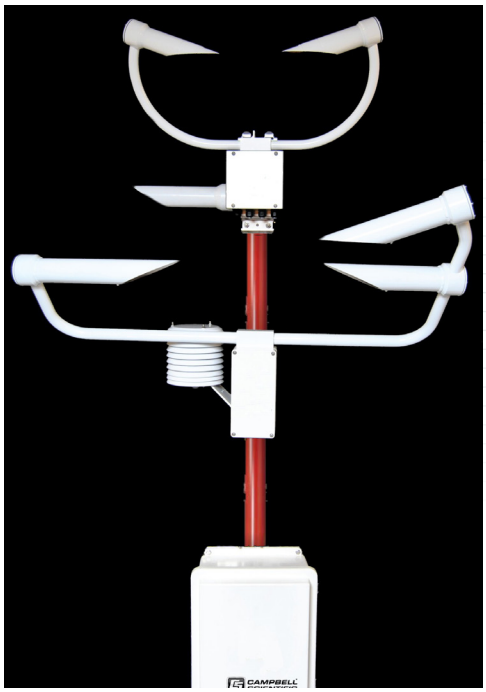
CAMPBELL SCIENTIFIC
WHEN MEASUREMENTS MATTER

AVM200

Visibility and Present Weather Sensor



Fully integrated visibility and present weather for aeronautic and synoptic applications

Overview

The Campbell Scientific Visibility and Present Weather Sensor AVM200 is designed for meteorological applications such as Runway Visual Range (RVR), present weather observation and aeronautical/synoptical visibility. It is a high-grade, combined RVR, visibility and present weather sensor delivering multi-parameter measurement in one single system. It reports present weather and precipitation data (including obscuration, precipitation type and intensity), visibility up to 75 km, background luminance (optional) and raw data.

The AVM200 complies with ICAO and CAA guidance and meets or exceeds all recommendations and specifications (including ICAO 9837, ICAO Annex 3, CAP437, CAP670 and CAP746).

Benefits and Features

- High performance sensor combining RVR, visibility and present weather detection in a single system.
- Uses established 42° scatter angle for good MOR readings in all precipitation types.
- Can be used in aeronautical and meteorological applications.
- Patented four beam laser system directly measures hydrometeor size and velocity.
- Supports WMO SYNOP present weather codes, NWS codes and associated METAR codes.
- Meets ICAO, CAA and WMO specifications.
- Very low maintenance requirements.
- Incorporates both dew and hood heaters for all-weather operation.
- Field calibratable.
- Meets ICAO frangibility standards.
- Lens contamination detection and correction.
- Open data access – raw data set available as well as processed output.
- Accurate and traceable measurement.

Scientifically Valid Chain of Calibration

Every AVM200 calibration device is traced to a reference CS120A visibility sensor, which is in continuous operation at Campbell Scientific's outdoor test field along with other reference instrumentation. The visibility measurement of the AVM200 is traceable to a CAA-approved sensor installation at an international airport.

High-Grade Performance and Reliable Operation in the Harshest Weather Conditions

The AVM200 is designed to ensure reliable operation in extreme weather conditions. The individual elements of the system have a set of unique design features, such as multi-layer scanning or downward pointing hoods to mention just two, that help reduce the risk of contamination of the optics and blockage with snow. This design also makes it easier to install without being affected by stray lights. Interference to the sample volume from the sensor by flow distortion or heat is also minimised. The system incorporates low power dew prevention heaters as well as higher power anti-icing heaters for the hoods as standard. These heaters are automatically controlled to ensure operation in all weathers or can be disabled to save power.

The AVM200 is unique in its design in that both of the sensor elements are capable of providing visibility and present weather data independently. This feature represents an element of system redundancy and makes the system uniquely resilient and robust.

Unparalleled Accuracy in Present Weather Detection and Visibility Measurement

The AVM200 provides automatic present weather observations with unparalleled accuracy using a patented laser based measurement system and 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 AVM200 uses a patented four light sheet, two detector system which gives much greater detail about the particle. As a consequence the AVM200 is not only better able to distinguish between rain and drizzle, but it also able to distinguish more clearly between polycrystalline and liquid precipitation.

