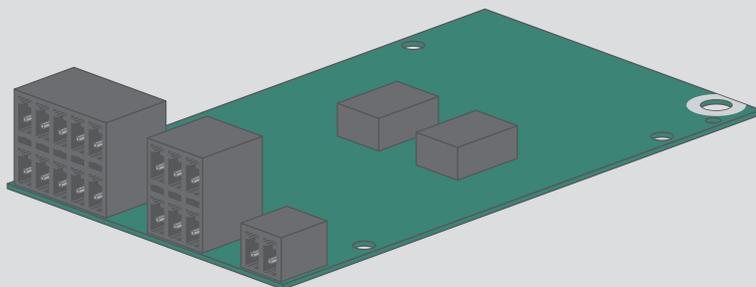


Installation Manual

SMA SENSOR MODULE

MD.SEN-40 (PC-SENS.BG1)



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1 Information on this Document

1.1 Validity

This document is valid for the SMA Sensor Module (MD.SEN-40) with assembly designation "PC-SENS.BG1" from hardware version A1.

You can find the latest version of this document at www.SMA-Solar.com.

1.2 Target Group

The tasks described in this document must only be performed by qualified persons. Qualified persons must have the following skills:

- Knowledge of how an inverter works and is operated
- Training in how to deal with the dangers and risks associated with installing and using electrical devices and installations
- Training in the installation and commissioning of electrical devices and installations
- Knowledge of the applicable standards and directives
- Knowledge of and compliance with this document and all safety information

1.3 Symbols

Symbol	Explanation
 DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury
 WARNING	Indicates a hazardous situation which, if not avoided, can result in death or serious injury
 CAUTION	Indicates a hazardous situation which, if not avoided, can result in minor or moderate injury
NOTICE	Indicates a situation which, if not avoided, can result in property damage
	Information that is important for a specific topic or goal, but is not safety-relevant
<input type="checkbox"/>	Indicates a requirement for meeting a specific goal
<input checked="" type="checkbox"/>	Desired result
	A problem that might occur

1.4 Typographies

Typography	Use	Example
bold	<ul style="list-style-type: none"> • Display texts • Elements on a user interface • Terminals • Elements to be selected • Elements to be entered 	<ul style="list-style-type: none"> • The value can be found in the field Energy. • Select Settings. • Enter 10 in the field Minutes.
>	<ul style="list-style-type: none"> • Connects several elements to be selected 	<ul style="list-style-type: none"> • Select Settings > Date.
[Button] [Key]	<ul style="list-style-type: none"> • Button or key to be selected or pressed 	<ul style="list-style-type: none"> • Select [Next].

1.5 Nomenclature

Complete designation	Designation in this document
SMA Sensor Module	Module, product
PV system	PV system

2 Safety

2.1 Intended Use

The SMA Sensor Module is a module for SMA inverters. The SMA Sensor Module has different interfaces for connecting various sensors. The SMA Sensor Module converts the signals of the connected sensors and transmits them to the inverter.

The SMA Sensor Module has the following interfaces:

- Two temperature inputs for connecting the temperature sensors
- One analog input for voltage or current signals (e.g. of an irradiation sensor)
- One supply voltage for a signal source (e.g. of an irradiation sensor)
- One S0 interface (e.g. for connecting an anemometer or energy meter)

The SMA Sensor Module must only be installed in the following SMA inverters:

- STP 50-40 (Sunny Tripower CORE1)

The inverter still complies with the standard after the product has been installed.

The product must only be operated with temperature sensors with a Pt100 measuring shunt or a Pt1000 measuring shunt.

The product must only be operated with irradiation sensors that can output a current signal in the range from 0 mA to 20 mA or 4 mA to 20 mA or a voltage signal in the range from 0 V to +10 V.

The product must only be operated with anemometers with impulse output for S0 impulses in accordance with DIN EN 62053-31 (IEC 62053-319).

The product must only be operated with energy meters with S0 interface in accordance with DIN EN 62053-31 (IEC 62053-31).

A list with SMA Sensor Module compatible products is available at www.SMA-Solar.com.

The product must only be used in countries for which it is approved or released by SMA Solar Technology AG and the grid operator.

All components must remain within their permitted operating ranges at all times.

Use this product only in accordance with the information provided in the enclosed documentation and with the locally applicable standards and directives. Any other application may cause personal injury or property damage.

Alterations to the product, e.g. changes or modifications, are only permitted with the express written permission of SMA Solar Technology AG. Unauthorized alterations will void guarantee and warranty claims and in most cases terminate the operating license. SMA Solar Technology AG shall not be held liable for any damage caused by such changes.

Any use of the product other than that described in the Intended Use section does not qualify as the intended use.

The enclosed documentation is an integral part of this product. Keep the documentation in a convenient place for future reference and observe all instructions contained therein.

