

Precipitation measurement
OTT Parsivel² –
Laser-optical disdrometer for capturing particle size and velocity of liquid and solid precipitation

OTT Parsivel²

Multifunctional laser-optic disdrometer in the premier class

OTT Parsivel² is a modern, laser-based disdrometer for comprehensive and reliable measurement of all types of precipitation. The device works on the extinction principle and measures precipitation particles using the shadowing effects they cause when they pass through a laser band.

Parsivel² captures both the size and the rate of fall in detail of the individual hydrometeors and classifies them into a range of 32 classes each. Depending on the measurement interval set, the resulting precipitation spectrum covers a time of between 10 seconds and one hour. A fast signal processor uses the raw data to calculate the type of precipitation as well as the amount and intensity of the precipitation, the visibility in the precipitation, the kinetic energy of the precipitation and the equivalent radar reflectivity. Using standard ports, both the calculated and the spectral data are output to a datalogger, an automatic weather station or a PC.

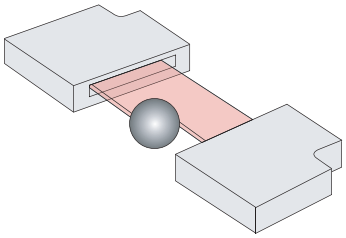
Meteorology

Precipitation measurement with the OTT Parsivel^2

The principle

OTT Parsivel^2 uses a laser-optical sensor to measure precipitation. The transmitter unit of the sensor generates a flat, horizontal beam of light that the receiver unit converts to an electrical signal. This signal changes whenever a hydrometeor falls through the beam anywhere within the measuring area (54 cm^2). The degree of dimming is a measure of the size of the hydrometeor, and the fall velocity is derived from the extinction signal duration.

The measured values are characterized by high accuracy, which is retained over a long period. The ratiometric process also helps to ensure this, as it automatically compensates for the influence of the temperature characteristic curve and aging of the laser diodes.



OTT Parsivel^2 – persuasive technology

- Accurate – measures the size and speed of each individual hydrometeor and derives from these all important meteorological parameters
- Maintenance free – lowest obstruction to wind and freely accessible optical measuring area without moving parts or collection bucket
- Durable – continuous and precise precipitation data in all environmental and weather conditions. Integrated overvoltage protection
- Economical in use – economic electronics and galvanically separate, controllable head heating, giving power supply that is flexibly designed and with minimal energy consumption
- Convenient – integrated USB port configuration and online monitoring using a laptop
- Flexible – standard ports RS 485, SDI-12 and impulse for connecting to a datalogger, automatic weather station (AWS) or PC
- Transparent – control LEDs for showing function, measurement, communication and status
- Thought-out – integrated push-in connection for connecting the electrical supply and data ports
- Cleverly designed – robust aluminium housing and symmetrically arranged measuring heads whose design prevents dripping in the direction of the laser band



Advantages and application possibilities

- Detailed recording and analysis of precipitation type, amount and distribution
- Disdrometer in the premier class – homogenous laser band guarantees exact raw data of the captured precipitation over the complete area of the laser band
- Maintenance free alternative to tipping bucket rain gauges – continuous precipitation measurement without delays with pulse output of the precipitation amount (0.1/0.01 mm)
- Conforms to WMO – measurement accuracy for liquid precipitation meets the WMO recommendation of ±5% in the intensity range of 0.001 to 1,200 mm/h
- Present Weather Sensor – classifies the precipitation round the clock and automates the tasks of a synoptic observer
- Can be used as a maintenance free, autonomous system or as part of an unmanned weather station



Multifunctional, flexible and easy to operate

Ports

OTT Parsivel² communicates using several output ports: Precipitation intensities are provided via the pulse output, present weather data via SDI-12 and complex spectral information via RS-485. With the help of the operating and monitoring software ASDO, the user can configure and optimize the data output in accordance with the respective application case. Thanks to the USB port integrated into the device base, a laptop can be connected in no time.
Power supply and output ports can be connected conveniently and service-friendly via a device connector.



One device – five system solutions

Precipitation

Parsivel² determines the precipitation intensity from only 0.001 mm/h. With the integral volume equivalent of all particle sizes classified per time unit, it calculates the volume and intensity of the precipitation that has fallen and takes account of physical aspects in the process, such as droplet model and differentiated precipitation densities. This leads to particularly precise results, even with mixed precipitation.
With the values measured for size and velocity of the individual particles, the Parsivel² also determines the composition of the precipitation and records it statistically.

