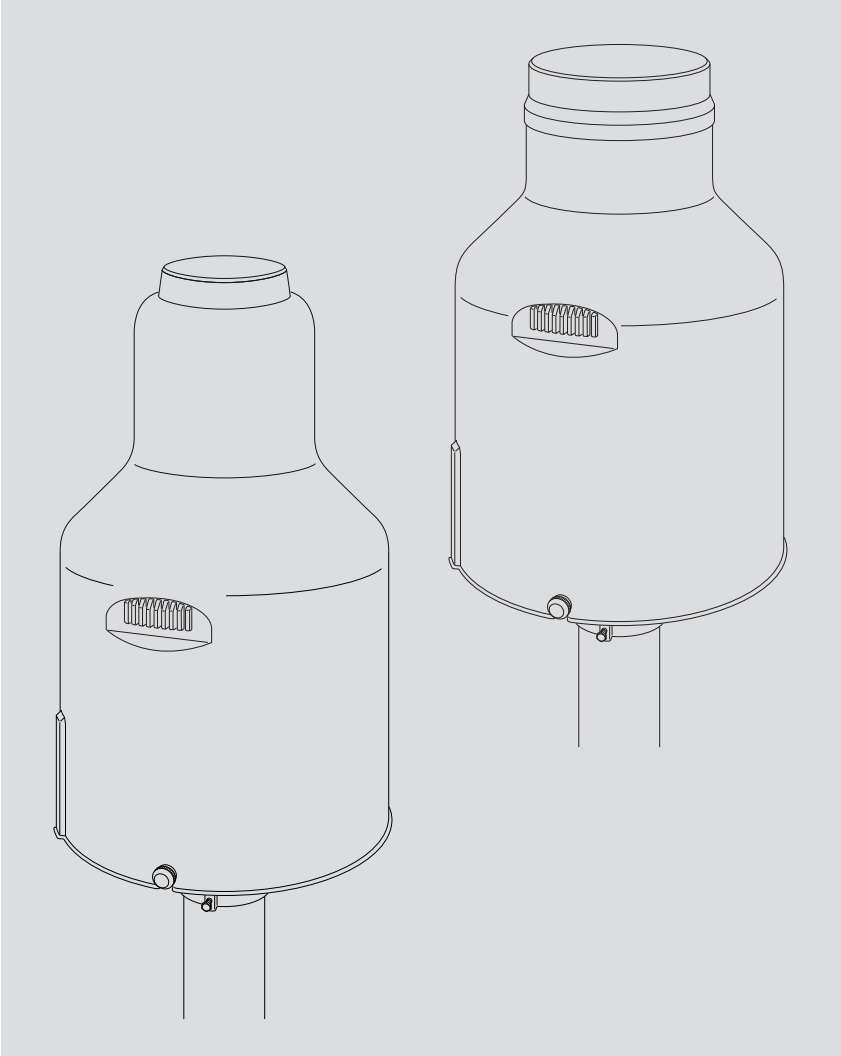
Operating instructions

# Precipitation Gauge OTT Pluvio²



English

We reserve the right to make technical changes and improvements without notice.

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## 1 Scope of supply

▶ **OTT Pluvio ²**

– 1 precipitation gauge using the balance principle with a recording capacity of 1,500 mm (Version 200) or 750 mm (Version 400) precipitation. Consisting of: base plate with balance system, bucket overlay, collecting bucket and pipe housing. With SDI-12, RS-485 and USB interface (for servicing purposes). Additional impulse outputs for amount of precipitation and status information.
– 1 set of installation accessories
(6 hexagon bolts M8 x 40;
17-pin screw terminal strip;
16-pin screw terminal strip;
3 cable ties 140 x 3.6;
1 open-end wrench, size: 10/13)
– 1 set of operating instructions
– 1 factory acceptance test certificate (FAT)

## 2 Order numbers

▶ **OTT Pluvio²**

| | |
|---|---|
| **Version 200**<br>– collecting area: 200 $cm^2$<br>– recording capacity: 1,500 mm precipitation | 70.020.000.9.0 |
| **Version 200 RH**<br>– collecting area: 200 $cm^2$<br>– recording capacity: 1,500 mm precipitation<br>– with integrated orifice rim heating | 70.020.001.9.0 |
| **Version 400**<br>– collecting area: 400 $cm^2$<br>– recording capacity: 750 mm precipitation | 70.020.020.9.0 |

For accessories and replacement parts, see Appendix H.

## 3 Introduction

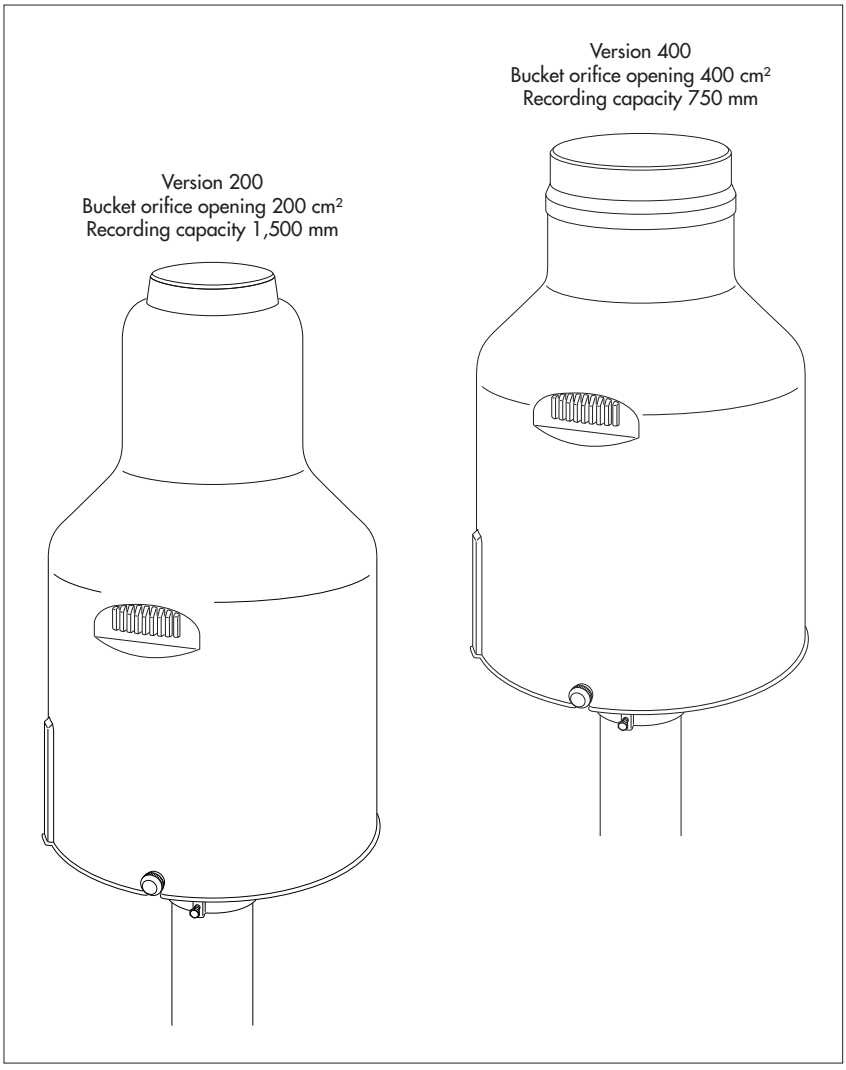
The OTT Pluvio² precipitation gauge is used for automatic determination of the intensity and amount of precipitation.

In contrast to conventional precipitation gauges, the OTT Pluvio² works using the balance principle. The OTT Pluvio² reliably recognizes precipitation, whether liquid or solid, by determining the weight of the collecting bucket. The OTT Pluvio² requires little maintenance due to its large collection capacity, weighing principle technology (does not require collection funnel or tilt mechanism), and robust design of the balance system used to weigh the bucket contents..

A high-precision stainless steel load cell used to weigh the bucket contents is hermetically sealed against environmental influences and that remains stable over a long period of time. An integrated temperature sensor compensates for the temperature changes in the balance system. The mechanical overload protection prevents damage to the load cell from blunt forces in a vertical direction, e.g. during transport or when emptying the collecting bucket.

Fig. 1: Precipitation gauge OTT Pluvio².

The Pluvio² is available in two versions: version 200 and version 400.




The precipitation gauge determines the weight of the collecting bucket including content every 6 seconds with a resolution of 0.01 mm (= raw data). The difference between this measurement and the base weight of the empty collecting bucket gives the current bucket content.

Every 6 seconds the OTT Pluvio² calculates the bucket content using multiple raw values. A special filter algorithm prevents incorrect measurement results in the process, from effects such as wind. The difference between the current bucket content and the previous one gives the precipitation intensity in mm/min or mm/h alternatively in/min or in/h (units must be set to imperial, default setting is metric).

These 6-second values for the precipitation intensity are added to the accumulated precipitation amount (accumulated total NRT - see below) by the OTT Pluvio².

Depending on the filter algorithm run, the measured values are available as real-time and non real-time values:

| | |
|---|---|
| Real-time output (RT): | The Pluvio² outputs the measurement **within a minute** of the precipitation event occurring. Advantage: fast reaction time and precipitation output with correct intensity. |
| Non-real-time output (NRT): | The Pluvio² outputs the measurement **5 minutes** after the precipitation event occurring. If very fine precipitation is involved (< 0.1 mm/min), the output delay is up to 65 minutes. Advantage: more precise output with correct precipitation volume. |

All measurements can be called up via a serial SDI-12 or RS-485 interface. In detail, these are:

- Intensity RT (fixed update interval: 1 minute)
- Accumulated RT/NRT (since the last measurement sample)
- Accumulated NRT (since the last measurement sample)
- Accumulated total NRT (since the last reset)
- Bucket RT
- Bucket NRT
- Temperature load cell
- Status Pluvio² (since the last measurement sample)

A detailed description of the Pluvio² operation can be found in Chapter 3.1.

The Pluvio² outputs the precipitation amount RT/NRT and the status information via two impulse outputs.

The OTT Pluvio² is set up on a 4" pedestal, which can either be concreted in or fixed to a concrete base using a bottom plate.
The standard setup height is 1 metre (height of the bucket orifice). Alternatives of 1.5 and 2 metres are possible.

Approx. 4 seconds after attaching the supply voltage, the OTT Pluvio² automatically starts the measurement operation. The OTT Pluvio² is calibrated at the factory. On location, no further calibration measures are necessary.

For service purposes (test measurements, convenient setting of operating parameters and for an accuracy test) a USB interface has been provided. The particular advantage of this is: when using the USB interface, no separate power supply is required.
**Caution:** After attaching the USB interface, the OTT Pluvio² interrupts communication on the other interfaces!

The measuring system of the Pluvio² prevents any incorrect output of the precipitation after the following situations and does not output real time measurements:

| | |
|---|---|
| - USB interface connected (pipe housing removed) | for approx. 5 minutes |
| - Emptying (large reduction in weight) | for approx. 5 minutes |
| - Power failure | for approx. 2 minutes |

Increases in weight greater than approx. 4 mm in 6 seconds are not output as precipitation, as they exceed a natural level of precipitation. In this way, spurious increases, such as bucket changes or filling with anti-freeze, are suppressed. Check measurements, even with large reference weights, are possible using the values bucket RT and NRT. The measurement sample is carried out in a joint data telegram with multiple measured values. Individual samples with different intervals are not possible.

### 3.1 Measurement output at the SDI-12 and RS-485 interface

#### ▶ Intensity RT

Moving precipitation growth over the last minute before the sample interval (measurement process in accordance with WMO Guideline No. 8). This measurement is particularly suitable, for example, for the exact determination of intensity with heavy precipitation and for alarm management, but not for daily and monthly totals.

| | |
|---|---|
| Output detail: | real-time output (RT) |
| Units: | mm/h or mm/min<br>in/h or in/min |
| Discrimination threshold: | Version 200: 0.2 mm/min or 12 mm/h<br>Version 400: 0.1 mm/min 6 mm/h |
| Recommended sample interval: | 1 minute |
| Recommended storage interval: | 1 minute |

**Note:** Larger sample intervals always give the precipitation intensity of the minute just before the sample interval!

#### ▶ Accumulated RT-NRT

This value represents the sum of the correct volumes of precipitation over the sample interval. If the amount of precipitation exceeds the discrimination threshold, the Pluvio² outputs the measurement result in real time. Otherwise, it collects the fine precipitation over a maximum of an hour and outputs the measured value in non-real-time. If the fine precipitation does not reach the discrimination threshold within an hour, there is no output. This measured value is similar to the behavior of a precipitation gauge with tipping bucket. This value is particularly suitable for daily or monthly totals and for alarm management.

| | |
|---|---|
| Output detail: | Real-time output (RT) for precipitation events ≥ 0.1 mm/min; non-real-time output (NRT) for precipitation events < 0.1 mm/min |
| Units: | mm or inch |
| Discrimination threshold: | Version 200: 0.2 mm within an hour<br>Version 400: 0.1 mm within an hour |
| Recommended sample interval: | 1 minute (with simultaneous sampling of the precipitation intensity) |
| Recommended storage interval: | any time between 1 minute and 24 hours. The datalogger must total the individual measurement values using a sum function over the complete storage interval! |

**Note:** Every interface query resets the total measurement value in the Pluvio² to zero!

### ▶ Accumulated NRT

This value outputs the sum of the correct amounts of precipitation over the sample interval with a fixed output delay of 5 minutes. Fine precipitation is collected over a maximum of one hour and output on reaching the discrimination threshold. If the fine precipitation does not reach the discrimination threshold within an hour, there is no output. This value is particularly suitable for daily and monthly totals.

| | |
|---|---|
| Output detail: | Non-real-time (NRT) |
| Units: | mm or inch |
| Discrimination threshold: | Version 200: 0.2 mm within an hour<br>Version 400: 0.1 mm within an hour |
| Recommended sample interval: | 1 minute (with simultaneous sampling of the precipitation intensity) |
| Recommended storage interval: | any time between 1 minute and 24 hours. The datalogger must total the individual measurement values using a sum function over the complete storage interval! |

**Note:** Every interface query resets the total measurement value in the Pluvio² to zero.

### ▶ Accumulated total NRT

This value outputs the sum of the correct amounts of precipitation since the last device start with a fixed output delay of 5 minutes. Fine precipitation is collected over a maximum of one hour and output on reaching the discrimination threshold. If the fine precipitation does not reach the discrimination threshold within an hour, there is no output. This value is particularly suitable for daily and monthly totals. Advantage: no loss of collected precipitation amounts, even if individual sample intervals are lost due to interface failures.

Resetting this value is achieved
– by separate SDI-12 reset command, or
– switching the power supply on/off, or
– automatically if the measurement range (500/200 mm, 50 inch) is exceeded.

| | |
|---|---|
| Output detail: | non-real-time (NRT) |
| Units: | mm or inch |
| Discrimination threshold: | Version 200: 0.2 mm within an hour<br>Version 400: 0.1 mm within an hour |
| Recommended sample interval: | 1 minute (with simultaneous sampling of the precipitation intensity) |
| Recommended storage interval: | any time between 1 minute and 24 hours (do not total/average measured values) |

### ▶ Bucket RT

This value outputs the current unfiltered bucket content. The value is particularly suitable for quick reference measurements of the current bucket level.

| | |
|---|---|
| Output detail: | real-time output (RT) |
| Units: | mm or inch |
| Discrimination threshold: | Version 200: 0.01 mm (1 mm ≙ 20 g)<br>Version 400: 0.01 mm (1 mm ≙ 40 g) |
| Recommended sample interval: | 1 minute (with simultaneous sampling of the precipitation intensity) |
| Recommended storage interval: | any time between 1 minute and 24 hours (possible averaging over 10 minutes) |

### ▶ Bucket NRT

This measured value outputs the current measured filtered bucket content.
The value is particularly suitable for determining the content of the bucket and for calculating the evaporation behavior.

| | |
|---|---|
| Output detail: | Non-real-time output (RT) |
| Units: | mm or inch |
| Discrimination threshold: | Version 200: 0.01 mm (1 mm ≙ 20 g)<br>Version 400: 0.01 mm (1 mm ≙ 40 g) |
| Recommended sample interval: | 1 minute (with simultaneous sampling of the precipitation intensity) |
| Recommended storage interval: | any time between 1 minute and 24 hours |

### ▶ Temperature load cell

Internal temperature of the load cell used for compensating temperature changes. This value is only relevant for internal purposes and generally varies from the current surrounding temperature by several °C.

| | |
|---|---|
| Units: | °C or °F |
| Recommended sample interval: | 1 minute (with simultaneous sampling of the precipitation intensity) |
| Recommended storage interval: | only as required (any time between 1 minute and 24 hours) |

## 3.2 Measurement output at the impulse output

### ▶ Accumulated RT-NRT

This value represents the sum of the correct volumes of precipitation over the sample interval. If the amount of precipitation exceeds the discrimination threshold, the Pluvio² outputs the measurement result in real time. Otherwise, it collects the fine precipitation over a maximum of an hour and outputs the measured value in non-real-time. If the fine precipitation does not reach the discrimination threshold within an hour, there is no output. This measured value is similar to the behavior of a precipitation gauge with a tipping bucket. This value is particularly suitable for daily or monthly totals and for alarm management. The measured value is output as an impulse sequence with a frequency of 5 Hz (standard setting) or 2 Hz (configurable with operating program via USB interface).

| | |
|---|---|
| Output detail: | Real-time output (RT) for precipitation events ≥ 0.1 mm/min; non-real-time output (NRT) for precipitation events < 0.1 mm/min |
| Impulse factor: | 0.1 mm or 0.01 in (1 mm = 10 impulses) |
| Discrimination threshold: | Version 200: 0.2 mm within an hour<br>Version 400: 0.1 mm within an hour |
| Recommended sample interval: | continuous impulse counting |
| Recommended storage interval: | any time between 1 minute and 24 hours |

**Electrical characteristic of the impulse output**

| | |
|---|---|
| Impulse "on": | contact closed |
| Impulse/interval ratio: | 1:1<br>for 5 Hz ≙ 100/100 ms<br>for 2 Hz ≙ 250/250 ms |
| Contact design: | bounce-free, polarity-independent<br>(from hardware index "E/1";<br>SDI-12 command **aOOB!** can be queried) |
| Ampacity: | ≤ 200 mA (short-circuit proof) |
| Voltage: | ≤ 28 V |