The type label must remain permanently attached to the product.

2.2 Safety Information

This section contains safety information that must be observed at all times when working on or with the product.

To prevent personal injury and property damage and to ensure long-term operation of the product, read this section carefully and observe all safety information at all times.

DANGER

Danger to life due to high voltages of the PV array

When exposed to sunlight, the PV array generates dangerous DC voltage, which is present in the DC conductors and the live components of the inverter. Touching the DC conductors or the live components can lead to lethal electric shocks.

- Prior to performing any work on the inverter, always disconnect the inverter from voltage sources on the AC and DC sides as described in the inverter manual. When doing so, note that even if the DC load-break is switched off, there will be dangerous direct voltage present in the DC conductors of the inverter.

NOTICE

Damage to seals on the enclosure lids in subfreezing conditions

If you open the enclosure lids when temperatures are below freezing, the enclosure seals can be damaged. This can lead to moisture entering the inverter.

- Only open the enclosure lids if the ambient temperature is not below -5°C
- If a layer of ice has formed on the seal of the lid when temperatures are below freezing, remove it prior to opening the enclosure lids (e.g. by melting the ice with warm air). Observe the applicable safety regulations.

NOTICE

Damage to the inverter or product due to electrostatic discharge

Touching electronic components can cause damage to or destroy the inverter or the product through electrostatic discharge.

- Ground yourself before touching any component.

3 Scope of Delivery

Check the scope of delivery for completeness and any externally visible damage. Contact your distributor if the scope of delivery is incomplete or damaged.

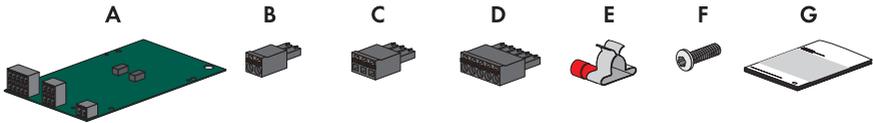


Figure 1: Components included in the scope of delivery

Position	Quantity	Designation
A	1	SMA Sensor Module
B	1	2-pole connecting terminal plate
C	2	3-pole connecting terminal plate
D	2	5-pole connecting terminal plate
E	3	Shield clamp with ring terminal lug
F	1	Fastening screw (M5, TX 25)
G	1	Quick Reference Guide

4 Product Description

4.1 SMA Sensor Module

The SMA Sensor Module is a module for SMA inverters. The SMA Sensor Module has different interfaces for connecting various sensors. The SMA Sensor Module converts the signals of the connected sensors and transmits them to the inverter.

The SMA Sensor Module has the following interfaces:

- Two temperature inputs for connecting the temperature sensors
- One analog input for voltage or current signals (e.g. of an irradiation sensor)
- One supply voltage for a signal source (e.g. of an irradiation sensor)
- One S0 interface (e.g. for connecting an anemometer or energy meter)

The SMA Sensor Module performs the following tasks:

- Receive measured data from Pt100 or Pt1000 temperature sensors
- Receive measured data of an irradiation sensor that can output current or voltage signals as well as provide supply voltage for this irradiation sensor
- Receive measured data of a remote terminal (e.g. anemometer or energy meter)

Design of the module

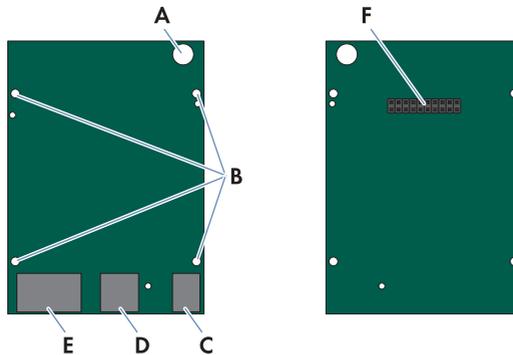


Figure 2: Design of the module

Position	Designation	Explanation
A	-	Opening for the fastening screw
B	-	Openings for the guide pins of the communication assembly
C	S0	Terminal for receiving S0 impulses
D	ANA-IN	Terminal for the analog voltage or current measurement as well as supply voltage of 24 V _{DC}

Position	Designation	Explanation
E	TEMP-IN	Terminals for the temperature measurement
F	-	Connector strip on the back of the module for connection to the communication assembly in the inverter

4.2 Type Label

The type label clearly identifies the product. The type label is located on the front of the product.



Figure 3: Design of the type label

Position	Explanation
A	Device type
B	Serial number
C	Hardware version

You will require the information on the type label to use the product safely and when seeking customer support from Service (see Section 9 "Contact", page 30).

