

# Model DATARAIN-4000

## ELECTRONIC WEIGHING PRECIPITATION SENSOR



- **AUTOMATIC EMPTYING SYSTEM**
- **200 cm<sup>2</sup> or 400 cm<sup>2</sup> COLLECTING AREA**
- **0.001 mm VERY HIGH RESOLUTION**
- **0.02% WEIGHING ACCURACY**
- **0-2000 mm/h LARGE PRECIPITATION INTENSITY MEASURING RANGE**
- **ULTRA-LOW POWER CONSUMPTION**
- **SMART ENERGY-EFFICIENT HEATING CONTROL**
- **WORLDWIDE ALL-WEATHER ACCURACY**

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

This precipitation sensor combines a very accurate measurement principle (electronic weighing) and an automatic emptying system, in such a way to allow unlimited (very low maintenance) very accurate operation.

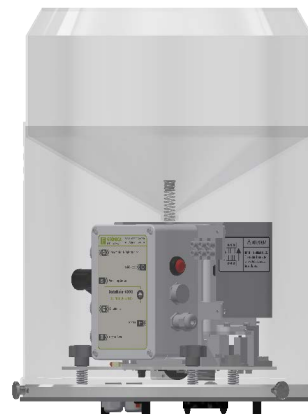
Due to its principle of operation, the sensor provides permanent calibration, and its resolution and accuracy are also maintained in the whole measuring range (up to 2000 mm/h precipitation intensity).

The upper limit of the intensity range of the smart precipitation gauge **DATARAIN-4000** largely exceeds natural phenomena.

Two different models of **DATARAIN-4000** are available whose only difference is their collecting are: 200 cm<sup>2</sup> or 400 cm<sup>2</sup>.

A built-in temperature probe allows a self-managed energy-efficient heating control when the optional two heaters are included.

**DATARAIN-4000** is compatible with a wide variety of interfaces and protocols. The precipitation data supplied by **DATARAIN-4000** depends on the interface and protocol used to communicate with the logger according the table on the right.



400 cm<sup>2</sup> Model



200 cm<sup>2</sup> Model

Interface	Protocol	Precip. Intensity (mm/h)	Intensity Control	Accumulated Precip. (mm) Since Start Up	Precip. in Accumulation Chamber (g)	Heating Control Temperature (°C)	Status
Reed/Solid State Relay	NA			√			
RS-232 or RS-485	Geonica	√	√	√	√	√	√
	ASCII/NMEA	√	√	√	√	√	√
	Modbus	√	√	√	√	√	√
SDI-12	SDI-12	√	√	√	√	√	√
USB	Interface for configuration						

## DATARAIN-4000 FEATURES

### Worldwide Smart Precipitation Sensor

Smart precipitation sensor featuring worldwide measuring accuracy, including monsoon, tropical, and cold regions.

### Direct Replacement of Tipping-Bucket Precip. Gauges

**DATARAIN-4000** incorporates a built-in solid state switch output, software configurable, with a factory default resolution of 0.05 mm per pulse, to definitively solve the limited accuracy and measuring range offered by the classical mechanical tipping-bucket precipitation gauges.

### Very Low Maintenance

The embedded automatic draining system has been designed to significantly reduce maintenance works or manual draining tasks usually required by other technologies.

### Configuration Interface and on-field Firmware Update via USB or Serial Port

**DATARAIN-4000** includes an interface to set up the internal configuration according to each project requirements: serial baud-rate, pulse resolution, identifier, protocol, etc. This interface is accessible through the serial port and the USB port. It also allows the internal program to be updated.

### Hydrophobic Coating

An optional long lasting hydrophobic coating layer can be supplied to ensure that almost any drop of precipitation is measured.

### Self-Controlled Draining Management

The precipitation accumulated in the internal chamber is controlled and drained after every precipitation event.



PEDESTAL  
Model SPL-4100

### Smart Data Processing and Filtering Algorithms

Algorithm settings customizable to adapt sensor operation to strong wind environments, avoiding unwanted incorrect precipitation measurements.

### Precipitation and Diagnosis Information

**DATARAIN-4000** sensor supplies accumulated amount of precipitation and intensity of precipitation.

In addition, it supplies some extra internal status data. This information is bit-coded forming a 16-bit code updated every 1 second.

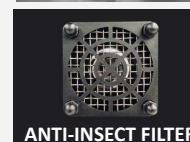
The Sensor Status Coded Data provides information about the internal hardware status, the resets in the last minute, the internal sampling rate, status of automatic draining system, etc.

### Protection Filters

- The stainless steel protection cartridge filter can be installed inside the collection funnel to filter out leaves, etc.
- The anti-insect drain filter prevents insects from entering through the drain orifice.



CARTRIDGE FILTER



ANTI-INSECT FILTER

### Heater

An optional automatic self-managed heater with built-in smart energy-efficient heating control has been designed and adapted to perform the melting process for solid precipitation events.

### Electronic Unit

IP66 protected electronic unit for data processing and filtering, low power operation, smart heating control and data output via different communication protocols.

## 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 with an accuracy class C3 load cell (0.1 g / 0.02%) according to OIML R60.
- Collecting area**  
Two models: 200 cm<sup>2</sup> and 400 cm<sup>2</sup>.
- Collecting volume**  
Unlimited due to its automatic self-draining system.
- Automatic draining**  
Automatic draining system controlled by a position encoder that allows unattended long time operation.

