USER'S GUIDE

Vaisala DRYCAP® Dewpoint Transmitters DMT345 and DMT346

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CHAPTER 1
GENERAL INFORMATION

This chapter provides general notes for the manual and the product.

About This Manual

This manual provides information for installing, operating, and maintaining Vaisala DRYCAP® Dewpoint Transmitters DMT345 and DMT346.

Contents of This Manual

This manual consists of the following chapters:

- Chapter 1, General Information, provides general notes for the manual and the product.

- Chapter 2, Product Overview, introduces the features and advantages of the Vaisala DRYCAP® Dewpoint Transmitters DMT345 and DMT346.

- Chapter 3, Installation, provides you with information that is intended to help you install this product.

- Chapter 4, Operation, contains information that is needed to operate this product.

- Chapter 5, Maintenance, provides information that is needed in basic maintenance of the product. Possible error states and situations, their probable causes and remedies are described in this chapter. This chapter also contains contact information for Vaisala Technical Support and Vaisala Service Centers.

- Chapter 6, Calibration and Adjustment, provides you with instructions on how to calibrate and adjust Vaisala DRYCAP® Dewpoint Transmitters DMT345 and DMT346.

- Chapter 7, Technical Data, provides the technical data of the product.

- Appendix A, Example Installation of DMT346, illustrates an example installation of DMT346 transmitter into a process.

- Appendix B, Calculation Formulas, contains the formulas used for the calculated output quantities.

Version Information

Table 1   Manual Revisions

Manual Code	Description
M210726EN-A	May 2006 - First version
M210726EN-B	June 2007 - New options added: Data logger module and USB-RJ45 cable. Support for Chinese language.
M210726EN-C	May 2008 – New options added: LAN Interface, WLAN Interface. Display Alarm feature added.
M210726EN-D	June 2009 – Added PuTTY terminal application instructions, revised description of the MI70 Link software. Removed instructions for HyperTerminal. Removed Humicap 180L2 sensor option.

Related Manuals

Table 2   Related Manuals

Manual Code	Manual Name
M010091EN-E	Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70 User's Guide, March 2006
M210185en-B	Humidity Calibrator HMK15 User's Guide

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

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 DMT345/46 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, lead to malfunction, or make the product noncompliant with applicable legislation.

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.

Regulatory Compliances

Transmitters with LAN or WLAN Interface

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television

reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Transmitters with WLAN Interface

This device has been designed to operate with a 2 dBi half-wave antenna. Antennas with a gain greater than 2 dB are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.

This Class [B] digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe [B] est conforme à la norme NMB-003 du Canada.

Patent Notice

The Vaisala DRYCAP® Dewpoint Transmitters DMT345 and DMT346 are protected by, for example, the following patents and their corresponding national rights:

Finnish patents 98861 and 99164, French patents 6650303 and 9504397, German patents 69418174 and 19513274, Japanese patents 3585973 and 2801156, UK patents 0665303 and 2288465, U.S. patent 5607564.

Trademarks

DRYCAP® is a registered trademark of Vaisala Oyj.

Windows® is a registered trademark of Microsoft Corporation in the United States and/or other countries.

License Agreement

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

For certain products Vaisala normally gives a limited one-year warranty. Please observe that any such warranty may not be valid in case of damage due to normal wear and tear, exceptional operating conditions, negligent handling or installation, or unauthorized modifications. Please see the applicable supply contract or Conditions of Sale for details of the warranty for each product.

CHAPTER 2
PRODUCT OVERVIEW

This chapter introduces the features and advantages of the Vaisala DRYCAP® Dewpoint Transmitters DMT345 and DMT346.

Introduction to DMT345 and DMT346

The DMT345 and DMT346 transmitters incorporate the advanced Vaisala DRYCAP® technology, which enables reliable and accurate dewpoint measurement. Both transmitters also feature the AutoCal function which provides excellent long term stability of the measurement.

The DMT345 is designed for measurement of relative humidity in temperatures up to 180 °C. The transmitter outputs dewpoint/frostpoint (Td/f), mixing ratio (x), volume concentration (ppm), relative humidity (RH), and temperature (T).

The DMT346 is a high-performance instrument for measurement of dewpoint and mixing ratio in temperatures up to 350 °C.

DMT346 also outputs sensor saturation rate (SSR) and temperature ($T_S = T_{Sensor}$) of the cooled Vaisala DRYCAP® sensor. Because the sensor is cooled, these values do not represent true process conditions, hence they cannot be used for process control. Nevertheless, they provide a valuable aid for calibration and for checking the cooling effect.

For quantities measured by DMT345, see Table 3 below. For the optional calculated quantities measured by DMT345, see Table 4 on page 20.

For quantities measured and calculated by DMT36, see Table 5 on page 20.

Table 3   Output Quantities and Their Abbreviations for Vaisala DRYCAP® Dewpoint Transmitter DMT345

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
Relative humidity RH	RH	%RH	%RH

Quantity	Abbreviation	Metric Unit	Non Metric Unit
Temperature T	T	ºC	ºF

Table 4   **Optional Output Quantities and Their Abbreviations for Vaisala DRYCAP® Dewpoint Transmitter DMT345**

Quantity	Abbreviation	Metric Unit	Non Metric Unit
Parts per million	H2O	ppm_v/ ppm_w	ppm_v/ ppm_w
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

Table 5   **Output Quantities and Their Abbreviations for Vaisala DRYCAP® Dewpoint Transmitter DMT346**

Quantity	Abbreviation	Metric Unit	Non Metric Unit
Dewpoint temperature ($T_{d/f}$)	TDF	ºC	ºF
Mixing ratio (x)	X	g/kg	gr/lb
Sensor saturation rate	SSR	%	-
Sensor temperature	TS	ºC	ºF

Basic Features and Options

DMT345/346 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, optional third analog output.
- Installation accessories
    - DMT345: mounting flange,
    - DMT346: cooling set for high temperature applications.
- User friendly multilingual display option.
- Different sensor protection options and probe cable lengths 2 m, 5 m or 10 m.
- USB connectivity for service connections via the optional USB-RJ45 cable
- Optional modules:
    - galvanic isolation for outputs

- AC mains power supply
- RS-485 serial line
- LAN and WLAN interfaces
- data logger module with real time clock
- additional analog output module
- alarm relay module

Operating Principle

The DMT345/346 transmitter incorporates the Vaisala DRYCAP® sensor, which uses an operating principle based on changes in capacitance as its thin polymer film absorbs water molecules together with a combined temperature measurement with a PT100 resistive temperature sensor.

The DMT345/346 transmitter measures water vapor directly and gives thus accurate results of moisture in the process. In DMT346 the sensor is cooled down with a cooling set which makes it possible to use a polymer sensor in very high temperatures, for example +100 ... +350 °C. With this technique, no complicated sampling systems are needed. The cooling set is thermally isolated from the process itself. The temperature of the sensor is cooled down which increases the sensor saturation rate.

Sensor saturation rate and temperature are then measured, and the transmitter calculates the dewpoint and the mixing ratio on the basis of these readings.

Note that for DMT346, SSR and temperature values don't represent the process itself as they are measured after cooling. Dewpoint and mixing ratio, however, are independent of temperature and remain unchanged.

The dewpoint measurement range is -25 ... +100 °C.

Structure of the Transmitter
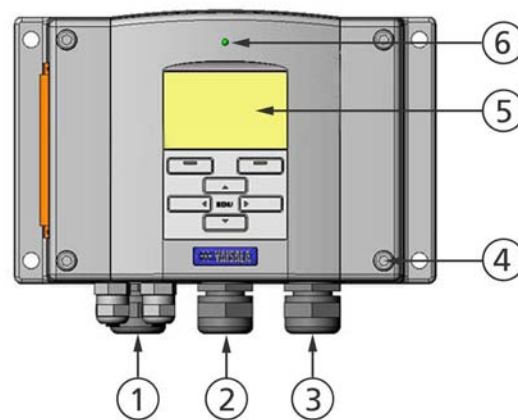
0604-005

Figure 1   Transmitter Body

The numbers refer to Figure 1 above:

1 = Signal + powering cable gland
2 = Cable gland for optional module, or WLAN antenna connector
3 = Cable gland for optional module
4 = Cover screw (4 pcs)
5 = Display with keypad (optional)
6 = Cover LED
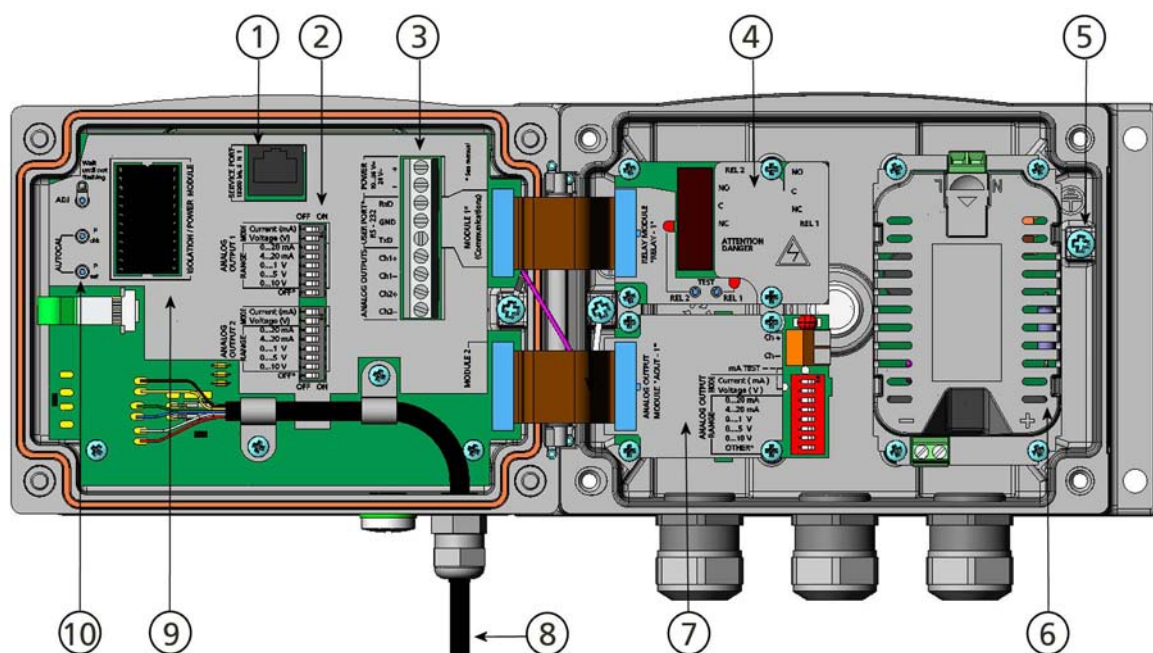
Figure 2   Inside the Transmitter

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, data logger, RS-422/485, LAN, or WLAN module (optional)
5 = Grounding connector
6 = Power supply module (optional)
7 = Relay, data logger, or analog output module (optional)
8 = Dewpoint probe
9 = Output isolation module (optional)
10 = Adjustment button and Manual AutoCal buttons with indicator led and pressure set buttons.

Probes and Cooling Set
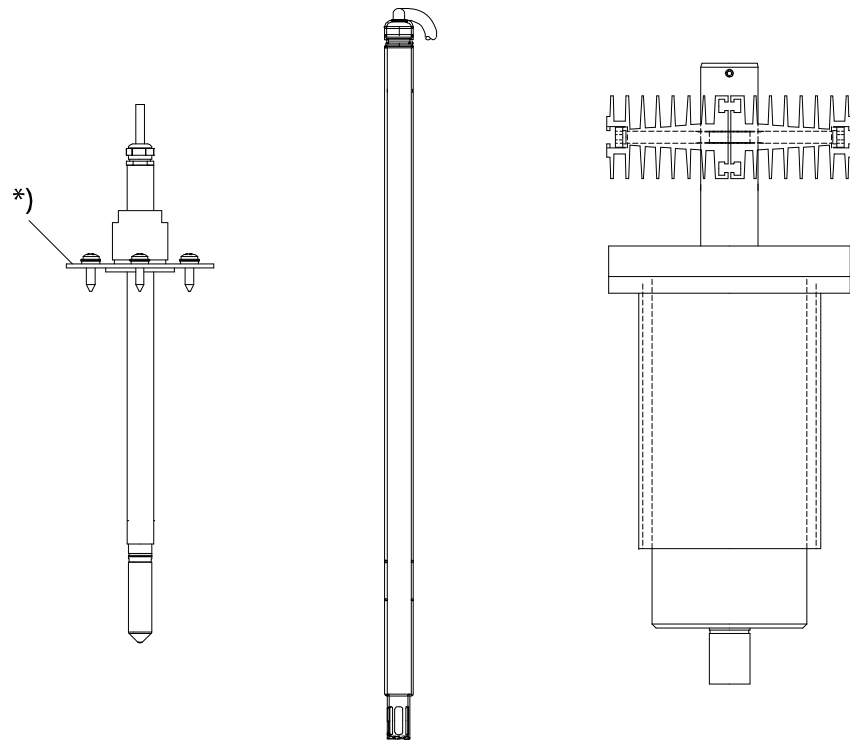
0604-007

Figure 3   **Probes, Cooling Set**

Figure 3 above shows from left to right: DMT345 probe, DMT346 probe and the cooling set. The probes are available with the following cable lengths: 2 m, 5 m, and 10 m.

*)   =   Optional mounting flange for DMT345 probe

CHAPTER 3
INSTALLATION

This chapter provides you with information that is intended to help you install this product.

Selecting Location

Finding a suitable site for the dewpoint measurement probe is important for getting representative process or environmental measurements. The location of the probe should provide a good representation of the area of interest. Also select a location that is as clean as possible. Air should circulate freely around the sensor.

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).

169 (6.65)

96 (3.78)

Ø 7 (0.28)

0804-066
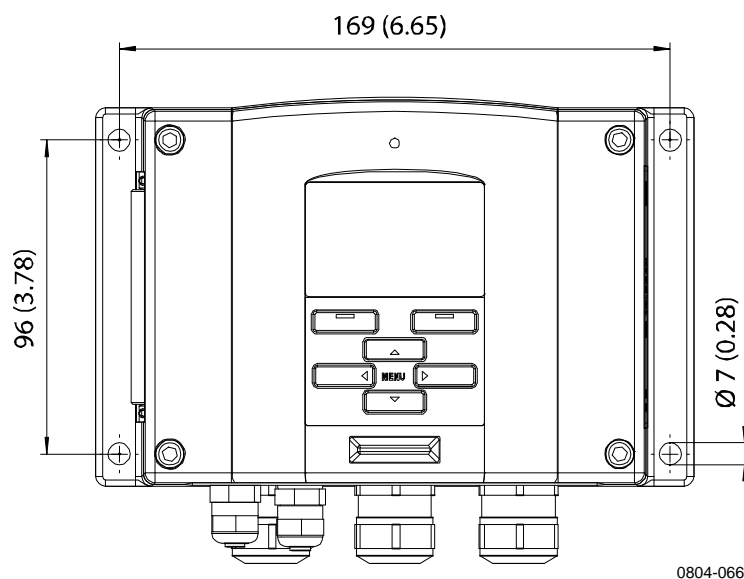
Figure 4   Standard Mounting

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.

0604-009
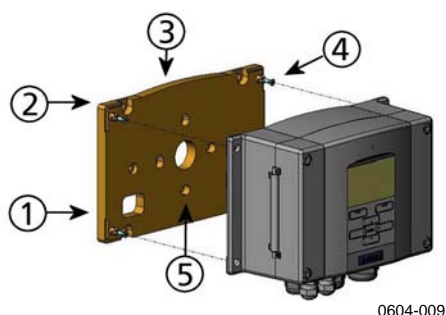
Figure 5   Mounting with Wall Mounting Kit

The following 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 the transmitter to the mounting plate with 4 fixing screws M3 (provided)
5 = Holes for wall/junction box mounting
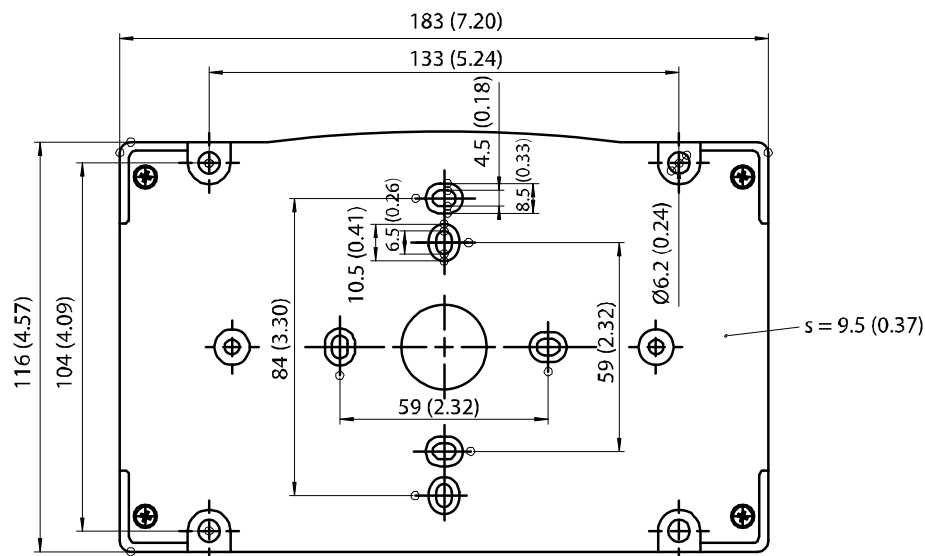
0804-065

Figure 6   Dimensions of the Plastic Mounting Plate (mm/inch)

Metal mounting plate is included in rain shield with installation kit and installation kit for pole or pipeline.
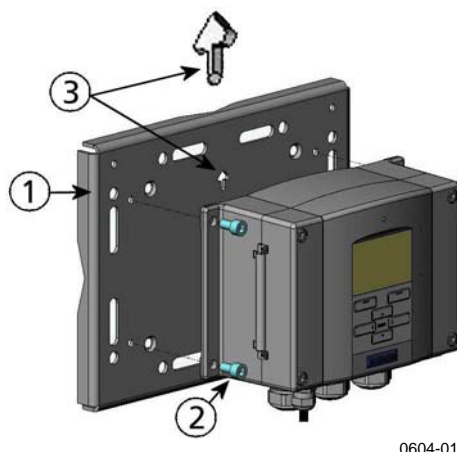
0604-011

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 the transmitter 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.
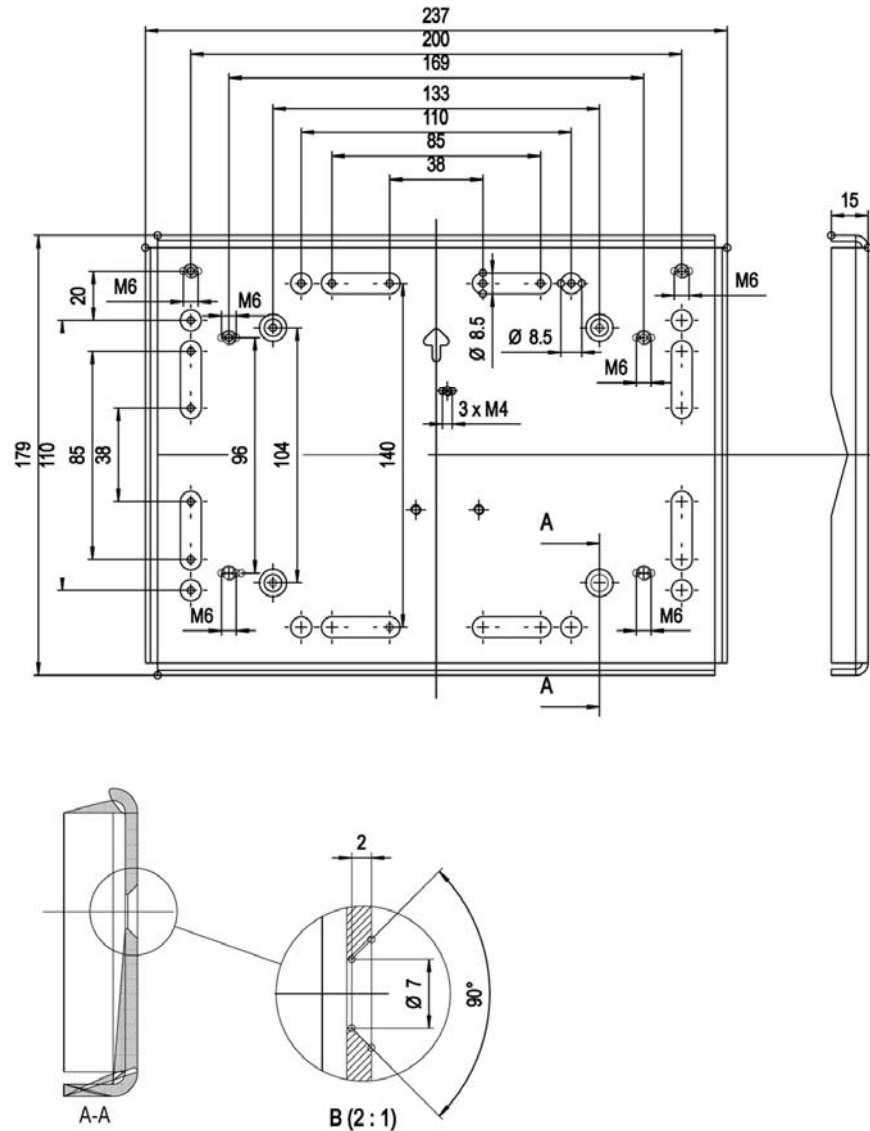
Figure 8   Dimensions of the Metal Mounting Plate (in mm)

Mounting with DIN Rail Installation Kit

DIN rail installation kit includes a wall mounting kit, 2 clip-fasteners and 2 screws M4 × 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 the transmitter 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.
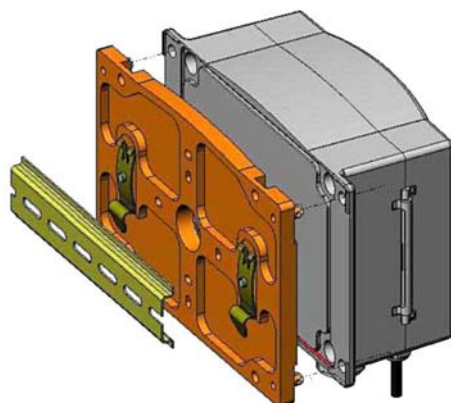
0604-013

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 27.
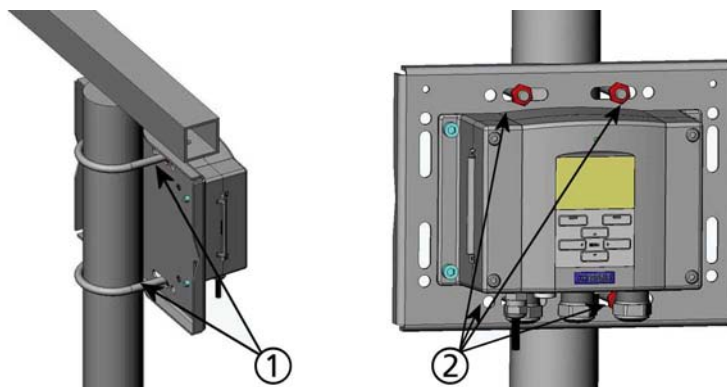
0604-014

Figure 10   Vertical Pole Installation

Numbers refer to Figure 10 above:

1   =   U-bolts (2 pcs) M8 (provided) for 30 ... 102 mm poles.
2   =   Mounting nuts M8 (4 pcs)
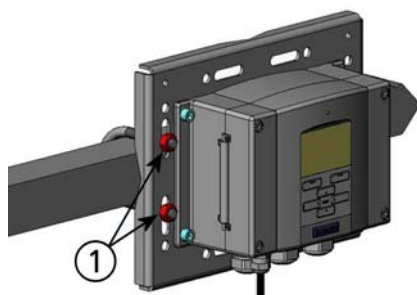
0604-015

Figure 11   Horizontal Pole Installation

Number refers to Figure 11 above:

1   =   Mounting nuts M8 (4 pcs)

Mounting Rain Shield with Installation Kit

Vaisala order code for the rain shield: 215109.