### 3.3 Orifice rim heating

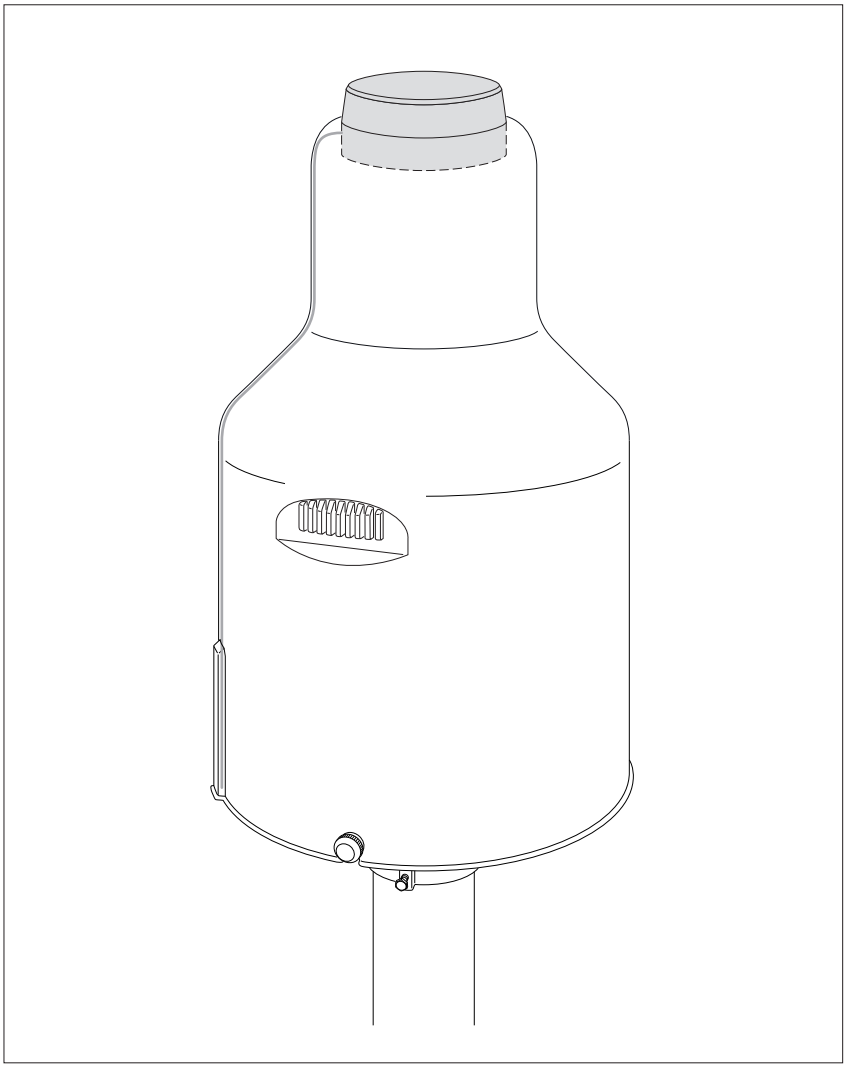
The OTT Pluvio², version 200, can be supplied with optional orifice rim heating. This reliably keeps the orifice ring rim free of snow and ice during low temperatures (e.g. no snow buildup).

The orifice rim heating consists of a ring-shaped heating element integrated in the pipe housing with temperature sensor and an electronic rim heating module for controlling and monitoring the heating function.

Only the orifice ring rim is heated so as to avoid unwanted losses from evaporation. The orifice rim heating therefore does not prevent the contents of the collecting bucket from freezing. The heating control reliably prevents a stack effect (errors in precipitation measurement caused by thermal effects) with a low and continuously monitored orifice ring rim temperature.

Fig. 2: Schematic diagram of the Pluvio² orifice rim heating.

The surface shown in gray (orifice ring rim) is the heated part of the tube housing.



The electrical connection of the heating connection cable is automatic via two plug contacts when the pipe housing is placed onto the base plate.

The heating control has been designed such that it is active over an ambient temperature range of –40 ... +8 °C. Experience shows that snow and ice do not build up outside this temperature range.

The orifice rim heating heats the orifice ring rim until the set target temperature of +8 °C is reached.

For this, the rim heating module measures the ambient temperature and the orifice ring rim temperature and calculates the impulse/pause relationship of the heating control from these values together with the target temperature (+8 °C). Depending on their level, the rim heating module supplies the heating element with electricity for 1 to 60 seconds.

In the temperature range –40 to +30 °C, the Pluvio² continuously carries out functional checks for the recognition of any error states. The result is used for system checks in the measuring areas. The functional check is successful if after a short heating period an increase in rim temperature of +0.5 °C can be recorded. The duration of this short heating period is dependent on the outside temperature. This functional check is also carried out in summer periods. For this, there is a minimum heating capacity of 5 W. If the fault cannot be rectified (unusual operating states or heating defect), the status information "Functional check of orifice rim heating was defective" follows. See SDI-12 command **aD1!** (after **aM!**), Chapter 6.1. Approx. 10 minutes after a restart of the Pluvio 2, the first result of the functional check is available.

If the orifice ring rim or load cell temperature is lower than +30 °C, no heating is carried out and there is no functional check. If the measured rim temperature increases during heating above 42 °C, the rim heating module triggers an automatic safety shutoff of the heating element.

The orifice rim heating can be switched on/off using an advanced SDI-12 command or via the separate power supply. In this way it is possible to completely switch off the orifice rim heating, for example in summer. In the delivery state set at the factory, the orifice rim heating is switched on.

An appropriate message is entered in the status information if the heating is switched off.

The nominal supply voltage for operating the orifice rim heating is 24 V DC, and the maximum heating capacity with very low ambient temperatures is approximately 53 watts. Optionally, the power supply of the orifice rim heating can be supplied separately from or jointly with the power supply of the precipitation gauge.

# 4 Basic safety information

- Read these operating instructions before using the OTT Pluvio² for the first time! Make yourself completely familiar with the installation and operation of the OTT Pluvio². Retain these operating instructions for later reference.
- The OTT Pluvio² is used for automatic determination of the meteorological intensity and amount of precipitation. Only use the OTT Pluvio² as described in these operating instructions!
  For further information, → see Chapter 3, "Introduction".

- Note all the detailed safety information given within the individual work steps. All safety information in these operating instructions are identified with the warning symbol shown here.
- Only transport the precipitation gauge with the transportation lock in place. **Caution:** Even with the transportation lock fitted, this is no absolute protection against damage.
  For further information, → see Chapter 5.4, "Preparing base plate".
- Avoid heavy shaking and impacts during transport and operation! Only use the original packaging for transport.
- Ensure the electrical, mechanical, and climatic specifications listed in the technical data are adhered to.
  For further information → see Chapter 10, "Technical data".
- Carry out all recommended maintenance work at the frequencies specified. See Chapter 7, "Carrying out maintenance work".
- Do not make any changes or retrofits to the OTT Pluvio²! If changes or retrofits are made, all guarantee claims are voided.
- Only have a defective OTT Pluvio² checked and repaired by the OTT repair center. On no account carry out repairs yourself!
  For further information → see Chapter 8, "Repair".
- Dispose of the OTT Pluvio² properly after taking out of service. On no account put the OTT Pluvio² into the normal household waste.
  For further information → see Chapter 9, "Note about the disposal of old units".

# 5 Installing the OTT Pluvio2

The installation of the OTT Pluvio² is carried out on a 4" pedestal made of galvanized steel (possible external diameter of pedestal 100 ... 120 mm). The pedestal must be securely fixed with a suitably sized concrete base, with the pedestal either being concreted into the base or fixed to a bottom plate that is then fixed to the concrete base.

The standard height recommended by the World Meteorological Organization, WMO, for precipitation gauges is 1 meter (height of bucket orifice). Alternatives of 1.5 or 2 meters are possible.

Carefully choose your setup location according to your meteorological requirements. At the same time, ensure the location is free of vibration. For example, traffic on a nearby road can influence the measurement results with its vibration.

The maximum distance to the data collection device and the power supply to which the OTT Pluvio² is to be connected is dependent on the interface used:

- SDI-12: 70 meters
- RS-485: 1,000 meters
- Impulse output: 1,000 meters

With a Pluvio² with orifice rim heating, the maximum distance to the mains adapter of the orifice rim heating is 125 meters.

**Caution:** The OTT Pluvio² precipitation gauge is equipped with a highly sensitive electronic balance system! Only undertake the installation as described in these operating instructions. To avoid damage to the Pluvio² balance system during installation: Avoid strong vibration of and large forces on the bucket overlay (for position see Fig. 4)!

## 5.1 Recommended cable types/maximum cable lengths

To operate the Pluvio², the connection of

- the power supply for the precipitation gauge,
- the power supply of the orifice rim heating (optional),
- the data collection device (SDI-12/RS-485 interface, impulse output) and
- the ground terminal

are necessary.

For the precipitation gauge power supply and the connection of the data collection device, a joint connection cable can be used.

With a Pluvio² with orifice rim heating, an additional connection cable is possible. This has the advantage that the orifice rim heating can be switched on and off separately from the precipitation gauge. In addition, the power consumption of the orifice rim heating of 2.2 amperes means a larger wire is required for long connection cables.

In total, the connection area of the Pluvio² has two cable entrances (rubber grommets).

**Caution:** The protection concept of the Pluvio² against overloads is designed such that all overloads are transfered away via a ground connection. For this, the proper and functional installation of a ground cable is absolutely necessary! This is connected to the Pluvio² at the ground terminal and at the other end in the area of the data collection device or directly at the Pluvio² to a concrete footing ground or ground rod.

**Caution:** All connection cables must be UV-resistant and suitable for laying in the ground!

**Connection cable data collection device/power supply precipitation gauge**

| | |
|---|---|
| SDI-12 interface | – Cable length: maximum 70 m[1)]<br>– Cable type: unshielded low-voltage cable<br>– Wire size: 3 x 0.5 mm² [2)] |
| RS-485 interface | – Cable length: maximum 1,000 m<br>– Cable type: twisted-pair cable[3)]; shielded or unshielded design<br>– Wire size<br>1 … 400 m: 2 x 2 x 0.34 mm²<br>400 ... 1,000 m: 2 x 2 x 0.5 mm² |
| Impulse output | – Maximum cable length: 1,000 m<br>– Cable type: unshielded low-voltage cable<br>– Wire size: 6 x 0.5 mm² |

The connection cable recommended in each case includes the wires for the power supply and for the data collection device.

[1)] With a point-to-point connection (no SDI-12 bus operation), a cable length of up to 300 m is possible.
[2)] With standard SDI-12 wiring, alternatively 4 x 0.5 mm² with separate power supply.
[3)] The wires intended for the power supply can be twisted pair, but do not have to be.

**Connection cable for orifice rim heating power supply**

– Cable length: maximum 125 m
– Cable type: unshielded low-voltage cable
– Wire size

| | |
|---|---|
| 1 ... 25 m: | 2 x 0.5 mm² |
| 25 … 50 m: | 2 x 1.0 mm² |
| 50 … 75 m: | 2 x 1.5 mm² |
| 75 … 125 m: | 2 x 2.5 mm² |

Basis of the calculation: output voltage of the power supply 24 V DC (e.g. mains adapter). If required, an output voltage of 28 V DC allows double the cable length in each case.

**Ground cable**

– Cable length: maximum 5 m
– Cable type: unshielded, low-voltage cable
– Wire size: 1 x 10 mm²

**USB cable**
If any changes are made to the factory settings, at startup a USB cable is temporarily required (see Appendix H, Accessories/spare parts). Maximum cable length: 3 m.
**Caution:** the USB port has no overload protection. It is only conceived as a service interface to be used temporarily.

## 5.2 Required tools and aids

- open-ended wrench, size 13 mm (supplied)
- cross head (Phillips) screwdriver, size: PH 2
- slot screwdriver, size: 0.8 mm x 4 mm and 1.0 mm x 6 mm
- tool for stripping insulation on electrical cables
- wire-cutting pliers
- With a connection cable with wires made of strands: wire end sleeves and sleeve crimping pliers

### 5.3 Preparing the installation location

**Caution:** The depth of the concrete base should be determined by the local conditions: The base must reach into the frost-free zone in the ground. The measurements given for the base depth are typical values for central European conditions.

We recommend that an empty conduit pipe (with a wire for pulling in) for the connection and ground cables is integrated in the concrete base.

**Version A – pedestal without bottom plate:**

- Make a concrete base with measurements of approx. 45 x 45 x 80 cm and concrete in the pedestal. **Caution:** The pedestal must be as vertical as possible! See Appendices B and D.

**Version B – pedestal with bottom plate:**

- Attach the pedestal with the bottom plate to a concrete base with measurements of approx. 45 x 45 x 80 cm using suitable bolts and plugs (hole diameter of the bottom plate: 16 mm).
  **Caution:** The pedestal must be as vertical as possible! See Figure 3 and Appendices C and E.

- Pull connection cable to the data collection device/power supply of the precipitation gauge into the empty conduit pipe.
- OTT Pluvio² with orifice rim heating: Pull additional connection cable for the orifice rim heating power supply into the empty conduit pipe.
- In the case of the ground for the OTT Pluvio² being implemented centrally in the area of the data collection device: Also pull the ground cable into the empty conduit pipe (alternatively, the ground is established directly at the OTT Pluvio² with a concrete footing ground or ground rod).

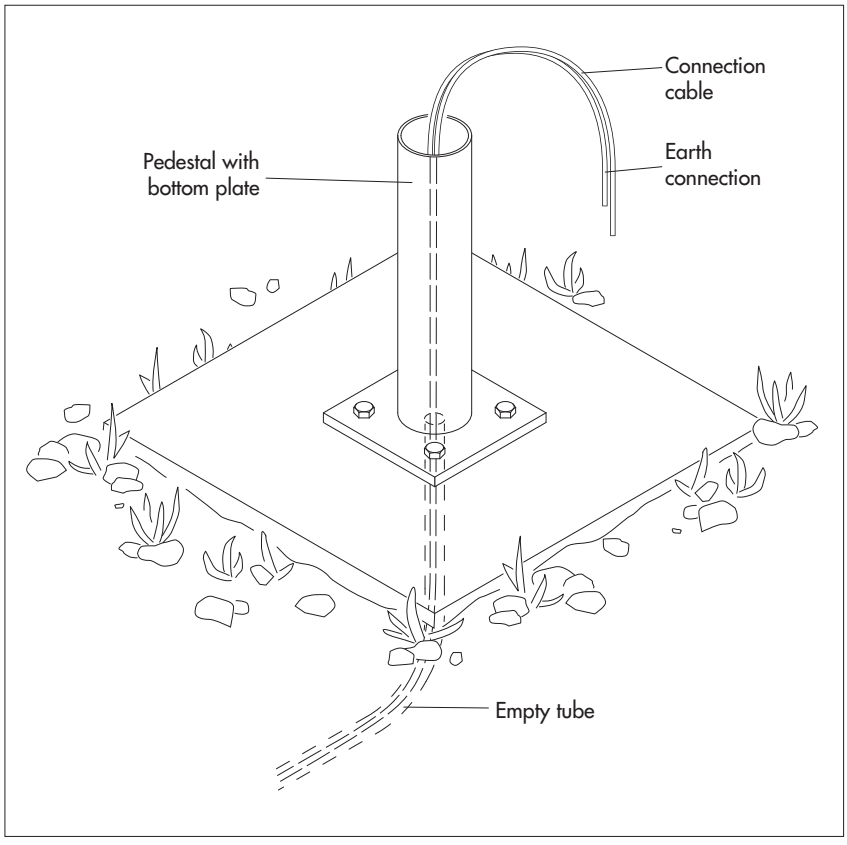



Fig. 3: The location prepared for installing the OTT Pluvio².

With an OTT Pluvio² with orifice rim heating, an additional connection cable is possible for supplying power to the orifice rim heating.

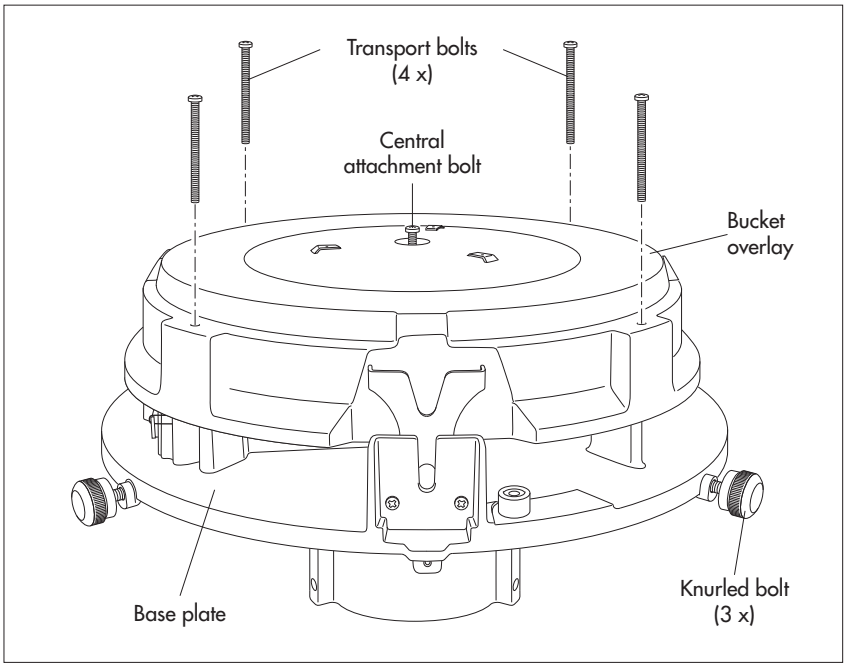
The cables can alternatively be laid outside of the pedestal. To protect the cables (e.g. against animal bites), laying the cables inside the pedestal is recommended.

### 5.4 Preparing the base plate

- Transport the OTT Pluvio² carefully to the installation location upright in the transport box.
- Turn the OTT Pluvio² transport box upside down.
- Open the transport box and remove the upper foam insert.
- Remove the box with the installation materials.
- Unscrew the three knurled screws on the pipe housing. Remove base plate from transport box. OTT Pluvio² with orifice rim heating: Follow the sheet included to take the base plate out of the pipe housing! (For now, leave the collecting bucket and pipe housing in the transport box.)
- Place the base plate on a level surface.

The balance system of the OTT Pluvio² has a transportation lock, consisting of four cross-head bolts (M5 x 60). These reduce the risk of damage to the electronic balance system during transport.

