

HD2016 is a rain gauge that detects the weight of the rainfall collected by a 400 cm² inlet. The sensor is a load cell located at the base of the rainfall collecting reservoir. The signal of the load cell is processed by the internal electronic board of the rain gauge in order to output the information on the rainfall.

Various outputs are available:

- RS485 with Modbus-RTU or proprietary ASCII protocol • SDI-12
- Voltage-free pulse contact output

The rain gauge is able to provide the total rainfall, the partial rainfall (from the last reset command or from the last reading command), the average rainfall rate in the last minute and in the last hour.

The measured rainfall is regularly saved into a non-volatile memory, which retains the information even in case of power failure.

The automatic discharge of the rainfall collected allows using a compact and lightweight structure for the installation of the rain gauge.

So as to ensure accurate measurement even with low temperature climatic conditions, a version with heating which is automatically activated below +4 °C has been developed (**HD2016R**) so that snow deposits and ice formations are prevented. Adding anti-freeze or oil in the reservoir is not required.

If the discharge of the water collected takes place during a rainfall, a retention valve, located at the top of rain gauge, temporarily holds the current rainfall, so to avoid losing the amount of rainfall that falls while discharging.

The rain gauge is equipped with sophisticated features that allow reducing the effects of wind, ensuring a better accuracy and stability of the measurement. An NTC temperature sensor allows keeping under control the internal temperature of the instrument.

Filter

The corrosion resistant materials used and the absence of moving parts guarantee a reduced maintenance and a long operating life. The rainfall collecting parts are treated with a non-adherent product for a better water flow.

The rain gauge is factory calibrated in three points. A self-diagnostic system periodically checks the correct operation of the instrument and reports any anomalies.

The multiplicity of outputs makes the rain gauge suitable to be connected to different ac-acquisition systems. For example:

- The pulse contact output can be connected to the HD2013-DB data logger, to the wireless data loggers of the HD35EDW... series provided with input for contact rain gauge (for example HD35EDWH, HD35EDW-MB, HD35EDWPTC, HD35EDLM..., etc.) or to a generic pulse counter.
- The RS485 Modbus-RTU output can be connected to the HD32MT.1 and HD32MT.3 data loggers for weather station, or to the HD35EDW-MB wireless data logger or to any data logger provided with RS485 Modbus-RTU input.
- The SDI-12 output can be connected to the HD32MT.3 data logger for weather station or to any data logger provided with SDI-12 input.

The rain gauge requires 10...15 Vdc power supply.

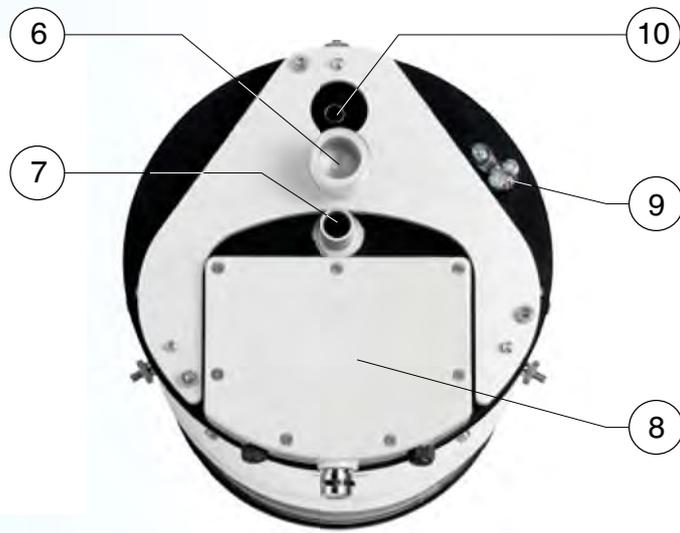
When submitting your order, upon request a bird dissuader, made of eight 3 mm diameter spikes, 60 mm in height, can be installed on the rain gauge.

No need for math algorithms to compensate for the weight due to leaves, branches or other solid objects.