0604-016

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 the transmitter to the mounting plate with 4 fixing
screws (provided).

Panel Mounting Frame

To enable a neat and dirt free embedded installation of the transmitter, a panel mounting frame is available as an option (Vaisala order code: 216038). The frame is a thin, flexible plastic frame for the transmitter, with adhesive tape on one side.

The frame is used to hide any rough edges of the installation hole, and provide a more finished look. Note that the panel mounting frame is not intended to bear the weight of the transmitter, and does not include any mounting supports.

Use the panel mounting frame as follows:

1.   Use the frame as a template to mark the required size for the installation hole in the panel.
2.   Cut the hole in the panel.
3.   Mount the transmitter through the panel with suitable supports.
4.   Remove the paper protecting the adhesive tape on the frame, and attach the frame around the transmitter. Refer to Figure 13 below.

0704-002
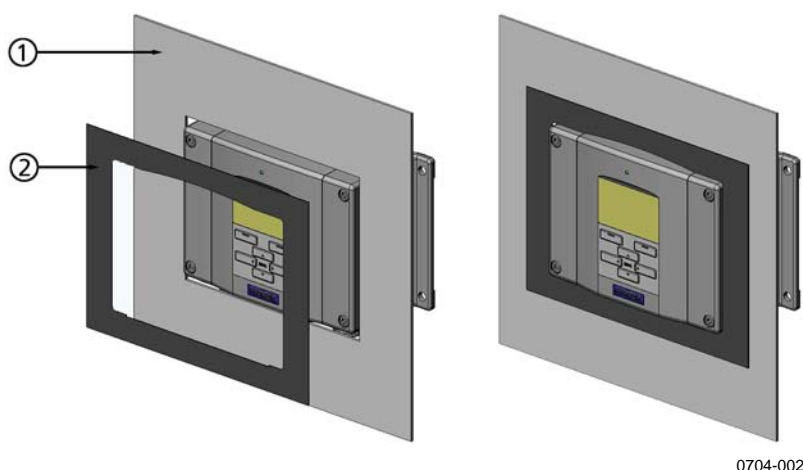
Figure 13   Panel Mounting Frame

The following numbers refer to Figure 13 above:

1   =   Panel (not included)
2   =   Panel mounting frame
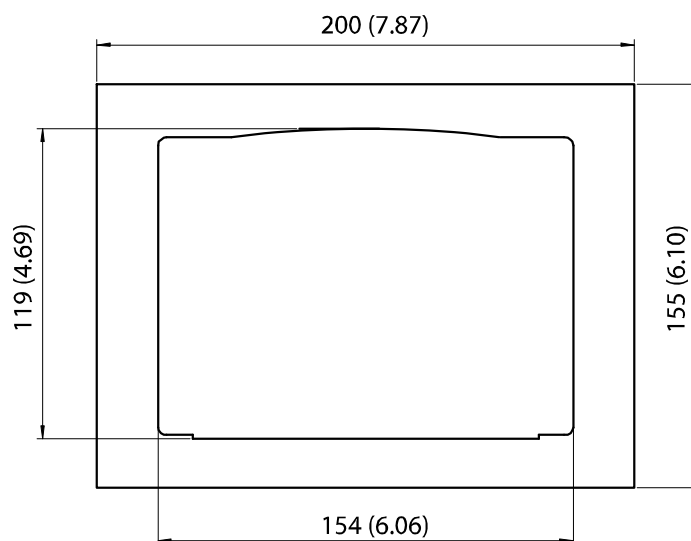
0804-083

Figure 14   Panel Mounting Dimensions (mm/inch)

DMT345 Probe Mounting
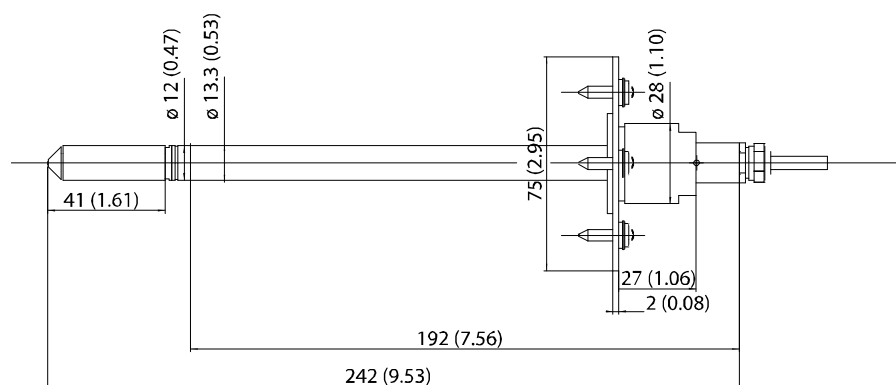
0604-018

Figure 15   DMT345 Probe Dimensions (mm/inch)

Installation with Flange

The DMT345 is a small size (d = 12 mm) general purpose probe suitable for installation through process or duct walls with the flange installation kit available from Vaisala.

The duct installation kit includes a flange, a sealing ring and screws for attaching the flange to the process or duct wall (Vaisala order code: 210696).
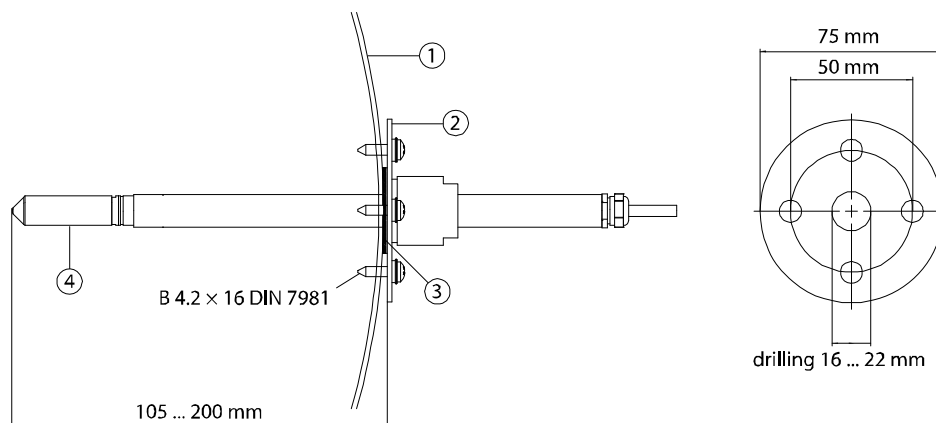
0604-019

Figure 16   Flange Installation Kit

The following numbers refer to Figure 16 above:

1   =   Process or duct wall
2   =   Flange
3   =   Sealing ring
4   =   Probe

NOTE	When the temperature difference between the process or duct and the surroundings is large, the probe must be installed as deep in the process or duct as possible. This prevents errors caused by heat conduction in the probe cable.

DMT346 Probe and Cooling Set Mounting
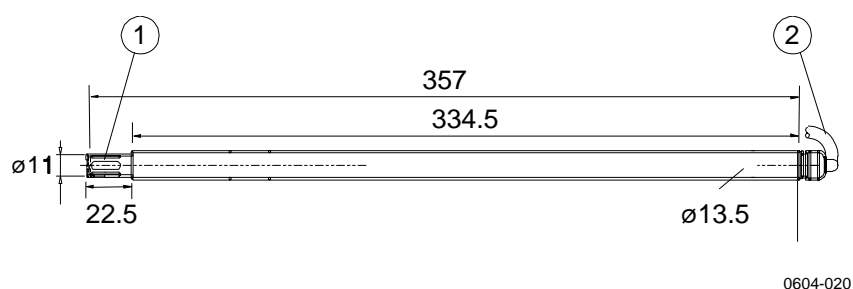
0604-020

Figure 17   DMT346 Probe Dimensions (in mm)

The following numbers refer to Figure 17 above:

1   =   Stainless steel grid
2   =   Cable (length 2 m, 5 m or 10 m)

Description of the Cooling Set
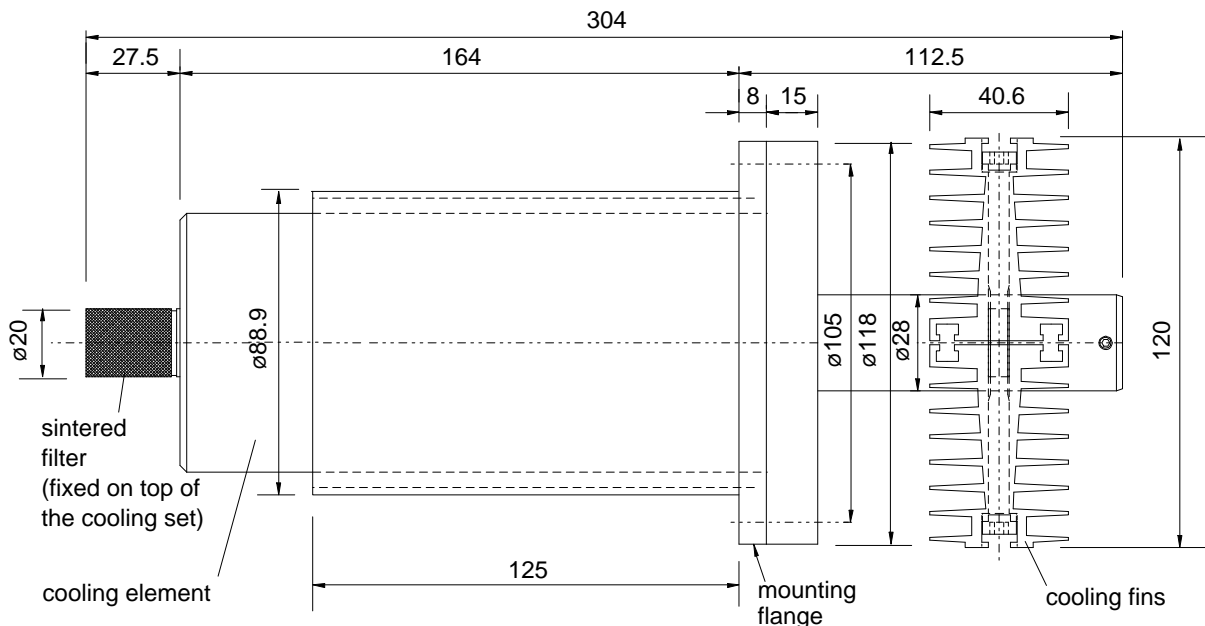
Figure 18   Cooling Set Dimensions (in mm)

The cooling set consists of a cooling element and removable cooling fins. The cooling fins are meant to be installed in applications where the process temperature and dewpoint are continuously in the range indicated in Figure 19 on page 35 (Measurement Ranges With and Without the Cooling Fins). However, if there is a possibility that the dewpoint is above this range, the measurements have to be taken without the cooling fins in order to avoid condensation.

The flow rate and ambient temperature have an effect on the cooling rate. In Figure 19, it is assumed that ambient temperature is +25 °C. When ambient temperature is raised by +10 °C, the measurement ranges with and without cooling fins rise approximately +6 °C. Correspondingly, every -10 °C change in ambient temperature changes the ranges by approximately -6 °C. It is recommended that after installing the transmitter without the cooling fins, the transmitter is allowed to stabilize and then the SSR reading is checked either from the local display or with a terminal connected to an RS line. If the SSR reading is below 20 %, it is recommended that the cooling fins are installed.

NOTE	Make sure that the upper limit of the dewpoint measurement range is not exceeded in low temperatures as this would lead to condensation.

> **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.
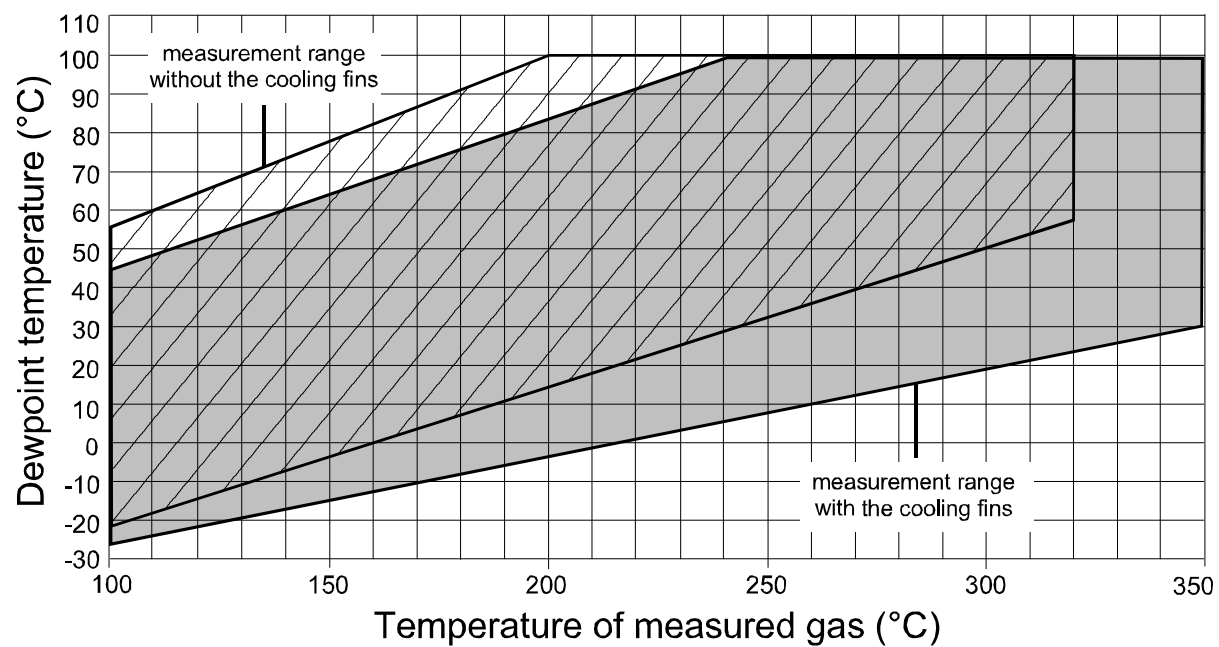
0604-022

Figure 19   Measurement Ranges With and Without the Cooling Fins

Parts of the Cooling Set
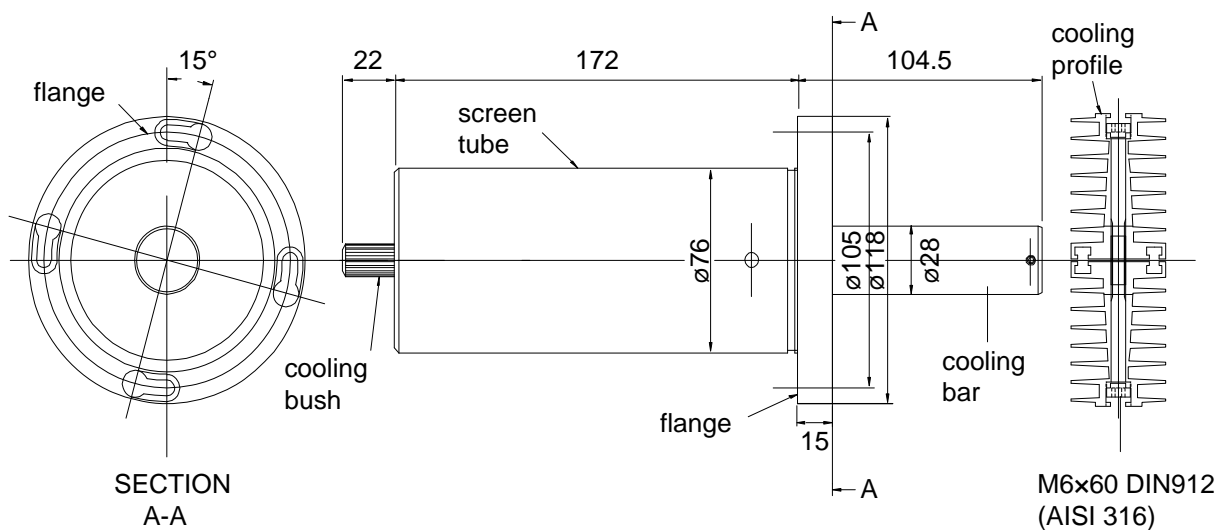
0604-023

Figure 20   Parts of the Cooling Set (Dimensions in mm)
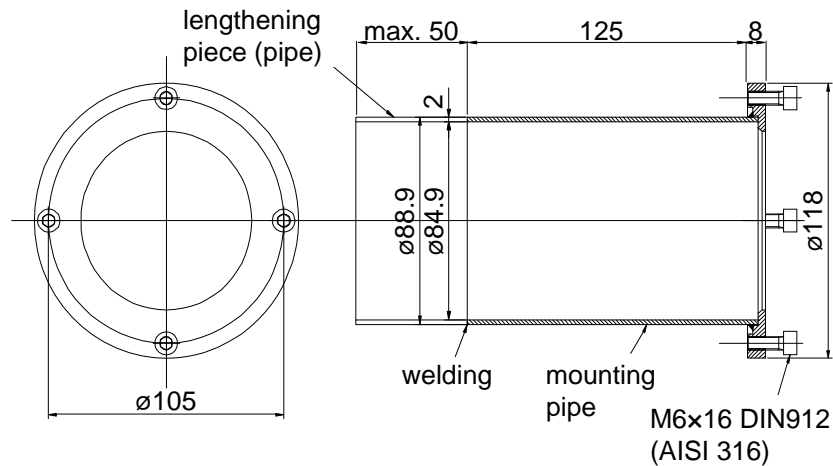
0605-023

Figure 21   Mounting Flange Dimensions (in mm)

General Probe and Cooling Set Mounting Instructions

Follow these general mounting instructions to make the installation. Note the additional instructions in the following sections regarding specific situations (mounting with process shut down, mounting with process running, removing the transmitter for maintenance).

Appendix A, Example Installation of DMT346 on page 151 provides photographs of installating DMT346 transmitter through a process wall.

The probe should be installed horizontally whenever possible in order to ensure the best possible performance of the cooling set. Install the probe according to the following instructions (see also Figure 22 on page 37):

1.   Make a round 89.5 + 0.5 mm hole on the process wall.
2.   Weld the tube of the mounting flange tightly on the inner metal plate of the process wall. If the process wall is more than 125 mm thick, a lengthening piece (max. 50 mm) can be welded on the mounting tube (for walls thicker than 175 mm, see Figure 23 on page 37).
3.   The cooling set is mounted in a vertical position. Tighten the screws properly in order to ensure a thermal contact.
4.   Unfasten the locking screws on the cooling bar so that you can push the probe into the bar.

NOTE	Push the probe deep enough: make sure that the marking hole meets the end of the bar.