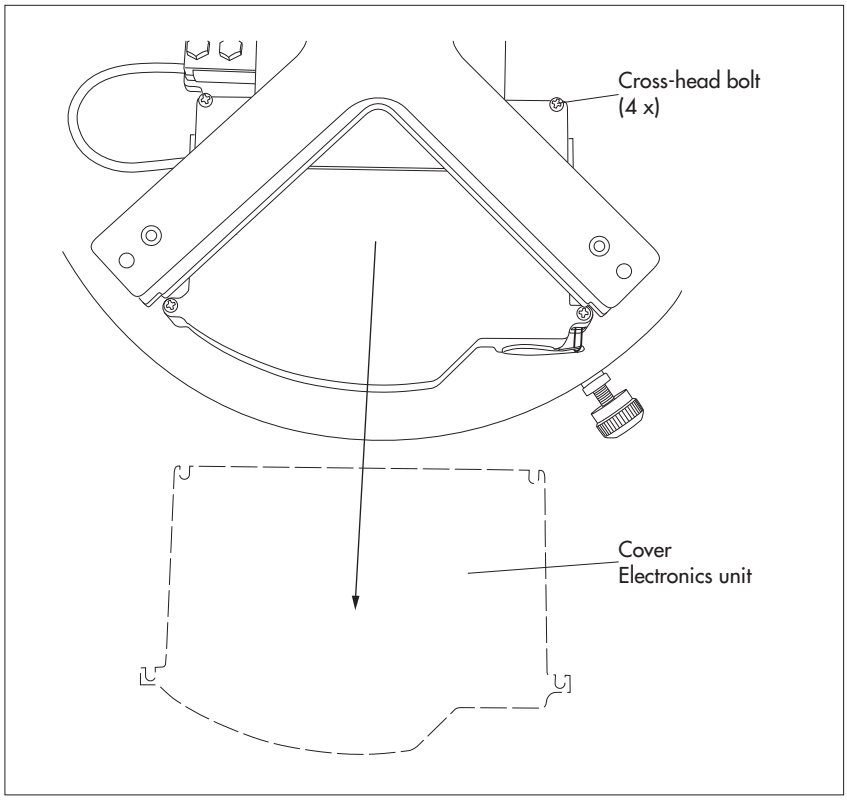
Fig. 4: Removing transportation lock and taking off bucket overlay.




- Remove the four outside cross-head bolts (transportation lock) in the bucket overlay. Retain the cross-head bolts for later transport!
- Loosen the central attachment bolt in the bucket overlay (the bolt is secured with two hexagonal nuts).
- Remove the bucket overlay.

- Unscrew 4 cross-head bolts on the cover of the electronics unit approx. 3 mm, raise the cover slightly and pull it off forwards. If the foam rubber seal for the cover is stuck to the surface below: Carefully pry off the cover with a flat head screwdriver.

Fig. 5: Removing cover of electronics unit.




### 5.5 Preparing the connection cable

**Connection cable for data collection device/power supply for precipitation gauge:**

- Shorten the connection cable so that it sticks out approx. 35 - 40 cm above the pedestal. (The "excess" cable can be stored later in the pedestal.)
- Take the rubber grommet out of the electronics unit (see Fig. 9). Remove the white blanking plug from the rubber grommet and push the grommet onto the connection cable.
- Strip approx. 8 cm of the outer sheath of the connection cable.
- Strip approx. 5 mm of the insulation from the individual wires.
- With a connection cable made of strands: push wire end sleeves onto the wires and crimp with end-sleeve crimping pliers.
- Attach the connection cable to the 6-pin (only if using impulse output) and 7-pin screw terminal strip (supplied in plastic bag):
  - SDI-12 interface → see Figure 6
  - RS-485 interface → 7-pin screw terminal strip, contact 1/2 + 5/6
  - impulse output → 6-pin screw terminal strip, contact 3/4 + 5/6 (as required) and 7-pin screw terminal strip, contact 5/6

**Orifice rim heating connection cable (optional)**

- Assemble connection cable as described above and connect to the 7-pin screw terminal strip. See Figure 7.

**Caution:** If it is a shielded connection cable, only connect the shielding at the data collection device/power supply!

Abb. 6: Connecting connection cable for the data recording device/power supply for the precipitation gauge to 6-pin and/or 7-pin screw terminal strip (example: SDI-12 interface).

Standard SDI-12 wiring has three wires (SDI-12 DATA, GND and power supply (+12 V)). With separate power supplies, an additional GND wire is present.

Contacts 3, 6 and 7 of the 7-pin screw terminal strip are bridged internally!

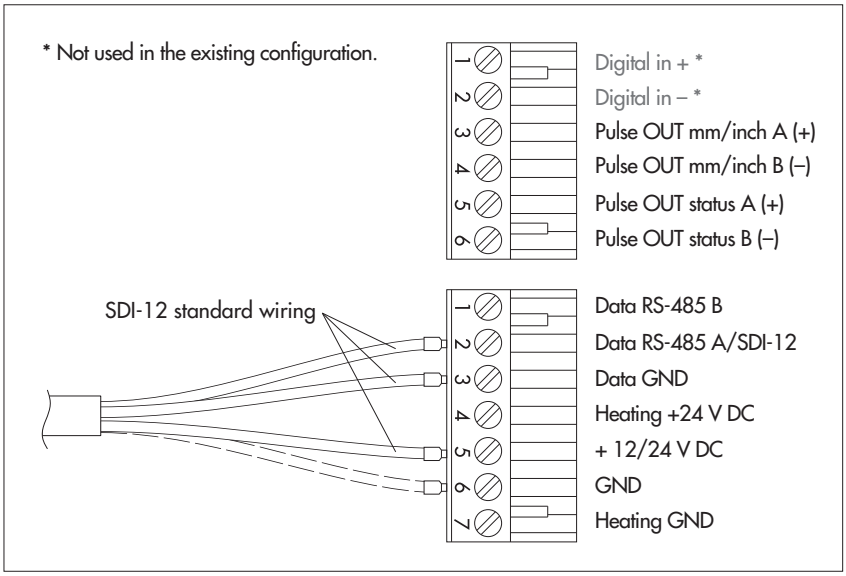
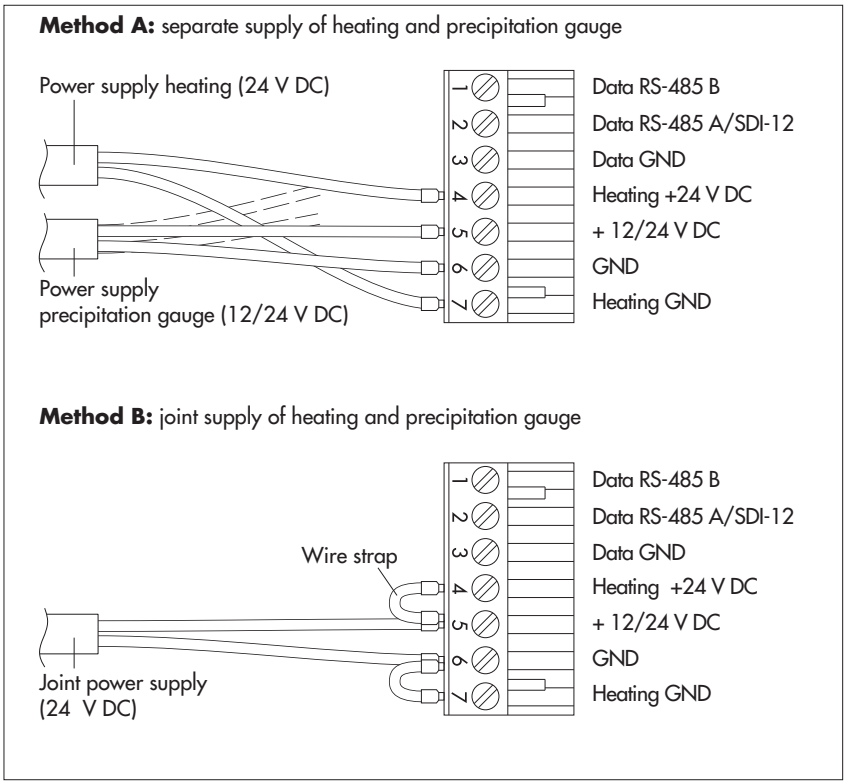



Fig. 7: **OTT Pluvio² with orifice rim heating:** Connection possibilities for the power supply of the precipitation gauge and the orifice rim heating.

**Caution:** With version B, the power supply must be 24 V DC!

The wires for connecting the data recording device are either not shown or shown as dashed lines for reasons of clarity.

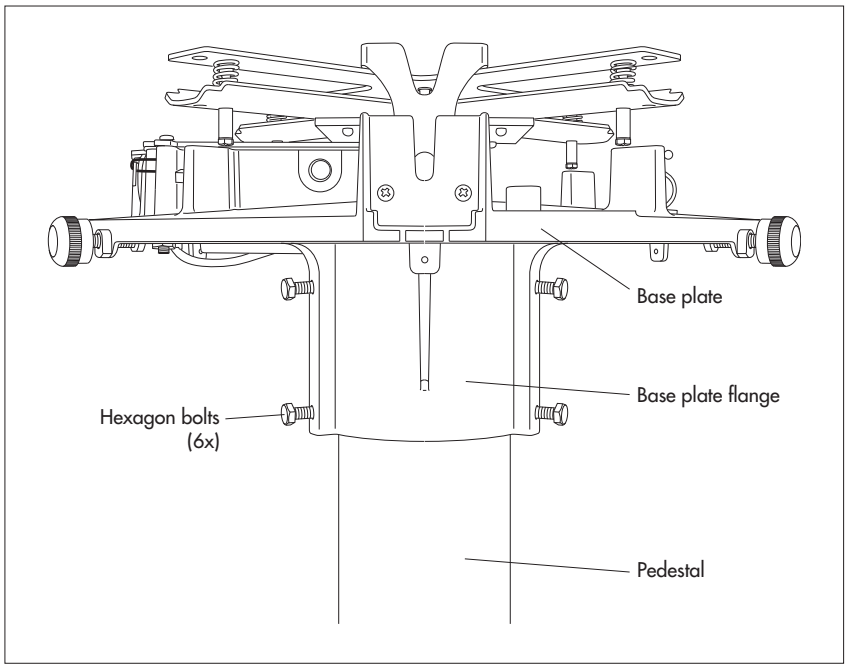
With version B, a wire strap should also be established between contacts 6 and 7 (high power consumption of the orifice rim heating)!



### 5.6 Installing the base plate on the pedestal

- Place the base plate onto the pedestal such that the connection and ground cables come out of the slit in the base plate flange (see Figure 10).
- Screw in the six hexagon bolts into the base plate flange with open-ended wrench size 13 mm (supplied). **Caution:** screw in all hexagon bolts approximately the same distance! Do not yet fully tighten the hexagon bolts!

Fig. 8: Installing base plate on pedestal.

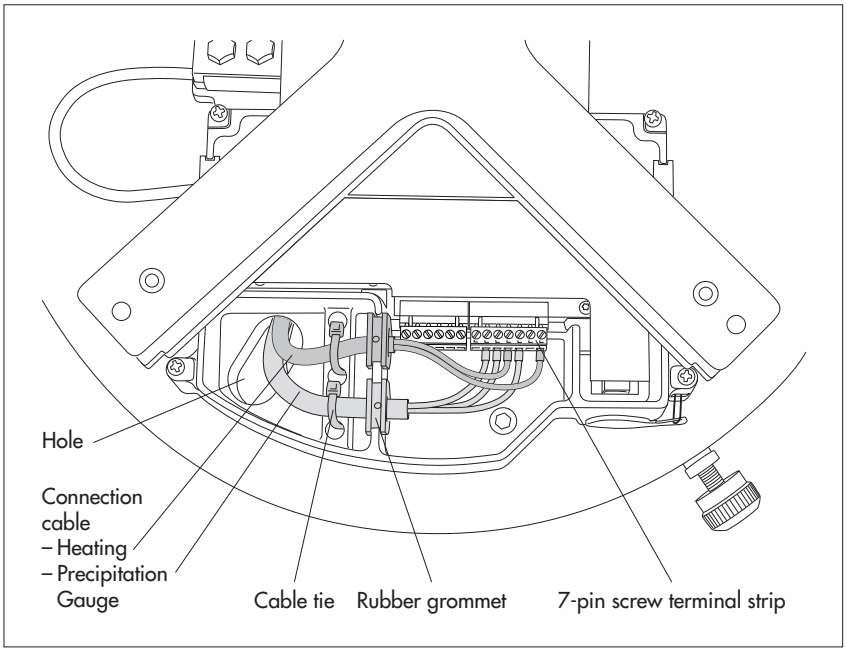



### 5.7 Connecting the connection cable

- Feed connection cable through hole in base plate.
- Push rubber grommet(s) with connection cable into the slot.
- Connect 6-pin (only if using the impulse output) and 7-pin screw terminal strip to the appropriate PCB socket(s).
- If necessary, pull back connection cable and store in pedestal (raise base plate again if necessary).
- Push a cable tie through the holes in the base plate and fix the connection cable with the cable tie.

Fig. 9: Connecting the connection cable in the electronics unit.

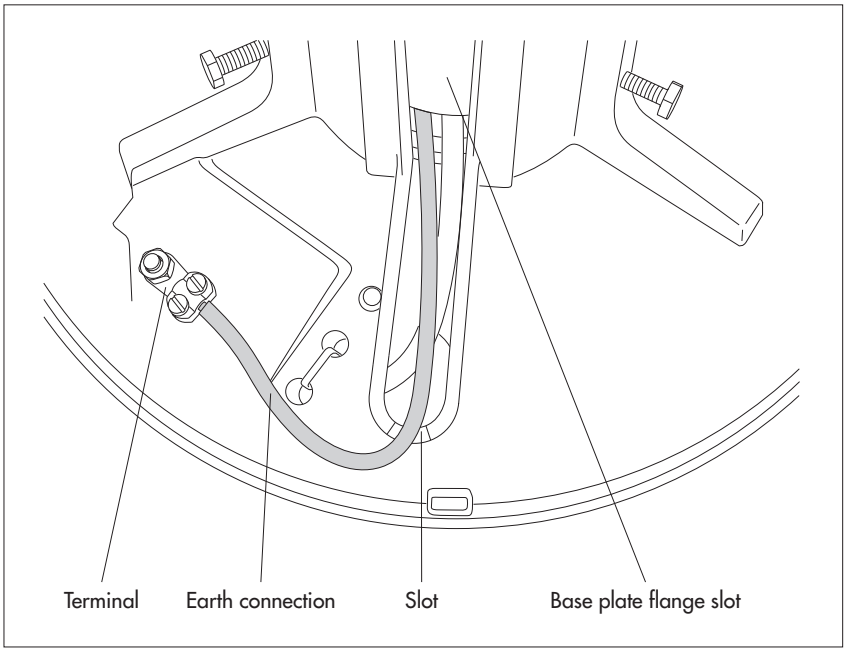
(The illustration shows the example of a standard SDI-12 wiring with optional orifice rim heating)




## 5.8 Connecting the ground cable

- Shorten the ground cable (size 10 mm $^2$) to approx. 30 - 35 cm.
- Strip approx. 10 mm of the ground cable insulation and connect to the terminal on the underside of the base plate. With an ground wire made of strands: push on wire end sleeves and crimp with end sleeve crimping pliers.
- Connect the ground cable to a concrete footing ground or ground rod.

Fig. 10: Connecting ground connection.

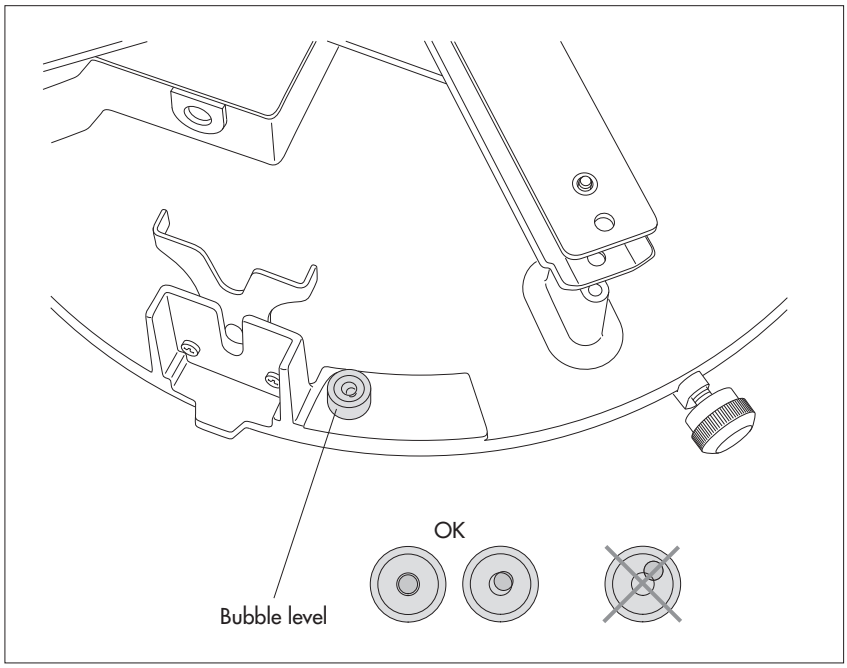


## 5.9 Adjusting the base plate

- First fix the base plate with the three upper hexagon bolts.
  Alternately tighten the bolts until all are touching the pedestal.
  Important: screw in all hexagon bolts approximately the same distance!
- Adjust the base plate with the lower hexagon bolts such that the air bubble in the bubble level is within the marked ring. While screwing in a hexagon bolt, the air bubble moves in the direction of this bolt position.
- Fully tighten all hexagon bolts alternately.
- Check bubble level once more for correct adjustment.

Fig. 11: Leveling the OTT Pluvio[2].

