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<td>9.3</td>
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<tr>
<td>14</td>
<td>Contact</td>
<td>50</td>
</tr>
</tbody>
</table>
1 Information on this Document

1.1 Validity

This document is valid for:

- MC-BOX-12.3-20 (Multicluster-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

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>📝</td>
<td>Information that is important for a specific topic or goal, but is not safety-relevant</td>
</tr>
<tr>
<td>☐️</td>
<td>Indicates a requirement for meeting a specific goal</td>
</tr>
<tr>
<td>☑️</td>
<td>Desired result</td>
</tr>
<tr>
<td>✗</td>
<td>A problem that might occur</td>
</tr>
<tr>
<td>🦅️</td>
<td>Example</td>
</tr>
</tbody>
</table>
1.5 Typical Typography in the Document

<table>
<thead>
<tr>
<th>Typography</th>
<th>Use</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>bold</td>
<td>Messages</td>
<td>Connect insulated conductors to terminals X703:1 to X703:6, enter 10 in Minutes.</td>
</tr>
<tr>
<td></td>
<td>Terminals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Elements on a user interface</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Elements to be selected</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Elements to be entered</td>
<td></td>
</tr>
<tr>
<td>&gt;</td>
<td>Connects several elements to be selected</td>
<td>Select Settings &gt; Date.</td>
</tr>
<tr>
<td>[Button]</td>
<td>Button or key to be selected or pressed</td>
<td>Select [Enter].</td>
</tr>
<tr>
<td>[Key]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#</td>
<td>Placeholder for variable components (e.g., parameter names)</td>
<td>Parameter WCtlHz.Hz#</td>
</tr>
</tbody>
</table>

1.6 Designation in the Document

<table>
<thead>
<tr>
<th>Complete designation</th>
<th>Designation in this document</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-Connect-Box 12</td>
<td>Grid-Connect-Box</td>
</tr>
<tr>
<td>Multicluster-Box 12</td>
<td>Multicluster-Box</td>
</tr>
<tr>
<td>Sunny Island 6.0H / 8.0H</td>
<td>Sunny Island, battery inverter</td>
</tr>
</tbody>
</table>

1.7 Additional Information

For more information, please go to www.SMA-Solar.com.

<table>
<thead>
<tr>
<th>Title and information content</th>
<th>Type of information</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUNNY ISLAND 4.0M / 6.0H / 8.0H</td>
<td>Operating manual</td>
</tr>
<tr>
<td>GRID-CONNECT-BOX 12</td>
<td>Operating manual</td>
</tr>
</tbody>
</table>
2 Safety

2.1 Intended Use

The Multicluster-Box is the main AC distribution board in a multicluster system. The multicluster 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 Multicluster-Box. Cables with copper conductors must be used for the installation.

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

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

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

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

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

- If the multicluster 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 Multicluster-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 Multicluster-Box, the neutral point of the utility grid must be grounded (see Section 6.8, page 25).

The Multicluster-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°C and +60°C.

The Multicluster-Box is designed for use at altitudes of up to 2300 m above Mean Sea Level. If you would like to use the Multicluster-Box at altitudes above 2300 m, contact Service (see Section 14, page 50).

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 the intended use.

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 and is not intended to replace any local, state, provincial, federal or national laws, regulations or codes applicable 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

SAVE THESE INSTRUCTIONS

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.

<table>
<thead>
<tr>
<th><strong>DANGER</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Danger to life due to electric shock when live components or cables are touched</strong></td>
</tr>
<tr>
<td>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.</td>
</tr>
<tr>
<td>• Do not touch non-insulated parts or cables.</td>
</tr>
<tr>
<td>• Disconnect the product from voltage sources and make sure it cannot be reconnected before working on the device.</td>
</tr>
<tr>
<td>• Only disassemble the protective covers, if the product is disconnected from all voltage sources.</td>
</tr>
<tr>
<td>• Wear suitable personal protective equipment for all work on the product.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>CAUTION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risk of injury if the product tips over</strong></td>
</tr>
<tr>
<td>The product is heavy and may tip over if not properly fastened to the support surface. This can result in crushing injuries.</td>
</tr>
<tr>
<td>• Upon installation, attach the product to the support surface.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>CAUTION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risk of burns due to hot components</strong></td>
</tr>
<tr>
<td>Some components and terminals inside the product can become hot during operation. Touching hot components or terminals can result in burn injuries.</td>
</tr>
<tr>
<td>• Wear suitable personal protective equipment for all work on the product.</td>
</tr>
<tr>
<td>• Only operate the product with its protective cover mounted.</td>
</tr>
<tr>
<td>• Prior to removing the protective cover, let the product cool down.</td>
</tr>
</tbody>
</table>
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.

