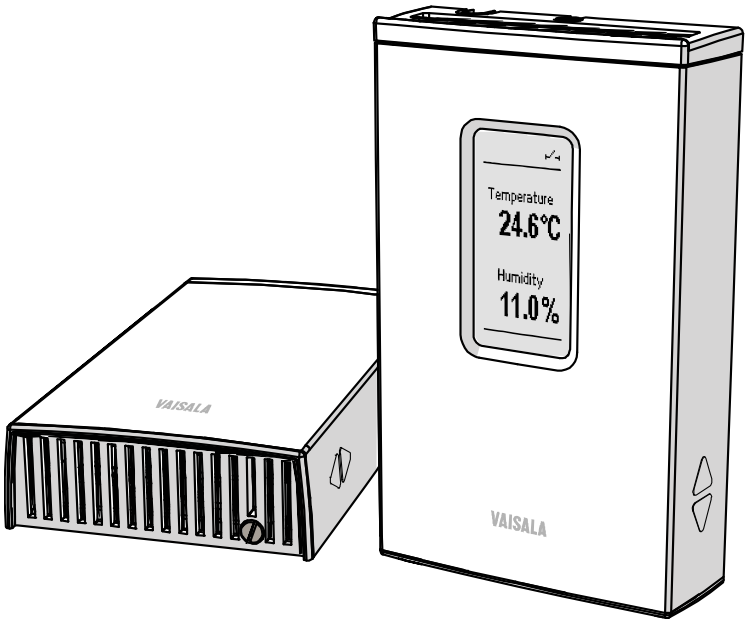
VAISALA

USER'S GUIDE

Vaisala HUMICAP® Humidity and Temperature Transmitter HMW90 Series



M211399EN-A

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CHAPTER 1

GENERAL INFORMATION

This chapter provides general notes for the manual and HMW90 series transmitters.

About This Manual

This manual provides information for installing, operating, and maintaining HMW90 series transmitters.

Contents of This Manual

This manual consists of the following chapters:

- Chapter 1, General Information, provides general notes for the manual and HMW90 series transmitters.
- Chapter 2, Product Overview, introduces the features, advantages, and the product nomenclature.
- Chapter 3, Installation, provides you with information that is intended to help you install the HMW90 series transmitters.
- Chapter 4, Operation, contains information that is needed to operate the HMW90 series transmitters.
- Chapter 5, Maintenance, provides information that is needed in basic maintenance of the HMW90 series.
- Chapter 6, Troubleshooting, describes common problems, their probable causes and remedies, and provides contact information for technical support.
- Chapter 7, Technical Data, provides the technical data of the HMW90 series transmitters.

Version Information

Table 1 Manual Revisions

Manual Code	Description
M211399EN-A	December 2011. This manual. First version.

Related Manuals

Table 2 Related Manuals

Manual Code	Manual Name
M211398EN	HMW92 and HMW93 Quick Guide

Documentation Conventions

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

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

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

NOTE	Note highlights important information on using the product.

Safety

The HMW90 series transmitter delivered to you has been tested and approved as shipped from the factory. Note the following precautions:

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

ESD Protection

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

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

- Handle ESD sensitive components on a properly grounded and protected ESD workbench.
- Always hold component boards by the edges and avoid touching the component contacts.

Recycling

Recycle all applicable material.

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

Regulatory Compliances

The HMW90 series complies with the following performance and environmental test standards:

- EMC-Directive

Conformity is shown by compliance with the following standards:

- EN 61326-1: Electrical equipment for measurement, control, and laboratory use – EMC requirements – for use in industrial locations.
- EN 550022: Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement.

CE N17728

Patent Notice

The HMW90 series is protected by, for example, the following patents and their corresponding national rights:

Finnish patent 98861, French patent 6650303, German patent 69418174, Japanese patent 3585973, UK patent 0665303, U.S. patent 5607564.

Trademarks

HUMICAP® is a registered trademark of Vaisala Oyj.

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

License Agreement

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

Warranty

Visit our Internet pages for our standard warranty terms and conditions: www.vaisala.com/warranty.

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

CHAPTER 2

PRODUCT OVERVIEW

This chapter introduces the features, advantages, and the product nomenclature.

Introduction to HMW90 Series

HMW92 and HMW93 are wall-mount transmitters for building automation applications. Common features:

- Display (visible or hidden behind the cover).
- Sliding cover for accessing maintenance functions.
- Adjustment trimmers for humidity and temperature measurement.
- DIP switches for most common configuration tasks.
- RS-485 line for temporary service use with hand-held MI70 indicator or PC.

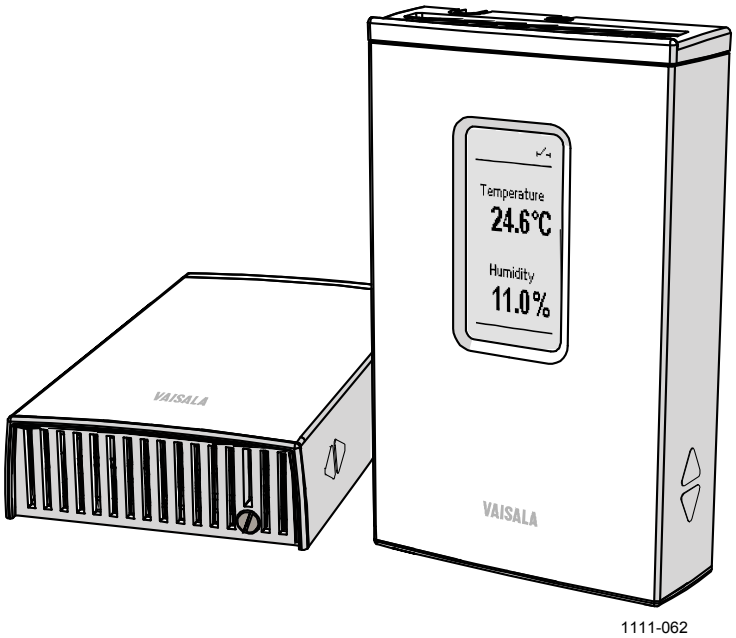

Figure 1 HMW90 Series Transmitters

HMW90 Series Transmitters

Table 3 below lists the most important differences between the HMW90 series transmitter models. For more information, see Chapter 7, Technical Data, on page 61.

Table 3 HMW90 Series Transmitters

Product Code	Short Description
HMW92	Humidity and temperature transmitter with - two current outputs (4 ... 20 mA) - display hidden under sliding cover
HMW92D	Humidity and temperature transmitter with - two current outputs (4 ... 20 mA) - visible display
HMW93	Humidity and temperature transmitter with - two voltage outputs (0 ... 5 V or 0 ... 10 V) - relay - display hidden under sliding cover
HMW93D	Humidity and temperature transmitter with - two voltage outputs (0 ... 5 V or 0 ... 10 V) - relay - visible display

Supported Quantities

Table 4 Quantities Supported by HMW90 Series

Quantity	Symbol	Unit(s)	Description
Temperature	T	°C °F	Temperature in Celsius or Fahrenheit scale.
Relative humidity	RH	%	Ratio of the partial pressure of water vapor in the air to the saturation vapor pressure of air at the current temperature.
Dewpoint	Td	°C °F	Temperature at which the water vapor in the air will condense into water at the current pressure.
Dewpoint	Tdf	°C °F	Same as Td, except when the dewpoint is below 0 °C, the transmitter outputs frostpoint (Tf) instead of dewpoint.
Dewpoint depression	dTd	°C °F	Difference between ambient temperature and dewpoint (Tdf).
Wet bulb temperature	Tw	°C °F	The minimum temperature that can be reached by evaporative cooling in the current conditions.
Absolute humidity	a	g/m3 gr/ft3	Quantity of water in a cubic meter (or cubic foot) of air.
Mixing ratio	x	g/kg gr/lb	Ratio of water vapor mass per kilogram (or pound) of dry air.
Enthalpy	h	kJ/kg btu/lb	Sum of the internal energy of a thermodynamic system.

