C2Ai
Instrumentation et régulation des fluides

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REF. HD!2016

English

Operating manual

Tipping bucket rain gauge

HD2015

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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 such as the **HD2013-DB** 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**) and absorbs about 50 W. 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

	HD2015R	HD2015
Power supply	12 Vdc or 24 Vdc ± 10% / 50 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 **to be specified at the time of placing the order**	
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 curve as a function of the rainfall rate (fig. 1 and 2), the error is typically less than ± 2% in the interval 0…200 mm/h. If the HD2013-DB data logger is used, the measurement can be automatically corrected according to the graphs in fig. 1 and 2.	
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 64	
Collector area	200 cm^2	
Minimum section of the wires of the connecting cable	0.5 mm^2 for the version without heating system (HD2015) 2.5 mm^2 for the version with heating system (HD2015R)	

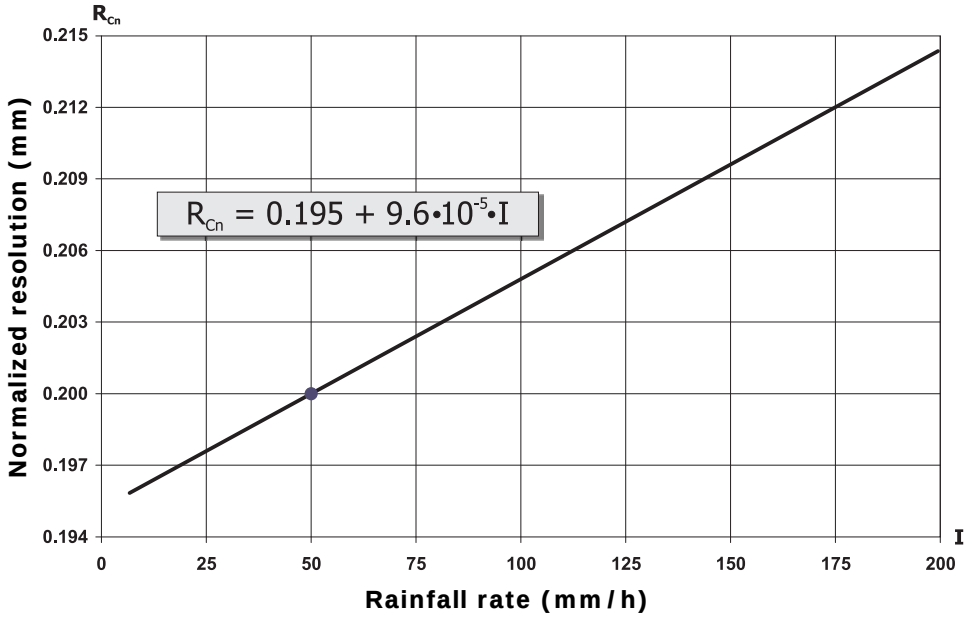


Fig. 1 – Normalized resolution (0.2 mm @ 50 mm/h) as a function of the rainfall rate

