OPERATING MANUAL

HD2015

Tipping bucket rain gauge



EN

V1.7

senseca

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1 Introduction

HD2015 is a reliable and sturdy bucket rain gauge, entirely constructed of corrosion resistant materials in order to guarantee its durability. To ensure accurate measurements even with low temperature climatic conditions or during and after precipitations of snow, a version with heating system, automatically activated around +4 °C has been developed to prevent snow deposits and ice formations.

The rain gauge is formed by a metal base on which a tipping bucket is set. The rain collector cone, fixed to the aluminium cylinder, channels the water inside the tipping bucket: once the predefined level is reached, the calibrated bucked rotates under the action of its own weight, discharging the water. During the rotation phase, the normally closed reed contact opens for a fraction of a second, sending an impulse to the counter.

The quantity of rainfall measured is based on the count of the number of times the bucket is emptied: the reed contacts, normally closed, open at the moment of the rotation between one bucket's section and the other. The number of impulses can be detected and recorded by a data logger or by a pulse counter.

A removable filter for periodic cleaning and maintenance is inserted in the water collector cone so as to prevent leaves or other elements blocking the end of the hole. For a better water flow, the collecting cone is treated with a non-stick coating.

In the version with heating HD2013…**R**…, the heating circuit operates with 12 Vdc or 24 Vdc direct voltage (**to be specified when ordering**). Heating is activated around +4 °C.

The different models differ in the tipping bucket resolution and in the heating power supply:

HD2015

Heating
Blank = not heating
R = heated – power voltage 24 Vdc
R1 = heated – power voltage 12 Vdc

Resolution
Blank = 0.2 mm
/1 = 0.1 mm
/5 = 0.5 mm

2 Technical specifications

Power supply Basic version Heating	 --- 12 Vdc (HD2015**R1**) or 24 Vdc (HD2015**R**) ± 10%
Consumption Basic version Heating	 --- 75 W (HD2015**R**…)
Contact output	NC contact (opens during tipping)
Resolution	0.1 – 0.2 or 0.5 mm/tip depending on model
Accuracy	+2.5…-2.5% in the interval 0…100 mm/h (version with 0.2 mm @ 50 mm/h nominal resolution) +1.5…-1.5% in the interval 0…100 mm/h (version with 0.5 mm @ 50 mm/h nominal resolution) The error refers to the calculation of the amount of rain using the resolution stated in the rain gauge label. If the amount of rain is calculated using the correction curves as a function of the rainfall rate (see the graphs at the following page), the error is typically: < ± 2% for rainfall rate up to 200 mm/h < ± 4% for rainfall rate greater than 200 mm/h If the HD2013-DB data logger is used, the measurement can be automatically corrected according to the correction curves.
Maximum rainfall rate	600 mm/h (versions with 0.1 and 0.2 mm nominal resolution) 1000 mm/h (version with 0.5 mm nominal resolution)
Operating temperature Without heating With heating	 0…+70 °C -20…+70 °C (heating intervention temperature +4 °C)
Protection degree	IP 65
Collector area	200 cm^2
Dimensions	∅189 x 274 mm (excluding ground support feet or support for mast)
Minimum section of the connecting cable wires	0.5 mm^2 without heating 2.5 mm^2 for heating

