



DESCRIPTION

Module temperature sensor measures the temperature back of the solar panels. It works in degrees Celsius (°C) by using a sensor which can be PT1000 or DS18B20. The Module Temperature Sensor in a plastic housing with aluminum plate with One-Wire-Bus technique and Compatible with Seven Transducers, Irradiance Sensor Box and Seven Sensor Box. It is mounting back of solar panel with a three meters PUR cable. It can be used for measuring of any surface tempratures for indoor and outdoor applicaitons.

SEVEN offers Six models;

1. 3S-MT-DS18B20
2. 3S-MT-PT1000
3. 3S-MT-DS18B20-MB
4. 3S-MT-DS18B20-3MB
5. 3S-MT-PT1000-MB
6. 3S-MT-PT1000-5MB



DATA TECHNICAL

3S-MT

Model	Communication Output	Sensor Type	Input Channel	Measuring Range	Accuracy	Sensor Housing	Cable	Protection	Sensor Housing Dimension	Input Voltage	Power Consumption
3S-MT-DS18B20	Direct DS18B20	DS18B20	NA (The Sensor itself is connected to Seven Irradiance Sensor Box or Seven Sensor Box)	-55°C to 125°C	± 0.5 °C IEC61724-1 Compliance	Plastic Box & Aluminum Plate for Contact Surface	5 m PUR Cable, UV and weather resistant	IP68	50 mm (L) 50 mm (W) 12 mm (H)	NA	NA
3S-MT-DS18B20-MB	RS-485 Modbus		1pc. Temperature Sensor can be connected to Transducer							20 mA max @24 VDC	
3S-MT-DS18B20-3MB	Direct PT1000	PT1000	NA (The Sensor itself is connected to Seven Irradiance Sensor Box or Datalogger)	-40°C to 90°C	± 0.1 °C IEC61724-1 EN60751 Class 1/3B Compliance					NA	NA
3S-MT-PT1000-MB			RS-485 Modbus							1pc. Temperature Sensor can be connected to Transducer	20 mA max @24 VDC
3S-MT-PT1000-SMB			5pc. Temperature Sensor can be connected to Transducer							12...28 VDC	20 mA max @24 VDC

FEATURES of ELEMENTS

DS18B20 Digital Temperature Probe:

The DS18B20 is a temperature sensor that provides 9-to-12-bit temperature readings. Its communication can be done via a one-wire bus protocol. The DS18B20 is more significant in terms of temperature measurement accuracy, conversion time, transmission distance and resolution. It offers more convenient operation and more satisfying effects for users.

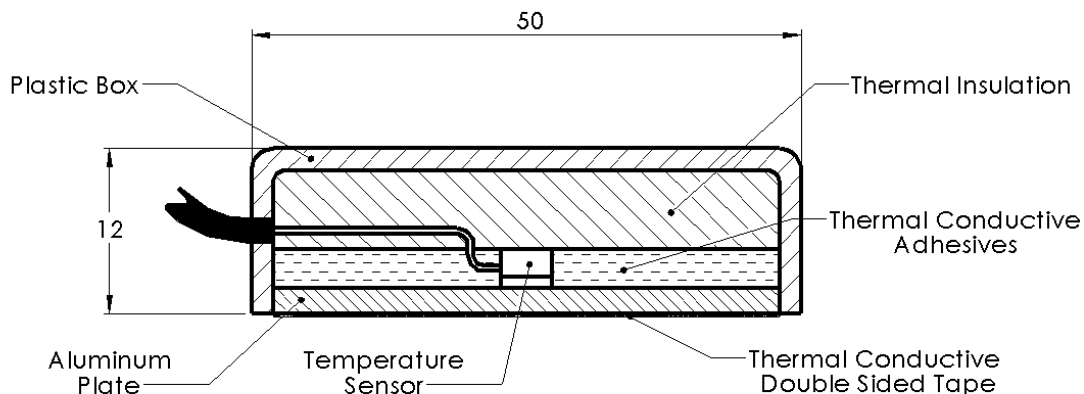
The unique one-wire structure of the DS18B20 digital temperature sensor has an output that connects directly to the Irradiance Sensor Box or one of Seven Transducer Models. Therefore, using the DS18B20 Temperature.