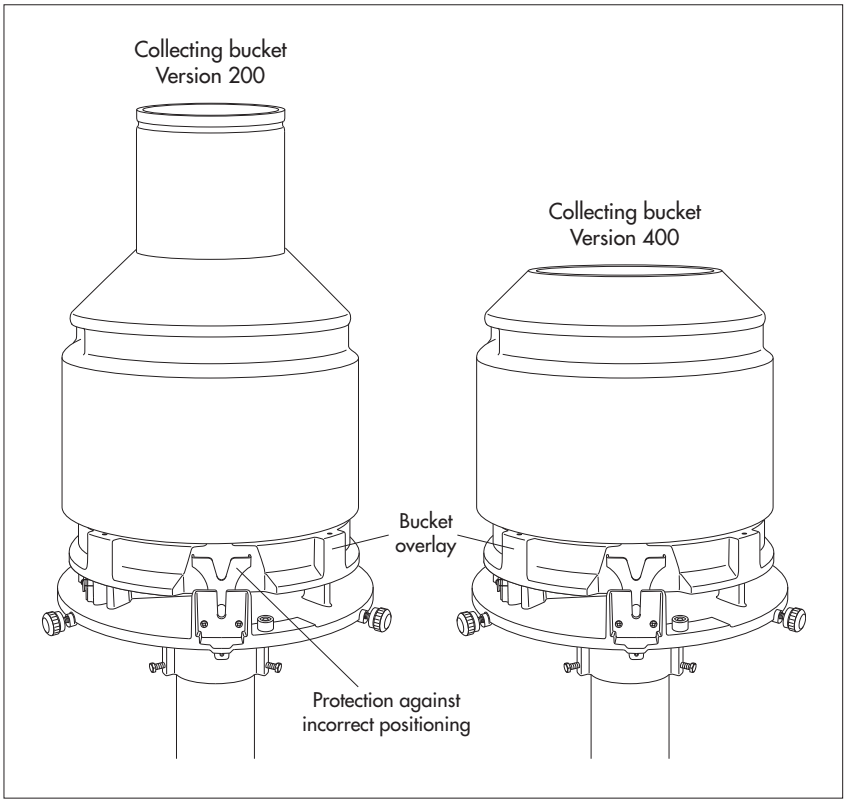
Correct functioning of the balance mechanism is only ensured if the base plate is optimally leveled!




## 5.10 Final work

- Place the electronics unit cover back on and tighten the four cross-head bolts.
- Position bucket overlay (note protection against incorrect positioning) and fix using the central attachment bolt.
- Take the pipe housing out of the transport box with the collecting bucket and push the collecting bucket out of the pipe housing from above.
- Place collecting bucket onto bucket overlay. Ensure secure positioning of bucket by aligning the inset groove!

Fig. 12: Placing collecting bucket onto bucket overlay.



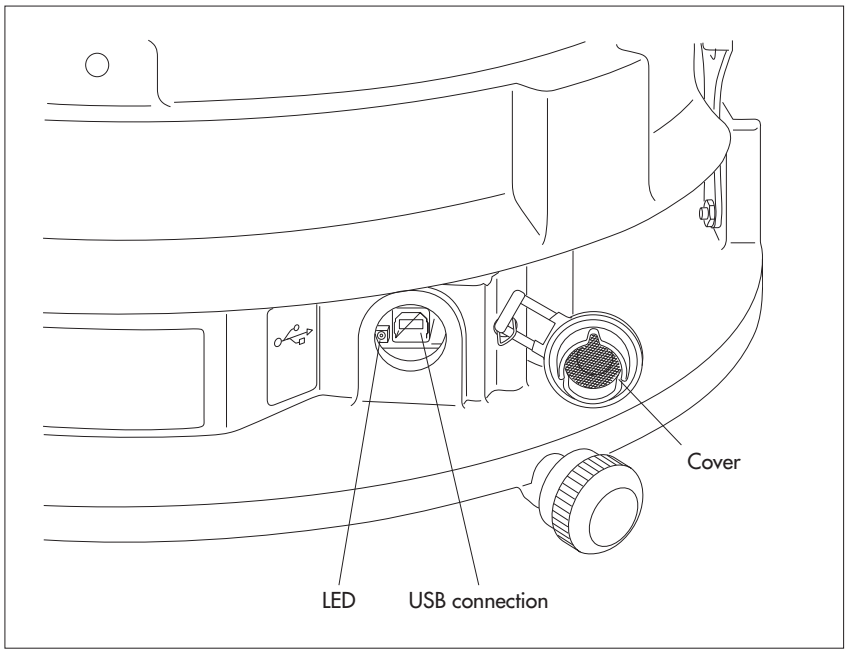

- If necessary: change the factory settings with the Pluvio² operating program. For installation and use of the operating program, see Chapter 7.6.
  **Factory settings:**

| | |
|---|---|
| – SDI-12 sensor address | 0 |
| – Serial interface | SDI-12 |
| – temperature measurement unit | °C |
| – intensity measurement unit | mm/min |
| – impulse output frequency | 5 Hz |
| – orifice rim heating* | On |
| – target temperature orifice rim heating* | +8 °C |

  * version 200 RH
- With environmental temperatures below 0 °C, add anti-freeze. See Chapter 7.2.
- Connect the connection cable of the data collection device/power supply of the precipitation gauge to the data collection device. With RS-485 interface and impulse output: Additionally, connect connection cable to an external power supply.
- OTT Pluvio² with orifice rim heating and separate power supply: Connect connection cable for the orifice rim heating to the power supply.
- Configure data collection device. For this refer to the manual for the data collection device. SDI-12 commands and responses used: see Chapter 6.

- Carrying out functional check: Remove cover of the USB interface → red LED must briefly blink once a second.
- Replace cover again.

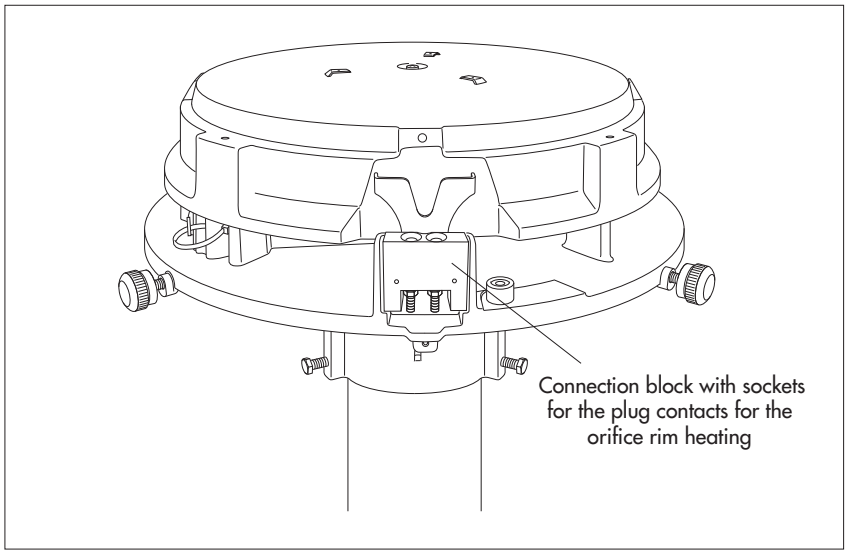
Fig. 13: Carrying out functional check.




- Place the pipe housing level onto the base plate (note protection against incorrect positioning). Pluvio² with orifice rim heating: Ensure that the sockets in the connection block are not contaminated.

Fig. 14: Connection block for the plug contacts for the orifice rim heating.

**Caution:** Always place and remove pipe housing of the Pluvio² with orifice rim heating level!




- Tighten three knurled screws.

# 6 SDI-12 commands and responses

## 6.1 Standard commands

All SDI-12 standard commands are implemented in the OTT Pluvio². The following SDI-12 standard commands are relevant for the operation of the OTT Pluvio²:

| Command | Response | Description |
|---|---|---|
| **a!** | **a<CR><LF>** | Confirmation active<br>**a** – sensor address; factory setting = 0 |
| **aI!** | **al3ccccccccmmmmmm** …<br>… **vvvxxxx<CR><LF>** | Send identification<br>**a** – sensor address<br>**13** – SDI-12 protocol version<br>**cccccccc** – manufacturer's identification (company name)<br>**mmmmmm** – sensor identification<br>**vvv** – sensor version (firmware)<br>**xxxxxx** – Serial number<br>Answer OTT Pluvio² = 013OTTHACHPLUVIO100xxxxxx |
| **aAb!** | **b<CR><LF>** | Change sensor address<br>**a** – old sensor address<br>**b** – new sensor address |
| **?!** | **a<CR><LF>** | Query sensor address<br>**a** – sensor address |
| **aM!** / **aM1!** | **atttn<CR><LF>**<br>and after 1 second<br>**a<CR><LF>** | Starting the measurement<br>**a** – sensor address<br>**ttt** – Time in seconds until the sensor has determined the measurement result<br>Answer OTT Pluvio² = 001<br>**n** – number of measurement values<br>Answer OTT Pluvio² = 9<br>**a<CR><LF>** – service request |
| **aMC!** / **aMC1!** | **atttn<CR><LF>**<br>and after 1 second<br>**a<CR><LF>** | Start measurement and request CRC (Cyclic Redundancy Check). For details, see command **aM!**. The responses to the **aD0!** … **aD2!** commands in this case are extended by a CRC value (example):<br>**a<value1><value2><value3><value4><CRC><CR><LF>** |
| **aC!** / **aC1!** | **atttnn<CR><LF>** | Start concurrent measurement (simultaneous measurement with multiple sensors on one bus feed). For details see command **aM!** The number of values in the answer to this command is two-digit: **nn** = 02. |
| **aCC!** / **aCC1!** | **atttnn<CR><LF>** | Start concurrent measurement (simultaneous measurement with multiple sensors on one bus feed) and request CRC (Cyclic Redundancy Check). For more details, see command **aM!** The number of measured values in the answer to these commands is two-digit: **nn** = 02.<br>The responses to the **aD0!** … **aD2!** commands in this case are extended by a CRC value (example):<br>**a<value1><value2><value3><value4><CRC><CR><LF>** |

**Notes:** Each **aM!** command resets the total measured values *Accumulated RT-NRT* and *Accumulated NRT* to zero!

| Command | Response | Description |
|---|---|---|
| **aD0!*** <br>* after **aM!**, **aMC!**, **aC!**, **aCC!** | **a<value1><value2>** … <br>… **<value3><value4><CR><LF>** | Send data<br>**a** – sensor address<br>**<value1>** – **Intensity RT**<br>200 [mm]: **pbbbb.d** (12.0 … 1,800.0)<br>200 [mm/min]: **pbb.dd** (0.20 … 30.00)<br>400 [mm/h]: **pbbbb.d** (6.0 … 1,800.0)<br>400 [mm/min]: **pbb.d** (0.10 … 30.00)<br>**<value2>** – **Accumulated RT-NRT**<br>200 [mm]: **pbbb.dd** (0.20 … 500.00)<br>400 [mm]: **pbbb.dd** (0.10 … 500.00)<br>**<value3>** – **Accumulated NRT**<br>200 [mm]: **pbbb.dd** (0.20 … 500.00)<br>400 [mm]: **pbbb.dd** (0.10 … 500.00)<br>**<value4>** – **Accumulated total NRT**<br>200 [mm]: **pbbb.dd** (0.20 … 500.00)<br>400 [mm]: **pbbb.dd** (0.10 … 500.00)<br>**p** – sign (+)<br>**b** – numbers before the decimal point<br>**d** – numbers after the decimal point |
| **aD1!** | **a<value5><value6>** … <br>… **<value7><value8><CR><LF>** | Send data<br>**a** – sensor address<br>**<value5>** – **Bucket RT**<br>200 [mm]: **pbbbb.dd** (40.00 ... 1,700.00)<br>400 [mm]: **pbbb.dd** (20.00 ... 850.00)<br>**<value6>** – **Bucket NRT**<br>200 [mm]: **pbbbb.dd** (40.00 ... 1,700.00)<br>400 [mm]: **pbbb.dd** (20.00 ... 850.00)<br>**<value7>** – **Load cell temperature**<br>[°C]: **pbb.d** (–50.0 … +70.0)<br>[°F]: **pbbb.d** (–58.0 … +158.0)<br>**<value8>** – **Heating status**<br>**pbbb**<br>+000 = Orifice rim heating working correctly<br>+001 = W: Temperature of orifice ring rim > 40 °C<br>+002 = A: Temperature of orifice ring rim < –20 °C<br>+004 = A: Temperature sensor not connected<br>+008 = A: Temperature sensor short-circuited<br>+016 = A: Communication to rim heating module is defective (the pipe housing may have been removed)<br>+032 = A: Functional check of orifice rim heating was faulty<br>+064 = not used<br>+128 = W: Orifice rim heating deactivated or not present<br>**p** – sign (+,–)<br>**b** – numbers (before the decimal point)<br>**d** – numbers after the decimal point<br><br>W = warning; A = alarm.<br>Intermediate values: there are several results. For further information, see Chapter 7.5, Troubleshooting. The status information output – assuming the cause has been rectified – is reset the next time the command **aM!** is called. |

| Command | Response | Description |
|---|---|---|
| aD2! | a<value9><CR><LF> | Send data<br>a – sensor address<br><value9> – **Status**<br>pbbb<br>+001 = W: Bucket content > 80 %<br>+002 = W: USB interface is/was connected<br>+004 = W: Restart (due to power failure)<br>+008 = W: Restart (due to firmware)<br>+016 = W: Weight change out of range<br>+032 = W: Supply voltage < 7 V<br>+064 = A: Weight measurement unstable<br>+128 = A: Weight measurement incorrect<br>+256 = A: Weight below minimum<br>+512 = A: Weight above maximum<br>+1024 = A: No weight calibration<br>p – sign (+)<br>b – number<br>W = warning; A = Alarm.<br>Intermediate values: there are several results. For further information see Chapter 7.5, Troubleshooting. |
| aD0!*<br>* after aM1!, aMC1!, aC1!, aCC1! | a<value1><value2><value3><CR><LF><br>> | Send data<br>a – sensor address<br><value1> – **Temperature electronics unit**<br>(approximately the ambient temperature with time delay)<br>[°C]: pbb.d (–50.0 … +70.0)<br>[°F]: pbbb.d (–58.0 … +158.0)<br><value2> – **Power supply**<br>pbb.d (+4.5 … 28.0)<br><value3> – **Orifice ring rim temperature**<br>[°C]: pbb.d (–50.0 … +70.0)<br>[°F]: pbbb.d (–58.0 … +158.0)<br>p – sign (+)<br>b – numbers before the decimal point<br>d – numbers after the decimal point |

**Note on *bucket RT* and *bucket NRT*:** With an empty bucket, the OTT Pluvio² 400 outputs a value between 80 and 100 mm (at a filling level of 70 %: 610 - 630 mm; at a filling level of 100 %: 830 … 850 mm). The OTT Pluvio² 200 outputs a value between 160 and 200 mm (at a filling level of 70 %: 1220 - 1,260 mm; at a filling level of 100 %: 1660 … 1770 mm). This is caused by the weight of the bucket overlay and the collecting bucket.

More information on the SDI-12 standard commands can be found in the document *SDI-12; A Serial-Digital Interface Standard for Microprocessor-Based Sensors; Version 1.3* (see Internet page*www.sdi-12.org*).

### 6.2 Advanced SDI-12 commands

All advanced SDI-12 commands begin with an "O" for OTT. With these commands it is possible, for example, to use the transparent mode of a datalogger to query additional information from an OTT Pluvio² or to configure an OTT Pluvio².

| Command | Response | Description |
|---|---|---|
| ▶ Reading out firmware version | | |
| aOOV! | ac.cc.cc<CR><LF> | Read out firmware version of the OTT Pluvio²<br>a – Sensor address<br>c.cc.ccc – Firmware version<br>Example: V1.00.00 (first firmware version supplied) |

▶ Setting/reading the temperature value unit

| | | |
|---|---|---|
| **aOUTb!** | **ab<CR><LF>** | Set unit |
| **aOUT!** | **ab<CR><LF>** | Read out unit |
| | | **a** – Sensor address |
| | | **b** – 0 = °C; factory setting |
| | | 1 = °F |

▶ Set/read unit for the intensity measurements
(this command changes the units for "Accumulated…" and "Bucket…" at the same time; mm ↔ inch)

| | | |
|---|---|---|
| **aOUIb!** | **ab<CR><LF>** | Set unit |
| **aOUI!** | **ab<CR><LF>** | Read out unit |
| | | **a** – Sensor address |
| | | **b** – 0 = mm/min; factory setting |
| | | 1 = mm/h |
| | | 2 = inch/min |
| | | 3 = inch/h |

▶ Setting/reading impulse output frequency

| | | |
|---|---|---|
| **aOCIb!** | **ab<CR><LF>** | Set output frequency |
| **aOCI!** | **ab<CR><LF>** | Read out output frequency |
| | | **a** – Sensor address |
| | | **b** – 0 = 5 Hz; factory setting |
| | | 1 = 2 Hz |

▶ Switching orifice rim heating on/off (Pluvio² with orifice rim heating)

| | | |
|---|---|---|
| **aOCHb!** | **ab<CR><LF>** | Switch orifice rim heating on/off |
| | | **a** – Sensor address |
| | | **b** – 0 = switch **off** orifice rim heating |
| | | 1 = switch **on** orifice rim heating |

▶ Setting target temperature of the orifice rim heating (Pluvio² with orifice rim heating)

| | | |
|---|---|---|
| **aOCHSbb!** | **abb<CR><LF>** | Set target temperature of orifice rim heating |
| | | **a** – Sensor address |
| | | **b** – 5 … 20 (+5 … +20 °C); |
| | | factory setting +8 °C |

▶ Set/read serial interface (SDI-12 or RS-485)

| | | |
|---|---|---|
| **aOCLb!** | **ab<CR><LF>** | Set serial interface |
| **aOCL!** | **ab<CR><LF>** | Read serial interface |
| | | **a** – sensor address |
| | | **b** – 0 = SDI-12; factory setting |
| | | 1 = RS-485 |

▶ Set/read protocol on the RS-485 interface

| | | |
|---|---|---|
| **aOCMb!** | **ab<CR><LF>** | Set protocol |
| **aOCM!** | **ab<CR><LF>** | Read protocol |
| | | **a** – sensor address |
| | | **b** – 0 = SDI-12 protocol; factory setting |
| | | 1 = ASCII (RS-485 command line mode) |

▶ Reset "Accumulated total NRT"

| | | |
|---|---|---|
| **aOMR!** | **a<CR><LF>** | Reset Accumulated total NRT |
| | | **a** – sensor address |

### 6.3 RS-485 command line mode (ASCII text call)

When using the RS-485 interface, the standard transmission protocol is the SDI-12 protocol. This assumes that the data recording device connected can process the SDI-12 protocol. The OTT LogoSens 2 or OTT DuoSens dataloggers can, for example, do this.

To achieve the simple system integration of the Pluvio² into any measuring station infrastructure, a so-called command line mode is implemented in the Pluvio². Using a compact command set in ASCII format, all measurements can be called and various settings made. This command set must be programmed in the data recording device.

