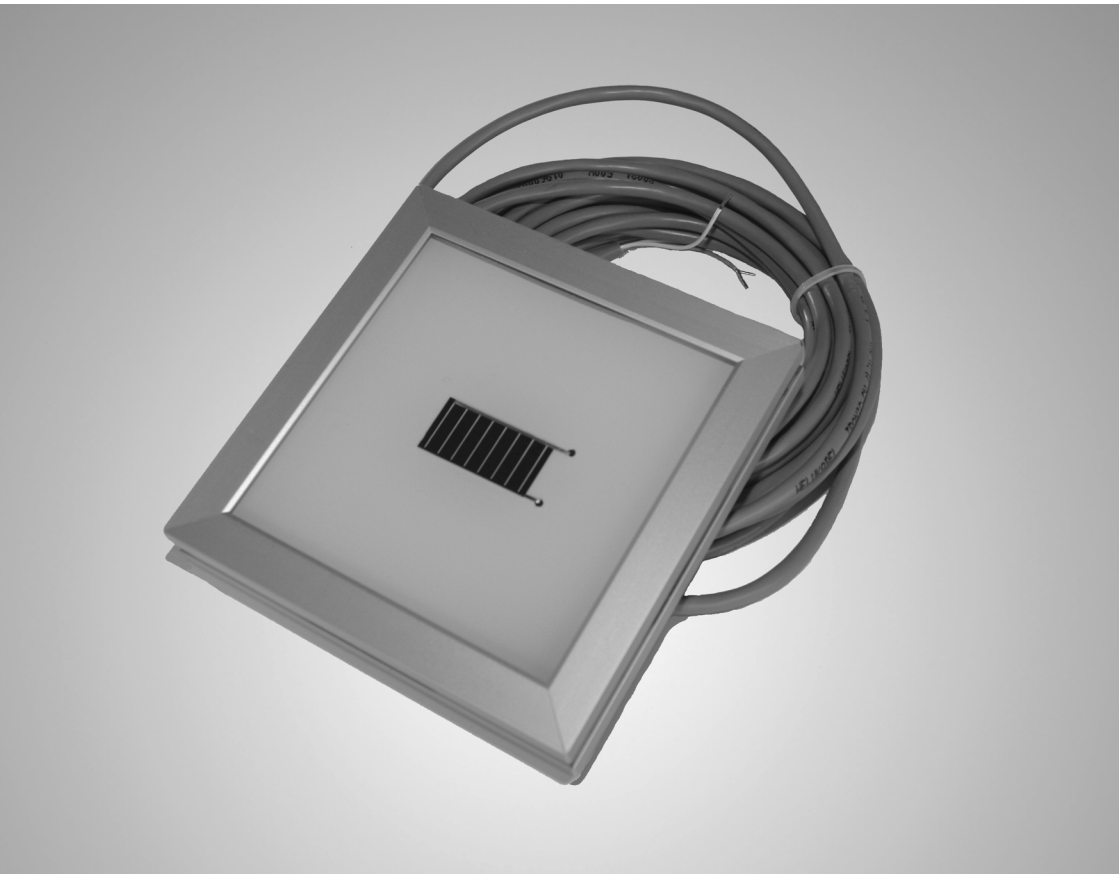
System Monitoring

RA100T-NR

Installation Guide



RA100TNR-IEN083510 | 98-0018210 | Version 1.0

EN

Table of Contents

1 Notes on this Manual

This manual describes the installation and commissioning of the irradiation and temperature sensor. Store this manual where it will be accessible at all times.

1.1 Validity

This manual is valid for the RA100T upgrade kit.

1.2 Target Group

This manual is for qualified personnel.

1.3 Symbols Used

The following types of warnings and general information appear in this document as described below.

DANGER!

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING!

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION!

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury!

NOTICE!

ATTENTION indicates a situation that can result in property damage if not avoided.

Information

"Information" provides tips that are valuable for the optimal operation of your product.

2 Safety

2.1 Appropriate Usage

The RA100T is a modular irradiation and temperature sensor. The sensor consists of a monocrystalline silicon solar cell and an integrated temperature sensor module PT100. The irradiation sensor is calibrated to 25 °C; the measuring range can be found on the sensor's type label. The measuring range of the temperature sensor is between -30 °C and +50 °C.

In order to process the ambient data, the sensors must be connected to the Sunny Boy Control Plus or the Sunny Central Control.

The sensor is only suitable for use with original SMA accessories or with accessories recommended by SMA Solar Technology AG.

Appropriate usage also includes observing all further documentation relating to this device and its components.

2.2 Safety Instructions

NOTICE!

Damage to the sensor as a result of incorrect connection to the Sunny Boy Control Plus or Sunny Central Control.

