

Electronic Weighing Precipitation Sensor

DataRain-4000

INTRODUCTION

The DataRain-4000 is a professional electronic weighing precipitation sensor designed in accordance with WMO requirements for high-accuracy rainfall measurement. It combines a high-precision load cell with an automatic self-draining system to deliver unlimited measuring capacity with very low maintenance, even at very high precipitation intensities up to 2000 mm/h.

Thanks to its weighing principle, the sensor provides permanent calibration, maintaining its 0.001 mm resolution and 0.02% weighing accuracy across the entire measuring range. Two models are available with 200 cm² or 400 cm² collecting areas, both featuring ultra-low power consumption and an optional smart, energy-efficient heating system controlled by an internal temperature probe. DataRain-4000 is compatible with multiple interfaces and protocols, allowing easy integration into new or existing monitoring networks.

FEATURES

Electronic weighing with permanent calibration

High-precision C3 load cell and weighing principle ensure stable accuracy without periodic recalibration.

Unlimited capacity with automatic draining

Internal accumulation chamber and self-draining system provide unlimited cumulative precipitation and long unattended operation.

Wide range, high resolution and accuracy

Measures 0–2000 mm/h with accumulated resolution to 0.001 mm and overall error typically below 0.30%.

Direct replacement for tipping buckets

Includes a built-in solid-state switch output (factory default 0.05 mm per pulse, configurable from 0.01 mm) to replace mechanical tipping-bucket gauges while improving accuracy and range.

Worldwide all-weather performance

Smart precipitation sensor with <0.30% error over the full intensity range (<0.15% from 0 to 1000 mm/h), suitable for monsoon, tropical and cold-climate conditions.

Smart heating and low-maintenance design

Optional automatic heater, contamination filters and self-diagnosis minimise maintenance.

CONFIGURATION & MEASUREMENT

Measurement principle and range

DataRain-4000 uses an electronic weighing system with a C3-class load cell to measure liquid, mixed and solid precipitation with unlimited cumulative volume and intensities up to 2000 mm/h.

Resolution and data quality

Depending on interface, accumulated precipitation is reported with up to 0.001 mm resolution and intensity with 0.001 mm/h, with weighing accuracy of 0.02% and precipitation error typically <0.30%.

Outputs and interfaces

Provides accumulated precipitation, intensity and status code via pulse output, RS-232/RS-485 (ASCII/NMEA, Modbus, proprietary binary protocol) or SDI-12, with USB for configuration and firmware updates.

Smart processing and protection

Configurable algorithms and mechanical filters (inlet cartridge, drain filter, optional hydrophobic coating) reduce wind and contamination effects, while the IP66 unit manages low-power operation, heating and automatic draining.



- **AUTOMATIC SELF-EMPTYING SYSTEM**
- **COLLECTING AREA: 200 CM² OR 400 CM²**
- **0.001 MM PRECIPITATION RESOLUTION**
- **0.02% WEIGHING ACCURACY (C3 LOAD CELL)**
- **LARGE PRECIPITATION INTENSITY MEASURING RANGE: 0–2000 MM/H**
- **ULTRA-LOW POWER CONSUMPTION**
- **SMART ENERGY-EFFICIENT HEATING CONTROL**
- **WORLDWIDE ALL-WEATHER MEASURING ACCURACY**
- **COMPLIANCE WITH INTERNATIONAL STANDARDS:**
 - 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 AND IEC 60529
 - EUROPEAN DIRECTIVES: 2014/35/UE - 2014/30/UE - 2011/65/UE - 2014/32/UE

General specifications

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	200 cm ² or 400 cm ² .
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.
Operating temp.	
Heated (no icing, no snow blowing)	-40 °C to +70 °C
Heated	-30 °C to +60 °C
Unheated	0 °C to +60 °C
Storage temp.	-25 °C to +60 °C
Relative humidity	0 - 100 %
Protection degree	
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)
Dimensions	
200 cm ²	203 mm (body diameter) x 330 mm (height)
400 cm ²	270 mm (body diameter) x 370 mm (height)
Weight	4 kg approximately
Mounting	On SPL-4000 pedestal or support arm to tower
Levelling	By 3 adjusting knobs and spirit level
Materials	
external body and collecting funnel	repulsed anodized aluminium
internal parts	anodized aluminium / ABS

Measurement specifications

Measuring range	
Cumulative precipitation	unlimited
Precipitation intensity	0 - 2000 mm/h (0 - 33 mm/min)
Resolution	
Reed/Solid State Relay interface	0.05 mm (Configurable from 0.01 mm)
RS-232/RS-485 / SDI-12 interface	Accumulated Precipitation: 0.001 mm Intensity of Precipitation: 0.001 mm/h
Quality of measurements	
Weighing accuracy	Class C3 (0.1 g / 0.02%) According to OIML R60
Precipitation error	< 0.30% in the whole intensity range < 0.15% from 0 to 1000 mm/h

Ordering Code

DTR-4000-02	200 cm ² collecting area
DTR-4000-02H	200 cm ² collecting area, with heating
DTR-4000-04	400 cm ² collecting area
DTR-4000-02H	400 cm ² collecting area, with heating
SPL-4100	Vertical support

Technical specifications

Power supply & consumption

Ultra-low power consumption	Less than 35 mW typical, keeping interfaces alive by executing a smart adaptive low power firmware.
Enabled Communication Protocol	Power Consumption
Reed/Solid State Relay, NMEA & SDI12	< 35 mW typ.
Modbus & Proprietary Binary Protocol	< 182 mW typ.
During 2s Long Draining Event (every12h)	< 18 W max
Power supply	(9 to 20 VDC) with overvoltage and undervoltage protection
Sensor	9 to 20 VDC 20 W
Heating kit (opt)	24 VDC 60 W with automatic control by embedded thermistor sensor
Proprietary brown-out protection	System that avoids data loss/corruption during power supply dips

Measurement output

Precipitation Intensity	Last-minute average (mm/h), updated every minute, with an internal control counter incremented at each update.
Amount of Precipitation (Accumulated)	Absolute precipitation accumulated from the sensor's initial power-on, factory set to 0 and updated every second. The value increases for the entire operating life and can be reset via the configuration interface; accumulation between polls is obtained by subtracting consecutive readings.
Sensor Status Code	DataRain self-diagnosis information (refer to the manual)
Volume in Accumulation Chamber (g)	Updated every second
Heating Control Temperature (°C)	Updated every minute
Internal sampling rate	1 second
Query interval	Polled output (1 second minimum interval)

Interfaces and protocols

Interface	Protocol	Data Refresh	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	NA			✓			
RS-232 or RS-485	Senseca	Polled	✓	✓	✓	✓	✓	✓
	ASCII/NMEA	1-60 s	✓	✓	✓	✓	✓	✓
	Modbus	Polled	✓	✓	✓	✓	✓	✓
SDI-12	SDI-12	Polled	✓	✓	✓	✓	✓	✓
USB	Interface for configuration							