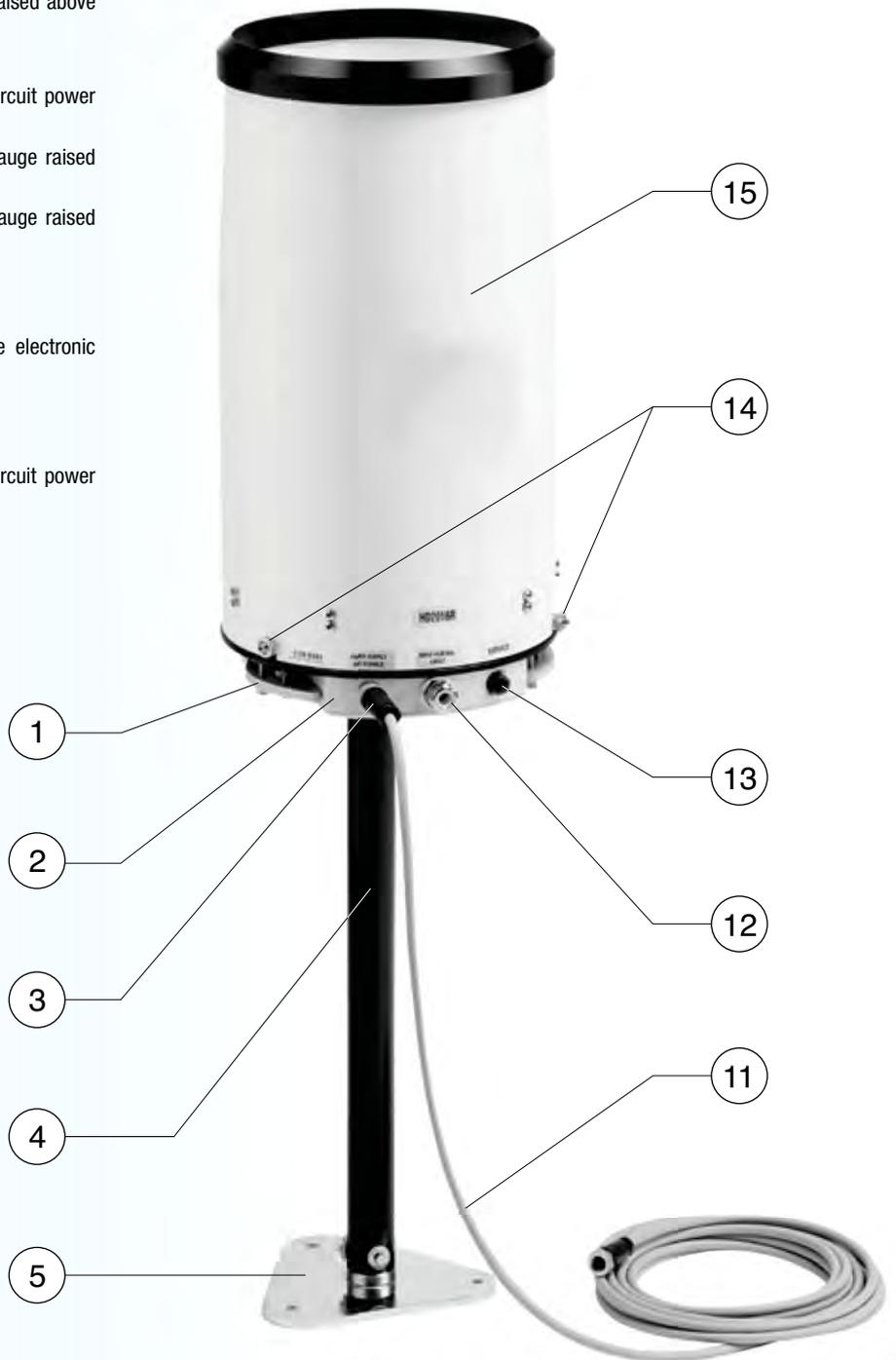
The breaker plate and the wire mesh filter prevent obstruction of water flow by leaves or branches. They should be cleaned regularly.



