# USER'S GUIDE

## Vaisala INTERCAP® Humidity and Temperature Transmitters HMDW80 Series

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CHAPTER 1
# GENERAL INFORMATION

This chapter provides general notes for the manual and the HMDW80 series.

## About This Manual

This manual provides information for installing, operating, and maintaining HMDW80 series transmitters.

### Contents of This Manual

This manual consists of the following chapters:

- Chapter 1, General Information, provides general notes for the manual and the HMDW80 series.
- Chapter 2, Product Overview, introduces the features and options of the HMDW80 series transmitters.
- Chapter 3, Installation, provides you with information that is intended to help you install HMDW80 series transmitters.
- Chapter 4, Maintenance, provides information that is needed in basic maintenance of HMDW80 series.
- Chapter 5, Troubleshooting, describes possible problems, their probable causes and remedies, and provides contact information for technical support.
- Chapter 6, Technical Data, provides the technical data of the HMDW80 series.

# Version Information

**Table 1        Manual Revisions**

| Manual Code | Description |
|---|---|
| M211510EN-E | May 2016. This manual. Changes:<br>- Added transmitter models TMS82, TMW88, and HMW82P100.<br>- Updated the HMD82(D)/HMW88(D)/HMS82 wiring diagram for one power supply alternative.<br>- Updated the HMD82(D), HMW88(D), HMS82, and TMD82 power supply requirements information in wiring diagrams. |
| M211510EN-D | March 2015. Previous version. Changes:<br>- Updated wiring information for models HMD82(D), HMW88(D), and HMS82.<br>- Updated troubleshooting instructions.<br>- Updated technical specification: accuracy of calculated parameters and current consumption of voltage output models.<br>- Updated list of spare parts and accessories. |
| M211510EN-C | June 2013. Changes:<br>- Added outdoor transmitter models HMS82 and HMS83.<br>- Changed PTFE membrane filter model from 230727SP (30 mm long) to ASM210856SP (24.5 mm long).<br>- Changed PTFE filter model from 219452SP (40 mm long) to DRW239993SP (22 mm long).<br>- Improved IP classification of models with display to IP65. |

# Related Manuals

**Table 2        Related Manuals**

| Manual Code | Manual Name |
|---|---|
| M211507EN | HMD82 HMD83 Wiring Diagram |
| M211508EN | HMW88 HMW89 TMW88 Wiring Diagram |
| M211328EN | HMW82 HMW83 Quick Guide |
| M211509EN | HMS82 HMS83 TMS82 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 HMDW80 series transmitter delivered to you has been tested for safety and approved as shipped from the factory. Note the following precautions:

| WARNING | Installation of HMDW80 series transmitters may involve working at a height. Assess the risks and plan your work so it is carried out safely. Try avoiding work at height, if you can. |
|---|---|

| CAUTION | Make sure the wires are de-energized when you connect them to the screw terminals. |
|---|---|

| 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, 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

HMDW80 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.



# Trademarks

INTERCAP® is a registered trademark of Vaisala Oyj.

# Software License

This product contains software developed by Vaisala. Use of the software is governed by license terms and conditions included in the applicable supply contract or, in the absence of separate license terms and conditions, by the General License Conditions of Vaisala Group.

# Warranty

Visit our Internet pages for 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 and options of the HMDW80 series transmitters.

## Introduction to HMDW80 Series

Vaisala INTERCAP® Humidity and Temperature Transmitter Series HMDW80 measure relative humidity and temperature in various building automation applications. Transmitters combine easy installation and reliable operation with a low requirement for maintenance.

HMDW80 series includes transmitters for wall and duct mounting, humid areas, and for outdoor installation. It also includes temperature-only transmitters and transmitters with an optional display. Calculated humidity parameters – dewpoint, wet bulb temperature, and enthalpy – are also available.

HMDW80 series transmitters require minimal maintenance thanks to their excellent sensor stability and high-quality materials. If necessary, the INTERCAP® humidity sensor can be easily exchanged in the field with practically no downtime.

Features provided by transmitters in the HMDW80 series:

- ±3.0 %RH accuracy.
- 0 ... 100 %RH measurement range.
- User exchangeable INTERCAP® humidity sensor for easy field replacement.
- Several output parameters; see HMDW80 Series Transmitter Models on page 11 for list of supported parameters by transmitter model.
- Several IP65-classified models for demanding HVAC applications.
- UL-V0 flammability rating.

# HMDW80 Series Transmitter Models

Table 3 below lists the most important differences between the HMDW80 series transmitter models. For technical specifications, see Chapter 6, Technical Data, on page 43.

**Table 3          HMDW80 Series Transmitter Models**

| Model | Type | Outputs | Display | IP Rating | Output Parameters |
|---|---|---|---|---|---|
| HMD82 | Duct | 2 × 4 ... 20 mA | No | IP65 | T, RH, Td, h, Tw |
| HMD82D | Duct | 2 × 4 ... 20 mA | Yes | IP65 | T, RH, Td, h, Tw |
| TMD82 | Duct | 1 × 4 ... 20 mA | No | IP65 | T |
| HMD83 | Duct | 2 × 0 ... 10 V | No | IP65 | T, RH, Td, h, Tw |
| HMD83D | Duct | 2 × 0 ... 10 V | Yes | IP65 | T, RH, Td, h, Tw |
| TMD83 | Duct | 1 × 0 ... 10 V | No | IP65 | T |
| HMW82 | Wall | 2 × 4 ... 20 mA | No | IP30 | T, RH |
| HMW82P100 | Wall | 2 × 4 … 20 mA | No | IP30 | T, RH |
| TMW82 | Wall | 1 × 4 ... 20 mA | No | IP30 | T |
| HMW83 | Wall | 2 × 0 ... 10 V | No | IP30 | T, RH |
| TMW83 | Wall | 1 × 0 ... 10 V | No | IP30 | T |
| HMW88 | Wall | 2 × 4 ... 20 mA | No | IP65 | T, RH, Td, h, Tw |
| HMW88D | Wall | 2 × 4 ... 20 mA | Yes | IP65 | T, RH, Td, h, Tw |
| HMW89 | Wall | 2 × 0 ... 10 V | No | IP65 | T, RH, Td, h, Tw |
| TMW88 | Wall | 1 × 4 … 20 mA | No | IP65 | T |
| HMW89D | Wall | 2 × 0 ... 10 V | Yes | IP65 | T, RH, Td, h, Tw |
| HMS82 | Outdoor | 2 × 4 ... 20 mA | No | IP65 | T, RH, Td, h, Tw |
| HMS83 | Outdoor | 2 × 0 ... 10 V | No | IP65 | T, RH, Td, h, Tw |
| TMS82 | Outdoor | 1 x 4 … 20 mA | No | IP65 | T |

# Output Parameters Explained

**Table 4          Parameters Supported by HMDW80 Series**

| Parameter | Symbol | Unit(s) | Description |
|---|---|---|---|
| Temperature | T | °C<br>°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<br>°F | Temperature at which the water vapor in the air will condense into water at the current pressure. When the dewpoint is below 0 °C, the transmitter outputs frostpoint (Tf) instead of dewpoint. |
| Enthalpy | h | kJ/kg<br>BTU/lb | Sum of the internal energy of a thermodynamic system. |
| Wet bulb temperature | Tw | °C<br>°F | The minimum temperature that can be reached by evaporative cooling in the current conditions. |

# Transmitter Parts – Duct Models
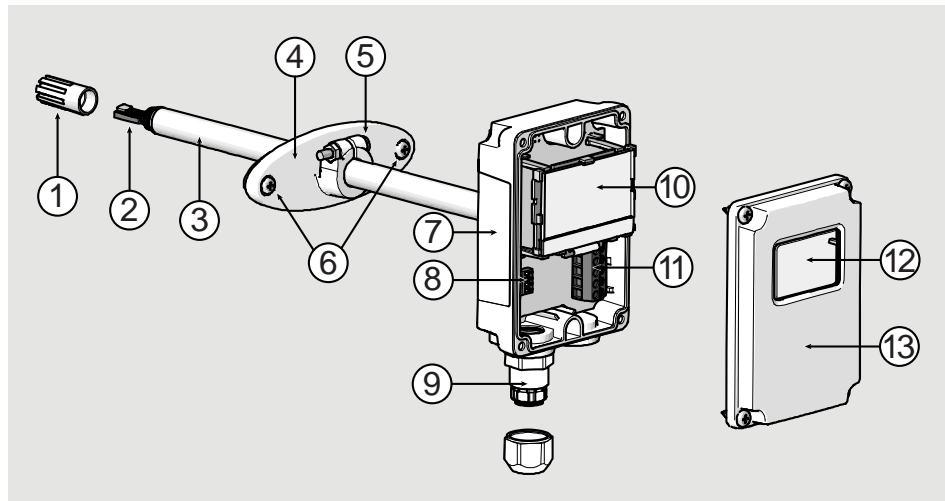


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**Figure 1        Parts of Duct Mounted Models (HMD82/83 and TMD82/83)**

1  =  PTFE membrane filter (spare part item ASM210856SP).
2  =  INTERCAP® humidity sensor and temperature sensor.
      Not included in TMD82 and TMD83 models.
3  =  Probe.
4  =  Fastening flange.
5  =  Tightening screw for fastening flange.
6  =  Screws for attaching the flange to a duct (2 pcs included).
7  =  Type label.
8  =  DIP switches for selecting humidity parameter and display units.
      Not included in TMD82 and TMD83 models.
9  =  Cable gland. Suitable for 4 ... 8 mm diameter cable.
10 =  Display (in HMD82D and HMD83D models).
11 =  Screw terminals.
12 =  Window for display (in HMD82D and HMD83D models).
13 =  Transmitter cover with captive screws.

