
## Features

- **High-end solution for your precise measurements of precipitation quantity, intensity and 16 different types of precipitation (in accordance with WMO standard)**
- **The radar module of the rain[e]observer operates without moving parts and is therefore wear and tear-free**
- **Save time and money with easy installation and maintenance**
- **Plug & play upgrade set for the rain[e] series**

  **rain[e]** is the weighing precipitation sensor with its unique, self-draining collection system

  **rain[e]** combines the highest resolution and precision in a very compact design

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# 1 General safety information

The system is state-of-the-art and built in accordance with recognized safety regulations.

**However, you should pay attention to the following information.**

1. Before using the device, make yourself familiar with the relevant operating instructions.
2. Observe any in-house and country-specific guidelines and accident prevention regulations (e.g. from the employers' liability insurance). Obtain more information from your company safety officer, if necessary.
3. Use the system only in accordance with the purpose designated in the operating instructions.
4. Always keep the operating instructions close to hand wherever the system is used.
5. Operate the system only if it is in a technically flawless condition. You should immediately rectify any malfunctions that occur that may have an adverse effect on safety.
6. Do not allow any impermissible liquids to penetrate the inside of the measuring device.
7. You should take account of power surges and lightning protection as well as possibly appropriate grounding measures required in accordance with local regulations.

# 2 Warranty

**Note the loss of warranty and exclusion of liability in the event of unauthorized access to the system.** Changes to or interventions in system components may only be made with the explicit approval of **LAMBRECHT meteo GmbH by qualified staff.**

**The warranty does not include**

1. Mechanical damage due to external impact (e.g. falling ice, falling rocks, vandalism).
2. Effects or damage caused by power surges or electromagnetic fields that go beyond the standards and specifications referred to in the technical data.
3. Damage caused by improper handling, such as the use of incorrect tools, incorrect installation, incorrect electrical installation (reverse polarity) etc.
4. Damage that can be attributed to operation of the devices outside the specified conditions of use.

# 3 Disposal

Lambrecht Meteo GmbH is registered with the *Elektro-Altgeräte Register* (EAR Foundation) for waste electronic devices as follows.

**WEEE-Reg.-Nr. DE 45445814**

In the monitoring and control instrument category, type of device: Monitoring and control instruments for exclusively commercial use.

**Within the EU**

The device must be disposed of in accordance with European directives 2002/96/EC and 2003/108/EC (waste electrical and electronic devices). Waste devices must not be disposed of with household garbage. For environmentally friendly recycling and disposal of your waste device, please contact a certified disposal company for electronic waste.

**Outside the EU**

Please observe the regulations applicable to the proper disposal of waste electronic devices in each country.

## 4 Introduction

With the extension set described here and the electric module, in addition to the amount and intensity of precipitation, the rain[e] can use radar measurements to differentiate between 16 types of precipitation and thus becomes a rain[e]observer. These instructions describe the installation and commissioning of the rain[e]observer and the extension set.

## 5 Operating principle

The rain[e]observer's Doppler radar sends electromagnetic waves in the mW range upwards via a transmitting antenna array, i.e. towards the precipitation. The frequency used is internationally approved for measurements of this kind. The receiving antenna array of the sensor receives the signal reflected by the droplets or particles, from which the difference frequency between the two signals is determined.

The exact falling speed of the drops (particles) can be calculated from the difference frequency, which combined with the measurements taken for air temperature and humidity allows for 16 types of precipitation to be determined and differentiated approximately (see chart).

## 6 Scope of delivery

**Scope of delivery for rain[e]observer installation set · ID no. 32.15184.300000**

**Note: rain[e] precipitation sensor not included (please order separately)**

| Item number | Designation |
|---|---|
| 32.15184.200000 | Detection of precipitation type (observer module) |
| 32.15184.301000 | Observer connection box |
| 33.14627.001010 | Aluminum profile 8 40x16 E 0.75 m |
| 33.14627.002000 | Mast mount |
| 35.09331.540100 | Hexagonal screw M8 x 16 DIN 933 A2 |
| 35.67981.500841 | Serrated lock washer 8.4 DIN 6798 A A2 |
| 69.06500.590000 | T nut 8 St M8, galvanized |
| 69.61010.210000 | Tension band |
| 69.61010.210100 | Turnbuckle |

## 7 Choosing the installation site

To minimize possible spraying, it is recommended that you avoid locations with a hard floor surface (such as concrete) and to install the precipitation sensor instead on grass or another soft surface. In general, the sensor should not be placed on roofs or slopes.

In accordance with DWD standards, we recommend installing the precipitation sensor at a distance of at least 2 m or the obstacle height (above the sensor edge) to the next obstacle (such as trees or walls), twice the obstacle height in accordance with WMO standards or ideally four times the obstacle height.

Overgrowth by plants around the precipitation sensor must be regularly trimmed back to the height of the sensor in order to prevent the results being falsified and to reduce the effects of wind at the same time.

A specific point about the rain[e]observer's radar module is that there should be no large moving objects such as trees or cars driving within a radius of up to 10 meters in the module's field of vision. This applies in particular to moving objects at sensor height as well as gas disposal lamps (e.g. street lighting). The radar signals reflected from these objects could produce Doppler frequencies, which could be incorrectly interpreted as precipitation events.

You should take account of power surges and lightning protection as well as possibly appropriate grounding measures required on site in accordance with local regulations.

## 8 Connecting cables for rain[e] precipitation sensor and heating

To connect the rain[e] to a data collection device such as the PreLOG data logger, you require a connection cable with an M12 plug (ID no. 32.15184.060000). To power the heating you need a power cable (ID no. 32.15184.061000 or 32.15184.061010).

| | |
|---|---|
| Connection cable for the sensor, 8-pin, M12 plug, length: 10 m | 32.15184.060000 |
| Connection cable for the heating, length: 1 m | 32.15184.061000 |
| Connection cable for the heating, length: 10 m | 32.15184.061010 |

**You should ensure that the external power connection for the heating is connected first – before the clamping plug for the heating in the device and the sensor connection. Otherwise the heating will be switched off during the automatic heating check.**

The maximum possible distance between the rain[e] and the data collection device depends on the interface used.

- SDI-12 65...100 m, unshielded, low voltage cable
- RS485 1,000 m,
- Pulse output 1,000 m.

You can find further details of the respective cable lengths in the corresponding SDI-12 and RS485 standards.

$$P_a = \frac{U_N^4}{P_N\left(\frac{U_N^2}{P_N} + 2\rho\frac{l}{A}\right)^2}$$

If you use a power cable longer than the 1 m long cable we recommend to supply the heating, this formula gives you information about the actual power $P_a$ at the nominal voltage $U_N$ = 24 VDC, the nominal power $P_N$ = 140 W, the specific electrical resistance $\rho = 0.017\ \Omega mm^2/m$ *for copper*, the length of the cable $l$ and the cross-sectional area of cable $A$.

The actual output should be $P_a$ > 125 W in order to guarantee sufficient heating performance.

The USB cables for connections to the service interface (inside the **rain[e]**) should be no longer than 3 m.

Applies to **rain[e]H**: $P_a$ > 125 W and $P_N$ = 140 W; applies to **rain[e]400H and rain[e]314H**: $P_a$ > 187 W and $P_N$ = 210 W

# 9 Initial operation

## 9.1 General

**There are different versions of the rain[e], which have already been prepared for the observer module upon delivery. With the rain[e] versions that are <u>not</u> prepared for the observer module, two additional installation steps have to be carried out first.**

Essentially, the observer module can be connected to the following rain[e] models.


(1) rain[e]

(2) rain[e]314

(3) rain[e]400

(4) rain[e]H3

You can tell from the item number whether the rain[e] has been pre-wired and configured as standard for use as a rain[e]observer.

**00.15184.XXX9XX**

If there is an item number 9 at this point, the respective rain[e] model is directly prepared for connection of the observer module. (X = any number). Otherwise, the configuration of the 8-pin device plug must be wired in the precipitation sensor in accordance with the following connection diagram.

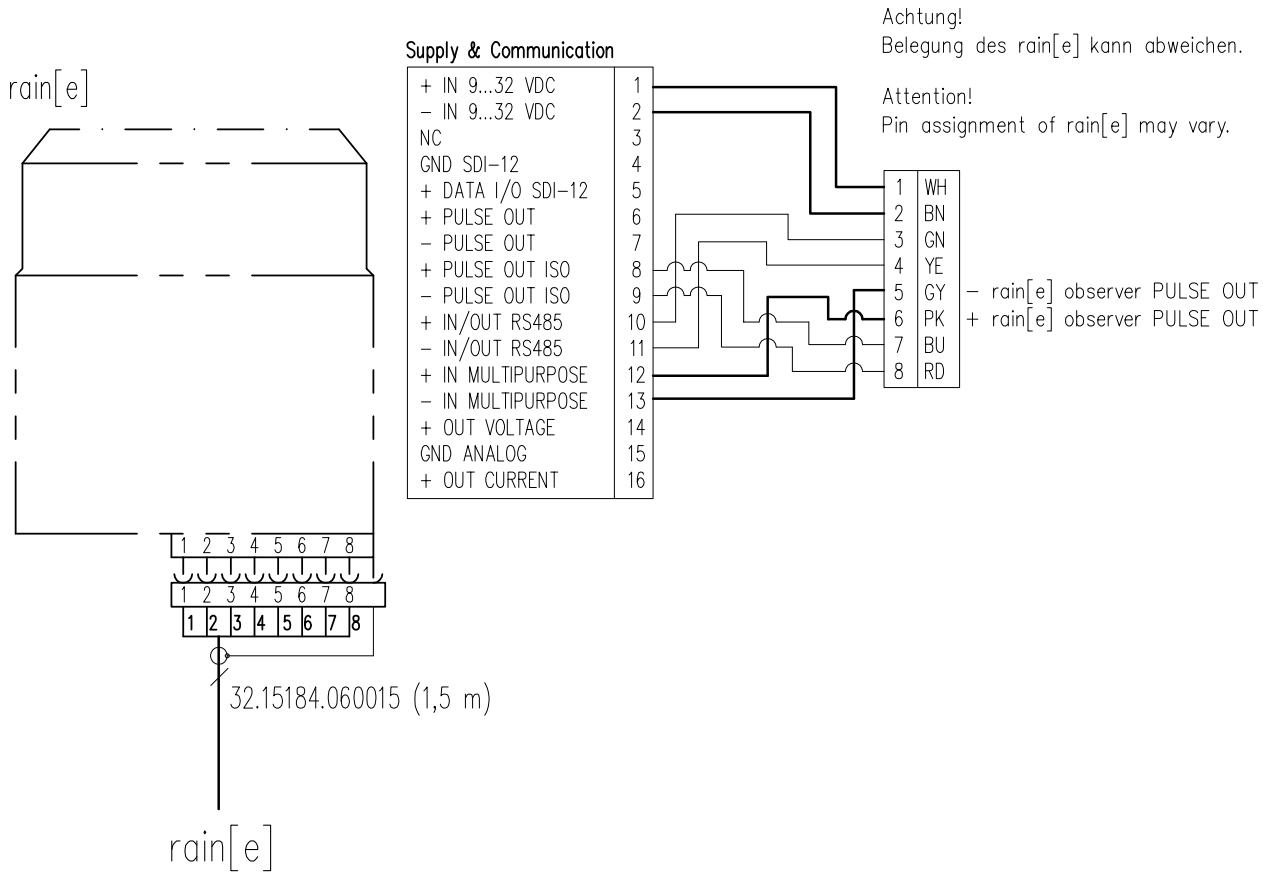
Installation involves the following steps.

1. Adapt the wiring of the 8-pin device plug in the rain[e] precipitation sensor *)
2. Configuration of the rain[e] as rain[e]observer with the rain[e] commander *)
3. Installation of the rain[e] at the installation site as required
4. Installation of the observer module
5. Plug in the system cabling
6. System start

**) These steps are omitted for the above-mentioned rain[e] sensors that have already been prepared for connecting the observer module.*

## 9.2 Wiring the rain[e] as rain[e]observer · Internal connection diagram

If the observer module is retrofitted to a rain[e] precipitation sensor or if it is not supplied with a rain[e] prepared for the rain[e]observer, the configuration of the 8-pin device plug in the precipitation sensor must be wired in accordance with the following connection diagram.




**It is important that the configuration of wires with the thick lines (WH, BN, GY, PK) is strictly adhered to. All other wires can be connected as desired.**

Note: It is not possible to use the SDI-12 interface and the RS485 interface at the same time. To avoid malfunctions, it is recommended that only one of the two interfaces be connected to the plug connector internally. Communication via the SDI-12 interface is provided as standard; for the RS485 interface connection, see the section *Changing the serial interface from SDI-12 (default) to RS485*.

To change the wiring, open the housing.

### 9.2.1 Opening the housing

- Unscrew the knurled screw on the underside and turn the upper section counterclockwise in the direction of open. Carefully lift off the housing and pay attention to the connector for the heating inside the housing.

**Please note that the measuring edge of the housing's upper section is very sharp. There is a risk of cuts. It is recommended that you do not press on the measuring edge and/or wear heavy-duty gloves.**

- Pull out the clamping plug for the upper heating section and put the housing in a safe place. When putting the housing upper section aside, avoid placing it on the cutting edge of the receiver opening, in order not to damage it.

### 9.2.2 Changing the wiring

The wires are equipped with wire end sleeves and plug into push-in terminals. To loosen the wires, press the orange release button with a screwdriver (size 2) until the wire can be easily pulled out.

Based on the desired wiring scheme, place the loosened wires into the push-in terminals as far as they will go. It is not necessary to press the orange release button.

### 9.2.3 Closing the housing

1. Connect the clamping plug of the heating and position the upper housing section in such a way that the open/close sticker sits over the knurled screw.
2. Press the housing down and turn it clockwise in the direction of close.
3. Tighten the knurled screw.