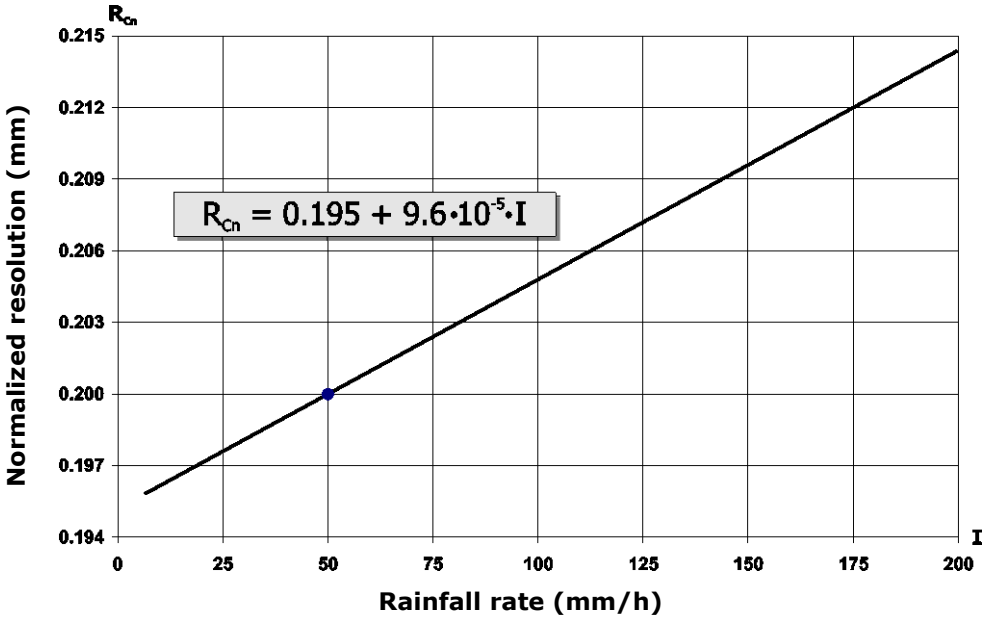


Fig. 2.1 – Normalized resolution (0.2 mm @ 50 mm/h) as a function of the rainfall rate

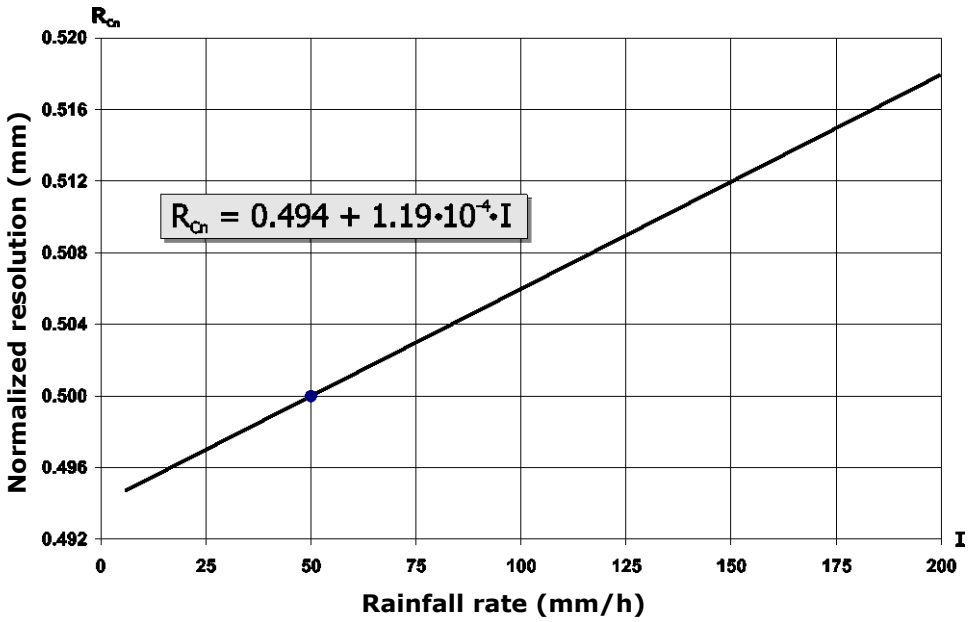


Fig. 2.2 – Normalized resolution (0.5 mm @ 50 mm/h) as a function of the rainfall rate

To correct the measurement depending on the rainfall rate, it is necessary to log, in addition to the number of pulses, also the instants at which the pulses occur.

Example of measurement correction:

Let's assume that a rain gauge with nominal resolution R_N = 0.209 mm @ 50 mm/h has generated 25 pulses at the frequency of 1 pulse every 50 seconds.

The rainfall rate can be estimated considering the nominal resolution R_N and the interval between two successive pulses: I = 0.209 x 3600 / 50 ≈ 15 mm/h.

From the linear equation in fig. 2.1 we obtain the normalized corrected resolution: R_{Cn} = 0.196 mm.