### MEASURING FEATURES

- Measuring range**  
Cumulative Precipitation: Unlimited  
Precipitation Intensity:  
  - 0 - 2000 mm/h (0 - 33 mm/min)

### Resolution

Interface	Resolution
Reed/Solid State Relay	0.05 mm (Configurable from 0.01 mm)
RS-232/RS-485 SDI-12	Accumulated Precipitation: 0.001 mm Intensity of Precipitation: 0.001 mm/h

### Quality of Measurements

<b>Weighing Accuracy</b>	Class C3 (0.1 g / 0.02%) According to OIML R60
<b>Precipitation Error</b>	< 0.30% in the whole intensity range < 0.15% from 0 to 1000 mm/h

## POWER SUPPLY / POWER CONSUMPTION

- **Ultra-low power consumption:**  
Less than 35 mW typical, keeping interfaces alive by executing a smart adaptive low power firmware.

Enabled Communication Protocols	Power Consumption
Reed/Solid State Relay, NMEA & SDI12	< 35 mW typ.
Modbus & Geonica Binary Protocol	< 182 mW typ.

- **Power supply**  
(9 to 20 VDC) with overvoltage and undervoltage protection.  
Sensor: 9 to 20 VDC (35 mW typical)  
Heating kit (optional): 24 VDC/AC (25 W) with automatic control by embedded thermistor sensor.
- **Proprietary brownout protection**  
System that avoids data loss/corruption during power supply dips.

## 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). **DATARAIN-4000** is supplied with this value set to '0' as the factory default setting. The accumulator keeps increasing this value with each new precipitation event during the whole system operation life. The user can restart this counter back to zero via the configuration interface.
  - In order to know the accumulated value from Last Poll (in mm), the user can calculate the difference between two consecutive requests.
  - Updated every second
- **Volume in Accumulation Chamber (g):** Updated every second
- **Sensor Status Code:**  
- Information on the device behaviour:
  - Bit 0: Cold reset in last minute
  - Bit 1: <Reserved>
  - Bit 2: Draining not done
  - Bit 3: <Reserved>
  - Bit 4: Hardware self-diagnosis status
  - Bit 5: Heater ON (1)/OFF(0)
  - Bit 6: Heater temperature out of range
  - Bit 7: <Reserved>
  - Bit 8: Automatic draining event in last minute
  - Bit 9: Draining module status
  - Bit 10: Freezing status
- **Heating Control Temperature (°C):** Updated every minute
- **Internal sampling rate:** 1 second
- **Query interval:** Polled output (1 second minimum interval)

## INTERFACES AND PROTOCOLS

- All the available interfaces and protocols are user configurable.
- SDI-12, Reed/Solid State Relay and Serial (RS-232 / RS-485) are independent hardware and so they can communicate simultaneously.

Interface	Associated Protocols
<b>Reed/Solid State Relay</b> Bounce-free dry contact	Pulses of configurable resolution: 0.01/0.05/0.1/0.2/0.5 mm per pulse and others (user defined)
<b>Serial RS-232 / RS-485</b> (Half-duplex multi-drop)	ASCII/NMEA Protocol Modbus Protocol Geonica Binary Protocol
<b>SDI-12 (V1.3)</b>	SDI-12
<b>USB</b>	Interface for internal configuration

## PHYSICAL FEATURES

- **Collecting Area:** 200 cm<sup>2</sup> or 400 cm<sup>2</sup>
- **Mechanical**
  - Dimensions:
 

Collect. Area	Body Diameter	Height
200 cm <sup>2</sup>	203 mm (7.99 in)	330 mm (12.99 in)
400 cm <sup>2</sup>	270 mm (10.63 in)	370 mm (14.57 in)
  - Weight: 4 kg approximately
  - Mounting: On SPL-4100 pedestal or support arm to tower (inform at purchase)
  - Leveling: By 3 adjusting knobs and spirit level
- **Materials:**
  - External body: Repulsed anodized aluminum
  - Collecting funnel: Repulsed anodized aluminum
  - Internal parts: Anodized aluminum/ABS

## ENVIRONMENTAL CONDITIONS

- **Operating temperature**
  - Heated (no icing, no snow blowing) -40 °C to +70 °C
  - Heated -30 °C to +60 °C
  - Unheated 0 °C to +60 °C
- **Storage temperature** -25 °C to +60 °C
- **Relative humidity** 0 - 100 %
- **Degree of protection**
  - Electronics: NEMA 4 & 4X / IP66  
According to NEMA 250 / IEC 60529
  - Load Cell: NEMA 4 & 4X / IP65  
According to NEMA 250 / IEC 60529
- **Real Time Clock accuracy:** ±4 Min/Year or ±7.6 ppm  
(Within the full operating temperature range)

## COMPLIANCE OF INTERNATIONAL STANDARDS

- **Fully compliant with WMO No. 8 recommendations**
- **EMI/ESD:** in accordance with IEC/EN 61326
- **EMC:** in accordance with IEC/EN 61000-4-2/3/4/5/6/8
- **Safety:** in accordance with IEC/EN 61010
- **Load Cells**
  - OIML R 60
- **Degree of Protection**
  - NEMA 250
  - IEC 60529
- **European Directives**
  - 2014/35/UE
  - 2014/30/UE
  - 2011/65/UE
  - 2014/32/UE