view from below



1. **Optional** flange for the installation of the rain gauge raised above ground.
2. Electronic board housing.
3. M12 connector for the connection of the measuring circuit power supply and signals.
4. **Optional** support rod for the installation of the rain gauge raised above ground.
5. **Optional** flat base for fixing the support of the rain gauge raised above ground.
6. Place for the support rod.
7. Discharge of the rainfall collected.
8. Cover of the electronic board housing. To access the electronic board, loosen the 7 screws that secure the cover.
9. Terminal for protective earth connection.
10. Overflow drain.
11. **Optional** cable for the connection of the measuring circuit power supply and signals.
12. Cable gland for the heater power supply.
13. Port reserved for technical service.
14. Screws for fixing the cylindrical cover.
15. Cylindrical cover.



TECHNICAL CHARACTERISTICS

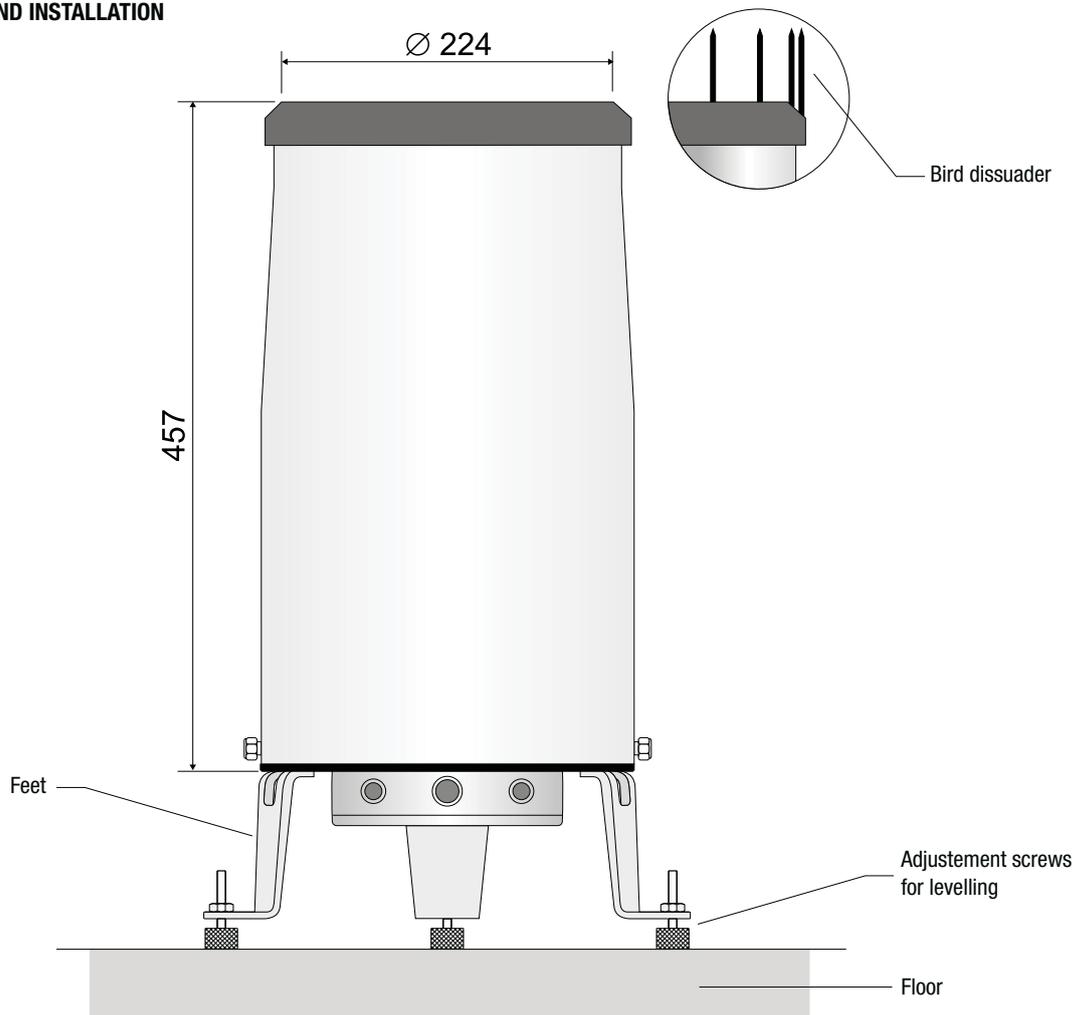
Power supply	Measuring circuit: 10...15 Vdc Heater: 12 Vdc \pm 10% (only HD2016R)
