

English

# Operating manual

Tipping bucket rain gauge  
**HD2015**



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**Keep for future reference.**

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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.

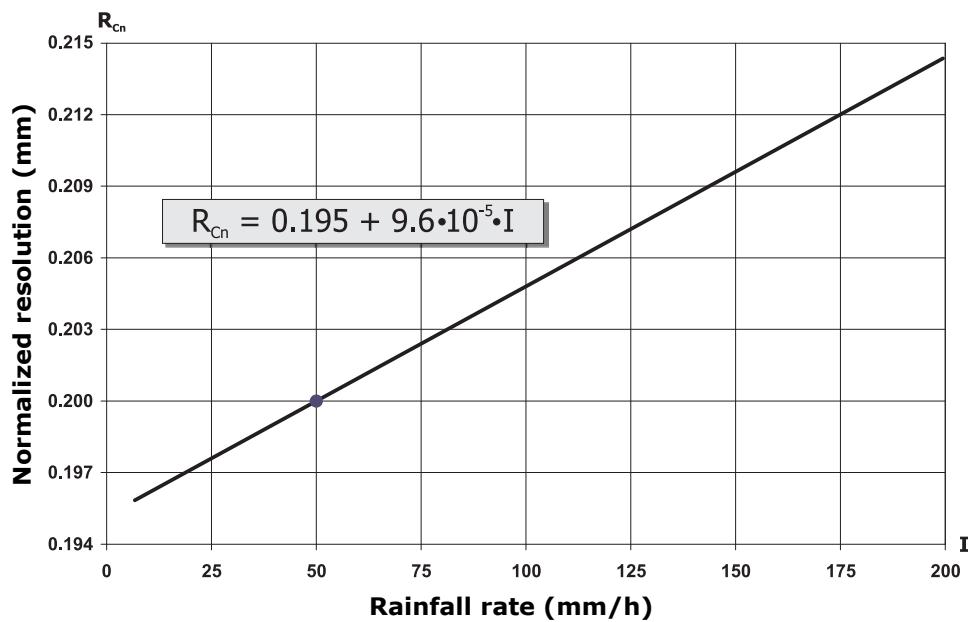
For a better water flow, the collecting cone is treated with a non-stick coating.

The version with heating option **HD2015R** works with 12 Vdc or 24 Vdc direct voltage (**to be specified at the time of order**). The heating system is activated around +4 °C.

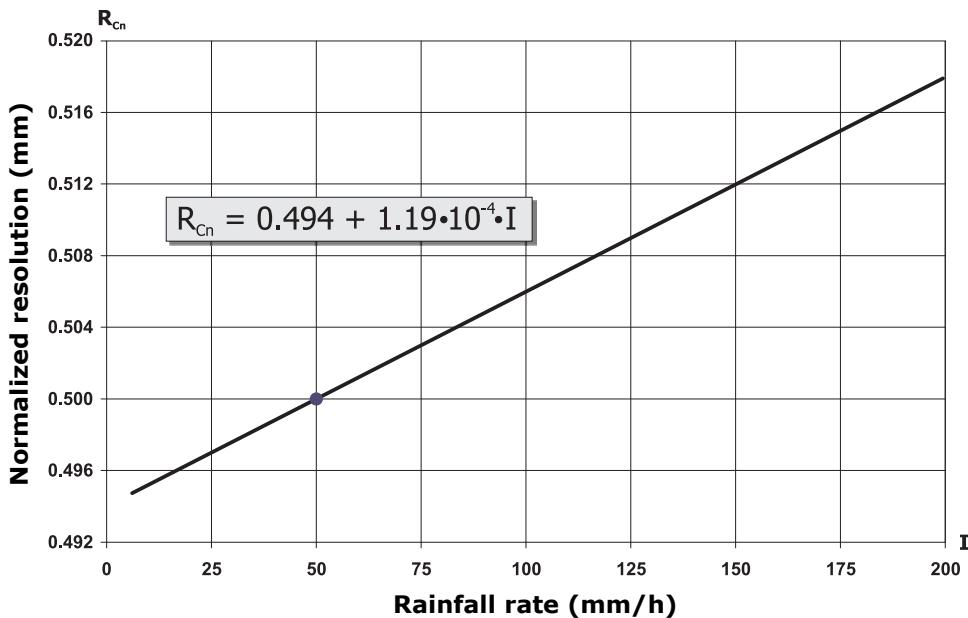
**When submitting your order**, it is possible to request a bird dissuader, made of eight 3 mm diameter spikes, 60 mm in height, to be installed on the rain gauge.

