



**MEDIUM VOLTAGE POWER STATION  
with 1 SUNNY CENTRAL UP / SUNNY CENTRAL STORAGE UP /  
ELECTROLYZER CONVERTER UP**

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## SMA Solar Technology AG

Sonnenallee 1

34266 Niestetal

Germany

Tel. +49 561 9522-0

Fax +49 561 9522-100

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

E-mail: [info@SMA.de](mailto:info@SMA.de)

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## 1 Information on this Document

### 1.1 Validity

This document is valid for:

- MVPS-####-S2-10 (Medium Voltage Power Station)

Depending on the functions and selected options, individual sections may be irrelevant for installation and operation.

Illustrations in this document are reduced to the essential information and may deviate from the real product.

SMA Solar Technology reserves the right to make changes to the product.

### 1.2 Target Group

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

- Knowledge of how the product works and is operated
- Knowledge of how medium-voltage transformers work and are operated
- Knowledge of how medium-voltage switchgear works and is operated
- Training in the installation and commissioning of electrical devices and installations
- Knowledge of all applicable laws, regulations, 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

Symbol	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"/>	Required result
	Example

## 1.5 Typographies in the document

Typography	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 selected or pressed</li> </ul>	<ul style="list-style-type: none"> <li>Select <b>[Enter]</b>.</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>WCtlHz.Hz#</b></li> </ul>

## 1.6 Designations in the Document

Complete designation	Designation in this document
Battery Management System	BMS
Medium Voltage Power Station	MV Power Station
Sunny Central, Sunny Central Storage, Electrolyzer Converter	Sunny Central, inverter

## 1.7 Additional Information

Additional information is available at [www.SMA-Solar.com](http://www.SMA-Solar.com).

Title and information content	Type of information
"PUBLIC CYBER SECURITY - Guidelines for a Secure PV System Communication"	Technical Information

For information on maintenance activities of the DC switchgear and AC disconnect unit please visit [www.abb.com](http://www.abb.com):

Component	Document number
DC switchgear: T-Max	1SDH000707R0001

## 2 Safety

### 2.1 Intended Use

The MV Power Station is a complete system for PV power plants, DC-coupled systems, battery storage systems or gas storage systems. The type of application depends on the installed Sunny Central, Sunny Central Storage or Electrolyzer Converter. The MV Power Station includes all components for the connection to the utility grid.

#### Environment

The product is intended for use in industrial environments.

The product is designed for outdoor use only.

Operation of the MV Power Station is only permitted providing that the maximum permissible DC voltage, AC voltage and the permitted ambient conditions are adhered to. The maximum permissible DC voltage, AC voltage and the required ambient conditions are subject to the respective configuration of the MV Power Station. Ensure that the ambient conditions and the maximum permissible voltage are complied with prior to commissioning the MV Power Station.

The product must not be opened when it is raining or when humidity exceeds 95%.

#### System requirements

The product must only be used in a system that is designed as a closed electrical operating area according to IEC 61936-1.

The specified minimum clearances must be observed.

In accordance with EN 55011, the product must only be operated at locations where the distance between the product and third-party radio-communication installations is greater than 30 m.

This product is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

The required fresh-air supply must be assured. Ensure that no exhaust air from other devices interferes with the air intake.

The product must not be operated with open covers or doors.

#### AC Connection

Do not deactivate or modify settings that affect grid management services without first obtaining approval from the grid operator.

#### Statutory warranty

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.

The documentation must be strictly followed. Deviations from the described actions and the use of materials, tools, and aids other than those specified by SMA Solar Technology AG are expressly forbidden.

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 as well as failure to observe the documentation 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 documentation supplied is an integral part of SMA products. 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 product must not be operated with any technical defects.

The type label must remain permanently attached to the product.

## 2.2 IMPORTANT SAFETY INFORMATION

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, some residual risks remain 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.
- Disconnect the product from the power transmission path and from the control path if no voltage is required for working on the product and the connected components.
- After switching off the inverter, wait at least 25 minutes before opening the inverter to allow the capacitors to discharge completely.
- Wear suitable personal protective equipment of the corresponding hazard risk category for all work when the power transmission path is connected. The hazard risk categories of the various areas of the product are different.
- Always perform all work in accordance with the locally applicable standards, directives and laws.
- Observe all safety information on the product and in the documentation.
- The product must not be operated with open covers or doors.
- Cover or isolate all live components.

### ⚠ DANGER

#### **Danger to life due to high short-circuit current in the battery**

Despite careful construction, a short circuit may occur in the product under fault conditions. In case of a short circuit in the product, the connected battery can supply a very high short-circuit current. The resulting electric arc and pressure wave lead to death or serious injuries.

- Install the product in a closed electrical operating area.
- Always close and lock the product.
- Before entering the operating area, externally disconnect the product on the AC and DC side and secure against reconnection.
- After switching off the inverter, wait at least 25 minutes before opening the inverter to allow the capacitors to discharge completely.

**⚠ DANGER****Danger to life due to electric shock when live components or DC cables are touched**

When exposed to light, the PV modules generate high DC voltage which is present in the DC cables. Touching live DC 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.
- Wear suitable personal protective equipment of the corresponding hazard risk category for all work when the power transmission path is connected. The hazard risk categories of the various areas of the product are different.

**⚠ DANGER****Danger to life due to electric shock when operating a damaged product**

Operating a damaged product can lead to hazardous situations since high voltages can be present on accessible product parts. Touching live parts and cables results in death or lethal injuries due to electric shock.

- Only operate the product when it is in a flawless technical condition and safe to operate.
- Make sure that all external safety equipment is freely accessible at all times.
- Make sure that all safety equipment is in good working order.
- Wear suitable personal protective equipment of the corresponding hazard risk category for all work when the power transmission path is connected. The hazard risk categories of the various areas of the product are different.

**⚠ DANGER****Danger to life from electric shock from stepping on the protective cover between the inverter and the MV transformer**

The protective cover between the inverter and the MV transformer guards against accidental contact with the AC connection busbars. The protective cover may become permanently bent when stepped on and may allow accidental contact with live components. Touching live parts will result in death or serious injury due to electric shock.

- Never step on the protective cover between the inverter and the MV transformer.

**⚠ DANGER****Danger to life from electric shock from improperly operating the tap changer of the MV transformer**

Operating the tap changer of the MV transformer while energized will create a short circuit in the MV transformer. The resulting voltages will lead to death or serious injury.

- Only operate the tap changer when the MV transformer is fully de-energized.
- Have a duly authorized person ensure that the MV transformer is de-energized prior to any work or adjustments to settings.
- Any work on the MV transformer or adjustments to settings may only be performed by qualified service partners.
- Wear suitable protective equipment for all work.

**⚠ DANGER****Danger to life due to electric shock in case of a ground fault**

If there is a ground fault, components that are supposedly grounded may in fact be live. Touching live parts will result in death or serious injury due to electric shock.

- Before working on the system, ensure that no ground fault is present.
- Wear suitable personal protective equipment of the corresponding hazard risk category for all work when the power transmission path is connected. The hazard risk categories of the various areas of the product are different.

**⚠ WARNING****Danger to life from electric shock when the product is left unlocked**

If the product is not locked, unauthorized persons will have access to components carrying lethal voltages. Touching live components can result in death or serious injury due to electric shock.

- Always close and lock the product.
- Ensure that unauthorized persons do not have access to the closed electrical operating area.

**⚠ WARNING****Danger to life due to fire when failing to observe tightening torque specifications on live bolted connections**

Failure to follow the specified tightening torques reduces the ampacity of live bolted connections and the contact resistances increase. This can cause components to overheat and catch fire. Death or lethal injuries can result.

- Ensure that live bolted connections are always tightened with the exact tightening torque specified in this document.
- Ensure that the terminal lugs used do not exceed the maximum material thickness. In this way, you avoid that the screws supplied are too short for the installation and that the required torque cannot build up.
- Only use suitable tools when working on the device.
- Avoid repeated tightening of live bolted connections as this may result in inadmissibly high tightening torques.

**⚠ WARNING****Danger to life from electric shock when entering the system**

Damaged insulation in the system can cause lethal currents to ground. Lethal electric shocks can result.

- Ensure that the insulation resistance of the system exceeds the minimum value. The minimum value of the insulation resistance is: 14 kΩ.
- All work on the inverter must only be carried out by qualified persons.
- Before entering the system, switch the system with the ground fault detection system (Remote GFDI) to insulated operation.
- After entering the system, immediately ensure that the inverter does not display an insulation error.
- Disconnect the product from the power transmission path and from the control path if no voltage is required for working on the product and the connected components.
- Wear suitable personal protective equipment for all work on the product.

**⚠ WARNING****Danger to life due to arc fault caused by fault in the medium-voltage switchgear**

If there is a fault in the medium-voltage switchgear, arc faults may occur during operation of the product which can result in death or serious injuries. In the event of arc faults in the medium-voltage switchgear, the pressure escapes to the rear into the medium-voltage transformer compartment.

- Only perform work on the medium-voltage switchgear when it is in a voltage-free state.
- Prior to commissioning and operating the medium-voltage switchgear, close the front panels of the base below the medium-voltage switchgear.
- When performing switching operations, make sure that the hatch of the arc fault opening can be easily opened and is not covered by objects (e.g., ice, vegetation).
- When performing switching operations, open the doors of the medium-voltage cabinet and attach the doors to the designated positions.
- All work and switching operations on the medium-voltage switchgear must only be performed by qualified persons wearing adequate personal protective equipment.
- All other persons are to keep a safe distance from the product when switching operations are performed. The internal arc pressure safety area is to be cordoned off.
- Do not touch or access the roof of the medium-voltage switchgear when medium voltage is connected.
- Do not access the medium-voltage cabinet.

**⚠ WARNING****Danger to life due to electric shock when switching the medium-voltage switchgear when the level of insulating gas is low**

When the level of insulating gas is low, life-threatening electric shocks may arise when switching the medium-voltage switchgear, which can lead to death or serious injuries.

- Before switching the medium-voltage switchgear, check the level of the insulating gas.
- Contact SMA Service if the level of the insulating gas is below the acceptable limit.

**⚠ WARNING****Danger to life due to electric shock if external supply voltage is not disconnected**

When using an external supply voltage, even after disconnecting the product, there may still be lethal voltages present in cables. Touching live components can result in death or serious injury due to electric shock.

- Disconnect the external supply voltage.
- Do not touch the orange cables in the inside of the product. These cables are used for connecting the external supply voltage and can be dangerous to touch.
- Wear suitable personal protective equipment of the corresponding hazard risk category for all work when the power transmission path is connected. The hazard risk categories of the various areas of the product are different.

**⚠ WARNING****Hearing impairment due to high-frequency noises of the product**

The product generates high-frequency noises during operation. This can result in hearing impairment.

- Wear hearing protection.

**⚠ WARNING****Danger to life due to electric arc if there are tools inside the product**

When reconnecting and in operation, an electric arc can arise if conductive foreign parts (e.g., tools) are located in the product and establishes a conductive connection between live components. This can result in death or serious injury.

- Before commissioning or reconnection, verify that no tools are inside the product.

**⚠ CAUTION****Risk of burns due to hot components**

Some components of the product can get very hot during operation. Touching these components can cause burns.

- Observe the warnings on all components.
- During operation, do not touch any components marked with such warnings.
- After switching off the product, wait until any hot components have cooled down sufficiently.
- Wear suitable personal protective equipment for all work on the product.

**⚠ CAUTION****Risk of injury when using unsuitable tools**

Using unsuitable tools can result in injuries.

- Ensure that the tools are suitable for the work to be carried out.
- Wear personal protective equipment for all work on the product.

**⚠ CAUTION****Danger of crushing and collision when carelessly working on the product**

Carelessly working on the product could result in crushing injuries or collisions with edges.

- Wear personal protective equipment for all work on the product.

**NOTICE****Damage to the system due to sand, dust and moisture ingress**

Sand, dust and moisture penetration can damage the products of the system and impair its functionality.

- Only open the product if the humidity is within the thresholds and the environment is free of sand and dust.
- Do not open the product during a dust storm or precipitation.
- In case of interruption of work or after finishing work, mount all enclosure parts and close and lock all doors.
- Only operate the product when it is closed.
- Store the closed product in a dry and covered location. Observe storage conditions.
- The temperature at the storage location must be in the specified range. The temperature range is: -40°C to +70°C. Depending on the type of oil of the medium-voltage transformer, the minimum temperature may be higher.

**NOTICE****Damage due to environmental disturbances**

The product can be damaged by environmental disturbances e.g. earthquakes, storms or flooding. With a damaged product, a safe and trouble-free operation is not guaranteed. Considerable damages to the product and yield losses can result.

- Always disconnect the product from voltage sources as quickly as possible after large-scale environmental disturbances.
- Once disconnected from voltage sources, perform a thorough 12-month-maintenance check that is not subject to the maintenance schedule. Shorten the maintenance intervals depending on the determined maintenance requirements.
- After a dust or snow storm, ensure that the air inlets and outlets are not covered by any objects (e.g., sand).
- Only recommission the product once any damages have been rectified.

**NOTICE****Damage to the oil tray due to ice**

Water in the oil tray can freeze at low temperatures and damage the oil tray.

- Check the oil spill containment regularly for water. Remove water (if necessary).
- Ensure that the water can drain off.

**i Additional hazard labels**

Additional labeling of sources of danger (e.g. high voltage) must be carried out in accordance with the locally applicable standards, guidelines and laws.

## 2.3 Personal Protective Equipment

When doing work on live parts of the product, protective equipment for the respective hazard risk category is required. The hazard risk categories of the various areas of the power converter are different. The areas are identified with warning labels. The required protective equipment must comply with the national regulations.

Always wear suitable protective equipment when performing switching operations on the medium-voltage switchgear. The required protective equipment must comply with the national regulations.

The following personal protective equipment is regarded to be the minimum requirement:

- Proper head protection
- Tight-fitting work clothes made of 100% cotton
- Suitable work pants
- Proper hearing protection
- Safety gloves
- In a dry environment, safety shoes of category S3 with perforation-proof soles and steel toe caps
- During precipitation or on moist ground, safety boots of category S5 with perforation-proof soles and steel toe caps
- LV/HRC fuse extractor

If necessary, LV/HRC fuse extractors can be ordered from SMA using the following material number: 61-0193.

Any other prescribed protective equipment must also be used.

## 2.4 Cyber Security

Most operating activities such as monitoring and control of systems can be done locally by the PV system operator or service personnel without the need for data communication via public Internet infrastructure. These operating activities, including data communication between PV system operator/service personnel and data logger, inverter or additional equipment, can be accessed by using local displays, keypads or using local access of the webserver of a device in the LAN of the PV system or of the building.

In other use cases of systems, the PV systems are also part of the global communication system, which is based on Internet infrastructures.

The data communication via Internet is an up-to-date, economically viable and customer-friendly approach in order to enable easy access for the following modern applications such as:

- Cloud platforms (e.g. Sunny Portal)
- Smartphones or other mobile devices (iOS or Android apps)
- SCADA systems, which are remotely connected
- Utility interfaces for grid management services

Alternatively, selected and secured communication interfaces may be used. These solutions are no longer state of the art and are very expensive to use (special communication interfaces, separate wide area networks and more).

When using the Internet infrastructure, the systems connected to the Internet are entering a basically unsecure area. Potential attackers constantly seek vulnerable systems. Usually, they are criminally motivated, have a terrorist background or aim to disrupt business operations. Without taking any measures to protect systems and other systems from such misuse, a data communication system should not be connected to the Internet.

You can find the current recommendations of SMA Solar Technology AG on the topic of cyber security in the technical information "PUBLIC CYBER SECURITY - Guidelines for a Secure PV System Communication" at [www.SMA-Solar.com](http://www.SMA-Solar.com).

## 3 Scope of Delivery

### 3.1 Checking scope of delivery

After the MV Power Station has arrived, check the scope of delivery for completeness and any apparent external damage.

- Check the completeness of the MV Power Station delivery
- Complete the digital transport checklist
- Return the digital transport checklist to the customer project manager at SMA Solar Technology AG. **Please make sure to return the transport checklist no later than 3 days after receipt of the delivery at the construction site or warehouse.**

### 3.2 MV Power Station Scope of Delivery

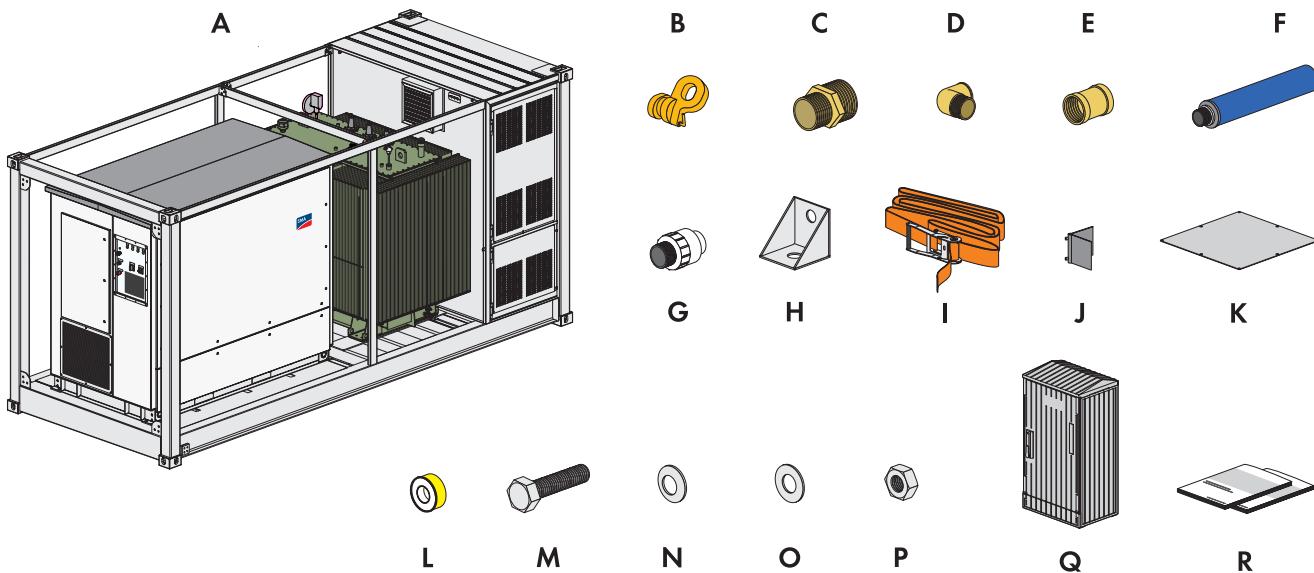


Figure 1: Scope of delivery of the MV Power Station

Position	Quantity	Designation
A	1	MV Power Station
B	4	Lifting lugs <sup>1)</sup>
C	1	Reducer <sup>2)</sup>
D	1	Angle joint <sup>2)</sup>
E	1	Extension <sup>2)</sup>
F	1	Oil filter <sup>2)</sup>
G	1	Pre-filter <sup>2)</sup>
H	4	Side twistlock with fastening material on the station frame <sup>3)</sup>
I	2	Tie-down strap <sup>4)</sup>

<sup>1)</sup> Optional

<sup>2)</sup> In case of order option "Oil Containment"

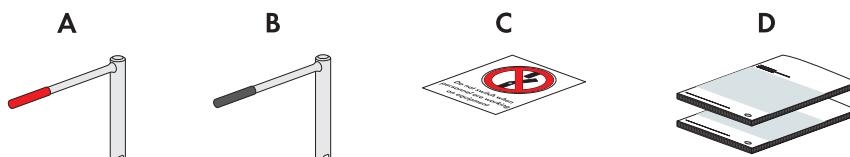
<sup>3)</sup> For the order option "Earthquake and Storm Package"

<sup>4)</sup> For the order option "Earthquake and Storm Special"

Position	Quantity	Designation
J	8	Edge protection angle <sup>4)</sup>
K	1	Cover plate <sup>4)</sup>
L	1	Teflon tape <sup>2)</sup>
M	8	Screw M12 for the grounding connection
N	8	Spring washer M12 for the grounding connection
O	16	Fender washer M12 for the grounding connection
P	8	Nut M12 for the grounding connection
Q	1	Switch cabinet for the order option "Cascade Control" <sup>1)</sup>
R	1	Documentation, circuit diagram

### 3.3 Scope of Delivery of the Medium-Voltage Switchgear

The scope of delivery of the medium-voltage switchgear is located in the medium-voltage cabinet.



Position	Quantity	Designation
A	1	Actuation lever for grounding switch
B	1 / 2 <sup>5)</sup>	Actuation lever for disconnection unit, load-break switch and circuit breaker
C	1	Magnetic sign "Do not switch"
D	1	Documentation for the medium-voltage switchgear

<sup>5)</sup> Quantity depending on the manufacturer of the medium-voltage switchgear

## 4 Product overview

### 4.1 System Overview

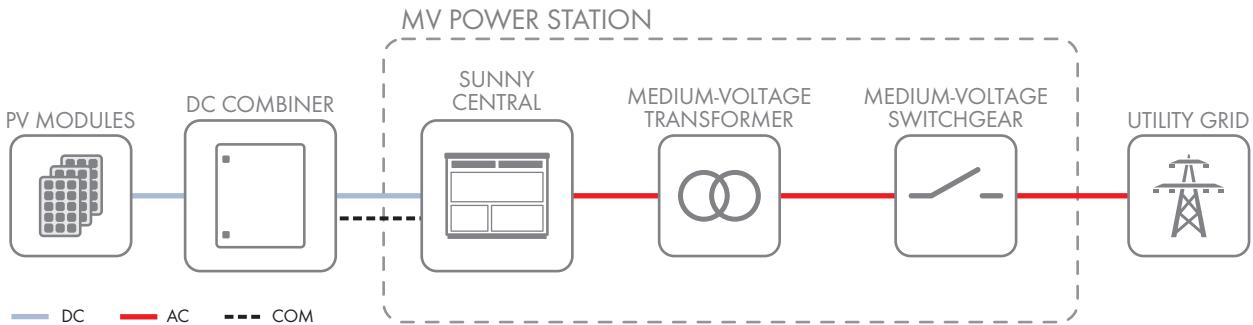


Figure 2: Design with Sunny Central and PV-coupled system (example)

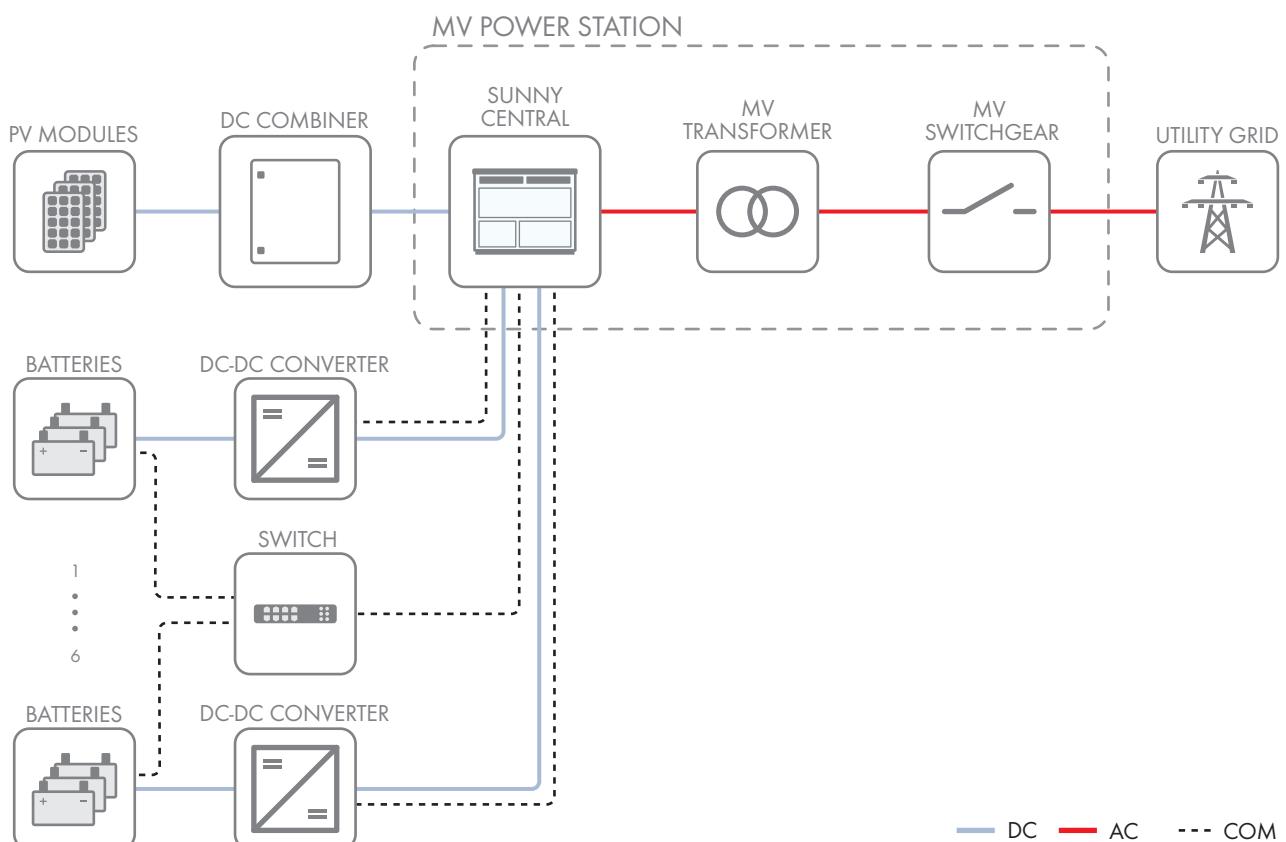


Figure 3: Design with Sunny Central and battery-coupled system (example)

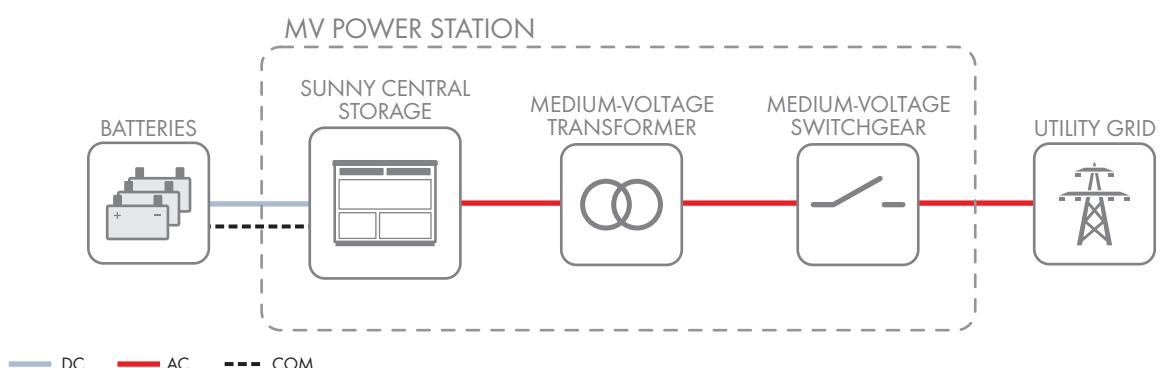


Figure 4: Design with Sunny Central Storage and battery (example)

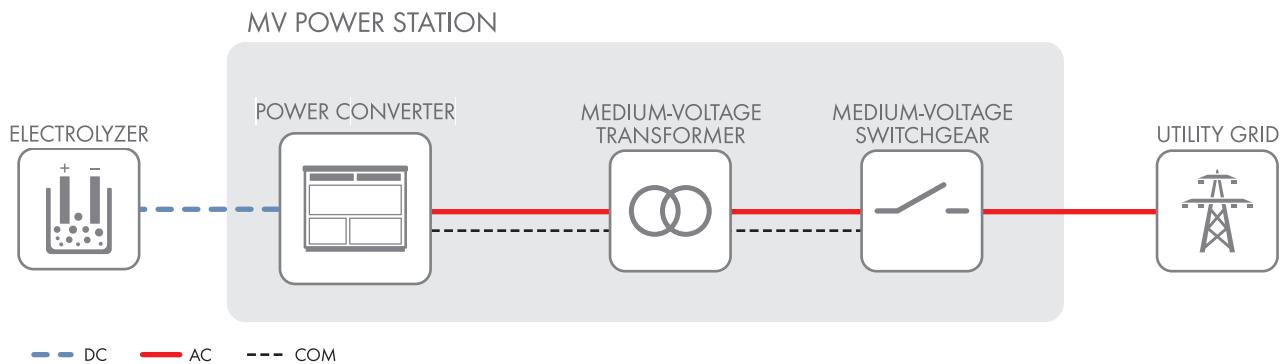


Figure 5: Design with Electrolyzer Converter (example)

## 4.2 Overall System Requirements

- When designing the components of the system, you should take account of the maximum inrush current.
- During configuration, you should take account of the fact that the closed-loop control of the compensation plant on the MV side does not affect the closed-loop control of the inverter or Electrolyzer.
- When configuring the system, the selective time intervals of the various medium-voltage switchgear units must be coordinated. This means that only PV systems, in which a disturbance has occurred, are disconnected from the utility grid.

## 4.3 Design of the MV Power Station

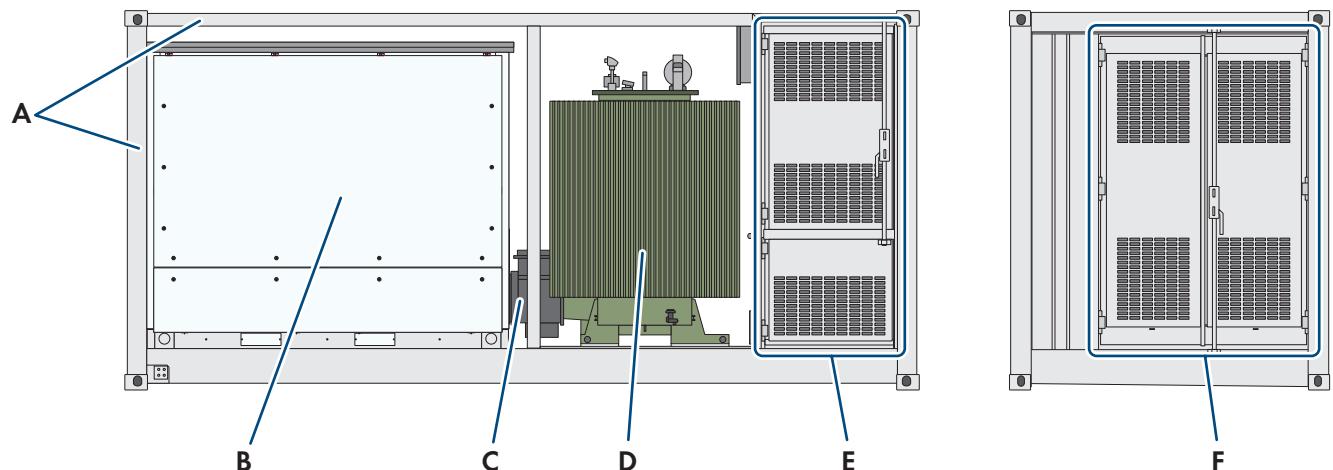


Figure 6: Design of the MV Power Station

Position	Designation	Explanation
A	Rack	For the order option "Sea Freight", the MV Power Station is equipped with a rack.

Position	Designation	Explanation
B	Sunny Central	The Sunny Central is a PV inverter that converts the direct current generated in the PV arrays into grid-compliant alternating current.
	Sunny Central Storage	The Sunny Central Storage is a battery inverter that converts the direct current supplied by a battery into grid-compliant alternating current. It also charges the battery with energy drawn from the medium-voltage grid.
	Electrolyzer Converter	The Electrolyzer Converter is a power converter that converts the alternating current from the utility grid into direct current.
C	Low-voltage connection	Low-voltage connection between medium-voltage transformer and inverter with protective cover.
D	Medium-voltage transformer	The MV transformer converts the inverter output voltage to the voltage level of the medium-voltage grid. Depending on the order option, the medium-voltage transformer is protected with a protective grid.
E	Low-voltage cabinet	The low-voltage cabinet contains the station subdistribution and the optional low-voltage transformer.
F	Medium-voltage cabinet	The medium-voltage switchgear connects and disconnects the medium-voltage transformer to and from the medium-voltage grid.

#### 4.4 Components of the Medium-Voltage Cabinet

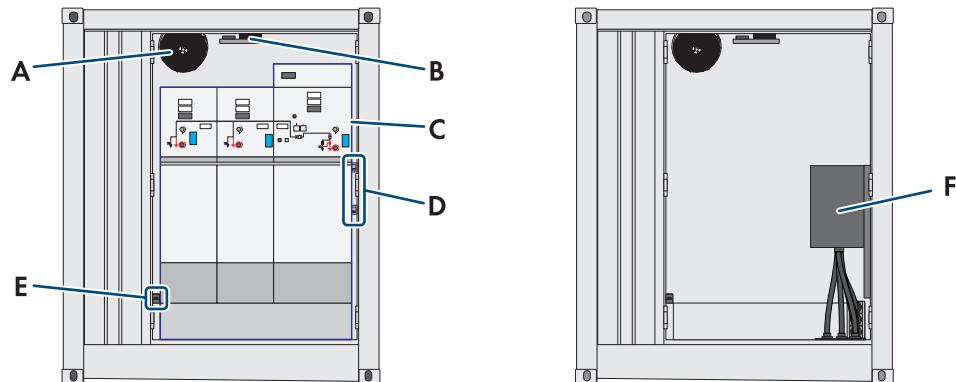


Figure 7: Components of the medium-voltage cabinet, left with the order option "With MVSG", right with the order option "Without MVSG" (example)

Position	Designation	Explanation
A	Fan	Optional
B	Lighting / heat detector	Optional
C	Medium-voltage switchgear	Optional
D	Thermostats for heating and safety shutdown of the medium-voltage switchgear	For the order option "Ambient Temperature: -40 °C to +45 °C" or "Ambient Temperature: -35 °C to +55 °C"

Position	Designation	Explanation
E	Heating	With order option "Ambient Temperature: -40°C to +45°C"
F	Connection box for the medium-voltage transformer	For the order option "Without MVSG"

Further details are to be found in the circuit diagram.