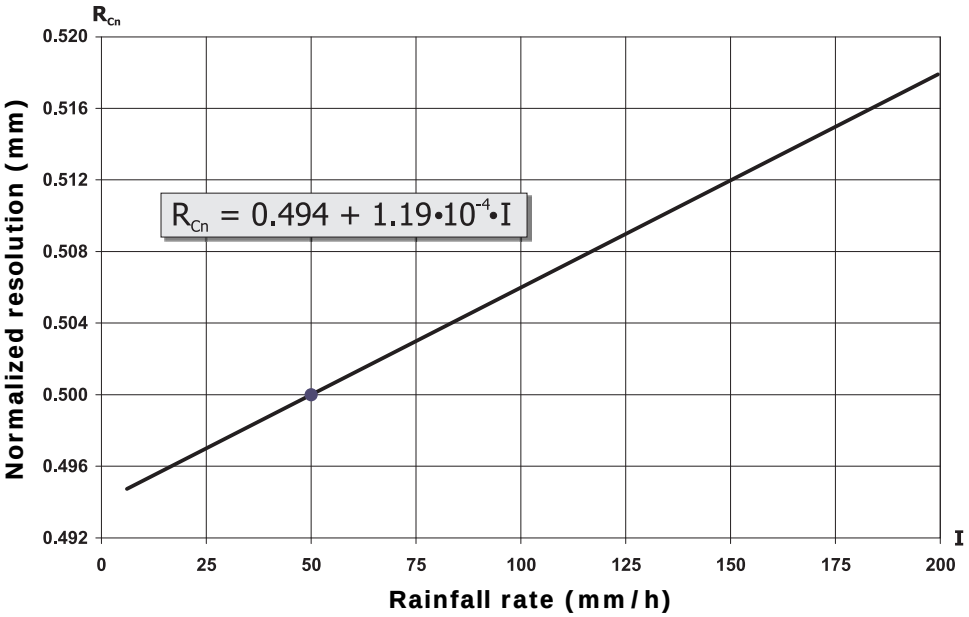


Fig. 2 – Normalized resolution (0.5 mm @ 50 mm/h) as a function of the rainfall rate

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. 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 at 0.1 - 0.2 or 0.5 mm of rain per tip of the bucket: the calibration value 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 installed on the ground or 500 mm off the ground. Other sizes of the support for installation off the ground are available upon request.

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 installations off the ground, a flange to be fixed to the base of the instrument, where the support clamp must be inserted, is supplied; the clamp ends either with a flange so that it can be fixed to the floor, or with a tip to be driven into the ground. For the various fastening systems please refer to the figures 5, 6, 7 and 8.

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 from the base of the cylinder that supports the water collector cone (see fig. 2). A heating resistor is placed around the cone in the **HD2015R** version. The heater is automatically disconnected when the cone is lifted up.

3.1 ELECTRICAL CONNECTIONS

For the version without heating system, use a 2-wire cable with 0.5 mm^2 minimum wires section; for the version with heating system, 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 figure 2. **The rain gauge output, indicated in point 1 of the drawing below, must be connected to the input of the HD2013-DB rain gauge data logger** (please see the details in the manual of the data logger) **or to a pulse counter or to a data logger**.

The heated version requires power for the resistors (12 Vdc or 24 Vdc depending on the version supplied): perform the connection as indicated at point 2 of fig. 3.