## 2 TECHNICAL CHARACTERISTICS

	<b>HD2015R</b>	<b>HD2015</b>
Power supply	12 Vdc or 24 Vdc $\pm 10\%$ / 75 W (to be specified when ordering)	---
Type of output contact	NC contact (opens during tipping)	
Resolution	0.1 – 0.2 or 0.5 mm/tip <b>to be specified at the time of placing the order</b>	
Accuracy	<p>+2.5...-2.5% in the interval 0...100 mm/h (version with 0.2 mm @ 50 mm/h nominal resolution)</p> <p>+1.5...-1.5% in the interval 0...100 mm/h (version with 0.5 mm @ 50 mm/h nominal resolution)</p> <p>The error refers to the calculation of the amount of rain using the resolution stated in the rain gauge label.</p> <p>If the amount of rain is calculated using the correction curve as a function of the rainfall rate (fig. 1 and 2), the error is typically:</p> <ul style="list-style-type: none"> <li>&lt; <math>\pm 2\%</math> for rainfall rate up to 200 mm/h</li> <li>&lt; <math>\pm 4\%</math> for rainfall rate greater than 200 mm/h</li> </ul> <p>If the HD2013-DB data logger is used, the measurement can be automatically corrected according to the graphs in fig. 2.1 and 2.2.</p>	
Maximum rainfall rate	600 mm/h (version with 0.2 mm nominal resolution) 1000 mm/h (version with 0.5 mm nominal resolution)	
Operating temperature range	-20 °C ...+70 °C	0 °C ...+70 °C
Heating intervention temperature	+4 °C	---
Protection degree	IP 65	
Collector area	200 cm <sup>2</sup>	
Dimensions	Ø189 x 274 mm (excluding ground support feet or support for mast)	
Minimum section of the wires of the connecting cable	0.5 mm <sup>2</sup> for the version without heating system (HD2015) 2.5 mm <sup>2</sup> for the version with heating system (HD2015R)	



**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:  $I = 0.209 \times 3600 / 50 \approx 15$  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  $25 \times 0.205 = 5.125$  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.

The rain gauge can be requested in the version for ground installation or for installation raised above the ground.

For the installation on the floor, three adjustable support feet are supplied, so that the instrument can be levelled correctly, and also proper holes for a possible fixing on a floor.

For installation raised above the ground, insert the flange at the base of the instrument in the support mast. At the opposite end, the mast may end with either a flange so that it can be fixed to the floor, or a tip to be driven into the ground. The various fastening systems can be seen in the figures 3.4 and 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.