**Switching to RS-485 command line mode**

In the Pluvio² operating program, set:
Communication interface: RS-485
RS-485 protocol type: ASCII text call

**Transmission parameters**

19.200 8 N 1

**Units**

The units are set with the Pluvio² operating program.
Temperature values: °C and °F
Intensity: mm/min and mm/h
inch/min and inch/h

**Commands**

**`M[separator]<CR>`**

returns the measurements Intensity RT; Accumulated RT/NRT; Accumulated NRT; Accumulated total NRT; Bucket RT; Bucket NRT; Temperature load cell; Status, as a sequence of ASCII characters.
Immediately after the character **`M`**, any separator can follow optionally. This character then separates the individual values from each other in the answer from the Pluvio².

| **Format** | **metric** | **imperial** |
|---|---|---|
| Intensity RT | +0000.0/+00.00 | +00.000/+0.000 |
| Accumulated RT/NRT | +0000.00 | +00.000 |
| Accumulated NRT | +0000.00 | +00.000 |
| Accumulated total NRT | +0000.00 | +00.000 |
| Bucket RT | +0000.00 | +00.000 |
| Bucket NRT | +0000.00 | +00.000 |
| Temperature load cell | +00.0 | +000.0 |
| Heating status* | +000 | +000 |
| Status* | +000 | +000 |

*For description of the status information, see Chapter 6.1

**`E<CR>`** additionally to the command **`M`** returns the values "Temperature electronics unit", "Supply voltage" and "Temperature orifice ring rim"

**`R<CR>`** resets the value "Accumulated total NRT" to zero

**`W<CR>`** switches the orifice rim heating on

**`S<CR>`** switches the orifice rim heating off

**`I<CR>`** calls various pieces of information on the device: Serial number, firmware, device version, unit, hardware index, pcb number, load cell number

**Examples**

**`M;<CR>`**
**`+0000.00;+0000.00;+0000.00;+0031.04;`**
**`+0463.60;+0463.62;+23.7;+000;+000;<CR><LF>`**

**`E;<CR>`**
**`+0020.61;+0000.40;+0000.27;+0028.22;+0587.66;+0585.96;`**
**`+24.4;+000;+000;+24.6;+13.0+24.3;<CR><LF>`**

**`R<CR>`**
**`OK<CR><LF>`**

**`W<CR>`**
**`Heating ON<CR><LF>`**
**`OK<CR><LF>`**

**`W<CR>`**
**`Heating OFF<CR><LF>`**
**`OK<CR><LF>`**

**`I<CR>`**
**`226770;V1.12.000;200;mm/min;d2;498680083;30405378<CR><LF>`**
**`OK<CR><LF>`**

**Note:** Each command **`M`** or **`E`** resets the total measured values *Accumulated RT-NRT* and *Accumulated NRT* to zero!

# 7 Carrying out maintenance work

To guarantee trouble-free operation of the precipitation gauge, we recommend the following maintenance work is carried out at the intervals given:

- Emptying: at the latest when the collecting bucket is 80 % full
- Visual check: once a year
- Check measurement: once a year
- Add anti-freeze: with environmental temperatures under 0 °C

## 7.1 Emptying collecting bucket

To prevent the collecting bucket overflowing, the bucket should be emptied after long periods of precipitation.

If the status information "+001" is present in the status signal (answer to SDI-12 command "`aD2!`"), emptying is necessary (depending on region approx. 1 to 2 times a year).

You can empty the bucket contents at any time, independently of how full it is. Any overflowing of the collecting bucket will lead to inaccurate measurements but will not damage the balance system.

**To empty bucket:**

- Unscrew the three knurled screws on the pipe housing.
- Remove pipe housing.
- Carefully remove the collecting bucket and empty it. If necessary, enlist the help of a second person.
  **Caution:** a full collecting bucket is very heavy! Depending on how full it is, it can weigh over 30 kg! With careless handling there is a risk of injury from a falling collecting bucket! It is also possible that the balance system could be damaged!
- Position the pipe housing (note position of alignment aid).
- Retighten three knurled screws.
- Alternatively, a drain pump can be used for emptying (accessory). For this it is necessary to remove the pipe housing.

## 7.2 Adding anti-freeze solution for winter operation

With negative temperatures we recommend adding anti-freeze to the collecting bucket. This solution enables the solid precipitation to melt in the collecting bucket and prevents severe deformation of the bucket floor if the collected precipitation freezes completely. For this use anti-freeze POWERCOOL DC 924-PXL from Thermochema GmbH, A-4460 Losenstein, telephone +43 / 72 55 / 42 440. Internet: www.thermochema.at.

**How to add the anti-freeze:**

- Add anti-freeze in the proportion according to the table (the pipe housing does not have to be removed for this):

| Mixing proportions | | Filling level 35 % | Filling level 80 % |
|---|---|---|---|
| POWERCOOL DC 924-PXL | water | protection up to approx. | |
| 5 l | 0.5 l | –34 °C | –6 °C |
| 7.5 l | 1.0 l | –34 °C | –10 °C |
| 10 l | 1.0 l | –34 °C | –15 °C |

**Caution:** Only add anti-freeze as dilute solution! Never use undiluted! (POWERCOOL exhibits hygroscopic behavior.)

- If necessary after precipitation, manually mix the anti-freeze around (incorrect results can arise due to vibrations).

**Note on disposing of anti-freeze solution:**
The anti-freeze may not be disposed of in the amounts used in the public sewer system. Please refer to your local authority responsible for questions regarding disposal and/or contact Thermochema GmbH.

**Note on winter operation without anti-freeze:**
Complete freezing of the collected precipitation with levels above approx. 200 mm precipitation usually leads to deformation of the bucket floor and tipping of the collecting bucket, so that the bucket is lying against the pipe housing (force shunt). This causes inaccurate measurement results.

Reliable winter operation without anti-freeze is thus only possible with bucket filling levels of less than 200 mm precipitation. Regular checking and emptying is absolutely necessary in this case!

**Note on third-party anti-freeze solution products:**
Third-party products can be used under consideration of the following factors:
- Easily dissolved in water with low density (no sinking of the anti-freeze under the water).
- Low evaporation (no methanol used).
- Low corrosion of aluminium and stainless steel.
- Low freezing point even with high filling level in the collecting bucket.
- Low hygroscopic properties (absorption of moisture from the air, which would affect the measurement results).
- Ensure chemical compatibility with collecting bucket (ASA and polyethylene).
- No gumming after use in open containers for several months.

### 7.3 Carrying out a visual check

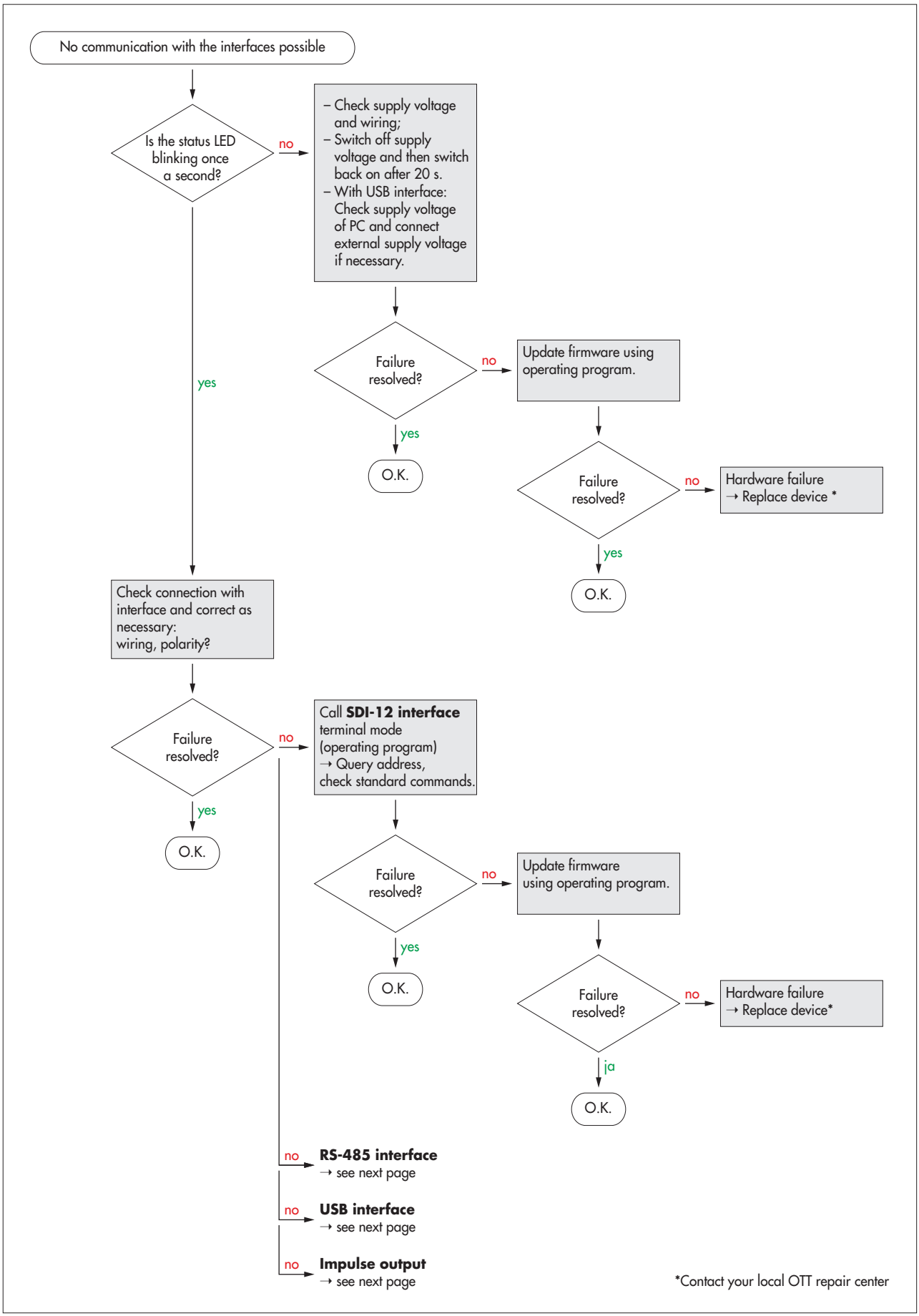
- Check the ease of movement of the collecting bucket in all directions at the lower edge of the bucket orifice. To do this, with the pipe housing closed, move the bucket slightly with a sideways tap on the inside. The upper bucket edge may not contact the housing.
  Note: A short movement can affect the measured value "Intensity RT" (short lag time)!
- If present, carefully remove contamination (e.g. insects, insect nests, spiders' webs, etc.) and ice.

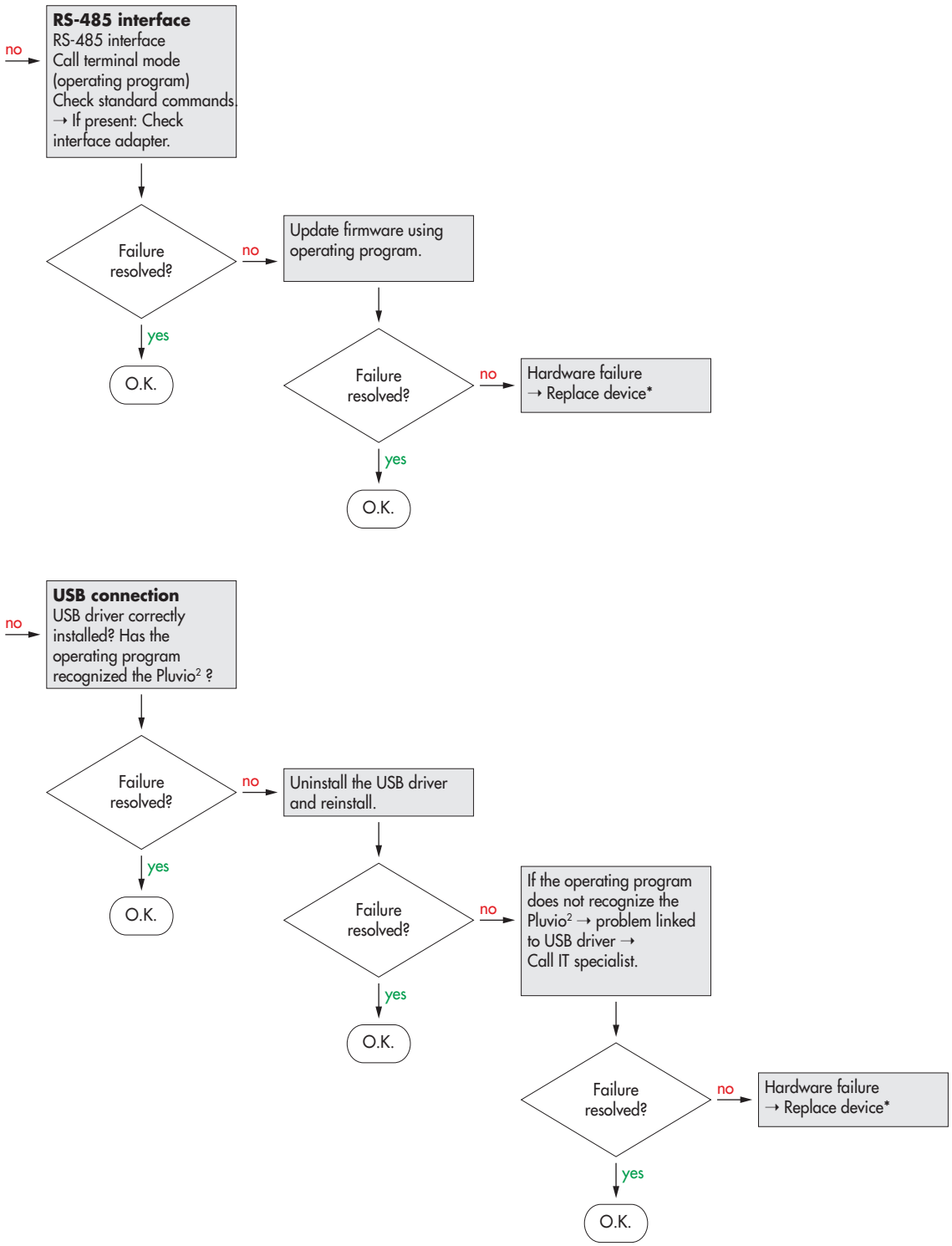
### 7.4 Additional checks in cases of defect

- Transportation lock removed?
- Is the bucket distorted?
- Is the bucket standing securely on the bucket overlay?
- Is the pipe housing positioned correctly and undamaged?
- Does the moving part of the balance system make contact with fixed parts?
- Is the LED blinking? See also Chapter 7.5

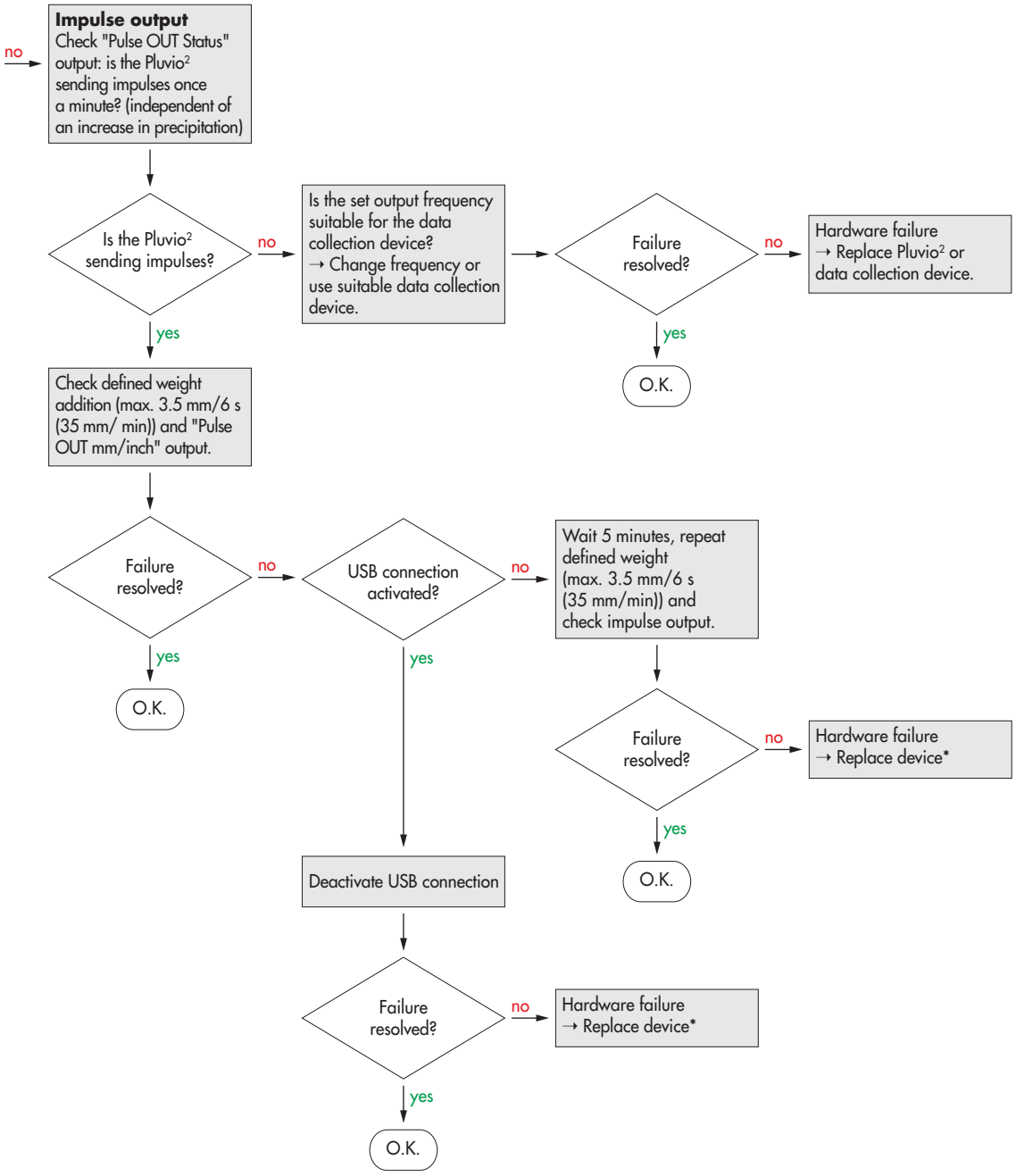
- If in doubt, carry out an accuracy test as described in Chapter 7.6

