



## MULTICLUSTER-BOX 12

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# 1 Information on this Document

## 1.1 Validity

This document is valid for:

- MC-BOX-12.3-20 (Multicloud-Box 12)

## 1.2 Target Group

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

- Training in how to deal with the dangers and risks associated with installing, repairing and using electrical devices, batteries and installations
- Training in the installation and commissioning of electrical devices and installations
- Knowledge of all applicable laws, standards and directives
- Knowledge of and compliance with this document and all safety information

## 1.3 Levels of warning messages

The following levels of warning messages may occur when handling the product.

### **⚠ DANGER**

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

### **⚠ WARNING**

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

### **⚠ CAUTION**

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

### **NOTICE**

Indicates a situation which, if not avoided, can result in property damage.

## 1.4 Symbols in the Document

Icon	Explanation
	Information that is important for a specific topic or goal, but is not safety-relevant
<input type="checkbox"/>	Indicates a requirement for meeting a specific goal
<input checked="" type="checkbox"/>	Desired result
	A problem that might occur.
	Example

## 1.5 Typographical Elements in the Document

Typographical element	Use	Example
<b>bold</b>	<ul style="list-style-type: none"> <li>Messages</li> <li>Terminals</li> <li>Elements on a user interface</li> <li>Elements to be selected</li> <li>Elements to be entered</li> </ul>	<ul style="list-style-type: none"> <li>Connect the insulated conductors to the terminals <b>X703:1</b> to <b>X703:6</b>.</li> <li>Enter <b>10</b> in the field <b>Minutes</b>.</li> </ul>
>	<ul style="list-style-type: none"> <li>Connects several elements to be selected</li> </ul>	<ul style="list-style-type: none"> <li>Go to <b>Settings &gt; Date</b>.</li> </ul>
[Button]	<ul style="list-style-type: none"> <li>Button or key to be clicked on or pressed down</li> </ul>	<ul style="list-style-type: none"> <li>Select [Enter].</li> </ul>
[Key]		
#	<ul style="list-style-type: none"> <li>Placeholder for variable components (e.g., parameter names)</li> </ul>	<ul style="list-style-type: none"> <li>Parameter <b>WCtrlHz.Hz#</b></li> </ul>

## 1.6 Designations in the Document

Complete designation	Designation in this document
Grid-Connect-Box 12	Grid-Connect-Box
Multicluseter-Box 12	Multicluseter-Box
Sunny Island 6.0H / 8.0H	Sunny Island, battery inverter

## 1.7 Additional Information

For more information, please go to [www.SMA-Solar.com](http://www.SMA-Solar.com).

Title and information content	Type of information
SUNNY ISLAND 4.0M / 6.0H / 8.0H	Operating manual
GRID-CONNECT-BOX 12	Operating manual

## 2 Safety

### 2.1 Intended Use

The Multicuster-Box is the main AC distribution board in a multicuster system. The multicuster system forms an AC grid and is made up of several three-phase clusters.

The product is not suitable for supplying life-sustaining medical devices. A power outage must not lead to personal injury.

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

The generator must always be connected directly to the Multicuster-Box.

The utility grid may only be connected to the terminal provided for the generator on the Multicuster-Box under the following conditions:

- Connecting the utility grid to the Multicuster-Box must be permitted in accordance with the local standards and directives.
- Connecting the utility grid to the Multicuster-Box must be agreed with the grid operator.
- No generator may be installed in the multicuster system.

To connect the generator and the utility grid, it is necessary to install a Grid-Connect-Box between the utility grid and the Multicuster-Box.

The Multicuster-Box is designed for connection to TN-S, TN-C-S, and TT systems:

- If the multicuster system is using a generator as grid-forming source, the neutral point of the generator must be grounded (see Section 6.8, page 25).
- If the Multicuster-Box is used together with the Grid-Connect-Box, remember that the all-pole disconnection can be deactivated on the Grid-Connect-Box (see operating manual of the Grid-Connect-Box). If the all-pole disconnection on the Grid-Connect-Box is deactivated, the utility grid must be configured as a TN-C-S system (see Section 4.3, page 13).
- If the utility grid is connected directly to the Multicuster-Box, the neutral point of the utility grid must be grounded (see Section 6.8, page 25).

The Multicuster-Box must only be operated in conjunction with Sunny Island 6.0H (SI6.0H-13 / SI6.0H-12) or Sunny Island 8.0H (SI8.0H-13 / SI8.0H-12). Always take the maximum AC connection power and the permitted inverter combinations into account.

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 (as per IEC 61439-1:2011).

The product is designed for indoor use only.

Only operate the product at temperatures between  $-25^{\circ}\text{C}$  and  $+60^{\circ}\text{C}$ .

The Multicuster-Box is designed for use at altitudes of up to 2300 m above Mean Sea Level. If you would like to use the Multicuster-Box at altitudes above 2300 m, contact Service (see Section 15, page 51).

Use SMA products only in accordance with the information provided in the enclosed documentation and with the locally applicable laws, regulations, standards and directives. Any other application may cause personal injury or property damage.

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

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

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

This document does not replace any regional, state, provincial, federal or national laws, regulations or standards that apply to the installation, electrical safety and use of the product. SMA Solar Technology AG assumes no responsibility for the compliance or non-compliance with such laws or codes in connection with the installation of the product.

The type label must remain permanently attached to the product.

## 2.2 IMPORTANT SAFETY INSTRUCTIONS

Keep the manual for future reference.

This section contains safety information that must be observed at all times when working.

The product has been designed and tested in accordance with international safety requirements. As with all electrical or electronical devices, there are residual risks despite careful construction. To prevent personal injury and property damage and to ensure long-term operation of the product, read this section carefully and observe all safety information at all times.

### ⚠ DANGER

#### Danger to life due to electric shock when live components or cables are touched

High voltages are present in the conductive components or cables of the product. Touching live parts and cables results in death or lethal injuries due to electric shock.

- Do not touch non-insulated parts or cables.
- Disconnect the product from voltage sources and ensure it cannot be reconnected before working on the device.
- Only disassemble the protective covers, if the product is disconnected from all voltage sources.
- Wear suitable personal protective equipment for all work on the product.

### ⚠ CAUTION

#### Risk of injury if the product tips over

The product is heavy and may tip over if not properly fastened to the support surface. This can result in crushing injuries.

- Upon installation, attach the product to the support surface.

### ⚠ CAUTION

#### Risk of burns due to hot components

Some components and terminals inside the product can become hot during operation. Touching hot components or terminals can result in burn injuries.

- Wear suitable personal protective equipment for all work on the product.
- Only operate the product with its protective cover mounted.
- Prior to removing the protective cover, let the product cool down.

### NOTICE

#### Damage to the product due to sand, dust and moisture ingress

Sand, dust and moisture penetration can damage the product and impair its functionality.

- Do not open the product during a dust storm or precipitation.
- Close the product in case of interruption of work or after finishing work.
- Only operate the product when it is closed.
- Store the closed product in a dry and covered location. Observe storage conditions.

 **Effects of an emergency disconnection**

Emergency disconnection on the battery inverter triggers the uncontrolled shutdown of the system and unsaved data is lost.

- Only trip the emergency disconnection to avoid danger or consequential damage.
- In the event of an emergency disconnection, always check whether any fuse elements in the product, 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.

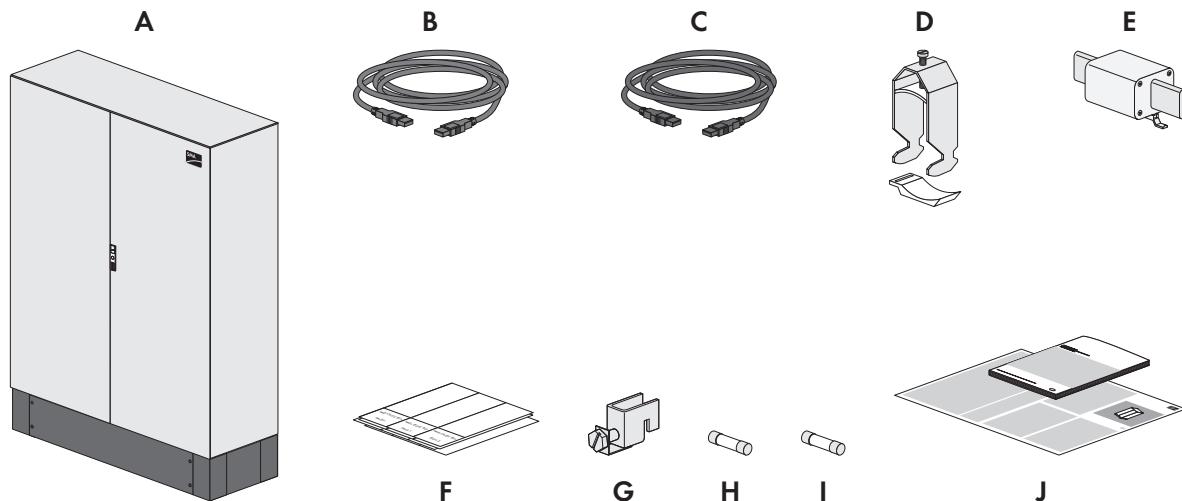


Figure 1: Components included in the scope of delivery

Position	Quantity	Designation
A	1	Multicloud-Box
B	1	Data cable for communication (10 m, black)
C	3	Data cable for measurement and control signals (10 m, red)
D	20	Strain relief with counter-sleeve (22 mm to 28 mm)
E	3	LV/HRC size 1 fuse link, 200 A
F	1	Set of non-woven adhesive labels for cable designation
G	4	Terminal incl. screws for connecting the protective conductors
H	3	Fuse link 1 A, tripping characteristics: gG
I	1	Fuse link 6 A, tripping characteristics: gG
J	1	Operating manual and circuitry overview

## 4 Product Overview

### 4.1 Product Description

The Multicloud-Box is an SMA multicloud technology device for off-grid systems, battery-backup systems, and systems for increased self-consumption. The Multicloud-Box is a main AC distribution board to which you can connect up to 4 clusters. Each cluster is three-phase and made up of 3 DC-side, parallel-switched Sunny Island 6.0H / 8.0H inverters with firmware version 3.5 or higher. Functions of the Multicloud-Box include:

- Main AC distribution board for Sunny Island inverters, one generator, one load, and one PV system
- Load shedding
- Automatic bypass and reverse current monitoring for the generator
- Active anti-islanding

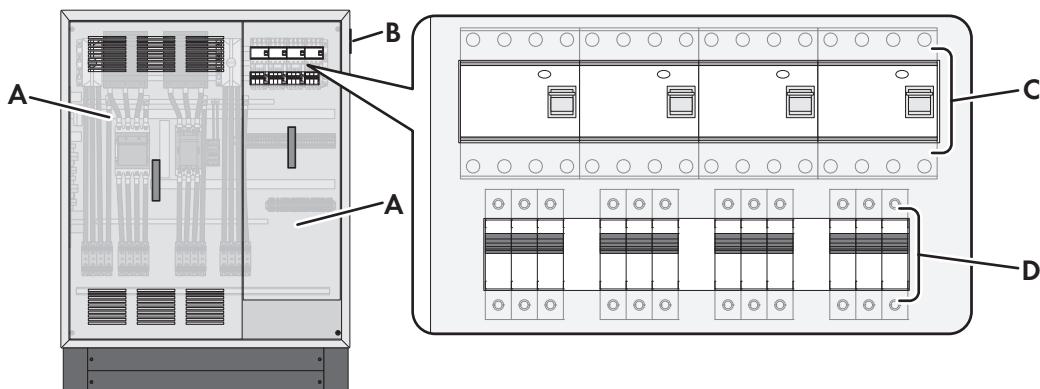


Figure 2: Multicloud-Box with cabinet door open

Position	Designation
A	<p>Protective cover</p> <p>Prevents inadvertent contact with live components during operation and thus protects from electric shocks. When the product is in operation, the protective covers must always be mounted.</p>
B	<p>Type label</p> <p>The type label clearly identifies the product. The type label must remain permanently attached to the product. You will find the following information on the type label:</p> <ul style="list-style-type: none"> <li>• Device type (Model)</li> <li>• Serial number (Serial No. or S/N)</li> <li>• Date of manufacture</li> <li>• Device-specific characteristics</li> </ul>

Position	Designation
C	<p>Residual-current device</p> <p>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 switches the loads off at all poles. 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.</p> <p>The residual-current device has a test button and a switch lever. The test button is used to test the residual-current device. The switch lever is used to activate and deactivate (see Section 10.1, page 38).</p>
D	<p>Circuit breaker</p> <p>Protects power cables of the connected inverters.</p>

## 4.2 Symbols on the Product

Icon	Explanation
	<p>Beware of electrical voltage</p> <p>The product operates at high voltages.</p>
	<p>Beware of hot surface</p> <p>The product can get hot during operation.</p>
	<p>Danger to life due to high voltages in the inverter; observe a waiting time of 15 minutes.</p> <p>High voltages that can cause lethal electric shocks are present in the live components of the inverter.</p> <p>Prior to performing any work on the inverter, disconnect it from all voltage sources as described in this document.</p>
	<p>Observe the documentations</p> <p>Observe all documentations supplied with the product.</p>
	<p>Grounding conductor</p> <p>This symbol indicates the position for connecting a grounding conductor.</p>
	<p>WEEE designation</p> <p>Do not dispose of the product together with the household waste but in accordance with the disposal regulations for electronic waste applicable at the installation site.</p>
	<p>Degree of protection IP55</p> <p>The product is protected against interior dust deposits and water that is directed as a jet against the enclosure from all directions.</p>

Icon	Explanation
	CE marking The product complies with the requirements of the applicable EU directives.
	RoHS labeling The product complies with the requirements of the applicable EU directives.

