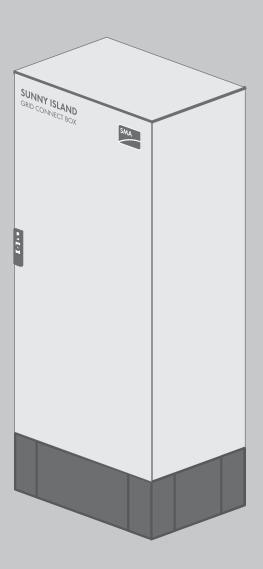


Operating Manual

GRID-CONNECT-BOX 12



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SMA Solar Technology AG

Sonnenallee 1 34266 Niestetal Germany

Tel. +49 561 9522-0 Fax +49 561 9522-100

www.SMA.de E-mail: info@SMA.de

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1 Information on this Document

1.1 Validity

This document is valid for the device type "GRID-CONNECT-BOX 12.3-20" (Grid-Connect-Box 12).

1.2 Target Group

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

- Training in how to deal with the dangers and risks associated with installing and operating electrical devices and batteries
- Training in the installation and commissioning of electrical devices
- Knowledge of and adherence to the local standards and directives
- Knowledge of and compliance with this document and all safety information

1.3 Additional Information

Links to additional information can be found at www.SMA-Solar.com:

Document title	Document type
MULTICLUSTER-BOX 12	Installation - circuitry overview
MULTICLUSTER-BOX 12	Operating manual

1.4 Symbols

Symbol	Explanation
▲ DANGER	Indicates a hazardous situation that, if not avoided, will result in death or serious injury
▲ WARNING	Indicates a hazardous situation that, if not avoided, can result in death or serious injury
▲ CAUTION	Indicates a hazardous situation that, if not avoided, can result in minor or moderate injury
NOTICE	Indicates a situation that, if not avoided, can result in property damage
i	Information that is important for a specific topic or goal, but is not safety-relevant
	Indicates a requirement for meeting a specific goal
	Desired result
×	A problem that might occur

1.5 Typographies

Typography	Application	Example
bold	 Display messages Parameter Terminals Slots Elements to be selected or entered 	 Connect the neutral conductor to the spring-cage terminal N at terminal X301:6. Connect the line conductors to the spring-cage terminals L1, L2 and L3 at the terminals X301:8-10.
>	 Connects several elements to be selected 	-
[Button/Key]	 Button on the device to be selected or pressed 	Press the [TEST] button.

1.6 Nomenclature

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Complete designation	Designation in this document
Grid-Connect-Box12	Grid-Connect-Box
Multicluster-Box 12	Multicluster-Box

2 Safety

2.1 Intended Use

The Grid-Connect-Box is an automatic transfer switch which enables the safe operation of the utility grid and an electricity generator as energy sources of an SMA multicluster system.

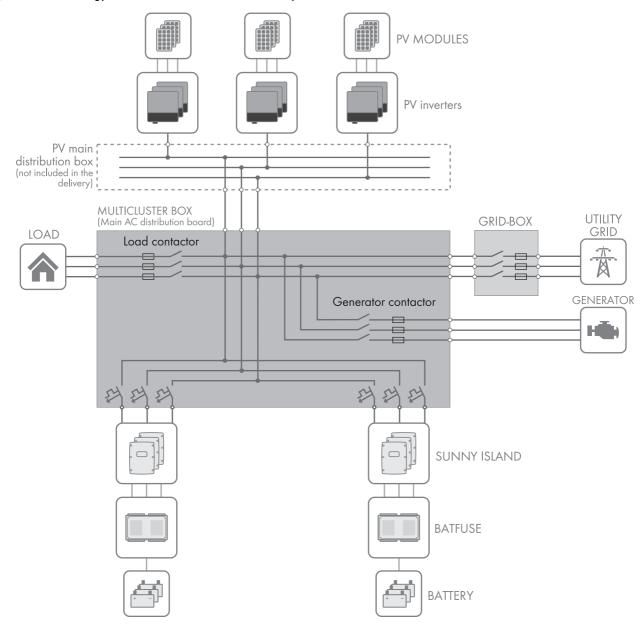


Figure 1: Circuitry principle of a multicluster system with the Grid-Connect-Box

The technical connection requirements of the grid operator and the local standards and directives specify whether the multicluster system, in the event of grid failure, disconnects from the utility grid at all poles or only the line conductors. The Grid-Connect-Box is always supplied with an all-pole disconnection function. If all-pole disconnection is not permitted, the Grid-Connect-Box all-pole disconnection function must be deactivated (see Section 6.2, page 18).

If the Grid-Connect-Box is used with all-pole disconnection, the utility grid must be either a TN-S, TN-C-S or TT system. If the Grid-Connect-Box is used without all-pole disconnection, the utility grid must be a TN-C-S system (for grounding in the multicluster system, see the Multicluster-Box operating manual).

Do not exceed the maximum AC connection power of the Grid-Connect-Box. Cables with copper conductors must be used for the installation.

In terms of interference immunity, the product is suitable for EMC environment A, and in terms of EMC emissions, it is suitable for EMC environment B^* .

The Grid-Connect-Box may only be commissioned in conjunction with the Multicluster-Box.

The Grid-Connect-Box is designed for use at altitudes of up to 3000 m above Mean Sea Level. If you would like to use the Grid-Connect-Box at altitudes above 3000 m, contact Service (see Section 13, page 35).

The Grid-Connect-Box is suitable for indoor use. The product may only be operated at temperatures between -25 °C and +60 °C.

All work on the product must only be performed using appropriate tools and in compliance with the ESD protection regulations.

Suitable personal protective equipment must be worn by all persons working on or with the product.