5 Mounting

5.1 Mounting position

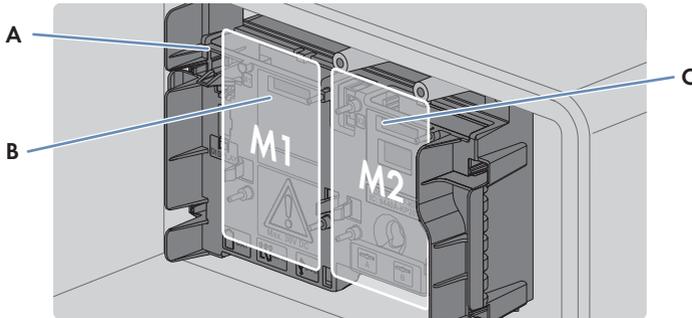


Figure 4: Communication assembly in the inverter with mounting position for the module

Position	Designation
A	Communication assembly
B	Module slot M1 *
C	Module slot M2

* Either of the two module slots can be used for the SMA Sensor Module. SMA Solar Technology AG recommends using module slot **M1** for the SMA Sensor Module.

5.2 Installing the Module

i Maximum number of modules of the same device type per inverter

You can only use a maximum of one SMA Sensor Module per inverter.

Procedure:

- ⚠ DANGER**

Danger to life due to high voltages of the PV array

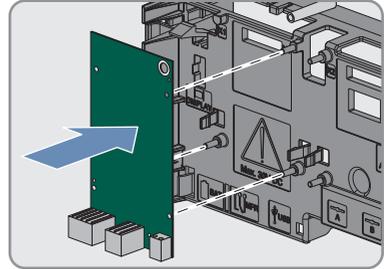
When exposed to sunlight, the PV array generates dangerous DC voltage, which is present in the DC conductors and the live components of the inverter. Touching the DC conductors or the live components can lead to lethal electric shocks.

- Prior to performing any work on the inverter, always disconnect the inverter from voltage sources on the AC and DC sides as described in the inverter manual. When doing so, note that even if the DC load-break is switched off, there will be dangerous direct voltage present in the DC conductors of the inverter.

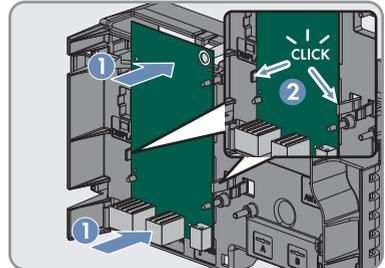
2. To achieve an optimum WLAN range, the module should ideally be installed on module slot

M1. Perform the following steps:

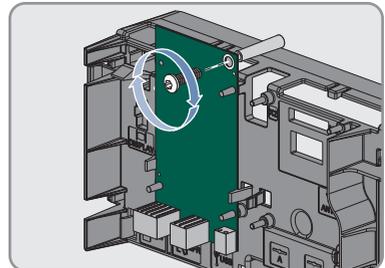
- Guide the three guide pins on the communication assembly through the holes in the module. The holes in which the guide pins must be inserted depend on the module slot.



- Carefully push the module down on the upper edge and on the connection sockets at the same time (1) until it audibly snaps into both side locking tabs of the communication assembly (2). The connector strip on the back of the module is automatically pushed into the socket terminal strip of the communication assembly.



3. Tighten the fastening screw with a Torx screwdriver (TX 25) on the module (torque: 1.5 Nm). This additionally fixes the module in place and grounds it in the inverter enclosure.



6 Connection

6.1 Safety during Electrical Connection

⚠ DANGER

Danger to life due to high voltages of the PV array

When exposed to sunlight, the PV array generates dangerous DC voltage, which is present in the DC conductors and the live components of the inverter. Touching the DC conductors or the live components can lead to lethal electric shocks.

- Prior to performing any work on the inverter, always disconnect the inverter from voltage sources on the AC and DC sides as described in the inverter manual. When doing so, note that even if the DC load-break is switched off, there will be dangerous direct voltage present in the DC conductors of the inverter.

NOTICE

Damage to the inverter or product due to electrostatic discharge

Touching electronic components can cause damage to or destroy the inverter or the product through electrostatic discharge.

- Ground yourself before touching any component.

6.2 Cable Requirements

i UV resistance of connection cables

Connection cables to be laid outdoors must be UV-resistant or routed in a UV-resistant cable channel.