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

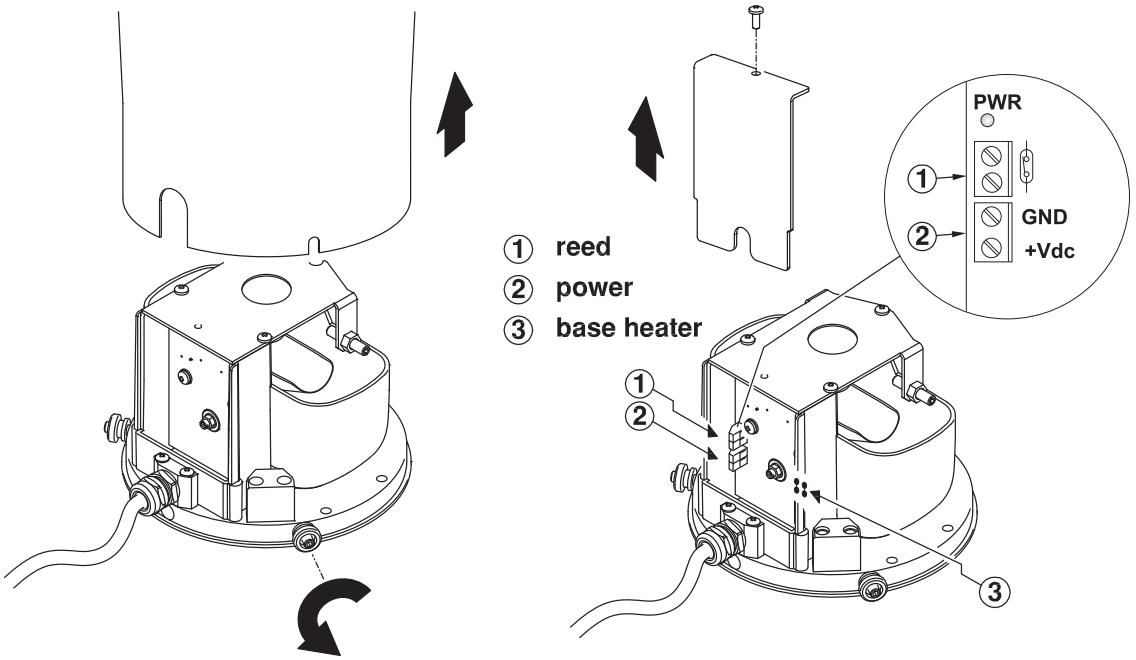


Fig. 3 – Electrical connections (version with heating system)

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.4.

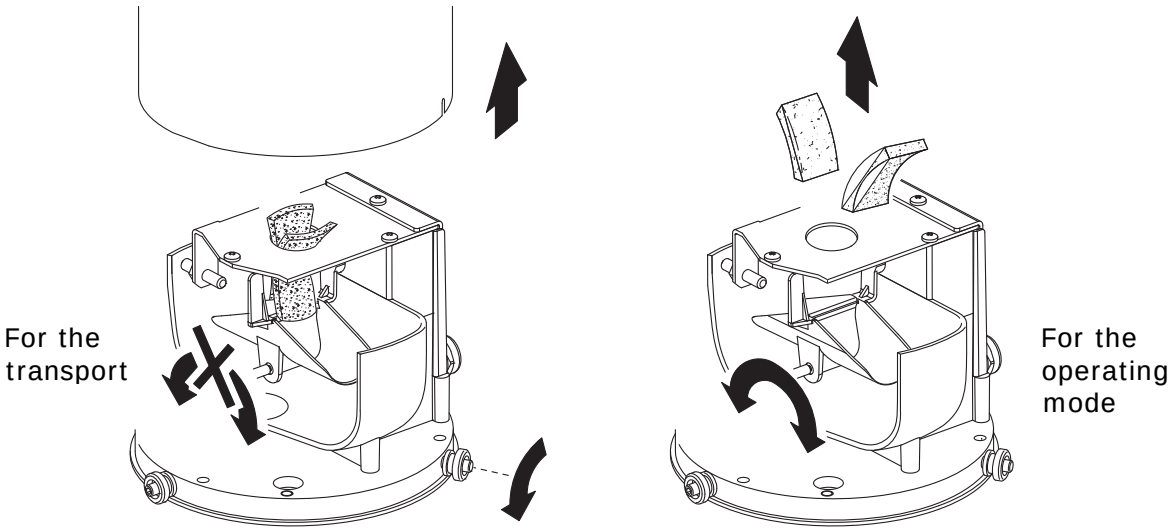


Fig. 4 – Locking and unlocking the tipping bucket

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. 5.