## 4.3 Grounding in the Multicluseter System

### Grounding in the Multicluseter-Box

The grounding busbar **X100** of the Multicluseter-Box is always connected to the enclosure of the Multicluseter-Box. All grounding conductors must be connected in accordance with the specifications of this operating manual (see Section 6, page 19).

With TN-S, TN-C-S, and TT systems, the neutral conductor must be grounded for protection against indirect contact with live components. The following conditions apply to grounding the neutral conductor in the multicluseter system:

- If the multicluseter system is using a generator as grid-forming source, the neutral point of the generator must be grounded.
- If the multicluseter system is connected to the utility grid via a Grid-Connect-Box, the neutral point is grounded via the utility grid when in parallel grid operation. However, in case of grid failure, the multicluseter system must disconnect from the utility grid. For this disconnection, either only the line conductors are disconnected, or in case of all-pole disconnection, the line conductors and the neutral conductor.
- If the utility grid is connected directly to the Multicluseter-Box, the neutral point of the utility grid must be grounded. The installer bears sole responsibility for the grounding configuration and the grid disconnection required for instances of grid failure. Directly connecting the utility grid to the Multicluseter-Box must be permitted in accordance with the local standards and directives and agreed with the grid operator.

With all-pole disconnection, the multicluseter system with line conductors and neutral conductor are disconnected from the utility grid in the event of grid failure. This disconnection does not ground the neutral conductor in the grid of the multicluseter system. Therefore, in multicluseter systems with all-pole disconnection, the grounding contactor of the Multicluseter-Box must ground the neutral conductor in the event of grid failure. The grounding contactor ensures the necessary protection in case of indirect contact with live components. The grounding contactor is in fail-safe design.

If the neutral conductor of the multicluseter system is connected to the utility grid, no further grounding is permitted in the electricity grid of the multicluseter system. Therefore, if the multicluseter system is connected to the utility grid or generator, the grounding contactor of the Multicluseter-Box breaks the connection between neutral conductor and ground potential.

## 4.4 System Structure

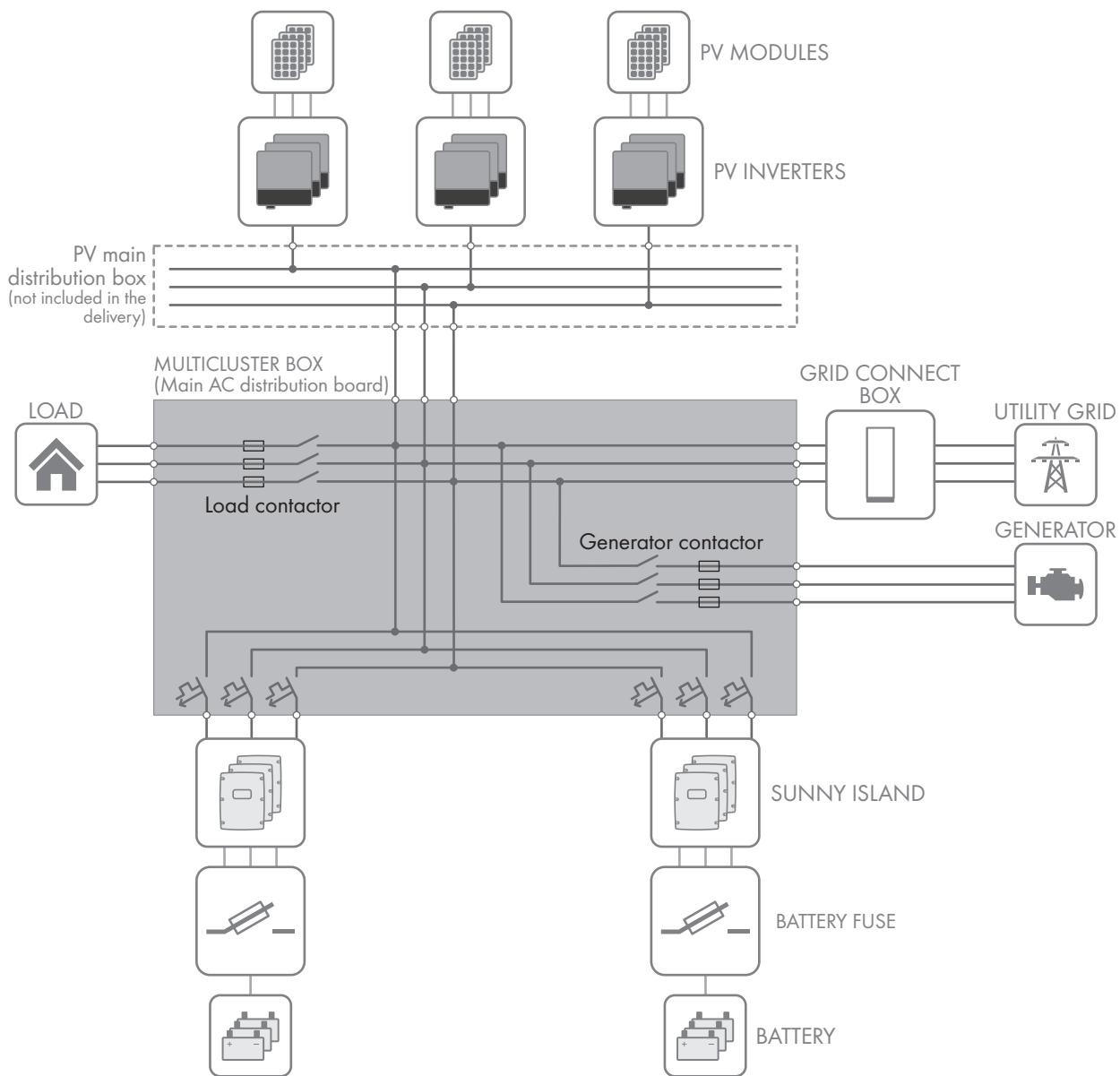


Figure 3: Circuitry principle of a multicluster system – example with Multicluster-Box

## 5 Mounting

### 5.1 Requirements for Mounting

Requirements for the mounting location:

**⚠ WARNING**

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

Despite careful construction, electrical devices can cause fires. This can result in death or serious injury.

- Do not mount the product in areas containing highly flammable materials or gases.
- Do not mount the product in potentially explosive atmospheres.

**i Optimum mounting location**

The ambient temperature influences the tripping threshold of the circuit breakers for the connected battery inverters. The higher the temperature, the earlier the circuit breakers will trip. At high ambient temperatures, the derating function of the battery inverters inhibits premature tripping of the circuit breakers.

- To ensure optimum operation, mount and install the Multiclus-ter-Box and the battery inverters at the same location.
- A solid, flat support surface must be available for mounting.
- The mounting location must be suitable for the weight and dimensions of the product (see Section 12, page 43).
- The mounting location must be less than 2300 m above Mean Sea Level. If you would like to use the Multiclus-ter-Box at altitudes above 2300 m, contact Service (see Section 15, page 51).
- The mounting location must not hinder access to disconnection devices.
- All local requirements concerning minimum passage widths and escape routes must be observed.
- The mounting location should be freely and safely accessible at all times without the need for any auxiliary equipment (such as scaffolding or lifting platforms). Non-fulfillment of these criteria may restrict servicing.
- All ambient conditions must be met (see Section 12, page 43).

**Permitted and prohibited mounting positions:**

- The product may only be mounted in a permitted mounting position.

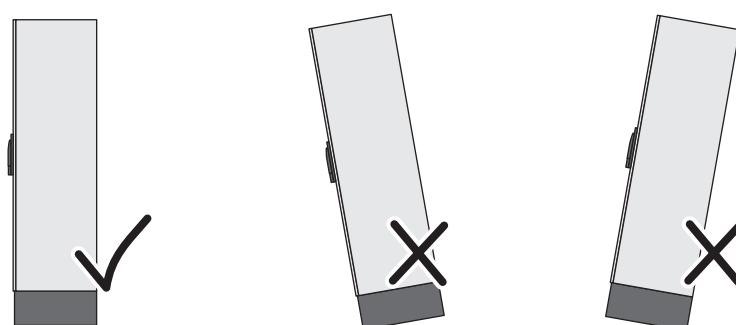


Figure 4: Permitted and prohibited mounting positions

**Recommended clearances:**

- There must be a distance of at least 300 mm between the Multiclus-ter-Box and the Grid-Connect-Box. This will ensure adequate heat dissipation for each product.

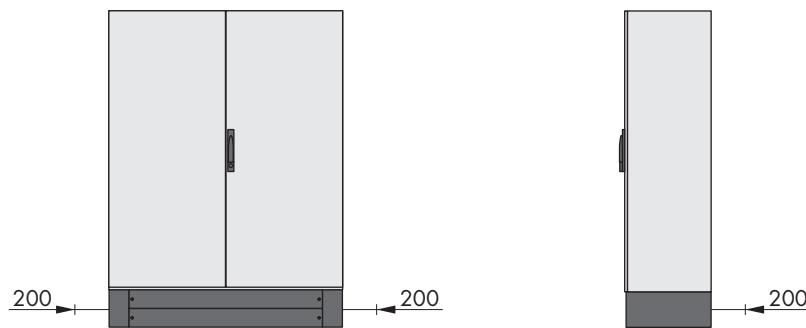


Figure 5: Recommended clearances(Dimensions in mm)

## 5.2 Preparing the Mounting Location

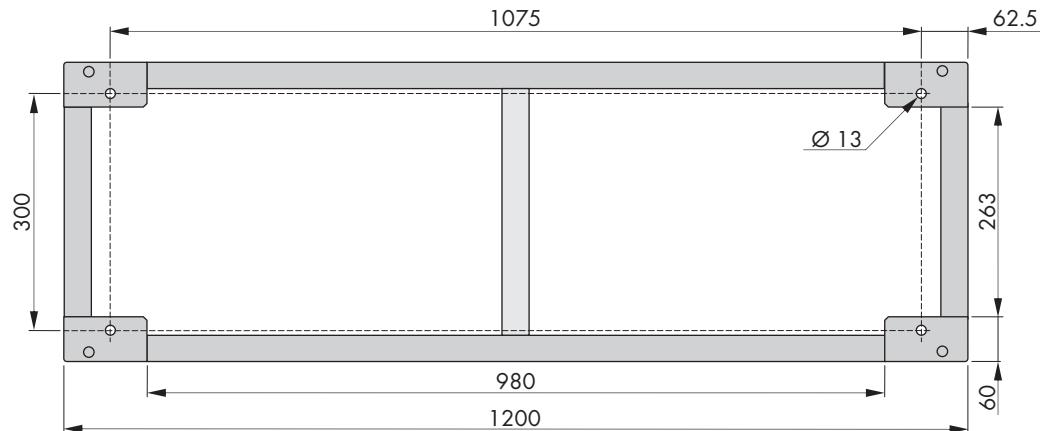
### **⚠ WARNING**

#### **Danger to life due to fire or explosion if mounted at an unsuitable location**

Mounting the product in areas with a high fire hazard can result in fire. This can result in death or serious injury.

