DMP246 DEWPOINT TRANSMITTER User's Guide

M210183en-A
July 2002

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1. PRODUCT DESCRIPTION

1.1 General characteristics

The DMP246 transmitter is a microprocessor based instrument for the measurement of dewpoint and mixing ratio in high temperatures. The transmitter also outputs relative humidity and temperature of the cooled DRYCAP® sensor. Thus, these values cannot be used for process control; they are meant to be used for calibration and for checking the cooling effect. The DMP246 transmitter has two analogue outputs and can be connected to a serial bus via the RS 232C interface or through an RS 485/422 serial module or a current loop module. An alarm output unit is also available.

The transmitter can be configured in many ways. It can have either a blank cover or a cover with a local display and keypad with which the user can operate the transmitter. Local display is also recommended to be used during installation.

NOTE

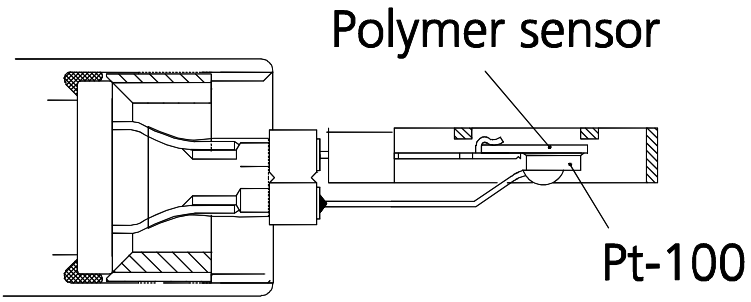
If the transmitter does not have a local display, it is recommended that during installation a terminal is connected to an RS line in order to be able to set an appropriate cooling effect for the sensor.

The power supply voltage ranges can be selected from three alternatives. Two analogue output signals are selected from the measured quantities; the signals can be scaled and the measurement ranges changed within certain limits. The DMP246 transmitter can be supplied with two, five or ten metre sensor head cable.

Options	
Power supply	24 VDC (standard), (for 24 VAC, see Chapter 2.4.1) 115/230 VAC
Serial interface	RS 232C (standard), RS 485/422, current loop
Alarm output unit	two relay outputs
Display cover	cover with or without local display & keypad
Cable length	2, 5 or 10 metres

1.2 The operating principle of the DMP246

The DMP246 transmitter incorporates the 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 Pt 100 resistive temperature sensor.



The DMP246 transmitter measures water vapour directly and gives thus accurate results of moisture in the process. The sensor is cooled down with a cooling set which makes it possible to use a polymer sensor in very high temperatures, i.e. +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 relative humidity. The relative humidity and temperature are then measured, and the transmitter calculates the dewpoint and the mixing ratio on the basis of these readings. Note that the RH and temperature are not those of the process itself but the ones measured after the cooling process. The dewpoint measurement range is +10...+100 °C.

2. INSTALLATION

2.1 Selecting the place of installation

Choose a place which will give a true picture of the environment or process; also select a place that is as clean as possible. Air should circulate freely around the sensor.

NOTE

To ensure an IP 65 class protection for the transmitter housing:

1. Always mount the transmitter housing with the cable bushings pointing downwards.

2. Make sure that the connection cable has the right thickness (∅ 7...10 mm) and that the cable bushing is carefully tightened.

3. Pay always special attention to closing the transmitter cover carefully and remember to tighten all four screws.

2.2 Mounting

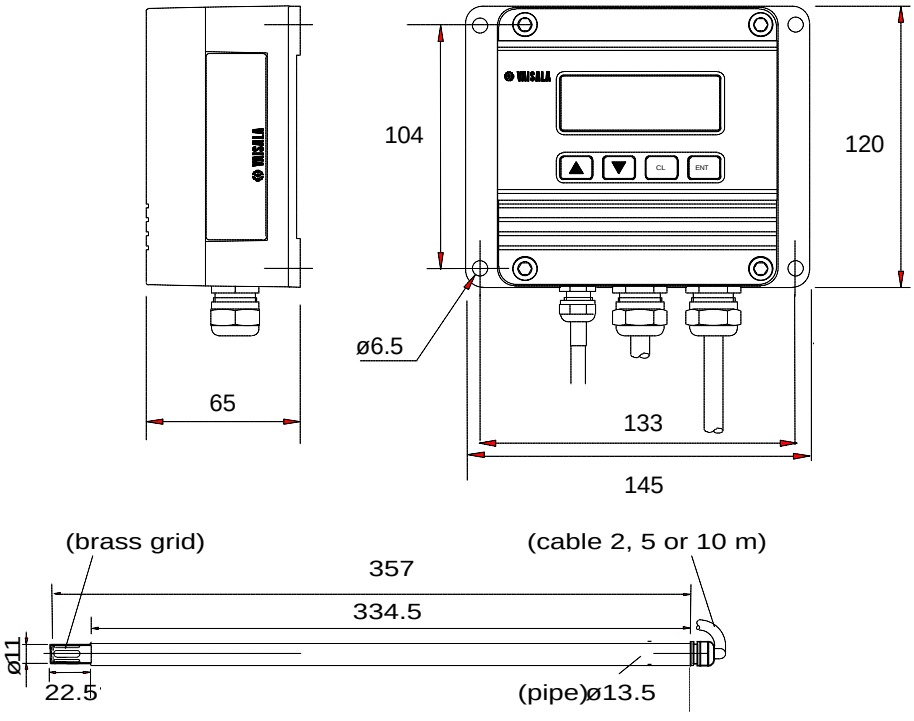


Figure 2.2.1 Dimensions (in mm) of the DMP246 housing and probe head

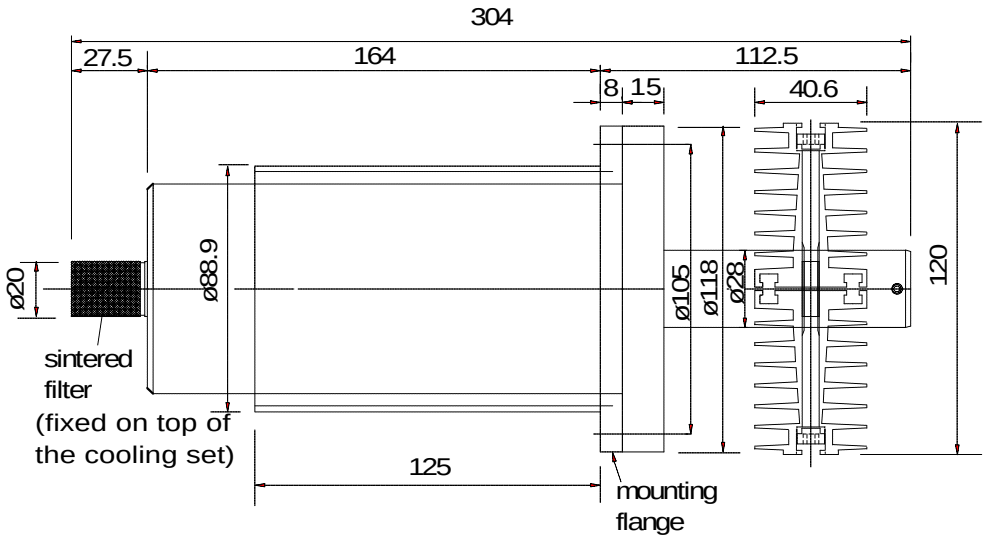


Figure 2.2.2 Dimensions of the cooling set (in mm)

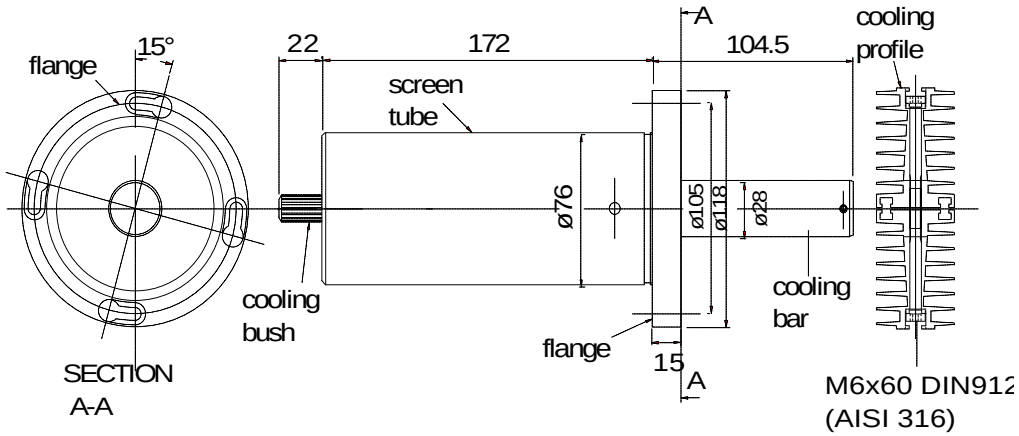


Figure 2.2.3 Parts of the cooling set (dim. in mm)

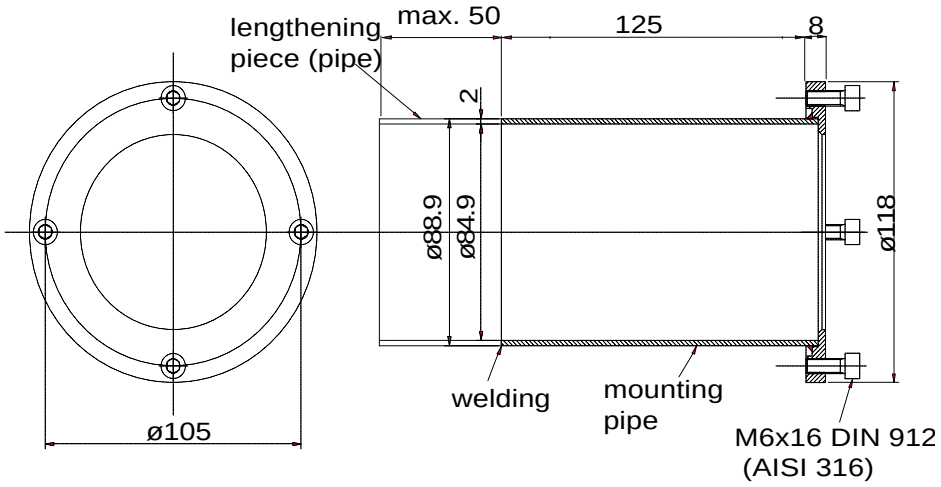


Figure 2.2.4 Dimensions of the mounting flange (in mm)

2.2.1 The cooling profile

The cooling profile is meant to be installed in applications where the process temperature and dewpoint are continuously in the range indicated in the figure below (measurement with cooling profile). However, if there is a possibility that the dewpoint is above this range, the measurements have to be taken without the cooling profile in order to avoid condensation. The flow rate and ambient temperature have an effect on the cooling rate. In the figure below, the ambient temperature is supposed to be +25 °C. Each time the ambient temperature rises +10 °C, the measurement ranges with and without cooling profile rise approximately +6 °C; correspondingly, every -10 °C change in ambient temperature changes the ranges with approximately -6 °C. It is recommended that after having installed the transmitter without the cooling profile, it is left to stabilize and then the RH reading is checked either from the local display or with a terminal connected to an RS line. If the RH reading is below 20 %RH, the cooling profile should be 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.

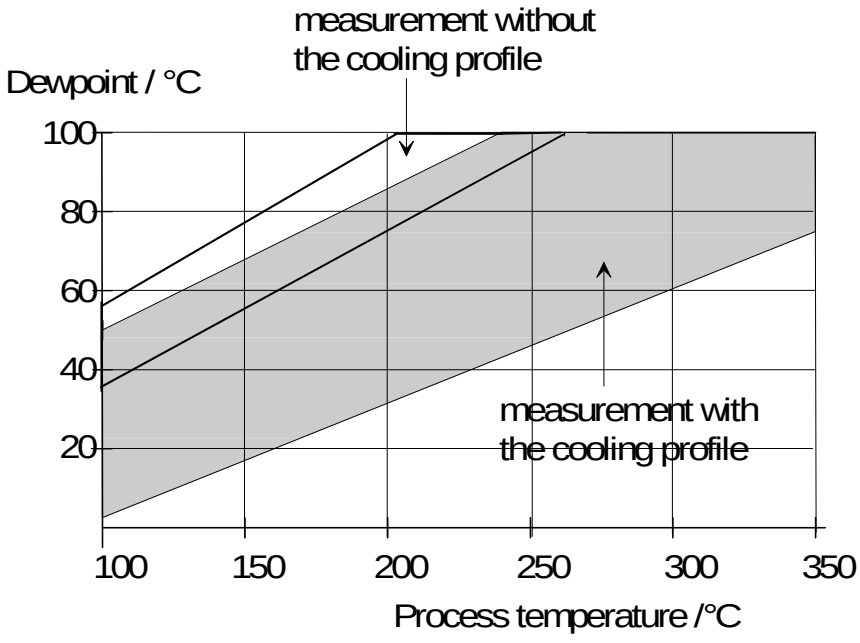


Figure 2.21.1 Measurement ranges for using and not using the cooling profile

2.2.2.1 Mounting the probe and the cooling set

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 2.2.2.1):

- Make a round ∅ 89.5 + 0.5 mm hole on the process wall.
- 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 Fig. 2.2.2.2).
- The cooling profile is mounted in a vertical position. Tighten the screws properly in order to ensure a thermal contact.
- Unscrew the locking screws on the cooling bar so that you can push the sensor head into the bar.

NOTE

Push the sensor head deep enough: make sure that the marking hole meets the end of the bar.

- Lock the sensor head in place by tightening the locking screws on the bar.

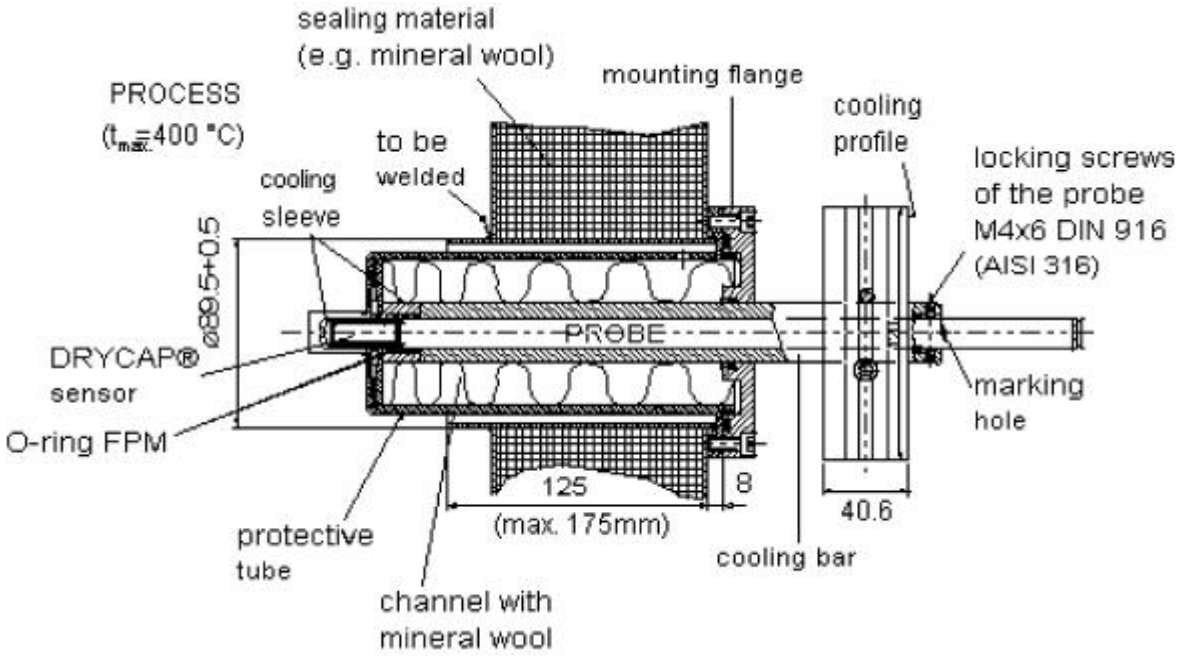


Figure 2.2.2.1 Installing the probe through the process wall

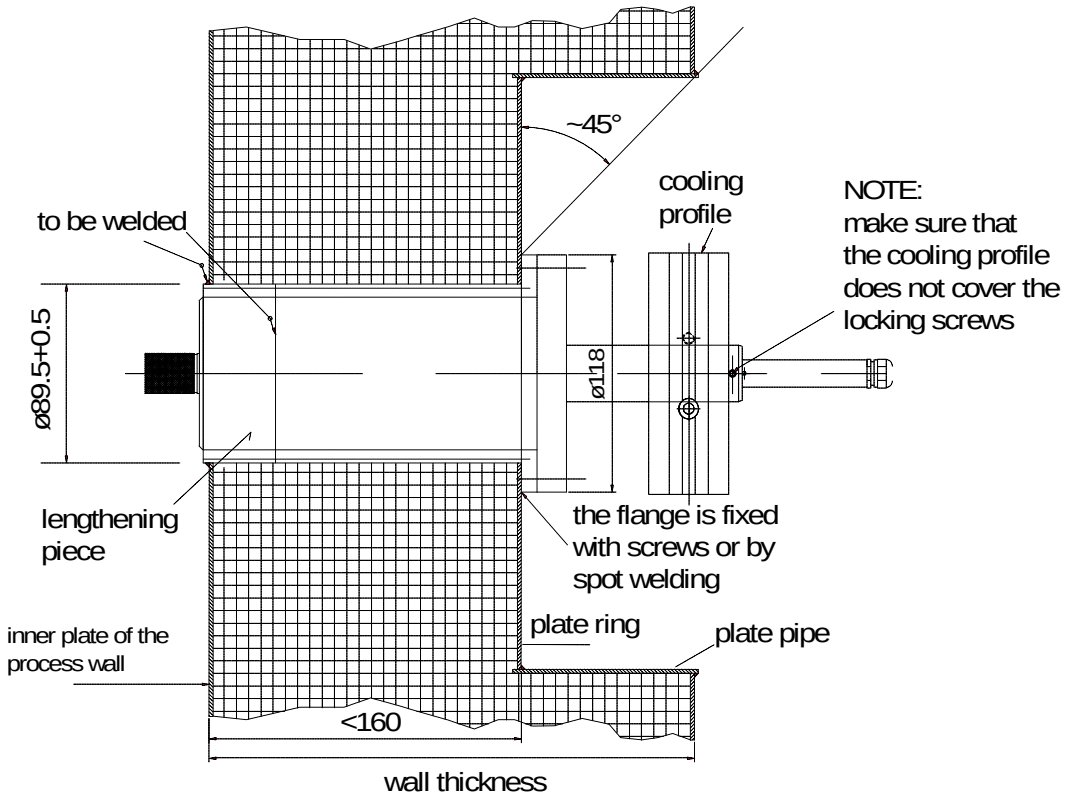


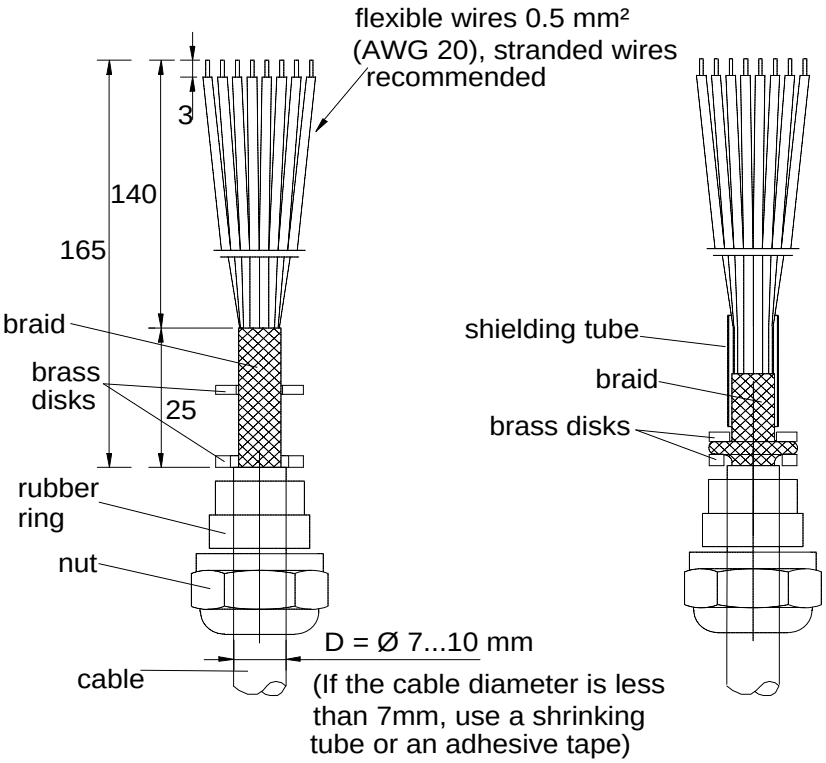
Figure 2.2.2.2 Installing the probe through thick walls

2.3 Grounding

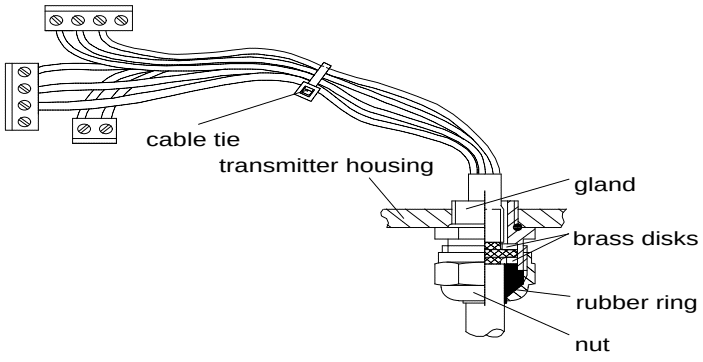
A single electrical cable with a screen and three to ten wires is recommended for power and analogue output/serial bus connections. The cable diameter should be 7...10 mm.

