Pyrheliometers

For unattended direct normal incidence solar radiation measurement

Solar rays travelling through our atmosphere are absorbed and scattered, resulting in different components of solar radiation reaching the Earth's surface. The direct component travels in a straight beam from the sun. Diffuse components come from all directions, due to atmospheric scattering processes.

A pyrheliometer is an instrument designed specifically to measure the direct beam solar irradiance with a field of view limited to 5 °. This is achieved by the shape of the collimation tube, with precision apertures, and the detector design. The front aperture is fitted with a quartz window to protect the instrument and to act as a filter that passes solar short-wave radiation between 200 nm and 4000 nm in wavelength.

The Kipp & Zonen CHP1 pyrheliometer is an all-weather instrument for the continuous measurement of direct solar radiation and exceeds the specifications for high end networks, such as the Baseline Surface Radiation Network (BSRN). These networks need accurate and reliable long-term measurements for climate change investigations and validating satellite data (ground-truthing).

The SHP1 is the world's first smart pyrheliometer with built-in intelligence. Building on the proven CHP1 design and measurement technology it adds digital signal processing to improve performance and interfaces optimised for industrial data acquisition and control systems. The fast response time and individual temperature correction make it the best ISO First Class pyrheliometer available.

Good quality Direct Normal Incidence (DNI) irradiance data is often needed in the renewable energy sector, in particular for concentrating systems (CPV and CSP). For example, when 'prospecting' for sites to locate solar farms the incoming energy available throughout the year is a key part of the decision making process.

Pyrheliometers must be pointed accurately at the sun at all times and Kipp & Zonen automatic sun trackers are specifically designed for this purpose.

CHP1

CHP1 exceeds ISO performance criteria for First Class Normal Incidence Pyrheliometers. Every CHP1 is calibrated upon manufacture, and is supplied as standard with a WRR (World Radiometric Reference) traceable calibration certificate.

Thanks to the superior mechanical design, CHP1 offers excellent performance under any atmospheric condition. The zero offsets have been reduced to a minimum and the temperature response is limited to just ± 0.5 % between -20 °C and +50 °C. The rain shield protects the window and there are integrated alignment aids.

Both Pt-100 and 10 K thermistor temperature sensors are fitted as standard, to allow use of the individual temperature response data supplied with each CHP1, and for easy connection to any type of data logger.

Thanks to the signal cable connector and screw-in desiccant cartridge the instrument is easy to install and maintain.

Specifications	
Classification to ISO 9060:1990	First Class
Spectral range (50 % points)	200 to 4000 nm
Sensitivity	7 to 14 µV/W/m²
Impedance	10 to 100 Ω
Expected output range (0 to 1500 W/m²)	0 to 20 mV
Maximum operational irradiance	4000 W/m²
Response time (63 %) (95 %)	< 1.7 s < 5 s
Zero offset (b) temperature change (5 K/h)	 < 1 W/m²
Non-stability (change/year)	< 0.5 %
Non-linearity (100 to 1000 W/m²)	< 0.2 %
Spectral selectivity (350 to 1500 nm)	< 1 %
Temperature response	< 0.5 % (-20 °C to +50 °C)
Tilt response (0° to 90° at 1000 W/m²)	< 0.5 %
Field of view	5° ± 0.2°
Temperature sensor output	10 K thermistor and Pt-100
Required sun pointing accuracy	< 0.5° from centre
Detector type	Thermopile
Operational temperature range	-40 °C to +80 °C
Storage temperature range	-40 °C to +80 °C
Humidity range	0 to 100 % non-condensing
Ingress Protection (IP) rating	67

Part number	Instrument
0368900-032	CHP1 Pyrheliometer • 10 K + Pt-100 • 10 m cable
0368900-030	CHP1 Pyrheliometer • 10 K + Pt-100 • no plug, no cable
0368900-832	CHP1 Pyrheliometer • AMPBOX • 10 K + Pt-100 • 10 m cable
0368900-830	CHP1 Pyrheliometer • AMPBOX • 10 K + Pt-100 • no plug, no cable
Note: AMPBOX is adjusted so that 4 to 20 mA output = 0 to 1600 W/m²	