- Do not install the product on flammable construction materials.
- Do not mount the product in areas containing highly flammable materials.
- Do not mount the product in potentially explosive atmospheres.

#### **Dimensions for mounting the base:**



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

- 4 suitable screw anchors for attaching the product

#### **Procedure:**

1. On the support surface, mark the positions of the 4 drill holes for attaching the base.
2. Drill holes at the marked positions.
3. Use screw anchors that are suitable for the support surface.

## 5.3 Transporting and Mounting the Product

### **⚠ WARNING**

#### **Danger to life if raised or suspended loads tip over, fall or sway**

Vibrations or careless or hasty lifting and transportation may cause the product to tip over or fall. This can result in death or serious injury.

- Always transport the product as close to the floor as possible.
- All means of transport and auxiliary equipment used must be designed for the weight of the product. Weight: 228 kg.
- Always transport and lift the product upright.
- Always maintain a sufficient safety distance from the product during transport.
- Take into account the center of gravity of the product. The center of gravity is approximately in the center of the cabinet.
- Wear suitable personal protective equipment for all work on the product.

### **NOTICE**

#### **Damage to the product due to sand, dust and moisture ingress after setting down on unsuitable surface**

Setting the product down on an unsecured or uneven surface may cause the product to warp and allow sand, dust and moisture to enter the product. Sand, dust and moisture penetration can damage the product and impair its functionality.

- Never set the product down on an unsecured or uneven surface.

#### **Overview of transport options:**

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

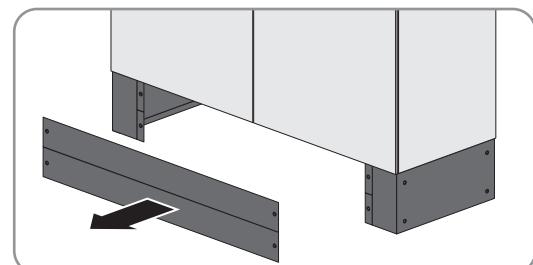
- Forklift
- Crane with suitable fork

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

- 4 suitable screws to attach the product to the support surface

#### **Procedure:**

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



3. Retain the kick plates and the fastening screws for later use.
4. Slide a suitable means of transport under the product.
5. Transport the product to the mounting location using a suitable transport lock.

6.

**⚠ CAUTION****Risk of injury if the Multicuster-Box tips over**

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

- Attach the product to the support surface using 4 suitable screws.

## 6 Electrical Connection

### Also see:

> Section 6.3 "Connecting the Generator", page 21

### 6.1 Overview of the Connection Area

#### 6.1.1 Interior View

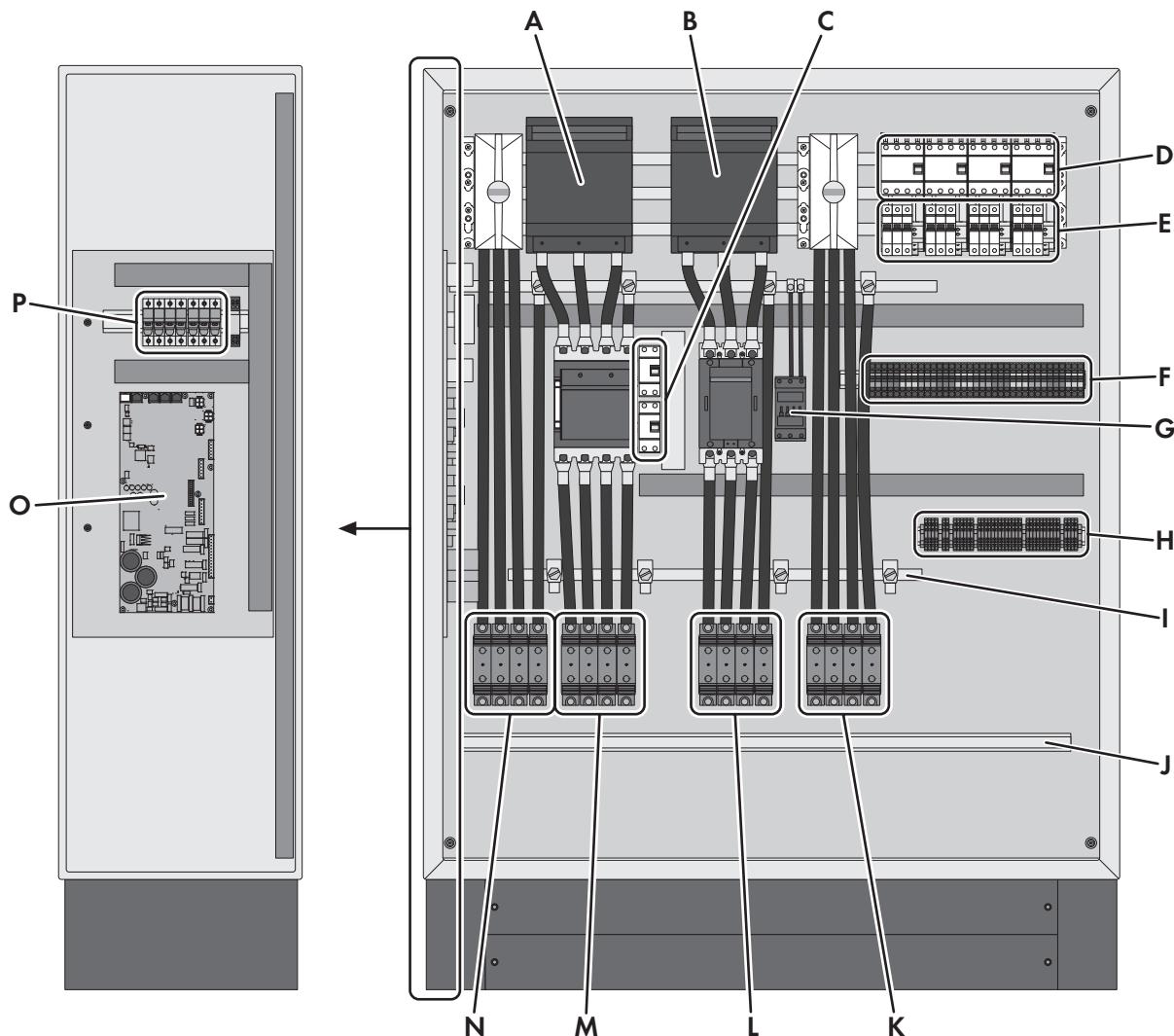


Figure 6: Components and terminals inside the Multicluseter-Box

Position	Designation
A	Fuse switch-disconnector <b>F101</b> for LV/HRC size 1 fuse links of the generator terminal
B	Fuse switch-disconnector <b>F102</b> for LV/HRC size 1 fuse links of the load terminal
C	De-energized surge arrester
D	Residual-current device of the Sunny Island inverters
E	Circuit breakers for protecting the power cables of the Sunny Island inverters
F	Spring-cage terminals <b>X105</b> for connecting the power cables of the Sunny Island inverters

Position	Designation
G	Grounding contactor
H	Spring-cage terminals <b>X106</b> to <b>X113</b> for connecting the control cables of the Sunny Island inverters, battery fuse and Grid-Connect-Box
I	Grounding busbar <b>X100</b> for connecting the grounding conductors of the generator, the loads, and the PV system as well as to connect the Multicuster-Box to the equipotential bonding If the Grid-Connect-Box is installed, the corresponding grounding conductor is also connected here. When connecting the utility grid directly to the Multicuster-Box, the grounding conductor is also connected here (see Section 6.4.1, page 22).
J	Cable support rail
K	Terminal <b>X104</b> with spring-cage terminals <b>L1</b> , <b>L2</b> , <b>L3</b> and <b>N</b> to connect the line conductors and the neutral conductor of the PV system
L	Terminal <b>X103</b> with spring-cage terminals <b>L1</b> , <b>L2</b> , <b>L3</b> and <b>N</b> to connect the line conductors and the neutral conductor of the main distribution for loads
M	Terminal <b>X102</b> with spring-cage terminals <b>L1</b> , <b>L2</b> , <b>L3</b> and <b>N</b> to connect the line conductors and the neutral conductor of the generator When connecting the utility grid directly to the Multicuster-Box, the line conductors are also connected here (see Section 6.4.1, page 22).
N	Terminal <b>X101</b> with spring-cage terminals <b>L1</b> , <b>L2</b> , <b>L3</b> and <b>N</b> to connect the line conductors and the neutral conductor of the Grid-Connect-Box If only the Multicuster-Box is installed, these terminals are not connected.
O	<b>SIBUCTRL</b> with RJ45 jacks for connecting the data cables
P	Fuses to protect the internal cabling

### 6.1.2 View from Below

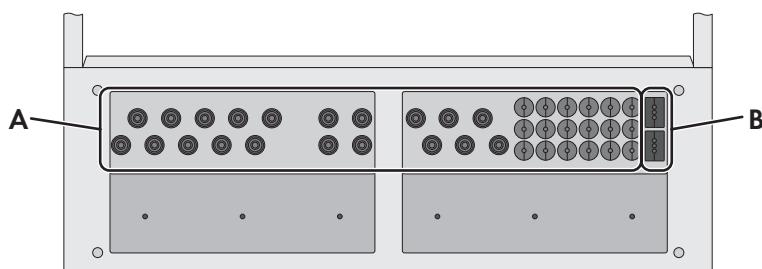


Figure 7: Enclosure openings in the bottom of the Multicuster-Box

Position	Designation
A	Base plate with membranes for inserting the power cables
B	Two-part cable feed-through for inserting the data cables

## 6.2 Installing the Multicuster-Box without Grid-Connect-Box

If the Multicuster-Box is installed without Grid-Connect-Box, the terminals of the grounding contactor and the generator contactor must be equipped with a jumper wire.

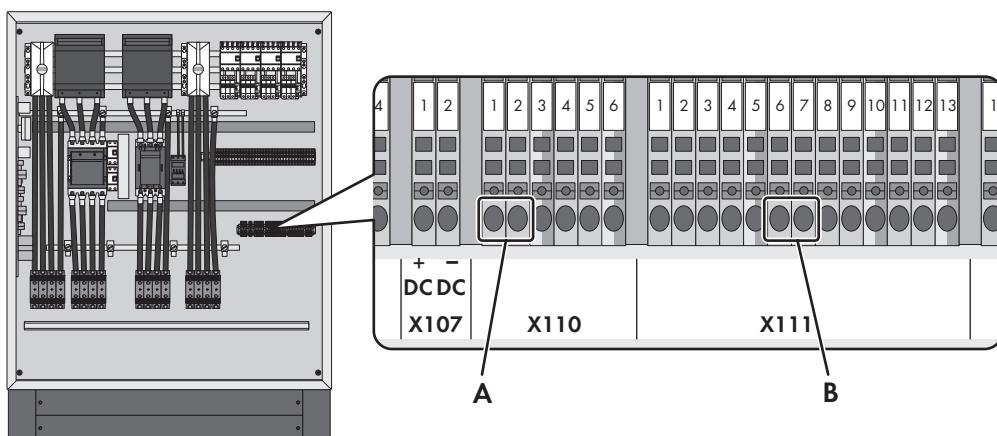


Figure 8: Overview of the provided jumper wires when installing the Multicuster-Box without Grid-Connect-Box

### Position

A	Position of the jumper wire for blocking the grounding contactor
B	Position of the jumper wire for blocking the generator contactor

### Procedure:

1. Short-circuit **X110:1** and **X110:2** with a jumper wire to block the grounding contactor.
2. Short-circuit **X111:6** and **X111:7** with a jumper wire to block the generator contactor.

## 6.3 Connecting the Generator

You can connect a three-phase generator to the Multicuster-Box. The line conductors are routed via fuse switch-disconnectors in the Multicuster-Box. LV/HRC size 1 fuse links 200 A are installed in the fuse switch-disconnector by default.

### **i** Generator output fuse influences dimensioning of the PV system power cables

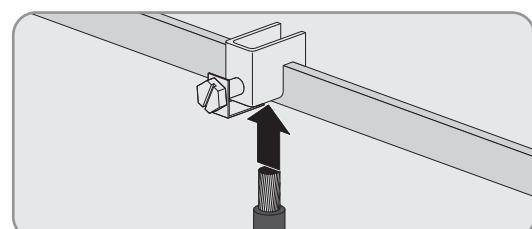
Remember that the size of the generator output fuse affects the dimensioning of the PV system cable (see Section 6.6, page 24).