The corrected resolution of the rain gauge is: $R_C = R_{Cn} \times R_N / 0.2$ = 0.205 mm.

The amount of rain detected is 25 x 0.205 = 5.125 mm.

3 Installation

The rain gauge is supplied already calibrated and the calibration value (resolution) is shown on the instrument label.

The instrument must be installed in an open area, away from buildings, trees, etc., ensuring that the space above is free from objects which may obstruct the rain measurements and placed in an easily accessible position for periodical cleaning of the filter.

Avoid installations in areas exposed to wind gusts, turbulences (for example on the top of a hill) as they may distort the measurements.

As standard, the rain gauge is supplied for ground installation, with three height-adjustable support feet for proper levelling of the instrument, and holes for possible later fixing to the floor (fig. 3.4).

The rain gauge can be installed raised above the ground using the optional **ACCR001** support (a mast with M37 internal thread on one side is required). To install the ACCR001 support, it is necessary to unscrew the 3 brackets with feet from the base of the rain gauge, then attach the support for mast as shown in fig. 3.5.

In order to make the tipping device properly working and the measurements correct, it is important that the instrument is placed perfectly levelled. The base of the rain gauge is fitted with a bubble level.

For the installation, unscrew the three screws at the base of the cylinder that supports the water collector cone.

Attention: a heating resistor is fitted around the cone in the heated version. The heater is automatically disconnected when the cone is lifted up.

Eight bird spikes can be attached to the rain gauge (optional accessory **ACCR002**), which are screwed into the holes on the top ring of the rain gauge. **Be careful not to get hurt by sharp spikes**.

3.1 Electrical connection

For the version without heating use a 2-wire cable with 0.5 mm^2 minimum wires section, for the version with heating use a 4-wire cable with 2.5 mm^2 minimum wires section.

Use a shielded cable over long distances. Slide the cable through the cable gland and fasten it with the cable fastener located near the entry hole, at the base of the rain gauge.

Unscrew the terminal block protection cover and perform the connections as shown in the following figure.

Connection of heating:

The heated version requires power (12 Vdc or 24 Vdc depending on the version supplied) for the resistors: perform the connection as indicated at point 2 of fig. 3.1.

If the connections are set correctly, the LED placed near the terminals will be lit up.

Connection of contact output:

The rain gauge contact output, indicated at point 1 in fig. 3.1, must be connected to a data logger or to a pulse counter.

