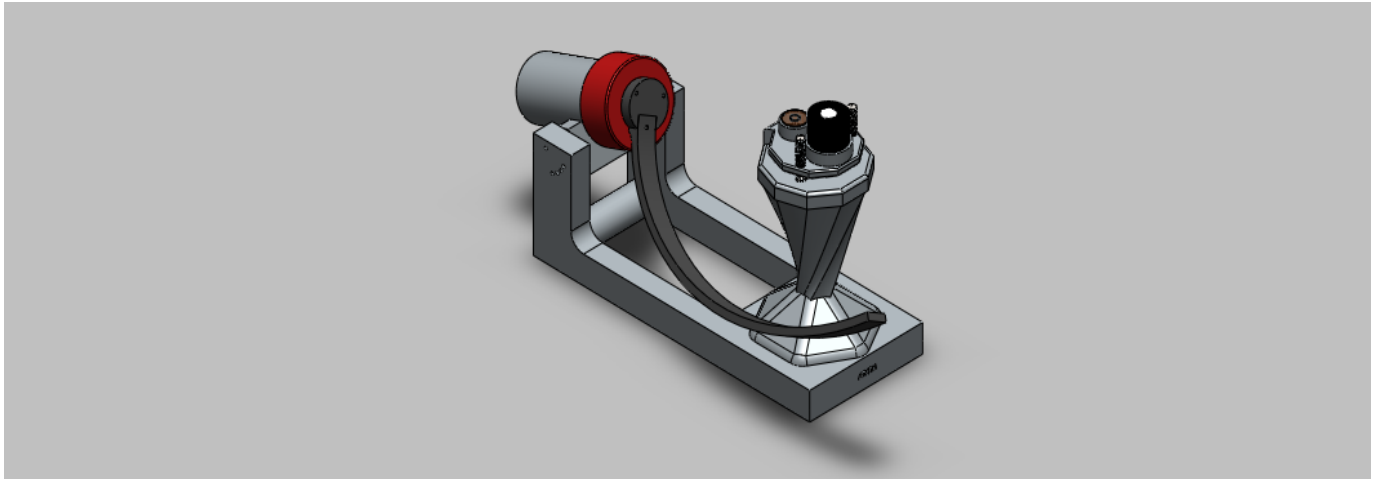




SUN TO MARKET SOLUTIONS



ARSIM Advanced Rotating Shadowband Irradiation Meter

Making more from the Sun

ARSIM is a Rotating Shadowband Pyranometer (RSP). This is an instrument that measures the solar irradiation as measured in watts per square meter. A RSP uses a Pyranometer that is regularly shaded to provide a reliable measurement of Global Horizontal (GHI), Direct Normal (DNI) and Diffuse Horizontal Irradiation (DHI).

Kinds of instruments to measure irradiation

The instruments designed to measure any radiation are called radiometers. This section summarizes the types of radiometers commonly used to measure solar radiation:

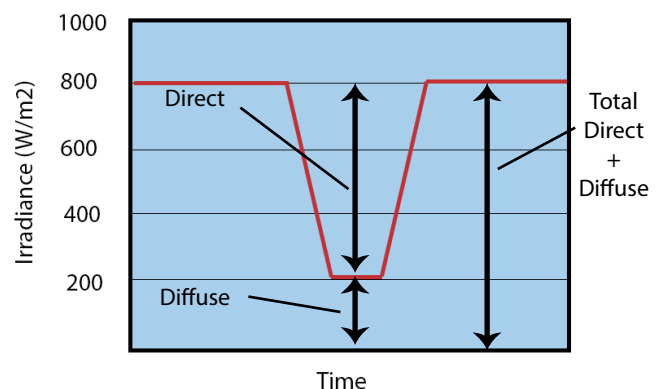
Radiometer Type	Measurement	FOV (full angle)	Installation
Pyrheliometer	DNI	5.7 degrees to 6.0 degrees	Mounted on automatic solar tracker for alignment with the solar disk
Pyranometer	GHI	2π steradians	Mounted on stable horizontal surface free of local obstruction
Pyranometer	DHI	2π steradians	Mounted on automatic solar tracker fitted with shading mechanism or on blocking DNI from detector surface
Pyranometer	POA	2π steradians	Mounted in the POA of the flat plate solar collector

Pyranometers and pyrhemometers normally use thermoelectric detectors and photodiodes to convert solar flux on a proportional electrical signal.

