Transportation and Installation Requirements


# MEDIUM VOLTAGE POWER STATION
# SUNNY CENTRAL
# SUNNY CENTRAL UP
# SUNNY CENTRAL STORAGE
# SUNNY CENTRAL STORAGE UP

ENGLISH

MVPS-S2-UP-A4-TA-en-13 | Version 1.3

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# 1 Information on this Document

## 1.1 Validity

**Medium Voltage Power Station from production version 1.0**

- MVPS-2660-S2-10 (Medium Voltage Power Station with 1 Sunny Central 2660 UP)
- MVPS-2800-S2-10 (Medium Voltage Power Station with 1 Sunny Central 2800 UP)
- MVPS-2930-S2-10 (Medium Voltage Power Station with 1 Sunny Central 2930 UP)
- MVPS-3060-S2-10 (Medium Voltage Power Station with 1 Sunny Central 3060 UP)
- MVPS-4000-S2-10 (Medium Voltage Power Station with 1 Sunny Central 4000 UP)
- MVPS-4200-S2-10 (Medium Voltage Power Station with 1 Sunny Central 4200 UP)
- MVPS-4400-S2-10 (Medium Voltage Power Station with 1 Sunny Central 4400 UP)
- MVPS-4600-S2-10 (Medium Voltage Power Station with 1 Sunny Central 4600 UP)
- MVPS-2660-S2-10 (Medium Voltage Power Station with 1 Sunny Central Storage 2300 UP-XT)
- MVPS-2800-S2-10 (Medium Voltage Power Station with 1 Sunny Central Storage 2400 UP-XT)
- MVPS-2930-S2-10 (Medium Voltage Power Station with 1 Sunny Central Storage 2530 UP-XT)
- MVPS-3060-S2-10 (Medium Voltage Power Station with 1 Sunny Central Storage 2630 UP-XT)
- MVPS-4000-S2-10 (Medium Voltage Power Station with 1 Sunny Central Storage 3450 UP(-XT))
- MVPS-4200-S2-10 (Medium Voltage Power Station with 1 Sunny Central Storage 3600 UP(-XT))
- MVPS-4400-S2-10 (Medium Voltage Power Station with 1 Sunny Central Storage 3800 UP(-XT))
- MVPS-4600-S2-10 (Medium Voltage Power Station with 1 Sunny Central Storage 3950 UP(-XT))
- MVPS-2200-S2-11 (Medium Voltage Power Station with 1 Sunny Central 2200)
- MVPS-2475-S2-11 (Medium Voltage Power Station with 1 Sunny Central 2475)
- MVPS-2200-S2-11 (Medium Voltage Power Station with 1 Sunny Central Storage 1900)
- MVPS-2200-S2-11 (Medium Voltage Power Station with 1 Sunny Central Storage 2200)
- MVPS-2475-S2-11 (Medium Voltage Power Station with 1 Sunny Central Storage 2475)
- MVPS-2900-S2-11 (Medium Voltage Power Station with 1 Sunny Central Storage 2900)

**Inverters as of firmware version 8.00.##.R**

- SC-2200-10 (Sunny Central 2200)
- SC-2475-10 (Sunny Central 2475)
- SCS-1900-10 (Sunny Central Storage 1900)
- SCS-2200-10 (Sunny Central Storage 2200)
- SCS-2475-10 (Sunny Central Storage 2475)
- SCS-2900-10 (Sunny Central Storage 2900)

**Inverters as of firmware version 8.00.##.R**

- SC 2660 UP (Sunny Central 2660 UP)
- SC 2800 UP (Sunny Central 2800 UP)
- SC 2930 UP (Sunny Central 2930 UP)
- SC 3060 UP (Sunny Central 3060 UP)
- SC 4000 UP (Sunny Central 4000 UP)
- SC 4200 UP (Sunny Central 4200 UP)
- SC 4400 UP (Sunny Central 4400 UP)
- SC 4600 UP (Sunny Central 4600 UP)
- SCS 3450 UP (Sunny Central Storage 3450 UP)
- SCS 3600 UP (Sunny Central Storage 3600 UP)
- SCS 3800 UP (Sunny Central Storage 3800 UP)
- SCS 3950 UP (Sunny Central Storage 3950 UP)
- SCS 2300 UP-XT (Sunny Central Storage 2300 UP-XT)
- SCS 2400 UP-XT (Sunny Central Storage 2400 UP-XT)
- SCS 2530 UP-XT (Sunny Central Storage 2530 UP-XT)
- SCS 2630 UP-XT (Sunny Central Storage 2630 UP-XT)
- SCS 3450 UP-XT (Sunny Central Storage 3450 UP-XT)
- SCS 3600 UP-XT (Sunny Central Storage 3600 UP-XT)
- SCS 3800 UP-XT (Sunny Central Storage 3800 UP-XT)
- SCS 3950 UP-XT (Sunny Central Storage 3950 UP-XT)

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.

# 2 Scope of Delivery

After the MV Power Station has arrived, check the scope of delivery for completeness and any apparent external damage. For this purpose, complete a digital transport checklist and send it back to the customer project manager of SMA Solar Technology AG no later than 3 days after the arrival at the construction site or warehouse.