## 4.5 Configuration of Station Subdistribution

All fuse switches for the MV Power Station are located in the station subdistribution. The station subdistribution is still the central connection point for communication. The positions of the components can vary depending on the order option. Reference designations are attached to the individual devices of the station subdistribution.

For the order option "Ambient Temperature: -35°C to +55°C" there are additional heaters and thermostats behind the cover of the station subdistribution.

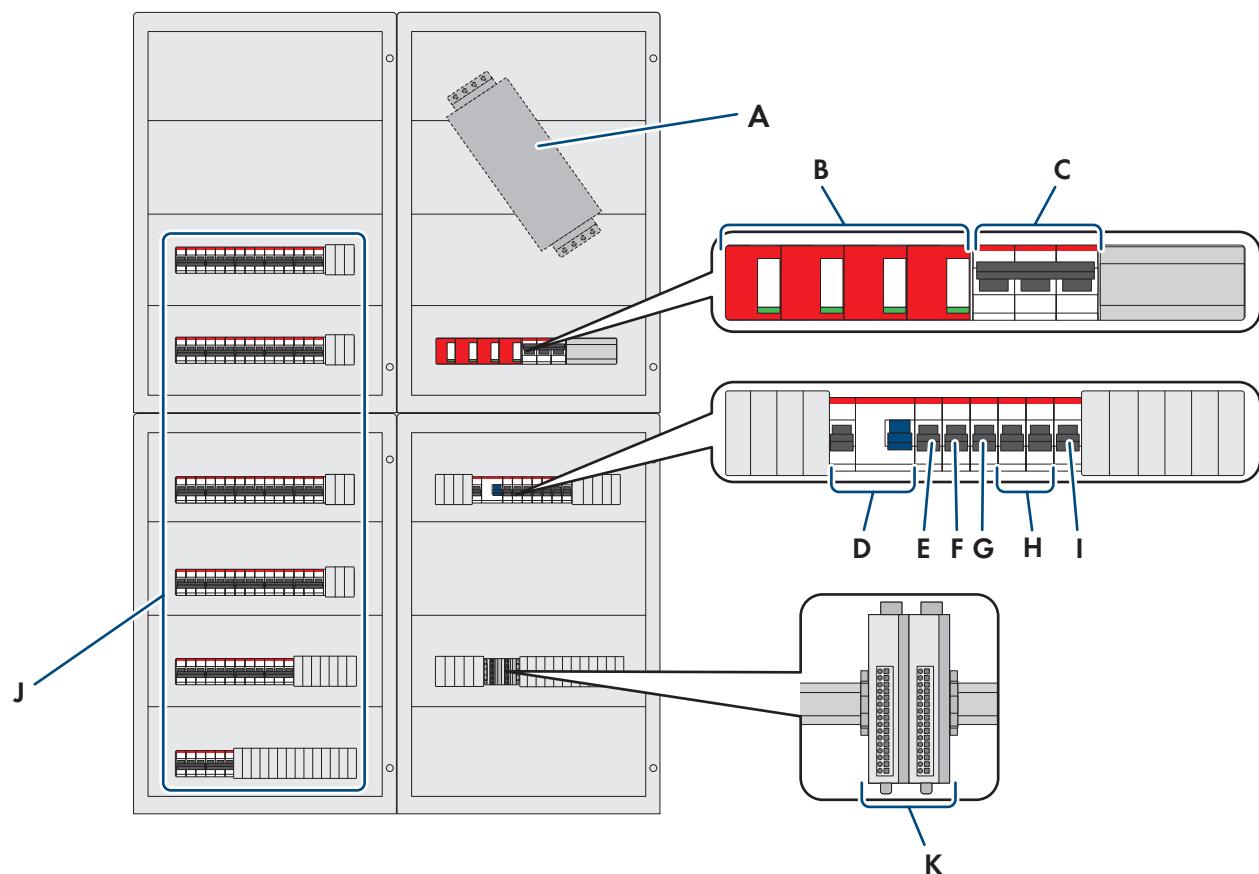


Figure 8: Devices in the station subdistribution (example)

Position	Designation	Explanation
A	Low-voltage transformer EMC filtering device	Optional
B	Surge arrester -F1 for tracker motors and DC-DC Converter	Optional
C	Main miniature circuit breaker -F101 for tracker motors and DC-DC Converter	Optional
D	Miniature circuit breaker -F32 and residual-current device -F32D for lighting systems	Optional

Position	Designation	Explanation
E	Miniature circuit breaker <b>-F34</b> for the fan	Optional
F	Miniature circuit breaker <b>-F36</b> for monitoring and communication in terms of order option "Monitoring Package" (optional)	Optional
G	Miniature circuit breaker <b>-F37</b> for cascade control (optional)	Optional
H	Miniature circuit breaker <b>-F41</b> and <b>-F42</b> for protection of the customer equipment	Optional
I	Miniature circuit breaker <b>-F50</b> (for the order option "Ambient Temperature: -40 °C to +45 °C") or <b>-F51</b> (for the order option "Ambient Temperature: -35 °C to +55 °C") for the heating	-
J	Miniature circuit breakers for external loads such as tracker motors, DC-DC converters or the supply of battery containers <b>-F2</b> to <b>-F25</b>	Optional
K	I/O System Monitoring Package	Optional

Further details are to be found in the circuit diagram.

## 4.6 Protective grid and splash guard in front of the medium-voltage transformer

For the order option "Grids MVT Room", the medium-voltage transformer is protected by a protective grid on the side.

For the order option "Splash Guards", the medium-voltage transformer is protected by a splash guard on the side.

Access to the medium-voltage transformer is made via a 2 lockable doors. For the order option "Grids Special", the medium-voltage transformer is also protected by a protective grid on the top.

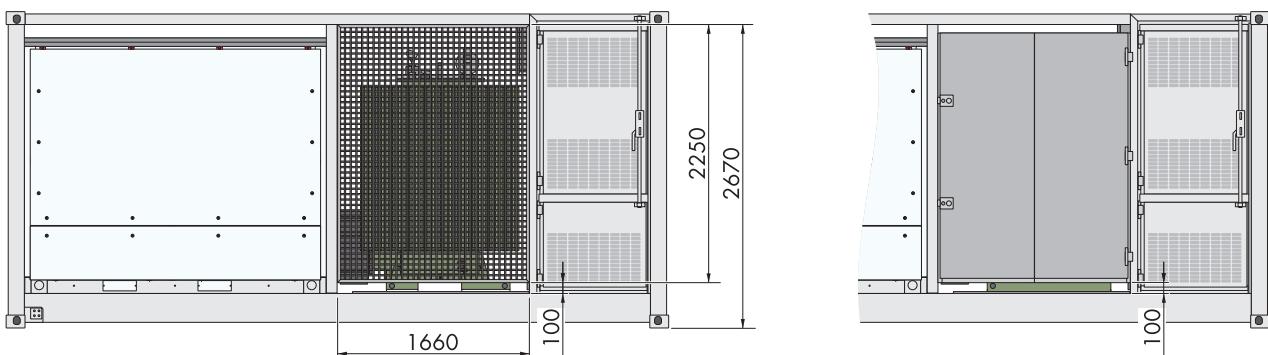


Figure 9: Position and dimensions of the protective grid in front of the medium-voltage transformer, on the left for the order option "Grids MVT Room", on the right for the order option "Splash Guards" (Dimensions in mm)

## 4.7 Devices of the Medium-Voltage Switchgear

The MV Power Station is equipped with a medium-voltage switchgear depending on the order option. The medium-voltage switchgear is used to disconnect the MV Power Station from the medium-voltage grid.

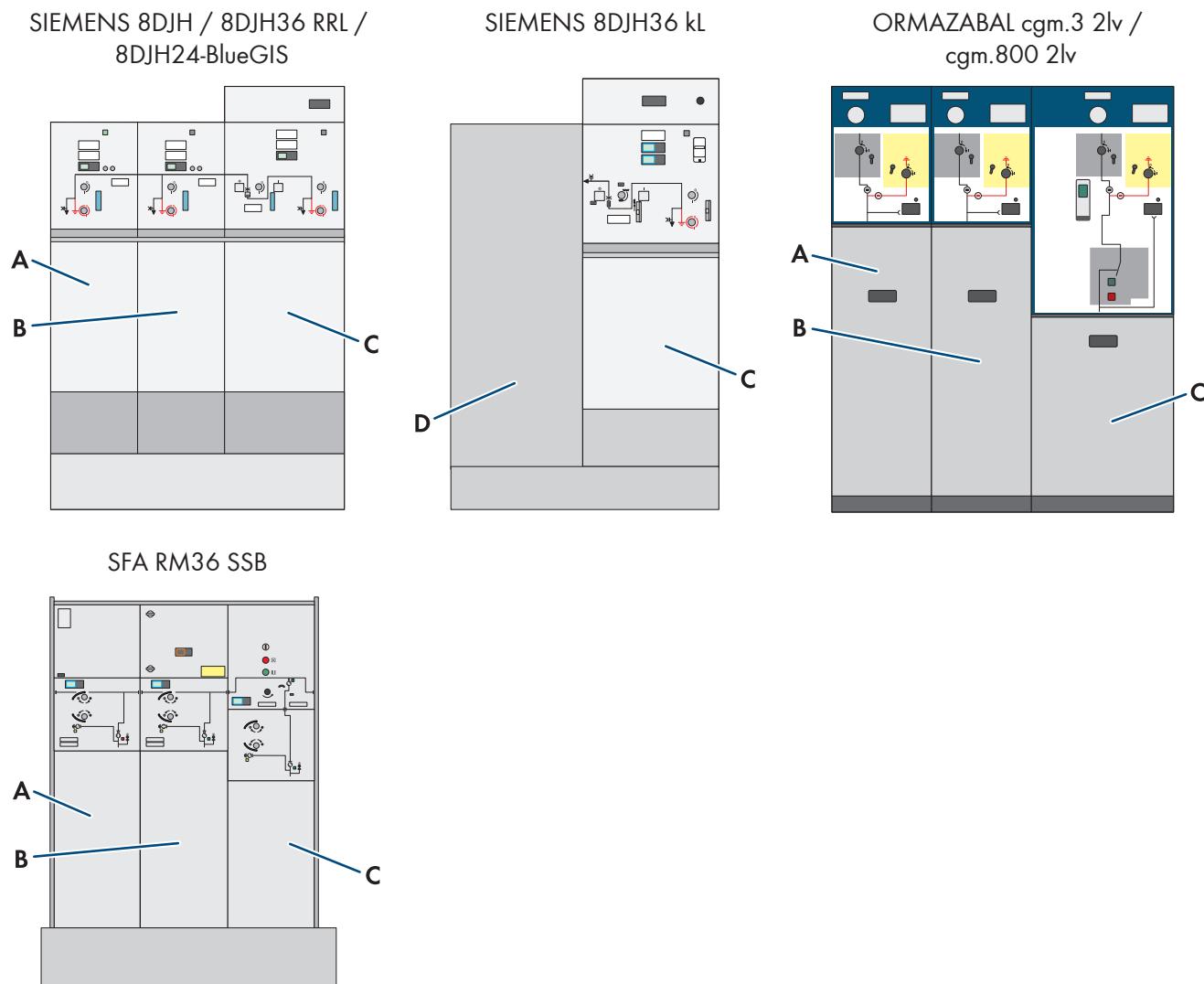


Figure 10: Components of the medium-voltage switchgear (example)

Position	Designation	Explanation
A	Cable panel 1 with load-break switch	Optional
B	Cable panel 2 with load-break switch	Optional
C	Transformer compartment with disconnector	-
D	Side cable connection panel	Optional

## 4.8 Circuitry Principle for Installation of 1 MV Power Station

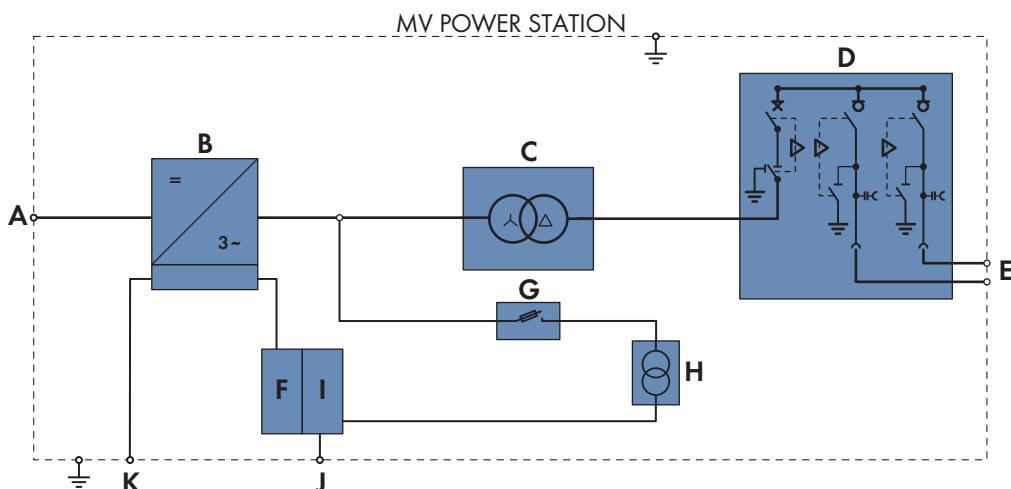


Figure 11: Circuitry principle of the MV Power Station (example)

Position	Designation
A	DC Input
B	Inverter
C	Medium-voltage transformer
D	Medium-voltage switchgear (optional)
E	AC output
F	Station subdistribution
G	Fuse holder with thermal fuse of the low-voltage transformer (optional)
H	Low-voltage transformer (optional)
I	Overvoltage protection, load-break switch, and EMC filtering device of the low-voltage transformer, and miniature circuit breaker for tracker motors (optional)
J	Connection of additional components (e.g., tracker motors) (option)
K	Customer connection. Depending on the order option, the terminal for the external communication is located on the station subdistribution or inverter.

## 4.9 Circuitry principle of 2 MV Power Stations with 1 medium-voltage switchgear

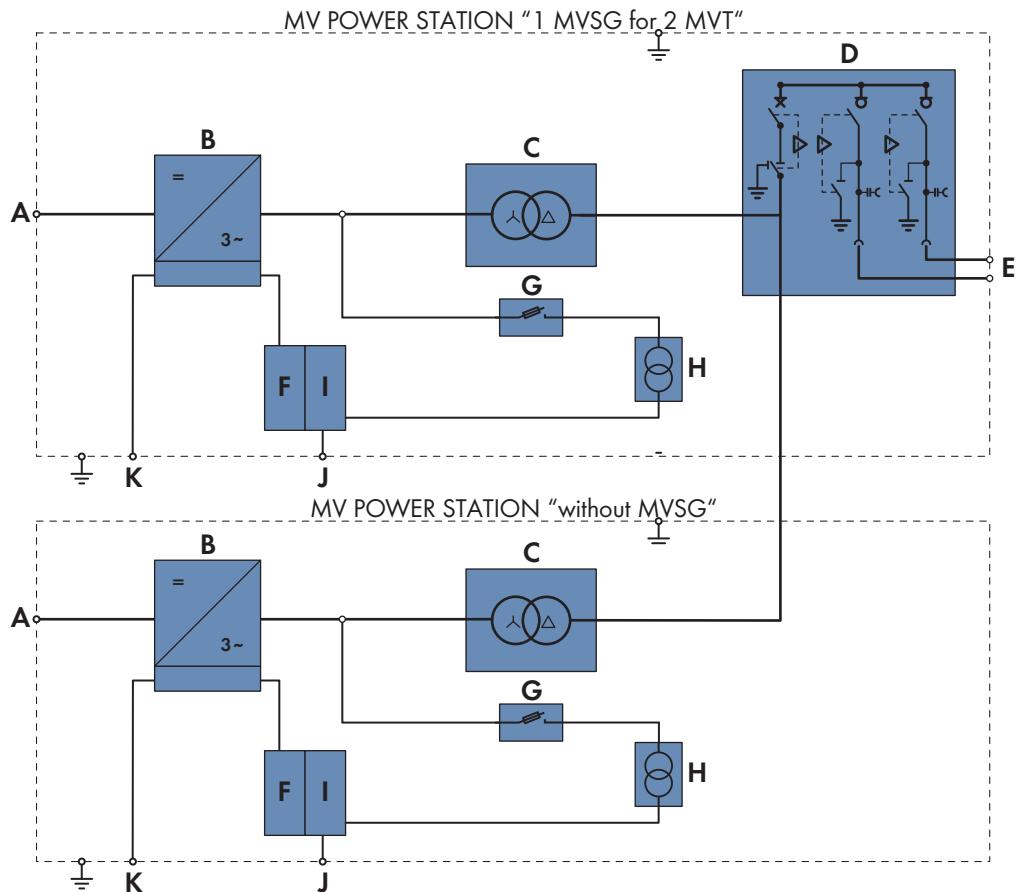


Figure 12: Circuitry principle of 2 MV Power Stations with 1 medium-voltage switchgear (example)

Position	Designation
A	DC Input
B	Inverter
C	Medium-voltage transformer
D	Medium-voltage switchgear (optional)
E	AC output
F	Station subdistribution
G	Fuse holder with thermal fuse of the low-voltage transformer (optional)
H	Low-voltage transformer (optional)
I	Overvoltage protection, load-break switch, and EMC filtering device of the low-voltage transformer, and miniature circuit breaker for tracker motors (optional)

Position	Designation
J	Connection of additional components (e.g., tracker motors) (option)
K	Customer connection. Depending on the order option, the terminal for the external communication is located on the station subdistribution or inverter.

## 4.10 Operating and Display Elements

### 4.10.1 Fast-stop switch of the MV Power Station

The MV Power Station is equipped with a fast-stop switch depending on the order option.

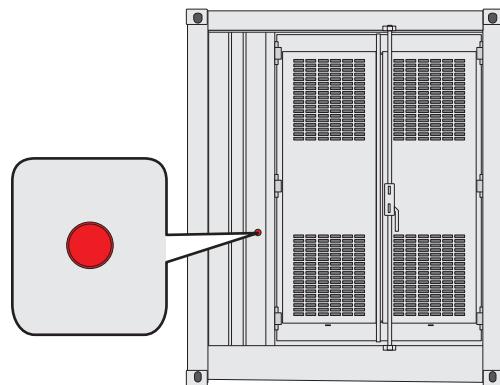


Figure 13: Position of the fast-stop switch

The medium-voltage switchgear and the inverter can be switched off with the fast-stop switch.

The fast-stop switch is only to be used in the event of emergencies.

## 4.10.2 Switches on the Cascade Control

The MV Power Station is equipped with a cascade control depending on the order option. With the cascade control, the switch-on behavior for each MV Power Station can be configured so that the stations can be connected to the utility grid in a staggered manner after a grid failure. The configuration is carried out during commissioning. The control elements of the cascade control are protected by lockable caps. Padlocks for the caps are not included in the scope of delivery.

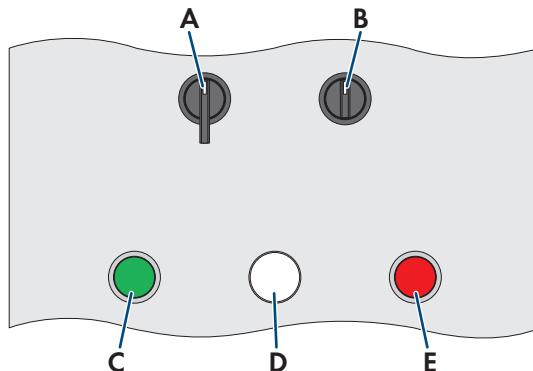


Figure 14: Cascade control switches

Position	Explanation
A	Main switch <b>S1</b> : <ul style="list-style-type: none"> <li><b>Local / Remote control</b>: Local control and remote control are activated.</li> <li><b>OFF</b>: All controls are deactivated.</li> <li><b>Local / Remote control / Cascade control</b>: Cascade control, local control and remote control are activated.</li> </ul>
B	Switch to activate the cascade- and remote control <b>S3</b> .
C	Button for switching on the circuit breaker of the medium-voltage switchgear <b>S10</b>
D	Status display of cascade control <b>H1</b>
E	Button for switching off the circuit breaker of the medium-voltage switchgear <b>S11</b>

## 5 Transport and Mounting

### 5.1 Safety during Transport and Mounting

#### ⚠ CAUTION

##### Danger of crushing and collision when carelessly working on the product

Carelessly working on the product could result in crushing injuries or collisions with edges.

- Wear personal protective equipment for all work on the product.

#### NOTICE

##### Damage to the frame construction due to uneven support surface

If the product is set down on uneven surfaces, components may distort. This may lead to moisture and dust penetration into the components.

- Never place the product on an unstable, uneven surface; not even for a short period of time.
- The unevenness of the support surface must be less than 0.5%.
- The support surface must be suitable for the weight of the product.
- Prior to storage, ensure that the doors of the product are tightly closed.

#### **i Wash the closed station with clear water after maritime transport or transport on salt-covered roads**

High humidity and salt water can cause corrosion of the station.

- Wash the station with clear water and low pressure within 3 days after it arrives at the construction site. This will inhibit the corrosion process. Do not use a high-pressure cleaner. By processing and painting the affected areas further corrosion can be prevented.

### 5.2 External Dimensions and Weight

#### With oil spill containment

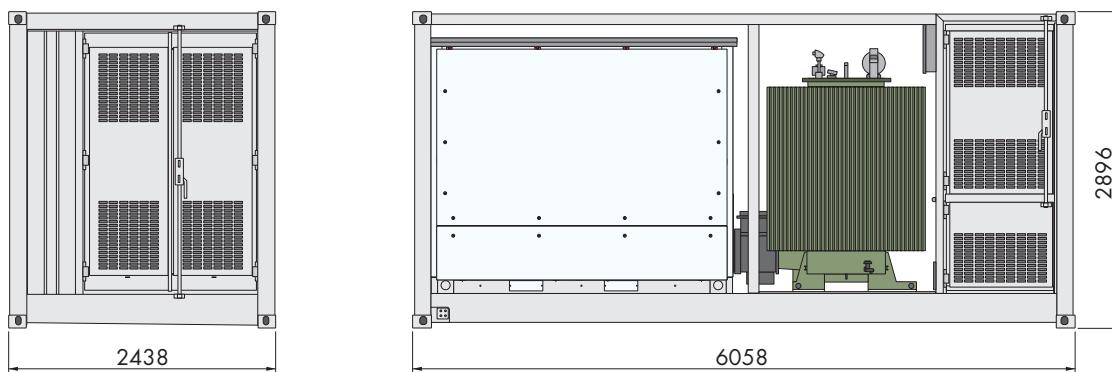


Figure 15: Dimensions of the MV Power Station (Dimensions in mm)

Width	Height	Depth	Weight
6058 mm	2896 mm	2438 mm	< 18 t

## 5.3 Requirements for the Mounting Location

### 5.3.1 Closed Electrical Operating Area

For safety reasons, the entire system must be installed in a closed electrical operating area in accordance with IEC 61936-1. The overall system includes all components of the system.

#### Recommendations:

- Ensure that unauthorized persons have no access to the entire system.
- The components of the entire system may only be switched and operated by trained and qualified persons.

### 5.3.2 Minimum clearances

#### 5.3.2.1 Observing Minimum Clearances

Observe the minimum clearances to ensure trouble-free operation of the MV Power Station. The minimum clearances are necessary to ensure trouble-free installation of the MV Power Station and easy replacement of the devices (e.g. with a crane) during service and maintenance. In addition, locally applicable regulations must be observed. Non-observance of the minimum clearances may result in the use of additional devices or greater amount of time and labor. The additional costs incurred will be invoiced also in case of a warranty claim.

If servicing is necessary, the minimum clearances for servicing must be ensured. Shorter minimum clearances for servicing are also possible if the specified conditions are met.

#### 5.3.2.2 Minimum Clearance Values

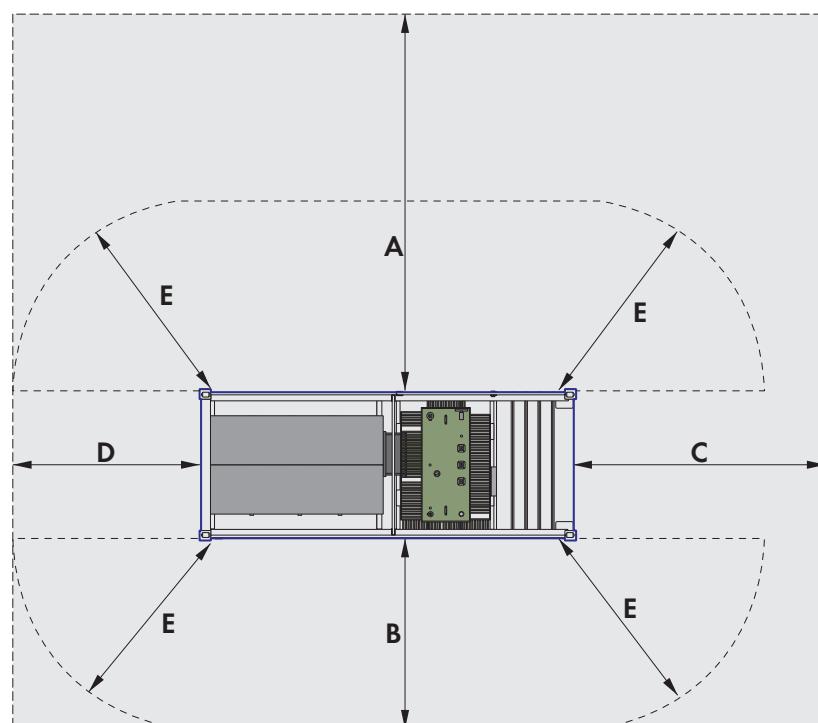


Figure 16: Minimum clearances

Position	Minimum clearance for servicing	Minimum clearance for trouble-free operation Shorter minimum clearances for servicing
A	6000 mm	2500 mm

Position	Minimum clearance for servicing	Minimum clearance for trouble-free operation
B	3000 mm	2500 mm
C	4000 mm	2500 mm
D	3000 mm	2500 mm

Internal arc pressure safety areas when switching the medium-voltage switchgear:

Position	Minimum clearance for inflammable materials	Minimum clearance for personnel
E	1000 mm	3000 mm

The work area intended for switching in front of the medium-voltage switchgear is excluded.

### 5.3.2.3 Conditions for Shorter Minimum Clearances for Servicing

Greater minimum clearances are required for servicing than for operation. You can reduce the minimum clearances for servicing to the minimum clearances for operation if the following conditions are met:

- A spot for a crane from which all stations can be reached must be available.
- Access roads and areas must be accessible and passable for service vehicles (e.g. forklift or crane truck).
- The unloading site for the crane and trucks must be firm, dry and horizontal.
- The crane must have sufficient load-carrying capacity according to the operating conditions (medium-voltage transformer, medium-voltage switchgear including crane pallet fork, inverter choke, inverter with crane traverse, station with crane traverse).
- For smaller loads, suitable lifting gear (e.g. pallet truck and forklift) must be available on site.
- To transport smaller loads to the MV Power Station, the areas between the stations must be accessible by pallet truck and forklift.

### 5.3.2.4 Arc pressure relief

In the event of arc faults in the medium-voltage switchgear, pressure and hot plasma escape to the medium-voltage transformer. At the same time, the safety area for arc pressure relief system must not be blocked. The MV Power Station has the arc fault qualification IAC A according to IEC 62271-202. The arc pressure relief system must be checked against the local regulations during installation.

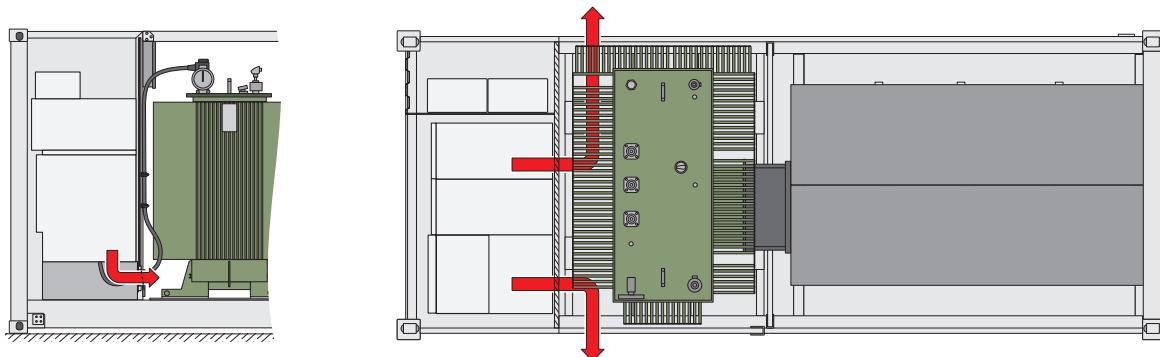


Figure 17: Internal arc pressure at the MV Power Station

### 5.3.3 Ambient Conditions

#### Requirements for the mounting location:

- The mounting location must be freely accessible at all times.
- The permissible maximum values for relative humidity must not be exceeded. The maximum values are as follows: 0% to 95% (annual average) and > 95% to 100% (up to two months per year).
- The fresh air consumption of the MV Power Station must be assured. The fresh air consumption is: 10000 m<sup>3</sup>/h.
- The maximum permissible installation altitude must not be exceeded.
- The system must have a minimum clearance of 30 m to radio equipment.
- The ambient temperature must be within the operating temperature range.
- The air quality for mechanically active substances in accordance with IEC 60721-3-4: 2019 must be observed.
- The air quality for chemically active substances in accordance with ISO 12944-2: 2019 must be observed.
- The product must not be operated right next to unprotected coastlines. For distances up to 5 km, the product must be equipped with the order option "Environment:Harsh+".

#### Equipment and ambient conditions of the MV Power Station:

Component / order option	Class C according to DIN EN ISO 9223 (2012) and EN ISO 12944-2 (2017) (e.g., chlorides due to salt spray in applications near to the sea or sulfur dioxide)	Class S according to IEC 60721-3-4 (2019) (Sand and dust)
Inverter standard	C5 (high air concentration)	4S13 (high air concentration)
MV Power Station standard	C3 (low air concentration)	4S12 (low air concentration)
MV Power Station Option Harsh	C5 (high air concentration)	4S13 (high air concentration)
MV Power Station option Harsh+	C5 (very high air concentration)	4S13 (high air concentration)

### 5.3.4 Foundation

#### 5.3.4.1 Support surface

The MV Power Station is installed on a foundation with multiple support points and a pea gravel ground. The design of the foundation is the responsibility of the customer. The MV Power Station can also be placed on posts driven into the ground. The weight distribution depends on the number and position of the piles and must be designed accordingly.

To avoid corrosion, the MV Power Station must be installed above the ground. If a higher setup is required, SMA Technology AG must first approve it. If the MV Power Station is placed higher, a platform must be provided for servicing.

#### 5.3.4.2 Requirements for a Service Platform

- The service platform must extend at least to the bottom edge of the MV Power Station.
- The service platform or mobile platforms must meet the following dimensions: depth of 1500 mm, width of 2000 mm.
- Fall protection must be present.
- The service platform must have a minimum load capacity of 500 kg (for 2 people with tools and spare parts)
- The width of the access routes must not be reduced by the service platform.
- The service platform must comply with local safety regulations.

### 5.3.4.3 Foundation Requirements

- The design of the foundation and selection of building materials (e.g. type of concrete and reinforcement) depends on the soil conditions. The foundation is to be defined by the customer based on the given requirements (weights and tolerances) and ambient conditions.
- The foundation must be mounted on solid ground.
- The foundation must be suitable for the weight of the product.
- The burial depth of the foundation must satisfy the structural requirements.
- The height tolerance between the individual foundations must not exceed 3 mm. Deviations must be compensated.
- The middle foundation must be designed 23 mm to 26 mm higher than the outer foundation. Shim plates can be used to compensate for the height difference.
- In order that the opening for the cable is not covered, the foundation may not protrude more than 240 mm from the outer edge below the station.
- The professional welding of the station on steel foundations is permitted. The customer is responsible for taking the appropriate corrosion protection measures. Claims regarding rust at the welding points cannot be made.
- When designing the foundations, safety factors must be taken into account according to local conditions or country-specific regulations.
- With the order option "Earthquake and Storm Package", additional space is required for anchoring the side twistlocks. The surface area of the side twistlocks is: 130 mm x 135 mm.
- For the "Oil Containment" order option, the foundation must not obstruct the oil filter.
- The oil filter can be mounted horizontally. For optimal rain drainage, the oil filter must be tilted downward by 15° to 25°. Ensure that the distance between the oil filter and the station frame is 35 mm.
- A visual inspection of the underside of the oil spill containment must be possible in order to detect leaks at an early stage.

### 5.3.4.4 Structure of the Support Surface

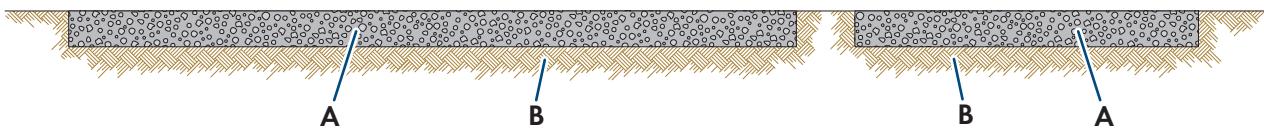


Figure 18: Structure of the support surface

Position	Designation
A	Pea gravel ground
B	Solid ground, e.g., gravel

### 5.3.4.5 Requirements for the support surface and the loose gravel ground

#### Minimum requirements for the support surface:

- The support surface must be a dry and solid foundation, e.g. gravel.
- In areas subject to strong precipitation or high groundwater levels, a drainage system is recommended.
- Do not mount the MV Power Station into ground depressions to prevent water ingress.
- The support surface underneath the MV Power Station must be clean and firm to avoid any dust circulation.

#### Minimum requirements for the pea gravel ground:

- The load capacity of the subgrade must be given.
- Minimum clearances for servicing must be observed.

- Access roads and areas must be accessible and passable, without any obstructions, for service vehicles (e.g. forklift or crane truck).

### 5.3.4.6 Weight load on the support points

To ensure the stability and safe standing of the MV Power Station, the station container must stand on at least 4 support points on the outer feet and on 2 support points under the MV transformer. The weight load for each support point depends, among other things, on the height tolerance of the foundation. The weight loads must be determined on a project-specific basis.

It is recommended that the support points each be designed for 5400 kg.