### Cable requirements:

- Conductor type: copper wire
- Conductor cross-section: 50 mm<sup>2</sup> to 150 mm<sup>2</sup>
- The power cables must be ground-fault and short-circuit protected.
- The AC conductors and DC conductors must always be routed in separate cables.

### Procedure:

1. Insert the power cables into the Multicuster-Box (see Section 9.2, page 32).
2. Connect the grounding conductor to the grounding busbar (AF 17, torque: 15 Nm). To do this, use the screw terminal included in the scope of delivery.



3. Connect the neutral conductor to the spring-cage terminal **N** at terminal **X102:4** (see Section 9.4, page 34).
4. Connect the line conductors to the spring-cage terminals **L1**, **L2**, and **L3** at the terminals **X102:1** to **X102:3**.
5. Ensure that a right-hand rotating magnetic field is present at the generator terminal.
6. Provide for strain relief of the power cables by attaching them to the appropriate cable support rail. Use the strain reliefs and counter-sleeves provided.
7. According to the type of cable routing and the installation conditions, determine the required fuse link for the fuse switch-disconnector and insert it into the fuse switch-disconnector **F101**.

## 6.4 Utility Grid Connection

### 6.4.1 Utility Grid Connection Options

You can connect the utility grid in the following ways:

- Utility grid connection via Grid-Connect-Box
- Utility grid connection directly to the Multicluseter-Box

The following conditions must be observed when connecting the utility grid.

#### Utility grid connection via Grid-Connect-Box

If the VDE-AR-N 4105 rule does not apply to the utility grid and a generator has to be connected in addition to the utility grid, a Grid-Connect-Box must be installed between the utility grid and the Multicluseter-Box (see Section 6.4.2, page 22).

#### Utility grid connection directly to the Multicluseter-Box

For direct connection of the utility grid to the Multicluseter-Box, the following requirements must be fulfilled:

- The VDE-AR-N 4105 rule must not apply to the utility grid.
- Directly connecting the utility grid to the Multicluseter-Box must be permitted in accordance with the local standards and directives and agreed with the grid operator.
- If the utility grid is directly connected to the Multicluseter-Box, no generator is to be installed in the multicluseter system.

To connect the utility grid directly to the Multicluseter-Box, terminal **X102** of the generator is provided (see Section 6.1.1, page 19). When connecting the utility grid directly to the Multicluseter-Box, proceed as described below for the generator (see Section 6.3, page 21).

### 6.4.2 Connecting the Grid-Connect-Box

#### **i The grid terminal output fuse influences dimensioning of the PV system power cables**

Remember that the size of the grid fuse affects the dimensioning of the PV system cable (see Section 6.6, page 24).

#### Requirements:

- The Grid-Connect-Box must be properly installed (see operating manual of the Grid-Connect-Box).

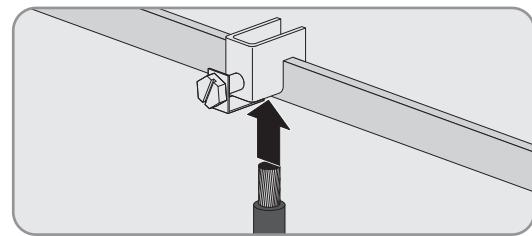
#### Cable requirements:

- Conductor type: copper wire
- Conductor cross-section: 50 mm<sup>2</sup> to 150 mm<sup>2</sup>
- The power cables must be ground-fault and short-circuit protected.
- The AC conductors and DC conductors must always be routed in separate cables.

#### Procedure:

1. Insert the power cables into the Multicluseter-Box (see Section 9.2, page 32).

2. Connect the grounding conductor to the grounding busbar (AF 17, torque: 15 Nm). To do this, use the screw terminal included in the scope of delivery.



3. Connect the grounding conductor to the grounding busbar (AF 17, torque: 15 Nm). To do this, use the screw terminal included in the scope of delivery.
4. Connect the line conductors to the spring-cage terminals **L1**, **L2**, and **L3** at the terminals **X101:1** to **X101:3** (see Section 9.4, page 34).
5. Ensure that a right-hand rotating magnetic field is present at the terminal of the Grid-Connect-Box.
6. Provide for strain relief of the power cables by attaching them to the appropriate cable support rail. Use the strain reliefs and counter-sleeves provided.

## 6.5 Connecting the Loads

The line conductors L1, L2, and L3 are routed via a fuse switch-disconnector in the Multicuster-Box. LV/HRC size 1 fuse links 200 A are installed in the fuse switch-disconnector by default.

### **i** Cable protection

The Multicuster-Box is not a substitute for the load distribution board.

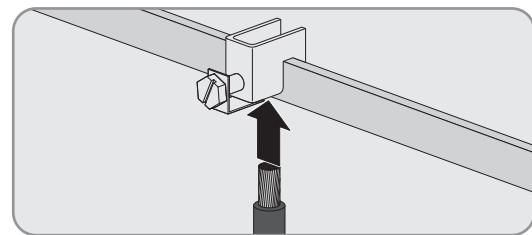
- Between the Multicuster-Box and the loads, you must install a distribution board with circuit breakers to protect and isolate the loads, as well as a residual-current device.
- Adhere to all standards and directives for the installation of electrical devices and systems applicable at the installation location.

#### Cable requirements:

- Conductor type: copper wire
- Conductor cross-section: 50 mm<sup>2</sup> to 150 mm<sup>2</sup>
- The power cables must be ground-fault and short-circuit protected.
- The AC conductors and DC conductors must always be routed in separate cables.

#### Procedure:

1. Insert the power cables into the Multicuster-Box (see Section 9.2, page 32).
2. Connect the grounding conductor to the grounding busbar (AF 17, torque: 15 Nm). To do this, use the screw terminal included in the scope of delivery.
3. Connect the neutral conductor to the spring-cage terminal **N** at terminal **X103:4** (see Section 9.4, page 34).
4. Connect the line conductors to the spring-cage terminals **L1**, **L2**, and **L3** at the terminals **X103:1** to **X103:3**.
5. Ensure that a right-hand rotating magnetic field is present at the load terminal.
6. Provide for strain relief of the power cables by attaching them to the appropriate cable support rail. Use the strain reliefs and counter-sleeves provided.
7. According to the type of cable routing and the installation conditions, determine the required fuse link for the fuse switch-disconnector and insert it into the fuse switch-disconnector **F102**.



## 6.6 Connecting the PV System

### **i** Connection of other energy sources

Instead of a PV system, you can connect other energy sources (e.g., small wind turbine systems) to the Multicuster-Box.

### **i** Cable protection

The Multicuster-Box does not take the place of the distribution board of the PV system (PV main distribution board).

- Install a circuit breaker and, if necessary, a residual-current device between the Multicuster-Box and the PV system for protection and disconnection purposes.
- Adhere to all standards and directives for the installation of electrical devices and systems applicable at the installation location.

#### Cable dimensioning:

In the event of a short circuit in the PV system cable, short-circuit currents arising in the generator or Grid-Connect-Box will flow via the unprotected cable between the Multicuster-Box and main PV distribution.

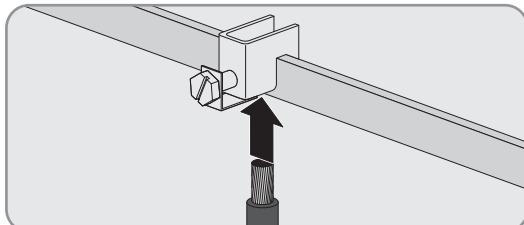
- Size the cables to match the fusing of the generator or the Grid-Connect-Box.

When planning the short-circuit protection of cables, the PV inverters and Sunny Island inverters may be disregarded, as their construction precludes any danger to power cables in case of short circuits.

#### Cable requirements:

- Conductor type: copper wire
- Conductor cross-section: 50 mm<sup>2</sup> to 150 mm<sup>2</sup>
- The power cables must be ground-fault and short-circuit protected.
- The AC conductors and DC conductors must always be routed in separate cables.

#### Procedure:

1. Insert the power cables into the Multicuster-Box (see Section 9.2, page 32).
  2. Connect the grounding conductor to the grounding busbar (AF 17, torque: 15 Nm). To do this, use the screw terminal included in the scope of delivery.
- 
3. Connect the neutral conductor to the spring-cage terminal **N** at terminal **X104:4** (see Section 9.4, page 34).
  4. Connect the line conductors to the spring-cage terminals **L1**, **L2** and **L3** at the terminals **X104:1** to **X104:3**.
  5. Provide for strain relief of the power cables by attaching them to the appropriate cable support rail. Use the strain reliefs and counter-sleeves provided.

## 6.7 Connecting the Sunny Island

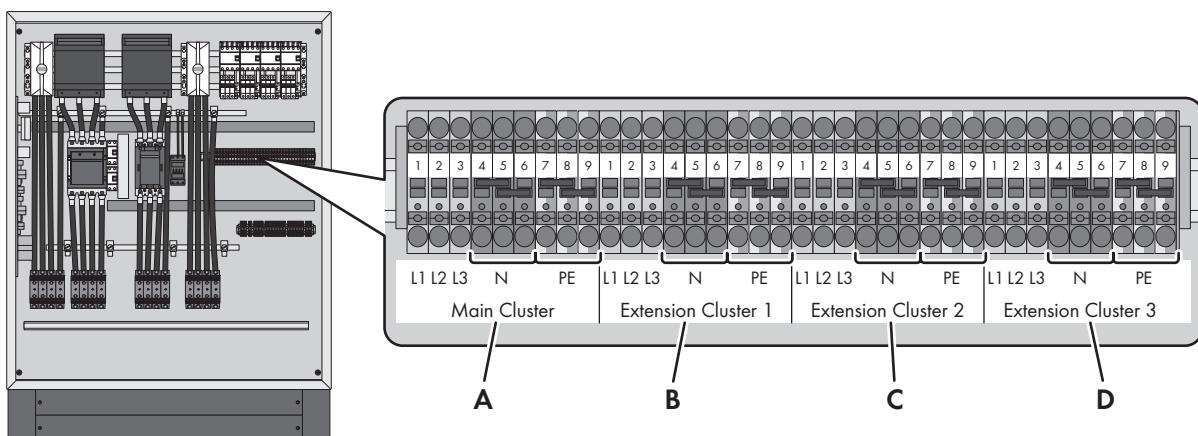


Figure 9: Overview of the spring-cage terminals for connecting the power cables of the Sunny Island inverters

Position	Explanation
A	Terminal for the power cables of the main cluster
B	Terminal for the power cables of extension cluster 1
C	Terminal for the power cables of extension cluster 2
D	Terminal for the power cables of extension cluster 3

### **i Fusing of the Sunny Island inverters**

The power cables of each Sunny Island inverter are fused with a 40 A circuit breaker inside the Multicluseter-Box.

#### **Cable requirements:**

- Conductor material: Copper
- The AC conductors and DC conductors must always be routed in separate cables.
- Conductor cross-section: 0.5 mm<sup>2</sup> to 10 mm<sup>2</sup>

#### **Procedure:**

1. Insert the power cables into the Multicluseter-Box (see Section 9.2, page 32).
2. Connect the line conductors, the neutral conductors and the grounding conductors of all Sunny Island inverters to the spring-cage terminals X105 for the Sunny Island inverters (see Section 9.4, page 34).

## 6.8 Grounding the Multicluseter System

The neutral conductors inside the Multicluseter-Box are not connected to the grounding conductor by default. To ensure safe operation of the multicluseter system, you must perform the following action prior to commissioning:

#### **Cable requirements:**

- Conductor type: copper wire
- Conductor cross-section: 16 mm<sup>2</sup> to 120 mm<sup>2</sup>
- The power cables must be ground-fault and short-circuit protected.
- The AC conductors and DC conductors must always be routed in separate cables.

**Procedure:**

1. If connecting a generator to the multicluster system, the neutral point of the generator must be grounded. All standards and directives applicable to the installation site must be observed.
2. If the utility grid is only connected to the multicluster system, the neutral point of the utility grid must be grounded. All standards and directives applicable to the installation site must be observed.

