



Present weather observations

Patented laser based unparalleled accuracy measurement system

Overview

The PWS100 provides automatic present weather observations with unparalleled accuracy using a patented laser based measurement system; reports present weather, visibility, precipitation data or raw signal.

Most optical precipitation devices detect the light scatter or occlusion of a particle passing through a single light sheet, as received at a single detector. The PWS100 uses a patented four light sheet, two detector system which gives much greater detail about the particle.

A single beam system cannot directly measure the vertical velocity and size of a falling hydrometeor but only infers them based on the duration and signal pattern detected and assumptions regarding the relationship between them. It's a two dimensional view of a three dimensional phenomenon. The PWS100's unique four layer measurement volume allows direct measurements of velocity as falling particles pass through each light sheet in turn (see Figs a and b) and direct measurement of particle size. As a consequence the PWS100 is better able to distinguish between rain and drizzle.

With four light sheets rather than the usual one the PWS100 is also able to discriminate more clearly between polycrystalline precipitation and rain. The random scatter caused by polycrystalline particles generates a distinct "pedestal" in the received signal (see Fig c). The size of the fluctuations as particles pass in relation to the size and shape of this pedestal allows the PWS100 to distinguish with greater confidence between types of frozen precipitation.

With the addition of an optional temperature and relative humidity sensor the PWS100 is both a reliable distrometer, reporting particle size, velocity and type and a consistent and dependable present weather sensor.

The PWS100 complies with ICAO and CAA guidance and meets or exceeds all recommendations and specifications (this includes ICAO 9837, ICAO Annex 3, CAP437, CAP670 and CAP746).

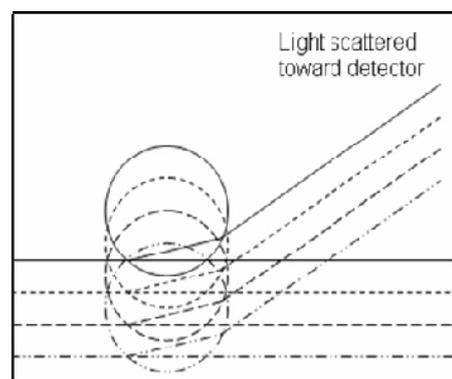


Fig a - A simplified illustration showing how a direct measurement of velocity is possible simply by timing a falling particle as it passes through successive light sheets

Benefits and Features

- › Patented four beam, two receiver system directly measures hydrometeor size and velocity
- › Identifies 9 basic precipitation types including: drizzle, hail, snow and snow grains
- › Reports MOR visibility in range 0-20,000 m with programmable alarm
- › Supports 58 WMO present weather codes, 10 NWS codes and associated METAR codes
- › Detects hydrometeors between 0.1 and 30 mm diameter
- › Reports particle size distribution to below 0.5 mm
- › Open data access - raw data set available as well as processed output
- › Integrated dew heaters, hood heaters and built-in dirty window detector
- › Input for optional temperature and RH sensor or temperature and RH data from an external system for enhanced precipitation classification
- › Unique calibration kit available to calibrate particle size and speed measurement to give confidence in reliable measurement of present weather parameters.

Typical Applications

- › National weather networks
- › Environmental monitoring
- › Automatic weather stations
- › Road weather monitoring
- › Airport weather monitoring
- › Soil erosion studies
- › Weather radar calibration

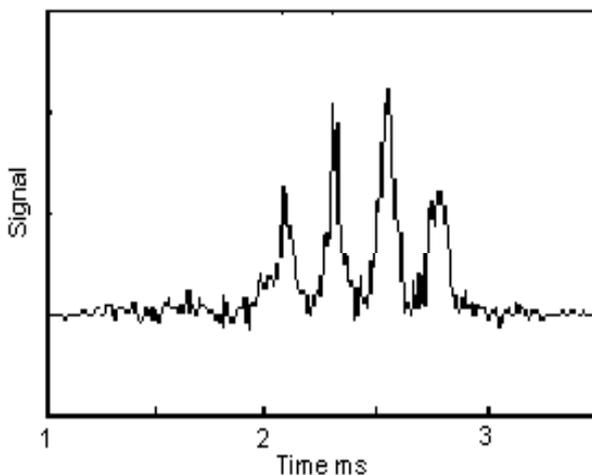


Fig b - The scatter signal detected from a raindrop falling through the sample area