Cable type	Requirements
Cable for shielding the analog input and the temperature inputs	<input type="checkbox"/> Number of conductors: 1 <input type="checkbox"/> Conductor cross-section: 1.5 mm ² <input type="checkbox"/> Cable length: 120 mm

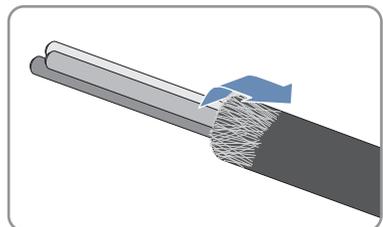
Cable type	Requirements
Connection cables for temperature inputs	<input type="checkbox"/> Number of insulated conductors for tolerance $\pm 2^{\circ}\text{C}$: at least two <input type="checkbox"/> Number of insulated conductors for tolerance $\pm 0.5^{\circ}\text{C}$: at least four <input type="checkbox"/> Shielding: yes <input type="checkbox"/> Conductor cross-section with four-conductor connection technology: at least $4 \times 0.25 \text{ mm}^2$ <input type="checkbox"/> Maximum cable length for four-conductor connection technology: 20 m <input type="checkbox"/> Conductor cross-section for two-conductor connection technology: at least $2 \times 0.25 \text{ mm}^2$ <input type="checkbox"/> Maximum cable length for two-conductor connection technology: 2.5 m <input type="checkbox"/> External cable diameter: 4.5 mm to 7.0 mm
Connection cable for analog input	<input type="checkbox"/> Number of conductors: at least 2 <input type="checkbox"/> Shielding: yes <input type="checkbox"/> Conductor cross-section: 0.2 mm^2 to 1.5 mm^2 <input type="checkbox"/> Maximum cable length: 30 m
Connection cable for S0 interface	<input type="checkbox"/> Number of conductors: 2 <input type="checkbox"/> Shielding: yes <input type="checkbox"/> Conductor cross-section: 0.2 mm^2 to 1.5 mm^2 <input type="checkbox"/> Maximum cable length: 30 m

6.3 Preparing the Connection Cable

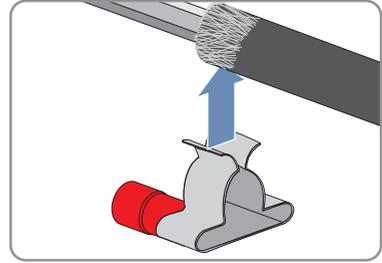
Prepare each connection cable for connection and the cable for shielding the analog input and the temperature inputs in accordance with the following procedure for connection to the multipole terminal blocks.

Procedure:

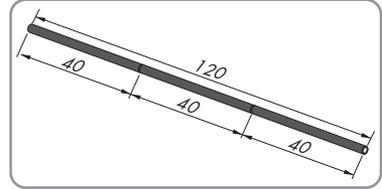
- Strip 40 mm of cable sheath from the end of the connection cable to which the multipole terminal block is to be attached. Make sure that no pieces of cable are dropped into the inverter.
- Trim the cable shield to a length of 15 mm and fold it over the cable sheath.



3. Press the shield clamp onto the cable shield. The cable shield must be clamped under the shield clamp as completely as possible.



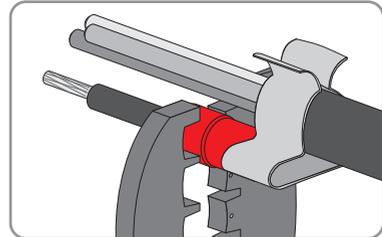
4. For each connection cable, cut 40 mm from the 120 mm cable for shielding.



5. Remove 6 mm of cable sheath from both ends of each piece of cable and strip off 6 mm of the insulation of each conductor.



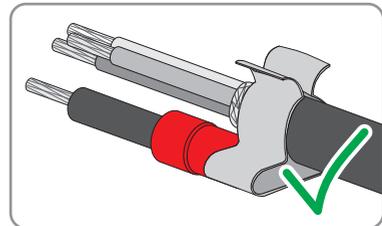
6. Attach each cable piece for shielding to a shield clamp. To do so, plug one end of each cable piece into the ring terminal lug of the shield clamp and crimp using a crimping tool.



7. Strip off 6 mm of the conductor insulation from each of the connection cable conductors.

8. Trim unneeded insulated conductors of the connection cable flush with the cable sheath.

- The connection cable and the cable for shielding have been prepared for connection.



6.4 Preparing the Enclosure Opening on the Inverter

Additionally required material (not included in the scope of delivery):

- Connection cable (see Section 6.2 "Cable Requirements", page 14)

Procedure:

1. Make sure that the inverter has been disconnected and is secured against reconnection (see the inverter manual).
2. Push the filler plug out of the enclosure opening and retain it for later decommissioning.
3. Insert the cable gland supplied from the outside and tighten it with the counter nut from the inside.
4. Unscrew the swivel nut of the cable gland.
5. Press the seal out of the cable gland from the inside.
6. Remove the filler plugs from the four-hole seal depending on the number of connection cables and store safely for later decommissioning.
7. Lead the connection cable through the swivel nut and seal into the inverter.
8. Screw the swivel nut of the cable gland on loosely.