Transmitter parts

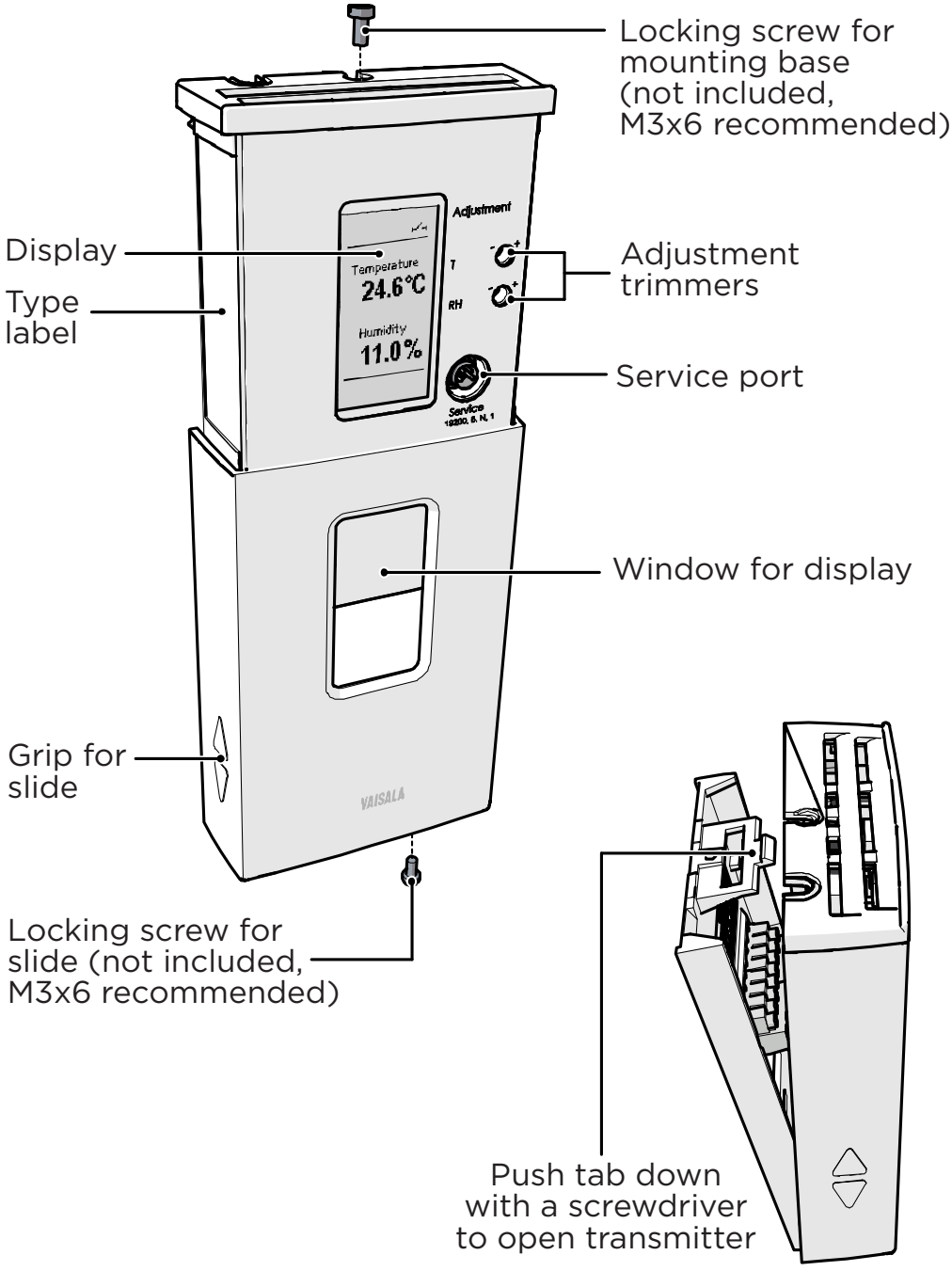

Figure 2 Transmitter Parts – Outside

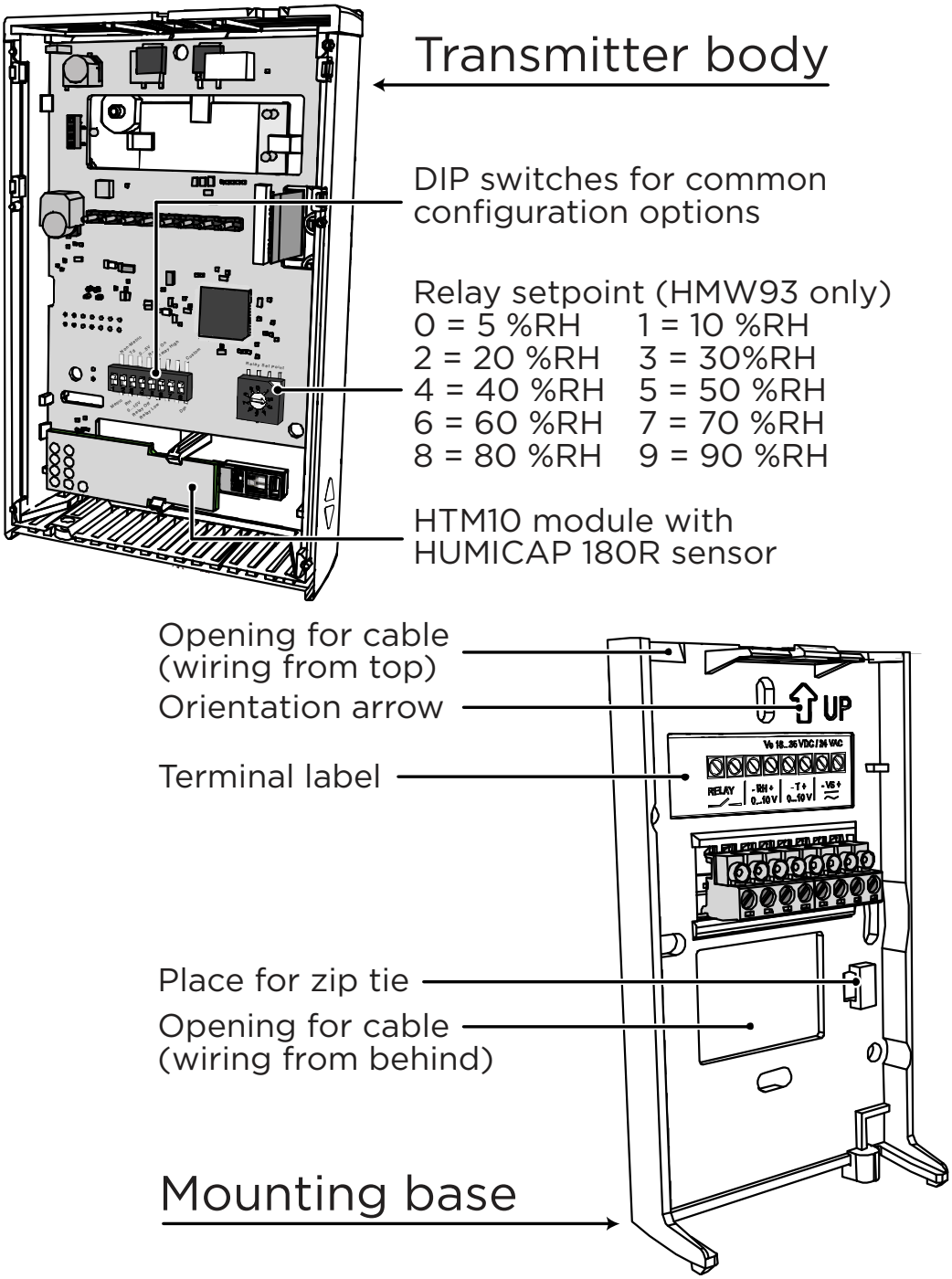

Figure 3 Transmitter Parts - Inside

CHAPTER 3

INSTALLATION

This chapter provides you with information that is intended to help you install the HMW90 series transmitters.

Configuration Before Installation

If you need to change the settings of the transmitter, it is best to do this before it has been installed. You can configure HMW90 series transmitters in two ways:

- Using the DIP switches (and rotary switch on the HMW93) on the component board. See the following sections for instuctions:
  - Configuration Using DIP Switches on page 14
  - Relay Configuration in Rotary Switch Mode on page 15
- Configuring the settings in software through the service port. See connection instructions and serial line commands in Chapter 4, Operation, on page 21.

These two configuration methods are mutually exclusive. If the DIP switch configuration is used, software settings have no effect on settings that are controlled by the DIP switches. DIP switch number 8 is the master switch that controls which configuration method is used.

Configuration Using DIP Switches

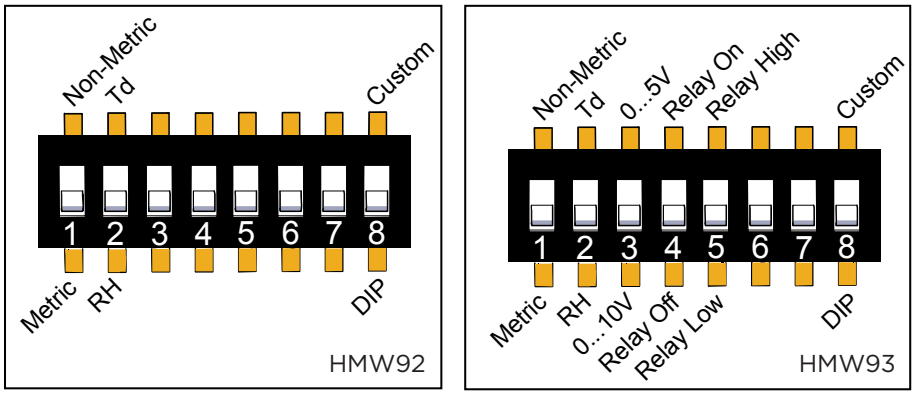

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Figure 4 DIP Switch Settings

DIP	Position	Setting
1	Non-metric	Non-metric units (°F)
	Metric	Metric units (°C)
2	Td	Td (dewpoint) as humidity quantity on display and analog output
	RH	RH (relative humidity) as humidity quantity on display and analog output
3	0...5V	0...5V analog output (both channels)
	0...10V	0...10V analog output (both channels)
4	Relay On	Relay enabled
	Relay Off	Relay disabled
5	Relay High	Relay closed when RH above setpoint
	Relay Low	Relay closed when RH below setpoint
6	Not used	
7	Not used	
8	Custom	Configuration through service port only
	DIP	Configuration by DIP switches only

NOTE If DIP switch 8 is set to **Custom**, the transmitter ignores all other DIP switch settings. In custom mode the transmitter uses settings that are configured in software using the service port.

If you change the position of DIP switch 8, note the following:

- When changing from **Custom** to **DIP**: Current custom settings are overwritten by the settings from the DIP switches at next power up. Settings that do not have DIP switches remain unchanged, except for display layout (**DSEL** command) that is set to default.
- When changing from **DIP** to **Custom**: The DIP settings that were used when the power was last on are carried over to the custom settings at next power up.

Relay Configuration in Rotary Switch Mode

NOTE Relay is included on HMW93 transmitters only.

When the transmitter is configured using DIP switches, the functioning of the relay is configured by DIP switch 5 and the rotary switch on the component board:

- DIP 5 determines if the relay is closed above or below the setpoint.
- The position of the rotary switch determines the setpoint according to the table below.

Table 5 Rotary Switch and Relay Setpoint

Rotary Switch Position	Relay Setpoint
0	5 %RH
1	10 %RH
2	20 %RH
3	30 %RH
4	40 %RH
5	50 %RH
6	60 %RH
7	70 %RH
8	80 %RH
9	90 %RH

NOTE The rotary switch only has 10 positions. Do not turn the switch so that it is between two positions.

For examples of relay behavior in rotary switch mode, see Figure 5 and Figure 6 on page 16. Note also the following:

- Relay operation in rotary switch mode is always linked to RH measurement.
- Relay contacts are open if the transmitter is in error state (an active error is present).
- Relay contacts are open when transmitter is powered off.

If you need to configure the relay for some other quantity or need additional configuration options, see section Relay Configuration in Custom Mode on page 40.

