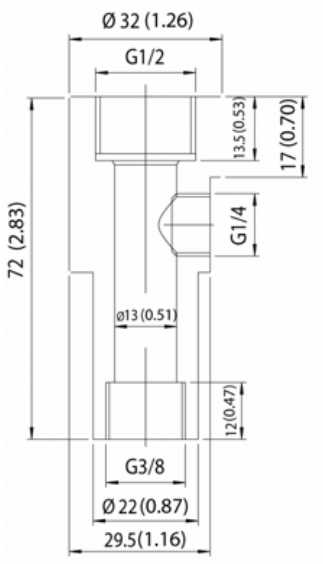

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Figure 74 Sampling Cell Dimensions

Replacing Consumables

Parts List for Consumables

Table 32 Available Spare Parts

Module	Order Code
MODULES	
Relay module	RELAY-1
Analog Output Module	AOUT-1
Isolated RS485 Module	RS485-1
Power Supply Module	POWER-1
Galvanic Isolation Module	DCDC-1
FILTERS	
Sintered Filter AISI 316L	HM47280SP
Stainless Steel Filter	HM47453SP
TRANSMITTER MOUNTING ACCESSORIES	
Wall Mounting Kit	214829
Installation Kit for Pole or Pipeline	215108
Rain Shield with Installation Kit	215109
DIN Rail Clips with Installation Plate	215094
Panel Mounting frame	216038
PROBE MOUNTING ACCESSORIES	
DMT342	
Sampling Cell for Probe with Flange	HMP302SC
5 pcs O-ring Set Size 14.1×1.6	216026
DMT344	
Fitting Body M22×1.5	17223
Fitting Body NPT1/2	17225
DMT347	
Swagelok for 12mm Probe 3/8" ISO Thread	SWG12ISO38
Swagelok for 12mm Probe 1/2" NPT Thread	SWG12NPT12
DMT348	
Fitting Body ISO1/2 Solid Structure (without leak screw)	DRW212076SP
Fitting Body NPT1/2 Solid Structure (without leak screw)	212810SP
Fitting Body Set ISO 1/2 (with leak screw)	ISOFITBODASP
Fitting Body Set (ISO 1/2 + NPT 1/2)	THREADSETASP
Leaking Screw with Allen Key	216027
Thread Adapter ISO1/2 to NPT1/2	210662
M22×1.5 Plug for Fitting Body	218370
PROBE MOUNTING ACCESSORIES	
Sampling Cell with Female Connectors	DMT242SC
Sampling Cell with Swagelok Connectors	DMT242SC2
Ball Valve ISO1/2 with Welding Joint	BALLVALVE-1
Installation Flange ISO1/2	DM240FA
Manual Press	HM36854SP

Module	Order Code
CONNECTION CABLES	
Serial Interface Cable	19446ZZ
MI70 Connection Cable with RJ45 Connector	211339
OUTPUT CABLES for 8-pin connector	
Connection Cable 5m 8-pin M12 Female, Black	212142
Connector 8-pin M12 with Screw Terminals	212416
Male Connector 8-pin M12 with Cable and Adapter	214806SP
CABLE BUSHINGS	
Cable Gland M20×1.5 for 8 ... 11mm Cable	214728SP
Cable Gland M20×1.5 for 11 ... 14mm Cable	214729
Conduit Fitting M20×1.5 for NPT1/2 Conduit	214780SP
Dummy Plug M20×1.5	214672SP
WINDOWS SOFTWARE	
Software Interface Kit	215005
OTHER	
Calibration Adapter for HMK15	211302SP

Technical Support

For technical questions, contact the Vaisala technical support:

E-mail helpdesk@vaisala.com

Fax +358 9 8949 2790

Return Instructions

If the product needs repair, please follow the instructions below to enable us to serve you better.

1. Read the warranty information on page 12.
2. Please include with the transmitter:
   - serial number of the unit
   - date and place of purchase or last calibration
   - description of the fault
   - circumstances over which the fault occurs/occurred
   - name and contact information of a technically competent person who can provide further information on the problem
3. Include a detailed return address with your preferred shipping method.
4. Pack the faulty product using an ESD protection bag of good quality with proper cushioning material in a strong box of adequate size.
5. Contact the Vaisala Service Center nearest to you and send the box to the addresses on page 145.