5.   Lock the probe in place by tightening the locking screws on the bar.

Figure 22   Installing the Probe Through Process Wall
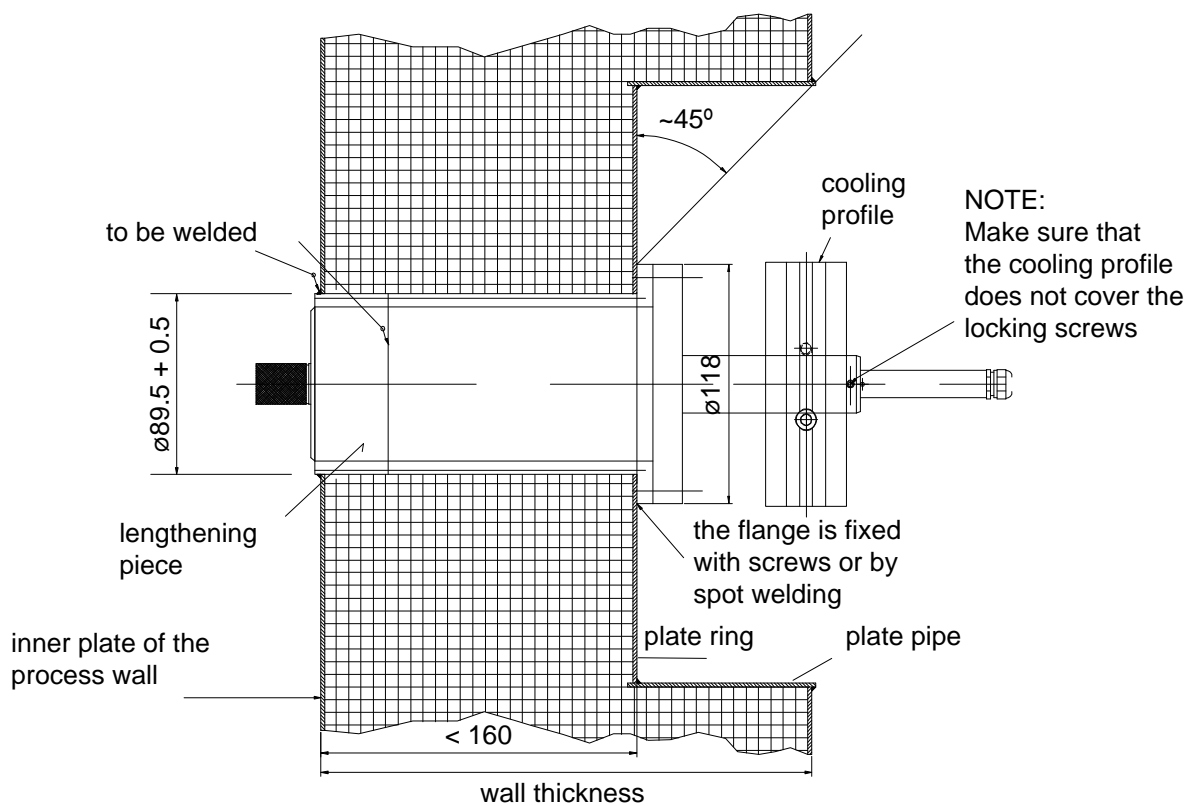
Figure 23   Installing Probe Through Thick Walls

Probe and Cooling Set Mounting with Process Shut Down

Complete the entire mounting process as instructed on page 36.

Probe and Cooling Set Mounting with Process Running

Follow this procedure to reduce the amount of condensation that builds up in the installation hole.

1. First mount the cooling element (and fins) to warm it up; tightly plug the hole for the probe in the cooling element for the duration of the warmup period.

2. After a few hours, complete the installation by installing the probe.

Removing the Transmitter for Maintenance

If you remove the transmitter from the process to send it to service etc., leaving the cooling set in its place, make sure you plug tightly the hole for the probe in the cooling element. This will lessen the amount of condensation that builds up in the hole.

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:
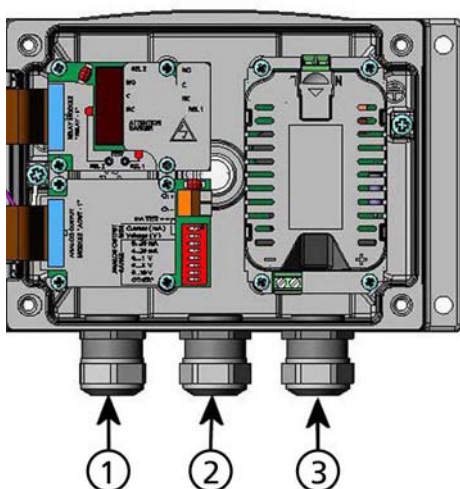
0605-026

Figure 24   Cable Bushings

Numbers refer to Figure 24 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.

Cable Grounding

Ground the screen of the electrical cable properly to achieve the best possible EMC performance.
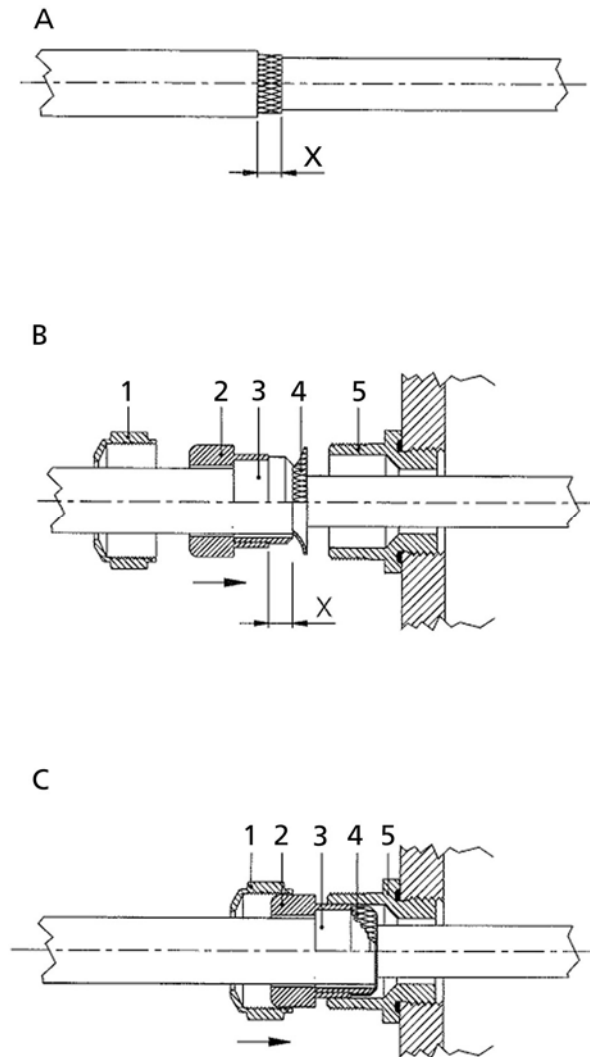
0605-027

Figure 25   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 25 A above).
3.   Push the domed cap nut (item 1 in Figure 25) and the seal insert with contact socket of the gland (items 2 & 3) onto the cable as shown in the diagram.
4.   Bend over the screen braiding or screen foil by about 90° (item 4).
5.   Push the seal insert with the contact socket of the gland (items 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 (item 2 & 3) and flush into the lower part (item 5).

8. Install 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 22). Note anyhow that the probe 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, DMT346 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 60.
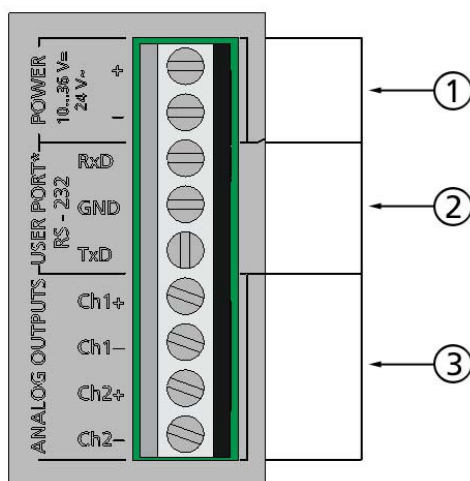
0605-028

Figure 26   **Screw Terminal Block on the Motherboard**

Numbers refer to Figure 26 above:

1 = Supply terminals **POWER 10 ... 35 VDC = 24 V~**
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 Serial Line Communication on page 72.

4.   When wiring the optional modules, see the corresponding section for instructions:

   - Installation and Wiring of RS-422/485 Interface on page 53
   - Installation and Wiring of Alarm Relays on page 51
   - LAN Interface on page 56
   - WLAN Interface on page 57

NOTE   The markings on the module and in this manual are according to the line driver manufacturers' application notes, where A is posive against B when measured with a voltmeter.

When connecting the module, be prepared to swap the A and B wires if you have a communication problem.

5. Connect the power supply wires to the connectors:
    POWER 10 ... 35 V = 24 V~ (+) and (−) terminals. (If using AC voltage, **always** connect phase **(~)** to power supply **(+)** and **0** to power supply **(−)**). When wiring the power supply module, see section Power Supply Module on page 45.

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 the upper part of Figure 27 on page 44). If you have to connect several transmitters or other instruments to one AC supply, the phase (~) must always be connected to the (+) connector of each transmitter (see the lower part of Figure 27).

CAUTION	**24 VAC POWER SUPPLY USE**
	To prevent fire and/or damage, if either 24 VAC wire is **grounded** or **connected to a "-", "0", or "GND" terminal** of any other device, you must **connect the same wire on the "-" terminal** also on this instrument.

No common loop - RECOMMENDED!
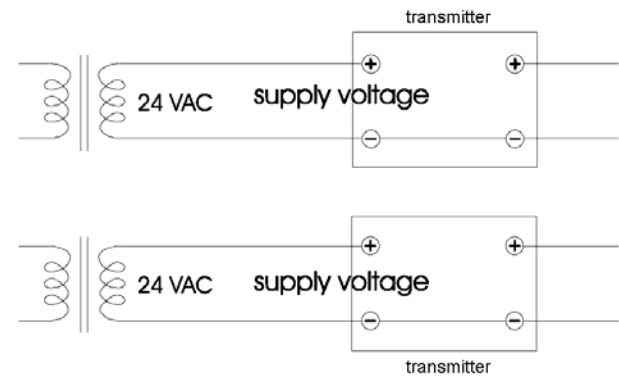
Common loop formed - NOT recommended!
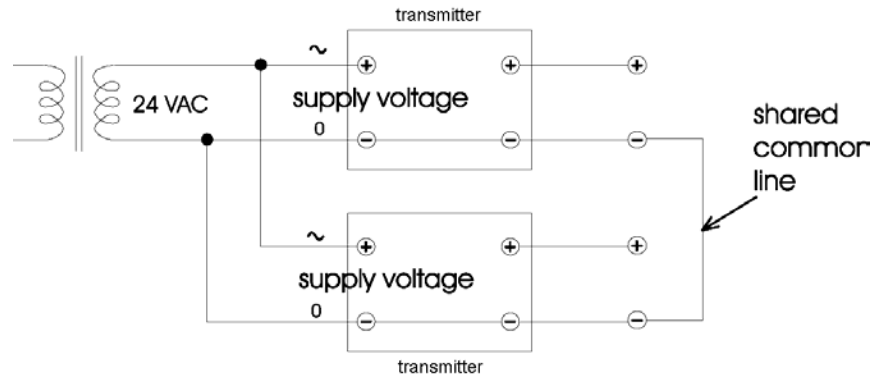
Figure 27   Connections to 24 VAC Power Supply

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.
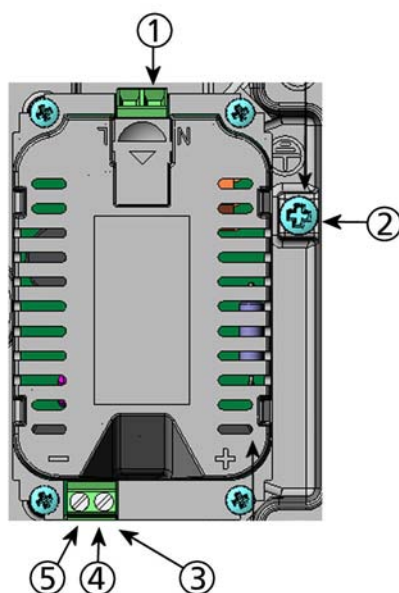
0605-030

Figure 28   Power Supply Module

Numbers refer to Figure 28 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 ... 35V 24V terminals of the motherboard.
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 from section Basic Features and Options on page 20.

4. Connect the wires from the terminals of the power supply module marked with + and – to the terminals **POWER 10 ... 35V = 24 V~** 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

Dieses Produkt entspricht der Niederspannungsrichtlinie (2006/95/EWG).

- Das Netzmodul darf nur von einem dazu befugten Elektriker angeschlossen werden.
- Trennen Sie das Netzmodul nicht vom Messwertgeber, wenn der Strom eingeschaltet ist.
- Verbinden Sie das Netzmodul nur mit der Spannungsquelle, wenn es im Messwertgeber DMT345/346 montiert ist.
- Das Erdungskabel muss zum Schutz immer angeschlossen sein.

Ce produit est conforme à la Directive relative à la Basse Tension (2006/95/EEC).

- Seul un électricien compétent est habilité à raccorder le module d'alimentation au secteur.
- Ne pas détacher le module d'alimentation du transmetteur lorsqu'il est en service.
- Ne pas raccorder le secteur au module d'alimentation lorsque celui-ci n'est pas installé dans le transmetteur DMT345/346.
- Toujours raccorder un bornier de protection à la terre.

Tämä tuote on pienjännitedirektiivin (2006/95/EEC) mukainen.

- Vaihtovirtaliitännän saa kytkeä tehonsyöttömoduuliin ainoastaan valtuutettu sähköasentaja
- Älä irrota tehonsyöttömoduulia lähettimestä, kun virta on kytkettynä.
- Älä kytke verkkovirtaa tehonsyöttömoduuliin, jos kyseistä moduulia ei ole asennettu DMT345/346 lähettimeen.
- Kytke aina maadoitusliittimet.

Denna produkt uppfyller kraven i direktivet om lågspänning (2006/95/EEC).

- Nätanslutningen (växelströmsanslutningen) får bara anslutas till strömförsörjningsmodulen av en behörig elektriker.
- Ta inte loss strömförsörjningsmodulen från mätaren när strömmen är på.
- Anslut inte strömförsörjningsmodulen till nätet när den inte är installerad i DMT345/346-mätaren
- Anslut alltid en skyddande jordningsplint.

Questo prodotto é conforme alla Direttiva sul basso voltaggio (2006/95/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 DMT345/346.
- Collegare sempre il morsetto protettivo a terra!

Dette produkt er i overensstemmelse med direktivet om lavspænding (2006/95/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 DMT345/346- senderen
- Forbind altid den beskyttende jordklemme!

Dit product voldoet aan de eisen van de richtlijn 2006/95/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 DMT345/346-transmitter is gemonteerd.
- Altijd beschermend aardcontact aansluiten!

Este producto cumple con la directiva de bajo voltaje (2006/95/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 DMT345/346.
- Conecte siempre el terminal de protección de conexión a tierra.

See toode vastab madalpinge direktiivile (2006/95/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 DMT345/346-tüüpi saatjasse paigaldatud.
- Ühendage alati kaitsev maandusklemm!

Ez a termék megfelel a Kisfeszültségű villamos termékek irányelvnek (2006/95/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 DMT345/346 távadóba.
- Feltétlenül csatlakoztasson földelő védőkapcsot!

Šis produktas atitinka direktyvą dėl žemos įtampos prietaisų (2006/95/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 DMT345/346 siųstuve, nejunkite jo į elektros tinklą.
- Visada prijunkite prie apsauginės įžeminimo jungties!

Šis produkts atbilst Zemsprieguma direktīvai (2006/95/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 uzstādīts DMT345/346 raidītājā
- Vienmēr pievienot aizsargājošu iezemētu terminālu !

Ten produkt spełnia wymogi Dyrektywy niskonapięciowej (2006/95/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 DMT345/346.

- Zawsze należy podłączać zabezpieczający zacisk uziemiający!

Tento výrobek vyhovuje Směrnici pro nízké napětí (2006/95/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 DMT345/346.

  - Vždy zapojte ochrannou zemnící svorku!

Galvanic Isolation for Output

If galvanic isolation of the power supply line from the output signals is needed, DMT346 can be ordered with optional output isolation module. This module prevents harmful grounding loops.

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

0605-031
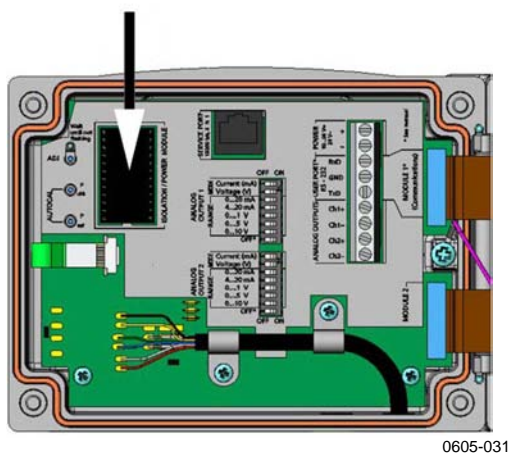
Figure 29   Galvanic Output Isolation Module

Third Analog Output

0503-030
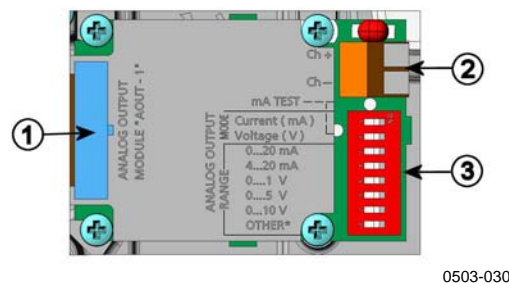
Figure 30   Third Analog Output

The following numbers refer to Figure 30 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.   Open the transmitter cover and and fasten the analog output module to the position for MODULE 2 with four screws. Refer to Figure 2 on page 23.

3.   Connect the flat cable between the analog output module and the motherboard's connector for 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.

	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.

Channel 3

0508-029

Figure 31   Third analog output selection

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 108. For testing the analog output, see Section Analog Output Tests on page 110. For fault indication setting, see section Analog Output Fault Indication Setting on page 111.

Alarm Relays

DMT346 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 Optional Modules on page 146.

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 23.

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**.

CAUTION	For installations in the USA: If your transmitter has both the relay module and a LAN or WLAN module, the maximum voltage you are allowed to connect to the relay module is 50 V.

Selecting Relay Activation State

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 Relays on page 112.
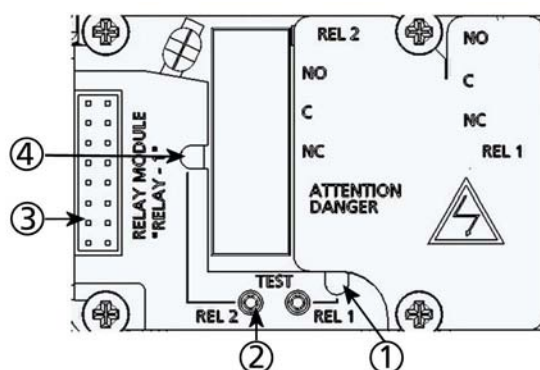
0605-032

Figure 32   Relay Module

Numbers refer to Figure 32 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
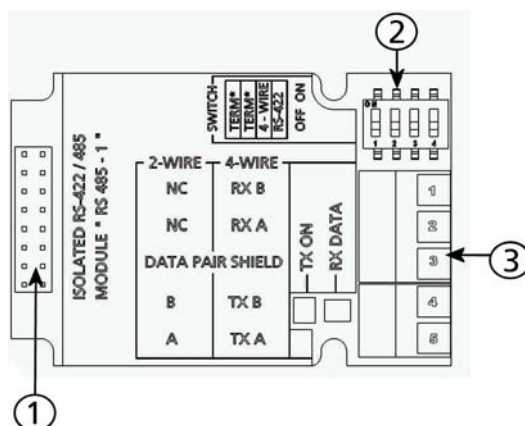
0605-033

Figure 33   RS-485 Module

Numbers refer to Figure 33 above:

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

NOTE	The markings on the module and in this manual are according to the line driver manufacturers' application notes, where A is posive against B when measured with a voltmeter.
	When connecting the module, be prepared to swap the A and B wires if you have a communication problem.