PT1000 Digital Temperature Probe:

PT1000 sensors are part of the group of temperature sensors called Resistance Temperature Detectors (RTD). The first part of the name Pt1000, 'Pt', is the chemical symbol for Platinum and this shows that the sensor is Platinum-based. The second part, 1000, indicates the nominal resistance of the sensor at 0°C. In this case 1000Ω. For precision work, sensors have four wires- two to carry the sense current, and two to measure the voltage across the sensor element.

Waterproof Box:

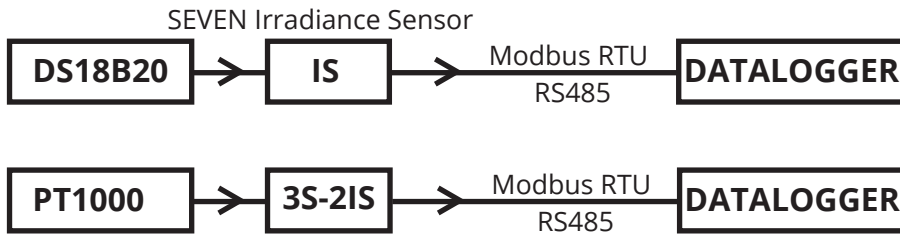
The components of module temperature sensor are installed inside of a waterproof box with in IP-68 protection level.



COMMUNICATION

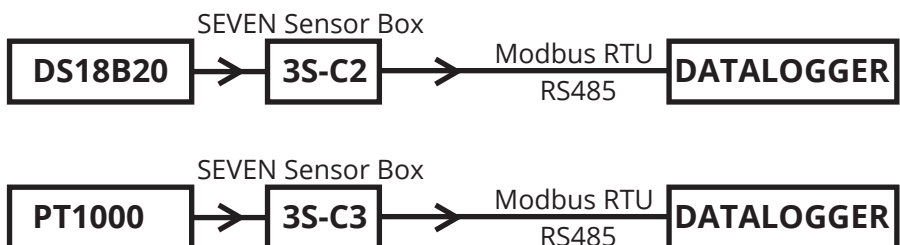
Through Irradiance Sensor Box:

The communication between the DS18B20/PT1000 module Temperature Sensor and the datalogger is done through the Irradiance Sensor, which is supplied with a Modbus RTU protocol. The Irradiance Sensor communicates directly with the datalogger and transfers all data collected by the back of panel Temperature Sensor in an accurate manner. Thus, the communication process will be easier and more convenient in terms of wires, costs and efficiency.



Through Seven Sensor Box:

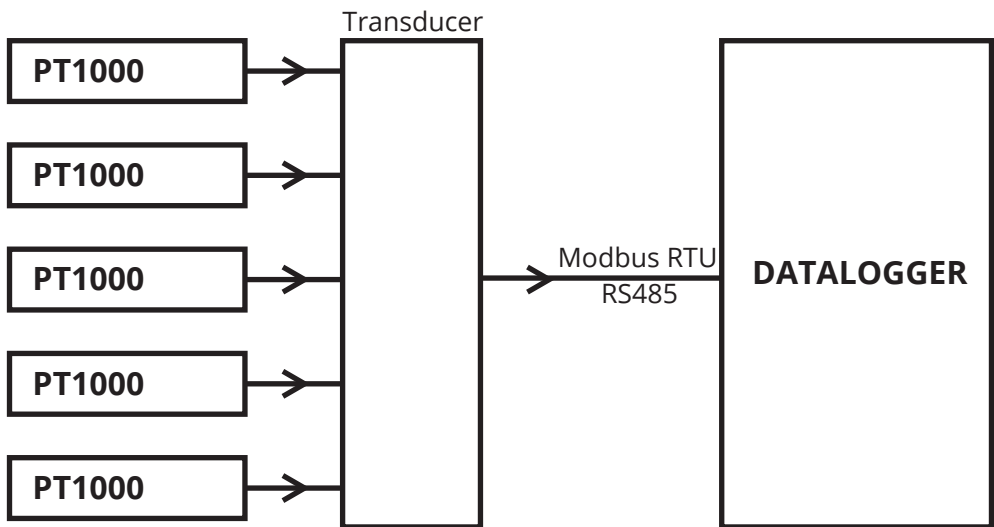
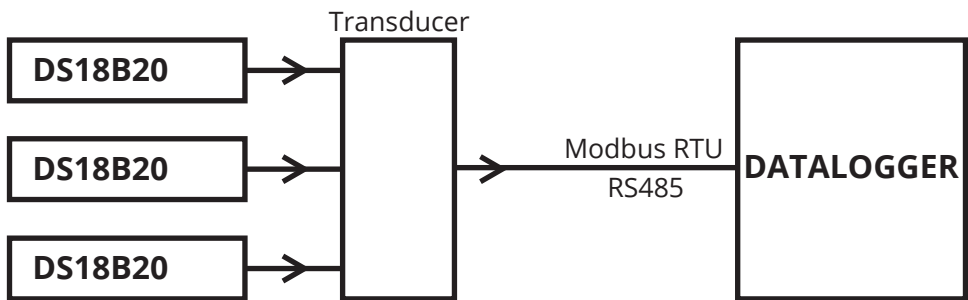
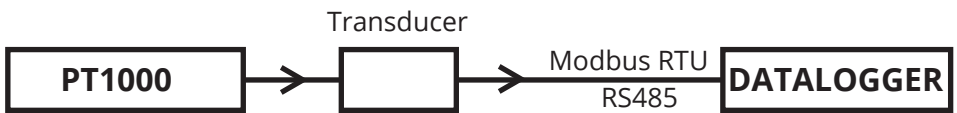
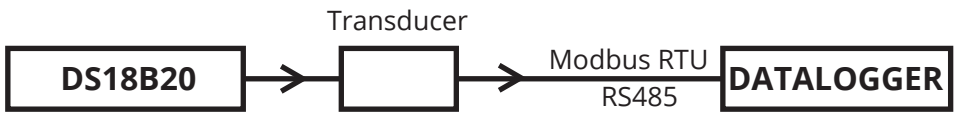
The communication between the DS18B20 / PT1000 module Temperature Sensor and the datalogger is done through the SEVEN sensor box, which is supplied with a Modbus RTU protocol. The sensor box will receive the data and convert it to Modbus protocol and send to Data Manager by RS485 with a single cable.



3S-MT

Through Transducer:

The communication between the DS18B20 / PT1000 module Temperature Sensor and the datalogger is done a used transducer. There are 1,3,5 and 6 inputs as per the temperature sensor type. There is a transducer to convert it and this device supports Modbus RTU commands.



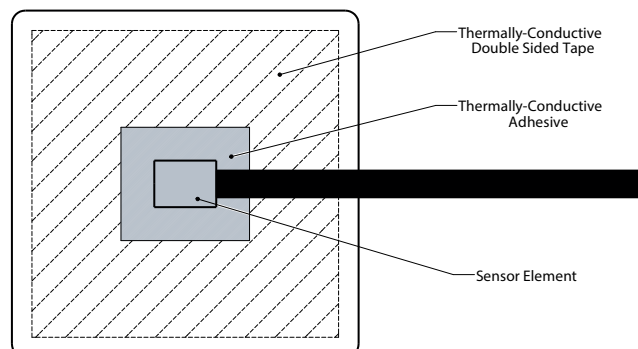
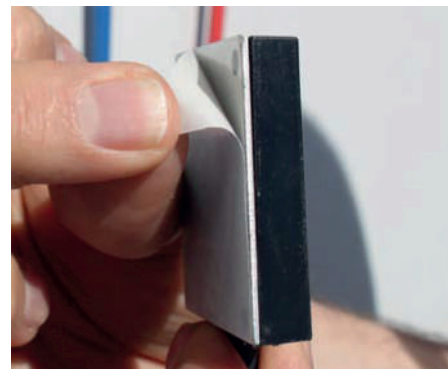
3S-MT