![Components included in the scope of delivery](image)

---

**Position** | **Quantity** | **Designation**
--- | --- | ---
A | 1 | Multicluster-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

---

Figure 1: Components included in the scope of delivery
4 Product Overview

4.1 Product Description

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

![Multicluster-Box with cabinet door open](image)

<table>
<thead>
<tr>
<th>Position</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Protective cover</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>B</td>
<td>Type label</td>
</tr>
<tr>
<td></td>
<td>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:</td>
</tr>
<tr>
<td></td>
<td>Device type (Model)</td>
</tr>
<tr>
<td></td>
<td>Serial number (Serial No. or S/N)</td>
</tr>
<tr>
<td></td>
<td>Date of manufacture</td>
</tr>
<tr>
<td></td>
<td>Device-specific characteristics</td>
</tr>
</tbody>
</table>
### Position C
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 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.

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).

### Position D
Circuit breaker

Protects power cables of the connected inverters.

### 4.2 Symbols on the Product

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Explanation</th>
</tr>
</thead>
</table>
| ![Beware of electrical voltage](image) | Beware of electrical voltage  
The product operates at high voltages. |
| ![Beware of hot surface](image) | Beware of hot surface  
The product can get hot during operation. |
| ![Danger to life due to high voltages in the inverter](image) | Danger to life due to high voltages in the inverter; observe a waiting time of 15 minutes  
High voltages that can cause lethal electric shocks are present in the live components of the inverter.  
Prior to performing any work on the inverter, disconnect it from all voltage sources as described in this document. |
| ![Observe the documentation](image) | Observe the documentation  
Observe all documentation supplied with the product. |
| ![Grounding conductor](image) | Grounding conductor  
This symbol indicates the position for connecting a grounding conductor. |
| ![WEEE designation](image) | WEEE designation  
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. |
| ![Degree of protection IP55](image) | Degree of protection IP55  
The product is protected against interior dust deposits and water that is directed as a jet against the enclosure from all directions. |
4.3 Grounding in the Multicluster System

Grounding in the Multicluster-Box

The grounding busbar X100 of the Multicluster-Box is always connected to the enclosure of the Multicluster-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 multicluster system:

- If the multicluster system is using a generator as grid-forming source, the neutral point of the generator must be grounded.
- If the multicluster 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 multicluster 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 Multicluster-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 Multicluster-Box must be permitted in accordance with the local standards and directives and agreed with the grid operator.

With all-pole disconnection, the multicluster 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 multicluster system. Therefore, in multicluster systems with all-pole disconnection, the grounding contactor of the Multicluster-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 multicluster system is connected to the utility grid, no further grounding is permitted in the electricity grid of the multicluster system. Therefore, if the multicluster system is connected to the utility grid or generator, the grounding contactor of the Multicluster-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

⚠️ 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.

ℹ️ 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 Multicluster-Box and the battery inverters at the same location.

Mounting 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 "Technical Data", page 43).
- 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.
- The mounting location must not hinder access to disconnection devices.
- All local requirements concerning minimum passage widths and escape routes must be observed.
- All ambient conditions must be met (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 Multicluster-Box at altitudes above 2300 m, contact Service (see Section 14, page 50).
- The product may only be mounted in a permitted mounting position.

Permitted and prohibited mounting position:

Figure 4: Permitted and prohibited mounting positions
Recommended clearances:

![Recommended clearances](image)

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

Dimensions for Mounting:

![Dimensions for Mounting](image)

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.