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 6:

Table 6   Connecting Twisted Pair Wires to 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
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 DMT346 to a master computer, enable the internal termination of DMT346 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 DMT346 through terminals RxA and RxB and receives data from DMT346 through terminals TxA and TxB.
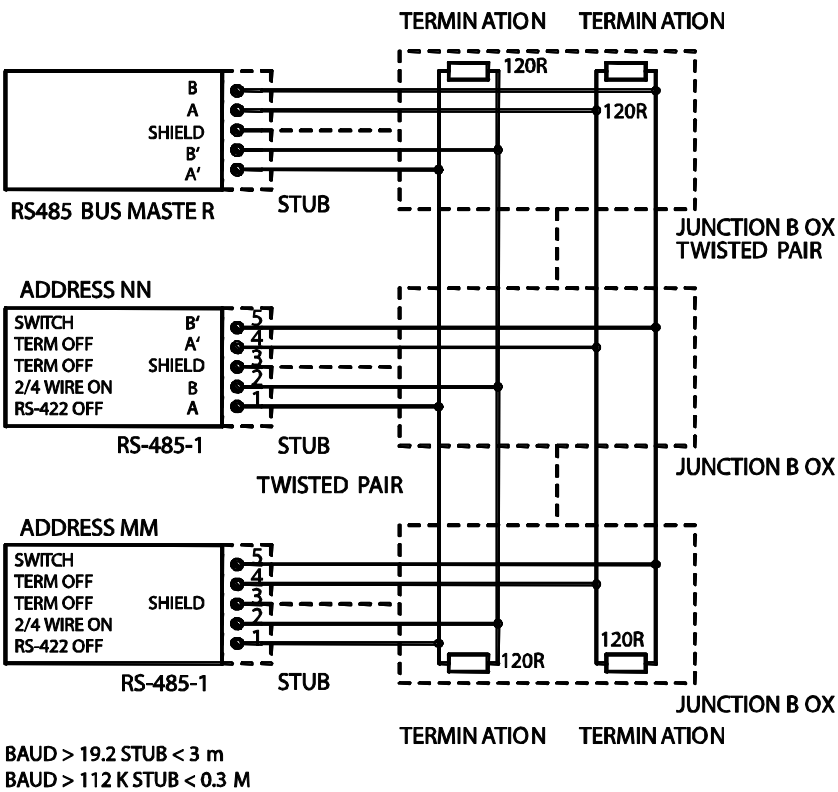
Figure 34 **4-Wire RS-485 Bus Connections, Part A**

Table 7 **4-Wire (Switch 3:On)**

RS-485 master	Data	DMT346
TxA	→	RxA
TxB	→	RxB
RxA	←	TxA
RxB	←	TxB
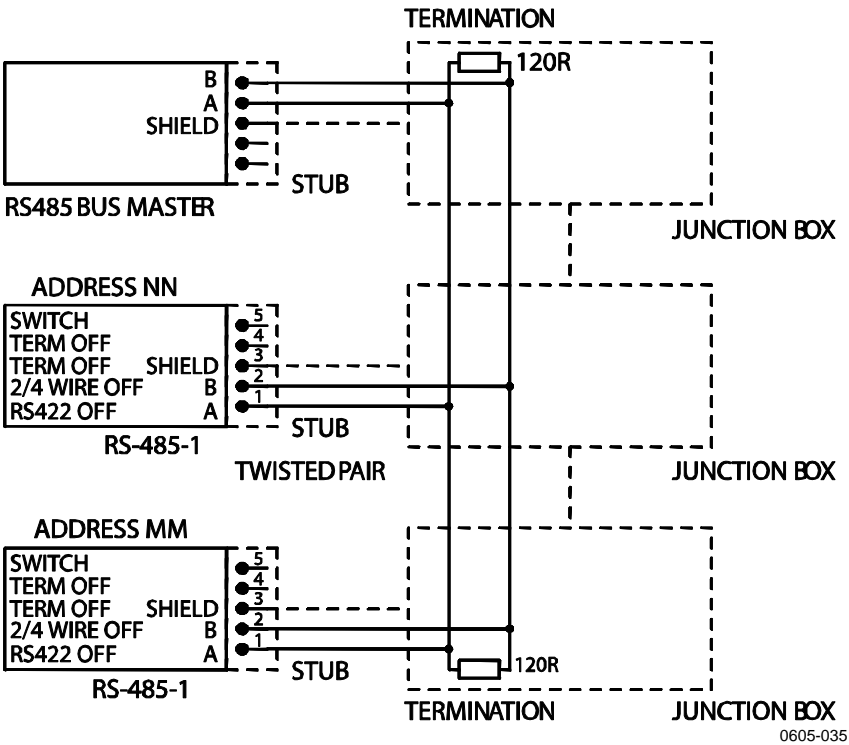
Figure 35   4-Wire RS-485 Bus Connections, Part B

Table 8   2-Wire (Switch 3:Off)

RS-485 master	Data	DMT346
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.

LAN Interface

The optional LAN interface enables an Ethernet connection to the transmitter. The user can establish a virtual terminal session using a telnet client program such as PuTTY. When the LAN Interface is in use, serial communication using the User Port is disabled.

The LAN interface module must be installed at the factory (when ordering the transmitter), or by a Vaisala Service Center. Once installed, the module is automatically used by the transmitter. The physical connection to the network is made to the RJ45 connector on the LAN interface module, using a standard twisted pair Ethernet cable

(10/100Base-T). Transmitters with the optional LAN interface are delivered pre-installed with a suitable cable and cable gland.

The LAN interface can use both static and dynamic network settings. If the interface is configured to use dynamic settings, the network where the LAN interface is connected must have a DHCP server that provides the settings.

The network configuration can be done using the optional display and keypad, or by using the service port. For instructions, see section LAN Communication on page 75. The LAN interface also provides a web configuration interface, which you can access by entering the IP address of the LAN interface in the address field of a web browser. For instructions on how to verify the current settings and status of the LAN interface, see section Device Information on page 98.
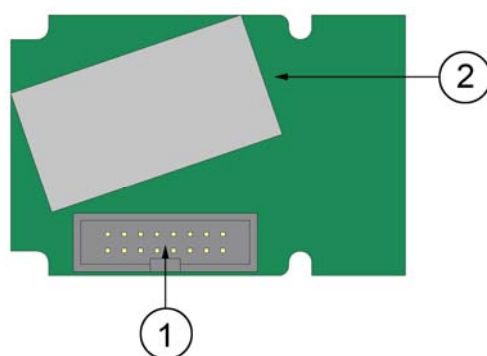
0709-003

Figure 36   LAN Interface Module

The following numbers refer to Figure 36 above:

1   =   Flat cable connector
2   =   RJ45 connector with indicator LEDs for link and activity

WLAN Interface

The optional WLAN interface enables a wireless Ethernet connection (IEEE 802.11b) to the transmitter. The user can establish a virtual terminal session using a telnet client program such as PuTTY. The interface supports Wired Equivalent Privacy (WEP) and Wi-Fi Protected Access (WPA). For WEP, 64 and 128 bit encryption is supported, with open system or shared key authentication. WPA is used in the Pre-Shared Key (PSK) mode, with either TKIP or CCMP protocol.

When the WLAN Interface is in use, serial communication using the User Port is disabled.

Similarly to the LAN Interface, the WLAN interface can use both static and dynamic network settings. If the interface is configured to use dynamic settings, the network where the WLAN interface is connected must have a DHCP server that provides the settings.

The WLAN interface also provides a web configuration interface, which you can access by entering the IP address of the WLAN interface in the address field of a web browser.
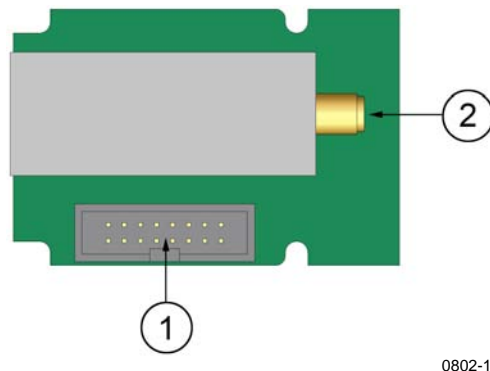
0802-103

Figure 37   WLAN Interface Module

The following numbers refer to Figure 37 above:

1   =   Flat cable connector
2   =   Connector for antenna cable (connected to transmitter cover)

Attaching the WLAN Antenna

The LAN interface module must be installed at the factory (when ordering the transmitter), or by a Vaisala Service Center. Before taking the transmitter into use, the user must attach the antenna of the WLAN interface into the RP-SMA connector on the transmitter cover. The location of the antenna is shown in Figure 75 on page 150.

Data Logger Module

The optional data logger module extends the data storage for the measurement data. When the data logger is present, this storage is automatically used by the transmitter. The stored data can be browsed using the optional display module, and accessed through the serial connections. See sections Graphic Historyon page 64 and Data Recording on page 102.

The data logger module contains non-volatile flash memory providing 4 years 5 months of storage for 3 parameters at a 10 second sampling interval. When the memory is full, the data recording will not stop. Instead, the oldest data is overwritten. For each parameter and observation period, the module stores the minimum and maximum values

during the interval, as well a data trend value that is averaged from samples taken during the interval (see Table 9 on page 59).

Table 9   Observartion Periods and Resolution

Observation Period	Period for Trend/Max/Min Calculations (Resolution)
3 hours	90 seconds
1 day	12 minutes
10 days	2 hours
2 months	12 hours
1 year	3 days
4 years	12 days

The quantities that are logged are the same that have been selected for measurement using the display/keypad or the serial line. When taking the transmitter into use, verify that the desired quantities are selected. If you change the quantities later, the transmitter will start logging the new quantities, and stop logging the quantities that are no longer selected. Changing the quantities does not delete any measurement data that is already in memory.

The data logger module has a real time clock with a battery back-up. The clock has been set to the Coordinated Universal Time (UTC) at the factory, and its time cannot be set by the user. The data that is stored in the logger's memory is timestamped using the logger's clock.

When date and time are set on the transmitter, they are stored to the transmitter's memory as an offset from the time on the logger's clock. When browsing the stored data, the time offset is applied to the timestamps shown in the graphical history, and data outputted from the serial port. The timestamps in the data logger's memory remain as they were originally stored.

You can compensate for the clock drift (less than ± 2 min/year) by setting the time on the transmitter. This updates the time offset used on the display and the serial port. You can set the time by using the keypad/display or the serial commands.

0706-068
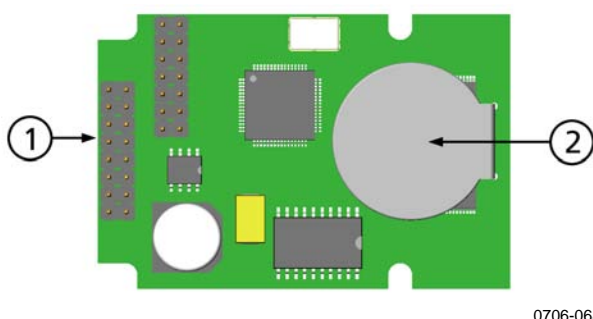
Figure 38   Data Logger Module

The following numbers refer to Figure 38 on page 59:

1 = Flat cable pins
2 = Battery

After a reset or a power up, it will usually take at least 10 seconds before the data logger module is initialized. The real time clock and the data logging and reading functions are not available before the initialization is complete.

The indicator LED on the module will blink green during normal operation. If the LED is lit in red color, there is a problem with the module. The transmitter will also indicate the problem by activating the "Add-on module connection failure" error. If the module is not operating correctly, the transmitter must be sent to Vaisala for maintenance.

The data logger module must be installed at the factory (when ordering the transmitter), or by a Vaisala Service Center. Once installed, the module is automatically used by the transmitter. When the module requires a new battery, the transmitter must be sent to Vaisala for maintenance.

8-Pin Connector
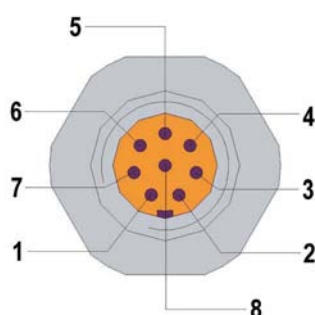
0511-048

Figure 39   Wiring of Optional 8-Pin Connector

Table 10   8-Pin Connector Wiring

PIN/Terminal	Wire	Serial Signal RS-232 (EIA-232)	RS-485 (EIA-485)	Analog Signal
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 –

PIN/Terminal	Wire	Serial Signal		Analog Signal
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 left-hand ⬚ 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 section Pressure Compensation Setting on page 92 for instructions on how to set the pressure.

Start-up time for DMT345/346 transmitter is in total about 6 minutes. The outputs (serial and analog) are activated 3 seconds after powering up the transmitter. 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 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 Quantities and Units on page 89).
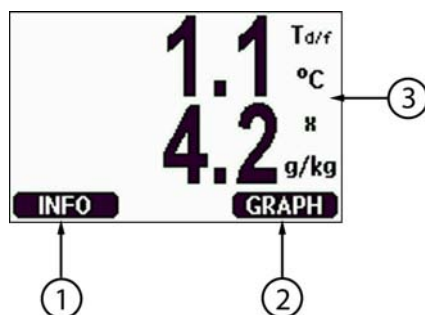
0605-036

Figure 40   Basic Display

The numbers refer to Figure 40 above:

1   =   The **INFO** shortcut 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 98.

NOTE	From any view, 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 or min/max graph of the
selected quantities, one at a time. The graph is updated automatically
while measuring.
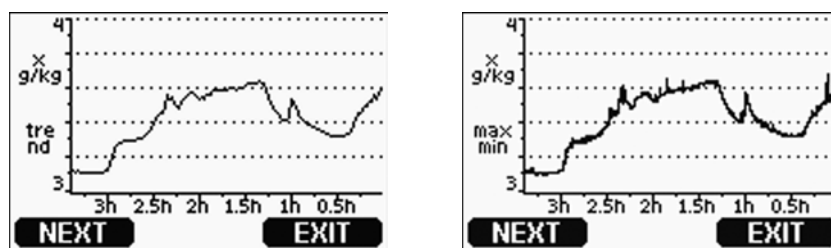
0706-028

Figure 41   Graphical Display

Trend graph: Shows you a curve of average values. Each value is a
calculated average over a period. See Table 11 on page 65.

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 11

below. The period for the trend and max/min calculations depends on the selected graph window as follows:

Table 11   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
4 year*	12 days

* Shows the maximum logging period of the data logger module (available when data logger module is installed)

Use the following functions in the graphical display:

- Press the **NEXT** button to change between the trend graph and max/min graph for the quantities selected for display.
- Press the **EXIT** button to return to the basic display.
- Press the ▼ ▲ arrow buttons to zoom in and out in the graph window.
- Press the ◄ ► arrow buttons move the cursor (vertical bar) along the time axis. The cursor mode allows you to observe individual measuring points. The numerical value at the cursor position is shown at the left upper corner. The right upper corner shows the time from the present to the chosen moment (without the logger module), or the date and time at the cursor position (when the logger module is installed).
- If the optional data logger module is installed, you can scroll the cursor off the screen to move to a new point on the time axis. The new date will be displayed, and the cursor will be centered at the date where the cursor scrolled off the screen.

0706-030
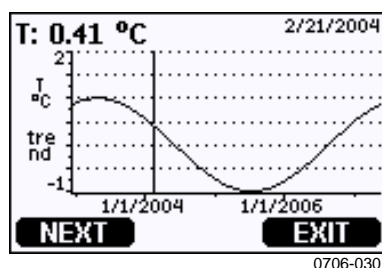
Figure 42 Graphical Display with Data Logger

The time that is shown below the graph is adjusted with the current time offset of the transmitter. If you change the transmitter's date and time setting, the displayed timestamps in the history graph change accordingly. For an explanation of the effect of changing the date and time manually, see section Data Logger Module on page 58.

Table 12   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 the ► 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.
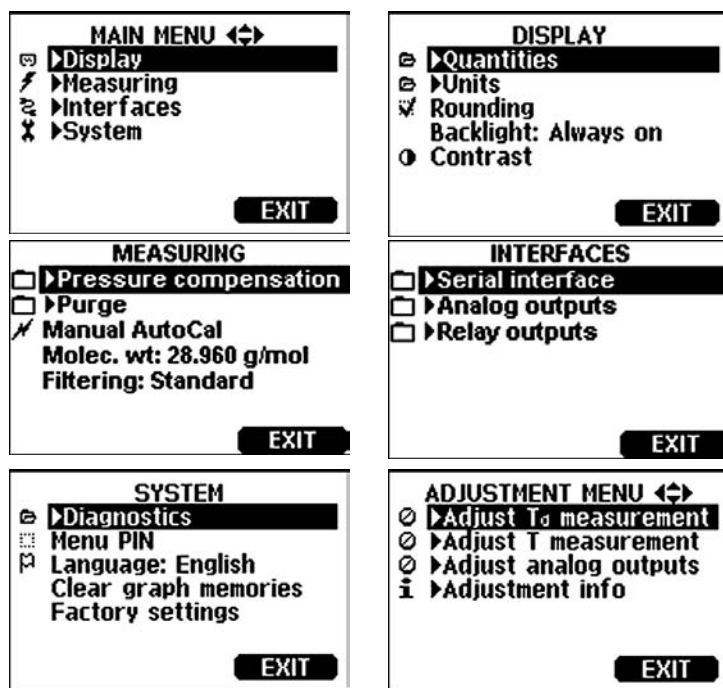
Figure 43   Main Views

Some menu items, such as **Relay outputs** in the **Interfaces** menu, are only shown if supported by the transmitter and the installed options.

Changing the Language

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.   Scroll to the **System** menu option, and press the ► button. The menu option is indicated with the wrench ✗ symbol.

4.   Scroll to the **Language** menu option, and the left-hand ⬚ button. The menu option is indicated with the flag ⚑ symbol.

5.   Select the language with the ▼▲ buttons, and confirm the selection by pressing the left-hand ⬚ button.

6.   Press the right-hand ⬚ button to exit 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 ⌷ 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. Open the **MAIN MENU** by pressing any of the ▲ ▼ ◄ ► arrow buttons.

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 89 for a description of the other menu options.

Display Alarms

The Display Alarm feature provides two independently configurable alarms for transmitters with the display/keypad option. Each alarm tracks a selected quantity, with a freely configurable low and high limit. Each alarm also has a configurable hysteresis value to prevent unnecessary triggering when the measurement fluctuates around an alarm limit. The alarms can be configured for any quantity supported by the transmitter.

The configuration of the Display Alarms can only be done using the display/keypad option.

An alarm is activated when the selected quantity goes higher than the high limit, or lower than the low limit, much in the same way as the relays. When an alarm is activated, an alarm note is displayed on the display, and the lights of the display will blink.
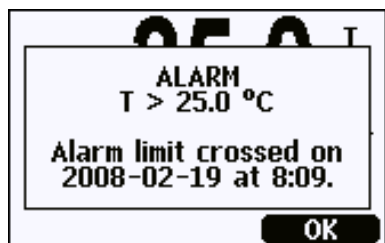
0802-041

Figure 44   Display Alarm Active

Multiple alarms can be active at the same time; the alarm that was triggered first will be shown on the display. The next active alarm is revealed when the currently shown alarm is acknowledged by pressing the **OK** button.

Note that activated alarms are only shown on the screen. There are no alarm messages output to the serial line, or markers placed in the graph data. After an alarm has been acknowledged, you must refer to the data graphs to see when the measured quantities have exceeded the limits.

Configuring a Display Alarm

1.   Enter the **MAIN MENU** by pressing an arrow key on the keypad.

2.   Use the arrow keys to select **Display**, followed by **Alarms,** to open the **Display Alarms** menu. The **Display Alarms** menu shows the currently enabled and disabled alarms.

0802-069

Figure 45   Display Alarms

3.   Use the arrow keys to select an alarm to configure. The alarm editing page opens.

NOTE	Changes you do on the alarm editing page will take effect immediately, and may cause an alarm to appear on the screen.

4. To select a quantity for the alarm, press the **Change** button and select the quantity from the list.

5. To modify or remove the alarm limit values, move the selection over the **Act. above** or **Act. below** field and press the **Set** button. You will be prompted to **Modify** or **Remove** the value.

```
          ALARM 1
   Quantity: T
   Act. above: +025.00 °C
   Act. below: 0.00 °C
   Hysteresis: 1.00 °C
 ☑ Alarm enable

 [ OK ]          [CANCEL]
```
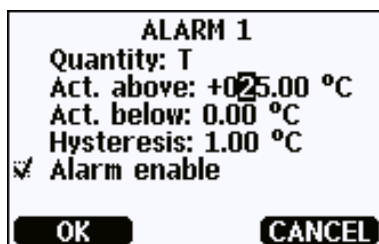
0802-070

Figure 46   Modifying an Alarm Limit

When modifying the value, use the arrow up and down buttons to change the value under the cursor. Left and right arrow buttons move the cursor. Select the **OK** button to accept the modified value, or **Cancel** to undo the modification.

6. Set a suitable **Hysteresis** value to prevent the alarm from being triggered unnecessarily by small measurement changes that pass the alarm limit repeatedly.

7. Set or clear the **Alarm enable** checkbox to enable or disable the alarm.

8. Press the **Exit** button to leave the alarm configuration screen and return to the basic view.

MI70 Link Program for Data Handling

The real-time window function of the MI70 Link program allows you to monitor transmitter readings directly with a PC when transmitter is connected with a serial or USB cable. You can also transfer recorded data from the main transmitter memory in numeric or graphical format, for further use in a spreadsheet program (such as Microsoft Excel) or virtually any other application.

Follow the steps below to connect your transmitter to the MI70 Link program using the serial interface:

1. Connect your PC to the transmitter. Refer to section Serial Line Communication on page 72.

2. Check that the transmitter is powered.

3. Start the MI70 Link program.

4. Start using the program. There is usually no need to select a COM port manually, the MI70 Link software can detect it automatically.

The MI70 Link program, and the optional connection cables, are available from Vaisala. See list of accessories in section Options and Accessories on page 148.

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 connections use the service port. Service port is always available with fixed serial settings.
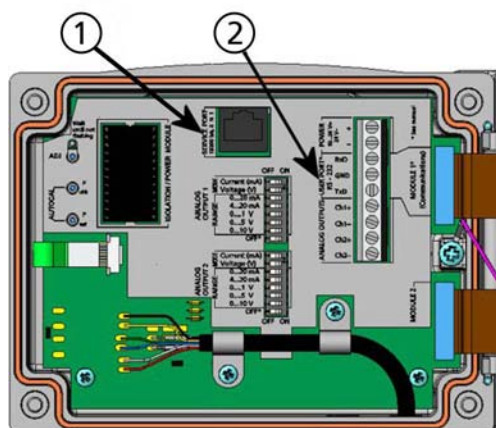
0605-039

Figure 47   Service Port Connector and User Port Terminal on the Motherboard

Numbers refer to Figure 47 above:

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 13   Default Serial Communication Settings for User Port

Parameter	Value
Bauds	4800
Parity	Even
Data bits	7
Stop bits	1
Flow control	None
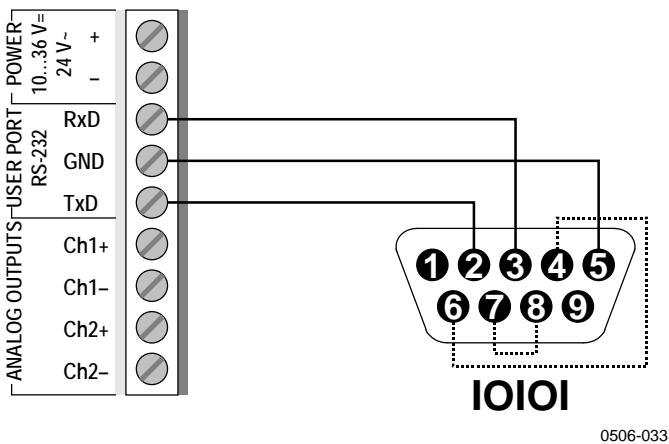
Figure 48   Connection Example Between PC Serial Port and User Port

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

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

Service Port Connection

Connection Cables

To connect to the service port, you need a suitable cable with an RJ45 connector. Depending on the connections of your PC, you can either use the Serial Connection Cable (optional accessory 19446ZZ) or the USB-RJ45 Serial Connection Cable (optional accessory 219685). The USB cable enables you to connect the transmitter to a PC via a standard type A USB port. Note that the USB cable does not enable high speed data transfer, since the bit rate is limited by the serial interface of the service port.