The screen of the electrical cable must be grounded properly to achieve best possible EMC performance. Recommended cable shield is done in the cable gland as shown in the figure next page.

- remove the brass disks, rubber ring and nut from the transmitter housing
- strip 165 mm of the cable insulation, but leave 25 mm of the braid visible
- slip the nut and rubber ring over the cable insulation
- slip the brass disk that has the bigger hole in it over the braid so that it rests against the cable insulation
- slip the other brass disk over the wires to the middle of the braid



- push back the braid and press it between the two brass disks to achieve a full 360° grounding; the fold between the disks should have the same diameter as the brass disks
- secure the braid with a shielding tube
- insert the wires into the transmitter housing through the gland
- tighten the nut
- connect the wires into the screw terminals and fasten a cable tie around the wires



NOTE

When the cable is grounded as above, the metallic parts of the sensor head, the shield of its cable, the transmit-

ter housing and the shield of the signal cable to external system are all connected to each other. After this the whole system can be grounded from one point only. If the grounding is made via several points (sensor head, transmitter housing, signal cable), make sure that the different groundings are made to the same grounding potential. Otherwise harmful grounding currents may be generated. If you do the grounding via the transmitter housing, use one serrated lock washer between a mounting screw and the housing; the lock washer breaks the paint on the housing.

When mains power supply is in use, the housing must be grounded by protective ground wire using a grounding screw at the right-hand side of the power supply module (see Appendix 2: Installing the power supply module).

2.4 Electrical connections

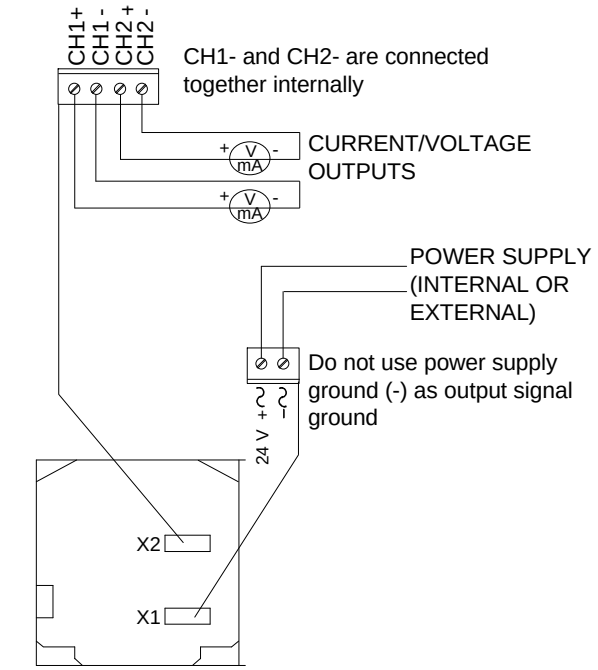


Figure 2.4.1 Electrical connections

Power supply	24 VDC (for 24 VAC, see Chapter 2.4.1)
Output signals	0...20 mA
	4...20 mA
	0...1 V
	0...5 V
	0...10 V

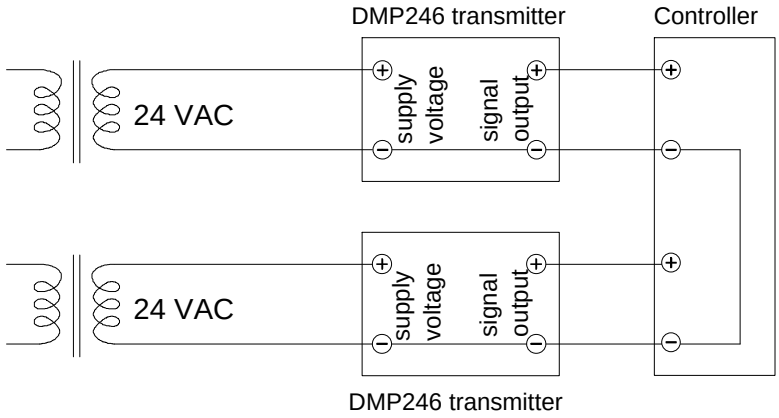
Power supply ground (-) is connected to the housing with parallel connection of 15 nF capacitor and 300 kΩ resistor.

See Appendix 2 on how to connect the power supply module to the transmitter.

2.4.1 Connection to a 24 VAC supply

The DMP246 transmitters can also be connected to a 24 VAC supply without an external rectifier. However, when more than one transmitter is connected to one 24 VAC transformer, a common loop is formed and there is an increased risk of a short-circuit. To avoid this, always use separate floating supply for each transmitter (see Figure 2.4.1.1 A). However, if several transmitters have to share one transformer, the phase (~) must always be connected to + connector in each transmitter (see Figure 2.4.1.1 B).

A) NO COMMON LOOP FORMED - RECOMMENDED



B) COMMON LOOP FORMED - **NOT RECOMMENDED!**

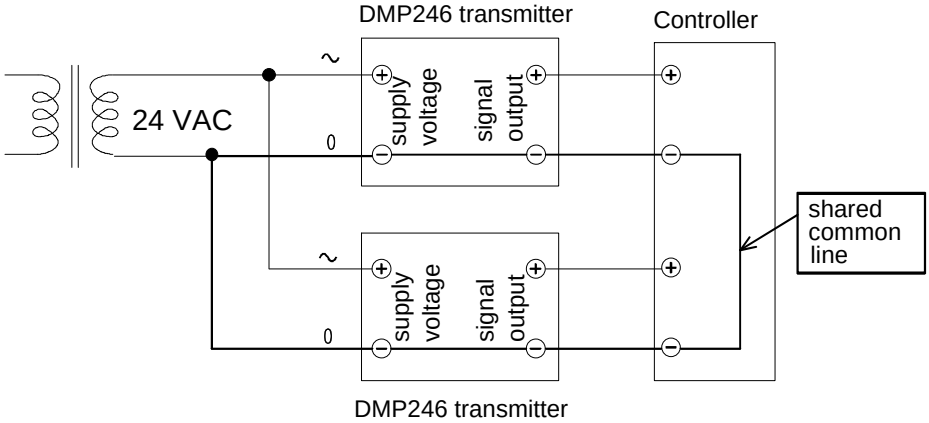


Figure 2.4.1.1 Connecting the transmitters to a 24 VAC supply

3. COMMISSIONING

When the DMP246 transmitter leaves the factory, its measurement ranges and output signals have already been selected. The user can subsequently change the measurement units between metric and non-metric and select and scale the output signals with software functions, see Chapter 4 and Appendix 1.

3.1 Security lock jumper

Before the settings can be changed, the user must first remove the security lock jumper in connector X15 (see Fig. 3.1). The security lock jumper makes it impossible to change the transmitter settings by mistake.

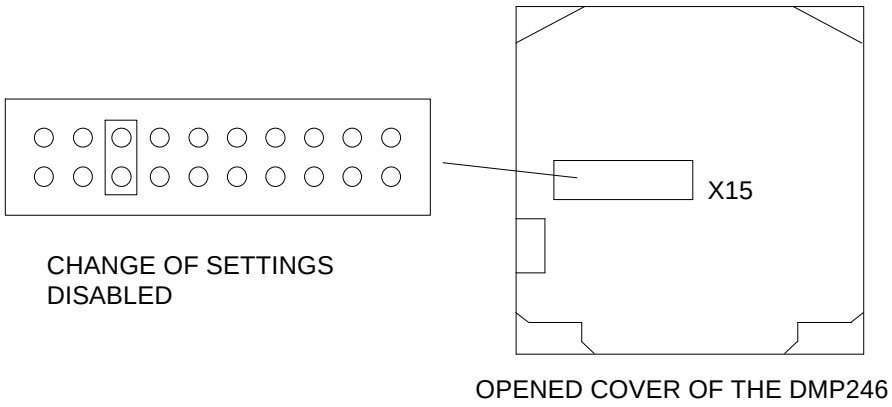


Figure 3.1 Location of the security lock jumper

When the security lock jumper is connected, some commands cannot be used, see Chapter 5.

3.2 Selecting the analogue outputs

The DMP246 transmitters can be ordered with the required current or voltage outputs already selected. If the outputs need to be changed, move the jumpers in connector X15 into positions shown in Figure 3.2.

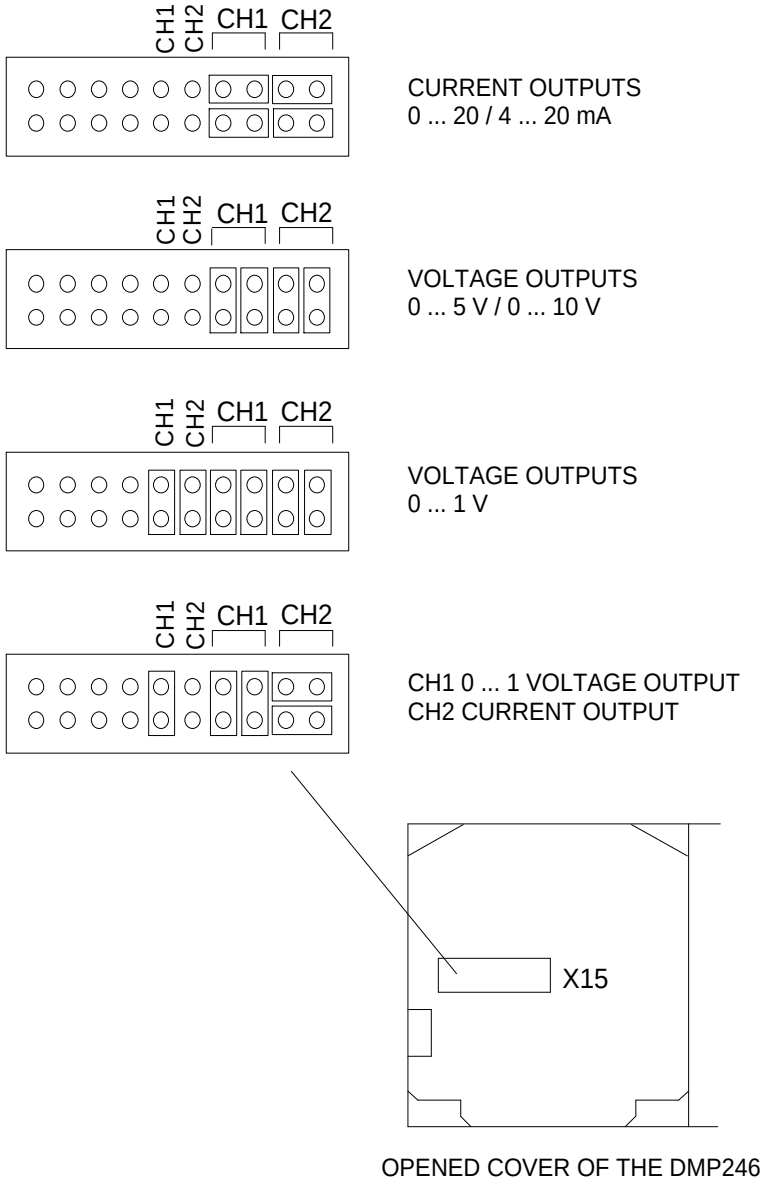


Figure 3.2 Selecting the analogue outputs with jumpers

The software also has to be informed which outputs are in use. This is done either through the serial interface or the menus on local display when one is in use. The serial command is AMODE and the display/keypad command "Mode ⇨ Analog outputs ⇨ Mode" (see Chapter 4). If the outputs need to be scaled, see serial command ASCL and the display command "Mode ⇨ Analog outputs ⇨ Scale".

All jumpers are used only with the 0...1 V outputs. When other outputs are in use, the spare jumpers are kept in connector X55.

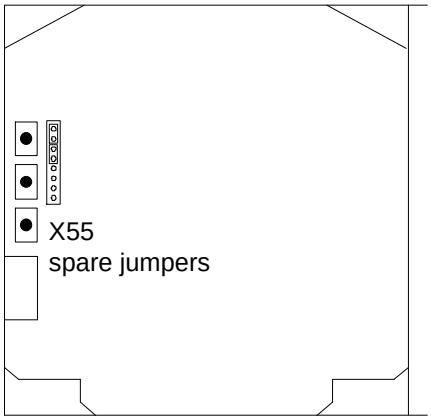


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Figure 3.2.1 Spare jumpers

3.3 Connecting the RS 232C serial bus

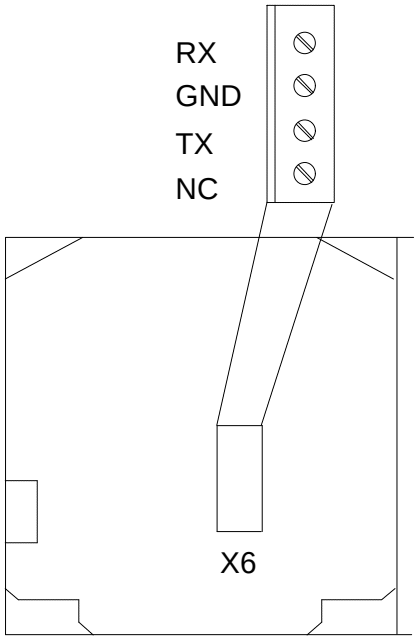

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Figure 3.3.1 Serial bus connections

To connect a PC to the DMP246 transmitters via the RS 232C serial bus, one of the following cables is required. The type of cable depends on the terminal and the connector type.

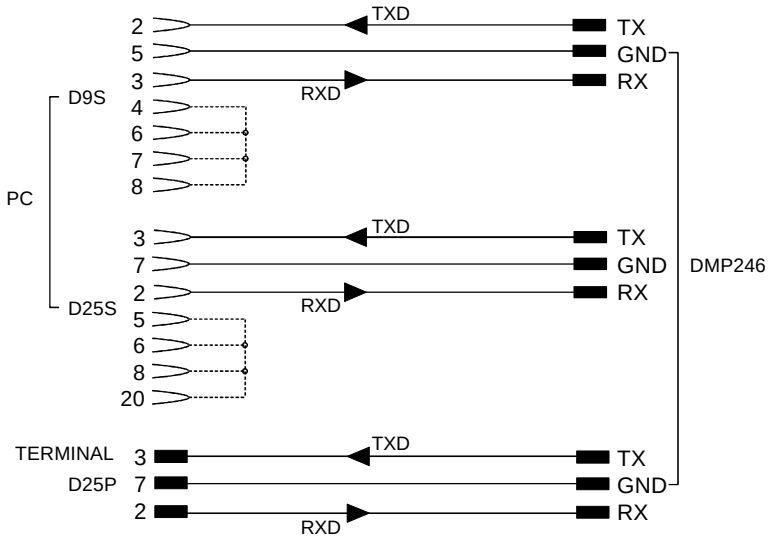

Figure 3.3.2 Connection of cables

When the serial bus has been connected between the PC and the transmitter, the PC is switched on. When using a PC, a terminal emulation programme (e.g. Procomm Plus, Datastorm or Windows terminal) is started.

The factory settings for data transfer are:

- 4800 baud
- even parity
- 7 data bits
- 1 stop bit
- full duplex

NOTE

When the serial bus settings are changed, the transmitter has to be reset before the new settings become effective.

The processor does not allow the following combinations:

- no parity, 7 data bits, 1 stop bit: if this combination is given the DMP246programme will change the number of stop bits to 2
- even or odd parity, 8 data bits, 2 stop bits: if this combination is given the programme changes the number of stop bits to 1

Refer to the manuals of the PC and the terminal emulation programme when giving serial settings.

The RS 232C screw terminal cannot be used if an RS 485/422 serial module or a current loop module is used. See Appendices 3 and 4 on how to install and operate these modules.

In calibrating or changing the settings of the transmitter it can be more convenient to use the connector X17, if connector X6 is already in use. This connector, however, transfers only RS 232C signals. If an RS 485/422 serial port module or a current loop module has been installed, it has to be removed before communicating through the X17 connector.

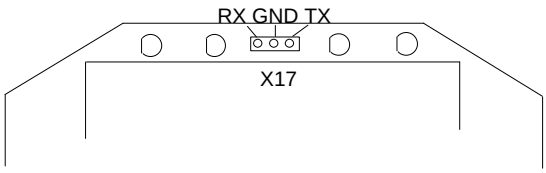

Figure 3.3.3 Location and connections of connector X17

NOTE

Some PC computers can generate interferences to the measured humidity and temperature values if the transmitter and the PC are connected to different mains outlets. To minimize the possibility of these interferences, always use the same mains outlet (same phase of the mains electricity) for the PC and the power supply of DMP246. This is especially the case when using the serial line connector X17. The serial line connector X6 is more immune to these interferences than connector X17.

3.3.1 Reverting to factory settings of the serial port

If the serial port settings are not known, no commands can be given via the serial interface. The settings can be reverted to the factory settings by inserting a jumper in connector X16. The jumper must be inserted when the power is on!

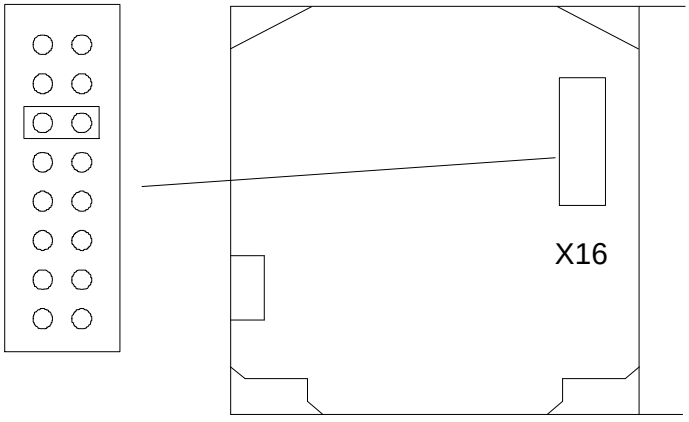

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Figure 3.3.1.1 Forcing the serial port settings back to factory settings

When the jumper is inserted the serial line factory settings become valid, but only temporarily. **The transmitter must be given new settings; otherwise the transmitter uses the old, unknown settings after power-up.** When the new settings have been given, the transmitter must be reset. The jumper must be removed before the transmitter is reset; if the jumper is in place when power is turned on, the transmitter does not work.

After jumper insertion the transmitter is in STOP mode, ready to receive commands.

The same method is used when the transmitter is in POLL mode and the user has forgotten its address.

CAUTION

Inserting a jumper in any other place in connector X16 voids the guarantee of the transmitter.

4. COMMANDS

The DMP246 transmitters use microprocessors; therefore their configuration can be set according to the user's needs. This is done through commands, either utilizing the menus on the local display or giving commands through the serial interface (see Appendix 1). Most often the commands are used to change the settings of the two analogue channels.

A limited range of commands can be given by using the three press switches - up, down and enter - inside the transmitter housing. Four LEDs indicate the command given with the up and down switches. The switches and LEDs are in all DMP246 transmitters. LED commands can be used to calibrate the transmitters' measurement accuracy or to calibrate the analogue outputs.

A full range of commands can be given through the display/keypad or through the RS 232C serial bus. The commands can be used e.g. to select and scale the outputs, to calibrate the humidity and temperature channels as well as the analogue outputs and to set the serial interface.