# Transmitter Parts – Wall Models
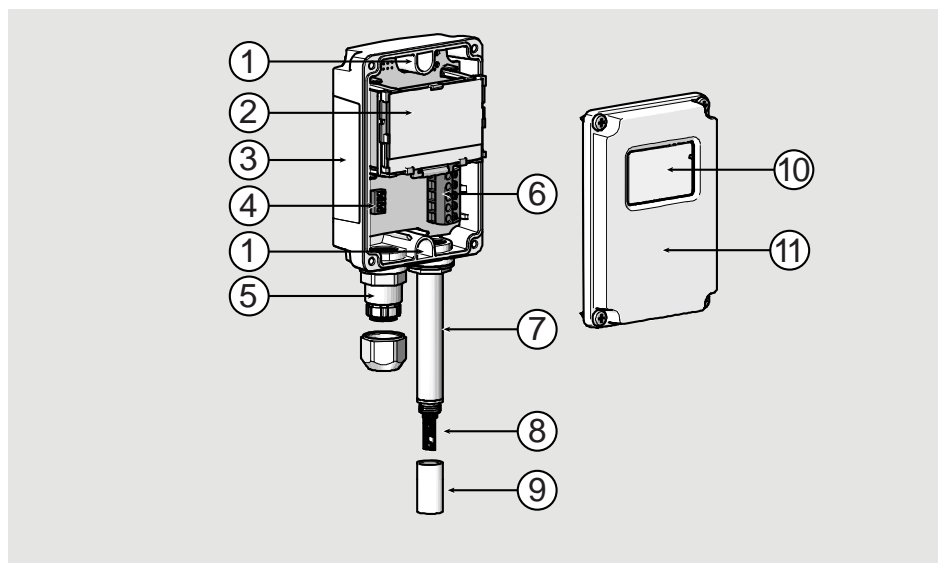


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**Figure 2          Parts of Wall Mounted Models (HMW88/89, TMW88)**

1 = Screw holes for mounting (2 pcs).
2 = Display (in HMW88D and HMW89D models).
3 = Type label.
4 = DIP switches for selecting humidity parameter and display units
5 = Cable gland. Suitable for 4 ... 8 mm diameter cable.
6 = Screw terminals.
7 = Probe.
8 = INTERCAP® humidity sensor and temperature sensor.
9 = PTFE filter (spare part item DRW239993SP).
10 = Window for display (in HMW88D and HMW89D models)
11 = Transmitter cover with captive screws.
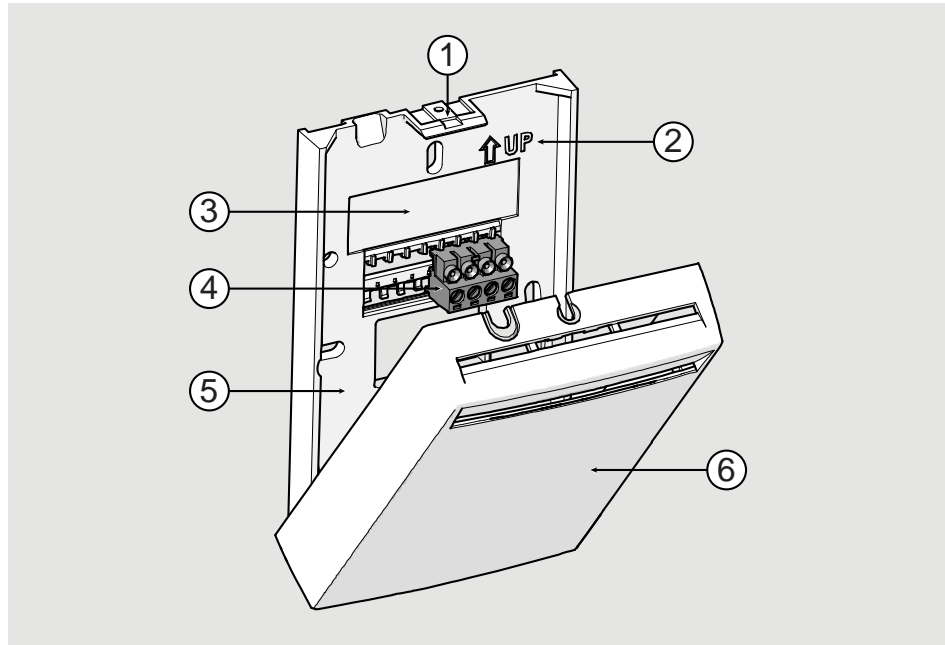
1302-020

**Figure 3      Parts of Wall Mounted Models (HMW82/82P100/83 and TMW82/83)**

1   =   Opening tab: push down to open the transmitter.
2   =   Direction arrow. Must point up after mounting base has been installed on the wall.
3   =   Wiring label.
4   =   Screw terminals.
5   =   Mounting base.
6   =   Transmitter cover with component board.

# Transmitter Parts – Outdoor Models
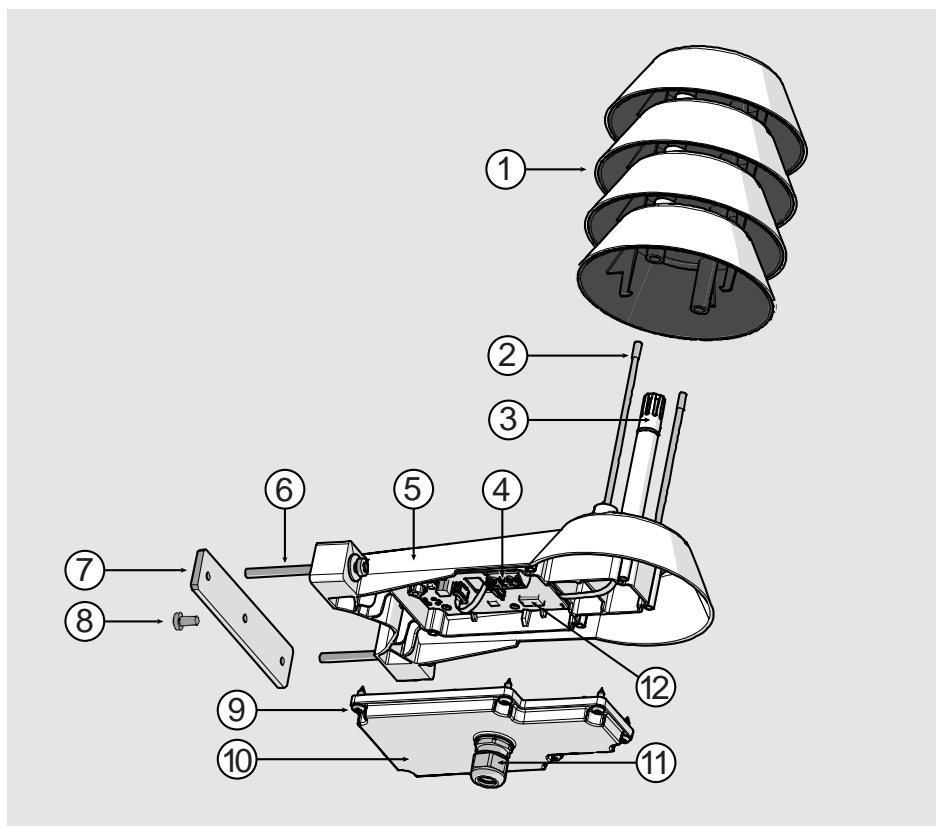


1304-048

**Figure 4        Parts of Outdoor Models (HMS82/83, TMS82)**

1 = Radiation shield. Do not remove for installation, only when changing sensor or filter.
2 = Long screws that keep the radiation shield in place (2 pcs), 3 mm hex socket.
3 = INTERCAP® humidity sensor and temperature sensor under PTFE membrane filter (filter spare part item ASM210856SP).
4 = Screw terminal. Detachable for easy installation.
5 = Transmitter body.
6 = Screws for pole mounting (2 pcs), medium size crosshead type (Pozidriv).
7 = Clamp for pole mounting. The holes are threaded for the included pole mounting screws and set screw.
8 = Set screw, medium size crosshead type (Pozidriv). Install after pole mounting to stop the transmitter from turning.
9 = Medium size crosshead screws (6 pcs) that hold the transmitter cover in place.
10 = Transmitter cover.
11 = Cable gland. Suitable for 4 ... 8 mm diameter cable.
12 = Configuration DIP switches. See section DIP Switches on page 31.

# Display

Display is present on the following models:

- HMD82D and HMD83D
- HMW88D and HMW89D

When the transmitter is powered on, it displays a sequence of information screens about the transmitter and its analog outputs.
The screens are shown for a few seconds each. Checking the screens on startup is a good way to verify that the transmitter's configuration DIP switches are set correctly.



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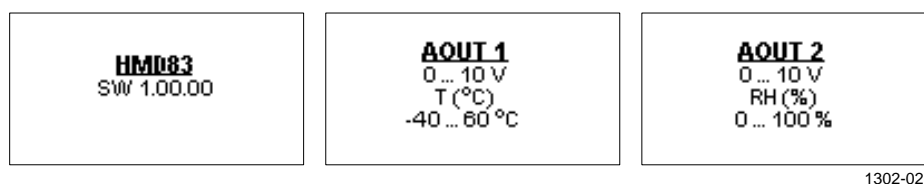
**Figure 5          Startup Screens (HMD83D)**

After the startup screens have been displayed, the transmitter will show the measurement screen.



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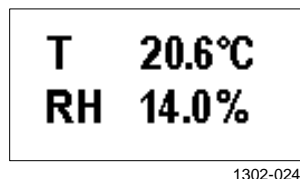
**Figure 6          Measurement Screen (HMD83D)**

If one of the transmitter's error states is active, a notification symbol and error text will appear on the screen. Depending on the error, the affected measurement readings may be replaced by asterisks "*". For more information on the possible errors, see section Error Messages on the Display on page 41.



1302-025

**Figure 7          Measurement Screen with Error (HMD83D)**

# Analog Output Overrange Behavior

Analog outputs of the HMDW80 series transmitters have a defined behavior when the values measured by the transmitter are outside the scaled analog output range:

- Output is clipped at the end of the range.
- Output is set to error state when measured value is 5% outside the scaled range. See section Analog Output Error State on page 41.
- Output resumes normal function when measured value is back on the scaled range.

| | |
|---|---|
| **NOTE** | HMW82/83 and TMW82/83 transmitters are different from the rest of the HMDW80 series. Their analog output is clipped at 10% outside the scaled range, and their analog outputs enter the error state when the measured value is 20% outside the range. |

For example, consider the temperature output of the HMD82 transmitter. The output is 4 ... 20 mA, scaled to -40 ... +60 °C (-40 ... +140 °F).

- When measured temperature rises above +60 °C (+140 °F), the output rises to 20 mA and stops rising even if temperature rises further.
- If the temperature rises above +65 °C (+149 °F), the output enters the error state of 3.6 mA.

| | |
|---|---|
| **NOTE** | This overrange behavior does not mean there is a problem with the measurements, and it does not affect the readings shown on the display (if included in the transmitter model). The display always shows the currently measured readings if the measurement is operating without error. For more information on transmitter errors, see section Error Messages on the Display on page 41. |

# CHAPTER 3
# INSTALLATION

This chapter provides you with information that is intended to help you install HMDW80 series transmitters.

## Selecting Location

When mounting duct model transmitters:

- Avoid installing in a location where condensation may fall on the sensor inside the duct.
- Position the sensor in the center of the duct.
- Select a site where the transmitter can be installed horizontally, onto the side of the duct.

When mounting wall model transmitters:

- Select a location that represents well the area of interest.
- Do not install 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.

When mounting outdoor transmitters:

- Install in a place that receives minimal direct sunlight. In the northern hemisphere, the North side of the building typically provides a suitable shaded location.
- Avoid placing the transmitter near windows, air conditioning units, or other heat and moisture sources such as cooling towers.
- Install the transmitter at least 2.5 m above ground level.