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 four drill holes for attaching the base (see Section 5.1, page 15).
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.
### CAUTION

**Risk of injury if the Multicluster-Box tips over**

The Multicluster-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 four suitable screws.
6 Electrical Connection

6.1 Overview of the Connection Area

6.1.1 Interior View

Figure 7: Components and terminals inside the Multicluster-Box

<table>
<thead>
<tr>
<th>Position</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Fuse switch-disconnector F101 for LV/HRC size 1 fuse links of the generator terminal</td>
</tr>
<tr>
<td>B</td>
<td>Fuse switch-disconnector F102 for LV/HRC size 1 fuse links of the load terminal</td>
</tr>
<tr>
<td>C</td>
<td>De-energized surge arrester</td>
</tr>
<tr>
<td>D</td>
<td>Residual-current device of the Sunny Island inverters</td>
</tr>
<tr>
<td>E</td>
<td>Circuit breakers for protecting the power cables of the Sunny Island inverters</td>
</tr>
<tr>
<td>F</td>
<td>Spring-cage terminals X105 for connecting the power cables of the Sunny Island inverters</td>
</tr>
<tr>
<td>G</td>
<td>Grounding contactor</td>
</tr>
</tbody>
</table>
### Position | Designation
--- | ---
H | Spring-cage terminals X106 to X113 for connecting the control cables of the Sunny Island inverters, battery fuse and Grid-Connect-Box
I | Grounding busbar X100 for connecting the grounding conductors of the generator, the loads, and the PV system as well as to connect the Multicluster-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 Multicluster-Box, the grounding conductor is also connected here (see Section 6.4.1, page 22).
J | Cable support rail
K | Terminal X104 with spring-cage terminals L1, L2, L3 and N to connect the line conductors and the neutral conductor of the PV system
L | Terminal X103 with spring-cage terminals L1, L2, L3 and N to connect the line conductors and the neutral conductor of the main distribution for loads
M | Terminal X102 with spring-cage terminals L1, L2, L3 and N to connect the line conductors and the neutral conductor of the generator
   | When connecting the utility grid directly to the Multicluster-Box, the line conductors are also connected here (see Section 6.4.1, page 22).
N | Terminal X101 with spring-cage terminals L1, L2, L3 and N to connect the line conductors and the neutral conductor of the Grid-Connect-Box
   | If only the Multicluster-Box is installed, these terminals are not connected.
O | SIBUCTRL with RJ45 jacks for connecting the data cables
P | Fuses to protect the internal cabling

### 6.1.2 View from Below

![Figure 8: Enclosure openings in the bottom of the Multicluster-Box](image)

### 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 Multicluster-Box without Grid-Connect-Box

If the Multicluster-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 9: Overview of the provided jumper wires when installing the Multicluster-Box without Grid-Connect-Box](image)

<table>
<thead>
<tr>
<th>Position</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Position of the jumper wire for blocking the grounding contactor</td>
</tr>
<tr>
<td>B</td>
<td>Position of the jumper wire for blocking the generator contactor</td>
</tr>
</tbody>
</table>

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 Multicluster-Box. The line conductors are routed via fuse switch-disconnectors in the Multicluster-Box. LV/HRC size 1 fuse links 200 A are installed in the fuse switch-disconnector by default.

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 material: copper
- Conductor cross-section: 50 mm² to 150 mm²
- 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 Multicluster-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 Multicluster-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 Multicluster-Box (see Section 6.4.2, page 22).

Utility grid connection directly to the Multicluster-Box

For direct connection of the utility grid to the Multicluster-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 Multicluster-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 Multicluster-Box, no generator is to be installed in the multicluster system.

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

6.4.2 Connecting the Grid-Connect-Box

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 material: copper
- Conductor cross-section: 50 mm² to 150 mm²
- 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 Multicluster-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 Multicluster-Box. LV/HRC size 1 fuse links 200 A are installed in the fuse switch-disconnector by default.