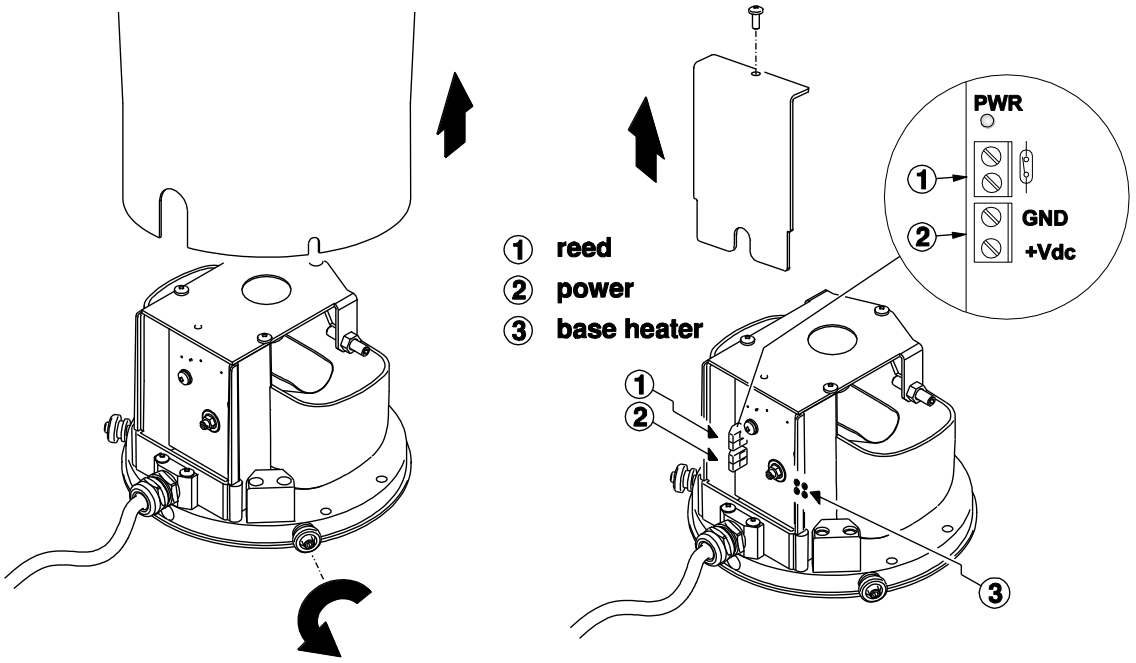


Fig. 3.1 - Connections of contact output and heating

3.2 Tipping bucket

The tipping bucket is locked for the transport of the rain gauge. To unlock the bucket, remove the holders as shown in the following figure.

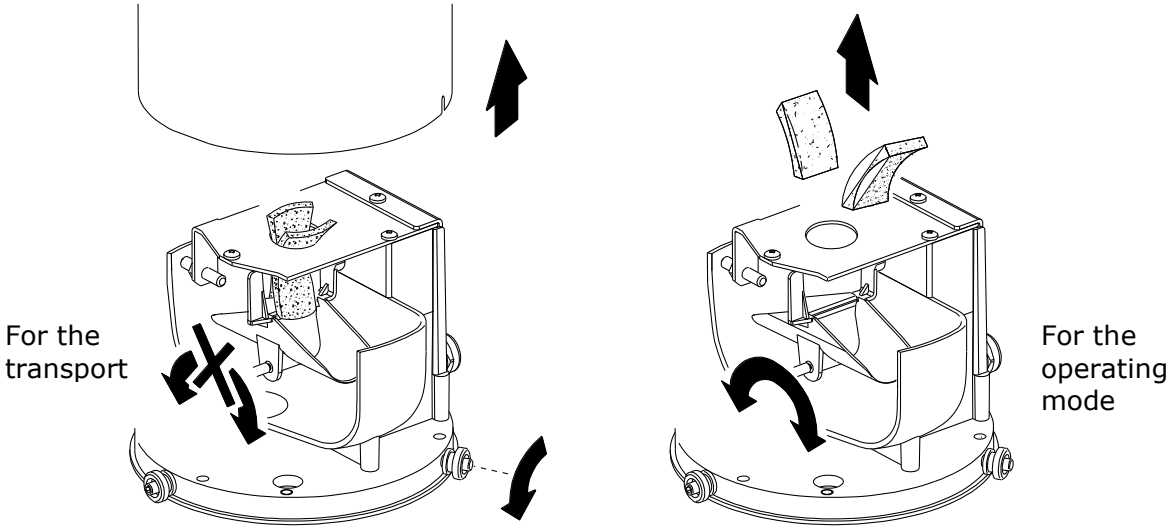


Fig. 3.2 – Locking and unlocking the tipping bucket

The oscillation of the tipping bucket can be adjusted through the two threaded rods located at the sides of the bucket, as illustrated in the following figure.