# Installing Duct Models HMD82/83 and TMD82/83

| **REQUIRED TOOLS** | - Medium size crosshead screwdriver (Pozidriv) for screws on cover and flange.<br>- Small slotted screwdriver for screw terminals.<br>- Drill with 2.5 mm and 13 mm bits for making the installation holes.<br>- Tools for cutting and stripping wires.<br>- 19 mm open-end wrench for tightening the cable gland. |
|---|---|

1. Remove the yellow transport protection cap and separate the fastening flange from the transmitter.
2. Use the flange to mark the location and size of the installation holes on the side of the duct.
3. Drill the installation holes in the duct. Refer to Figure 8 below.
4. Secure the fastening flange to the duct with the two screws (included).
5. Push the probe of the transmitter through the flange and into the duct. The probe should reach far enough so that the sensor is located in the middle of the duct.
6. Secure the transmitter to the flange by tightening the screw on the flange that holds the probe in place.
7. Open the transmitter cover, and route the power and signal cable through the cable gland. Connect the wires to the screw terminals. Refer to section Wiring on page 27.
8. Check that the DIP switches (if present in your transmitter model) are set as desired. See section DIP Switches on page 31.
9. Tighten the cable gland and close the transmitter cover.

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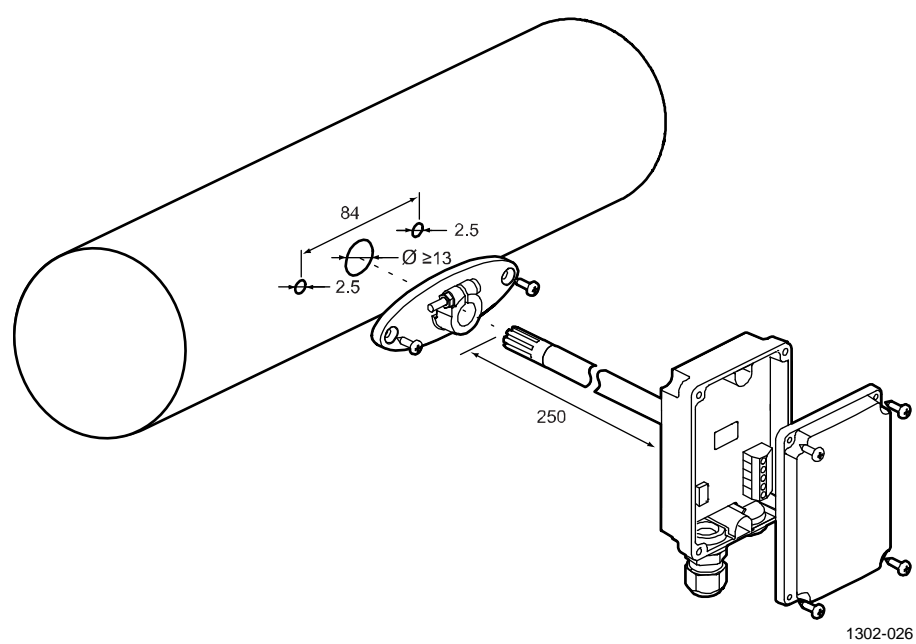
**Figure 8        Duct Model Installation**



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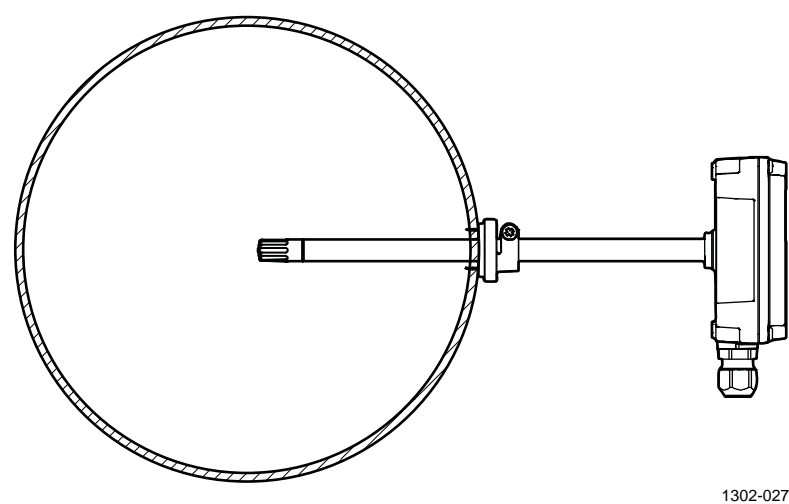
**Figure 9        Position the Sensor to Center of Duct**



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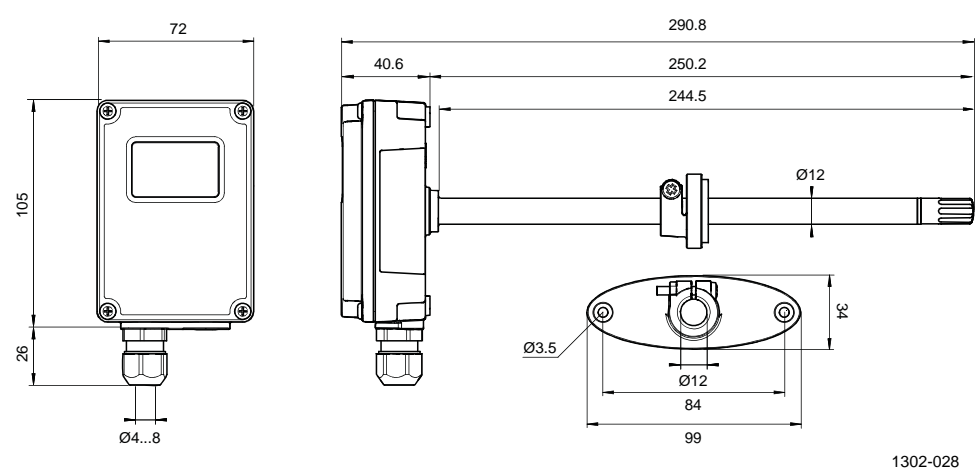
**Figure 10        Duct Model Dimensions (HMD82/83 and TMD82/83)**

# Installing Wall Models HMW88, HMW89 and TMW88

| | |
|---|---|
| **REQUIRED TOOLS** | - Medium size crosshead screwdriver (Pozidriv) for cover screws.<br>- Small slotted screwdriver for screw terminals.<br>- Two installation screws: Ø < 3.5 mm, head Ø < 10 mm.<br>- Depending on the wall material and screw type, you may need a drill and a suitable drill bit to make installation holes for screws.<br>- Tools for cutting and stripping wires.<br>- 19 mm open-end wrench for tightening the cable gland. |

1. Open the transmitter cover and use two screws (not included) to attach the transmitter to the wall. The probe and cable gland should point down.

2. Route the power and signal cable to the screw terminals and connect the wires. Refer to section Wiring on page 27.

3. Close the transmitter cover and remove the yellow transport protection cap from the probe.
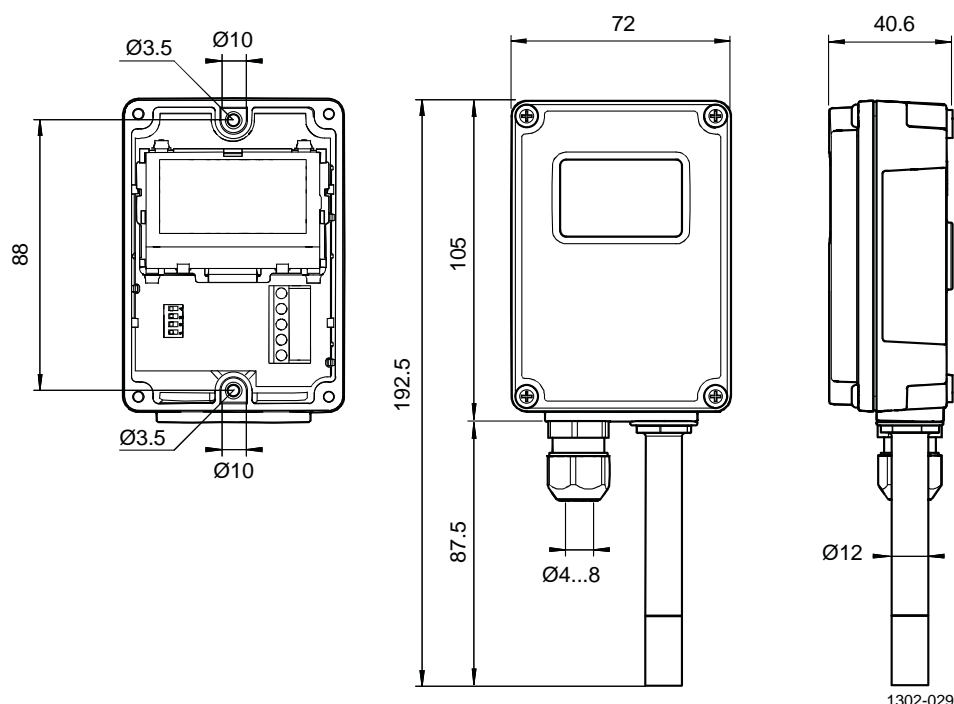


**Figure 11      Wall Model Dimensions (HMW88/89, TMW88)**

# Installing Wall Models HMW82/82P100/83 and TMW82/83

| REQUIRED TOOLS | - Small flat head screwdriver for opening the transmitter and for screw terminals.<br>- Two screws, max Ø 4 mm.<br>- Depending on the wall material and screw type, you may need a drill and a suitable drill bit to make installation holes for screws.<br>- Tools for cutting and stripping wires. |
|---|---|

1.  Use a flat head screwdriver to push down the tab on top of the transmitter and separate the mounting base from the transmitter cover.