## 6.9 Connecting the Control Cables

### 6.9.1 Assignment of Spring-Cage Terminals

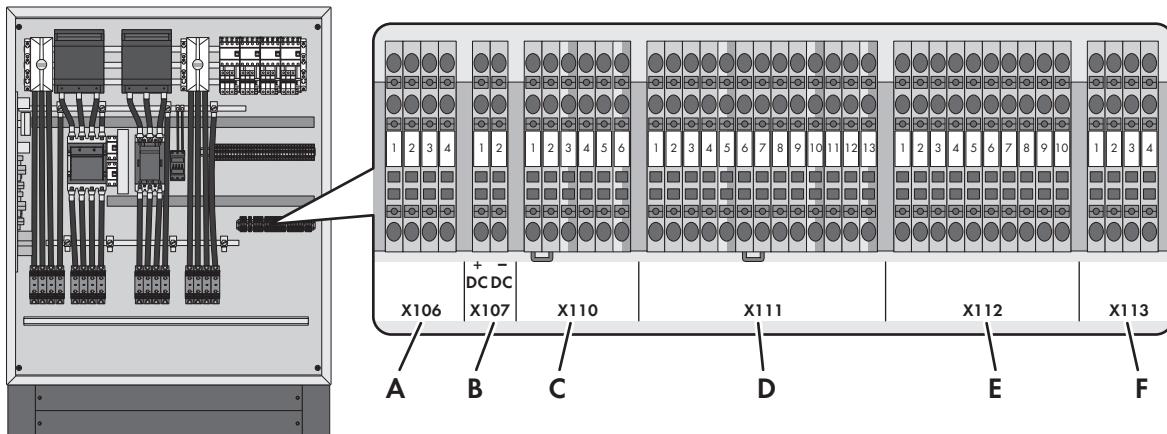


Figure 10: Overview of spring-cage terminals for connecting the control cables

Position	Designation	Description
A	X106	Control voltage from master of main cluster (AC)
B	X107	Supply voltage for grounding contactor <b>Q109</b> of Multicluster-Box, e.g. of the battery fuse (DC)
C	X110	Connection of control cables from Grid-Connect-Box (DC)
D	X111	Connection of control cables from Grid-Connect-Box (AC)
E	X112	Connection of the control cables to each Sunny Island in the main cluster: always to the <b>ExtVtg</b> terminal (AC) Connection of control cables to the master of the main cluster: terminals <b>Relay 1C</b> and <b>Relay 1NC</b> (AC).
F	X113	Connection of control cables to the master of the main cluster: terminals <b>BatVtgOut+</b> , <b>DigIn+</b> , <b>Relay2 NO</b> , and <b>Relay2 C</b> (DC)

### 6.9.2 Connecting the Control Cables of the Sunny Island Inverters

The Sunny Island inverters of the main cluster must be connected to the Multicluster-Box via several control cables. These control cables transmit measurement and control signals between the Sunny Island inverters of the main cluster and the Multicluster-Box.

**Cable requirements:**

- Conductor type: copper wire
- Conductor cross-section: 0.75 mm<sup>2</sup> to 2.5 mm<sup>2</sup>
- The AC conductors and DC conductors must always be routed in separate cables.

**Assignment of spring-cage terminals:**

Designation	Description
X106	Control voltage from master of main cluster
X112	Control cable to each Sunny Island in the main cluster (always to terminal <b>ExtVtg</b> ) and control cable to the master of the main cluster (terminals <b>Relay 1C</b> and <b>Relay 1NC</b> )
X113	Control cables to the master of the main cluster: terminals <b>BatVtgOut+</b> , <b>DigIn+</b> , <b>Relay2 NO</b> , and <b>Relay2 C</b>

**Procedure:**

1. Insert the control cables into the Multicuster-Box (see Section 9.2, page 32).
2. Connect the cables to the spring-cage terminals **X106**, **X112**, and **X113** (see Section 9.5, page 35):

### 6.9.3 Connecting Supply Voltage for Grounding Contactor

The grounding contactor **Q109** of the Multicuster-Box must be connected to an external DC voltage of 48 V. The external DC voltage can be tapped from the battery fuse or the terminal **BatVtgOut** of a Sunny Island inverter.

**Requirements:**

- A battery fuse must be installed or an unoccupied **BatVtgOut** terminal must be available at a Sunny Island inverter
- Maximum current load at the terminal **BatVtgOut**: 600 mA

**Cable requirements:**

- Conductor type: copper wire
- Conductor cross-section: 0.75 mm<sup>2</sup> to 2.5 mm<sup>2</sup>
- The AC conductors and DC conductors must always be routed in separate cables.

**Procedure:**

1. Insert the control cables into the Multicuster-Box (see Section 9.2, page 32).
2. Connect the cables to the spring-cage terminals **X107** (see Section 9.5, page 35). Make sure that the poling of the terminals is correct.

### 6.9.4 Connecting the Control Cables to the Grid-Connect-Box

**i Ground connection at terminals X110 and X111**

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

**Cable requirements:**

- Conductor type: copper wire
- Conductor cross-section: 0.75 mm<sup>2</sup> to 2.5 mm<sup>2</sup>
- The AC conductors and DC conductors must always be routed in separate cables.

**Assignment of spring-cage terminals:**

Designation	Description
<b>X110:1 and X110:2</b>	Block of grounding contactor of Multicuster-Box
<b>X110:4 and X110:5</b>	Grid-Connect-Box AC contactor feedback
<b>X111:1 to X111:4</b>	Voltage measurement of Grid-Connect-Box

Designation	Description
X111:6 and X111:7	Block of generator contactor of Multicuster-Box
X111:8 and X111:9	Block of grid contactor of Grid-Connect-Box

**Procedure:**

1. Insert the control cables into the Multicuster-Box (see Section 9.2, page 32).
2. Connect the cables to the spring-cage terminals **X110** and **X111** (see Section 9.5, page 35):

## 6.10 Connecting the Data Cable

The data cables for measurement signals and communication are connected on the **SIBUCTRL**

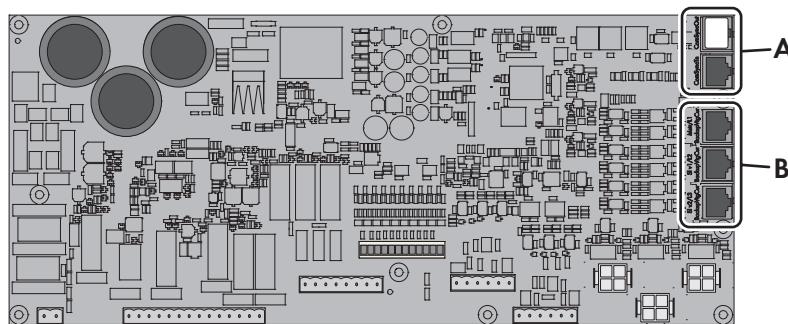


Figure 11: Overview of the connection area in the **SIBUCTRL**

Position	Designation
A	Jacks for communication ( <b>ComSyncIn</b> , <b>ComSyncOut</b> )
B	Sockets for measurement signals (red): <ul style="list-style-type: none"> <li>• Master of main cluster to socket <b>Mstr/L1 BackupVtgCur (X30)</b></li> <li>• Slave 1 of main cluster to socket <b>Slv1/L2 BackupVtgCur (X31)</b></li> <li>• Slave 2 of main cluster to socket <b>Slv2/L3 BackupVtgCur (X32)</b></li> </ul>

**Requirements:**

- The total length of the communication bus must not exceed 30 m. Keep in mind that the communication bus can connect several nodes.
- Make sure that the data cables are always routed separately from the power cables.

**Procedure:**

1. Insert the data cables into the Multicuster-Box (see Section 9.3, page 33).
2. Connect the data cables for measuring signals (red): for the master of the main cluster to the socket **Mstr/L1 BackupVtgCur (X30)**, for the slave 1 of the main cluster to the socket **Slv1/L2 BackupVtgCur (X31)** and for the slave 2 of the main cluster to the socket **Slv2/L3 BackupVtgCur (X32)**.
3. Connect the data cable for communication between the Sunny Island inverters and the Multicuster-Box (black) to jack **ComSyncIn**.
4. Connect the other end of the data cable to jack **ComSyncIn** of a Sunny Island inverter in the main cluster. Since all Sunny Island inverters of the main cluster (master and slaves) are interconnected via a communication bus, the Multicuster-Box can be connected to a slave or to the master of the main cluster (see operating manual of the Sunny Island).
5. Ensure that the terminator is plugged into the jack **ComSyncOut**.

## 7 Preparing for Commissioning

### **i Load shedding in the first two operating hours**

The state of charge (SOC) recorded by battery management and the available battery capacity (SOH) will deviate strongly from the actual values of SOC and SOH for a newly connected battery. During operation, the values recorded by battery management will gradually approach the real values. In the first two operating hours with the new battery, these deviations can lead to load shedding and corresponding messages. These messages will be displayed on the Sunny Island user interface.

#### **Requirements:**

- The Multicluseter-Box must be correctly mounted (see Section 5, page 15).
- All cables must be correctly connected (see Section 6, page 19).
- All cables must be tightly enclosed by a membrane or cable entry of the Multicluseter-Box.
- All power cables must be secured inside or outside the Multicluseter-Box.
- The multicluseter system must be grounded outside the Multicluseter-Box on the generator side or via the Grid-Connect-Box (see Section 6.8, page 25).
- If the Multicluseter-Box is installed without Grid-Connect-Box, the terminals of the grounding contactor and the generator contactor must be equipped with a jumper wire (see Section 6.2, page 21).
- In a multicluseter system with Grid-Connect-Box: all preparations for commissioning at the Grid-Connect-Box must have been completed (see operating manual of the Multicluseter-Box and operating manual of the Grid-Connect-Box).
- The floor of the Multicluseter-Box must be closed with the base plates (see Section 9.2, page 32). All seals at the base plates must be correctly positioned.

#### **Procedure:**

1. Ensure that the power cables are secured with a strain relief.
2. Insert the kick plates and attach with the fastening screws (TX 30, torque: 13 Nm).
3. Mount the protective covers and base plates.
4. Close Multicluseter-Box.
5. Commission the multicluseter system (see documentation of the Sunny Island).
6. In order to receive service assignments for the multicluseter system, all system data must be recorded in the information sheet for Sunny Island systems and made available to Service. To do this, access the information sheet at [www.SMA-Solar.com](http://www.SMA-Solar.com).

## 8 Disconnect from voltage sources

### CAUTION

#### Risk of burns due to hot components

Some components and terminals inside the product can become hot during operation. Touching hot components or terminals can result in burn injuries.

- Wear suitable personal protective equipment for all work on the product.
- Only operate the product with its protective cover mounted.
- Prior to removing the protective cover, let the product cool down.

#### Procedure:

1. Switch off all loads.
2. Stop the multicluster system on the master of the main cluster (see operating manual of the Sunny Island).
3. Switch off all Sunny Island inverters (see the Sunny Island operating manual).
4. Disconnect the PV main distribution board from voltage sources and secure against reconnection.
5. Shut down the generator and secure against reconnection.
6. If a Grid-Connect-Box is present, switch off all circuit breakers and residual-current devices in the Grid-Connect-Box and disconnect the AC voltage supply at the grid-connection point.
7. Open Multicluster-Box.
8. In the Multicluster-Box, open all circuit breakers of the Sunny Island inverters.
9. Prior to removing the protective cover, wait 15 minutes until the capacitors have discharged.
10. Remove the protective cover.
11. Ensure that no voltage is present at all terminals of the Multicluster-Box.
12. Ground the PV main distribution board outside the Multicluster-Box and short-circuit.
13. Ground the generator outside the Multicluster-Box and short-circuit.
14. Cover and isolate any adjacent live components.

## 9 Periodic Actions

### 9.1 Removing the Protective Cover

#### ⚠ DANGER

##### Danger to life due to electric shock when live components or cables are touched

High voltages are present in the conductive components or cables of the product. Touching live parts and cables results in death or lethal injuries due to electric shock.

- Do not touch non-insulated parts or cables.
- Disconnect the product from voltage sources and ensure it cannot be reconnected before working on the device.
- Only disassemble the protective covers, if the product is disconnected from all voltage sources.
- Wear suitable personal protective equipment for all work on the product.

