# MODEL DataRain-4000

## NEW ELECTRONIC WEIGHING PRECIPITATION SENSOR

### WITH VERY HIGH RESOLUTION (0.02mm), WEIGHING ACCURACY (0.02%) AND A LARGE MEASURING RANGE (0-1200mm/h)


Model **DataRain-4000** is a new professional precipitation sensor designed by **GEONICA** according to the requirements of the WMO (World Meteorological Organization).

This patented precipitation sensor combines a very accurate measurement principle (electronic weighing) and an automatic emptying system, in such a way to allow unlimited (non-maintenance) very accurate operation, from a minimum detectable precipitation intensity as low as 0.02 mm/h, up to a very high, constant and permanent precipitation rate of 1200 mm/h (200 cm² collecting area version) or 800 mm/h (300 cm² collecting area version).

Due to the principle of operation, the sensor offers a permanent calibration, and its resolution is also maintained in all the measuring range from 0.02 mm/h to full range (800 mm/h for 300 cm² version or 1200 mm/h for 200 cm²).

The upper measuring range of the smart precipitation gauge **DataRain-4000** largely exceeds natural phenomena.

On the other hand, and also due to its very high resolution, the standard collecting area of 200 cm² is more than enough for measuring very low precipitation rates where higher sensitivity/resolution is required (0.02 mm of precipitation). For applications requiring higher resolution (0.013 mm) the version with collecting area of 300 cm² is available.

300cm²

200cm²

**INTERNATIONAL PATENT PENDING IN EUROPE, USA AND OTHER COUNTRIES**

## DATARAIN-4000 FEATURES

- **Worldwide Smart Precipitation sensor**

Smart precipitation sensor that is accurate world-wide including monsoon, tropical and cold regions.

- **Direct replacement of Tipping Bucket precipitation gauges:**

DataRain-4000 incorporates a built-in solid state switch output, software configurable, for: 0.05; 0.1; 0.2 and 0.5 mm per pulse, or any other resolution, solving definitively the limited accuracy and measuring range offered by the classical mechanical tipping bucket precipitation gauges.

- **Maintenance Free**

Unlimited operation by automatic emptying procedure. This reduces maintenance tasks and avoids periodic manual draining works.

- **Configuration Interface**

The DataRain-4000 includes an interface to setup the internal configuration according to each project requirements: serial baudrate, pulse resolution, identifier, etc. This interface is accessible from the serial port.

PEDESTAL
MODEL SPL-4000

- **Precipitation and Diagnosis Information**

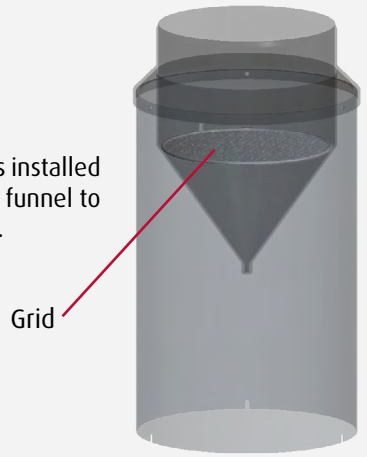
The DataRain-4000 sensor supplies accumulated amount of precipitation and intensity of precipitation.

In addition, it supplies some extra information about its internal status. This information is encoded in bits forming a 16 binary code updated every 1 second.

The Sensor Status Code information provides information about the internal hardware status, the resets in the last minute, the internal sampling rate, status of automatic emptying system, etc.

- **Protection Grid**

The protection grid is installed inside the collecting funnel to filter out leaves, etc.




## TECHNICAL SPECIFICATIONS

### GENERAL DATA

- Types of precipitation
  Liquid, mixed and solid (with optional automatic self-managed heater with built-in smart energy-efficient control).

- Measuring principle
  Electronic weighing (no moving parts) with accuracy class C3 load cell (0.1g / 0.02%) according to OIML R60.

- Collecting area
  Two versions: 200 $cm^2$ and 300 $cm^2$.

- Collecting volume
  Unlimited due to its automatic self-emptying system.

- Measuring range
  Cumulative Precipitation: Unlimited
  Precipitation Intensity:
  - 200 $cm^2$: 0 - 1200 mm/h
    0 - 20 mm/min
  - 300 $cm^2$: 0 - 800 mm/h
    0 - 13.3 mm/min

### MEASURING FEATURES

- Resolution
  **Impulse output**: configurable for 0.05; 0.1; 0.2 and 0.5 mm per pulse and others (user defined).
  **SDI-12 and RS-232/RS-485 output**:

| Area | Resolution (Amount) | Resolution (Intensity of Precipitation) |
|---|---|---|
| 200 $cm^2$ | 0.02 mm | 0.02 mm/s or mm/min or mm/h |
| 300 $cm^2$ | 0.013 mm | 0.013 mm/s or mm/min or mm/h |

*Note: Precipitation events below the resolution threshold are accumulated so very little amount of water is also measured.*