### 5.3.4.7 Mounting options

#### Mounting option with pile foundations

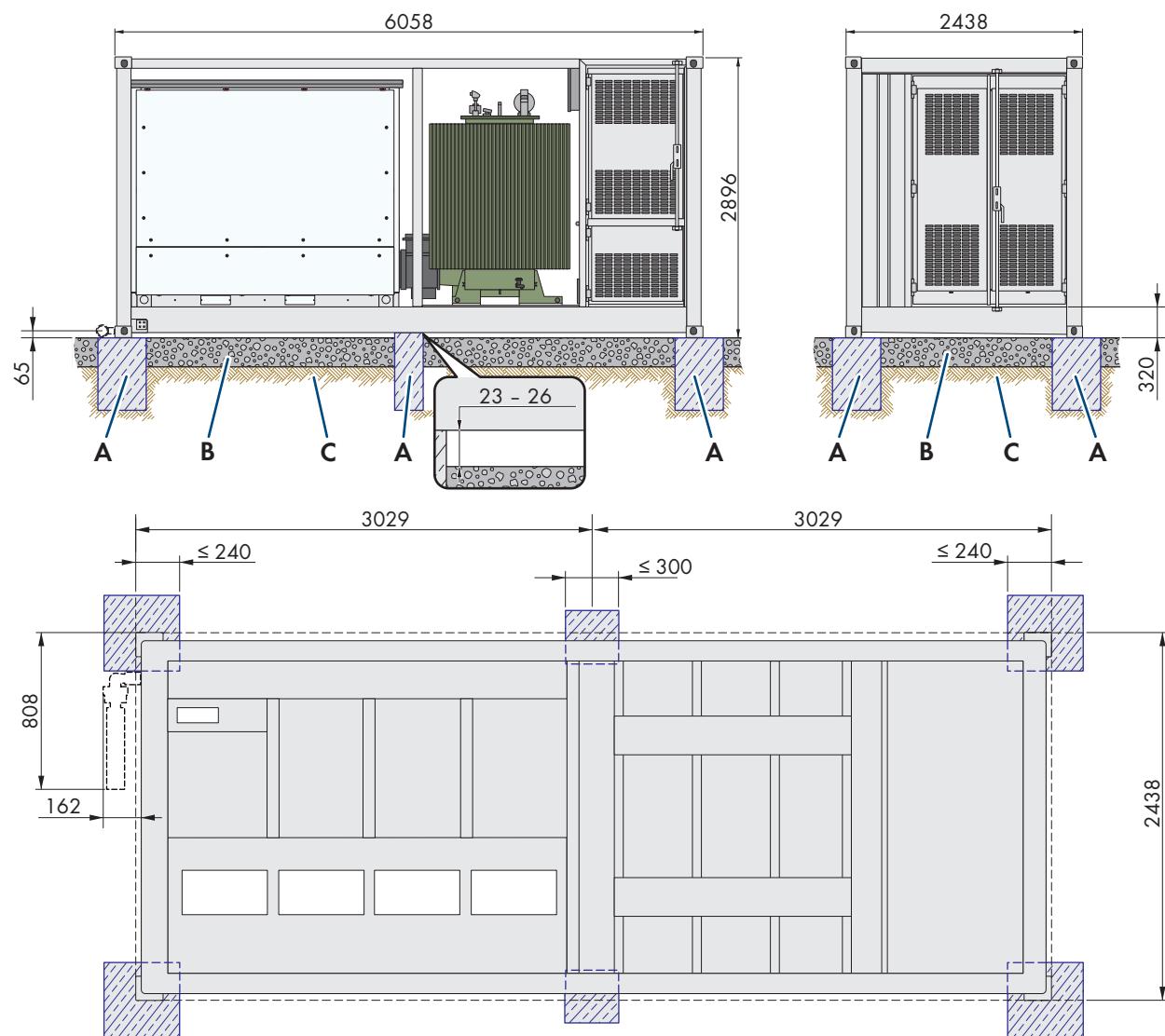


Figure 19: Mounting option with pile foundations (Dimensions in mm) (example)

Position	Designation
A	Pile foundations
B	Pea gravel ground
C	Solid ground, e.g., gravel

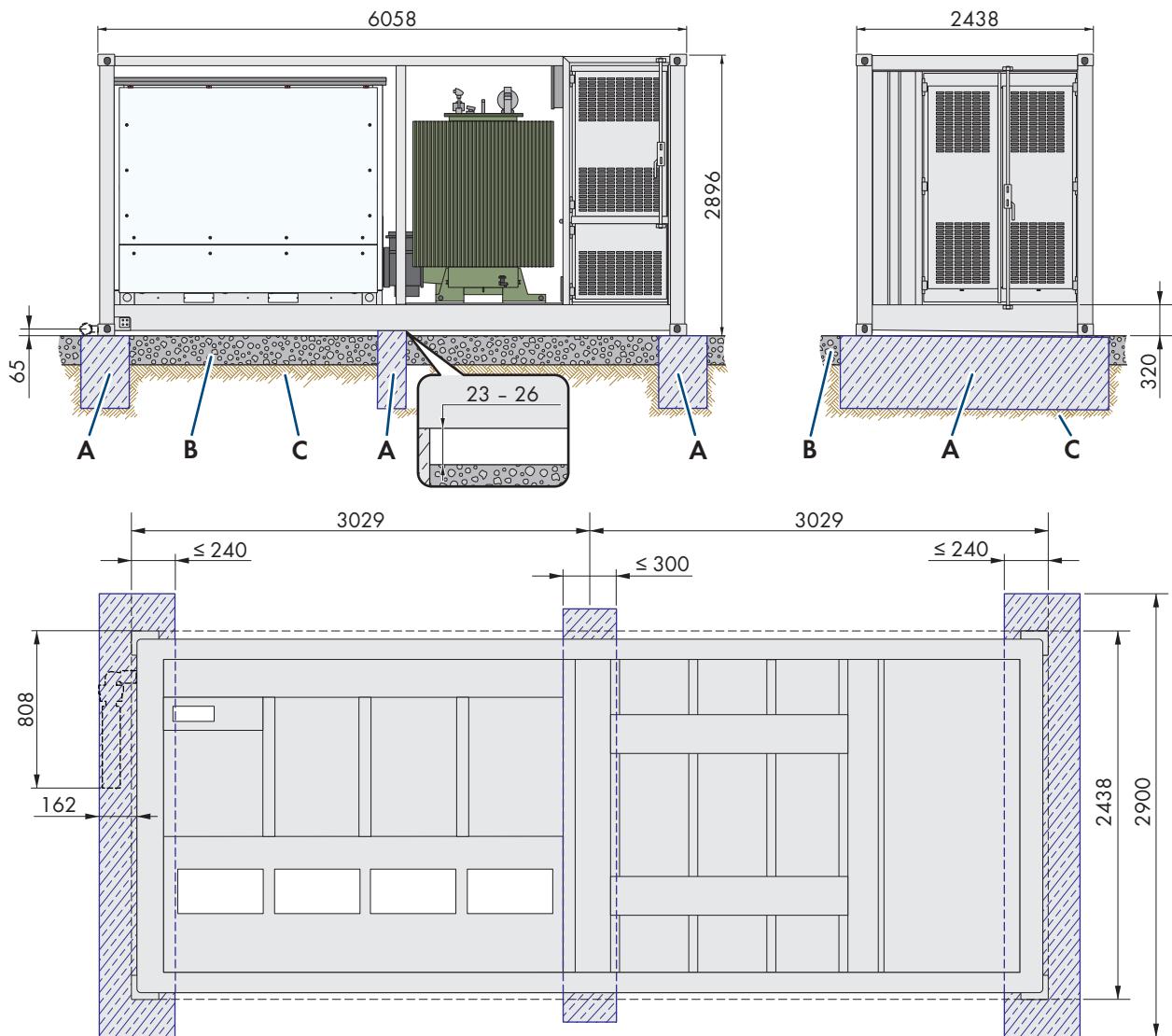
**Mounting option with strip foundations**

Figure 20: Mounting option with strip foundations (Dimensions in mm) (example)

Position	Designation
A	Strip foundations
B	Pea gravel ground
C	Solid ground, e.g., gravel

### 5.3.4.8 Oil spill containment

Depending on the order option, an oil spill containment is integrated into the floor and the station container substructure of the MV Power Station container.

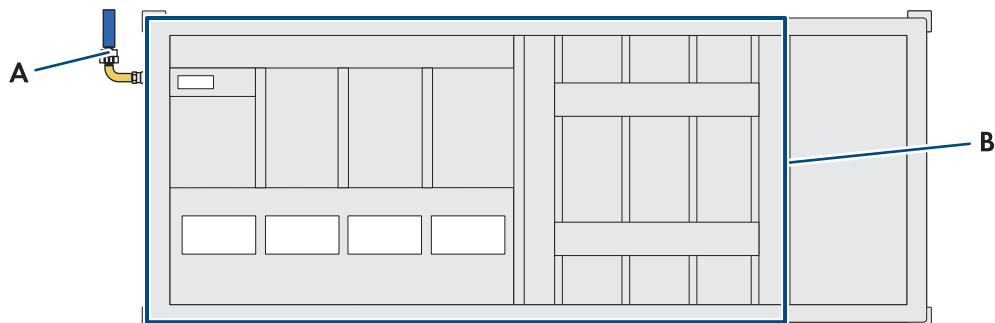


Figure 21: Position of the oil spill containment

Position	Designation	Explanation
A	Oil filter	Order option "Oil Containment"
B	Integrated oil spill containment	Order option "Oil Containment"

### 5.3.5 Overview of Openings in the Base Plate of the MV Power Station

The MV Power Station is fitted with base plates through which the cables are inserted. The cables should be protected between the foundation and the MV Power Station. Cable protection measures are customer responsibility.

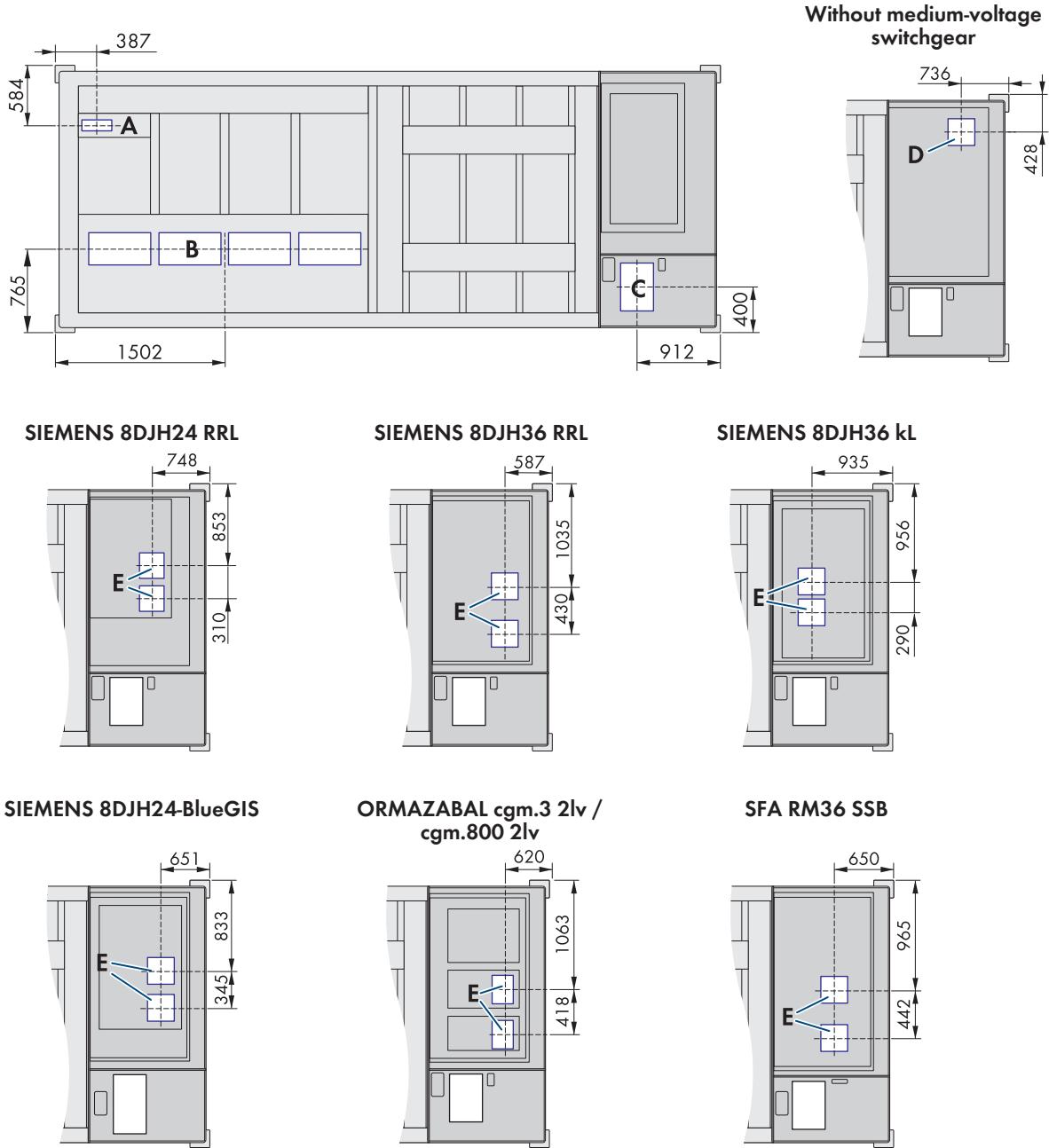


Figure 22: Positions of the openings for cable entry (Dimensions in mm)

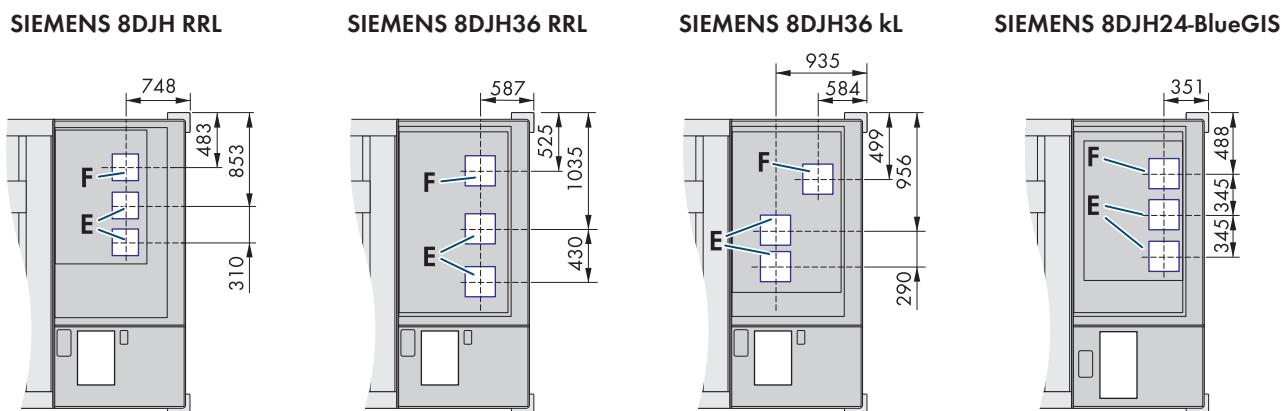


Figure 23: Positions of the openings for cable entry with order option "1 MVSG for 2 MVT" (Dimensions in mm)

Position	Designation	Recommended dimensions Width x depth
A	Opening underneath the inverter for insertion of the cables for communication, control, and monitoring  With the order option "Cable Entry Kit", the opening is fitted with 2 sliding panels.	210 mm x 95 mm
B	Opening underneath the inverter for insertion of the DC cables  With the order option "Cable Entry Kit", the opening is fitted with 4 sliding panels.	Left: 559 mm x 386 mm Center: 575 mm x 386 mm Right: 543 mm x 386 mm
C	Opening for insertion of the communication and connection cables in the low-voltage room, of the tracker motors as well as the supply voltage of the DC/DC converters  With the order option "Cable Entry Kit," the opening is fitted with 1 sliding panel.	300 mm x 430 mm
D	Opening for insertion of AC cables without medium-voltage switchgear  With the order option "Cable Entry Kit", the openings are fitted with cable support sleeves.	255 mm x 255 mm
E	Openings underneath the MV switchgear for insertion of the AC cables  With the order option "Cable Entry Kit", the openings are fitted with cable support sleeves.	255 mm x 255 mm
F	Openings underneath the MV switchgear for insertion of the AC cables with order option "1 MVSG for 2 MVT"  With the order option "Cable Entry Kit", the openings are fitted with cable support sleeves.	255 mm x 255 mm

## 5.4 Transport by truck or ship

The dimensions of the MV Power Station correspond to those of an ISO container (20-foot container). It can be transported by truck or ship. Country-specific regulations must be complied with regarding transportation. Transport by railroad is not permitted.

Transport and unloading may cause damage to the surface and coatings. Minor damage to the paint does not impair the function of the MV Power Station. However, any damage must be remedied by the customer using the spare paint described in the manual within 3 weeks after arrival at the construction site (or being placed in storage) at the latest. More significant damage to the paint, deep scratches, bulges, and holes must be documented using photos. These photos must be returned to the project manager at SMA together with the signed transport checklist. Note that the functionality of the doors can only be checked once the MV Power Station has been finally positioned and aligned.

## 5.5 Requirements for Transport Routes and Means of Transport

### **i Requirements for transport routes and means of transport**

The product complies with the requirements of 2M4 in accordance with IEC 60721-3-2: 2018, with the exception of the free-fall requirements as well as rail transport. The transport routes and means of transport must be such that they comply with the requirements described in the standard.

- The access road must be accessible for servicing during the entire service life of the product.
- The maximum permissible gradient of the access road is 10%.
- During unloading, a distance of at least 2 m to neighboring obstacles must be observed.
- The access roads and the unloading site must be designed to accommodate the length, width, height, total weight and curve radius of the truck.
- Transport must be carried out by truck with air-sprung chassis (also for intermediate transports such as in port facilities).
- In order to avoid hard impacts during transport by truck, the driving speed must be adapted to the road conditions.
- The unloading site for the crane and truck must be firm, dry and horizontal.
- The MV Power Station must always be lowered carefully when loading and unloading. Free fall is not permitted.
- The external temperature during transport must be greater than -25°C.
- There must be no obstacles above the unloading site (e.g., live overhead power lines).

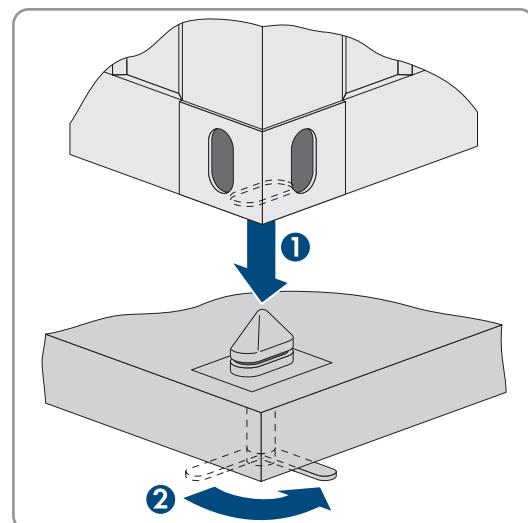
## 5.6 Transport lock

For transportation by truck or ship, the product must be secured at least at all 4 lower corner castings. This can be done by various methods, depending on the fastening system of the means of transportation. The most common methods are described below.

### Twistlock

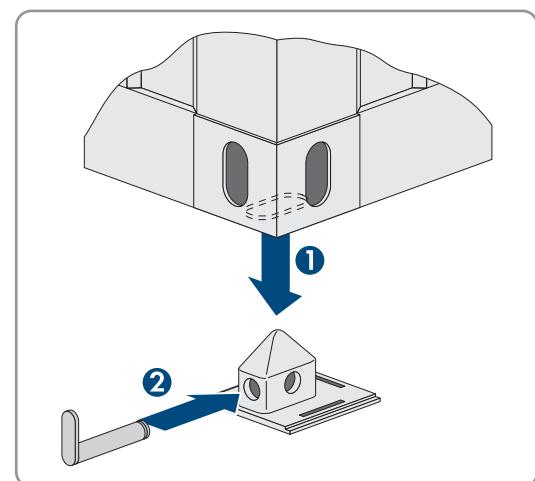
The product is set down on the locking mechanisms. By turning the twistlock, an interlocking is made.

### Pinlock



### Pinlock

The product is set down on the locking mechanisms. Any slippage of the load is prevented by inserting the pinlock.



## 5.7 Center of gravity

The center of gravity of the product is not in the middle. Take this into consideration during transport of the product. The center of gravity depends on the order option.

The center of gravity is marked on the product.



Figure 24: Center of gravity symbol

## 5.8 Procedure for transport and installation

This section describes the procedure for planning and carrying out the transport and installation of the MV Power Station. It provides an overview of the steps, which must be performed in the prescribed sequence.

Procedure	See
1. Determine the installation location, taking all requirements into account.	Section 5.3, page 31
2. Make sure that the requirements for the means of transport and access routes are met.	Section 5.5, page 40
3. Prepare the foundation at the mounting location in accordance with the requirements.	Section 5.3.4.1, page 33
4. After the MV Power Station has arrived at the construction site: complete the transport checklist and send it to the SMA project manager.	-
5. Transport the MV Power Station to the mounting location or storage location.	Section 5.9, page 42
6. For the order option "Sea Freight": remove foil.	Section 5.11, page 44
7. Optional: storage	Section 5.10, page 43

Procedure	See
8. Mounting the MV Power Station	Section 5.13, page 44
9. For the order option "Earthquake and Storm Package": provide additional protection for the MV Power Station.	Section 5.14, page 45

## 5.9 Transporting the Station Using a Crane

### ⚠ WARNING

#### Danger of crushing if raised or suspended loads tip over, fall or sway

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

- Follow all national transportation standards and regulations.
- Before each transport, inspect the product for rust and visible deformations. If necessary, take safety measures.
- Never allow anyone to walk or stand under a suspended load at any time.
- Always transport the load as close to the ground as possible.
- Use all suspension points for transportation.
- Use the tie-down and crane points provided for transportation.
- Do not lift at damaged load-bearing parts.
- Avoid fast or jerky movements during transport.
- Always maintain an adequate safety distance during transport.
- Note the center of gravity of the product during transport.
- All means of transport and auxiliary equipment used must be designed for the weight of the product.
- Wear suitable personal protective equipment for all work on the product.

### NOTICE

#### Damage to the product due to inappropriate transport

Lifting using chain slings on the upper corner castings can lead to damage to the product.

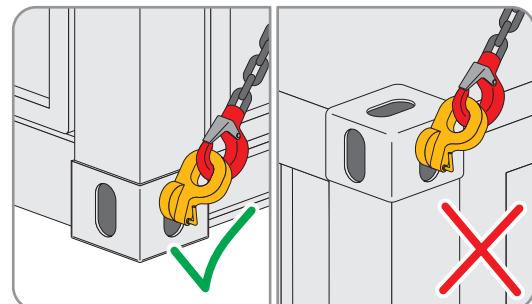
- Attach the lifting lugs to the lower corner castings only.
- Work may only be carried out in accordance with this document.

#### Requirements:

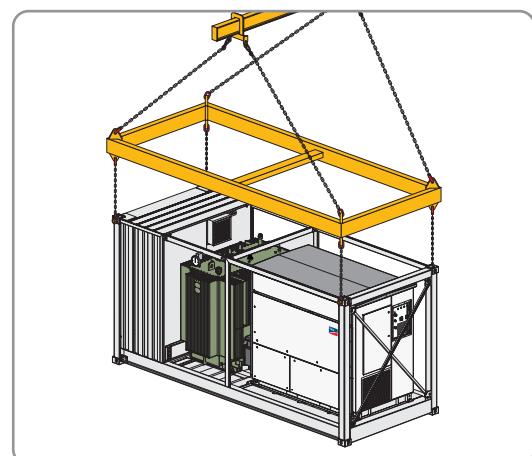
- The crane and lifting gear must be suitable for the weight.
- The lifting gear must be properly connected to the crane.
- The factory-fitted transport lock on the devices of the MV Power Station must be in place.
- All doors of the MV Power Station must be closed.

**Procedure:**

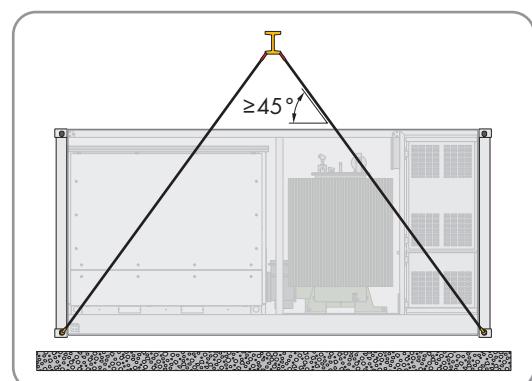
1. If the MV Power Station is to be transported by the lower corner castings, transport the MV Power Station with container cross beam and chain slings. To do so, attach the chain slings to the 4 lower corner castings on the MV Power Station with lifting lugs and protect the MV Power Station enclosure from mechanical damage caused by the hoist. If required, the lifting lugs can be ordered from SMA (material number: 104672-00.01).



2. For the "Sea Freight" order option: If the MV Power Station is to be transported by the upper corner castings, use a hoist frame to attach the chain slings to the upper corner castings. Make sure that the corners of the lifting gear frame are exactly above the corner castings of the station. This avoids horizontal forces on the station frame.



3. Ensure that the lifting gear is attached correctly.
4. Slowly raise the MV Power Station and check if the hoist is taut evenly.



5. If the MV Power Station is not level when raised, lower it back down to the ground.
6. Make sure that the hoist is attached so that the MV Power Station will be lifted level. If necessary extend the chains of the hoist with shackles, so that the MV Power Station is in a horizontal position.
7. Raise the MV Power Station slightly.
8. Transport the MV Power Station to its final position as close to the ground as possible.
9. Set the MV Power Station down. While doing so, make sure to protect the MV Power Station from vibrations to prevent damages to the station frame. The support surface must be suitable for the weight of the MV Power Station in accordance with the requirements.

## 5.10 Requirements for Storage

If you need to store the product prior to final installation, note the following points:

- Do not place the MV Power Station on an unstable, uneven surface.
- The humidity at the storage location is within the thresholds and the environment is free of sand and dust.
- Once the MV Power Station has been set down on the surface, do not attempt to adjust its position by pulling or pushing.

- For the order option "Sea Freight", the foil must be removed.
- Prior to storage, ensure that the doors of the MV Power Station are tightly closed.

#### **i Storage more than 18 months**

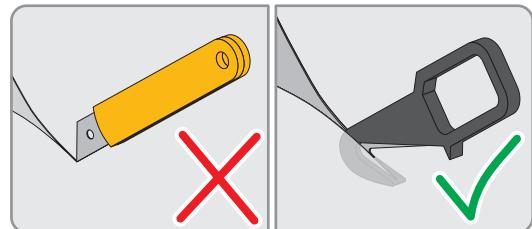
If the product is stored for more than 18 months, measures other than those described here must be taken. You can get the required information from SMA Solar Technology AG.

### 5.11 Removing the Film Following Transport by Ship

For the order option "Sea Freight", the MV Power Station is covered with a protective foil. This foil must be removed within 3 days after arrival at the mounting location and prior to final installation.

#### Procedure:

1. Remove the foil from the station container. Do not use any sharp objects to avoid damage to paintwork.



2. Dispose foil (material: polyethylene C2H4) in accordance with the local disposal regulations.
3. Wash the station with clear water. This will inhibit the corrosion process.

### 5.12 Removing the Film Following Transport by Truck

There is film covering the ventilation grilles of the medium-voltage cabinet and low-voltage cabinet with a "Road Transport" order.

#### Procedure:

- Remove the film covering the ventilation grilles of the medium-voltage cabinet and low-voltage cabinet. Remove the adhesive films.

### 5.13 Mounting the MV Power Station

The MV Power Station can be mounted and attached on point or strip foundations. The customer is responsible for mounting and anchoring the MV Power Station on the support surface. Which foundation option is selected is at the discretion of the customer.

#### Requirements:

- The pea gravel ground and foundation must be prepared.
- The requirements for the foundation must be complied with.
- Empty conduits for the cables must be laid under the support surface.

#### **i Avoid damaging the cables when installing the MV Power Station**

To avoid damaging the cables during installation, the cables may only be fed through the empty conduits once the MV Power Station has been set in place. The use of pull wires is recommended.

#### Procedure:

1. Transport the MV Power Station to the mounting location.
2. Set the MV Power Station down on the support surface. While doing so, make sure to protect the MV Power Station from vibrations to prevent damages to the station frame. Use the base plates to compensate any unevenness. The unevenness must be less than 0.5%.
3. Ensure that the height difference of  $45\text{ mm} \pm 1.5\text{ mm}$  below the medium-voltage transformer is evened out. This prevents the station frame from bending.

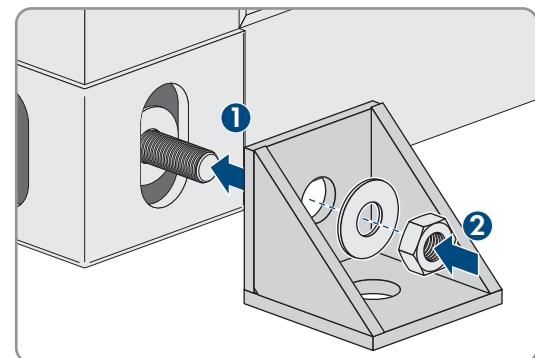
## 5.14 Provide protection for the MV Power Station with order option "Earthquake and Storm Package"

### Requirements:

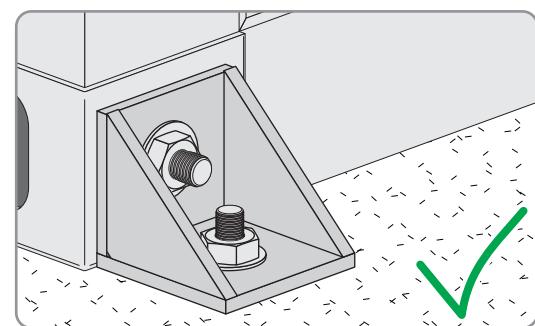
- The MV Power Station has been mounted.
- An extra area of 130 mm x 135 mm for the corners of the station container is provided on the foundation.

### Procedure:

1. Attach the side twistlocks at the 4 corners of station container.  
Take the 4 kg weight of the side twistlocks into account. Use the new supplied M24 x 90 screws, M24 flat nut and anchor plate for this.



2. Drill holes for the screw anchors (diameter of side twistlock: 32 mm).
3. Attach the side twistlocks to the foundation with bolts.



4. Install the Hurricane Kit as stated in the documentation.

### Also see:

- Mounting the MV Power Station ⇒ page 44

## 6 Installation

### 6.1 Safety during Installation

#### ⚠ 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.
- Disconnect the product from the power transmission path and from the control path if no voltage is required for working on the product and the connected components.
- After switching off the inverter, wait at least 25 minutes before opening the inverter to allow the capacitors to discharge completely.
- Wear suitable personal protective equipment of the corresponding hazard risk category for all work when the power transmission path is connected. The hazard risk categories of the various areas of the product are different.
- Always perform all work in accordance with the locally applicable standards, directives and laws.
- Observe all safety information on the product and in the documentation.
- The product must not be operated with open covers or doors.
- Cover or isolate all live components.

#### ⚠ DANGER

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

When exposed to light, the PV modules generate high DC voltage which is present in the DC cables. Touching live DC 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.
- Wear suitable personal protective equipment of the corresponding hazard risk category for all work. The hazard risk categories of the various areas of the product are different. For further information, contact us.

#### ⚠ DANGER

##### **Danger to life by electric arc when there is a reverse-poled connection of the DC cables**

A reverse-poled connection of the DC cables can cause an electric arc. Electric arcs can result in death or serious injury.

- Ensure that the polarity of the DC cables is correct prior to connection.

**⚠ DANGER****Danger to life due to electric shock in case of a ground fault**

If there is a ground fault, components that are supposedly grounded may in fact be live. Touching live parts will result in death or serious injury due to electric shock.

- Before working on the system, ensure that no ground fault is present.
- Wear suitable personal protective equipment of the corresponding hazard risk category for all work when the power transmission path is connected. The hazard risk categories of the various areas of the product are different.

**⚠ WARNING****Danger to life due to fire when failing to observe tightening torque specifications on live bolted connections**

Failure to follow the specified tightening torques reduces the ampacity of live bolted connections and the contact resistances increase. This can cause components to overheat and catch fire. Death or lethal injuries can result.

- Ensure that live bolted connections are always tightened with the exact tightening torque specified in this document.
- Ensure that the terminal lugs used do not exceed the maximum material thickness. In this way, you avoid that the screws supplied are too short for the installation and that the required torque cannot build up.
- Only use suitable tools when working on the device.
- Avoid repeated tightening of live bolted connections as this may result in inadmissibly high tightening torques.

**⚠ WARNING****Danger to life due to arc fault caused by damaged connection busbars**

If excessive force is exerted while connecting the cables, the connection busbars can be bent or damaged. This will lead to reduced clearances and creepage distances. Reduced clearances and creepage distances can lead to arc faults.

- Cut the cables to the correct length and prepare them for connection.
- Position the terminal lugs on the connection busbars ensuring a large contact surface.
- Tighten to the specified torque.

**⚠ WARNING****Danger to life due to electric arc if there are tools inside the product**

When reconnecting and in operation, an electric arc can arise if conductive foreign parts (e.g., tools) are located in the product and establishes a conductive connection between live components. This can result in death or serious injury.

- Before commissioning or reconnection, verify that no tools are inside the product.

**⚠ CAUTION****Risk of injury when using unsuitable tools**

Using unsuitable tools can result in injuries.

- Ensure that the tools are suitable for the work to be carried out.
- Wear personal protective equipment for all work on the product.

**NOTICE****Damage to the PV array due to faulty connection of the DC cables**

When installing a one-pole fused PV array, a short circuit can occur by connecting ungrounded DC cables to the fused DC input. The PV array can be damaged as a result.

- During the installation, ensure that the ungrounded DC cables are connected to the fused connection lugs.
- During the installation, ensure that the grounded DC cables are connected to the busbar or that busbars are inserted in the fuse holders.

