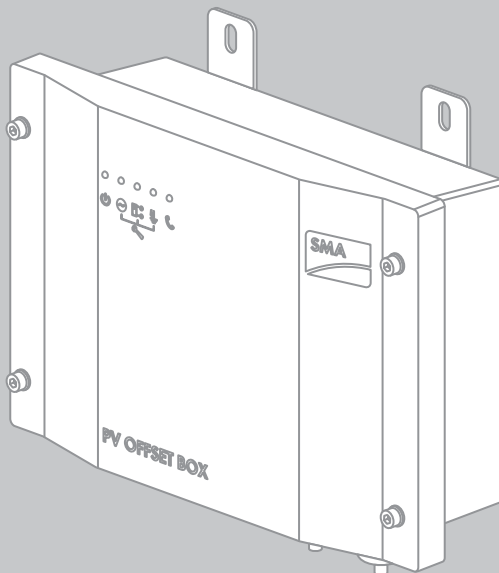


Accessories for PV Inverters

## SMA PV Offset Box

Installation Manual





# Table of Contents

<b>1</b>	<b>Information on this Manual</b>	<b>5</b>
<b>2</b>	<b>Safety</b>	<b>7</b>
2.1	Appropriate Usage	7
2.2	Qualifications of Skilled Persons	9
2.3	Safety precautions	9
<b>3</b>	<b>Scope of Delivery</b>	<b>10</b>
<b>4</b>	<b>Product Description</b>	<b>11</b>
4.1	SMA PV Offset Box	11
4.2	Fault Indication Relay	12
4.3	Type Label	12
4.4	LEDs	14
<b>5</b>	<b>Assembly</b>	<b>15</b>
5.1	Selecting the Mounting Location	15
5.2	Mounting the SMA PV Offset Box	18
<b>6</b>	<b>Setting the Operating Mode and Output Voltage</b>	<b>19</b>
<b>7</b>	<b>Electrical Connection</b>	<b>23</b>
7.1	Overview of the Connection Area	23
7.1.1	View from Below	23
7.1.2	Interior View	24
7.2	AC Connection	25
7.2.1	Conditions for AC Connection	25
7.2.2	Connecting the SMA PV Offset Box to the Electricity Grid (AC)	27
7.2.3	Connecting the Fault Indication Relay	30
7.2.4	Connecting Additional SMA PV Offset Boxes	31
7.3	DC Connection	33
7.3.1	Conditions for DC Connection	33
7.3.2	Assembling the DC Connectors	37
7.3.3	Connecting the PV Array (DC)	39

<b>8</b>	<b>Commissioning</b> .....	<b>41</b>
<b>9</b>	<b>Disconnecting the SMA PV Offset Box from Voltage Sources</b> .....	<b>43</b>
<b>10</b>	<b>Troubleshooting</b> .....	<b>45</b>
	10.1 LED Displays .....	45
	10.2 Resetting the Fault Display .....	47
<b>11</b>	<b>Decommissioning</b> .....	<b>48</b>
	11.1 Disassembling the SMA PV Offset Box .....	48
	11.2 Packing the SMA PV Offset Box .....	48
	11.3 Disposing of the SMA PV Offset Box .....	48
<b>12</b>	<b>Technical Data</b> .....	<b>49</b>
<b>13</b>	<b>Accessories</b> .....	<b>51</b>
<b>14</b>	<b>Contact</b> .....	<b>52</b>

# 1 Information on this Manual

## Validity

This manual is valid for the device type PVO-N-20.

## Target Group





This manual is intended for skilled persons. Only qualified personnel with the appropriate skills are allowed to perform the tasks set forth in this manual (see Section 2.2 "Qualifications of Skilled Persons", page 9).

## Additional Information

Links to additional information can be found at [www.SMA-Solar.com](http://www.SMA-Solar.com).

Document Title	Document Type
PID - The Problem and How to Solve It	Technical information
SMA PV Offset Box	Datasheet

## Symbols

Symbol	Explanation
 <b>DANGER</b>	Indicates a hazardous situation which, if not avoided, will result in death or serious injury
 <b>WARNING</b>	Indicates a hazardous situation which, if not avoided, could result in death or serious injury
 <b>CAUTION</b>	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury
<b>NOTICE</b>	Indicates a situation which, if not avoided, can result in property damage.
	Information that is important for a specific topic or objective, but is not safety-relevant
<input type="checkbox"/>	Indicates a requirement for meeting a specific goal
<input checked="" type="checkbox"/>	Desired result
<b>✘</b>	Undesired result. Followed by a solution on how to achieve the desired result.

## Abbreviations

<b>Abbreviation</b>	<b>Designation</b>	<b>Explanation</b>
AC	Alternating Current	-
DC	Direct Current	-
LED	Light-Emitting Diode	-
PV	Photovoltaics	-

## 2 Safety

### 2.1 Appropriate Usage

The SMA PV Offset Box applies a voltage against earth to PV modules and in this way dissipates any power-reducing charges in the PV modules.

The SMA PV Offset Box is intended exclusively for in-parallel operation on inverters with a maximum DC voltage of 400 V to 1,000 V.

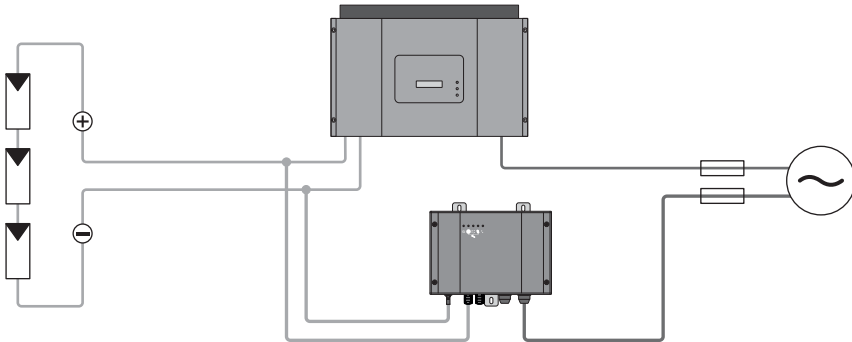


Figure 1: Principle of a PV plant with SMA PV Offset Box and string inverter

The SMA PV Offset Box can be operated with both a string inverter and with an inverter with several inputs. In an inverter with several inputs, the negative PV inputs must be internally bridged for this purpose. This is the case with SMA multi-string inverters, providing that the DC switch-disconnector, Electronic Solar Switch (ESS) is plugged in.

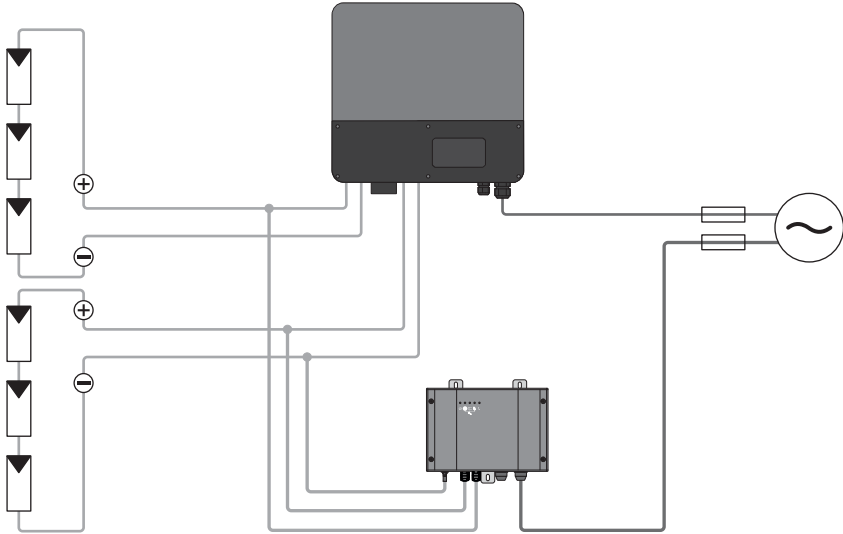


Figure 2: Principle of a PV plant with SMA PV Offset Box and multi-string inverter

No more than 1 SMA PV Offset Box must be connected per inverter. Exceptions to this rule are inverters with several inputs in which the negative DC inputs are not internally bridged.

1 SMA PV Offset Box per string can be connected to this type of inverter.

The SMA PV Offset Box can only be operated with PV plants having an insulation resistance (including insulation resistance of the inverter) of at least 200 k $\Omega$ .

The SMA PV Offset Box must only be operated with PV arrays (modules and cabling) of protection class II.

Before installing the SMA PV Offset Box, ensure that the permitted operating range of each component is maintained at all times.

You may only operate the SMA PV Offset Box once you have obtained the appropriate approval from both the manufacturer of the PV modules and the manufacturer of the inverter. Note any relevant restrictions in the approvals, e.g., pertaining to the maximum output voltage of the SMA PV Offset Box.

Any applications other than those described here shall be considered contrary to the appropriate usage. Alternative uses or modifications to the SMA PV Offset Box will void the warranty claims and operation permit.

Appropriate usage also includes compliance with all the supplied documentation. Keep this manual in a convenient place for future reference.



## 2.2 Qualifications of Skilled Persons

The work described in this document must be performed by skilled persons only. Skilled persons must have the following qualifications:

- Knowledge of how an inverter works and is operated
- Training in how to deal with the dangers and risks involved in installing and operating electrical devices and plants
- Training in the installation and commissioning of electrical devices and plants
- Knowledge of all applicable standards and directives
- Knowledge and observance of this document and all safety precautions

## 2.3 Safety precautions

### Electric Shock

When the SMA PV Offset Box is in operation, voltage will be present in the PV array at night.

