CES180
Thermopile pyranometer

CES180 is a class I WMO pyranometer, equipped with a type white and black and single cup thermopile sensor. It is designed for highly accurate measurement of the global solar irradiance (direct and scattered) on a plane surface .It covers spectral bandwidth from 300 to 3000 nm and is fully compliant with the standards ISO 9060 and IEC 60904.

The pyranometer CES180 can be used in combination with a second pyranometer to measure albedo (albedopmeter) or in inverted position to measure soil reflected solar radiation

Benefits

High measurements quality

- Spectral bandwidth covers the global irradiance from 300 to 3000 nm
- Unresponsive to azimuth effects
- Very good cosine response
- Unresponsive to infrared radiation beyond 4µm

Excellent reliability

- Embedded spirit level in the sensor
- Exceptional leveling accuracy
- Power supply is provided by the acquisition unit

Robustness

CES180 is designed for continuous outdoor use

- Light alloy anti-corrosion deep anodized body
- Screen shield : light and white coated alloy
- Anti-scratching made up material cup
- Tightness IP67: apparent desiccant supplied in a receptacle
- Lightning: surge protection mechanism

- MTBF > 10 years

Very low maintenance

- Periodic cleaning of the disc and cup as soon as they are dirty
- Dessicant level control through its transparent receptacle

Measurement principle

- The sensing element is a « black and white» thermopile, sensitive to the entire solar flux
- The thermopile is housed (to prevent it from dust) under a mono-cup glass dome. ensuring a large spectral bandwidth (from 300 to 3000 nm)
- The mono-cup technology prevents from the cosine effects showing up in double cups systems because of the reflection between cups
- The pile consists of 64 copper- constantan thermocouples connected in series , set radially on a ceramics support and covered with a highly stable paint (black and white)
- The incident radiation (direct and scattered) passes through the transparent dome without distortion and heats the thermopile. The spectral range (300 to 3000 nm) represents 99% of the total solar radiation
- The pile detects the temperature divergence between black and white parts and converts it (with a temperature correction) into an analog current

Operation

CES180 has been designed specifically to be mounted on Cimel's automatic weather stations, operating with Cimel's MicroAmps technology

- The sensor is powered with the weather station acquisition unit and provides an analog voltage with a very low power consumption
- It is provided with a support plate, a screw system and a bubble level to instate the device horizontality

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- A white thermal screen protects the body of the pyranometer in order to limit its temperature variations
- A drying cartridge keeps the device interior free from humidity
- A ventilation unit can be used to prevent from dew point, snow and ice accumulation that disrupt the measurement (ventilation unit needs to be connected to the main power)

Technical features

Measures	Distorsion	<0,1%
	Spectral range	300 to 3000 nm
	Measurement range	0 to 2000W /m^2 (linear up to 4000 W/m^2)
	Sensitivity	12µV/W/m^2
	Impedance	About 70Ω
	Accuracy and linearity	1% for the whole measurement range
	Azimutal effect	Neglegable
	Cosine and azimut response	None
	Sensitivity temperature coefficient	20.10^{-6}/C°
	Response time at 99%	30s (5s at 1/ε)
	Time irradiance calculation	80 to 120 W/m^2
Output signal	Connection	Plug and 3m max cable
Power		Digital 0-25mV
Environment	Temperature range	-40°C to +80°C
	Humidity range	From 0 to 100% HR
	Irradiance	4kW/m^2
		Tightness IP67 : apparent dessicant supplied in a receptacle

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	Protection	Lightning: surge protection mechanism
General	Shim stock	With bubble level and screws system
	Body	Light alloy anti-corrosion deep anodized
	Thermal screen shield	Light and white painted alloy
	Base diameter	120 mm
	Height	74 mm
	Weight	600g

Implementation

Pyranometer mounted on a tubular arm on an automatic weather station