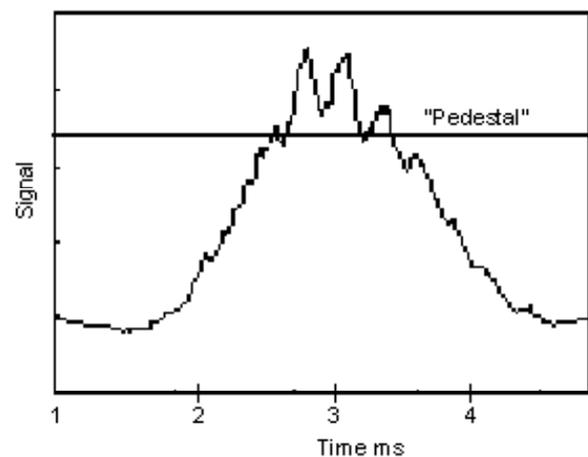
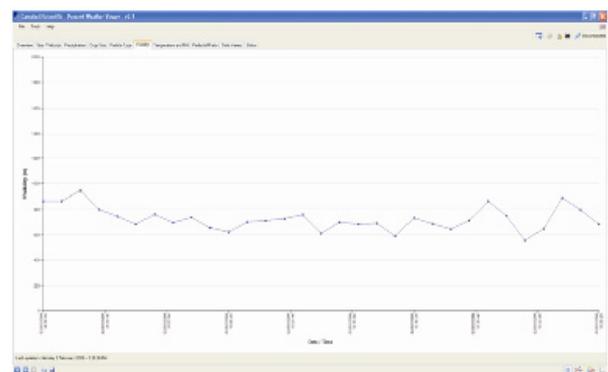


Fig c - The scatter signal detected from a snowflake falling through the sample area

Visibility

The PWS100 determines visibility by monitoring the background signal coming from the measured volume. Once again having four light sheets reaps rewards because it means the background signal is stronger and more even than would be the case using a single beam, this improves the consistency of visibility measurement. The software is set to report meteorological optical range (MOR) in the range 0 to 20 km.



PWS100 Viewer - Visibility

Open data access

As a research grade instrument, the PWS100 makes available the complete particle size and velocity raw data set as well as the processed output allowing customers to apply their own algorithms or calibrations.

Calibration

The PWS100 can be checked in the field with a unique calibration device, PWC100, which not only simulates visibility but also checks particle size and velocity measurements.



Fig d - Unique particle size/velocity calibrator

Maintenance

With the lenses protected by baffles and integrated dew heaters the PWS100 is designed to keep maintenance visits to a minimum. As with all optical sensors, we recommend regular lens cleaning. The PWS100 has an integral dirty window detector, to show when this is required.

PWS Viewer – Free sensor interface software

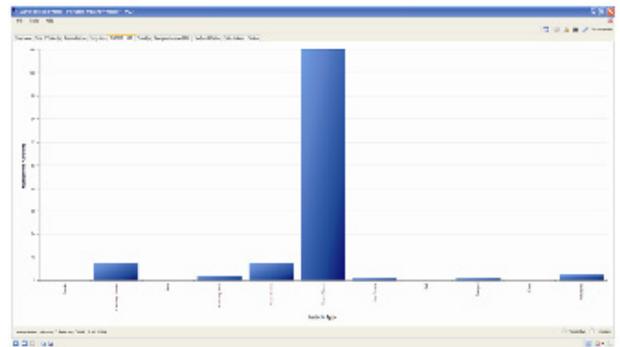
The PWS100 is supplied with its own viewing software which provides an interface to the sensor for set-up as well as providing graphical displays of the sensors output.

The main overview page displays all the other screens which can be accessed by either clicking on the images or on tabs along the top. Graphs are provided for particle size/velocity, precipitation intensity and accumulation, drop size, particle type, visibility, temperature and relative humidity, pedestal ratio, data values and status.