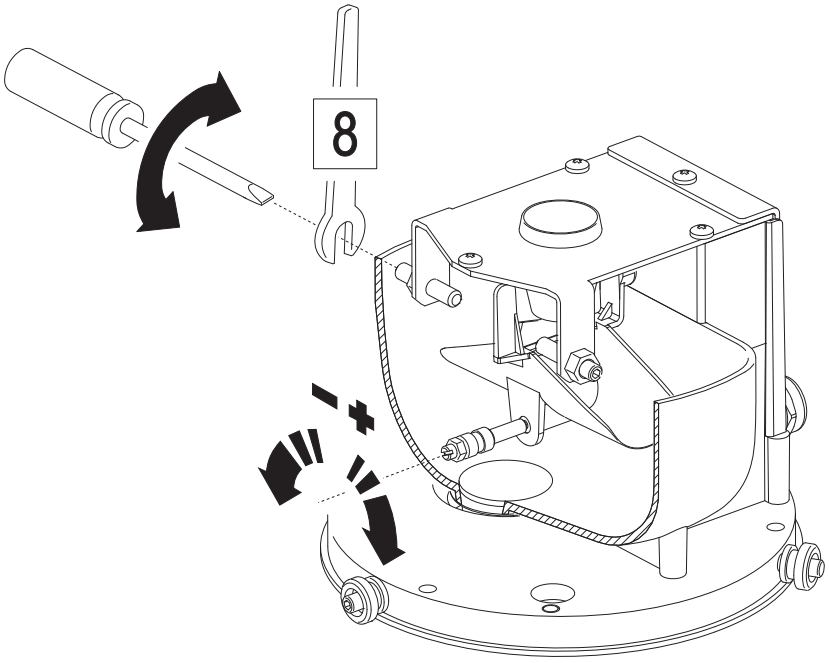


Fig. 5 – Adjustment of the tipping bucket

3.3 INSTALLATION MODES

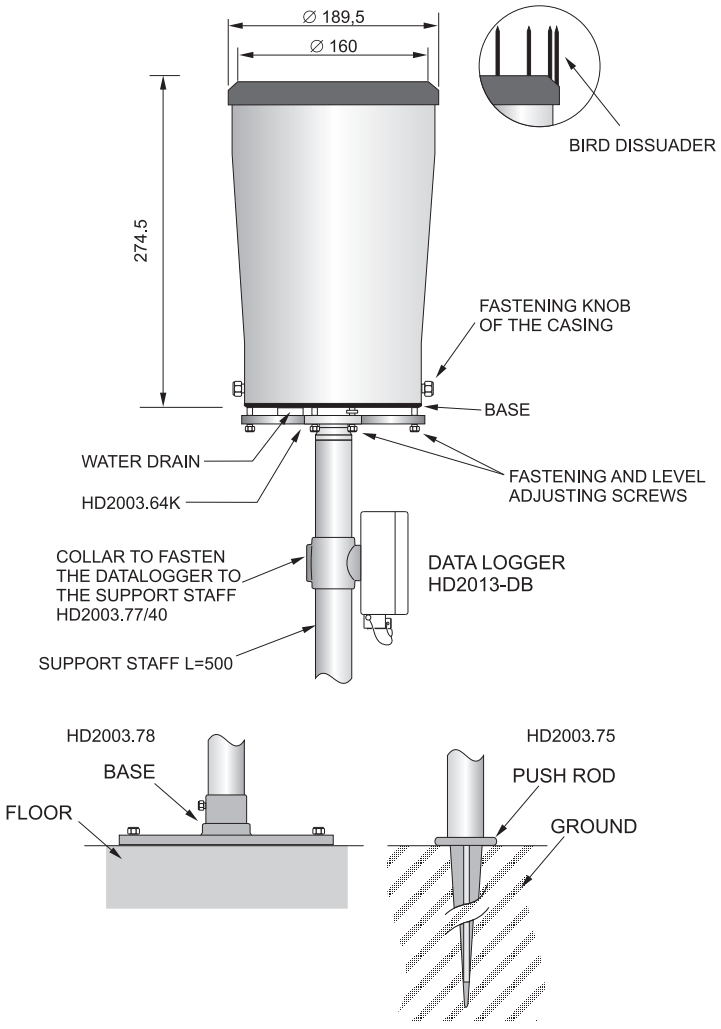


Fig. 6 – Mechanical dimensions, installation modes

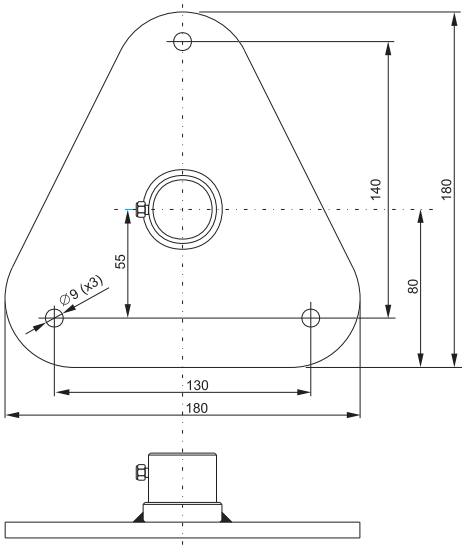


Fig. 7 – Base for ground fastening (HD2003.78)