Installing the Driver for the USB Cable

Before taking the USB cable into use, you must install the provided USB driver on your PC. When installing the driver, you must acknowledge any security prompts that may appear. The driver is compatible with Windows® 2000, Windows® XP, Windows Server® 2003, and Windows® Vista.

1. Check that the USB cable is not connected. Disconnect the cable if you have already connected it.

2. Insert the media that came with the cable, or download the driver from www.vaisala.com.

3. Execute the USB driver installation program (setup.exe), and accept the installation defaults. The installation of the driver may take several minutes.

4. After the driver has been installed, connect the USB cable to a USB port on your PC. Windows will detect the new device, and use the driver automatically.

5. The installation has reserved a COM port for the cable. Verify the port number, and the status of the cable, using the **Vaisala USB Instrument Finder** program that has been installed in the Windows Start menu.

Windows will recognize each individual cable as a different device, and reserve a new COM port. Remember to use the correct port in the settings of your terminal program. If you are using the Vaisala MI70 Link application, you do not need to check the COM port, as the MI70 Link detects the USB connection automatically.

There is no reason to uninstall the driver for normal use. However, if you wish to remove the driver files and all Vaisala USB cable devices, you can do so by uninstalling the entry for **Vaisala USB Instrument Driver** from the **Add or Remove Programs** (**Programs and Features** in Windows Vista) in the Windows Control Panel.

Using the Service Port

1. Unfasten the screws on the transmitter cover, and open the transmitter.

2. Connect the desired cable (serial interface cable or USB cable) to your PC and the service port connector on the transmitter. For location of the service port, refer to Figure 48 on page 72.

3.   Open a terminal program and set the communication settings as follows:

Table 14   Communication Settings for the Service Port

Parameter	Value
Bauds	19200
Parity	None
Data bits	8
Stop bits	1
Flow control	None

For a detailed explanation of using a terminal program, see section Terminal Program Settings on page 82.

4.   Power-up the DMT346.

LAN Communication

To enable LAN communication, a LAN or WLAN interface must be physically connected to the network, and the networking settings must be suitable for your network. For a description of interfaces, see sections LAN Interface on page 56 and WLAN Interface on page 57.

The LAN and WLAN interfaces both operate by accessing the serial interface (User Port) of the transmitter. All commands that are available using the serial interface are available through the LAN and WLAN interfaces; refer to section List of Serial Commands on page 85. For instructions on how to connect using a terminal program, see section Terminal Program Settings on page 82.

IP Configuration

The IP settings of the LAN and WLAN interfaces are described in Table 15. The current settings can be viewed on the serial line or using the device information display; see section Device Information on page 98.

Table 15   IP Settings for the LAN and WLAN Interfaces

Parameter	Description
Automatic configuration (DHCP)	If enabled, the transmitter will retrieve its network settings (including the IP Address) from a server in the network. If disabled, static network settings are used instead.
Web configuration	If enabled, the settings of the interface can be changed using a web browser. The configuration page can be accessed by browsing to the IP address of the transmitter.
IP Address	The four part network ID of the transmitter. Must be set manually if automatic configuration is not used. Example value: **192.168.0.222**
Netmask	Used together with the IP address to determine which network the transmitter is a part of. Must be set manually if automatic configuration is not used. A common netmask is **255.255.255.0**.
Gateway	IP address of the server that enables the transmitter to access other networks. Must be set manually if automatic configuration is not used. Example value: **192.168.0.1**
MAC	The MAC address is the unique hardware address of the LAN or WLAN interface. Cannot be changed.

Using Display/Keypad

You can configure the IP settings of the LAN and WLAN interfaces using the display/keypad as follows:

1.   Press any of the arrow buttons to open the **MAIN MENU**.

2.   Press the ► arrow button to select **Interfaces**.

3.   Press ► arrow button to select **Network settings**. There will be a delay as the transmitter refreshes the network information.

4.   You are now in the **Network Interface** menu. Selecting the **IP configuration** option opens the IP configuration menu.
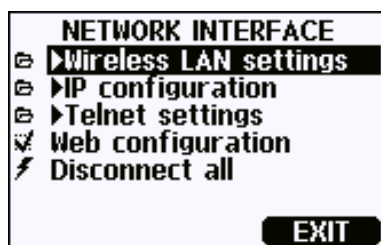
0802-113

Figure 49   Network Interface Menu

The **Network Interface** menu also allows you to enable or disable the **Web configuration** option, or **Disconnect all** users that are currently accessing the LAN or WLAN interface.

5. In the IP configuration menu, select **Automatic configuration (DHCP)**, or enter the **IP address**, **Netmask** and **Gateway** manually. If automatic configuration is enabled, manual configuration cannot be done.
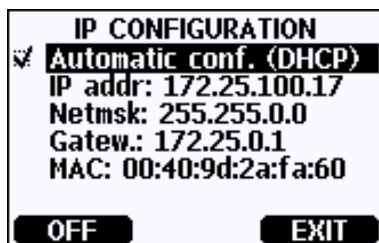
0709-004

Figure 50   IP Configuration Menu

To enter a value manually, use the the ▲▼ arrow buttons to select the parameter to change, and press **Change**. A cursor will appear in the first digit. Move the cursor using the ◄► arrow buttons, and change the value under the cursor using the ▲▼ arrow buttons. Confirm the selection by pressing **OK**.

6. After configuring the desired parameters, press **EXIT** to return to the basic display.

Using Serial Line

Use the serial line command **NET** to view or set the network settings for the LAN and WLAN interfaces. You can also refresh the network information or disconnect all active connections.

NET [*REFRESH*] [*DISCONNECT*] [*DHCP WEB*] [*DHCP IP SUBNET GATEWAY WEB*]

where

REFRESH	=	Updates the network information and displays it.
DISCONNECT	=	Disconnects all current sessions.
DHCP	=	ON or OFF. Enables or disables the automatic IP configuration.
WEB	=	ON or OFF. Enables or disables the Web Configuration page.
IP	=	The four part network ID of the transmitter. Must be set manually if automatic configuration is not used.
SUBNET	=	Used together with the IP address to determine which network the transmitter is a part of. Must be set manually if automatic configuration is not used.

where

GATEWAY = IP address of the server that enables the transmitter to access other networks. Must be set manually if automatic configuration is not used.

Examples:

```
>net refresh
OK
DHCP           : OFF
IP address     : 192.168.0.101
Subnet mask    : 255.255.255.0
Default gateway: 192.168.0.1
Web config.    : OFF
MAC address    : 00:40:9d:2c:d2:05
Telnet         : Not connected
>

>net on off
DHCP           : ON
IP address     : 192.168.0.104
Subnet mask    : 255.255.255.0
Default gateway: 192.168.0.1
Web config.    : OFF
MAC address    : 00:40:9d:2c:d2:05
Telnet         : Connected
OK
>

>net off 192.168.0.101 255.255.255.0 192.168.0.1 off
DHCP           : OFF
IP address     : 192.168.0.101
Subnet mask    : 255.255.255.0
Default gateway: 192.168.0.1
Web config.    : OFF
MAC address    : 00:40:9d:2c:d2:05
Telnet         : Connected
OK
>
```

Wireless LAN Configuration

The settings of the WLAN interface are described in Table 16. The current settings can be viewed on the serial line or using the device information display; see section Device Information on page 98.

Table 16   Wireless LAN Settings

Parameter	Description
SSID	The service set identifier (i.e. network name) of the wireless network to connect to. 1 … 32 characters.
Security type	The security type of the wireless network. The options are: OPEN OPEN/WEP WPA-PSK/TKIP WPA-PSK/CCMP All other choices except OPEN require a security key; see below.
Security key	The encryption key or passphrase that is used with an encrypted network.

Using Display/Keypad

You can configure the Wireless LAN settings using the display/keypad as follows:

1.   Press any of the arrow buttons to open the **MAIN MENU**.

2.   Press the ► arrow button to select **Interfaces**.

3.   Press the ► arrow button to select **Network settings**. There will be a delay as the transmitter refreshes the network information.

4.   Press the ► arrow button to select **Wireless LAN settings**.
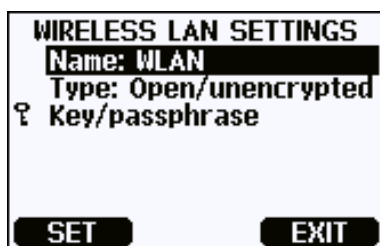
0802-111

Figure 51   Wireless LAN Settings

5.   The **Name** entry on the page shows the SSID of the currently selected wireless network. To change the SSID, press the **SET** button. Use the ▲ ▼ arrow buttons to change the character under the cursor, and ◄ ► arrow buttons to more the cursor. Press the **OK** button when done.
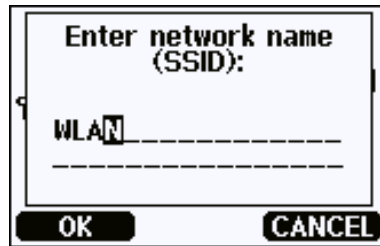
0802-110

Figure 52   Entering Network SSID

6.   To change the currently selected Network type, select the **Type** entry and press the **Change** button. Select the new type from the list and press the **Select** button.
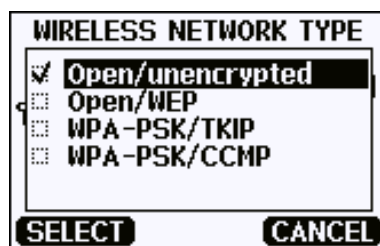
0802-112

Figure 53   Selecting the Wireless Network Type

7.   If you have selected an encrypted network type (WEP or WPA), you must enter the security key to be used. Select the **Key/passphrase** entry and press the **Set** button. Enter the key in the same way as the SSID, and press the **OK** button. With the WEP encryption you must enter the encryption key in hexadecimal (10 hexdecimals for 64-bit encryption or 26 hexadecimals for 128-bit encryption). A WPA key must be 8 … 63 ASCII characters.

8.   After setting the wireless network parameters, press the **Exit** button in the **Wireless Network Settings** menu. You will be asked to confirm the new settings. Note that when new settings are saved, all currently active WLAN connections are disconnected.

Using Serial Line

Use the serial line command **WLAN** to view or set the wireless network settings. If you set an encrypted network type, you will be asked to enter the security key. With the WEP encryption you must enter the encryption key in hexadecimal (10 hexdecimals for 64-bit encryption or 26 hexadecimals for 128-bit encryption) or with plain ASCII characters (5 characters for 64-bit encryption or 13 characters for 128-bit encryption). A WPA key must be 8 … 63 ASCII characters.

WLAN [*SSID TYPE*]

Where

SSID	=	The network name in 1 … 32 characters
TYPE	=	The security type of the wireless network. The options are:

                OPEN
                OPEN/WEP
                WPA-PSK/TKIP
                WPA-PSK/CCMP

Examples:

```
>wlan ?
Network SSID   : WLAN-AP
Type           : OPEN
>

>wlan accesspoint wpa-psk/tkip
Network SSID   : accesspoint
Type           : WPA-PSK/TKIP
WPA-PSK phrase ? thequickbrownfox
Warning: Active connection will be disconnected.
Save changes (Y/N) ? y
OK
>
```

Telnet Settings

When a telnet connection is established via the LAN or WLAN interface, the session has the same communication mode, run interval, poll address and echo settings as the serial port (user port) session would have.

These settings can be changed using the display/keypad, using the serial line (user port or service port), or on-the-fly during the telnet session.

The display menu path to the telnet settings is:
Main menu ► Interfaces ► Network Interface ► Telnet settings.

The commands for changing the settings are **SMODE**, **INTV**, **ADDR**, and **ECHO**.

Web Configuration for LAN and WLAN

The LAN and WLAN interfaces both have a web configuration page that is accessible using a browser. If you have not disabled the page from the network settings, you can access it with a web browser at the IP address of the interface.

When accessing the web configuration page, you must first log in.

Username: **user**
Password: **vaisala**

The web configuration page provides similar network configuration options as the serial line and the display/keypad. It also has additional options for advanced users. For example, there are more options for securing the wireless network.

If these additional options are used, they will appear as custom configurations when viewed from the serial line or the display/keypad.
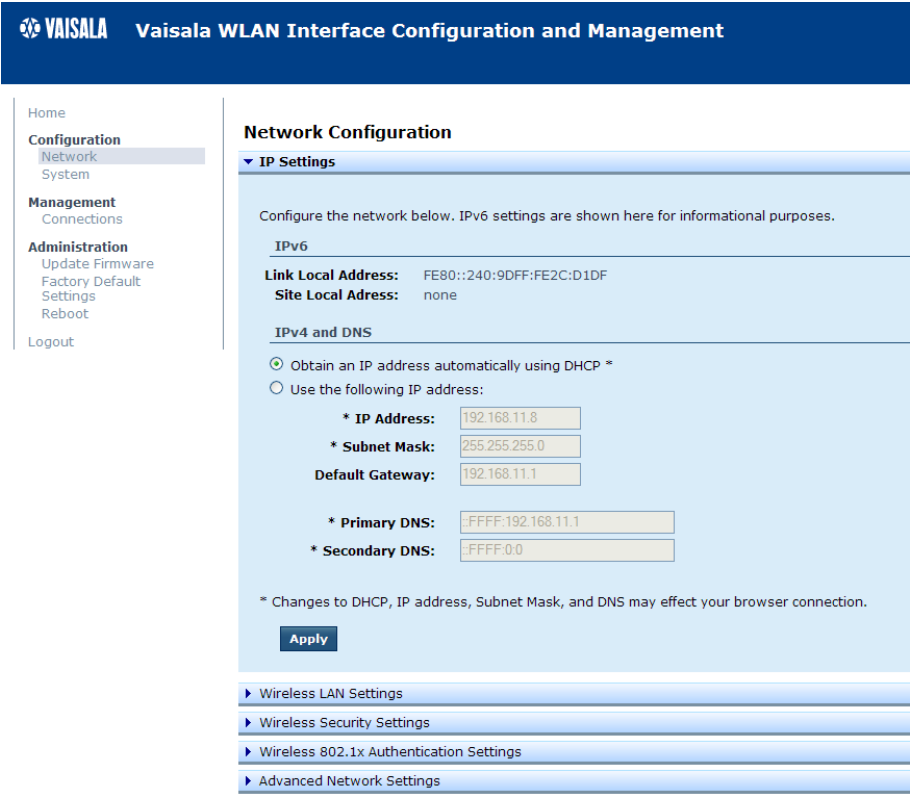
0802-114

Figure 54   Web Configuration Interface for WLAN

Terminal Program Settings

The instructions below describe how to connect to the transmitter using the PuTTY terminal application for Windows. Perform the necessary cabling and configuration of the transmitter before following the instructions.

PuTTY is available for download at www.vaisala.com.

Opening a Serial/USB Connection

1.   Power up the transmitter and start the PuTTY application.

2.   Select the Serial & USB settings category, and check that the correct COM port is selected in the **Serial or USB line to connect to** field. Change the port if necessary.

     If you are using a Vaisala USB cable, you can check the port that it uses by clicking the **USB Finder...** button. This opens the *Vaisala USB Instrument Finder* program that has been installed along with the USB drivers.

3.   Check that the other serial/USB line settings are correct for your connection, and change if necessary. The default settings (shown in Figure 1) are used by the Service Port of the transmitter.
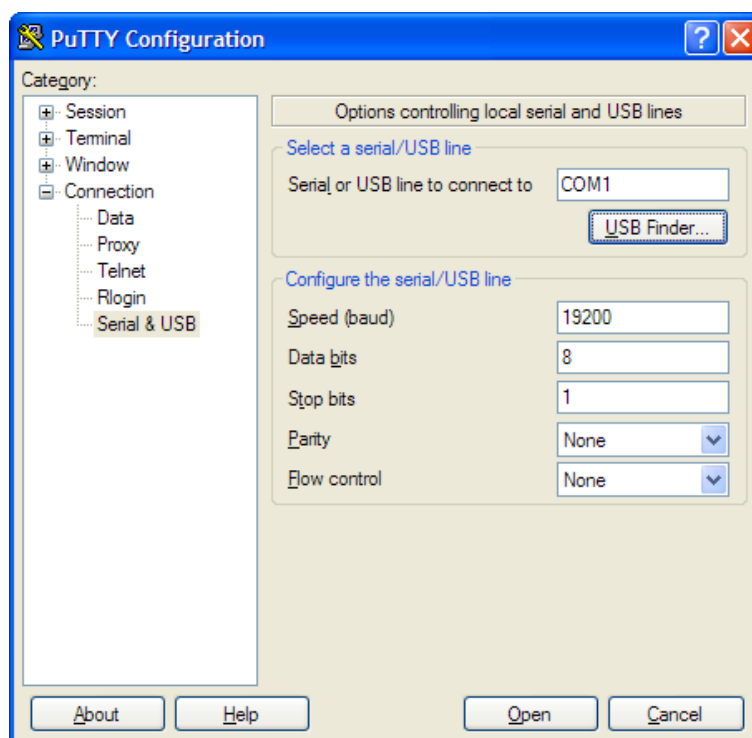
0810-070

Figure 55   Opening a Serial Connection

4.   Click the **Open** button to open the connection window and start using the serial line.

     If PuTTY is unable to open the serial port you selected, it will show you an error message instead. If this happens, restart PuTTY and check the settings.

Opening a Telnet Session (LAN/WLAN)

NOTE	The instructions below assume that the LAN/WLAN interface on the transmitter is correctly configured and the network connection is already done.

1. Power up the instrument and start the PuTTY application. If your transmitter acquires a network address using DHCP, wait for a minute for this to complete, then verify the address from the transmitter.

2. In the Session window, select the **Telnet** connection type.

3. Enter the IP address of your transmitter in the **Host Name (or IP address)** field. If you do not know the port, the default port **23** is likely correct.
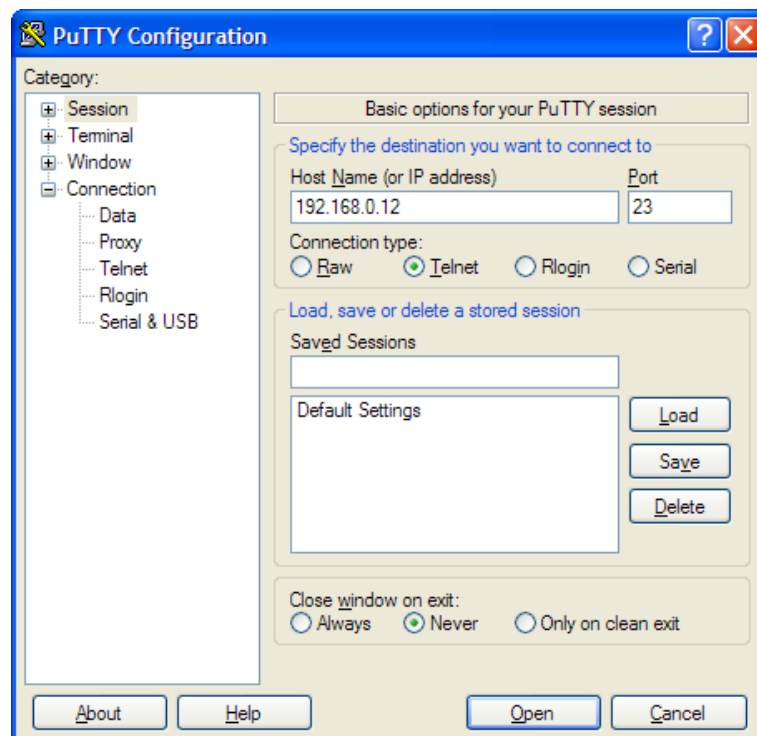
0810-071

Figure 56   Opening a Telnet Connection

4. Click the **Open** button to open the connection window and start using the telnet session.

    If PuTTY is unable to connect the IP address you entered, it will show you an error message instead. If this happens, check the IP address and the connections, restart PuTTY, and try again.