4.1 Commands and security lock jumper

In order to prevent any tampering with the transmitter settings, the transmitters cannot be calibrated, the analogue outputs set or the analogue output quantities selected or scaled unless the security lock jumper has been disconnected. The commands involved are:

- all LED commands
- display/keypad commands:

  Cali ⇨ RH cal T cal
  Analog outputs
  Mode ⇨ Analog outputs ⇨ Mode
  Scale

- serial commands:

  CRH, CT, ACAL; AMODE, ASEL, ASCL

In the following, the description of these functions is preceded with a reminder of the security lock jumper:

Disconnect the security lock jumper!

4.2 LED commands

NOTE

If the transmitter has a display/keypad cover, the LED commands can not be used.

LED commands can be used to operate the transmitters in the field. These commands can be used in calibration of the measurement accuracy and in calibration of the analogue outputs.

Open the housing and press any one of the three press switches. The LEDs will light up for 2...3 seconds.

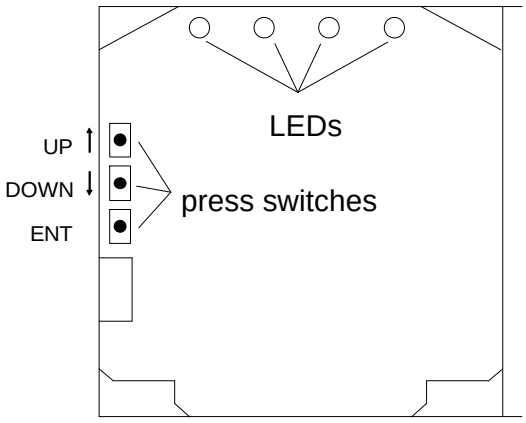

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Figure 4.1 Location of press switches and LEDs

Use the up and down switches (marked with arrows on the printed board) to find the desired command code and acknowledge it with the ENT switch. The command codes are (● = lit, ○ = dark):

○○○○	(0)	return to normal state
○○○●	(1)	relative humidity calibration
○○●○	(2)	temperature calibration
○○●●	(3)	calibration of analogue outputs

4.3 Display/keypad commands

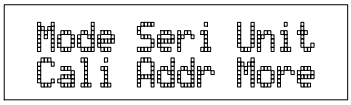
4.3.1 Display mode

In the display mode the transmitters output measurements on the display; different quantities can be scrolled with the arrow keys: the first line is scrolled with ▲ and the second line with ▼; all selections are acknowledged with ENTER. After reset the transmitters are always in the display mode.

The display also shows error messages and alarms if they occur.

4.3.2 Command mode

Press the CL key to enter the command mode. The first display is the main menu:



The commands can be scrolled with the arrow keys. The currently active command flashes; a command is selected with the ENT key. When a menu is displayed, either the first command or the currently valid setting flashes. The CL key takes the transmitter back to the display mode.

4.3.3 Entering numbers

When it is necessary to enter numbers into the programme (e.g. when scaling or setting the analogue outputs, in calibration or when giving the transmitter an address), the field is either empty or the currently valid figure is displayed. Any previously given value is deleted with the CL key.

When the field is empty, a cursor blinks at the right side of the display. Pressing the arrow keys brings either a blank ( ), a comma (,), a dash (-), a full stop (.) or a number from 0 to 9 on the display. The right character is selected with ENT; after that the number or numbers move left one step. Entering numbers is ended with selecting a blank ' ' and pressing ENT. The last character entered can be deleted with CL. If CL or ENT key is pressed when the field is empty, the programme returns to the previous display.

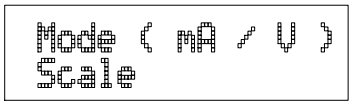
With some commands (e.g. calibration) the figures are changed using the arrow keys. When an arrow key is pressed continuously for a while, the numbers start changing at an increasing rate.

4.3.4 Analogue output commands

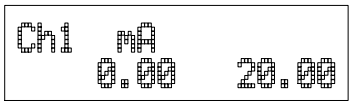
4.3.4.1 Selecting the output (mA/V)

Disconnect the security lock jumper!

- Select Mode in the main menu and Analog outputs in the Mode menu:

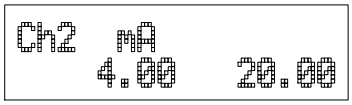


- Select Mode (mA / V). The current settings for channel 1 are displayed:



- If the settings are correct, press ENT.
- If the settings need to be changed, press CL:
  - the quantity (mA/V) starts flashing; it can be changed with the arrow keys and acknowledged with the ENT key
  - the lower limit starts flashing
  - acknowledge the lower limit with ENT or start changing it by pressing CL; a new lower limit is given one character at a time with the arrow keys
  - the upper limit starts flashing
- acknowledge the upper limit with ENT or start changing it by pressing CL; a new upper limit is given one character at a time with the arrow keys

When channel 1 has been set, the programme goes on to channel 2; the procedure is the same as with channel 1.



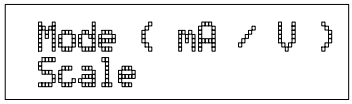
NOTE

Also the analogue output jumpers must be set to correct places (see Fig. 3.2).

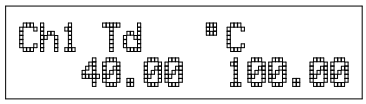
4.3.4.2 Selecting and scaling the analogue output quantities

Disconnect the security lock jumper!

- Select Mode in the main menu and Analog outputs in the Mode menu:



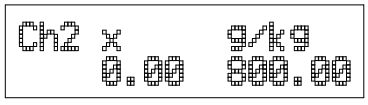
- Select Scale. The quantity and scaling for channel 1 are displayed:



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.

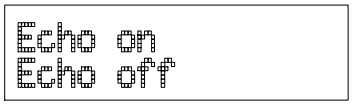
- If the settings are correct, press ENT.
- If the settings need to be changed, press CL:
  - the quantity (RH, T, Td, x,) starts flashing; it can be changed with the arrow keys and acknowledged with the ENT key
  - the lower limit starts flashing
  - acknowledge the lower limit with ENT or start changing it by pressing CL; a new lower limit is given with the arrow keys
  - the upper limit starts flashing
  - acknowledge the upper limit with ENT or start changing it by pressing CL; a new upper limit is given with the arrow keys
- When channel 1 has been set, the programme goes on to channel 2; the procedure is the same as with channel 1.



4.3.5 Output via the serial bus

4.3.5.1 Turning the serial interface echo ON/OFF

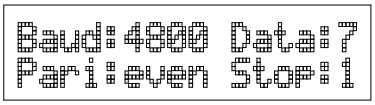
- Select More in the main menu, select More in the More menu and select Echo in the second More menu.



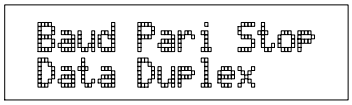
- Use the arrow keys to select the right alternative and press ENT.

4.3.5.2 Serial bus settings

- Select Seri in the main menu; the currently valid serial interface settings are displayed:

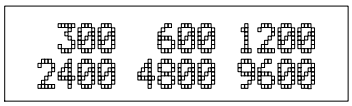


- If the settings are correct, press ENT; the programme returns to the display mode.
- If the settings need to be changed, press CL:

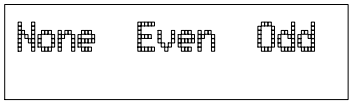


- Select the parameter to be changed with the arrow keys and ENT key.

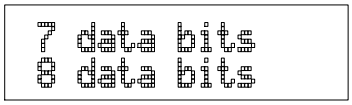
  Selecting baud rate:



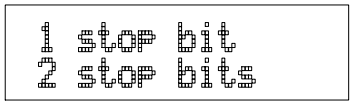
  Selecting parity:



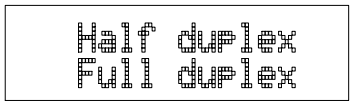
  Selecting data bits:



  Selecting stop bits:



Full duplex/half duplex:



The processor does not allow the following combinations:

- no parity, 7 data bits, 1 stop bit: if this combination is given the DMP246 programme will change the number of stop bits to 2
- even or odd parity, 8 data bits, 2 stop bits: if this combination is given the programme changes the number of stop bits to 1

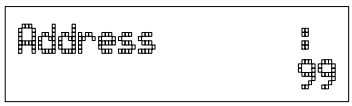
NOTE

The serial bus settings become effective only after reset.

4.3.5.3 Setting the transmitter address

Address is used when more than one transmitter is connected to one serial bus; this way, it is possible to communicate with one transmitter at a time.

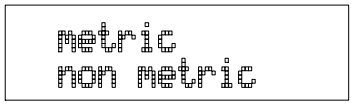
- Select Addr in the main menu; the following is displayed:



- Pressing ENT returns the programme to the main menu.
- Pressing CL deletes the old address; enter the new address with the arrow keys.

4.3.5.4 Selecting the output units

- Select Unit in the main menu:



- Use the arrow keys to select the right alternative and press ENT.

	metric	non-metric
Td	°C	°F
x	g/kg	gr/lb
RH*	%RH	%RH
T*	°C	°F

* to be used only in calibration or during installation

4.3.6 Output modes

The output modes only affect output through the serial interface: the transmitter accepts all display and LED commands irrespective of which serial output mode it is in. The DMP246 transmitters have three serial output modes: RUN, STOP and POLL.

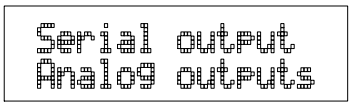
In the RUN state the transmitter outputs measurements automatically through the serial interface to a PC or a peripheral. The only command that can be given through the serial interface is S (stop), which ends the RUN state.

In the STOP state serial commands are given to the transmitters. Measurements are then output only by entering command SEND.

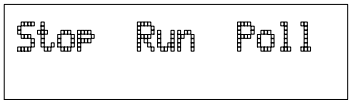
The POLL state is used when more than one transmitter is connected to the same serial bus; a single transmitter can be addressed and communicated with. When the connection to the one transmitter is opened in the POLL state, the transmitter goes into STOP state and can then receive commands normally. Closing the connection returns the transmitter to POLL state. In POLL state the transmitter outputs measurement only when requested (command SEND aa). If the user has forgotten the address of the transmitter and the transmitter does not have a display, the transmitter has to be reverted to the factory settings (see Chapter 3.3). If the transmitter has a display, the settings can be checked through it.

4.3.6.1 Setting the serial interface operation mode

- Select Mode in the main menu; the following is displayed:

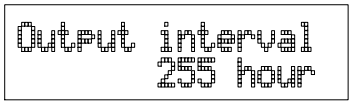


- Select Serial output:



- The currently valid setting flashes. Select the desired mode with the arrow keys and press ENT. After this the programme returns to the Mode Menu.
- When Run mode is selected, the currently valid output interval is displayed:

The output interval setting can be changed as follows:



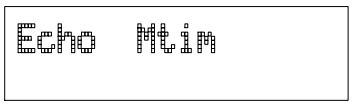
- press CL
- the number starts flashing
- if the interval needs to be changed, press CL again and enter the new interval; otherwise press ENT
- the unit (s, min, h) starts flashing
- the unit can be changed with the arrow keys and acknowledged with ENT
- after this the programme returns to Mode menu

4.3.7 Others

4.3.7.1 Setting the measurement integration time

By lengthening the measurement integration time any stray changes in the output can be filtered out: the transmitter calculates the average of a number of measurement cycles defined by the user.

- Select More in the main menu, select More in the More menu and select Mtim in the second More menu:

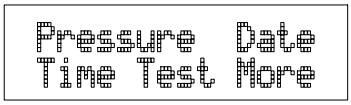


- Pressing ENT returns the programme to the main menu without changing the integration time.
- If the integration time needs to be changed, press CL; enter the new integration time with the arrow keys (4...255)

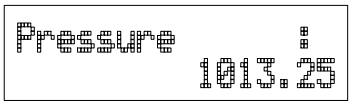
4.3.7.2 Setting the pressure for mixing ratio calculations

The atmospheric pressure has an effect on mixing ratio. Therefore accurate mixing ratio calculations can be achieved only when the ambient pressure is taken into consideration.

- Select More in the main menu:



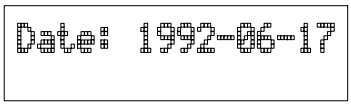
- Select Pressure:



- Pressing ENT returns the programme to the main menu without changing the pressure reading.
- If the pressure needs to be changed, press CL; enter the new pressure with the arrow keys

4.3.7.3 Setting the date

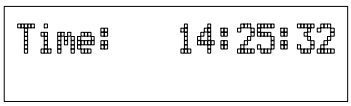
- Select More in the main menu; select Date in the More menu:



- If the date is correct, acknowledge it by pressing ENT; this takes the programme back to the More menu.
- If the date needs to be changed, press CL.
  - first the centuries (19) start flashing; use the arrow keys to change them and press ENT
  - the years (92) start flashing; use the arrow keys to change them and press ENT
  - the months (06) start flashing; use the arrow keys to change them and press ENT
  - the days (17) start flashing; use the arrow keys to change them and press ENT

4.3.7.4 Setting the time

- Select More in the main menu; select Time in the More menu:



- If the time is correct, acknowledge it by pressing ENT; this takes the programme back to the More menu.
- If the time needs to be changed, press CL.

- first the hours (14) start flashing; use the arrow keys to change them and press ENT
- the minutes (25) start flashing; use the arrow keys to change them and press ENT
- the seconds (32) start flashing; use the arrow keys to change them and press ENT

NOTE

The transmitter does not have a real-time clock with backup battery. This means that the date and time settings are not permanent.

4.4 Serial commands

More detailed descriptions of the serial commands can be found in Appendix 1. Here only the most commonly used command sequences are described. The instructions on how to connect the DMP246 transmitters to serial bus are given in Chapter 3.1.

Pressing ESC always interrupts any serial command being given. In the commands <cr> means carriage return.

4.4.1 Analogue output commands

4.4.1.1 Setting the analogue outputs

Disconnect the security lock jumper!

AMODE a bb.bbb cc.ccc d ee.eee ff.fff <cr>

a	=	channel 1:	U	=	voltage output
			I	=	current output
bb.bbb	=	lower limit of channel 1			
cc.ccc	=	upper limit of channel 1			
d	=	channel 2:	U	=	voltage output
			I	=	current output
ee.eee	=	lower limit of channel 2			
ff.fff	=	upper limit of channel 2			

The bb.bbb, cc.ccc, ee.eee and ff.fff parameters are entered in volts or milliamperes.

Example: lower limit of channel 1 is 0 V and upper limit 1 V (U 0 1)
lower limit of channel 2 is 2 V and upper limit 10 V (U 2 10)

```
>AMODE U 0 1 U 2 10 <cr>
Ch1 :  0.000 ...   1.000 V
Ch2 :  2.000 ...  10.000 V
```

4.4.1.2 Selecting and scaling the analogue output quantities

Disconnect the security lock jumper!

ASEL xxx yyy <cr>

xxx = channel 1's quantity (Td, Mix, RH, T)
yyy = channel 2's quantity (Td, Mix, RH, T)

Example: dewpoint temperature selected on channel 1 and mixing ratio on channel 2

```
>ASEL Td Mix <cr>
Ch1  (Td) lo   20.000 'C     ? <cr>
Ch1  (Td) hi   55.000 'C     ? <cr>
Ch2  (x ) lo   10.000 g/kg   ? <cr>
Ch2  (x ) hi   100.000 g/kg  ? <cr>
```

4.4.1.3 Scaling the analogue outputs

Disconnect the security lock jumper!

ASCL <cr>

Example: dewpoint temperature is scaled in the range of +20...+55 °C and mixing ratio in the range of 10...100 g/kg:

```
>ASCL <cr>
Ch1  (Td) lo   20.000 'C     ? <cr>
Ch1  (Td) hi   55.000 'C     ? <cr>
Ch2  (x ) lo   10.000 g/kg   ? 10 <cr>
Ch2  (x ) hi  100.000 g/kg   ? 100 <cr>
```

4.4.2 Output via the serial bus

4.4.2.1 Starting the measurement output

R <cr>

Starts output of measurements to the peripheral devices (RUN mode); the only command that can be used in S (stop).

The output format can be changed with command FORM (see Appendix 1).

4.4.2.2 Stopping the measurement output

S<cr>

Ends the RUN mode; after this command all other commands can be used.

4.4.2.3 Outputting the reading once

SEND <cr> in STOP mode

or

SEND aa <cr> in POLL state

aa = address of the transmitter when more than one transmitter is connected to a serial bus (0...99)

The output format can be changed with command FORM (see Appendix 1).

4.4.2.4 Setting the output interval for the RUN mode

INTV xxx yyy <cr>

xxx = output interval (0...255)
0: no pause between outputs
yyy = unit (s, min or h)

Example: output interval is changed into 10 minutes

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

4.4.2.5 Serial bus settings

SERI b p d s x <cr>

b = bauds (300, 600, 1200, 2400, 4800, 9600)
p = parity (n = none, e = even, o = odd)
d = data bits (7 or 8)
s = stop bits (1 or 2)
x = duplex (H = half, F = full)

The settings can be changed one parameter at a time or all parameters at once:

```
>SERI O <cr>                    changing parity only
4800 O 7 1 HDX

>SERI 600 N 8 1 F <cr>          changing all parameters
600 N 8 1 FDX
```

The processor does not allow the following combinations:

- no parity, 7 data bits, 1 stop bit: if this combination is given the DMP246programme will change the number of stop bits to 2
- even or odd parity, 8 data bits, 2 stop bits: if this combination is given the programme changes the number of stop bits to 1

NOTE

The serial bus settings become effective only after reset.

When the half-duplex mode is set, it will automatically turn the echo off. Even then the ECHO command can indicate that echo is on.

4.4.2.6 Selecting the output units

UNIT x <cr>

x = m(etric units)
n(on-metric units)

	metric	non-metric
Td	°C	°F
x	g/kg	gr/lb
RH*	%RH	%RH
T*	°C	°F

* to be used only in calibration or during installation

4.4.2.7 Setting the transmitter address

ADDR aa <cr>

aa = address (0...99)

Example: transmitter is given address 99

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

4.4.2.8 Resetting the transmitter

RESET <cr>

4.4.3 Operating the transmitter via the serial bus

4.4.3.1 Setting the serial interface

SMODE xxxx<cr>

xxxx = STOP, RUN or POLL

In STOP mode: measurements output only by command, all commands can be used

In RUN mode: outputting automatically, only command S (STOP) can be used

In POLL mode: measurements output only with command SEND. When in POLL state, the output state is changed as follows:

OPEN aa <cr>
SMODE xxxx<cr>

aa = address of the transmitter
xxxx = STOP, RUN or POLL

The OPEN command sets the bus temporarily in STOP state so that the SMODE command can be given.

Example:

```
>SMODE STOP <cr>              setting STOP state
Serial mode : STOP
```

4.4.3.2 OPEN & CLOSE

OPEN nn <cr>

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

CLOSE <cr>

In STOP mode: command OPEN has no effect, CLOSE sets the transmitter in POLL mode

In POLL mode: command OPEN sets the transmitter temporarily in STOP mode, command CLOSE returns the instrument to POLL mode

Example: relative humidity calibration is performed at transmitter 2 which is in POLL state

```
>OPEN 2 <cr>        opens the line to transmitter 2
>CRH <cr>           calibration started
...
>CLOSE <cr>         line closed
```

5. CALIBRATION

The DMP246 transmitters have been fully calibrated at the factory and there should be no immediate need to calibrate them again. The transmitters should be calibrated only if the adjustments of the transmitters for some reason have changed. In particular the adjustments of the temperature measurement channel and the analogue outputs are stable and in normal circumstances there is no need to recalibrate them. It is recommended that humidity calibration is performed once a year.

NOTE

If the process is not shut down for removing the transmitter for calibration, also the cooling set has to be removed; otherwise, there is a risk of water condensating inside the cooling pipe.

5.1 Humidity calibration

The DMP246 transmitter is calibrated against two accurate RH references. This can be performed by the end-user, or the instrument can be sent to Vaisala or a Vaisala representative. A two-point calibration can be performed with Vaisala's HMK15 salt bath calibrator.

Calibration can be performed by giving the commands using the press switches inside the housing (LED commands), through the serial bus or through the menus on the local display.

When LED commands are used and when the two analogue channels do not output either relative humidity and/or temperature (as is normally the case), relative humidity is calibrated on channel 1 and temperature is calibrated on channel 2. The calibration ranges are 0...100 %RH and -20...+80 °C. When the transmitters are calibrated at two points, the points must be either 50 %RH or 50 °C apart from each other.