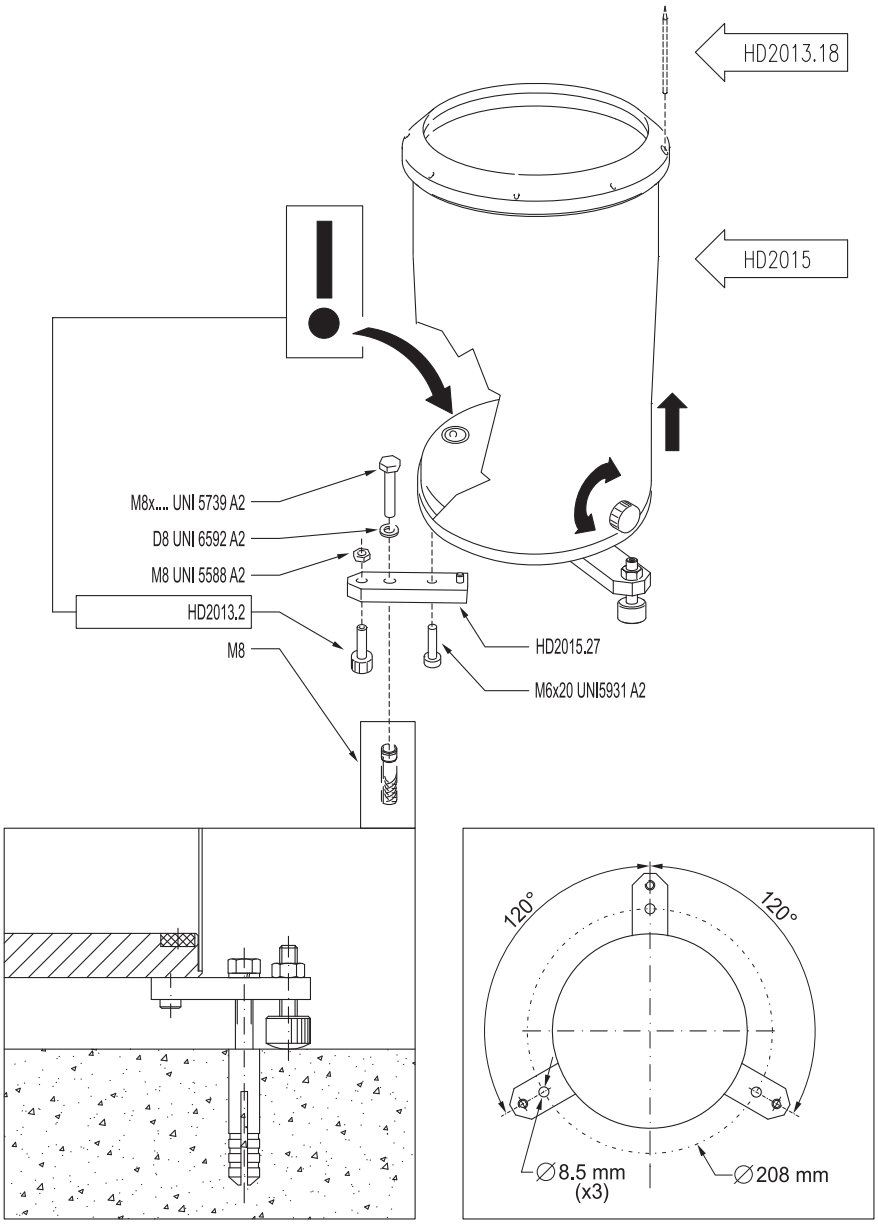


Fig. 8 – Ground installation

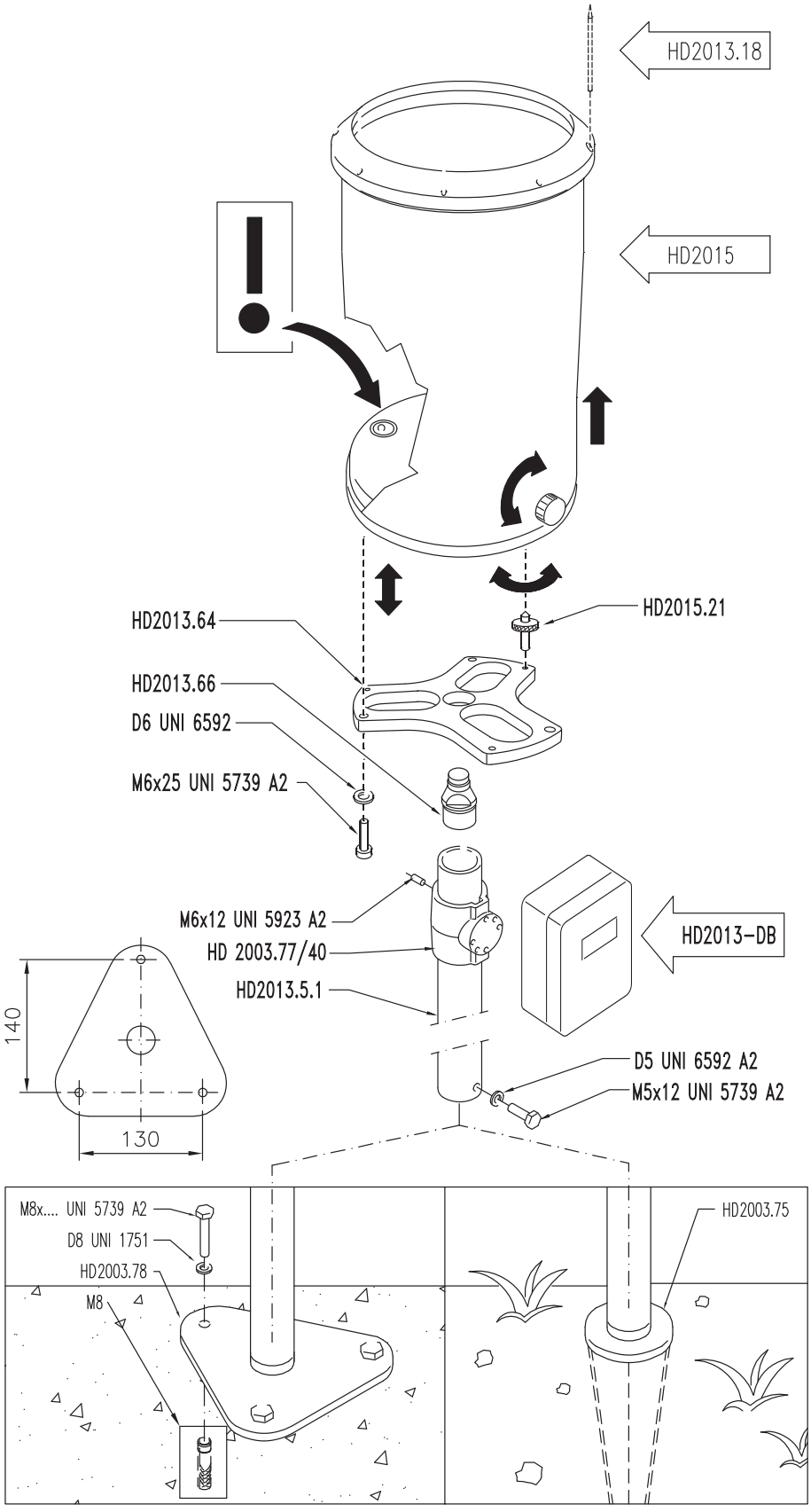


Fig. 9 – Installation raised above ground

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.