Prior to any maintenance work on the PV plant:

- Disconnect the inverter from all voltage sources (see the inverter installation manual).
- Disconnect the SMA PV Offset Box from all voltage sources (see Section 9 "Disconnecting the SMA PV Offset Box from Voltage Sources", page 43).

If the output voltage of the SMA PV Offset Box is set too high, the insulation of the connected inverters, PV modules or other DC-side components could be damaged. There is a risk of electric shock.

- Observe the maximum DC voltage of the PV modules, the inverter and any other DC-side components (see manufacturer specifications).
- Only connect approved PV modules and inverters.
- For SMA inverters, observe additional specifications on maximum DC voltage in the datasheet of the SMA PV Offset Box at [www.SMA-Solar.com](http://www.SMA-Solar.com).

### Electrostatic Discharge (ESD)

By touching electronic components you can cause damage to or destroy the SMA PV Offset Box through electrostatic discharge (ESD).

- Earth yourself on an earthed object before touching any component inside the SMA PV Offset Box. Do not use the enclosure of the SMA PV Offset Box for this purpose, as it is not earthed.

### 3 Scope of Delivery

Check the scope of delivery for completeness and any visible external damage. Contact your specialist dealer if the delivery is incomplete or you find any damage.

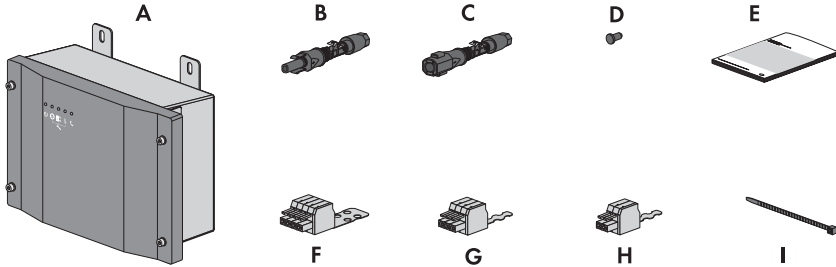


Figure 3: Components included in the scope of delivery

Item	Quantity	Description
<b>A</b>	1	SMA PV Offset Box
<b>B</b>	2	Positive DC connector
<b>C</b>	1	Negative DC connector
<b>D</b>	1	Sealing plugs
<b>E</b>	1	Installation manual
<b>F</b>	1	4-pole plug with strain relief
<b>G</b>	1	3-pole plug with strain relief
<b>H</b>	1	2-pole plug with strain relief
<b>I</b>	6	Cable tie

## 4 Product Description

### 4.1 SMA PV Offset Box

The SMA PV Offset Box dissipates power-reducing charges in PV modules.

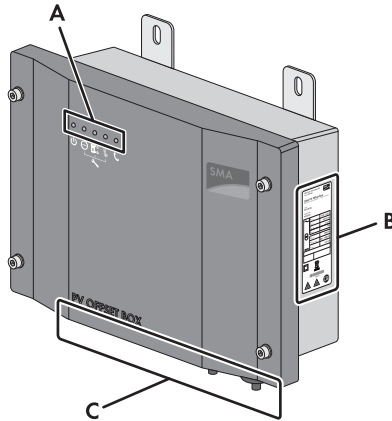


Figure 4: Parts of the SMA PV Offset Box

Item	Description	Explanation
A	LEDs	LEDs for operation and fault display
B	Type label	-
C	Connection area	Cable glands for the AC connection and DC connector

The SMA PV Offset Box is connected in parallel with the inverter and applies a voltage against earth to PV modules. It can apply a set voltage or automatically regulate its output voltage.

Depending on its configuration, the SMA PV Offset Box performs various functions. Overnight, it can dissipate PV modules charges which have accumulated during the day. In continuous operation, the SMA PV Offset Box regenerates PV modules whose efficiency was previously reduced.

The SMA PV Offset Box continually monitors the connection of the functional earthing (FE) and the insulation of the PV plant. Prior to starting operation, the SMA PV Offset Box checks whether the PV strings are reverse poled or interrupted. Faults are displayed via LEDs.

## 4.2 Fault Indication Relay

An external fault indicator can be connected via the fault indication relay in the SMA PV Offset Box. Depending on the type of electrical connection, the fault indicator is activated either in the event of a disturbance or during fault-free operation of the SMA PV Offset Box.

## 4.3 Type Label

The type label clearly identifies the SMA PV Offset Box. The type label is located on the right-hand side of the enclosure.

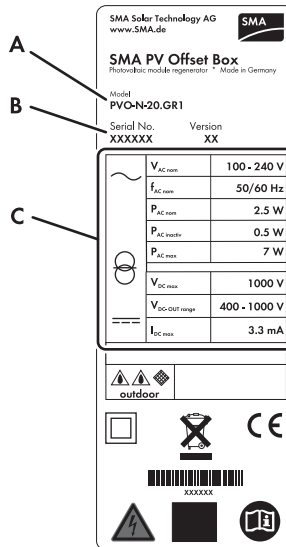











Figure 5: Layout of the type label

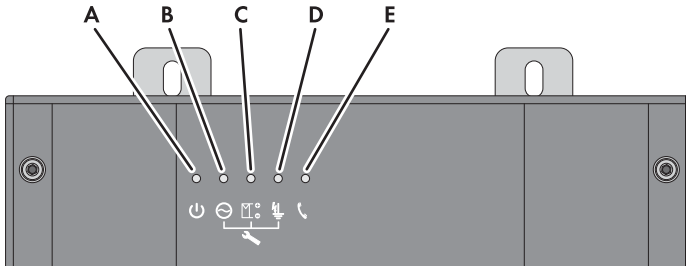
Item	Description	
A	Model	Device type
B	Serial No.	Serial number
C	Device-specific characteristics	-

The information on the type label will support you in the safe use of the SMA PV Offset Box and will be needed when you contact the SMA Service Line. The type label must be permanently affixed to the SMA PV Offset Box.

## Symbols on the Type Label

Symbol	Meaning	Explanation
	Danger to life due to high voltages	The SMA PV Offset Box operates at high voltages. All work on the SMA PV Offset Box must be performed by skilled workers only.
	Observe the documentation.	Observe all the documentation supplied with the SMA PV Offset Box.
	Proper disposal	Do not dispose of the SMA PV Offset Box with the household refuse.
	AC	Alternating current
	DC	Direct current
	With transformer	The SMA PV Offset Box is equipped with a transformer.
	Protection class II	The protection insulation of the SMA PV Offset Box is compliant with protection class II.
	CE marking	The SMA PV Offset Box complies with the requirements of the applicable EC directives.
	Degree of protection: IP65	The SMA PV Offset Box is protected against dust intrusion and water jets from any angle.

## 4.4 LEDs



Item	Description	Explanation
A	Green LED	Indicates the operating state of the SMA PV Offset Box.
B	Red-yellow LED	Indicates an FE connection fault or AC connection fault.
C	Red-yellow LED	Indicates a DC connection fault.
D	Red-yellow LED	Indicates an insulation fault.
E	Red-yellow LED	Indicates a device fault.

The LEDs for fault indication are 2-colour. They glow red if operation is currently interrupted. They glow yellow if a fault has previously occurred, but normal operation is currently possible.

## 5 Assembly

### 5.1 Selecting the Mounting Location

#### Requirements for the mounting location:

**⚠ DANGER****Danger to life due to fire or explosion**

Despite careful construction, electrical devices can cause fires.

- Do not mount the SMA PV Offset Box on flammable construction materials.
  - Do not mount the SMA PV Offset Box in the vicinity of highly flammable materials.
  - Do not mount the SMA PV Offset Box in potentially explosive areas.
- 
- The installation site must be freely and safely accessible at all times without the necessity for any auxiliary equipment (such as scaffolding or lifting platforms). Non-fulfillment of these criteria may restrict servicing.
  - The mounting surface must be even. The wall brackets of the SMA PV Offset Box must lie flush with the mounting surface.
  - The ambient temperature must be between  $-25^{\circ}\text{C}$  and  $+60^{\circ}\text{C}$ .
  - The LED display of the SMA PV Offset Box must be readable.
  - The mounting location should be close to the inverter. If the device is mounted on the PV array, support by SMA Service will not be possible.

**Dimensions for mounting:**

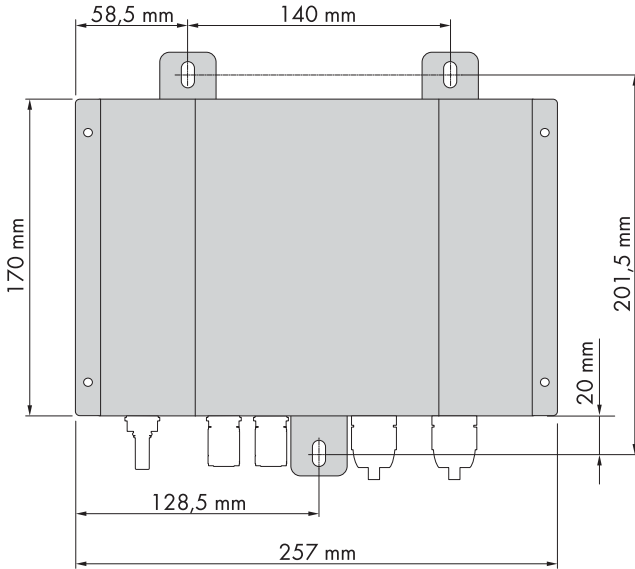
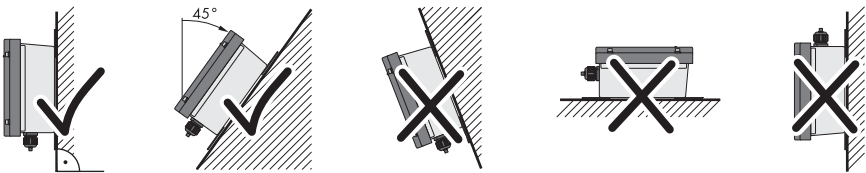


Figure 6: Dimensions of the SMA PV Offset Box and the drill holes for mounting

**Observe the permitted mounting positions:**

- Mount the SMA PV Offset Box in a vertical position or tilted backwards by max. 45°. The connection area must point downwards.