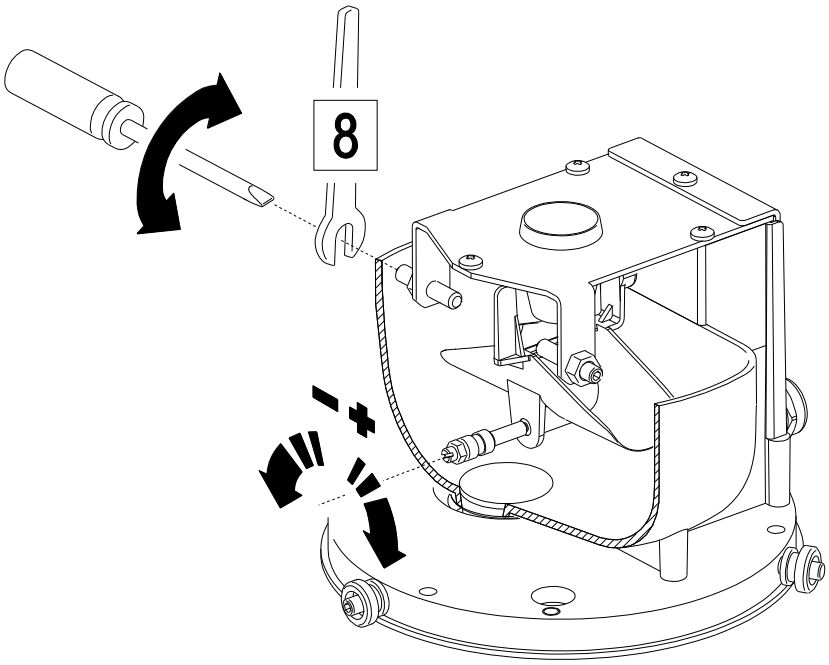


Fig. 3.3 – Adjustment of the tipping bucket

3.3 Installation modes

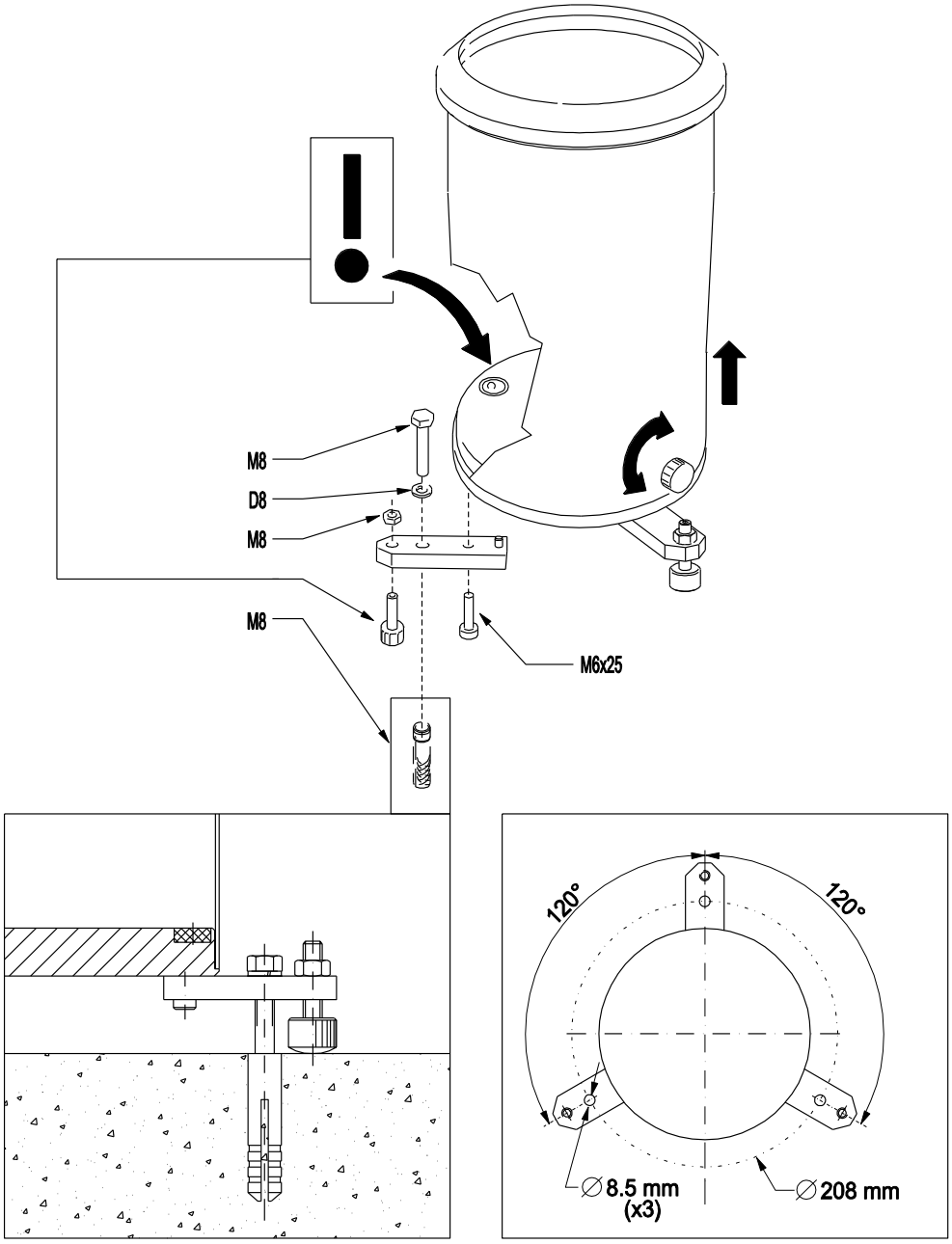


Fig. 3.4 – Ground installation

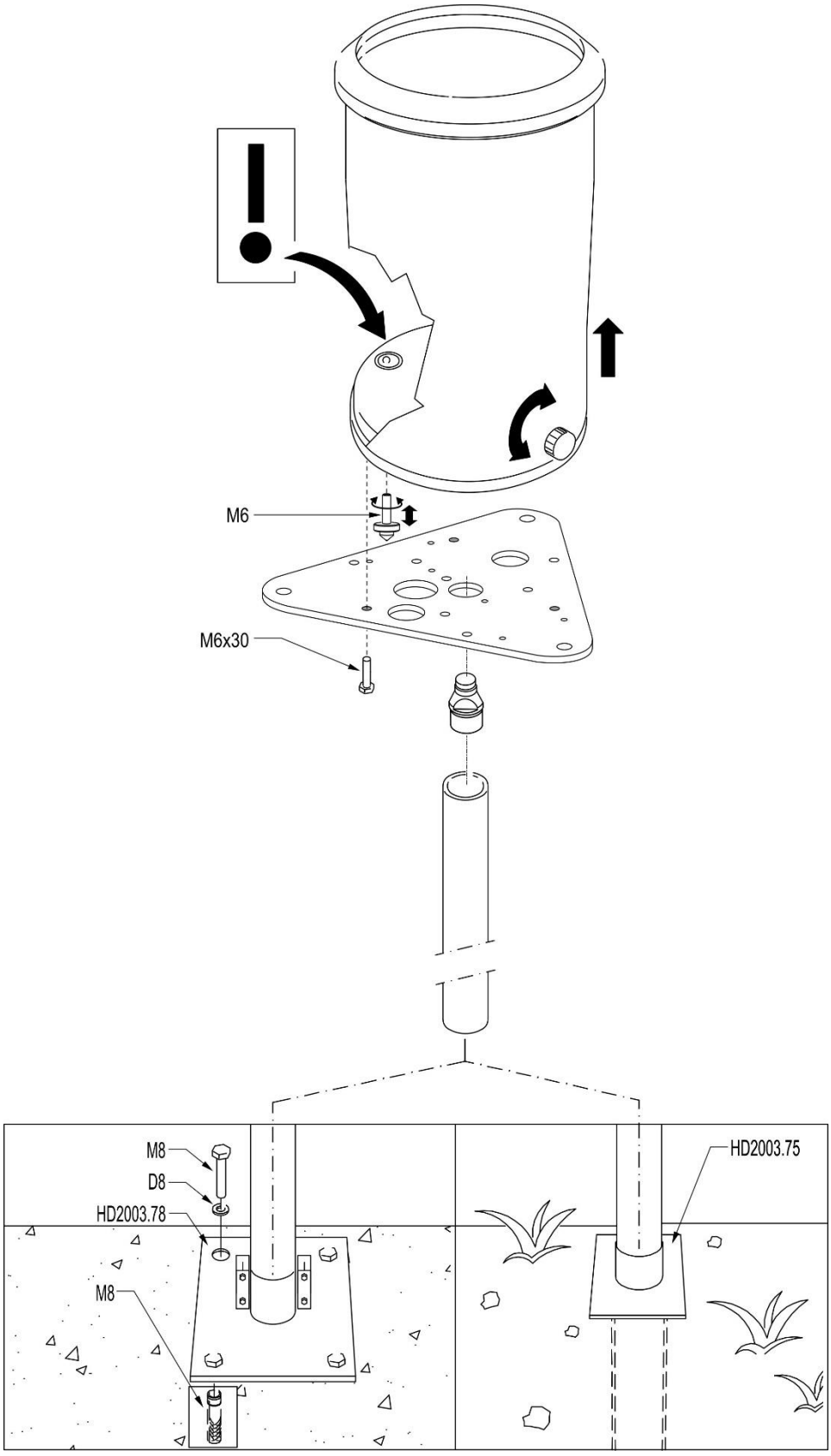


Fig. 3.5 – Installation raised above ground

4 Maintenance

Verify filters cleanliness periodically; check that there is no debris, leaves, dirt or anything else that might obstruct the flowing of water. Check that the tipping bucket contains no deposits of dirt, sand or any other obstruction. If necessary, the surfaces can be cleaned with non-aggressive detergent.

5 Safety instructions

The instrument proper operation and operating safety can be ensured only in the climatic conditions specified in this manual and if all standard safety measures as well as the specific measures described in this manual are followed.

Do not use the instrument in places where there are:

- Corrosive or flammable gases.
- Direct vibrations or shocks to the instrument.
- High-intensity electromagnetic fields, static electricity.

Do not remove the cylindrical cover of the instrument before unplugging the power cable of the heater.

Ensure that there is the system ground (Protective Earth) and the connecting cable is in good condition.

User obligations

The instrument operator shall follow the directives and regulations below that refer to the treatment of dangerous materials:

- EU directives on workplace safety.
