

Silicon Irradiance Sensors

for Measurement of Solar Irradiance



Application

IMT Solar is a world leader for both the development and production of silicon irradiance sensors used for solar irradiance measurement. Since 1994, we have manufactured thousands of sensors supporting applications for Photovoltaic (PV) installation monitoring, PV cell research and development, PV IV curve measurement, solar thermal installation monitoring and meteorological stations. Like other IMT equipment, the success of our silicon irradiance sensors is due to our dedication to deliver a product that is cost-effective, reliable, durable and accurate.

Function

Our sensors use a high-quality monocrystalline solar cell connected to a high accuracy shunt. The low shunt resistance causes the cell to operate close to the short-circuit point. To compensate for any possible measurement shifts caused by the temperature co-efficient relationship with the I_{sc} , all of our silicon sensors with the part number extension of "TC" employ active temperature compensation.

The compensation is realized by using a specific temperature sensor laminated to the rear side of the solar cell. One of the key elements of the electronic compensation circuit design is very low power consumption. The current consumption of our Si-01TC sensor which is powered by an internal Lithium battery is only about 15 μA .

IMT silicon sensors are manufactured in many different configurations to meet the monitoring requirements of almost any system. Sensors are available with an internal or external power supply, with both analog and digital (RS-485) output signals and with or without a sensor output for cell temperature. Sensors can also be purchased with a pre-connected cable or with standard industry connectors for a range of applications.

All sensors are calibrated in simulated sunlight against a reference cell of the same type. The reference cell calibration is periodically verified using a reference cell calibrated by Fraunhofer ISE, Freiburg.



Temperature Compensated Solar Irradiance Sensor
Model Si01TC-T-K. See additional models available on reverse.

Mechanical Construction

Our sensors are built using a powder-coated aluminum case sealed to IP 65. The solar cell is embedded in Ethylen-Vinyl-Acetate (EVA) between glass and Tedlar™. The laminated cell is integrated into a powder-coated aluminum case. This configuration of the sensor is comparable to that of a standard PV module making the sensor an ideal choice for irradiance monitoring of commercial PV installations.

The electrical connection for the sensor is realized by an integrated cable or an IP67 rated connector. A cable length of 3 meters is standard for most of our sensors, however other cable lengths can be provided.

Cell Temperature Measurement

Our silicon sensors with a "-T" extension to the part number provide an additional signal output representing cell temperature.

IMT Solar: North America

1801 North French Road
Amherst, NY 14068
Tel: 716 276 8466
Email: info@imtsolar.com
www.IMTSolar.com

INGENIEURBÜRO MENCKE & TEGTMEYER

Schwarzer Weg 43A 31789 Hameln, Germany
Tel: +49 (0) 5151/40 36 99-0
Fax: +49 (0) 51 51 /40 36 99-19
Email: info@ib-mut.de
www.ib-mut.de

www.imtsolar.com

Silicon Irradiance Sensor Specifications

General Information

- Solar cell: Monocrystalline Silicon (50 mm x 33 mm)
- Current shunt: 0.1 Ω (TC = 20 ppm / K) for 1 V and 20 mA output sensors
0.12 Ω (TC = 20 ppm / K) for 10 V output sensors, 0.1 Ω (TC = 30 ppm / K) for digital output sensors
- Operating temperature: -20 °C to 70 °C
- Electrical connection via shielded cable, length 3 m standard, or IP 67 rated connector
- Case, protection mode: Powder-coated aluminum, IP 65
- Dimension, Weight: 145mm x 86mm x 39mm, 340 g

Accuracy

Irradiance

- Error with temperature compensation compared to pyranometer within the operating range of -20 °C to 70 °C and vertically beam of irradiance: $\pm 5\%$
- Non-linearity of the electronic circuit: $\pm 0.3\%$ from reading for 50 to 1300 W/m²

Temperature

- Accuracy at 25 °C: $\pm 1.5\text{ °C}$
- Non-linearity: $\pm 0.5\text{ °C}$
- Error (over operating temperature range of -20 to -70°C): $\pm 2.0\text{ °C}$

Options

- Silicon sensor with shielded cable, 0.14 mm 2, UV- and temperature resistant
- Custom cable length
- Version with waterproof connector (Si-01TC always with connector)

Available Sensor Types

Part Number	Power Supply	Temp Comp	Output Format	Cell Temp Output
Si-01TC	Internal, battery	Yes	0-1V, 0-1000W/m ²	No
Si-01TCext	5-28V DC	Yes	0-1V, 0-1000W/m ²	No
Si-01TC-T	5-28V DC	Yes	0-1V, 0-1000W/m ²	Yes
Si-02	Not required	No	-60mV/1000W/m ²	No
Si-02-PT100	Not required	No	-60mV/1000W/m ²	Yes, PT100
Si-02-T	Not required	No	-60mV/1000W/m ²	Yes, KTY-81-210
Si-02-PT1000	Not required	No	-60mV/1000W/m ²	Yes, PT-1000
Si-10TC	12-28V DC	Yes	0-10V, 0-1000W/m ²	No
Si-420-TC	12-28V DC	Yes	4-20mA/0-1200W/m ²	No
Si-420TC-T	12-28V DC	Yes	4-20mA/0-1200W/m ²	Yes
Si-13TC	12-28V DC	Yes	0-10V, 0-1300W/m ²	No
Si-13TC-T	12-28V DC	Yes	0-10V, 0-1300W/m ²	Yes
Si-RS485-TC-T	12-28V DC	Yes	RS-485	Yes
Si-RS485 TC-2T-V	12-28V DC	Yes	RS-485	Yes

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