Permitted and prohibited mounting positions



**Observe recommended clearances:**

- In order to have sufficient room for mounting, installation, and maintenance of the SMA PV Offset Box, observe the recommended clearances. In addition, take the recommended clearances of the inverter into account.

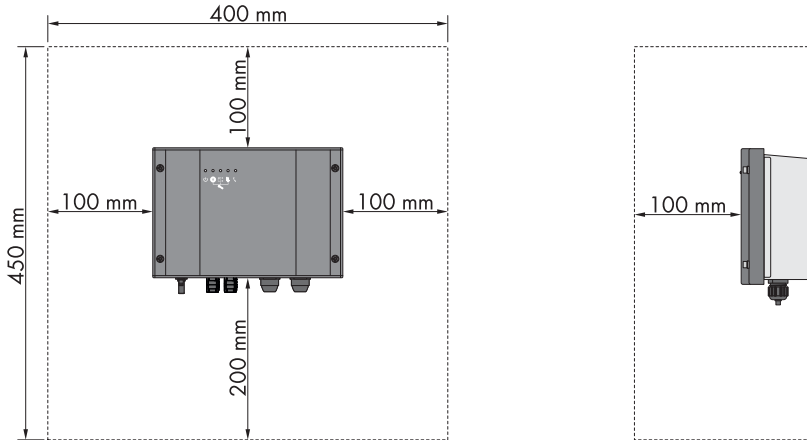


Figure 7: Recommended clearances

## 5.2 Mounting the SMA PV Offset Box

1. Mark the position of the drill holes.

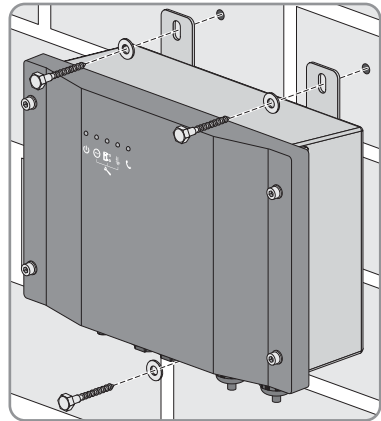
2. **⚠ DANGER**

**Danger to life due to electric shock or explosion if you drill into utility lines.**

There may be gas pipes or electric cables located behind the mounting points which could be damaged when you drill the holes for the SMA PV Offset Box.

- Make sure that there are no utility lines behind the mounting points.

3. Drill the holes.
4. Insert the wall plugs.
5. Screw the SMA PV Offset Box to the mounting surface.



6. Check that the SMA PV Offset Box is fixed securely to the surface.

## 6 Setting the Operating Mode and Output Voltage

### Setting Options for the Operating Mode

The SMA PV Offset Box has the following operating modes:

- Night operation: the SMA PV Offset Box emits voltage overnight and is inactive during the day.
- Continuous operation: the SMA PV Offset Box continuously applies a fixed voltage to the PV modules. During the continuous operation of the SMA PV Offset Box, the inverter must not be connected to the electricity grid. Afterwards, you must manually set the SMA PV Offset Box to another operating mode and restart the inverter.
- Temporary operation: the SMA PV Offset Box runs continuously for 10 days at a fixed set voltage and thereafter switches automatically to night mode. As long as the SMA PV Offset Box is continuously applying voltage, the inverter must not be connected to the electricity grid. There are two switch positions for the operating mode "Temporary operation": "Temporary operation 1" and "Temporary operation 2". After switching between these positions, the SMA PV Offset Box restarts temporary operation and runs for another 10 days in continuous operation.

### Setting Options for Output Voltage

The output voltage of the SMA PV Offset Box can be regulated in two ways, as follows:

- Fixed voltage setting: for fast regeneration of the PV modules, it is recommended to set the largest permissible fixed voltage. The output voltage can be set to a fixed voltage of 400 V, 550 V, 700 V or 1,000 V. The setting of a fixed voltage is required for the operating modes "Continuous operation" and "Temporary operation" and is optional for the operating mode "Night mode".
- Automatic voltage regulation: this setting is only required for the operating mode "Night mode". With automatic voltage regulation, the magnitude of the output voltage is based on the PV voltage of the previous day. For the automatic voltage regulation, there are two switch positions. If at the SMA PV Offset Box one terminal is assigned with PV+, select switch position "Automatic, 1 string". If two terminals are assigned with PV+, select switch position "Automatic, 2 strings".



#### Obtain approval from module manufacturer

Ask your module manufacturer which operating mode setting is recommended for your PV plant.

## Requirements for Setting a Fixed Output Voltage

If you set a fixed output voltage on the SMA PV Offset Box, this must not exceed the maximum system voltage of the PV modules, the inverter or other DC-side components.

General information on the maximum DC voltage of the PV modules and inverters can be found in the respective product documentation. Please refer to the manufacturer approvals on the PV modules and inverters for the specific requirements for operation with the SMA PV Offset Box.

The following applies to SMA inverters:

- For most SMA inverter types, the maximum voltage output to be set on the SMA PV Offset Box is equal to the maximum DC voltage of the inverter.
- The inverters approved by SMA are listed in the datasheet of the SMA PV Offset Box at [www.SMA-Solar.com](http://www.SMA-Solar.com).

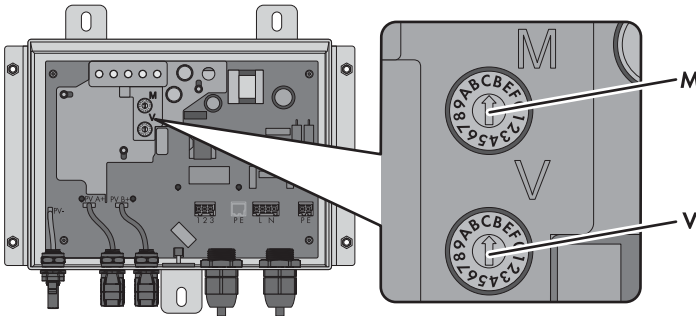
## Permissible Combinations of Operating Mode and Output Voltage

Operating mode	Voltage setting	Explanation
Night mode	fixed	This setting is suitable for the overnight regeneration of PV modules with severely reduced power. If you set the output voltage on the SMA PV Offset Box to the maximum system voltage, optimum regeneration will take place.
	automatic, 1 string	This setting is suitable for preventing power reductions in the PV modules. Since regeneration takes place overnight, inverter operation does not need to be interrupted. For automatic voltage regulation, you will need to set the number of connected strings.
	automatic, 2 strings	
Continuous operation	fixed	This operating mode is suitable for the rapid regeneration of PV modules with severely reduced power. During continuous operation the inverter must be disconnected from the grid.
Temporary operation	fixed	This operating mode is suitable for the rapid regeneration of PV modules with severely reduced power. The SMA PV Offset Box runs continuously for 10 days at a fixed set voltage and then switches to night mode with automatic voltage regulation. During continuous operation the inverter must be disconnected from the grid.

## Setting Faults

A setting fault is indicated by 3 red flashing LEDs. If the setting of the output voltage is not suitable for the selected operating mode, the SMA PV Offset Box displays a setting fault during commissioning (see Section 10 "Troubleshooting", page 45). A setting fault will also be displayed if you have selected an unassigned switch position. As long as a setting fault is present, the SMA PV Offset Box will not start operation.

**Overview of the Configuration Area**



Item	Explanation
<b>M</b>	Rotary switch for setting the operating mode
<b>V</b>	Rotary switch for setting the output voltage

**Procedure**

1. If the SMA PV Offset Box is already in operation, disconnect it from all voltage sources (see Section 9).
2. Unscrew all the enclosure lid screws and remove the lid.
3. Set the rotary switch **M** to the desired operating mode.

Switch position	Operating mode
0	No selection (default setting)
1	Night mode
3	Continuous operation
5	Temporary operation 1
7	Temporary operation 2

4. Set the rotary switch **V** to the desired output voltage.

Switch position	Output voltage
0	No selection (default setting)
1	400 V
3	550 V
5	700 V
7	1,000 V
9	automatic, 1 string
B	automatic, 2 strings

**⚠ WARNING****Danger to life due to electric shock**

If the output voltage of the SMA PV Offset Box is set too high, the insulation of the connected inverters, PV modules or other DC-side components could be damaged. There is a risk of electric shock.

- Observe the maximum DC voltage of the PV modules, the inverter and any other DC-side components (see manufacturer specifications).
- Only connect approved PV modules and inverters.
- For SMA inverters, observe additional specifications on maximum DC voltage in the datasheet of the SMA PV Offset Box at [www.SMA-Solar.com](http://www.SMA-Solar.com).