#### ⚠ CAUTION

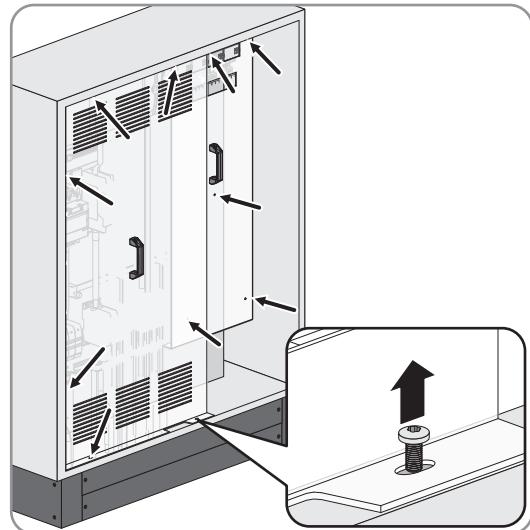
##### Risk of burns due to hot components

Some components and terminals inside the product can become hot during operation. Touching hot components or terminals can result in burn injuries.

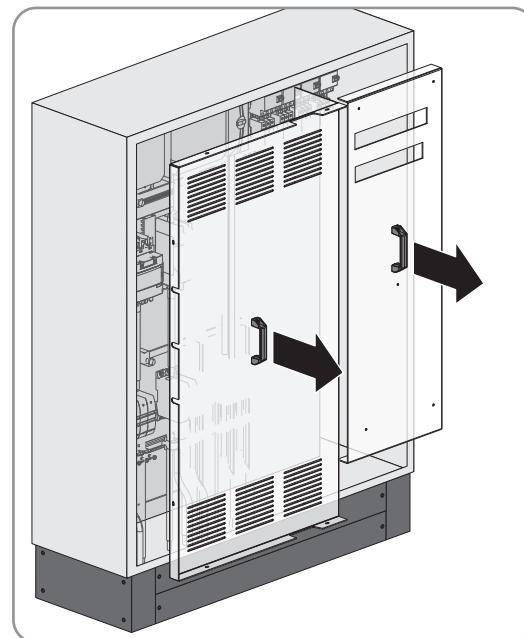
- Wear suitable personal protective equipment for all work on the product.
- Only operate the product with its protective cover mounted.
- Prior to removing the protective cover, let the product cool down.

#### Procedure:

1. Release all fastening screws in the protective cover (TX 30).



2. Remove the protective cover forwards.



3. Retain the protective cover and the fastening screws for later use. In this way, the protective cover can be mounted at a later time and thus the Multicloud-Box recommissioned.

## 9.2 Inserting Power and Control Cables

### NOTICE

#### **Damage to the product due to sand, dust and moisture because of leaky membranes**

By piercing unnecessary or oversized holes, the membranes in the cable feed-through plate become leaky. Sand, dust and moisture penetration can damage the product and impair its functionality.

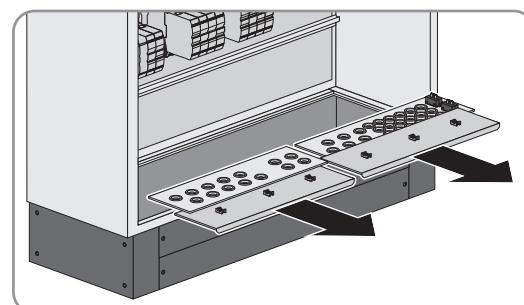
- Select membranes that match the cable diameter.
- Only pierce as many holes in the membranes of the cable feed-through plate as you need for the cables.
- The hole in each membrane must be smaller than the diameter of the cable to be led through.
- Only insert one cable in each membrane.

#### **Requirement:**

- The kick plates must be dismantled (see Section 5.3, page 17).

#### **Procedure:**

1. Remove the protective cover (see Section 9.1, page 31).
2. Remove all screws of the front and rear base plates (TX 25) and remove the base plates.



3. Insert all cables into the product in accordance with the following procedure:
4. Select a suitable cable entry for each cable.
5. Pierce the membrane of the selected cable entries with a pointed object. Ensure that the openings are not too large.

6. Insert each cable through the membrane of the selected cable entry into the Multicuster-Box. Ensure that the cable is tightly enclosed by the membrane.
7. Strip each cable (insulation stripping length for power cable: 40 mm / for control cable: 20 mm).
8. Ensure that the seal at the edge of the base plate is firmly attached.
9. Insert the base plates and tighten all screws of the base plate (TX 25 screwdriver, torque: 9 Nm).

### 9.3 Inserting Data Cables

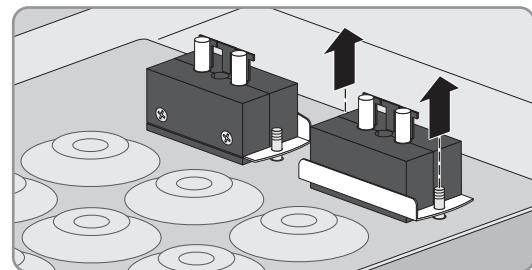
#### **i Separate wiring of data and power cables**

If data cables are wired near power cables, coupling interference signals can occur under unfavorable conditions.

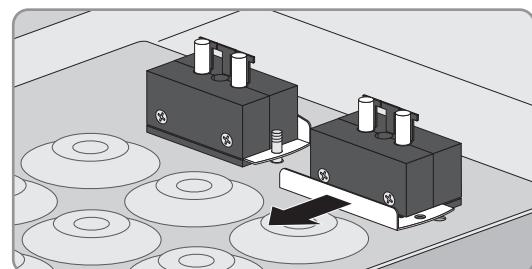
- Make sure that the data cables are always routed separately from the power cables.

#### Procedure:

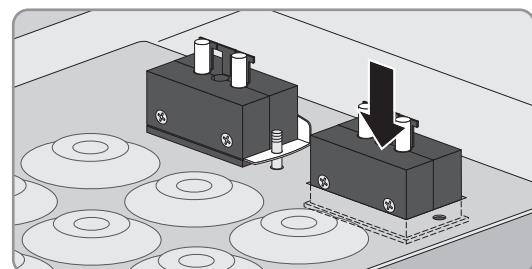
1. Loosen the screws of the mounting plate of the two-part cable feed-through inside the Multicuster-Box.



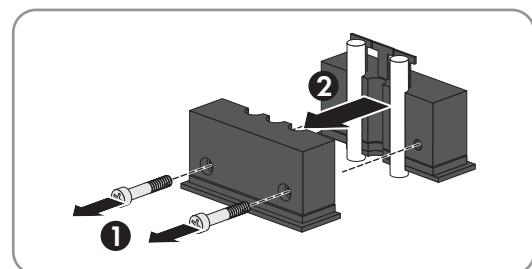
2. Remove the mounting plate and set it aside.



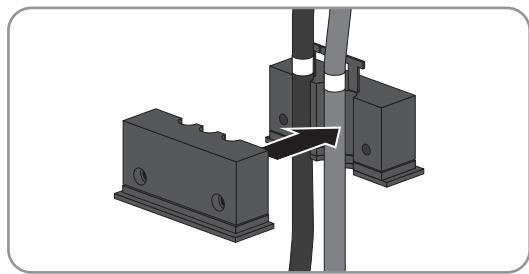
3. Remove the cable feed-through from the enclosure.



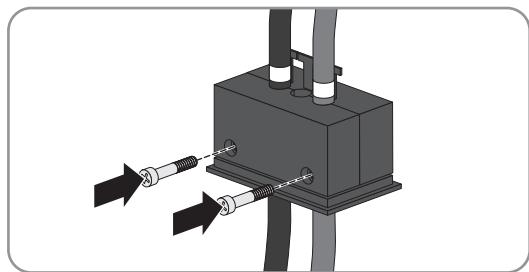
4. Loosen the screws of the two-part cable feed-through and remove the half without the T-shaped fastening pieces.



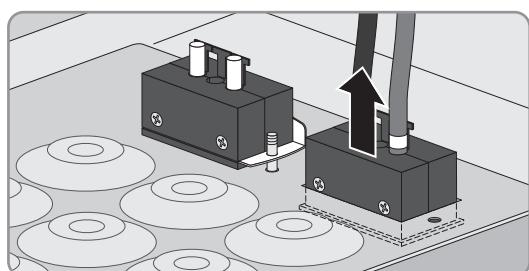
5. Lay the data cables into the half with the T-shaped fastening pieces, and secure with cable ties. Ensure sufficient cable length from the cable feed-through to the desired connection point.



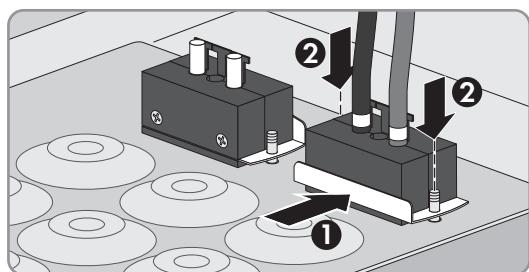
6. Screw the two halves back together. Fasten screws hand-tight. The data cables and placeholders (plastic inserts) must be firmly clamped between both sides of the two-part cable feed-through. This ensures tightness of the enclosure seal.



7. Position the cable feed-through including cable on the outside of the enclosure.



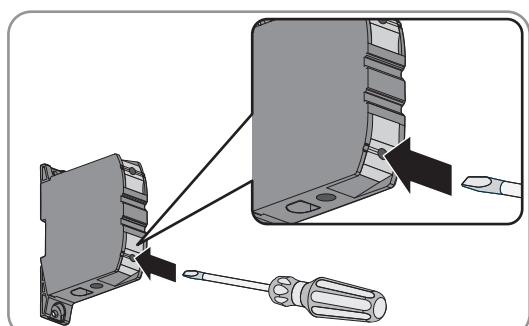
8. Attach the mounting plate of the two-part cable feed-through and the fasten the fastening screws hand-tight.



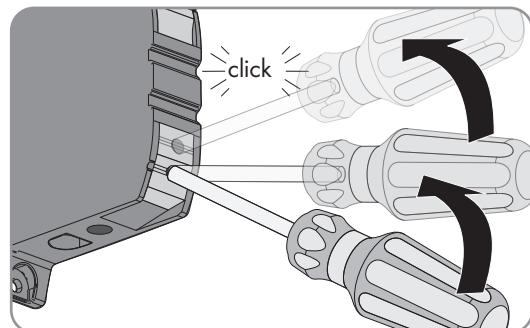
9. Repeat steps 1 to 9 for the remaining data cables. Use the second two-part cable feed-through for this.

## 9.4 Connecting Power Cables to Spring-Cage Terminals

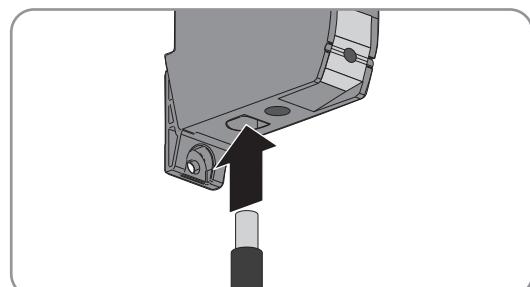
1. Insert the screwdriver into the clamping contact of the spring-cage terminal.



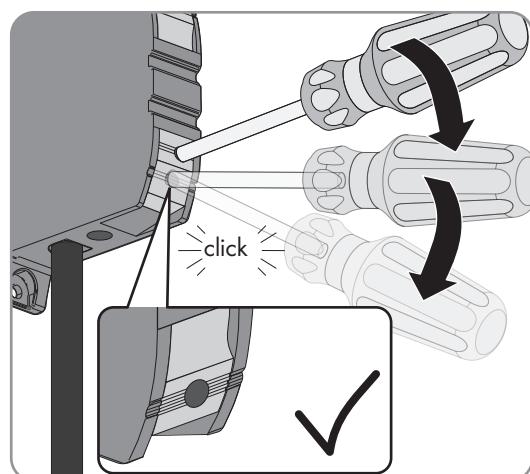
2. In the clamping contact, press the screwdriver upwards in two stages as far as the stop. This pretensions the spring of the spring-cage terminal. The spring-cage terminal emits an audible click when the clamping contact is sufficiently pretensioned.



3. Insert the stripped insulated conductor into the spring-cage terminal until it reaches the stop. Ensure that no insulation is trapped in the terminal.