## Scope of delivery of the MV Power Station

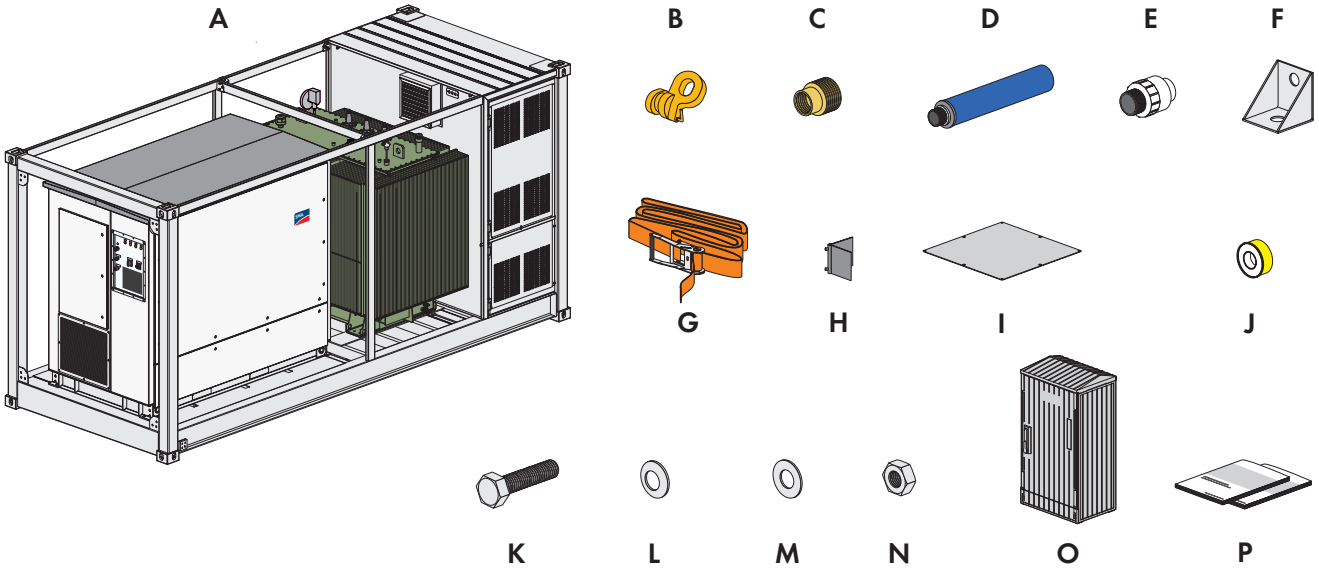



Figure 1: Scope of delivery of the MV Power Station

| Position | Quantity | Designation |
|---|---|---|
| A | 1 | MV Power Station |
| B | 4 | Lifting lugs[1)] |
| C | 1 | Reducer[2)] |
| D | 1 | Oil filter[2)] |
| E | 1 | Pre-filter[2)] |
| F | 4 | Side twistlock[3)] |
| G | 2 | Tie-down strap[4)] |
| H | 8 | Edge protection angle[4)] |
| I | 1 | Covering plate[4)] |
| J | 1 | Teflon tape[2)] |
| K | 8 | Screw M12 for the grounding connection |
| L | 8 | Spring washer M12 for the grounding connection |
| M | 16 | Fender washer M12 for the grounding connection |

[1)] Optional

[2)] In case of order option "Oil Containment"

[3)] For the order option "Earthquake and Storm Package"

[4)] For the order option "Earthquake and Storm Special"

| Position | Quantity | Designation |
|---|---|---|
| N | 8 | Nut M12 for the grounding connection |
| O | 1 | Switch cabinet for the order option "Cascade Control"[1)] |
| P | 1 | Documentation, circuit diagram |

## Scope of Delivery of the Medium-Voltage Switchgear

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

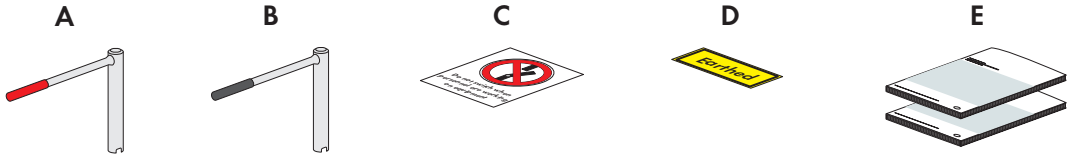



Figure 2: Scope of Delivery of the Medium-Voltage Switchgear

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

## Scope of Delivery of the Inverter for Order Option "DC Input Configuration"

The scope of delivery is located in the DC connection area of the inverter.