## 7 Electrical Connection

### 7.1 Overview of the Connection Area

#### 7.1.1 View from Below

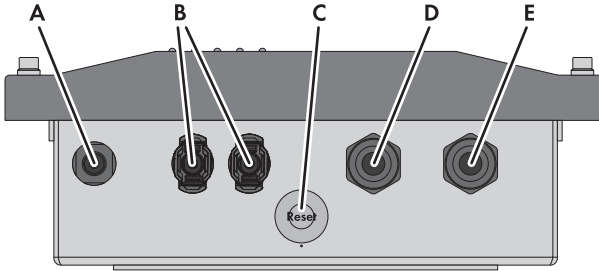


Figure 8: Exterior view of the connection area

Item	Description	Explanation
A	DC connector PV-	Negative DC terminal
B	DC connector PV+	Positive DC terminals
C	Reset button	For resetting the LED display
D	Enclosure opening M20	For looping the grid connection (AC) through to another SMA PV Offset Box
E	Enclosure opening M20	For the grid connection (AC) of the SMA PV Offset Box

### 7.1.2 Interior View

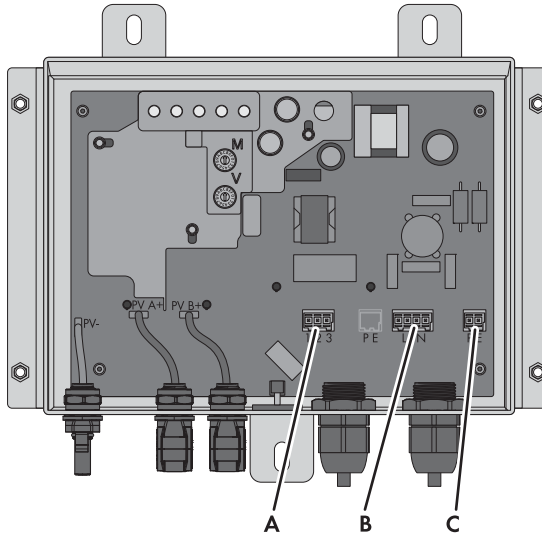


Figure 9: Interior view of the SMA PV Offset Box

Item	Description	Explanation
A	Connection socket	Connection socket for fault indication relay
B	Connection socket	Connection socket for AC connection
C	Connection socket	Connection socket for FE



## 7.2 AC Connection

### 7.2.1 Conditions for AC Connection

#### Cable Requirements:

- When using a fault indication relay: the AC cable must have at least 4 wires for the phase (L), the neutral conductor (N), the functional earth (FE) and the fault indication relay. In most countries, the green-yellow conductor for protective earth (PE) must **not** be used for functional earthing.
- When not using a fault indication relay: the AC cable must have at least 3 wires for L, N and FE. In most countries, the green-yellow conductor for protective earth (PE) must **not** be used for functional earthing.
- All cables must be double-insulated.
- External diameter: 5 mm - 13 mm.
- Conductor cross-section: 0.5 mm<sup>2</sup> - 1.5 mm<sup>2</sup>.

#### Miniature Circuit-Breaker

##### DANGER

#### Danger to life due to fire.

If a generator (inverter) and a load (SMA PV Offset Box) are connected to the same miniature circuit-breaker, the protective function of the miniature circuit-breaker is no longer guaranteed. The currents from the inverter and the electricity grid can accumulate to overcurrents which are not detected by the miniature circuit-breaker.

- Fuse the SMA PV Offset Box with a separate miniature circuit-breaker. Tip: you can connect up to 50 SMA PV Offset Boxes to the same miniature circuit-breaker.
- Observe the maximum permissible fuse protection of the SMA PV Offset Box when selecting the miniature circuit-breaker (see Section 12 "Technical Data", page 49).

#### Inverter Earthing

##### DANGER

#### Danger to life due to electric shock

If the SMA PV Offset Box is operated with an inverter with AC connector and the AC connector is disconnected during operation of the SMA PV Offset Box, the inverter enclosure will be live.

- Connect a second, non-disconnectable protective conductor to the inverter.
- Do not pull the AC connector out during operation with an SMA PV Offset Box.

**FE Connection:**

Since the SMA PV Offset Box applies a voltage against earth to the PV modules, an operational current flows through the protective conductor of the SMA PV Offset Box. In a standard-compliant installation, this current is not allowed to flow through a PE conductor. For this reason, you must use an FE conductor. You can connect the FE conductor either to the substructure of the PV plant or to an equipotential bonding busbar.

**Connection Options for the Potential-Free Fault Indication Relay**

You can connect a separate load optionally for fault indication or for fault-free operation. You can connect the fault indication relays to an external voltage source or use the voltage between L and N.

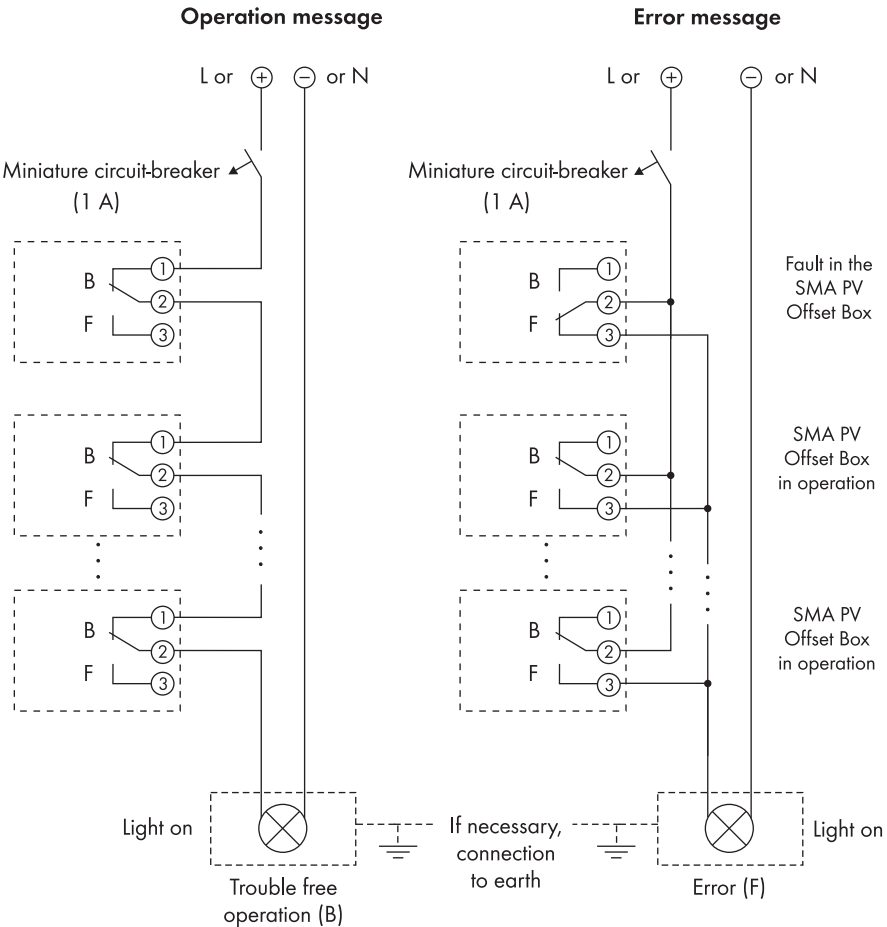


Figure 10: Connection principle for operation and fault indication

Description	Explanation
B	Fault-free operation
F	Fault
1	Terminal 1 of the fault indication relay
2	Terminal 2 of the fault indication relay
3	Terminal 3 of the fault indication relay

**Connection of several SMA PV Offset Boxes:**

The AC connection can be looped through to several SMA PV Offset Boxes. In total, you can connect up to 50 SMA PV Offset Boxes to one AC connection in this way.

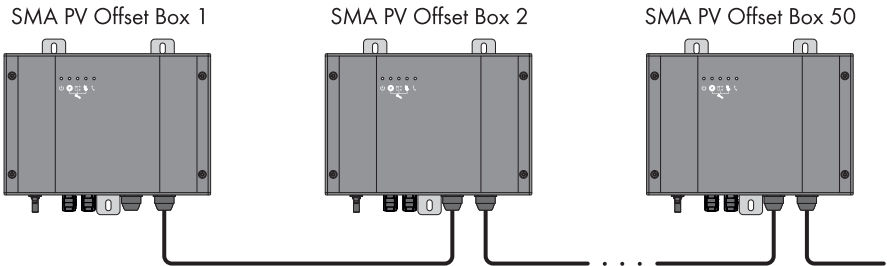
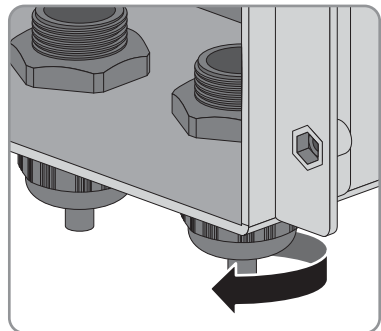


Figure 11: Connection of several SMA PV Offset Boxes

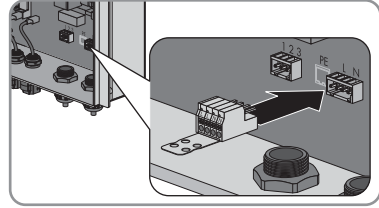
**7.2.2 Connecting the SMA PV Offset Box to the Electricity Grid (AC)**

1. Slightly release the swivel nut of the cable gland.

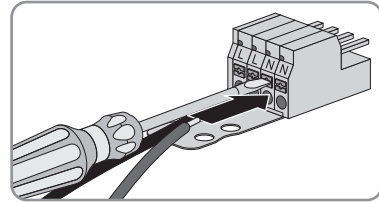


2. Strip the AC cable by by 130 mm.
3. Strip the insulated wires of the AC cable by 7 - 8 mm.
4. Route the AC cable through the cable gland to the AC terminals in the SMA PV Offset Box.

5. Plug the supplied 4-pole plug into the centre socket in the SMA PV Offset Box.



6. Connect L and N to the plug as follows:
- Connect **L** to the first or second terminal.
  - Connect **N** to the third or fourth terminal.