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. modifications or conversions, are only permitted with the express written permission of SMA Solar Technology AG. Unauthorized alterations will void guarantee and warranty claims and will usually void the operation license. SMA Solar Technology AG shall not be held liable for any damage caused by such alterations.

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.

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^{*} In accordance with IEC 61439-1:2011

2.2 Safety Information

This Section contains safety information that must be observed at all times during work 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.

A DANGER

Danger to life due to electric shock

High voltages are present in the Grid-Connect-Box and the multicluster system. Touching live components results in death or serious injury due to electric shock.

- Disconnect the Grid-Connect-Box and multicluster system from all voltage sources before carrying out any work on the Grid-Connect-Box (see Section 8, page 22).
- Only operate the Grid-Connect-Box with its protective cover in place.
- Work on the Grid-Connect-Box may only be performed by qualified persons.
- Do not touch any live components in the Grid-Connect-Box or any other components in the multicluster system.

A CAUTION

Risk of injury if the Grid-Connect-Box tips over

The Grid-Connect-Box is heavy and may tip over if not properly fastened to the support surface. This can result in injuries due to crushing.

• Upon installation, attach the Grid-Connect-Box to the support surface.

A CAUTION

Risk of burns due to hot components

Components and terminals inside the Grid-Connect-Box can become hot during operation. Touching hot components can cause burns.

- Only operate the Grid-Connect-Box with its protective cover in place.
- Prior to removing the protective cover, let the Grid-Connect-Box cool down.

i Effects of an emergency disconnection

Emergency disconnection of the Sunny Island triggers the uncontrolled shutdown of the system, resulting in any unsaved data being lost.

- Only use the emergency disconnection to avoid danger or consequential damage.
- In the event of an emergency disconnection, always check whether any fuse elements in the Grid-Connect-Box, such as circuit breakers, have tripped.

If any fuse elements have tripped, reactivate these fuse elements.

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.

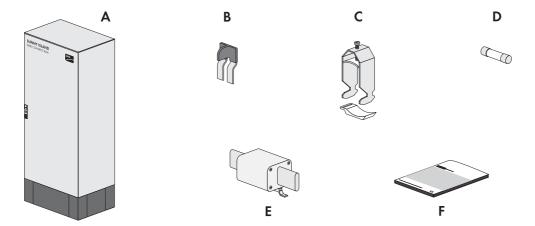


Figure 2: Components included in the scope of delivery

Position	Quantity	Designation
Α	1	Grid-Connect-Box
В	1	Two-pole N bridge
С	10	Strain relief with counter-sleeve (22 mm to 28 mm)
D	2	Fuse link (1 A, tripping characteristic gG)
E	2	LV/HRC fuse link (200 A, tripping characteristic: gG)
F	1	Operating manual

4 Product Description

4.1 Grid-Connect-Box

The Grid-Connect-Box is an automatic transfer switch which enables the safe operation of the utility grid and an electricity generator as energy sources of an SMA Multicluster System.

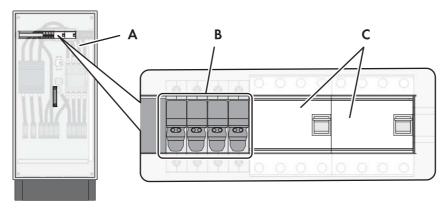


Figure 3: Grid-Connect-Box with cabinet door open

Position	Designation	Explanation
A	Protective cover	Prevents inadvertent contact with live components during operation and thus protects from electric shocks. The protective cover must always be in position when the Grid-Connect-Box is in operation.
В	Fuse holder 1 A	Receptacle for cylindrical thermal fuses (1 A, tripping characteristic gG). The thermal fuses protect the connected conductors from excessive heat build-up due to overload or short circuits.
С	Residual-current device	Protects against electric shock and is always used in addition to existing protective measures such as insulation or protective grounding. As soon as a dangerous touch voltage occurs, the residual-current device disconnects all poles of the loads.
		This is achieved by means of a summation current transformer in the residual-current device which detects the electric currents in the conductors L1 , L2 , L3 and N . In the normal operating state, the sum of these currents equals zero. Under fault conditions a differential current is formed which trips the residual-current device.

Residual-current device

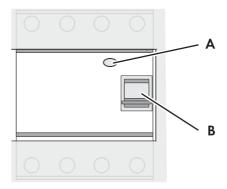


Figure 4: Overview of the residual-current device

Position	Designation	Explanation
A	Test button	The functionality of the residual-current device must be tested regularly (see Section 10.1, page 28).
В	Switch lever	Top position: ON - residual-current device is switched on.
		Bottom position: OFF - residual-current device has tripped or is switched off.

4.2 Type Label

The type label clearly identifies the product. The type label is located on the right-hand side of the enclosure.

You will find the following information on the type label:

- Address of SMA Solar Technology AG
- Device type (Type)
- Serial number (Serial No.)
- Article number (Art No.)
- Device-specific characteristics

You will require the information on the type label to use the product safely and when seeking customer support from Service.

Symbols on the type label

Symbol	Explanation
\wedge	Danger to life due to high voltages
14	The product operates at high voltages. All work on the product must be carried out by qualified persons only.
^	Risk of burns due to hot surfaces
	The product can become hot during operation. Avoid contact during operation. Allow the product to cool down sufficiently before carrying out any work. Wear personal protective equipment such as safety gloves.
	Observe the documentation
	Observe all documentation supplied with the product.
	WEEE designation
	Do not dispose of the product together with the household waste but in accordance with the locally applicable disposal regulations for electronic waste.
CE	CE marking
	The product complies with the requirements of the applicable EU directives.
** ^ ^	Degree of protection
₩ /•\/•\ IP55	The product is protected against interior dust deposits and water jets from all angles.

5 Installation

5.1 Storing the Grid-Connect-Box

Store the Grid-Connect-Box in a dry place at an ambient temperature of between - 25°C and +60°C.