NOTE

As relative humidity is a temperature dependent parameter, the probe and the salt bath calibrator have to stabilize to the same temperature for best accuracy. It is recommended to allow four hours for stabilization.

5.1.1 Two point calibration procedure

A two-point humidity calibration should be performed in stable conditions using saturated salt solutions as references. When the probe is removed from the process, remember to close the hole (∅89.5 + 0.5mm) carefully.

5.1.1.1 Using serial commands

- Leave the calibrator and the transmitter for at least 4 hours in the same space so that their temperatures have time to equalize. Remove the filter cap on the transmitter.

Disconnect the security lock jumper!

- Insert the sensor head in the calibration hole of the LiCl bottle (dry end reference) in the humidity calibrator.
- Wait for 30 minutes.
- Give command CRH <cr>, enter the first point value and press <cr>.

```
>CRH <cr>
RH :  xx.x   Ref1 ?  yy.y <cr>
Press any key when ready...
```

- If you want to see how the sensor stabilizes to the humidity in the calibrator, enter c <cr> until the first reference is entered:

```
RH : 11.9  Ref1  ? c <cr>
RH : 11.5  Ref1  ? c <cr>
RH : 11.5  Ref1  ? 11.3 <cr>
Press any key when ready...
```

- Insert the sensor head in the calibration hole of the NaCl bottle (wet end reference) in the humidity calibrator.
- Wait for 30 minutes.
- Press any key and enter the second point value and press <cr>.

```
RH  :  xx.x   Ref2 ?  yy.y <cr>
```

- The stabilization of the sensor can be monitored here as well by entering c <cr> until the reference value is entered.

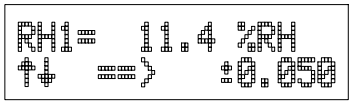
5.1.1.2 Using display/keypad commands

- Leave the calibrator and the transmitter for at least 4 hours in the same space so that their temperatures have time to equalize. Remove the filter cap on the transmitter.

Disconnect the security lock jumper!

- Insert the sensor head in the calibration hole of the LiCl bottle (dry end reference) in the humidity calibrator.

- Wait for 30 minutes.
- Select Cali in the main menu and then RH; select Not changed and then two-point calibration RH 2 point cal. Change the first point reading with the arrow keys to correspond to the reference humidity and press ENT; pressing an arrow once changes the reading by 0.05 %RH.



- Insert the sensor head in the calibration hole of the NaCl bottle (wet end reference) in the humidity calibrator.
- Wait for 30 minutes.
- If necessary, change the second point reading with the arrow keys and press ENT.

5.1.1.3 Using LED commands

- Leave the calibrator and the transmitter for at least 4 hours in the same space so that their temperatures have time to equalize. Remove the filter cap on the transmitter.

Disconnect the security lock jumper!

- Insert the sensor head in the calibration hole of the LiCl bottle (dry end reference) in the humidity calibrator.
- Wait for 30 minutes.
- Connect an ammeter/voltmeter to the analogue outputs (connector X2). Give command ○○○●. At the first calibration point the LED on the left flashes; adjust the first point (offset) with the arrow switches to the value given in the calibration table (Chapter 5.1.2) and press ENT switch.
- Insert the sensor head in the calibration hole of the NaCl bottle (wet end reference) in the humidity calibrator.
- Wait for 30 minutes.
- Check that the reading corresponds within the desired accuracy to that given in the calibration table (Chapter 5.1.2). If not, adjust the second point with the arrow switches to the correct value and press ENT. At the second calibration point the second LED from the left flashes.

5.1.2 Humidity calibration table

Temperature	°C	15	20	25	30	35
	°F	59	68	77	86	95
LiCl	%RH	*	11.3	11.3	11.3	11.3
4...20 mA			5.81	5.81	5.81	5.81
0...20 mA			2.26	2.26	2.26	2.26
0...1 V			0.113	0.113	0.113	0.113
0...5 V			0.565	0.565	0.565	0.565
0...10 V			1.13	1.13	1.13	1.13
NaCl	%RH	75.6	75.5	75.3	75.1	74.9
4...20 mA		16.10	16.08	16.05	16.02	15.98
0...20 mA		15.12	15.10	15.06	15.02	14.98
0...1 V		0.756	0.755	0.753	0.751	0.749
0...5 V		3.780	3.775	3.765	3.755	3.745
0...10 V		7.56	7.55	7.53	7.51	7.49

Table 1 Greenspan's calibration table

*) LiCl solution must not be used or stored in temperatures below +18 °C (+64 °F), otherwise the equilibrium humidity of the salt solution changes permanently.

5.2 Temperature calibration

The temperature channel has been calibrated at the factory and since it is very stable, calibration should be performed only when there is strong reason to believe that the adjustments have changed.

Temperature calibration should be done against some accurate temperature reference. It can be done either using the press switches inside the housing, through the serial bus or the menus on the local display. Either a one point offset correction or a two point calibration is possible.

NOTE

Temperature calibration cannot be performed in process conditions as the DMP246 measures a cooled temperature whereas the reference instrument measures the actual process temperature.

5.2.1 One point temperature calibration

5.2.1.1 Using serial commands

- Leave the reference instrument and the transmitter for at least 4 hours in the same space so that their temperatures have time to equalize. Remove the filter cap prior to calibration.

Disconnect the security lock jumper!

- Check the transmitter against the reference.
- Give command CT <cr>, enter the first point value and press <cr>:

```
>CT <cr>
T  :  xx.x   Ref1 ?  yy.y <cr>
Press any key when ready
```

- If you want to see how the sensor stabilizes to the reference temperature, enter c <cr> until entering the first reference:

```
T : 0.90  Ref1  ? c <cr>
T : 0.55  Ref1  ? c <cr>
T : 0.55 Ref1  ? 0.0 <cr>
Press any key when ready...
```

- After giving the correct temperature value (Ref1) and pressing <cr> press any key and press <cr>.

5.2.1.2 Using display/keypad commands

- Leave the reference instrument and the transmitter for at least 4 hours in the same space so that their temperatures have time to equalize. Remove the filter cap prior to calibration.

Disconnect the security lock jumper!

- Check the transmitter against the reference.
- Select Cali in the main menu and then T; select one-point calibration T 1 point cal.
- Change the reading with the arrow keys to correspond to the reference and press ENT.

5.2.1.3 Using LED commands

- Leave the reference instrument and the transmitter for at least 4 hours in the same space so that their temperatures have time to equalize. Remove the filter cap prior to calibration.

Disconnect the security lock jumper!

- Check the transmitter against the reference.
- Connect an ammeter/voltmeter to the analogue outputs (connector X2). Give command ○○●○. At the first calibration point the LED on the left flashes; adjust the first point (offset) with the arrow switches to the same reading with the reference and press ENT switch.
- After adjusting the offset point and pressing ENT the second LED from the left flashes. Press ENT without changing the output value.

5.2.2 Two point temperature calibration

5.2.2.1 Using serial commands

- Leave the reference instrument and the transmitter for at least 4 hours in the same space so that their temperatures have time to equalize. Remove the filter cap prior to calibration.

Disconnect the security lock jumper!

- Check the transmitter against the reference.
- Give command CT <cr>, enter the first point value and press <cr>:

```
>CT <cr>
T  :  xx.x   Ref1 ?  yy.y <cr>
Press any key when ready
```

- If you want to see how the sensor stabilizes to the reference temperature, enter c <cr> until entering the first reference:

```
T : 0.90  Ref1  ? c <cr>
T : 0.55  Ref1  ? c <cr>
T : 0.55 Ref1  ? 0.0 <cr>
Press any key when ready...
```

- Change the temperature and check the transmitter again against the reference.
- Check that the reading corresponds with the reading of the reference instrument. If not, adjust the second point.
- Press any key, enter the second point value and press <cr>.

```
T  :  xx.x   Ref2 ?  yy.y <cr>
```

- The stabilization of the sensor can be monitored by entering c <cr> until the reference value is entered.

5.2.2.2 Using display/keypad commands

- Leave the reference instrument and the transmitter for at least 4 hours in the same space so that their temperatures have time to equalize. Remove the filter cap prior to calibration.

Disconnect the security lock jumper!

- Check the transmitter against the reference.
- Select Cali in the main menu and then T; select two-point calibration T 2 point cal. Change the first point reading with the arrow keys and press ENT.
- Change the temperature and again check the transmitter against the reference.
- Check that the reading corresponds with the reading of the reference instrument. If not, adjust the second point.
- If necessary, change the second point reading with the arrow keys and press ENT.

5.2.2.3 Using LED commands

- Leave the reference instrument and the transmitter for at least 4 hours in the same space so that their temperatures have time to equalize. Remove the filter cap prior to calibration.

Disconnect the security lock jumper!

- Check the transmitter against the reference.
- Connect an ammeter/voltmeter to the analogue outputs (connector X2). Give command ○○●○. At the first calibration point the LED on the left flashes; adjust the first point (offset) with the arrow switches to the same reading with the reference and press ENT switch.
- Change the temperature and again check the transmitter against the reference.
- If necessary, adjust with the arrow switches to the correct value and press ENT. At the second calibration point the second LED from the left flashes.

5.3 Calibration of the analogue outputs

The analogue outputs have been calibrated at the factory and since they are very stable, calibration of the outputs should be performed only when there is reason to believe that their adjustments have changed.

5.3.1 Using serial commands

Disconnect the security lock jumper!

ACAL <cr>

The outputs on channels 1 and 2 are measured and the measured values (mA or V) entered as calibration coefficients.

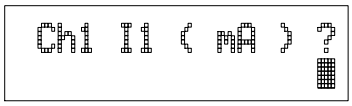
Example: both channels have 0...10 V outputs (set with AMODE command); enter the voltages measured at the analogue outputs:

```
>ACAL <cr>
Ch1  U1 ( V  ) ? 0.123 <cr>
Ch1  U2 ( V  ) ? 9.98 <cr>
Ch2  U1 ( V  ) ? 0.120 <cr>
Ch2  U2 ( V  ) ? 9.98 <cr>
```

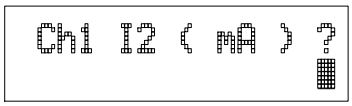
5.3.2 Using display/keypad commands

Disconnect the security lock jumper!

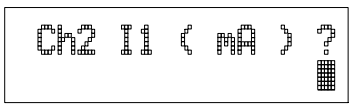
- Connect an ammeter/voltmeter to the output of channel 1, select Cali in the main menu and Analog outputs in the Cali menu. The following is displayed (the quantity can be either mA or V):



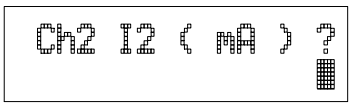
- Enter the measured lower end current/voltage on channel 1.



- Enter the measured upper end current/voltage on channel 1.



- Connect the meter to the output of channel 2 and enter the measured lower end current/voltage on channel 2.



- Enter the measured upper end current/voltage on channel 2.

5.3.3 Using LED commands

If both the analogue outputs and DRYCAP® sensor are calibrated, the analogue outputs should be calibrated first. This applies only when the calibrations are done using the LED commands!

- connect an ammeter/voltmeter to the analogue outputs (connector X2)

Disconnect the security lock jumper!

- Give command ○○●●.
- the LED on the left flashes; set the low end of channel 1 with the arrow keys and press ENT
- the second LED from the left flashes; set the high end of channel 1 with the arrow keys and press ENT
- the LED on the left flashes; set the low end of channel 2 with the arrow keys and press ENT
- the second LED from the left flashes; set the high end of channel 2 with the arrow keys and press ENT

The analogue outputs are calibrated to ensure outputs are correctly scaled: for example, when the output is scaled to 4...20 mA, the low end of the scale is 4 mA and high end 20 mA exactly. However, when 0... 20 mA output is used, the output cannot be adjusted to exactly 0 mA, but to 50 µA. When 0...1 V, 0...5 V or 0...10 V output is in use, the output is adjusted to 50 mV. The following table summarizes the correct output values.

Summary of the correct output values:

	Output scale:				
	0...20 mA	4...20 mA	0...1 V	0...5 V	0...10 V
low end:	50 µA	4 mA	50 mV	50 mV	50 mV
high end:	20 mA	20 mA	1 V	5 V	10 V

6. MAINTENANCE

6.1 Reference measurements

Reference measurements are needed to verify whether the transmitter readings are within specifications. This way the user can check if the transmitter needs calibration or service.

The reference measurement should be made as close to the checked sensor as possible and the readings should be read at the same time, when possible.

The best reference measurements are made in laboratories. If it is possible to take the transmitter out of process or control system, make the reference measurement in a laboratory where the conditions are stable.

6.2 Self-diagnostics

The DMP246 transmitters go through a self-diagnostics procedure when the power is switched on. When the procedure does not reveal any errors or faults, the transmitter starts operating normally. If errors or faults are found, check first if the DRYCAP® sensor is damaged. If it is intact, send the transmitter to Vaisala or a Vaisala representative for repairs. The error messages the transmitter outputs are listed in Appendix 5.

If any errors occur during operation, the error messages are output on the local display if the transmitter displays measurements; if the menus are used, error messages are not output. The LEDs indicate errors at all times. During operation, however, the error messages are not output automatically through the serial interface. If there is any reason to doubt that there is something wrong with the transmitter, use command ERRS:

ERRS <cr>

If there are no error messages, only a prompt is displayed:

```
>ERRS <cr>
>
```

When errors have occurred, the transmitter outputs the error code (see Appendix 5 for all error messages):

```
>ERRS <cr>
E40  f  ( all )   out of range
>
```

6.3 Changing the filter

Replace a dirty sintered filter to ensure a maximum lifetime for the sensor. Do not try to clean the filter.

6.4 Temperature channel adjustment with Pt 100 simulators

Switch the power off and disconnect the wires to the Pt 100 sensor from solder lugs TP5, TP6 and TP7.

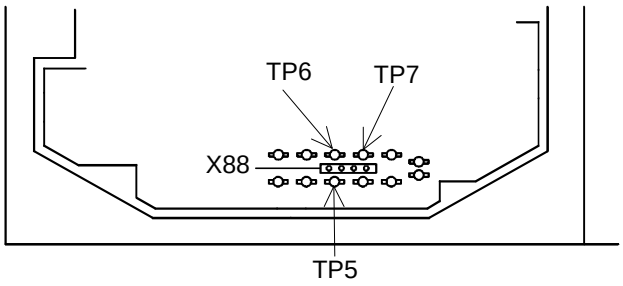


Figure 6.4.1 Location of solder lugs TP5, TP6 and TP7 and connector X88

Connect a Pt 100 simulator to connector X88 and set it at the lowest temperature to be calibrated.

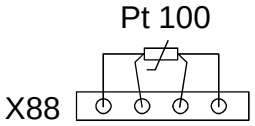


Figure 6.4.2 Connecting the Pt 100 simulator to connector X88

Switch the power on.

6.4.1 Adjustment using serial commands

Give command CT and enter the first point value and press <cr>:

```
>CT <cr>
'C  :  xx.x   Ref1 ?  yy.y <cr>
Press any key when ready
```

Set the Pt 100 simulator at the highest temperature to be calibrated and press any key. Enter the second point (gain) reference reading. If second reference is not needed, press <cr> to complete one point offset correction.

6.4.2 Adjustment using display commands

Select Cali in the main menu and then T; select two-point calibration T 2 point cal. Change the first point reading with the arrow keys and press ENT.

Set the Pt 100 simulator at the highest temperature to be calibrated and adjust the second point (gain) to the reference reading. If there is no second reference, press ENT to complete one point offset correction.

6.4.3 Adjustment using LED commands

Connect an ammeter/voltmeter to the analogue outputs (connector X2). Give command ○○●○ and adjust the first point (offset) with the arrow switches to the same reading with the reference and press ENT switch.

Set the Pt 100 simulator at the highest temperature to be calibrated and adjust the second point (gain) to the reference reading. If there is no second reference, press ENT to complete one point offset correction.

Disconnect the Pt 100 simulator and reconnect the Pt 100 wires to solder lugs TP5, TP6 and TP7.
The correct connections according to the wire colours for different transmitters are:

TP5	TP6	TP7	TP8
blue	green	yellow	black

If there is not a Pt 100 simulator available, the adjustment can be made with two resistors of 84 Ω and 154 Ω whose resistance is known precisely. Measure the resistor with a resistance meter. Look up the corresponding temperature value from a Pt 100 conversion table or calculate it using the following equation:

$$T = D0 + R \times \{D1 + R \times [D2 + R \times (D3 + R \times D4)]\}$$

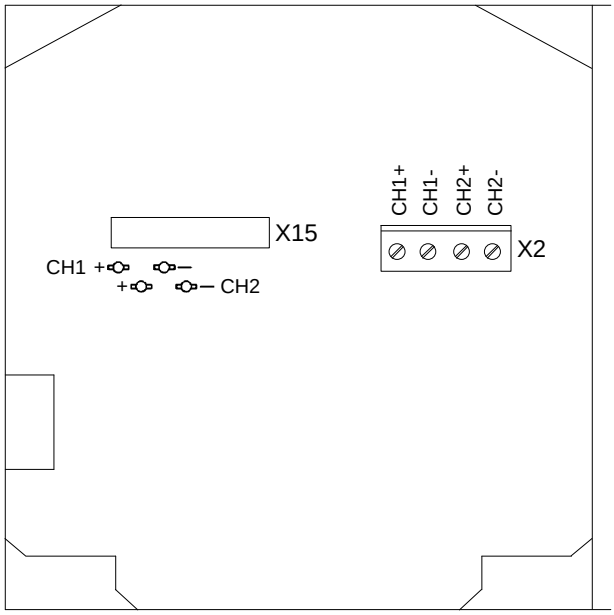
where

D0 = -243.5673014
D1 = 2.278542701
D2 = 0.002050681
D3 = -6.15025E-06
D4 = 1.34949E-08

6.5 Measurement of output currents using test points

If a current output has been connected e.g. to a process computer, the output current cannot be measured at the output connector X2 without disconnecting the external load. The output current can, however, be measured at test points CH1+/CH1- and CH2+/CH2- without disconnecting the output wires. These

test points can therefore be used in one point offset correction against an accurate reference or in checking the current output without disconnecting the analogue output from the process.



OPENED COVER OF THE DMP246

Figure 6.5.1 Location of the CH1 and CH2 test points

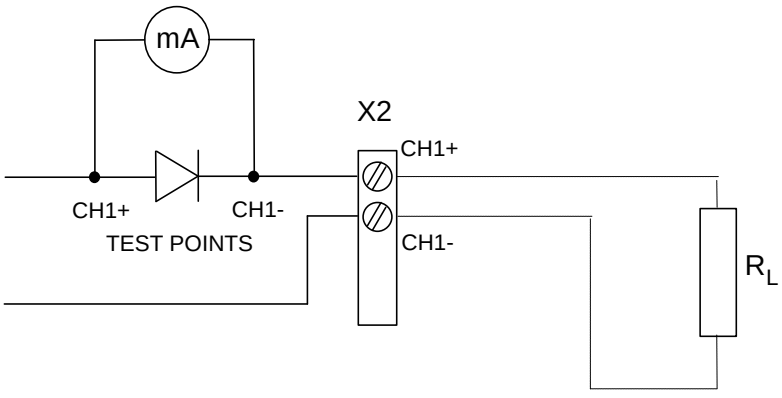


Figure 6.5.2 Circuit diagram of the analogue output current test points

6.6 Adjusting the contrast of the display

The contrast of the display can be adjusted using the trimmer "LCD display contrast" located next to the press switches.