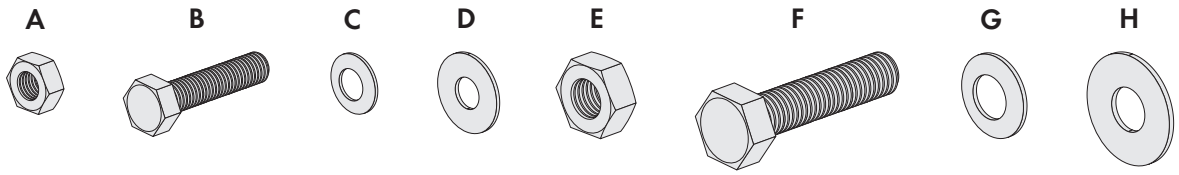



Figure 3: Scope of Delivery

| Position | Designation | Application |
|---|---|---|
| A | Nut M8 | - |
| B | Bolt M8 | |
| C | Spring washer M8 | |
| D | Fender washer M8 | |

[5)] Quantity depending on the manufacturer of the medium-voltage switchgear

| Position | Designation | Application |
|---|---|---|
| E | Nut M12 | Connection of the DC inputs |
| F | Bolt M12 | |
| G | Spring washer M12 | |
| H | Fender washer M12 | |

## Scope of delivery of the order option "DC fuse"

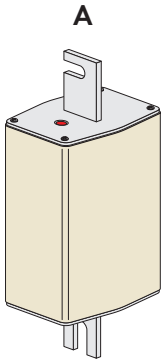



Figure 4: Scope of delivery

| Position | Quantity | Designation |
|---|---|---|
| A | option-dependent | DC fuse |

# 3 Product Overview

## 3.1 Design of the MV Power Station

The MV Power Station is a turnkey skid solution for PV and storage applications. It essentially includes the inverter, the medium voltage transformer and the optional medium-voltage switchgear.

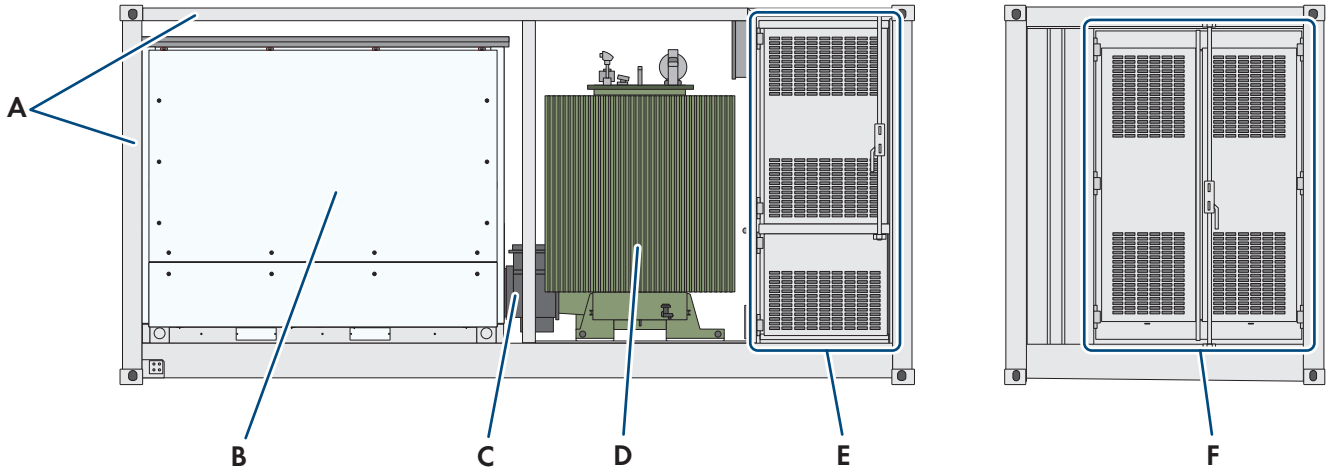



Figure 5: Design of the MV Power Station

| Position | Designation | Explanation |
|---|---|---|
| A | Rack | The MV Power Station is equipped with a rack with the order option "Sea freight". |
| B | Sunny Central / Sunny Central Storage | The Sunny Central is a PV inverter that converts the direct current generated in the PV arrays into grid-compliant alternating current. Additionally, the Sunny Central for DC-coupled storage solutions can be operated with batteries.<br>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. |
| 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. |
| E | LV 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. |

## 3.2 Components of the Medium-Voltage Cabinet

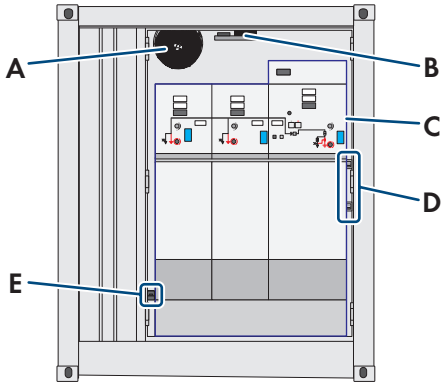



Figure 6: Components of the medium-voltage cabinet (example)

| Position | Designation |
|---|---|
| A | Fan[6)] |
| B | Lighting[6)]/ heat detector[6)] |
| C | Medium-voltage switchgear[6)] |
| D | Thermostats for heating and safety shutdown of the medium-voltage switchgear[7)] |
| E | Heating[7)] |

Further details are to be found in the circuit diagram.

## 3.3 Components of the Low-Voltage Cabinet

The low-voltage cabinet is divided into separate areas, one for the station subdistribution and one for the low-voltage transformer.