2.  Use the mounting holes to attach the mounting base securely. Use at least two screws (not included, max Ø 4 mm).

| NOTE | 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. |
|---|---|

3.  Route the power and signal cable to the screw terminals and connect the wires. Refer to section Wiring on page 27.

4.  Close the transmitter cover when done.
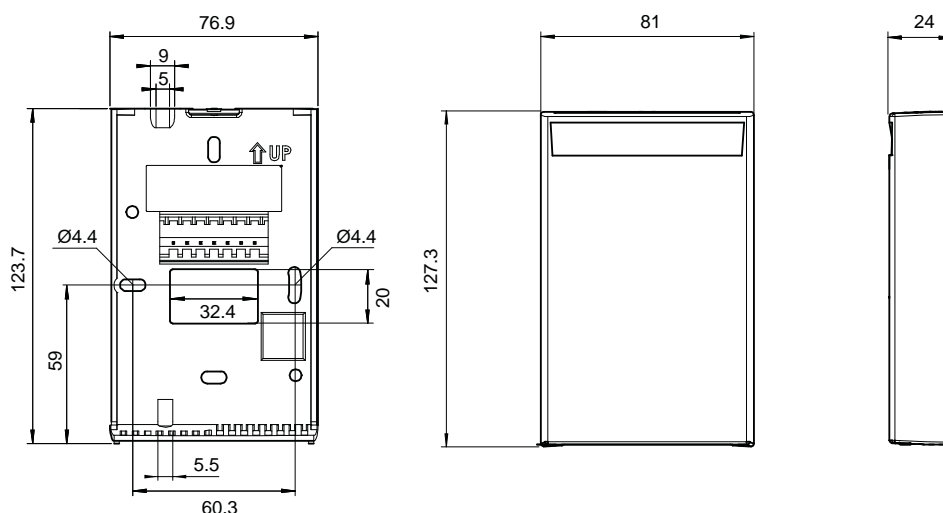


1302-030

**Figure 12    Wall Model Dimensions (HMW82/82P100/83 and TMW82/83)**

# Installing Outdoor Models HMS82/83, TMS82

| WARNING | Assess the risks posed by the height and accessibility of the installation location, and plan your work so it is carried out safely. Try avoiding work at height, if you can. |
|---|---|

| REQUIRED TOOLS | - Medium size crosshead screwdriver (Pozidriv) <br> - Small slotted screwdriver for screw terminals. <br> - Tools for cutting and stripping wires. <br> - 19 mm open-end wrench for tightening the cable gland. <br><br> Additional tools for pole installation: <br> - Zip ties for securing the cable to the pole. <br><br> Additional tools for wall installation: <br> - Drill and bits. <br> - Screws (2 pcs, Ø < 5.5 mm) and wall plugs <br> - Cable clips for securing the cable to the wall. |
|---|---|
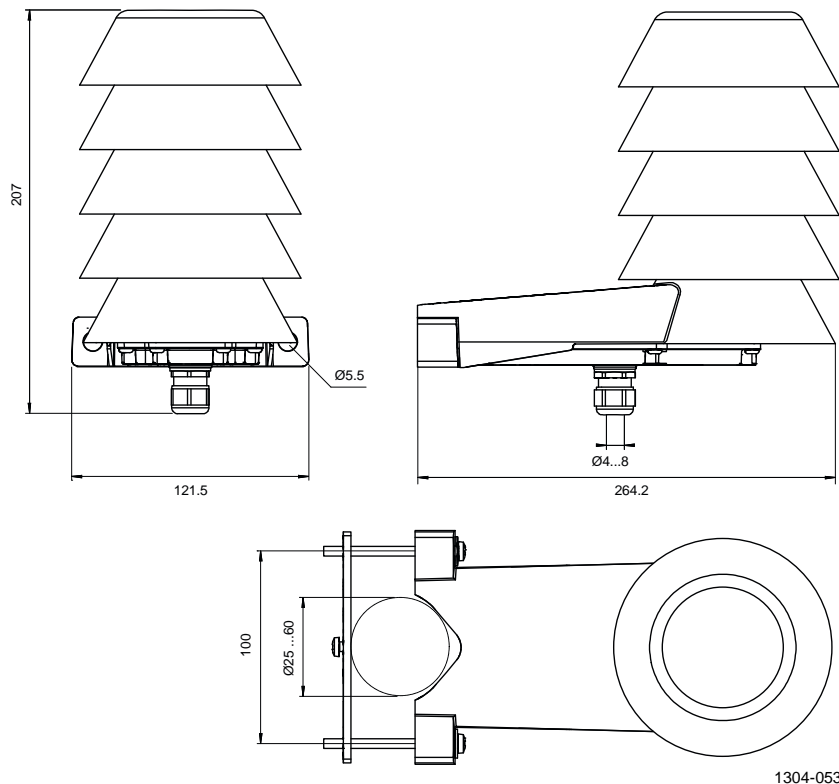


**Figure 13      Outdoor Model Dimensions (HMS82/83, TMS82)**

# Configuration and Wiring

To minimize working at height at the installation location, prepare the transmitter configuration and wiring before climbing up.

1. Open the six screws that hold the transmitter cover.
2. Check that the DIP switches are set as desired. See section DIP Switches on page 31.
3. Route the power and signal cable to the screw terminals and connect the wires. Refer to section Wiring on page 27.
4. Disconnect the screw terminal block by pulling it away from the component board.
5. Adjust the length of cable between the cable gland and the terminal block. Make the cable short enough to close the cover without leaving a cable loop in the transmitter.
6. Tighten the cable gland. Leave the cover off for now.



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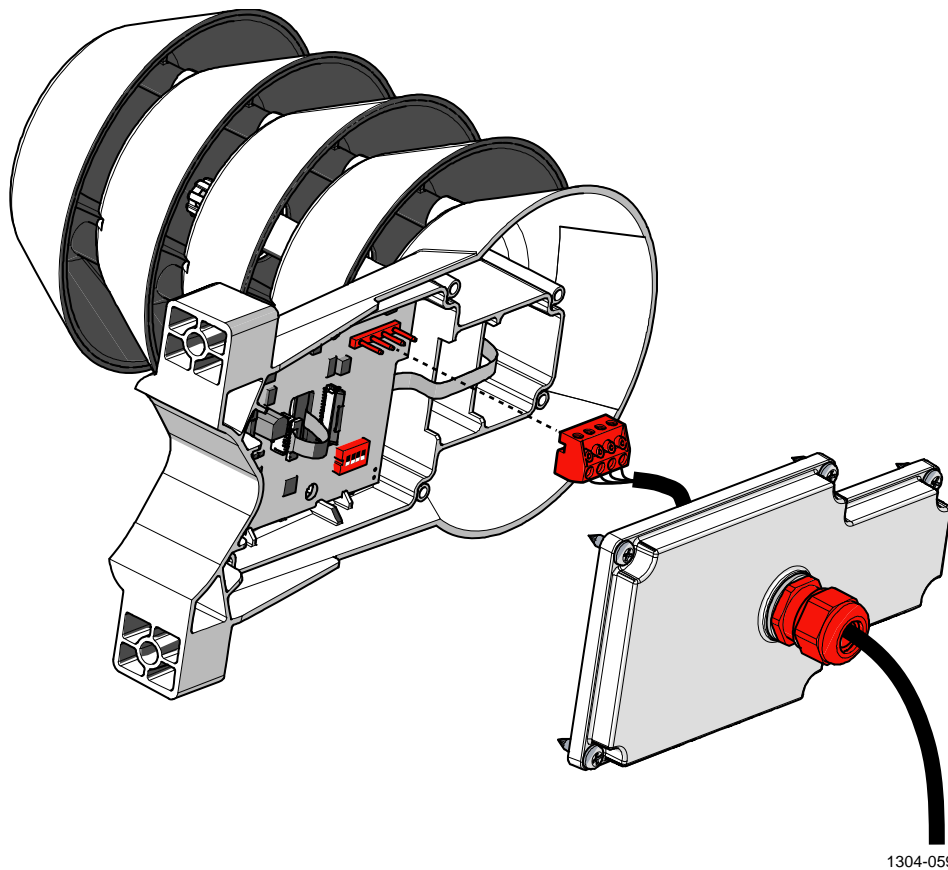
**Figure 14      Location of DIP Switches and Screw Terminal**

# Pole installation

| **NOTE** | Recommended pole diameter for HMS82/83/TMS82 installation with the supplied clamp and screws is 25 ... 60 mm. |
|---|---|

1.  Use the supplied clamp and screws to mount the transmitter on a pole.
2.  To prevent the transmitter from turning on the pole, tighten the set screw on the center hole of the clamp.
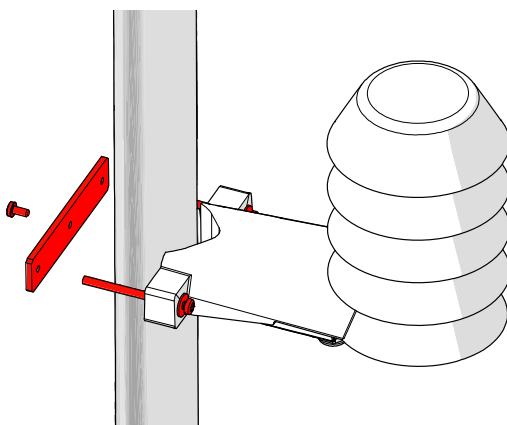


1304-054

**Figure 15    HMS82/83 Pole Installation**

3.  Plug in the screw terminal block, close the cover, and tighten the screws.
4.  Secure the cable to the pole using a zip tie. Allow some cable to hang down from the cable gland to prevent water from entering the transmitter along the cable.
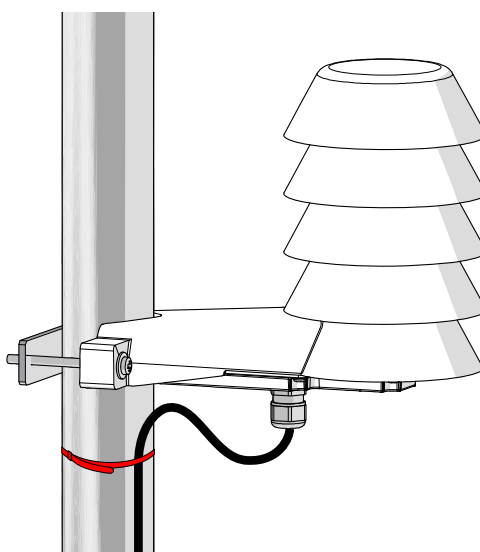


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**Figure 16    Securing the Cable on a Pole**

# Wall installation

1.    Drill two holes for wall plugs 100 mm apart.

2.    Place the wall plugs in the holes.

3.    Mount the transmitter using two screws of sufficient length.



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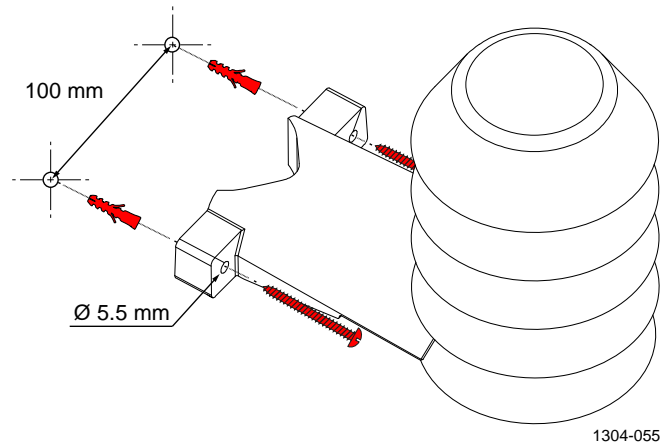
**Figure 17        HMS82/83 Wall Installation**

4.    Plug in the screw terminal block, close the cover, and tighten the screws.

5.    Secure the cable to the wall using cable ties. Allow some cable to hang down from the cable gland to prevent water from running to the transmitter along the cable.