## 7.5 Trouble shooting

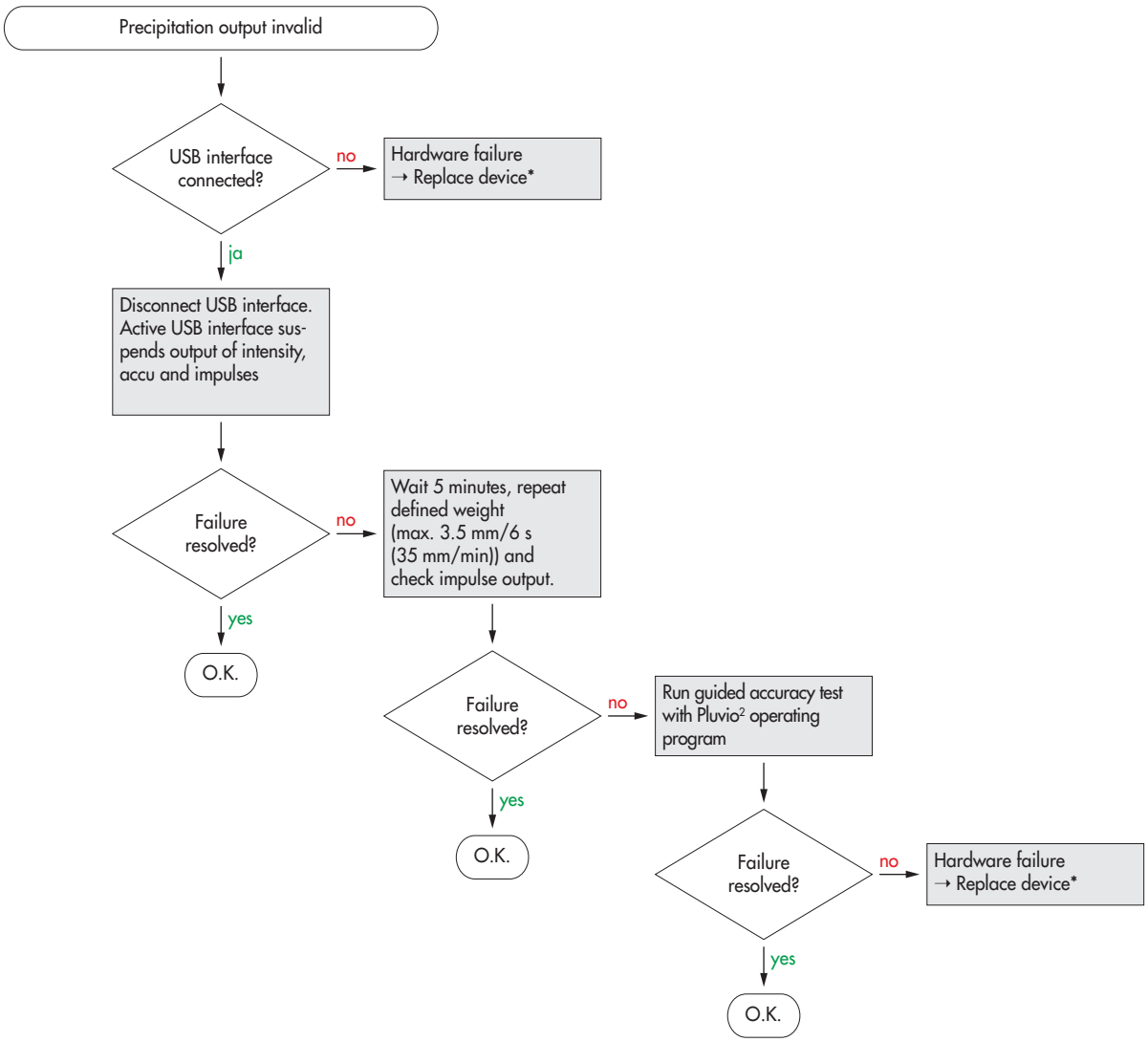





*Contact your local OTT repair center




*Contact your local OTT repair center




*Contact your local OTT repair center

### 7.6 Carrying out guided accuracy test (check measurement)

The Pluvio² operating program is supplied with the Pluvio² on the CD-ROM "OTT Pluvio² Software". With the help of this software, you can carry out a "guided accuracy test". With this, the Pluvio² can be simply and quickly checked on site for correct function.

With the Pluvio² operating program, you can also make basic settings for the Pluvio² or carry out a software update.

**Caution:** Only carry out the accuracy test on calm days without precipitation! (Otherwise, the test will be affected by wind and unwanted precipitation.) The USB interface also provides the Pluvio² with operating power. An additional attached power supply is not necessary, but it does not have to be removed for this.

**Preparation**

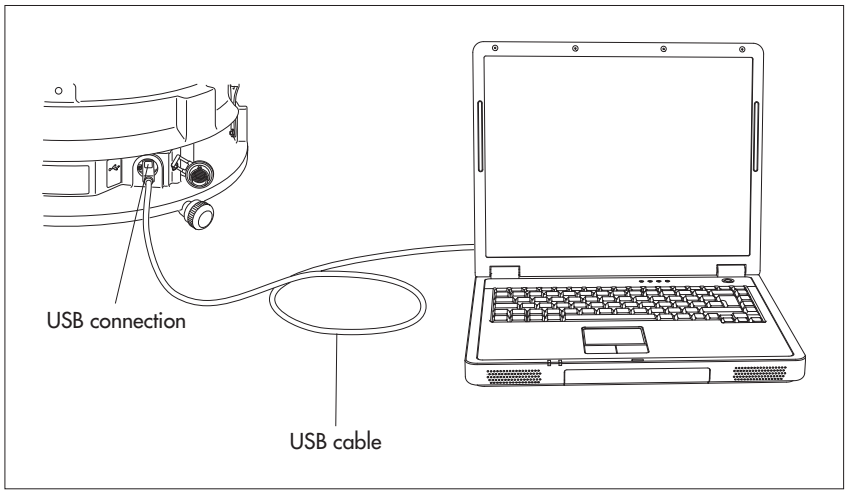
- Install the Pluvio² operating program on a notebook with an operating system of Microsoft Windows 98 or higher: For this, copy the file "Pluvio2Param.exe" to any folder on the PC.
- Install the USB interface driver (FTDI driver) onto the notebook: Log on to the PC with administrator rights! Copy the file "CDM 2.04.06.exe" to any directory on the PC. Connect the Pluvio² to the PC with a USB cable (accessory). See Figure 14. Close the hardware assistant that starts automatically and then start the file "CDM 2.04.06.exe".

**Carry out accuracy test**

- Unscrew the three knurled screws on the pipe housing.
- Remove pipe housing and collecting bucket.
- Connect the Pluvio² to the PC with a USB cable (accessory). See Figure 14.
- Start the Pluvio² operating program.
- Call the "guided accuracy test" function. An assistant now guides you through the accuracy test. Ensure you follow all the work steps and notes shown on the display.
- At the end of the accuracy test, remove the USB cable.
- Replace the cover for the USB interface.
- If necessary, empty the collecting bucket and put it back.
- Position the pipe housing (note position of alignment aid).
- Retighten three knurled screws.

**Caution:**After attaching the USB interface, the OTT Pluvio² interrupts communication on the other interfaces!

Fig. 14: Connect Pluvio² to the PC using the USB interface.



## 8 Repair

- Where there is a device defect, use Chapter 7.5 to see if you can resolve the problem yourself.
- In case of device defects, please contact the repair center of OTT or your local repair center:

OTT Hydromet GmbH
Repaircenter
Ludwigstrasse 16
87437 Kempten · Germany
Telephone +49 831 5617-433
Fax +49 831 5617-439
repair@ott.com

**Caution:** Only have a defective OTT Pluvio ² checked and repaired by the OTT repair center. Under no circumstances carry out any repairs yourself. Any repairs or attempted repairs carried out by the customer will result in the loss of any guarantee rights.

## 9 Note about the disposal of old units

**Within the member countries of the European Union**
In accordance with the European Union guideline 2002/96/EC, OTT takes back old devices within the member countries of the European Union and disposes of them in an appropriate way. The devices concerned by this are marked with the symbol shown here.

- For further information on the return procedure, please contact the Logistics department of OTT.

**For all other countries**

- Dispose of the OTT Pluvio² properly after taking out of service.
- Observe the regulations valid in your country for the disposal of electronic devices.
- Never put the OTT Pluvio² into the normal household waste.

**Materials used:**

| | |
|---|---|
| Base plate: | aluminium |
| Collecting bucket: | polyethylene, PE |
| Bucket overlay: | polypropylene, PP |
| Pipe housing: | ASA |

The material identification is found on the component itself for plastic parts.

## 10 Technical Data

| | |
|---|---|
| Supply voltage | 9 … 28 V DC, typically 24 V, secured against reverse polarity |
| Current consumption | ≤ 15 mA at 12 V |
| Power consumption | ≤ 180 mW |
| Recordable precipitation | liquid, solid, mixed |
| Recordable precipitation amount | |
| Version 200 | 1,500 mm |
| Version 400 | 750 mm |
| Resolution | |
| Intensity | 0.01 mm/min or mm/h |
| Amount of precipitation | 0.01 mm |
| Accuracy | see Limits/accuracy |
| Measuring range | |
| Bucket content | 750/1,500 mm ≙ 30 l |
| Collecting area | |
| Version 200 | 200 cm² (Ø 159.6 $^{\pm 0.3}$ mm) |
| Version 400 | 400 cm² (Ø 225.7 $^{\pm 0.4}$ mm) |
| Sample interval (poll) | 1 minute … 60 minutes |
| Output delay | |
| Real time | < 1 minute |
| Non-real-time (filtered values) | 5 ... 65 minutes |
| Interfaces | |
| USB | Version 1.1 (only for service purposes – no overload protection) |
| SDI-12 | Version 1.3 |
| RS-485 (two-wire, 19200 8 N 1) | SDI-12 protocol and RS-485 command line mode |
| Impulse output | 2 or 5 Hz |
| Output measurement values | Intensity RT, Accumulated RT/NRT, Accumulated NRT, Accumulated total NRT, Bucket RT, Bucket NRT, Temperature load cell, Status, Heating status |
| Supply voltage for orifice rim heating | 20 … 28 V DC; typically 24 V DC; secured against reverse polarity (a galvanic separation of the power supply for the orifice rim heating and the precipitation gauge is not necessary) |
| Current consumption | max. 2.2 A |
| Heating capacity | typically 53 W at 24 V; max. 58 W |
| Operating range of the orifice rim heating (ambient temperature) | –40 … +20 °C |
| Measuring range of orifice ring rim temperature | –20 … +40 °C |
| Set temperature for orifice ring rim | +5 … +20 °C ; factory setting: +8 °C |
| Accuracy of set temperature | ± 1 °C |
| Dimensions Ø x H | 450 mm x 670 mm |
| Weight (empty) | approx. 15 kg |
| Housing material | |
| Base plate | stainless steel/aluminium |
| Collecting bucket | polyethylene |
| Bucket overlay | polypropylene |
| Pipe housing | ASA, UV resistant |
| Type of protection | |
| Pipe housing closed | IP 65 (resistant to salt fog) |
| Pipe housing open | IP 63 |
| Load cell | IP 67 |
| Temperature range | |
| Operation | –40 … +60 °C |
| Storage | –50 … +70 °C |
| Temperature compensation | –25 … +45 °C |
| Max. wind speed to retain accuracy | 33 m/s |
| Max. wind speed without device fault | 50 m/s |
| Relative humidity | 0 ... 100 % (non-condensing) |
| EMC | complies with EN 61000-4-2/3/4/5/6 |

CE

| Measurement value | Units | Measuring range (1st value = discrimination threshold) Type 200 | Type 400 | Resolution | Accuracy absolute | Accuracy relative | Output delay |
|---|---|---|---|---|---|---|---|
| | | | | | the larger value in each case counts | | minutes |
| **SDI-12 command `aM!`** | | | | | | | |
| ▶ Intensity RT | mm/h | 12.0 … 1800.0 | 6,0 … 1800.0 | 0.6 | ±6 | ±5 % | <1 |
| | mm/min | 0.20 … 30.00 | 0.10 … 30.00 | 0.01 | ±0.1 | ±5 % | <1 |
| | inch/h | 0.480 … 70.000 | 0.240 … 70.000 | 0.001 | ±0.24 | ±5 % | <1 |
| | inch/min | 0.008 … 1.200 | 0.004 … 1.200 | 0.001 | ±0.005 | ±5 % | <1 |
| ▶ Accumulated RT/NRT | mm | 0.20 … 500.00 | 0.10 … 500.00 | 0.01 | ±0.1 | ±5 % | 1 … 65 |
| | inch | 0.008 … 50.000 | 0.004 … 50.000 | 0.001 | ±0.005 | ±5 % | 1 … 65 |
| ▶ Accumulated NRT | mm | 0.20 … 500.00 | 0.10 … 500.00 | 0.01 | ±0.1 | ±5 % | 5 … 65 |
| | inch | 0.008 … 50.000 | 0.004 … 50.000 | 0.001 | ±0.005 | ±5 % | 5 … 65 |
| ▶ Accumulated total NRT | mm | 0.20 … 500.00 | 0.10 … 500.00 | 0.01 | ±0.1 | ±5 % | 5 … 65 |
| | inch | 0.008 … 50.000 | 0.004 … 50.000 | 0.001 | ±0.005 | ±5 % | 5 … 65 |
| ▶ Bucket RT | mm | 40.00 … 1700.00 | 20.00 … 850.00 | 0.01 | ±0.1 | ±0.2 % | <1 |
| | inch | 1.500 … 67.000 | 0.800 … 33.500 | 0.001 | ±0.005 | ±0.2 % | <1 |
| ▶ Bucket NRT | mm | 40.00 … 1700.00 | 20.00 … 850.00 | 0.01 | ±0.1 | ±0.2 % | 5 |
| | inch | 1.500 … 67.000 | 0.800 … 33.500 | 0.001 | ±0.005 | ±0.2 % | 5 |
| ▶ Temperature load cell | °C | −50.0 … +70.0 | −50.0 … +70.0 | 0.1 | ±1 | | <1 |
| | °F | −58.0 … +158.0 | −58.0 … +158.0 | 0.1 | ±2 | | <1 |
| ▶ Heating status | | 0 … 128 | | 1 | | | <1 |
| ▶ Status Pluvio[2] | | 0 … 1024 | 0 … 1024 | 1 | | | <1 |
| **SDI-12 command `aM1!`** | | | | | | | |
| ▶ Temperature electronics unit | °C | −50.0 … +70.0 | −50.0 … +70.0 | 0.1 | ±1 | | <1 |
| | °F | −58.0 … +158.0 | −58.0 … +158.0 | 0.1 | ±2 | | <1 |
| ▶ Power supply | V | +4.5 … +28.0 | −4.5 … +28.0 | 0.1 | ±0.5 | | <1 |
| ▶ Temperature orifice ring rim | °C | −50.0 … +70.0 | | 0.1 | ±1 | | <1 |
| | °F | −58.0 … +158.0 | −58.0 … +158.0 | 0.1 | ±2 | | <1 |

# Appendix A – Connecting OTT Pluvio2 to an OTT datalogger

## A.1 Connecting the OTT Pluvio² via SDI-12 or RS-485 interface to LogoSens 2 or DuoSens

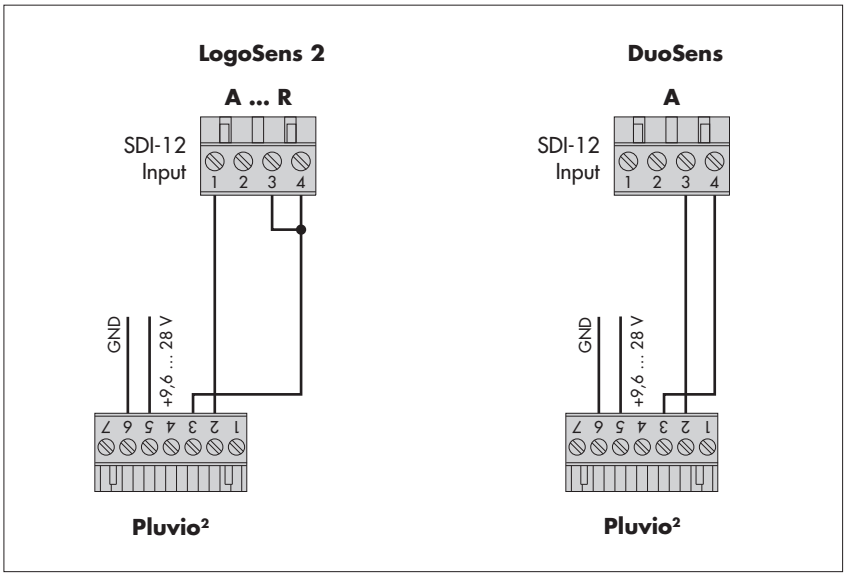
**Method A:** Connecting the OTT Pluvio² via the SDI-12 interface (protocol and physical interface: SDI-12). The maximum length of the cable is 70 m.

- Connect the OTT Pluvio² to the LogoSens 2 Station Manager or to the DuoSens Compact Datalogger as shown in Figure A1. Take note of the operating instructions for the LogoSens 2/DuoSens.

Fig. A1: Connecting the OTT Pluvio² to LogoSens 2 or DuoSens using an SDI-12 interface.

The letters above the screw terminal strip identify the possible connections on the LogoSens 2/DuoSens.

For this application, only the 7-pin screw terminal strip is needed.




**Method B:** Connecting OTT Pluvio² using the physical RS-485 interface (SDI-12 protocol via physical RS-485 interface). The maximum length of the cable is 1,000 m.

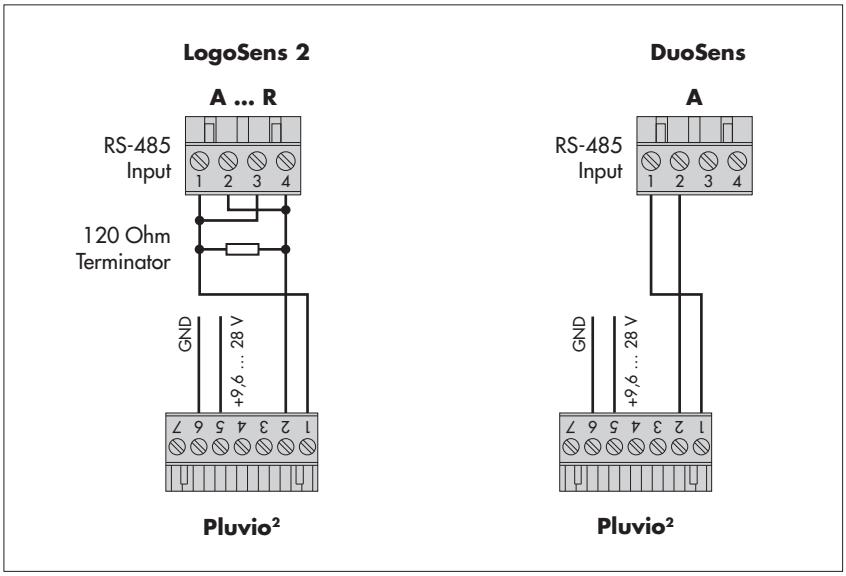
- Connect the OTT Pluvio² to the LogoSens 2 Station Manager or to the DuoSens Compact Datalogger as shown in Figure A2. Take note of the operating instructions for the LogoSens 2/DuoSens.