5.2 Requirements for Mounting

Mounting Location

- ☐ A firm, even support surface, e.g., a concrete foundation, must be available for mounting.
- ☐ The mounting location must be suitable for the weight and dimensions of the Grid-Connect-Box (see Section 12 "Technical Data", page 32).
- ☐ The mounting location must be clear and safely accessible at all times without any need for auxiliary equipment.
- ☐ The mounting location must not hinder access to disconnection devices.
- ☐ All local requirements concerning minimum passage widths and escape routes must be observed.
- ☐ Climatic conditions must be met (see Section 12 "Technical Data", page 32).
- ☐ The mounting location must be below 3000 m above MSL. If you would like to use the Grid-Connect-Box at altitudes above 3000 m, contact Service (see Section 13, page 35).

Minimum clearances

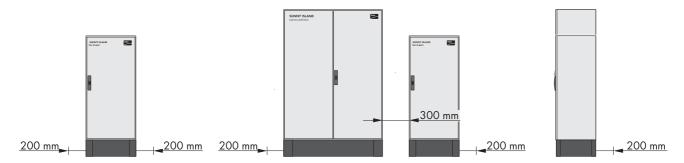


Figure 5: Minimum clearances

- ☐ There must be sufficient space at the mounting location to ensure compliance with the minimum clearances.
- ☐ There must be a distance of at least 300 mm between the Grid-Connect-Box and the Multicluster-Box. This will ensure adequate heat dissipation.

Mounting position



Figure 6: Permitted and prohibited mounting positions

☐ The mounting location must be suitable to ensure compliance with the permitted mounting position.

5.3 Preparing the Mounting Location

A WARNING

Danger to life due to fire or explosion

Despite careful construction, electronic devices can cause fires if they are not installed properly. Contact with flammable materials allows the fire to spread. This can result in death or serious injury.

- Do not install the Grid-Connect-Box on flammable construction materials.
- Do not install the Grid-Connect-Box in areas containing flammable substances or objects.
- Do not install the Grid-Connect-Box in potentially explosive atmospheres.

Dimensions of the drill holes for securing the Grid-Connect-Box:

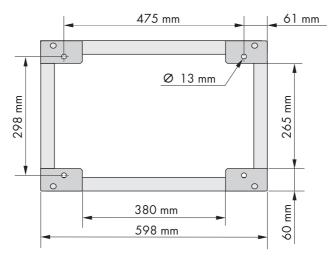


Figure 7: Exterior base measurements and dimensions of the drill holes

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

☐ 4 suitable screw anchors for attaching the Grid-Connect-Box

Procedure:

- 1. On the support surface, mark the positions of the four drill holes for attaching the base.
- 2. Drill holes at the marked positions.
- 3. Insert the screw anchors.

5.4 Transport

5.4.1 Transport Options

The Grid-Connect-Box is delivered on a Euro pallet. You can use the following means of transport to lift the Grid-Connect-Box off the Euro pallet:

- Forklift
- Crane with suitable fork

5.4.2 Transporting and Mounting the Grid-Connect-Box

A WARNING

Danger of crushing if the raised or suspended Grid-Connect-Box tips over or falls

The Grid-Connect-Box can tip over or fall if it is lifted and transported carelessly or hastily. This can result in death or serious injury.

- Always transport the Grid-Connect-Box as close to the ground as possible.
- Use a means of transportation which is suitable for the weight of the Grid-Connect-Box of 103 kg.
- Transport the Grid-Connect-Box in an upright position.
- Keep a safe distance from the Grid-Connect-Box at all times during transport.
- Be aware of the center of gravity of the Grid-Connect-Box. The center of gravity of the Grid-Connect-Box is located approximately in the center of the cabinet and is marked on the enclosure with the center of gravity symbol.

NOTICE

Damage to the Grid-Connect-Box due to inappropriate transport

Setting the Grid-Connect-Box down on uneven surfaces can lead to the Grid-Connect-Box buckling and the doors no longer closing properly. This can lead to moisture or dust penetrating the Grid-Connect-Box.

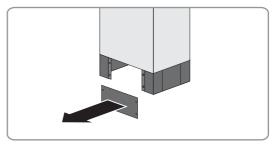
- Do not set the Grid-Connect-Box down on unpaved, uneven surfaces.
- Do not transport the Grid-Connect-Box with the kick plates mounted.

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

☐ 4 suitable screws for attaching the Grid-Connect-Box to the support surface

Procedure:

- 1. Remove all fastening screws from the kick plates at the front and rear (TX 30).
- 2. Remove the kick plates.



- 3. Retain the kick plates and the fastening screws for later use.
- 4. Push the means of transport under the Grid-Connect-Box and transport the Grid-Connect-Box to the mounting location.

5. **A CAUTION**

Risk of injury if the Grid-Connect-Box tips over

The Grid-Connect-Box is heavy and may tip over if not properly fastened to the support surface. This can result in injuries due to crushing.

• Attach the Grid-Connect-Box to the support surface using four suitable screws.