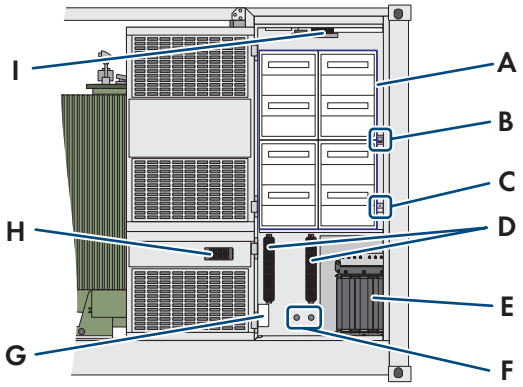



Figure 7: Components of the low-voltage cabinet (example)

| Position | Designation |
|---|---|
| A | Station subdistribution[8)] |
| B | Thermostat for fan control[9)] |

[6)] Optional

[7)] With order option "Ambient Temperature: -40 °C to +45 °C"

[8)] Optional, quantity and size depending on the order option

[9)] Optional

| Position | Designation |
|---|---|
| C | Hygrostat[10)] |
| D | Terminal blocks for the connection of external loads such as tracker motors, DC-DC converters or the supply of battery containers[8)] |
| E | Low-voltage transformer[8)] |
| F | Terminals for grounding resistance measuring device[11)] |
| G | Fuse holder with thermal fuse for the low-voltage transformer[8)] |
| H | Heating[10)] |
| I | Lighting[9)] |

All miniature circuit breakers for the MV Power Station are located in the station subdistribution. The positions of the components vary depending on the order option. Reference designations are attached to the individual devices of the station subdistribution.

With the "LV Transformer" order option the MV Power Station is equipped with a low-voltage transformer.

The MV Power Station low-voltage transformer provides the supply voltage for various components (see MV Power Station circuit diagram). The low-voltage transformer is equipped with an EMC filtering device and lightning protection and protected by a thermal fuse on the primary side.

The fuse protection of the tracker motors is located in a separate area of the station subdistribution. The tracker motors must be designed to cope with voltage fluctuations that can occur at the point of interconnection.

## 3.4 Customer Installation Location

### 3.4.1 Design of the Customer Installation Location

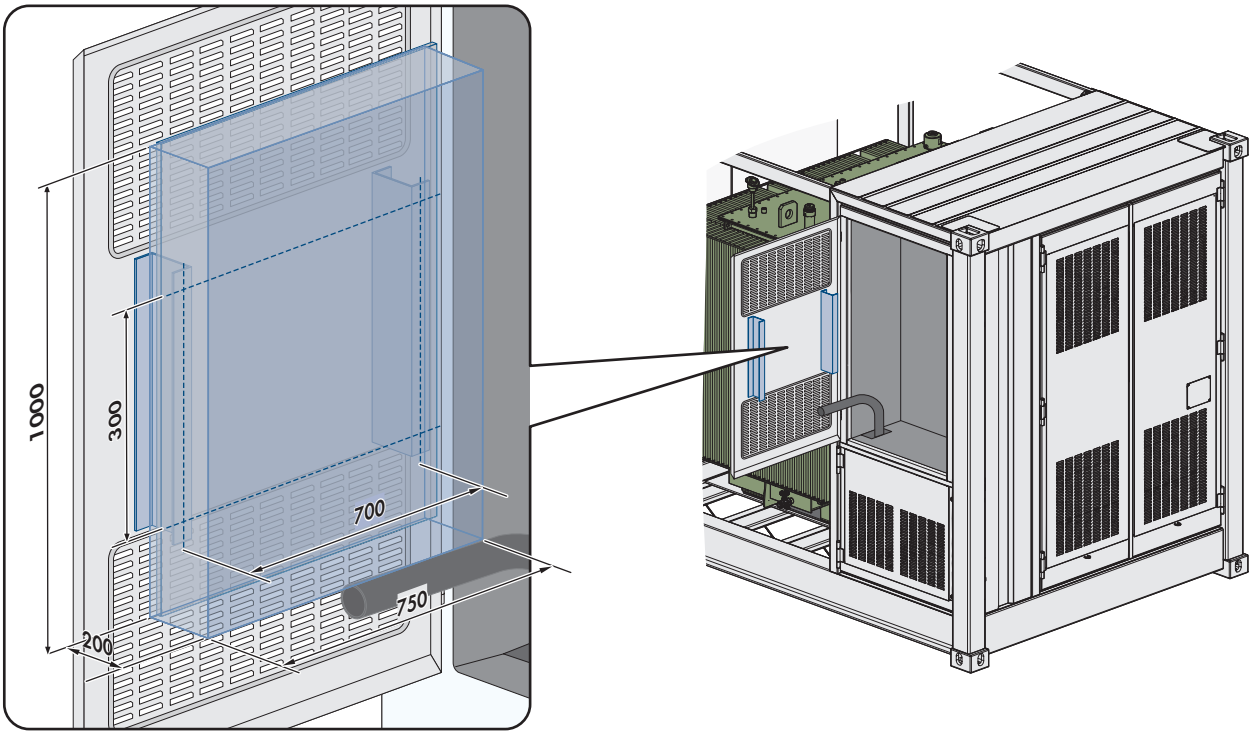



Figure 8: Position of customer installation location (Dimensions in mm)

[10)] With order option "Ambient Temperature: -40°C to +45°C"

[11)] With the order option "Country Package: Japan"

The location on the inside of the door of the low-voltage cabinet is reserved for customer-supplied devices. For mounting the customer's own devices, 2 brackets are provided on which a mounting plate can be attached by the customer.