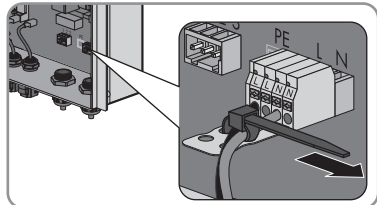


7. **⚠ DANGER**

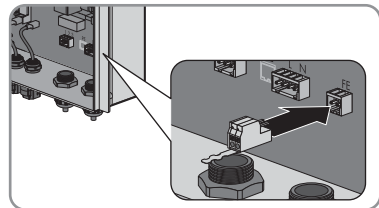
**Danger to life due to electric shock**

If the cables slip out of the terminal due to excessive tension, the enclosure will carry live voltage.

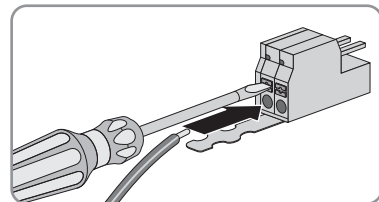
- Attach the supplied cable tie to relieve the tension.



8. Plug the supplied 2-pole plug into the right-hand socket in the SMA PV Offset Box.



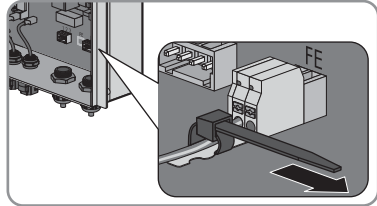
9. Connect FE to the plug.



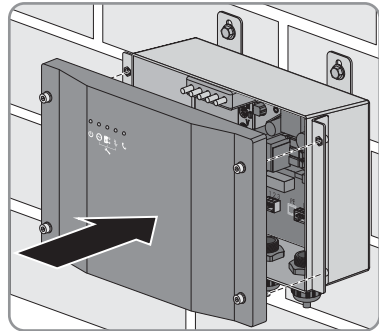
10. **⚠ DANGER****Danger to life due to electric shock**

If the cables slip out of the terminal due to excessive tension, the enclosure will carry live voltage.

- Attach the supplied cable tie to relieve the tension.



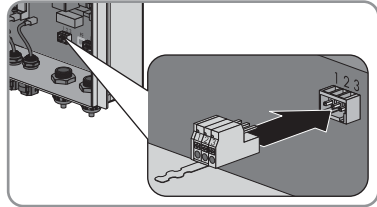
11. Screw the swivel nut firmly onto the cable gland.
12. If no fault indication relay is to be connected, screw the enclosure lid onto the SMA PV Offset Box using the 4 screws (torque: 5 Nm).



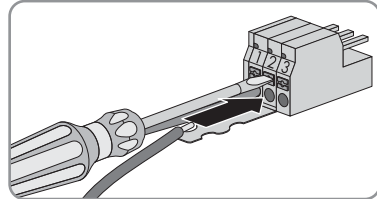
## 7.2.3 Connecting the Fault Indication Relay

If a fault indication relay is required, connect it as follows (see Connection Principle, P. 26):

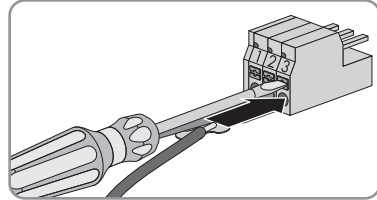
13. Plug the supplied 3-pole plug into the left-hand socket in the SMA PV Offset Box.



14. If you wish to receive an operation signal, connect the wires to terminals 1 and 2 of the plug.



15. If you wish to receive a fault signal, connect the wires to terminals 2 and 3 of the plug.

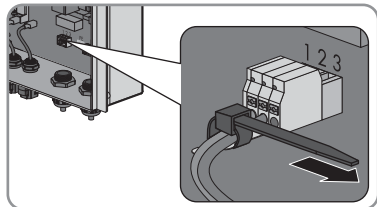


16. **⚠ DANGER**

### Danger to life due to electric shock

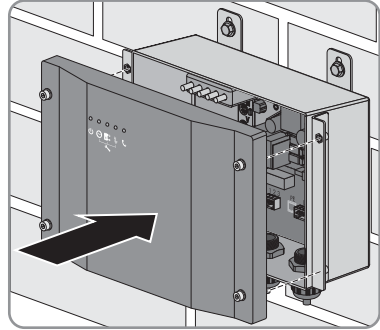
If the cables slip out of the terminal due to excessive tension, the enclosure will carry live voltage.

- Attach the supplied cable tie to relieve the tension.



17. Connect the fault indication relay either to an external voltage source or connect to L and N. The maximum supply voltage for the fault indicator is 240 V AC or 30 V DC. The maximum switching current is 1 A.

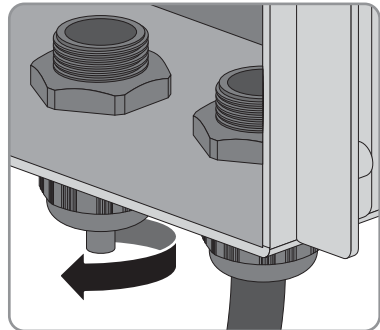
- Screw the enclosure lid onto the SMA PV Offset Box using the 4 screws (torque: 5 Nm).



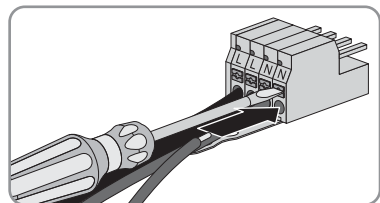
## 7.2.4 Connecting Additional SMA PV Offset Boxes

The AC cable is looped through between each SMA PV Offset Box.

- Disconnect the previously installed SMA PV Offset Box from all voltage sources (see Section 9).
- Slightly release the swivel nut of the second cable gland M20 on the previously installed SMA PV Offset Box.



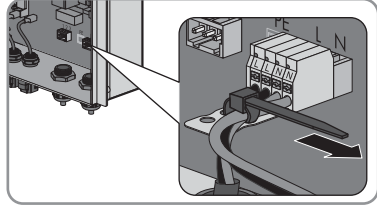
- Remove the sealing plug from the cable gland.
- Route the cable through the cable gland to the terminals in the previously installed SMA PV Offset Box.
- Remove the cable ties.
- Connect L and N to the 4-pole plug as follows:
  - Connect **L** to the first or second free terminal.
  - Connect **N** to the third or fourth free terminal.



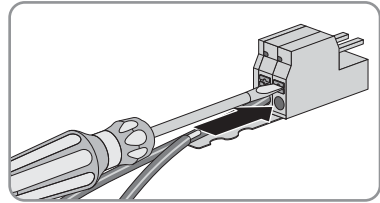
7. **⚠ DANGER****Danger to life due to electric shock**

If the cables slip out of the terminal due to excessive tension, the enclosure will carry live voltage.

- Attach the supplied cable tie to relieve the tension.

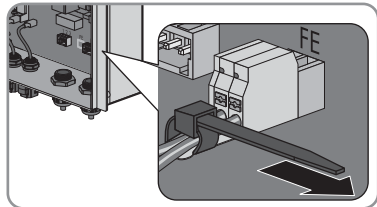


8. Connect FE to the free terminal of the 2-pole plug.

9. **⚠ DANGER****Danger to life due to electric shock**

If the cables slip out of the terminal due to excessive tension, the enclosure will carry live voltage.

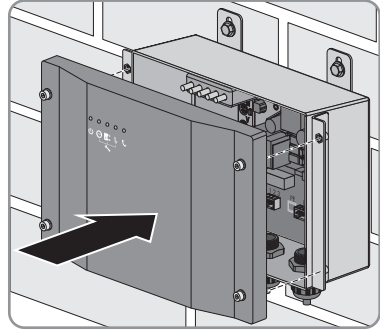
- Attach the supplied cable tie to relieve the tension.



10. Route the cable through the cable gland to the second SMA PV Offset Box and connect L, N and FE to the respective terminals in the same manner.
11. If a fault indication relay is required, loop it through as follows (see Connection Principle, P. 26).



12. Screw all enclosure lids onto the SMA PV Offset Boxes using the 4 screws (torque: 5 Nm).



## 7.3 DC Connection

### 7.3.1 Conditions for DC Connection

The SMA PV Offset Box is connected in parallel to the inverter. Depending on the type of inverter, you will need different DC connection options on the inverter for this.

If the necessary DC terminals are free on the inverter, you can connect the SMA PV Offset Box directly to the inverter. If the necessary terminals are not free, you will have to connect the SMA PV Offset Box via a Y plug. An individual Y plug will be needed for the DC output of each SMA PV Offset Box which cannot be connected directly to the inverter (for order numbers, see Section 13).

#### **⚠ WARNING**

##### **Danger of electric arcs if the DC circuit is interrupted by Y plugs**

- Y plugs must not be visible or freely accessible in close proximity to the inverter.
- The DC circuit must not be interrupted by Y plugs.
- Follow the procedure for disconnection of the inverter (see installation manual of the inverter).
- Follow the procedure for disconnection of the SMA PV Offset Box (see Section 9).

The DC connection cables must be fitted with the supplied DC connectors for connection to the SMA PV Offset Box (see Section 7.3.1 "Conditions for DC Connection", page 33).