6 Electrical Connection

6.1 Overview of the Connection Area

6.1.1 Components and Terminals

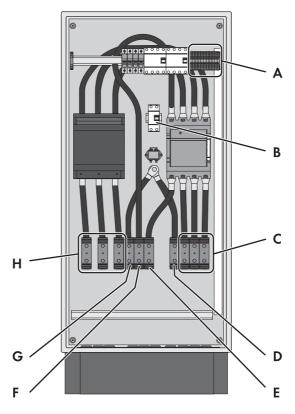


Figure 8: Overview of the connection area

Position	Designation	Explanation
A	Terminals X310 , X311 with spring-cage terminals	Spring-cage terminals for connecting the control cables
В	Surge arrester	The signal light on the surge arrester must be checked regularly (see Section 10.2, page 29).
С	Terminals X301:8-10 with spring-cage terminals L1 , L2 and L3	For connecting the Multicluster-Box line conductors
D	Terminal X301:7 with spring-cage terminal PE	For connecting the Multicluster-Box grounding conductor
E	Terminal X301:6 with spring-cage terminal N	For connecting the Multicluster-Box neutral conductor
F	Terminal X301:5 with spring-cage terminal N	For connecting the utility grid neutral conductor
G	Terminal X301:4 with spring-cage terminal PE	For connecting the utility grid grounding conductor
Н	Terminals X301:1-3 with spring-cage terminals L1, L2 and L3	For connecting the utility grid line conductors

6.1.2 Enclosure Openings in the Floor

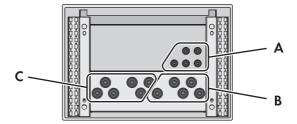


Figure 9: Position of the enclosure openings

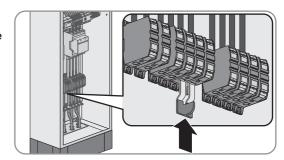
Position	Explanation
Α	Enclosure openings for the control cables
В	Enclosure openings for the Multicluster-Box power cables
С	Enclosure openings for the utility grid power cables

6.2 Deactivating All-Pole Disconnection

The technical connection requirements of the grid operator and the local standards and directives specify whether the multicluster system, in the event of grid failure, disconnects from the utility grid at all poles or only the line conductors. The Grid-Connect-Box is always supplied with an all-pole disconnection function. If all-pole disconnection is not permitted, you must deactivate the Grid-Connect-Box all-pole disconnection function. To do this, insert the two-pole N bridge included in the scope of delivery as follows:

Procedure:

For use of the Grid-Connect-Box without all-pole disconnection, connect the spring-cage terminal N on X301:5 to the spring-cage terminal N on X301:6. To do this, plug the two-pole N bridge included in the scope of delivery into the spring-cage terminals from below.



6.3 Connecting the Multicluster-Box

Cable requirements:

- ☐ Conductor material: copper
- ☐ Conductor cross-section: 50 mm² to 150 mm²
- ☐ The power cables must be ground-fault- and short-circuit protected.
- ☐ The line conductors, neutral conductor and grounding conductor must have the same cross-section.
- ☐ The AC conductors and DC conductors must always be routed in separate cables.

Procedure:

- 1. Insert the Multicluster-Box power cables into the Grid-Connect-Box (see Section 9.3, page 25).
- 2. Connect the grounding conductor to the spring-cage terminal **PE** at terminal **X301:7** (see Section 9.4.1, page 26).
- 3. Connect the neutral conductor to the spring-cage terminal **N** at terminal **X301:6**.
- 4. Connect the line conductors to the spring-cage terminals L1, L2 and L3 at the terminals X301:8-10.
- 5. Ensure that a right-hand rotating magnetic field is present at the connection point of the Multicluster-Box.
- 6. Provide for strain relief of the power cables in the spring-cage terminal by attaching them to the appropriate cable support rail. Use the strain reliefs and counter-sleeves included in the scope of delivery for this.

6.4 Connecting the Utility Grid

Cable requirements:

	Conductor material: copper
	The conductor cross-section must be selected according to the rated input power of the utility grid.
	Conductor cross-section: 50 mm² to 150 mm²
	The power cables must be ground-fault- and short-circuit protected.
	The line conductors, neutral conductor and grounding conductor must have the same cross-section.
П	The AC conductors and DC conductors must always be routed in senarate cables

Procedure:

- 1. Insert the Multicluster-Box power cables into the Grid-Connect-Box (see Section 9.3, page 25).
- 2. Connect the grounding conductor to the spring-cage terminal **PE** at terminal **X301:4** (see Section 9.4.1, page 26).
- 3. Connect the neutral conductor to the spring-cage terminal N at terminal X301:5.
- 4. Connect the line conductors to the spring-cage terminals L1, L2 and L3 at the terminals X301:1-3.
- 5. Ensure that a right-hand rotating magnetic field is present at the grid-connection point.
- 6. Provide for strain relief of the power cables in the spring-cage terminal by attaching them to the appropriate cable support rail. Use the strain reliefs and counter-sleeves included in the scope of delivery for this.

6.5 Connecting the Control Cables

Assignment of spring-cage terminals with the control cables:

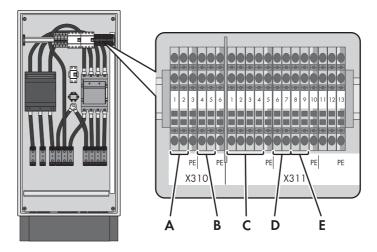


Figure 10: Overview of spring-cage terminals in the Grid-Connect-Box

Position	Explanation
Α	Multicluster-Box grounding contactor interlock (DC)
В	Grid-Connect-Box grid contactor feedback (DC)
С	Grid-Connect-Box voltage measurement (AC)
D	Multicluster-Box generator contactor interlock (AC)
E	Grid-Connect-Box AC contactor interlock (AC)

Cabl	е	red	uir	em	er	ıts:
	_		•	•		

☐ Conductor material: cop	per
---------------------------	-----

☐ Conductor cross-section: 1.5 mm² to 2.5 mm²

 $\hfill\square$ The AC conductors and DC conductors must always be routed in separate cables.

i Ground connection at terminals X310 and X311

If the control cable between the Multicluster-Box and Grid-Connect-Box contains a grounding conductor, the grounding conductor terminal must not be connected on both sides.