Part number	Accessories
2643960	Desiccant Refill Pack Contains 10 sachets
0999920-3	Extended Temperature Test for CHP1 Temperature response from -40 °C to +50 °C in 10 steps of 10 °C
0368700	Calcium Fluoride Window Kit Tube end-cap with Calcium Fluoride (CaF_2) window to replace standard end-cap with Quartz window. Spectral range 0.2 - 9.5 µm (50 % points)
Note: Calcium Fluoride is soft and slightly hygroscopic and is not suitable for continuous outdoor use	
Note: The CHP1 must be mounted on an automatic sun tracker such as the Kipp & Zonen SOLYS2, SOLYS Gear Drive or 2AP	

(*) This product will need to be registered by the end-user within 6 months of purchase to activate the warranty extension.

SHP1

SHP1 is a pyrheliometer for the measurement of direct solar radiation according to ISO 9060 First Class.

The SHP1 combines the CHP1 sensor technology with smart interface advantages, which makes the SHP1 the best commercially available First Class pyrheliometer.

The smart interface provides both analogue and digital outputs and individual correction for the temperature sensitivity of the detector from -40 °C to + 70 °C.

The improved response time and the standardised output make it easy to interchange instruments for recalibration.

SHP1 pyrheliometers have extremely low power consumption and operate from a wide range of supply voltages, making them ideal for power-critical applications.

SHP1 pyrheliometer is available in two versions, one has an analogue output of 0 to 1 V, the other is 4 to 20 mA. Both have a 2-wire RS-485 interface with Modbus® (RTU) protocol.

The included Smart Sensor Explorer software allows up to 10 smart radiometers to be connected to a Windows™ computer; for configuration, testing, read-out of settings and parameters and basic data logging functions.

Specifications	
Classification to ISO 9060:1990	First Class
Spectral range (50 % points)	200 to 4000 nm
Maximum operational irradiance	4000 W/m²
Analogue output • V-version Analogue output range	0 to 1 V -200 to 2000 W/m²
Analogue output • A-version Analogue output range	4 to 20 mA 0 to 1600 W/m²
Serial output	RS-485 Modbus®
Serial output range	-400 to 4000 W/m²
Response time (63 %) (95 %)	< 0.7 s < 2 s
Zero offset (b) temperature change (5 K/h)	 < 1 W/m²
Non-stability (change/year)	< 0.5 %
Non-linearity (100 to 1000 W/m²)	< 0.2 %
Spectral selectivity (350 to 1500 nm)	< 1 %
Temperature response	< 0.5 % (-30 °C to +60 °C)
Tilt response (0 ° to 90 ° at 1000 W/m²)	< 0.5 %
Field of view	5 ° ± 0.2 °
Temperature sensor output	10 K thermistor
Supply voltage	5 to 30 VDC
Power consumption	V-version: 55 mW A-version: 100 mW
Required sun pointing accuracy	< 0.5 ° from centre
Detector type	Thermopile
Windows™ compatible software	Smart Sensor Explorer Software, for configuration, test and data logging
Operational temperature range	-40 °C to +80 °C
Storage temperature range	-40 °C to +80 °C
Humidity range	0 to 100 % non-condensing
Ingress Protection (IP) rating	67

Part number	Instrument
0375900-102	SHP1-V Smart Pyranometer • 0 to 1 V version • 10 m cable
0375900-100	SHP1-V Smart Pyranometer • 0 to 1 V version • no plug, no cable
0375900-202	SHP1-A Smart Pyranometer • 4 to 20 mA version • 10 m cable
0375900-200	SHP1-A Smart Pyranometer • 4 to 20 mA version • no plug, no cable

Part number	Accessories
2643960	Desiccant Refill Pack Contains 10 sachets
0368700	Calcium Fluoride Window Kit Tube end-cap with Calcium Fluoride (CaF_2) window to replace standard end-cap with Quartz window. Spectral range 0.2 - 9.5 µm (50 % points)
Note: Calcium Fluoride is soft and slightly hygroscopic and is not suitable for continuous outdoor use	
Note: The SHP1 must be mounted on an automatic sun tracker such as the Kipp & Zonen SOLYS2, SOLYS Gear Drive or 2AP	

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