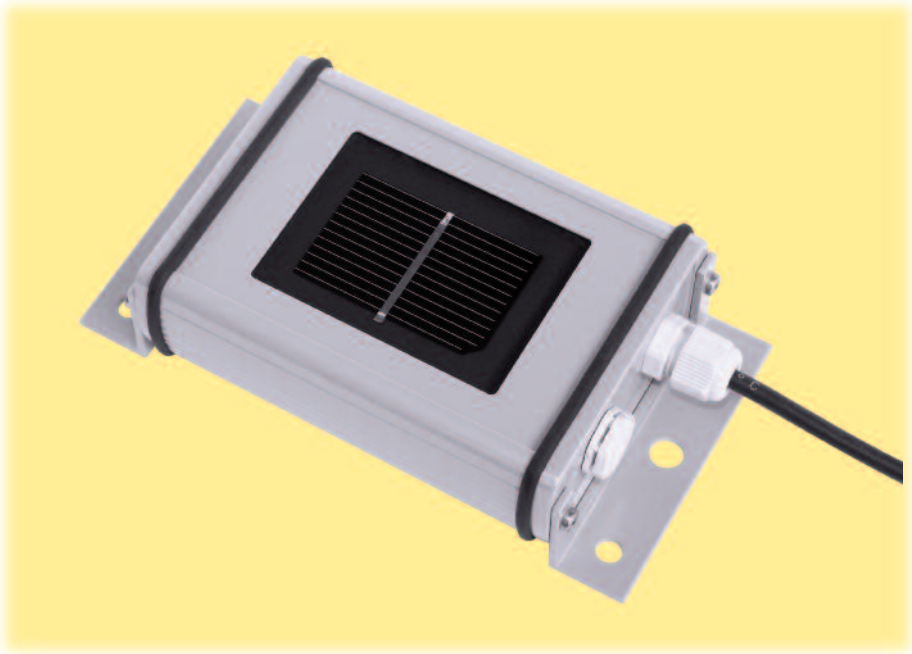
DIGITAL SILICON IRRADIANCE SENSOR SI-CANopen-T

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 build 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 laminated to the rear side of the solar cell.

The measuring signals of short-circuit current of the cell and the resistance value of the temperature sensor are measured by a microcontroller. The calculated values of irradiance and temperature are given onto a CAN port with application profile CiA 437 CANopen protocol. The electronic circuit is optimised for low power consumption.

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 or a waterproof (IP67) connector

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Technical Data

SI-SENSOR
General Information

- Solar cell: Monocrystalline Silicon (50 mm x 33 mm)
- Current shunt: 0,1 Ω (TK = 30 ppm / K)
- Measuring range: 0 to 1400 W/m²
- Operating temperature: –20 °C to 70 °C
- Electrical connection: via 3 m cable, UV and wheatherproof
- Power supply: 12 to 28 V_{DC}
- Power consumption: 40 mA typically at 20 V_{DC}
- Interface: CANopen, Application Profile CiA 437
- Galvanic isolation: 1000 V between power supply and RS485 bus
- Case, protection mode: Powder-coated aluminum, IP 65
- Dimensions, weight: 155mm x 85mm x 40mm, approx. 360 g
- Customs Number: 85 41 40 90

ACCURACY
Irradiance

- Error with temperature compensation compared to pyranometer within the operating range of -20 °C to 70 °C and vertically beam of irradiance: ± 5 %
- **Attention:** Horizontally mounting leads to increased reflexion on the glass surface and therefore to higher measurement errors.

Temperature

- Measuring error: ± 2,0 °C
- Measuring range: -20 … +70 °C

ELECTRICAL CONNECTION

Colour Mapping of Cable

Red (wire):	Power (plus)
Black (wire):	Power (minus)
Orange (wire):	CAN high
Brown (wire):	CAN low
Black (large profile):	shielding

The concept for over-voltage protection has to match the local specifications.

MECHANICAL INSTALLATION

The Si sensor has two tounges with each two M6 drills and one M8 drill. The installation at a suitable construction must use at least one M6 or M8 screw with washers at each toung.

During installation the pressure compensation element near the electrical connection may not be damaged. If the cap of the element has loosened, it can be snapped on again.

HANDLING OF 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.

OPTIONS

- Ambient temperature sensor in stainless steel bush with 3 m cable
  Measuring range: -20 … +70 °C
- Module temperature sensor in aluminum block with 3 m cable
  Measuring range: -20 … +70 °C
- Wind speed sensor with 5 m cable
  Measuring range: 0,8 … 40 m/s