- Quality of Measurements
  (from -40ºC to +50ºC, heating on)
  - Weighing Accuracy: Class C3 (0.1g / 0.02%)
  - Amount of Precipitation and Intensity:

| Area | Error (% Abs.) | Expanded Uncertainty (k=2) |
|---|---|---|
| 200 $cm^2$ | Less than 1% in all the measuring range (until 1200 mm/h) | ±0.32% at precipitation rates as high as 750 mm/h |
| 300 $cm^2$ | Less than 1% in all the measuring range (until 800 mm/h) | ±0.57% at precipitation rates as high as 800 mm/h |

## POWER SUPPLY / CONSUMPTION

- **Ultra-low power consumption:**
  Less than 15mW typical keeping interfaces alive by executing smart adaptive low power firmware.
- **Power supply**
  (11 to 20VDC) with overvoltage and under-voltage protection.
  Sensor: 11 to 20 VDC (15mW Typical)
  Heater (optional): 24 VDC/AC (25W-1.05A) with automatic control by embedded thermistor sensor
- **Proprietary brownout protection**
  System that avoids data loss/corruption during power supply drops.

## MEASUREMENT OUTPUT

- **Precipitation Intensity**:
  - Last minute (mm/hour): Updated every minute
  - Control (integer): Value increased with every 'Precipitation Intensity Last Minute' update.
- **Amount of Precipitation (Accumulated):**
  - Since last startup (mm). The DataRain-4000 is supplied with this value set to '0' as factory default. It only can be restarted using the configuration menu.
  - In order to know the accumulated value from Last Poll (in mm), the client should calculate the difference between two consecutives requests.
  - Updated every second
- **Volume in Accumulation Chamber (gr):**
  - Updated every second
- **Sensor Status Code:**
  Information about the device behaviour:
  - Bit 0: Cold reset in the last minute
  - Bit 1: Reserved
  - Bit 2: Low water outlet flow-rate in the last emptying (the automatic emptying system may be clogged)
  - Bit 3: Reserved
  - Bit 4: Failure in automatic internal diagnostics (5Vdc, the lithium battery status, the power consumption, etc.)
  - Bit 5: Internal heater activation/deactivation
  - Bit 6: Temperature sensor out of range or not connected
  - Bit 7: Low/fast sampling rate
  - Bit 8: Automatic emptying event in the last minute
- **Internal sampling rate:**
  - 1 second
- **Query interval:**
  - Polled output (1s minimum interval).

## INTERFACES

- Selectable SDI-12 and RS-232/RS-485-2-wire serial interface with RS-232 optional handshake pins and legacy solid state switch output (N.O. up to 60VDC/AC peak , 2.5A DC, 2.5A AC peak).

*NOTE: The SDI-12 and RS-232/RS-485 interfaces use independent hardware and so they can communicate simultaneously.*

- **SDI-12:** V1.3
  SDI-12 Protocol
- **RS-232/485:** Half duplex multi drop
  ASCII Protocol
- **Pulses:** Bounce free dry contact (Solid State Switch)
  Configurable resolution: 0.05/0.1/0.2/0.5 mm per pulse and others (user defined)

## PHYSICAL FEATURES

- **Collecting Area:** Optional 200 $cm^2$/300 $cm^2$ with maximum intensity ranges up to 1200 mm/h / 800 mm/h.
- **Mechanical (200 $cm^2$ /300 $cm^2$ version):**
  - Dimensions:

| Collect. Area | Body Diameter | Height |
|---|---|---|
| 200$cm^2$ | 206.5mm (8.13in) | 387.5mm (15.26in) |
| 300$cm^2$ | 206.5mm (8.13in) | 436mm (17.17in) |

  - Weight: 4 kg approx.
  - Mounting: On mast, pedestal or tower
  - Levelling: By 3 adjusting knobs and spirit level
- **Materials:**
  - External body: Aluminium/AISI 3016 stainless steel
  - Collecting funnel: Black anodized aluminium
  - Internal parts: Aluminium/ABS

## ENVIRONMENTAL CONDITIONS

- **Temperature in operation**
  Heater ON -40 ºC to +70 ºC
  Heater OFF 0 ºC to +70 ºC
- **Storage temperature** -25 ºC to +70 ºC
- **Relative humidity** 0 - 100 %
- **Degree of protection**
  Electronics: NEMA 4 & 4X / IP65 (IP66 optional) according to IEC 60529 / NEMA 250
  Load Cell: NEMA 4 & 4X / IP65 according to IEC 60529 / NEMA 250
- **Real Time Clock accuracy:** ±4 Min/Year or ±7.6 ppm (within the full operating temperature range).

## STANDARDS COMPLIANT

- **Fully compliant with WMO No. 8 recommendations**
- **EMI/ESD:** in accordance with IEC/EN 61326
- **EMC:** in accordance with IEC/EN61000-4-2/3/4/5/6/8
- **Safety:** in accordance with IEC/EN 61010
- **Load Cells**
  - OIML R 60
- **Degree of Protection**
  - NEMA 250
  - IEC 60529-2004
- **European Directives**
  - 2006/95/CE
  - 2004/108/CE
  - 2002/95/CE
  - 2004/22/CE

CE