#### Cable protection

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

- Between the Multicluster-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 material: copper
- Conductor cross-section: 50 mm² to 150 mm²
- 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 Multicluster-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

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

- **Cable protection**
  The Multicluster-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 Multicluster-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 Multicluster-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 material: copper
- Conductor cross-section: 50 mm² to 150 mm²
- 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 Multicluster-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 10: Overview of the spring-cage terminals for connecting the power cables of the Sunny Island inverters

<table>
<thead>
<tr>
<th>Position</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Terminal for the power cables of the main cluster</td>
</tr>
<tr>
<td>B</td>
<td>Terminal for the power cables of extension cluster 1</td>
</tr>
<tr>
<td>C</td>
<td>Terminal for the power cables of extension cluster 2</td>
</tr>
<tr>
<td>D</td>
<td>Terminal for the power cables of extension cluster 3</td>
</tr>
</tbody>
</table>

Fusing of the Sunny Island inverters

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

Cable requirements:
- Conductor material: Copper
- The AC conductors and DC conductors must always be routed in separate cables.
- Conductor cross-section: 0.5 mm² to 10 mm²

Procedure:
1. Insert the power cables into the Multicluster-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 Multicluster System

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

Cable requirements:
- Conductor material: copper
- Conductor cross-section: 16 mm² to 120 mm²
- The AC conductors and DC conductors must always be routed in separate cables.
- The grounding of the system must be designed in accordance with the national standards and directives and is the responsibility of the installer.
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

![Diagram of spring-cage terminals for connecting control cables]

**Figure 11: Overview of spring-cage terminals for connecting the control cables**

<table>
<thead>
<tr>
<th>Position</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>X106</td>
<td>Control voltage of the Sunny Island main cluster</td>
</tr>
<tr>
<td>B</td>
<td>X107</td>
<td>Connect the supply voltage of the grounding contactor, e.g. of the battery fuse (DC)</td>
</tr>
<tr>
<td>C</td>
<td>X110</td>
<td>Connection of control cables from Grid-Connect-Box (DC)</td>
</tr>
<tr>
<td>D</td>
<td>X111</td>
<td>Connection of control cables from Grid-Connect-Box (AC)</td>
</tr>
<tr>
<td>E</td>
<td>X112</td>
<td>Connection of control cables to the terminal ExVtg of each Sunny Island inverter in the main cluster (AC)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connection of control cables to the terminals Relay1 C and Relay1 NC at the master of the main cluster (AC)</td>
</tr>
<tr>
<td>F</td>
<td>X113</td>
<td>Connection of control cables to the master of the main cluster: terminals BatVt-gOut+, DigIn+, Relay2 NO, and Relay2 C (DC)</td>
</tr>
</tbody>
</table>

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 material: copper
- Conductor cross-section: 0.75 mm² to 2.5 mm²
- The AC conductors and DC conductors must always be routed in separate cables.
Procedure:
1. Insert the control cables into the Multicluster-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):
   - X106: control voltage of the main cluster
   - X112: control cables from Sunny Island 1 of the main cluster
   - X113: control cables from Sunny Island 2 of the main cluster

6.9.3 Connecting Supply Voltage for Grounding Contactor
The grounding contactor Q109 of the Multicluster-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 material: copper
☐ Conductor cross-section: 0.75 mm² to 2.5 mm²
☐ The AC conductors and DC conductors must always be routed in separate cables.

Procedure:
1. Insert the control cables into the Multicluster-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

- Ground connection at terminals X110 and X111
  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.

Cable requirements:
☐ Conductor material: copper
☐ Conductor cross-section: 0.75 mm² to 2.5 mm²
☐ The AC conductors and DC conductors must always be routed in separate cables.