**NOTICE****Damage to the system due to sand, dust and moisture ingress**

Sand, dust and moisture penetration can damage the products of the system and impair its functionality.

- Only open the product if the humidity is within the thresholds and the environment is free of sand and dust.
- Do not open the product during a dust storm or precipitation.
- In case of interruption of work or after finishing work, mount all enclosure parts and close and lock all doors.
- Only operate the product when it is closed.
- Store the closed product in a dry and covered location. Observe storage conditions.
- The temperature at the storage location must be in the specified range. The temperature range is:  $-40^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$ . Depending on the type of oil of the medium-voltage transformer, the minimum temperature may be higher.

**NOTICE****Damage to electronic components due to electrostatic discharge**

Electrostatic discharge can damage or destroy electronic components.

- Observe the ESD safety regulations when working on the product.
- Wear suitable personal protective equipment for all work on the product.
- Discharge electrostatic charge by touching grounded enclosure parts or other grounded elements. Only then is it safe to touch electronic components.

**NOTICE****Damage to optical fibers due to too tight bend radii**

Excessive bending or kinking will drop below of the permissible bend radii. When dropping below the permissible bend radii, the optical fibers may be damaged.

- Observe the minimum permissible bend radii of the optical fibers.

**NOTICE****Damage to the product due to non-removal of transport lock**

The product is provided with a special security lock for transport to protect it from moisture. Non-removal of the transport lock can cause condensation and overheating during operation.

- Prior to installation work, ensure that all transport locks on the product are removed.

## 6.2 Preparatory Work

### 6.2.1 Removing the Supporting Struts for Order Option "Sea Freight"

For the order option "Sea Freight", supporting struts protect the MV Power Station from contact with the inverter and the medium-voltage compartment. The supporting struts must be removed after installation. All transport locks must be kept for a potential return transport.

#### ⚠ CAUTION

##### Risk of injury when lifting the supporting struts or if they are dropped

When removing the supporting struts, there is a risk of injury if the supporting struts are lifted incorrectly or dropped. Weight of each supporting strut: maximum 15 kg.

- Assign at least two people for the removal of the supporting struts.
- Secure the supporting struts against falling before removing the screws.
- Wear personal protective equipment when removing the supporting struts.

#### NOTICE

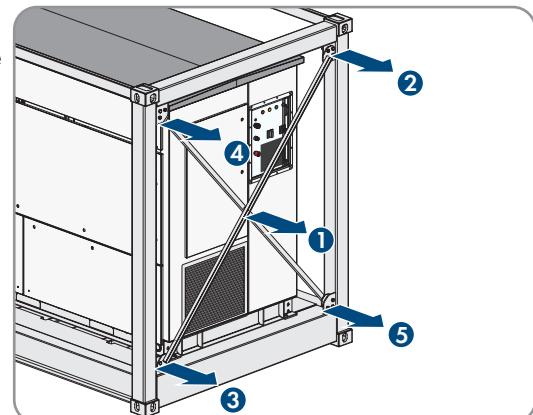
##### Damage to the product due to non-removal of transport lock

The product is provided with a special security lock for transport to protect it from moisture. Non-removal of the transport lock can cause condensation and overheating during operation.

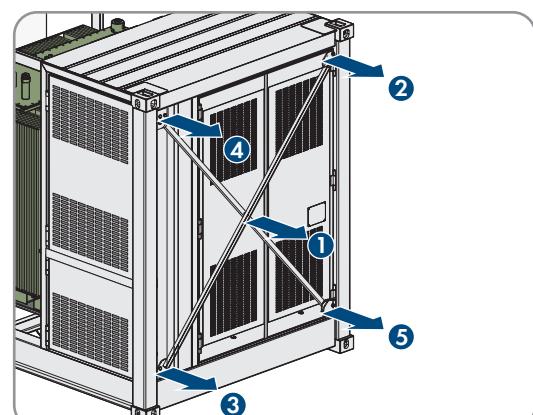
- Ensure that all adhesive foils are removed from doors and openings.

#### Procedure:

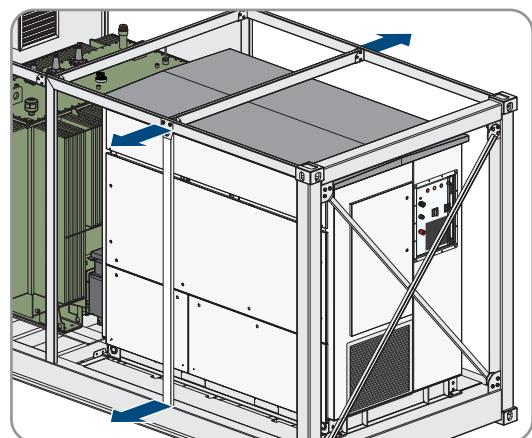
1. Remove the screws of the supporting struts (M22 external hexagon screw) in front of the inverter. When doing so, follow the sequence shown.



2. Remove the screws (M22 external hexagon screw) of the supporting struts and at least 16 screws of the right bracket corner (M16 hex socket) in front of the medium-voltage cabinet. When doing so, follow the sequence shown.



3. Remove the 6 upper screws and the 3 screws (M12 hex socket) for each side supporting strut in front of the inverter.



4. To protect the MV Power Station against corrosion: screw all the bolts into the remaining mounting holes again and grease the holes. If screws are missing, they must be replaced.
5. Remove all adhesive foils from doors and openings.

### 6.2.2 Loosening the Tie-Down Straps

#### **⚠ CAUTION**

##### **Risk of injury when releasing the tie-down straps**

Since there is tension on the tie-down straps, there is a risk of whiplash when they are released. This can result in cuts or crushing of limbs.

- Ensure that the tie-down straps cannot whiplash.
- Observe all manufacturer instructions on handling the tie-down straps.

##### **Procedure:**

1. Loosen and remove all tie-down straps from the frame.
2. Loosen and remove the 4 tie-down straps from the medium-voltage transformer.

### 6.2.3 Transport lock on the medium-voltage transformer

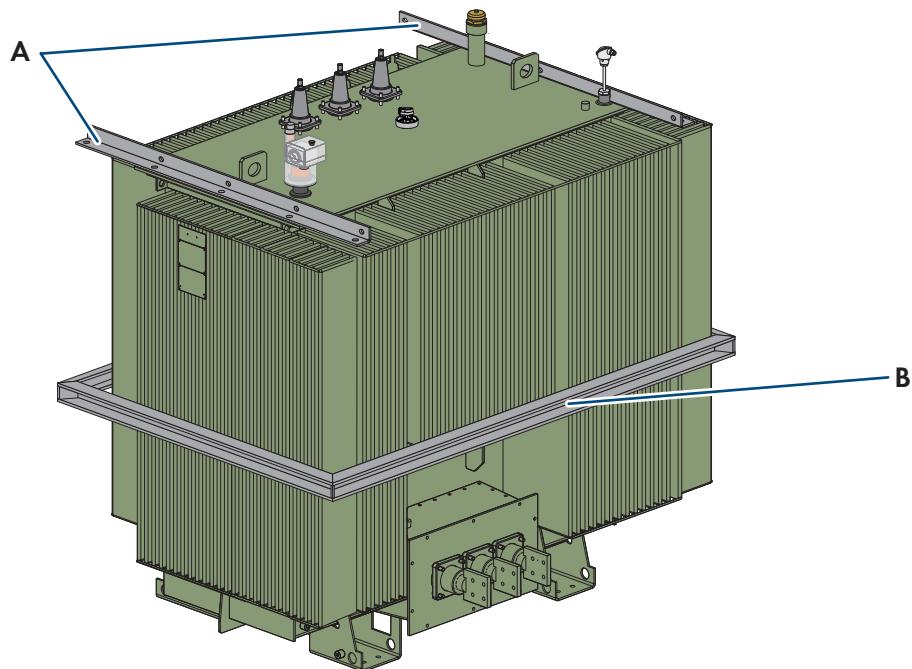


Figure 25: Position of the transport locks on the medium-voltage transformer

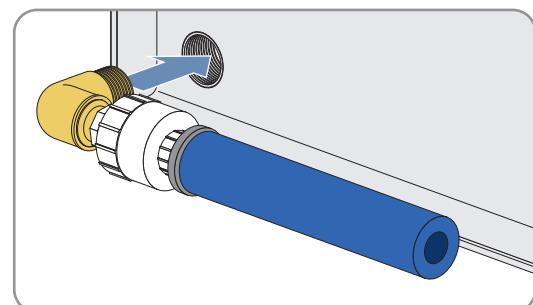
Position	Designation
A	L profile supports
B	Fin protection (depending on the supplier of the medium-voltage transformer)

### 6.2.4 Removing the transport locks on the medium-voltage transformer

1. At least 2 people are necessary to remove the frame surrounding the fins on the medium-voltage transformer. To do this, support the frame firmly and slowly loosen the bolts on the corners.
2. Remove the individual frame supports. Do not damage the paint when doing this.
3. Remove the 2 L-profile supports on the medium-voltage transformer. To do this, loosen the bolts and remove the supports.
4. To protect the medium-voltage transformer against corrosion: screw all the bolts into the remaining mounting holes again and grease the holes. If screws are missing, they must be replaced.
5. Store one set of the transport locks for service actions.
6. If necessary, repair any paint damage according to the instructions.

### 6.2.5 Mounting the oil filter

1. Unscrew the screw filler plugs from the oil drain of the station.
2. Screw the pre-filter together with the oil filter and mount it on the MV Power Station using the reducer, extension, and elbow. Use Teflon tape for sealing.



## 6.2.6 Preparing the Cable Entry

Cable entries are fitted underneath the inverter and the medium-voltage switchgear and in the low-voltage cabinet.

### Additional tools:

- Drill
- Cable glands

### Procedure:

1. Drill holes for the cables in the covering plate in accordance with the cable cross-section.
2. Install cable glands in the covering plate holes.
3. Mount the covering plate onto the station container.

## 6.3 Cable Requirements Overview

Position	Torque	Cable cross-section	Cable typ	Rated temperature
Terminal block for tracker motors	-	2.5 mm <sup>2</sup> to 35 mm <sup>2</sup>	Copper or aluminum	90 °C
Terminal for the DC-DC converters	-	0.5 mm <sup>2</sup> to 10 mm <sup>2</sup>	Copper or aluminum	90 °C
Medium-voltage switchgear <sup>6)</sup>	< 80 Nm	≤ 630 mm <sup>2</sup> <sup>7)</sup>	Copper or aluminum	90 °C
Terminal for grounding	80 Nm	≥ 185 mm <sup>2</sup> <sup>8)</sup> ≥ 300 mm <sup>2</sup> <sup>8)</sup>	Copper Aluminum	<sup>9)</sup>
Terminal for the DC cables	60 Nm	≤ 400 mm <sup>2</sup>	Copper or aluminum	80 °C
Connection to the connection box for the medium-voltage transformer	see documentation of the connector manufacturer	≤ 630 mm <sup>2</sup> <sup>7)</sup>	Copper or aluminum	90 °C

## 6.4 Requirements for the Cable Connection with Terminal Lugs

- All terminal lugs used must be suitable for temperatures of up to 90 °C and must be in accordance with the national standards and directives.
- The maximum material thickness of the terminal lugs must be observed:
  - When connecting with 1 terminal lug: 22 mm
  - When connecting with 2 terminal lugs: 11.25 mm
- The width of the terminal lugs must exceed the washer diameter. This will ensure that the specified tightening torques are effective over the whole surface.
- Use only tin-plated terminal lugs made from copper or aluminum.
- The specified tightening torques must always be complied with.

<sup>6)</sup> Dependent on the connection type and the cables used

<sup>7)</sup> Observe the clamping range of the strain-relief clamps!

<sup>8)</sup> Dependent on grounding concept

<sup>9)</sup> Dependent on ambient conditions

## 6.5 Assembly of the Bolted Connection with Single-hole Terminal Lugs

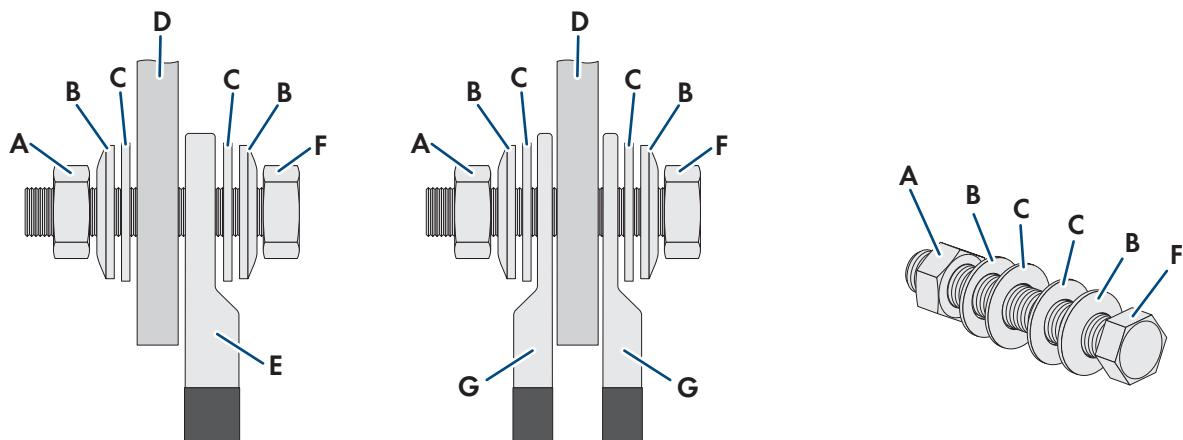


Figure 26: Assembly of the bolted connection with single-hole terminal lugs

Position	Designation
A	Nut
B	Spring washer
C	Fender washer
D	Connection busbar
E	One-hole terminal lug, maximum material thickness: 22 mm
F	Bolt
G	One-hole terminal lug, maximum material thickness: 11.25 mm

## 6.6 Assembly of the Bolted Connection with Two-hole Terminal lugs

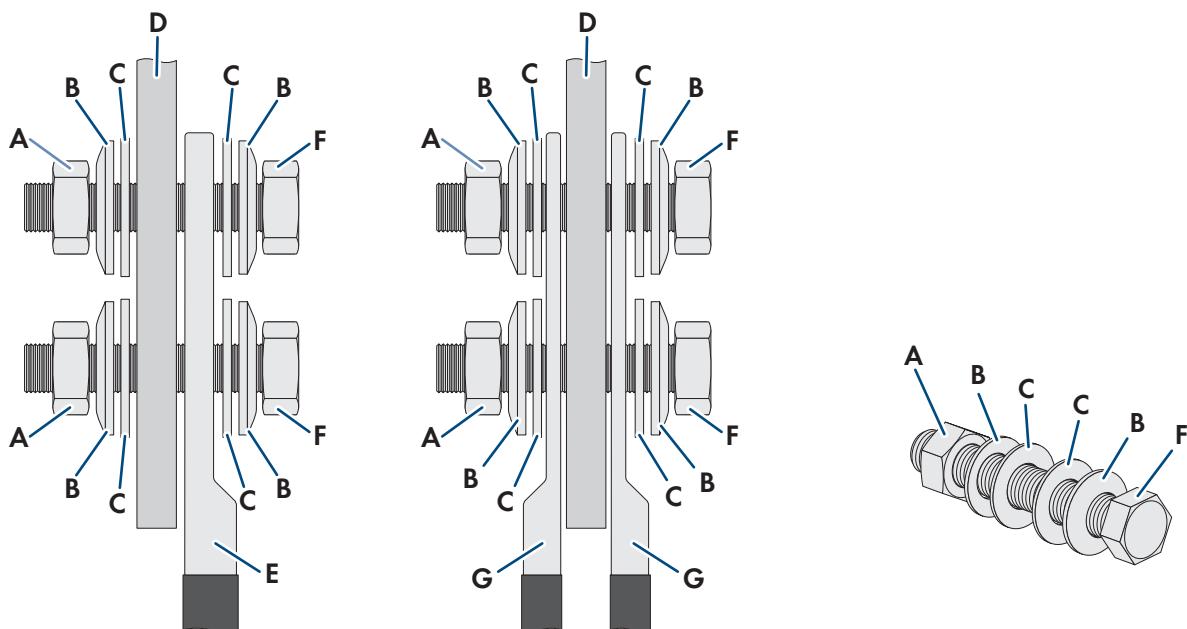


Figure 27: Assembly of the bolted connection with two-hole terminal lugs

Position	Designation
A	Nut
B	Spring washer
C	Fender washer
D	Connection busbar
E	Two-hole terminal lug, maximum material thickness: 22 mm
F	Bolt
G	Two-hole terminal lug, maximum material thickness: 11.25 mm, maximum material width: 48 mm

## 6.7 Grounding

### 6.7.1 Grounding Concept

In accordance with the latest technology, the inverters are discharged to ground. As a result, leakage currents to ground occur which must be taken into account when planning the system. The magnitude and distribution of such leakage currents is influenced by the grounding concept of all devices in the system. It is recommended that optical fiber technology is used for the transmission of signals, for example, when using cameras and monitoring equipment. This will counteract possible interference sources.

#### **i Double grounding of the MV Power Station**

We recommend that the grounding concept provides for double grounding of the MV Power Station.

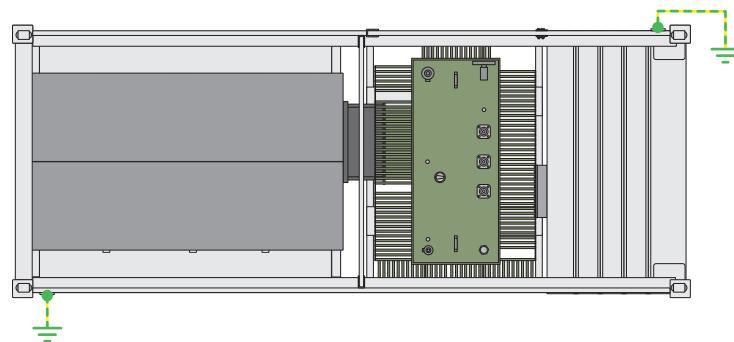


Figure 28: Grounding concept (example)

### 6.7.2 Design of the bolted connections for grounding

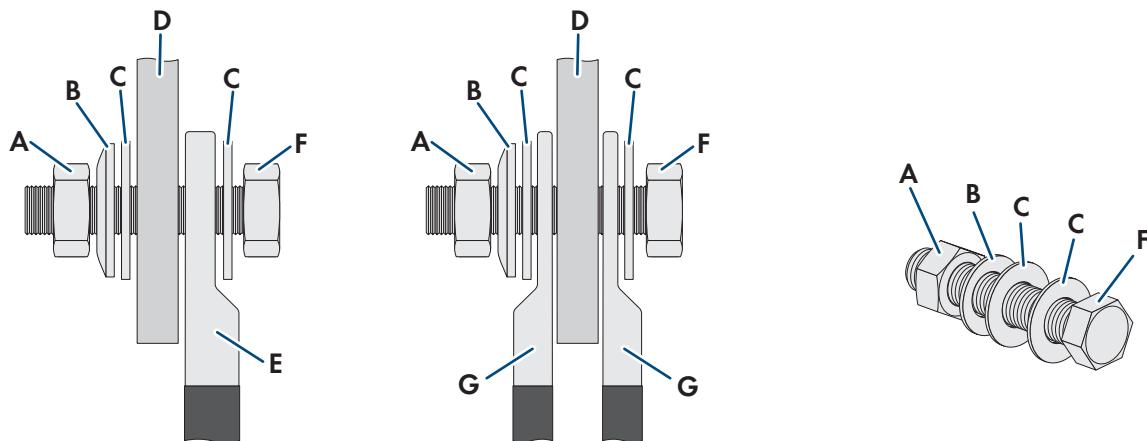


Figure 29: Assembly of the bolted connection

Position	Designation
A	Nut
B	Spring washer
C	Fender washer
D	Grounding terminal of MV Power Station
E	One-hole terminal lug, maximum material thickness: 22 mm
F	Bolt
G	One-hole terminal lug, maximum material thickness: 11.25 mm

### 6.7.3 Overview of the grounding connections

8 ground connections with 4 connection options each are available for the connection of the grounding. Due to reasons of electromagnetic compatibility, it is recommended to connect all grounding points.

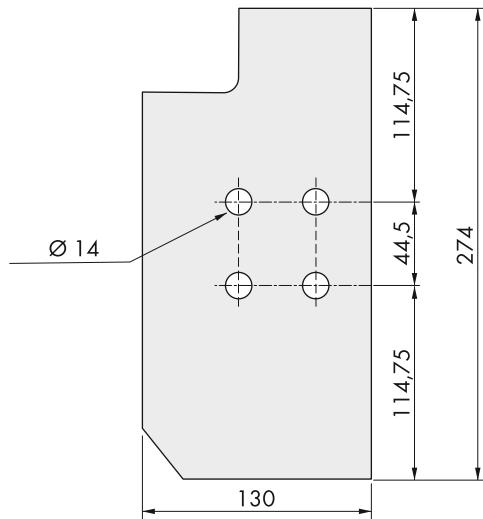


Figure 30: Dimensions of the grounding connections (Dimensions in mm)

### 6.7.4 Cable Requirement for Grounding

- All cables must be suitable for temperatures of up 72 °C and must be in accordance with the national standards and directives.
- All cables must be suitable for outdoor applications. They must be resistant to solar irradiation and, if necessary, oil.
- Use copper or aluminum cables only.
- The grounding of the system must be designed in accordance with the national standards and directives and is the responsibility of the installer.
- The cable cross-sections of the grounding depend on the installed overcurrent protective device. Calculating the required cross-sections depends on the national standards and directives. The following cable cross-sections are recommended:
  - For copper cable, at least: 185 mm<sup>2</sup>
  - For aluminum cable, at least: 300 mm<sup>2</sup>
- Depending on the design of the equipment, an additional grounding must be planned for a YNd11 / YNy0 transformer.

## 6.7.5 Connection of additional grounding of the YNd11 / YNy0 transformer

### 6.7.5.1 Position of the strain reliefs for the additional grounding

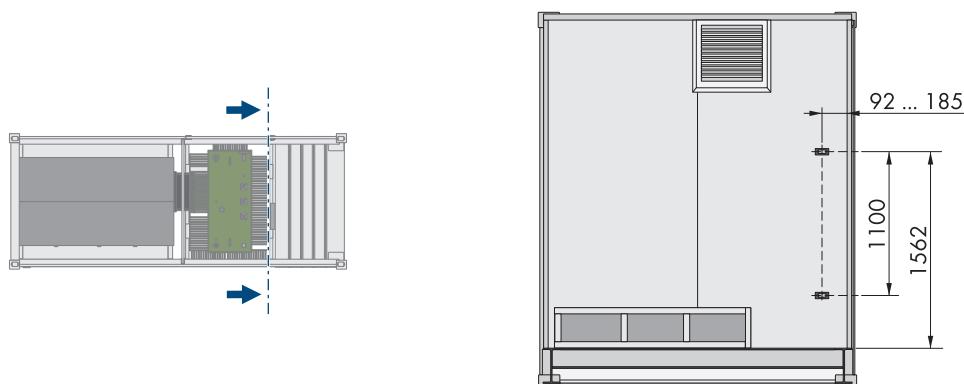


Figure 31: Position of the strain reliefs on the rear side of the medium-voltage compartment (Dimensions in mm)

### 6.7.5.2 Cable requirements for additional grounding

- Cable diameters: 35 mm to 54 mm
- The grounding cable must be suitable for outdoor applications.
- The grounding cable must be connected to the ground electrode and must not be connected to the ground terminal of the MV Power Station.
- The dielectric strength of the grounding cable must be rated in accordance with the utility grid and the grounding type.
- The grounding cable must be rated for the maximum short-circuit current to be expected.
- The MV transformer is equipped with outer cone, type C bushings according to EN50180. Appropriate touch-proof connectors for outdoor use must be used.
- If the medium-voltage transformer is not grounded, a voltage-free cap must be installed on the feed-through.

### 6.7.5.3 YNd11 / YNy0 transformer grounding

The MV Power Station is equipped with a YNd11 or YNy0 transformer depending on the order option. The medium-voltage transformer may additionally be grounded. Cable clamps are available to attach the grounding cable.

For the order option "Splash Guards", "Grids and Rodent Protection", "Grids Special" and "Grids Special and Rodent Prot." there is a gap of 100 mm below the grid door or splash guard for feeding the grounding cables through.

#### Procedure:

1. Connect the grounding cable to the neutral conductor feed-through on the medium-voltage transformer. When doing so, observe the maximum bending radius of 400 mm and the torque (see manufacturer's documentation). Furthermore, the feed-through must be protected against UV radiation.
2. Secure the grounding cable using the cable clamps. When doing so, ensure that no forces are applied to the feed-through.

#### Also see:

- [Cable requirements for additional grounding ⇒ page 57](#)
- [Position of the strain reliefs for the additional grounding ⇒ page 57](#)

## 6.8 DC Connection

Information on the DC connection can be found in the operating manual of the Sunny Central, Sunny Central Storage or Electrolyzer Converter.

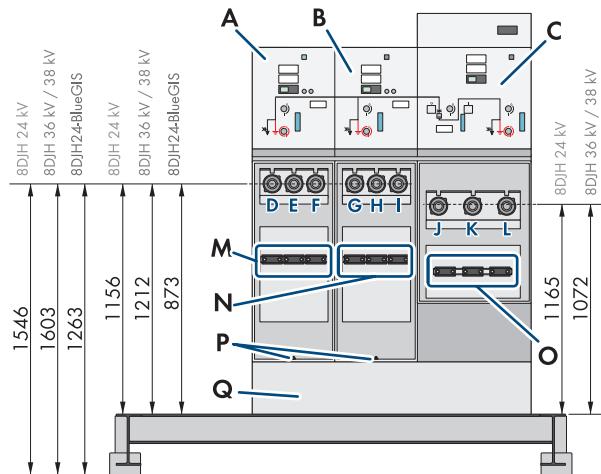
## 6.9 AC Connection

### 6.9.1 Cable Requirements for Medium-Voltage Connections

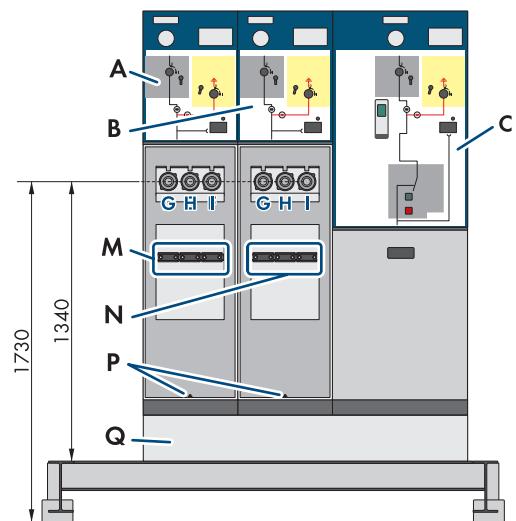
- The cables used must be made of aluminum or copper.
- The cable cross-sections used depend on the nominal currents of the medium-voltage transformer and the layout of the system. They are the responsibility of the customer.
- In the standard version of the MV Power Station, filler plates are intended for the enclosure openings. The required holes must be drilled.
- The holes must be closed with enclosing cable bushings (e.g. rubber grommets) to prevent animals from entering.
- For the cable length, the distance from the bottom of the MV Power Station to the medium voltage connections must be considered. The maximum distance depends on the medium-voltage switchgear used.
- If the strain reliefs of the medium-voltage switchgear are too small or too large, replace and adapt the strain reliefs to the cable diameter.
- Outer-cone angle plugs of type C with 630 A and the required rated voltage must be used. The equipment for the two-core terminal can be provided by SMA Solar Technology AG upon request.
- The connection plugs must be suitable for mounting aluminum or copper cable terminal lugs.
- Follow the manufacturer's instructions when installing the connection plugs.
- The connection plugs and the cables must be mounted without tension or pressure.
- When laying the cables, allow for settling in the floor area. Before connecting the connection plugs, the ground must be compacted.
- Depending on the connector type, the cable cross-section of the line conductor can be as high as 630 mm<sup>2</sup>.
- If three-core cables are used, the insulated conductors must be separated before insertion into the MV Power Station.

## 6.9.2 Overview of the connection area on the medium-voltage switchgear

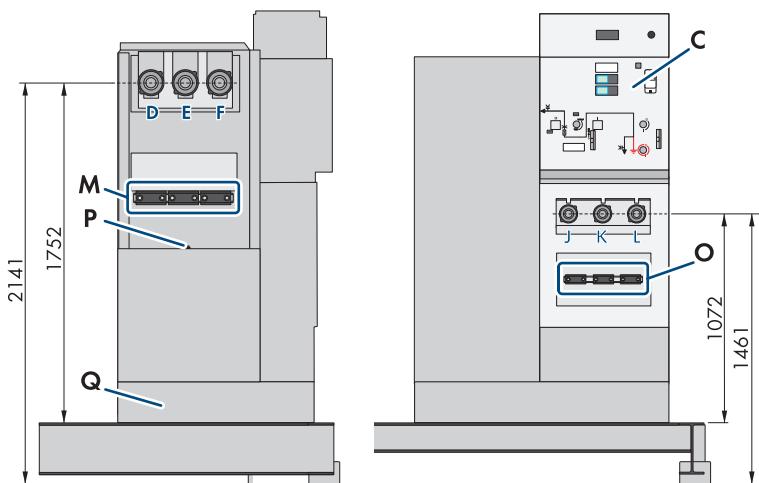
SIEMENS 8DJH / 8DJH36 RRL / 8DJH24-BlueGIS



ORMAZABAL cgm.3 2lv / cgm.800 2lv



SIEMENS 8DJH36 kl (36 kV / 38 kV)



SFA RM36 SSB

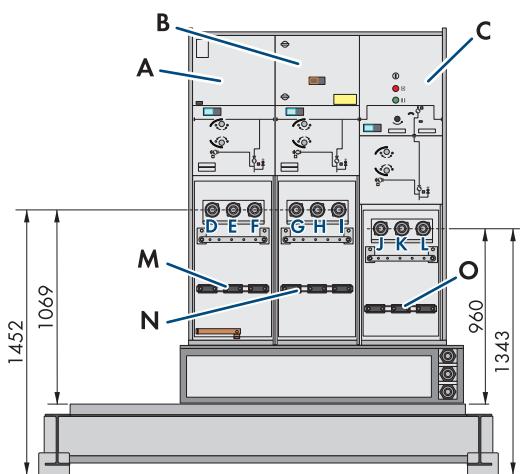


Figure 32: Connection area of medium-voltage switchgear (example) (Dimensions in mm)

Position	Designation	Explanation
A	Cable feeder 1	-
B	Cable feeder 2	-
C	Transformer panel	-
D	Line conductor L1 from cable feeder 1	-
E	Line conductor L2 from cable feeder 1	-
F	Line conductor L3 from cable feeder 1	-
G	Line conductor L1 from cable panel 2	-
H	Line conductor L2 from cable feeder 2	-
I	Line conductor L3 from cable panel 2	-

Position	Designation	Explanation
J	Line conductor L1 from transformer field	-
K	Line conductor L2 from transformer field	-
L	Line conductor L3 from transformer field	-
M	Cable support rail cable feeder 1	3 (6 with kL) strain-relief clamps per cable feeder are mounted on the cable support rail for attaching the cables. The equipment for connection of 2 cables per line conductor can be provided by SMA Solar Technology AG upon request.
N	Cable support rail cable feeder 2	
O	Cable support rail from transformer compartment	With the order option "1 MVSG for 2 MVT"
P	Grounding busbar for connecting AC cable shielding	-
Q	Kick plate	-

Further details are to be found in the circuit diagram.

### 6.9.3 Strain-relief clamps

The following strain-relief clamps are included in the standard scope of delivery of the medium-voltage switchgear:

Medium-voltage switchgear	Number of strain-relief clamps per cable feeder	Size
SIEMENS 8DJH RRL	3	36 mm to 52 mm
SIEMENS 8DJH24 BlueGIS	3	36 mm to 52 mm
SIEMENS 8DJH36 RRL	3	36 mm to 52 mm
SIEMENS 8DJH36 kL	6	36 mm to 52 mm
ORMAZABAL cgm.3 2lv	3	33 mm to 65 mm
ORMAZABAL cgm.800 2lv	3	33 mm to 65 mm
SFA RM36 SSB	3	36 mm to 52 mm

The strain-relief clamps from 36 to 52 mm each contain two 3 mm rubber inserts (only for SIEMENS). This allows single-core cables of 30 mm diameter or more to be used.

### 6.9.4 Installing the AC Connection on the Medium-Voltage Switchgear

#### **i Qualified persons must make medium-voltage connections**

Medium-voltage connections should only be made by a qualified person who is authorized to make medium-voltage connections.

#### **Requirements:**

- The cables must be inserted through the openings in the base plate.