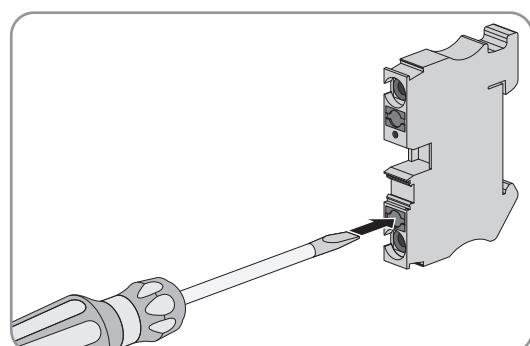
4. Press down the screwdriver in the clamping contact and pull it out of the contact.



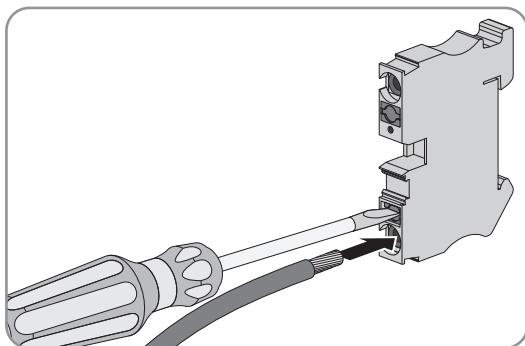
5. Make sure that the insulated conductor is securely attached and that no insulation is trapped.

## 9.5 Connecting Control Cables to Spring-Cage Terminals

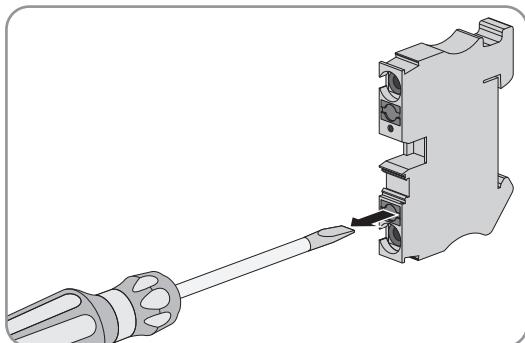
1. Insert the screwdriver into the clamping contact of the spring-cage terminal.



2. Insert the stripped insulated conductor into the spring-cage terminal until it reaches the stop. Ensure that no insulation is trapped in the terminal.



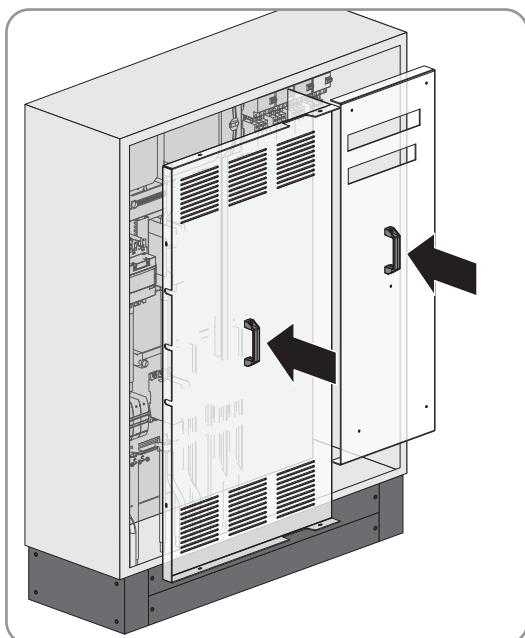
3. Pull the screwdriver out of the clamping contact.



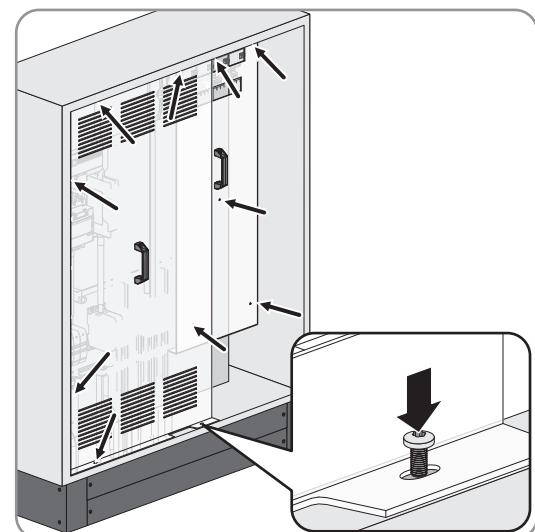
4. Make sure that the insulated conductor is securely attached and that no insulation is trapped.

## 9.6 Mounting the Protective Cover

1. Insert the protective cover into the product.



2. Tighten all fastening screws (TX30, torque: 4 Nm).



## 10 Maintenance

### 10.1 Inspection of Residual-Current Devices

#### **i** Inspection interval for residual-current devices

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

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

#### **i** Instruction of end users

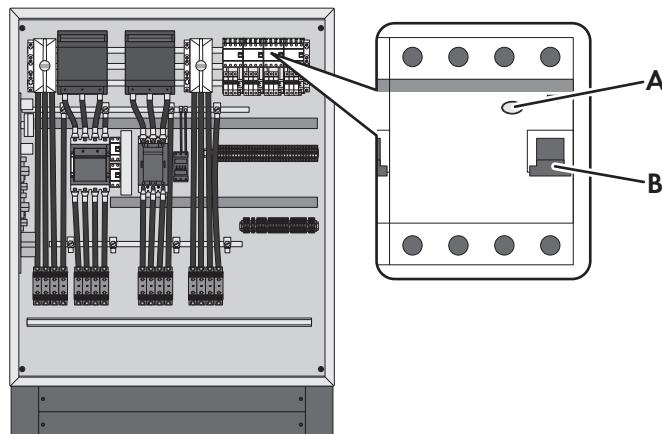
Because the protective cover remains in place during this test, testing is not hazardous and can be performed by the end user. However, if the residual-current device does not trip, the Multicluseter-Box and the multicluster system must be disconnected from voltage sources by a qualified person.

- Instruct the end user on the necessary procedure.
- Inform the end user that the inspection interval must always be complied with.
- Point out to the end user that if a defect is detected, a qualified person is required to perform the next steps.

#### **i** Supply of loads temporarily disconnected during testing

During testing of the residual-current devices, the connection to the utility grid is temporarily disconnected. When grid feed-in from a generator is discontinued, the supply of the loads is also interrupted.

- If the utility grid is connected, switch off sensitive loads prior to the test.



Overview of the residual-current device

Position	Designation
A	Test button
B	Switch lever Top position: residual-current device is switched on. Bottom position: residual-current device has tripped or is switched off.

#### Requirements:

- If only the Multicluseter-Box is installed, the generator must be connected to the multicluster system and must be in operation.
- If the Multicluseter-Box and Grid-Connect-Box are installed, 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 operating manual).
2. On the residual-current device **F141** press the **[TEST]** button.
3. If the residual-current device does not trip after pressing the button, release Multicluster-Box and multicluster system (see Section 8, page 30) and order a spare parts delivery. Contact the Service (see Section 15, page 51).
4. If the residual-current device has tripped, wait at least five seconds.
5. Reactivate the residual-current device after at least five minutes. To do this, move the switch lever of the residual-current device into the top position.
6. In the Multicluster-Box, also check the residual-current devices **F142**, **F143**, **F144** one after another. Use the same procedure as described for the residual-current device **F141**.
7. Start the multicluster system at the master of the main cluster (see Sunny Island operating manual).
8. Document the test result in accordance with the locally applicable standards and directives. This is your proof that regular inspection has taken place.

## 10.2 Checking the Surge Arresters

**i Inspection interval for surge arresters**

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

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

**i Instruction of end users**

Because the protective cover remains in place during this test, testing is not hazardous and can be performed by the end user. However, if the residual-current device does not trip, the Multicluster-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 always be complied with.
- Point out to the end user that if a defect is detected, a qualified person is required to perform the next steps.

**Procedure:**

1. Check whether the signal lights on the surge arresters **F150** and **F151** are showing green or red.  
If the signal light on the surge arrester shows green, the surge arrester is in proper working order.  
If the signal light on the surge arrester shows red, the surge arrester is defective.
2. If the surge arrester is defective, contact Service (see Section 15, page 51). This will trigger the requisite spare parts order.
3. Document the test result in accordance with the locally applicable standards and directives. This is your proof that regular inspection has taken place.

## 10.3 General Maintenance Work

### ⚠ DANGER

#### Danger to life due to electric shock when live components or cables are touched

High voltages are present in the conductive components or cables of the product. Touching live parts and cables results in death or lethal injuries due to electric shock.

- Do not touch non-insulated parts or cables.
- Disconnect the product from voltage sources and ensure it cannot be reconnected before working on the device.
- Only disassemble the protective covers, if the product is disconnected from all voltage sources.
- Wear suitable personal protective equipment for all work on the product.

### NOTICE

#### Damage to the product due to cleaning agents

The use of cleaning agents may cause damage to the product and its components.

- Clean the product and all its components only with a cloth moistened with clear water.

The general maintenance work must be performed every 12 months.

#### **i Adverse ambient conditions reduce maintenance intervals**

Location and ambient conditions influence the maintenance intervals. Note that cleaning and corrosion protection may be required more frequently depending on the conditions at the installation site.

- If the product is subject to adverse ambient conditions, a reduction of the maintenance intervals is recommended. Above all, the intervals between cleaning work and corrosion protection should be reduced.
- SMA recommends a monthly optical inspection to determine the maintenance requirement.

#### 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. It is taken for granted that standard tools and materials such as torque wrenches, one-contact voltage testers and wrenches will be available for all maintenance operations.

- To repair 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

#### Procedure:

1. Disconnect the product from voltage sources (see Section 8, page 30).
2. Check whether the inside of the product is soiled or moist.
3. If the interior of the product is dirty, clean the product.
4. If the interior of the product is moist or water has accumulated, dry the product out.
5. Check whether all connections have been tightened with the correct torque (see Section 12, page 43)
6. If any connections are not tightened with the correct torque, tighten with a suitable torque wrench.
7. Check all power cables on the product for discoloration or changes in the appearance of the insulation.
8. If any power cables are discolored or the appearance of the insulation has changed, replace these power cables.

9. Check all insulated conductors, terminals and components in the product for discoloration or changes in the appearance of the insulation.
10. If any insulated conductors, terminals or components in the product are discolored or have changed in appearance, contact Service .
11. Check whether the product is free of corrosion damage.
12. If the product shows corrosion damage, sand the affected area, clean with degreaser and paint.
13. Check whether all seals on the cabinet door are undamaged.
14. If a seal is damaged, contact Service.
15. Apply talcum, petroleum jelly or wax to seals. This will prevent frost damage.

## 11 Decommissioning the Product

### ⚠ DANGER

#### Danger to life due to electric shock when live components or cables are touched

High voltages are present in the conductive components or cables of the product. Touching live parts and cables results in death or lethal injuries due to electric shock.

- Do not touch non-insulated parts or cables.
- Disconnect the product from voltage sources and ensure it cannot be reconnected before working on the device.
- Only disassemble the protective covers, if the product is disconnected from all voltage sources.
- Wear suitable personal protective equipment for all work on the product.

### ⚠ WARNING

#### Danger to life if raised or suspended loads tip over, fall or sway

Vibrations or careless or hasty lifting and transportation may cause the product to tip over or fall. This can result in death or serious injury.

- Always transport the product as close to the floor as possible.
- All means of transport and auxiliary equipment used must be designed for the weight of the product. Weight: 228 kg.
- Always transport and lift the product upright.
- Always maintain a sufficient safety distance from the product during transport.
- Take into account the center of gravity of the product. The center of gravity is approximately in the center of the cabinet.
- Wear suitable personal protective equipment for all work on the product.

#### Procedure:

1. Make sure that the product and entire multicluster system have been disconnected from all voltage sources.
2. Remove all fastening screws from the kick plates at the front and rear (TX 30). Retain the kick plates and the fastening screws for later use.
3. Disassemble the protective covers and base plates.
4. Remove all cables from the product.
5. Release and remove the fastening screws on the bottom of the product.
6. Mount the protective covers and base plates.
7. Close the cabinet doors.
8. Insert the kick plates and attach with the fastening screws (TX 30, torque: 13 Nm).
9. Dispose of the product in accordance with the locally applicable disposal regulations for electronic waste.