Procedure:
1. Insert the control cables into the Multicluster-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):
   - X110:1 and X110:2: block of grounding contactor of Multicluster-Box
   - X110:4 and X110:5: feedback from AC contactor of Grid-Connect-Box
   - X111:1 to X111:4: voltage measurement of Grid-Connect-Box
   - X111:6 and X111:7: block of generator contactor of Multicluster-Box
   - X111:8 and X111:9: block of AC contactor of Grid-Connect-Box
### 6.10 Connecting the Data Cable

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

![Diagram](image)

**Figure 12: Overview of the connection area in the SIBUCTRL**

<table>
<thead>
<tr>
<th>Position</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Jacks for communication (ComSyncIn, ComSyncOut)</td>
</tr>
<tr>
<td>B</td>
<td>Jacks for measurement signals (Mstr/L1 Backup, Slv1/L2 BackupVtgCur, Slv2/L3 BackupVtgCur)</td>
</tr>
</tbody>
</table>

**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 Multicluster-Box (see Section 9.3, page 33).
2. Connect the data cables for measurement signals (red):
   - for the master of the main cluster to jack Mstr/L1 BackupVtgCur (X30)
   - for slave 1 of the main cluster to jack Slv1/L2 BackupVtgCur (X31)
   - for slave 2 of the main cluster to jack Slv2/L3 BackupVtgCur (X32)
3. Connect the data cable for communication between the Sunny Island inverters and the Multicluster-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 Multicluster-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

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:

☐ If the Multicluster-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 multicluster system with Grid-Connect-Box: all preparations for commissioning at the Grid-Connect-Box must have been completed (see operating manual of the Multicluster-Box and operating manual of the Grid-Connect-Box).

☐ The multicluster system must be grounded outside the Multicluster-Box on the generator side or via the Grid-Connect-Box (see Section 6.8, page 25).

☐ The Multicluster-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 feed-through in the floor of the Multicluster-Box.

☐ All power cables must be secured inside or outside the Multicluster-Box.

☐ The floor of the Multicluster-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: 12 Nm).

3. Mount the protective cover (see Section 9.6, page 36).

4. Close Multicluster-Box.

5. Commission the multicluster system (see documentation of the Sunny Island).

6. In order to receive service assignments for the multicluster 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.
8 Disconnect from voltage sources

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risk of burns due to hot components</strong></td>
</tr>
<tr>
<td>Some components and terminals inside the product can become hot during operation. Touching hot components or terminals can result in burn injuries.</td>
</tr>
<tr>
<td>• Wear suitable personal protective equipment for all work on the product.</td>
</tr>
<tr>
<td>• Only operate the product with its protective cover mounted.</td>
</tr>
<tr>
<td>• Prior to removing the protective cover, let the product cool down.</td>
</tr>
</tbody>
</table>

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 (see Section 9.1, page 31).
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 make sure 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 Multicluster-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 the 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:
   - Select a suitable enclosure opening for the given cable.
   - Pierce the membrane of the selected enclosure opening with a pointed object. Make sure that the opening is not too large.
• Insert each cable through the membrane of the selected enclosure opening into the Multicluster-Box. Ensure that the cable is tightly enclosed by the membrane.
• Strip the insulation of each cable.

<table>
<thead>
<tr>
<th>Cable type</th>
<th>Stripping length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power cable</td>
<td>40 mm</td>
</tr>
<tr>
<td>Control cable</td>
<td>20 mm</td>
</tr>
</tbody>
</table>

4. Ensure that the seal at the edge of the base plate is firmly attached.
5. Insert the base plates and tighten all screws of the base plate (TX 25 screwdriver, torque: 9 Nm).

9.3 Inserting Data Cables

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 Multicluster-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 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

- **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.

- **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.

- **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**

<table>
<thead>
<tr>
<th>Position</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Test button</td>
</tr>
<tr>
<td>B</td>
<td>Switch lever</td>
</tr>
</tbody>
</table>
  Top position: residual-current device is switched on.
  Bottom position: residual-current device has tripped or is switched off.

**Requirements:**
- If only the Multicluster-Box is installed, the generator must be connected to the multicluster system and must be in operation.
- If the Multicluster-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, perform the following steps:
   - Disconnect the Multicluster-Box and multicluster system from voltage sources (see Section 8, page 30)
   - Contact the Service (see Section 14, page 50). This will trigger the requisite spare parts order.
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

**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.

**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 14, page 50). 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

The general maintenance work must be performed every twelve months.

⚠️ 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 make sure 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 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.

💡 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 minor surface corrosion damage: touch-up sticks, paint brushes, spray paint or, alternatively, 2K-PUR acrylic paint (RAL-Farbe: 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

Procedure:

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

9. If any insulated conductors, terminals or fuse elements in the product are discolored or have changed in appearance, contact Service (see Section 14, page 50).