Sensor set-up allows changes to the date and time, sensor ID and password, weather parameters such as alarms and allows modification of the sensor messages. In addition the viewer provides a terminal emulator for direct connection to the sensor and has an options tab to set-up the interface.



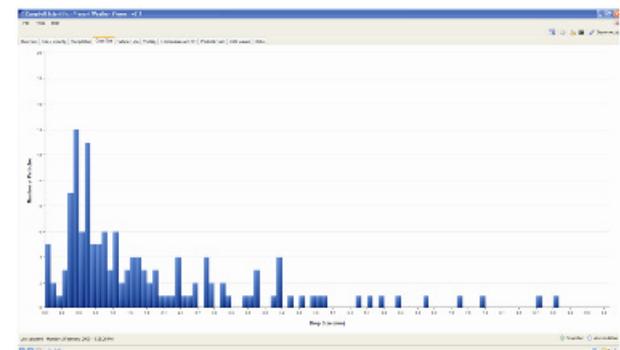
PWS100 Viewer - Size/Velocity



PWS100 Viewer - Particle Type



PWS100 Viewer - Overview



PWS100 Viewer - Drop Size

Specifications

Measurement:

- › Particle size: 0.1 mm to 30 mm diameter
- › Particle size distributions to below 0.5 mm
- › Particle size accuracy: $\pm 5\%$ for raindrops > 0.3 mm, < 3 mm diameter*
- › Detection threshold: > 0.02 mm hr⁻¹
- › Particle velocity: 0.16 ms⁻¹ to 30 ms⁻¹
- › Rain intensity range: 0 to 999.9 mm h⁻¹
- › Rain intensity accuracy: $\pm 10\%$
- › Accumulation accuracy: $\pm 10\%$
- › Visibility range: 0 to 20,000 m
- › Visibility accuracy: $\pm 10\%$ to 10,000 m
- › Visibility resolution: 1 m

Data Output:

- › Precipitation type
TYPES OF PRECIPITATION DETECTED: Drizzle, Rain, Snow Grains, Snow Flakes, Hail, Ice Pellets, Graupel, Freezing Rain, Freezing Drizzle and mixtures thereof.
- › Particle velocity distribution
- › Particle size distribution
- › WMO (Table 4680) Present Weather Codes (58 supported)
- › NWS codes with intensity characteristics (10 supported)
- › Associated METAR codes including intensity, freezing and mixtures
- › Precipitation intensity and accumulation
- › Visibility
- › Visibility Alarm (programmable)
- › Extensive status information

Physical:

- › Measuring area: 40 cm²
- › Standard operating temperature range: -25 °C to $+50$ °C (extended range: -40 °C to $+70$ °C)
- › Relative humidity range: 0 to 100%
- › IP Rating: IP 66 (NEMA 4X)
- › Housing materials: Aluminium. Outer parts treated and powder coated white.
- › Weight: 8 kg excluding mounting pole and AC power supply
- › Shipping weight: 20.4 kg (45 lbs)
- › Shipping dimensions: 1200 mm x 890 mm x 420 mm
- › Dimensions: 1150 mm x 700 mm x 400 mm
- › Mountings: Stainless steel quick release clip on V-bolt mounting to pole (diameter 32 mm to 52.5 mm)
- › 10 metre cables supplied

Electrical:

POWER REQUIREMENTS:

DSP Power 9-28V D.C. (200 mA - 1A)

Hood heaters 24V A.C. or D.C., 7 A (separate supply)

Optional power supplies with battery back-up available

Configurable low-voltage shutdown to protect back-up batteries

- › Laser source: 830 nm diode. Class 1M unit output. Collimated beam output.

NOTE: Viewing the laser output with optical instruments designed for use at a distance may pose an eye hazard.

- › Laser safety compliance to: EN60825-1:2001
- › Receivers: Photodiode with band pass filters

Communications:

Communication: RS-232, RS-422, RS-485. Baud rate selectable from 300 to 115,200 bps

Accessories:

- › External temperature/RH sensor
- › Size, velocity and visibility calibrator
- › PWS power supply unit
- › WMO compliant optical mast
- › ICAO compliant frangible masts for aviation use
- › Ethernet converters and modems are available.

*Accuracy figures are for laboratory conditions for liquid particles