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

- 3 cable connectors per cable panel, type C, rated voltage in accordance with the medium-voltage switchgear (see documentation of medium-voltage switchgear manufacturer)

- For the "1 MVSG for 2 MVT" order option: Connector (TE ELBA-CC-35-612XXX,XXX depending on the cable) for connection to the transformer compartment of the medium-voltage switchgear of another MV Power Station
- For the "1 MVSG for 2 MVT" order option: Connection plug (CELLPACK, CTKS 630 A, 24 kV or 36 kV) for connection to the transformer panel of the medium-voltage switchgear of another MV Power Station

Grid voltage	Pre-installed connection plug	Connection plug to be provided
≤ 21 kV	CELLPACK, CTS 630 A, 24 kV (part number: 355434)	CELLPACK, CTKS 630 A, 24 kV (part number depends on selected cable cross-section)
≥ 22 kV	CELLPACK, CTS 630 A, 36 kV (part number: 355562)	CELLPACK, CTKS 630 A, 36 kV (part number depends on selected cable cross-section)

- When selecting connectors for the medium-voltage switchgear, the depth of the cable compartment must be taken into account:

Manufacturer	Standard	Optional
SIEMENS	300 mm in length	350 mm in length
ORMAZABAL	430 mm in length	-
SFA	417 mm in length	-

#### Procedure:

1. Disassemble the kick plate of the medium-voltage switchgear.
2. For the order option without "Cable Entry Kit": Remove the base plates of the cable entries. Drill holes in the base plates.
3. For the order option with "Cable Entry Kit": Remove the plates of the Cable Entry Kit. For each cable panel, there are 6 rubber bushings for cable diameters from 39 mm to 60 mm.
4. Thread the cables with cable glands or rubber bushings through the holes in the plate. Ensure that the cable glands or rubber bushings cleanly enclose and seal the cables. This prevents animals from entering the product and allows for a proper internal arc pressure.
5. Remove the strain-relief clamps from the cable support rail.
6. Attach the cables to the cable support rail using the strain-relief clamps. Ensure that the cables run straight down, the strain-relief clamps safely enclose the cable and the cable has no play. This helps prevent mechanical strain on the outer cone bushings of the medium-voltage switchgear. Ensure that the AC cable shielding is not mounted in the strain-relief clamp.
7. For the order option "1 MVSG for 2 MVT", pull the pre-installed current transformers for each line conductor over the individual cables and the summation current transformer around all cables. When doing this, route the grounded shield through the current transformers.
8. Connect the cables to the medium-voltage switchgear (see documentation for the medium-voltage switchgear and cable connector manufacturers). The torque specifications of the cable plug manufacturer must be adhered to in order to prevent the emission of SF<sub>6</sub> gas.
9. Connect the shielding of the AC cables to the grounding busbar.
10. For the order option with "Cable Entry Kit": Attach the plates of the Cable Entry Kit.
11. For the order option without "Cable Entry Kit": Attach the base plates of the cable entries.
12. Close all unused outer cone bushings of a cable panel with voltage-resistant filler plugs.
13. Mount the kick plate of the medium-voltage switchgear.
14. If necessary, install additional surge arresters. Mounting the surge arresters in the transfer station is recommended. When doing this, follow the manufacturer's instructions.

**Also see:**

- Overview of the connection area on the medium-voltage switchgear ⇒ page 59
- Strain-relief clamps ⇒ page 60

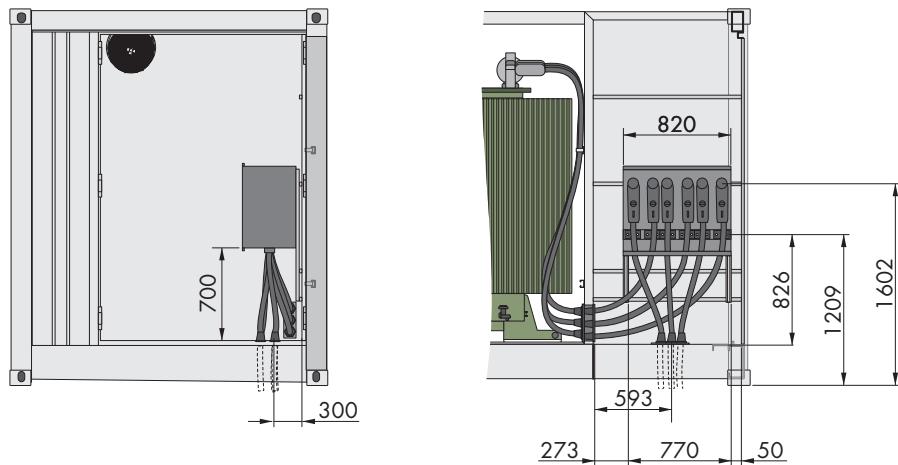
**6.9.5 Connection to the connection box for the medium-voltage transformer****6.9.5.1 Cable route when connecting to the connection box for the medium-voltage transformer**

Figure 33: Cable route when connecting to the connection box for the medium-voltage transformer

**6.9.5.2 Requirements for the connection to the connection box for the medium-voltage transformer**

- The requirements for the protective settings and maximum short-circuit times must be observed.
- For the order option with "Cable Entry Kit", the openings for the cables on the connection box are designed for diameters from 39 mm to 60 mm.
- Insulated, type-tested cables and connectors with grounded shielding must be used.
- The strain reliefs for securing the cables (diameter: 36 mm to 52 mm) are included in the scope of delivery.

**6.9.5.3 Installing the AC connection on the connection box**

If the MV Power Station was ordered without a medium-voltage switchgear, the AC cables must be connected to the connection box for the medium-voltage transformer.

**Procedure:**

1. For the order option with "Cable Entry Kit": Remove the plates of the Cable Entry Kit from the floor of the medium-voltage compartment. Thread the cables with rubber bushings through the holes in the plate. When doing so, ensure that the rubber bushings cleanly enclose and seal the cables. This prevents animals from entering the product.
2. For the option without "Cable Entry Kit": Drill holes in the base plates in the medium-voltage compartment. Thread the cables with cable glands or rubber bushings through the holes in the base plate. Ensure that the cable glands or rubber bushings cleanly enclose and seal the cables. This prevents animals from entering the product. Observe the marking for the phase sequence.
3. Connect the AC cables to the connection box for the medium-voltage transformer. Observe the marking for the phase sequence and the maximum tightening torque (see the manufacturer documentation).
4. Support the AC cables with the pre-mounted strain reliefs.

5. Protect the medium-voltage transformer from overload, short circuit and ground fault. For the order option without "MV Switchgear", use medium-voltage switchgear with a circuit breaker and transformer protection device that has the appropriate functionality.
6. To enable transformer protection with the protective devices installed on the medium-voltage transformer (oil level, gas and pressure), establish a connection from terminal **-X3503:1/2** in the station subdistribution to the trip coil of the upstream medium-voltage switchgear. In case of error, the MV Power Station sends a signal to terminal **-X3503:1/2** with a triggering voltage of 230 VAC.
7. For the order option "1 MVSG for 2 MVT" for communication between both stations, establish a connection from terminal **-X3503:1/2** of the station without medium-voltage switchgear to terminal **-X3804:1/2** of the station with medium-voltage switchgear. Use a cable with at least the following cross-section: 1.5 mm<sup>2</sup>.

## 6.10 Connection for communication, control and monitoring

### 6.10.1 Connect the cable for the feedback contact and the trigger of the fast-stop function in the MV Power Station.

In addition to the feedback contact of the fast-stop key switch -S2 (terminal -X412:1/2 in the inverter), a feedback contact is available in the station subdistribution of the MV Power Station. This allows additional devices to be integrated into the fast-stop sequence.

**Procedure:**

1. Open the low-voltage cabinet.
2. Ensure that no voltage is present.
3. Connect the cable for the feedback contact to terminal **-X3801:1/2** in the station subdistribution.
4. Connect the cable for the external trigger with potential-free contact to terminal **-X3800:1/2** in the station subdistribution.
5. Attach the cable to the cable support rail using a cable tie. This will prevent the cables from being pulled out inadvertently.
6. Close the low-voltage cabinet.

## 6.11 Supply voltage

### 6.11.1 Connecting External Supply Voltage for Motor-Driven Circuit Breaker of Medium-Voltage Switchgear

If the MV Power Station is used with the remote control of the motor-driven circuit breaker of the medium-voltage switchgear (order option "Remote Control"), the motor-driven circuit breaker must be supplied by an external voltage supply.

If the inverter/power converter is not supplied externally, an external supply voltage for the motor-driven circuit breaker of the medium-voltage switchgear must be connected.

**Requirements:**

- The nominal voltage of the external supply voltage between line conductor and neutral conductor must be 230 V / ±10 % at 50 Hz / 60 Hz.
- The maximum power consumption is 100 W for 15 seconds when tensioning the spring and < 350 W for 1 second when switching on and off via remote control.

**Procedure:**

1. Ensure that the external supply voltage is disconnected.
2. Connect the cable of the external supply voltage for the motor-driven circuit breaker of the medium-voltage switchgear in the station subdistribution as follows:

3. Connect the cable **L1** to the terminal **-X3803:1**.
4. Connect the cable **N** to the terminal **-X3803:2**.
5. Connect the **grounding conductor** cable to terminal **-X3803:PEe** in the station subdistribution.

### 6.11.2 Connecting the external low-voltage transformer

For the order option "External LVT", the MV Power Station is equipped with a fuse switch-disconnector for the connection of an external low-voltage transformer.

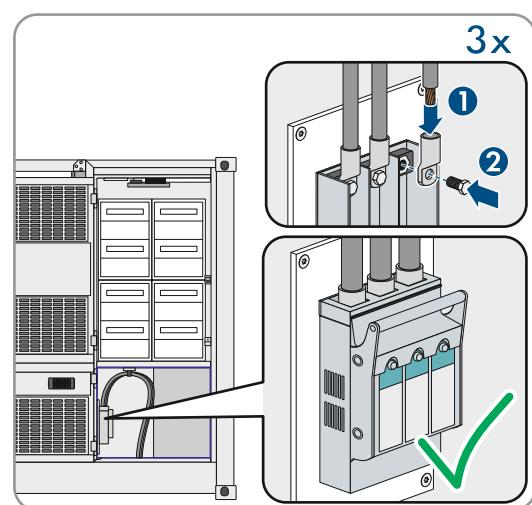
- "Ext. LVT 120 kVA" 200 A
- "Ext. LVT 180 kVA" 315 A

#### Requirements for the external low-voltage transformer:

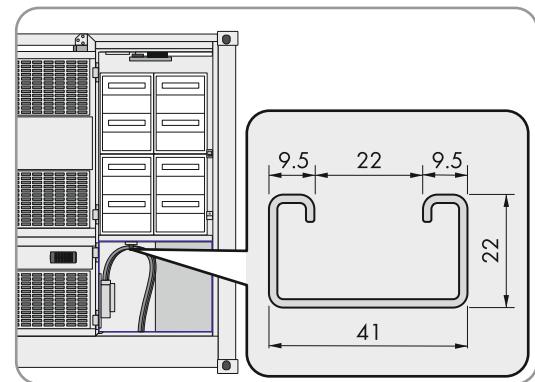
- Short-circuit impedance:  $uk_{min} = 2.5\%$ ,  $uk_{max} = 5\%$
- Inrush current: maximum  $6 \times I_n$  for a maximum of 10 ms
- Short-circuit current capability: 1 s
- To minimize interference emissions (EMC), the cable length from the MV Power Station to the low-voltage transformer should be as short as possible.
- A main switch is recommended on the primary side of the low-voltage transformer.
- A main switch, an EMC filtering device and a surge arrester are recommended on the secondary side of the low-voltage transformer.
- The low-voltage transformer must be protected on the primary and secondary side.
- The low-voltage transformer must be grounded.
- Observe further information from the "Technical Information - Requirements for medium-voltage transformers and transformers for internal power supply for SUNNY CENTRAL and SUNNY CENTRAL STORAGE".

#### Procedure:

1. Ensure that the internal medium-voltage transformer and the external low-voltage transformer are disconnected from all voltage sources.
2. Insert the 3 cables of the low-voltage transformer (maximum diameter: 32 mm) into the low-voltage cabinet.
3. Fit the 3 cables with terminal lugs (maximum width: 56 mm).
4. Connect the 3 cables of the external low-voltage transformer to the fuse switch-disconnector **F100** (M10, tightening torque: 30 Nm). Take the bend radius of 129 mm into account.



5. Secure the cables using strain-relief clamps, screws and slide nuts (not included in the scope of delivery) to the zinc-plated C busbar (VARIFIX 41/22 C) in the low-voltage cabinet.



### 6.11.3 Cables for the Supply Voltage of Loads (e.g. Tracker Motors) for the Order Option "STSD for LVT"

#### 6.11.3.1 Requirements for the cables for the supply voltage of loads

The customer is responsible for selecting the cable cross-sections which depend on the power of the loads and the cable routing.

- The following cable cross-section is recommended for clamps by PHOENIX CONTACT GMBH & CO. KG, model PTPOWER 35: 2.5 mm<sup>2</sup> to 35 mm<sup>2</sup>
- For clamps from Wago Kontakttechnik GMBH and CO. KG Model Power Cage Clamp 285-135, the following cable cross-section is recommended: 6 mm<sup>2</sup> to 35 mm<sup>2</sup>
- For the length of the cables, a maximum height of 1000 mm from the corner of the station container or 670 mm (26.37 in) from the bottom of the MV Power Station to the terminals must be taken into account.
- The insulation of the conductors must be designed for a temperature of at least 75 °C.
- The ampacity of the conductors must be designed for the maximum temperature at the connection point of 60 °C.
- Depending on the low-voltage transformer, the terminals **-X3810:1** to **-X3810:80** are available for the connection:

Low-voltage transformer Order option "LV Transformer"	Feeders for loads Order option "STSD for LVT"	Fusing
10 kVA	4 or 8	25 A <sup>10)</sup>
20 kVA	4, 8 or 12	25 A <sup>10)</sup>
30 kVA	4, 8, 12 or 16	25 A <sup>10)</sup>
40 kVA	8, 12, 16 or 20	25 A <sup>10)</sup>
50 kVA	12, 16 or 20	25 A <sup>10)</sup>
60 kVA	16 or 20	25 A <sup>10)</sup>

#### 6.11.3.2 Connecting the cables for the supply voltage of the loads

1. Ensure that no voltage is present.
2. Open the doors of the low-voltage cabinet to the low-voltage transformer.
3. For the order option without "Cable Entry Kit": Remove the base plate to insert the connection cables in the low-voltage room. Drill holes in the base plate.
4. For the order option with "Cable Entry Kit": Remove the plates of the Cable Entry Kit.

<sup>10)</sup> Due to the temperature derating, the fuse protection of the tracker motors is limited to a maximum of 16 A.

5. Thread the cables with cable glands or rubber bushings through the holes in the base plate. Ensure that the cable glands or rubber bushings cleanly enclose and seal the cables. This prevents animals from entering the product.
6. Connect the cables in accordance with the circuit diagram.
7. Mount the base plate of the cable entries.
8. Close the doors of the low-voltage cabinet to the low-voltage transformer.

#### **6.11.4 Cables for the Supply Voltage of the DC-DC Converters for the Order Option "Min. LV Transformer: 10 kVA" and "Inverter Type: with DC-Coupling"**

##### **6.11.4.1 Requirements for the cables for the supply voltage of the DC-DC Converters**

Selecting the cable cross-sections depends on the power of the DC-DC Converters and the cable routing. Cable routing is the responsibility of the customer. The cables for the DC-DC Converter can be connected to free outputs of the low-voltage transformer or to the terminals in the station subdistribution.

The customer is responsible for selecting the cable cross-sections which depend on the cable routing.

- The following cable cross-section is recommended for terminals by CABUR SRL model HMM.6/GR: 0.5 mm<sup>2</sup> to 10 mm<sup>2</sup> (24 AWG to 12 AWG)
- The following cable cross-section is recommended for terminals by PHOENIX CONTACT GMBH & CO. KG, model ST6: 0.2 mm<sup>2</sup> to 10 mm<sup>2</sup> (24 AWG to 10 AWG)
- The terminals **-X3811:1** to **-X3811:12** are available for the connection for up to 6 DC-DC Converters.

##### **6.11.4.2 Connecting the cables for the supply voltage of the DC-DC Converters**

1. Ensure that no voltage is present.
2. Open the doors of the low-voltage cabinet to the low-voltage transformer.
3. For the order option without "Cable Entry Kit": Remove the base plate to insert the connection cables in the low-voltage room. Drill holes in the base plate.
4. For the order option with "Cable Entry Kit": Remove the plates of the Cable Entry Kit.
5. Thread the cables with cable glands or rubber bushings through the holes in the base plate. Ensure that the cable glands or rubber bushings cleanly enclose and seal the cables. This prevents animals from entering the product.
6. Connect the cables in accordance with the circuit diagram.
7. Mount the base plate of the cable entries.
8. Close the doors of the low-voltage cabinet to the low-voltage transformer.

#### **6.11.5 Cables for the Supply Voltage of Customer-Supplied Devices for the Order Option "STSD for LVT: Without"**

##### **6.11.5.1 Requirements of the cables for the supply voltage of the customer-supplied devices**

The customer is responsible for selecting the cable cross-sections which depend on the power of the customer-supplied devices and the cable routing.

- The following cable cross-section is recommended for clamps by PHOENIX CONTACT GMBH & CO. KG, model PTPOWER 95: 2.5 mm<sup>2</sup> to 35 mm<sup>2</sup>
- For clamps from Wago Kontakttechnik GMBH and CO. KG Model Power Cage Clamp 285-135, the following cable cross-section is recommended: 6 mm<sup>2</sup> to 35 mm<sup>2</sup>
- For clamps from Wago Kontakttechnik GMBH and CO. KG Model Power Cage Clamp 285-195, the following cable cross-section is recommended: 25 mm<sup>2</sup> to 95 mm<sup>2</sup>

- For the length of the cables, a maximum height of 1000 mm from the corner of the station container or 670 mm (26.37 in) from the bottom of the MV Power Station to the terminals must be taken into account.
- The insulation of the conductors must be designed for a temperature of at least 75 °C.
- The ampacity of the conductors must be designed for the maximum temperature at the connection point of 60 °C.
- Depending on the low-voltage transformer, the terminals **-X3812:1** to **-X3812:4** are available for the connection:

Low-voltage transformer	Fusing
10 kVA	16 A
20 kVA	32 A
30 kVA	50 A
40 kVA	63 A
50 kVA	80 A
60 kVA	100 A

### 6.11.5.2 Connecting the Cables for Supply Voltage of Customer-Supplied Devices

1. Ensure that no voltage is present.
2. Open the doors of the low-voltage cabinet to the low-voltage transformer.
3. For the order option without "Cable Entry Kit": Remove the base plate to insert the connection cables in the low-voltage room. Drill holes in the base plate.
4. For the order option with "Cable Entry Kit": Remove the plates of the Cable Entry Kit.
5. Thread the cables with cable glands or rubber bushings through the holes in the base plate. Ensure that the cable glands or rubber bushings cleanly enclose and seal the cables. This prevents animals from entering the product.
6. Connect the cables in accordance with the circuit diagram.
7. Mount the base plate of the cable entries.
8. Close the doors of the low-voltage cabinet to the low-voltage transformer.

## 6.12 MV Power Station Customer Installation Location

### 6.12.1 Internal Customer Installation Location

#### 6.12.1.1 Position and dimensions of the internal customer installation location

For the order options "Customer Installation Area: Internal" and "Customer Installation Area: Internal and External", a customer installation location is integrated into the door of the low-voltage cabinet.

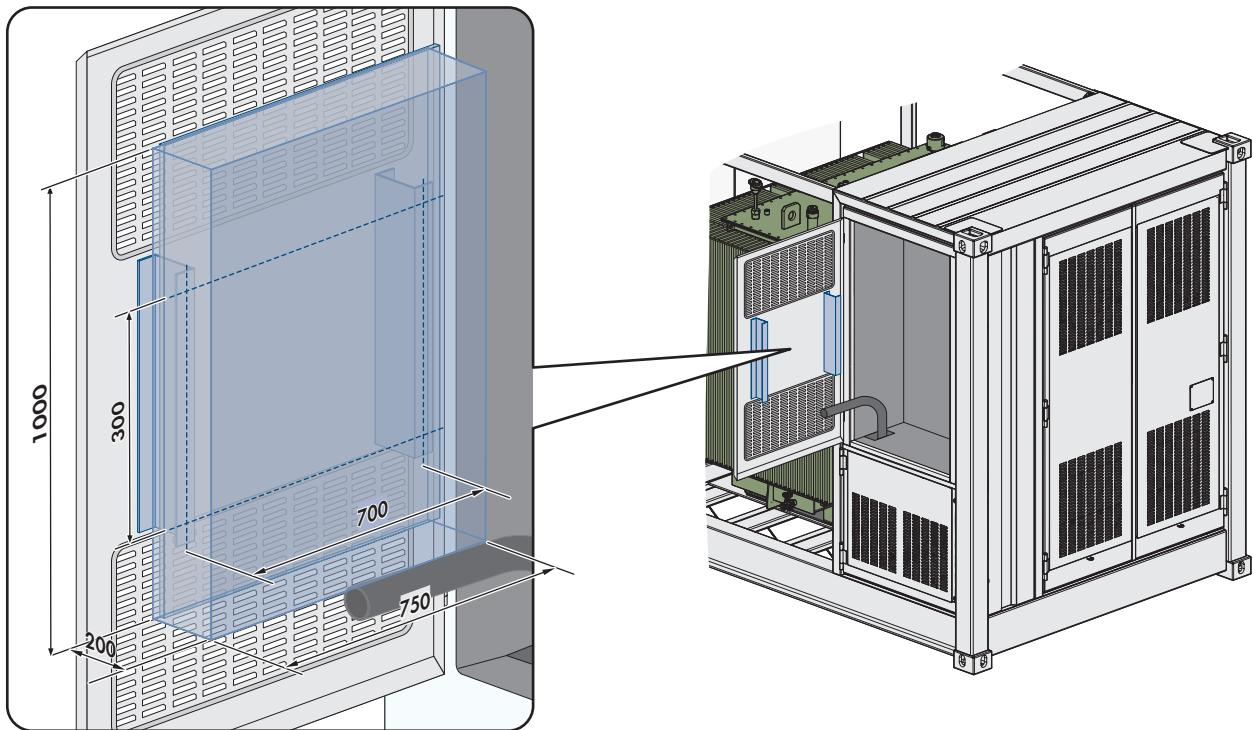


Figure 34: Position of the internal customer installation location and maximum dimensions for customer-side installations (Dimensions in mm)

#### 6.12.1.2 Installation of customer-owned equipment in the internal customer installation location

The customer installation location on the inside of the door of the low-voltage cabinet is reserved for customer-supplied devices.

2 brackets are provided on the mounting plate for mounting customer devices. The 4 anchoring points for the brackets have the following distances:

- Width: 700 mm
- Altitude: 300 mm
- Fastening material: M8 screws, conical spring washer, and washer (not included in the scope of delivery)

#### 6.12.1.3 Connection of customer-owned equipment in the internal customer installation location

The MV Power Station is equipped with cable channels (inside diameter: 45 mm) at the factory from the opening in the low-voltage cabinet to the internal customer installation location and from the station subdistribution to the customer installation location.

Cables for customer-owned equipment must be routed through the cable channels during installation. A network cable with RJ45 plug is located on the door to the low-voltage cabinet for the network connection. The length of the network cable from the customer installation location to the customer installations is 2000 mm.

## 6.12.2 External Customer Installation Location

### 6.12.2.1 Position and dimensions of the external customer installation location

For the order options "Customer Installation Area: External" and "Customer Installation Area: Internal and External", a customer installation location is installed on the outside of the medium-voltage cabinet.

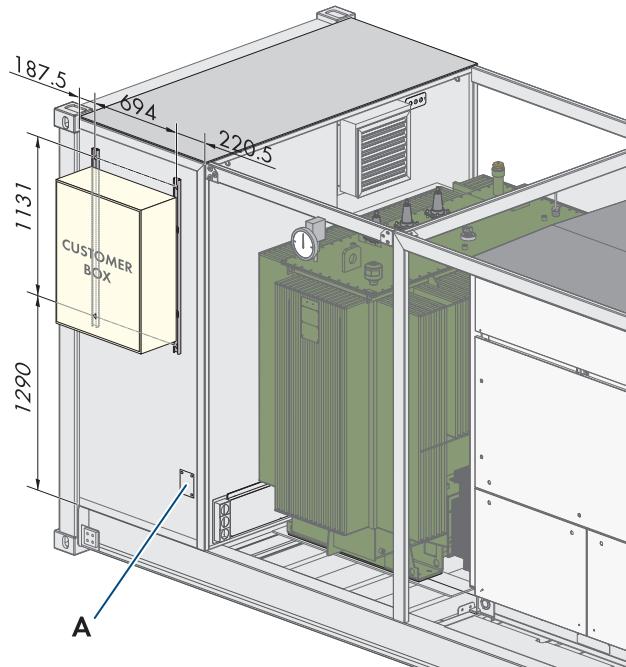


Figure 35: Position of the external customer installation location (Dimensions in mm)

Position	Description
A	Plate for enclosure opening

### 6.12.2.2 Installation of customer-owned equipment in the external customer installation location

There is a variable mounting structure with 4 C busbars for the external customer installation location.

- Width: 694 mm
- Height: up to 1131 mm
- Fastening material: M8 screws, washer, and conical spring washer (not included in the scope of delivery)

### 6.12.2.3 Connection of customer-owned equipment in the external customer installation location

For the external customer installation location, a cable channel runs from the low-voltage cabinet to the plate on the right exterior side of the medium-voltage cabinet. The cable glands for enclosure openings are not included in the scope of delivery from SMA. A network cable is supplied with an excess length of 5000 mm and is located on the inside of the door of the low-voltage cabinet. To use the external customer installation location, the network cable must be routed through the cable channel to the external customer installation location.

## 6.12.3 Mechanical Requirements for Customer-Owned Equipment

- The dimensions of the customer installations in the internal customer installation location may not exceed 1000 mm x 750 mm x 200 mm (height x width x depth).

- Narrow units in the internal customer installation location may have a maximum depth and must not exceed 800 mm x 600 mm x 210 mm (height x width x depth). They are mounted on the holder using either 2 profile rails or 1 mounting plate (not included in the scope of delivery).
- The maximum weight including mounting plate is 80 kg.
- For the internal customer installation location, depending on application, the customer installations must be designed for temperatures from -40 °C to 65 °C.
- The dimensions of the customer installations in the external customer installation location may not exceed 1000 mm x 750 mm (height x width).
- The maximum weight of customer installations is 80 kg.
- For the external customer installation location, the customer installations must be designed for outdoor temperatures.
- The customer installations comply with at least the degree of protection IP54.

#### 6.12.4 Electrical Requirements for Customer-Owned Equipment

- Connection voltage for customer installations: 230 V ±10% tolerance, 50 Hz
- If an internal or external customer connection has been ordered, 2 additional miniature circuit breakers of type C16A (230 V) are provided to protect the customer equipment.
- Maximum power loss of customer installations: 300 W
- There is a socket in the customer connection area of the inverter.
- For the order option "Country Package: Australia" there is 1 socket, 230 V, type I, maximal 300 W, in the station subdistribution.
- For the order option "Country Package: France" there are 2 sockets, 230 V, type E, maximal 300 W, in the station subdistribution. Here, one socket is reserved for an inspection lamp.
- For the order option "Country Package: Japan" with the order option "LV transformer 10 kVA, 173/100 V" the following terminals are available:
  - 3 miniature circuit breakers C16 A (100 V) + RCD 30 mA
  - 3 sockets, 100 V, type B, up to max. 1000 W each, in the station subdistribution
- The maximum power available for connection of customer equipment depending on the order option:
  - As standard: 2500 VA
  - For the order option "Country Package: Japan" with the order option "LV transformer 10 kVA, 173/100 V": 10 kVA at 100 VAC and 2500 A at 230 VAC
- The customer devices are designed to cope with voltage fluctuations that can occur at the point of interconnection. Further details are to be found in the circuit diagram.

The following powers must be taken into consideration for the supply of the MV Power Station:

Component	Order option	Power
Fan in the medium-voltage cabinet	"Ambient temperature: -25 °C to +55 °C" "Ambient temperature: -35 °C to +55 °C" "Environment: Harsh" "Environment: Harsh+" "LV-Transformer 40 / 50 / 60 kVA"	230 W
Lighting in the medium-voltage and low-voltage cabinet	"Lighting"	50 W
Cascade control	"Cascade control"	150 W

Component	Order option	Power
Monitoring and communication	"Monitoring"	100 W
Heaters in the medium-voltage and low-voltage cabinet	"Ambient temperature: -40 °C to +45 °C"	2300 W
Heaters in the station subdistribution	"Ambient temperature: -35 °C to +55 °C"	200 W

## 6.13 Cascade control

### 6.13.1 Overview of the cascade control layout

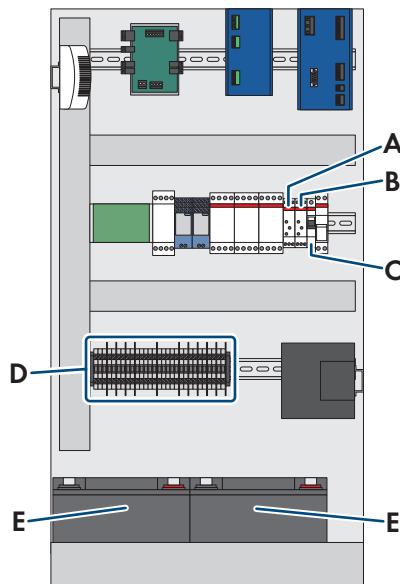


Figure 36: Cascade control layout

Position	Designation
A	Time relay K1
B	Time relay K2
C	Fuse service switch F71 for the battery voltage
D	Terminal block
E	Batteries

### 6.13.2 Installing the cascade control

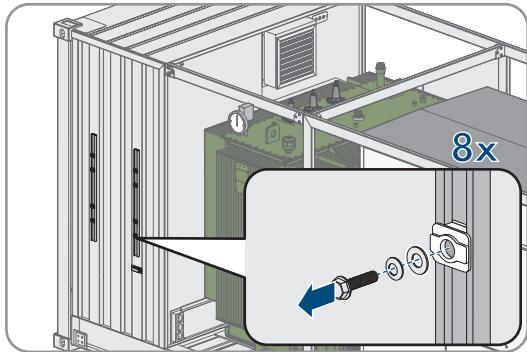
For the order option "Cascade Control", the MV Power Station is delivered with a cascade control. The cascade control must be mounted on the outside of the medium-voltage cabinet. The cascade control can be connected to a signal generator.

#### Requirements:

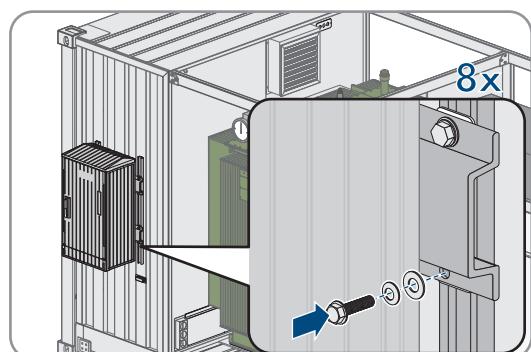
- The MV Power Station must be de-energized.

**Procedure:**

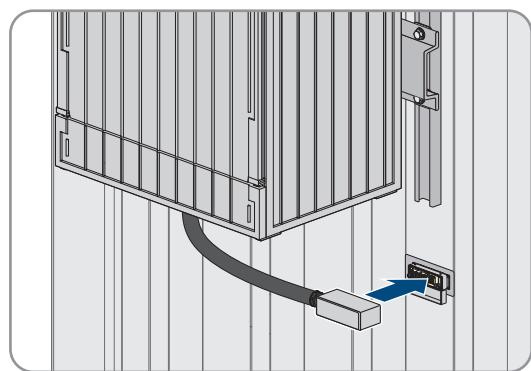
1. Unscrew the 8 screws (M8) with spring washer and conical spring washer from the wall mounting bracket on the outside of the medium-voltage cabinet.



2. Use 2 people to lift the cascade control to the wall mounting bracket. Pay attention to the weight of the cascade control.
3. Insert the 8 screws with spring washer and conical spring washer through the Omega profile of the cascade control and screw them tightly to the wall mounting bracket of the MV Power Station (torque: 20 Nm).



4. Open the cover of the socket on the outside of the medium-voltage cabinet.
5. Insert the connection plug of the cascade control into the socket and lock it in place.



6. Open the cascade control door.
7. Place the separately supplied batteries for the cascade control in the metal rail of the cascade control. Align the negative terminal to the left and the positive terminal to the right. Place the two batteries close to each other.
8. Position temperature sensor **-G6** between the two batteries.
9. Connect cable **-3.1** to the negative terminal and cable **+7.1** to the positive terminal of the left battery.
10. Connect cable **-7.1** to the negative terminal and cable **+3.2** to the positive terminal of the right battery.
11. Close the cascade control door.

## 6.14 Sealing the Cable Entries

**Requirement:**

All cables must be inserted in and connected to the MV Power Station.

**Procedure:**

1. Close and fasten the base plates underneath the station subdistribution. Ensure that the enclosure openings close tightly. This prevents animals from entering the product.

2. Screw the rubber gaskets onto the MV switchgear base plate.
3. Insert the base plates under the inverter. The base plates must be aligned as close as possible to each other.
4. Tighten the base plates. Ensure that the enclosure openings close tightly.
5. Seal all cable entries properly.

## 6.15 Requirements for Commissioning

### 6.15.1 General Requirements for Commissioning

- All foils and packaging must have been removed.
- All components must be in clean and purified condition.
- None of the devices must display any damage.
- Paintwork damage on the product must be repaired.
- The base of the product must not show any deformations.
- All devices must be correctly installed.
- All devices must be properly grounded.
- All transport locks and desiccant bags must be removed.
- All devices must be properly closed and sealed.
- All doors and locks must function properly.
- All labels and signs must be in place.
- Air inlets must be opened.
- All cables leading to the MV Power Station must be correctly routed, connected and attached to the cable support rail.
- Replace the desiccant bags in the inverter with new desiccant bags from the scope of delivery 24 hours prior to commissioning. This will protect the electronic components against moisture. Moisture can delay commissioning and additional travel costs for SMA service personnel must be paid by the customer.
- An ambient temperature above 0°C is recommended for commissioning.
- For the order option "Sea Freight", the supporting struts in front of the inverter and the medium-voltage compartment must be removed.
- All documentation must be available.
- The completed transport checklist must be available.
- SMA Solar Technology AG must have access to the safety documentation for the construction site.
- All system documentation, such as cabling diagrams, must be present.

### 6.15.2 Requirements for the DC side

- All DC cables must be correctly connected to the inverter. The installer is responsible for ensuring that the bolted connection is correct.
- The DC load must have been checked.
- The polarity of all DC cables must have been checked.
- The DC voltages must be checked.
- An insulation measurement must be carried out and recorded.
- At least 50% of the PV modules of the entire PV system must be installed and connected to the inverter. The minimum power for commissioning may deviate depending on the country. Please contact your project manager for the exact power value.

### 6.15.3 Requirements for the AC side

- The AC circuit breaker of the inverter must be opened.
- The medium-voltage transformer must be connected to the utility grid.
- The medium-voltage transformer must not show any oil leakage.
- The pressure gauge for the SF<sub>6</sub> gas on the medium-voltage switchgear gas must be in the green range.
- The accessories for the medium-voltage switchgear must be available.

### 6.15.4 Requirements for the communication

- Communication connections and the supply voltage must be connected and checked.
- The cable entries must be sealed against moisture penetrating from the outside.