10. Check whether the product is free of corrosion damage.

11. If the product displays minor corrosion damage, treat the affected area as follows:
   - Sand the area.
   - Clean the area with degreaser.
   - Paint the area.

12. If the product displays large-scale corrosion damage, treat the entire surface as follows:
   - Sand the surface.
   - Clean the entire surface with degreaser.
   - Paint the entire surface.

13. Check whether all seals on the cabinet door are undamaged.

14. If a seal is damaged, replace the seal.

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 make sure 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.

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. WARNING

Danger of crushing if raised or suspended loads tip over or fall

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 of the product is approximately in the center of the cabinet and is marked on the packaging with the center of gravity symbol.

9. Remount the kick plates on the product.
10. Dispose of the product in accordance with the locally applicable disposal regulations for electronic waste.
## 12 Technical Data

### Connection of loads

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of terminals</td>
<td>1 x three-phase</td>
</tr>
<tr>
<td>Rated power</td>
<td>138 kW</td>
</tr>
<tr>
<td>Rated grid voltage between L and N</td>
<td>230 V</td>
</tr>
<tr>
<td>Rated grid voltage between L1 and L2</td>
<td>400 V</td>
</tr>
<tr>
<td>AC voltage range between L1 and N</td>
<td>172.5 V to 265 V</td>
</tr>
<tr>
<td>AC voltage range between L1 and L2</td>
<td>300 V to 433 V</td>
</tr>
<tr>
<td>Current at rated values</td>
<td>3 x 200 A</td>
</tr>
<tr>
<td>Terminals for connection N, L1, L2, L3</td>
<td>Spring-cage terminals</td>
</tr>
<tr>
<td>Maximum connectable conductor cross-section</td>
<td>150 mm²</td>
</tr>
<tr>
<td>Minimum connectable conductor cross-section</td>
<td>50 mm²</td>
</tr>
<tr>
<td>Fuse</td>
<td>LV/HRC 1</td>
</tr>
<tr>
<td>Maximum permitted fuse rating for F102</td>
<td>200 A gG</td>
</tr>
</tbody>
</table>

### Sunny Island Connection

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum number of Sunny Island inverters</td>
<td>12</td>
</tr>
<tr>
<td>Rated power of the Sunny Island inverters</td>
<td>72 kW</td>
</tr>
<tr>
<td>Rated operating voltage between L and N</td>
<td>230 W</td>
</tr>
<tr>
<td>Rated operating voltage between L1 and L2</td>
<td>400 W</td>
</tr>
<tr>
<td>Current at Sunny Island ratings</td>
<td>12 x 26 A</td>
</tr>
<tr>
<td>Unaffected short-circuit current / relative rated short-circuit current at the terminals</td>
<td>≤ 10 kA</td>
</tr>
<tr>
<td>Terminals for connection N, PE, L</td>
<td>Spring-cage terminals</td>
</tr>
<tr>
<td>Maximum connectable conductor cross-section</td>
<td>10 mm²</td>
</tr>
<tr>
<td>Minimum connectable conductor cross-section</td>
<td>0.5 mm²</td>
</tr>
<tr>
<td>Fuses</td>
<td>12 x circuit breaker C40 A</td>
</tr>
<tr>
<td>Maximum permitted rated current of the back-up fuse</td>
<td>40 A gG</td>
</tr>
<tr>
<td>Short-circuit current breaking capacity of the back-up fuse</td>
<td>≥25 kA</td>
</tr>
<tr>
<td>Forward current of the back-up fuse</td>
<td>≤ 10 kA</td>
</tr>
</tbody>
</table>

### Generator connection

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of terminals</td>
<td>1 x three-phase</td>
</tr>
<tr>
<td>Rated operating voltage between L and N</td>
<td>230 V</td>
</tr>
</tbody>
</table>