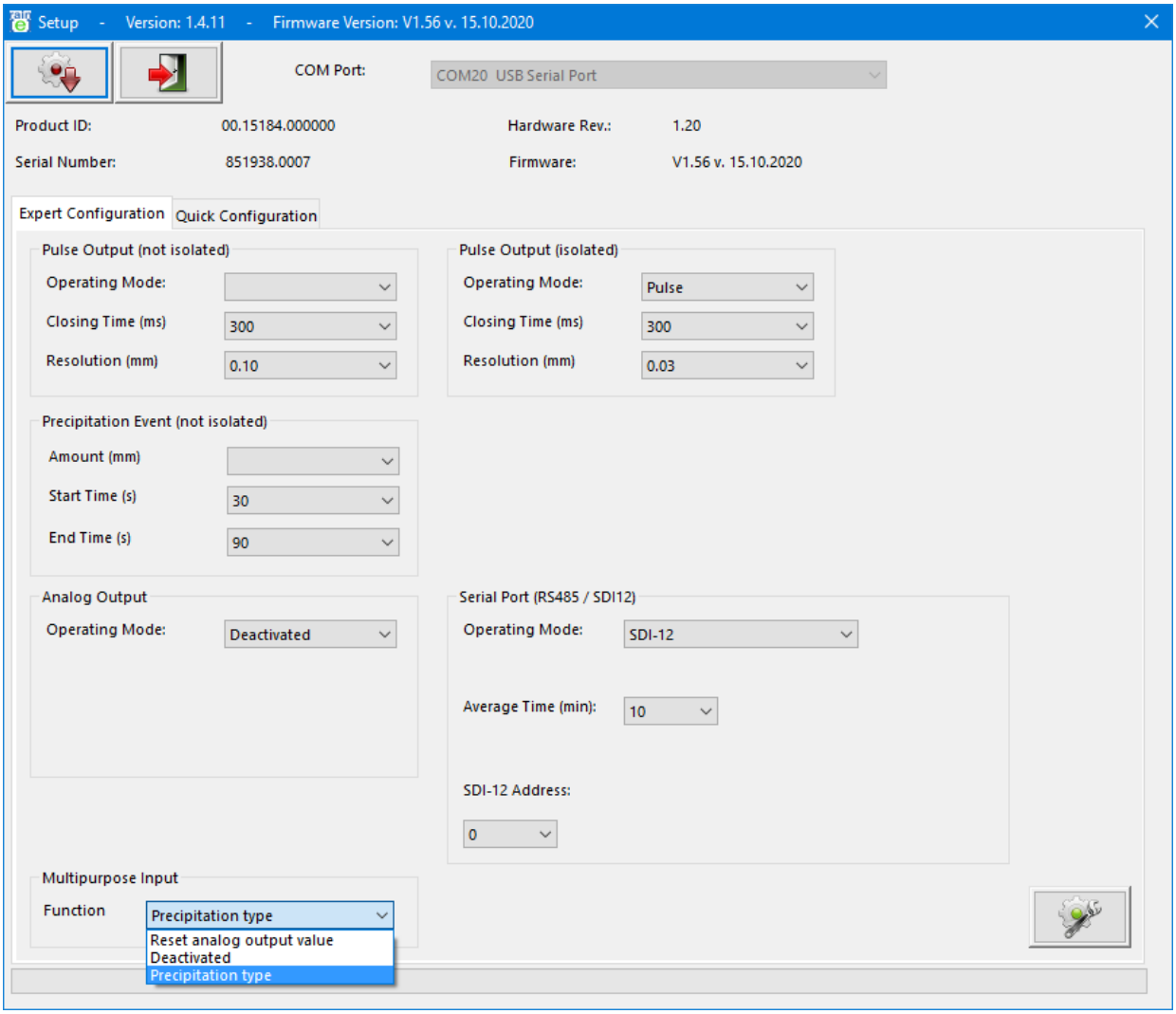
## 9.3 Configuration of the rain[e] as a rain[e]observer

If this has not yet happened upon delivery, the rain[e] precipitation sensor must be reconfigured with the rain[e] commander in order to use the observer module.

Depending on the version, the rain[e] commander can be downloaded from the Lambrecht website or is included with the sensor upon delivery. For the configuration, the rain[e] does not have to be supplied with electricity but is fed via the service USB interface.

**With the rain[e]H3 model, the USB interface only works if the external sensor supply is disconnected.**

1. Connect the sensor using the supplied mini-USB on USB 2.0 cable to a PC, laptop or similar device on which the rain[e] commander has been installed and start the rain[e] commander. The observer module does not have to be connected for the configuration.
2. Select the used COM port of the USB interface (USB serial port).
3. Press the button  to load the current configuration for the rain[e].
4. For the “multipurpose” input, choose the precipitation type.




5. If necessary, change the protocol that is to output the type of precipitation.

**The precipitation type is only available in the SDI-12 extended protocol or the Modbus protocol. Other protocols can also be selected but these do not support the output of precipitation type. (For further details see the section on "*Protocols of the rain[e]observer*".)**

6. Send the new configuration to the rain[e] by pressing the button 

## 9.4 Installation of the rain[e] at the installation site

### 9.4.1 Choosing the installation site

To minimize possible spraying, it is recommended that you avoid locations with a hard floor surface such as concrete and to install the precipitation sensor instead on grass or another soft surface. In general, the sensor should not be placed on roofs or slopes. In accordance with DWD standards, we recommend installing the precipitation sensor at a distance of at least 2 m or the obstacle height (above the sensor edge) to the next obstacle (such as trees or walls), twice the obstacle height in accordance with WMO standards or ideally four times the obstacle height.
Overgrowth by plants around the precipitation sensor must be regularly trimmed back to the height of the sensor in order to prevent the results being falsified and to reduce the effects of wind at the same time.

### 9.4.2 Assembly

**Required tools**

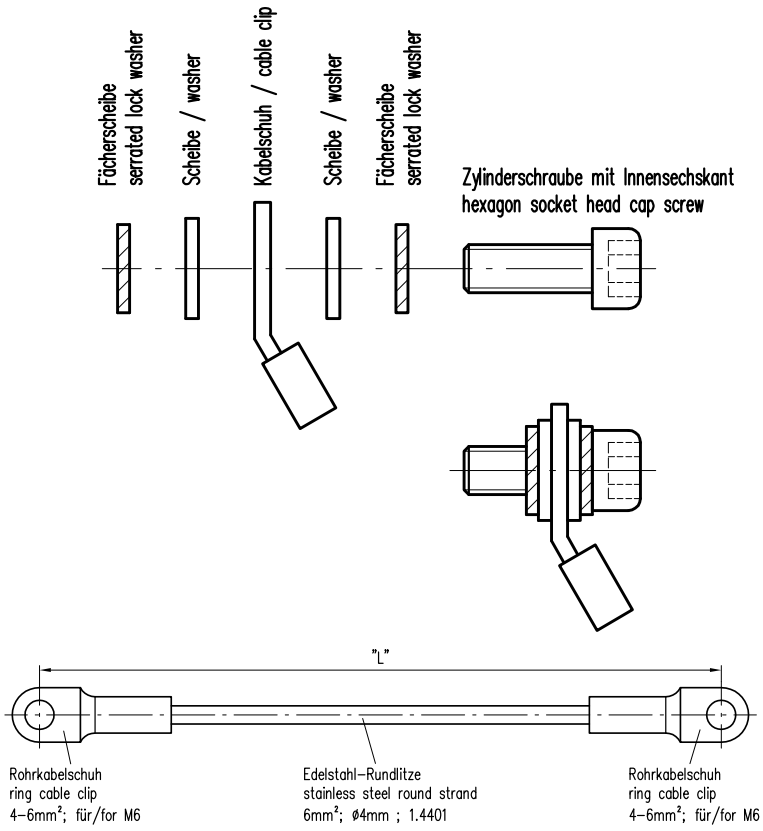
- ► Wrench (13 mm)
- ► Allen key (6 mm)
- ► Slotted screwdriver (approx. 2.5 blade width)

- Unpack the device.
- Take the box with the collecting container from the funnel of the **rain[e]**.
- Check the container for transport damage and place it back in the box until it is installed.

- Place the sensor on a pipe or mast with an outer diameter of 60 mm. If a wooden post is used, we recommend using an intermediate ring made of metal with a minimum length of 100 mm. Use the wrench (13 mm) to tighten the screws evenly on the base.

**Avoid damage to the upper measuring edge.**

- In order to improve operational safety at places at risk of lightning strikes, we recommend grounding the sensor with the **rain[e]'s** integrated earthing screw. The illustration shows the steps required to install the ground with a cable lug and an earthing screw on the sensor. The other end of the grounding cable should be connected with a peg.

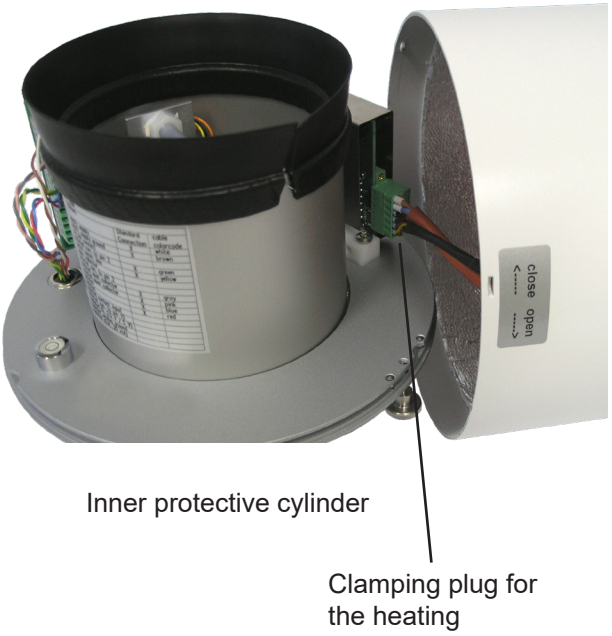


### 9.4.3 Integrated collection container

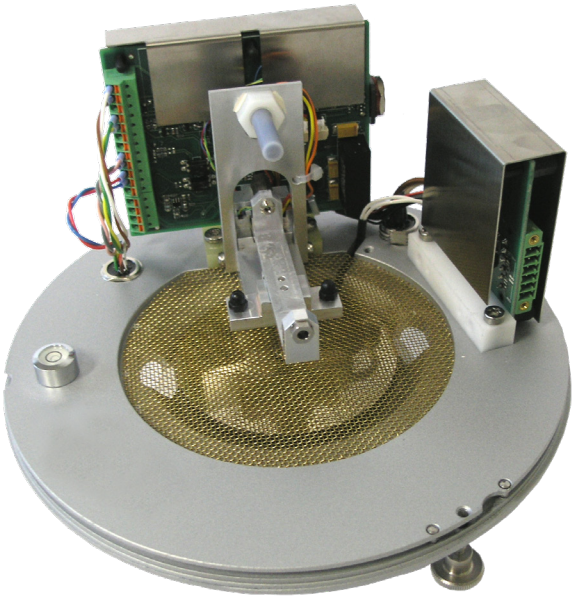
#### Illustrations using the rain[e]


- Open the device
  - Unscrew the knurled screw on the underside.
  - Grasp the upper edge of the funnel and the mast shaft and turn the upper section counterclockwise (open).
  - Carefully lift off the housing - pay attention to the connector for the heating.

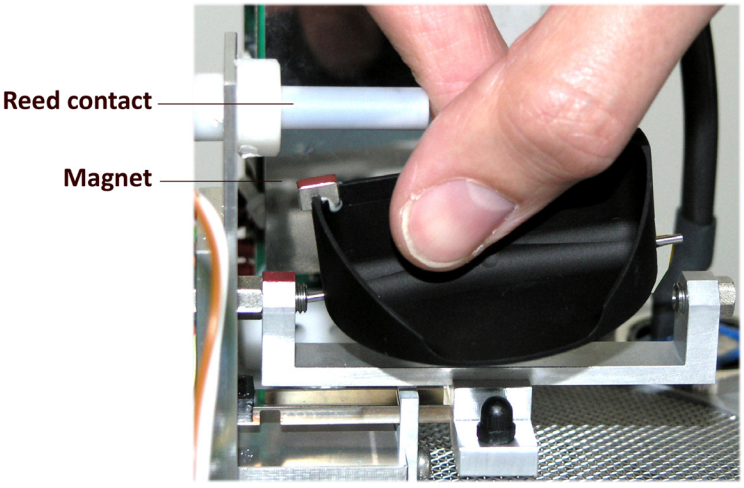
**The housing upper section's measuring edge is very sharp. There is a risk of cuts. It is recommended that you do not press on the measuring edge and/or wear gloves.**



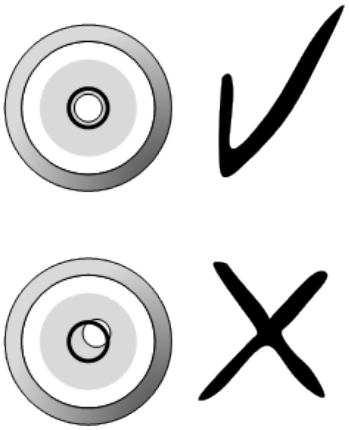

- Remove the clamping plug.
- Set the housing aside.
- Lift off the inner protective cylinder.



**rain[e]** inner workings without the collecting container



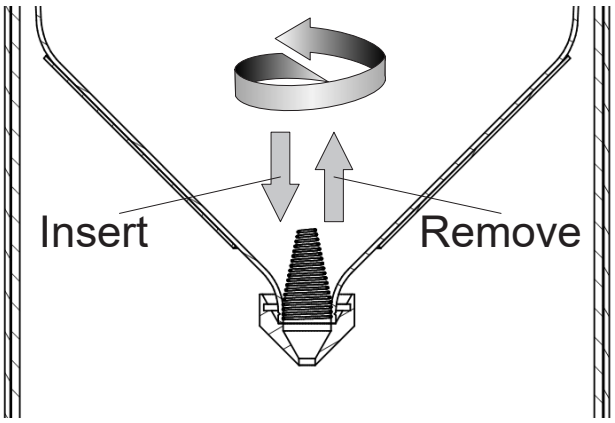

- Unpack the collecting container.
- Installing the collecting container
  - Press the collecting container with the magnetic side towards the reed contact against the bearing spring.
  - Insert the other side of the axle into the other side of the bearing.
  - **Make sure that the collecting container tilts properly.**



Use a spirit level to level the device by tightening the hexagonal screws evenly on the base.