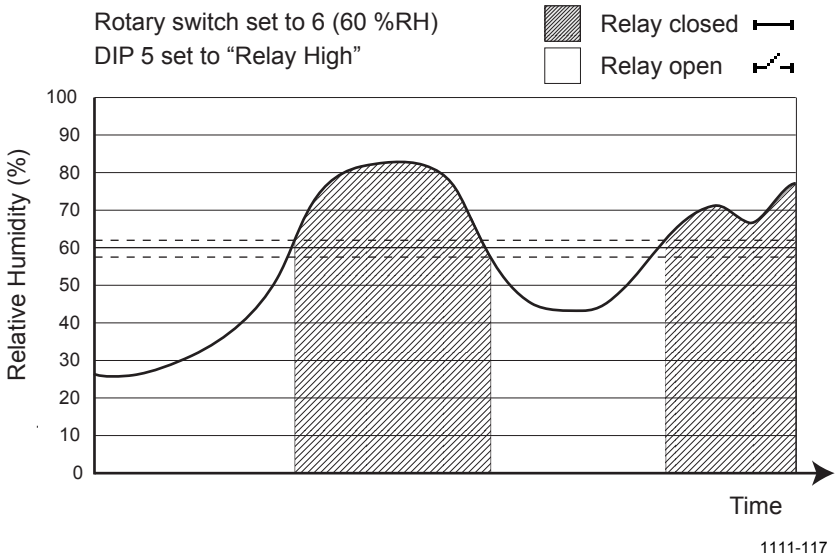

Figure 5 Relay High in Rotary Switch Mode

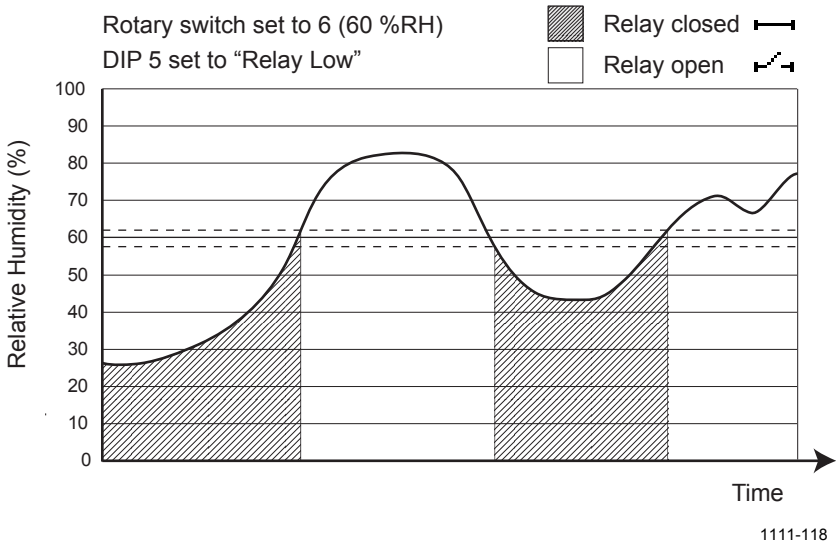

Figure 6 Relay Low in Rotary Switch Mode

NOTE	There is a 2 %RH hysteresis around the setpoint value to prevent rapid relay switching when the measured value moves around the setpoint. This means that the relay will not close or open exactly at the setpoint, but slightly above and below.

Selecting Location

The conditions at the location should represent well the area of interest. Do not install the transmitter on the ceiling. Avoid placing the transmitter near heat and moisture sources, close to the discharge of the supply air ducts, and in direct sunlight.

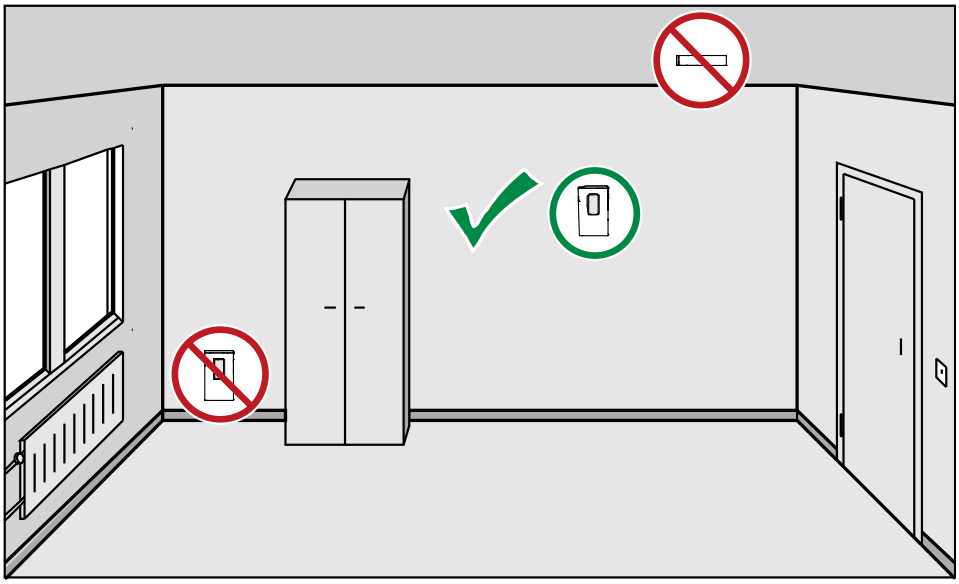

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Figure 7 Selecting Transmitter Location

Use the mounting holes to attach the mounting base securely. Use at least two screws (not included, M3x6 recommended). Remember to leave sufficient clearance below the transmitter to operate the slide. For mounting dimensions, see section Dimensions in mm on page 63.

CAUTION	The arrow on the mounting base must point straight up after installation. Proper orientation is important: air must flow through the vents on the bottom and top.

Wiring

Connect the wiring to the screw terminals on the mounting base. The supply voltage and terminal assignments are model-specific. Max wire size 2 mm2 (AWG14).

After completing the wiring, connect the transmitter body over the mounting base. Note that mounting bases are model-specific.

Wiring HMW92

You must connect the RH channel of the HMW92, even if you only want to measure temperature. Connecting the T channel is optional.

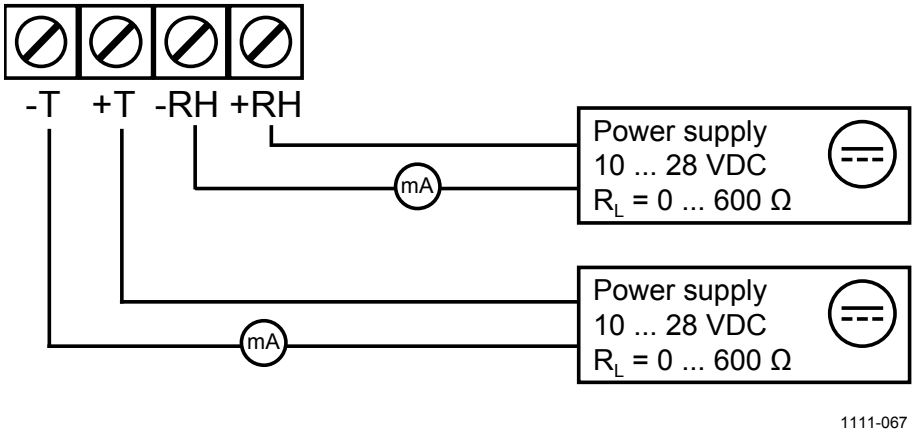

Figure 8 Wiring HMW92

Wiring HMW93

Recommended wiring for long cables:

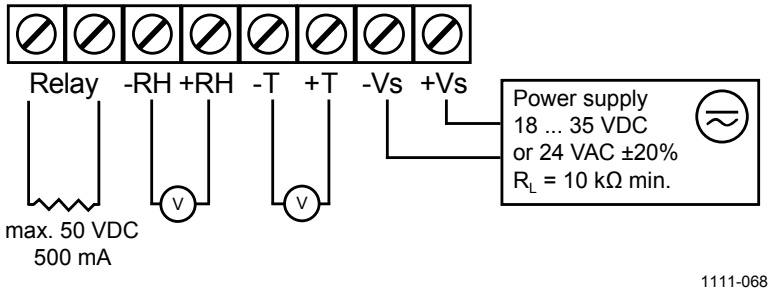

Figure 9 Wiring HMW93

3-wire connection with -Vs as common ground. Maximum cable resistance is 2.5 Ω (24V supply, 0 ... 10 V output, relay not used).

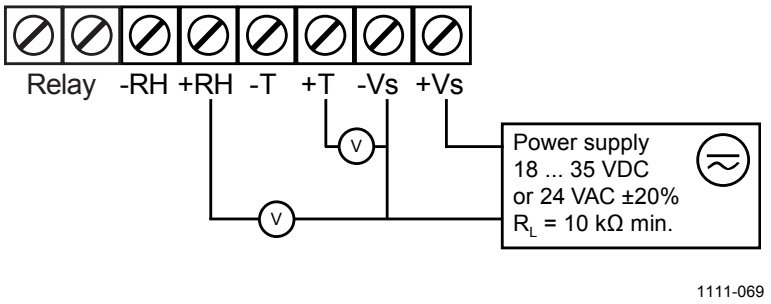

Figure 10 Three-Wire Wiring for HMW93

If you are connecting a common 24 VAC power supply to several transmitters, make sure to connect the same terminal to +Vs and –Vs on all transmitters. This will avoid a short-circuit through the shared common line at the controller; see Figure 11 below.

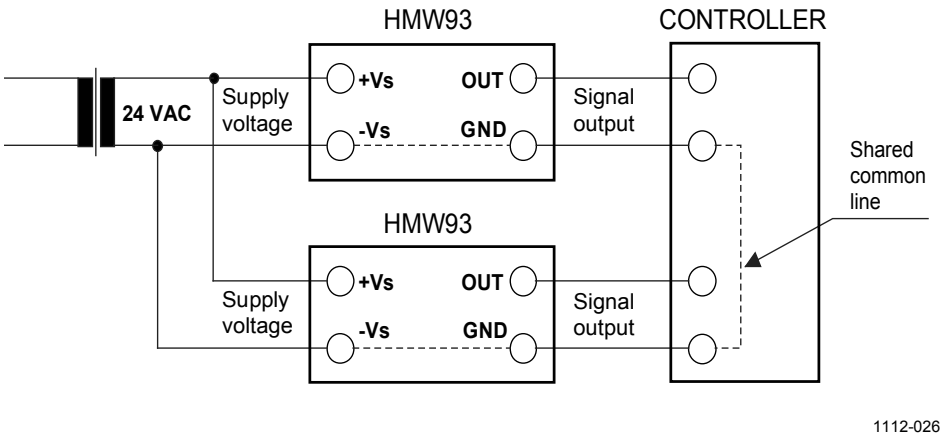

Figure 11 Connecting a Common AC Power Supply

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CHAPTER 4

OPERATION

This chapter contains information that is needed to operate the HMW90 series transmitters.

Display

Startup Screens

When the transmitter is powered on, it displays a sequence of information screens. The screens are shown for a few seconds each.