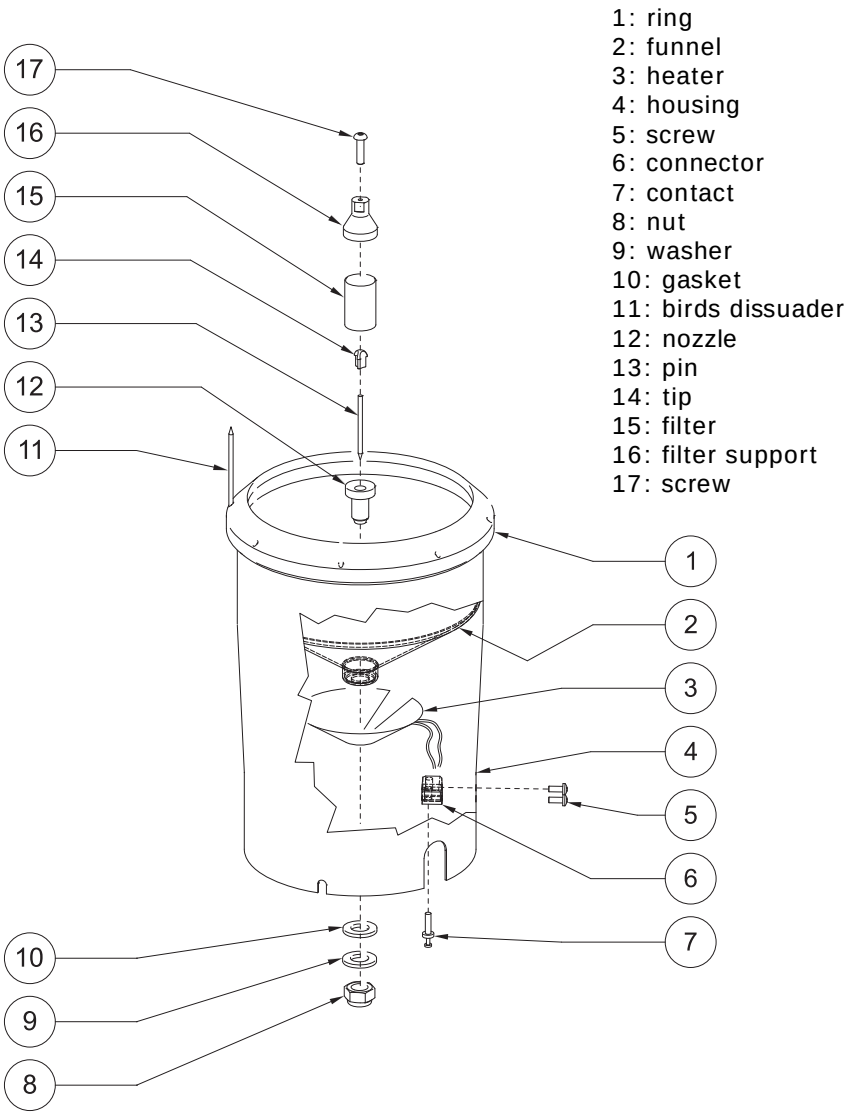
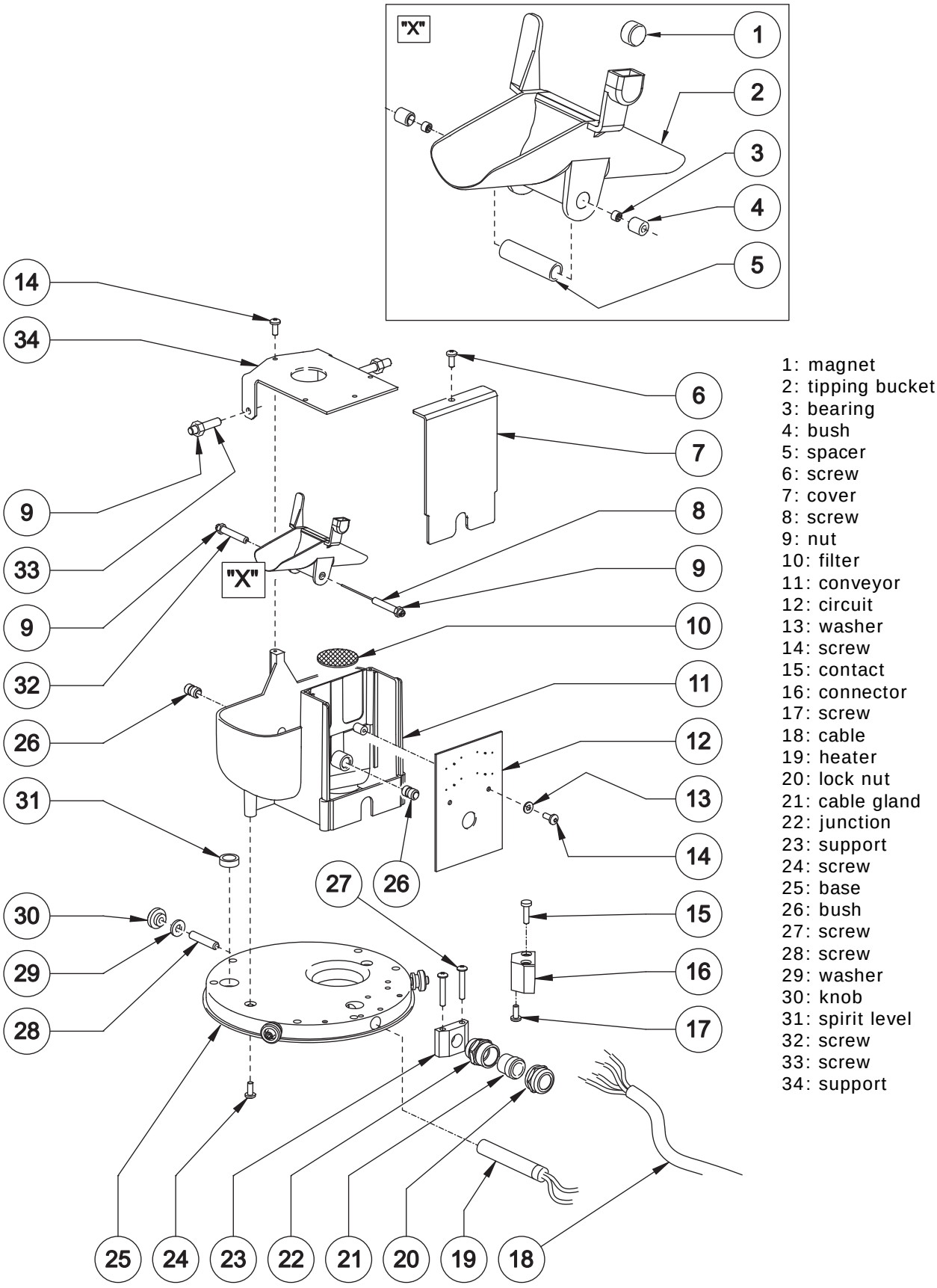