- Reassembly
  - Carefully reinsert the inner protective cylinder.
  - Connect the clamping plug for the heating.
  - Place the housing back on the device – embossings into the recesses.
  - Press the housing down and turn it clockwise in the direction of close.
  - Tighten the knurled screw.
  - Insert the enclosed dirt trap into the funnel.

**The housing upper section's measuring edge is very sharp. There is a risk of cuts. It is recommended that you do not press on the measuring edge and/or wear gloves.**

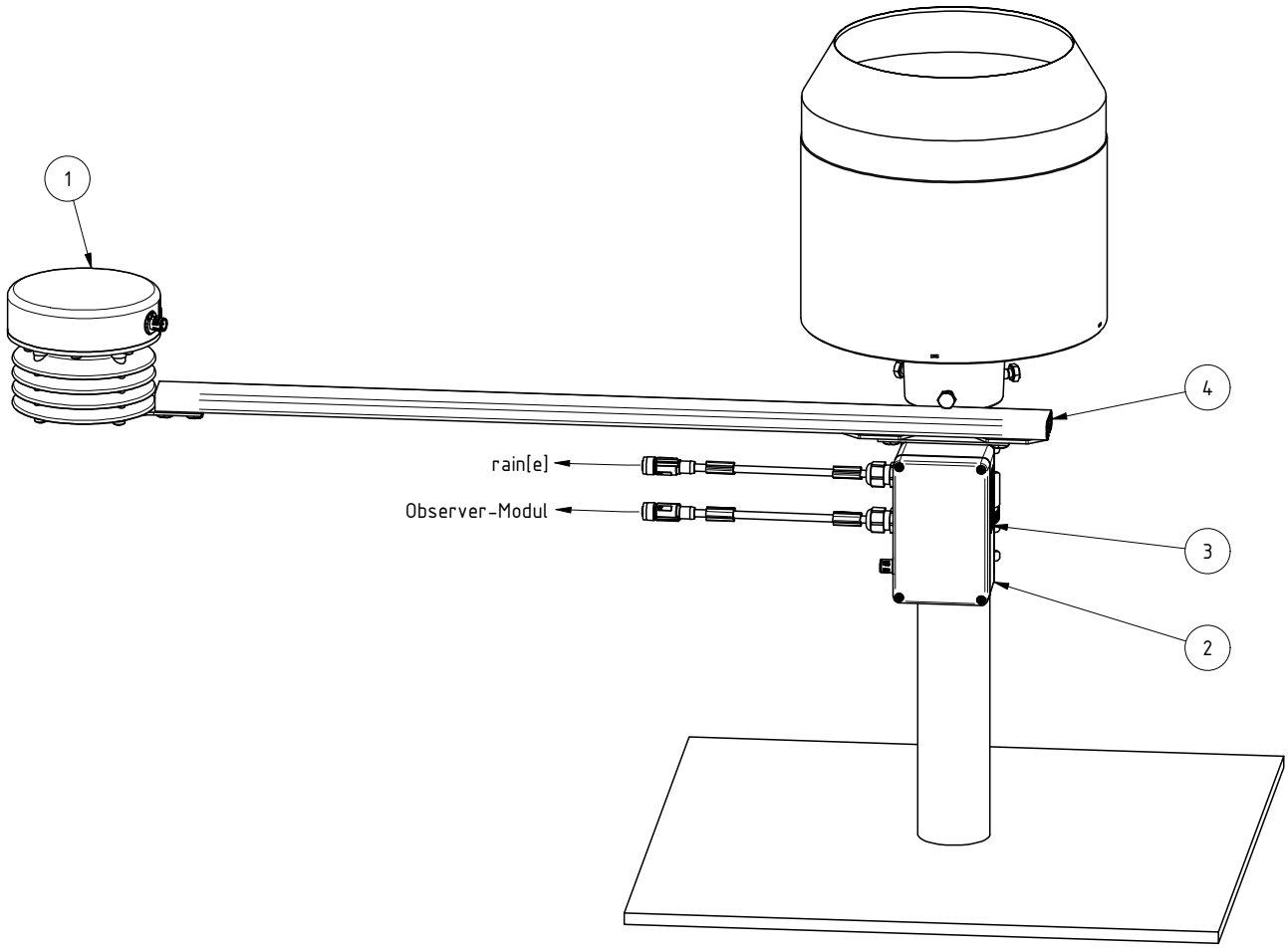



- **Inserting the dirt trap**
  Insert the enclosed dirt trap into the funnel. Try to hold the dirt trap in such a way that you can complete one whole anti-clockwise rotation and press the dirt trap into the funnel mouth as you twist it from above.
- **Removing the dirt trap**
  Hold the dirt trap in such a way that you can complete one whole anti-clockwise rotation and pull the dirt trap upwards out of the funnel mouth as you twist it.

## 9.5 Installation of the observer module

**Required tools**

- Combination spanners or socket wrenches
  - o SW7 turnbuckle
    (Optional slot 6.5 x 1.2)
  - o SW13 nut (mast)
- Allen key
  - o SW4 grub screw (traverse)



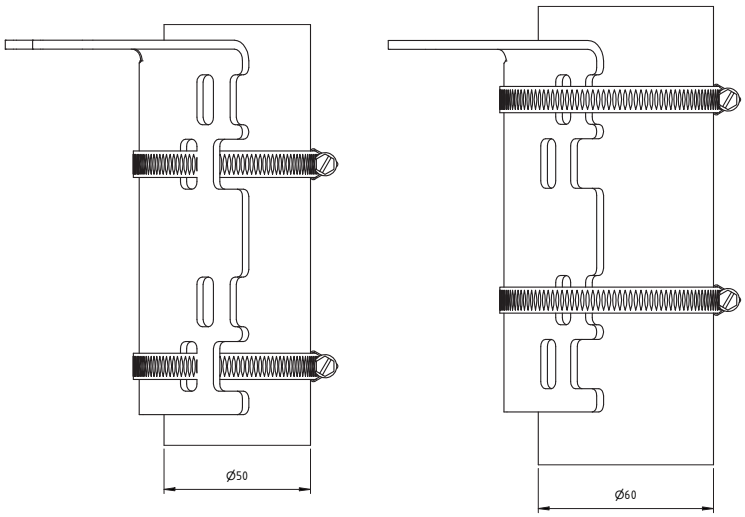

| Pos. | Number | Component no. | Designation |
|---|---|---|---|
| 1 | 1 | 32.15184.200000 | Observer Modul |
| 2 | 1 | 32.15184.301000 | rain[observer] junction box |
| 3 | 1 | 33.00001.072000 | Nameplate WN1-72 |
| 4 | 1 | 33.14627.001010 | Aluminium profile 8 40x16 E 0.75 m |
| 5 | 1 | 33.14627.002000 | Pole mount |
| 6 | 4 | 35.09331.540100 | Hexagon head screw M8 x 16 DIN 933 A2 |
| 7 | 4 | 35.67981.500841 | Serrated lock washer 8.4 DIN 6798 A A2 |
| 8 | 2 | 67.04010.280000 | Hose clamp TORRO W5 9mm 60-80 |
| 9 | 4 | 69.06500.590000 | Slot nut 8 St M8, galvanized |

## 9.6 Installing the mast mount for the traverse

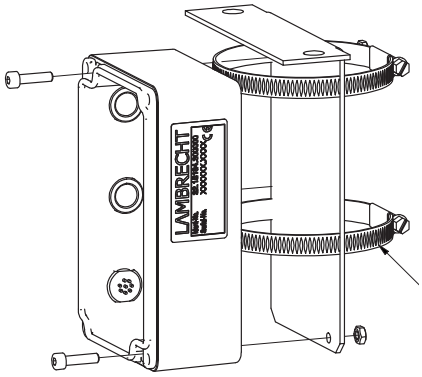
**Mast bracket assembly**

Hold the mast bracket at the desired position of the mast in order to select the appropriate recess to guide the hose clamp, so that a good junction is created between the mast, mast bracket and hose clamp.

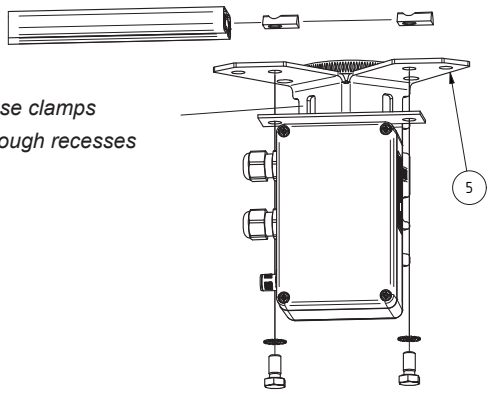
The hose clamps should be guided around the mast bracket and tightened with the turnbuckle on the back.