Monitoring of road conditions

Heavily localized precipitation can lead to aquaplaning or packed snow. To prevent accidents, fast traffic warning and control systems are necessary. Precipitation amount, hydrometeor composition and atmospheric visibility are of significant importance in these systems. Parsivel² is an intelligent sensor that measures all these values.



Flood early warning



To be able to warn of impending flooding in a timely way, it is necessary to measure the amount and spatial distribution of precipitation quickly and exactly. This goal is achieved with a combination of weather radar measurements (spatial information with reduced accuracy) and ground-based disdrometer measurements.
Parsivel² does not only provide the droplet size distribution on the ground (S), but also calculates all relevant ground data for deriving the local Z/R and Z/S ratios, such as precipitation rate (R) and the radar reflectivity (Z). These values can be used immediately to adjust the weather radar data and thus to optimize the intensity forecast in the spatial development of the precipitation event. Combined with water level sensors and drainage modeling, Parsivel² is thus the central component for a modern, high-performance, regional, flooding early warning system.

Present Weather Sensor (PWS)

Parsivel² classifies the current weather and the precipitation types (rain, drizzle/rain, snow, hail and sleet) according to an international weather code, which was originally introduced by the WMO. For unmanned weather stations, the automatic, reliable and unique identification of the current precipitation event is necessary. Parsivel² determines the atmospheric visibility in any weather, as well as the type, amount and composition of the precipitation.



Monitoring of disposal locations

Parsivel² calculates the distribution of kinetic precipitation energy and outputs it. Together with precipitation data and other parameters such as ground state or relief, the precipitation energy is decisive for the effect of the rain on the ground and an important input for erosion models.

OTT ASDO user software

The convenient operating and monitoring software OTT ASDO is available in two versions:

— Basic version for setting all system parameters for startup and for online recording and visualization of the data (supplied)

— Full version with integrated database for automated, convenient online operation. The measured values are saved on a PC with the help of the software at set intervals.



Technical data

Optical sensor, laser diode
- Wavelength: 780 nm, Output rating: 0.5 mW
- Laser class: 1 (21 CFR 1040.10 and 1040.11) 1 (IEC/EN 60825-1 A2:2001)

Measuring area
180 x 30 mm (54 cm²)

Measuring ranges
- Particle size: liquid precipitation: 0.2 … 5 mm solid precipitation: 0.2 … 25 mm
- Particle velocity: 0.2 … 20 m/s

Classification
- 32 size and 32 velocity classes
- Measurement accuracy1): ± 1 size class (0.2 … 2 mm) ± 0.5 size class (> 2 mm)

Types of precipitation
8 precipitation types (drizzle, drizzle/rain, rain, mixed rain/snow, snow, snow grains, sleet, hail)

Differentiation of precipitation types
Sleet, rain, hail, snow > 97 % (compared to synoptic observer)

Precipitation intensity
0.001 ... 1,200 mm/h

Accuracy precipitation amount[1)]
±5 % (liquid) /±20 % (solid)

Kinetic energy
0.001 … 30 KJ

Reports
WMO 4680/4677 (SYNOP), 4678 (METAR/SPECI) and NWS tables

Visibility in precipitation (MOR)
100 … 5,000 m ± 10%

Radar reflectivity Z
9.9 ... 99 dBz ±20%

Measurement interval
10 seconds to 60 minutes

Power supply
- Electronics: 10 ... 28 VDC
- Heating: 12/24 VDC

Current consumption
- Electronics: 1.5 W (60 mA@24 VDC)
- Heating: 50/100 W (4A@12/24 VDC)

Overvoltage protection
EN 61000-4-2/4/5/6 (4 kV and 10 V/m), integrated for power supply and interface circuit

Ports (configurable)[2)]
- RS-485 for all values incl. spectral data (1,200 ... 57,600 baud)
- SDI-12 for calculated values
- Opto relay output, bounce-free, for pulse output of the precipitation amount: 0.1 mm (2 Hz)/0.01 mm (20 Hz) Voltage: max. 28 VDC Current: max. 120 mA, short-circuit proof
- USB 2.0 for PC connection (configuration and service)

Material
Seawater-resistant aluminium

Weight
6.4 kg

Dimensions (H x W x D)
670 x 600 x 114 mm

Environmental conditions
- – 40 … +70 °C
- 0 … 100 % relative humidity

Protection
IP 65

Installation
2 inch pipe, Ø 50 … 62 mm

EMV / EMI
- EN 61000-4-3, CE conformity
- EN 55022 class B, CE conformity

[1)] Proof under laboratory conditions using an OTT test system with reference particle simulation of 0.5 mm, 1.0 mm, 2.0 mm and 4.0 mm

[2)] ASDO configuration software supplied (basic version)

Hydromet

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