The Sunny Boy Control installation guide and the wiring diagram provided must be used for establishing the electrical connections and connectors!

NOTICE!

Destruction of the PV system by a lightning strike.

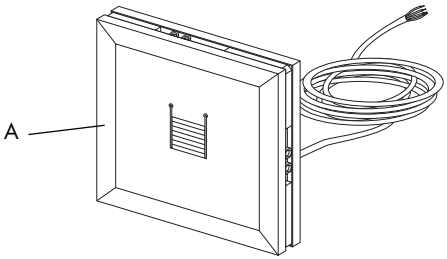
All devices installed on a rooftop must be integrated in the existing lightning protection of the PV system.

Overvoltage protector

Protect your PV system components against overvoltage from outside by connecting the sensors to an overvoltage protector. For using the sensors with the Sunny Central Control, the corresponding overvoltage protectors can be ordered from Sunny Central as an option.

3 Unpacking

3.1 Scope of delivery



A 1 RA100T (irradiation and temperature sensor with 5 m cable)

3.2 Identifying the Irradiation and Temperature Sensor

You can identify the sensor using the type plate. The type plate can be found on the back of the enclosure.

4 Assembly and Electrical Connection

The irradiation and temperature sensor RA100T can be connected to the Sunny Boy Control Plus or the Sunny Central. Observe the prefabricated cable length of 5 m. The cable must not be shortened. If the length of the cable is insufficient, you can extend it using a junction box, for example. The temperature sensor can then be connected in either a 2- or 4-cable system.

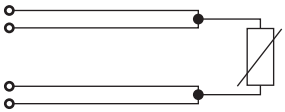
2-cable system

When connecting the temperature sensor in a 2-cable system, the cable resistance is included in the measurement. This can lead to measuring inaccuracies depending on the cable length.

For this reason, the 2-cable system should only be used with short cable lengths (max. 3 m) or where the level of measuring accuracy required is not as high. In order to increase the measuring accuracy, the use of a 4-cable system is recommended.

4-cable system

To offset measuring errors that occur due to cable resistance, connect the temperature sensor in a 4-cable system. With this type of connection, the current feed and voltage measurement are carried out by separate pair cables. The length of the cable must not exceed 30 m.



Protect connection interfaces against weather effects.

When extending the sensor cable, protect the connection interface against weather effects (e.g. using a junction box or terminal box).

4.1 Cabling Recommendations

The cable length and quality have an effect on the signal quality. To achieve a good quality signal, observe the following instructions regarding cabling:

Outdoors

For the outdoors, use a communication cable with the following key properties.

- Cross-section: min. 6 x 0.25 mm^2, min. 6 x AWG 24
- UV-resistant

We recommend the following cable types:

- UL-listed Lapp cable: UNITRONIC Li9Y11Y 8 x 0.25 mm^2, order no.: 7038 868

Indoors

If you protect the cable from UV radiation outdoors by means of a suitable cable channel, you can also use a non-UV-resistant (indoor) cable with the basic properties mentioned above.

We recommend the following cable types:

- Lapp cable: Unitronic LiYY 7 x 0.25 mm^2, order no.: 0028 307
- UL-listed Lapp cable: UNITRONIC LiYY UL/CSA 7 x AWG22/7, order no.: 0022 607
- Helukabel: TRONIC LiYY 6 x 0.25 mm^2, order no.: 18033

4.2 Selecting the Mounting Location

Consider the following points during the selection of a mounting location:

- The sensor is suitable for outside mounting.
- Select a position that is as level with the solar cells as possible and not shaded during the daytime.
- Observe the prefabricated cable length of 5 m; the cable must not be shortened.

4.3 Mounting the Irradiation and Temperature Sensor

1. Connect the irradiation and temperature sensor to the bracket using the nuts recessed in the frame.
2. Lay the connection cable.

☑ The irradiation and temperature sensor is fully mounted.

4.4 Connection Overview

The sensor's wire assignment is as follows:

Wire color	Assignment
Green	Irradiation sensor +
White	Irradiation sensor -
Yellow	Temperature sensor PT100
Brown	(The sensor's wire assignment can be defined as desired. However, when using a 4-cable system, the connection assignment should be observed)

4.5 Connecting the Sensor to the Sunny Boy Control Plus

The sensor is connected to the analog input port (ANALOG IN) of the Sunny Boy Control Plus.

Protect connection interfaces against weather effects.

When extending the sensor cable, protect the connection interface against weather effects (e.g. using a junction box or terminal box).

Connection of sensors using a connection terminal block

To connect to the Sunny Boy Control Plus, use the 25-pin connection terminal block (see section 8 "Accessories" (page 17)).

4.5.1 Irradiation Sensor

The irradiation sensor is connected to an available analog input port (ANALOG IN) of the Sunny Boy Control Plus.