### Connection of String Inverters with One Single Input

For a string inverter, 1 positive and 1 negative DC terminal is required on the SMA PV Offset Box. Only in the operating modes "Continuous operation" or "Temporary operation" will both positive DC outputs on the SMA PV Offset Box need to be assigned. If only 1 DC input is to be connected, the second positive DC terminal on the SMA PV Offset Box must also be connected to PV+ on the inverter. The following DC connection options are possible (as examples):

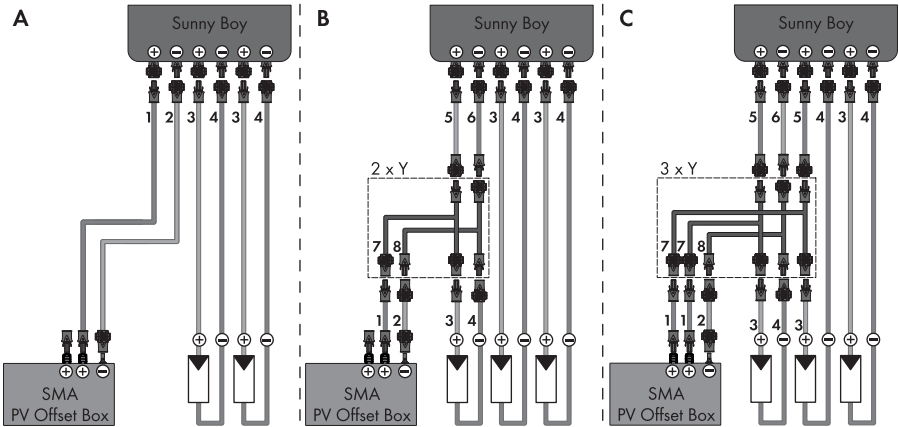


Figure 12: DC connection options for a string inverter

### Connection Options

Option	Description
A	String inverter with DC input not assigned - operating mode "Night mode"
B	String inverter with all DC inputs assigned - operating mode "Night mode"
C	String inverter with all DC inputs assigned - operating mode "Continuous operation" or "Temporary operation"

## Cable Connections

Connection	Description	SUNCLIX
1	PV+ connection cable SMA PV Offset Box to inverter or Y distribution	2 x positive (+)
2	PV – connection cable SMA PV Offset Box to inverter or Y distribution	2 x negative ( – )
3	PV+ connection cable PV array to inverter	1 x positive (+)
4	PV – connection cable PV array to inverter	1 x negative ( – )
5	PV+ connection cable Y distribution to inverter	1 x positive (+), 1 x negative ( – )
6	PV – connection cable Y distribution to inverter	1 x negative ( – ), 1 x positive (+)
7	PV+ Y distribution	2 x negative ( – ), 1 x positive (+)
8	PV – Y distribution	2 x positive (+), 1 x negative ( – )

### Connection of Inverters with Several Independent Inputs

For an inverter with 2 independent inputs and 1 internally bridged negative DC terminal, such as in SMA multi-string inverters, 1 positive DC terminal per input and 1 negative DC terminal at one of the two inputs are required. As a result, you will only need 1 SMA PV Offset Box for all the PV modules connected to the inverter. Should the negative DC inputs of the inverter not be internally bridged (see inverter documentation), the SMA PV Offset Box will only apply voltage to one string. In this case, you must connect 1 SMA PV Offset Box per string.

For an inverter with more than 2 independent inputs, 1 positive DC terminal is required at each input to which voltage is applied first in the morning and last at night. In addition, 1 negative DC terminal is required at one of these inputs.

If an inverter has several independent inputs but only 1 input is assigned, just 1 positive and 1 negative DC terminal will be required at the assigned input. Only in the operating modes "Continuous operation" or "Temporary operation" do both positive DC outputs on the SMA PV Offset Box have to be assigned. In the event that only 1 DC input is to be connected, the positive DC outputs of the SMA PV Offset Box must be bridged with a Y plug.

The following DC connection options are possible (as examples):

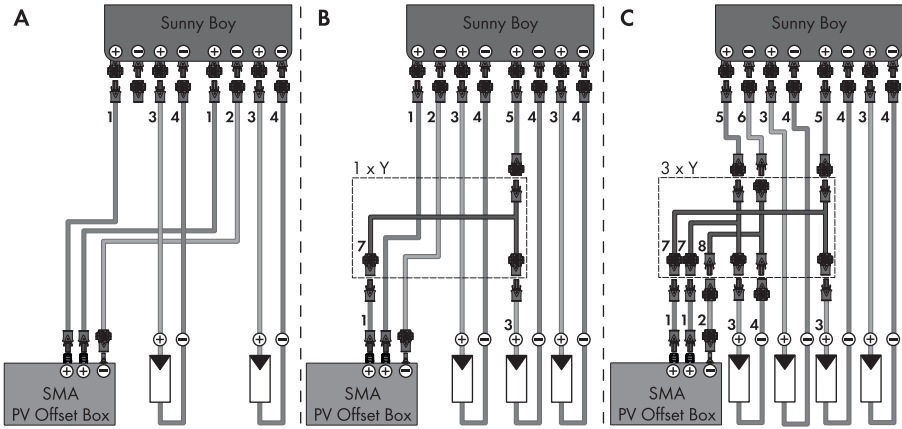


Figure 13: DC connection options for a multi-string inverter

**Connection Options**

Option	Description
A	Multi-string inverter with no DC input assigned - all operating modes
B	Multi-string inverter with one DC input area completely assigned - all operating modes
C	Multi-string inverter with all DC inputs completely assigned - all operating modes

**Cable Connections**

Connection	Description	SUNCLIX
1	PV+ connection cable SMA PV Offset Box to inverter or Y distribution	2 x positive (+)
2	PV – connection cable SMA PV Offset Box to inverter or Y distribution	2 x negative (-)
3	PV+ connection cable PV array to inverter	1 x positive (+)
4	PV – connection cable PV array to inverter	1 x negative (-)
5	PV+ connection cable Y distribution to inverter	1 x positive (+), 1 x negative (-)
6	PV – connection cable Y distribution to inverter	1 x negative (-), 1 x positive (+)
7	PV+ Y distribution	2 x negative (-), 1 x positive (+)

Connection	Description	SUNCLIX
8	PV – Y distribution	2 x positive (+), 1 x negative (-)

### 7.3.2 Assembling the DC Connectors

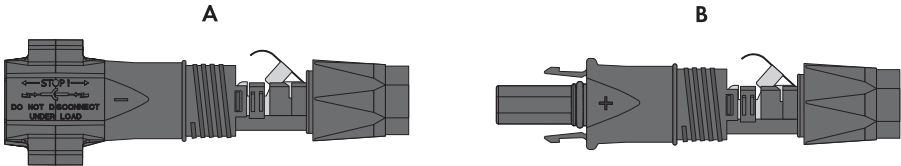


Figure 14: DC connector

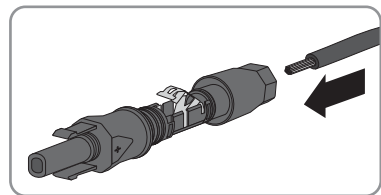
Item	Description
A	Negative DC connector
B	Positive DC connector

#### Cable Requirements:

- External diameter: 5 mm - 8 mm.
- Cable cross-section: 2.5 mm<sup>2</sup> - 6 mm<sup>2</sup>.

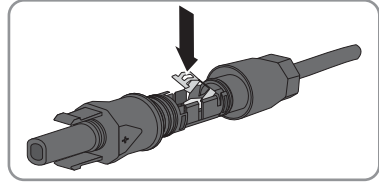
Proceed as follows to assemble each DC connector.

1. Strip 12 mm off the cable insulation.
2. Lead the stripped cable all the way into the DC connector. Be sure to observe the correct polarity.

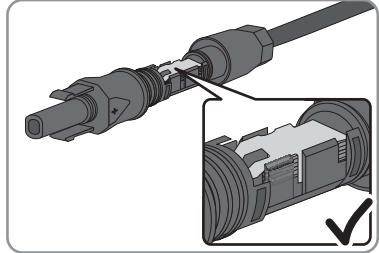


3. Push the clamping bracket down.

☑ The clamping bracket clicks audibly into place.



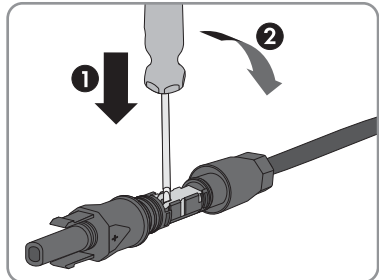
☑ The stranded wire is visible inside the clamping bracket chamber.



✘ You cannot see the stranded wire inside the clamping bracket chamber.

The cable is not correctly in place.

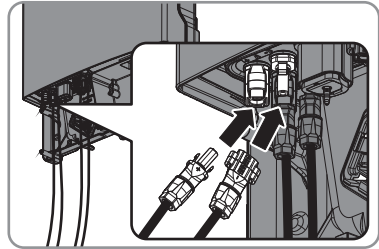
- Release the clamping bracket. To do so, insert a 3.5 mm screwdriver into the clamping bracket and lever it open.
- Remove the cable and go back to step 2.



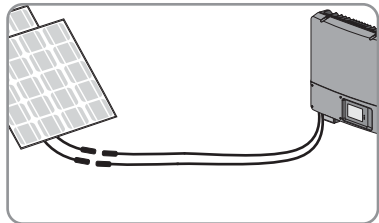
4. Push the swivel nut up to the thread and tighten (torque: 2 Nm).

### 7.3.3 Connecting the PV Array (DC)

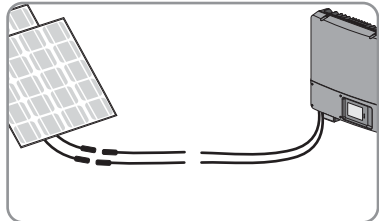
1. Disconnect the SMA PV Offset Box from all voltage sources (see Section 9).
2. If the necessary DC terminals are free on the inverter, connect the SMA PV Offset Box directly to the inverter. To do this, fit the connection cables with the respective mating connectors.