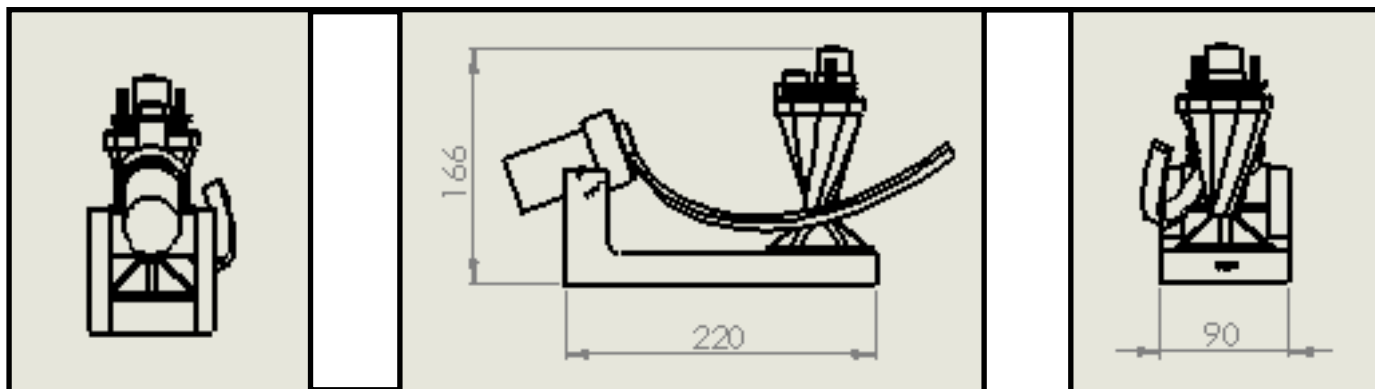
Rotating Shadowband Pyranometers (RSP) use a pyranometer that periodically is shaded from a band rotated by a motor. The RSP is constantly measuring GHI and during the

time when the pyranometer is shaded, it provides DNI and DHI out of algorithms.

ARSIM Output during Shadowband Motion



The graph illustrates the drop of the measurement when the shadowband moves over the sensor. This occurs once per minute. During this period the sensor signal is sampled. When the sensor is completely shaded from the sun, the instrument reads only the diffuse irradiance. The drop is processed to determine the direct irradiance. The global horizontal irradiance is measured only when the pyranometer is not shading.



Technical Specification

Calibration	Calibrated against a Reference RSP under natural daylight condition + Use of DLR's enhanced correction procedures. Typical error under these conditions is $\pm 2-3\%$	
Sensor LI-200SZ	Sensitivity	Typically $90 \mu\text{A}$ per 1000 W/m^2
	Stability	$< \pm 2\%$ change over a 1 year period
	Response Time	$10 \mu\text{s}$
	Temperature Dependence	0.15% per $^{\circ}\text{C}$ maximum
	Cosine Correction	Cosine corrected up to 80° angle of incidence
	Azimuth	$< \pm 1\%$ error over 360° at 45° elevation
	Tilt	No error induced from orientation
	Operating Temperature	-40 to $60 \text{ }^{\circ}\text{C}$
Total system operating temperature	-10°C to $+50^{\circ}\text{C}$. Including the motor, the mechanical part and the global pyranometer.	
Instrument enclosure	ABS motor enclosure and aluminium support	
ARSIM software	S2m Software license to control the motor and determine the global, diffuse and direct irradiance and ambient air temperature	



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