### Rated operating voltage between L1 and L2
- **400 V**

### Rated grid input power
- **138 kW**

### AC input current
- **3 x 200 A**

<table>
<thead>
<tr>
<th>Terminals for connection N, PE, L1, L2, L3</th>
<th>Spring-cage terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum connectable conductor cross-section</td>
<td>150 mm²</td>
</tr>
<tr>
<td>Minimum connectable conductor cross-section</td>
<td>50 mm²</td>
</tr>
<tr>
<td>Unaffected short-circuit current / relative rated short-circuit current at the terminals</td>
<td>≤ 10 kA</td>
</tr>
</tbody>
</table>

### Fuse
- LV/HRC 1

| Maximum permitted fuse rating for F101 | 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

<table>
<thead>
<tr>
<th>Number of terminals</th>
<th>1 x three-phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated power</td>
<td><strong>138 kW</strong></td>
</tr>
<tr>
<td>Rated operating voltage between L and N</td>
<td>230 V</td>
</tr>
<tr>
<td>Rated operating voltage between L1 and L2</td>
<td><strong>400 V</strong></td>
</tr>
<tr>
<td>Rated current / AC input current</td>
<td><strong>3 x 200 A</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Terminals for connection N, PE, L1, L2, L3</th>
<th>Spring-cage terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum connectable conductor cross-section</td>
<td>150 mm²</td>
</tr>
<tr>
<td>Minimum connectable conductor cross-section</td>
<td>50 mm²</td>
</tr>
<tr>
<td>Unaffected short-circuit current / relative rated short-circuit current at the terminals</td>
<td>≤ 10 kA</td>
</tr>
</tbody>
</table>

| 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

<table>
<thead>
<tr>
<th>Number of terminals</th>
<th>1 x three-phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated power</td>
<td><strong>138 kW</strong></td>
</tr>
<tr>
<td>Rated operating voltage between L and N</td>
<td>230 V</td>
</tr>
<tr>
<td>Rated operating voltage between L1 and L2</td>
<td><strong>400 V</strong></td>
</tr>
<tr>
<td>Rated current / AC input current</td>
<td><strong>3 x 200 A</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Terminals for connection N, PE, L1, L2, L3</th>
<th>Spring-cage terminals</th>
</tr>
</thead>
</table>
### Maximum connectable conductor cross-section
- 150 mm²

### Minimum connectable conductor cross-section
- 50 mm²

### Unaffected short-circuit current / relative rated short-circuit current at the terminals
- \( \leq 10 \text{ kA} \)

### Maximum permitted rated current of the back-up fuse
- 200 A gG

### Short-circuit current breaking capacity of the back-up fuse
- \( \geq 25 \text{ kA} \)

### Forward current of the back-up fuse
- \( \leq 10 \text{ kA} \)

### Connection of grounding

<table>
<thead>
<tr>
<th>Width across flats for hexagon screws on the grounding busbar</th>
<th>AF 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum torque</td>
<td>15 Nm</td>
</tr>
<tr>
<td>Maximum connectable conductor cross-section</td>
<td>120 mm²</td>
</tr>
<tr>
<td>Minimum connectable conductor cross-section</td>
<td>16 mm²</td>
</tr>
</tbody>
</table>

### Data cable
- Maximum overall length of the communication bus: 30 m

### Auxiliary electric circuits

<table>
<thead>
<tr>
<th>Fuse</th>
<th>10x38 cylinder fuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum permitted fuse rating for F105, F106 and F110</td>
<td>1 A gG</td>
</tr>
<tr>
<td>Maximum permitted fuse rating for F111</td>
<td>6 A gG</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Terminals for connecting the control cables</th>
<th>Spring-cage terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum connectable conductor cross-section</td>
<td>0.75 mm²</td>
</tr>
<tr>
<td>Maximum conductor cross-section</td>
<td>2.5 mm²</td>
</tr>
</tbody>
</table>

| Unaffected short-circuit current / relative rated short-circuit current at the terminals | \( \leq 10 \text{ kA} \) |
| 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 | \( \leq 10 \text{ kA} \) |
| 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 | \( \leq 10 \text{ kA} \) |
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 & $\leq 10$ kA \\