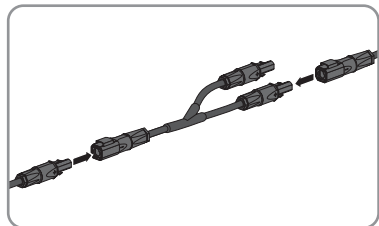
3. If the necessary DC terminals are not free on the inverter, connect the respective DC outputs of the SMA PV Offset Box using Y plugs, as follows:
  - Disconnect the PV cables from the PV array.



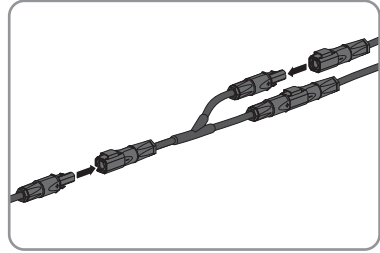
- Split the PV cables between the inverter and PV array.



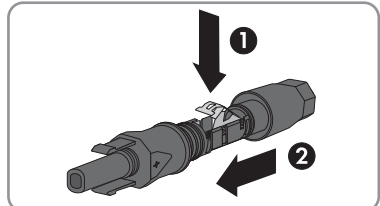
- Fit the open cable ends with mating connectors and connect to the Y plug. Connect the inverter to the plug which has a direct connection to the PV array.



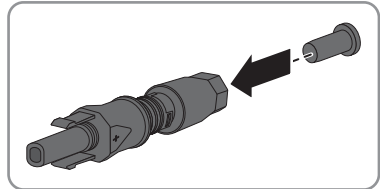
- Connect the SMA PV Offset Box to the other branch of the Y plug. To do this, fit the cables with corresponding mating connectors.



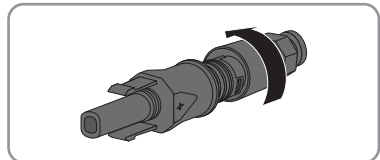
4. Connect the PV cables to the PV array.
5. If a DC output on the SMA PV Offset Box is not required, create a hermetic seal with a DC plug connector and sealing plugs. Do **NOT** plug sealing plugs directly into the DC output on the SMA PV Offset Box.
  - Push the clamping bracket of the unneeded DC connector down (1) and push the swivel nut up to the thread (2).



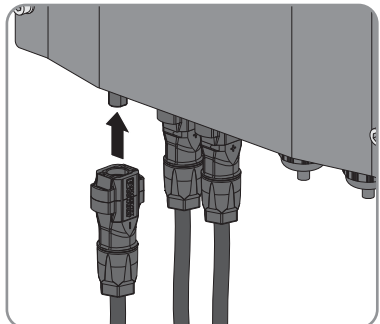
- Insert the sealing plug into the DC connector.



- Push the swivel nut to the thread and tighten (torque: 2 Nm).



- Plug the DC connector with sealing plug into the DC output of the SMA PV Offset Box.





## 8 Commissioning



### Commissioning for the operating modes "Continuous operation" or "Temporary operation"

For the operating modes "Continuous operation" and "Temporary operation" of the SMA PV Offset Box, the inverter must not yet be fully commissioned. The PV cables must be connected to the inverter and the DC switch-disconnector closed so that the SMA PV Offset Box can apply voltage to the PV modules. However, during continuous operation, the inverter must not be connected to the electricity grid. The miniature circuit-breaker must be switched off.

After completion of continuous operation or after the first 10 days of temporary operation, the inverter must be re-commissioned.



### Operation of the SMA PV Offset Box with SMA multi-string inverters

In SMA multi-string inverters, the strings in the inverter are disconnected by the pulling the Electronic Solar Switch (ESS) out.

If the SMA PV Offset Box is commissioned while the inverter remains disconnected (e.g. during continuous operation), the SMA PV Offset Box will only apply voltage to one string.

- Prior to commissioning the SMA PV Offset Box with a disconnected SMA multi-string inverter, re-plug the ESS on the inverter.

#### Requirements:

- SMA PV Offset Box is fixed firmly to the wall.
- Operating mode and output voltage are set correctly.
- AC cable is correctly connected.
- DC cables are correctly connected.
- Unnecessary AC terminals are closed with the corresponding sealing plugs.
- Unused DC inputs are closed with the corresponding DC connectors and sealing plugs

## Procedure

### 1. **DANGER**

#### **Danger to life due to electric shock**

During operation, voltages up to 1,000 V are present in the SMA PV Offset Box.

- Ensure that the cover is securely screwed on.
2. If the SMA PV Offset Box is to be used in the operating modes "Continuous operation" or "Temporary operation":
    - Connect PV cables to the inverter.
    - Close DC switch-disconnector on the inverter.
    - Commission the inverter as far as possible (see inverter installation manual) **without** connecting the inverter to the electricity grid.
    - Leave the miniature circuit-breaker of the inverter **switched off**.
  3. If the SMA PV Offset Box is to be used in the operating mode "Night operation", commission the inverter (see inverter installation manual).
  4. Switch the miniature circuit-breaker of the SMA PV Offset Box on.
    - ☑ The green LED on the SMA PV Offset Box is glowing or flashing. The SMA PV Offset Box is in operation.
    - ✘ One or more LEDs are glowing red or all LEDs are off.  
A fault has occurred.
      - Rectify the fault (see Section 10 "Troubleshooting", page 45).

## 9 Disconnecting the SMA PV Offset Box from Voltage Sources

1. Disconnect the inverter from all voltage sources (see the inverter installation manual).
2. Switch off the miniature circuit-breaker of the SMA PV Offset Box and secure against inadvertent re-connection.
3. If a fault indication relay is connected, switch off the voltage supply to the fault indication relay and secure against inadvertent re-connection.

### 4. **⚠ DANGER**

#### **Danger to life due to high voltages in the PV array**

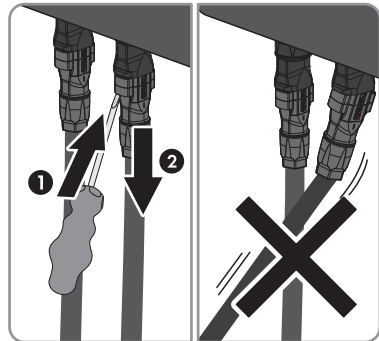
During operation with the SMA PV Offset Box, dangerously high voltages may be present at the PV array due to leakage capacitances.

- Wait one minute for the PV array to discharge before pulling the DC connectors.

### 5. **⚠ DANGER**

#### **Danger of electric arcs if the DC circuit is interrupted by Y plugs**

- Do not use Y plugs to interrupt the DC circuit.
- Release and remove all DC connectors on the SMA PV Offset Box. To do this, insert a flat-blade screwdriver (blade width: 3.5 mm) into one of the side slots and pull the DC connectors straight down. Do **NOT PULL ON THE CABLE**.



6. Using a suitable multimeter, ensure that no voltage against earth (FE) is present on the DC outputs of the SMA PV Offset Box. Only use multimeters with a DC input voltage range up to at least 1,000 V.

### 7. **⚠ DANGER**

#### **Danger to life due to high voltages**

The SMA PV Offset Box takes 1 minute to discharge.

- Wait 1 minute before opening the enclosure lid.

8. **NOTICE****Damage to the SMA PV Offset Box due to electrostatic discharge**

The components inside the SMA PV Offset Box can be destroyed by electrostatic discharge.






- Earth yourself before touching any components. Do not use the enclosure of the SMA PV Offset Box for this purpose, as it is not earthed.
9. Unscrew all the enclosure lid screws and remove the lid.
  10. Ensure that no voltage is present between L and N on the AC terminal using a suitable multimeter.
  11. Ensure that no voltage is present between L and FE on the AC terminal using a suitable multimeter.
  12. Ensure that no voltage is present between any fault indication relay terminal and FE using a suitable multimeter.







# 10 Troubleshooting

## 10.1 LED Displays

The LEDs for fault indication are 2-colour. They glow red if operation is currently interrupted. They glow yellow if a fault has previously occurred, but normal operation is currently possible.

The possible combinations are given in the following table. The "x" entry in the table means that the previous display of the LED is retained.

					Description and corrective measure
Flashing green	x	x	x	x	Ready for operation
Green	x	x	x	x	Operation
x	Yellow, red	x	x	x	FE connection fault or AC connection fault: <ul style="list-style-type: none"> <li>- L / N swapped</li> <li>- N not connected (SMA PV Offset Box connected between L1 and L2)</li> <li>- FE connection interrupted</li> <li>- Voltage difference between connected N conductor and FE larger than 50 V (AC or DC)</li> </ul> <ul style="list-style-type: none"> <li>• Check AC-side installation.</li> </ul>
x	x	Yellow, red	x	x	DC connection fault: <ul style="list-style-type: none"> <li>- DC connections reverse poled</li> <li>- DC connection to PV array interrupted</li> <li>- Installed in an area with insufficient irradiation, or irradiation interrupted during the day</li> <li>- SMA PV Offset Box is disconnected on the AC or DC side during the day.</li> <li>- Regeneration time too short (average night period is less than 5 hours)</li> </ul> <ul style="list-style-type: none"> <li>• Check DC-side installation.</li> </ul>

					<b>Description and corrective measure</b>
					
x	x	x	Yellow, red	x	Insulation fault: <ul style="list-style-type: none"> <li>- Insulation resistance (including inverter) against earth less than 200 kΩ</li> <li>- Earth fault in the PV array</li> <li>- Inverter and PV Offset Box in operation simultaneously</li> <li>• Check PV array for earth fault (see inverter installation manual).</li> </ul>
x	x	x	x	Yellow, red	Device fault <ul style="list-style-type: none"> <li>• Contact the SMA Service Line (see Section 14 "Contact", page 52).</li> </ul>
Off	Flashing red	Flashing red	Flashing red	x	Setting fault: <ul style="list-style-type: none"> <li>- The operating mode and output voltage settings are not compatible</li> <li>- Prohibited switch position selected</li> <li>• Configure the SMA PV Offset Box correctly (see Section 8 "Commissioning", page 41).</li> </ul>
Off	Off	Off	Off	Off	No supply voltage <ul style="list-style-type: none"> <li>• Check AC-side installation.</li> </ul>

## 10.2 Resetting the Fault Display

After a reset, the SMA PV Offset Box checks whether there is still any fault present. After a waiting period, the display is updated. Any faults still present will be re-displayed via red LEDs. The display of previous faults via yellow LEDs will be deleted.

