

Digital Irradiation Sensor SPEKTRON 485mb



General Data

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 calculated 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 Ethylene-Vinyl-Acetate (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 3m cable or a water proof (IP67) connector.

Technical Data

General information

- Solar cell: Monocrystalline Silicon (50 mm x 33 mm)
- Current shunt: 0.1 Ω (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_{DC} (40 mA typically at 20 V_{DC})
- 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:

- Error with temperature compensation compared to pyranometer within the operating range of -20°C to 70°C and vertically beam of irradiance: $\pm 5 \%$

Temperature:

- 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 wings with each two M6 and one M8 drills. The installation at a suitable construction must use at least one M6 screw with washers at each wing.

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.