**General Data**

<table>
<thead>
<tr>
<th>Number of line conductors</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permitted grid configuration</td>
<td>TN-S, TN-C-S and TT</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>50 Hz</td>
</tr>
<tr>
<td>Frequency range 50 Hz$^*$</td>
<td>45 Hz to 52 Hz</td>
</tr>
<tr>
<td>Frequency range 60 Hz$^*$</td>
<td>45 Hz to 65 Hz</td>
</tr>
<tr>
<td>Rated load factor (RDF)</td>
<td>0.8</td>
</tr>
<tr>
<td>Rated impulse withstand voltage</td>
<td>4 kV (2000 m)</td>
</tr>
<tr>
<td>Width x height x depth (with base)</td>
<td>1200 mm x 1600 mm x 435 mm (incl. 200 mm base)</td>
</tr>
<tr>
<td>Weight</td>
<td>228 kg</td>
</tr>
<tr>
<td>Maximum operating altitude above mean sea level</td>
<td>2300 m</td>
</tr>
<tr>
<td>Inner subdivision</td>
<td>Form 1 (no subdivision)</td>
</tr>
<tr>
<td>Exterior design</td>
<td>closed type</td>
</tr>
<tr>
<td>Installation</td>
<td>only fixed interior installation permitted</td>
</tr>
<tr>
<td>Construction type</td>
<td>fixed components</td>
</tr>
<tr>
<td>Suitable for use by electrically qualified persons or unqualified persons</td>
<td>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</td>
</tr>
<tr>
<td>Measures for protection against electric shock</td>
<td>Basic protection through insulation materials and covers / fault protection through grounding conductors and short-circuit protection devices / personal protection through residual-current devices</td>
</tr>
<tr>
<td>Enclosure degree of protection (as per IEC 60529)</td>
<td>IP55</td>
</tr>
<tr>
<td>Degree of protection with open enclosure door (as per IEC 60529)</td>
<td>IP20B</td>
</tr>
<tr>
<td>Pollution degree at the mounting location (as per IEC 61439-1:2011)</td>
<td>3</td>
</tr>
<tr>
<td>Pollution degree in the enclosure (micro-environment)</td>
<td>2</td>
</tr>
</tbody>
</table>
### 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**
- -25°C to +60°C

### Humidity (non-condensing)
- 0% to 100%

* Depending on order option
** At operating temperatures above 40°C, the Sunny Island inverters reduce their output power (derating).

### Derating

![Derating Graph](image)

Figure 13: Power-temperature curve

<table>
<thead>
<tr>
<th>Ambient temperature T [°C]</th>
<th>Output power / Rated power</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>138 kW</td>
</tr>
<tr>
<td>30</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Connection Type</th>
<th>Voltage (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch cabinet wiring L to N</td>
<td>250 V AC</td>
</tr>
<tr>
<td>Switch cabinet wiring L1 to L2</td>
<td>433 V AC</td>
</tr>
<tr>
<td>Auxiliary AC circuits</td>
<td>250 V AC</td>
</tr>
<tr>
<td>Auxiliary DC circuits</td>
<td>70 V DC</td>
</tr>
</tbody>
</table>
13 Multicluster 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.

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

Multicluster-Box
The Multicluster-Box is the AC main distributor in a multicluster system. The Multicluster-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 multicluster 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 multicluster 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 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:**
  - Device type
  - Quantity

- **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)

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**Österreich**  Sunny Boy, Sunny Mini Central, Sunny Tripower, Sunny Highpower: +49 561 9522-1499
**Schweiz**  Monitoring Systems (Kommunikationsprodukte): +49 561 9522-2499
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**België**  Luxembourg: +31 30 2492 000
**Luxembourg**  SMA Online Service Center: www.SMA-Service.com
**Nederland**  SMA Online Service Center: www.SMA-Service.com
**Česko**  SMA Service Partner TERMS a.s.
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  SMA Online Service Center: www.SMA-Service.com
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<td>Other countries</td>
<td>International SMA Service Line Niestetal 00800 SMA SERVICE (+800 762 7378423) SMA Online Service Center: <a href="http://www.SMA-Service.com">www.SMA-Service.com</a></td>
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