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 AVM200s 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.

With four light sheets rather than the usual one the AVM200 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 AVM200 to distinguish with greater confidence between types of frozen precipitation.

With the addition of a temperature and relative humidity sensor the AVM200 is both a reliable distrometer, reporting particle size, velocity and type and a consistent and dependable present weather sensor. It uses continuous high speed sampling to reduce errors during mixed weather events and events that return intermittent signals, such as rain and hail, while still providing reliable readings during more stable

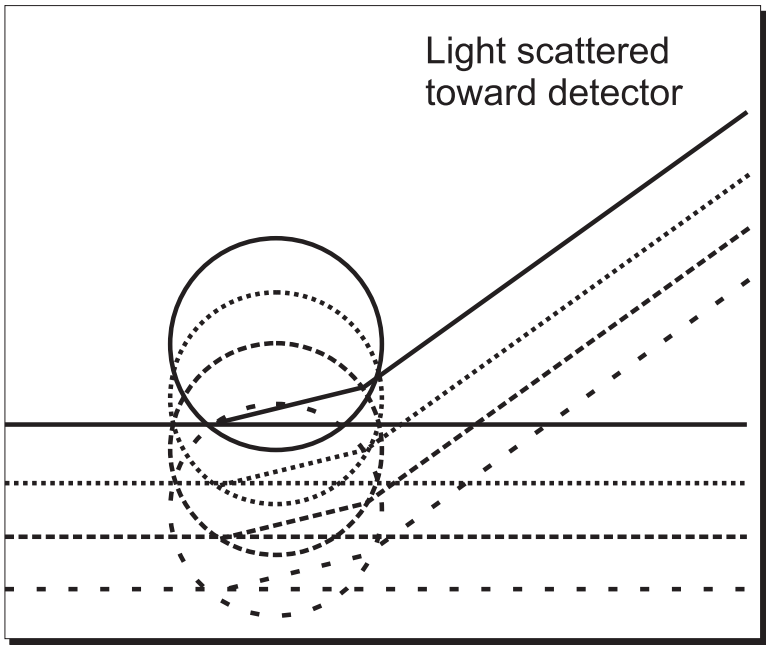


Fig a - A simplified illustration showing how a direct measurement of velocity is possible simply by timing a falling particle as is passes through successive light sheets

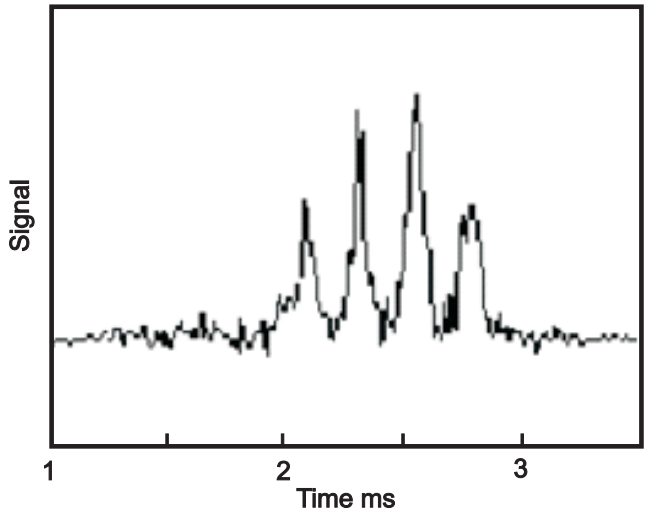


Fig b - The scatter signal detected from a raindrop falling thorugh the sample area