Connection of the irradiation sensor	
Green (irradiation sensor +)	PIN 1 (AIN-1) or PIN 3 (AIN-2) or PIN 5 (AIN-3) to PIN 8 (AIN-6)
White (irradiation sensor -)	PIN 14 (AGND) to PIN 19 (AGND) or PIN 24 (AGND)

4.5.2 Temperature sensor

The temperature sensor is connected using a 2- or 4-cable system to the analog input port (ANALOG IN) of the Sunny Boy Control Plus.

4-cable system

The analog input ports AIN-7 and AIN-8 are fitted with PT100 resistors for use with a 4-cable system. The supply currents required for this are provided by the Sunny Boy Control Plus. The temperature sensor's connection wires are duplicated in the direct vicinity of the sensor. Thus a total of 6 wires are required (2 wires for the irradiation sensor and 4 wires for the temperature sensor).

Connection of temperature sensor PT100 to "AIN-7" in a 4-cable system	
Original wire, yellow	PIN 11 (PT100-I1+)
Duplicated wire, yellow	PIN 9 (AIN-7+)
Duplicated wire, brown	PIN 20 (AIN-7-)
Original wire, brown	PIN 22 (PT100-I1-)

or

Connection of temperature sensor PT100 to "AIN-8" in a 4-cable system	
Original wire, yellow	PIN 12 (PT100-I2+)
Duplicated wire, yellow	PIN 10 (AIN-8+)

Connection of temperature sensor PT100 to "AIN-8" in a 4-cable system	
Duplicated wire, brown	PIN 21 (AIN-8-)
Originalader, Braun	PIN 23 (PT100-I2-)

2-cable system

Connection of temperature sensor PT100 to "AIN-7" in a 2-cable system	
Yellow	Bridge PIN 9 (AIN-7+) with PIN 11 (PT100-I1+)
Brown	Bridge PIN 20 (AIN-7-) with PIN 22 (PT100-I1-)

or

Connection of temperature sensor PT100 to "AIN-8" in a 2-cable system	
Yellow	Bridge PIN 10 (AIN-8+) with PIN 12 (PT100-I2+)
Brown	Bridge PIN 21 (AIN-8-) with PIN 23 (PT100-I2-)

4.6 Connecting the Sensor to the Sunny Central

At the Sunny Central, the sensor is connected to the Sunny Central Control using the terminal strips Z5-X5.

Protect connection interfaces against weather effects.

When extending the sensor cable, protect the connection interface against weather effects (e.g. using a junction box or terminal box).

Realizing the electrical connection

The wiring diagram provided must be used for establishing the electrical connections and connectors.

4.6.1 Irradiation Sensor

In this case, an analog input is used as the voltage input. To do so, the positive pole of the reference cell is connected to terminal 5 or 7 and the negative pole of the reference cell is connected to terminal 6 or 8.

Connection of irradiation sensor to "=Z5-X5"	
Green (irradiation sensor +)	Terminal 5
White (irradiation sensor -)	Terminal 6

or

Connection of irradiation sensor to "=Z5-X5"	
Green (irradiation sensor +)	Terminal 7
White (irradiation sensor -)	Terminal 8

4.6.2 Temperature sensor

The temperature sensor is connected using a 2 or 4-cable system.

4-cable system

The temperature sensor's connection wires are duplicated in the direct vicinity of the sensor. Thus a total of 6 wires are required (2 wires for the irradiation sensor and 4 wires for the temperature sensor). The connection is established without using bridges on the terminal strip in accordance with the following connection plan:

Connection of temperature sensor PT100 to "=Z5-X5" in a 4-cable system	
Original wire, yellow	Terminal 1
Duplicated wire, yellow	Terminal 2
Original wire, brown	Terminal 3
Duplicated wire, brown	Terminal 4

2-cable system

If measuring is carried out using a 2-cable system, the connection is established in accordance with the following connection plan:

Connection of temperature sensor PT100 to "=Z5-X5" in a 2-cable system	
Yellow	Bridge terminal 1 with terminal 2
Brown	Bridge terminal 3 with terminal 4

or

Connection of temperature sensor PT100 to "=Z5-X5" in a 2-cable system	
Yellow	Terminal 5
Brown	Terminal 6

or

Connection of temperature sensor PT100 to "=Z5-X5" in a 2-cable system	
Yellow	Terminal 7
Brown	Terminal 8

5 Configuration

Since the RA100 T consists of two sensors (irradiation and temperature), two sensors must be programmed:

5.1 Irradiation Sensor

5.1.1 Configuring the Sensor with the Sunny Boy Control Plus

To configure the Sunny Boy Control Plus suitably for the connected irradiation sensor, proceed as follows:

1. Log in to the Sunny Boy Control Plus as the installer.
2. Select the menu option "Setup > Plus I/O > Anlalog In" in the Sunny Boy Control Plus.
3. Select the input port that is to be configured.
4. Under "Function", select the desired measuring range (± 500 mV).
5. Under "Name", enter the desired sensor name (e.g. RA100T).
6. Under "Unit", enter the desired unit (W/m²).
7. Under "Gain", enter the desired gain. The gain V is calculated from the value specified on the type plate for the measurement voltage at 1000 W/m² and at 25 °C as follows:

   V = 1000 / measurement voltage at 1000 W/m²
8. Under "Offset", enter the value 0.