Fig. A2: Connecting the OTT Pluvio² to LogoSens 2 or DuoSens using an RS-485 interface (SDI-12 protocol).

The letters above the screw terminal strip identify the possible connections on the LogoSens 2/DuoSens.

For this application, only the 7-pin screw terminal strip is needed.

When connecting the OTT Pluvio² to the LogoSens 2, use a 120 Ohm terminator (order number: 96.300.205.9.5).

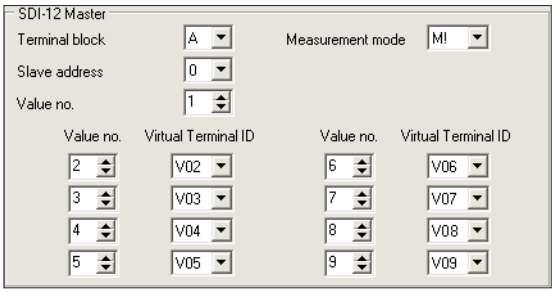


## Configuring the LogoSens 2/DuoSens for the OTT Pluvio² with SDI-12 interface

- Create a LogoSens 2/DuoSens channel with *SDI-12 Master* or *OTT SDI RS485* function block (*Serial sensors* tab).
- Apply the following settings:

Fig. A3: Setting the operating parameters of the LogoSens 2/DuoSens *SDI-12 Master* function block.

The function block *OTT SDI RS485* is set in the same way.




- Terminal block — LogoSens 2: A … R; DuoSens *SDI-12 Master*: A 3-4 (specified); DuoSens *OTT SDI RS485*: A 1-2 (specified); terminal block used (screw terminal strip) of the LogoSens 2/DuoSens.
- Slave address — SDI-12 bus address. Each slave address may only be allocated once to an SDI-12 bus feed. (Checking/setting: see operating instructions LogoSens 2/DuoSens, Chapter *SDI-12 transparent mode*.) Typical setting: *0* (only one OTT Pluvio² is connected to the terminal block: no bus operation).
- Value no. — identifies which value (the xth of *n* values + status information) of the OTT Pluvio² is recorded in this channel. Typical setting: *1* (first of seven values: precipitation intensity)
- Measurement mode — *M!* (for the maximum seven measured values + status information for the OTT Pluvio²).
- Value no./ Virtual terminal ID — Allocation of further values + status information for the OTT Pluvio² to virtual terminals (for more information, see also Chapter 6.1; command aM!).

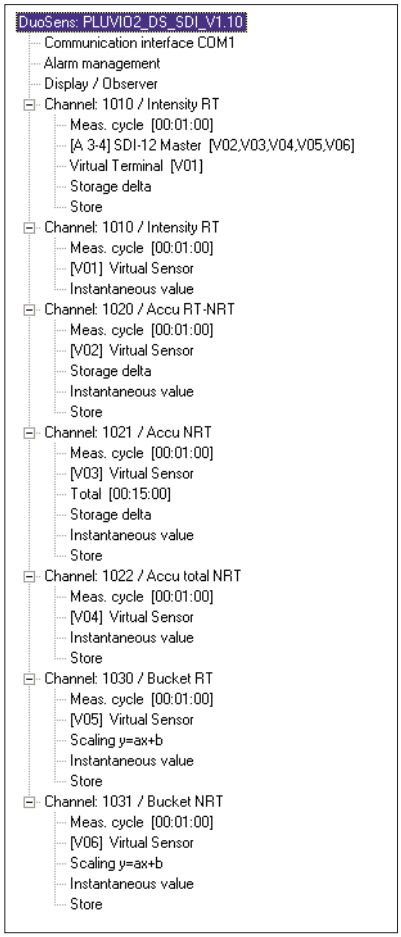
- In the appropriate *Channel* function blocks, set the required units and number of digits after the decimal place.

**Notes:**

- For recording the seven measured values + status information for an OTT Pluvio², nine channels in the LogoSens 2/DuoSens are thus necessary. The first channel contains the function block *SDI-12 Master* or *OTT SDI RS485* as the input signal. The other channels each contain a function block *Virtual Sensor* (V02 to V09) as the input signal. Naturally, just individual channels can also be recorded. In this case, there are fewer entries required in the *Value no. / Virtual terminal ID* field.
- Further information on the SDI-12 commands and responses used can be found in Chapter 6, SDI-12 commands and responses.
- The OTT Pluvio² makes the measurement results available 1 second after the SDI-12 command aM!.

Fig. A4: Example configuration of a DuoSens with 6 values recorded.

Further configuration examples can be found on the *OTT Pluvio² Software* CD-ROM.



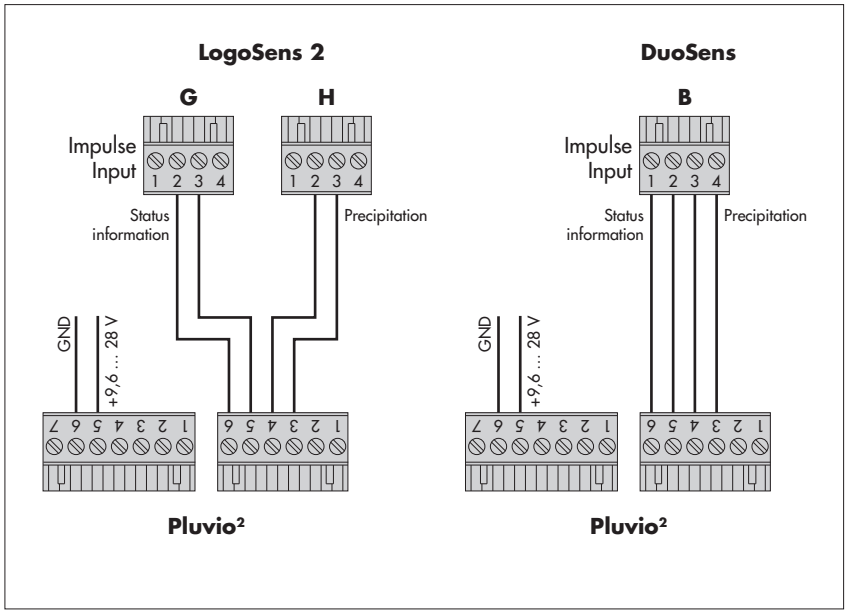

## A.2 Connecting OTT Pluvio² via the impulse output to the LogoSens 2 or DuoSens

- Connect the OTT Pluvio to the LogoSens 2 Station Manager or to the DuoSens Compact Datalogger as shown in Figure A5. Take note of the operating instructions for the LogoSens 2/DuoSens.
  Maximum cable length: 1,000 m.

Fig. A5: Connecting OTT Pluvio² via the impulse output to the LogoSens 2.

The letters above the screw terminal strip identify the possible connections on the LogoSens 2/DuoSens.

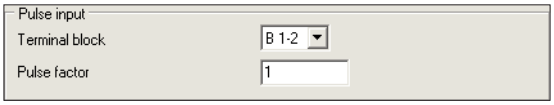
One impulse input of the LogoSens 2/ DuoSens is used in each case for the precipitation amount and the status information.



### Configuring LogoSens 2/DuoSens for OTT Pluvio² with impulse output

- Create two LogoSens 2/DuoSens channels with function blocks *Impulse input* (*Digital sensors* tab). (If you only want to record the amount of precipitation, one function block is sufficient.)
- Apply the following settings:

Fig. A6: Adjusting the operating parameters of the LogoSens 2/DuoSens *Pulse input* function block.



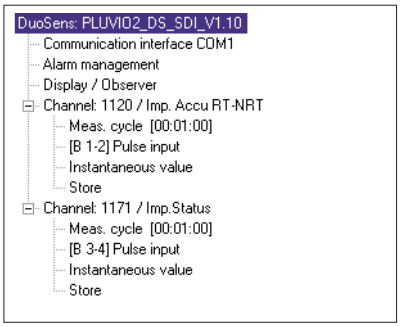

- Terminal block — LogoSens 2: G or H; DuoSens: B 1-2 or B 3-4
- Pulse factor — Impulse factor
  – precipitation amount: 0.1 (one impulse corresponds to 0.1mm of precipitation).
  – Status information: 1.

**Caution:**
– Always position an impulse input at the beginning (top) of the function tree.
– After changing the impulse factor, a data reset (reset LogoSens 2/DuoSens) is necessary.

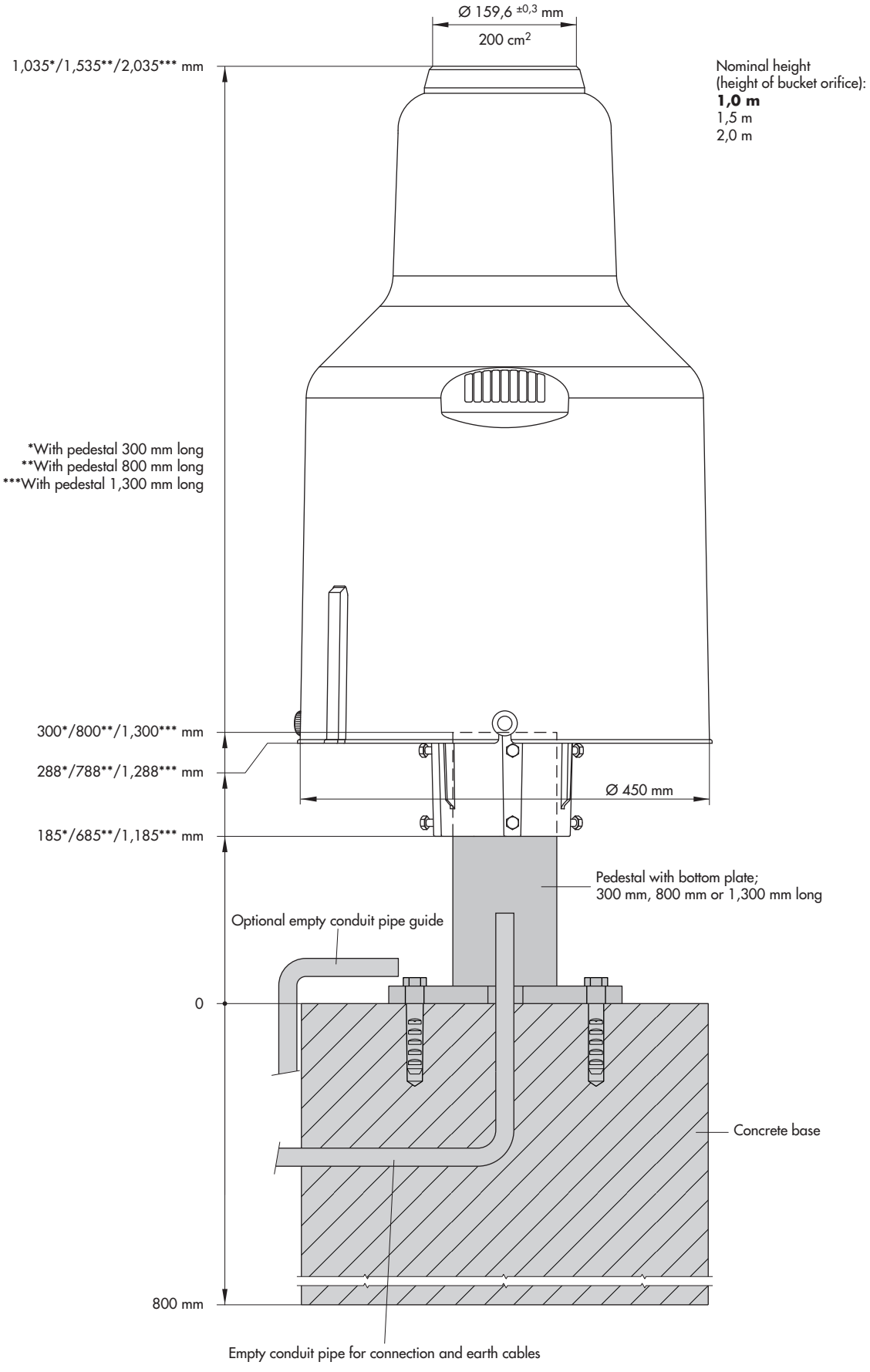
- In the Channel function block, set the required units and number of digits after the decimal place.

Fig. A7: Example configuration of a DuoSens with 2 values recorded.

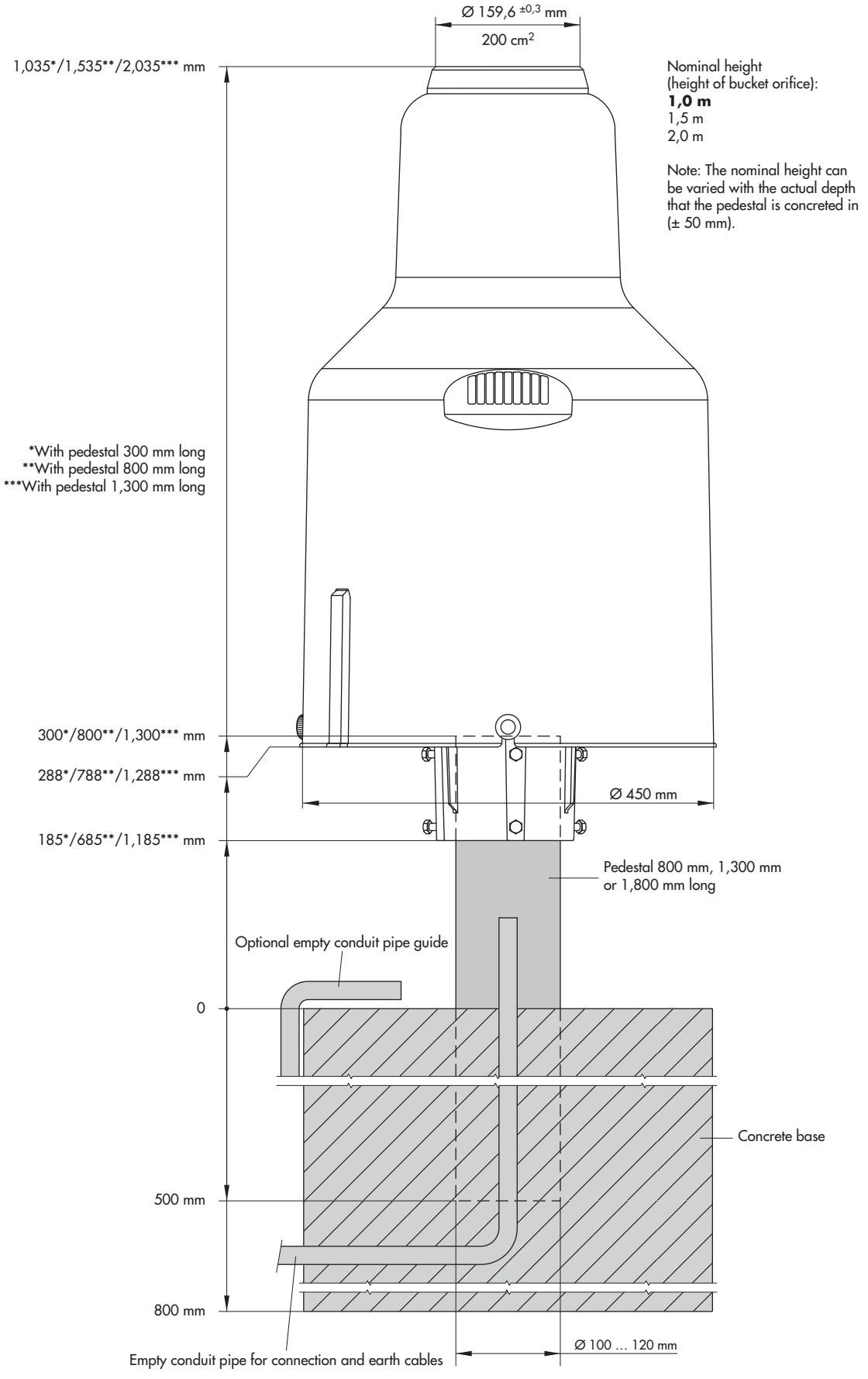
Further configuration examples can be found on the *OTT Pluvio² Software* CD-ROM.