Fig. 10 – Exploded view of the upper part (version with heating)



1: magnet
2: tipping bucket
3: bearing
4: bush
5: spacer
6: screw
7: cover
8: screw
9: nut
10: filter
11: conveyor
12: circuit
13: washer
14: screw
15: contact
16: connector
17: screw
18: cable
19: heater
20: lock nut
21: cable gland
22: junction
23: support
24: screw
25: base
26: bush
27: screw
28: screw
29: washer
30: knob
31: spirit level
32: screw
33: screw
34: support

Fig. 11 – Exploded view of the lower part (version with heating)

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 Tipping bucket rain gauge, area 200 cm^2, for temperatures from 0 °C to +70 °C. **Resolution to be specified upon request at the time of placing the order**: 0.1 – 0.2 or 0.5 mm. Output contact normally closed.

HD2015R Tipping bucket rain gauge, area 200 cm^2, with heating system for temperatures from -20 °C to +70 °C. **Resolution to be specified upon request at the time of placing the order**: 0.1 – 0.2 or 0.5 mm. Output contact normally closed. Power supply voltage: 12 Vdc or 24 Vdc ± 10% (to be specified at the time of placing the order) / absorbed power 50 W.

HD2013.18 Bird dissuader.

HD2015.5K Kit of accessories for the installation of the rain gauge raised 500 mm off the ground (HD2013.5.1 + HD2013.64 + HD2013.66).

HD2015.5K.1 Kit of accessories for the installation of the rain gauge raised 1 m off the ground (HD2013.5.3 + HD2013.64 + HD2013.66).

HD2003.75 Base with tip for the ground to support the rain gauge installed off the ground.

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