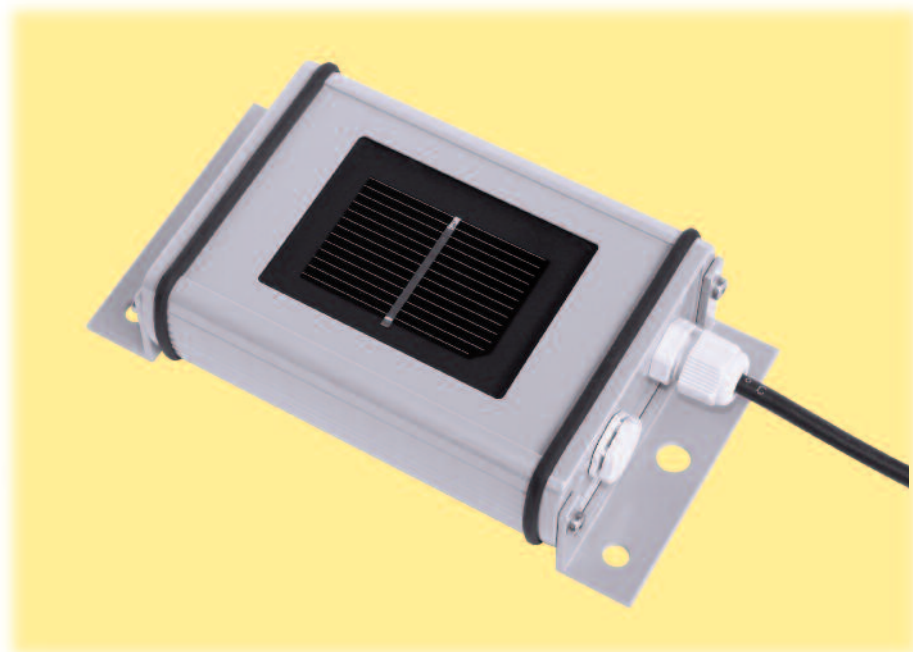


# DIGITAL SILICON IRRADIANCE SENSOR

## Si-RS485-TC-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 15000 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 Description

#### 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 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 calcula-

ted values of irradiance and temperature are given onto a RS485 port with customer specification 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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# DIGITAL SILICON IRRADIANCE SENSOR

## Si-RS485-TC-T

### Technical Data

#### SI-SENSOR

##### General information

- Solar cell: Monocrystalline Silicon (50 mm x 33 mm)
- Current shunt: 0.1  $\Omega$  (TK = 30 ppm / K)
- Operating temperature: -20°C to 70°C
- Electrical connection: via 3 m cable, UV and weatherproof
- Power supply: 12 to 28 V<sub>DC</sub> (40 mA typically at 20 V<sub>DC</sub>)
- Interface: RS485 up to 19200 Baud
- Protocol: M&T, MODBUS, customer specific
- Galvanic isolation: 1000 V between power supply and RS485 bus
- Case, protection mode: Powder-coated aluminum, IP 65
- Dimensions, weight: 155 mm x 85 mm x 40 mm, approx. 360 g
- Customs Number: 85 41 40 90

#### ACCURACY

##### Irradiance

##### Temperature

- Error with temperature compensation compared to pyranometer within the operating range of -20°C to 70°C and vertically beam of irradiance:  $\pm 5\%$
- Error at minimum and maximum temperature:  $\pm 1.0^\circ\text{C}$

#### ELECTRICAL CONNECTION

##### Colour mapping of cable

- Red (wire): Power (plus)
- Black (wire): Power (minus)
- Brown (wire): Data +
- Orange (wire): Data -
- Black (large profile): shielding

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

#### MECHANICAL INSTALLATION

The Si sensor has two tongues with each two M6 and one M8 drills. The installation at a suitabel construction must use at least one M6 screw with washers at each tongue.

During installation the pressure compensation element near the electrical connection must 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

- Si-RS485-TC-2T: Same as Si-RS485-TC-T, but additionally with fixed ambient temperature sensor with 3 m cable, measuring range: -25 ... +75°C
- Si-RS485-TC-2T-v: Same as Si-RS485-TC-T, but with optional connections for external ambient or module temperature sensor and wind speed sensor

#### ACCESSORIES FOR SI-RS485-TC-2T-V

- Ambient temperature sensor in stainless steel bush with 3 m cable  
Measuring range: -25 ... +75°C
- Module temperature sensor in aluminum block with 2 m cable  
Measuring range: -25 ... +75°C
- Wind speed sensor with 5 m cable  
Measuring range: 0,8 ... 40 m/s