List of Serial Commands

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

Table 17   Measurement Commands

Command	Description
R	Start the Continuous Outputting
S	Stop the Continuous Outputting
INTV [**0** ... 255 **S**/MIN/H]	Set the Continuous Output Interval (for RUN mode)
SEND [0 ... 99]	Output the Reading once
SMODE [**STOP**/RUN/POLL/SEND]	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)
NET	View or set networking parameters for LAN and WLAN interfaces
WLAN	View or set wireless network parameters for WLAN interface
OPEN [**0** ... 99]	Open Temporarily Connection to a POLL Mode Device
CLOSE	Close the Temporary Connection (Back to POLL Mode)

Table 18   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 19   Data Recording Commands

Command	Description
DIR	Lists trend log files
PLAY [0 ... 21] [START END]	Output recorded data file. Start and end times can only be specified if the data logger module is installed. The times must be given in the following format: yyyy-mm-dd hh:mm:ss
DSEL	Select logged (and displayed) quantities
DELETE	Delete all data files, including the memory of the optional data logger module
UNDELETE	Recover the deleted files that have not been overwritten

Table 20   Purge Commands

Command	Description
PUR	Purge settings
PURGE	Start manual purge

Table 21   Autocalibration Commands

Command	Description
AUTO	AutoCal settings
AUTOCAL	Start manual AutoCal

Table 22   Calibration and Adjustment Commands

Command	Description
FCRH	RH 2-point-adjustment
AØ1	Td/f 1-point-adjustment
CT	T 1/2-point-adjustment
ACAL	Perform analog output adjustment

Table 23   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 24   Setting and Testing the Relays

Command	Description
RSEL	Configure relay settings
RTEST	Test relays

Table 25   Other Commands

Command	Description
?	Output the information about the device
??	Output the information about the device in POLL-state
CDATE	Display 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.
DSEND	Output the reading, also in poll mode.
ECHO	Turn the serial interface echo ON/OFF
ERRS	Display transmitter error messages
FIND	All devices in POLL mode send their addresses
HELP	List the most common commands
LOCK	Lock the menu/keypad
MODS	Display module status
PRES	Set the value for pressure compensation

Command	Description
RESET	Reset the device
TEST	Self-diagnostics information
TIME	Set time.
UNIT	Display output units
VERS	Display the software version information
XPRES	Set pressure (temporarily)
MOL/MOLI	View/set mole weight parameter

Getting Measurement Message from Serial Line

Starting Continuous Outputting

R

Enter the **R** command to start the continuous output of measurements.

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
>
```

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

You can change the format of the output with the following commands:

- Outputting interval can be changed with the **INTV** command.
- Output message format can be changed with the **FORM** command**.**
- Status of purge, sensor warming and AutoCal can be added with the **FST** command.
- Date and time information can be added with commands **FDATE** and **FTIME**.

Stopping Continuous Outputting

S

Use the **S** command to end the RUN mode. After this command all other commands can be used. You can also press the **Esc** button or reset the transmitter to stop the outputting.

See command **SMODE** to change the default (power-up) operation mode.

Formatting Serial Line Message

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 issue command **FTIME** [*x*].

Syntax:

FTIME

Syntax: to add date to **R** and **SEND** outputs:

FDATE [*x*]

where

x   =   ON or OFF

Example:

```
>send
RH= 16.2 %RH T= 22.0 'C
>ftime on
Form. time     : ON
>send
00:03:56 RH= 16.2 %RH T= 22.0 'C
>fdate on
Form. date     : ON
>send
2000-01-01 00:04:08 RH= 16.2 %RH T= 22.0 'C
>
```

FST

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

Syntax: **FST** [*x*]

where

x   =   ON or OFF (default)

Example:

```
>fst on
Form. status   : ON
>send
w     0 Tdf=  0.6 'C x=   4.0 g/kg  SSR= 22.5 %  Ts= 23.2
'C
>
```

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

General Settings

Changing Quantities and Units

To change quantities and units use serial commands or the optional display/keypad. See Table 5 on page 20 for available quantities.

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

Using Display/Keypad

Use display/keypad to select the display output quantities.

1. Open the **MAIN MENU** by pressing any of the ▲ ▼ ◄ ► arrow buttons.
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. Open the **MAIN MENU** by pressing any of the ▲ ▼ ◄ ► arrow buttons.
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.

Using Serial Line

Use the serial line command **FORM** to change the format, and the command **UNIT** to select metric or non-metric 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**.

Syntax: **FORM** [*x*]

where

x   =   Formatter string

Formatter string consists of quantities and modifiers. If no formatter string is entered, the command will display the currently active formatter string. Note that the hash symbol "#" is shown as a backslash "\" when viewing the current formatter string.

When selecting the quantity, use the abbreviations of the quantities presented in Table 5 on page 20 when issuing the command. The modifiers are presented in Table 26 below.

Table 26   Modifiers

Modifier	Description
x.y	Length modifier (number of digits and decimal places)
#t	Tabulator
#r	Carriage-return
#n	Line feed

Modifier	Description
""	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 159 ºC S 115.0　　　purge cooling active, temperature 115 ºC X　95.0　　　sensor heating active, temperature 95 ºC
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 "SSR=" 4.2 ssr U5 #t "Ts=" ts U3 #r #n
OK
>
>send
SSR=  22.51%            Ts=  23.14'C
>
```

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

```
>form /
OK
>send
Tdf=  0.5 'C x=   4.0 g/kg  SSR= 22.4 %  Ts= 23.1 'C
>
```

UNIT

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

Syntax: **UNIT** [*x*]

where

x　　=　M　or N
　　　　M　=　metric units
　　　　N　=　nonmetric 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.

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. If you are using mixing ratio as an output quantity, it is recommended that you make the pressure compensation setting.

Note that conversions from mmHg and inHg are defined at 0°C and for mmH$_2$O and inH$_2$O 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 Quantities and Units on page 89.

1. Open the **MAIN MENU** by pressing any of the ▲ ▼ ◄ ► arrow buttons.
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 Motherboard

Pressure set buttons (P_{chk} and P_{set}) can be used to set the process pressure.
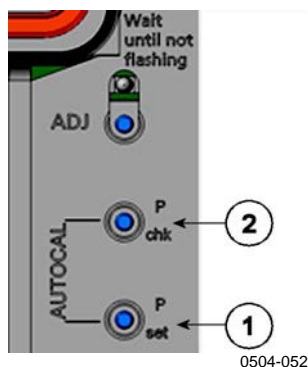
Figure 57   Pressure Set Buttons on Motherboard

Numbers refer to Figure 57 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.

Syntax:

PRES [*aaaa.a*]

XPRES [*aaaa.a*]

where

aaaa.a   =   Absolute process pressure (hPa)

Example:

```
>pres
Pressure        : 1013.00 hPa ?
>pres 1010
Pressure        : 1010.00 hPa
>
```

Table 27   Multiplication Factors

From	To: hPa
mbar	1
PaN/m2	0.01
mmHg torr	1.333224
inHg	33.86388
mmH$_2$O	0.09806650
inH$_2$O	2.490889
atm	1013.25
at	980.665
bar	1000
psi$_a$ [1]	68.94757

1)   psi$_a$ = psi absolute

Example:

$29.9213 \text{ inHg} = 29.9213 \times 33.86388 \text{ hPa} = 1013.25 \text{ hPa}$

Date and Time

Using Display/Keypad

If the optional Data Logger Module is installed, you can change the time and date using the display/keypad.

1.   Press any of the arrow buttons to open the **MAIN MENU**.
2.   Select **System** and press the ► arrow button to confirm your selection.
3.   Select **Date and time** and press the ► arrow button.
4.   Press the **SET** button to enter the adjustment mode, and use the arrow buttons to select and change the values.
5.   You can also change the date and time formats that are shown in the graphs. The selected formats are only used in graphical display, they do not change the formats that are used in the serial communication.
6.   Press **EXIT** to return to the basic display.

Using Serial Line

To set time enter the **TIME** command. To set date enter the **DATE** command.

TIME

DATE

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.

Example:

```
>TIME
Time            : 13:42:49 ?

>DATE
Date            : 2007-05-31 ?
```

NOTE	If the optional Data Logger Module is not installed, time and date are cleared to 2000-01-01 00:00:00 at reset or at power failure.

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. Open the **MAIN MENU** by pressing any of the ▲ ▼ ◄ ► arrow buttons.
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.

Syntax: **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.

Syntax: **SMODE** [*xxxx*]

where

xxxx   =   STOP, RUN, POLL or SEND

Table 28   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 53.
SEND	One message at power-up	

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.

Syntax: **INTV**[*xxx yyy*]

 where

xxx =   Output interval (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.

Syntax: **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 29   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.   Open the **MAIN MENU** by pressing any of the ▲ ▼ ◄ ► arrow buttons.
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

Set the filtering level.

Syntax: **FILT** [*xxx*]

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
- Display Alarm settings
- serial interface information
- network settings and status of the LAN and WLAN interfaces
- analog output information
- relay output information
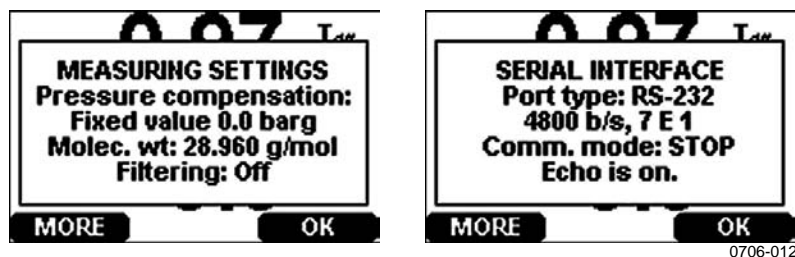
Figure 58 Following Device Information on the Display

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.

Example:

```
>?
DMT340 / 3.01
Serial number  : A3220001
Batch number   : A3120029
Adjust. date   : 2005-08-09
Adjust. info   : Vaisala/HEL
Date           : 2000-01-01
Time           : 00:42:41
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 Tdf   low  : 0.00 'C
Ch1 Tdf   high : 100.00 'C
Ch2 x     low  : 0.00 g/kg
Ch2 x     high : 1000.00 g/kg
Module 1       : not installed
Module 2       : not installed
>
```

HELP

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

```
>help
?          ACAL       ADDR       AERR       ALSEL
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       NET        OPEN       PLAY       PRES
R          RESET      SEND       SERI       SMODE
TEST       TIME       UNDELETE   UNIT       VERS
WLAN       XPRES
>
```

ERRS

Use the command **ERRS** to display transmitter error messages, see Table 30 on page 128.

Examples:

```
>ERRS
NO ERRORS
>
```

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

VERS

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

Example:

```
>vers
DMT346 / 3.01
>
```

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**.

Locking Menu/Keypad by Using Serial Line

LOCK

Use the **LOCK** command to prevent the user from entering the menu using the keypad, or to lock the keypad completely. You can optionally set a 4-digit PIN code, for example 4444.

If a PIN code has been set, the user will be prompted to enter the code when trying to access the menu. Entering the code correctly will disable the lock until the user returns back to the basic view.

LOCK [*x*] [*yyyy*]

where

x	=	Keypad locking level, range 0...2. The options are: 0 - No lock (enables full access) 1 - Menu locked, but graphs are accessible 2 - Keypad completely disabled
yyyy	=	4-digit PIN code. The code can only be set when keypad locking level is 1.

Examples:

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

>lock 1
Keyboard lock  : 1
>
```

Data Recording

Data recording function is always on and collects data automatically into the memory of the device. If the optional data logger module is installed, the transmitter uses it automatically. Recorded data does 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 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 Quantities and Units on page 89 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.

Syntax: **DSEL** [*xxx*]

where

xxx = Data recording quantity. See Table 5 on page 20 for output available quantities.

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

Example:

```
>dsel tdf x
 Tdf x
>dsel
 Tdf x
>
```

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 64 for details about graphical display.

DIR

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

Without the data logger module, the transmitter records five files (five observation periods) for each selected quantity. The data logger raises the number of recorded files to six for each quantity. Thus, the total amount of the files varies between 5 and 18. See Table 11 on page 65.

Select, for example, two quantities (T and Tdf). The last column illustrates the number of data points that has been stored in the file.

Example (data logger module installed):

```
>dir
   File description       Oldest data available    No. of points
1  T    (90 s intervals)  2007-05-30 05:25:30      1555200
2  T    (12 min intervals) 2007-05-29 05:48:00     194400
3  T    (2 h intervals)   2007-05-19 02:00:00      19440
4  T    (12 h intervals)  2007-03-23 12:00:00      3240
5  T    (3 d intervals)   2006-04-20 00:00:00      540
6  T    (12 d intervals)  2002-12-16 00:00:00      135
7  Tdf  (90 s intervals)  2007-05-30 05:25:30      1555200
8  Tdf  (12 min intervals) 2007-05-29 05:48:00     194400
9  Tdf  (2 h intervals)   2007-05-19 02:00:00      19440
10 Tdf  (12 h intervals)  2007-03-23 12:00:00      3240
11 Tdf  (3 d intervals)   2006-04-20 00:00:00      540
12 Tdf  (12 d intervals)  2002-12-16 00:00:00      135
>
```

Example (without data logger module):

```
>dir
   File description       Oldest data available    No. of points
1  T    (90 s intervals)  2008-04-11 20:41:11      135
2  T    (12 min intervals) 2008-04-10 21:03:41     135
3  T    (2 h intervals)   2008-03-31 18:03:41      135
4  T    (12 h intervals)  2008-02-04 12:03:41      135
5  T    (3 d intervals)   2007-03-04 00:03:41      135
6  Tdf  (90 s intervals)  2008-04-11 20:41:11      135
7  Tdf  (12 min intervals) 2008-04-10 21:03:41     135
8  Tdf  (2 h intervals)   2008-03-31 18:03:41      135
9  Tdf  (12 h intervals)  2008-02-04 12:03:41      135
10 Tdf  (3 d intervals)   2007-03-04 00:03:41      135
>
```

PLAY

Use the **PLAY** command to output the selected file to the serial line. If the data logger module is installed, you can specify an interval to be outputted.

Data in the output is <TAB> delimited. This is compatible with most spreadsheet programs. Before giving the command, set the local date and time with **TIME** and **DATE** commands, if needed.

PLAY [*x*] [*start_date start_time end_date end_time*]

where

x	=	Number of the data file that will be outputted, range 0 ... 18. The numbers correspond to the output of the DIR command; refer to the example on page 103. Selecting number 0 will output all data files.
start_date	=	Starting date of the interval to be outputted. Must be given in the following format: yyyy-mm-dd

where

start_time = Starting time of the interval to be outputted. Must be given in the following format: hh:mm:ss
end_date = Ending date of the interval to be outputted. Must be given in the following format: yyyy-mm-dd
end_time = Ending time of the interval to be outputted. Must be given in the following format: hh:mm:ss

Example:

```
>play 7 2007-05-05 00:00:00 2007-05-06 00:00:00
Tdf  (12 min intervals) 2007-05-05 00:00:00  121
Date          Time        trend    min      max
yyyy-mm-dd  hh:mm:ss        'C      'C       'C
2007-05-05  00:00:00 -22.60   -22.63   -22.57
2007-05-05  00:12:00 -22.55   -22.58   -22.53
2007-05-05  00:24:00 -22.50   -22.53   -22.45
2007-05-05  00:36:00 -22.43   -22.45   -22.41
2007-05-05  00:48:00 -22.35   -22.41   -22.32
2007-05-05  01:00:00 -22.31   -22.33   -22.29
...
```

NOTE	Output of large amounts of recorded data can result in huge data files and take a long time, up to several days for the entire memory of the data logger. To make it easier to process the data it is recommended to select the largest suitable data interval, and to specify the start and end times carefully.

Deleting Recorded Files

You can delete the recorded data files using the keypad/display, or the **DELETE** command on the serial line. The deletion is always done for all data; you cannot delete individual files.

Note that the transmitter automatically overwrites the old data when the memory is full, so manual deletion of the recorded files is not necessary in normal use.

To delete the data files using the keypad/display:

1. Open the **MAIN MENU** by pressing any of the ▲ ▼ ◄ ► arrow buttons.
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 the entire data history of the transmitter, including all graphs and the content of the optional data logger module.

UNDELETE

Similarly to the **DELETE** command, the **UNDELETE** command is used without any arguments. It will recover all deleted data that has not been overwritten 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.

Changing Output Mode and Range

Both output channels have their own dip switch module with 8 switches, see the position in Figure 2 on page 23 (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.
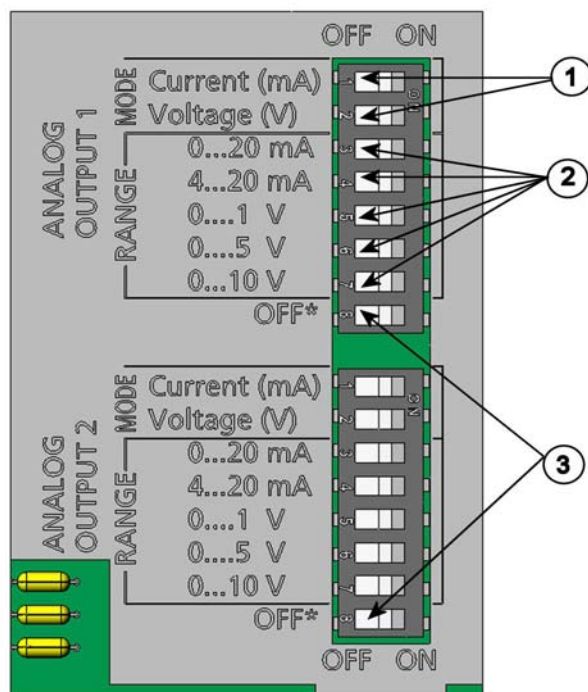
0503-045

Figure 59   Current/Voltage Switches of Output Modules

Numbers refer to Figure 59 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 111.

Analog Output Quantities

NOTE	The relative humidity and temperature readings are not those of the process itself but the ones measured after the cooling process. Therefore, they should not be selected as output quantities. They are meant to be used in calibration or during installation.

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

1. Open the **MAIN MENU** by pressing any of the ▲ ▼ ◄ ► arrow buttons.

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 5 on page 20.

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

Example:

```
>asel
Ch1 Tdf    low  : -20.00 'C ?
Ch1 Tdf    high : 100.00 'C ?
Ch2 x      low  : 0.00 g/kg ?
Ch2 x      high : 500.00 g/kg ?
>
```

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.   Open the **MAIN MENU** by pressing any of the ▲ ▼ ◄ ► arrow buttons.
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 issue the command **ITEST** without parameters or reset the transmitter.

Syntax: **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
Ch1 (Tdf )     :          *          20.000 mA   H'CCD3
Ch2 (x   )     :          *          20.000 mA   H'CCCB
>itest 20 5
Ch1 (Tdf )     :          *          20.000 mA   H'CCD3
Ch2 (x   )     :          *           5.000 mA   H'34BD
>
```

Analog Output Fault Indication Setting

Factory default state for analog outputs during error condition is 0 V/ 0 mA. 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. Open the **MAIN MENU** by pressing any of the ▲ ▼ ◄ ► arrow buttons.
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 Relays

Quantity for Relay Output

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

Measurement-Based Relay Output Modes

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. See Figure 60 below for illustrative examples of the different measurement-based relay output modes.

Mode 1: Only "*above*" setpoint set

measured value

Relay is active when value is above the setpoint.

Mode 2: Only "*below*" setpoint set

measured value

Relay is active when value is below the setpoint.

Legend

A "*Active above*" setpoint value

B "*Active below*" setpoint value

h Hysteresis value

▨ Relay is active (**NO – C** connected)

• Relay is released

○ Relay is activated

Mode 3: Both setpoints set, "*above*" > "*below*"

measured value

Relay is **active** when value is outside the setpoints.

Mode 4: Both setpoints set, "*above*" < "*below*"

measured value

Relay is **released** when value is outside the setpoints.

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Figure 60   Measurement-Based Relay Output Modes

Mode 4 is usually used if an alarm needs to be triggered when the measured value exceeds a safe range. The relay is active when measurement is in range, and is released if the value goes out of range or the measurement fails.

NOTE	If the measurement of the selected quantity fails or the transmitter loses its power, the relay is released.

Hysteresis

Hysteresis function is to prevent the relay switching back and forth when the 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 not released before 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 50 ºC and the hysteresis value is 2 ºC, relay activates when the relative humidity reaches 50 ºC. As the humidity then decreases, relay releases at 48 ºC.

```
>rsel tdf ts
Rel1 Tdf  above: 0.00 'C ? 50
Rel1 Tdf  below: 0.00 'C ? -
Rel1 Tdf  hyst : 0.00 'C ? 2
Rel1 Tdf  enabl: OFF ? on
Rel2 Ts   above: 0.00 'C ? 80
Rel2 Ts   below: 0.00 'C ? 60
Rel2 Ts   hyst : 0.00 'C ? 1
Rel2 Ts   enabl: OFF ? 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 state, chemical purge or adjustment mode): relay released (C and NC outputs are closed)

See Figure 61 on page 115 for illustrative examples of the FAULT/ONLINE STATUS relay output modes.

Analog output vs. "*FAULT STATUS*" relay

Legend

AERR Analog output "fault indication" value set by user

Outputs frozen because of e.g. *Purge* or *Autocal*

⚠ Measurement failure because of e.g. damaged sensor

---- True value of the measurement parameter during the exceptional situation

Relay active (**NO – C** connected)

● Relay is activated
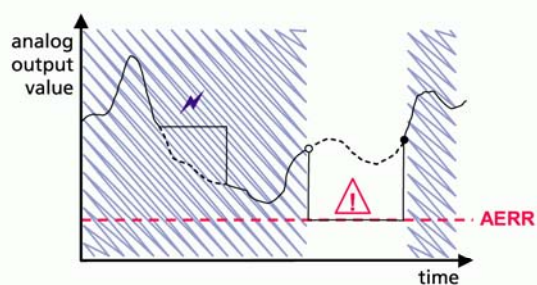
○ Relay is released

Relay is released in case of a measurement failure only.

Analog output vs. "*ONLINE STATUS*" relay
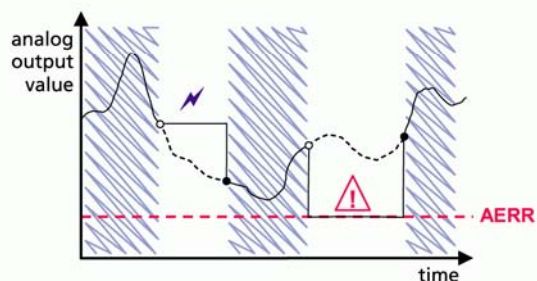
Relay is released when the output values are frozen, the adjustment mode is activated, or an instrument failure is detected

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Figure 61   FAULT/ONLINE STATUS Relay Output Modes

FAULT/ONLINE STATUS relays are usually used in conjunction with an analog output to obtain validity information for the output value.

NOTE	If transmitter loses its power, all status-based relays are released similarly to the case of an instrument failure.

Enabling/Disabling Relays

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

Indication Led Operation

Relay is activated: LED is lit
Relay is not activated: LED is not lit

Setting 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 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'
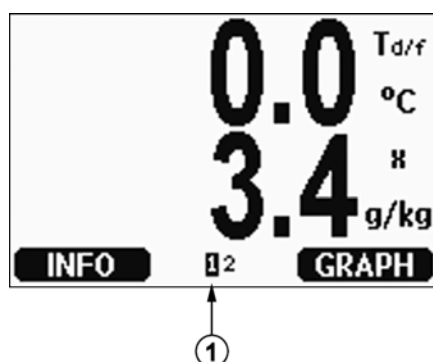
0706-029

Figure 62   Relay Availability

Arrow in Figure 62 above shows where enabled relays are listed on the display. Activation state shown in black. Disabled relays are not shown.

Use the display/keypad to set the relay outputs.

1.   Open the **MAIN MENU** by pressing any of the ▲ ▼ ◄ ► arrow buttons.

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 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. Issue the **RSEL** command.

Syntax: **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 5 on page 20.

Example of window limit switch: Selecting relay 1 to follow dewpoint measurement and relay 2 to follow sensor temperature measurement. Two relay setpoints are set for both relays.