The customer installations must satisfy the following requirements:

- ☐ The maximum dimensions of the customer installations may not exceed 1000 mm x 750 mm x 200 mm (height x width x depth).
- ☐ Narrow units must not exceed 800 mm x 600 mm x 210 mm (height x width x depth) and must be mounted on the holders using 2 profile rails or 1 mounting plate (not included in the scope of delivery).
- ☐ The maximum weight incl. mounting plate is 80 kg
- ☐ The 4 anchoring points for the brackets have the following distances: width 700 mm, height 300 mm, hole diameter 10 mm for bolts with 8 mm diameter
- ☐ Depending on application, the customer installations must be designed for temperatures from -40°C to 65°C.
- ☐ The customer installations must be at least degree of protection IP54.
- ☐ The customer devices must be designed to cope with voltage fluctuations that can occur at the point of interconnection.

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 customer installation location and from the station subdistribution to the customer installation location. The feed-throughs for the cables into the MV Power Station must be prepared. A network cable with RJ45 plug is located on the door to the customer installation location for the network connection. The length of the network cable from the customer installation location to the customer installations is 2000 mm.

Further details are to be found in the circuit diagram.

### 3.4.2 Power for Customer Devices

- ☐ Connection voltage for customer installations: 230 V ±10% tolerance, 50 Hz
- ☐ In addition, two miniature circuit breakers of type C16A (230 V) are available 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 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° to +55°C", "Ambient Temperature -35°C to +55°C", "Environment: Harsh" or "Low-voltage transformer 40 / 50 / 60 kVA" | 230 W |

| Component | Order option | Power |
|---|---|---|
| Lighting in the medium-voltage and low-voltage cabinet | "Lighting" | 50 W |
| Cascade control | "Cascade control" | 150 W |
| 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 |

## 3.5 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.

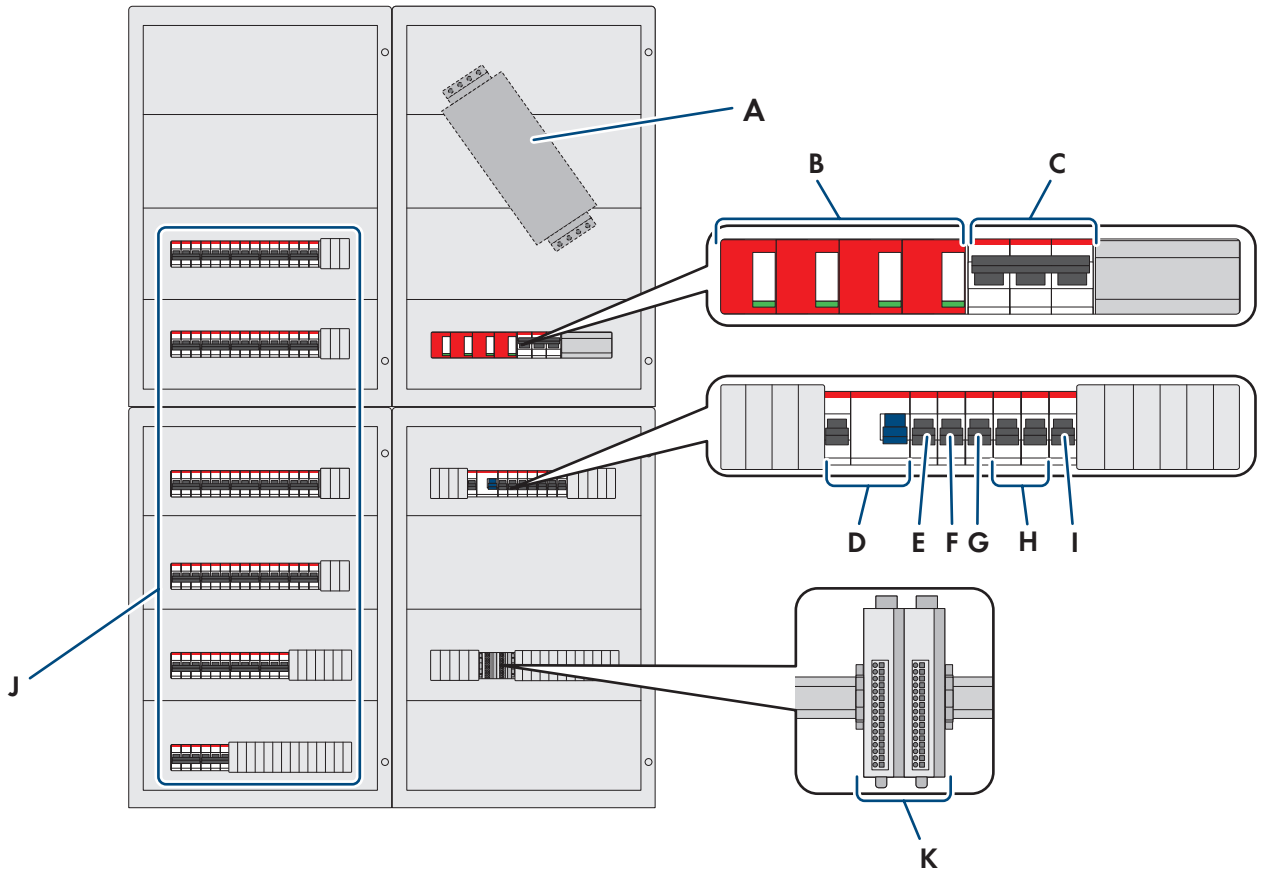



Figure 9: Devices in the station subdistribution (example)