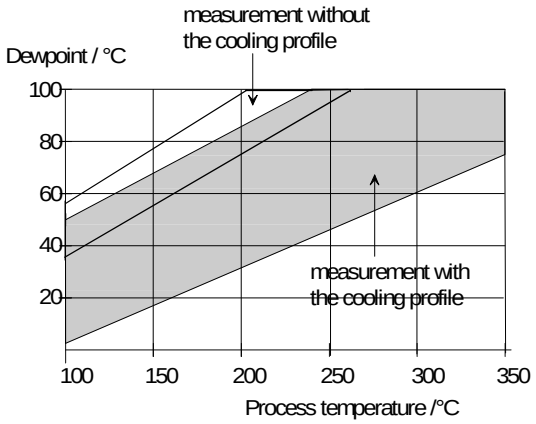
7. TECHNICAL DATA

7.1 Dewpoint temperature

Measurement range +10...+100 °C

NOTE

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



Accuracy ±2 °C

entire measurement range:

	Dewpoint temperature (°C)									
Process temp. (°C)	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
100	2.0	1.2	0.9	0.7	0.6					
120	2.8	1.7	1.1	0.8	0.6	**0.7**				
140	4.0	2.3	1.4	1.0	0.8	0.6	**0.7**			
160		3.1	1.9	1.3	0.9	0.8	0.7	**0.7**		
180		4.2	2.5	1.6	1.2	0.9	0.8	0.7	**0.8**	
200			3.3	2.1	1.4	1.1	0.9	0.8	**0.9**	**0.8**
220			4.3	2.7	1.8	1.3	1.0	0.9	0.8	**0.9**
240				3.5	2.3	1.6	1.2	1.0	0.9	0.8
260				4.4	2.9	2.0	1.5	1.2	1.0	0.9
280					3.6	2.5	1.8	1.4	1.1	1.0
300						3.0	2.2	1.6	1.3	1.1
320						3.8	2.6	2.0	1.5	1.3
340							3.2	2.4	1.8	1.5
350							3.5	2.6	2.0	1.6

The values are calculated with the cooling profile installed, except for values in bold letters (in these temperatures the cooling profile cannot be used as it would lead to condensation).

Response time (90 %):
at +135 °C, from dry to wet 10s
at +135 °C, from wet to dry 50 s

7.2 Outputs

Two analogue outputs selectable	0...20 mA	4...20 mA
	0...1 V	0...5 V
	0...10 V	
Typical accuracy of analogue output at +20 °C	±0.05 % full scale	
Typical temperature dependence of analogue output	0.005 % full scale/°C	

The formulas used in measurement of dewpoint and mixing ratio are presented in Appendix 6.

7.3 General

Sensor	DRYCAP®
Connections	screw terminals, 0.5 mm^2 wires (AWG 20), stranded wires recommended
Operating voltage	24 VDC (20...28 V) isolated 24 VAC option 115 VAC, 230 VAC
Power consumption	100 mA maximum (24 VDC)
Recommended external load for:	
current outputs	<500 Ω
0...1 V voltage output	>2 kΩ (to ground)
0...5 and 0...10 V voltage outputs	>10 kΩ (to ground)
Operating temperature range for	
sensor head	0...350 °C
electronics	-40...+60 °C
with display cover	0...+50 °C
with power supply unit	-40...+45 °C
with alarm outputs up to 8A	-40...+40 °C
up to 6A	...+60 °C
Storage temperature range	-40...+70 °C
Housing material	G-AlSi12 (DIN 1725)
Housing classification	IP 65 (NEMA 4)

Bushing	for 7...10 mm diameter cable (8 x 0.5 mm^2 shielded cable)
Sensor protection	stainless steel sintered filter (part no. HM46780)
Housing dimensions	145 x 120 x 65 mm

Sensor head dimensions (in mm):

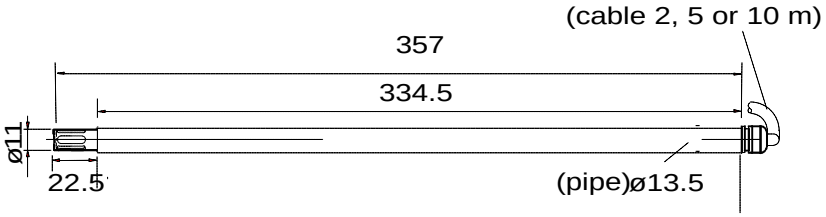


Figure7.3 DMP246 sensor head dimensions

Weight with cooling unit (without display cover):

2 m cable	5 m cable	10 m cable
1300 g	1600 g	2100 g

Weight of display cover 420 g

7.4 Electronics

User interface	3 keys and 4 LEDs inside the housing or local display keypad (option)
Display (option)	2 x 16 character alphanumeric LCD
character height	3.85 mm (0.15")
Keyboard	1 x 4 keypad

7.5 Serial interface modules

Module types	RS 485/422, digital current loop
Connections	screw terminals for 0.5 mm^2 wires (AWG20), stranded wires recommended
Assembly	plug-in module
Number of devices on line	
RS 485/422	32
digital current loop	6 (single loop) 9 (dual loop)
Network cable type	twisted pair
Network cable length	1000 m max.
Network data speed	
RS 485/422	9600 baud max.
digital current loop	4800 baud max.

7.6 Electromagnetic compatibility

EN 61326-1: 1997 + Am.1:1998 Electrical equipment for measurement, control and laboratory use- EMC requirements, Industrial environment environment.

Test methods

Emission	
Radiated emissions	CISPR16 class B (CISPR22 Class B)
Immunity	
Electrostatic discharge (ESD)	EN/IEC 61000-4-2
EM field	EN/IEC 61000-4-3
EFT Burst	EN/IEC 61000-4-4
Surge	EN/IEC 61000-4-5
Conducted RF	EN/IEC 61000-4-6

CE

8. OPTIONS

Power supply	24 VDC/VAC (standard), 115/230 VAC
Cable length	2, 5 or 10 metres
Alarm outputs	2 pcs 230 VAC SPCO (Single Pole Change Over) max. current up to +40 °C 8 A max. current up to +60 °C 6 A
Display cover	cover with or without local display & keypad

9. SPARE PARTS

Order code	Description
HM46780	Sintered filter, stainless steel
DRYCAP S	DRYCAP® sensor
DMP240ALSP	Alarm output module
HMP230PW	Power supply unit
HMP230RS	RS 485/422 serial module
HMP230CL	Current loop module
16611	Calibration adapter for the HMK13B Calibrator
16612	Calibration adapter for the HMK11 Calibrator
17143	Fuse 8 A for alarm output module
5237	Fuse 160 mA T 5x20 mm for power supply module

GUARANTEE

Vaisala issues a guarantee for the material and workmanship of this product under normal operating conditions for one (1) year from the date of delivery. Exceptional operating conditions, damage due to careless handling and mis-application will void the guarantee. Drilling holes in the transmitter housing may affect the EMC certification and will in any case nullify the warranty.

APPENDIX 1: SERIAL COMMANDS

The commands function as described when the serial interface is in full-duplex mode and echo is on. All commands except FORM can be given in either capital or small letters.

In the commands <cr> means carriage return, <lf> line feed and <ht> horizontal tabulation.

1. ANALOGUE OUTPUT COMMANDS

AMODE Setting the analogue outputs

Disconnect the security lock jumper!

AMODE a bb.bbb cc.ccc d ee.eee ff.fff <cr>

a	=	channel 1:	U	=	voltage output
			I	=	current output
bb.bbb	=	lower limit of channel 1			
cc.ccc	=	upper limit of channel 1			
d	=	channel 2:	U	=	voltage output
			I	=	current output
ee.eee	=	lower limit of channel 2			
ff.fff	=	upper limit of channel 2			

The bb.bbb, cc.ccc, ee.eee and ff.fff parameters are entered in volts or milliamperes.

Sets the analogue outputs on channels 1 and 2. An example of this is when the voltage output on channel 1 is set to be 0...1 V and channel 2 set to 2...10 V:

```
>AMODE U 0 1 U 2 10 <cr>
Ch1 :  0.000 ...    1.000 V
Ch2 :  2.000 ...  10.000 V
```

The current settings can be checked by giving the command without any parameters:

```
>AMODE <cr>
Ch1 :  0.000 ...  20.000 mA
Ch2 :  0.000 ...  20.000 mA
```

ASEL Selecting the scaling the analogue output quantities

Disconnect the security lock jumper!

ASEL xxx yyy <cr>

xxx	=	channel 1's quantity (Td,x, RH, T)
yyy	=	channel 2's quantity (Td, x, RH, T)

NOTE

RH and T outputs are to be used only in calibration and during installation.

For example, dewpoint temperature is selected to be output on channel 1 and mixing ratio on channel 2; the mixing ratio range is scaled to 0...500 g/kg:

```
>ASEL  Td  Mix <cr>
Ch1  ( Td )  lo    -50.000 'C    ? 40<cr>
Ch1  ( Td )  hi      0.000 'C    ? 100<cr>
Ch2  ( x  )  lo     0.000 g/kg  ? <cr>
Ch2  ( x  )  hi   500.000 g/kg  ? <cr>
>
```

When the ASEL command is given on its own, the transmitter outputs its current settings:

```
    >ASEL <cr>
Ch1  ( Td )  lo   20.000 'C      ? <cr>
Ch1  ( Td )  hi   55.000 'C      ? <cr>
Ch2  ( x  )  lo   10.000 g/kg    ? <cr>
Ch2  ( x  )  hi  100.000 g/kg    ? <cr>
```

The outputs and their scales can also be given directly with the ASEL command.

ASEL xxx yyy aaa.a bbb.b ccc.c ddd.d <cr>

xxx	=	channel 1's quantity
yyy	=	channel 2's quantity
aaa.a	=	lower limit of channel 1
bbb.b	=	upper limit of channel 1
ccc.c	=	lower limit of channel 2
ddd.d	=	upper limit of channel 2

ASCL Scaling the analogue outputs

Disconnect the security lock jumper!

ASCL <cr>

Scales the outputs selected on channels 1 and 2.

For example, scaling dewpoint temperature on the range of 20...55 °C and mixing ratio 10...100 g/kg:

```
>ASCL <cr>
Ch1  ( Td )  lo    20.000 'C       ? <cr>
Ch1  ( Td )  hi    55.000 'C       ? <cr>
Ch2  ( x  )  lo    10.000 g/kg     ? <cr>
Ch2  ( x  )  hi   100.000 g/kg     ? <cr>
>
```

The output scales can also be given directly with the ASCL command.

ASCL aaa.a bbb.b ccc.c ddd.d <cr>

aaa.a	=	lower limit of channel 1
bbb.b	=	upper limit of channel 1
ccc.c	=	lower limit of channel 2
ddd.d	=	upper limit of channel 2

For example, when dewpoint temperature is scaled to 20...55 °C on channel 1 and mixing ratio to 10...100 g/kg on channel 2:

```
     >ASCL 20  55  10  100 <cr>
Ch1  ( Td )  lo   20.000 'C     ? <cr>
Ch1  ( Td )  hi   55.000 'C     ? <cr>
Ch2  ( x  )  lo   10.000 g/kg   ? <cr>
Ch2  ( x  )  hi  100.000 g/kg   ? <cr>
>
```

2. CALIBRATION COMMANDS

CRH Relative humidity calibration

Disconnect the security lock jumper!

CRH <cr>

With this command the transmitters can be calibrated against two relative humidity references. Two-point calibration is performed using e.g. saturated salt solutions in controlled conditions according to the following instructions:

```
>CRH <cr>
RH  :  12.00   Ref1 ?  11.3 <cr>
Press any key when ready ...
RH  :  76.00   Ref2 ?  75.5 <cr>
```

If the stabilization of the sensor to the humidity in the calibrator needs to be monitored, the measurement output can be repeated by giving command c<cr> at Ref1 and Ref2:

```
>CRH <cr>
RH  :  12.00  Ref1 ?  c <cr>
RH  :  11.70  Ref1 ?  c <cr>
RH  :  11.50  Ref1 ?  11.3 <cr>
Press any key when ready ...
RH  :  76.00  Ref2 ?  75.5 <cr>
```

CT Temperature calibration

Disconnect the security lock jumper!

CT <cr>

Using this command the transmitters can be calibrated against an accurate reference, such as a Pt 100 simulator. A two-point calibration is performed as follows:

```
>CT <cr>
T  :  0.80    Ref1 ?   0.0 <cr>
Press any key when ready ...
T  :  56.20   Ref2 ?   55.0 <cr>
```

In one-point offset correction, the Ref2 prompt is acknowledged with <cr>:

```
>CT <cr>
T  :  0.80    Ref1 ?   0.0 <cr>
Press any key when ready ...
T  :  75.50   Ref2 ?   <cr>
```

If the stabilization of the sensor to the temperature of the calibrator or the reference needs to be monitored, the measurement output can be repeated by giving command c<cr> at Ref1 and Ref2:

```
>CT <cr>
T  :  0.80    Ref1 ?   c <cr>
T  :  0.40    Ref1 ?   0.00 <cr>
Press any key when ready ...
T  :  56.20   Ref2 ?   55.0 <cr>
```

ACAL Calibrating the analogue outputs

Disconnect the security lock jumper!

ACAL <cr>

Calibrates the outputs selected on channels 1 and 2. The output is measured and the measured values (mA or V) entered as calibration coefficients.

For example, calibrating the outputs when 0...10 V signal has been selected on both channels (set with AMODE command)

```
>ACAL <cr>
Ch1  U1   (V  ) ?  0.123 <cr>
Ch1  U2   (V  ) ?  9.98 <cr>
Ch2  U1   (V  ) ?  0.120 <cr>
Ch2  U2   (V  ) ?  9.98 <cr>
```

L Outputting linear correction coefficients

L <cr>

With the help of command L the user can check how the transmitter has been adjusted after it has been calibrated at the factory.

```
>L <cr>
RH   offset    : 0.000
RH   gain      : 1.000
Ts    offset   : 0.000
Ts   gain      : 1.000
```

LI Entering linear correction coefficients

Disconnect the security lock jumper!

LI <cr>

With LI command the calibration settings can be changed directly.

```
>LI <cr>
RH   offset    : 0.000  ?  -.6 <cr>
RH   gain      : 1.000  ? <cr>
Ts   offset    : 0.000  ? <cr>
Ts   gain      : 1.000  ?  0.99 <cr>
```

The factory settings are offset 0 and gain 1. By giving these values to the transmitter it can be returned to its factory calibration.

NOTE

The temperature unit in offset correction is always degrees Centigrade, even if the transmitter is using non-metric units (Fahrenheit) in its measurement output.

3. OUTPUT VIA THE SERIAL BUS

R Starting the measurement output

R <cr>

Starts output of measurements to the peripheral devices (PC display or printer); output interval is set with command INTV.

Factory setting of the output format:

```
Td= -2.4'C   x= 3.2 g/kg  RH= 17.1 %RH   T= 24.0 'C
...
```

When the transmitter sends out the readings, the serial interface does not echo any commands; the only command that can be used is S (stop).

The output format can be changed with command FORM.

S Stopping the measurement output

S<cr>

Ends the RUN state; after this command all other commands can be used.

SEND Outputting a reading once

SEND <cr> in STOP state

or

SEND aa <cr> in POLL state

aa = address of the transmitter when more than one transmitter is connected to a serial bus (0...99; set with command ADDR)

Outputs the current measurement readings via the serial line. The output type is the following:

```
Td= -2.4'C   x= 3.2 g/kg  RH= 17.1 %RH   T= 24.0 'C
...
```

The output format can be changed with command FORM.

DSEND Outputting readings of all connected transmitters once

DSEND <cr>

All transmitters connected to the serial bus send their addresses and current measurement readings in an order defined by their addresses. After receiving DSEND command a transmitter sets a delay time according to its address value and sends the data after this delay. DSEND works also in POLL mode. With this command the user can, for example, easily find out the addresses of the transmitters.

The output when four transmitters with addresses 4, 5, 10, 33 have been connected to the serial bus:

```
>dsend <cr>
4    20.0 'C
5    22.7 'C
10   25.4 'C
33   22.3 'C
>
```

ERRS Outputting error messages

ERRS <cr>

During operation error messages are not output automatically through the serial interface. If there is any reason to doubt that there is something wrong with the transmitter, possible error messages can be output with command ERRS.

If there are no error messages, only a prompt is displayed:

```
>ERRS <cr>
>
```

If errors have occurred, the transmitter outputs the error code (see Appendix 5 for error messages):

```
>ERRS <cr>
E40  f  ( all )  out of range
>
```

ECHO Turning the serial interface echo ON/OFF

ECHO xxx <cr>

xxx = ON or OFF

When the echo is off, the commands given through the serial interface or the prompt > cannot be seen on the display.

When the serial interface is in half-duplex mode, the echo is always off. Even then the ECHO command can indicate that echo is on.

INTV Setting the output interval for the RUN state

INTV xxx yyy <cr>

xxx = output interval (0...255)
0: no pause between outputs
yyy = unit (s, min or h)

Sets the output interval when the transmitter outputs measurement readings to a peripheral device.

For example, the currently valid settings are output with:

```
>INTV <cr>
Output intrv. :  0 min
```

When this is changed into 10 minutes, the command is:

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

The unit is changed into seconds with:

```
>INTV S <cr>
Output intrv. :  10 s
```

The change can also be done with one command:

```
>INTV 10 S <cr>
Output intrv. :  10 s
```

FORM Setting the output format

FORM <cr>
"xxx...xxx"
? zzz...zzz <cr>

xxx...xxx	=	old format
zzz...zzz	=	new format

The FORM command sets the format of the outputs generated in RUN state and by SEND command. Please note that **capital and small letters have different meanings**.

\DD..DD\	dewpoint temperature
\MM..MM\	mixing ratio
\UU..UU\	relative humidity
\TT..TT\	temperature
\uu..uu\	unit according to the preceding variable
\n	line feed <lf>
\r	carriage return <cr>
\t	horizontal tabulation <ht> or <tab>
\\	\

For example:

```
format                                  output
\DDD.DD\ \+MM.MM\\r                     55.00 +99.99 <cr>
\MMM.M\ \uu\\r\n                        15.2 g/kg <cr><lf>
\DDD.D\ \uuu\\+MM.M\ \uu\\r             46.9   'C   +10.8   g/kg
<cr>
```

Any text can be written in the command and it appears in the output. For example:

```
Td: \DDD.D\ M: \+MM.MM\\r       Td: 54.0  M: 10.8 <cr>
```

The format can be deleted by giving \ as a parameter:

```
>FORM \<cr>
```

Note. only one space before \ and none after

or

```
>FORM <cr>
"xxx...xxx"
?\<cr>
```

An example of a format suitable for use in Microsoft Excel spreadsheets:

```
>FORM <cr>
"xxx...xxx"
?\DDD.D\\t\MMM.M\\t\TTT.T\\t\\r\n <cr>
```

The output is then:

```
47.4<tab> 22.4 <tab> 10.6 <tab> <cr><lf>
```

FTIME Adding time to output

FTIME xxx <cr>

xxx = ON or OFF

When FTIME is activated, the current time is output at the beginning of the output line. The time is set with command TIME. After RESET or power on the current time is 00:00:00.

Activating the time output

```
>ftime on
Form. time    :  ON
>intv 5 s                                  setting the output interval
Output intrv. :     5 s
>r
09:31:13 Td= 55.4 'C x= 10.2 'C
09:31:18 Td= 55.4 'C x= 10.2 'C
09:31:23 Td= 55.4 'C x= 10.2 'C
09:31:28 Td= 55.4 'C x= 10.2 'C
09:31:33 Td= 55.4 'C x= 10.2 'C
09:31:38 Td= 55.4 'C x= 10.2 'C
...
```

Inactivating the time output

```
>ftime off
Form. time    :  OFF
>r
Td= 55.4 'C x= 10.2 'C
Td= 55.4 'C x= 10.2 'C
Td= 55.4 'C x= 10.2 'C
Td= 55.4 'C x= 10.2 'C
Td= 55.4 'C x= 10.2 'C
Td= 55.4 'C x= 10.2 'C
...
```

FDATE Adding date to output

FDATE xxx <cr>

xxx = ON or OFF

When FDATE is activated, the current date is output at the beginning of the output line. The time is set with command DATE. After RESET or power on the current date is 1991-01-01.

Activating the date output

```
>fdate on
Form. date    :  ON
>r
1995-03-10 Td= 55.4 'C x= 10.2 'C
1995-03-10 Td= 55.4 'C x= 10.2 'C
1995-03-10 Td= 55.4 'C x= 10.2 'C
1995-03-10 Td= 55.4 'C x= 10.2 'C
1995-03-10 Td= 55.4 'C x= 10.2 'C
1995-03-10 Td= 55.4 'C x= 10.2 'C
...
```

Inactivating the date output

```
>fdate off
Form. date    :  OFF
>r
Td= 55.4 'C x= 10.2 'C
Td= 55.4 'C x= 10.2 'C
Td= 55.4 'C x= 10.2 'C
Td= 55.4 'C x= 10.2 'C
Td= 55.4 'C x= 10.2 'C
Td= 55.4 'C x= 10.2 'C
...
```

SERI Serial bus settings

SERI b p d s x <cr>

b	=	bauds (300, 600, 1200, 2400, 4800, 9600)
p	=	parity (n = none, e = even, o = odd)
d	=	data bits (7 or 8)
s	=	stop bits (1 or 2)
x	=	duplex (H = half, F = full)

Giving the command on its own outputs the current settings:

```
>SERI <cr>
4800 E 7 1 FDX
```

The settings can be changed one parameter at a time or all parameters at once:

```
>SERI O H <cr>                changing parity and duplex
4800 O 7 1 HDX

>SERI 600 N 8 1 F <cr>        changing all parameters
600 N 8 1 FDX
```

The processor does not allow the following combinations:

- no parity, 7 data bits, 1 stop bit: if this combination is given the DMP246 programme will change the number of stop bits to 2
- even or odd parity, 8 data bits, 2 stop bits: if this combination is given the programme changes the number of stop bits to 1

NOTE

The serial bus settings become effective only after reset.