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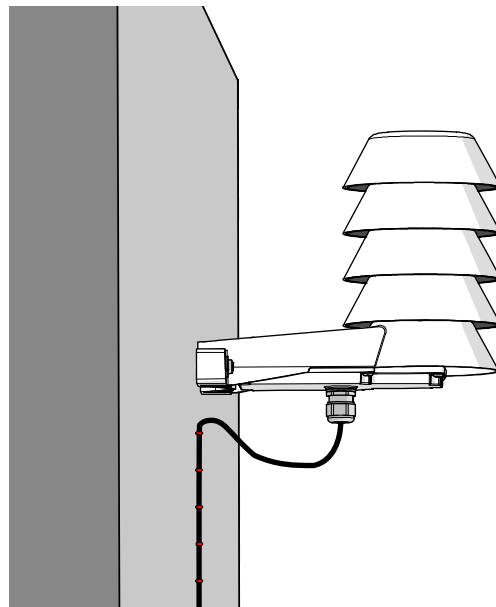
**Figure 18        Securing the Cable on a Wall**

# Wiring

| WARNING | Connect only de-energized wires. |
|---|---|

| NOTE | Transmitters with a configurable humidity output parameter use the marking **HUM** on the screw terminal labels. The default output parameter is relative humidity (RH) with output scaled to 0 ... 100 %RH, but the parameter can be changed using DIP switches. Changing the parameter also changes the output scaling. See section DIP Switches on page 31. |
|---|---|
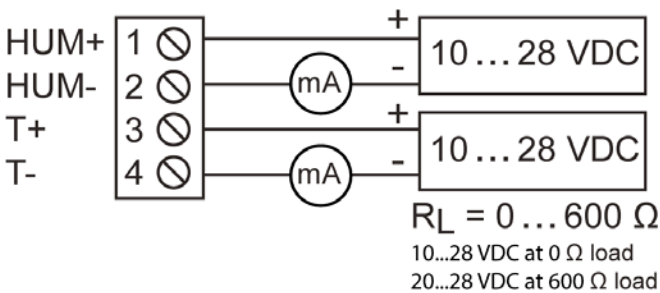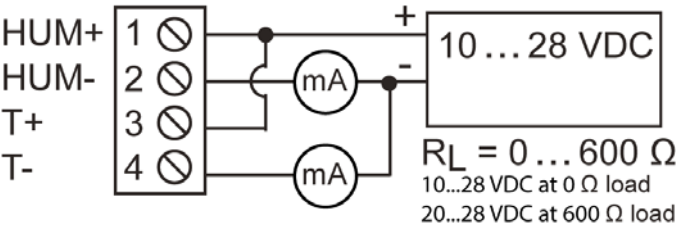
## HMD82(D), HMW88(D), and HMS82

| Two 4 ... 20 mA outputs, temperature output scaling -40 ... +60 °C (-40 ... +140 °F).<br><br>**You must connect the HUM channel** even if you only want to measure temperature. Connecting the T channel is optional. |  |
|---|---|
| Alternate wiring with one power supply. |  |

# TMS82

| | |
|---|---|
| 4 ... 20 mA output, scaling -40 ... +60 °C (-40 ... +140 °F).<br><br>Leave terminals 3 and 4 unconnected. | T+ 1 ⊘    + 10 ... 28 VDC<br>T- 2 ⊘   (mA) -<br>3 ⊘    $R_L = 0 ... 600\ \Omega$<br>4 ⊘    10...28 VDC at 0 Ω load<br>   20...28 VDC at 600 Ω load |
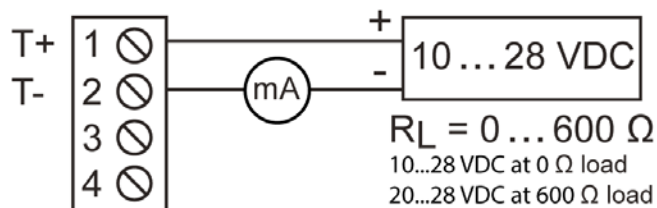
# TMD82

| | |
|---|---|
| 4 ... 20 mA output, scaling -40 ... +60 °C (-40 ... +140 °F).<br><br>Leave terminals 3 and 4 unconnected. | T+ 1 ⊘    + 10 ... 28 VDC<br>T- 2 ⊘   (mA) -<br>3 ⊘    $R_L = 0 ... 600\ \Omega$<br>4 ⊘    10...28 VDC at 0 Ω load<br>   20...28 VDC at 600 Ω load |

# TMD83
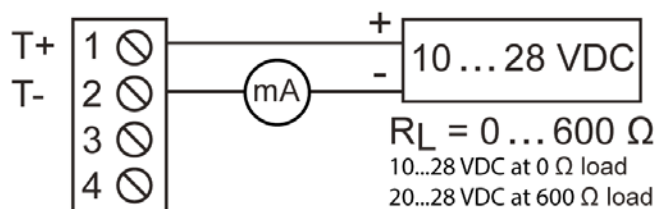
| | |
|---|---|
| One 0 ... 10 V output, scaling -40 ... +60 °C (-40 ... +140 °F). | VDC+/AC 1 ⊘    + 18 ... 35 VDC<br>VDC-/AC 2 ⊘    - or 24 VAC<br>T+ 3 ⊘<br>HUM+ 4 ⊘   (V)<br>T-/HUM- 5 ⊘    $R_L = $ min. 10 kΩ |
| Terminals 2 and 5 are internally connected on the transmitter, so you can also use a cable with three wires. | VDC+/AC 1 ⊘    + 18 ... 35 VDC<br>VDC-/AC 2 ⊘    - or 24 VAC<br>T+ 3 ⊘   (V)<br>HUM+ 4 ⊘<br>T-/HUM- 5 ⊘    $R_L = $ min. 10 kΩ |
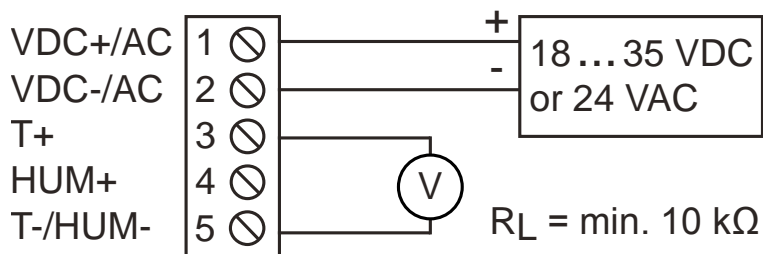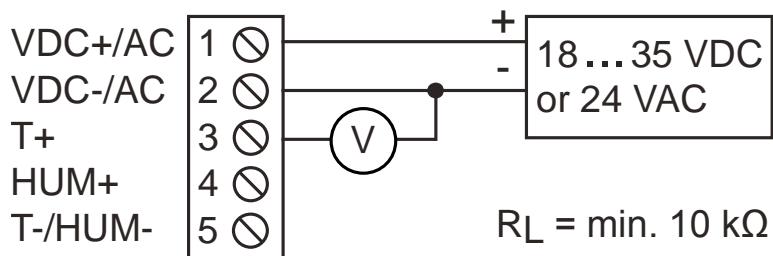
## HMW82

Two 4 ... 20 mA outputs, temperature output scaling -5 ... +55 °C (+23 ... +131 °F).

**You must connect the RH channel of the HMW82**, even if you only want to measure temperature. Connecting the T channel is optional.

-T  +T  -RH  +RH

mA        + - 10 ... 28 VDC

mA        + - 10 ... 28 VDC

$R_L = 0 ... 600\ \Omega$

## HMW82P100

Pt100
2   1   1
t+   -T  +T  -RH  +RH

mA
4...20 mA
(0 ... 100% RH)

Power supply
10 ... 28 VDC
$R_L = 0 ... 500\ \Omega$

mA
4...20 mA
(-5 ... +55ºC)
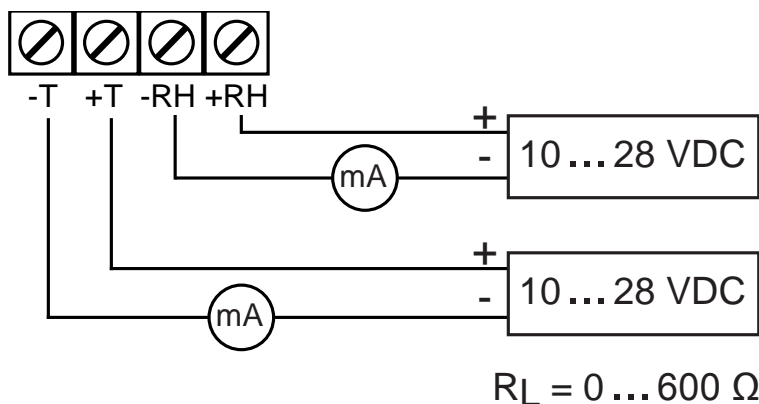
Power supply
10 ... 28 VDC
$R_L = 0 ... 500\ \Omega$
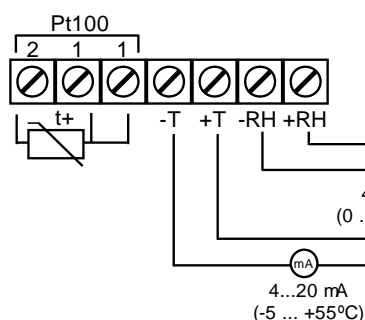
**HMW82P100**
Includes a passive Pt100 temperature sensor (Class F 0.1 IEC 60751) with a 3-wire connection.

## TMW82

One 4 ... 20 mA output, scaling -5 ... +55 °C (+23 ... +131 °F).

Leave the two terminals on the left unconnected.