Procedure:

- 1. Insert the control cables into the Grid-Connect-Box (see Section 9.3, page 25).
- 2. Connect the control cables to the spring-cage terminals (see Section 9.4.2, page 27).
 - X310:1,2: Multicluster-Box grounding contactor interlock
 - X310:4,5: Grid-Connect-Box grid contactor feedback
 - X311:1-4: Grid-Connect-Box voltage measurement
 - X311:6,7: Multicluster-Box generator contactor interlock
 - X311:8.9: Grid-Connect-Box AC contactor interlock
- 3. Ensure that the insulated conductors are firmly in place.

6.6 Mounting the Kick Plates

Requirement:

☐ All installation work must be completed.

Procedure:

- 1. Ensure that the power cables are secured with a strain relief.
- 2. Insert the kick plates and attach using the fastening screws (TX 30, torque: 12 Nm).

7 Preparing the Multicluster System for Commissioning

In order to receive service assignments for the Sunny Island system, all system data must be recorded in the information sheet for Sunny Island systems during commissioning and made available to Service (for information sheet see www.SMA-Solar.com).

Requirements:

☐ The G	Grid-Connect-Box must be correctly mounted (see Section 5, page 14).
☐ All po	ower cables must be correctly connected (see Section 6, page 17).
☐ All co	ontrol cables must be correctly connected (see Section 6.5, page 19).
☐ All ca	ables must be tightly enclosed by the membrane on the underside of the Grid-Connect-Box.
☐ All po	ower cables must be secured inside or outside the Grid-Connect-Box.
☐ The fl	oor of the Grid-Connect-Box must be closed with the base plates. All seals must be correctly positioned.
☐ The ki	ick plates must be attached to the base of the Grid-Connect-Box (see Section 6.6, page 20).

Procedure:

- 1. Mount the protective cover (see Section 9.2, page 24).
- 2. Close the Grid-Connect-Box.
- 3. Ensure that the requirements for commissioning the Multicluster-Box are fulfilled (see Multicluster-Box operating manual).

Disconnecting the Grid-Connect-Box and Multicluster System from **Voltage Sources**

- 1. Disconnect the loads.
- 2. Stop the multicluster system at the master of the main cluster (see Sunny Island inverter documentation).
- 3. Switch off all Sunny Island inverters (see Sunny Island inverter documentation).
- 4. Disconnect the PV main distribution board from voltage sources and secure against reconnection.
- 5. Disconnect the electricity generator and secure against reconnection.
- 6. Disconnect the utility grid from the multicluster system at the grid-connection point and secure against reconnection.
- 7. Open the Grid-Connect-Box.
- 8. Open all fuse holders and residual-current devices in the Grid-Connect-Box.

A CAUTION

Risk of burns due to hot components

Components and terminals inside the Grid-Connect-Box can become hot during operation. Touching hot components can cause burns.

- Prior to removing the protective cover, let the Grid-Connect-Box cool down.
- 10. Remove the protective cover (see Section 9.1, page 23).
- 11. Ensure that no voltage is present in the Grid-Connect-Box.
- 12. Cover and isolate any adjacent live components.

9 Periodic Actions

9.1 Removing the Protective Cover

▲ WARNING

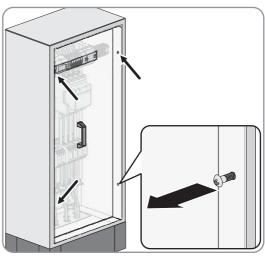
Danger to life due to electric shock

High voltages are present in the Grid-Connect-Box and the multicluster system. Touching live components can result in death or serious injury due to electric shock.

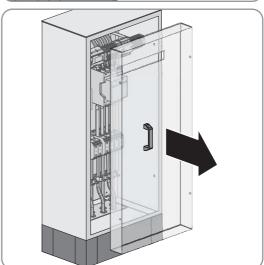
• Disconnect the Grid-Connect-Box and multicluster system from all voltage sources before carrying out any work on the Grid-Connect-Box (see Section 8, page 22).

Procedure:

 Remove all four fastening screws from the protective cover (TX 30).



2. Remove the protective cover.

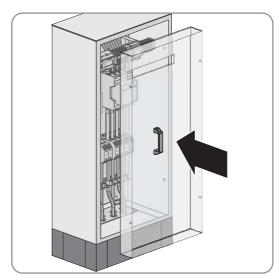


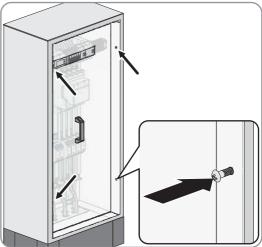
3. Retain the protective cover and the fastening screws for later use.

9.2 Mounting the Protective Cover

1. Insert the protective cover into the Grid-Connect-Box.

2. Insert all four fastening screws and tighten them (TX 30, torque: 4 Nm).





9.3 Inserting the Cables

NOTICE

Damage to the Grid-Connect-Box due to moisture penetration

Dust and moisture can penetrate the Grid-Connect-Box due to overstretched or damaged membranes. Dust and moisture can cause irreparable damage to the Grid-Connect-Box.

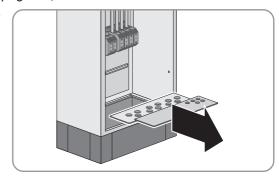
- When selecting the enclosure opening, match the diameter of the membrane to the diameter of the cable.
- Choose a suitable tool for piercing the membrane.
- Ensure that the membrane does not tear when the cable is inserted.

Requirement:

☐ The kick plates must be dismantled (see Section 5.4.2 "Transporting and Mounting the Grid-Connect-Box", page 16).

Procedure:

- 1. Remove the Grid-Connect-Box protective cover (see Section 9.1, page 23).
- 2. Remove all front- and rear base plate screws (TX 25) from the floor of the Grid-Connect-Box and remove the base plates.



- 3. Insert all cables into the Grid-Connect-Box in accordance with the following procedure:
 - Select a suitable enclosure opening for the given cable.
 - Pierce the membrane of the selected enclosure opening with a pointed object. Make sure that you do not make the opening too large.
 - Insert each cable through the membrane of the selected enclosure opening into the interior of the Grid-Connect-Box. When doing so, ensure that the cable is tightly enclosed by the membrane.
 - Strip the insulation of each cable.