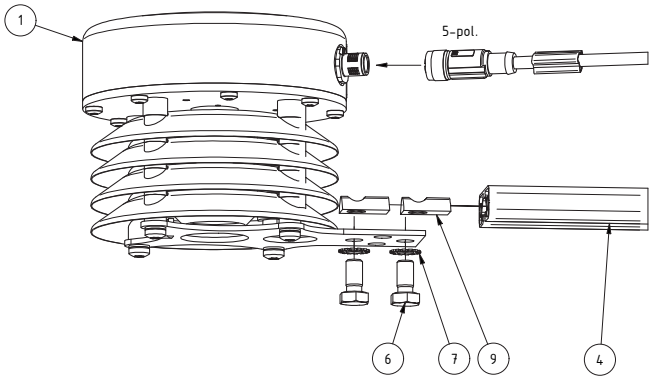

**2. Mounting the angle bracket on the distribution box**




**3. Mounting the traverse on the mast bracket together with the distribution box**

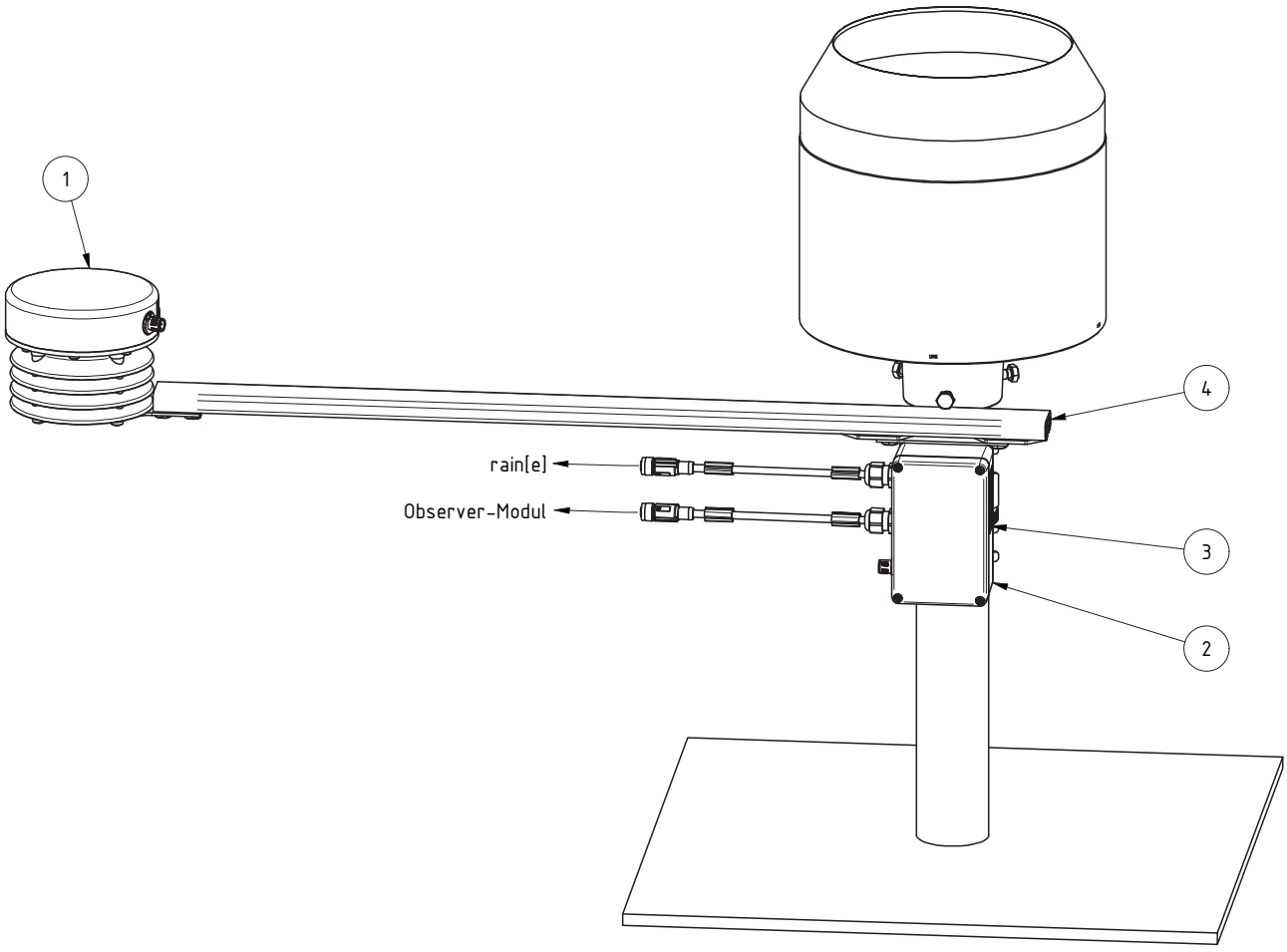


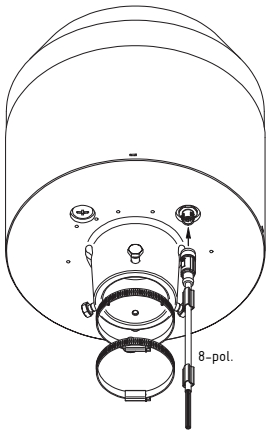

**4. Mounting the observer module on the other end of the traverse**

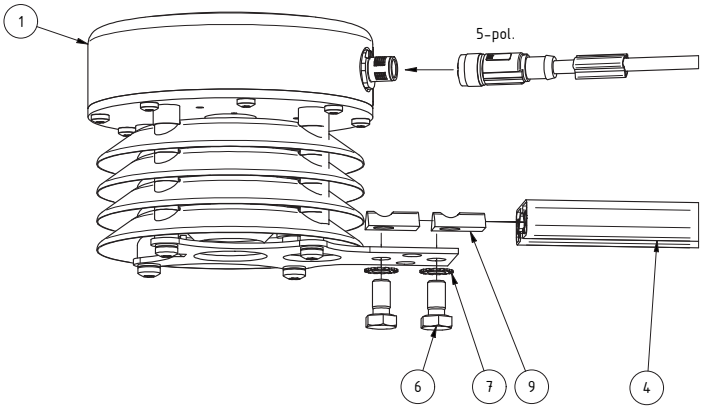


## 9.7 Connecting the rain[e]observer - Connecting the system cabling

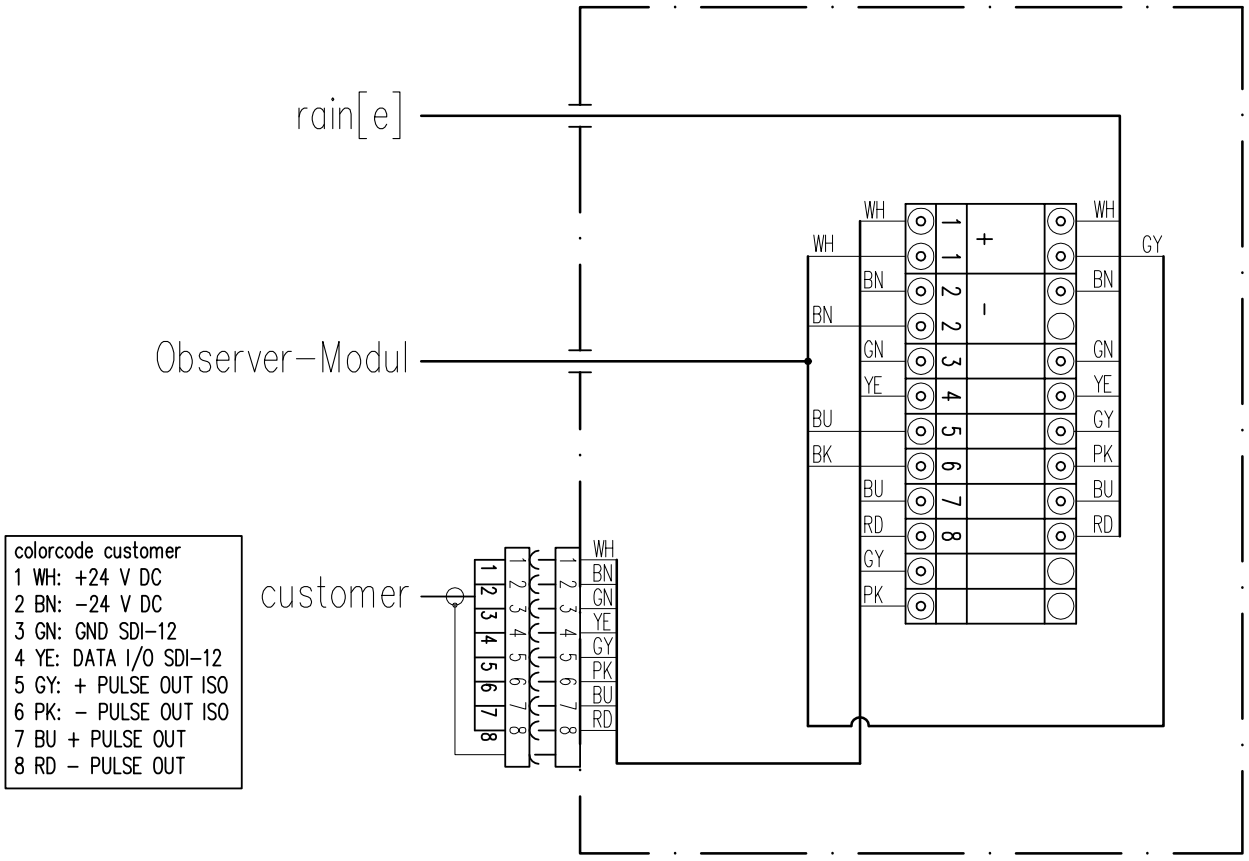
### 9.7.1 Connecting cables to the observer module and the rain[e]



### 9.7.2 Connection diagram




## 9.8 System start

The entire rain[e]observer system starts automatically as soon as the sensor cable is connected. Once the system starts, an LED on the main circuit board of the precipitation sensor lights up for three seconds and then changes to rapid flashing during operation. The observer module shows a green light for about five minutes after the power supply is switched on. (Visible through the translucent housing.)

After ~15 seconds the rain[e] observer is ready to operate and starts by measuring and sending data to a connected data logger in accordance with the device configuration.

## 10 rain[e]observer protocols

This section only describes the protocols that also support output of the type of precipitation. You can find details about the other protocols supported by the rain[e] in the operating instructions of the rain[e] weighing precipitation sensor.

## 10.1 SDI-12 interface

Communication using the SDI-12 protocol via the SDI-12 interface is based on the *SDI-12 A Serial Digital Interface Standard for Microprocessor-Based Sensors, version 1.3, 2012*. The rain[e] can be used in bus operation parallel to other rain[e] devices.

The following subset of SDI-12 commands has been implemented in the rain[e]. For further information about the SDI-12 protocol, we refer you to the aforementioned standard documentation or the website www.SDI-12.org.

**Implemented SDI-12 commands:**

| Command | Function | Sensor response |
|---|---|---|
| **a!** | Activity confirmation | a<CR><LF> |
| **?!** | Address query command | a<CR><LF> |
| **aI!** | Send identification | allccccccccmmmmmmvvvxx...xx<CR><LF> |
| **aAb!** | Change address | b<CR><LF> |
| **aM!** | Start measurement | atttn<CR><LF> |
| **aMC!** | Start measurement with CRC | atttn<CR><LF> |
| **aC!** | Start parallel measurements | atttnn<CR><LF> |
| **aCC!** | Start parallel measurements with CRC | atttnn<CR><LF> |
| **aD0!**<br>**aD1!** | Send data (buffer 0)<br>Send data (buffer 1)<br>If required with CRC | a<Werte<CR><LF><br>a<Werte><CRC><CR><LF> |
| **aM1!** | Generate variance | atttn<CR><LF> |
| **aM2!** | Generate heating data | atttn<CR><LF> |
| **aM3!** | Start measurement intensity (mean value, maximum and minimum) | atttn<CR><LF> |
| **aMC1!** | Generate variance with CRC | atttn<CR><LF> |
| **aMC2!** | Generate heating data with CRC | atttn<CR><LF> |
| **aMC3!** | Start measurement intensity (mean value, maximum and minimum) with CRC | atttn<CR><LF> |
| **aC1!** | Generate variance | atttnn<CR><LF> |
| **aC2!** | Generate heating data | atttnn<CR><LF> |
| **aC3!** | Start measurement intensity (mean value, maximum, minimum) | atttnn<CR><LF> |
| **aCC1!** | Generate variance with CRC | atttnn<CR><LF> |
| **aCC2!** | Generate heating data with CRC | atttnn<CR><LF> |
| **aCC3!** | Start measurement intensity (mean value, maximum, minimum) with CRC | atttnn<CR><LF> |
| **aV!** | Start verification | atttn<CR><LF> |

a = Address of the corresponding sensor; standard sensor address = 0

SDI-12 commands always begin with the address of the corresponding sensor. All the other sensors on the same bus therefore ignore such commands. SDI-12 commands end with a **!**. All sensor responses also begin with the address of the sensor, but end with the ASCII characters for carriage return, **<CR>** and line feed, **<LF>**.

The SDI-12 protocol is based on the ASCII character set. The baud rate is 1,200 Bd and has the byte frame format:

1 Start bit
7 Data bits (least significant bit first)
1 Parity bit (even parity))
1 Stop bit

## Activity conformation - a!

This command ensures the sensor is responding to inquiries. Essentially, it asks the sensor to confirm that it is connected to the bus.

The sensor responds with its address and the characters **<CR><LF>**.

**Syntax**

| Command | Response |
|---|---|
| **a!**<br>**a** – Sensor address<br>**!** – Command end | **a<CR><LF>**<br>**a** – Sensor address<br>**<CR><LF>** – End of response |

**Example:**

| Command | Response |
|---|---|
| **0!** | **0<CR><LF>** |
| **1!** | **1<CR><LF>** |

## Send identification - aI!

The command **aI!** Requests the sensor to return its model number and firmware version.

**Syntax**

| Command | Response |
|---|---|
| **aI!**<br>a – Sensor address<br>**I** – Command - Send identification<br><br><br><br><br><br><br><br>**!** – Command end | **a 13LMGmbH1515184x1.0781129.0001<CR><LF>**<br>**a** – Sensor address<br><br>**13LMGmbH1515184x1.0781129.0001**<br>**13** – 2 characters SDI-12 version no.<br>13 = Version 1.3<br>**LMGmbH15** – 8 characters manufacturer name<br>(= Lambrecht meteo GmbH)<br>**15184x** – 6 characters sensor type<br>(= **rain[e]** precipitation sensor)<br>**1.0** – Sensor version (= version 1)<br>**781129.0001** – 11 characters serial number<br>**<CR><LF>** – End of response |

**Beispiel:**

| Befehl | Antwort |
|---|---|
| **0I!** | **013LMGmbH1515184x1.0781129.0001<CR><LF>** |
| **1I!** | **113LMGmbH1515184x1.0781129.0002<CR><LF>** |

## Change address - aAb!

The factory setting for the address is **0**. If several sensors are connected to the same bus, the sensor address can be changed using the command **aAb!**. The address is always a single ASCII character. By default, the ASCII characters are used for the numbers between **0** and **9** (decimal 48 to 57). If more than 10 sensors are connected to a bus, the characters **A** to **Z** (decimal 65 to 90) and **a** to **z** (decimal 97 to 122) can also be used. The sensor responds with its new address and **<CR><LF>**. After the address has been changed, no further commands should be sent to the sensor for about a second. (see also *SDI-12 Standard, version 1.3, 2012*).

**Syntax**

| Command | Response |
|---|---|
| **aAb!** | **b<CR><LF>** |
| **a** – Old sensor address | **b** – New sensor address |
| **A** – Command - Other address | |
| **b** – New sensor address | |
| **!** – Command end | **<CR><LF>** – End of responset |

**Example:**

| Command | Response |
|---|---|
| **0A1!** | **1<CR><LF>** |

## Start measurement - aM!

The **aM!** command requests the sensor to process the available measurement data and write it to an output string. Unlike standard sensors, as described in the SDI-12 documentation, the **rain[e]** measures continuously. As the string is generated, the recorded measurement values are loaded into a temporary buffer and are then processed upon completion of this event. Which is why the **rain[e]** always responds with **a003**. This is also the reason why the **rain[e]** does not send a **service request** and ignores commands to interrupt measuring. The connected data logger has to comply with the returned waiting time (3 seconds). When the waiting time is over, the data can be retrieved with the commands **aD0!** and **aD1!** (See below under **Send data**). The data are not overwritten until the next **C**, **M**, or **V** command and can be called up multiple times.

**Syntax**

| Command | Response |
|---|---|
| **aM!** | **a0036<CR><LF>** |
| **a** – Sensor address | **a** – Sensor address |
| **M** – Command - Start measurement | **003** – Seconds until the sensor returns the measurement data (= 3 s) |
| | **06** – Number of measurement data |
| **!** – Command end | **<CR><LF>** – End of response |

**Example**:

| Command | Response |
|---|---|
| **1M!** | **10036<CR><LF>** |

The measurement data can then be called up with the commands **aD0!** and **aD1!** (See below under **Send data**).

## Start measurement with CRC - aMC!

The same command as **aM!** but the sensor also sends a 3-digit CRC checksum in addition to the prepared measurement data. For further information on generating this CRC checksum, we refer you to *SDI-12 Standard, version 1.3, 2012, section 4.4.12*.

**Syntax**

| Command | Response |
|---|---|
| **aMC!**<br>**a** – Sensor address<br>**M** – Command - Start measurement with CRC<br>**C** – Request a CRC checksum to send<br>**!** – End of command | **a0036<CR><LF>**<br>**a** – Sensor address<br>**003** – Seconds until the sensor returns the measurement data (= 3 s)<br>**6** – Number of measurement data<br>**<CR><LF>** – Ende der Antwort |

**Example:**

| Command | Response |
|---|---|
| **2MC!** | **20036<CR><LF>** |

## Starte parallele Messung - aC!

With the **parallel measurement** the data logger can measure simultaneously with several **rain[e]** devices connected to the same bus.

The **aC!** command requests the sensor to process the available measurement data and write it to an output string. Unlike standard sensors, as described in the SDI-12 documentation, the **rain[e]** measures continuously. As the string is generated, the recorded measurement values are loaded into a temporary buffer and are then processed upon completion of this event. Which is why the **rain[e]** always responds with **a003**. This is also the reason why the **rain[e]** does not send a **service request** and ignores commands to interrupt measuring. The connected data logger has to comply with the returned waiting time (3 seconds). When the waiting time is over, the data can be retrieved with the commands **aD0!** and **aD1!** (See below under **Send data**).

The data are not overwritten until the next C, M, or V command and can be called up multiple times.