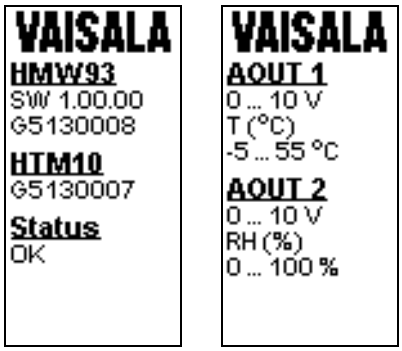

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Figure 12 HMW93 Startup Screens

Measurement Screen

Measurement screen shows the measured quantities and currently active indicators.

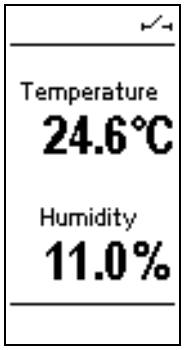

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Figure 13 Measurement Screen – Normal Operation

If there is a problem with measurement, affected readings are replaced with stars. The alarm indicator and an error message will also appear on the screen.

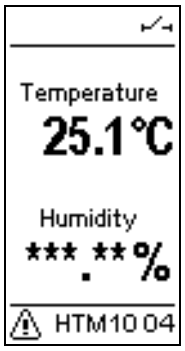

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Figure 14 Measurement Screen – Problem With Measurement

Indicators on the Display

Indicator	Position on Screen	Meaning
	Top right	Is shown when relay contacts are open (HMW93 only).
	Top right	Is shown when relay contacts are closed (HMW93 only).
	Top left	Is shown when an MI70 Indicator is connected to the service port.
	Bottom left	Is shown if an error is active. The error message is written after the indicator. See section Error Messages on the Display on page 58.

Service Port

You can connect to the service port on the HMW90 series transmitters using a PC or an MI70 indicator. The MI70 indicator is the hand-held display device that is included with, for example, the Vaisala HUMICAP® Hand-Held Humidity and Temperature Meter HM70.

CAUTION The service port is not galvanically isolated from the rest of the transmitter electronics. Connect only equipment with a floating power supply (not grounded) to the service port. If you connect a device that is grounded to a different potential than the transmitter's power supply, you will affect the accuracy of the transmitter's analog outputs. You may even affect the transmitter's functionality or cause damage to the transmitter.

Connecting With an MI70 Indicator

When connecting using an MI70 indicator, use the connection cable for HM70 hand-held meter (Vaisala order code 219980). The following functionality is available when using the MI70:

- Standard MI70 functions such as viewing, logging, and graphs of measurement results.
- Calibration and adjustment fuctions for the transmitter. For more information, see section Adjustment Using an HM70 on page 53.
- Setting of the pressure compensation value for humidity measurement (**Environment** menu in the MI70).

Connecting With a PC

Connecting with a PC allows you to use a terminal the serial line commands to configure and troubleshoot your transmitter. For a list of commands, see section List of Serial Commands on page 27.

When connecting using a PC, use the Vaisala USB cable (Vaisala order code 219690) and a suitable terminal application:

- If you have not used the Vaisala USB cable before, install the driver that came with the cable. Refer to section Installing the Driver for the USB Service Cable on page 24 for detailed instructions.
- For more information on using a terminal application, see section Terminal Application Settings on page 25.

Installing the Driver for the USB Service Cable

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

1. Check that the USB service cable is not connected. Disconnect the cable if you have already connected it.
2. Insert the media that came with the cable, or download the driver from www.vaisala.com.
3. Execute the USB driver installation program (setup.exe), and accept the installation defaults. The installation of the driver may take several minutes.
4. After the driver has been installed, connect the USB service cable to a USB port on your PC. Windows will detect the new device, and use the driver automatically.
5. The installation has reserved a COM port for the cable. Verify the port number, and the status of the cable, using the **Vaisala USB Instrument Finder** program that has been installed in the Windows Start menu.

Windows will recognize each individual cable as a different device, and reserve a new COM port. Remember to use the correct port in the settings of your terminal program.

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

Terminal Application Settings

The serial interface settings of the service port are presented in Table 6 below. The settings are fixed, and cannot be changed by the user.

Table 6 Serial Interface Settings

Property	Description / Value
Baud rate	19200
Parity	None
Data bits	8
Stop bits	1
Flow control	None

The steps below describe how to connect to the transmitter using the PuTTY terminal application for Windows (available for download at www.vaisala.com) and a USB serial interface cable:

1. Connect the USB serial interface cable between your PC and the service port of the transmitter.
2. Start the PuTTY application.
3. Select the **Serial** settings category, and check that the correct COM port is selected in the **Serial line to connect to** field.

   Note: You can check which port the USB cable is using with the **Vaisala USB Instrument Finder program** that has been installed in the Windows Start menu.
4. Check that the other serial settings are correct for your connection, and change if necessary. **Flow control** should be set to **None** unless you have a reason to change it.
5. Click the **Open** button to open the connection window and start using the serial line.

   Note: If PuTTY is unable to open the serial port you selected, it will show you an error message instead. If this happens, restart PuTTY and check the settings.
6. You may need to adjust the **Local echo** setting in the **Terminal** category to see what you are typing on the serial line. To access the configuration screen while a session is running, click the right mouse button over the session window, and select **Change Settings...** from the pop-up menu.

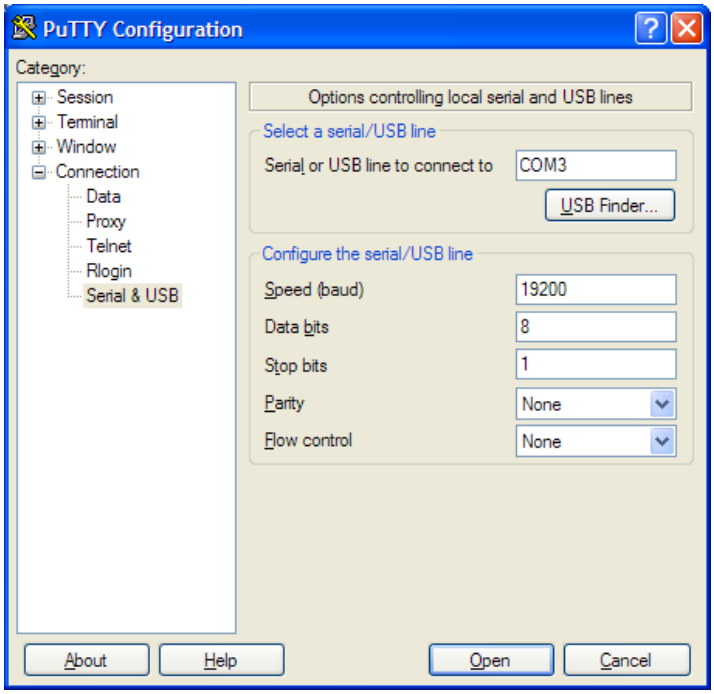

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Figure 15 PuTTY Terminal Application

List of Serial Commands

All commands can be issued either in uppercase or lowercase. In the command examples, the keyboard input by the user is in **bold** type.

The notation <cr> refers to pressing the carriage return (**Enter**) key on your computer keyboard. Enter a <cr> to clear the command buffer before starting to enter commands.

Table 7 Basic Serial Commands

Command	Description
?	Show transmitter information.
CALCS	Show all measured quantities.
ECHO	Show or set remote echo mode.
ENV	Show or set environmental parameters.
ERRT	Show error table.
ERRS	Show currently active errors.
FORM [modifier string]	Show or set output format.
HELP	Show list of currently available serial commands.
INTV [0 ... 9999 s/min/h]	Set continuous output interval for R command.
PASS [9000]	Access advanced serial commands.
R	Start the continuous outputting.
RESET	Reset the transmitter.
S	Stop the continuous outputting.
SDELAY [0 ... 255]	Show or set serial line transmission delay in milliseconds.
SEND	Output measurement message once.
SNUM	Show transmitter serial number.
STATUS	Show transmitter status.
UNIT [m/n]	Select metric or non-metric units.
VERS	Show transmitter firmware version.

Table 8 Advanced Serial Commands

Command	Description
AMODE	Show or set analog output mode.
AOVER	Show or set overrange and clipping behavior.
ASEL	Show or set analog output quantity.
ATEST	Test analog putput.
CDATE	Show or set calibration date.
CRH	Calibrate and adjust RH measurement.
CT	Calibrate and adjust T measurement.
CTEXT	Show or set calibration information.
DSEL	Select quantities to display on screen.
FRESTORE	Restore transmitter to factory settings.
RMODE	Show or set relay operation mode.
RSEL	Show or set relay quantity and limits.
RTEST [open/closed]	Test relay operation.

Transmitter Information

Show Transmitter Information

The **?** command outputs a listing of device information.

?<cr>

Example:

```
>?
Device              : HMW93
SW version          : 1.00.0.0000
SNUM                : G5130008

HTM10 module information
Software version    : 1.00.0
SNUM                : G5130007
```

Show Transmitter Firmware Version

Use the **VERS** command to show the transmitter model and firmware version.

VERS<cr>

Example:

```
>vers
HMW93 / 1.00.0
```

Show Transmitter Serial Number

Use the **SNUM** command to show the transmitter serial number.

SNUM<cr>

Example:

```
>snum
Serial number       : G5130008
```

Show Transmitter Status

Use the **STATUS** command to view detailed information on transmitter model and configuration.

STATUS<cr>

Example:

```
>status
Device Name          : HMW93
Copyright            : Copyright Vaisala Oyj 2011
SW Name              : XM90
SW Model             : XM9x
SW version           : 1.00.0.0000
Serial number        : G5130008
Address              : 0

SUB FUNCTIONS

* Serial Port (COM1) *
Mode                 : STOP

* Error Manager (ERR) *
Status               : NORMAL
Active errors        : 0

* MCI communication (MCI) *
Status               : NORMAL

* Analog output 1 (AOUT1) *
Quantity             : T
Input range          : -5.000 ... 55.000 'C
Output range         : 0.000 ... 5.000 V
Output clipping      : 0.00 % (0.00 ... 5.00 V)
Valid output range   : 5.00 % (-0.25 ... 5.25 V)
Error value          : 5.500 V
Input now            : 24.937 'C
Output now           : 2.495 V
State                : Normal

* Analog output 2 (AOUT2) *
Quantity             : RH
Input range          : 0.000 ... 100.000 %
Output range         : 0.000 ... 5.000 V
Output clipping      : 0.00 % (0.00 ... 5.00 V)
Valid output range   : 5.00 % (-0.25 ... 5.25 V)
Error value          : 5.500 V
Input now            : 2.365 %
Output now           : 0.118 V
State                : Normal

* Relay output (RELAY) *
Quantity             : RH
Setpoint             : 88.000 ... 92.000 %
Mode                 : Lo_Active
Status               : Closed

* Measurement module (HTM10) *
Status               : NORMAL
Factory date         : 2011-11-09
```

Show Measured Quantities

Use the **CALCS** command to list the measurement quantities that the transmitter supports. RH and T are measured directly by the transmitter, the rest are calculated based on the measured values.