- National law regulations on workplace safety.
- Accident prevention regulations.

6 Accessories ordering codes

The rain gauge is supplied as standard for ground installation with feet.

Bird spikes, bracket for mast installation and mast have to be ordered separately.

ACCR002	Bird spikes (8 spikes).
ACCR001	Support for installation on a mast (not included); a mast with M37 internal thread on one side is required.
POLT005	Mast ∅40 mm, internally threaded M37 on one side; length 500 mm.
POLT010	Mast ∅40 mm, internally threaded M37 on one side; length 1 m.
HD2003.75	Spike base for fixing the mast to the ground.
HD2003.78	Flat base for fixing the mast to a floor.

NOTES

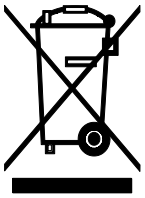
WARRANTY

The manufacturer is required to respond to the "factory warranty" only in those cases provided by Legislative Decree 6 September 2005 - n. 206. Each instrument is sold after rigorous inspections; if any manufacturing defect is found, it is necessary to contact the distributor where the instrument was purchased from. During the warranty period (24 months from the date of invoice) any manufacturing defects found will be repaired free of charge. Misuse, wear, neglect, lack or inefficient maintenance as well as theft and damage during transport are excluded. Warranty does not apply if changes, tampering or unauthorized repairs are made on the product. Solutions, probes, electrodes and microphones are not guaranteed as the improper use, even for a few minutes, may cause irreparable damages.
The manufacturer repairs the products that show defects of construction in accordance with the terms and conditions of warranty included in the manual of the product. For any dispute, the competent court is the Court of Padua. The Italian law and the "Convention on Contracts for the International Sales of Goods" apply.

TECHNICAL INFORMATION

The quality level of our instruments is the result of the continuous product development. This may lead to differences between the information reported in the manual and the instrument you have purchased.
We reserve the right to change technical specifications and dimensions to fit the product requirements without prior notice.

DISPOSAL INFORMATION



Electrical and electronic equipment marked with specific symbol in compliance with 2012/19/EU Directive must be disposed of separately from household waste. European users can hand them over to the dealer or to the manufacturer when purchasing a new electrical and electronic equipment, or to a WEEE collection point designated by local authorities. Illegal disposal is punished by law.

Disposing of electrical and electronic equipment separately from normal waste helps to preserve natural resources and allows materials to be recycled in an environmentally friendly way without risks to human health.

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