**Syntax**

| Command | Response |
|---|---|
| **aC!**<br>**a** – Sensor address<br>**C** – Command - Start parallel measurement<br>**!** – Command end | **a00306<CR><LF>**<br>**a** – Sensor address<br>**003** – Seconds until the sensor returns the measurement data (= 3 s)<br>**6** – Number of measurement data<br>**<CR><LF>** – End of response |

**Example:**

| Command | Response |
|---|---|
| **2C!** | **200306<CR><LF>** |

The measurement data can then be called up with the commands **aD0!** and **aD1!** (See below under **Send data**).

## Start parallel measurement with CRC - aCC!

The same command as **aC!** but the sensor also sends a 3-digit CRC checksum in addition to the prepared measurement data. For further information on generating this CRC checksum, we refer you to *SDI-12 Standard, version 1.3, 2012, section 4.4.12*.

**Syntax**

| Command | Response |
|---|---|
| **aCC!**<br>**a** – Sensor address<br>**C** – Command - Start parallel measurement with CRC“<br>**C** – Request a CRC checksum to send<br>**!** – End of command | **a00306<CR><LF>**<br>**a** – Sensor address<br>**003** – Seconds until the sensor returns the the measurement data (= 3 s)<br>**06** – Number of measurement data<br>**<CR><LF>** – End of response |

**Example:**

| Command | Response |
|---|---|
| 2CC! | 200306<CR><LF> |

## Send data - aD0! / aD1! / aD2! aD3! and D4! (SDI-12 extended)

In the following section, only the output of the measurement values in the SDI-12 extended protocol is described. The order of measured values in the buffers D0 and D1 corresponds to the Rain[e]'s original SDI-12 output, while the SDI-12 extended protocol provides information and readings in the buffers D2 and D3.

The type of precipitation code is output in buffer D4.

The data requested by the sensor with the commands C, M or V can be called up with the commands aD0! and aD1!. The sensor uses the corresponding prefixes (+ or -) as field separators. If the data has been requested with a CC or MC command, a CRC checksum is also returned. For further information on generating this CRC checksum, we refer you to *SDI-12 Standard, version 1.3, 2012, section 4.4.12*. The measurement data are output in metric units.

**Due to hardware differences, some information about the rain[e]H3 is not available for the other rain[e] models. The corresponding fields are output as 0 and are marked as {rain[e] always 0} in the table below.**

| Command | Position | rain[e] / rain[e]H3 |
|---|---|---|
| DO | 1 | Precipitation intensity of the last minute (mm/min) |
| | 2 | Precipitation intensity of the last minute (mm/h) |
| | 3 | Precipitation intensity since last access (mm/min) |
| D1 | 4 | Precipitation intensity since last access (mm/h) |
| | 5 | Precipitation amount since last access (mm) |
| | 6 | Total precipitation amount (mm) |
| D2 | 7 | Housing status (1 = open; 0 = closed) {rain[e] always 0} |
| | 8 | Error status<br>Value from 0 to 255 is evaluated bit by bit<br>Bit 0 Heating temperature error<br>Bit 1 Heating test error<br>Bit 2 Temperature sensor housing bottom error<br>Bit 3 Temperature sensor funnel error<br>Bit 4 RTC initialization error {rain[e] always 0}<br>Bit 5 Temperature sensor outside error {rain[e] always 0}<br>Bit 6 Power supply error<br>Bit 7 Reserved |
| | 9 | Heating active (0 = no; 1 = yes) |
| | 10 | Operating hours {rain[e] always 0} |
| D3 | 11 | Temperature of housing bottom (°C) |
| | 12 | Temperature of funnel (°C) |
| | 13 | Heating capacity (%) |
| D4 | 14 | Precipitation type Synop code see *Precipitation codes by Synop* section (only with available observer module) |

## Synop-based precipitation codes

The following chart shows the keys of the recognizable types of precipitation based on the Synop table 4680, prohibitions and restrictions, volume D supplement 6 valid for automatic stations.

| **SYNOP keys**<br>**w**<br>**a**<br>**w**<br>**a** | **Meaning** |
|---|---|
| 0 | No precipitation |
| 40 | Precipitation present |
| 51 | Light drizzle |
| 52 | Moderate drizzle |
| 53 | Heavy drizzle |
| 61 | Light rain |
| 62 | Moderate rain |
| 63 | Heavy rain |
| 67 | Light rain and/or drizzle with snow |
| 68 | Moderate rain and/or drizzle with snow |
| 70 | Snow |
| 71 | Light snow |
| 72 | Moderate snow |
| 73 | Heavy snow |
| 74 | Ice grains |
| 89 | Heavy hail |
| 255 | Error code |

**Syntax for measurements with aC! or aM! command**

| Command | Response |
|---|---|
| **aD0!**<br>**a** – Sensor address<br>**D** – Command - Send data<br>**0** – Request for data from Buffer 0<br>or<br>**1** = Buffer 1<br>**!** – End of command | **a<values><CR><LF>**<br>**a** – Sensor address<br>**<values>** – Called up data separated by corresponding prefix (“+” or “-”)<br>**<CR><LF>** – Ende der Antwort |

**Example:**

| Command | Response |
|---|---|
| **0C!** | **000306<CR><LF>** |
| **0D0!** | **0+0.100+6.000+0.100<CR><LF>** |
| **0D1!** | **0+6.000+12.000+25.231<CR><LF>** |

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**Syntax for measurements with aCC! or aMC!**

| Command | Response |
|---|---|
| **aD0!**<br>**a** – Sensor address<br>**D** – Command - Send data<br>**0** – Request for data from Buffer 0<br>or<br>**1** = Buffer 1<br>**!** – End of command | **a<values><CRC><CR><LF>**<br>**a** – Sensor address<br>**<values>** – Called up data separated by corresponding prefix (“+” or “-”)<br>**<CRC>** – 3-digit CRC checksum<br>**<CR><LF>** – End of response |

## Additional measuring options

The following commands can be used to request further measurement data from the **Rain[e]** and call up with **aD0!**.

The measurement commands **aMn!** and **aMCn!** have the same format as the commands **aM!** and **aMC!**. The same applies to the commands **aCn!** and **aCCn!**, which have the same format as the commands **aC!** and **aCC!**.

| n | Function | | Command | Response |
|---|---|---|---|---|
| 1 | Creation of variance data (over 4 s) | | **aM1!** | **a0031<CR><LF>** |
| | | | **aC1!** | **a00301<CR><LF>** |
| | | with CRC checksum | **aMC1!** | **a0031<CR><LF>** |
| | | | **aCC1!** | **a00301<CR><LF>** |
| 2 | Creation of heating data<br>**Measurements** / **Unit**<br>Buffer 0<br>Temperature inside – °C<br>Heating ON (1) / OFF (0)<br>Total heating capacity – % | | **aM2!** | **a0033<CR><LF>** |
| | | | **aC2!** | **a00303<CR><LF>** |
| | | with CRC checksum | **aMC2!** | **a0033<CR><LF>** |
| | | | **aCC2!** | **a00303<CR><LF>** |
| 3 | Creation of data: mean precipitation intensity and max. and min. intensity of the last x minutes*.<br>**Measurements** / **Unit**<br>Buffer 0<br>Mean value of the last x minutes* – mm/min<br>Max. intensity of the last x minutes* – mm/min<br>Min. intensity of the last x minutes* – mm/min<br>The standard value for the time x is 10 minutes. It can be changed using the **rain[e]** commander. | | **aM3!** | **a0033<CR><LF>** |
| | | | **aC3!** | **a00303<CR><LF>** |
| | | with CRC checksum | **aMC3!** | **a0033<CR><LF>** |
| | | | **aCC3!** | **a00303<CR><LF>** |

* The recording of the data starts with transmission of the command. Call up must occur after exactly x minutes with the command **aD0!**.

## Start verification - aV! (Error string)

The **aV!** command is used to carry out a system analysis for service purposes and to create an error string. It has the same format as the command **aM!** (see above). The **rain[e]** responds to it with **a0039**.

**Syntax**

| Command | Response |
|---|---|
| **aV!** | **a0039<CR><LF>** |
| **a** – Sensor address | **a** – Sensor address |
| **V** – Command - Start verification | **003** – Seconds until the sensor returns the measurement data (= 3 s) |
| | **9** – Number of measurement data |
| **!** – Command end | **<CR><LF>** – End of response |

**Example**

| Command | Response |
|---|---|
| **1V!** | **10039<CR><LF>** |

The measurement data can be called up using the command **aD0!** (See above under **Send data**).

| Output data | Value range |
|---|---|
| Buffer 0 | |
| Only for Lambrecht service | 0...99 |
| Error exceeding 10°C with heating on | 0 or 1 |
| Heating error | 0 or 1 |
| Temperature sensor error inside | 0 or 1 |
| Temperature sensor error on the funnel | 0 or 1 |
| Only for Lambrecht service | 0 or 1 |
| Only for Lambrecht service | 0 or 1 |
| Only for Lambrecht service | 0 or 1 |
| Only for Lambrecht service | 0 or 1 |

+0 = ok; +1 = error

The data are not overwritten until the next “**C**”, “**M**”, or “**V**” command and can be called up multiple times.

## Note on the SDI-12 Pause signal

As the **rain[e]** does not have any sleep mode, it does not have to be woken up from one. This means it ignores the **Pause** command. Therefore, restrictions that are associated with the **Pause** command do not have to be considered.

# 11 Modbus protocol

The Lambrecht meteo Modbus sensors and the met[LOG] follow the specification of the Modbus organization. Modbus Application Protocol Specification V1.1b3 (see www.modbus.org).

## 11.1 Data encoding

Modbus uses the "Big-Endian" format for addresses and data. This means that if a value is transmitted with a number format that is larger than a single byte, the most significant byte is sent first. With values that go beyond a register (e.g. 32 bit), this is not clearly specified at Modbus. The Lambrecht Modbus sensors follow the "Big-Endian" number format in these cases (32 bit or 64 bit).

**Big-Endian example (1 register value):**
16 bit value
0x1234 is transmitted in the order: 0x12 0x34.

**Big-Endian example (2 register value):**
32 bit value
0x12345678 is transmitted in the order: 0x12 0x34 0x56 0x78.

To obtain the actual measured value, divided the received register value by the divisor. Values of -9999 (16 bit value) or -9999999 (32 bit value) indicate and internal sensor error.

## 11.2 Device address

Modbus allows for the addresses 1...247.

## 11.3 Standard configuration - default

Baud rate: 19200 baud
Address: Each sensor type (or family) is given its own default address.

**Default addresses of Lambrecht sensors:**

| Address | Sensor |
|---|---|
| 1 | Wind speed |
| 2 | Wind direction |
| 3 | Precipitation Rain[e] |
| 4 | THP |
| 5 | EOLOS IND · u[sonic]WS6 |
| 6 | com[b] |
| 7 | PREOS |
| 8 | ARCO |
| 9 | u[sonic] |
| 10 | Pyranometer 2nd Class |
| 11 | Secondary standard pyranometer |
| 12 | PT100 to Modbus converter (temperature) |
| 13 | u[sonic]WS7 |

Byte frame in accordance with Modbus standard for RTU mode:
8E1 (1 start bit, 8 data bits, 1 parity bit (even parity), 1 stop bit)

## 11.4 Modbus command set

The Lambrecht Modbus sensors support the following commands.

- Read holding register command: 0x03 (descriptive sensor data register)
- Read input register command: 0x04 (measurement value register, each measured value to be requested individually)
- Write multiple register command: 0x10 (writing in configuration register)

## 11.5 Measured value and parameter register Lambrecht sensors

The register range 30001 to 35000 is provided for measured values in the Lambrecht sensors.

**The following measured values are provided by the Rain[e] precipitation sensors**.

| Register | Parameter name | Unit | Divisor | Number of registers | Access type | |
|---|---|---|---|---|---|---|
| 31001 | Total precipitation amount (standard resolution) | mm | 10 | 1 | Read only | INT |
| 31101 | Total precipitation amount (high resolution) | mm | 1000 | 2 | Read only | LONG |
| 31103 | Precipitation amount since last access (high resolution) | mm | 1000 | 2 | Read only | LONG |
| 31201 | Precipitation intensity of the last minute (sliding) | mm/min | 1000 | 1 | Read only | INT |
| 31301 | Type of precipitation, code<br>**Only available with the rain[e] observer.** | Open unit | 1 | 1 | Read only | INT |
| 34901 | Sensor status | - | 1 | 1 | Read only | INT |
| 34921 | Heating status | - | 1 | 1 | Read only | INT |
| 34922 | Internal temperature | °C | 10 | 1 | Read only | INT |
| 34931 | Total heating capacity in % | % | 1 | 1 | Read only | INT |

**The precipitation code in register 31301 is listed in the following table.**

| SYNOP keys<br>**W**<br>a<br>**W**<br>a | Meaning |
|---|---|
| 0 | No precipitation |
| 40 | Precipitation present |
| 51 | Light drizzle |
| 52 | Moderate drizzle |
| 53 | Heavy drizzle |
| 61 | Light rain |
| 62 | Moderate rain |
| 63 | Heavy rain |
| 67 | Light rain and/or drizzle with snow |
| 68 | Moderate rain and/or drizzle with snow |
| 70 | Snow |
| 71 | Light snow |
| 72 | Moderate snow |
| 73 | Heavy snow |
| 74 | Ice grains |
| 89 | Heavy hail |

The following chart shows the keys of the recognizable types of precipitation based on the Synop table 4680, prohibitions and restrictions, volume D supplement 6 valid for automatic stations.

Register addresses 30001 to 35000 apply to all Lambrecht Meteo Modbus sensors, but are only present or valid if the respective sensor supports the corresponding values (e.g a pure wind sensor does not provide any air humidity). Lambrecht sensors return 0xD8F1=-9999(16 bit) or 0xFF676981=-9999999 (32 bit) as an error code or invalid value.