When the half-duplex mode is set, it will automatically turn the echo off. Even then the ECHO command can indicate that echo is on.

UNIT Selecting the output units

UNIT x <cr>

x = m(etric units)
n(on-metric units)

	metric units	non-metric units
Td	°C	°F
x	g/kg	gr/lb
T	°C	°F
RH	%RH	%RH

For example, the command for setting the non-metric units is:

```
>UNIT N <cr>
Output units : non metric
```

When the command is given with no parameters, the transmitter outputs the currently valid setting.

ADDR Setting the transmitter address

ADDR aa <cr>

aa = address (0...99)

The address is used when more than one transmitter is connected to one serial bus. The ADDR command makes it possible to communicate with one transmitter at a time in POLL state.

For example, transmitter is given address 99

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

When asking the current address, no address number is given:

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

RESET Resetting the transmitter

RESET <cr>

Resets the transmitter. All settings that have been changed stay in the memory even after reset or power failure.

3.1 Operation modes

SMODE Setting the serial interface

SMODE xxxx<cr>

xxxx = STOP, RUN or POLL

In STOP mode: measurements output only by command, all commands can be used

In RUN mode: outputting automatically, only command S can be used

In POLL mode: measurements output only with command SEND. When in POLL mode, the output state is changed as follows:

OPEN aa <cr>
SMODE xxxx<cr>

aa = address of the transmitter
xxxx = STOP, RUN or POLL

The OPEN command sets the bus temporarily in STOP MODE so that the SMODE command can be given. For example:

```
>SMODE <cr>                    which mode is in use at the moment
Serial mode    : STOP
>SMODE STOP <cr>               setting STOP mode
Serial mode    : STOP
```

OPEN & CLOSE

OPEN nn <cr>

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

CLOSE <cr>

In STOP mode: command OPEN has no effect, CLOSE sets the transmitter in POLL mode

In POLL mode: command OPEN sets the transmitter temporarily in STOP mode, command CLOSE returns the instrument to POLL mode

When more than one transmitter is connected to the same serial bus, the POLL mode makes it possible to communicate with the transmitters. For example, a relative humidity calibration is performed at transmitter 2 (<bel> = ASCII 7):

```
>OPEN 2 <cr>
<cr><lf> 'DMP nn line opened for operator commands'
<cr><lf><lf><bel>
>CRH <cr>
...
>CLOSE <cr>
<cr><lf> 'line closed' <cr><lf>
```

4. OTHERS

ITEST Testing the analogue outputs

ITEST <cr>

or

ITEST a b <cr>

a = current/voltage of channel 1
b = current/voltage of channel 2

The operation of the analogue outputs can be tested by forcing the outputs to given values which can then be measured with a current/voltage meter from the analogue outputs. The response to ITEST command gives six outputs/parameters. Only the first two are relevant; they show the channel current or voltage in mA or V. The other four figures contain information for service purposes only.

Examples:

- reading the channel outputs and parameters

```
>itest <cr>
  1.9438  2.3483  1.00694 10.64634  1.97374  2.17665
>
```

- forcing outputs 0.5 V and 4 V to channels 1 and 2

```
>itest 0.5 4 <cr>
  0.5000  4.0000  1.00694 10.62970  1.23336  3.01722
>
```

- releasing the forced control and reading the outputs

```
>itest <cr>
  1.9427  2.3392  1.00731 10.62428  1.97157  2.16978
>
```

MTIM Setting the measurement integration time

MTIM nnn <cr>

nnn = number of cycles measured (4...255)

By lengthening the measurement integration time any stray changes in the output can be filtered out: the transmitter calculates the average of a number of measurement cycles defined by the user. The command can be given in two ways:

```
>MTIM <cr>
Mtim     :    4  ?  5 <cr>
```

or

```
>MTIM 5 <cr>
Mtim :    5
```

PRES Setting the pressure for mixing ratio calculations

PRES pppp.pp <cr>

pppp.pp = pressure (hPa)

The atmospheric pressure has an effect on mixing ratio. Therefore accurate mixing ratio calculations can be achieved only when the ambient pressure is taken into consideration.

When the command is given, the transmitter first gives the currently used pressure; after this a new value can be entered or the old one acknowledged:

```
>PRES <cr>
Pressure :  1013.25  ?  1000.00 <cr>
```

When the currently used pressure is known, a new pressure can also be entered directly:

```
>PRES 1010 <cr>
Pressure  :  1010
```

NOTE

If the pressure setting is frequently adjusted, e.g. by using an external barometer as a pressure input source, the command XPRES is recommended.

XPRES Setting the pressure for mixing ratio calculations temporarily

XPRES pppp.pp <cr>

pppp.pp = pressure (hPa)

The function and format of XPRES are the same as those of the PRES command except that with XPRES command the setting is valid only until a reset is given, power is turned off or pressure is set to zero with XPRES. After this the pressure stored with command PRES is valid again.

CDATE Entering calibration date

CDATE xxxxxx <cr>

xxxxxx = calibration date (000101...991231)

When the latest calibration date has to be kept in memory, it is entered as follows:

```
>CDATE 940506 <cr>
```

If the command is given without the date, the transmitter outputs the latest calibration already in memory.

```
>CDATE <cr>
940420
```

The date can be given in any format; however, the maximum number of digits is six.

DATE Setting the date

DATE <cr>

For example, to enter a new date:

```
>DATE <cr>
Current date is 1993-01-30
Enter new date (yyyy-mm-dd) : 1993-06-12 <cr>
```

When the current date is asked, the new date is passed with <cr>.

TIME Setting the time

TIME <cr>

For example, to enter a new time:

```
>TIME <cr>
Current time is 01:35:54
Enter new time (hh:mm:ss) : 13:25:56 <cr>
```

When the current time is asked, the new time is passed with <cr>.

VERS Name and version of the programme

VERS <cr>

For example:

```
>VERS <cr>
DMP246 / x.yy
```

where x.yy is the programme version.

? Outputting the transmitter settings

? <cr>

For example:

```
>? <CR>

DMP246 / 1.01
CPU serial nr : A1234567
Keyboard type : 0
Address       : 0
Output units  : metric
Baud P D S    : 4800 E 7 1 FDX
Serial mode   : STOP
Output intrv. : 0 s
Mtim          : 32
Pressure (hPa): 1013.25
Analog outputs
 Ch1   0.00 ... 20.00 mA
 Ch2   0.00 ... 20.00 mA
 Ch1  ( Td ) lo   20.00 'C
 Ch1  ( Td ) hi   55.00 'C
 Ch2  ( X  ) lo   10.00 g/kg
 Ch2  ( X  ) hi  100.00 g/kg
PRB serial nr : 9619
PRB cal. date : 960611
>
```

?? Outputting the transmitter settings also in POLL mode

?? <cr>

Command ?? outputs the same information as command ? but it works also when the transmitter has been set to POLL mode. However, if there are more than one addressed transmitters connected to the serial bus, they all will respond at the same time and the output on the screen will be chaotic.

APPENDIX 2: INSTALLING THE POWER SUPPLY MODULE

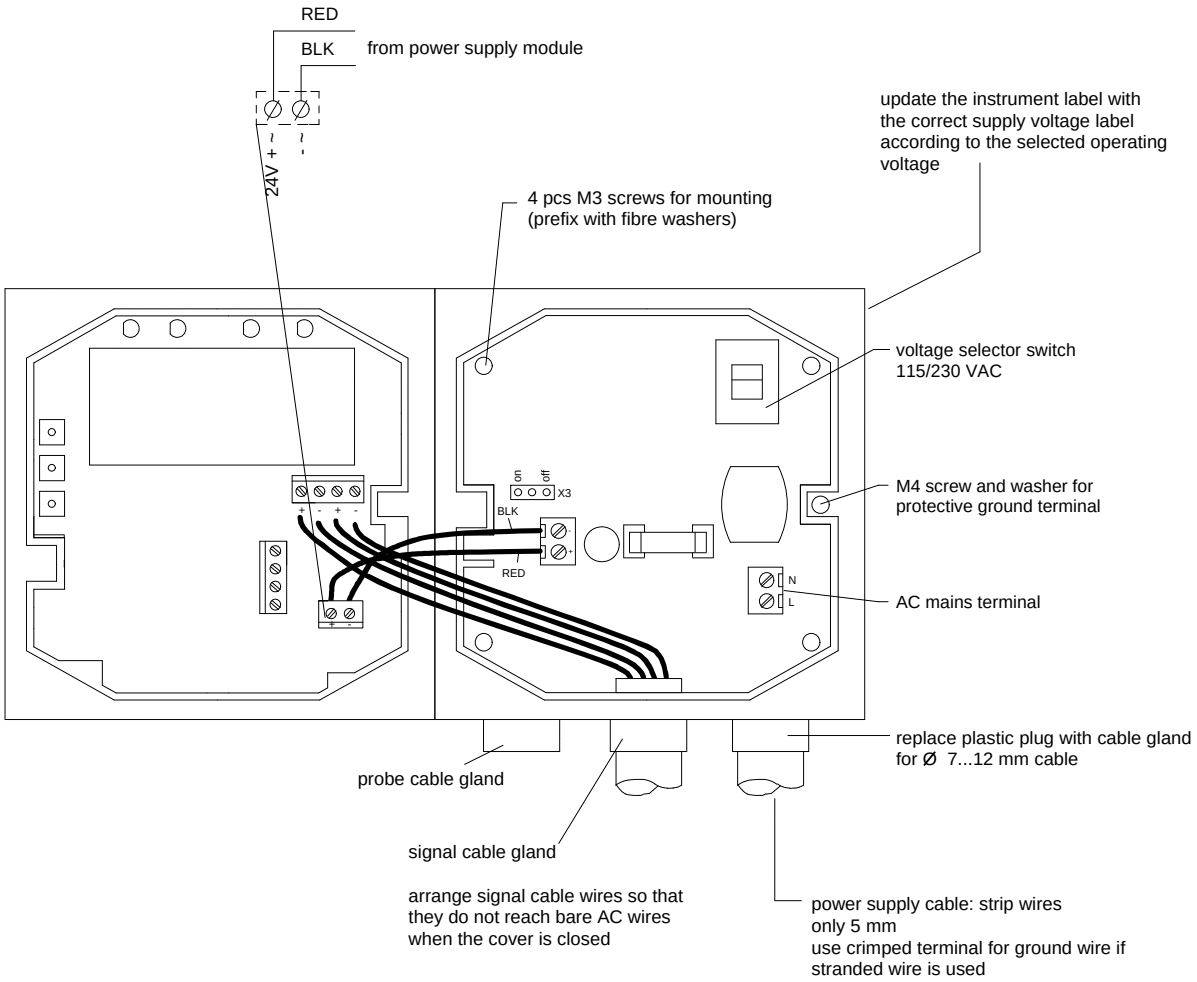
INSTALLING THE POWER SUPPLY MODULE

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 (IEC 950).

1. Remove the plastic plug in the transmitter housing and replace it with the cable gland.
2. Fasten the power supply module to the bottom of the housing with four screws
3. Select the correct mains voltage with voltage selector switch (230/115).
4. Attach the grounding wire screw (M4) and washer to the protective ground terminal on the right-hand side of the module.
5. Attach the wires from the power supply module to the power terminal on the main board of the transmitter (see figure below).

When the power supply module is on, the power on LED is lit.

NOTE	The jumper in connector X3 has to be in position ON; otherwise no power is supplied to the transmitter.



Peel the correct power supply voltage from the sticker enclosed in the power supply module package and attach it on the instrument label to indicate that the supply voltage has been changed.

NOTE 1	The power supply module is not recommended to be used in the HMP231 transmitters

NOTE 2	The power supply module cannot be used in transmitters with the re-gaining option.

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

WARNING Do not connect the power supply to mains when it is not installed in a HMP230 transmitter.

WARNING Always connect protective ground terminal !

TECHNICAL SPECIFICATIONS

Operating voltage	115 VAC (93...127 V) 230 VAC (187...253 V)
Connections	screw terminals for 0.5... 2.5 mm^2 wire (AWG 20...14)
Bushing	for 7...12 mm diameter cable
Indicator	PWR ON LED on power supply module board
Operating temperature range	-40...+45 °C
Storage temperature range	-40...+70 °C

NOTE 1

The power supply module is not recommended to be used in the HMP231 transmitters.

NOTE 2

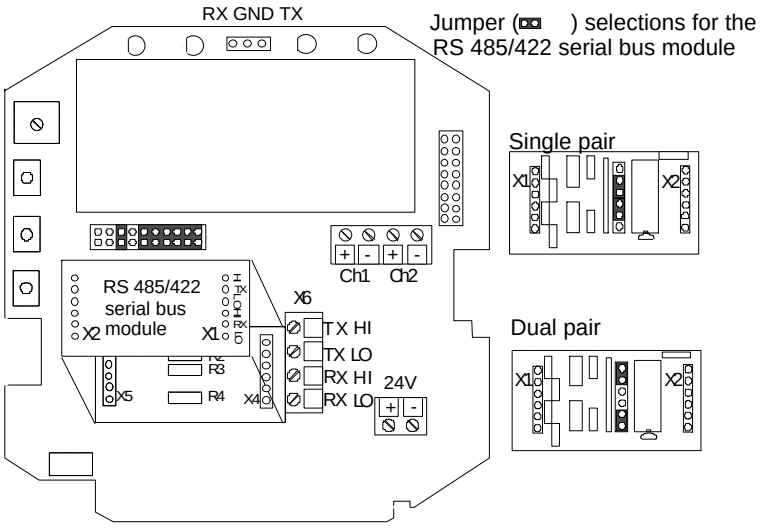
The power supply module cannot be used in transmitters with the re-gaining option.

APPENDIX 3: INSTALLING AND USING THE RS 485/422 SERIAL PORT MODULE

1. INSTALLATION

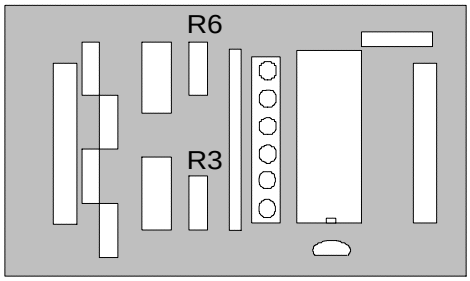
Switch the transmitter off.

Resistors R2, R3 and R4 between connectors X4 and X5 in the component board in the cover of the transmitter are removed with side-cutting pliers. The module is plugged in connectors X4 and X5 on the main board of the DMP246 transmitter; connector X1 on the module board to connector X4 and connector X2 to connector X5.



Cut off the resistors R2, R3 and R4 on the main board.
New signal names for X6 screw terminal are on the module.
Follow the instructions on the module:
X1 to X4 and
X2 to X5 on the mother board

NOTE! If the transmitter is NOT at the end of the bus OR the line has a dynamic line termination, the resistors R3 and R6 have to be removed!



Connect the data wires to screw terminal X6 on the main board. Switch the power on.

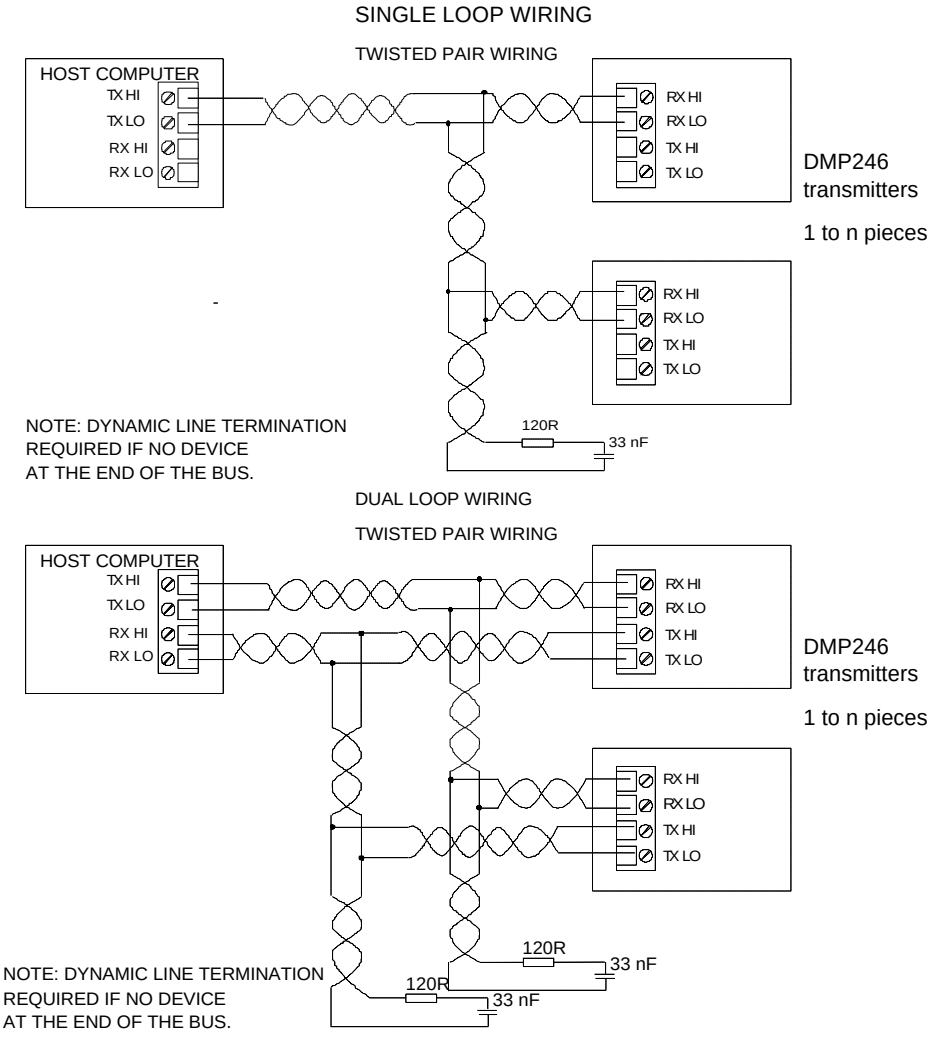
2. OPERATION

The DMP246 transmitters can either be given an address or operated without an address. Both single and dual loop wiring with half duplex connection can be used. No address is needed when only one DMP246 transmitter is used; when several transmitters are connected to the same line, each transmitter must be given an address in the initial configuration.

A single transmitter can get its operating voltage from the master or it can have its own (floating) power supply or it has the power supply module in use.

The serial line structure is a parallel interfaced chain (daisy chain). At the ends of the serial line there must be a DMP246 transmitter, dynamic line adapter (120 ohm resistor in series with a 33 nF capacitor) or line master. If a branch line is made with a junction box, the branch should be shorter than 3 meters.

When connecting the device, follow the instructions given in the figure in Chapter 1.



The RS 485/422 module has separate lines for transmitting and receiving, but they can be connected together with jumpers. Dual loop connection is the factory setting; when a single loop connection is used, the positions of jumpers in connector X4 on the module must be changed.

The HI of the receiving line is approx. 0.6 V and its LO is approx. 0 V in order to reduce noise on the lines when no data is transferred (idling). Both lines are terminated with a 120 ohm resistor in series with a 33 nF capacitor. When operating the transmitter through a single pair, naturally only one line terminal impedance is in use. The line must not be terminated with a resistor alone, as then the power consumption increases too much.

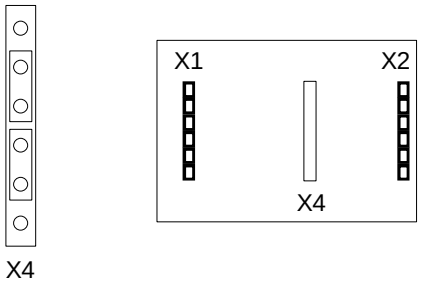
The data lines can withstand short circuit to ground and to each other. They do not survive connection of supply voltage to the data lines.