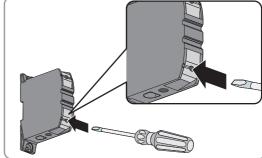
Cable type	Insulation stripping length
Power cable	40 mm
Control cable	20 mm

- 4. Insert the base plate and tighten all screws (TX 25 screwdriver, torque: 9 Nm).
- 5. Attach the kick plates to the Grid-Connect-Box using the fastening screws (TX 30, torque: 12 Nm).

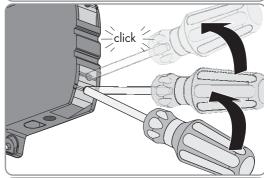
9.4 Connection to Spring-Cage Terminals

9.4.1 Connecting Power Cables to Spring-Cage Terminals

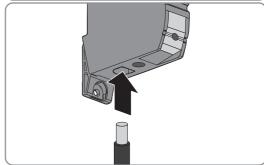
1. Insert the screwdriver into the clamping contact of the spring-cage terminal.



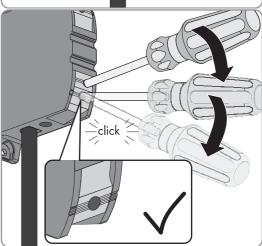
Push the screwdriver upwards in two stages as far as the stop.
 This pretensions the spring of the spring-cage terminal. The spring-cage terminal emits an audible click when the clamping contact is sufficiently pretensioned.



3. Insert the stripped insulated conductor into the spring-cage terminal until it reaches the stop. When doing so, ensure that no insulation is trapped in the terminal.



- 4. Press the screwdriver down and pull it out of the clamping contact.
 - ☑ The spring in the spring-cage terminal securely clamps the insulated conductor.

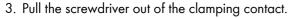


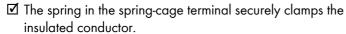
5. Make sure that the insulated conductor is securely attached and that no insulation is trapped.

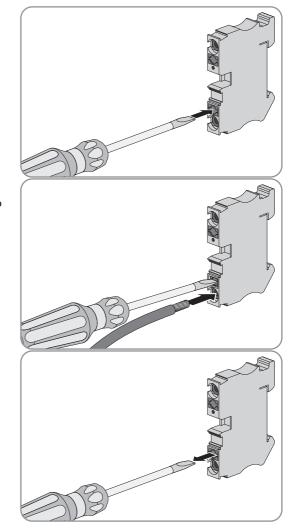
9.4.2 Connecting Control Cables to Spring-Cage Terminals

1. Using a screwdriver, press and hold down the orange break contact of the spring-cage terminal.

2. Insert the stripped insulated conductor into the spring-cage terminal until it reaches the stop. When doing so, ensure that no insulation is trapped in the terminal.







4. Make sure that the insulated conductor is securely attached and that no insulation is trapped.

10 Maintenance

10.1 Testing the Residual-Current Device

Test interval for residual-current devices

The test interval for residual-current devices depends on the prevailing operating temperature.

- At prevailing operating temperatures of up to 40°C: every 6 months
- At prevailing operating temperatures of above 40°C: every 3 months

i Instruction for end users

Because the protective cover remains in place during testing of the residual-current device, testing the residual-current device is not hazardous and can be performed by the end user. However, if the residual-current device does not trip, the Grid-Connect-Box and the multicluster system must be disconnected from voltage sources by a qualified person.

- Instruct the end user on the necessary procedure.
- Inform the end user that the inspection interval must be complied with.
- Inform the end user that in the event that the residual-current device does not trip, a qualified person must perform the subsequent steps.

Requirement:

☐ The utility grid must be connected to the multicluster system.

Procedure:

1. Stop the multicluster system at the master of the main cluster (see Sunny Island inverter operating manual).

i Supply of loads temporarily disconnected

During testing of the residual-current devices, the connection to the utility grid is temporarily disconnected. The supply to the loads is therefore also interrupted.

- Switch off sensitive loads prior to the test.
- 2. Perform the following test on the Grid-Connect-Box residual-current device F339:
 - Press the [TEST] button.
 - ☑ The residual-current device trips.
 - **★** The residual-current device does not trip?
 - Disconnect the Grid-Connect-Box and multicluster system from voltage sources (see Section 8, page 22).
 - Contact Service (see Section 13, page 35). This will trigger the requisite spare parts order.
 - If the residual-current device trips, wait for at least five seconds.
 - Reactivate the residual-current device. To do this, move the switch lever of the residual-current device to the ON
 position.
- 3. Start the multicluster system at the master of the main cluster (see Sunny Island inverter operating manual).
- 4. Document the test result in accordance with the locally applicable standards and directives. This is your proof that regular testing has taken place.

10.2 Testing the Surge Arrester

1 Test interval for surge arresters

The test interval for surge arresters depends on the prevailing operating temperature.

- At prevailing operating temperatures of up to 40°C: every 6 months
- At prevailing operating temperatures of above 40°C: every 3 months

i Instruction for end users

Because the protective cover remains in place during testing of the surge arresters, testing the surge arresters is not hazardous and can be performed by the end user. However, if a surge arrester is defective, the surge arrester must be replaced by a qualified person.

- Instruct the end user on the necessary procedure.
- Inform the end user that the inspection interval must be complied with.
- Inform the end user that in the event that the surge arrester is defective, a qualified person must perform the subsequent steps.

Procedure:

1. Check whether the signal light on the surge arrester **F340** is green or red.

If the signal light on the surge arrester is green, the surge arrester is in proper working order.

If the signal light on the surge arrester is red, the surge arrester is defective.