Example Total precipitation amount (standard resolution)

| 03 | 04 | 79 | 19 | 00 | 01 | F8 | B3 | 03 | 04 | 02 | 00 | 01 | 01 | 30 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| LEN 6 | Transmission Query => | Source Master | Dest Slave 3 | Function Read Input Register (4) | Func Desk Address=31001, Quantity of Register=1 | Checksum OK:B3F8 |
|---|---|---|---|---|---|---|
| LEN 5 | Transmission Response <= | Source Slave 3 | Dest Master | Function Read Input Register (4) | Func Desk Byte count=2 | Data 00 01 | Checksum OK:3001 |

Example Total precipitation amount (high resolution)

| 03 | 04 | 79 | 7D | 00 | 02 | F9 | 6D | 03 | 04 | 04 | 00 | 00 | 00 | 91 | 19 | E8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| LEN 6 | Transmission Query => | Source Master | Dest Slave 3 | Function Read Input Register (4) | Func Desk Address=31101, Quantity of Register=2 | Checksum OK:6DF9 |
|---|---|---|---|---|---|---|
| LEN 7 | Transmission Response <= | Source Slave 3 | Dest Master | Function Read Input Register (4) | Func Desk Byte count=4 | Data 00 00 00 91 | Checksum OK:E819 |

## 11.6 Special case of precipitation amount

Except for the amount of precipitation, all the measured values should be read as instantaneous values. The amount of precipitation should be read as the total amount. And the difference from the previous access must be shown for the amount of precipitation displayed and to be saved.

**The value overflow of the total precipitation must be taken into account when calculating the difference. The value overflow occurs at 60,000 g of collected liquid. This results in a value overflow at 3,000 mm for sensors with a collection area of 200 cm² and a value overflow at 1,500 mm for sensors with a collection area of 400 cm².**

## 11.7 Sensor status

The sensor status can be called up via register 34901. The returned numerical value must be interpreted in binary as follows.

| Bit position | Status message |
|---|---|
| 0 | 1 = Error due to exceeding the maximum heating temperature |
| 1 | 1 = Heating error |
| 2 | 1 = Temperature sensor error inside |
| 3 | 1 = Temperature sensor error on the funnel |
| 4 | 1 = RTC initialization error |
| 5 | 1 = Outside temperature sensor error (only rain[e]H3) |
| 6 | 1 = Poor quality of power supply (only rain[e]H3) |

## 11.8 Descriptive sensor parameter register (holding register)

| Register | Parameter name | Number of registers | Note | Access type |
|---|---|---|---|---|
| 40050 | Device identification number (15 characters) | 8 (2 characters in each register) | The returned data have the form of a 16 byte string with zero termination. | Read only |
| 40100 | Serial number (11 characters) | 6 (2 characters in each register) | The returned data have the form of a 12 byte string with zero termination. | Read only |
| 40150 | Firmware version (up to 25 characters) | 13 (2 characters in each register) | The returned data have the form of a 26 byte string with zero termination. | Read only |

Example: Calling up the device identification number
(The identification number shown in the example is sensor-dependent. It is used here only for demonstration purposes).

| | | | | | | | | | | | | | | | | ASCII |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05 | 03 | 9C | 72 | 00 | 08 | CB | C3 | 05 | 03 | 10 | 30 | 30 | 2E | 31 | 36 | □□□□□□□□□□□□□□□□ |
| 34 | 38 | 30 | 2E | 30 | 30 | 30 | 31 | 33 | 30 | 00 | 37 | CA | | | | 00.16480.000130.□□ |

| | | | | | | |
|---|---|---|---|---|---|---|
| LEN 6 | Transmission Query => | Source Master | Dest Slave 5 | Function Read Holding Register (3) | Func Desk Address=40050, Quantity of Register=8 | Checksum OK:C3CB |
| LEN 19 | Transmission Response <= | Source Slave 5 | Dest Master | Function Read Holding Register (3) | Func Desk Byte count=16 | Data 30 30 2E 31 36 34 38 30 2E 30 30 30 31 33 30 00 / Checksum OK:CA37 |

## 11.9 Sensor parameters / configuration parameters

| Register | Parameter name | Allowed values | Number of registers | Access type |
|---|---|---|---|---|
| 40001 | Modbus address device | | 1 | Write only |
| 40200 | Baud rate | 96 = 9600<br>192 = 19200<br>384 = 38400 | 1 | Write only |
| 40201 | Parity | 1 = even<br>0 = none | 1 | Write only |

The device must be restarted after any setting is changed.
Example Changing the RTU address from 3 to 1

| 03 | 10 | 9C | 41 | 00 | 01 | 02 | 00 | 01 | 2D | E8 | 03 | 10 | 9C | 41 | 00 | 01 | 7E | 6F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| LEN 9 | Transmission Query => | Source Master | Dest Slave 3 | Function Write Multiple Register (16) | Func Desk Address=40001, Quantity=1 | Byte count 2 | Register values 00 01 | Checksum OK:E82D |
| LEN 6 | Transmission Response <= | Source Slave 3 | Dest Master | Function Write Multiple Register (16) | Func Desk Address=40001, Quantity=1 | Checksum OK:6F7E | | |

## 11.10 Autoconfiguration

All Lambrecht Modbus sensors provide the experienced user with the option of implementing auto-configuration in his Modbus master based on additional information stored in the sensor. The required information can be found in the document *General Instructions for Lambrecht Meteo Modbus Sensors*.

## 11.11 Total amount of precipitation

To measure the amount of precipitation from dataset to dataset using the serial protocols (e.g. SDI 12, Talker, Modbus), the difference between the total amount of precipitation and the previous reading must be calculated.

**The value overflow of the total precipitation must be taken into account when calculating the difference. The value overflow occurs at 60000 g of collected liquid. This results in a value overflow at 3,000 mm for sensors with a collection area of 200 cm² and a value overflow at 1,500 mm for sensors with a collection area of 400 cm².**

## 11.12 Pulse output

Each pulse corresponds to a predefined amount of measured precipitation. The rocker factor value range is 0.01...200 mm/pulse. The rocker factor can be set with the Rain[e] commander along with the closing time / pulse width. The pulse duty factor is 1:1, so the closing time is just as long as the pause time.

If more pulses have to be output than is possible with the set rocker factor and closing time, the excess pulses are placed in a queue and output as soon as no further pulses are added. If we now take the case that, for example, at a closing time of 200 ms, a rocker factor of 0.01 (corresponds to 300 pulses per minute) and a participation intensity of 4 mm/min over 2 minutes and then 1.9 mm/min (corresponds to 190 pulses per minute). Then the pulse output outputs 300 pulses in the first 2 minutes and 200 pulses are placed in the queue. In the third minute, 300 pulses are output again; 190 due to the current precipitation and 110 from the queue. Accordingly, 280 pulses are output in the fourth minute and 190 in all subsequent minutes. After the fourth minute, the pulses in the queue are completed.

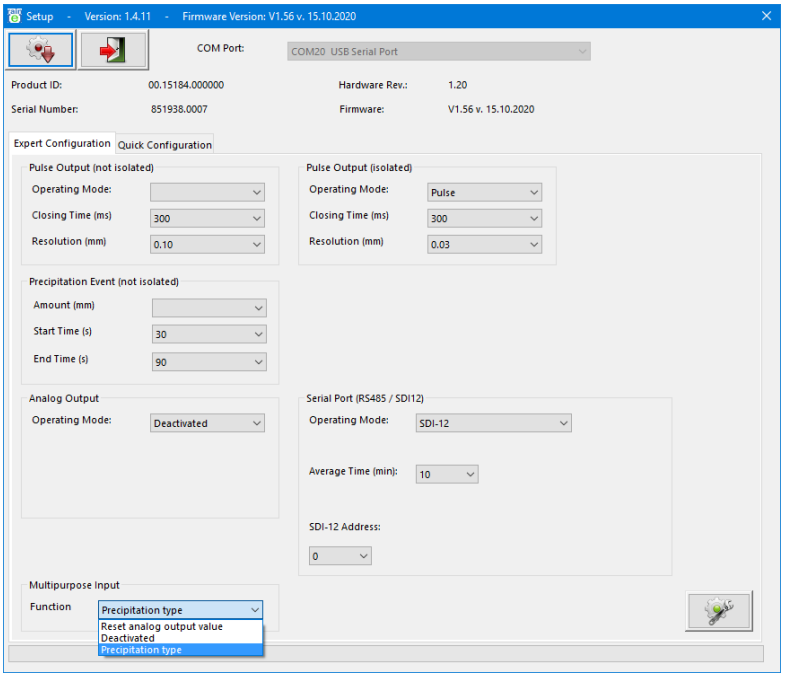
# 12 Changing the communication protocol

See also the section *Configuration of the rain[e] as a rain[e]observer*.

For the configuration, the Rain[e] does not have to be supplied with electricity but is fed via the service USB interface.

**With the rain[e]H3 model, the USB interface only works if the external sensor supply is disconnected.**

1. Connect the sensor using the supplied mini-USB on USB 2.0 cable to a PC, laptop or similar device on which the rain[e] commander has been installed and start the rain[e] commander. The observer module does not have to be connected for the configuration.
2. Select the used COM port of the USB interface (USB serial port).
3. Press the button  to load the current configuration for the rain[e].




4. Select the desired protocol in the operating mode field in the serial interface RS485/SDI-12 group.

**The precipitation type is only available in the SDI-12 extended protocol or the Modbus protocol. Other protocols can also be selected but these do not support the output of precipitation type.**

5. If necessary, you can change the operating mode in the pulse output isolated group. You can choose between pulses, rain yes/no and heating on/off.

**The analog output and the non-isolated pulse output are not available in the standard configuration.**

6. Send the new configuration to the Rain[e] by pressing the button  .

## 13 Changing the serial interface from SDI-12 (default) to RS485

The following steps are required to convert the interface used from SDI-12 to RS485.

1. Open the housing
2. Change the device's internal wiring
3. Change the output protocol
4. Close the housing

### 13.1 Opening the housing

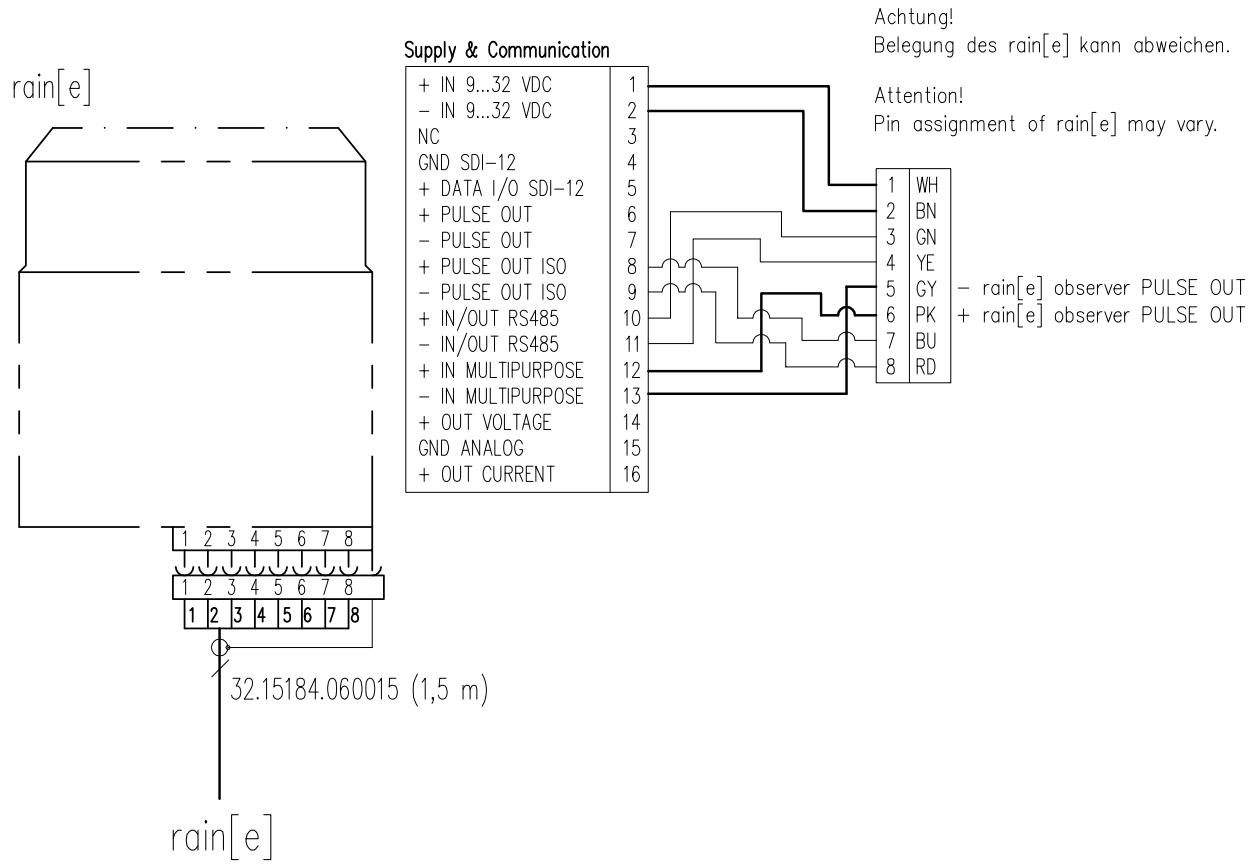
- Unscrew the knurled screw on the underside and turn the upper section counterclockwise in the direction of open. Carefully lift off the housing and pay attention to the connector for the heating inside the housing.

**Please note that the measuring edge of the housing's upper section is very sharp. There is a risk of cuts. It is recommended that you do not press on the measuring edge and/or wear heavy-duty gloves.**

- Pull out the clamping plug for the upper heating section and put the housing in a safe place. When putting the housing upper section aside, avoid placing it on the cutting edge of the receiver opening, in order not to damage it.

## 13.2 Change the device's internal wiring

The following internal wiring is recommended.




To change the wiring, open the housing.