INSTALLATION

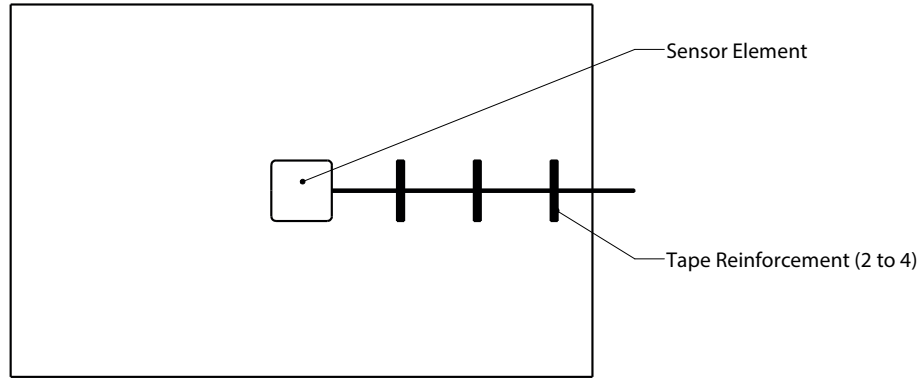


Clean the module's rear surface of oil and dust by using lint-free wipes dampened with a 70 % solution of isopropyl alcohol in distilled water. Allow all cleaned surfaces to dry completely before proceeding.

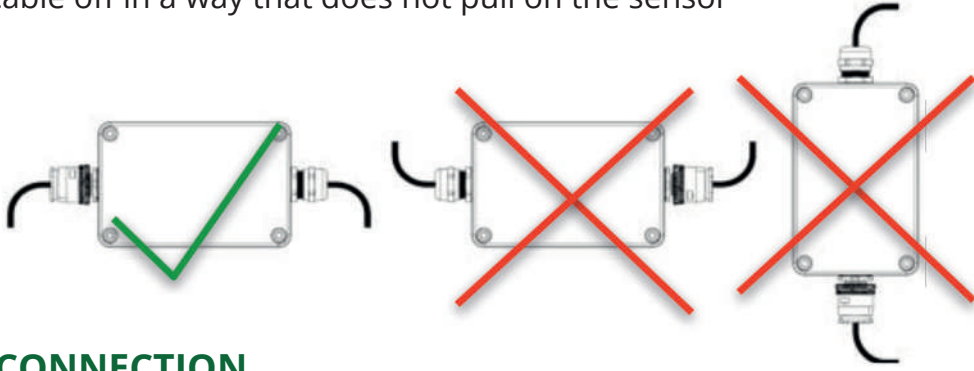
Select a sensor location at the centre of a cell close to the centre of the module, avoiding boundaries between cells.
For crystalline silicon modules, select the centre of the centre-most cell within the module, or, when the module is built with even numbers of rows or columns of cells, select one of the cells closest to the centre.
For thin-film modules, place the sensor within the boundary of a cell near the centre of the module, avoiding scribe lines between adjacent cells if possible.