## 7 Disconnecting and Reconnecting

### 7.1 Safety When Disconnecting and Reconnecting Voltage Sources

#### ⚠ 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.
- Disconnect the product from the power transmission path and from the control path if no voltage is required for working on the product and the connected components.
- After switching off the inverter, wait at least 25 minutes before opening the inverter to allow the capacitors to discharge completely.
- Wear suitable personal protective equipment of the corresponding hazard risk category for all work when the power transmission path is connected. The hazard risk categories of the various areas of the product are different.
- Always perform all work in accordance with the locally applicable standards, directives and laws.
- Observe all safety information on the product and in the documentation.
- The product must not be operated with open covers or doors.
- Cover or isolate all live components.

#### ⚠ DANGER

##### **Danger to life due to electric shock in case of a ground fault**

If there is a ground fault, components that are supposedly grounded may in fact be live. Touching live parts will result in death or serious injury due to electric shock.

- Before working on the system, ensure that no ground fault is present.
- Wear suitable personal protective equipment of the corresponding hazard risk category for all work when the power transmission path is connected. The hazard risk categories of the various areas of the product are different.

#### ⚠ DANGER

##### **Danger to life due to electric arcs if measuring device is not connected correctly**

If the measurement points are incorrectly contacted, this can cause an electric arc. Electric arcs can result in death or serious injury.

- Select the appropriate measurement range on the measuring device.
- Wear suitable personal protective equipment for all work on the device.
- Select correct measurement points.

**⚠ WARNING****Danger to life due to electric shock if external supply voltage is not disconnected**

When using an external supply voltage, even after disconnecting the product, there may still be lethal voltages present in cables. Touching live components can result in death or serious injury due to electric shock.

- Disconnect the external supply voltage.
- Do not touch the orange cables in the inside of the product. These cables are used for connecting the external supply voltage and can be dangerous to touch.
- Wear suitable personal protective equipment of the corresponding hazard risk category for all work when the power transmission path is connected. The hazard risk categories of the various areas of the product are different.

**⚠ WARNING****Danger to life from electric shock when entering the system**

Damaged insulation in the system can cause lethal currents to ground. Lethal electric shocks can result.

- Ensure that the insulation resistance of the system exceeds the minimum value. The minimum value of the insulation resistance is: 14 kΩ.
- All work on the inverter must only be carried out by qualified persons.
- Before entering the system, switch the system with the ground fault detection system (Remote GFDI) to insulated operation.
- After entering the system, immediately ensure that the inverter does not display an insulation error.
- Disconnect the product from the power transmission path and from the control path if no voltage is required for working on the product and the connected components.
- Wear suitable personal protective equipment for all work on the product.

**⚠ WARNING****Danger to life due to arc fault caused by fault in the medium-voltage switchgear**

If there is a fault in the medium-voltage switchgear, arc faults may occur during operation of the product which can result in death or serious injuries. In the event of arc faults in the medium-voltage switchgear, the pressure escapes to the rear into the medium-voltage transformer compartment.

- Only perform work on the medium-voltage switchgear when it is in a voltage-free state.
- Prior to commissioning and operating the medium-voltage switchgear, close the front panels of the base below the medium-voltage switchgear.
- When performing switching operations, make sure that the hatch of the arc fault opening can be easily opened and is not covered by objects (e.g., ice, vegetation).
- When performing switching operations, open the doors of the medium-voltage cabinet and attach the doors to the designated positions.
- All work and switching operations on the medium-voltage switchgear must only be performed by qualified persons wearing adequate personal protective equipment.
- All other persons are to keep a safe distance from the product when switching operations are performed. The internal arc pressure safety area is to be cordoned off.
- Do not touch or access the roof of the medium-voltage switchgear when medium voltage is connected.
- Do not access the medium-voltage cabinet.

**⚠ WARNING****Danger to life due to electric shock when switching the medium-voltage switchgear when the level of insulating gas is low**

When the level of insulating gas is low, life-threatening electric shocks may arise when switching the medium-voltage switchgear, which can lead to death or serious injuries.

- Before switching the medium-voltage switchgear, check the level of the insulating gas.
- Contact SMA Service if the level of the insulating gas is below the acceptable limit.

**⚠ WARNING****Danger to life due to electric arc if there are tools inside the product**

When reconnecting and in operation, an electric arc can arise if conductive foreign parts (e.g., tools) are located in the product and establishes a conductive connection between live components. This can result in death or serious injury.

- Before commissioning or reconnection, verify that no tools are inside the product.

**⚠ WARNING****Hearing impairment due to high-frequency noises of the product**

The product generates high-frequency noises during operation. This can result in hearing impairment.

- Wear hearing protection.

**⚠ CAUTION****Risk of burns due to hot components**

Some components of the product can get very hot during operation. Touching these components can cause burns.

- Observe the warnings on all components.
- During operation, do not touch any components marked with such warnings.
- After switching off the product, wait until any hot components have cooled down sufficiently.
- Wear suitable personal protective equipment for all work on the product.

** Connecting and disconnecting medium voltage**

Only a duly authorized person trained in electrical safety is allowed to connect and disconnect the medium voltage.

## 7.2 Power Connection Points

### 7.2.1 Power connection points of the Sunny Central and PV-coupled system

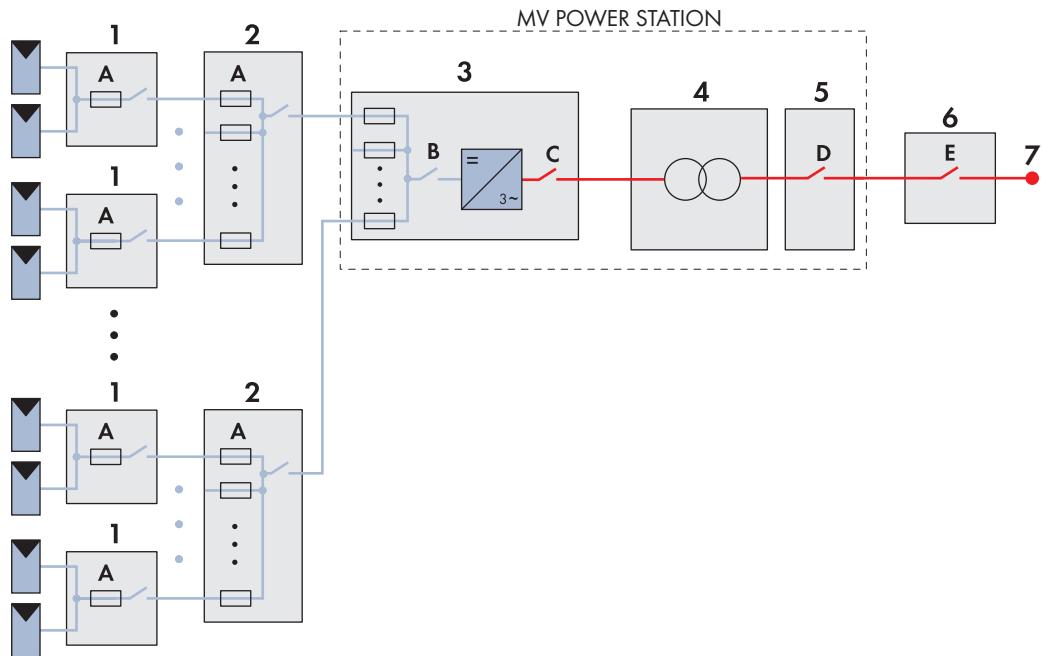


Figure 37: Overview of the power connection points of the Sunny Central and PV-coupled system

Position	Designation
1	DC subdistribution
2	DC main distribution unit
3	Inverter
4	Medium-voltage transformer
5	Medium-voltage switchgear
6	Higher-level medium-voltage switchgear (string, ring or transfer station)
7	Utility grid
A	DC subdistribution or DC main distribution disconnection device
B	Inverter DC switchgear
C	Inverter AC disconnection unit
D	Medium-voltage circuit breaker
E	Transfer station disconnection device

## 7.2.2 Power connection points of the Sunny Central and battery-coupled system

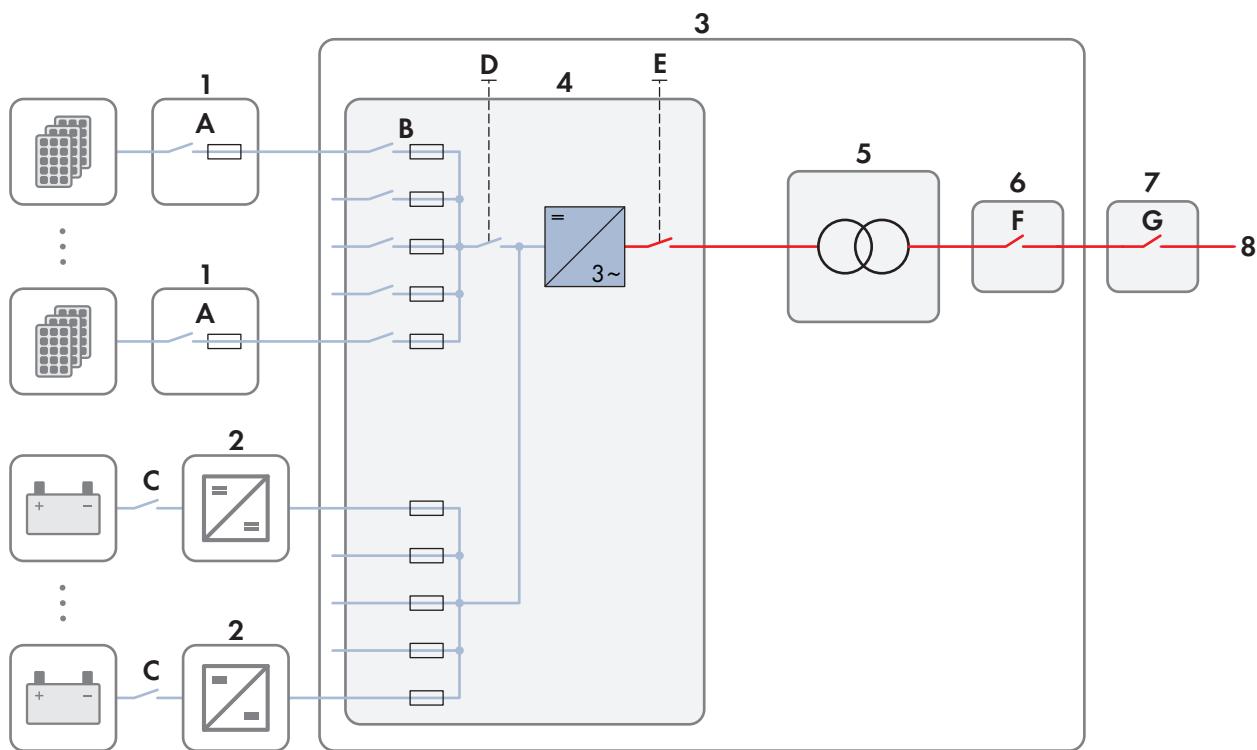


Figure 38: Overview of the power connection points of the Sunny Central and battery-coupled system

Position	Designation
1	DC subdistribution or DC main distribution
2	DC-DC Converter
3	MV Power Station
4	Inverter
5	Medium-voltage transformer
6	Medium-voltage switchgear
7	Higher-level medium-voltage switchgear (string, ring or transfer station)
8	Utility grid
A	DC subdistribution or DC main distribution disconnection device
B	Inverter fuses
C	Load-break switch of the battery
D	Inverter DC switchgear
E	Inverter AC disconnection unit
F	Medium-voltage switch
G	Transfer station disconnection device

### 7.2.3 Power connection points of the Sunny Central Storage and battery

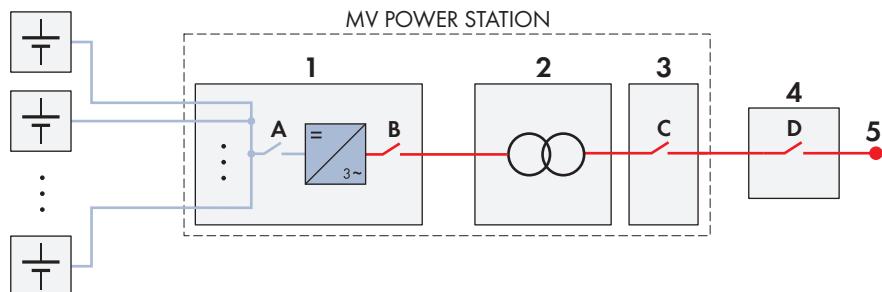


Figure 39: Overview of the power connection points of the Sunny Central Storage and battery

Position	Designation
1	Inverter
2	Medium-voltage transformer
3	Medium-voltage switchgear
4	Higher-level medium-voltage switchgear (string, ring or transfer station)
5	Utility grid
A	Inverter DC switchgear
B	Inverter AC disconnection unit
C	Medium-voltage switch
D	Transfer station disconnection device

### 7.2.4 Power connection points of the Electrolyzer Converter

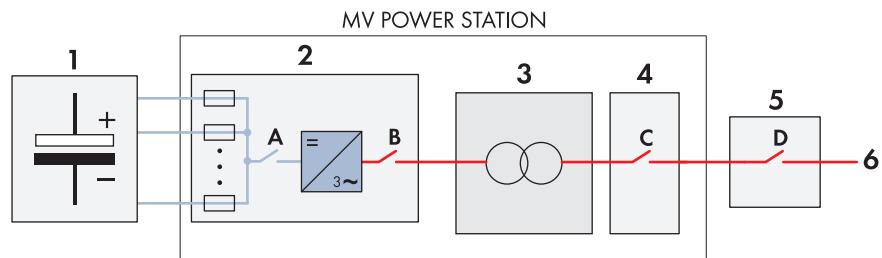


Figure 40: Overview of the power connection points of the Electrolyzer Converter

Position	Designation
1	Electrolyzer
2	Power converter (optional with internal, active discharge unit)
3	Medium-voltage transformer
4	Medium-voltage switchgear
5	Higher-level medium-voltage switchgear (string, ring or transfer station)
6	Utility grid
A	DC switchgear of the power converter

Position	Designation
B	The AC disconnection unit of the power converter
C	Medium-voltage circuit breaker
D	Transfer station disconnection device

### 7.3 Connection Points for Supply Voltage

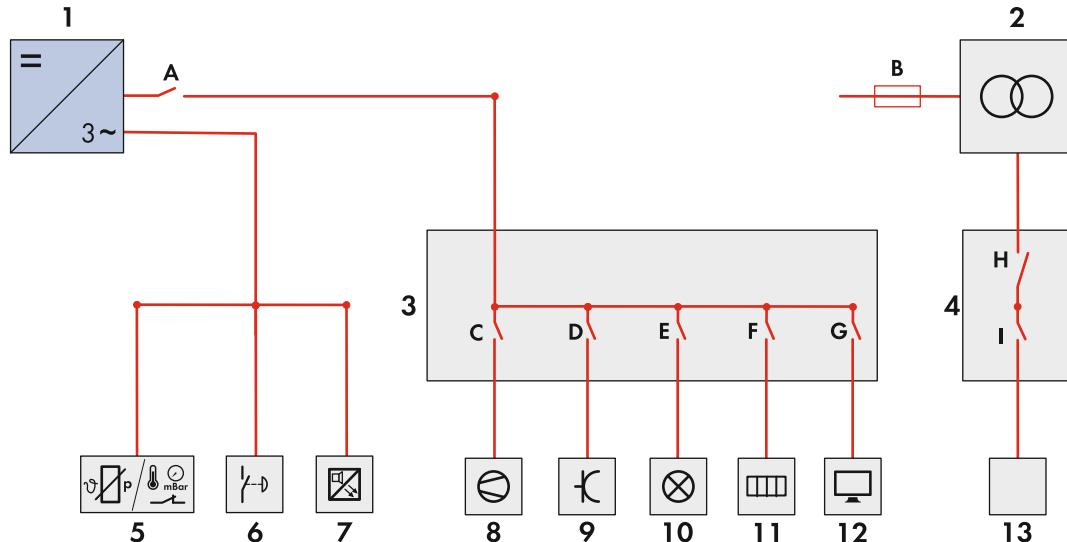


Figure 41: Connection points for supply voltage (example)

Position	Designation	Explanation
1	Inverter/power converter	-
2	Low-voltage transformer of MV Power Station	Optional
3	Station subdistribution	-
4	Separate subdistribution for the low-voltage transformer	Optional
5	Hermetic protection device for oil pressure, oil level and temperature	-
6	Fast-stop switch	Optional
7	Heat detector	Optional
8	Fan	Optional
9	Socket	Optional
10	Lighting for low-voltage and medium-voltage cabinet	Optional
11	Heating	Optional
12	Monitoring and communication	Optional
13	Tracker Motors	Optional
A	Fuse switch -F70/-F4 of the inverter/power converter	-
B	Fuse holder with thermal fuse of the low-voltage transformer	Optional

Position	Designation	Explanation
C	Miniature circuit breaker for the fan	Optional
D	Miniature circuit breaker for the socket	Optional
E	Miniature circuit breaker for the lighting	Optional
F	Miniature circuit breaker for the heating	Optional
G	Miniature circuit breaker for monitoring and communication	Optional
H	Miniature circuit breaker <b>-F101</b>	-
I	Miniature circuit breakers for tracker motors  The number of the installed miniature circuit breakers depends on the low-voltage transformer used.	Optional

Further details are to be found in the circuit diagram.

## 7.4 Disconnecting from voltage sources

### 7.4.1 Disconnection Procedure

This section describes the procedure for disconnecting and reconnecting the individual components of the MV Power Station. It provides an overview of the steps, which must be performed in the prescribed sequence.

1. When using a Sunny Central with DC-coupling or Sunny Central Storage, disconnect the battery storage system from voltage sources.
2. When using an Electrolyzer Converter, disconnect the Electrolyzer from voltage sources.
3. Disconnect the supply voltages of the station subdistribution from voltage sources.
4. Disconnect the inverter from voltage sources.
5. Disconnect the medium-voltage transformer.
6. Disconnect the MV Power Station from voltage sources.

### 7.4.2 Disconnecting the Battery Storage System

1. Log into the user interface.
2. Set the parameter **InvOpMod** to **Stop** via the user interface.
3. If the battery is not controlled via the inverter, stop the battery manually and secure it against re-activation.
4. On the user interface, check whether the switch between the DC side and the inverter is open.
5. Disconnect the battery voltage at the external fuse switch-disconnector or circuit breaker and secure against reconnection.

Entering the operating area is permitted.

### 7.4.3 Disconnecting the Supply Voltages of the Station Subdistribution

The miniature circuit breakers for the devices of the MV Power Station are located in the station subdistribution.

**⚠ DANGER****Danger to life due to applied voltages in the low-voltage cabinet**

The components of the low-voltage cabinet are supplied by the inverter as well as by the medium-voltage transformer. Even after the inverter has been disconnected from voltage sources, there are still high voltages applied to the terminals to the low-voltage transformer. Touching live components results in death or serious injury due to electric shock.

- Before carrying out any work on the station subdistribution or on the low-voltage transformer, disconnect the inverter and the medium-voltage transformer from voltage sources.

**Procedure:**

1. To disconnect the lighting from the supply voltage, switch off the **-F32** miniature circuit breaker.
2. To disconnect the fan from the supply voltage, switch off the **-F34** miniature circuit breaker.
3. If the supply voltage for the components of the MV Power Station is to be disconnected, switch off the fuse switch **-F70/-F4** in the inverter or disconnect the inverter from voltage sources.

#### 7.4.4 Disconnecting the Inverter

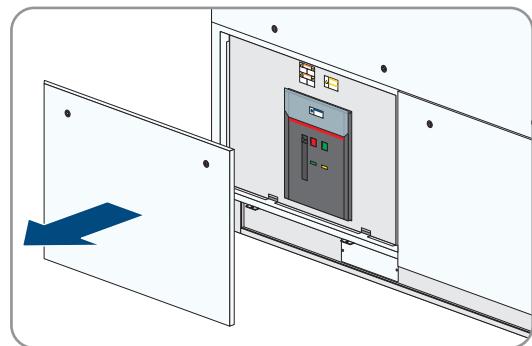
**Additionally required material (not included in the scope of delivery):**

- Measuring device according to locally applicable standards and directives with a DC input voltage range of at least 1500 V, suitable for the mounting location
- 2 padlocks for key switch. Diameter of the shackle: 5 mm to 8 mm.
- Depends on variant: 1 padlock for AC disconnection unit. Diameter of the shackle: 5 mm to 8 mm

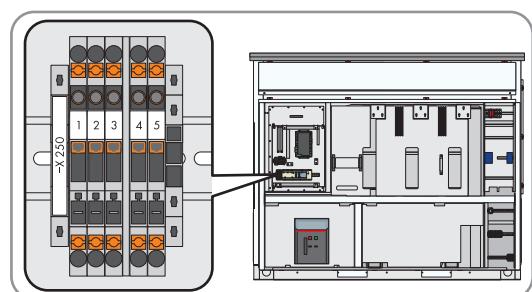
**Procedure:**

1. On the user interface make sure that error **6494** is not present.
2. Turn the key switch **-S1** to **Stop**.
3. Remove the key. In this way, you secure the product against inadvertent reconnection.
4. Turn the DC load-break switch **-Q61** to the **OFF** position. Note that the cable to the load-break switch is still energized.
5. Pull the bracket out of the switch lever.
6. Hook a suitable padlock into the bracket and lock it. This will ensure that the switch lever cannot reconnect inadvertently.
7. Turn the load-break switch of the supply voltage **-Q62** to the **OFF** position. Note that the cable to the load-break switch is still energized.
8. Pull the bracket out of the switch lever.
9. Hook a suitable padlock into the bracket and lock it. This will ensure that the switch lever cannot reconnect inadvertently.
10. If external supply voltage is used, disconnect the supply voltage via upstream switching devices.
11. Ensure that 25 minutes have passed after switching off the load-break switch **-Q61**.

12. Remove the outer panel of the AC switch module.



13. Verify that the switch state display of the AC disconnection unit is in the **OPEN** position.  
 14. Ensure that the AC disconnection unit cannot be reconnected. Use the key supplied or a padlock, depending on the version of the AC disconnection unit.  
 15. Open the hatch on the AC side of the product.  
 16. Ensure that no voltage is present on the **-X250** terminal.



The inverter must be disconnected from all voltage sources on the AC side.

17. Open the hatch on the DC side of the product.  
 The inverter is completely disconnected from all voltage sources.

#### 7.4.5 Crocodile clips on the inverter

To ensure that the DC side is de-energized before opening the inverter, the inverter is equipped with measuring points for determining the DC voltage. The voltage applied on the DC side is displayed in a ratio of 10:1.

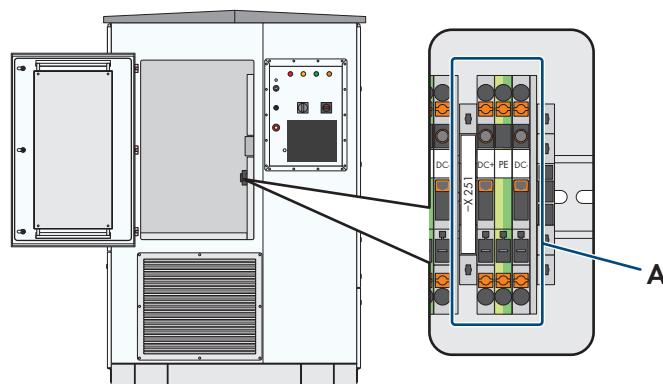


Figure 42: Position of measuring points in the customer installation location

Position	Designation
A	-X251 for measuring the PV voltage
Measuring points	Measurement result
DC+ to DC-	10% of DC voltage present

Measuring points	Measurement result
DC+ to PE	10% of DC voltage present
DC- to PE	0 V

## 7.4.6 Disconnecting the Medium-Voltage Transformer

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

- At least 1 padlock. Diameter of the bracket: 5 mm to 8 mm, quantity depending on the type of the medium-voltage switchgear
- Voltage measuring device with a dielectric strength of at least 2.6 kV

### Requirements:

- The tap changer of the medium-voltage transformer must only be operated in a de-energized state.
- The tap changer of the medium-voltage transformer must not be operated at oil and ambient temperatures under -10°C.

### Procedure:

1. Ensure that the inverter is disconnected from all voltage sources.
2. Make sure that the safety clearances around the MV Power Station are complied with.
3. Ensure that the medium-voltage cabinet doors are secured.
4. Switch off the circuit breaker of the transformer panel of the medium-voltage switchgear (see manufacturer's documentation).
5. Switch off the disconnect of the transformer panel of the medium-voltage switchgear (see manufacturer's documentation).
6. Check that there is no voltage present by using the voltage indicator located on the transformer panel.
7. Connect the circuit breaker for the transformer panel of the medium-voltage switchgear (see manufacturer's documentation).
8. Lock the circuit breaker, and if necessary the grounding switch, of the medium-voltage switchgear using a padlock. This secures the medium-voltage switchgear from accidentally being switched on again (see manufacturer's documentation).
9. Disconnect any additional external voltage.
10. Ensure that there is no voltage present on the undervoltage side of the medium-voltage transformer.
11. Cover or isolate any adjacent live components.

## 7.4.7 Disconnecting the MV Power Station

Only when the entire MV Power Station has been disconnected and the medium-voltage side of the MV Power Station has been grounded and short-circuited, will you be able to work on the devices of the MV Power Station without risk.

### Procedure:

1. Ensure that the minimum clearances of all MV Power Stations of the complete system are complied with.
2. Disconnect any additional external supply voltages.
3. Disconnect the inverter from voltage sources.
4. Disconnect the supply voltages of the station subdistribution from voltage sources.
5. Disconnect the medium-voltage transformer.
6. Depending on the medium-voltage switchgear, switch off the cable panel (see manufacturer's documentation).

7. Disconnect the MV Power Station from the utility grid at the superordinate medium-voltage switchgear (refer to manufacturer documentation). Always observe the five safety rules.
8. In the case of a three-field medium-voltage switchgear, ground the cable panel (see manufacturer's documentation)
9. In the case of a 1-field medium-voltage switchgear, ground the upstream and downstream medium-voltage switchgear (see manufacturer's documentation).
10. Cover or isolate any adjacent live components.

## 7.5 Reconnection

### 7.5.1 Reconnecting the MV Power Station

The MV Power Station must not be started at temperatures lower than -25 °C.

#### Procedure:

1. Ensure that the minimum clearances of all MV Power Stations of the complete system are complied with.
2. Depending on the medium-voltage switchgear, remove the grounding from the cable panel of the medium-voltage switchgear (see manufacturer's documentation) or remove the grounding of the upstream and downstream medium-voltage switchgear.
3. Reconnect the MV Power Station from the utility grid at the superordinate medium-voltage switchgear (see manufacturer's documentation).
4. Depending on the medium-voltage switchgear, switch on the cable panel of the medium-voltage switchgear (see manufacturer's documentation).
5. Reconnect the medium-voltage transformer.
6. Reconnect the supply voltage of the station subdistribution.
7. Reconnect the inverter.
8. Reconnect any additional external supply voltages.

### 7.5.2 Reconnecting the Medium-Voltage Transformer

#### Requirements:

- The tap changer of the medium-voltage transformer must only be operated in a de-energized state.
- The tap changer of the medium-voltage transformer must not be switched at oil and ambient temperatures under -10 °C.

#### Procedure:

1. Make sure that the safety clearances around the MV Power Station are complied with.
2. Ensure that the medium-voltage cabinet doors are secured.
3. If necessary, disconnect the grounding system on the low-voltage side of the medium-voltage transformer.
4. Remove the grounding from the transformer panel of the medium-voltage switchgear (see manufacturer's documentation).
5. Switch on the transformer panel of the medium-voltage switchgear (see manufacturer's documentation).

### 7.5.3 Reconnecting the Inverter

#### Procedure:

1. Make sure that all hatches are closed and locked.
2. If the inverter is equipped with a Remote GFDI, set the parameter **PvGnd.OpnRemGfdi** to **Enable** and thus cancel the grounding of the PV field.

3. If the inverter is equipped with a Remote GFDI, set the parameter **PvGnd.OpnRemGfdi** to **Disable** and thus activate the grounding of the PV field.
4. Remove protection against reconnection at the AC disconnection unit.
5. Mount the outer panel of the AC switch module.
6. If external supply voltage is used, reconnect the external supply voltage
7. Remove the padlocks from the brackets of the DC switches **-Q61** and **-Q62**.
8. Turn the DC load-break switch **-Q62** to the **ON** position.
9. Turn the DC load-break switch **-Q61** to the **ON** position.
10. Turn the key switch **-S1** to **Start**.

#### 7.5.4 Reconnecting the Supply Voltage of the Station Subdistribution

1. If needed, reconnect the inverter for the supply voltage of the MV Power Station components and switch on the miniature circuit breaker **-F70/-F4** in the inverter.
2. Switch on the miniature circuit breaker **-F32** for lighting.
3. Switch on the miniature circuit breaker for the optional fan **-F34**.

#### 7.5.5 Reconnect the battery storage system

1. Ensure that there are no more people in the operating area.
2. Leave the operating area and lock it.
3. Externally connect the battery voltage.
4. If the batter is not controlled via the inverter, start the battery.
5. Log into the user interface.
6. Set the parameter **InvOpMod** to **Operation** via the user interface.

## 8 Operation

### 8.1 Safety during Operation

#### **WARNING**

##### **Danger to life due to arc fault caused by fault in the medium-voltage switchgear**

If there is a fault in the medium-voltage switchgear, arc faults may occur during operation of the product which can result in death or serious injuries. In the event of arc faults in the medium-voltage switchgear, the pressure escapes to the rear into the medium-voltage transformer compartment.

- Only perform work on the medium-voltage switchgear when it is in a voltage-free state.
- Prior to commissioning and operating the medium-voltage switchgear, close the front panels of the base below the medium-voltage switchgear.
- When performing switching operations, make sure that the hatch of the arc fault opening can be easily opened and is not covered by objects (e.g., ice, vegetation).
- When performing switching operations, open the doors of the medium-voltage cabinet and attach the doors to the designated positions.
- All work and switching operations on the medium-voltage switchgear must only be performed by qualified persons wearing adequate personal protective equipment.
- All other persons are to keep a safe distance from the product when switching operations are performed. The internal arc pressure safety area is to be cordoned off.
- Do not touch or access the roof of the medium-voltage switchgear when medium voltage is connected.
- Do not access the medium-voltage cabinet.

#### **WARNING**

##### **Danger to life due to electric shock when opening the customer installation location**

Dangerous contact voltages are present in the customer installation location during operation. Touching live parts can result in death or lethal injuries due to electric shock.

- Wear suitable personal protective equipment when opening the customer installation location.

#### **NOTICE**

##### **Operation failure of the PV power plant due to incorrectly set parameters**

If the parameter settings for grid management services are incorrect, the PV power plant may not be able to meet the requirements of the grid operator. This can involve yield losses and the inverter may have to be disconnected by the grid operator.

- When setting the modes of grid management services, ensure that the control procedures agreed with the grid operator are parameterized.
- If the inverter is operated with a Power Plant Controller, ensure that the mode **WCtlCom** for active power limitation and the mode **VArCtlCom** for reactive power control are selected in the inverter.

**NOTICE****Unwanted product behavior following a Firmware update**

When the firmware is updated, the default values for several parameters might be newly defined. Adopting default settings after a Firmware update without checking them can change the previous settings and result in unwanted behavior of the product. It can cause the product to disconnect because voltage limits are exceeded. This can result in yield losses.

- Before changing the parameter by simulation, ensure that the grid stability at the AC connecting rails of the product as well as at the point of interconnection is observed, also with the extended reactive power range.
- Ensure that MV transformer is designed for the permanent feed-in of reactive power.
- Check whether the reactive power range extension requires changes to the SCADA system or the system control. If changes are necessary, perform them.
- After adjusting the parameters for the reactive power setpoint, check whether the Modbus specifications for the reactive power values fed in by the product correspond to the specifications before the change and correspond to the expected values. If the specifications do not match, the percentage value for the reactive power setpoint in the SCADA system or of system controller must be adjusted.
- Ensure that the grid limits at the AC connecting rails of the product are observed with the extended reactive power range.

**i Development of odors after commissioning**

In the first days after commissioning of the product, odors may develop. Despite the development of odors, no substances hazardous to health are released. The odor subsides after a few days.

## 8.2 Settings of the protective device of the medium-voltage switchgear

**i Tripping time of circuit breaker panel of medium-voltage switchgear**

The grounding inside the MV Power Station is laid out in such a way that the troubleshooting time of the circuit breaker panel is less than 170 ms in the event of a short circuit. Depending on the order option, the grounding of the medium-voltage switchgear is designed for a short-circuit current with a tripping time of maximum 20 kA / 1 s or 25 kA / 1 s. The protection device must be configured accordingly and the response times of the protective device and circuit breaker observed. SMA Solar Technology AG recommends setting the parameter for the tripping time  $t_{>>}$  in the event of a short circuit to a maximum of 40 ms in order to avoid damages to the grounding device and injury to persons.  $t_{>>}$  is factory set to 0 ms.

The inrush current of the medium-voltage transformer must be considered to guarantee a smooth operation. The inrush-current curve can be made available by SMA Solar Technology AG upon request.

The MV Power Station will be delivered with system-optimized default settings. The settings must be adjusted to the local conditions (selective coordination with upstream safety devices). The actual tripping times must be verified through selective measurements and documented prior to commissioning. Selective measurement and configuration is the responsibility of the farm operator.

The procedure for setting the parameters for the MV switchgear protective device is to be found in the manufacturer documentation.

## 8.3 Cascade control

### 8.3.1 Commissioning the cascade control

To control the MV Power Station via the cascade control, the cascade control must be activated.

**Requirements:**

- The communication connection must be installed to control the cascade control remotely.

**Procedure:**

1. Open the cascade control door.
2. Ensure that the fuse in the fuse switch **F71** in the switch cabinet is inserted. The fuse is included in the scope of delivery.
3. Set the switch-on delay at the relay **K1** in the switch cabinet. Set the proper default values by turning the control knobs **Range** und **Time**. The set default value is 1 minute.
4. Set the switch-off delay at the relay **K2** in the switch cabinet. Set the proper default values by turning the control knobs **Range** und **Time**. The set default value is 5 seconds.
5. Close the cascade control door.
6. Switch on the fuse service switch **F70** for the supply voltage in the station subdistribution.

