

SEVEN SOLAR SENSOR BOX

Solar Radiation Sensor Box

Measurement of Solar Irradiance

3S-SR-2T-WS-MB



Irradiance sensor is an affordable solution for measurement of solar irradiance. The powder-coated aluminum case in conjunction with the solar cell laminated between glass and Tedlar foil builds a very reliable and rugged sensor.

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 sensors is measured by a microcontroller. The calculated values of irradiance and temperature given onto a RS485 port with customer specification protocol. The electronic circuit is optimized for low power consumption.

MECHANICAL CONSTRUCTION

The solar cell is embedded in Ethylene- Vinyl- Acetate (EVA) between glass and Tedlar. Plain integration into the top cover of the box Advanced weatherproof junction box made of UV resistant material with cable gland and screw-less terminal for the connection of the measuring cable, therefore, the sensor construction is comparable to that of a standard PV module. The electrical connection is realized by a 3m cable.

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.

TECHNICAL DATA

General Information

Solar Cell	Monocrystalline Silicon (50 mm x 33 mm)
Current shunt	0.1 W (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 VDC (40 mA typically at 20 VDC)
Interface	RS485 up to 19200 Baud
Protocol	The sensor is connected via a 2-wire RS485 bus with open vendor-independent Modbus RTU protocol
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

Accuracy

Irradiance	0...1500W/m2, Error with temperature compensation compared to pyranometer within the operating range of -20°C to +70°C and vertically beam of irradiance. ± 5 %
Temperature	Error at minimum and maximum temperature. ± 1.0°C

Electrical Connection

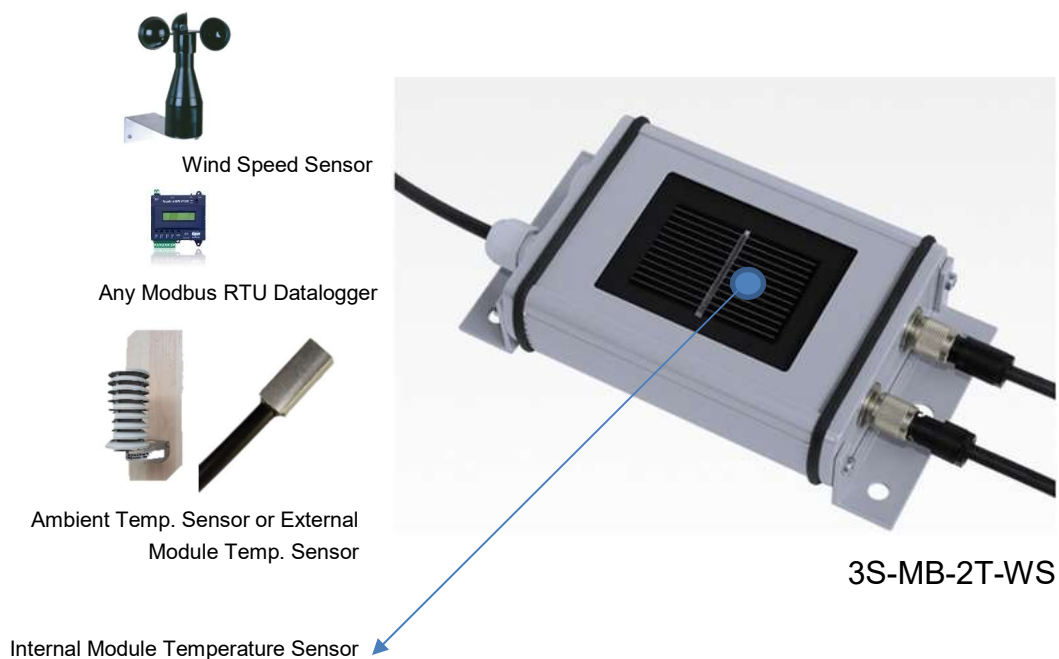
Color mapping of cable	Red (wire)	Power (plus)
	Black (wire)	Power (minus)
	Brown (wire)	Data + / A
	Orange (wire)	Data - / B
	Black (large profile)	Shielding
Input, Wind Speed	3S-WS-PLS-CON, Wind speed sensor, reed contact, pulse with Binder 712 M9 2 pins connector	
Input, Ambient Temperature or Module Temperature	3S-AT-PT1000-CON or 3S-MT-PT1000-CON, Ambient or module temperature sensor, PT1000, with Binder 712 M9 3 pins connector	
Integrated Module Temp.	Integrated module temperature sensor, PT1000	

Others

Calibration	All sensors are calibrated in artificial sunlight against a reference cell calibrated at the Physikalisch-Technische Bundesanstalt (PTB, National Metrology Institute of Germany).
Handling Case	The sensor can be cleaned using a smooth cotton cloth, water and a mild cleaning fluid. Opening of the sensor case by the user or installation staff is not necessary. If the case is opened, we cannot guarantee the seal of the case anymore.

Modbus Specification	
Baud Rate	1200, 2400, 9600, 19200, 38400
Parity	No, even, odd
Stop Bit	1, 2 (only at no parity)
Factory Default	9600 Baud, 8N1, address: 1

WIRING EXTERNAL SENSORS



RELATED PRODUCTS

3S-WS-PLS-CON	Wind speed sensor, reed contact, pulse with Binder 712 M9 2 pins connector
3S-AT-PT1000-CON	Ambient temperature sensor, PT1000, with Binder 712 M9 3 pins connector
3S-MT-PT1000-CON	Module temperature sensor, PT1000, with Binder 712 M9 3 pins connector
3S-MTG-01	Mounting bracket for Solar Radiation sensor 3S-SR-2T-WS-MB
3S-PS-12VDC	Power supply, 220VAC, 50/60Hz, 12VDC, 300mA
3S-Shield-A	Solar Radiation Shield for Ambient Temperature Sensor PT100, PT1000, DS18B20 etc.

Module temperature sensor

3S-MT-PT1000-CON

We supply economical module temperature sensors for universal application as well as for solar photovoltaics projects. Many different industrial output signals are available.



TECHNICAL DATA

General Information

Sensor type	PT1000 temperature probe, for flat surface (backside of solar panel), IP67
Temperature range	-40...+85°C
Sensor housing	Aluminum block, self-adhesive, H x W x L: 6 mm x 12 mm x 35mm
Cable	3 m or 5 m PVC or UV-resistant PUR cable with Binder 712 M9 3 pins conn.
Connection	Two wire

RELATED PRODUCTS

3S-SR-2T-WS-MB

SEVEN Solar Sensor Box, Modbus RTU, RS485