Consumption	Measuring circuit: ~ 20 mA (~ 1.5A while discharging, typ. for less than 1 min. with 300 cc and max. 5 min. with full reservoir) Heater: 90 W (only HD2016R)
Contact output	Isolated NO (Normally Open) contact ($R_{ON} \approx 1 \text{ k}\Omega$, $T_{ON} \approx 60 \text{ ms}$)
Digital outputs	RS485 with Modbus-RTU or ASCII proprietary protocol SDI-12
Resolution	Rainfall: 0.001 mm Weight: 1 mg Rate: 0.001 mm/h or 0.001 mm/min Temperature: 0.1 °C
Accuracy	Rainfall: \pm 0.2 mm (wind speed < 30 m/s). Maximum rainfall rate: 1000 mm/h. Temperature: \pm 1 °C
Operating temperature	+4...+60 °C without heating -20...+60 °C with heating (only HD2016R)
Heater intervention temperature	+4 °C (only HD2016R)
Capacity	The automatic discharge of the 3000 cc reservoir allows seamless rainfall measurement
Protection degree	IP 64
Collector area	400 cm ²
Minimum section of the wires of the connecting cable	Measuring circuit: 0.7 mm ² (AWG 19) Heater: 2.5 mm ² (AWG 13, only HD2016R)