| Position | Designation |
|---|---|
| A | Low-voltage transformer EMC filtering device[12)] |
| B | Surge arrester **-F1** for tracker motors and DC-DC Converter[12)] |
| C | Main miniature circuit breaker **-F101** for tracker motors and DC-DC Converter[12)] |
| D | Miniature circuit breaker **-F32** and residual-current device **-F32D** for lighting systems[12)] |

[12)] Optional

| Position | Designation |
|---|---|
| E | Miniature circuit breaker **-F34** for the fan[12] |
| F | Miniature circuit breaker **-F36** for monitoring and communication in terms of order option "Monitoring Package"[12] |
| G | Miniature circuit breaker **-F37** for cascade control[12] |
| H | Miniature circuit breaker **-F41** and **-F42** for protection of the customer equipment |
| I | Miniature circuit breaker **-F50**[13] or **-F51**[14] for the heating |
| J | Miniature circuit breakers for external loads such as tracker motors, DC-DC converters or the supply of battery containers **-F2** to **-F25**[12] |
| K | I/O System Monitoring Package[12] |

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

Further details are to be found in the circuit diagram.

## 3.6 Design of the Inverter

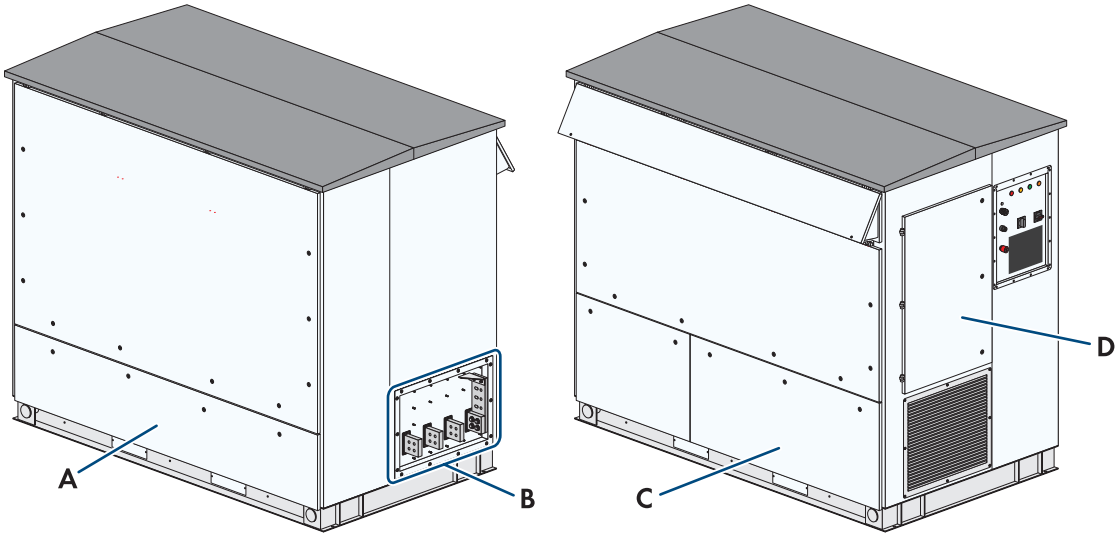



Figure 10: Design of the inverter

| Position | Designation |
|---|---|
| A | DC connection area and grounding |
| B | AC connection area and grounding |
| C | Connection area for electronics |
| D | Customer installation location |

[13] With order option "Ambient Temperature: -40°C to +45°C"

[14] With order option "Ambient Temperature: -35°C to +55°C"

## 3.7 Components of the Medium-Voltage Transformer

The medium-voltage transformer is the link between the inverter and the medium-voltage grid. The positions of the operating- and display elements of the medium-voltage transformer can vary depending on the manufacturer and the selected order option. Pressure and oil level can be monitored via an hermetic protection relay depending on the order option.

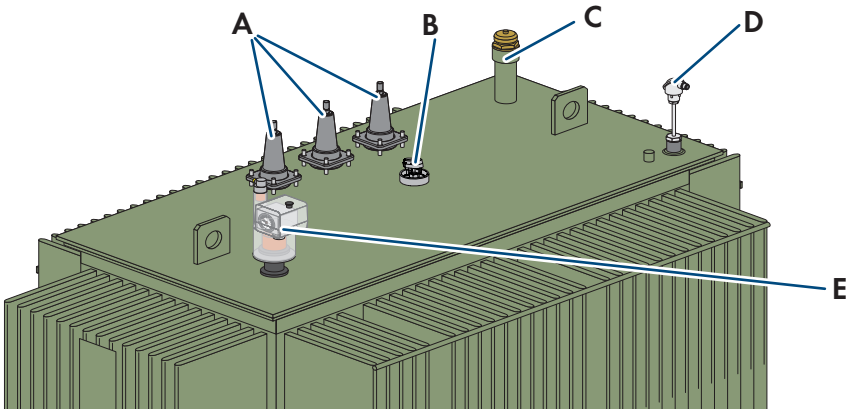



Figure 11: Components of the medium-voltage transformer (example)

| Position | Designation |
|---|---|
| A | Medium-voltage bushings for connecting the AC cables |
| B | Tap changer for adjusting the turn ratio[15)] |
| C | Oil filler neck with pressure relief valve[15)] |
| D | Thermometer for oil temperature (PT100) |
| E | Hermetic protection device or single devices for pressure and oil level[15)] |

