



SolarSAT solar irradiance sensors

SolarSAT is capable of determining the energy expected from a photovoltaic plant starting from the information about solar energy that effectively impinges on the PV panel. SolarSAT can evaluate such solar energy either by using solar irradiance data acquired in real time by satellites or by measuring it with a dedicated irradiance sensor.

The SolarSAT irradiance sensor, available in several versions, is installed at the PV plant and is managed by a SolarSAT data logger (SuperLog or LightLog models) which provides data acquisition and transmission to the SolarSAT control station via GPRS or Ethernet link.

**The robust and reliable
Silicon sensor for the
measurement of solar
irradiance on a PV plant**



**Solar irradiance sensor
SS-RAD-01-TC**

Working principle

A silicon solar cell can be used as an irradiance sensor, because the short-circuit current is proportional to irradiance. The sensors are built out of a monocrystalline solar cell connected to a shunt. Due to the low resistance of the shunt the cell is working near the short circuit. The sensors have an active temperature compensation (TC) that allows a high precision in measuring irradiance. The compensation is realized by using a specific temperature sensor laminated to the rear side of the solar cell.

Mechanical construction

SolarSAT irradiance sensors are built in several models, having internal or external power supply, with different output signals, among which an optional one is for the measurement of cell temperature.

The solar cell is embedded in Ethylen-Vinyl-Acetat (EVA) between glass and Tedlar. The laminated cell is integrated into a case of powder-coated aluminium. Therefore the sensor construction is comparable to that of a standard PV module. The electrical connection is realized by a waterproof (IP65) connector.

Calibration

All sensors are calibrated in simulated sunlight against a reference cell. The reference cell is calibrated against a secondary standard pyranometer (Kipp & Zonen, type CM 11), which is yearly recalibrated by using a DKD service (German Calibration Service). Once that the sensor is installed by the plant, the SolarSAT service also allows a periodical check of its calibration by comparison with satellite data.

Temperature measurement

Additionally to the irradiance measurement the sensors with the extension "-T" are able to measure the temperature of the solar cell, which is close to that of PV modules. Therefore a temperature sensor is laminated to the rear side of the cell.



General information

Solar cell	Monocrystalline Silicon (50 mm x 33 mm)
Current shunt	0,1 Ω (TC = 20 ppm / K) with 1 V output 0,12 Ω (TC = 20 ppm / K) with 10 V output
Operating temperature	- 20 °C to 70 °C
Electrical connection	done by a waterproof connector
Case, protection mode	Powder-coated aluminium, IP 65
Dimension, weight	145mm x 83mm x 39mm, appr. 250 g

Accuracy

Irradiance

Error with temperature compensation (*)	$\pm 5 \%$
Linearity of the electronic circuit	$\pm 0,3\%$ from reading for 50 to 1300 W/m ²

(*) compared to pyranometer within the temperature range of -20 °C to 70 °C

Temperature

Accuracy at 25 °C	$\pm 1,5 \text{ }^\circ\text{C}$
Linearity	$\pm 0,5 \text{ }^\circ\text{C}$
Error at minimum and maximum temperature	$\pm 2,0 \text{ }^\circ\text{C}$

Sensor types

Model	Supply	Irradiance			Cell temperature	
		Range	Output signal	Temperature compensation	Range	Output signal
SS-RAD-01-TC	Li internal battery	0 ÷ 1000 W/m ²	0 ÷ 1 V	yes	-	-
SS-RAD-01-TC-ext	5 ÷ 28 Vdc	0 ÷ 1000 W/m ²	0 ÷ 1 V	yes	-	-
SS-RAD-01-TC-T	5 Vdc $\pm 10\%$	0 ÷ 1000 W/m ²	0 ÷ 1 V	yes	-20 ÷ 100 °C	1,235V +T [°C] 10mV/°C
SS-RAD-10-TC	12 ÷ 28 Vdc	0 ÷ 1000 W/m ²	0 ÷ 10 V	yes	-	-