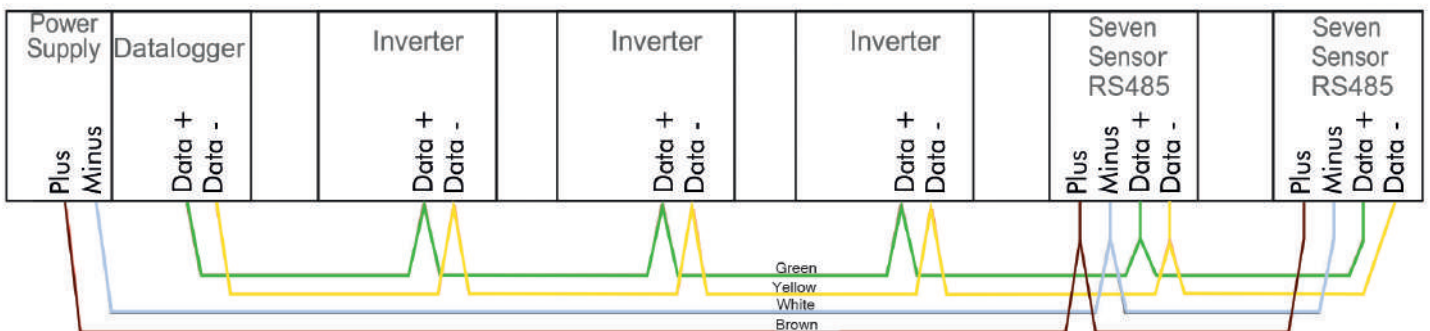
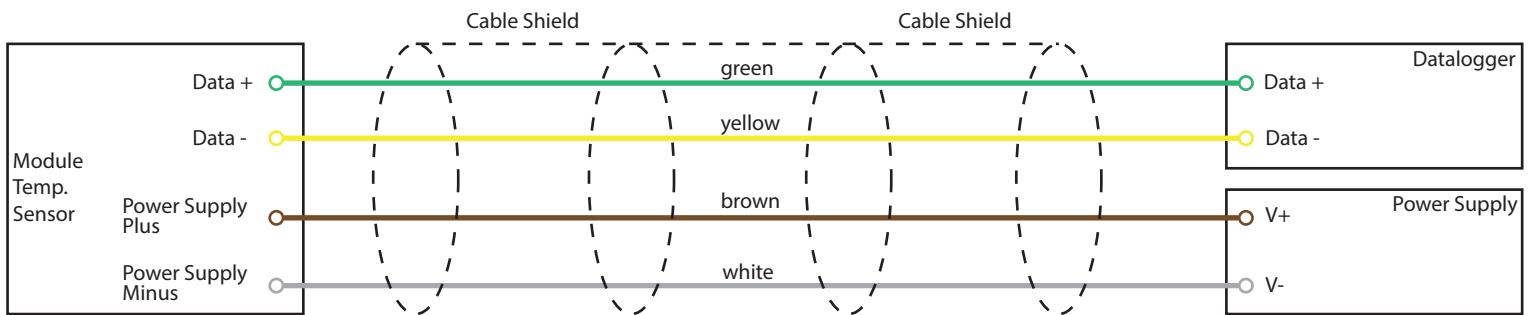
Secure the sensor wire to the module's backsheet using polyester tape at 2 to 4 points to reduce strain on the sensor element. Generally, tape sections will not need to exceed approximately 2 cm wide by 5 cm in length. Use as little tape as possible to secure the lead wires.



Press the sensor firmly against the surface
 Do not attempt to extend or shorten the pre-assembled 5m cable
 Tie the sensor cable off in a way that does not pull on the sensor



ELECTRICAL CONNECTION



AS PER IEC 61724-1:2021 RELATION BETWEEN SYSTEM SIZE (AC) AND NUMBER OF SENSORS

System size (AC)	Number of Module Temperature Sensor
< 40 MW	6
≥ 40 MW to < 100 MW	9
≥ 100 MW to < 300 MW	12
≥ 300 MW to < 500 MW	15
≥ 500 MW to < 700 MW	18
≥ 700 MW	21 pcs. Plus 1 for each additional 200 MW.

The care shall be taken to place temperature sensors in representative locations such that the desired information is obtained. For performance monitoring, a number of temperature sensors should be distributed throughout the system so that the average temperature can be determined.

In addition, when the array consists of more than one module type or includes sections with different orientations or other attributes that can affect temperature, at least one temperature sensor is required for each module type or section type, and additional sensors, if required according to array size, are to be distributed in a representative manner amongst the different module types and section types.

TEST

All SEVEN products are tested before delivery. The Test certificate can be delivered to the customers along with the products, as per buyer request.

The Test of the module temperature sensor is carried out by comparing it with a reference temperature sensor that has been calibrated. During this test, data is taken from both temperature sensors for certain predetermined values.

WARRANTY

SEVEN Sensor provides a 5-year warranty against manufacturer defects. The warranty certificate is also delivered with the products.

Modbus RTU Specifications

Supported Bus Protocol

BaudRate :1200, 2400, 9600, 19200, 38400

Parity : No, even, odd

Stop Bit : 1, 2 (only at no parity)

Factory Default: 9600 Baud, 8N1, address: 1

Transmission mode: MODBUS RTU

Supported function codes:

- 0x 4: Read Input Register

The following Mod bus data can be read individually or in blocks:

ID-Dec.	ID-Hex	Value
25	0x19	Ext. temp. 1 as 'sign value' -400 ... +900 [range -40 ... +90°C] in 0.1°C
26	0x1A	Ext. temp. 2 as 'sign value' -400 ... +900 [range -40 ... +90°C] in 0.1°C
27	0x1B	Ext. temp. 3 as 'sign value' -400 ... +900 [range -40 ... +90°C] in 0.1°C
28	0x1C	Ext. temp. 4 as 'sign value' -400 ... +900 [range -40 ... +90°C] in 0.1°C