INSTALLATION

The rain gauge can be installed on the ground or raised 500 mm above the ground. Other sizes above the ground are available on request.

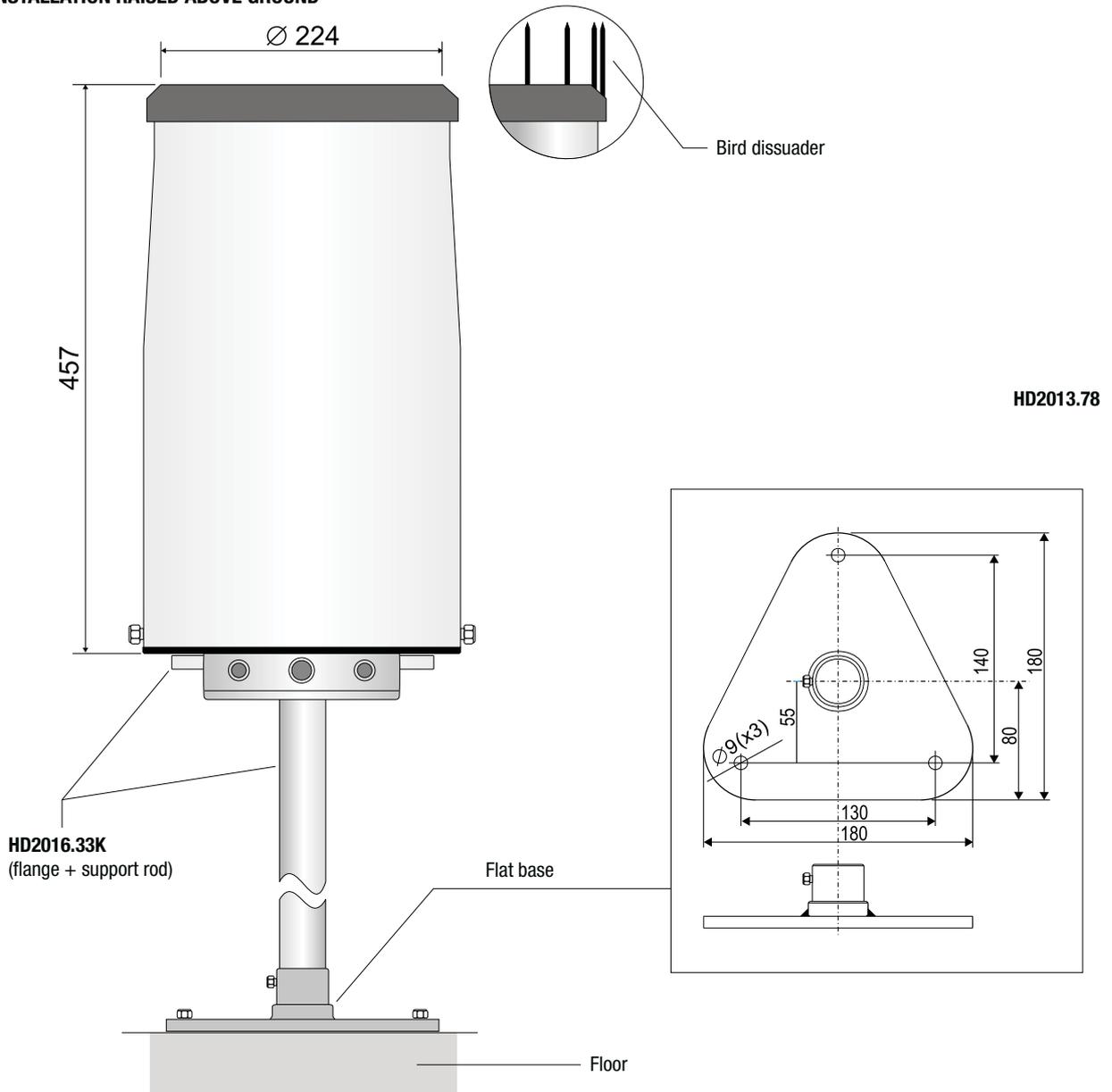
For ground installation, three adjustable support feet, so that the instrument can be levelled correctly, and holes for fixing to the floor have been provided.

RAIN GAUGE GROUND INSTALLATION



For raised installations, a flange to be fastened to the base of the instrument, and on which the support rod must be inserted, is provided. The rod may end with a flange so that it can be fixed to the floor.

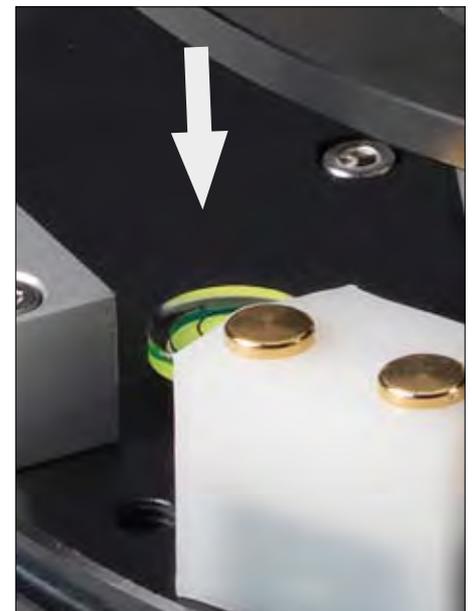
RAIN GAUGE INSTALLATION RAISED ABOVE GROUND



The base of the rain gauge is fitted with a bubble level to place the instrument perfectly levelled.