### 3.1 ELECTRICAL CONNECTIONS

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

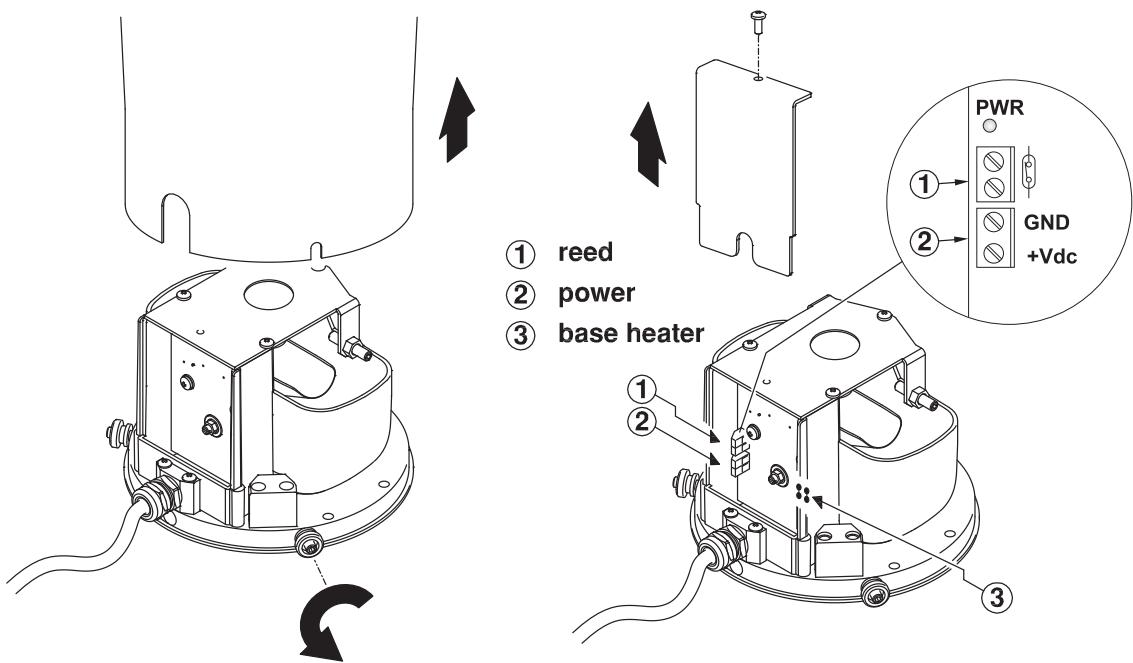
#### Connection of heating:

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:

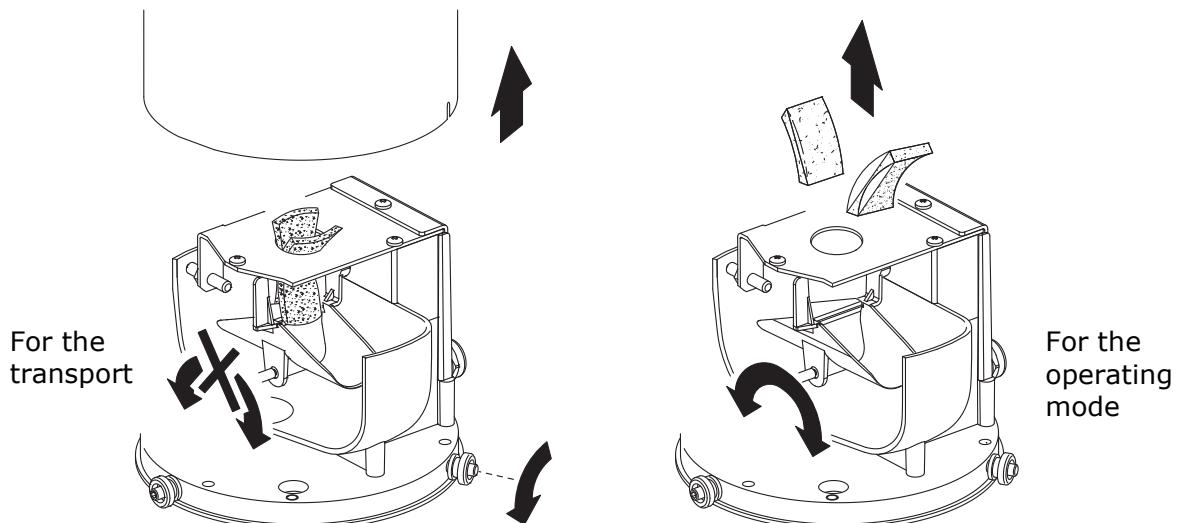
The rain gauge contact output, indicated at point 1 in the figure 3.1, **must be connected to a data logger or to a pulse counter**.