- Arrange for the surge arrester to be replaced immediately. Contact Service (see Section 13, page 35) for this.
- 2. Document the test result in accordance with the locally applicable standards and directives. This is your proof that regular testing has taken place.

10.3 Maintenance Work Every 12 Months

A WARNING

Danger to life due to electric shock

High voltages are present in the Grid-Connect-Box and the multicluster system. Touching live components can result in death or serious injury due to electric shock.

• Disconnect the Grid-Connect-Box and multicluster system from all voltage sources before carrying out any work on the Grid-Connect-Box (see Section 8, page 22).

i The ambient conditions influence the maintenance intervals

The mounting location and ambient conditions influence the maintenance intervals. More frequent cleaning and corrosion protection work may be necessary in adverse ambient conditions.

- If the Grid-Connect-Box is subject to adverse ambient conditions, SMA Solar Technology AG recommends carrying out maintenance work on the Grid-Connect-Box more frequently.
- SMA Solar Technology AG recommends an optical inspection every month to determine maintenance needs.

Required maintenance materials and tools:

Only those consumables and maintenance materials not normally included in the standard equipment of an electrically
qualified person are listed below. It is assumed that standard tools and materials such as torque wrenches are available
or all maintenance operations.

•	all maintenance operations.
	To repair minor surface corrosion damage: touch-up sticks, paint brushes, spray paint or, alternatively, 2K-PUR acrylic paint (RAL color: 7035)
	To repair large-surface corrosion damage: touch-up sticks or, alternatively, 2K-PUR acrylic paint (RAL color: 7035)
	Abrasive cloth
	Degreaser
	For maintaining the seals: talcum, petroleum jelly or wax
Mo	aintenance work
•	Check whether the inside of the Grid-Connect-Box is soiled or moist.
	If the inside of the Grid-Connect-Box is dirty, clean the Grid-Connect-Box.
	If the inside of the Grid-Connect-Box is moist or water has accumulated, dry the Grid-Connect-Box out.
•	Check all Grid-Connect-Box power cables for discoloration or changes in the appearance of the insulation.
	If any power cables are discolored or the appearance of the insulation has changed, replace these power cables.
•	Check all insulated conductors, terminals and fuse elements in the Grid-Connect-Box for discoloration or changes in the appearance of the insulation.
	If any insulated conductors, terminals or fuse elements in the Grid-Connect-Box are discolored or have changed in appearance, contact Service (see Section 13, page 35).
•	Check whether the Grid-Connect-Box is free of corrosion damage.
	If the Grid-Connect-Box displays minor corrosion damage, treat the affected area as follows:
	Sand the affected area.
	Clean the affected area with degreaser.
	Paint the affected area.
	If the Grid-Connect-Box displays large-scale corrosion damage, treat the entire surface as follows:

- Sand the surface.
- Clean the entire surface with degreaser.
- Paint the entire surface.
- Check all door seals for damage.

If a door seal is damaged, replace this door seal.

• Apply talcum, petroleum jelly or wax to the door seals. This will prevent frost damage.

11 Decommissioning

11.1 Disassembling the Grid-Connect-Box

1. A DANGER

High voltages are present in the Grid-Connect-Box and the multicluster system. Touching live components results in death or serious injury due to electric shock.

- Disconnect the Grid-Connect-Box and multicluster system from voltage sources (see Section 8, page 22).
- 2. Remove all fastening screws from the kick plates at the front and rear. Retain the screws for later use. These screws will be needed later to reattach the kick plates.
- 3. Remove the protective cover and base plates.
- 4. Remove all cables from the Grid-Connect-Box.
- 5. Loosen and remove the Grid-Connect-Box fastening screws.
- 6. Mount the protective cover and base plates.
- 7. Close the Grid-Connect-Box doors.

8. **A WARNING**

Danger of crushing if the raised or suspended Grid-Connect-Box tips over or falls

The Grid-Connect-Box can tip over or fall if it is lifted and transported carelessly or hastily. This can result in death or serious injury.

- Always transport the Grid-Connect-Box as close to the ground as possible.
- Use a means of transportation which is suitable for the weight of the Grid-Connect-Box of 103 kg.
- Transport the Grid-Connect-Box in an upright position.
- Keep a safe distance from the Grid-Connect-Box at all times during transport.
- Be aware of the center of gravity of the Grid-Connect-Box. The center of gravity of the Grid-Connect-Box is located approximately in the center of the cabinet and is marked on the enclosure with the center of gravity symbol.
- 9. Remount the kick plates on the Grid-Connect-Box.

11.2 Disposing of the Grid-Connect-Box

Dispose of the Grid-Connect-Box in accordance with the locally applicable disposal regulations for electronic waste.

12 Technical Data

Utility grid connection

Number of terminals	1 x three-phase
Rated input power	138 kW
Rated operating voltage between L and N	230 V
Rated operating voltage between L1 and L2	400 V
Rated current / AC input current	3 x 200 A
Terminals for connection N, PE, L1, L2, L3	Spring-cage terminals
Minimum conductor cross-section	50 mm²
Maximum conductor cross-section	150 mm²
Fuse	LV/HRC 1
Maximum permitted fuse rating	200 A
Switching capacity of backup fuse	≥ 25 kA
Maximum unaffected short-circuit current / maximum relative rated short-circuit current	≤ 17 kA
Maximum permissible back-up fuse	200 A

Multicluster-Box connection

Number of terminals	1 x three-phase
Rated input power	138 kW
Rated operating voltage between L and N	230 V
Rated operating voltage between L1 and L2	400 V
Rated current / AC input current	3 x 200 A
Terminals for connection N, PE, L1, L2, L3	Spring-cage terminals
Minimum conductor cross-section	50 mm²
Maximum conductor cross-section	150 mm²
Switching capacity of backup fuse	≥ 25 kA
Maximum unaffected short-circuit current / maximum relative rated short-circuit current	≤ 17 kA
Maximum permissible back-up fuse	200 A