[15)] Optional

## 3.8 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.

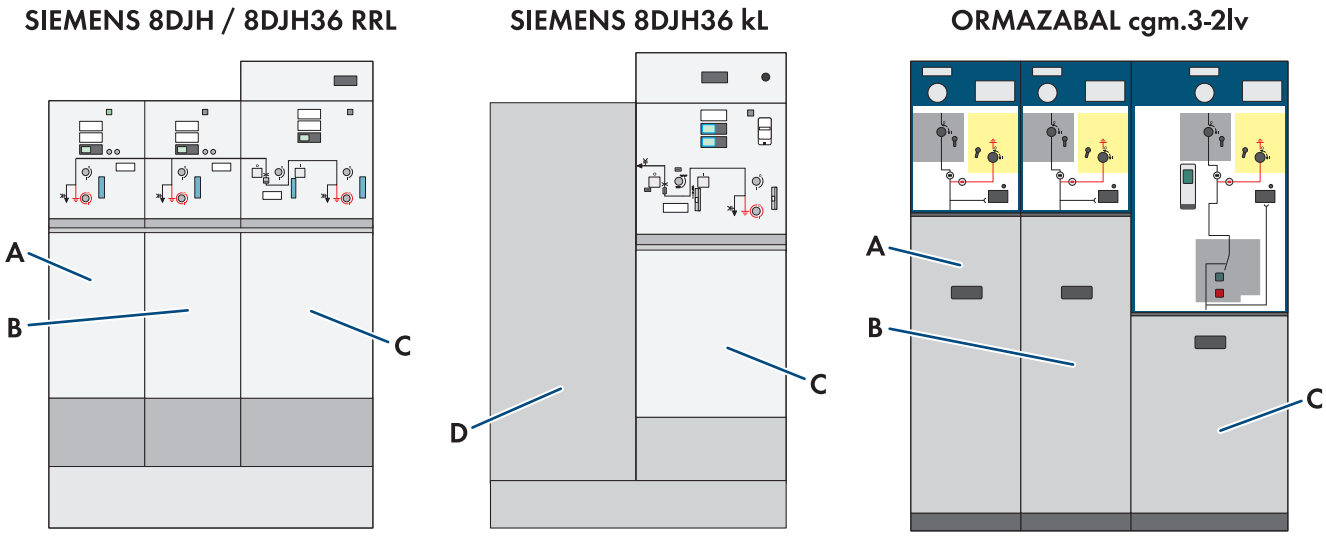



Figure 12: Components of the medium-voltage switchgear (example)

| Position | Designation |
|---|---|
| A | Outer cable panel with load-break switch[16)] |
| B | Central cable panel with load-break switch[16)] |
| C | Transformer compartment with disconnector |
| D | Side cable connection panel[16)] |