**Fig. 3.1 – Connections of contact output and heating**

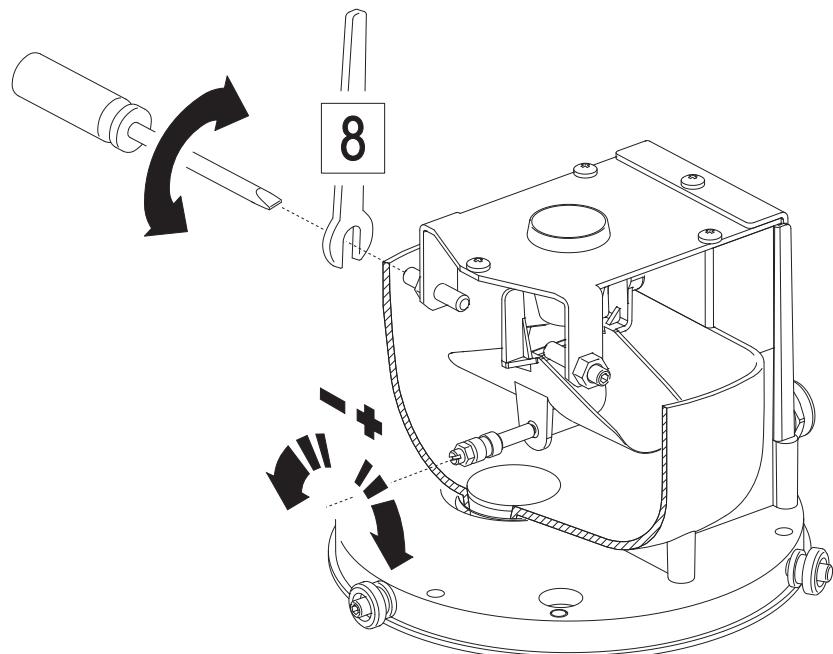
### **3.2 TIPPING BUCKET**

The tipping bucket is locked for the transport of the rain gauge. To unlock the bucket, remove the holders as shown in fig.3.2.



**Fig. 3.2 – Locking and unlocking the tipping bucket**

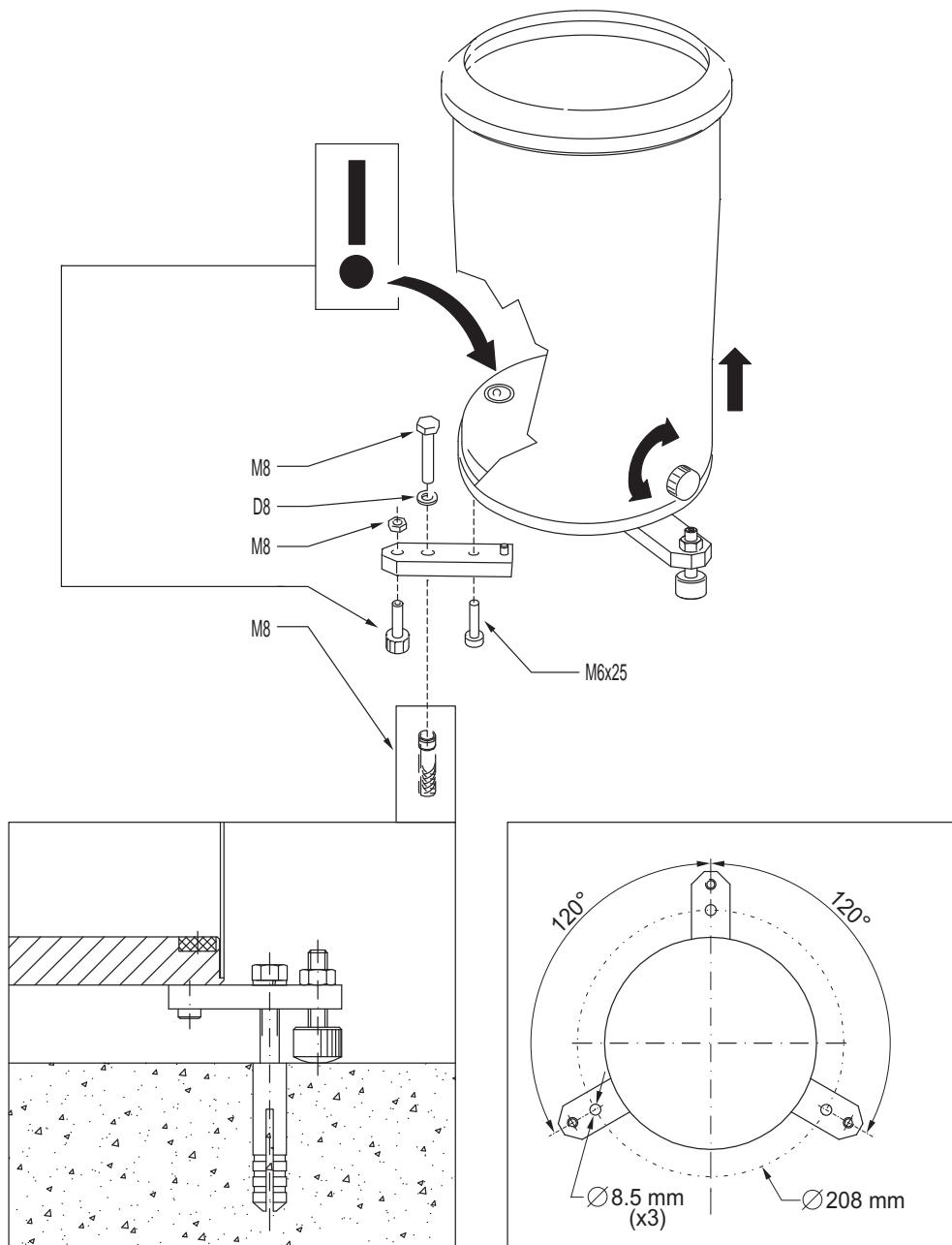
The oscillation of the tipping bucket can be adjusted through the two threaded rods located at the sides of the bucket, as illustrated in fig. 3.5.