**8.3.2 Resetting the cascade control**

- Activate the switch **S3** of the cascade control.
- The status display **H1** of the cascade control is glowing.

**8.3.3 Selecting the operating mode for the cascade control**

The MV Power Station can be controlled locally via the remote control or cascade control. Depending on the switch position of switch **S1**, multiple operating modes are possible in parallel.

Switch <b>S1</b>	Local control	Remote control	Cascade control
Off	Off	Off	Off
Local/remote control	On	On	Off
Local/remote control/cascade control	On	On	On
Operation	Activate via switch <b>S10</b> Deactivate via switch <b>S11</b>	Remote control via MOXA module or terminal <b>X600:1-4</b>	Controlled by the circuit breaker of the medium-voltage switchgear

**Procedure:**

- Set switch **S1** to the desired operating mode.

**8.3.4 Switching off the Cascade Control**

It is recommended to switch off the cascade control when the MV Power Station is to be taken out of operation longer than 24 hours. The discharging of the batteries is avoided.

**Procedure:**

1. Set switch **S1** of the cascade control to **OFF**.
- The status display of the cascade control **H1** is no longer glowing.
2. Switch off the fuse service switch **F70** for the supply voltage in the station subdistribution.
3. Open the cascade control door.
4. Operate the switch **S2** of the cascade control to switch off the uninterruptible power supply of the cascade control.
5. Open the battery fuse **F71** if the cascade control will be inactive for a longer period.
6. Close the cascade control door.

## 9 Troubleshooting

### 9.1 Safety during Troubleshooting

#### ⚠ 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.
- Disconnect the product from the power transmission path and from the control path if no voltage is required for working on the product and the connected components.
- After switching off the inverter, wait at least 25 minutes before opening the inverter to allow the capacitors to discharge completely.
- Wear suitable personal protective equipment of the corresponding hazard risk category for all work. The hazard risk categories of the various areas of the product are different. For further information, contact us.
- Always perform all work in accordance with the locally applicable standards, directives and laws.
- Observe all safety information on the product and in the documentation.
- The product must not be operated with open covers or doors.
- Cover or isolate all live components.

#### ⚠ DANGER

##### **Danger to life from electric shock due to high voltages on the product**

High voltages can be present on the product under fault conditions. Touching live components results in death or serious injury due to electric shock.

- Observe all safety information when working on the product.
- Wear suitable personal protective equipment for all work on the product.
- If you cannot remedy the disturbance with the help of this document, contact the Service.

#### ⚠ WARNING

##### **Danger to life due to electric shock if external supply voltage is not disconnected**

When using an external supply voltage, even after disconnecting the product, there may still be lethal voltages present in cables. Touching live components can result in death or serious injury due to electric shock.

- Disconnect the external supply voltage.
- Do not touch the orange cables in the inside of the product. These cables are used for connecting the external supply voltage and can be dangerous to touch.
- Wear suitable personal protective equipment of the corresponding hazard risk category for all work when the power transmission path is connected. The hazard risk categories of the various areas of the product are different.

**⚠ WARNING****Hearing impairment due to high-frequency noises of the product**

The product generates high-frequency noises during operation. This can result in hearing impairment.

- Wear hearing protection.

**⚠ WARNING****Danger to life due to electric shock when opening the customer installation location**

Dangerous contact voltages are present in the customer installation location during operation. Touching live parts can result in death or lethal injuries due to electric shock.

- Wear suitable personal protective equipment when opening the customer installation location.

**⚠ CAUTION****Risk of burns due to hot components**

Some components of the product can get very hot during operation. Touching these components can cause burns.

- Observe the warnings on all components.
- During operation, do not touch any components marked with such warnings.
- After switching off the product, wait until any hot components have cooled down sufficiently.
- Wear suitable personal protective equipment for all work on the product.

**⚠ CAUTION****Danger of crushing and collision when carelessly working on the product**

Carelessly working on the product could result in crushing injuries or collisions with edges.

- Wear personal protective equipment for all work on the product.

**NOTICE****Shortened service life of the compact flash memory card due to frequently writing event messages**

Resetting error messages causes an event message to be stored on the compact flash memory card. Cyclic resetting generates a large number of event messages, which reduces the service life of the compact flash memory card.

- Reset errors only when the cause of the error has been remedied.
- Have the state of health of the compact flash memory card checked.

## 9.2 Missing supply voltage

Due to the missing supply voltage, individual components (e.g. lighting) are not supplied.

**Cause****CORRECTIVE MEASURES**

The main breaker has tripped.

1. Ensure that the main breaker is intact.
2. Ensure that the miniature circuit breaker **-F70/-F4** in the inverter is switched on.

## 9.3 The low-voltage transformer is not supplying voltage

Cause	CORRECTIVE MEASURES
The primary side thermal fuse has tripped.	<ol style="list-style-type: none"> <li>1. Ensure that the size of the thermal fuse on the primary side of the low-voltage transformer is set correctly.</li> <li>2. Replace the thermal fuse.</li> </ol>
The low-voltage transformer is defective.	<ul style="list-style-type: none"> <li>• Replace the low-voltage transformer. Contact us regarding this.</li> </ul>
The EMC filtering device is defective.	<ul style="list-style-type: none"> <li>• Replace the EMC filtering device. Contact us regarding this.</li> </ul>
The cabling is damaged.	<ul style="list-style-type: none"> <li>• Replace defective cables.</li> </ul>

## 9.4 The lighting is not working

Cause	CORRECTIVE MEASURES
The lamps are defective.	<ol style="list-style-type: none"> <li>1. Replace lamp.</li> </ol>
The miniature circuit breaker has tripped.	<ol style="list-style-type: none"> <li>1. Check whether apparent damage is visible in the corresponding electrical circuit.</li> <li>2. If any damage is present, remove it.</li> <li>3. Switch the miniature circuit breaker back on.</li> </ol>
The supply voltage of the MV Power Station has failed.	<ol style="list-style-type: none"> <li>1. Ensure that the supply voltage is available.</li> </ol>
The door contact switch is defective.	<ol style="list-style-type: none"> <li>1. Replace the door contact switch. Contact us regarding this.</li> </ol>

### Also see:

- [Missing supply voltage](#) ⇒ page 92

## 9.5 The fan does not start up

Cause	CORRECTIVE MEASURES
The required temperature has not been reached.	<ol style="list-style-type: none"> <li>1. To check whether the fans are working, note the position of thermostat <b>-S1</b>. Turn down the thermostat. This starts the fans.</li> <li>2. Reset the thermostat to the initial value.</li> </ol>
The miniature circuit breaker has tripped.	<ol style="list-style-type: none"> <li>1. Check whether apparent damage is visible in the corresponding electrical circuit.</li> <li>2. If any damage is present, remove it.</li> <li>3. Switch the miniature circuit breaker back on.</li> </ol>
The fan is defective.	<ul style="list-style-type: none"> <li>• Replace the fan. Contact us regarding this.</li> </ul>
The supply voltage of the MV Power Station has failed.	<ul style="list-style-type: none"> <li>• Ensure that the supply voltage is available.</li> </ul>
The cabling is damaged.	<ul style="list-style-type: none"> <li>• Replace defective cables.</li> </ul>

### Also see:

- Missing supply voltage ⇒ page 92

## 9.6 Medium-voltage transformer cannot be connected

Cause	CORRECTIVE MEASURES
The medium-voltage transformer is defective.	1. Replace the medium-voltage transformer. Contact us regarding this.
The oil sight gauge shows a low oil level.	1. Check the medium-voltage transformer for leakage. 2. Ensure that no air is in the medium-voltage transformer. 3. Contact us.
The medium-voltage transformer is too warm.	1. Read off the temperature of the medium-voltage transformer from the inverter. 2. Let the medium-voltage transformer cool down. 3. If the error reoccurs, contact Service.
The relay in the station subdistribution is not working properly.	1. Ensure that the relay in the station subdistribution is correctly functioning. 2. Replace defective cables.

## 9.7 The medium-voltage switchgear switches off

Cause	CORRECTIVE MEASURES
The temperature in the low-voltage cabinet is very high.	1. If present, check the fans. 2. Check ventilation grids and filter pads and clean or replace if needed.
The protective device of the medium-voltage transformer has triggered.	1. Check the protective device of the medium-voltage transformer. 2. Contact us. Reconnection without analyzing the cause of the error can result in the destruction of the medium-voltage transformer and is not permitted.
The fast stop (if present) was enabled.	1. Disable the fast stop. 2. Reconnect the medium-voltage switchgear.
The heat detector (if present) has triggered.	1. Check the low-voltage and medium-voltage cabinet for heat and fire. 2. If needed, please contact us.

## 9.8 The inverter switches off with an error and the pressure indicator shows excess pressure or negative pressure

Cause	CORRECTIVE MEASURES
The cause must be determined by SMA Service.	• Contact us.

## 9.9 The inverter switches off with an error and the oil sight gauge shows a low oil level

Cause	CORRECTIVE MEASURES
The cause must be determined by SMA Service.	<ul style="list-style-type: none"> <li>• Contact us.</li> </ul>

## 9.10 There is oil on or below the medium-voltage transformer

Cause	CORRECTIVE MEASURES
<p>Oil probably leaked from the medium-voltage transformer.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> <li>• The medium-voltage transformer has traces of oil on the seals.</li> <li>• There is a leakage at the transformer boiler of the medium-voltage transformer.</li> </ul>	<ol style="list-style-type: none"> <li>1. Do not continue to operate the medium-voltage transformer.</li> <li>2. Clean the medium-voltage transformer.</li> <li>3. Check whether the cause can be further narrowed down.</li> <li>4. Contact us.</li> </ol>

## 9.11 The pressure-relief valve has triggered

Cause	CORRECTIVE MEASURES
The cause must be determined by SMA Service.	<ol style="list-style-type: none"> <li>1. Do not continue to operate the medium-voltage transformer.</li> <li>2. Contact us.</li> </ol>

## 10 Maintenance

### 10.1 Safety during Maintenance

#### ⚠ 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.
- Disconnect the product from the power transmission path and from the control path if no voltage is required for working on the product and the connected components.
- After switching off the inverter, wait at least 25 minutes before opening the inverter to allow the capacitors to discharge completely.
- Wear suitable personal protective equipment of the corresponding hazard risk category for all work. The hazard risk categories of the various areas of the product are different. For further information, contact us.
- Always perform all work in accordance with the locally applicable standards, directives and laws.
- Observe all safety information on the product and in the documentation.
- The product must not be operated with open covers or doors.
- Cover or isolate all live components.

#### ⚠ DANGER

##### **Danger to life from electric shock from improperly operating the tap changer of the MV transformer**

Operating the tap changer of the MV transformer while energized will create a short circuit in the MV transformer. The resulting voltages will lead to death or serious injury.

- Only operate the tap changer when the MV transformer is fully de-energized.
- Have a duly authorized person ensure that the MV transformer is de-energized prior to any work or adjustments to settings.
- Any work on the MV transformer or adjustments to settings may only be performed by qualified service partners.
- Wear suitable protective equipment for all work.

**⚠ WARNING****Danger to life from electric shock when entering the system**

Damaged insulation in the system can cause lethal currents to ground. Lethal electric shocks can result.

- Ensure that the insulation resistance of the system exceeds the minimum value. The minimum value of the insulation resistance is: 14 kΩ.
- All work on the inverter must only be carried out by qualified persons.
- Before entering the system, switch the system with the ground fault detection system (Remote GFDI) to insulated operation.
- After entering the system, immediately ensure that the inverter does not display an insulation error.
- Disconnect the product from the power transmission path and from the control path if no voltage is required for working on the product and the connected components.
- Wear suitable personal protective equipment for all work on the product.

**⚠ WARNING****Danger to life due to electric shock if external supply voltage is not disconnected**

When using an external supply voltage, even after disconnecting the product, there may still be lethal voltages present in cables. Touching live components can result in death or serious injury due to electric shock.

- Disconnect the external supply voltage.
- Do not touch the orange cables in the inside of the product. These cables are used for connecting the external supply voltage and can be dangerous to touch.
- Wear suitable personal protective equipment of the corresponding hazard risk category for all work when the power transmission path is connected. The hazard risk categories of the various areas of the product are different.

**⚠ WARNING****Hearing impairment due to high-frequency noises of the product**

The product generates high-frequency noises during operation. This can result in hearing impairment.

- Wear hearing protection.

**⚠ WARNING****Danger to life due to electric shock when opening the customer installation location**

Dangerous contact voltages are present in the customer installation location during operation. Touching live parts can result in death or lethal injuries due to electric shock.

- Wear suitable personal protective equipment when opening the customer installation location.

**⚠ CAUTION****Risk of burns due to hot components**

Some components of the product can get very hot during operation. Touching these components can cause burns.

- Observe the warnings on all components.
- During operation, do not touch any components marked with such warnings.
- After switching off the product, wait until any hot components have cooled down sufficiently.
- Wear suitable personal protective equipment for all work on the product.

**⚠ CAUTION****Risk of injury when using unsuitable tools**

Using unsuitable tools can result in injuries.

- Ensure that the tools are suitable for the work to be carried out.
- Wear personal protective equipment for all work on the product.

**NOTICE****Damage to the system due to sand, dust and moisture ingress**

Sand, dust and moisture penetration can damage the products of the system and impair its functionality.

- Only open the product if the humidity is within the thresholds and the environment is free of sand and dust.
- Do not open the product during a dust storm or precipitation.
- In case of interruption of work or after finishing work, mount all enclosure parts and close and lock all doors.
- Only operate the product when it is closed.
- Store the closed product in a dry and covered location. Observe storage conditions.
- The temperature at the storage location must be in the specified range. The temperature range is: -40°C to +70°C. Depending on the type of oil of the medium-voltage transformer, the minimum temperature may be higher.

**NOTICE****Damage to electronic components due to electrostatic discharge**

Electrostatic discharge can damage or destroy electronic components.

- Observe the ESD safety regulations when working on the product.
- Wear suitable personal protective equipment for all work on the product.
- Discharge electrostatic charge by touching grounded enclosure parts or other grounded elements. Only then is it safe to touch electronic components.

**NOTICE****Damage due to environmental disturbances**

The product can be damaged by environmental disturbances e.g. earthquakes, storms or flooding. With a damaged product, a safe and trouble-free operation is not guaranteed. Considerable damages to the product and yield losses can result.

- Always disconnect the product from voltage sources as quickly as possible after large-scale environmental disturbances.
- Once disconnected from voltage sources, perform a thorough 12-month-maintenance check that is not subject to the maintenance schedule. Shorten the maintenance intervals depending on the determined maintenance requirements.
- After a dust or snow storm, ensure that the air inlets and outlets are not covered by any objects (e.g., sand).
- Only recommission the product once any damages have been rectified.

## 10.2 Information on Maintenance

Observance of the maintenance intervals ensures trouble-free operation.

The general maintenance work must be performed on all components of the product according to the required intervals. The first maintenance work must be done no later than 12 months after delivery of the MV Power Station.

In addition, obey the instructions on additional maintenance work in the manufacturer's documentation.

### **i Correct performance of maintenance work**

All maintenance work must be performed as described in this document. Deviations from procedures or failure to comply with the maintenance intervals will lead to any guarantee- or warranty claims becoming null and void.

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

Location and ambient conditions influence the maintenance intervals. In particular, cleaning and corrosion protection work may be required more frequently depending on the conditions at the installation site. Examples of adverse ambient conditions include storms, flooding, coastal location, or a site with high dust pollution levels.

- 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.

### **i Maintenance report for maintenance**

All maintenance work must be documented in a maintenance report. The maintenance report can be found on the website <https://www.sma.de/en/products/system-solutions-packages/medium-voltage-power-station-4600> under "Downloads" and "Maintenance documents".

- After maintenance work, save the maintenance report.
- In addition, a copy is to be sent to [maintenance.service@sma.de](mailto:maintenance.service@sma.de) at the latest four weeks after completion of the maintenance work. Enter the serial number of the system on which maintenance was carried out in the subject line.

### **i Consumables and maintenance materials**

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.

### **i Spare parts**

Only original parts or parts recommended by SMA Solar Technology AG are to be used as spare parts when replacing components.

Spare parts can be identified via the reference designation and the circuit diagram. The spare-parts list includes the article numbers of each spare part. For information on a specific article number, contact us.

## **10.3 Requirements for paint for repair work**

Use a touch-up stick in the appropriate RAL color to repair small-area damage. Observe the relevant instructions of the paint manufacturer.

Position	Color	Color
Enclosure of the inverter	RAL 9016	Traffic white
Medium-voltage transformer	RAL 7033 / 7035	Cement gray / light gray
Low- and medium-voltage cabinet	RAL 7004	Signal gray
Rack	Zinc paint (e.g. WÜRTH Zink 300)	Galvanized

For the paints for medium-voltage transformers, low- and medium-voltage cabinets, observe the following information according to the order option:

	"Environment: Standard"	"Environment: Harsh"
Basic requirement	Suitable as corrosion protection for C3H as per ISO 12944-5:2019	Suitable as corrosion protection for C5H as per ISO 12944-5:2019
Color structure / color composition	1-K (one-component)	2-K (two-component)
Temperature resistance	130 °C (266 °F)	130 °C (266 °F)
Layer thickness	240 µm to 260 µm	320 µm
Number of coating layers	1 to 2	2 to 3

For further information on the Harsh+ order option, please contact SMA.

## 10.4 Servicing Schedule

### 10.4.1 Servicing Schedule for General Work

Carry out the following maintenance work when no voltage is present. The general maintenance work must be performed on all components of the product according to the required intervals.

Task	Interval	See
Maintain the key switches and seals.	12 months	Section 10.5.1.2, page 106
Perform visual inspection of the MV Power Station.	12 months <sup>11)</sup>	Section 10.5.1.3, page 106
Perform visual inspection of the inverter.	C5M: 6 months <sup>12)</sup> C4M: 12 months C3H: 24 months	Inverter documentation
Clean the interior.	12 months <sup>11)</sup>	Section 10.5.1.5, page 107
Save the operating data of the inverter. To do this, the supply voltage must be present.	12 months <sup>13)</sup>	Inverter documentation
Check the surfaces for rust damage. If necessary, remove the rust and paint over with primer and the respective color.	12 months <sup>11)</sup>	Manufacturer documentation
If needed, touch up the station frame with zinc paint. The proportion of zinc dust as a pigment should be greater than 90% of the weight. Make sure that traces of corrosion have been removed and that the surface is free of grease and oil. The zinc paint must overlap the hot-dip galvanizing. The layer thickness of the area to be touched up should be at least 100 µm. Zinc sprays are not permitted.		

<sup>11)</sup> If the product is subject to adverse ambient conditions, SMA Solar Technology AG recommends that the maintenance interval be reduced in accordance with the ambient conditions.

<sup>12)</sup> The length of the maintenance interval affects the term of protection of the coating system.

<sup>13)</sup> In order to reduce the data transmission time, the interval should be shortened.

Task	Interval	See
In case of salt spray, the salt must be removed from the product surface on a regular basis to prevent rust damage.	12 months <sup>11)</sup>	-
Check the fast stop function of the MV Power Station (if any).	12 months <sup>11)</sup>	-
Check the latches, door stops and hinges.	24 months	Section 10.5.1.4, page 107
Check the labels of the MV Power Station.	24 months <sup>11)</sup>	
Check whether any warning message or label is damaged or missing. Replace any warning messages and labels which are missing or illegible. If necessary, you can order labels as a complete set. Contact us.		
Check the inverter label.	24 months <sup>11)</sup>	-
Check whether any warning message or label is damaged or missing. Replace any warning messages and labels which are missing or illegible. If necessary, you can order labels as a complete set. Contact us.		
Check that the grounding connections are securely in place. Check the grounding connections for discoloration and corrosion. If necessary, repair any corrosion damage and grease.	24 months <sup>11)</sup>	-
Check all components of the product and ensure operational safety after environmental disturbances (e.g., earthquakes, storms or flooding).	If necessary	Section 10.5.1.1, page 106
Contact the SMA Service Line after each short circuit.	After any short circuit	-

#### Also see:

- Requirements for paint for repair work ⇒ page 99

## 10.4.2 Servicing schedule for the low-voltage connection between inverter and medium-voltage transformer

Carry out the following maintenance work when no voltage is present.

Task	Interval
Clean the busbar and feed-throughs.	12 months <sup>14)</sup>
Check whether the ventilation grids are free from pollution and deposits and clean if needed.	24 months <sup>14)</sup>

<sup>14)</sup> If the product is subject to adverse ambient conditions, SMA Solar Technology AG recommends that the maintenance interval be reduced in accordance with the ambient conditions.

### 10.4.3 Servicing schedule for work in the medium-voltage cabinet

Carry out the following maintenance when supply voltage is present.

Task	Interval	See
Check function of the fan. To do this, turn the thermostat lower than the ambient temperature until the fan starts. After the test, set the thermostat back to the original value.	12 months	-
For the order option "Environment: Harsh", "Environment: Harsh+" or "Ambient Temperature: -35 °C to +55 °C": clean the filter pad at the air inlets and outlets. For this, wash with clear water, dry and reinsert the filter pad. The filter pad must be replaced by a new one after 10 washes.  Additionally required material: filter pads for air inlets and outlets (material number: 113059-00.01)	12 months <sup>15)</sup>	-
Check the heat detector.	12 months	Manufacturer documentation
Depending on the order option: in the cascade control, check the LED display to see the status of the battery on the C-TEC 2425 P. If the LED does not light up, replace the batteries of the cascade control.  Additionally required material: batteries for the cascade control (material number: 109005-00.01)	12 months <sup>15)</sup>	-
Check whether the ventilation grid function is given.	24 months <sup>15)</sup>	-
Clean the medium-voltage cabinet.	24 months <sup>15)</sup>	-
Clean the ventilation shaft of the fan and the ventilation grids on the doors.	24 months <sup>15)</sup>	-
Ensure that the grounding contacts are securely in place and show no discoloration or corrosion.	24 months	-
Check the function of the lighting.	24 months	-
Check the function of the doors and hinges and lubricate them.  Additionally required material: a suitable water-free, temperature-resistant lubricant	24 months	-
Replace the heat detector.	10 years	-

<sup>15)</sup> If the product is subject to adverse ambient conditions, SMA Solar Technology AG recommends that the maintenance interval be reduced in accordance with the ambient conditions.

#### 10.4.4 Servicing schedule for the low-voltage cabinet

Task	Interval
Check the surge arrester and, if necessary, remove it. Additionally required material: surge arrester (material number: 62-951001)	12 months, after thunderstorms or noticeable voltage surges in the utility grid
Clean the filter pad at the air inlets and outlets. For this, wash with clear water, dry and reinsert the filter pad. The filter pad must be replaced by a new one after 10 washes. Additionally required material: filter pads for air inlets and outlets (material number: 113059-00.01)	12 months <sup>16)</sup>
Check function of the heaters. To do this, turn the thermostat higher than the ambient temperature until the heaters start. After the test, set the thermostat back to the original value.	12 months
Check function of the residual-current device.	12 months
Check that the protective covers of the fuses are securely in place and correct, if necessary.	24 months
Ensure that the grounding connections are securely in place and show no discoloration or corrosion.	24 months
Check the function of the relay in the safety loop.	24 months
Clean the inside of the enclosure.	24 months <sup>16)</sup>

#### 10.4.5 Servicing Schedule for the Medium-Voltage Transformer

Carry out the following maintenance work when no voltage is present.

Task	Interval	See
Check the oil temperature in the instantaneous value <b>6107</b> .	12 months	-
Check low-voltage and medium-voltage cable entries for discolorations and damages.	24 months	Section 10.5.2.4, page 108
Check electrical connections for dirt and signs of electric arcs.	24 months	Section 10.5.2.5, page 108
Check the cooling surfaces for dirt and damages.	24 months	Section 10.5.2.1, page 107
Check maintenance seal and security seals for damage.	24 months	Section 10.5.2.3, page 108
Check the torques of grounding connections.	24 months	Section 10.5.2.6, page 108
Check function of the tap changer.	24 months	Section 10.5.2.9, page 109
Check the oil level.	24 months	
Check the medium-voltage transformer for paint damage and rust. Remove any rust patches and repaint (if necessary).	24 months	Manufacturer documentation

<sup>16)</sup> If the product is subject to adverse ambient conditions, SMA Solar Technology AG recommends that the maintenance interval be reduced in accordance with the ambient conditions.

Task	Interval	See
Check all seals of the medium-voltage transformer for leakage. In case of leakage, contact us.	24 months	Manufacturer documentation
Take an oil sample and have it tested.	Recommended after a failure when, for example, the hermetic protection device has tripped.	Contact us.
Check the medium-voltage transformer for abnormal noises during operation.	If necessary	-

In addition, obey the instructions on additional maintenance work in the manufacturer's documentation.

#### Also see:

- [Checking the transformer tank for damage](#) ⇒ page 108
- [Assignment of the transformer protection plug on the medium-voltage transformer side](#) ⇒ page 109
- [Checking the Function of the Control Elements of the Hermetic Full-Protection Device](#) ⇒ page 109

### 10.4.6 Servicing Schedule for the Medium-voltage Switchgear

Carry out the following maintenance work when no voltage is present.

Task	Interval	See
Checking Gas Fill Level in Medium-Voltage Switchgear	Prior to each switching procedure:	Section 10.5.3.1, page 110
Carry out the visual inspection of the general condition (cleanliness, no corrosion, etc.). If required, clean the enclosure and repair corroded surfaces.	24 months <sup>17)</sup>	-
Check the lid of electric-arc opening.	24 months and prior to each switching operation.	Section 10.5.3.2, page 110
Check grounding connections.	24 months	Section 10.5.3.4, page 110
Check the functionality of the switch.	24 months	Section 10.5.3.5, page 110
Depending on the order option: Check the motor-drive function.	24 months	Manufacturer documentation
Check the locking of the cable cover in ungrounded condition.	24 months	Manufacturer documentation
Check functionality of the over-current protection device. This task must only be performed by qualified protection tester.	4 years	-
Check electrical connections.	6 years	Section 10.5.3.3, page 110
Check the accessory for completeness and its current state.	6 years	Manufacturer documentation

<sup>17)</sup> If the product is subject to adverse ambient conditions, SMA Solar Technology AG recommends that the maintenance interval be reduced in accordance with the ambient conditions.

Task	Interval	See
Check that switch position indicators are aligned.	6 years	Section 10.5.3.6, page 111
Replace the battery (Saft Type LS 17500, 3.6 V) of the overcurrent protection devices IKI 30E and IKI 35.	15 years	Manufacturer documentation

In addition, obey the instructions on additional maintenance work in the manufacturer's documentation.

## 10.4.7 Servicing Schedule for the Oil Spill Containment

The MV Power Station is equipped with an oil spill containment depending on the order option.

Task	Interval
Check the oil spill containment underneath the medium-voltage transformer and the inverter and clean if necessary. To clean the oil spill containment, remove the base plates (10 x M6 hex socket) in front of the inverter. Remove leaves and other debris. If there is oil leakage, use a pump placed at the lowest point of the oil spill containment.	12 months <sup>18)</sup>
Check the prefilter and oil filter and clean if necessary.	12 months <sup>18)</sup>
Check the oil spill containment underneath the medium-voltage transformer and the inverter regularly for leakages. If necessary, eliminate leakages.	24 months <sup>18)</sup>
Check the oil spill containment underneath the medium-voltage transformer and the inverter regularly for water to prevent frost damage. Remove water if necessary.	24 months <sup>18)</sup>
Replace the prefilter.	36 months
Additionally required material:	
<input type="checkbox"/> Pre-filter (order number: 58-940000.01) <input type="checkbox"/> If necessary, filter media for the pre-filter (order number: 65-171800.01) <input type="checkbox"/> Sealant (e.g. Teflon tape) to seal the connections between the oil drain valve, oil filter and pre-filter	
Replace the oil filter if clean and clear water flows through the filter.	5 years or if the oil filter has come into contact with oil.
Additionally required material:	
<input type="checkbox"/> Oil filter for organic oil for KNAN transformers (order number: 58-940200.01) <input type="checkbox"/> Sealant (e.g. Teflon tape) to seal the connections between the oil drain valve, oil filter and pre-filter	

<sup>18)</sup> If the product is subject to adverse ambient conditions, SMA Solar Technology AG recommends that the maintenance interval be reduced in accordance with the ambient conditions.

## 10.5 Maintenance Work

### 10.5.1 General Maintenance Work

#### 10.5.1.1 Maintenance tasks after extraordinary environmental incidents

After extraordinary environmental incidents (e.g. sand or snow storm, volcanic eruption, forest fire) have occurred, unscheduled maintenance within one week is required to ensure trouble-free operation.

#### NOTICE

##### Damage due to environmental disturbances

The product can be damaged by environmental disturbances e.g. earthquakes, storms or flooding. With a damaged product, a safe and trouble-free operation is not guaranteed. Considerable damages to the product and yield losses can result.

- Always disconnect the product from voltage sources as quickly as possible after large-scale environmental disturbances.
- Once disconnected from voltage sources, perform a thorough 12-month-maintenance check that is not subject to the maintenance schedule. Shorten the maintenance intervals depending on the determined maintenance requirements.
- After a dust or snow storm, ensure that the air inlets and outlets are not covered by any objects (e.g., sand).
- Only recommission the product once any damages have been rectified.

##### Procedure:

1. Check surface of the product for damage.
2. In case of salt spray: the salt must be removed from the product surface to prevent rust damage.
3. Check ventilation grids and air duct for pollution and deposits. If dust or other deposits cover the air inlets and outlets, clean the ventilation grids and air duct.
4. Check the product behavior for errors within the next 4 weeks. If errors occur more frequently than before the environmental incident, contact us.
5. Check the product behavior for derating within the next 4 weeks. If the product is in derating mode more frequently than before the environmental incident, clean the ventilation grids and the air duct again.

#### 10.5.1.2 Maintaining Key Switches and Seals

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

- Talcum, petroleum jelly or wax for maintaining the seals
- Non-greasing antifreeze agent

##### Procedure:

1. Ensure that all poles are de-energized. Observe the discharging time of the capacitors of 15 minutes.
2. Check whether the seals in the sealing area of the enclosure opening show any signs of damage. If seals are damaged, contact us.
3. Apply talcum, petroleum jelly or wax to seals. This will prevent frost damage.
4. If the product is installed in regions in which temperatures below freezing occur, protect the key switch from icing-up with non-greasy antifreeze agent.

#### 10.5.1.3 Performing the Visual Inspection

1. Ensure that all poles are de-energized.
2. Check all surfaces for dirt. Remove dirt (if necessary).

3. Ensure that there are no foreign materials or objects in or on the MV Power Station and its devices that are flammable or that could otherwise endanger operational safety. If necessary, remove foreign materials and seal any holes to prevent further intrusion.
4. Ensure that there are no objects in front of or behind the medium-voltage transformer compartment, which will endanger operational safety in the event of arc faults and which prevent arc fault diversion.
5. Ensure that all cable entries are intact and that the cables are not damaged (e.g., due to animal bites).
6. Ensure that the ventilation and exhaust air vents are not obstructed.
7. Ensure that there are no objects around the product which prevent the cooling air from circulating.
8. Check the welded joints on the devices for damage. Contact the SMA Service Line if any welded joints are damaged.
9. Check whether all type labels of the MV Power Station (incl. medium-voltage transformer, low-voltage transformer and low-voltage transformer) are present, complete and legible. Replace the type label if it is not legible. Contact us.
10. Check whether the circuit diagram and documentation are complete and legible. If the circuit diagram or documentation is not legible, contact us.

#### 10.5.1.4 Checking the Latches, Door Stops and Hinges

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

- A suitable water-free, heat-resistant lubricant, e.g., WD40
- Non-greasing antifreeze agent, e.g., PS88

**Procedure:**

1. Ensure that all poles are de-energized.
2. Check whether the doors latch easily. Open and close the doors several times. If the doors do not latch easily, lubricate all moving parts of the latch.
3. Check whether the stops hold the doors in place. If the stops cannot hold the doors in place, contact us.
4. Check whether the door hinges move easily. If the door hinges do not move easily, lubricate the hinges.
5. Lubricate all moving parts and movement points.
6. Tighten any loose screws with the appropriate torque.
7. If the product is installed in regions where below-freezing temperatures occur, apply the non-greasing antifreeze to the profile cylinders of the door locks and the key switch in order to protect them from icing up.

#### 10.5.1.5 Cleaning the Interior

1. Ensure that all poles are de-energized.
2. Remove dirt and dust from all interiors and from all devices.
3. Check the interior for leaks. If leaks are present, fix them.
4. Remove moisture.

#### 10.5.1.6 Checking the Labels

- Check whether any warning message or label is damaged or missing. Replace any warning messages and labels which are missing or illegible. If necessary, you can order labels as a complete set. Contact us.

### 10.5.2 Maintenance Work on the Medium-Voltage Transformer

#### 10.5.2.1 Checking the Cooling Surfaces for Dirt and Damages

1. Ensure that the medium-voltage transformer and inverter are disconnected from all voltage sources.

2. Clean the cooling surfaces of the medium-voltage transformer.
3. Check the cooling surfaces of the medium-voltage transformer for damage. If the cooling surfaces are damaged, contact us.

#### **10.5.2.2 Checking the transformer tank for damage**

1. Remove dirt and dust from the surface of the medium-voltage transformer. Do not use any high-concentration cleaning agents for this.
2. Check the surface of the medium-voltage transformer for oil traces and cracks. If the surface has any oil traces and cracks, please contact us.

#### **10.5.2.3 Checking Maintenance Seal and Security Seals for Damage**

There are maintenance seals and security seals on the MV Power Station. These maintenance seals and security seals ensure that unauthorized access to the MV Power Station parts can be recognized.

##### **Procedure:**

1. Ensure that the medium-voltage transformer and inverter are disconnected from all voltage sources.
2. Check the security seals on the oil filler neck and oil drain valve.
3. If the maintenance seals or security seals are damaged, contact us.

#### **10.5.2.4 Checking Low-Voltage and Medium-Voltage Cable Entries for Discolorations and Damages**

1. Ensure that the medium-voltage transformer and inverter are disconnected from all voltage sources.
2. Check low-voltage and medium-voltage cable entries for discolorations and damages. If the cable entries are discolored or damaged, contact us.