## 12 Technical Data

### Connection of loads

Number of terminals	1 x three-phase
Rated power	138 kW
Rated grid voltage between L and N	230 V
Rated grid voltage between L1 and L2	400 V
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
Current at rated values	3 x 200 A
Terminals for connection N, L1, L2, L3	Spring-cage terminals
Maximum connectable conductor cross-section	150 mm <sup>2</sup>
Minimum connectable conductor cross-section	50 mm <sup>2</sup>
Fuse	LV/HRC 1
Maximum permitted fuse rating for F102	200 A gG

### Sunny Island Connection

Maximum number of Sunny Island inverters	12
Rated power of the Sunny Island inverters	72 kW
Rated operating voltage between L and N	230 V
Rated operating voltage between L1 and L2	400 V
Current at Sunny Island ratings	12 x 26 A
Unaffected short-circuit current / relative rated short-circuit current at the terminals	≤ 10 kA
Terminals for connection N, PE, L	Spring-cage terminals
Maximum connectable conductor cross-section	10 mm <sup>2</sup>
Minimum connectable conductor cross-section	0.5 mm <sup>2</sup>
Fuses	12 x miniature circuit breaker C40 A
Maximum permitted rated current of the back-up fuse	40 A gG
Short-circuit current breaking capacity of the back-up fuse	≥ 25 kA
Forward current of the back-up fuse	≤ 10 kA

### Generator connection

Number of terminals	1 x three-phase
Rated operating voltage between L and N	230 V

Rated operating voltage between L1 and L2	400 V
Rated grid input power	138 kW
AC input current	3 x 200 A
Terminals for connection N, PE, L1, L2, L3	Spring-cage terminals
Maximum connectable conductor cross-section	150 mm <sup>2</sup>
Minimum connectable conductor cross-section	50 mm <sup>2</sup>
Unaffected short-circuit current / relative rated short-circuit current at the terminals	≤ 10 kA
Fuse	LV/HRC 1
Maximum permitted fuse rating for <b>F101</b>	200 A gG
Maximum permitted rated current of the back-up fuse	200 A gG
Short-circuit current breaking capacity of the back-up fuse	≥25 kA
Forward current of the back-up fuse	≤ 10 kA

### Connection of PV system

Number of terminals	1 x three-phase
Rated 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
Maximum connectable conductor cross-section	150 mm <sup>2</sup>
Minimum connectable conductor cross-section	50 mm <sup>2</sup>
Unaffected short-circuit current / relative rated short-circuit current at the terminals	≤ 10 kA
Maximum permitted rated current of the back-up fuse	200 A gG
Short-circuit current breaking capacity of the back-up fuse	≥25 kA
Forward current of the back-up fuse	≤ 10 kA

### Connection of NA-Box / Grid-Connect-Box

Number of terminals	1 x three-phase
Rated 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

Maximum connectable conductor cross-section	150 mm <sup>2</sup>
Minimum connectable conductor cross-section	50 mm <sup>2</sup>
Unaffected short-circuit current / relative rated short-circuit current at the terminals	≤ 10 kA
Maximum permitted rated current of the back-up fuse	200 A gG
Short-circuit current breaking capacity of the back-up fuse	≥ 25 kA
Forward current of the back-up fuse	≤ 10 kA

### Connection of grounding

Width across flats for hexagon screws on the grounding busbar	AF 17
Maximum torque	15 Nm
Maximum connectable conductor cross-section	120 mm <sup>2</sup>
Minimum connectable conductor cross-section	16 mm <sup>2</sup>

### Data cable

Maximum overall length of the communication bus	30 m
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### Auxiliary electric circuits

Fuse	10x38 cylinder fuse
Maximum permitted fuse rating for F105, F106 and F110	1 A gG
Maximum permitted fuse rating for F111	6 A gG
Terminals for connecting the control cables	Spring-cage terminals
Minimum connectable conductor cross-section	0.75 mm <sup>2</sup>
Maximum conductor cross-section	2.5 mm <sup>2</sup>
Unaffected short-circuit current / relative rated short-circuit current at the terminals	≤ 10 kA
Rated operating voltage of the AC auxiliary circuits	230 V
AC auxiliary circuit via X106:1 to X106:3: maximum permitted rated current of the back-up fuse	6 A gG
AC auxiliary circuit via X106:1 to X106:3: forward current of the back-up fuse	≤ 10 kA
Rated operating voltage of the DC auxiliary circuits	48 V
DC auxiliary circuit via X107:1 and X107:2: maximum permitted rated current of the back-up fuse	6 A gG
DC auxiliary circuit via X107:1 and X107:2: forward current of the back-up fuse	≤ 10 kA

DC auxiliary circuit via **X113:3** and **X113:4**: maximum permitted rated current of the back-up fuse 0.5A mT

DC auxiliary circuit via **X113:3** and **X113:4**: forward current of the back-up fuse ≤ 10 kA

## General Data

Number of line conductors	3
Permitted grid configuration	TN-S, TN-C-S and TT
Rated frequency	50 Hz
Frequency range 50 Hz (depending on order option)	45 Hz to 52 Hz
Frequency range 60 Hz (depending on order option)	45 Hz to 65 Hz
Rated load factor (RDF)	0.8
Rated impulse withstand voltage	4 kV (2000 m)
Width x height x depth (with base)	1200 mm x 1600 mm x 435 mm (incl. 200 mm base)
Weight	228 kg
Maximum operating altitude above mean sea level	2300 m
Inner subdivision	Form 1 (no subdivision)
Exterior design	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
Enclosure degree of protection (as per IEC 60529)	IP55
Degree of protection with open enclosure door (as per IEC 60529)	IP20B
Pollution degree at the mounting location (as per IEC 61439-1:2011)	3
Pollution degree in the enclosure (micro-environment)	2

Protection class (as per IEC 417)	1
Overvoltage category (as per IEC 60664)	Overvoltage category 3
EMC environment, emission (as per IEC 61439-1:2011)	Electromagnetic interference, environment B (EMC directive, Article 5 – Annex I.1.b)
EMC environment, interference immunity (as per IEC 61439-1:2011)	Interference immunity, environment A (EMC Directive Article 5 – Annex I.1.b)
EU Declaration of Conformity	Yes
Operating temperature range <sup>1)</sup>	-25 °C to +60 °C
Humidity (non-condensing)	0% to 100%

### Derating

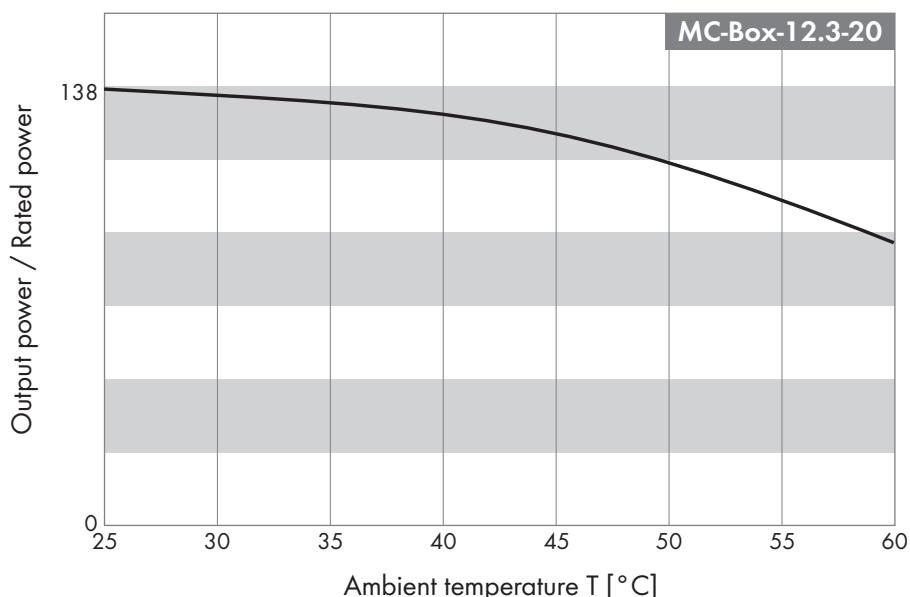


Figure 12: Power-temperature curve

Output power / rated power up to 25 °C	138 kW
Output power / rated power up to 60 °C	1 derating according to power-temperature curve

### Rated voltage / rated insulation voltage

Switch cabinet wiring L to N	250 V AC
Switch cabinet wiring L1 to L2	433 V AC
Auxiliary AC circuits	250 V AC
Auxiliary DC circuits	70 V DC

<sup>1)</sup> At operating temperatures of over 40 °C the battery inverters reduce their output power (derating).

## 13 Multicloud Technology Terms

### Stand-alone grid

A stand-alone grid is a utility grid which is independent of the public energy supply. A stand-alone grid with Sunny Island is designed as a single-phase or three-phase AC grid which integrates various kinds of power generators (e.g., PV systems, small wind turbine systems and diesel generators).

Batteries for energy storage are also an integral part of stand-alone grids. The Sunny Island battery inverter forms a stand-alone grid and maintains a stable energy supply by regulating all processes.

### Cluster

A cluster is made up of three Sunny Island inverters and one battery. One Sunny Island inverter per line conductor, i.e., three Sunny Island inverters in total, are connected to form a three-phase stand-alone grid. Within the cluster, one Sunny Island is the master, while the other two are slaves.

### Multicloud system

A multicloud system is made up of several clusters connected in parallel. The power of the multicloud system increases with the number of clusters. The individual clusters must be connected to a Multicloud-Box. The size of the Multicloud-Box is determined when the system is designed depending on the power requirement.

### Multicloud-Box

The Multicloud-Box is the AC main distributor in a multicloud system. The Multicloud-Box connects the Sunny Island clusters with the loads and the power generators within a stand-alone grid.

### Master

The master is the control and communication center in a cluster. It carries out the following tasks:

- Switching slaves on and off
- Controlling and monitoring the slaves, e.g., regulating frequency and voltage
- Controlling battery charge and discharge
- Monitoring battery capacity and state of charge
- Storing cluster and battery data on SD memory card
- Requesting diesel generator
- Exchanging data with the masters of other clusters
- Updating both slaves after firmware updates
- Displaying system values and system states
- Central capture of user entries

### Slave

A slave is a functional unit subordinated to the master. A slave receives its configuration settings, current firmware updates, and start/stop commands from the master. It transmits its operating data to the master and executes commands issued by the master.

### Main cluster

The main cluster is the leading cluster in the multicloud system. The master of the main cluster is the central user interface for the main cluster and all extension clusters of a stand-alone grid. The master of the main cluster is superior to the masters of the extension clusters. The tasks performed by the master of the main cluster include the following:

- Starting and stopping the multicloud system
- Controlling and monitoring the masters of the extension cluster

- Communicating with the Multicluster-Box

If the master of the main cluster stops operation, the entire multicluster system shuts down. If a diesel generator is integrated in the stand-alone grid, it will take over the power supply to the loads in this case.

### **Extension cluster**

Each extension cluster is subordinate to the main cluster.

The master of the extension cluster follows the instructions issued by the master of the main cluster, and sends the operating data of its cluster to the master of the main cluster. If the master of an extension cluster stops operation, then only this cluster shuts down. In this case, the multicluster system continues to operate with reduced power.

## 14 EU Declaration of Conformity

within the scope of the EU directives



- Electromagnetic compatibility 2014/30/EU (29.3.2014 L 96/79-106) (EMC)
- Low Voltage Directive 2014/35/EU (29.3.2014 L 96/357-374) (LVD)
- Restriction of the use of certain hazardous substances 2011/65/EU (L 174/88, June 8, 2011) and 2015/863/EU (L 137/10, March 31, 2015) (RoHS)

SMA Solar Technology AG confirms herewith that the products described in this document are in compliance with the fundamental requirements and other relevant provisions of the above-mentioned directives. The entire EU Declaration of Conformity can be found at [www.SMA-Solar.com](http://www.SMA-Solar.com).

## 15 Contact

If you have technical problems with our products, please contact the SMA Service Line. The following data is required in order to provide you with the necessary assistance:

- Box:
  - Device type
  - Serial number
- Battery inverter:
  - Device type
  - Quantity
- PV inverter:
- Electrical loads:
  - Device type
  - Quantity
- Type, power and maximum current for the generator (if present)
- Grid-Connect-Box (if available)
  - Device type
  - Serial number
- Batteries:
  - Type
  - Nominal capacity and nominal voltage (with lead-acid batteries)

You can find your country's contact information at:



<https://go.sma.de/service>



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