You can only reset the LED fault display by pressing the reset button. A grid failure or AC-side disconnection of the SMA PV Offset Box will not influence the LED display.

1. Press the reset button on the bottom of the SMA PV Offset Box.
  - The fault display is reset.
2. Wait 6 minutes.
3. Read off the LED display again.
  - The green LED on the SMA PV Offset Box is glowing or flashing. The SMA PV Offset Box is in operation.
  - One or more LEDs are glowing red or all LEDs are off.
    - A fault has occurred.
      - Eliminate the fault and reset the fault display.

## 11 Decommissioning

### 11.1 Disassembling the SMA PV Offset Box

1. Disconnect the SMA PV Offset Box from all voltage sources (see Section 9 "Disconnecting the SMA PV Offset Box from Voltage Sources", page 43).
2. Remove all connection cables from the SMA PV Offset Box.
3. Loosen the fastening screws and remove the SMA PV Offset Box from the mounting surface.
4. Screw the enclosure lid onto the SMA PV Offset Box with the 4 screws.

### 11.2 Packing the SMA PV Offset Box

- Pack the SMA PV Offset Box. Use the original packaging or packaging suitable for the weight and dimensions of the SMA PV Offset Box (see Section 12 "Technical Data", page 49).

### 11.3 Disposing of the SMA PV Offset Box

- Dispose of the SMA PV Offset Box at the end of its service life in accordance with the disposal regulations for electronic waste currently applicable at the installation site.



## 12 Technical Data

### AC Input

Nominal AC voltage	100 V / 110 V / 120 V / 220 V / 230 V / 240 V
AC mains frequency	50 Hz / 60 Hz
Power consumption in standby operation	< 0.5 W
Typical power consumption in operation	3 W
Maximum power consumption in operation	< 7 W
Maximum switching voltage of the fault indication relay	240 V AC / 30 V DC
Maximum switching current of the fault indication relay	1.0 A

### DC Output

Adjustable output voltage against earth	400 V / 550 V / 700 V / 1,000 V
Maximum output current in operation	3.3 mA
Maximum short-circuit current	6.7 mA
Disconnection time in case of short-circuit	< 30 s

### PV Plant Requirements

Maximum PV voltage	1,000 V
Minimum MPP voltage of the inverter*	75 V
Minimum system voltage of the PV array	400 V
Minimum system voltage of the inverter	400 V
Minimum insulation resistance	200 k $\Omega$

\* In case of inverters with lower input voltages, it is assumed that the inverter and the SMA PV Offset Box will cause mutual interference.

## Protective Devices

Maximum permissible fuse protection of the AC supply voltage	10 A
Output current limitation according to IEC 62103	6.7 mA

## General Data

Width x height x depth of device (including wall brackets, cable glands and lid screws)	270 mm x 230 mm x 100 mm
Length x width x height of packaging	340 mm x 300 mm x 190 mm
Weight	1.4 kg
Transport weight	2.3 kg
Degree of protection according to IEC 60529	IP65
Protection class according to IEC 60529	II

## Climatic Conditions

Operating temperature range	- 25 °C - +60 °C
Temperature range for transport	- 25 °C - +60 °C
Maximum permissible value for relative humidity, non-condensing	100%
Air pressure range	70 kPa - 106 kPa
Maximum operating altitude above MSL	3,000 m

## Features

AC connection	spring clamp terminal for conductors up to 1.5 mm <sup>2</sup>
DC connection	spring clamp terminal for conductors up to 6 mm <sup>2</sup> (SUNCLIX DC connector)
Fault indication relay	standard fitting
Connection fault indication relay	spring clamp terminal for conductors up to 1.5 mm <sup>2</sup>

## Torques

Enclosure lid screws	5 Nm
SUNCLIX swivel nut	2 Nm

## 13 Accessories

You will find the corresponding accessories and spare parts for your product in the following overview. If required, you can order these from SMA Solar Technology AG or your specialist dealer.

<b>Description</b>	<b>Brief description</b>	<b>Order number</b>
Y plug set (+/-) Multi-Contact 3	Y plug set Multi-Contact 3 for parallel connection of 2 strings	SB-Y (SMA)
Y plug set (+/-) Multi-Contact 4	Y plug set Multi-Contact 4 for parallel connection of 2 strings	MC-SET-Y (SMA)
Y plug set (+/-) Tyco	Y plug set Tyco for parallel connection of 2 strings	TYCO-SET-Y (SMA)
SUNCLIX DC connector ( - )	1 negative field plug ( - )	1463050 (Phoenix Contact)
SUNCLIX DC connector (+)	1 positive field plug (+)	1463054 (Phoenix Contact)
SUNCLIX Y distribution (+/ --)	1 x positive field plug (+) 2 x negative field plug ( - )	1787739 (Phoenix Contact)
SUNCLIX Y distribution ( - /++)	1 x negative field plug (+) 2 x positive field plug ( - )	1787726 (Phoenix Contact)
SUNCLIX Y distribution set	2 x SUNCLIX Y distribution (+/ --) 1 x SUNCLIX Y distribution ( - /++)with mating connectors	SUNCLIX-Y-SET-10 (SMA)

## 14 Contact

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

- Serial number of the SMA PV Offset Box
- Device type of the connected inverter
- Type and number of the connected PV modules
- Number of PV modules connected in series per string
- Mounting location of the SMA PV Offset Box and of the connected inverter
- LED display of the SMA PV Offset Box
- Configured operating mode of the SMA PV Offset Box
- Configured output voltage of the SMA PV Offset Box
- Type of fault indicator connected, if applicable

### **SMA Solar Technology AG**

Sonnenallee 1

34266 Niestetal, Germany

[www.SMA.de](http://www.SMA.de)

### **SMA Service Line**

Inverters: +49 561 9522 1499

Communication: +49 561 9522 2499

Fax: +49 561 9522 4699

E-Mail: [ServiceLine@SMA.de](mailto:ServiceLine@SMA.de)





# Legal Provisions

The information contained in this document is the property of SMA Solar Technology AG. Publishing its content, either partially or in full, requires the written permission of SMA Solar Technology AG. Any internal company copying of the document for the purposes of evaluating the product or its correct implementation is allowed and does not require permission.

## SMA Factory Warranty

The current warranty conditions come enclosed with your device. These are also available online at [www.SMA-Solar.com](http://www.SMA-Solar.com) and can be downloaded and are available on paper from the usual sales channels if required.

## Trademarks

All trademarks are recognised even if these are not marked separately. Missing designations do not mean that a product or brand is not a registered trademark.

The *Bluetooth*<sup>®</sup> word mark and logos are registered trademarks owned by Bluetooth SIG, Inc. and any use of such marks by SMA Solar Technology AG is under licence.

QR Code<sup>®</sup> is a registered trademark of DENSO WAVE INCORPORATED.

### SMA Solar Technology AG

Sonnenallee 1  
34266 Niestetal  
Germany

Tel. +49 561 9522-0  
Fax +49 561 9522-100  
[www.SMA.de](http://www.SMA.de)  
E-Mail: [info@SMA.de](mailto:info@SMA.de)

© 2004 to 2013 SMA Solar Technology AG. All rights reserved

**SMA Solar Technology**

**www.SMA-Solar.com**

**SMA Solar Technology AG**

[www.SMA.de](http://www.SMA.de)

**SMA Australia Pty. Ltd.**

[www.SMA-Australia.com.au](http://www.SMA-Australia.com.au)

**SMA Benelux bvba/sprl**

[www.SMA-Benelux.com](http://www.SMA-Benelux.com)

**SMA Beijing Commercial Company Ltd.**

[www.SMA-China.com.cn](http://www.SMA-China.com.cn)

**SMA Central & Eastern Europe s.r.o.**

[www.SMA-Czech.com](http://www.SMA-Czech.com)

**SMA France S.A.S.**

[www.SMA-France.com](http://www.SMA-France.com)

**SMA Hellas AE**

[www.SMA-Hellas.com](http://www.SMA-Hellas.com)

**SMA Ibérica Tecnología Solar, S.L.U.**

[www.SMA-Iberica.com](http://www.SMA-Iberica.com)

**SMA Solar India Pvt. Ltd.**

[www.SMA-India.com](http://www.SMA-India.com)

**SMA Italia S.r.l.**

[www.SMA-Italia.com](http://www.SMA-Italia.com)

**SMA Japan K.K.**

[www.SMA-Japan.com](http://www.SMA-Japan.com)

**SMA Technology Korea Co., Ltd.**

[www.SMA-Korea.com](http://www.SMA-Korea.com)

**SMA Middle East LLC**

[www.SMA-Me.com](http://www.SMA-Me.com)

**SMA Portugal - Niestetal Services Unipessoal Lda**

[www.SMA-Portugal.com](http://www.SMA-Portugal.com)

**SMA Solar (Thailand) Co., Ltd.**

[www.SMA-Thailand.com](http://www.SMA-Thailand.com)

**SMA Solar UK Ltd.**

[www.SMA-UK.com](http://www.SMA-UK.com)