Bubble level



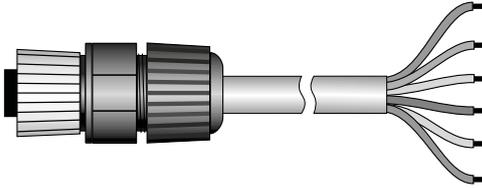
ELECTRICAL CONNECTION

The measuring circuit power supply and the outputs (RS485, SDI-12 or contact) are connected via the male 8-pole M12 connector of the instrument. Use a cable with a female 8-pole M12 connector and 0.7 mm² minimum wires section. Use a shielded cable over long distances. **Upon request, CP18... cables with 5 or 10 m standard length are available (other lengths available upon request).**

Instrument
M12 male connector



CP18... cable



Connector numbering	Function	CP18... cable numbering
1	Measuring circuit power supply negative (GND) SDI-12 output negative	12, 7, 6
2	Measuring circuit power supply positive (+Vdc)	1, 2, 4
3	Not connected	
4	DATA – (RS485)	9
5	DATA + (RS485) or SDI-12 line	5
6	1 st pole of the voltage-free contact	8
7	Not connected	
8	2 nd pole of the voltage-free contact	11



MODBUS INPUT REGISTERS

Register address	Datum	Format
0	Content of the status register	16-bit integer
1	Not used	16-bit integer
2,3	Partial rainfall, in μm , from the last reading command	16-bit integer
4,5	Total rainfall in μm	16-bit integer
6,7	Partial rainfall, in μm , from the last reset command	16-bit integer
8,9	Average rainfall rate, in $\mu\text{m}/\text{min}$, calculated in the last minute	16-bit integer
10,11	Average rainfall rate, in $\mu\text{m}/\text{h}$, calculated in the last hour	16-bit integer
12,13	Rain gauge internal temperature in $^{\circ}\text{C}$	16-bit integer
14,15	Rainfall total weight (Pmg) in mg ^(*)	16-bit integer
16,17	Rainfall total weight, in mg, considering the evaporation (Wmg) ^(*)	16-bit integer
18,19	Weight, in mg, of the current reservoir content (Tmg) ^(*)	16-bit integer
20,21	Partial rainfall, in mils, from the last reading command	16-bit integer
22,23	Total rainfall in mils	16-bit integer
24,25	Partial rainfall, in mils, from the last reset command	16-bit integer
26,27	Average rainfall rate, in mils/min, calculated in the last minute	16-bit integer
28,29	Average rainfall rate, in mils/h, calculated in the last hour	16-bit integer
30,31	Rain gauge internal temperature in $^{\circ}\text{F}$	16-bit integer

The measures are signed 32-bit integer values. Two consecutive 16-bit registers must be accessed to read a measure.

Sequence to remove the cylindrical cover from the base of the rain gauge.





Removing the cylindrical cover



Reservoir

ORDERING CODES

- HD2016** Weighing rain gauge, area 400 cm², Operating temperature from +4 °C to +60 °C. RS485 Modbus-RTU or SDI-12 output. Voltage-free contact (NO) output. Power supply: 10...15 Vdc.
- HD2016R** Weighing rain gauge, area 400 cm², with heater. Operating temperature from -20 °C to +60 °C. RS485 Modbus-RTU or SDI-12 output. Voltage-free contact (NO) output. Power supply: 10...15 Vdc for the measuring circuit, 12 Vdc / 90 W for the heater.
- CP 18.5** 12-pole cable. Length 5 m. 8-pole M12 connector on one end, open wires on the other side.
- CP 18.10** 12-pole cable. Length 10 m. 8-pole M12 connector on one end, open wires on the other side.
- HD2013.18** Bird dissuader.
- HD2016.33K** Kit of accessories for the installation of the rain gauge raised 500 mm above ground.
- HD2016.33K.1** Kit of accessories for the installation of the rain gauge raised 1 m above ground.
- HD2013.78** Flat base for fastening the support of the rain gauge raised above ground.



The qualitative level of our instruments is the result of a continuous evolving of the product itself. This may bring to slight differences between what written in the following manual and the instrument you bought. We cannot completely exclude the presence of errors inside the manual, which we apologise for. Data, images and descriptions included in this manual cannot be enforced legally. We reserve the right to perform modifications and corrections at any time without notice.

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