## 13.3 Change the output protocol

**The precipitation type is only available in the SDI-12 extended protocol or the Modbus protocol.**

**The SDI-12 protocol can also be output via the RS485. Some data loggers on the market, such as the Ser[LOG], support this mode, which enables cable lengths of up to 1 km to be used for data transfer. Standard SDI-12 uses a signal to ground and is therefore limited to 65...100 m cable length. If disruptions in the communication occur, we recommend allowing communication via the RS485 interface, as long as the data logger (data collector) supports this function.**

The usual communication settings apply to the SDI-12 protocol on the RS485 interface.

| | |
|---|---|
| Baud rate: | 1200 baud |
| Data bits: | 7 |
| Parity: | even |
| Stop bits: | 1 |

The following communication settings apply to the Modbus protocol.

| | |
|---|---|
| Baud rate: | 19200 baud |
| Data bits: | 8 |
| Parity: | even |
| Stop bits: | 1 |

Other protocols can also be selected but these do not support the output of precipitation type. For further details see the section *Protocols of the rain[e]observer*.

The changes to the output protocol are in accordance with the section *Changing the communication protocol*.

## 13.4 Closing the housing

1. Connect the clamping plug of the heating and position the upper housing section in such a way that the open/close sticker sits over the knurled screw.
2. Press the housing down and turn it clockwise in the direction of close.
3. Tighten the knurled screw.

# 14 Checking and troubleshooting

- Visual inspections for contamination should be carried out regularly - depending on the environment and seasonal influences (spider and bird populations, pollen, foliage, etc.). In accordance with section 6 of the *VDI guidelines - environmental meteorology - meteorological measurements - precipitation, VDI 3786 part 7 (December 2010)*, monthly inspections are recommended. In areas with high air pollution levels, weekly inspections may be necessary in order to ensure correct measurement results.

**Please disconnect all external cables before you clean the inside of the sensor in order to avoid incorrect measurements. The funnel heating and drainage heating may get very hot if the heating is operated with the housing open. There is a risk of burns. It is therefore recommended that you unplug the heating supply connector when doing any cleaning or maintenance work.**

- All parts exposed to water should be cleaned regularly. Rinsing with clean water should be enough to remove most of the dirt. Any dirt stuck in the collecting funnel or drainage system must be carefully removed. Slight soiling of the collecting container is not critical. The collecting container can be cleaned with water and a mild detergent.
- Make sure the device is stable and upright and check the bird deterrent ring, the sensor and especially the funnel surface for damage.
- Keep the measuring site free of overgrowing bushes and trees.
- The bird deterrent ring must be removed during periods of frost and snow.

**Care should be taken when cleaning the collecting container in order to avoid damage. Do not clean the Rain[e] and the collecting container with a steel brush or similar devices or with aggressive cleaning agents.**

## Troubleshooting

**The heating was switched off after the device was set up (error string: Heating error = 1)**

- Disconnect the power supply to the sensor.
- Check that the power plug for the heating and the clamping plug for the funnel heating (inside the device) are connected.
- Reconnect the sensor to the power supply.

If the problem persists, it may be due to one of the following reasons.

- Drainage heating is not working or is not connected internally.
- Funnel heating is not working.
- Heating power cable is too long or defective.

⇨ In any case, please contact Lambrecht service.

**Error message when calling up data from the rain[e] with the rain[e] commander.**

Please disconnect the USB cable, reconnect it and restart the Rain[e] commander.

**Rain[e] commander shows *COM port not found* or *rain[e] is not responding*.**

- Check whether the rain[e] is connected correctly to the PC and the correct COM interface has been selected.
- If the problem persists, restart the rain[e].

**The system always outputs 0 for the type of precipitation.**

Check the connections of the observer module and the distribution box. Are the observer module and the rain[e] properly connected?

## 15 Observer module maintenance

As the precipitation detector operates without moving parts, i.e. wear and tear-free, only minimal service work is required.

Depending on its location, the device may become dirty. Cleaning should be carried out with non-aggressive cleaning agents, water and a soft cloth.

⚠ **The surface of the device cover has been roughened for technical measurement reasons and must not be polished under any circumstances. When cleaning the cover, please ensure that you use only soft cloths or brushes without any polishing effect and a grease-dissolving cleaning agent (washing-up liquid, no aggressive solvents such as acetone).**

During storage, assembly, dismantling, transport or maintenance of the precipitation detector, you should ensure that no water gets inside the device and the plug. The cover surface should not be touched with the palms of hands or fingers, in order to avoid contamination with sebaceous matter.

⚠ **Attention: Do NOT clean the housing cover with a microfiber cloth.**

If you need help with solving any problems that may occur, please contact Lambrecht meteo service at

Tel +49-(0)551-4958-0
E-mail support@lambrecht.net

## 16 Storage and handling

The rain[e]observer should be stored in its original packaging in a dry place (relative humidity < 60 %) and at moderate temperatures (5...25 °C).

**The storage temperature range specified in the technical data should not fall below or exceed this. The rain[e]observer must be transported in its original packaging.**

## 17 Accessories and spare parts

**General accessories**

| | |
|---|---|
| 32.15184.060 000 | Connection cable with M12 plug (sensor data logger); L = 10 m (8-wire) |
| 65.53090.160 100 | USB cable (sensor configuration) |
| 36.15184.000 000 | **rain[e]** commander |
| 00.15180.400 000 | Stainless steel mast for concrete foundation |
| 00.15180.800 050 | Stainless steel mast for concrete foundation with base plate |
| 32.15180.022 020 | Bird deterrent ring for **rain[e]H3** |
| 32.15180.022 040 | Bird deterrent ring for **rain[e]400** and **rain[e]314** |
| 32.15180.023 020 | Bird deterrent ring for **rain[e]** |
| 33.15189.049 010 | Dirt trap (replacement part) |
| 32.15184.080 000 | Maintenance set |

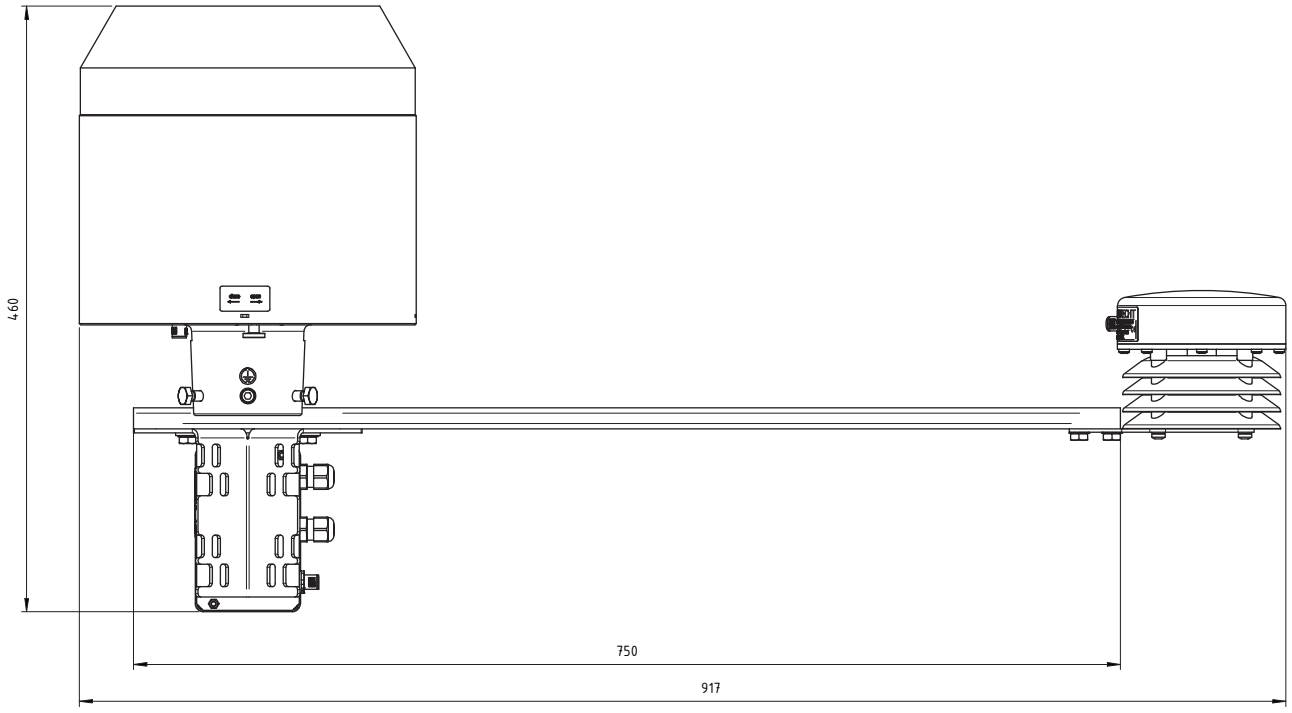
**For heated versions**

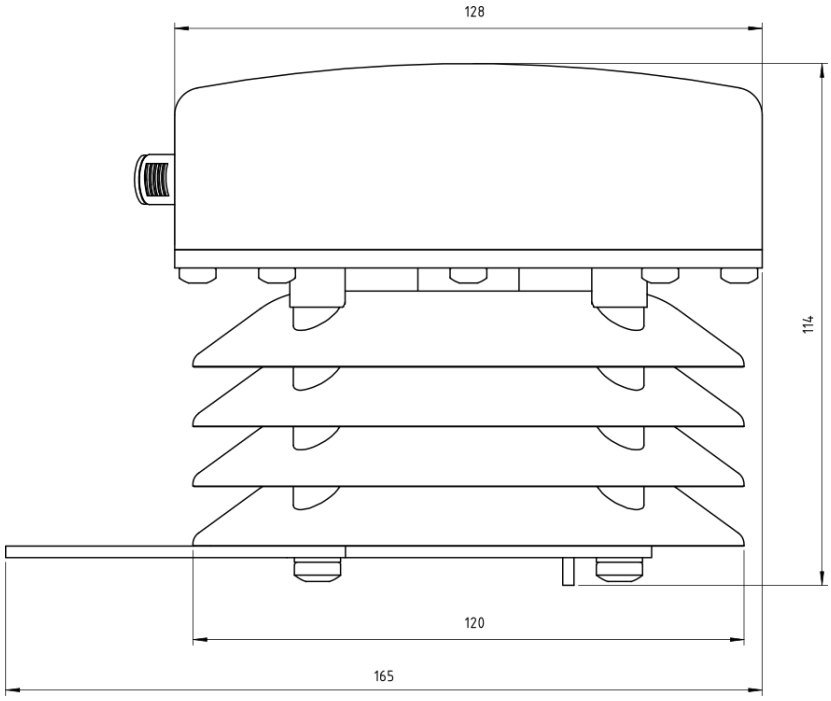
| | |
|---|---|
| 00.14966.200 000 | Power supply 150 W · **not** for rain[e]400H and rain[e]400H |
| 00.14966.500 000 | Power supply 240 W for rain[e]400H and rain[e]314H |
| 32.15184.061 000 | Connection cable (heating) for mounting on mast; L ≈ 1 m (4-wire) |
| 32.15184.061 010 | Connection cable (heating) for mounting on mast; L ≈ 10 m (4-wire), T-coded |
| 32.14622.220 000 | Mast bracket for power supply |

**Services**

| | |
|---|---|
| 97.15180.000 000 | Customer-specific configuration |

## 18 Dimensions rain[e]observer



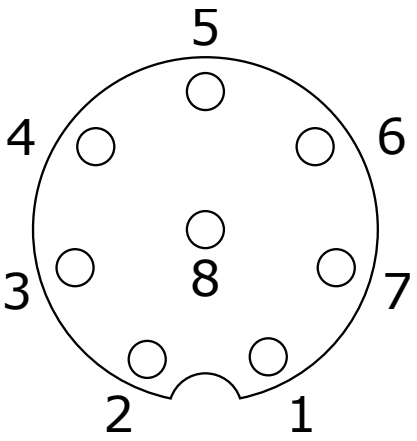
# 19 Connection cable (sensor / data logger)

## 19.1 Technical data connection cable

| Connection cable | ID no. 32.15184.060000 |
|---|---|
| **General data** | |
| Rated current at 40°C | 2 A |
| Rated voltage | 30 V AC |
| Number of terminals | 8 |
| Contact resistance | ≤ 5 mΩ |
| Insulation resistance | ≥ 100 MΩ |
| Cable length | 10 m |
| **General characteristics** | |
| Standards/regulations | M12 connector IEC 61076-2-101 |
| Coding | A - standard |
| Protection type | IP65/IP67 |
| Cycle of operation | ≥ 100 |
| **Material** | |
| Material contact | CuZn |
| Material contact surface | Ni/Au |
| Material carrier material | TPU GF |
| Material handle body | TPU, flame retardant, self-extinguishing |
| Knurl material | Die-cast zinc, nickel-plated |
| Material seal | NBR |
| **Line** | |
| Cable type | PUR halogen-free black |
| Conductor cross-section | 8x 0.25 mm² (signal line) |
| AWG signal line | 24 |
| Cable outer diameter D | 5.9 mm ± 0.2 mm |
| Wire colors | Brown, white, green, yellow, gray, pink, blue, red |
| Insulation resistance | ≥ 1 GΩ*km (at 20 °C) |
| Conductor resistance | ≤ 78 Ω/km (at 20 °C) |
| Nominal voltage line | ≤ 300 V |
| Test voltage line | ≥ 3000 V AC (spark test) |
| Cable weight | 53 kg/km |
| Minimum bending radius, permanently laid | 5 x D |
| Flame resistance | In accordance with UL FT-2<br>In accordance with UL 758/1581 (horizontal)<br>In accordance with UL 758/1581 FT2<br>In accordance with DIN EN 60332-2-2 (20 s) |
| Halogen-free | In accordance with DIN VDE 0472 part 815<br>In accordance with IEC 60754-1 |
| Oil resistance | In accordance with IEC 60811-2-1 |
| Other resistance | Good resistance to acids, alkalis and solvents<br>Resistant to hydrolysis and microbes |