6.5 Connecting the Temperature Sensor

You can connect one outside temperature sensor and one module temperature sensor each to the module. The measured values from the temperature sensors are shown on the user interface of the inverter.

Additionally required material (not included in the scope of delivery):

- Up to two temperature sensors
- Up to two connection cables (see Section 6.2, page 14)

Requirements:

- The temperature sensor must be technically suitable for connection to the temperature input (see Section 8, page 28).
- The connection cable must be prepared for connection to the multipole terminal block (see Section 6.3, page 15).

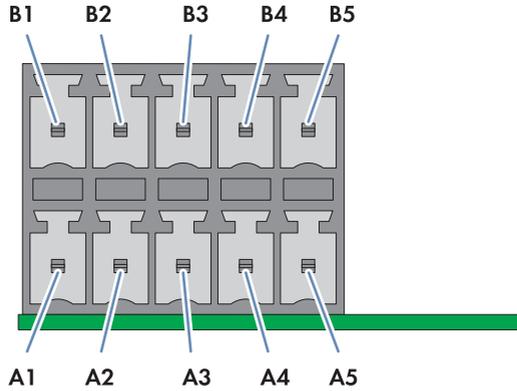


Figure 5: Pin assignment for terminal **TEMP-IN**

Temperature input	Pin	Signal	Explanation
Outside temperature	A1	GND	Shield ground
	A2	I+	Current output
	A3	V+	Voltage input
	A4	V-	Voltage return
	A5	I-	Current return
Cell temperature	B1	GND	Shield ground
	B2	I+	Current output
	B3	V+	Voltage input
	B4	V-	Voltage return
	B5	I-	Current return

Circuitry overviews:

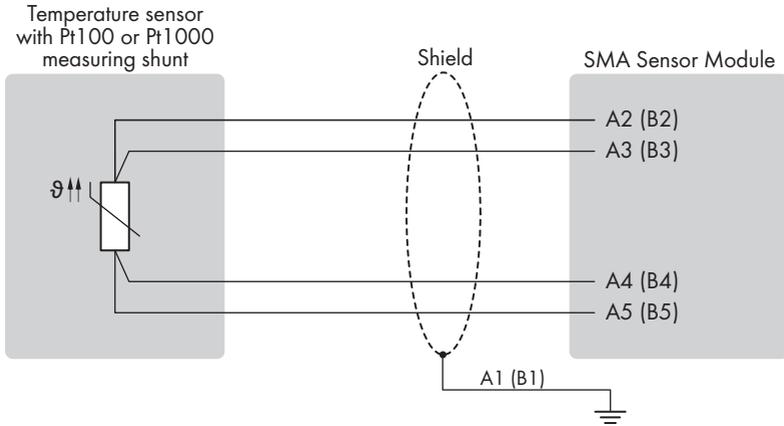


Figure 6: Connection of a temperature sensor with four-conductor connection technology

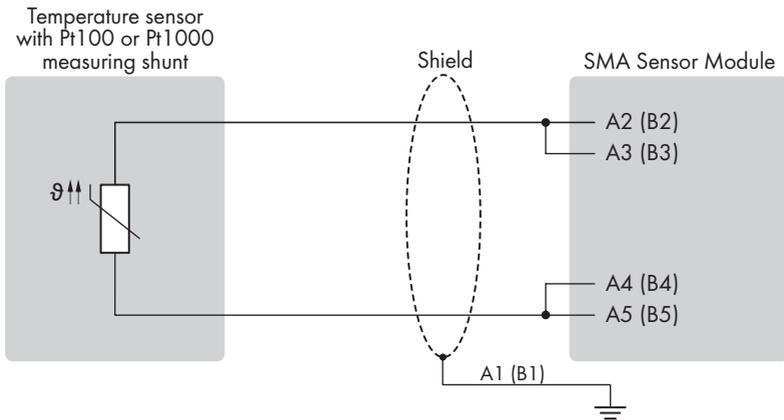
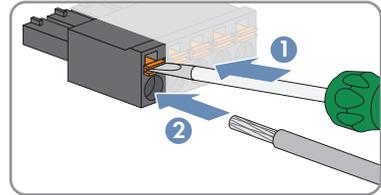


Figure 7: Connection of a temperature sensor with two-conductor connection technology

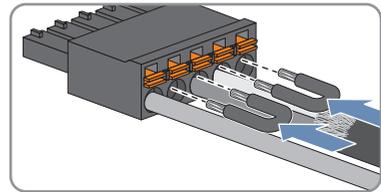
Procedure:

1. Connect the connection cable to the temperature sensor (see the manual from manufacturer). Trim the unneeded insulated conductors up to the cable shield and note down the conductor colors.

2. On the 5-pole connecting terminal plate, unlock the terminal position 1 using a suitable tool (1) and plug the conductor of the cable piece for shielding into this terminal position (2).