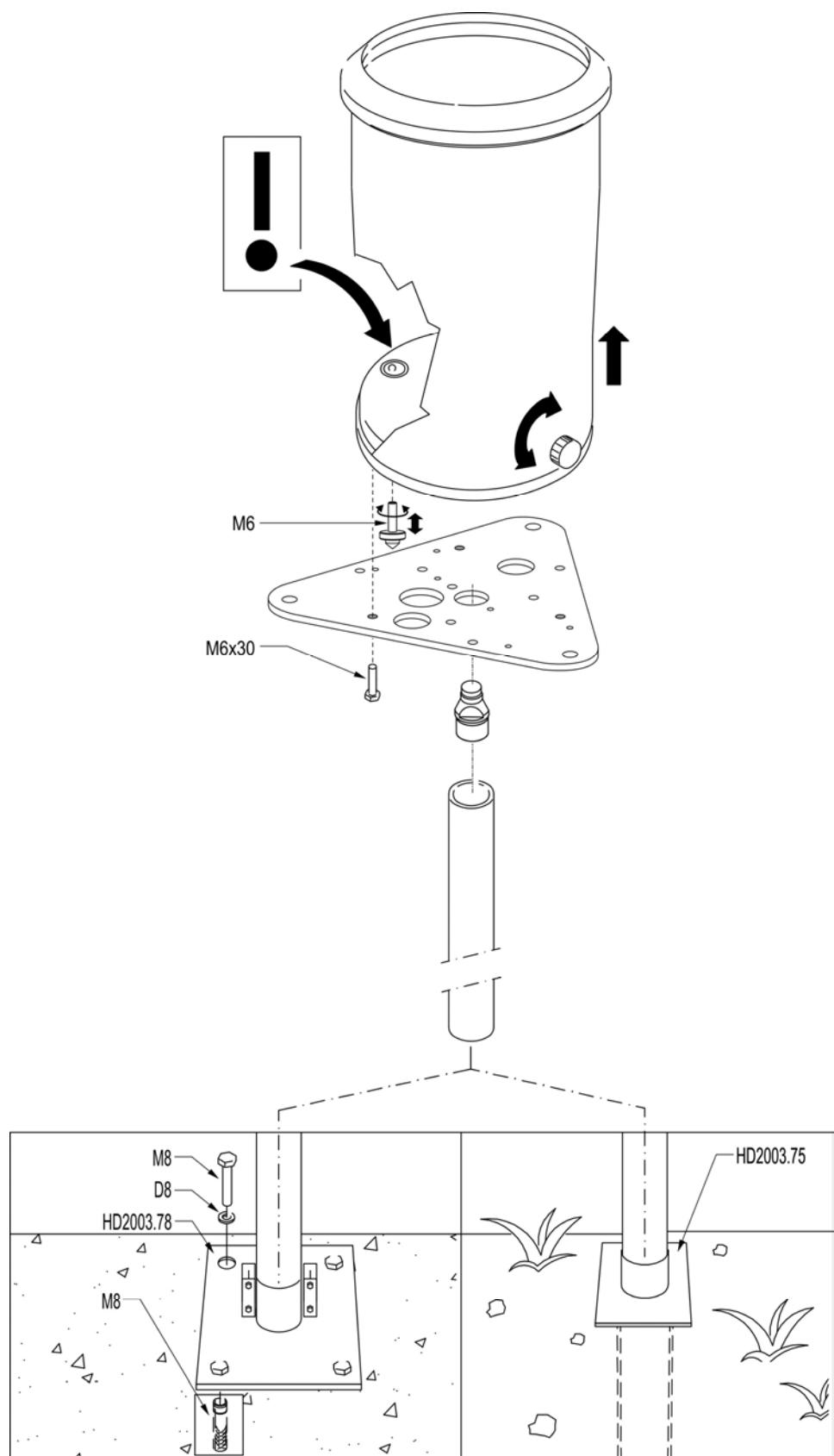
**Fig. 3.3 – Adjustment of the tipping bucket**