Vaisala Service Centers

Vaisala Service Centers perform calibrations and adjustments as well as repair and spare part services, see contact information below.

Vaisala Service Centers offer also extended services, for example accredited calibrations, maintenance contracts and calibration reminder program. Do not hesitate to contact them to get further information.

NORTH AMERICAN SERVICE CENTER
Vaisala Inc., 10-D Gill Street, Woburn, MA 01801-1068, USA.
Phone: +1 781 933 4500, Fax: +1 781 933 8029
E-mail: us-customersupport@vaisala.com

EUROPEAN SERVICE CENTER
Vaisala Instruments Service, Vanha Nurmijärventie 21 FIN-01670 Vantaa, FINLAND.
Phone: +358 9 8949 2658, Fax: +358 9 8949 2295
E-mail: instruments.service@vaisala.com

TOKYO SERVICE CENTER
Vaisala KK, 42 Kagurazaka 6-Chome, Shinjuku-Ku, Tokyo 162-0825, JAPAN.
Phone: +81 3 3266 9617, Fax: +81 3 3266 9655
E-mail: aftersales.asia@vaisala.com

BEIJING SERVICE CENTER
Vaisala China Ltd., Floor 2 EAS Building, No. 21 Xiao Yun Road, Dongsanhuan Beilu, Chaoyang District, Beijing, P.R. CHINA 100027.
Phone: +86 10 8526 1199, Fax: +86 10 8526 1155
E-mail: china.service@vaisala.com

www.vaisala.com

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APPENDIX A
CALCULATION FORMULAS

The DMT340 series transmitters measure relative humidity and temperature. From these values dewpoint, mixing ratio, absolute humidity and enthalpy in normal pressure are calculated using the following equations:

Dewpoint:

$$T_d = \frac{T_n}{\frac{m}{\log\left(\frac{Pw}{A}\right)} - 1} \quad (1)$$

The parameters A, m, and Tn depend on temperature according to the following table (* used for frostpoint calculation if the dewpoint is negative):

t	A	m	Tn
<0 °C *	6.1134	9.7911	273.47
0 ... 50 °C	6.1078	7.5000	237.3
50 ... 100 °C	5.9987	7.3313	229.1
100 ... 150 °C	5.8493	7.2756	225.0
150 ... 180 °C	6.2301	7.3033	230.0

Mixing ratio:

$$x = 621.99 \cdot \frac{P_w}{p - P_w} \quad (2)$$

Absolute humidity:

$$a = 216.68 \cdot \frac{P_w}{T} \quad (3)$$

Enthalpy:

$$h = (T - 273.15) \cdot (1.01 + 0.00189 \cdot x) + 2.5 \cdot x \quad (4)$$

The water vapour saturation pressure P_{ws} is calculated by using two equations (5 and 6):

$$\Theta = T - \sum_{i=o}^{3} C_i T^i \quad (5)$$

where:

T = temperature in K
C_i = coefficients
C_0 = 0.4931358
C_1 = $-0.46094296 * 10^{-2}$
C_2 = $0.13746454 * 10^{-4}$
C_3 = $-0.12743214 * 10^{-7}$

$$\ln P_{ws} = \sum_{i=-1}^{3} b_i \Theta^i + b_4 \ln \Theta \quad (6)$$

where:

b_i = coefficients
b_{-1} = $-0.58002206 * 10^{4}$
b_0 = $0.13914993 * 10^{1}$
b_1 = $-0.48640239 * 10^{-1}$
b_2 = $0.41764768 * 10^{-4}$
b_3 = $-0.14452093 * 10^{-7}$
b_4 = 6.5459673

The water vapor pressure is calculated using:

$$P_w = RH \cdot \frac{P_{ws}}{100} \tag{7}$$

Parts per million by volume is calculated using:

$$ppm_v = 10^6 \cdot \frac{P_w}{(p - P_w)} \tag{8}$$

Symbols:

Td = dewpoint temperature (°C)
Pw = water vapour pressure (hPa)
Pws = water vapour saturation pressure (hPa)
RH = relative humidity (%)
x = mixing ratio (g/kg)
p = atmospheric pressure (hPa)
a = absolute humidity (g/m3)
T = temperature (K)
h = enthalpy (kJ/kg)

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