CALCS<cr>

Example:

```
>calcs
RH        - Relative Humidity
T         - Temperature
Tdf       - Dew/Frost point temperature
Td        - Dew point temperature
Tw        - Wetbulb temperature
h         - Enthalpy
x         - Mixing ratio
a         - Absolute humidity
dTd       - Dew/frostpoint depression
```

Show Command List

Use the **HELP** command to list the currently available serial commands. If the **PASS** command has not been used, only the basic serial commands are available.

HELP<cr>

Example (shows basic serial commands, advanced commands are not enabled here):

```
>help
?
CALCS
ECHO
ENV
ERRT
ERRS
FORM
HELP
INTV
PASS
R
RESET
SDELAY
SEND
SNUM
STATUS
UNIT
VERS
```

Show Command Help

To see a short description of an individual command, issue the command with a question mark as a parameter.

Example:

```
>calcs ?
Display measured quantities
```

Measurement Settings

Set Environmental Parameters

Use the **ENV** command to set environmental parameters that affect the measurement. For HMW90 series transmitters you can set the ambient pressure value that is used for pressure compensation of calculated quantities.

ENV [*pressure*]<cr>

where

pressure = Ambient pressure in hPa.

Example:

```
>env 1013.3
Pressure (hPa)      : 1013.3
```

Select Units

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

UNIT [*x*]<cr>

where

x = Selects the unit type to output:
m = metric units, for example, Celsius
n = non-metric units, for example, Fahrenheit

Example:

```
>unit m
Unit                : Metric
```

Analog Output Settings

Set Analog Output Mode

Use the **AMODE** command to set the analog output mode and error level. Note that you cannot change between analog output types, for example, from voltage to current output.

AMODE [*channel lo_value hi_value error_value*]<cr>

where

channel = Analog output channel, 1 or 2.
lo_value = Low limit of the channel.
hi_value = High limit of the channel.
error_value = Error value of the channel.

Example (show current configuration):

```
>pass 9000
>amode
Aout 1 range ( V)   : 0.00 ... 5.00 (error: 5.50)
Aout 2 range ( V)   : 0.00 ... 5.00 (error: 5.50)
```

Example (set channel 1 to 0 ... 1 V output, with error level at 2 V):

```
>amode 1 0 1 2
Aout 1 range ( V)   : 0.00 ... 1.00 (error: 2.00)
```

Set Analog Output Scaling

Use the **ASEL** command to select the output quantity and scaling for analog output channels.

ASEL [*channel quantity lo_value hi_value*]<cr>

where

channel = Analog output channel, 1 or 2.
quantity = Quantity that is output on the channel. Available quantities are:

RH	relative humidity
T	temperature
Tdf	dew/frost point temperature
Td	dew point temperature
Tw	wetbulb temperature
h	enthalpy
x	mixing ratio
a	absolute humidity
dTd	dew/frost point depression

lo_value = Low limit of the scaling, in the units of the selected quantity.
hi_value = High limit of the scaling in the units of the selected quantity.

Example (set channel 1 to output dewpoint, in the range -10 ... 20 °C):

```
>pass 9000
>asel 1 TD -10 20
Aout 1 quantity     : Td (-10.00 ... 20.00 'C)
```

Set Output Clipping and Error Limit

Use the **AOVER** command to define the behavior of the analog outputs when the measured value is outside the scaled output range.

AOVER [*channel clip% valid%*]<cr>

where

channel = Analog output channel, 1 or 2.
clip% = Output margin (%) at which the output is clipped. Range 0 ... 20.
valid% = Output margin (%) at which the output of the channel goes into the error state. Range 0 ... 20. The error state is defined using the **AMODE** command, see section Set Analog Output Mode on page 32.

As an example, let us first check the current settings using the **ASEL** and **AMODE** commands:

```
>pass 9000
>asel
Aout 1 quantity     : RH (0.00 ... 100.00 %)
Aout 2 quantity     : T (-5.00 ... 55.00 'C)

>amode
Aout 1 range ( V)   : 1.00 ... 5.00 (error: 6.00)
Aout 2 range ( V)   : 1.00 ... 5.00 (error: 6.00)
```

The quantity for channel 2 is T, with standard output range 1 ... 5 V and scaling -5 ... 55 °C. Now we give the **AOVER** command:

```
>aover 2 10.0 20.0
Aout 2 clipping      : 10.00 %
Aout 2 error limit   : 20.00 %
```

Channel 2 now behaves like this:

- Clipping is now set to 10%, meaning the output is allowed to vary between 0.6 ... 5.4 V. The channel will output the measurement for -11 ... 61 °C, but range 1 ... 5 V remains scaled to show -5 ... 55 °C.
- Error limit is 20%, which means channel 2 will show the error state (6 V) when the measured value is 20% outside the scaled output range. With the settings above, this will happen if the measured temperature is outside range -17 ... 67 °C.
- The output will never actually be between 5.4 and 6.0 V because of clipping.

Display Settings

Select Quantities to Display

Use the **DSEL** command to select the quantities that are displayed on the transmitter screen. You can select quantities by abbreviation, or select same quantities as are assigned to the analog outputs. If only one quantity is selected, it is shown vertically centered on the transmitter screen.

DSEL [*Q1 Q2 Q2*]<cr>

where

Q1 = First quantity to show on the screen. Available quantities are:

out1	Same quantity as analog output channel 1
out2	Same quantity as analog output channel 2
RH	relative humidity
T	temperature
Tdf	dew/frost point temperature
Td	dew point temperature
Tw	wetbulb temperature
h	enthalpy
x	mixing ratio
a	absolute humidity
dTd	dew/frost point depression

Q2 = Second quantity to show on the screen. Available quantities are the same as for Q1.

Q3 = Third quantity to show on the screen. Available quantities are the same as for Q1.

Example (show currently displayed quantities):

```
>pass 9000
>dsel
Quant 1             : T
Quant 2             : RH
Quant 3             : Disabled
```

Example (change display to only show RH):

```
>dsel RH
OK
```

Example (change display to show same quantities as are assigned to analog output channels):

```
>dsel out1 out2
OK
```

Serial Line Output Commands

Start Measurement Output

Use the **R** command to start the continuous outputting of measurement values as an ASCII text string to the serial line. The format of the measurement message is set with the **FORM** command.

R<cr>

Example (measurement message in default format):

```
>r
RH = 21.71 %RH  T = 23.13 'C
RH = 21.72 %RH  T = 23.12 'C
RH = 21.77 %RH  T = 23.12 'C
RH = 21.77 %RH  T = 23.12 'C
...
```

Outputting the results continues in intervals issued with the command **INTV**. You can stop the output with the **S** command. Since the interface is half-duplex, you must enter the commands when the transmitter is not outputting.

Stop Measurement Output

You can stop the measurement output with the **S** command:

S<cr>

Output a Reading Once

Use the **SEND** command to output a single measurement message.

SEND<cr>

Example:

```
>send
RH = 21.72 %RH  T = 23.12 'C
```

Set Output Interval

Use the **INTV** command to change the output interval of the automatically repeating measurement messages. The measurement messages are repeated in the RUN mode, or after the **R** command has been given.

INTV [*n xxx*]<cr>

where

n = time interval, range 0 ... 9999.
xxx = time unit = "S", "MIN", or "H"

The shortest output interval (with n = 0) outputs the measurement messages as quickly as the transmitter produces them, without additional delay.

Example:

```
>intv 1 min
Output interval     : 1 min
```

Set Output Format

Use the serial line command **FORM** to change the measurement message sent by the transmitter on the service port. You can freely define the output message to include the desired parameters, formatting options, text strings, and additional fields.

FORM [*modifier string*]<cr>

where

modifier string = String of parameters and modifiers that defines the output format, length 1 ... 150 characters. Maximum length may be shorter when text strings are used. See Table 9 and Table 10 on page 39, and examples below.

Command to set default format:

>**form /**

Example of default output:

```
RH =  5.17 %RH  T = 24.33 'C
RH =  5.17 %RH  T = 24.33 'C
RH =  5.18 %RH  T = 24.33 'C
RH =  5.18 %RH  T = 24.33 'C
...
```

Command to set output format as Tdf and T with Modulus-256 checksum:

>**form "Tdf =" U3 4.2 tdf " T =" U3 3.2 t CS2 \r \n**

Output example:

```
Tdf = -15.72 'C  T = 24.38 'C C9
Tdf = -15.71 'C  T = 24.38 'C C8
Tdf = -15.71 'C  T = 24.38 'C C8
Tdf = -15.69 'C  T = 24.38 'C CF
...
```

Command to set output format as Tdf and T, with **start of text** (ASCII character 002) and **end of text** (003) ASCII codes, and without line feed and carriage return at the end:

>**form #002 "Tdf =" U3 3.2 tdf " T =" U3 3.2 t #003**

Output example (ASCII codes not visible here):

```
Tdf =-15.14 'C  T = 24.40 'CTdf =-15.14 'C  T = 24.40 'CTdf
=-15.14 'C  T = 24.40 'CTdf =-15.14 'C  T = 24.40 'CTdf =-
15.13 'C  T = 24.40 'CTdf =-15.13 'C  T = 24.40 'C ...
```

Table 9 FORM Command Parameters

Measured Parameter	Abbreviation in FORM Command
Relative humidity	RH
Temperature	T
Dew/frost point temperature	Tdf
Dewpoint temperature	Td
Wetbulb temperature	Tw
Enthalpy	h
Mixing ratio	x
Absolute humidity	a
Dew/frost point depression	dTd

Table 10 FORM Command Modifiers

Modifier	Description
x.y	Length modifier (number of digits and decimal places)
#t	Tabulator
#r	Carriage-return
#n	Line feed
""	String constant, length 1 ... 15 characters
#xxx	ASCII code value (decimal) of a special character; for example, **#027** for ESC
Ux	Shows the name of the measurement unit using "x" number of characters. For example, **U3** shows the name of the measurement unit with three characters
CS2	Modulus-256 checksum of message sent so far, ASCII encoded hexadecimal notation
CS4	Modulus-65536 checksum of message sent so far, ASCII encoded hexadecimal notation
CSX	NMEA xor-checksum of message sent so far, ASCII encoded hexadecimal notation

NOTE When entering modifiers, you can also use the backslash character "\" instead of the hash "#".