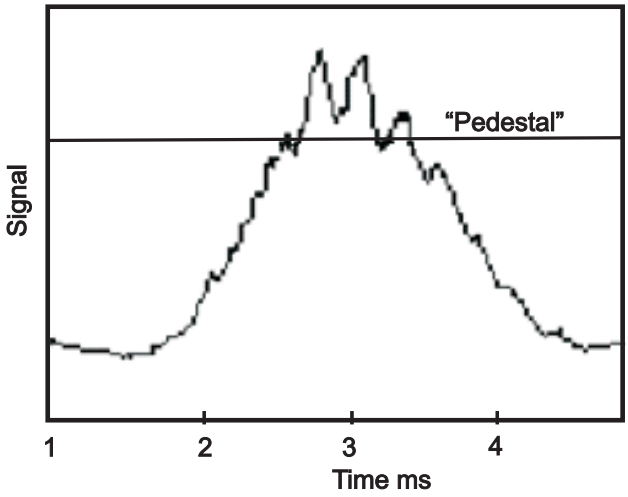


Fig c - The scatter signal detected from a snowflake falling through the sample area

events such as fog and mist. The inclusion of our T & RH sensor provides temperature and relative humidity data in the same data stream as the visibility and present weather data.

The AVM200 uses the well-established infrared forward scatter technology for visibility measurement, utilising a 42° scatter angle which gives accurate readings Meteorological Optical Range (MOR) for all precipitation types.

The AVM200 combines Campbell Scientific's unique technology of the widely-used and renowned Present Weather & Visibility Sensors (PWS100, CS125 and CS120A), thus relying on a combination of independent sensing techniques and fine-tuned algorithms to provide unparalleled visibility and present weather detection. The technology used in all of three of these sensors has been subjected to various national and international intercomparison studies and shown to be reliable and accurate.

Reduced Maintenance and Calibration

The AVM200 is modular in design and incorporates sophisticated self-diagnostics, which keep maintenance and service visits to a minimum and very short duration. The visibility measurement sensor, present weather detector and optional background luminance sensor are independent instruments that can be replaced rapidly as pre-calibrated spare parts; crucial for when service visits have to be as brief as possible. The AVM200 also includes an integral system that detects and compensates for lens contamination; a feature that can also send an alarm when the lens is contaminated and needs to be cleaned, thus keeping intervals between service visits as long as possible.

Calibration can easily be checked in the field with an optional automatic calibration fixture. This uses unique calibrator devices with a simulated raindrop and scatter disk to check particle and visibility measurement.

Technical Compatibility

The AVM200 is compatible with the CS120A, CS125 and PWS100 and can be used to replace any of these sensors. They provide the same mechanical, electrical and communication interfaces and can output the message formats that are commonly used in aviation and meteorology.

Accessories and Options

- Calibrator sets
- Background luminance sensor
- Battery backup
- Modem for long distance communications
- Obstruction light
- WMO compliant optical mast
- ICAO compliant frangible mast
- Maintenance cable
- Optional Ethernet output

Technical Specifications

Visibility (Meteorological Optical Range)

- Measurement range (MOR): 0 m - 75,000 m
- Accuracy:
  - <600 m ±8%
  - 600 – 10,000 m ±10%
  - 10,000 – 15,000 m ±15%
  - 15,000 – 75,000 m ±20%
- Scatter measurement accuracy: ±2.5%

Optical

- Operating principle: Forward scatter measurement
- Scattering angle: 42°
- Light source: Near infrared LED

Present Weather

- Precipitation types detected:
  9 different types (drizzle, rain, snow grains, snow flakes, hail, ice pellets, graupel, freezing rain, freezing drizzle and mixtures thereof)
- Reports:
  WMO 4680 (SYNOP), 4678 (METAR) and NWS codes
  58 different codes supported in the WMO 4680 code table
- Precipitation detection intensity: 0-999 mm/h
- Precipitation detection sensitivity: 0.01 mm/h in 1 minute

Electrical

Power Requirements:

- DSP Power: 9-28V D.C.
- Hood heaters: 24V A.C. or D.C., 7 A (separate supply)
- Optional mains power supplies with battery back-up available.

Mechanical

- Dimensions:
  2.8 m x 1 m x 1 m (with ICAO compliant frangible mast
- Weight:
  55 kg (with ICAO compliant frangible mast)
- Mast:
  Frangible and hinged fibre mast

Operational

- Operating temperature: -25 to +60°C
- Extended operating temperature: -40 to +70°C option
- Operating humidity: 0-100%
- Wind speed: up to 60 m/s
- Sensor sealing: rated to IP66
- Interfaces:
  RS232, RS485, RS422, Ethernet (Optional)
- Baud rate:
  selectable from 300 bps to 115.2kbps