Grounding connection

Terminal for grounding conductor connection	Spring-cage terminal
Minimum conductor cross-section	50 mm ²
Maximum conductor cross-section	150 mm²

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Auxiliary electric circuits

Fuse	10x38 cylinder fuse
Maximum permitted fuse rating	F333 to F336: 1 A
Terminals for connecting the control cables	Spring-cage terminal
Minimum conductor cross-section	0.75 mm²
Maximum conductor cross-section	2.5 mm ²
General data	
Number of line conductors	3
Permitted grid configuration	TN-S, TN-C-S or TT
AC voltage range between L1 and N	172.5 V to 265 V
AC voltage range between L1 and L2	300 V to 433 V
Rated frequency	50 Hz
Frequency range	45 Hz to 65 Hz
Rated impulse withstand voltage	4 kV (2000 m)
Width x height x depth (with base)	600 mm x 1400 mm x 435 mm (incl. 200 mm base)
Weight	103 kg
Maximum operating altitude above mean sea level	3000 m
Inner subdivision	Form 1 (no subdivision)
Exterior structure	Closed type
Installation	only fixed interior installation permitted
Construction type	fixed components
Suitable for use by electrically qualified persons or unqualified persons	Installation of the system and replacement of equipment by electrically qualified persons only / actuation of test buttons and read-off of information by unqualified persons permitted
Measures for protection against electric shock	Basic protection through insulation materials and covers / fault protection through grounding conductors and short-circuit protection devices / personal protection through residual-current devices
Degree of protection of enclosure*	IP55
Degree of protection with open enclosure door*	IP20
Pollution degree at the mounting location**	3
Pollution degree in the enclosure (micro-environment)	2
Protection class***	1
Overvoltage category****	Overvoltage category 3

EMC environment**

EMC emissions, environment B (EMC Directive, Article 5 - Annex I.1.a)

Interference immunity, environment A (EMC Directive Article 5 - Annex I.1.b)

EC Declaration of Conformity	Yes		
Operating temperature range****	− 25°C to +60°C		
Humidity	0% to 100%		

^{*} in accordance with IEC 60529

Derating

Output power / rated power at up to 40°C	100%		
Output power / rated power at 40°C to 60°C	Derating according to power-temperature curve (see Multicluster-Box operating manual)		
Rated voltage / rated insulation voltage			
Switch cabinet wiring L to N	250 V AC		
Switch cabinet wiring L1 to L2	433 V AC		
AC auxiliary AC circuits	250 V AC		
DC auxiliary AC circuits	70 V DC		

^{**} in accordance with IEC 61439-1:2011

^{***} in accordance with IEC 417

^{****} in accordance with EN 60664

^{*****}At operating temperatures above 40°C, the Sunny Island inverters reduce their output power (derating).

13 Contact

If you experience any 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:

- Multicluster-Box type
- Multicluster-Box serial number
- Grid-Connect-Box type and serial number
- Type and number of Sunny Island inverters connected
- Type of battery connected
- Nominal battery capacity
- Nominal battery voltage
- Type and number of PV inverters connected
- Type and number of loads connected
- If an electricity generator is connected:
 - Type
 - Power
 - Maximum current

In order to receive service assignments for the Sunny Island system, all system data must be recorded in the information sheet for Sunny Island systems during commissioning and made available to Service (for information sheet see www.SMA-Solar.com).

Danmark	SMA Solar Technology AG	Belgien	SMA Benelux BVBA/SPRL
Deutschland	Niestetal	Belgique	Mechelen
Österreich	СМА С	België	+32 15 286 730
Schweiz		Luxemburg	
	Sunny Boy, Sunny Mini Central, Sunny Tripower: +49 561 9522-1499	Luxembourg	
		Nederland	
	Monitoring Systems	Česko	SMA Service Partner TERMS a.s.
	(Kommunikationsprodukte):	Magyarország	+420 387 6 85 111
	+49 561 9522-2499	Slovensko	
Fuel Save Controller (PV-Diesel Hybridsysteme): +49 561 9522-3199 Sunny Island, Sunny Backup,	•	Polska	SMA Polska
			+48 12 283 06 66
	Ελλάδα	SMA Hellas AE	
	Hydro Boy: +49 561 9522-399 Sunny Central: +49 561 9522-299	Κύπρος	Αθήνα
S			+30 210 9856666
España	SMA Ibérica Tecnología Solar, S.L.U.	France	SMA France S.A.S.
Portugal	Barcelona		Lyon
	+34 935 63 50 99		+33 472 22 97 00
Bulgaria	SMA Italia S.r.l.	United Kingdom	SMA Solar UK Ltd.
Italia	Milano		Milton Keynes
România	+39 02 8934-7299		+44 1908 304899

United Arab	SMA Middle East LLC	India	SMA Solar India Pvt. Ltd.
Emirates	Abu Dhabi		Mumbai
	+971 2234 6177		+91 22 61 <i>7</i> 13888
대한민국	SMA Technology Korea Co., Ltd. 서울	ไทย	SMA Solar (Thailand) Co., Ltd. กรุงเทพฯ
	+82-2-520-2666		+66 2 670 6999
South Africa	SMA Solar Technology South Africa Pty Ltd. Cape Town 08600SUNNY (08600 78669) International: +27 (0)21 826 0600	Argentina Brasil Chile Perú	SMA South America SPA Santiago +562 2820 2101
Australia	SMA Australia Pty Ltd. Sydney Toll free for Australia: 1800 SMA AUS (1800 762 287) International: +61 2 9491 4200	Other countries	International SMA Service Line Niestetal Toll free worldwide: 00800 SMA SERVICE (+800 762 7378423)

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