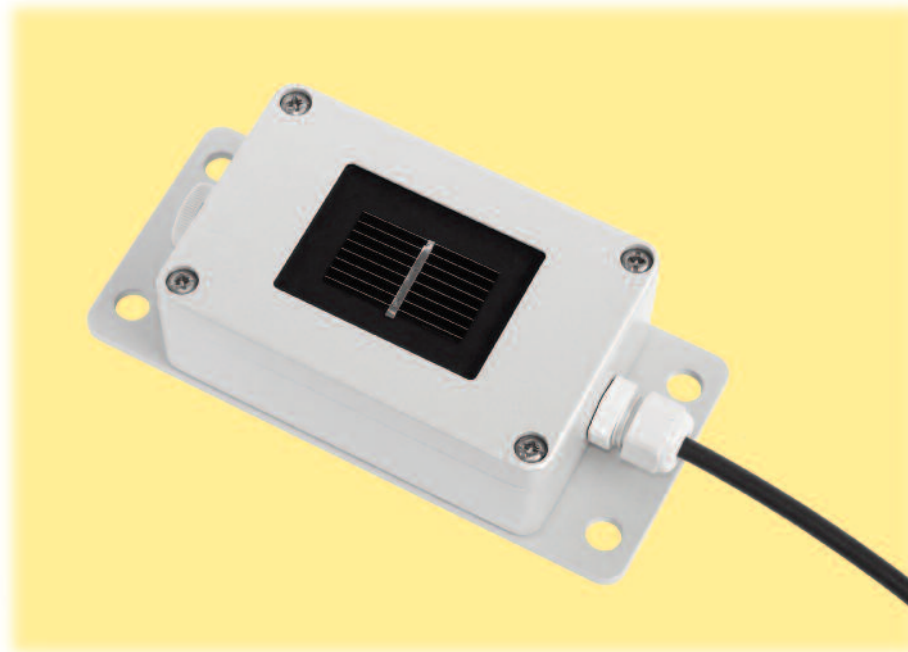


SILICON IRRADIANCE SENSOR

Measurement of Solar Irradiance

Since 1994 we have been developing and producing different types of silicon irradiance sensors. Until the year 2010 more than 18000 sensors were sold worldwide. Our silicon sensor is an affordable solution for measurement of solar irradiance. The powder-coated aluminium case in conjunction with the solar cell laminated between glass and Tedlar foil builds a very reliable and rugged sensor.



General Information

Mode of Operation

A silicon solar cell can be used as an irradiance sensor, because the short-circuit current is proportional to irradiance. Our sensors are built out of a monocrystalline solar cell connected to a shunt. Due to the low resistance of the shunt the cell operates next to short-circuit.

The temperature coefficient of the short-circuit current creates a small error. Therefore all of our silicon sensors with the extension „TC“ have an active temperature compensation, which reduces this error by factor 20. The compensation is realized by using a specific temperature sensor mounted to the rear side of the solar cell. The electronic circuit integrated has a very low power consumption. The current consumption of the SiS-13TC is only 90µA at an irradiance of 1000 W/m².

Our silicon sensors are manufactured in several types with an external power supply, with different output signals and with an optional sensor output for the cell temperature.

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

Mechanical Construction

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 3 m cable.

Optional Temperature Measurement

Additionally to the irradiance measurement our silicon sensors with the extension “-T” are able to measure the temperature of the solar cell. Therefore a temperature sensor is mounted to the rear side of the cell to detect the correct cell temperature.



Meßgeräte für die Solartechnik

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SILICON IRRADIANCE SENSOR

Technical Data

SI-SENSOR General information

- Solar cell: Monocrystalline Silicon (20 mm x 34 mm)
- Current shunt: 0,27 Ω (TC = 20 ppm / K) with 1 V and 20 mA output
- Operating temperature: -20 °C to 70 °C
- Electrical connection done via shielded cable, length 3 m
- Case, protection mode: Powder-coated aluminum, IP 67
- Dimension, weight: 138mm x 63mm x 40mm, appr. 440 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: $\pm 5\%$ at 1000 W/m²
- Non-linearity of the electronic circuit: $\pm 0,3\%$ from reading for 50 to 1300 W/m²
- Accuracy at 25 °C: $\pm 1,5\%$ °C
- Non-linearity: $\pm 0,5\%$ °C
- Error (over operating temperature range of -20...-70°C): $\pm 2,0\%$ °C