3. For connection to the module using two-conductor connection technology, perform the following steps:
 - On the 5-pole connecting terminal plate, unlock the terminal positions 3 and 4 using a suitable tool and plug the conductors of the connection cable into these terminal positions. Observe the pin assignment.
 - On the 5-pole connecting terminal plate, bridge the terminal positions 2 and 3 as well as the terminal positions 4 and 5.



4. For connection to the module using four-conductor connection technology, unlock the terminal positions 2, 3, 4, and 5 on the 5-pole connecting terminal plate using a suitable tool and plug the conductors of the connection cable into these terminal positions. Observe the pin assignment.
 5. To connect the outside temperature sensor, plug the 5-pole connecting terminal plate into pin row A on terminal **TEMP-IN**.
 6. To connect the module temperature sensor, plug the 5-pole connecting terminal plate into pin row B on terminal **TEMP-IN**.
 7. If no further connections are required on the module or in the inverter, close the inverter and commission it (see the inverter manual).
- The type of temperature sensor is detected automatically by the inverter. Configuration is not necessary.

6.6 Connecting an Irradiation Sensor

You can connect a maximum of one irradiation sensor to the module.

Additionally required material (not included in the scope of delivery):

- 1 irradiation sensor
- 1 connection cable (see Section 6.2, page 14)

Requirements:

- The irradiation sensor must be technically suitable for connection to the analog input (see Section 8, page 28).
- The connection cable must be prepared for connection to the multipole terminal block (see Section 6.3, page 15).

Pin assignment:

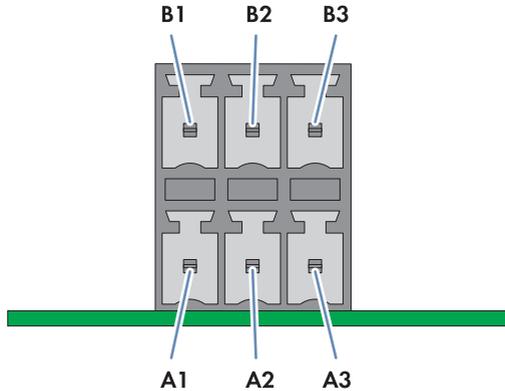


Figure 8: Pin assignment for terminal **ANA-IN**

Pin	Signal	Explanation
B1	V+	Voltage input
B2	I+	Current input
B3	GND	Reference potential of the supply voltage
A1	SHIELD	Shield ground
A2	24V	Supply voltage 24V DC
A3	GND	Reference potential of the supply voltage

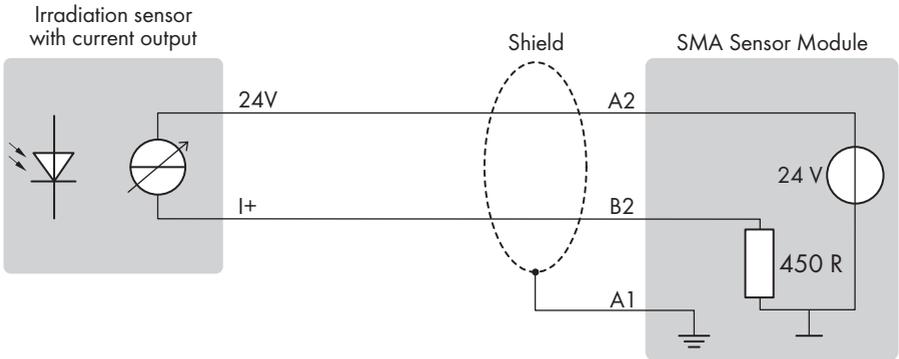
Circuitry overviews:

Figure 9: Connection of an irradiation sensor with current output

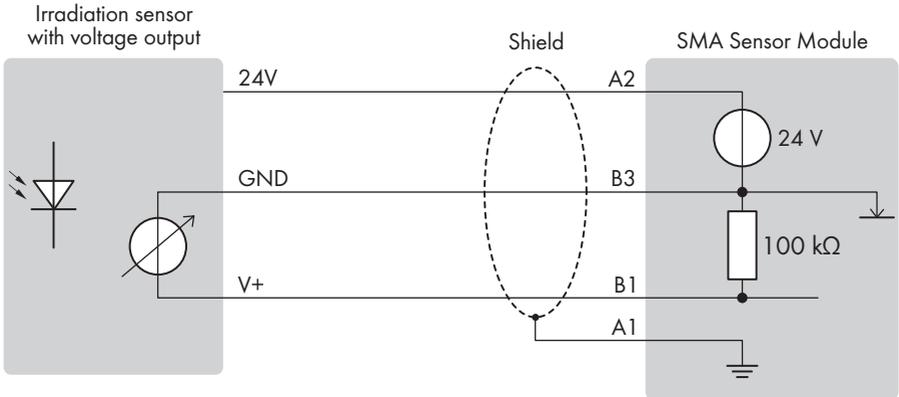
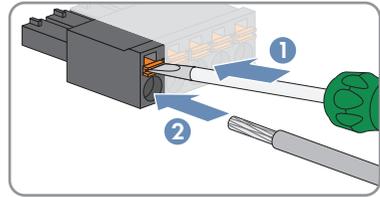