The module must be mounted on the main board in the right direction. It can be mounted in the wrong direction or to the wrong pins without breaking the module; it simply does not work then.

3. NETWORK CONFIGURATION

Single loop operation

Bi-directional data on one pair is one of the great advantages of the RS 485 line. Set jumpers in connector X4 on the module board as shown in the figure below.



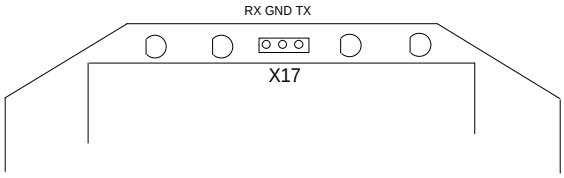
This jumper setting connects RX HI to TX HI and RX LO to TX LO and selects only one common line termination. The HI and LO terminals of the RX pair can now be used for operation.

Supplying power from the same end to the whole network prevents common mode voltages from rising too high (over 7 V).

- Connect wires to the transmitter's serial connector.
- Check the wiring.

The following procedure must be repeated with all transmitters.

- Open the transmitter cover.
- Pull out the RS 485/422 serial port module, if it is already mounted.
- Set the serial port of the terminal to 4800 baud, even parity, seven data bits and one stop bit, full duplex (4800 E 7 1 FDX).



- The serial settings of the transmitter must also be 4800 E 7 1 FDX and the transmitter must be in STOP mode. If these factory settings have been changed, they must be changed back. Connect the RS 232C port of the terminal to connector X17 on the top of the main board and switch the power on.
- Set the address of the transmitter; it can be any number between 1 and 99. In this example the address is 22:

```
>addr 22
Address  :  22
```

- Set the serial bus settings according to your network specifications. This setting will become valid after next RESET or power off:

```
>seri 2400 e 7 1 h
2400 E 7 1 HDX
```

- Set the transmitter in POLL mode:

```
>smode poll
Serial mode   : POLL
```

NOTE 1

The SMODE command must be given last.

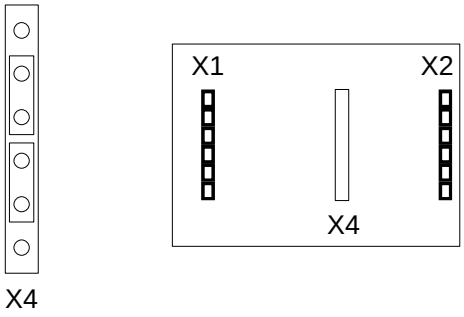
NOTE 2

The transmitter outputs no prompt (>) after the SMODE POLL command and it only reacts to commands which include its address.

- Check that the transmitter responds to its address:

```
>send 22
Td= 54.4 'C x= 10.1 g/kg
```

- Disconnect the terminal.
- Check that the jumpers in connector X4 are in correct places:



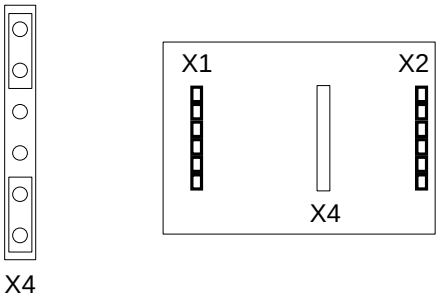
- Remount the RS 485/422 serial module.
- Close the cover.
- When all transmitters on the network have been configured, switch them off.

Dual loop operation

The following procedure must be repeated with all transmitters.

- Open the transmitter cover.
- Pull out the RS 485/422 serial port module, if it is already mounted.
- Set the serial port of the terminal to 4800 baud, even parity, seven data bits and one stop bit, full duplex (4800 E 7 1 FDX).
- The serial settings of the transmitter must also be 4800 E 7 1 FDX and the transmitter must be in STOP mode. If these factory settings have been changed, they must be returned. Connect the RS 232C port of the terminal to connector X17 on the top of the main board and switch the power on.

When dual loop is used, the jumpers in connector X4 on the module board must be as shown below:



- Set the address of the transmitter, it can be any number between 1 and 99. In this example the address is 22:

```
>addr 22
Address : 22
```

- Set the serial bus settings according to your system. This setting will become valid after next RESET or power off:

```
>seri 2400 e 7 1 f
2400 E 7 1 FDX
```

- Switch echo on:

```
>echo on
ECHO : ON
>
```

- Change the serial output mode into POLL:

```
>smode poll
Serial mode : POLL
```

NOTE 1

The SMODE command must be given last.

NOTE 2

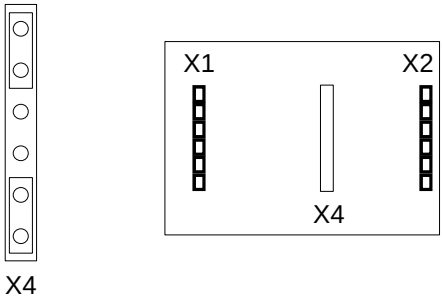
The transmitter outputs no prompt (>) after the SMODE POLL command and it only reacts to commands which include its address.

- Check that the transmitter responds to its address:

```
>send 22
Td= 54.4 'C x= 10.1 g/kg
```

- Disconnect the terminal.

- Check that the jumpers in connector X4 are in correct places:



- Remount the RS 485/422 serial module.
- Close the cover.
- Repeat this setting procedure with each transmitter.
- When all transmitters on the network have been configured, switch them off.

4. CHECKING THE SERIAL PORT NETWORK OPERATION

Normally measurement readings are asked when the transmitter is in POLL mode; the command must then include the address of the transmitter. If the settings need to be changed, the transmitter is switched to STOP mode with command OPEN; commands can then be given without address. When the line to the transmitter is closed, it returns to POLL mode.

STOP mode

Open the line to the transmitter:

```
open 22<cr>
DMP 22 line opened for operator commands
```

Transmitter no. 22 is now temporarily set to STOP mode; it accepts commands sent without address until CLOSE command is given. Individual settings can now be easily modified. Do not open more than one line at a time.

Use command ? to find out the settings of the active transmitter:

```
? <cr>
DMP246 / 1.01
CPU serial nr :  0
Keyboard type :  0
Address  :  7
Output units  :  metric
Baud P D S    :  4800 E 7 1 FDX
Serial mode   :  STOP
Output intrv. :  0 min
Mtim     :  32
Pressure :  1013.25
Analog outputs
Ch1   0.00 ...  10.00 V
Ch2   0.00 ...  10.00 V
Ch1  ( Td )   lo   20.000 'C
Ch1  ( Td )   hi   55.000 'C
Ch2  ( X  )   lo   10.000 g/kg
Ch2  ( X  )   hi  100.000 g/kg
Transducer    :
PRB serial nr :  0
Calibr. date  :  0
```

When the necessary settings have been given, close the line to transmitters (the command closes all open lines):

```
>close
line closed
```

CLOSE command is always given without address. If no lines are open, there will be no response to the CLOSE command.

POLL mode

If a transmitter has been set to POLL mode, it will respond only to commands which include its address:

```
send 22
Td= 54.4 'C x= 10.1 g/kg
```

Addresses from 1 to 99 can be used. According to the RS 485/422 standard a maximum of 32 devices can be connected on same bus, but the number can be increased if the line length and/or baud rate is reduced.

The line terminations must be dynamic; e.g. an RC circuit is used instead of a simple resistor termination. Each RS 485 module has a dynamic line termination so it can be used at the end of a line.

RS 485 network settings

DMP246 settings	single pair	dual pair
Full duplex/half duplex	HDX	FDX
Echo on/off	OFF	ON

Terminal settings	single pair	dual pair
Line feed after carriage return	yes	no
HDX/FDX	FDX	FDX

When terminal is set to general <lf> (line feed) after <cr> (carriage return), the listings will have two line feeds when also the DMP246 transmitters send line feed.

5. SPECIFICATIONS

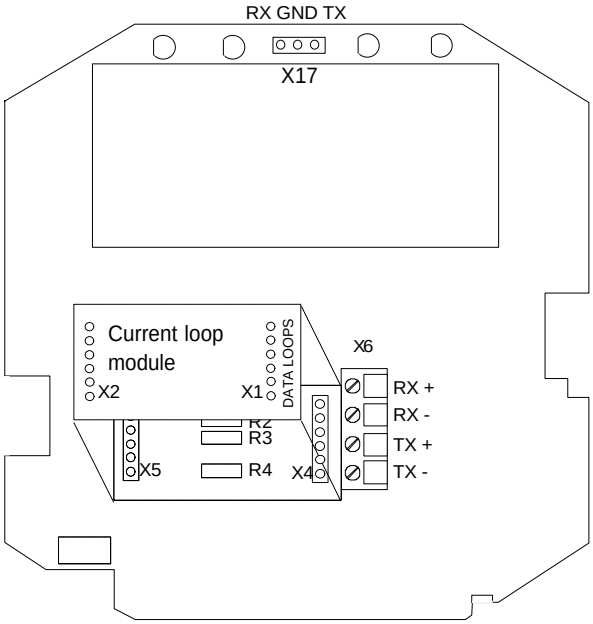
Connections	Berg sockets
on the main board	screw terminals 0.5 mm² wires, stranded wires recommended
Assembly	plug-in module
Board dimensions	40 x 28 mm
Operating mode (single or dual pair wiring)	half duplex
Network:	
network type	daisy chain
cable type	twisted pair
line length max.	1000 m (3000 ft)
number of devices	32 devices on line
data speed	9600 baud max. for DMP246 transmitters
operating mode	polling mode
common mode voltage range	±7 V
Operating temperature	-40...+60 °C
Storage temperature	-40...+70 °C

APPENDIX 4: INSTALLING AND USING THE DIGITAL CURRENT LOOP MODULE

1. INSTALLATION

Switch the transmitter off.

Resistors R2, R3 and R4 between connectors X4 and X5 in the component board in the cover of the transmitter are removed with side-cutting pliers. The module is plugged in connectors X4 and X5 on the main board of the DMP246 transmitter; connector X1 on the module board to connector X4 and connector X2 to connector X5.



Connect the data wires to screw terminal X6 on the main board. Switch the power on.

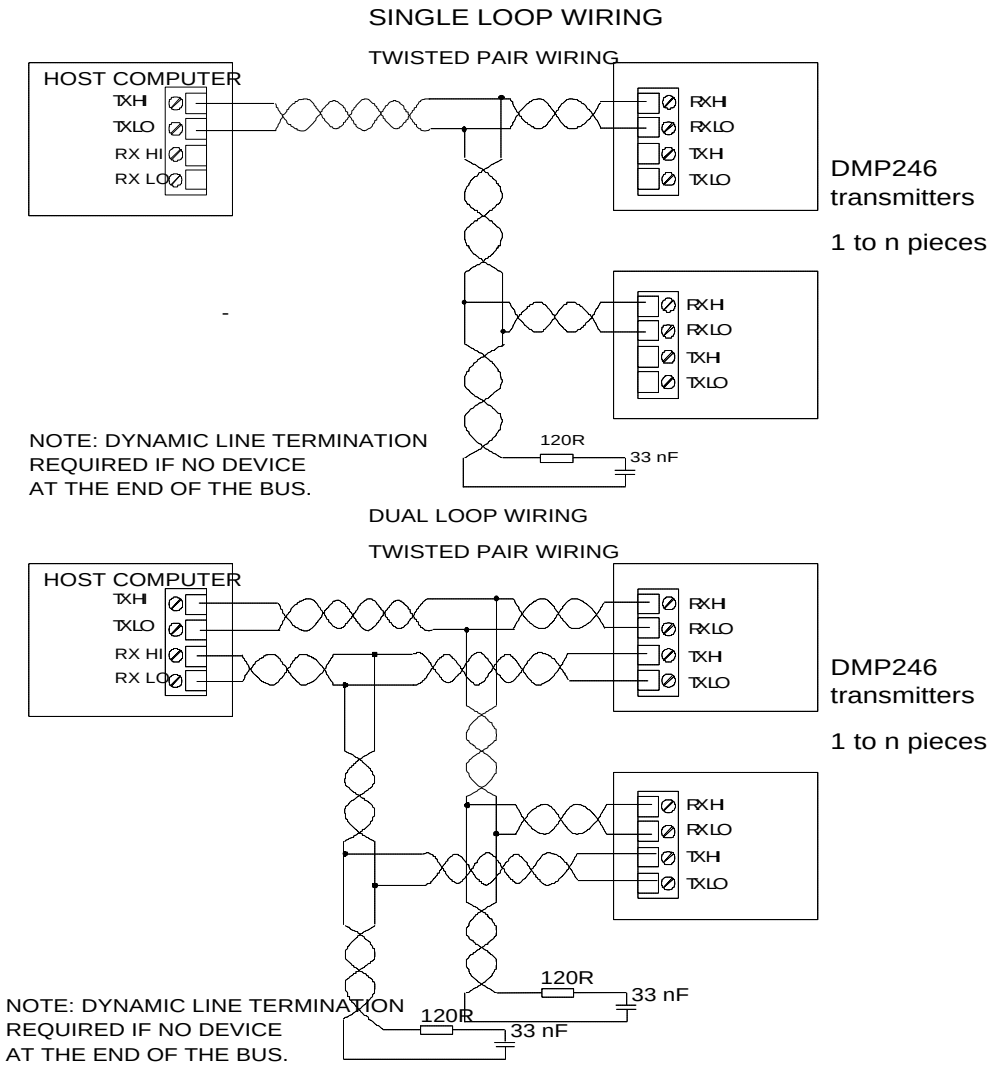
2. OPERATION

The DMP246 transmitters can either be given an address or operated without an address. Both single and dual loop wiring with half duplex connection can be used. No address is needed when only one DMP246 transmitter is used; when several transmitters are connected to the same line, each transmitter must be given an address in the initial configuration.

A current loop must get its operating voltage from the master or it can have its own (floating) power supply capable of supplying 15...40 V and 20...30 mA. Unregulated AC/DC adapter can be used, if the current is limited to 20 mA at least by a serial resistor.

NOTE: The host computer can restrict the loop supply voltage that can be used; see computer specifications.

The serial line structure is a serial interfaced chain (daisy chain). At one end of the serial line there must be a DMP246 transmitter and at the other end a line master. A branch line can be made with a junction box.



The digital current loop module has separate lines for transmitting and receiving. Both single loop wiring and dual loop wiring can be used (see figure). With dual loop connection there can be a few more transmitters on the same loop pair. A single loop connection has simpler wiring. Data transmission is achieved by switching the loop current on and off.

Normally, current flows through the loop(s) even when the DMP246 transmitter is not on, so switching one transmitter off does not affect the other transmitters on the loop.

When the wires have been connected correctly, the voltage drop from RX+ to RX- is bleow 2 V. If the wires RX+ and RX- or TX+ and TX- are connected incorrectly, the voltage drop from RX+ to RX- or from TX+ to TX- is below 1 V and the transmitter does not work. Even then the current goes through the loop and the other transmitters can be operated normally.

When the loop supply is current limited, the data lines can withstand short circuit to ground and to each other. They do not survive connection of supply voltage to the data lines.

The module must be mounted on the main board in the right direction. It can be mounted in the wrong direction or to the wrong pins without breaking the module; it simply does not work then. Reverse wiring of RX+ and RX- or TX+ and TX- does not affect the module.

3. NETWORK CONFIGURATION

Single loop operation

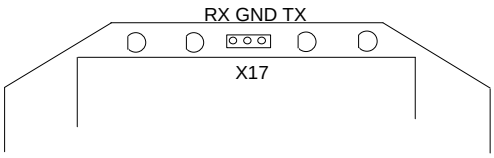
Bi-directional data on one pair and galvanic isolation are the advantages of the current loop. Single pair/dual pair use is configured through wiring (see figure on page 3).

Supplying power from the same end to the loops prevents crossover voltages.

- Connect wires to the transmitter's serial connector.
- Check the wiring.

The following procedure must be repeated with all transmitters.

- Open the transmitter cover.
- Pull out the digital current loop module, if it is already mounted.
- Set the serial port of the terminal to 4800 baud, even parity, seven data bits and one stop bit, full duplex (4800 E 7 1 FDX).
- The serial settings of the transmitter must also be 4800 E 7 1 FDX and the transmitter must be in STOP mode. If these factory settings have been changed, they must be returned. Connect the RS 232C port of the terminal to connector X17 on the top of the main board and switch the power on.



Single loop wiring

- Set the address of the transmitter; it can be any number between 1 and 99. In this example the address is 22:

```
>addr 22
Address : 22
```

- Set the serial bus settings according to your network specifications. This setting will become valid after next RESET or power off:

```
>seri 2400 e 7 1 h
2400 E 7 1 HDX
```

- Set the transmitter in POLL mode:

```
>smode poll
Serial mode   : POLL
```

NOTE 1

The SMODE command must be given last.

NOTE 2

The transmitter outputs no prompt (>) after the SMODE POLL command and it only reacts to commands which include its address.

- Check that the transmitter responds to its address:

```
send 22
Td= 54.4 'C x= 10.1 g/kg
```

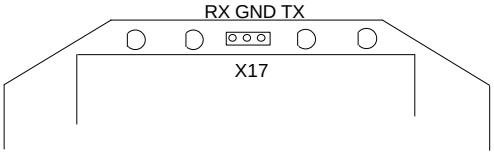
- Disconnect the terminal.
- Remount the digital current loop module.
- Close the cover.
- When all transmitters on the network have been configured, switch them off.

Dual loop operation

Single pair/dual pair use is configured through wiring (see figure on page 3).

The following procedure must be repeated with all transmitters.

- Open the transmitter cover.
- Pull out the digital current loop module, if it is already mounted.
- Set the serial port of the terminal to 4800 baud, even parity, seven data bits and one stop bit, full duplex (4800 E 7 1 FDX).
- The serial settings of the transmitter must also be 4800 E 7 1 FDX and the transmitter must be in STOP mode. If these factory settings have been changed, they must be returned. Connect the RS 232C port of the terminal to connector X17 on the top of the main board and switch the power on.



Dual loop wiring

- Set the address of the transmitter, it can be any number between 1 and 99. In this example the address is 22:

```
>addr 22
Address : 22
```

- Set the serial bus settings according to your system. This setting will become valid after next RESET or power off:

```
>seri 2400 e 7 1 f
2400 E 7 1 FDX
```

- Switch echo on:

```
>echo on
ECHO : ON
>
```

- Change the serial output mode into POLL:

```
>smode poll
Serial mode : POLL
```

NOTE 1

The SMODE command must be given last.

NOTE 2

The transmitter outputs no prompt (>) after the SMODE POLL command and it only reacts to commands which include its address.

- Check that the transmitter responds to its address:

```
>send 22
Td= 54.4 'C x=10.1 g/kg
```

- Disconnect the terminal.
- Remount the digital current loop module.
- Close the cover.
- Repeat this setting procedure with each transmitter.
- When all transmitters on the network have been configured, switch them off.

4. CHECKING THE SERIAL PORT NETWORK OPERATION

Normally, measurement readings are asked when the transmitter is in POLL mode; the command must then include the address of the transmitter. If the settings need to be changed, the transmitter is switched to STOP mode with command OPEN; commands can then be given without address. When the line to the transmitter is closed, it returns to POLL mode.

STOP mode

Open the line to the transmitter:

```
open 22<cr>
DMP 22 line opened for operator commands
```

Transmitter no. 22 is now temporarily set to STOP mode; it accepts commands without address until CLOSE command is given. Individual settings can now be easily modified. Do not open more than one line at a time.

Use command ? to find out the settings of the active transmitter:

```
? <cr>
DMP 246 /1.01
CPU serial nr :  0
Keyboard type :  0
Address  :  7
Output units  :  metric
Baud P D S    :  4800 E 7 1 FDX
Serial mode   :  STOP
Output intrv. :  0 min
Mtim     :  32
Pressure :  1013.25
Analog outputs
Ch1   0.00 ...  10.00 V
Ch2   0.00 ...  10.00 V
Ch1  ( Td )   lo   20.000 'C
Ch1  ( Td )   hi   55.000 'C
Ch2  ( X  )   lo   10.000 g/kg
Ch2  ( X  )   hi  100.000 g/kg
Transducer    :
PRB serial nr :  0
Calibr. date  :  0
```

When the necessary settings have been given, close the line to transmitters (the command closes all open lines):

```
>close
line closed
```

CLOSE command is always given without address. If no lines are open, there will be no response to the CLOSE command.