#### **10.5.2.5 Checking Electrical Connections for Dirt and Signs of Electric Arcs**

1. Ensure that the medium-voltage transformer and inverter are disconnected from all voltage sources.
2. Check electrical connections for dirt. Remove dirt (if necessary). To prevent oil leaks, do not damage the fins of the medium-voltage transformer when doing this (e.g., by stepping on or leaning against conductors).
3. Check electrical connections for signs of electric arcs. If the electrical connections show any discolorations, deformations or scorch marks, contact us.

#### **10.5.2.6 Checking Torque of the Grounding Connection**

1. Ensure that the medium-voltage transformer and inverter are disconnected from all voltage sources.
2. Check the tightening torque of the grounding connections on the medium-voltage transformer (60 Nm) and, if necessary, retighten the bolted grounding connection and grease.

### 10.5.2.7 Assignment of the transformer protection plug on the medium-voltage transformer side

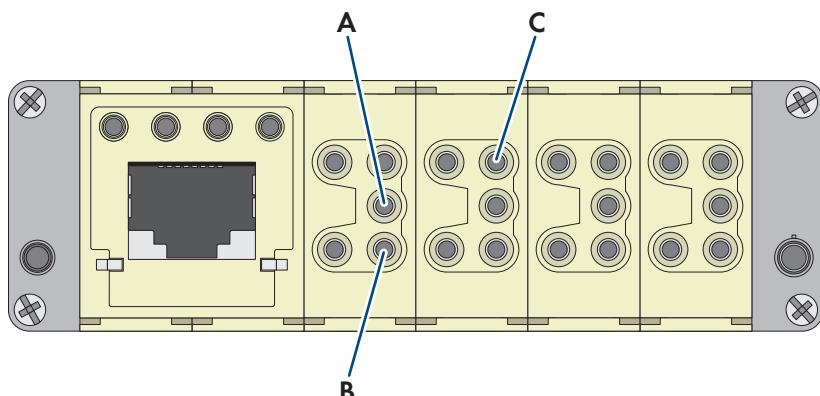


Figure 43: Assignment of the transformer protection plug on the medium-voltage transformer side

Position	Reference Designation	Designation at the plug	Description
A	-X4:3	Module insert 4: Connection designation: 3	Output: 24 V voltage supply
B	-X4:5	Module insert 4: Connection designation: 5	Input: Oil level or fill level
C	-X3:2	Module insert 3: Connection designation: 2	Input: GND for analog temperature monitoring

### 10.5.2.8 Checking the Function of the Control Elements of the Hermetic Full-Protection Device

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

- Magnet to move the float ball in the oil level indicator

**Procedure:**

1. Ensure that the MV Block and the inverter are disconnected from all voltage sources.
2. Open the brackets on the transformer protection plug. Then, remove the plug.
3. Ensure through measurement on the transformer protection plug between the terminals **X4:3** and **X4:5** that the contact is closed.
4. Pull the float of the oil level indicator down with a magnet.
5. Measure on the transformer protection plug between the terminals **X4:3** and **X4:5** whether the contact is open. When the contact is closed, the function of the oil-level monitoring system is not ensured. Contact us.

### 10.5.2.9 Checking the function of the tap changer

Regular switching of the tap changer prevents oil and carbon deposits from accumulating on the tap changer contacts.

**Procedure:**

1. Ensure that the medium-voltage transformer and inverter are disconnected from all voltage sources.
2. Make a note of the tap changer starting value.

3. Switch the tap changer of the medium-voltage transformer using at least 10 switching cycles across the entire voltage range.
4. Reset the tap changer to the starting value (noted value).

### 10.5.2.10 Checking the Oil Level

1. Ensure that the medium-voltage transformer and inverter are disconnected from all voltage sources.
2. Ensure that the oil level in the hermetic protection device is in the permissible range. If the oil level is outside the permissible range, please contact us.

## 10.5.3 Maintenance Work in Medium-Voltage Switchgear

### 10.5.3.1 Checking Gas Fill Level in Medium-Voltage Switchgear

The level of SF6 gas must be checked before performing any switching operation.

#### Procedure:

- Check the gas level of the medium-voltage switchgear on the manometer. If the level of the SF6 gas is too low, contact us.

### 10.5.3.2 Checking the Internal Arc Pressure Relief

1. Ensure that the MV Power Station is disconnected.
2. Ensure that there are no objects in front of or behind the medium-voltage transformer compartment, which will endanger operational safety in the event of arc faults and which prevent arc fault diversion.

### 10.5.3.3 Checking Electrical Connections

1. Ensure that the MV Power Station is disconnected.
2. Remove the covering plates of the medium-voltage switchgear in front of the cable panels and the transformer panel.
3. Ensure that the cable connections are securely in place. Retighten the connections (if necessary). Always adhere to the torque specifications.
4. Ensure that the strain reliefs are securely in place. Retighten the strain reliefs (if necessary). Replace the strain reliefs if they are too small or too large.
5. Check electrical connections for dirt. Remove dirt (if necessary).
6. Check electrical connections for signs of electric arcs. If the electrical connections show any discolorations, deformations or scorch marks, contact us.

### 10.5.3.4 Checking Grounding Connections

1. Ensure that the MV Power Station is disconnected.
2. Make sure that the grounding contacts of the station are securely in place and show no discoloration or corrosion. Retighten the grounding contacts (if necessary). If the grounding contacts are discolored or corroded, contact us.
3. Grease the grounding connections.

### 10.5.3.5 Checking Functionality of the Circuit Breaker

This procedure does not check the disconnection via the transformer protective relay. This test is done by checking the functionality of the over-current protection device.

#### Procedure:

1. Ensure that the MV Power Station is disconnected.

2. For the "Remote Control" option, set the Local/Remote switch on the medium-voltage switchgear to **Local**.
3. Check the functioning of the circuit breaker of the medium-voltage switchgear by performing 1 to 2 switching cycles. If the circuit breakers do not function correctly, contact us.

### 10.5.3.6 Checking the Alignment of the Switch Position Indicators

#### **i** Connecting and disconnecting medium voltage

Only a duly authorized person trained in electrical safety is allowed to connect and disconnect the medium voltage.

#### Procedure:

1. Check the function of the lock. To do so, ensure that in the connected state, no control levers can be plugged into the grounding.
2. Switch the individual connection points of the medium-voltage switchgear in the specified order. Check thereby the display of the switch position before and after each switching operation.
3. If the display of the switch position is not correct, the medium-voltage switchgear is defective. Contact us.

### 10.5.4 Maintenance Work at the Low-Voltage Connection between Inverter and MV Transformer

#### 10.5.4.1 Checking the Protective Cover of the Low-Voltage Connection

1. Ensure that the medium-voltage transformer and inverter are disconnected from all voltage sources.
2. Depending on the order option, open the protective grid or splash guard in front of the medium-voltage transformer.
3. Open the inspection lid. Use a wrench for this.
4. Check the low-voltage connection for dirt, damage and corrosion. If the protective cover is damaged or corroded, contact us.
5. Remove dirt (if necessary).
6. Reattach the inspection lid of the protective cover (torque: 8 Nm).
7. Close the protective grid in front of the medium-voltage transformer.

### 10.5.5 Completing Maintenance Work

#### Requirement:

All maintenance work must be completed.

#### Procedure:

1. Ensure that the MV Power Station is disconnected.
2. Close all hatches on the inverter.
3. Mount the covering plates of the medium-voltage switchgear in front of the cable panels and the transformer panel.
4. Insert the transformer protection plug into the inverter and lay down the bracket attached to the plug.
5. Document all maintenance work in the maintenance report.

## 11 Disposal

### WARNING

#### **Danger of crushing if raised or suspended loads tip over, fall or sway**

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

- Follow all national transportation standards and regulations.
- Before each transport, inspect the product for rust and visible deformations. If necessary, take safety measures.
- Never allow anyone to walk or stand under a suspended load at any time.
- Always transport the load as close to the ground as possible.
- Use all suspension points for transportation.
- Use the tie-down and crane points provided for transportation.
- Do not lift at damaged load-bearing parts.
- Avoid fast or jerky movements during transport.
- Always maintain an adequate safety distance during transport.
- Note the center of gravity of the product during transport.
- All means of transport and auxiliary equipment used must be designed for the weight of the product.
- Wear suitable personal protective equipment for all work on the product.

#### **Proper disposal**

A MV Power Station which has come to the end of their service life constitute electronic waste. Electronic waste contains on the one hand valuable materials (e.g., copper, aluminum or steel) which can be recycled as secondary raw materials, and on the other, substances which are hazardous to the environment (e.g., oil or SF<sub>6</sub> gas). Contact your local commercial disposal services for information on optimum material utilization and environmentally friendly disposal.

Prior to transporting the MV Power Station, the medium-voltage transformer and the inverters must be removed from the station to prevent possible damages due to an instable frame construction.

For further information on disposal and recycling, refer to the respective documentation of the individual devices. For example, once its useful life has expired, the SF<sub>6</sub> gas used in medium-voltage switchgears can be extracted completely and then sent for recycling.

We can support you in implementing the measures necessary for the disposal and recycling of the system.

## 12 Periodic Actions

### 12.1 Opening the Doors, Protective Grilles and Splash Guards on the MV Power Station

To access the medium-voltage switchgear, the station subdistribution or the low-voltage transformer and to perform maintenance work, you must unlock and open the doors of the product.

**Procedure:**

1. Unlock the doors.
2. Pull the door levers slightly forward and turn them 45° counterclockwise.
3. At the door to the low-voltage transformer, use a square key to open the sash lock on the right side of the door.
4. To lock the doors in place, open the doors to 90°.

### 12.2 Closing the Doors, Protective Grilles and Splash Guards on the MV Power Station

To lock the doors to the medium-voltage switchgear, the station subdistribution or the low-voltage transformer, it is recommended to use padlocks (diameter of the shackle: < 8 mm). Alternatively, suitable lock cylinders (EMKA 1109-U1-N) can be installed instead of the filler plugs.

**Procedure:**

1. Lift the bracket to unlock the locking mechanism.
2. Close the doors.
3. At the door to the low-voltage transformer, use a square key to close the sash lock on the right side of the door.
4. Turn the door levers 45° clockwise and press them lightly.
5. Lock the doors.

### 12.3 Feeding the cables through the base plate into the inverter/power converter

1. Cut the cables to the required length. Allow for some reserve.
2. For the order option with "Cable Entry Kit": Remove the plates of the Cable Entry Kit. Thread the cables with rubber bushings through the holes in the plate. When doing so, ensure that the rubber bushings cleanly enclose and seal the cables. This prevents animals from entering the product. Remount the Cable Entry Kit.
3. For the order option without "Cable Entry Kit": Remove the base plates of the cable entries. Drill holes in the base plates. Route the cables through the opening in the base of the MV Power Station into the DC connection area of the power converter. Thread the cables with cable glands or rubber bushings through the holes in the base plate. Ensure that the cable glands or rubber bushings cleanly enclose and seal the cables. This prevents animals from entering the product.
4. Route the data cables separately from the power cables.

## 12.4 Inserting the cables through the base plate of the medium-voltage switchgear

### **WARNING**

#### **Danger to life due to arc fault caused by fault in the medium-voltage switchgear**

If there is a fault in the medium-voltage switchgear, arc faults may occur during operation of the product. In the event of arc faults in the medium-voltage switchgear, the pressure escapes to the rear into the medium-voltage transformer compartment. Incorrectly installed cable protection can prevent arc fault diversion. This can result in death or serious injury.

- Mount the base plate and rubber bushings in such a way that gases cannot escape downwards.
- Do not place any objects in front of, under, next and behind the MV transformer compartment.

#### **Requirements:**

- The doors must be open .
- The kick plates of the medium-voltage switchgear must be removed.

#### **Procedure:**

1. Cut the cables to the required length. Allow for some reserve.
2. Insert the cables in the medium-voltage switchgear.

## 13 Function Description

### 13.1 Cascade Control

The order option "Cascade control" enables staggered reconnection of the MV Power Station after a grid failure or maintenance work. For this option, the following changes are implemented by default:

- The medium-voltage switchgear is motorized in the transformer outgoing feeder panel.
- The capacitive voltage detection system of the medium-voltage switchgear is equipped with an alarm contact in the left cable panel.
- The control is located on the right outside of the medium-voltage compartment of the MV Power Station.

The control device is connected to the transformer outgoing feeder panel of the medium-voltage switchgear and controls an integrated motor. Furthermore, the control device is connected to the alarm contact of the voltage detection system integrated in the medium-voltage switchgear. The alarm contact of the voltage detection system is used for connecting and disconnecting the transformer outgoing feeder panel. The switching limiting value for the voltage detection system is set in accordance with IEC 61 243-5. The voltage is measured upstream the load-break switch in the left cable panel.

If the voltage falls below the permissible switching limit value, a signal is sent to the control device and the transformer outgoing feeder panel of the medium-voltage switchgear is switched off with an adjustable delay. If the voltage detection system measures a voltage whose value is above the permissible switching limit value, a signal is sent to the control device and the transformer outgoing feeder panel of the medium-voltage switchgear is switched on with an adjustable delay. The time delay for disconnection and connection must be set in accordance with the grid operator's specifications. The time delay for disconnection is set to five seconds and for connection to one minute by default. The disconnection time should not be set less than 5 seconds so that the MV Power Station does not impact the utility grid during dynamic grid support.

The cascade control can be operated manually on site via remote control or during automatic control operation.

In order that the medium-voltage switchgear can also be controlled remotely, the customer can connect 2 switches to the cascade control terminal block.

### 13.2 Safety shutdown

The MV Power Station is equipped with a safety chain for the disconnection of the system depending on the order option. For triggering, the MV Power Station can be equipped with a fast stop switch, heat detector or individual devices for temperature, pressure and oil level. The fast-stop function can also be tripped by an external signal. For this, a potential-free make contact can be connected at terminal **-X3800:1/2** in the station subdistribution. This enables a customer's own devices to be integrated into safety chain. In addition, the terminal **-X3801:1/2** is available in the station subdistribution as a feedback contact for the fast-stop switch of the MV Power Station and fast-stop key switch **-S2** of the inverter.

By triggering the safety chain, the fast stop signal is sent to the inverter and the medium-voltage switchgear is switched off.

### 13.3 Monitoring the ambient temperatures

For the order option "Ambient Temperature: -40°C to +45°C", the MV Power Station is equipped with 2 heaters in the medium and low-voltage cabinet, 1 thermostat in the medium-voltage cabinet, and 1 hygrostat in the low-voltage cabinet. The heaters are activated at a temperature lower than -15°C or at a humidity above 90%. If the interior temperature in the medium-voltage cabinet sinks below -33°C, e.g. when opening the doors, the transformer field of the medium-voltage switchgear shuts off and the circuit breaker in the inverter opens.

For the order option "Ambient Temperature: -35 °C to +55 °C", the MV Power Station is also equipped with 1 thermostat and 1 heater on the right in the lower area of the station subdistribution. For the order option with a low-voltage transformer, there is also 1 thermostat and 3 heaters in the left and upper right area of the station subdistribution. In the medium-voltage compartment there is 1 thermostat for safe shutdown. If the ambient temperature drops below -33 °C for an extended period, the transformer field of the medium-voltage switchgear shuts off and the circuit breaker in the inverter opens.

## 13.4 Communication Network in the MV Power Station

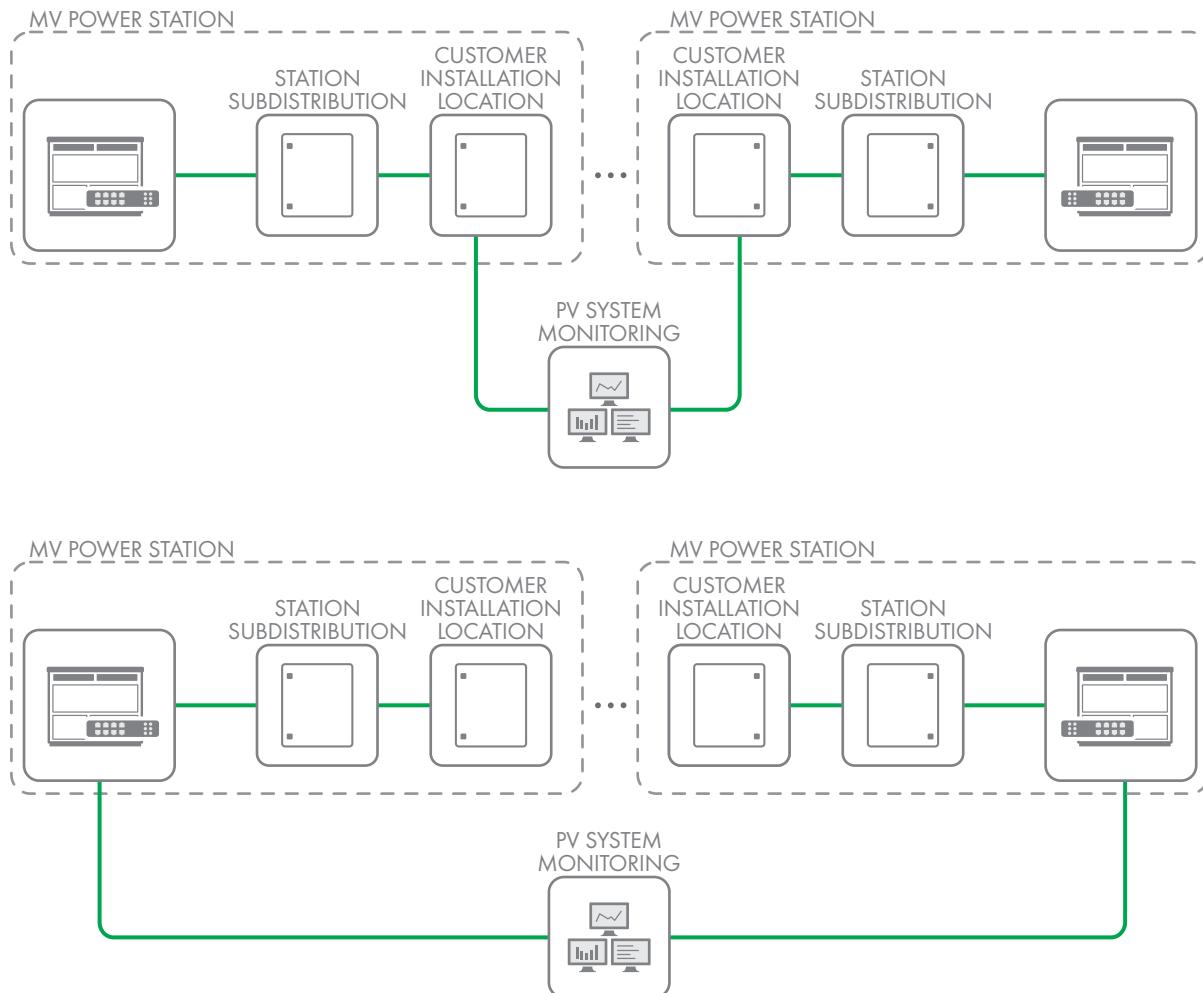


Figure 44: Communication network in the MV Power Station

Depending on the order option of the inverter, the terminal for the communication network is located in the inverter or in the station subdistribution of the MV Power Station.

In order to guarantee the implementation of control commands, the network that manages the control should be kept free from applications with a high network load, e.g. webcams. Using a separate network is recommended to implement data-heavy applications.

For a stable transmission of Modbus protocols, the frequency of the Modbus requests may not exceed 1/100 ms.

The DC-DC Converters and the batteries are each integrated into the internal network of the respective inverters. The design of the internal network must be provided by the client.

A connection from the managed switch of the inverter to the customer installation location of the MV Power Station has been factory-set via **LAN 2 port 4**.

## 13.5 Communication network in case of order option "Monitoring"

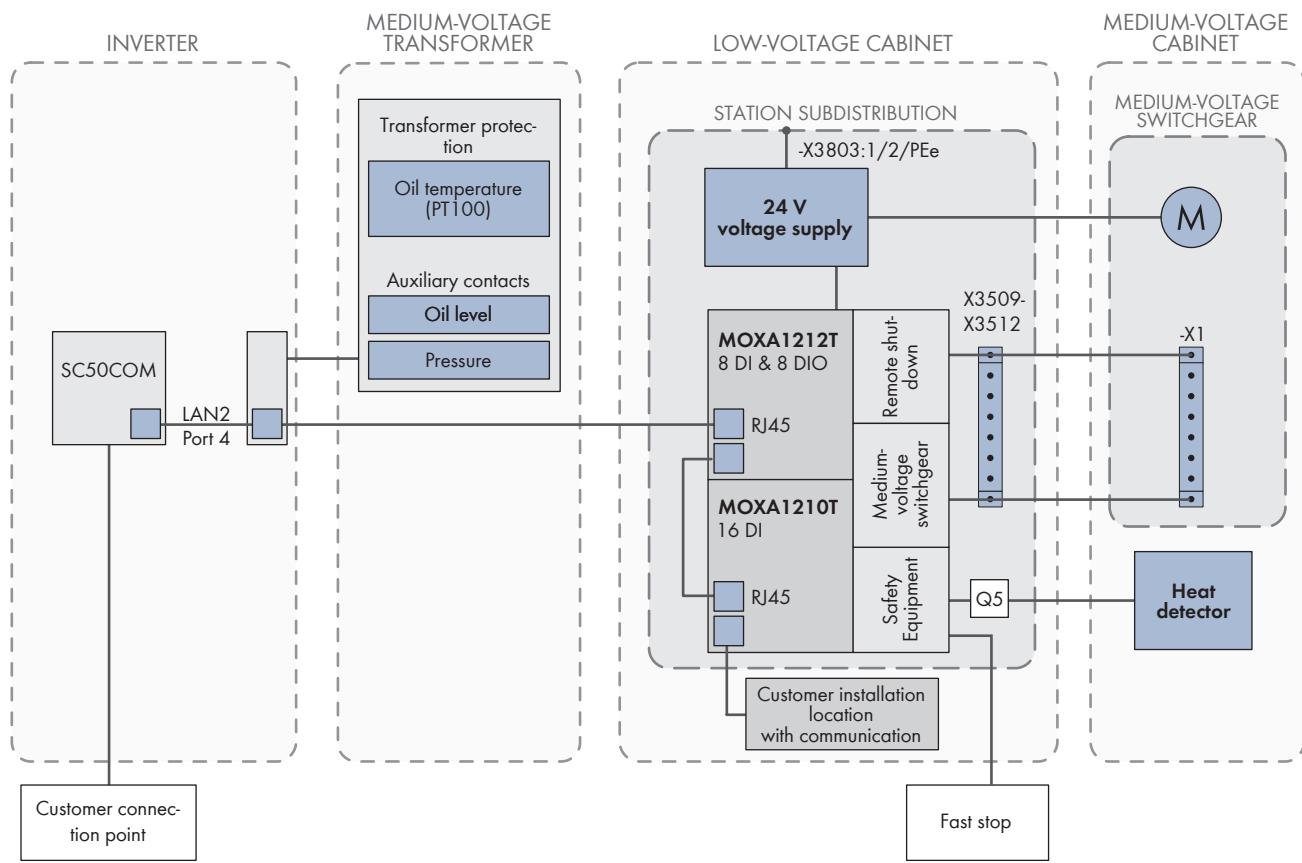


Figure 45: Communication network of the MV Power Station (example - order option "MVSG+Re Co+Sa Eq")

The type and number of MOXA modules in the station subdistribution depends on the order option:

Order option	Type MOXA 1	Type MOXA 2
Monitoring MVSG	MOXA 1210T	-
Monitoring MVSG + Remote Control	MOXA 1210T	MOXA 1212T
Monitoring MVSG + Remote Control + Safety Equipment	MOXA 1210T	MOXA 1212T
Monitoring MVSG + Safety Equipment	MOXA 1210T	MOXA 1210T
Monitoring Safety Equipment	-	MOXA 1210T

For the order option "Monitoring MVSG + Remote Control", the disconnect signal must be sent directly to the MOXA module. Since communication with the inverter is interrupted after the medium-voltage switchgear is switched off, a separate voltage supply must be provided.

## 14 Appendix

### 14.1 Load Profile of the MV Power Station

In order to operate the MV Power Station within the permitted temperature range, when planning the system, it must be ensured that the MV Power Station feeds in with 100% station power for a maximum of 12 hours per day.

If a DC-coupled storage solution is used, an average transformer load of 50% per day must not be exceeded.

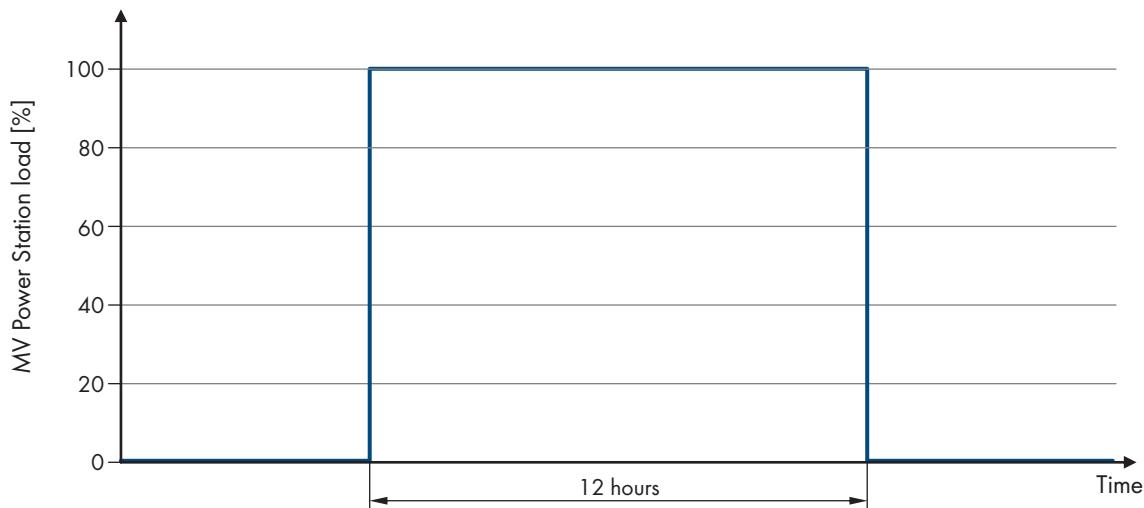


Figure 46: Maximum possible load profile of the MV Power Station without Q at Night

Depending on the order option, the MV Power Station can also be operated 24 hours with 100% station power.

### 14.2 Maximum continuous power of the low-voltage transformer

Depending on the order option, the MV Power Station is equipped with a low-voltage transformer with a nominal power of 10 kVA to 60 kVA. Above a nominal power of 30 kVA, the maximum continuous power over 24 hours per day is lower:

Nominal power	Continuous power
10 kVA	10 kVA
20 kVA	20 kVA
30 kVA	22 kVA
40 kVA	26 kVA
50 kVA	30 kVA
60 kVA	34 kVA

### 14.3 Intermittent operation for maximum nominal power of the low-voltage transformer

If the maximum nominal power of the low-voltage transformer is to be used intermittently, you can operate the low-voltage transformer in intermittent operation.

During intermittent operation, the low-voltage transformer supplies 6% of the power for 5 minutes. For example, a low-voltage transformer with 60 kVA has only 3.6 kVA available. To operate applications that only need power for a short time, the low-voltage transformer provides 100% of the power for 1 minute every 5 minutes. Thus, connected tracker motors can track the PV modules, for example.

To be able to have enough energy available to move the PV modules to a safe position in the event of a storm, the low-voltage transformer provides 100% of the power for 10 minutes after 6 intervals.

Time interval	Available power
1 minute (one-time start interval)	100 %
5 minutes (start of cyclical interval)	6 %
1 minute	100 %
5 minutes	6 %
1 minute	100 %
5 minutes	6 %
1 minute	100 %
5 minutes	6 %
1 minute	100 %
5 minutes	6 %
1 minute	100 %
5 minutes	6 %
10 minutes (end of cyclical interval)	100 %

#### 14.4 Nominal Current Depending on Ambient Temperature

The nominal current of the medium-voltage switchgear depends on the ambient temperature of the MV Power Station. During design, the maximum ampacity must be considered at high temperatures.

##### 630 A Switchgear SIEMENS 8DJH, 8DJH36 RRL, 8DJH36 kL, 8DJH24 Blue GIS

Ambient temperature of the MV Power Station	Nominal current at 1000 m	Nominal current at 2000 m
30°C	630 A	630 A
35°C	600 A	600 A
40°C	565 A	565 A
45°C	530 A	530 A
50°C	500 A	0 A
55°C	0 A	0 A

##### 630 A Switchgear ORMAZABAL cgm.3 2lv

Ambient temperature of the MV Power Station	Nominal current at 1000 m	Nominal current at 2000 m
30°C	630 A	630 A
35°C	585 A	585 A

Ambient temperature of the MV Power Station	Nominal current at 1000 m	Nominal current at 2000 m
40°C	540 A	540 A
45°C	480 A	480 A
50°C	430 A	0 A
55°C	0 A	0 A

### 800 A Switchgear ORMAZABAL cgm.800 2lv

Ambient temperature of the MV Power Station	Nominal current at 1000 m	Nominal current at 2000 m
30°C	800 A	800 A
35°C	800 A	800 A
40°C	800 A	800 A
45°C	780 A	780 A
50°C	740 A	0 A
55°C	0 A	0 A

### 630 A Switchgear SFA RM36 SSB

Ambient temperature of the MV Power Station	Nominal current at 1000 m	Nominal current at 2000 m
30°C	630 A	630 A
35°C	575 A	575 A
40°C	515 A	515 A
45°C	460 A	460 A
50°C	425 A	0 A
55°C	0 A	0 A

## 14.5 On-Site Services

The following provisions and services are not included in the product scope of delivery and must be provided:

- Crane for unloading the product at the construction site (can be supplied on request)
- Foundation for the product
- Shim plates to compensate for the height difference from the corners of the foundation to the middle foundation
- For the order option "Earthquake and Storm Package" suitable anchors in the foundation.
- Platforms or landings to overcome the step height. To prevent rust, the landings must not cover any parts of the MV Power Station.
- For the order option "Without MV Switchgear": suitable protective relay for the medium-voltage transformer
- For the "1 MVSG for 2 MVT" order option: cable and connection plug (CELLPACK, CTKS 630 A, 24 kV or 36 kV) for connection to the transformer panel of the medium-voltage switchgear of another MV Power Station

- For the order option "External LVT": strain-relief clamps, terminal lugs and fastening material for the cables
- Cable for the external fast-stop function
- Ladder
- Drainage channel for rainwater that has penetrated the oil filter
- Installation of the oil filter. The oil filter must be positioned at an angle of 15° to 25° downward, and if necessary, the ground must be excavated.
- Conduit for cable entry
- Overvoltage protection of the entire system
- Site external grounding system
- Disassembly and Disposal of the Packaging Materials
- All mounting and connection work at the construction site
- Door locks
- For the order option "Cascade Control": padlocks for the lockable caps of the operating elements
- Setting and measurement of the set tripping times of the circuit breaker panels' protective device of the medium-voltage switchgear
- Zinc paint and spare paint to touch up transport damage
- Touch up paint damage according to the specification of SMA
- For safe commissioning, the requirements for mounting must be fulfilled.
- After transport, wash the station with clear water within 3 days after it arrives at the construction site or is placed in storage.
- Cleaning of all components after completing the assembly and installation work before commissioning
- Removal of the supporting struts in front of the inverter and medium-voltage cabinet

If you have any questions, please contact us.

## 15 Technical Data

### 15.1 General Data

Width x height x depth (transport dimensions)	6058 mm x 2896 mm x 2438 mm
Weight	< 18.0 t
Maximum self-consumption <sup>19)</sup>	< 8.1 kW
Self-consumption at partial load <sup>19)</sup>	< 1.8 kW
Average self-consumption <sup>19)</sup>	< 2.0 kW
Standby consumption <sup>19)</sup>	< 370 W
Medium-voltage and low-voltage compartment degree of protection according to IEC 60529	Medium-voltage compartment IP33D Low-voltage compartment IP43
Inverter electronics degree of protection	IP54
Degree of protection busbar conduit between inverter and medium-voltage transformer	IP23D
Standards and directives complied with	IEC 60076, IEC 62271-200, IEC 62271-202, EN50588-1, CSC certificate

### 15.2 AC output

Nominal AC voltage	10 kV to 36 kV
AC grid frequency	50 Hz / 60 Hz
Transformer vector groups	Dy11 / YNd11 <sup>20)</sup> / YNy0 <sup>20)</sup>
Transformer cooling method	KNAN
Maximum total harmonic distortion	< 3 %
Power factor at rated power/adjustable displacement power factor	1 / 0.8 overexcited to 0.8 underexcited
Feed-in phases	3

### 15.3 Ambient Conditions

Maximum permissible value for the relative humidity	0% to 95% (annual average) and > 95% to 100% (up to 2 months per year)
Inverter standard	C5M / C4M / C3H (depending on the environment)
MV Power Station standard	C3 / 4S12 as per IEC 60721-3-4 (2019), DIN EN ISO 9223 (2012) and EN ISO 12944-2 (2017)
MV Power Station Option Harsh	C5 / 4S13 as per IEC 60721-3-4 (2019), DIN EN ISO 9223 (2012) and EN ISO 12944-2 (2017)

<sup>19)</sup> Information based on inverter

<sup>20)</sup> Optional

MV Power Station option Harsh+	C5 / 4S13 as per IEC 60721-3-4 (2019), DIN EN ISO 9223 (2012) and EN ISO 12944-2 (2017)
Maximum operating altitude above MSL	1000 m
Maximum operating altitude above MSL for option "Installation at high altitudes"	2000 m
Fresh air consumption <sup>21)</sup>	6500 m <sup>3</sup> /h
Operating temperature range	Standard: -25 °C to +45 °C Option: -25 °C to +55 °C Option: -40 °C to +45 °C Option: -35 °C to +55 °C
Temperature range (storage)	Standard: -25 °C to +65 °C Option: -40 °C to +65 °C Option: -35 °C to +65 °C

<sup>21)</sup> Information based on inverter

## 16 Contact

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

- Device type
- Serial number
- Firmware version
- Event message
- Installation site and mounting height
- Type and number of electrolyzer
- Optional equipment, e.g., communication products
- Detailed description of the problem

You can find your country's contact information at:



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





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