Figure 10: Connection of an irradiation sensor with voltage output

Procedure:

1. Connect the connection cable to the irradiation sensor (see the manual from manufacturer). Trim the unneeded insulated conductors up to the cable shield and note down the conductor colors.
2. Depending on the irradiation sensor and the pin assignment of pin row A, identify the terminal positions on the first 3-pole connecting terminal plate that are required for connecting the connection cable.

3. On the first 3-pole connecting terminal plate, unlock the required terminal positions using a suitable tool (1) and plug the conductors into these terminal positions (2).



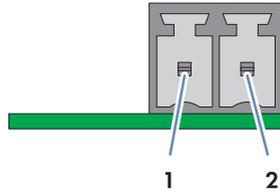
4. On the second 3-pole connecting terminal plate, unlock the terminal position 1 using a suitable tool and plug the conductor of the cable piece for shielding into this terminal position.
5. When using the supply voltage provided by the module, perform the following additional steps for the second 3-pole connecting terminal plate:
- Unlock terminal position 2 using a suitable tool and plug the insulated conductor for supply voltage into this terminal position.
 - Unlock terminal position 3 using a suitable tool and plug the insulated conductor for the reference potential of the supply voltage into this terminal position.
6. Plug the first 3-pole connecting terminal plate into pin row A on terminal **ANA-IN**.
7. Plug the second 3-pole connecting terminal plate into pin row B on terminal **ANA-IN**.
8. If no further connections are required on the module or in the inverter, close the inverter and commission it (see the inverter manual).
9. Configure the characteristic curve of the irradiation sensor via the inverter (see the inverter manual for login information).

6.7 Connecting the Remote Terminal to the S0 Interface

You can connect a maximum of one remote terminal for S0 impulses to the module, e.g. one anemometer or one energy meter.

Additionally required material (not included in the scope of delivery):

- 1 remote terminal with impulse output for S0 impulses to DIN EN 62053-31 (IEC 62053-31)
- 1 connection cable (see Section 6.2, page 14)

Pin assignment:Figure 11: Pin assignment for terminal **S0-IN**

Pin	Signal	Explanation
1	S0-	Input for S0 signal
2	S0+	Current-supplying output for supplying the S0 signal

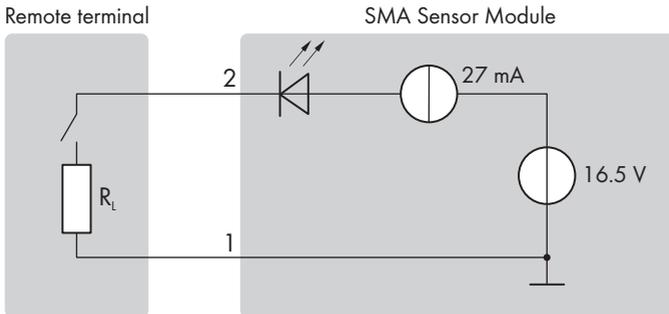
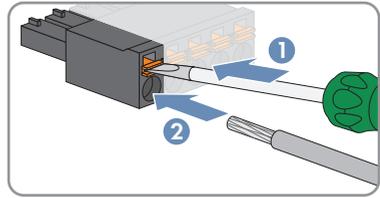
Circuitry overview:

Figure 12: Circuitry overview for the connection of a remote terminal to the S0 interface

Procedure:

1. Connect the connection cable to the remote terminal and write down the conductor colors (see the manual from manufacturer).
2. Connect the connection cable to the 2-pole connecting terminal plate:
 - 40 mm Peel cable sheath. Make sure that no pieces of cable are dropped into the inverter.
 - Strip off the conductor insulation by 6 mm.

- On the 2-pole connecting terminal plate, unlock the required terminal positions using a suitable tool (1) and plug the conductors of the connection cable into these terminal positions (2). Observe the pin assignment.



3. Plug the 2-pole connecting terminal plate into pin the row on terminal **S0-IN**.
4. If no further connections are required on the module or in the inverter, close the inverter and commission it (see the inverter manual).
5. Configure the remote terminal via the inverter user interface (see the inverter manual for login information).