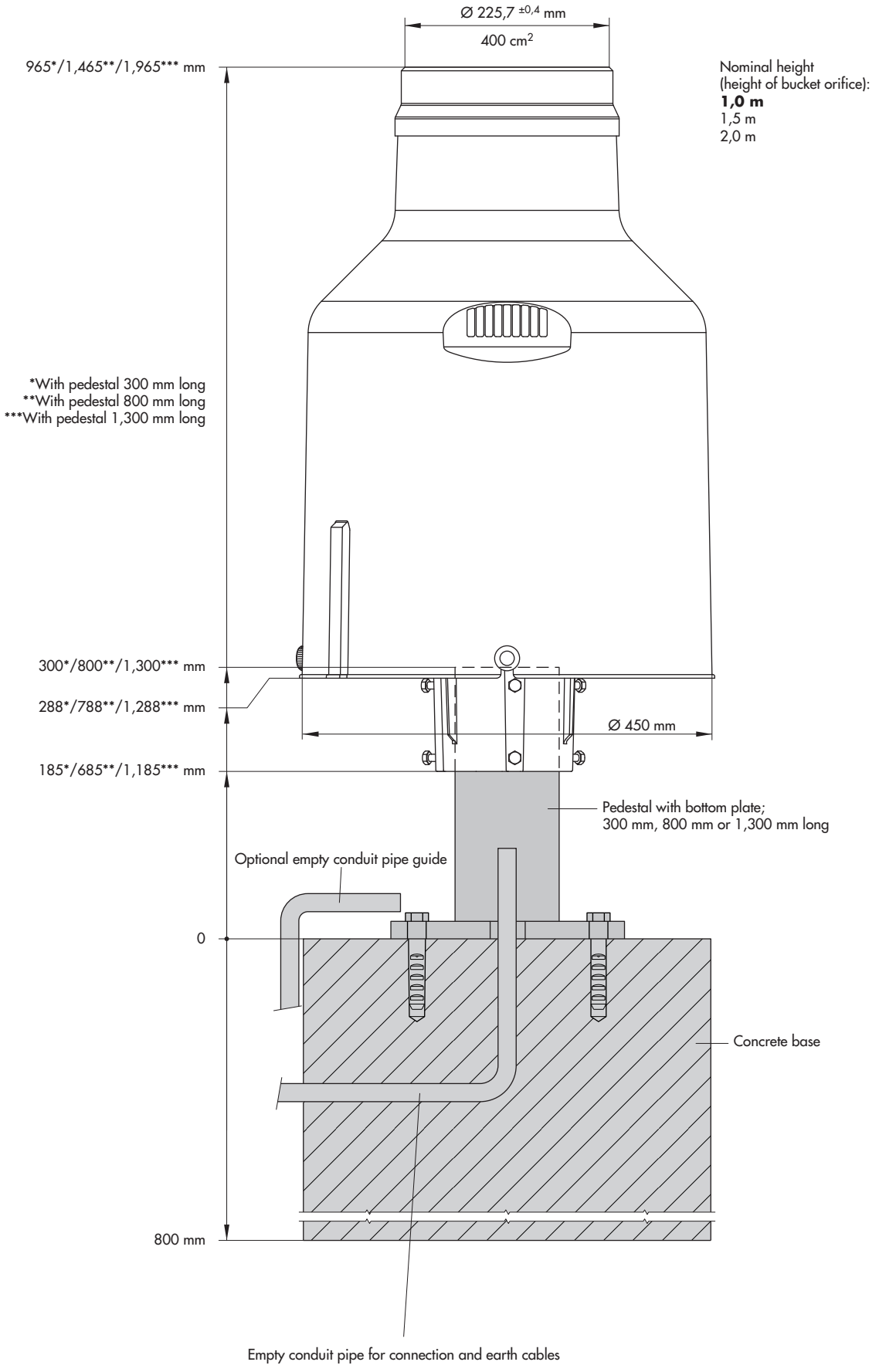
## Appendix B – Dimensions of OTT Pluvio² 200 with pedestal with bottom plate



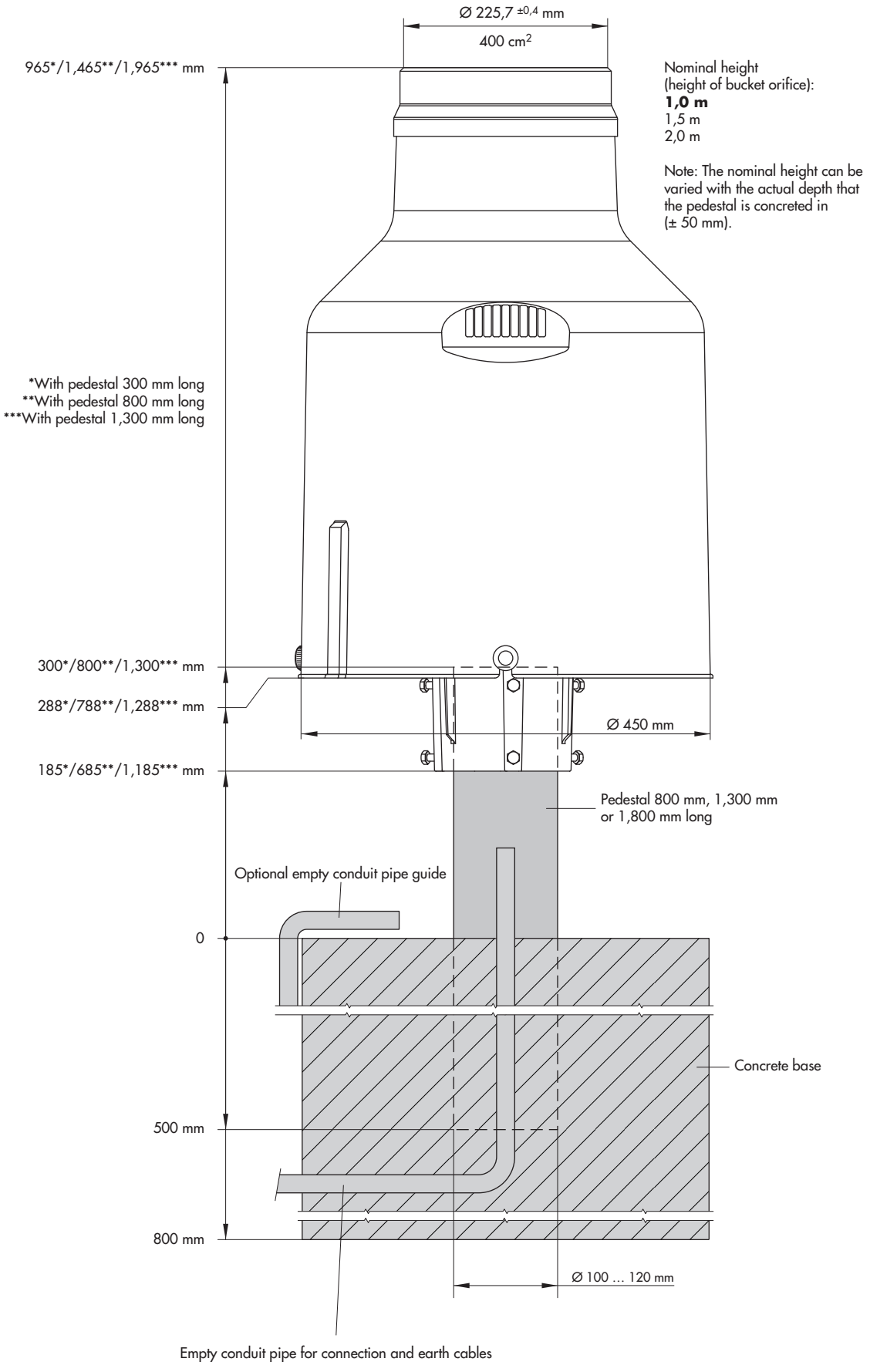
## Appendix C – Dimensions of OTT Pluvio² 200 with pedestal concreted in



## Appendix D – Dimensions of OTT Pluvio² 400 with pedestal with bottom plate

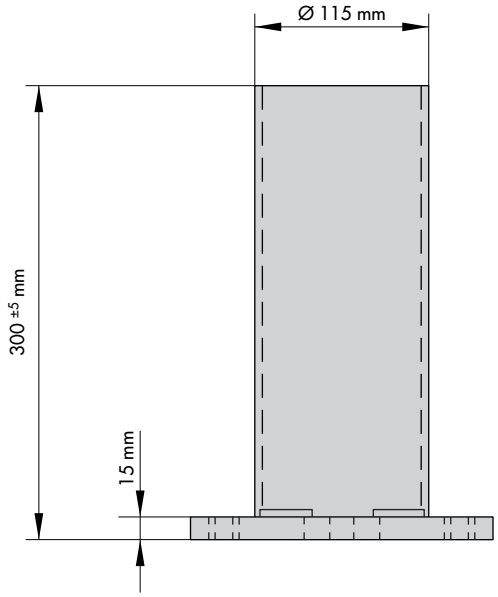


## Appendix E – Dimensions of OTT Pluvio² 400 with pedestal concreted in

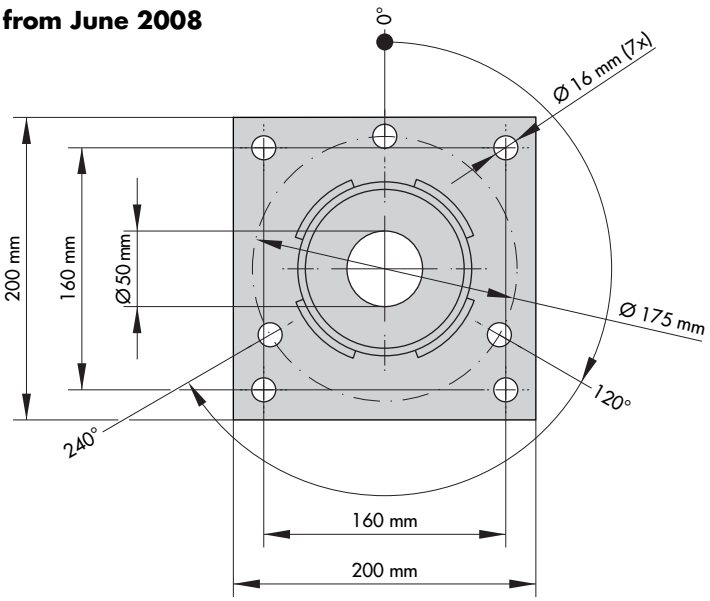


## Appendix F – Dimensions of pedestal with bottom plate

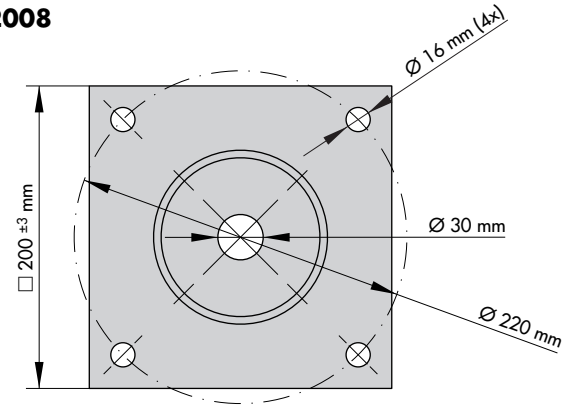
**Version A**
Nominal height of the Pluvio² bucket orifice: 1 m
(Order number: 70.020.481.4.1)



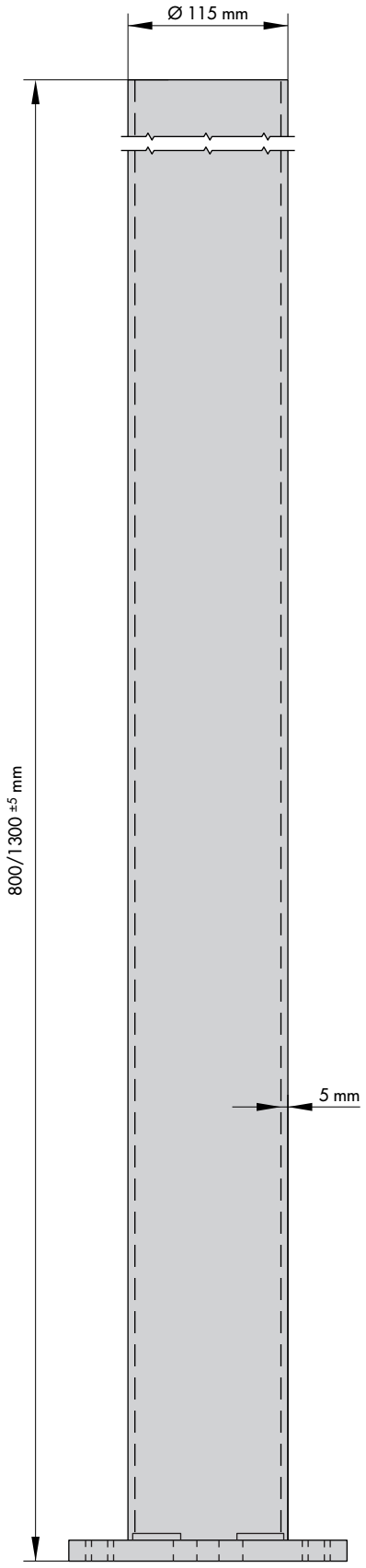

**from June 2008**




**until May 2008**

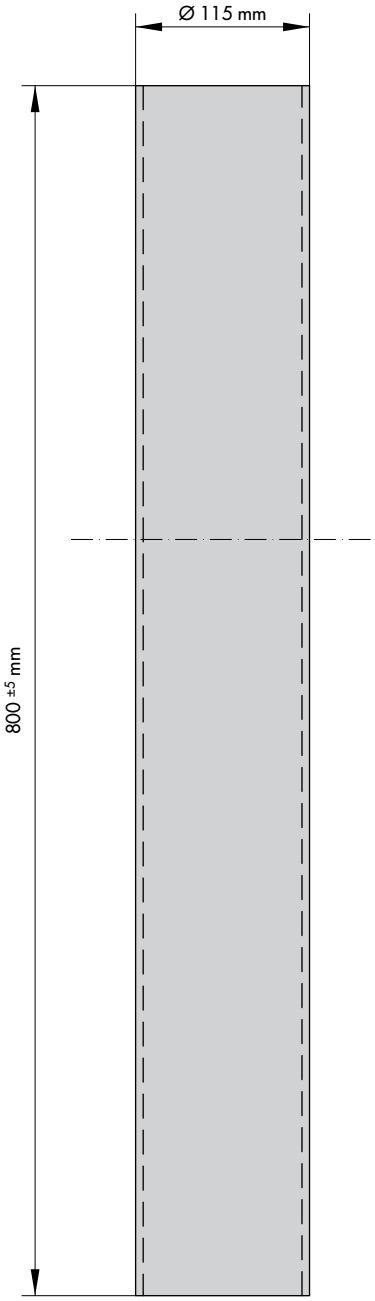



**Version B**
Nominal height of the Pluvio² bucket orifice: 1,5/2 m
(Order number: 70.020.482.4.1; 1,5 m
70.020.487.4.1; 2 m)

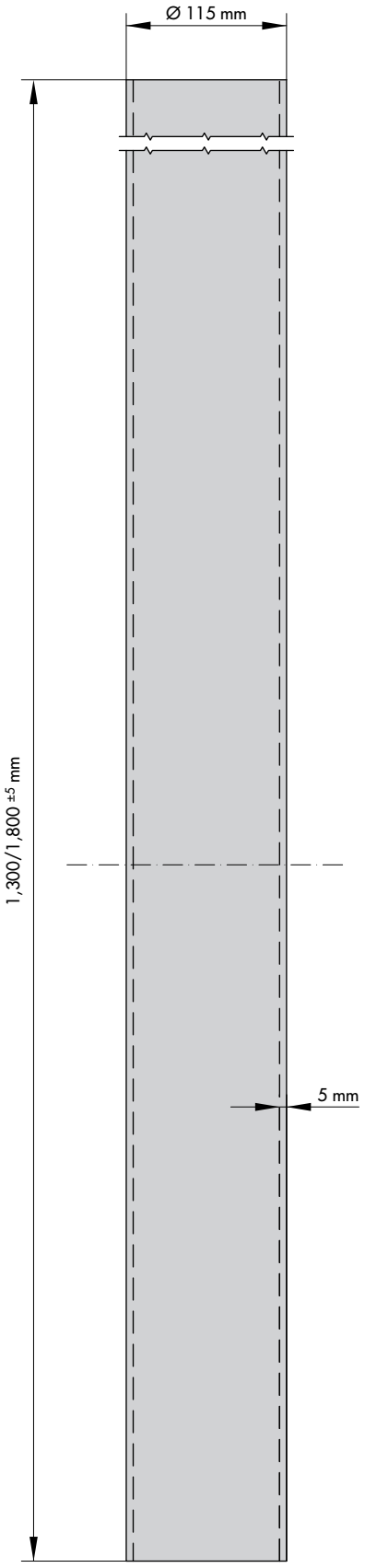


## Appendix G – Dimensions of pedestal

**Version A**
Nominal height of the Pluvio² bucket orifice: **1** m
(Order number: 70.020.480.9.1)




**Version B**
Nominal height of the Pluvio² bucket orifice: **1,5/2** m
(Order number: 70.020.48X.9.1)



## Appendix H – Accessories/replacement parts

| | | |
|---|---|---|
| ▶ **Accessories** | **4" pedestal, 800 mm**<br>– length 800 mm<br>– for concreting into a concrete base<br>– nominal height 1 m | 70.020.480.9.1 |
| | **4" pedestal, 1,300 mm**<br>– length 1300 mm<br>– for concreting into a concrete base<br>– nominal height 1.5 m | 70.020.488.9.1 |
| | **4" pedestal, 1,800 mm**<br>– length 1,800 mm<br>– for concreting into a concrete base<br>– nominal height 2 m | 70.020.483.9.1 |
| | **4" pedestal with bottom plate, 300 mm**<br>– length 300 mm<br>– with bottom plate<br>– for attaching to a concrete base<br>– nominal height 1 m | 70.020.481.4.1 |
| | **4" pedestal with bottom plate, 800 mm**<br>– length 800 mm<br>– with bottom plate<br>– for attaching to a concrete base<br>– nominal height 1 m | 70.020.487.4.1 |
| | **4" pedestal with bottom plate, 1,300 mm**<br>– length 1,300 mm<br>– with bottom plate<br>– for attaching to a concrete base<br>– nominal height 2 m | 70.020.482.4.1 |
| | **USB connection cable**<br>– USB connector type A to USB type B, 3 m | 97.970.065.9.5 |
| | **CD-ROM Pluvio² Software**<br>– with USB software driver<br>– with Pluvio² operating program<br>– with example configurations for OTT datalogger | 56.563.000.9.7 |
| | **Set of test weights**<br>– tara weight 2.5 kg<br>– reference weight 1,000/1,016 g<br>– in plastic box | 70.020.071.9.2 |
| | **Reference weight**<br>– 1,000/1,016 g | 70.020.070.9.2 |
| | **Manual drain pump**<br>– with 1.5 m suction and 2.5 m discharge hose | 70.010.241.9.2 |
| | **Anti-freeze**<br>– POWERCOOL DC 924-PXL<br>– container size: 5 liter canister | 0.929.002.002 |
| | **Bird repellent ring 200**<br>– prevents birds sitting on the orifice ring rim | under development |
| | **Bird repellent ring 400**<br>– prevents birds sitting on the orifice ring rim | under development |

| | | |
|---|---|---|
| | **power supply 24 V/50 W**<br>– protection type IP 20<br>– for top-hat rail installation<br>– input voltage: 90 … 260 V AC | 97.850.011.9.5 |
| | **Mains adapter 24 V/50 W**<br>– protection type IP 65<br>– in protective housing<br>– input voltage: 90 … 260 V AC | 97.850.012.9.5 |
| ▶ **Replacement parts** | **Collecting bucket 200** | 70.020.414.3.1 |
| | **Collecting bucket 400** | 70.020.461.3.1 |

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