

## Solar Radiation Sensor Measurement of Solar Irradiance



### 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.

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 micro controller.

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

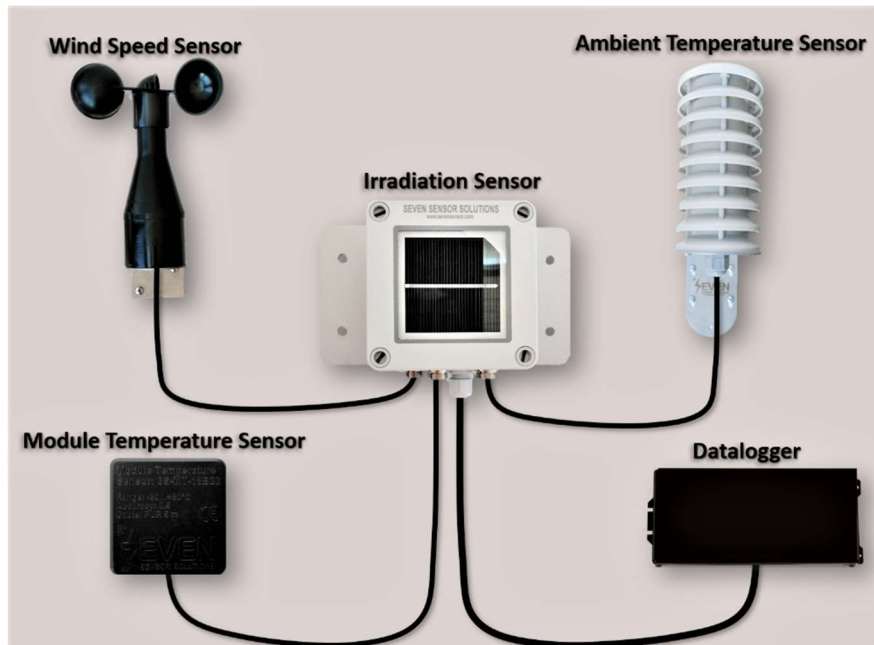
The solar cell is embedded in Ethylene- Vinyl- Acetate (EVA) between glass and Tedlar. Plain integration into the top cover of the box Advanced weatherproof junction box made of UV resistant material with cable gland and screw-less terminal for the connection of the measuring cable, therefore, the sensor 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 (52 mm x 52 mm)
Current Shunt	High precision shunt resistor directly soldered to the terminals of the cell
Operating Temperature	-30°C to +70°C
Electrical Connection	3 m PUR Cable, UV and weather resistant
Power Supply	12 to 30 VDC (30 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	Advanced weatherproof junction box made of UV resistant material
Dimensions, Weight	94 mm x 94 mm x 57 mm, approx. 200 g
Protection	IP54
Accuracy	
Irradiance	10...1500W/m <sup>2</sup> , Accuracy of monthly sums compared to a W.M.O. class 1 Pyranometer (e.g. CMP 11) according to ISO 9060: better ±5%
Drift	Very small drift of <0.3%/ year
Electrical Connection	
Brown	Power (+)
White	Power (-)
Green	RS485 Data (+) / A
Yellow	RS485 Data (-) / B
Input 1	3S-WS-PLS, Wind speed sensor, 2 pin connector
Input 2	3S-AT-18B20, Ambient temperature sensor, 3 pin connector
Input 3	3S-MT-18B20, Module temperature sensor, 4 pin connector
Others	
Calibration	Individual calibration of each sensors in the natural sunlight at AM 1,5 spectrum by means of a compatible calibrated reference cell.
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	Wind speed sensor, reed contact, pulse
3S-AT-18B20	Ambient temperature sensor, DS18B20
3S-MT-18B20	Module temperature sensor, DS18B20
3S-PS-12VDC	Power supply, 220VAC, 50/60Hz, 12VDC, 300mA
3S-Shield-A	Solar Radiation Shield for Ambient Temperature Sensor PT100, PT1000, DS18B20 etc.