7 Decommissioning

7.1 Removing the Module

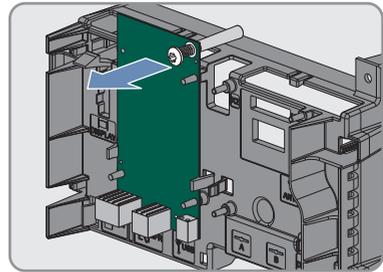
Procedure:

1. **DANGER**

Danger to life due to high voltages of the PV array

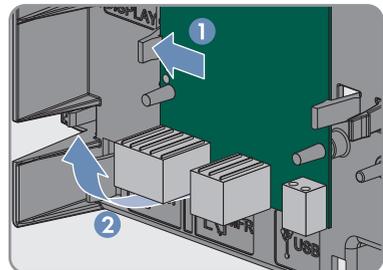
When exposed to sunlight, the PV array generates dangerous DC voltage, which is present in the DC conductors and the live components of the inverter. Touching the DC conductors or the live components can lead to lethal electric shocks.

- Prior to performing any work on the inverter, always disconnect the inverter from voltage sources on the AC and DC sides as described in the inverter manual. When doing so, note that even if the DC load-break is switched off, there will be dangerous direct voltage present in the DC conductors of the inverter.
2. Remove all connecting terminal plates from the used connection sockets of the module.
 3. Loosen the fastening screw on the module using a Torx screwdriver (TX 25).



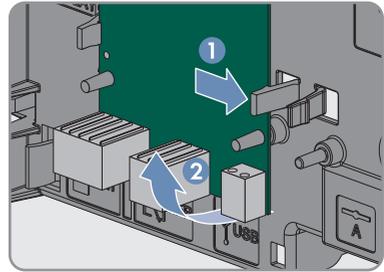
4. Remove the module:

- Press the right or left locking tab of the communication assembly slightly outwards (1) and pull the module slightly forwards holding the lower end (2) until the module is released from the interlock of the locking tab.



- Grab the module by the upper and lower edge with one hand.

- Slightly press the second locking tab outwards using the other hand (1) and pull the module slightly forwards on the lower end (2) until the module is released from the interlock of the locking tab.



- Remove the module from its slot by pulling it forwards.
5. Remove the connection cables and cable gland from the inverter.
 6. Seal the enclosure opening of the inverter with the corresponding sealing plug.
 7. Close the inverter and recommission it, if necessary (see inverter manual).

7.2 Packing the Product for Shipment

- Pack the product for shipping. Use the original packaging or packaging that is suitable for the weight and size of the product.

7.3 Disposing of the Product

- Dispose of the product in accordance with the locally applicable disposal regulations for electronic waste.

8 Technical Data

General Data

Mounting location	In the inverter
Voltage supply	Via the inverter

Mechanical data

Width x height x depth	60 mm x 105 mm x 33 mm
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Ambient conditions for storage/transport

Ambient temperature	-40 °C to +70 °C
Relative humidity, non-condensing	4% to 100%
Maximum height above mean sea level	3000 m

Ambient conditions during operation

Ambient temperature	-40 °C to +85 °C
Relative humidity, non-condensing	4% to 100%
Maximum height above mean sea level	3000 m

Temperature inputs

Quantity	2
Measuring shunt	Platinum sensor Pt100, platinum sensor Pt1000
Type of measurement	Two-conductor connection technology, four-conductor connection technology
Measurement range	-40 °C to +85 °C
Typical measurement accuracy	±0.3 °C when measured with four-conductor connection technology
Maximum measurement error	±1.7 °C when measured with four-conductor connection technology
Maximum cable length	20 m when measured with four-conductor connection technology 2.5 m when measured with two-conductor connection technology

Analog input / current or voltage input

Quantity	1
Measurement range of the voltage input	0 V to 10 V

Input resistance of the voltage input	100 k Ω
Measurement range of the current input	0 mA to 20 mA
Load resistance of the current input	450 Ω
Typical measurement accuracy	± 0.3 %
Maximum measurement error	+2.0 %
Maximum cable length	30 m

Supply voltage for irradiation sensor

Quantity	1
Output voltage	24 V _{DC}
Maximum power consumption	600 mW

S0 interface

Standard	EN 62053-31 (IEC 62053-31)
Number of wires	2-conductor connection
Maximum cable length	30 m
Maximum output current at 1 Ω load	27 mA
Output current at 800 Ω load	≥ 10 mA
Maximum open-circuit voltage	16.5 V

9 Contact

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

- Inverters:
 - Serial number
 - Firmware version
 - Special country-specific settings (if applicable)
- Module:
 - Serial number
 - Hardware version
- Cables and sensors used
- Detailed description of the problem

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Österreich	Sunny Boy, Sunny Mini Central,	België	+32 15 286 730
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	Fuel Save Controller (PV-Diesel-Hybridsysteme): +49 561 9522-3199	Nederland	
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