Temperature

Customs Numbers

for all silicon irradiance sensors: 85 41 40 90

Sensor Types:

Typ	Irradiance			Cell Temperature
	Power Supply	Temperature Compensation	Output Signal	Output Signal
SiS-01TCext	5 to 28 V _{DC}	Yes	0 to 1 V per 0 to 1000 W/m ²	./.
SiS-01TC-T	5 to 28 V _{DC}	Yes	0 to 1 V per 0 to 1000 W/m ²	1,235 V + T[°C]*10mV/°C
SiS-02	./.	No	appr. 60 mV per 1000 W/m ²	./.
SiS-02-Pt100 SiS-02-Pt1000	./.	No	appr. 60 mV per 1000 W/m ²	Pt100 / Pt1000
SiS-10TC	12 to 28 V _{DC}	Yes	0 to 10 V per 0 to 1000 W/m ²	./.
SiS-420TC	12 to 28 V _{DC}	Yes	4 to 20 mA per 0 to 1200 W/m ²	./.
SiS-420TC-T	12 to 28 V _{DC}	Yes	4 to 20 mA per 0 to 1200 W/m ²	(13,88+0,08/°C*T[°C])mA
SiS-13TC	12 to 28 V _{DC}	Yes	0 to 10 V 0 to 1300 W/m ²	./.
SiS-13TC-T	12 to 28 V _{DC}	Yes	0 to 10 V 0 to 1300 W/m ²	2,268V+86,9mV/°C*T

EXTEND OF SUPPLY

Options

- Silicon sensor with shielded cable, 0,14 mm², UV- and weather resistant, 3 m length with ferrules
- Ready-made cable of the requested length

SILICON IRRADIANCE SENSOR

Electrical connection and Pin numbers

ELECTRICAL CONNECTION

Colors of cable

Irradiance:	Orange
Power Supply (Plus):	Red
Power Supply / Signal (Minus):	Black
Temperature:	Brown; only versions with „-T“
Shield:	Black (bigger diameter)

SPECIALS

- **Attention:** The maximum load at the output signals with the Si-420TC(-T) is 400 Ω .
- **Attention:** Horizontally mounting leads to increased reflexion on the glass surface and therefore to higher measurement errors.

HANDLING AND INSTALLATION

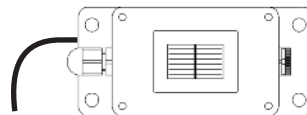
The Si sensor has two tongues with each two M8 drills. The installation at a suitable construction must use at least one M8 screw with washers at each mounting bracket.

During installation the pressure compensation element near the electrical connection must not be damaged.

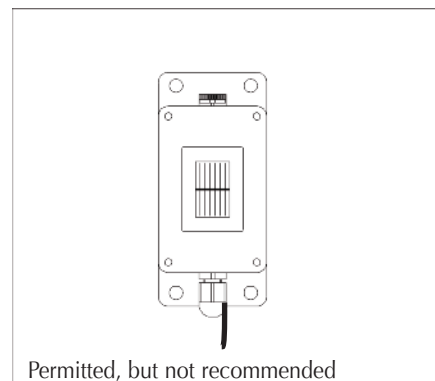
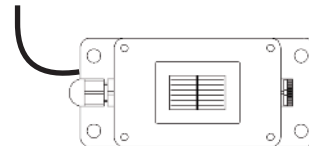
MECHANICAL INSTALLATION

MECHANICAL INSTALLATION

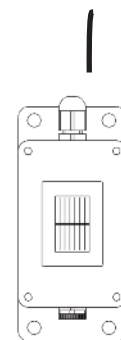
Recommended Installation



Installation not permitted



Permitted, but not recommended



HANDLING CASE

The Si sensor can be cleaned using a smooth cotton cloth, water and a mild cleaning fluid.

An opening of the sensor case by the user or installation staff is not necessary. If the case is opened, we can not guarantee the seal of the case anymore.

* Minus signals of all sensors are identical to supply ground