POLL mode

If a transmitter has been set to POLL mode, it will respond only to commands which include its address:

```
send 22
Td= 54.4 'C x= 10.1 g/kg
```

Addresses from 1 to 99 can be used. According to the 20 mA current loop standard current flows with no transmission on line. A maximum of 6 devices can be connected on same single loop line, but the number can be increased to 9 by using dual loop wiring.

Current loop settings

DMP246 settings	single pair	dual pair
Full duplex/half duplex	HDX	FDX
Echo on/off	OFF	ON

Terminal settings	single pair	dual pair
Line feed after carriage return	yes	no
HDX/FDX	FDX	FDX

When terminal is set to general <lf> (line feed) after <cr> (carriage return), the listings will have two line feeds when also the DMP246 transmitters send line feed.

5. SPECIFICATIONS

Galvanic isolation	1500 VAC/DC max. (1 min)
Loop supply voltage	40 V max.
Loop supply current must be current limited	20 mA nominal
Operating loop voltage requirement	4 V/each transmitter (TX+/TX-) on the loop 2 V/each receiver (RX+/RX-) on the loop
Loop current	12...30 mA (space) 0...2 mA (mark) 30 mA max.
Connections on the main board	Berg sockets screw terminals 0.5 mm² wires, stranded wires recommended
Assembly	plug-in module
Board dimensions	40 x 28 mm
Operating mode (single or dual pair wiring)	half duplex
Network:	
network type	serial daisy chain
cable type	twisted pair
line length max.	1000 m (3000 ft)
number of devices	6 devices on line (single loop) 9 devices on line (dual loop)
data speed	4800 baud max.
operating mode	polling mode
isolation voltage proof	250 VAC (1 min)
Operating temperature	-40...+60 °C
Storage temperature	-40...+70 °C

APPENDIX 5: ERROR MESSAGES

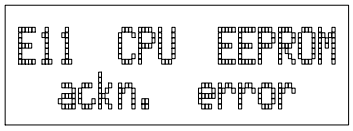
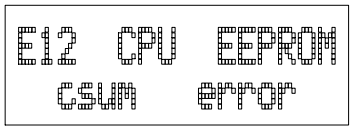
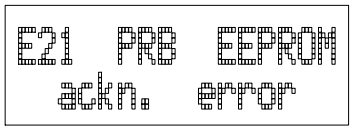
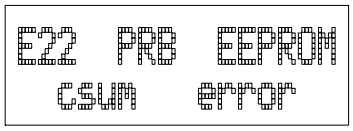
ERROR MESSAGES

The DMP246 transmitters go through a self-diagnostics procedure when the power is switched on. When the procedure does not reveal any errors or faults, the transmitter starts operating normally. If errors or faults are found, the transmitter outputs an error message. The error messages can be divided into two groups: error messages after reset and error messages during operation.

LED symbols:

○	LED dark
⊙	LED blinking
●	LED lit

Errors after reset

Display	Serial bus
	E11 CPU EEPROM ackn. error
	E12 CPU EEPROM csum error
	E21 PRB EEPROM ackn. error
	E22 PRB EEPROM csum error

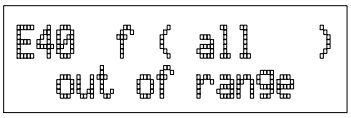
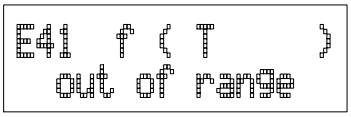
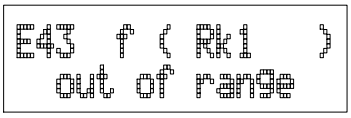
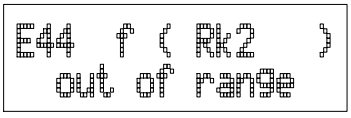
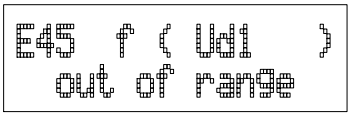
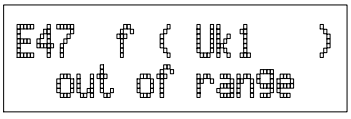
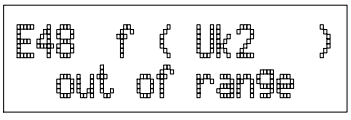
ackn. error = EEPROM is faulty
csum error = check sum is erroneous

The LEDs display these error types as follows:

○●○○	CPU EEPROM error
●○○○	input hybrid error

Errors during operation

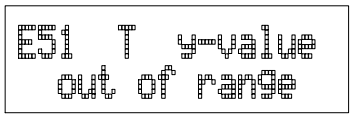
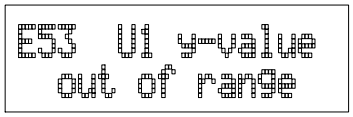
Two types of errors are possible during operation of the transmitters. The first type indicates that no frequency comes from the converter.

Display:	Serial bus:
	E40 f (all) out of range
	E41 f (T) out of range
	E43 f (Rk1) out of range
	E44 f (Rk2) out of range
	E45 f (Ud1) out of range
	E47 f (Uk1) out of range
	E48 f (Uk2) out of range

The LEDs display these error types as follows:

○○⊙⊙	no frequency at all
○○⊙○	a frequency missing from the RH channel
○○○⊙	a frequency missing from the T channel

The second error type indicates erroneous y-values (used in internal calculations):

Display:	Serial bus:
	E51 T y-value out of range
	E53 U1 y-value out of range

The LEDs display these error types as follows:

⊙○○○	RH channel y-value out of range
○⊙○○	T channel y-value out of range

APPENDIX 6: CALCULATION FORMULAS

Calculation

The DMP246 transmitters measure relative humidity and temperature. From these values they calculate the dewpoint and mixing ratio using the following equations:

dewpoint:
$$T_d = \frac{T_n}{\frac{m}{log\left(P_{ws} \cdot \frac{RH}{100 \cdot A}\right)} - 1} \qquad (1)$$

mixing ratio:
$$x = 621.98 \cdot RH \cdot \frac{P_{ws}}{\left(100 \cdot p - RH \cdot P_{ws}\right)} \qquad (2)$$

where
T_d = dewpoint temperature (°C)
P_{ws} = partial pressure of saturated water vapour (mbar)
RH = relative humidity (%)
x = mixing ratio (g/kg)
p = atmospheric pressure (mbar)
t = temperature (°C)

The partial pressure of water P_{ws} is calculated using equation

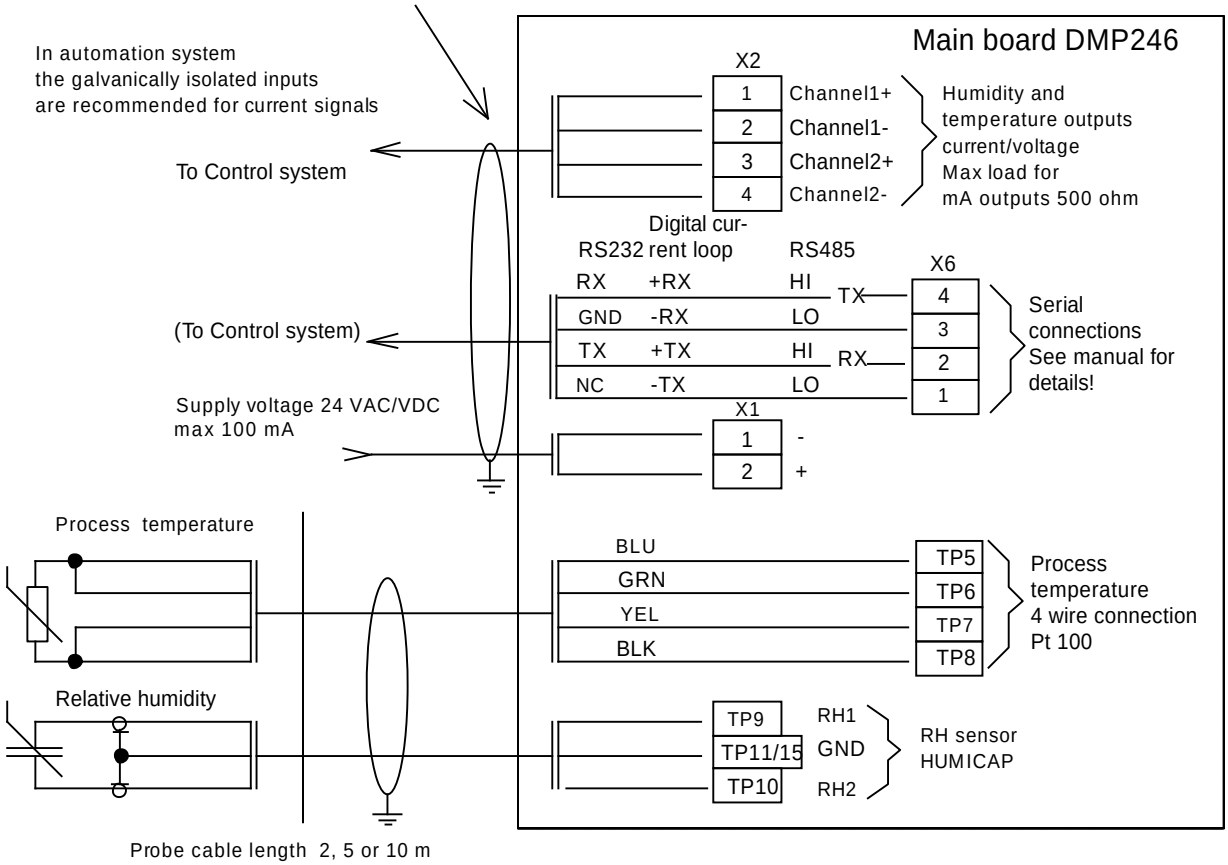
$$P_{ws} = A \cdot 10^{\left(\frac{m \cdot t}{t + T_n}\right)}. \qquad (3)$$

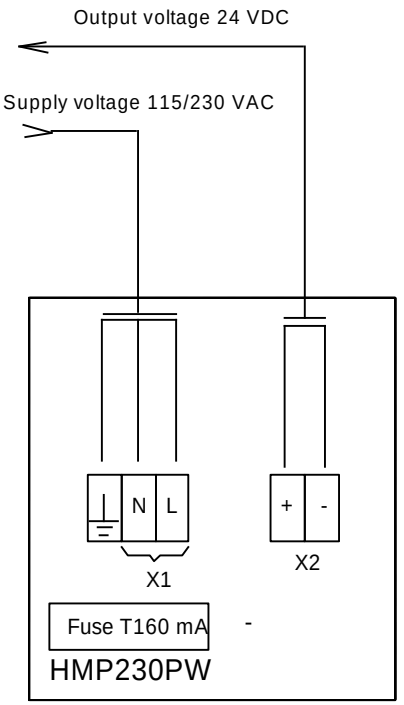
The parameters A, m, and T_n depend on temperature according to the following table:

t	A	m	T_n
-40 ... 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

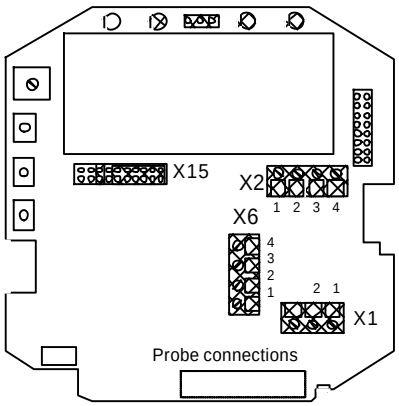
Ltr	Qty	Change	Reason/ECO no	Design	Date Review	Date Appr

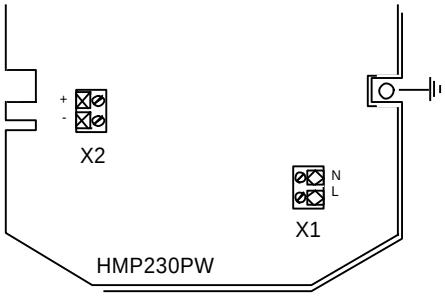
Note ! The cable shield has to be connected to the cable bushing for full EMC protection.



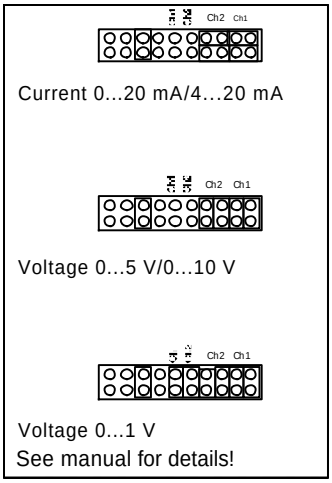


Location of main board terminals





Jumper selections in connector X15



Drawn	Arch id	Serial no	Sheet	Cooperator`s doc no
Review				VAISALA
Appr	Title	DMP246		
Design KUH	Scale	Wiring diagram	Dwg no MK45016	Rev A
Replaces				
Replaced by				

APPENDIX 8: ALARM OUTPUT UNIT

The alarm output unit consists of two alarm relays and two opto-isolated outputs (see Figure 1). The relay output 1 is available at screw terminal X1 and the relay output 2 at screw terminal X2. The opto-outputs are activated simultaneously with the corresponding relays and available at screw terminal X5.

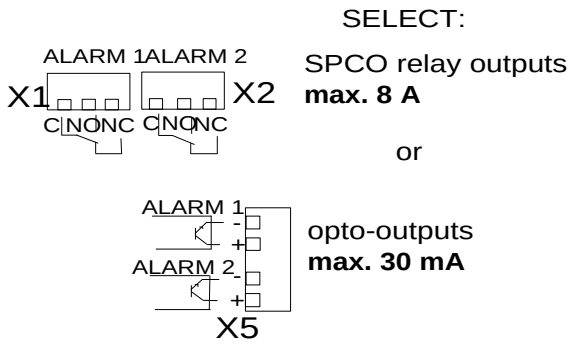


Figure 1 Relay and opto-outputs

When the relay is not activated, the C and NC outputs of the screw terminal are closed. When the relay is activated, these outputs are opened and the C and NO outputs are closed. If required, the relays can be activated by inserting a jumper to the test connector X4. By inserting the jumper to two pins on the left, relay 1 is activated and by inserting the jumper to two pins on the right, relay 2 is activated.

The alarm output unit is delivered with the alarm outputs in OFF mode (not in use). Therefore, the customer needs to set and take into use the desired outputs.

If the mains power is in use, only an authorized electrician may connect the alarm unit. A readily accessible disconnect device shall be incorporated in the fixed wiring (IEC 950).

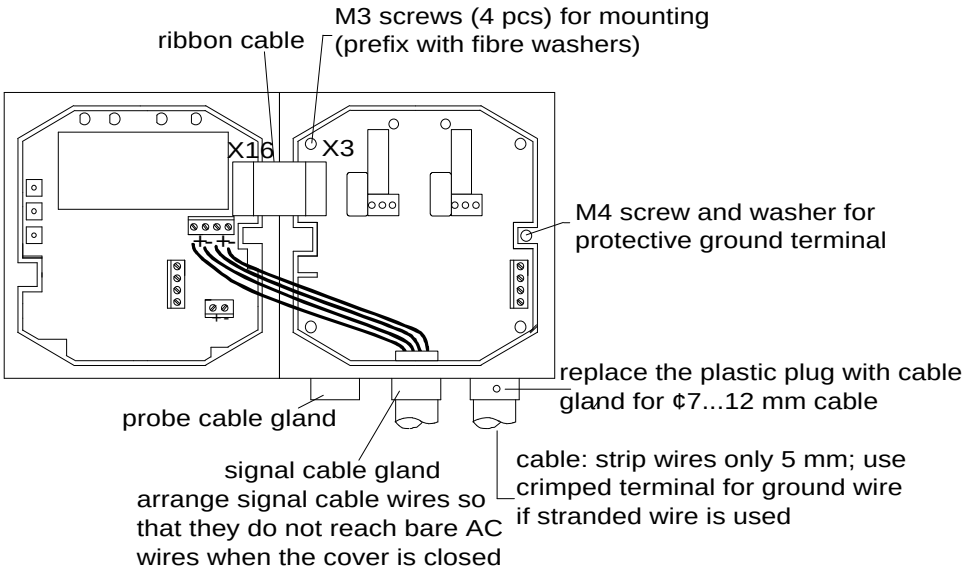
For alarm output cabling, remove the plastic plug in the transmitter housing and replace it with the cable gland. Fasten the alarm unit to the bottom of the housing with four screws.

Attach the grounding wire with the screw and washer to the grounding terminal on the right-hand side of the module if the mains power is in use. Attach the ribbon cable from X3 of the alarm unit to the X16 on the main board of the transmitter.

NOTE

NO jumper in connector X4 during normal operation.

When one alarm unit relay is on, the corresponding LED is lit.



Prefix the fastening screws with fiber washers for mounting the unit to the box.

NOTE

The alarm unit cannot be used with the power supply unit HMP230PW.

WARNING

Do not detach the alarm unit from the transmitter when the power is on.

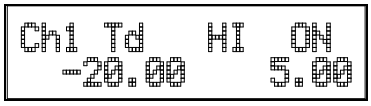
WARNING

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

Setting and activating the outputs with menu commands

Disconnect the security lock jumper!

- Select MORE in the main menu and then ALARM; the following is displayed:



- If the settings need to be changed, press CL:
  - the quantity starts blinking; it can be changed with arrow switches, and acknowledged with ENT.
  - the third parameter (in this example HI ON) starts blinking. This parameter determines whether the alarm output is in use or not, and when it is activated. Select the output control state with arrow switches. The selection is acknowledged with ENT.

  The options are the following:
  - HI ON (the alarm is activated by exceeding the setpoint, the output is in use)
  - LO ON (the alarm is activated if the value goes below the setpoint, the output is in use)
  - HI OFF (the alarm is activated by exceeding the setpoint, the output is not in use)
  - LO OFF (the alarm is activated if the value goes below the setpoint, the output is not in use)
  - the setpoint starts blinking (in this example, -20.00); if you wish to change it, press CL. Using the arrow keys select the new setpoint digit by digit and acknowledge each digit using ENT key. Using CL key you can correct the entry by deleting the digits one by one. When you have entered the whole setpoint, press ENT for the second time.
  - the hysteresis value starts blinking (in this example, 5.00); if you wish to change it, use a similar manner acknowledge or change the hysteresis value.

NOTE

The options HI OFF and LO OFF are used to deactivate the relay outputs e.g. for service purposes.

The settings of the channel 2 are changed in the same way.

Setting and activating the outputs using an RS line

Disconnect the security lock jumper!

ALARM <cr>

or

ALARM n ON <cr>

where n = channel number (1 or 2)

The currently valid settings of the alarm output unit can be checked with command ALARM:

```
>alarm<cr>
Ch1  RH   LO   OFF    0.00    0.00 %RH
Ch2  RH   HI   OFF  100.00    0.00 %RH
>
```

This is an example of the factory setting (both alarm outputs are in OFF mode, i.e. not in use). The settings can be changed with command ALARM:

```
>alarm   1    Td   HI   -20  5
Ch1  Td   HI   OFF  -20.00    5.00 'C
Ch2  RH   HI   OFF  100.00    0.00 %RH
>
```

When giving this command, first enter the channel number i.e. the number of the alarm output you wish to use (1 or 2). Then select the quantity you wish to have on that channel (Td, mix, RH or T; note that the RH and T are not values of the actual process). The third parameter (HI/LO) determines whether the alarm is activated when the setpoint value is exceeded (HI) or not reached (LO). The fourth parameter is the actual setpoint value which activates the alarm. The last parameter is the hysteresis value; it indicates how much the measured value has to exceed or go below the setpoint before the alarm is deactivated. If the third parameter is HI, the alarm is deactivated when the measured value goes below the setpoint with the chosen hysteresis value; if the parameter is LO, the alarm is deactivated when the measured value exceeds the setpoint with the chosen hysteresis value.

When the alarm outputs have been set, you can activate the outputs with commands ALARM 1 ON (channel 1) or ALARM 2 ON (channel 2). Note that you can also activate the outputs when giving other parameters with command ALARM.

Examples of activating the outputs:

with command ALARM:

```
>alarm   1    Td   HI   -20  5
Ch1  Td   HI   ON   -20.00   5.00 'C
Ch2  RH   HI   ON   100.00   0.00 %RH
>
```

with commands ALARM 1 ON and ALARM 2 ON:

```
>alarm   1    ON
Ch1  Td   HI   ON   -20.00   5.00 'C
Ch2  T    HI   OFF   30.00   5.00 'C
>alarm   2    ON
Ch1  Td   HI   ON   -20.00   5.00 'C
Ch2  T    HI   ON    30.00   5.00 'C
>
```