Serial Line Settings

Set Remote Echo

Use the **ECHO** command to enable or disable remote echo by the transmitter.

ECHO [*on/off*]<cr>

Example:

```
>echo on
Echo                 : ON
```

Set Serial Line Response Time

With the **SDELAY** command you can set delay (response time) of the serial line, or view the currently set delay value.

SDELAY [*delay*]<cr>

where

delay = Serial line delay in milliseconds, range 1 … 1000.

Example:

```
>sdelay 5
COM1 transmit delay : 5
```

Relay Configuration in Custom Mode

NOTE	Relay is included on HMW93 transmitters only.

Additional configuration options are available when relay functionality is configured via software. The configuration is done using the **RMODE** and **RSEL** commands. For examples, see section Relay Configuration Examples on page 42.

Set Relay Mode

Use the **RMODE** command to show or set the relay activation mode.

RMODE [*mode*]<cr>

where

mode = Activation mode of the relay. Options are:
None (relay is disabled, always open)
Lo_active (relay closed when below setpoint)
Hi_active (relay closed when above setpoint)
Fault (relay closed when transmitter in error state)
Not_fault (relay closed when transmitter not in error state)

Example (set relay to Lo_active mode):

```
>pass 9000
>rmode lo_active
Relay mode          : Lo_Active
```

Set Relay Quantity and Limits

Use the **RSEL** command to show or set the quantity that controls the relay, and the limits that are applied.

RSEL [*quantity lo_value hi_value*]<cr>

where

quantity = Quantity that controls the relay. Available quantities are:

RH	relative humidity
T	temperature
Tdf	dew/frost point temperature
Td	dew point temperature
Tw	wetbulb temperature
h	enthalpy
x	mixing ratio
a	absolute humidity
dTd	dew/frost point depression
Disabled	no quantity, relay disabled

lo_value = Low limit of relay activation.
hi_value = High limit of relay activation.

Example (show current settings):

```
>pass 9000
>rsel
Relay configuration   : RH (88.00 ... 92.00 %)
```

Example (set temperature as relay quantity, low limit 25, high limit 30):

```
>rsel t 25 30
Relay configuration   : T (25.00 ... 30.00 'C)
```

Relay Configuration Examples

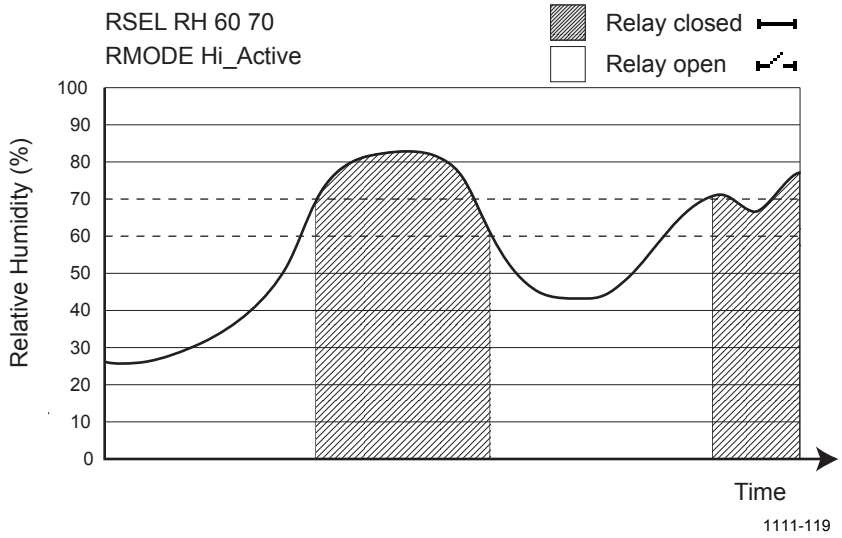


Figure 16 Relay Hi_Active in Custom Mode

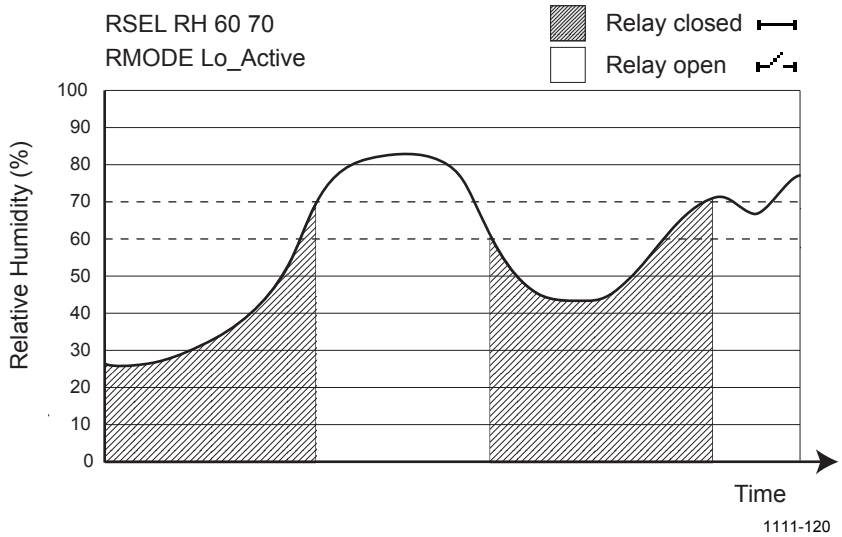


Figure 17 Relay Lo_active in Custom Mode

Calibration and Adjustment Commands

The following sections describe the calibration and adjustment commands of the HMW90 series. For general information on performing calibration and adjustment on the serial line, see section Adjustment Using a PC on page 54.

The 1-point humidity adjustment of the HMW90 series adjusts both offset and gain, depending on the adjustment condition. In a dry condition (for example, 11 %RH), offset is adjusted more than gain.

NOTE	The 1-point humidity adjustment requires that the target condition is at least 50% of the currently measured value. This prevents the user from making excessive corrections that are very unlikely to be needed. However, if you feel that you may have done an incorrect adjustment, you can easily remove the adjustment using the **CRH RESET** command.

Adjust Humidity Measurement

Use the **CRH** command to perform a humidity adjustment of the relative humidity (RH) measurement. You can do a 1-point or a 2-point adjustment, or clear the adjustment information from the HTM10 module. Note that the factory adjustment will remain intact when user adjustment is cleared.

Show Current RH Adjustment

CRH<cr>

Example (showing default offset and gain):

```
>pass 9000
>crh
RH Gain             : 1.000
RH Offset           : 0.000
```

1-point Adjustment of RH Measurement

The 1-point adjustment adjusts both offset and gain depending on the adjustment condition. The same type of adjustment is done when turning the RH trimmer.

Place the transmitter in the reference condition and allow it to stabilize before entering the adjustment.

CRH [*ONE*] [*x*]<cr>

where

x = The reference humidity condition (%RH) that the transmitter should be showing.

Example:

```
>pass 9000
>crh one 11
OK
```

2-point Adjustment of RH Measurement

CRH [*LO* | *HI*] [*x*]<cr>

where

LO = Adjustment point at the dry end (low RH).
HI = Adjustment point at the wet end (high RH). The difference between the two points should be at least 30 %RH.
x = The reference humidity condition (%RH) that the transmitter should be showing.

The 2-point correction is not applied immediately – you must use the **CRH SAVE** command to store your adjustment to the HTM10 module. If you have entered user adjustments using the CRH command but do not wish to commit them, use the **CRH CANCEL** command.

CRH [*SAVE* | *CANCEL*]<cr>

Example (two point adjustment, low point 11 %RH and high point 75 %RH):

```
>pass 9000
>crh lo 11
OK
>crh hi 75
OK
>crh save
OK
```

Clear User Adjustment of RH Measurement

CRH [*RESET*]<cr>

Example:

```
>pass 9000
>crh reset
OK
```

Adjust Temperature Measurement

Use the **CT** command to perform an adjustment of the temperature measurement. You can do a 1-point adjustment or clear the adjustment information from the HTM10 module. Note that the factory adjustment will remain intact when user adjustment is cleared.

Show Current T Adjustment

CT<cr>

Example (showing default temperature offset):

```
>pass 9000
>ct
Temperature offset  : 0.000
```

1-point Adjustment of T Measurement

Place the transmitter in the reference condition and allow it to stabilize before entering the adjustment.

CT [*x*]<cr>

where

x = The reference temperature (in degrees Celsius) that the transmitter should be showing.

Example:

```
>pass 9000
>ct 23
OK
```

Clear User Adjustment of T Measurement

CT [*RESET*]<cr>

Example:

```
>pass 9000
>ct reset
OK
```

Enter Calibration and Adjustment Information

Use the **CTEXT** command to store a text string that describes the calibration and/or adjustment. To enter a text string with spaces, enclose the string in quotation marks. Use the **CDATE** to store the date.

CTEXT [*text*]<cr>

CDATE [*YYYY-MM-DD*]<cr>

Examples:

```
>pass 9000
>ctext "adjusted rhlab/Tech021"
"adjusted rhlab/Tech021"

>cdate 2011-12-08
Calibration date    : 2011-12-08
```

Testing Commands

Test Analog Outputs

Use the **ATEST** command to force the analog outputs to the given value. Before using the **ATEST** command it is useful to give the **AMODE** command to verify the output mode of the channels.

ATEST [*channel value*]<cr>

where

channel = Number of analog output channel to be tested (1 or 2).
value = Voltage or current value to set the channel to. Unit is determined according to output type (V or mA).

The value you set may not be achievable by the transmitter. Voltage output can go as high as 12 V, and current output can go up to 25 mA. Also, output cannot go down to exactly zero.

After testing the output, give the **ATEST** command with the channel number to exit the test mode.

Example (verify output mode of the channels):

```
>pass 9000
>amode
Aout 1 range ( V)   : 0.00 ... 5.00 (error: 5.50)
Aout 2 range ( V)   : 0.00 ... 5.00 (error: 5.50)
```

Example (set channel 1 to 6 V):

```
>atest 1 6
Aout1 ( V)          : 6.000
```

Example (end test mode for channel 1, resume normal output):

```
>atest 1
Aout1 test mode disabled.
```

Test Relay Operation

Use the command **RTEST** to test the operation of the relay. Issue the command without parameters to end the relay test.

RTEST [*state*]<cr>

where

state = State of the relay contacts. Options are:
open (open the relay contacts)
closed (close the relay contacts)

Example (close relay contacts):

```
>pass 9000
>rtest closed
Relay test mode     : Closed
```

Example (exit relay test mode, resume normal operation):

```
>rtest
Relay test mode     : Canceled
```

Other Commands

Enable Advanced Serial Commands

Use the **PASS** command to enable the advanced serial commands.