-T   +T

mA      + - 10 ... 28 VDC

$R_L = 0 ... 600\ \Omega$
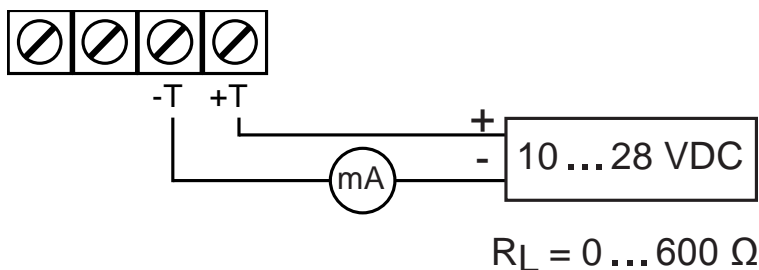
# HMW83

| | |
|---|---|
| Two 0 ... 10 V outputs, temperature output scaling -5 ... +55 °C (+23 ... +131 °F).<br><br>This is the recommended wiring for long cables. | <br>-RH +RH  -T  +T  -VS +VS<br>$R_L$ = min. 10 kΩ |
| 3-wire connection with -VS as common ground. Not recommended if cable resistance is more than 2.5 Ω. | <br>-RH +RH  -T  +T  -VS +VS<br>$R_L$ = min. 10 kΩ |
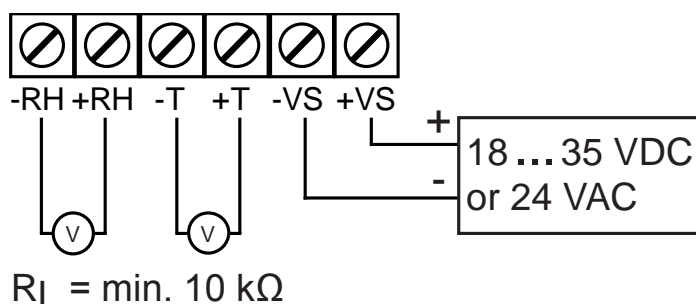
# TMW83
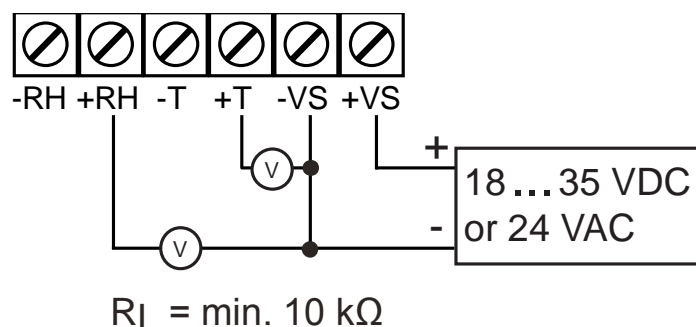
| | |
|---|---|
| One 0 ... 10 V output, scaling -5 ... +55 °C (+23 ... +131 °F).<br><br>This is the recommended wiring for long cables. | <br>-T  +T  -VS +VS<br>$R_L$ = min. 10 kΩ |
| 3-wire connection with -VS as common ground. Not recommended if cable resistance is more than 2.5 Ω. | <br>-T  +T  -VS +VS<br>$R_L$ = min. 10 kΩ |
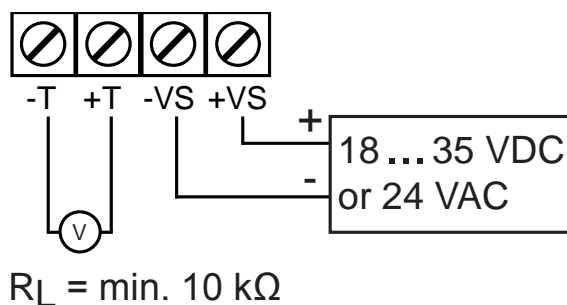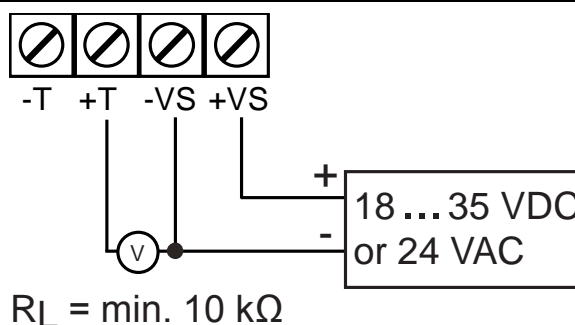
# DIP Switches

The DIP switches on the component board control the humidity output parameter and scaling, and the units that are shown on the display. The switches are present on the following models:

- HMD82(D) and HMD83(D)
- HMW88(D) and HMW89(D)
- HMS82 and HMS83

Figure 19 below shows the default position of the DIP switches. The default settings are:

- Metric units shown on display.
- Relative humidity (RH) selected as humidity output parameter.
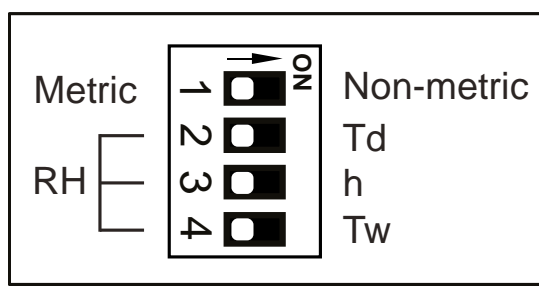


1302-053

**Figure 19      DIP Switches on Component Board**

**Table 5          DIP Switch Positions for Metric Output**

| DIP Position | Analog Output Parameter and Scaling | Parameters and Units on Display |
|---|---|---|
| 1 2 3 4 | Relative humidity (RH) 0 ... 100 % <br><br> Temperature (T) -40 ... +60 °C | RH (%) <br><br><br> T (°C) |
| 1 2 3 4 | Dewpoint (Td) -40 ... +60 °C <br><br> Temperature (T) -40 ... +60 °C | Td (°C) <br><br><br> T (°C) |
| 1 2 3 4 | Enthalpy (h) -40 ... +460 kJ/kg <br><br> Temperature (T) -40 ... +60 °C | h (kJ/kg) <br><br><br> T (°C) |
| 1 2 3 4 | Wet bulb temperature (Tw) -40 ... +60 °C <br><br> Temperature (T) -40 ... +60 °C | Tw (°C) <br><br><br> T (°C) |

**Table 6          DIP Switch Positions for Non-Metric Output**

| DIP Position | Analog Output Parameter and Scaling | Parameters and Units on Display |
|---|---|---|
| 1 2 3 4 | Relative humidity (RH) 0 ... 100 % <br><br> Temperature (T) -40 ... +140 °F | RH (%) <br><br><br> T (°F) |
| 1 2 3 4 | Dewpoint (Td) -40 ... +140 °F <br><br> Temperature (T) -40 ... +140 °F | Td (°F) <br><br><br> T (°F) |
| 1 2 3 4 | Enthalpy (h) -10 ... +190 BTU/lb <br><br> Temperature (T) -40 ... +140 °F | h (BTU/lb) <br><br><br> T (°F) |
| 1 2 3 4 | Wet bulb temperature (Tw) -40 ... +140 °F <br><br> Temperature (T) -40 ... +140 °F | Tw (°F) <br><br><br> T (°F) |

CHAPTER 4
# MAINTENANCE

This chapter provides information that is needed in basic maintenance of HMDW80 series.

## 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 or on the filter.

| NOTE | Do not attempt to clean contaminated INTERCAP® sensors or filters. Instead, replace them with new parts. Filters and sensors can be purchased from Vaisala. For order codes, see section Spare Parts and Accessories on page 47. |
|------|------|

## Calibration

You can verify the performance of your HMDW80 series transmitter by comparing its reading with the reading from a portable reference instrument such as the HM70 Hand-Held Humidity and Temperature Meter. For operating instructions, refer to the documentation of your reference instrument.

If the comparison indicates that the reading from the transmitter is not within specification, the transmitter may need to have its filter and sensor replaced.

# Replacing the INTERCAP® Humidity Sensor

HMDW80 series transmitters use the Vaisala INTERCAP® sensor for humidity measurement. The INTERCAP® sensor is designed to be replaced when necessary, and does not require adjustment by the user.

## Replacing the INTERCAP® Sensor on Models HMD82/83 and HMW88/89

| REQUIRED TOOLS | - New INTERCAP® humidity sensor. |
| | - New filter (always recommended when replacing the sensor). |
| | - Duct models only: medium size crosshead screwdriver (Pozidriv). |

1. Power down the transmitter.
2. Duct models only: loosen the tightening screw on the fastening flange, and pull the probe out of the duct.
3. Remove the filter to access the sensors. See Figure 20 below.
4. Pull out the old INTERCAP® sensor, and insert the new one.
5. Insert the new filter.
6. Duct models only: push the probe back into the duct, to the same depth where it was before. Tighten the tightening screw on the fastening flange.
7. Power up the transmitter.
8. Verify that the transmitter now provides a valid humidity reading.
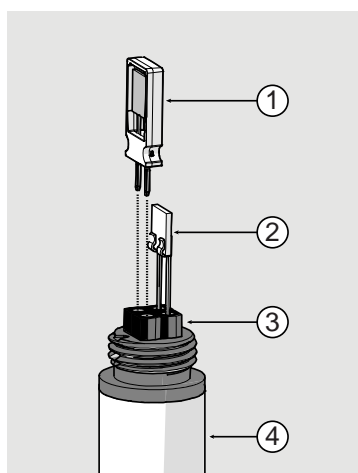


1305-024

**Figure 20      Sensors on HMD82/83 and HMW88/89 Models**

1   =   Vaisala INTERCAP® sensor. Handle by the plastic frame.
2   =   Temperature sensor. Do not touch or attempt to remove.
3   =   Sensor socket.
4   =   Transmitter probe.

# Replacing the INTERCAP® Sensor on Wall Models HMW82/82P100/83

| REQUIRED TOOLS | - New INTERCAP® humidity sensor.<br>- Small flat head screwdriver. |
|---|---|

1. Use the screwdriver to push down on the tab on the top of the transmitter and open the transmitter cover.
2. Remove the old sensor, and insert the new one. See Figure 21 below.
3. Reconnect the cover to the mounting base.
4. Verify that the transmitter now provides a valid humidity reading.



1305-018

**Figure 21      INTERCAP® Sensor on HMW82/83 Models**

# Replacing the INTERCAP® Sensor on Outdoor Models HMS82/83

| REQUID<br>TOOLS | - New INTERCAP® humidity sensor.<br>- New filter (always recommended when replacing the sensor).<br>- Medium size crosshead screwdriver (Pozidriv)<br>- Flat head screwdriver<br>- 3 mm hex key (Allen key) for opening the radiation shield screws.<br>- If transmitter mounted on pole: 2.5 mm hex key for opening and tightening the set screw. |
|---|---|

| NOTE | You will need to remove the radiation shield to access the sensor, and this is difficult to do while the transmitter remains mounted on a pole or wall. The procedure below takes advantage of the detachable screw terminal to allow the cable to remain in place during the operation. |
|---|---|

1. Power down the transmitter.
2. Open the transmitter cover and unplug the screw terminal. This allows you to leave the cable and cover at the installation site.
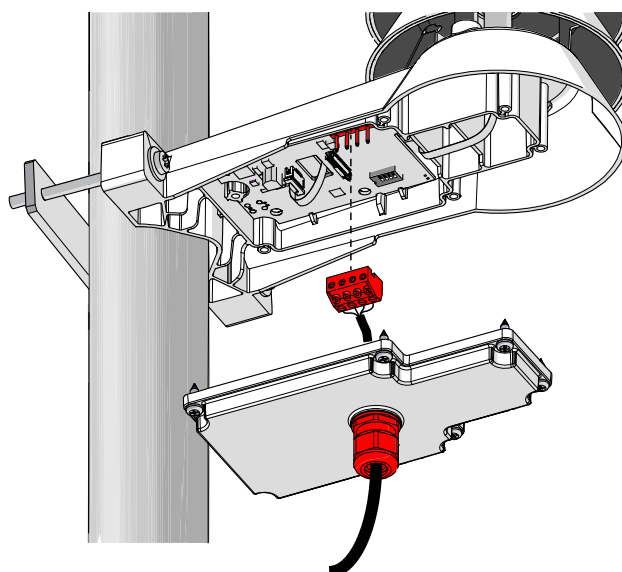