```
>rsel tdf ts
Rel1 Tdf  above: 70.00 'C ? 50
Rel1 Tdf  below: - ? 30
Rel1 Tdf  hyst : 2.00 'C ? 2
Rel1 Tdf  enabl: ON ? on
Rel2 Ts   above: 140.00 'C ? 140
Rel2 Ts   below: - ? 80
Rel2 Ts   hyst : 2.00 'C ? 2
Rel2 Ts   enabl: ON ? on
>
```

Example of normal limit switch: Selecting relay 1 to follow sensor saturation rate and relay 2 to follow sensor temperature. One setpoint is chosen for all the outputs.

```
>rsel ssr ts
Rel1 SSR  above: 50.00 % ? 70
Rel1 SSR  below: - ? -
Rel1 SSR  hyst : 2.00 % ? 2
Rel1 SSR  enabl: ON ? on
Rel2 Ts   above: 80.00 'C ? 140
Rel2 Ts   below: 60.00 'C ? -
Rel2 Ts   hyst : 1.00 'C ? 2
Rel2 Ts   enabl: ON ? 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 ts
Rel1 FAUL above: -
Rel1 FAUL below: -
Rel1 FAUL hyst : -
Rel1 FAUL enabl: ON ? on
Rel2 Ts   above: 140.00 'C ? 140
Rel2 Ts   below: 80.00 'C ? 80
Rel2 Ts   hyst : 2.00 'C ? 2
Rel2 Ts   enabl: ON ? on
>
```

Testing 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
```

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

Operation of the RS-485 Module

RS-485 interface enables communication between RS-485 network and DMT346 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 DMT346 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 85.

RS-485 configuration commands **SERI**, **ECHO**, **SMODE**, **INTV**, and **ADDR** may be issued by using either the service port or RS-422/485 port. Also the optional display/keypad can be used.

SERI

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

Syntax: **SERI** [*b p d s*]

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.

Syntax: **ECHO** [*x*]

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, POLL or SEND
                 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 121.
                 In SEND mode: no commands are needed, a message is
                                  automatically outputted after power-up

When several transmitters are connected to the same line, each transmitter must be issued 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.

Syntax: **INTV** [*n xxx*]

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.

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 96). Use the **ADDR** [*aa*] command to input the RS-485 transmitter address.

where

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

Example:

The transmitter is issued the address 99

```
>addr
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 issued.

Syntax: **OPEN** [*nn*]

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)
```

SDELAY

With the sdelay command you can set delay (response time) for user port (RS-232 or RS-485), or view currently set delay value. Value corresponds to tens of milliseconds (eg. 5 = 0.050s minimum answer delay). The value can be set between 0...254.

Example:

```
>sdelay
Serial delay  : 0 ? 10
>sdelay
Serial delay  : 10 ?
>
```

Sensor Functions

AutoCal

To obtain the best possible accuracy in measurements taken in dry environments, DMT345 and DMT346 have a built-in AutoCal feature. During the AutoCal, the transmitter 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 <10 %.
- Temperature must be 0<T<140 °C.
- Humidity environment must be stable. The maximum change in the dewpoint can be 2 °C 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 DMT345 and DMT346 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 ensure 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.

0706-014
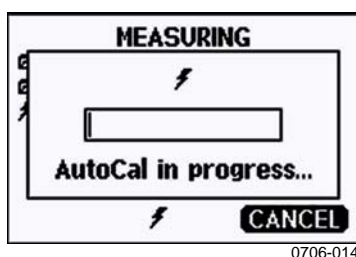
Figure 63   Following AutoCal on the Display

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

You can also activate Manual AutoCal by pressing both **AUTOCAL** buttons on the transmitter motherboard. These are the same buttons as the pressure set buttons, but when pressed simultaneously, they will start the AutoCal procedure. See Figure 57 on page 93 for location of the **AUTOCAL**/pressure set buttons.

If the AutoCal conditions are not fulfilled, a note appears on the display informing that the calibration cannot be made.

Sensor Purge

Sensor Purge is available for DMT345 and DMT346. 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. Sensor Purge also corrects the possible gain drift caused by some chemicals, thus ensuring 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 DMT345 and DMT346. 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 the transmitter, 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.
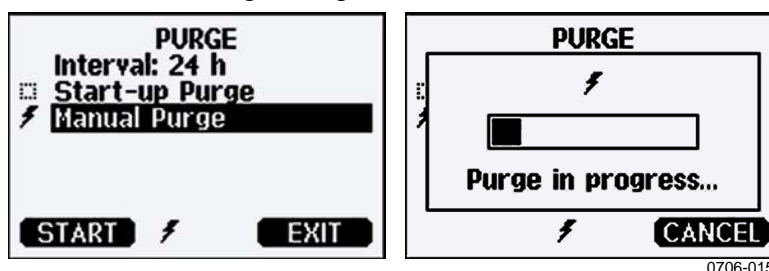
Figure 64   Performing Manual Purge

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 DMT345 and DMT346 leave 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 is to start within 10 seconds from the power-up of the device. This function can be disabled by using the serial line or the display/keypad.
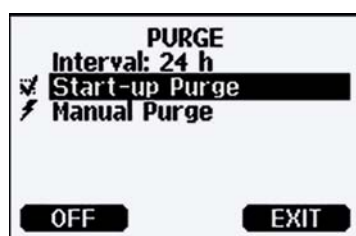
0706-016

Figure 65   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 : ON ?
Interval       : 1440 min ?
Power-up Purge : ON ?
Duration       : 60 s ?
Settling       : 240 s ?
Temperature    : 180 'C ?
Temp. diff.    : 0.5 'C ?
Trigger Purge  : OFF ?
RH trigger     : 20 %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. Issue command **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

DMT345 and DMT346 contain a sensor warming function, that is, when humidity reaches a set limit (default: 80%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, H_2O and P_w quantities, all others will be frozen.

CHAPTER 5
MAINTENANCE

This chapter provides information that is needed in basic maintenance of the product. Possible error states and situations, their probable causes and remedies are described in this chapter. This chapter also contains contact information for Vaisala Technical Support and Vaisala Service Centers.

Periodic Maintenance

Cleaning

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

Changing the Cooling Set Filter

1.   Turn the filter counter-clockwise to remove it.
2.   Install a new filter on the cooling set and tighten it.

New filters can be ordered from Vaisala, see Available Options and Accessories Table 41 on page 148.

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 111)
- the serial port outputs stars (***)
- the cover LED is blinking
- optional display: error indicator is lit.
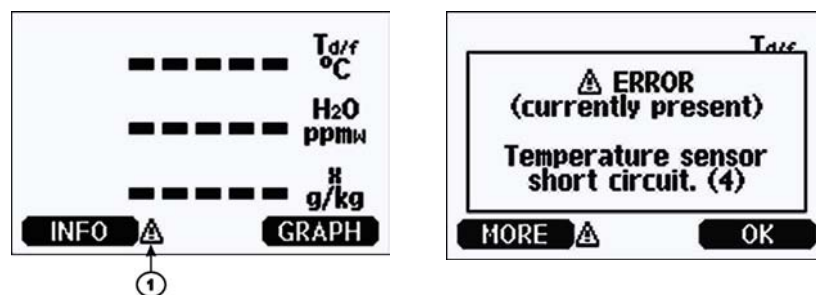
0706-017

Figure 66 Error Indicator and Error Message

Number refers to Figure 66 above:

1   =   Error Indicator

- 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.

Table 30   Error Messages

Error Code	Error Message	Action
0	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.
1	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.
2	Humidity sensor open circuit	Check the integrity of the humidity probe and the probe cable.
3	Temperature sensor open circuit.	Check the integrity of the humidity probe and the probe cable.
4	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.
5	Temperature measurement malfunction	Check the integrity of the humidity probe and the probe cable. Clean the probe from dirt water, ice or other contaminants.
6	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.
7	Internal ADC read error	Internal transmitter failure. Remove the transmitter and return the faulty unit to Vaisala Service.
9	Checksum error in the internal configuration memory	Internal transmitter failure. Remove the transmitter and return the faulty unit to Vaisala Service.
10	Internal EEPROM read error	Internal transmitter failure. Remove the transmitter and return the faulty unit to Vaisala Service.
11	Internal EEPROM write error	Internal transmitter failure. Remove the transmitter and return the faulty unit to Vaisala Service.
12 … 13	Add-on module 1 (or 2) connection failure	Turn off the power and check the module connection. Turn on the power.

Error Code	Error Message	Action
14	Device internal temperature out of range	Ensure that the operating temperature is within the valid range.
15	Operating voltage out of range	Ensure that the operating voltage is within the valid range.
18	Internal ADC reference voltage out of range	Internal transmitter failure. Remove the transmitter and return the faulty unit to Vaisala Service.
19	Internal analog output reference voltage out of range	Internal transmitter failure. Remove the transmitter and return the faulty unit to Vaisala Service.
20 … 23	Configuration switches for analog output 1/2/3 set incorrectly	Check and re-set the switches, see page 56.
24 … 25	EEPROM failure on add-on module 1 (or 2)	Disconnect the power and check the analog output module connection.
26	Communication module installed in incorrect add-on module slot	Disconnect the power and change the communication module to another module slot.
28 … 29	Unknown/incompatible module installed in add-on module slot 1(or2)	Ensure that the module is compatible with the DMT345/346.
30	Internal analog voltage out of range	Internal transmitter failure. Remove the transmitter and return the faulty unit to Vaisala Service.
31	Internal system voltage out of range	Internal transmitter failure. Remove the transmitter and return the faulty unit to Vaisala Service.

You can also check the error message via the serial interface by using the command **ERRS**. In case of constant error, please contact technical support.

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 speed up the process and to avoid extra costs to you.

1. Read the section Warranty on page 18.
2. Contact a Vaisala Service Center or a local Vaisala representative. The latest contact information and instructions are available from www.vaisala.com. Addresses of the Service Centers are provided in section Service Centers on page 130.

Please have the following information on hand:

- serial number of the unit
- date and place of purchase or last calibration
- description of the fault
- circumstances in which the fault occurs/occurred
- name and contact information of a technically competent person who can provide further information on the problem

3. Pack the faulty product in a strong box of adequate size, with proper cushioning material to avoid damage.

4. Include the information specified in step 2 in the box with the faulty product. Also include a detailed return address.

5. Ship the box to the address specified by your Vaisala contact.

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 also offer accredited calibrations, maintenance contracts, and a 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

CHAPTER 6
CALIBRATION AND ADJUSTMENT

This chapter provides you with instructions on how to calibrate and adjust Vaisala DRYCAP® Dewpoint Transmitters DMT345 and DMT346.

Calibration

DMT345 and DMT346 are fully calibrated and adjusted as shipped from the factory. The typical calibration interval is one year. 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 to a Vaisala Service Center for calibration and adjustment. See contact information in section Vaisala Service Centers on page 129.

NOTE	If the process is not shut down for removing the transmitter for calibration, the hole for the probe in the cooling set must be plugged; otherwise, there is a risk of water condensing inside the cooling pipe (in overpressurized processes).

User Calibration and Adjustment

When adjusting DMT345 or DMT346, the reading of the transmitter is changed to correspond to the reference value. After the adjustment, the original calibration certificate shipped with the product is no longer valid.

The following adjustments are possible:

- Two-point relative humidity adjustment
- One-point dewpoint adjustment
- One-point temperature adjustment
- Two-point temperature adjustment
- Analog output adjustment

Opening and Closing 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 23.

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

Table 31   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** button 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 98. 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 **SET**. 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) ? -60°C
>
```

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.

Two-Point Relative Humidity Adjustment

Using Display/Keypad

NOTE	Reference humidities must be ~0 %RH and 30 ... 75 %RH. A suitable product for the two point RH calibration is for example the Vaisala Humidity Calibrator HMK15.

1. Press the **ADJ** button (see Figure 2 on page 23) to open the **ADJUSTMENT MENU**:
2. Select **Adjust T$_d$ measurement**, press ► button.
3. Select **2-point RH adjustment**, press **START**. At this point, the device carries out the chemical purge.
4. Remove the filter from the probe and insert the probe in the dry end reference condition (~0 %RH). Press **OK**.
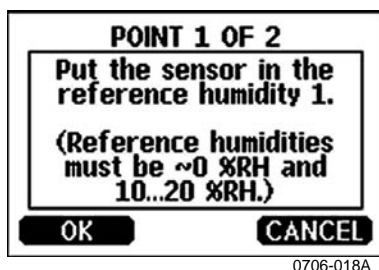
Figure 67   Inserting the Sensor in Reference Humidity 1

5. Wait at least 30 minutes for the sensor to stabilize. Follow the stabilization from the **GRAPH** display. Press **EXIT** to return to the previous display.

6. Press **READY** when stabilized. Enter the reference value by using the arrow keys.

0706-019B

Figure 68   Waiting for Readings to Stabilize

Now proceed to the adjustment at the wet end reference condition (30 ... 75 %RH) and carry out the procedure as described in the previous items.

7. Answer **YES** to confirm the adjustment. Press **OK** to return to the adjustment menu.

8. Before closing the adjustment mode, feed the adjustment information into the device, see section Adjustment Information on page 132. Press **EXIT** to close the adjustment mode and return to the basic display.

Using Serial Line

NOTE	Reference humidities must be ~0 %RH and 30 ... 75 %RH. A suitable product for the two point RH calibration is for example the Vaisala Humidity Calibrator HMK15.

1. Connect the DMT345/346 to a PC. See section Serial Line Communication on page 72. Open a terminal program.

2. Carry out the chemical purge.

3. Press the **ADJ** button.

4. Remove the filter from the probe and insert the probe in the dry end reference conditions (~0 %RH).

5. Issue the **FCRH** command and press **Enter**.

FCRH

6. Wait at least 30 minutes for the sensor to stabilize.

7. Press **Enter** a few times to check if the reading is stabilized.

8. When the reading is stabilized, give the reference humidity after the question mark and press **Enter**.

```
>fcrh

RH  :     11.25  Ref1 ?
RH  :     11.25  Ref1 ?
RH  :     11.25  Ref1 ?
RH  :     11.24  Ref1 ?
RH  :     11.24  Ref1 ? 11.3
Press any key when ready  ...
```

9. Now the device is waiting for the wet end reference. Insert the probe in the wet end reference condition (30 ... 75 %RH). Press any key when ready.

10. Let the probe stabilize for about 30 minutes. You can follow the stabilization by pressing **Enter**.

11. When stabilized, type the high end reference value after the question mark and press **Enter**.

```
>fcrh

RH  :     11.25  Ref1 ? c
RH  :     11.24  Ref1 ? c
RH  :     11.24  Ref1 ? 11.3
Press any key when ready  ...

RH  :     75.45  Ref2 ? c
RH  :     75.57  Ref2 ? c
RH  :     75.55  Ref2 ? c
RH  :     75.59  Ref2 ? 75.5
OK
>
```

12. The OK indicates that the adjustment has succeeded and the new calibration coefficients are calculated and stored. Enter the adjustment information (date and text) to the memory of the transmitter, see section Adjustment Information on page 132.

13. Press the **ADJ** button on the motherboard to close the adjustment mode.

14. Take the probe out of the reference conditions and replace the filter.

One-Point Dewpoint Adjustment

One-Point Dewpoint Adjustment Using Display/Keypad

NOTE	This is a highly critical adjustment, to be performed only in laboratory conditions.
	Preferably use the display/keypad interface to perform one-point dewpoint $T_{d/f}$ adjustment. Before proceeding with the Td/f adjustment you must perform the RH adjustment. For DMT345/346, the reference dewpoint must be below -25 °C (-13 °F) and temperature must be below 40 °C (104 °F).

NOTE	This adjustment is valid only if the measurement or process is in the lower end of the measurement range (in very dry). See Specifications on page 142.

When adjusting the dewpoint, refer to the following instructions:

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 one (1) hour. Follow the instructions on the display.

Figure 69   Following Stabilization

POINT 1 OF 1
T$_{d/f}$ measured: −34.25
T$_{d/f}$ actual: −033.00 °C

**Enter the actual dewpoint
temperature of the
reference used.**

OK   12   CANCEL

0706-044
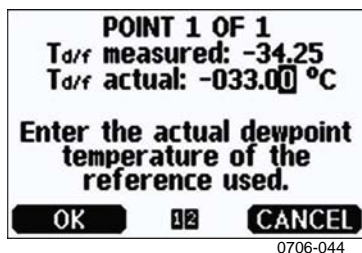
Figure 70   Proceeding with T $_{d/f}$ Adjustment

5.   Enter the actual reference frostpoint temperature.

6.   The transmitter performs T$_{d/f}$ adjustment. This may take up to six
      (6) minutes.

POINT 1 OF 1

Purge in progress...

12   CANCEL

0706-045
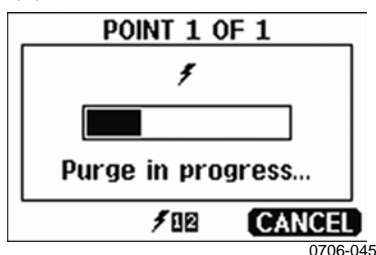
Figure 71   Completing T $_{d/f}$ Adjustment

7.   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 one (1) hour.

2.   Press the **ADJ** button on the motherboard to enable adjustments.

3.   Use the **AØ1** command to perform the adjustment.

Syntax: **AØ1**

Example:

```
>a01
Tf :   -34.25 'C  Ref ? -33
Wait for Purge data...OK
>
```

4.   Press the **ADJ** 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

NOTE	Temperature adjustment in process conditions is possible only with DMT345. Temperature adjustment of DMT346 cannot be performed in process conditions as the DMT346 measures a cooled temperature whereas the reference instrument measures the actual process 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 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 two-point adjustment proceed to the next adjustment point and carry out the procedure as described in the previous items. 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 into the reference temperature.

3.   Type **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 (two-point adjustment) 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 ℃.

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 DMT346 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**, 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
TECHNICAL DATA

This chapter provides the technical data of the product.

Specifications

Performance

Table 32   Dewpoint Specifications DMT345

Property	Description / Value
Sensor	Vaisala DRYCAP®180S
Measurement range	-40 ... +100 °C (-40 … +212 °F) T_d
Accuracy	±2 °C (±3.6 °F) T_d
	See accuracy graph in Figure 72 on page 143.
Response time 63% [90%] flow rate 1l/min and 1 bar pressure from dry to wet from wet to dry including auto- calibration	5s [10 s] 45s [5 min]
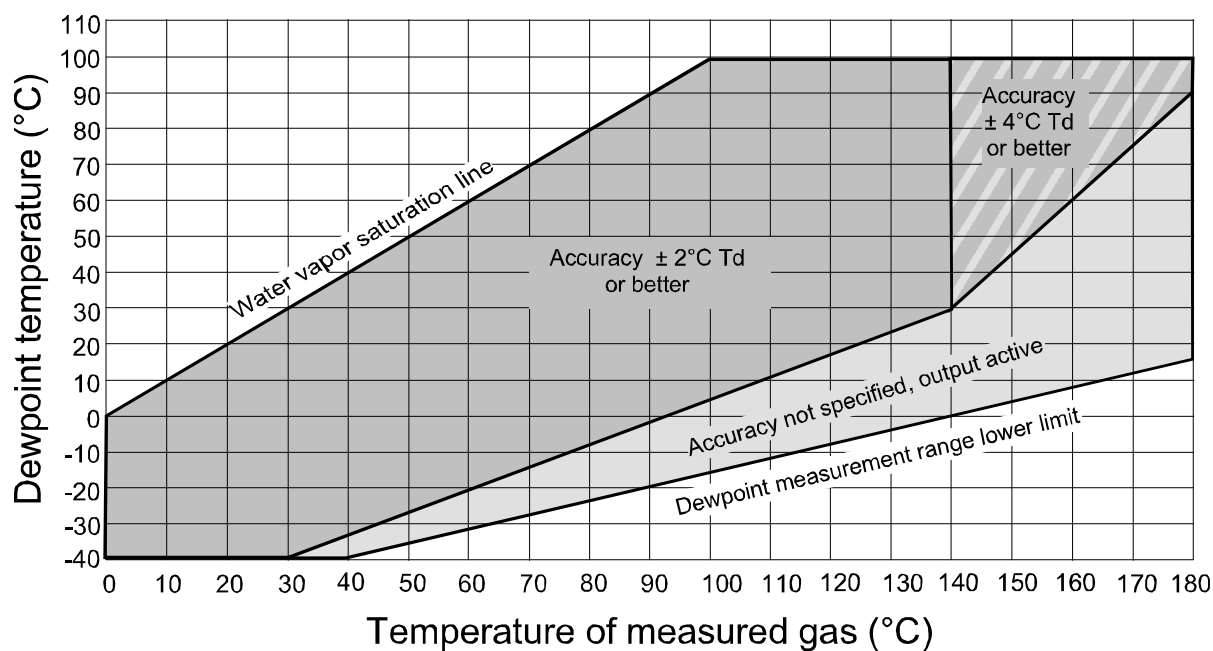
0605-043

Figure 72   Dewpoint Measurement Accuracy Graph DMT345

Table 33   Temperature Specifications DMT345

Property	Description / Value
Measurement range with sensor warming	0 ... +180 °C (+32 ... +356 °F) upper range limited by humidity (at 80% RH warming is switched on and T reading not actual process temperature)
Accuracy	±0.4 °C at 100 °C
Temperature sensor	Pt 100 IEC 751 1/3 class B

Table 34   Relative Humidity Specifications DMT345

Property	Description / Value
Measurement range with sensor warming	0 ... 100 %RH 0 ... 80 %RH

Accuracy
   below 10% RH
   above 10% RH
	
	±10 % of reading
	±1.5 %RH + 1.5 % of reading

Table 35   Mixing Ratio Specifications DMT345

Property	Description / Value
Measurement range (typical)	0 ... 1000 g/kg (0..7000 gr/lbs)
Accuracy	±12 % of reading

Table 36   Dewpoint Specifications DMT346

Property	Description / Value
Sensor	Vaisala DRYCAP®180S
Measurement range	-25 … +100 °C (-13 … +212 °F) T_d
Accuracy	±2 °C (±3.6 °F) T_d See the accuracy graph in Figure 73 below
Response time 63% [90%] flow rate 1l/min and 1 bar pressure from dry to wet from wet to dry including auto-calibration	 5s [10 s] 45s [5 min]
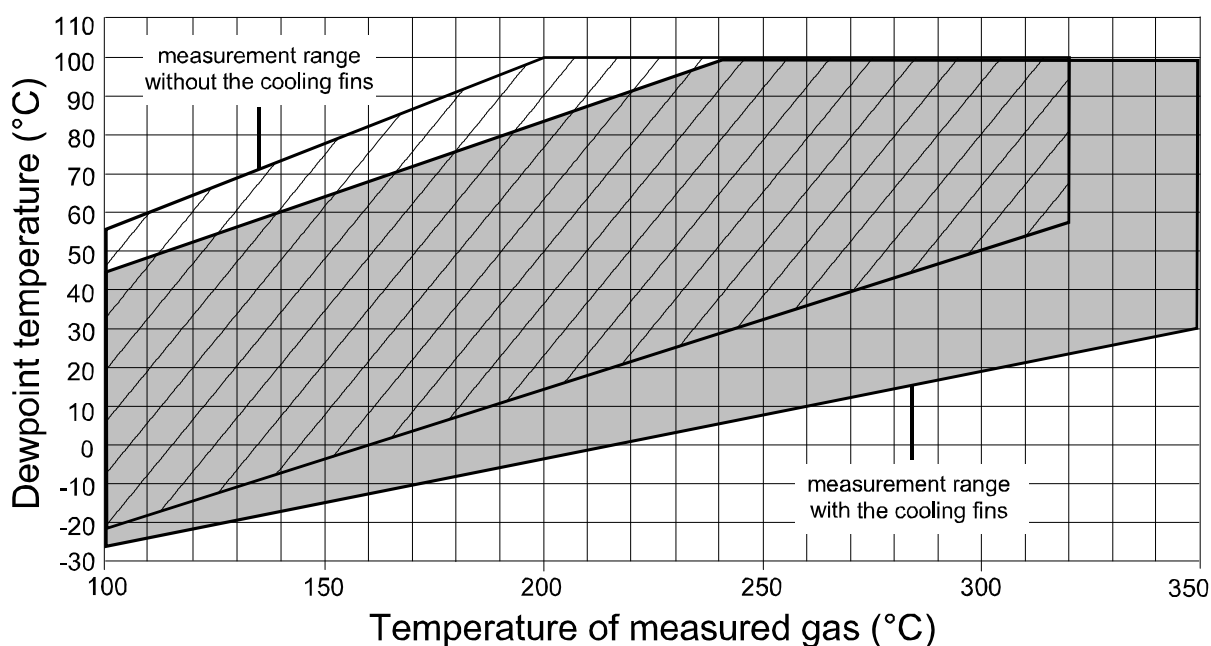
Figure 73   Dewpoint Measurement Accuracy Graph DMT346

Table 37   Mixing Ratio Specifications DMT346

Property	Description / Value
Measurement range (typical)	0 ... 1000 g/kg (0 … 7000 gr/lbs)
Accuracy	±12 % of reading

Table 38   Operating Environment Specifications (Both Models)

Property	Description / Value

Mechanical durability
    Probes
 	
    for transmitter body
    with display
	
	Up to +180 °C (+356 °F) for DMT345
	Up to +350 °C (+662 °F) for DMT346
	-40 ... +60 °C (-40 ... +140 °F)
	0 ... +60 °C (32 … +140 °F)

Storage temperature range	-55 ... +80 °C (-67…+176 °F)
Pressure range for probes	Slight pressure difference (~ 200 mbar)
Measured gases	Noncorrosive gases

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

Table 39   Inputs and Outputs Specifications (Both Models)

Property	Description / Value
Operating voltage with optional power supply module	10 ... 35 VDC, 24 VAC 100 ... 240 VAC 50/60 Hz

Default start-up time
    initial reading after power-up
    full operation after sensor Purge and AutoCal
	
	3 s
	Approximately 6 min

Power consumption @ 20 °C (U_{in} 24 VDC)
    U_{out} 2 × 0 ... 1V / 0 ... 5V / 0 ... 10V
    I_{out} 2 × 0 ... 20 mA
    RS-232
    Display and backlight
    During sensor purge and warming
	
	Max 25 mA
	Max 60 mA
	Max 25 mA
	+ 20 mA
	+ 110 mA max

Analog outputs (2 standard, 3rd optional)
    Current output
    Voltage output
	
	0 ... 20 mA, 4 ... 20 mA
	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 outputs
    0 ... 1V output
    0 ... 5V and 0 ... 10V outputs
	
	R_L < 500 Ω
	R_L > 2 k Ω
	R_L > 10 k Ω

Max wire size	0.5 mm^2 (AWG 20) stranded wires recommended
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, Chinese

Table 40   Mechanics Specifications (Both Models)

Property	Description / Value
Cable bushing	M20×1.5, for cable diameter 8 ... 11 mm / 0.31 ... 0.43"
Conduit fitting	1/2" NPT

User cable connector (optional)
    Option 1
    Option 2
	
	M12 series 8-pin (male)
	With plug (female) with 5 m / 16.4 ft black cable

Probe cable diameter	5.5 mm
Probe cable lengths	2 m, 5 m or 10 m
Probe tube material	AISI 316L
Housing material	G-AlSi 10 Mg (DIN 1725)
Housing classification	IP 65 (NEMA 4X)
Housing weight	1.2 kg

Technical Specifications of Optional Modules

Power Supply Module

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)
UL file number	E249387

Analog Output Module

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

Relay Module

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

RS-485 Module

Operating temperature range	-40 ... +60 °C (-40 ... +140 °F)
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 °C (-67 ... +176 °F)
Max wire size	1.5 mm2 (AWG16)

LAN Interface Module

Operating temperature range	-40 ... +60 °C (-40 ... +140 °F)
Storage temperature range	-40 ... +85 °C (-40 ... +185 °F)
Operating humidity range	5 … 95 %RH
Power consumption @ 24V	max 60 mA
Ethernet type	10/100Base-T
Connector	RJ45
Supported protocols	Telnet

WLAN Interface Module

Operating temperature range	-20 ... +60 °C (-4 ... +140 °F)
Storage temperature range	-40 ... +85 °C (-40 ... +185 °F)
Operating humidity range	5 … 95 %RH
Power consumption @ 24V	max 80 mA
Supported standards	802.11b
Connector	RP-SMA
Protocols	Telnet
Security	WEP 64/128,WPA

Data Logger Module

Operating temperature range	-40 ... +60 °C (-40 ... +140 °F)
Storage temperature range	-55 ... +80 °C (-67 ... +176 °F)
Power consumption @ 24V	max 10 mA
Logged parameters	up to three with trend/min/max values for each
Logging interval	10 s (fixed)
Maximum logging period	4 years 5 months
Logged points	13.7 million points / parameter
Accuracy of the clock	better than ±2 min/year
Battery lifetime	
at -40 ... +30 °C (-40 ... +86 °F)	7 years
at +30 ... +60 °C (+86 ... +140 °F)	5 years

Options and Accessories

Table 41   Options and Accessories

| Item	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	
for DMT345	
Sintered Filter AISI 316L	HM47280SP
for DMP246CS	
Sintered Filter AISI316L D=20mm	HM46780
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	
DMT345	
Mounting Flange for D13.5mm Probe	210696
DMT346	
Cooling Set with Installation Flange	DMP246CS
Plug D13.5mm with Wire Rope	217738
Installation Flange for Cooling Set	217490
CONNECTION CABLES	
Serial Interface Cable	19446ZZ
USB-RJ45 Serial Interface Cable	219685
MI70 Connection Cable with RJ45 Connector	211339
OUTPUT CABLES for 8-pin connector	
Connection Cable 5m 8-pin M12 Female, Black	212142
Female Connector 8-pin M12 with Screw Terminals	212416
Male Connector 8-pin M12 with Cable and Adapter	214806SP
CABLE BUSHINGS	
Cable Gland M20x1.5 for 8 ... 11 mm Cable	214728SP
Cable Gland M20x1.5 for 11 ... 14 mm 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 (to fit the DMT345 probe)	211302SP

Dimensions (mm/inch)
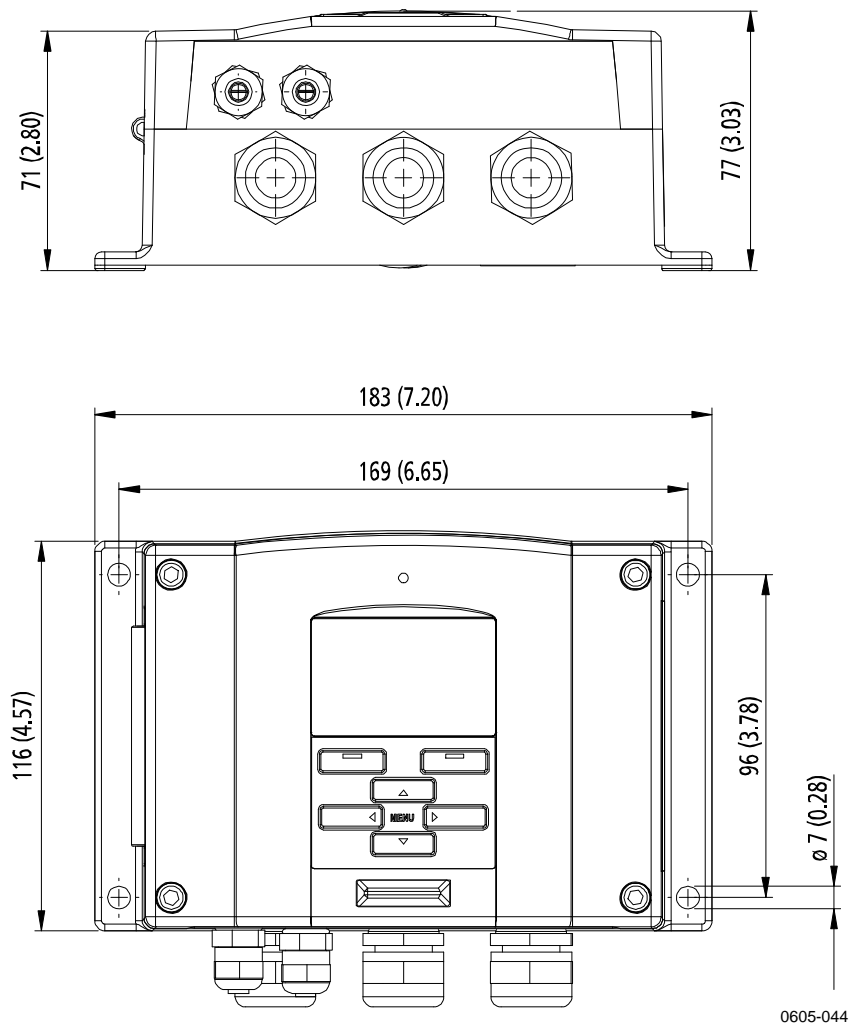
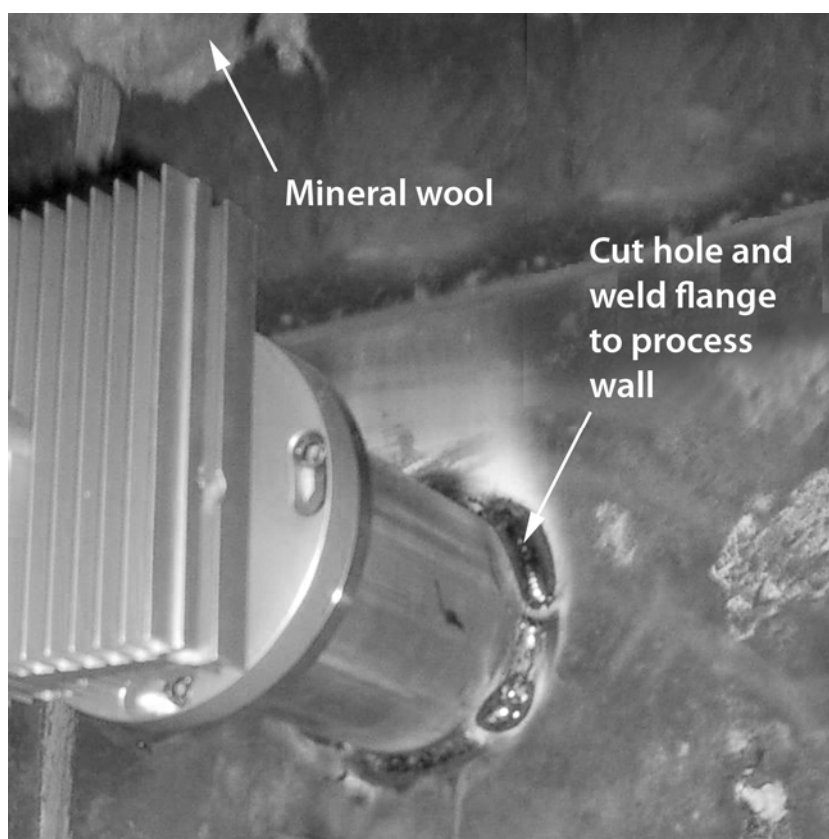**Figure 74   DMT345/346 Transmitter Body Dimensions**
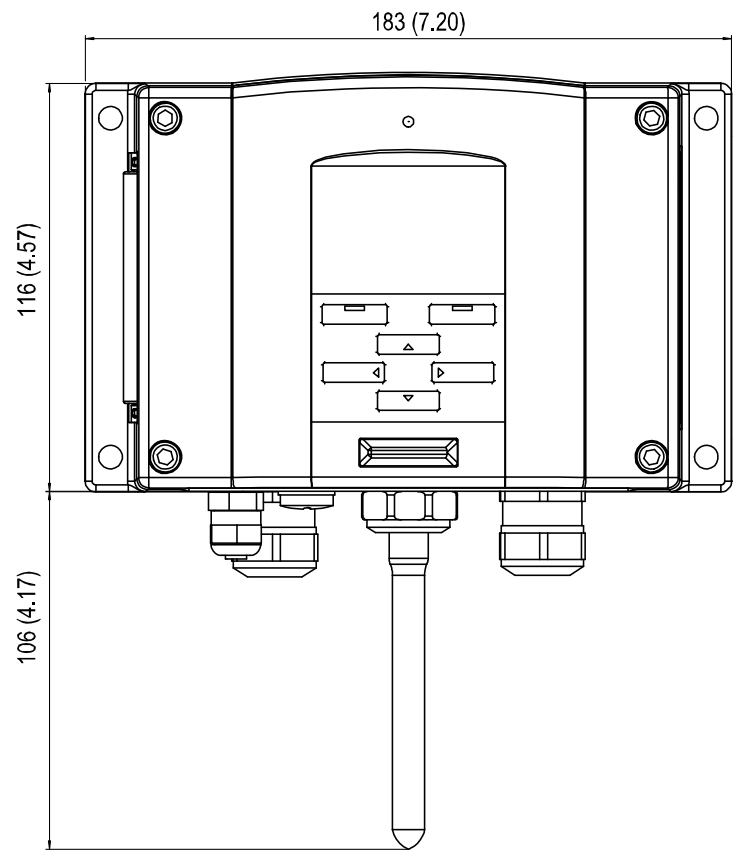
0804-035

Figure 75   WLAN Antenna Dimensions

APPENDIX A
EXAMPLE INSTALLATION OF DMT346

This Appendix illustrates an example installation of DMT346 transmitter into a process.

0605-045

Figure 76   Cooling Set Installation

1. Make a round 89.5 + 0.5 mm hole on the process wall.
2. Weld the tube of the mounting flange tightly on the inner metal plate of the process wall. If the process wall is more than 125 mm thick, a lengthening piece (max. 50 mm) can be welded on the mounting tube (for walls thicker than 175 mm, see Figure 23 on page 37).
3. The cooling set is mounted in a vertical position. Tighten the screws properly in order to ensure a thermal contact.

4.   Unfasten the locking screws on the cooling bar so that you can push the probe into the bar.

NOTE	Push the probe deep enough: make sure that the marking hole meets the end of the bar.

5.   Lock the probe in place by tightening the locking screws on the bar.

Probe and Cooling Set Mounting with Process Shut Down

-   Complete the entire mounting process as instructed on page 36.

Probe and Cooling Set Mounting with Process Running

-   First mount the cooling element (and fins) to warm it up; tightly plug the hole for the probe in the cooling element for the duration of the warmup period.
-   After a few hours, complete the installation by installing the probe.

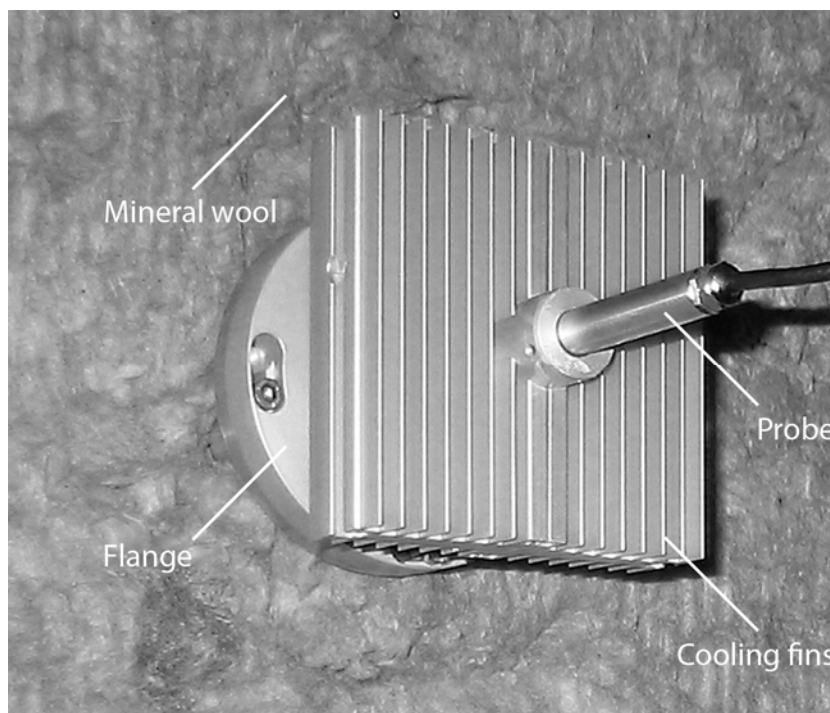This procedure should lessen the amount of condensation that builds up in the hole.

Figure 77   Insulation with Mineral Wool

APPENDIX B
CALCULATION FORMULAS

This Appendix contains the formulas used for the calculated output quantities.

The DMT346 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:

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

P_w is the water vapor pressure. The parameters A, m, and T_n depend on temperature according to the following table:

t	A	m	T_n
<0 °C [1]	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

[1] Used for frostpoint calculation if the dewpoint is negative

Mixing ratio:

$$x = 621.99 \cdot \frac{P_w}{p - P_w} \tag{2}$$

Absolute humidity:

$$a = 216.68 \cdot \frac{P_w}{T} \tag{3}$$

Enthalpy:

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

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

$$\Theta = T - \sum_{i=o}^{3} C_i T^i \tag{5}$$

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}

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

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:

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

(7)

Parts per million by volume is calculated using:

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

(8)

Symbols:

T_d	=	dewpoint temperature (°C)
P_w	=	water vapour pressure (hPa)
P_{ws}	=	water vapour saturation pressure (Pa)
RH	=	relative humidity (%)
x	=	mixing ratio (g/kg)
p	=	atmospheric pressure (hPa)
a	=	absolute humidity (g/m^3)
T	=	temperature (K)
h	=	enthalpy (kJ/kg)

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