PASS [*passcode*]<cr>

where

passcode = Passcode to enable advanced commands is **9000**.

Example:

```
>pass 9000
```

Revert to Factory Settings

Use the **FRESTORE** command to restore the transmitter to factory settings. Restoring the factory settings also clears the user-made humidity and temperature adjustments from the HTM10 module. The factory calibration will remain.

FRESTORE<cr>

Example:

```
>pass 9000
>frestore
Restoring HTM10 factory parameters
HTM10 factory parameters restored
Restoring HMW93 factory settings
72/72 parameters restored
OK
```

Reset Transmitter

Use the **RESET** command to reset the transmitter.

RESET<cr>

Example:

```
>reset
Resetting
HMW93 / 1.00.00.0000 / XM90
>
```

CHAPTER 5

MAINTENANCE

This chapter provides information that is needed in basic maintenance of the HMW90 series.

Periodic Maintenance

Cleaning

The body of the transmitter can be cleaned by wiping with a moistened lint-free cloth. Do not use cleaning agents or solvents, or blow pressurized air into the transmitter housing.

Do not attempt to clean contaminated HTM10 modules and HUMICAP® sensors. Dirty modules should always be replaced with new calibrated modules.

Calibration and Adjustment

HMW90 series transmitters are fully calibrated as shipped from factory. Calibration and adjustment services are available through Vaisala Service Centers.

HMW90 series transmitters have a display that makes it easy to compare the measured readings against any portable calibration reference. Note that depending on the ordered configuration, the display may be hidden under the sliding cover.

For adjustment of the measurement, you have the following options:

- 1-point adjustment using the trimmers under the sliding cover. See section Adjustment Using Display and Trimmers on page 52.
- 1-point or 2-point adjustment using the service port. See the following sections:
  - Adjustment Using an HM70 on page 53.
  - Adjustment Using a PC on page 54.
- Replacement of the Humidity and Temperature Module HTM10, which can be ordered as a spare part. See section Replacing the HTM10 Module on page 55.

The adjustment of temperature measurement is always a simple 1-point offset correction.

The 1-point humidity adjustment of the HMW90 series adjusts both offset and gain, depending on the adjustment condition. In a dry condition (for example, 11 %RH), offset is adjusted more than gain.

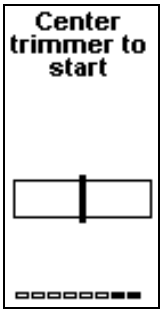
NOTE The 1-point humidity adjustment requires that the target condition is at least 50% of the currently measured value. This prevents the user from making excessive corrections that are very unlikely to be needed. However, if you feel that you may have done an incorrect adjustment, you can easily remove the adjustment using the HM70 or the **CRH RESET** command on the serial line.

Adjustment Using Display and Trimmers

CAUTION	The trimmers only turn 135 degrees each way, less than half a rotation. Do not force the trimmer past the stopping point.

NOTE	User calibration settings (adjustment by trimmers or service port) are stored in the HTM10 module. If you replace the module, there is no need to undo previous adjustments.

1. To enter the adjustment screen, open the slide and rotate the RH or T trimmer slightly during normal measurement. If the trimmer is not centered, you see the trimmer centering screen first. Simply turn the trimmer to the center and wait for the progress bar to complete.



1111-075

Figure 18 Trimmer Centering Screen

2. In the adjustment screen, turn the trimmer to set the desired correction. To commit the change, stop turning the trimmer and wait.

1111-076

Figure 19 Trimmer Centering Screen

3. If you wish to apply a greater correction than allowed by the trimmer in a single adjustment, re-enter the adjustment screen and apply a new correction. Corrections applied using the trimmers are cumulative.

Adjustment Using an HM70

1. Connect the HMW90 series transmitter to the HM70 hand-held meter using the connection cable (Vaisala order code 219980).
2. Depending on the connected devices, you may be prompted by the HM70 meter to check the currently applied environment settings. Check the settings when prompted.
3. In the **Functions** menu of the HM70, select **Calibrate XMW9x** and press **Start**.
4. Confirm **Yes**. Confirm the automatic power off notification with **Ok**.
5. Select quantity for adjustment, T or RH.
6. Screen shows the measured values and their difference. Press **Adjust** to select the Adjustment mode.
7. Select the desired adjustment type using arrow buttons and press **Select**:
   - **To same as reference**: Adjusts the measurement of the HMW90 transmitter to the same reading as the reference that is connected to the other port. When the quantity being adjusted is RH, both offset and gain are adjusted, depending on the adjustment condition (same as when turning the RH trimmer). This option is not available if no reference is connected to the HM70.
   - **1-point adjustment**: Adjusts the measurement of the HMW90 to a reference value that you specify. When the quantity being adjusted is RH, both offset and gain are adjusted, depending on the adjustment condition (same as when turning the RH trimmer). Follow the instructions from the HM70 when using this option.
   - **2-point adjustment**: Adjusts the measurement of the HMW90 at two points to reference values that you specify. This option is not available when adjusting temperature (T).
   - **Revert factory calib.**: This option removes the currently applied user adjustment from the HTM10 module. Only the adjustment for the selected quantity is removed (RH or T).
8. Complete the selected adjustment by following the instructions from the HM70.

Adjustment Using a PC

For more detailed instructions on using the Vaisala USB cable and a terminal application, see section Connecting With a PC on page 23.

For a description of the serial commands, see section Calibration and Adjustment Commands on page 43.

1. Connect the HMW90 series transmitter to your PC using the Vaisala USB cable (order code 219690).
2. Start a terminal application and open a new session to the service port of the transmitter. The serial line settings are 19200, N, 8, 1.
3. Before changing the adjustment, issue the following commands to see the transmitter's current adjustment information:

```
pass 9000
crh
ct
ctext
cdate
```

4. Place the entire transmitter in the desired reference condition and allow the measurement to stabilize. Follow the stabilization from the serial line (output from the **R** command) or the display.
5. You can now use the **CRH** and **CT** commands to adjust the transmitter's RH and T measurement. Refer to the command descriptions for the available options.
6. After performing the adjustment, verify from the serial line or the display that the measurement has been corrected.
7. After completing the adjustments, you can enter a descriptive text string in the transmitter's memory using the **CTEXT** command, and note the adjustment date using the **CDATE** command.

Repair Maintenance

Repair services are available through Vaisala Service Centers. For contact information of Vaisala Service Centers, see www.vaisala.com/servicecenters.

Replacing the HTM10 Module

If you cannot restore the measurement accuracy of the transmitter by calibration and adjustment, you can replace the HTM10 module inside the transmitter. HTM10 module is the small separate component board with the HUMICAP® sensor; see Figure 3 on page 12.

NOTE	User calibration settings (adjustment by trimmers or service port) are stored in the HTM10 module. If you replace the module, you do not need to undo the previously applied correction.

CAUTION	Handle the HTM10 module carefully. When reinstalling the transmitter body to the mounting base, avoid touching the HUMICAP® sensor or the module.

1. Disconnect the transmitter body from the mounting base.
2. With your fingers, push apart the two plastic holders that hold the HTM10 module and pull out the module.

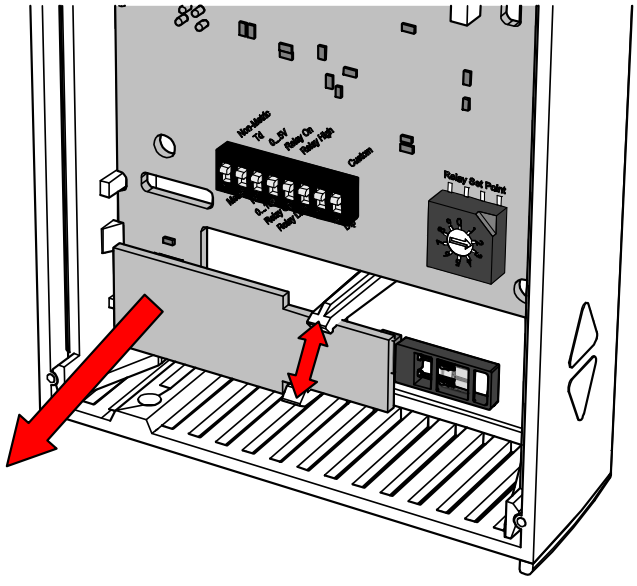


Figure 20 Replacing the HTM10 Module

3. Take the new module and insert the pins to the connector on the transmitter's component board.
4. Push down on the module so that the plastic holders clip into place.
5. Reconnect the transmitter to the mounting base.
6. Verify that there are no errors when the transmitter starts up. If you see the errors **HTM10 01** or **HTM10 02** on the screen, it is likely that the module is not seated properly in the connector. In that case, disconnect the transmitter body and try again.

CHAPTER 6
TROUBLESHOOTING

This chapter describes common problems, their probable causes and remedies, and provides contact information for technical support.

Problem Situations

Table 11 Troubleshooting Table

Problem	Possible Causes and Solutions
Temperature reading shown by the transmitter is too high.	1. The transmitter may be installed in an unsuitable location, for example, near a heat source or in sunlight. See section Relay Configuration in Rotary Switch Mode on page 17. 2. Check that the transmitter is installed in proper orientation, with the arrow on the mounting base pointing up.
Relay does not seem to be working as configured.	1. Check DIP switch settings. Is the relay configured using DIP switches and rotary switch, or software? Check that the rotary switch is not between two positions. 2. Note the effect of hysteresis in rotary switch mode (±2 %RH). See section Relay Configuration in Rotary Switch Mode on page 15. 3. Connect to the service port using a PC and use the **STATUS** command to view the current relay settings. 4. Use the **RTEST** command to test that the relay is working properly.
Transmitter does not recognize a valid serial command, responds with message `FAIL 1: Unknown command`	1. The command may be one of the advanced commands, and you have not enabled them using the **PASS 9000** command. 2. If you are using remote echo on the transmitter, disable it with the **ECHO OFF** command to avoid collisions. 3. There may be an intermittent connection problem between the transmitter and your terminal. Issue the command again.

Error Messages

Error Messages on the Display

Table 12 Error Messages on the Display

Error Message	Possible Cause and Solution
HTM10 01 HTM10 02	Communication failure with HTM10 module. Reconnect the module and check that it sits firmly in place.
HTM10 03 HTM10 04 HTM10 05	Problem with the HTM10 module. 1. Check for damage or missing humidity sensor. 2. Replace the module if unable to remove the problem.
Internal 1 Internal 2 Internal 3	Internal problem with the transmitter. 1. Reset the transmitter. 2. Restore the factory settings using service port if reset does not help.