1305-019

**Figure 22     Unplugging the Screw Terminal**

3. Remove the transmitter from its installation point.

4.    Open the two long screws that hold the radiation shield, and pull them out.
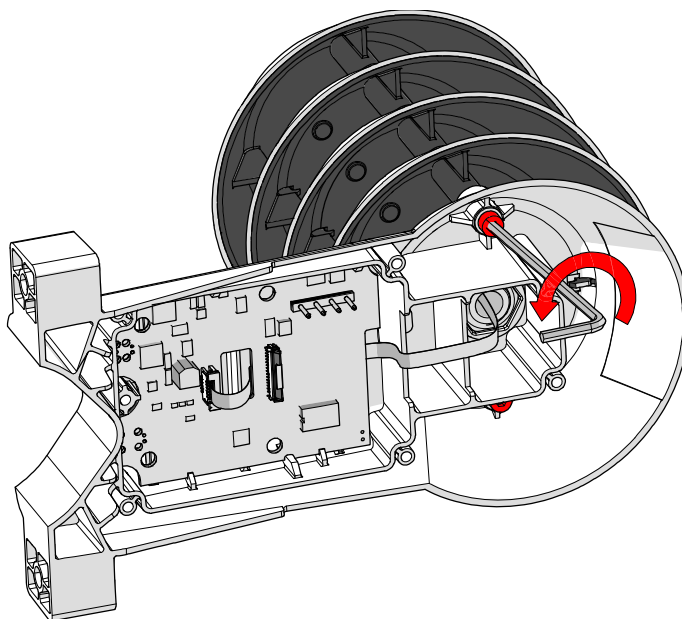


1305-020

**Figure 23        Opening the Radiation Shield Screws**
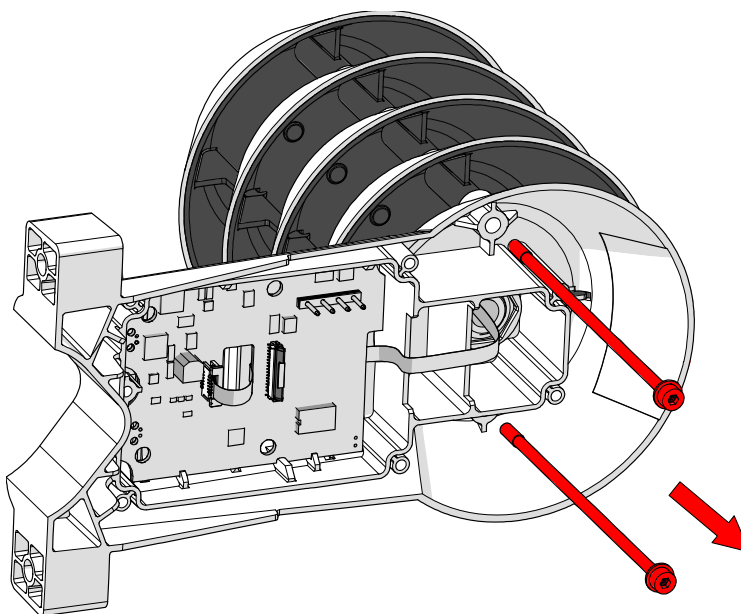


1305-021

**Figure 24        Removing the Radiation Shield Screws**

5. Use a flat head screwdriver to push on the visible plastic tab below the radiation shield.
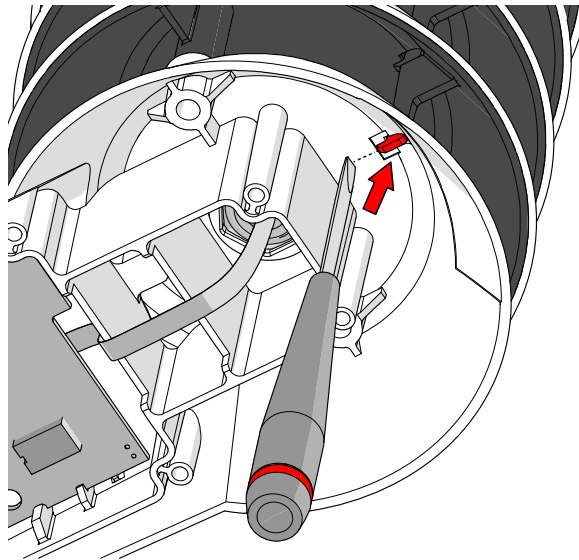


1305-022

**Figure 25** **Location of Locking Tab**

6. Tilt the radiation shield away from the opened tab. This opens the second tab on the other side, allowing you to remove the radiation shield.
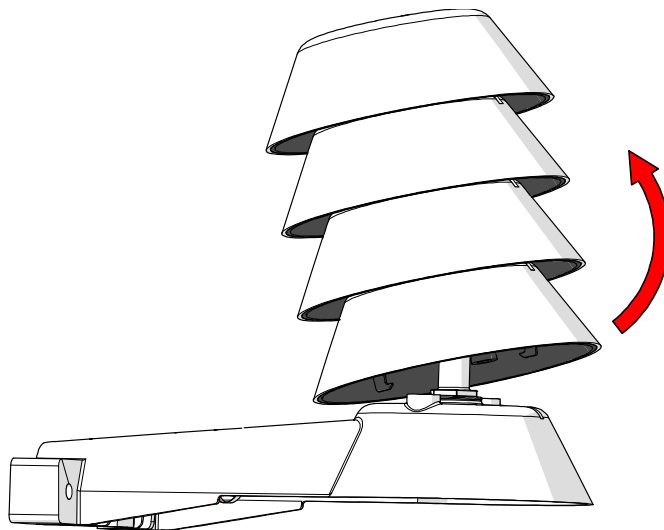


1305-023

**Figure 26** **Removing the Radiation Shield**

7.   Open the filter to expose the sensors.



1305-017
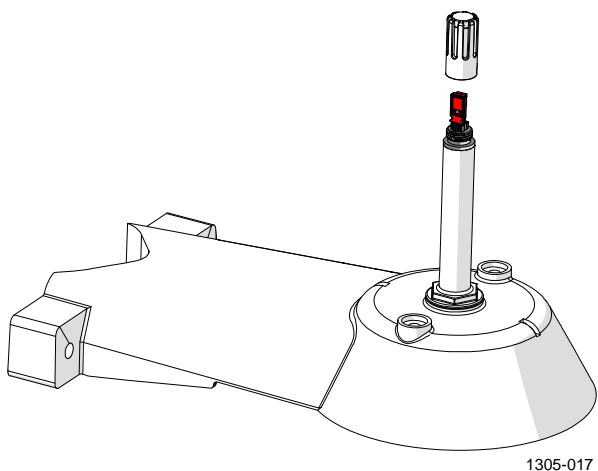
**Figure 27     Filter Removed**

8.   Pull out the old INTERCAP® sensor, and insert the new one.



1305-024
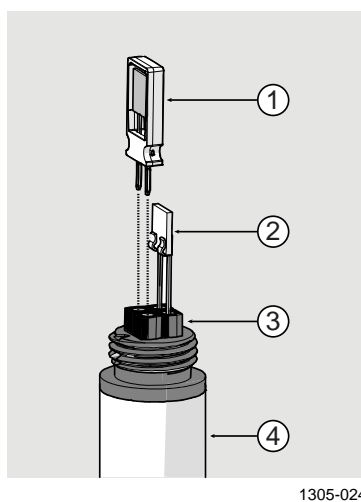
**Figure 28     Sensors on HMS82/83 Models**
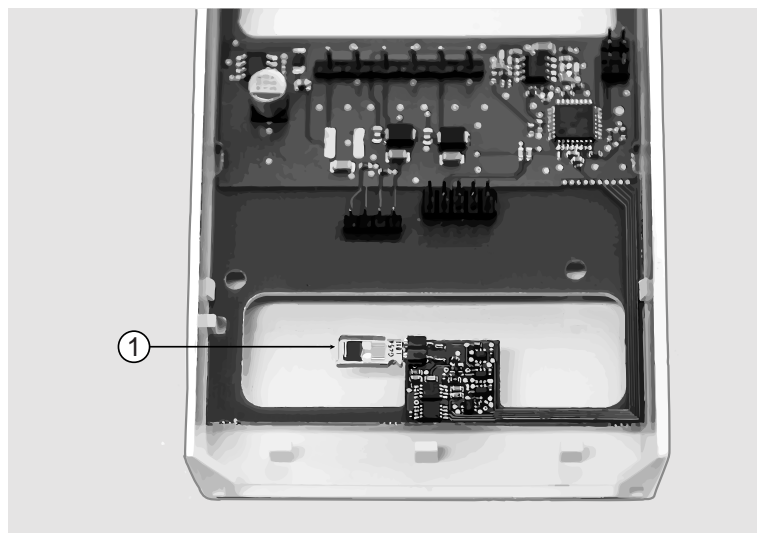
1   =   Vaisala INTERCAP® humidity sensor.
          Handle by the plastic frame.
2   =   Temperature sensor. Do not touch or attempt to remove.
3   =   Sensor socket.
4   =   Transmitter probe.

9.   Insert the new filter.
10.  Reassemble, remount, and reconnect the transmitter.
11.  Power up the transmitter.
12.  Verify that the transmitter now provides a valid humidity reading.

# CHAPTER 5
# TROUBLESHOOTING

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

## Problem Situations

**Table 7        Possible Problem Situations and Their Remedies**

| Problem | Probable Cause and Remedy |
|---|---|
| Transmitter outputs an incorrect humidity reading. | 1. Models with probes: check if the yellow transport protection cap has been left over the probe. Remove it if present.<br>2. Models with configurable output parameter: check that the desired output parameter has been selected using the DIP switches. |
| 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. Use a portable reference meter to check this.<br>2. HMW82 and HMW83: Check that the transmitter is installed in proper orientation, with the arrow on the mounting base pointing up. |
| Current output on the temperature channel is ~24 mA. | Check that the humidity output channel is powered. Loop powered HMDW80 series models that have humidity measurement require that the humidity output channel is connected, even if only measuring temperature. |
| Analog output reading is unchanging and incorrect. | The analog output channel may be in an error state. See section Analog Output Error State on page 41. |

# Analog Output Error State

HMDW80 series transmitters set the output channel(s) into a defined error level instead of the measured result in two situations:

- Transmitter detects a measurement malfunction. This means an actual measurement problem, such as sensor damage or unsuitable environmental conditions.
- Measured value(s) are well outside the scaled output range. For a more detailed explanation, see section Analog Output Overrange Behavior on page 17.

The error level depends on the output type:
- For 0 ... 10 V output, the error level is **11 V**.
  HMW83 and TMW83 are an exception to this, their error level is **0 V**.
- For 4 ... 20 mA output, the error level is **3.6 mA**.

The transmitter resumes normal operation of the analog output(s) when the cause of the error state is removed.