☑ The sensor is configured.

5.1.2 Configuring the Sensor with the Sunny Central Control

To configure the Sunny Central Control suitably for the connected irradiation sensor, proceed as follows:

1. Log in to the Sunny Boy Control Plus as the installer.
2. Select the menu option "Device Set-up > Interfaces > Analog In" in the Sunny Central Control.
3. Select the input port that is to be configured.
4. Under "Function", select the desired measuring range (± 500 mV).
5. Under "Name", enter the desired sensor name (e.g. RA100T).
6. Under "Unit", enter the desired unit (W/m²).
7. Under "Gain", enter the desired gain. The gain V is calculated from the value specified on the type plate for the measurement voltage at 1000 W/m² and at 25 °C as follows:

   V = 1000 / measurement voltage at 1000 W/m²
8. Under "Offset", enter the value 0.

☑ The sensor is configured.

5.2 Temperature Sensor for the Temperature Compensation

Configuration of the Sunny Boy Control Plus or Sunny Central Control

For the configuration, please refer to the Sunny Boy Control Plus user manual. In the case of the Sunny Central Control, the configuration is described in the Sunny Central user manual.

Temperature compensation

If required, manually perform a temperature compensation of both measured values (irradiation and temperature). The irradiation sensor is calibrated to 25 °C.

5.2.1 Configuring the Sensor with the Sunny Boy Control Plus

To configure the Sunny Boy Control Plus suitably for the connected temperature sensor, proceed as follows:

1. Log in to the Sunny Boy Control Plus as the installer.
2. Select the menu option "Settings > Plus I/O > Analog In" in the Sunny Boy Control Plus.
3. Select the input port that is to be configured:
   AIN7 (PT100)
   or
   AIN 8 (PT100)
4. Under "Function", select the desired temperature unit (e.g. °C).
5. Under "Name", enter the desired sensor name (e.g. PT100).

☑ The sensor is configured.

5.2.2 Configuring the Sensor with the Sunny Central Control

To configure the Sunny Central Control suitably for the connected temperature sensor module, proceed as follows:

1. Log in to the Sunny Boy Control Plus as the installer.
2. Select the menu option "Settings > Connections > Analog In" in the Sunny Central Control.
3. Select the input port that is to be configured.
4. Under "Function", select the desired temperature unit (e.g. °C).
5. Under "Name", enter the desired sensor name (e.g. temperature sensor module).

☑ The sensor is configured. The gain and offset do not require calculating.

6 Decommissioning

6.1 Dismounting the Sensor

1. Reset configuration of the sensor in the communication device.
2. Detach the sensor cable from the communication device.
3. Remove the sensor from the bracket.

☑ The irradiation and temperature sensor is dismounted.

6.2 Disposal

Dispose of the sensor at the end of its service life in accordance with the disposal regulations for electronic waste which apply at the installation site at that time. Alternatively, send it back to SMA Solar Technology with shipping paid by sender, and labeled "ZUR ENTSORGUNG" ("for disposal").

7 Technical Data

General data	
Dimensions (W/H/D) in mm	122/122/20
Mounting the Device	outdoor
Protection rating	IP65
Ambient temperature	-30 °C to +50 °C
Connection cable	
Connection cable	Pre-configured cable length of 5 m.
Irradiation sensor measured values	
Voltage at 1000 W/m^2 (approx. 100 mV), 25 °C	See type plate section 3.2 "Identifying the Irradiation and Temperature Sensor" (page 7))
Voltage tolerance	max. 5 %
Temperature sensor measured values	
Sensor resistor	PT100
Tolerance	Class 1/3B
Warranty, Certificates and Permits	
Warranty	2 years

8 Accessories

	Description	SMA order number
Analog IN connection terminal block	25-pin, D-Sub plug for Sunny Boy Control Plus (incl. 1:1 cable, D-Sub 25-pin, bushing/plug, length 0.5 m	SBCOP-ANA-KIT

9 Contact

If you have technical problems concerning our products, contact our Service Line. We need the following information in order to provide you with the necessary assistance:

- Model of the sensor
- Communication device
- Measured values

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