Error Messages on the Serial Line

View Currently Active Errors

Use the **ERRS** command to view currently active errors on the serial line:

ERRS<cr>

Example:

```
>errs
NO ERRORS
```

View Error Table

Use the **ERRT** command to view the table of possible transmitter errors. The table includes error ID, error count since last reset, level, current state, and error text. Most of the errors can be seen also on the display (see Table 12 on page 58) but there are some that can only be viewed on the serial line.

ERRT<cr>

Example:

```
>errt
Id:     N:     Level:State: Error text
 1:     0:  CRITICAL:OFF: FLASH memory corrupted
 2:     0:  CRITICAL:OFF: Parameter read (using defaults)
 3:     0:  CRITICAL:OFF: Parameter write
 4:     0:  CRITICAL:OFF: HTM10 03 FLASH Corrupted
21:     0:     ERROR:OFF: HTM10 04 RH measurement
22:     0:     ERROR:OFF: HTM10 05 T measurement
23:     0:     ERROR:OFF: HTM10 01 Continuous communication failure
43:     0:   WARNING:OFF: Factory parameter memory not consistent
41:     0:   WARNING:OFF: HTM10 02 Single Communication failure
42:     0:   WARNING:OFF: HTM10 06 Device Descriptor match
```

Table 13 Error Messages on the Serial Line

Error ID	Possible Cause and Solution
23 41	Communication failure with HTM10 module. Reconnect the module and check that it sits firmly in place.
4 21 22	Problem with the HTM10 module. 1. Check for damage or missing humidity sensor. 2. Replace the module if unable to remove the problem.
1 2 3 43 42	Internal problem with the transmitter. 1. Reset the transmitter. 2. Restore the factory settings using service port if reset does not help.

Error State

If there are any active “critical” or “error” level errors active in the transmitter, both analog outputs are set into a defined error level instead of the measured result. The error level depends on the output type:

- For 0 ... 5 V output, the default error level is **5.5 V**
- For 0 ... 10 V output, the default error level is **11 V**
- For 4 ... 20 mA output, the default error level is **3.6 mA**

If all “critical” and “error” level errors are turned off (by removing their cause), transmitter resumes normal operation of analog outputs.

You can configure the error level using the **AMODE** command. See section Set Analog Output Mode on page 32.

NOTE	You can also use the **AOVER** command to configure a channel to go to the error level if the measured quantity is sufficiently far out of the measured range. See section Set Output Clipping and Error Limit on page 34.

Technical Support

For technical questions, contact the Vaisala technical support by e-mail at helpdesk@vaisala.com. Provide at least the following supporting information:

- Name and model of the product in question.
- Serial number of the product.
- Name and location of the installation site.
- Name and contact information of a technically competent person who can provide further information on the problem.

Product Returns

If the product must be returned for service, see www.vaisala.com/returns.

For contact information of Vaisala Service Centers, see www.vaisala.com/servicecenters.

CHAPTER 7
TECHNICAL DATA

This chapter provides the technical data of the HMW90 series transmitters.

Specifications

Table 14 Performance

Property	Description / Value
Relative humidity	
Measurement range	0 ... 100 %RH
Accuracy Temperature range +10 ... +40 °C (+50 ... +104 °F) 0 ... 90 %RH 90 ... 100 %RH Temperature range -5 ... +10 °C, +40 ... + 55 °C (+23 ... +50 °F, +104 ... +131°F) 0 ... 90 %RH 90 ... 100 %RH	 ±1.7 %RH ±2.5 %RH ±3 %RH ±4 %RH
Stability in typical HVAC applications	±0.5 %RH/year
Humidity sensor	Vaisala HUMICAP® 180R
Temperature	
Measurement range	-5 ... +55 °C (+23 ... +131 ºF)
Accuracy +20 ... +30 °C (+68 ... +86 °F) +10 ... +20 °C, +30 ... +40°C (+50 ... +68 °F, +86 ... +104 °F) -5 ... +10 °C, +40...+55°C (+23 ... +50 °F, +104 ... +131 °F)	 ±0.2 °C (± 0.36 °F) ±0.3 °C (± 0.54 °F) ±0.5 °C (± 0.90 °F)
Temperature sensor	Digital temperature sensor

Table 15 Operating Environment

Property	Description / Value
Operating temperature range	-5 ... +55 °C (+23 ... +131 °F)
Storage temperature range	-20 ... +60 °C (-4 ... +140 °F)
Electromagnetic compliance	Complies with EMC standard EN61326-1, Industrial Environment

Table 16 Inputs and Outputs

Property	Description / Value
HMW92	
Outputs	2 x 4 ... 20 mA, loop powered
Loop resistance	0 ... 600 Ω
Supply voltage	20 ... 28VDC at 500 Ω load 10 .... 28VDC at 0 Ω load
Isolation between output channels	500VDC
HMW93	
Outputs	2 x 0 ... 5V, 0 ... 10 V
Load resistance	10 kΩ min.
Supply voltage	18 ... 35 VDC 24 VAC ±20 % 50/60 Hz
Max. current consumption	12 mA max. with relay 25 mA
Relay	1 pc (SPST, max. 50 VDC, 500 mA)
3-wire installation max cable resistance	2.5 Ω at 24V supply (with 10 V output, relay not used)
Service port	RS-485 line for temporary service use

Table 17 Mechanics

Property	Description / Value
IP class	IP30
Housing color	RAL9003
Housing material	ABS/PC, UL-V0 approved
Output connector	Screw terminals max. wire size 2 mm^2 (AWG14)
Service port connector	4-pin M8
Weight	155 g

Spare Parts and Accessories

Table 18 HMW90 Series Spare Parts and Accessories

Description	Order Code
Humidity and Temperature Module	HTM10SP
Connection cable for HM70 hand-held meter	219980
USB cable for PC connection	219690

Dimensions in mm

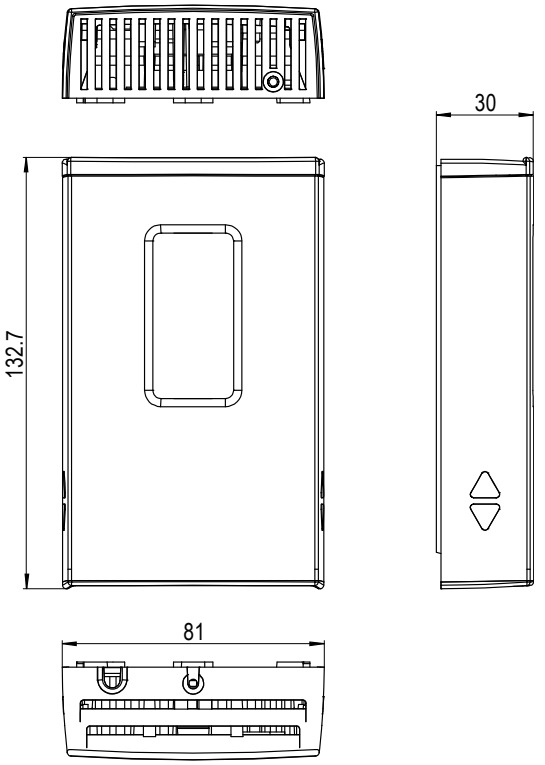


Figure 21 HMW90 Series Dimensions

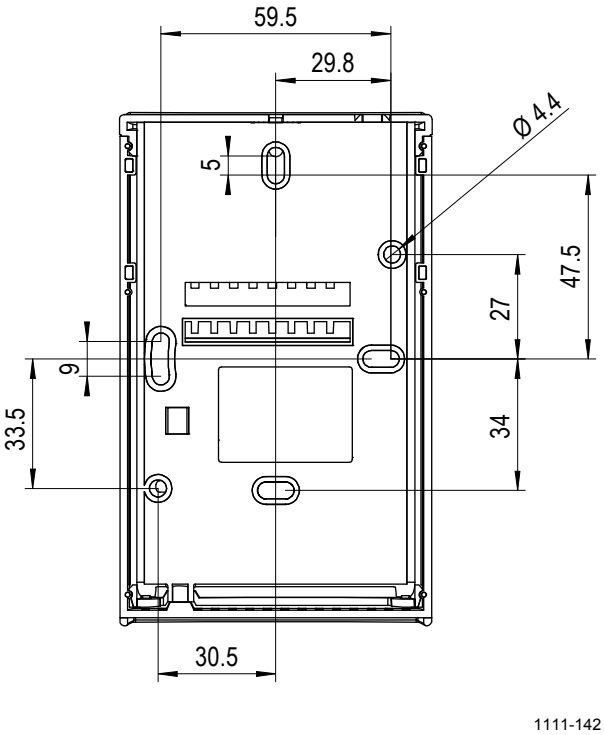
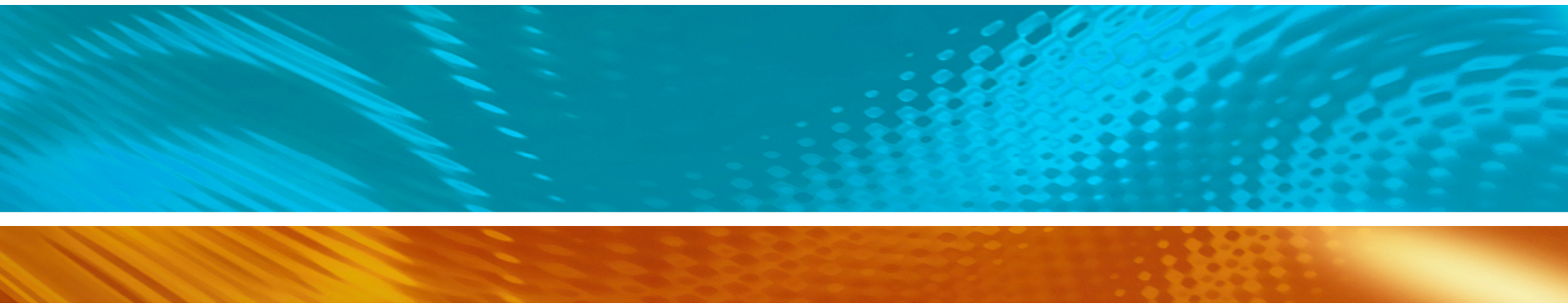


Figure 22 Dimensions of the Mounting Base



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