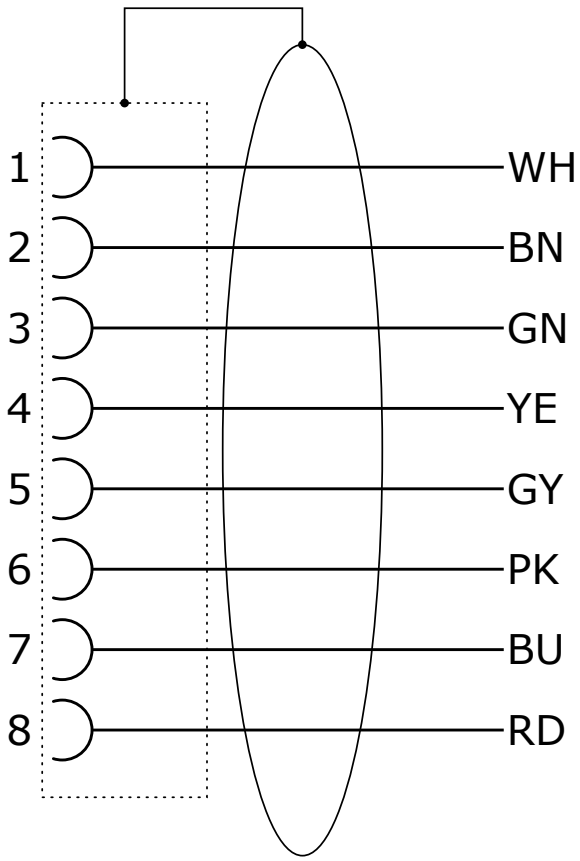
## 19.2 Connection cable drawings

**Schematic representation**



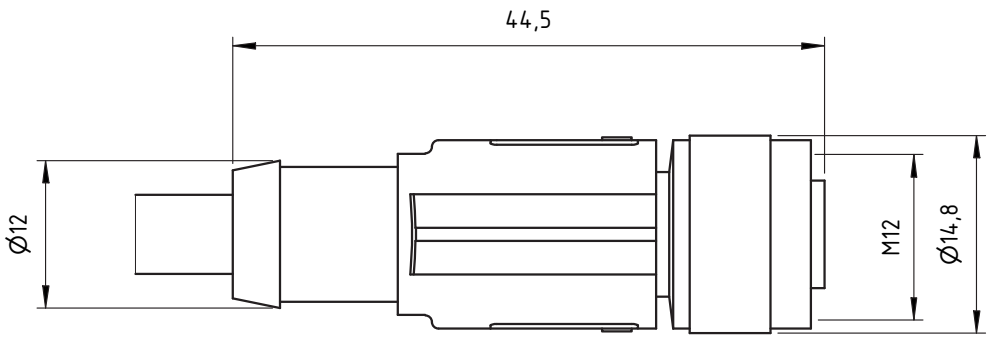

*Pin assignment M 12 socket, 8-pin, A-coded, socket side view*

**Circuit diagram**




*Contact assignment of the M12 socket*

**Dimensional drawing**




*M12 x 1 socket straight, shielded*

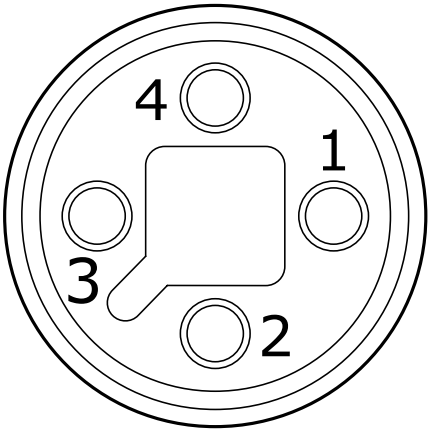
# 20 Heating cable

## 20.1 Technical data heating cable

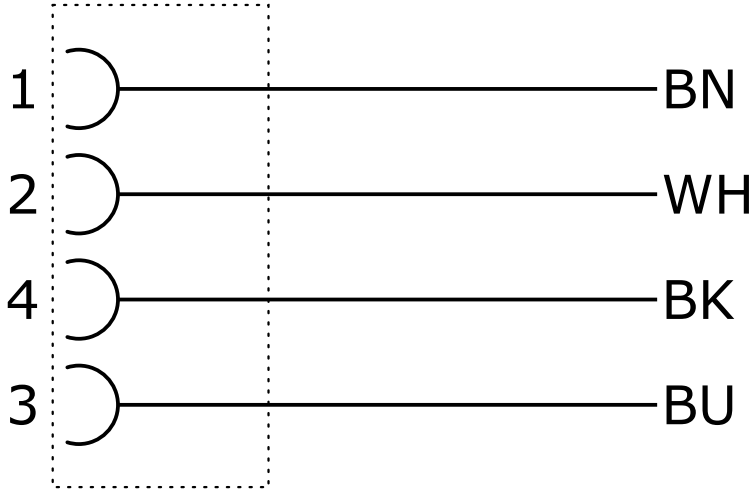
| Heating cable | ID no. 32.15184.061010 (length = 10 m)<br>ID no. 32.15184.061000 (length = 1 m) |
|---|---|
| **Environmental conditions** | |
| Protection type | IP65/IP67 |
| **General** | |
| Rated current at 40°C | 12 A |
| Rated voltage | 63 V DC |
| Rated impulse voltage | 1.5 kV |
| Number of terminals | 4 |
| Insulation resistance | ≥ 100 MΩ |
| Coding | T power |
| Cycle of operation | > 100 |
| **Material** | |
| Flammability class in accordance with UL 94 | V0 |
| Material contact | CuZn |
| Material contact surface | Ni/Au |
| Material carrier material | PA |
| Material handle body | PP |
| Knurl material | Die-cast zinc, nickel-plated |
| **Line** | |
| Cable type | PUR halogen-free black |
| Conductor cross-section | 4x 1.5 mm² |
| AWG power supply | 16 |
| Cable outer diameter D | 9.7 mm ± 0.3 mm |
| Wire colors | Brown, white, blue, black |
| Insulation resistance | ≥ 10 MΩ*km (at 20 °C) |
| Conductor resistance | ≤ 13.3 Ω/km (at 20 °C) |
| Nominal voltage line | 300 V AC |
| Test voltage line | 1500 V AC (5 min.) |
| Flame resistance | In accordance with EN 60332-1-2<br>In accordance with UL 1581 VW1 |
| Halogen-free | In accordance with DIN VDE 0472 part 815<br>In accordance with IEC 60754-1 |
| Oil resistance | In accordance with DIN EN 60811-2-1<br>In accordance with DIN EN 50363-10-2 |

## 20.2 Heating cable drawings

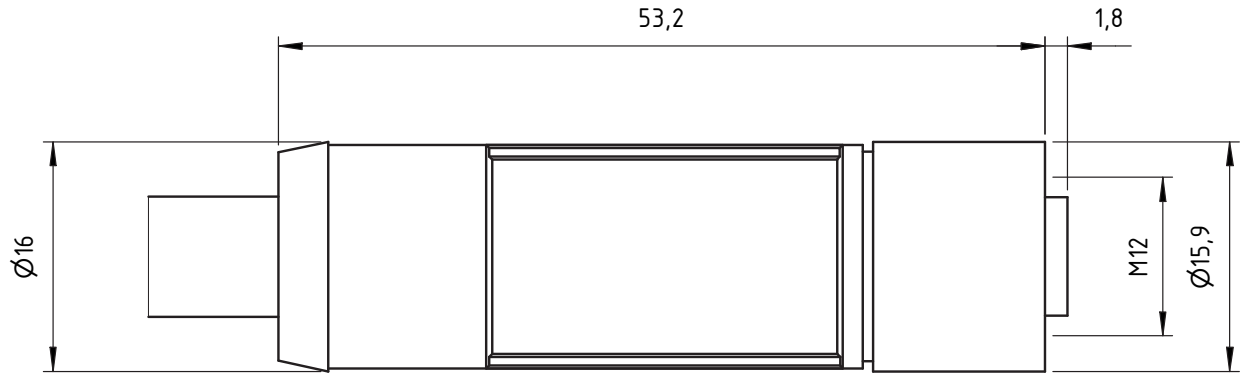
**Schematic representation**




**Circuit diagram**




**Dimensional drawing**



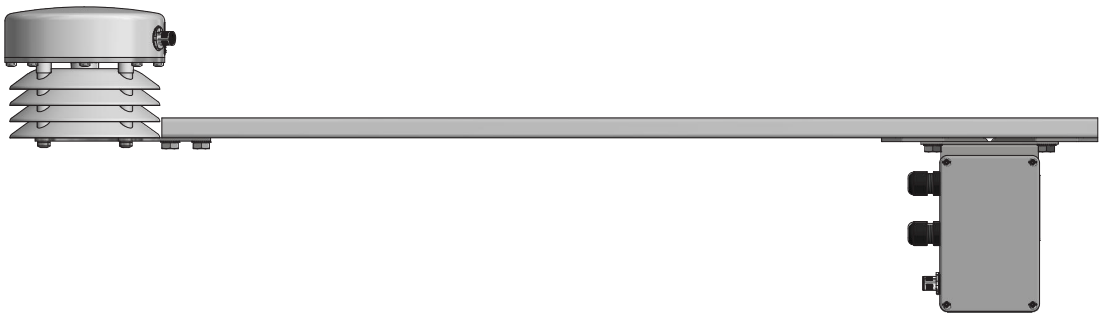
## 21 Technical data, rain[e] precipitation sensors

| | rain[e]<br>heated, preconfigured | rain[e]314<br>heated, preconfigured | rain[e]400<br>heated, preconfigured | rain[e]H3<br>heated, preconfigured |
|---|---|---|---|---|
| **ID no.** | **00.15184.400900** | **00.15184.403900** | **00.15184.404900** | **00.15184.540920** |
| **Measurable precipitation types** | Liquid, solid, mixed | | | |
| **Measuring principle** | Weighing, with automatic self-draining | | | |
| **Operating temperature** | -40…+70°C *) | | | |
| **Storage temperature** | -40…+70°C | | | |
| **Catchment area** | 200 $cm^2$ | 314 $cm^2$ | 400 $cm^2$ | 200 $cm^2$ |
| **Measuring range (amount)** | Without limitation (0.005…∞ mm) | Without limitation (0.0032…∞ mm) | Without limitation (0.0025…∞ mm) | Without limitation (0.005…∞ mm) |
| **Liquidation (amount)** | 0.001 mm (pulse output: 0.01 mm) | | | 0.001 mm |
| **Accuracy (amount)** | 0.1 mm or 1% at < 6 mm/min and 2% at ≥ 6 mm/min | 0.1 mm or 1% at < 3.82 mm/min and 2% at ≥ 3.82 mm/min | 0.1 mm or 1% at < 3 mm/min and 2% at ≥ 3 mm/min | 0.1 mm or 1% at < 6 mm/min and 2% at ≥ 6 mm/min |
| **Measuring range (intensity)** | 0…20 mm/min or 0…1,200 mm/h | 0…12 mm/min or 0…720 mm/h | 0…10 mm/min or 0…600 mm/h | 0…20 mm/min or 0…1,200 mm/h |
| **Liquidity (intensity)** | 0.001 mm/min or 0.001 mm/h | | | |
| **Accuracy (intensity)** | 0.1 mm/min or 6 mm/h | | | |
| **Measurement value output** | SDI-12 • Modbus RTU • Pulse output | | | |
| **Plugs** | 8-pin M12 (sensor)· 4-pin T-coded (heating) | | | 8-pin M12 (sensor) · 4-pin T-coded (heating) · 4-pin D-coded (Ethernet) |
| **Measurements** | 292 mm x 190 mm (H x D) | 311 mm x 256 mm (H x D) | 311 mm x 256 mm (H x D) | 377 mm x 190 mm (H x D) |
| **Mountable on** | Mounting mast Ø 60 mm | | | |
| **Weight** | Approx. 2.5 kg | Approx. 4 kg | Approx. 4 kg | Approx. 4 kg |
| **Standards** | WMO no. 8 • VDI 3786 Bl. 7 • EN 61000-2, -4 • EN 61000-4-2, -3, -4, -5, -6, -11 • Namur NE-21 | | | |
| **Protection class load cell** | IP67 | | | |
| **Power consumption** | Max. 45 mA at 24 V supply and analog output • typical 7.5 mA at 24 V supply and pulse output • typical 12.5 mA at 12 V | | | max. 45 mA at 24 V supply and analog output • typical 12.5 mA at 24 V • max. 150 mA at 12 V supply over Ethernet |
| **Power supply voltage** | 9.8... 30 V | | | |
| **Heating** | | | | |
| **Heating data** | Electronically controlled, 2 heating circuits | | | Electronically controlled, 3 heating circuits: Ring, funnel and drainage heating |
| **Target temperature** | +2°C funnel surface temperature | | | |
| **Accuracy** | ± 1°C | | | |
| **Heating capacity** | 80 W (funnel) · 60 W (drainage / collection container) | 150 W (funnel) · 60 W (drainage / collection container) | 150 W (funnel) · 60 W (drainage / collection container) | 70 W (funnel) · 60 W (drainage / collection container)· 70 W Ring heating |
| **Power supply voltage** | 24 VDC / 140 W | 24 VDC / 210 W | 24 VDC / 210 W | 24 VDC / 200 W |

◦ Pulse output 1 (galvanically separated, open collector): Max. 24 V DC / max. 0.05 A / max. 0.5 W
◦ Pulse output 2 (open collector): Max. 24 V DC / max. 0.1 A / max. 0.5 W

## 22 Technical data observer installation set

| ID no. | 32.15184.300000 |
|---|---|
| Measurement range | See Synop code table |
| Power current characteristics | In addition to the rain[e] 14 mA at 24 V; max. 25 W in heating mode |
| Area of application | -40...70 °C (heated, no icing, no snow drifting) |
| Storage conditions | -55...+80 °C |
| Protection type | IP65 / IP67 |
| Materials | • V4A tab<br>• Cover made of PC (polycarbonate – UV stabilized)<br>• Aluminum base plate, anodized<br>• ASA slats |
| Weight | 0.64 kg |
| Mounting type | Tab to mount on system traverse. The traverse can be fastened to pipes of up to 80 mm diameter. |



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