# Error Messages on the Display

**Table 8         Error Messages on the Display**

| Error Message | Possible Cause and Solution |
|---|---|
| INTERNAL 1 INTERNAL 2 INTERNAL 3 | Internal problem with the transmitter. Restart the transmitter to see if the problem remains. Contact Vaisala technical support if unable to remove the problem. |
| ERROR HUM | Humidity measurement failed. Check if the humidity sensor is damaged or missing. |
| ERROR T | Temperature measurement failed. Check if the temperature sensor is damaged or missing. |

# 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.

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

# CHAPTER 6
# TECHNICAL DATA

This chapter provides the technical data of the HMDW80 series.

# Specifications

**Table 9        Specifications for Models HMW82/83/HMW82P100 and TMW82/83**

| Property | Description / Value |
|---|---|
| **Operating environment** | |
| Operating temperature range | -5 ...+55 °C (+23 ... +131 °F) |
| Operating humidity range | 0 …100 %RH, non-condensing |
| **Relative humidity** | |
| Measurement range | 0 … 100 %RH |
| Accuracy | |
| Temperature range | |
| +10 ... +30 °C (+50 ... +86 °F) | |
| 30 ... 70 %RH | ±3 %RH |
| 0 … 30 %RH, 70 … 100 %RH | ±5 %RH |
| Temperature range | |
| -5 ... +10 °C, +30 ... + 55 °C | |
| (+23 ... +50 °F, +86 ... +131 °F) | |
| 0 …100 %RH | ±7 %RH |
| Stability in typical HVAC applications | ±2 %RH over 2 years |
| Humidity sensor | Vaisala INTERCAP® |
| **Temperature** | |
| Measurement range | -5 ...+55 °C (+23 ... +131 °F) |
| Accuracy | |
| +10 … +30 °C (+50 °F … +86 °F) | ±0.5 °C (±0.9 °F) |
| -5 … +10 °C, +30 … +55 °C | |
| (+23 ... +50 °F, +86 ... +131°F) | ±1.0 °C (±1.8 °F) |
| Temperature sensor | Digital temperature sensor |
| | |
| | HMW82P100: Pt100 Class F 0.1 IEC 60751 |

**Table 10        Specifications for Models HMD82/83, TMD82/83, HMW88/89, HMS82/83, and TMS82**

| Property | Description / Value |
|---|---|
| **Operating environment** | |
| Operating temperature range | -40 ...+60 °C (-40 ... +140 °F) |
| Operating humidity range | 0 …100 %RH |
| **Relative humidity** | |
| Measurement range | 0 … 100 %RH |
| Accuracy | |
| Temperature range | |
| +10 ... +30 °C (+50 ... +86 °F) | |
| 0 ... 90 %RH | ±3 %RH |
| 90 … 100 %RH | ±5 %RH |
| Temperature range | |
| -20 ... +10 °C, +30 ... +60 °C | |
| (-4 ... +50 °F, +86 ... +140 °F) | |
| 0 ... 90 %RH | ±5 %RH |
| 90 … 100 %RH | ±7 %RH |
| Temperature range -40 … -20 °C | |
| (-40 … -4 °F) | |
| 0 … 100 %RH | ±7 %RH |
| Stability in typical HVAC applications | ±2 %RH over 2 years |
| Humidity sensor | Vaisala INTERCAP® |
| **Temperature** | |
| Measurement range | -40 ...+60 °C (-40 ... +140 °F) |
| Accuracy | |
| At +20 °C (+68 °F) | ±0.3 °C (±0.54 °F) |
| Temperature dependence | ±0.01 °C/°C |
| Temperature sensor | Pt1000 RTD Class F0.1 IEC 60751 |
| **Calculated parameters** | |
| Measurement range for dewpoint temperature and wet bulb temperature | -40 ...+60 °C (-40 ... +140 °F) |
| Measurement range for enthalpy | -40…460 kJ/kg (-10…+190 BTU/lb) |
| Accuracy of the calculated parameters should be calculated at the actual condition based on the relative humidity and temperature specification. | |
| Accuracy at +20 °C (+68 °F) | |
| and 80 %RH: | |
| Dewpoint | ±0.9 °C (1.6 °F) |
| Wet bulb temperature | ±0.7 °C (1.3 °F) |
| Enthalpy | ±2kJ/kg (0.9 BTU/lb) |

**Table 11        Specifications for Models HMD82/83D, HMW88/89D, and TMW88**

| Property | Description / Value |
|---|---|
| **Operating environment** | |
| Operating temperature range | -5 … +60 °C (+23 … +140 °F) |
| Operating humidity range | 0…100 %RH, non-condensing |
| **Relative humidity** | |
| Measurement range | 0 … 100 %RH |
| Accuracy<br>Temperature range<br>+10 ... +30 °C (+50 ... +86 °F)<br>   0 ... 90 %RH<br>   90 … 100 %RH<br>Temperature range<br>-5 ... +10 °C, +30 ... +60 °C<br>(+23 ... +50 °F, +86 ... +140 °F)<br>   0 ... 90 %RH<br>   90 … 100 %RH | <br><br><br>±3 %RH<br>±5 %RH<br><br><br><br><br>±5 %RH<br>±7 %RH |
| Stability in typical HVAC applications | ±2 %RH over 2 years |
| Humidity sensor | Vaisala INTERCAP® |
| **Temperature** | |
| Measurement range<br>(Analog output scaling) | -40 … +60 °C (-40 … +140 °F) |
| Operating temperature range<br>of the display | -5 … +60 °C (+23 … +140 °F) |
| Accuracy<br>   At +20 °C (+68 °F) | ±0.3 °C (±0.54 °F) |
| Temperature dependence | ±0.01 °C/°C |
| Temperature sensor | Pt1000 RTD Class F0.1 IEC 60751 |
| **Calculated parameters** | |
| Measurement range for dewpoint<br>temperature and wet bulb temperature | -40 ...+60 °C (-40 ... +140 °F) |
| Measurement range for enthalpy | -40…460 kJ/kg (-10…+190 BTU/lb) |
| Accuracy of the calculated parameters<br>should be calculated at the actual<br>condition based on the relative humidity<br>and temperature specification. | |
| Accuracy at +20 °C (+68 °F)<br>and 80 %RH:<br>   Dewpoint<br>   Wet bulb temperature<br>   Enthalpy | <br><br>±0.9 °C (1.6 °F)<br>±0.7 °C (1.3 °F)<br>±2kJ/kg (0.9 BTU/lb) |

**Table 12      Operating Environment (All Models)**

| Property | Description / Value |
|---|---|
| Operating environment | See model specifications |
| Maximum wind/flow speed | 30 m/s |
| Storage temperature | -40 ... +60 °C (-40 ... +140 °F) |
| Electromagnetic compliance | EN61326-1, industrial environment |

**Table 13      Inputs and Outputs**

| Property | Description / Value |
|---|---|
| Current output models  (2-wire)<br>    Outputs<br>    Loop resistance<br>    Supply voltage | <br>4 ... 20 mA, loop powered<br>0 ... 600 Ω<br>20 ... 28 VDC at 600 Ω load<br>10 ... 28 VDC at 0 Ω load |
| Voltage output models (3-wire)<br>    Outputs<br>    Load resistance<br>    Supply voltage<br><br>    Current consumption | <br>0 ... 10 V<br>10 kΩ min<br>18 ... 35 VDC<br>24 VAC ±20 % 50/60 Hz<br>10 mA on DC power<br>30 mA on AC power |

**Table 14      Mechanics**

| Property | Description / Value |
|---|---|
| Max. wire size | 1.5 mm$^2$ (AWG 16) |
| Standard housing color | White (RAL9003) |
| Housing material<br>    HMW82/83, TMW82/83<br>    HMW88/89(D), HMD82/83(D),<br>    TMD82/83, HMS82/83 | <br>ABS/PC (UL-V0 approved)<br><br>PC + 10%GF (UL-V0 approved) |

# Spare Parts and Accessories
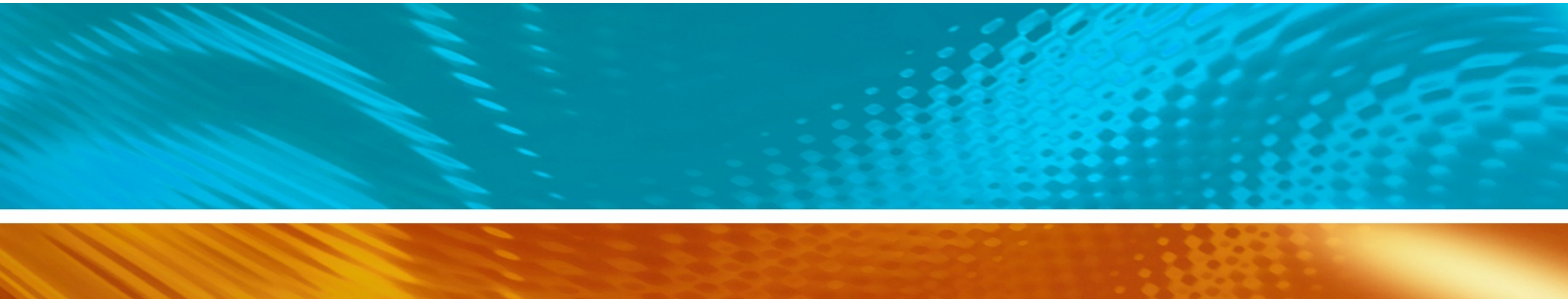
| | |
|---|---|
|  | Information on spare parts, accessories, and calibration products is available online at www.vaisala.com and store.vaisala.com. |

**Table 15      HMDW80 Series Spare Parts and Accessories**

| Description | HMD82/83 | TMD82/83 | HMW82/83 | HMW82P100 | TMW82/83 | HMW88/89 | TMW88 | HMS82/83 | TMS82 | Item Code |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sensors** | | | | | | | | | | |
| Vaisala INTERCAP® humidity sensor, 1 piece | ● | | ● | ● | | ● | | ● | | 15778HM |
| Vaisala INTERCAP® humidity sensor, 10 pcs | ● | | ● | ● | | ● | | ● | | INTERCAPSET-10PCS |
| **Sensor protection** | | | | | | | | | | |
| PTFE membrane filter | ● | ● | | | | | | ● | ● | ASM210856SP |
| PTFE filter | | | | | | ● | ● | | | DRW239993SP |
| **Accessories and Spare Parts** | | | | | | | | | | |
| Fastening flange assembly (screws  included) | ● | ● | | | | | | | | ASM210771SP |
| Fastening set for HMS80 | | | | | | | | ● | ● | 237805 |
| Cable gland with O-ring | ● | ● | | | | ● | ● | ● | ● | CABLEGLANDORING |
| Lid assembly with window for display (screws included) | ● | ● | | | | ● | ● | | | ASM210793SP |
| Conduit fitting + O-ring (M16x1.5 / NPT1/2 Inch) | ● | ● | | | | ● | ● | ● | ● | 210675SP |
| Conduit fitting + O-ring (M16x1.5 / PG9, RE-MS) | ● | ● | | | | ● | ● | ● | ● | 210674SP |
| Terminal block, blue | ● | ● | | | | ● | ● | ● | ● | 236620SP |

● = Part is compatible

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