### **3.3 INSTALLATION MODES**

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**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 INSTRUMENT STORAGE

Instrument storage conditions:

- Temperature: -30...+70 °C.
- Humidity: less than 90 %RH no condensation.
- In storage, avoid places where:
  - humidity is high;
  - the instrument is exposed to direct sun radiation;
  - the instrument is exposed to a high temperature source;
  - high vibration levels are present;
  - the instrument may be exposed to vapor, salt and/or corrosive gas.

## 6 SAFETY INSTRUCTIONS

### General safety instructions

The instrument has been manufactured and tested in accordance with the safety standard EN61010-1:2010 "Safety requirements for electrical equipment for measurement, control and laboratory use" and has left the factory in perfect safety technical conditions.

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

The instrument proper operation and operating safety can be ensured only in the climatic conditions specified in this manual.

Do not use the instruments 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:

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

## 7 ORDERING CODES

**HD2015**

**Mast / bird spikes kit:**

Blank = ground installation with feet, without bird spikes  
H0 = installation on Ø40 mm mast (not supplied), without bird spikes  
H1 = installation on Ø40 mm mast, with 1 m mast, without bird spikes  
H5 = installation on Ø40 mm mast, with 500 mm mast, without bird spikes  
K = ground installation with feet, with bird spikes  
K0 = installation on Ø40 mm mast (not supplied), with bird spikes  
K1 = installation on Ø40 mm mast, with 1 m mast, with bird spikes  
K5 = installation on Ø40 mm mast, with 500 mm mast, with bird spikes

**Heating:**

Blank = not heated  
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

**The mast base (with tip or flat) must be ordered separately.**

**Accessories:**

**HD2003.75** Base with tip for the ground to support the rain gauge raised above ground.

**HD2003.78** Flat base for fastening the support of the rain gauge raised above ground.

**DELTA OHM metrology laboratories LAT N° 124 are ISO/IEC 17025 accredited by AC-CREDIA for Temperature, Humidity, Pressure, Photometry / Radiometry, Acoustics and Air Velocity. They can supply calibration certificates for the accredited quantities.**

## **NOTES**

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## **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.

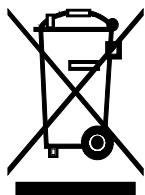
The manufacturer repairs the products that show defects of construction in accordance with the terms and conditions of warranty included in the manual of the product. For any dispute, the competent court is the Court of Padua. The Italian law and the "Convention on Contracts for the International Sales 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 reserves 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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