[16)] Optional

## 3.9 Connection Area of the Medium-Voltage Switchgear

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

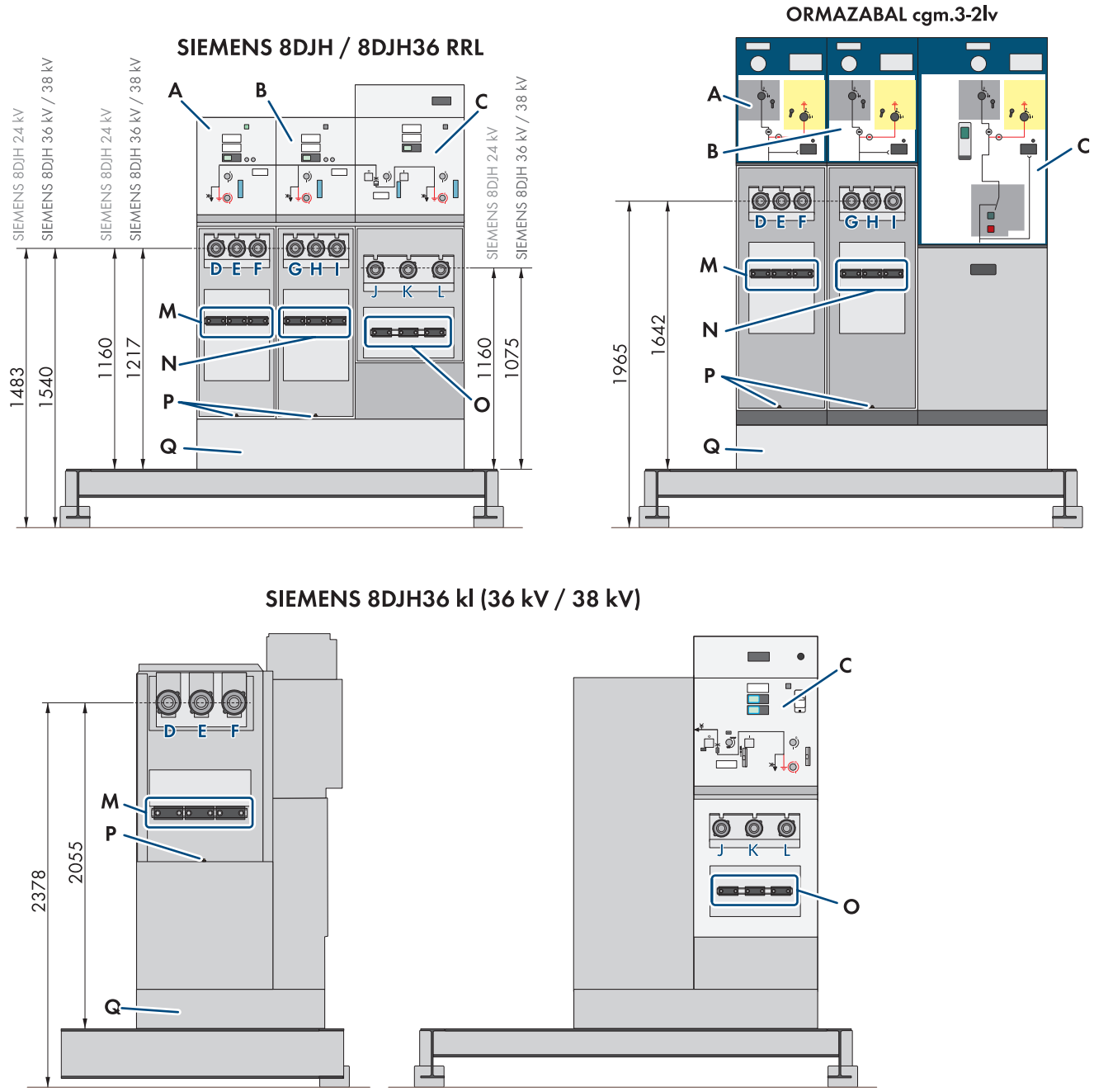



Figure 13: Connection area of medium-voltage switchgear (example) (Dimensions in mm)

| Position | Designation |
|---|---|
| A | Cable compartment 1 |
| B | Cable compartment 2 |
| C | Transformer compartment |
| D | Line conductor L1 from cable panel 1 |
| E | Line conductor L2 from cable panel 1 |

| Position | Designation |
|---|---|
| F | Line conductor L3 from cable panel 1 |
| G | Line conductor L1 from cable panel 2 |
| H | Line conductor L2 from cable panel 2 |
| I | Line conductor L3 from cable panel 2 |
| J | Line conductor L1 from transformer field |
| K | Line conductor L2 from transformer compartment |
| L | Line conductor L3 from transformer compartment |
| M | Cable support rail cable panel 1[17] |
| N | Cable support rail cable panel 2[17] |
| O | Cable support rail from transformer compartment[18] |
| P | Grounding busbar for connecting AC cable shielding |
| Q | Kick plate |

## 3.10 Oil spill containment

The MV Power Station is equipped with an integrated oil spill containment depending on the order option. The oil spill containment collects oil which may leak from the medium-voltage transformer under fault conditions.

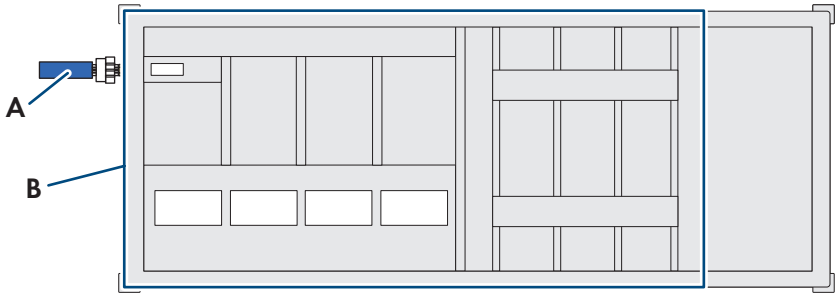



Figure 14: Position of the oil spill containment

| Position | Designation |
|---|---|
| A | Oil filter[19] |
| B | Integrated oil spill containment[19] |

The MV Power Station oil spill containment is integrated into the floor and the station container substructure.

In normal operation, penetrating rain water drains off via the mounted oil filter. If the medium-voltage transformer leaks and oil flows into the integrated oil spill containment and hence into the oil filter, the oil filter granulate reacts and prevents the oil being released into the environment. The oil filter is not mounted at the factory and must be installed after the MV Power Station has been set up.

In order to remove leaked oil from the substructure oil spill containment, an oil suction pump is required.

[17] 3 (6 with kL) strain-relief clamps per cable panel 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.

[18] With the order option "1 MVSG for 2 MVT"

[19] In case of order option "Oil Containment"

## 3.11 Circuitry Principle of the MV Power Station

### Setup of 1 MV Power Station

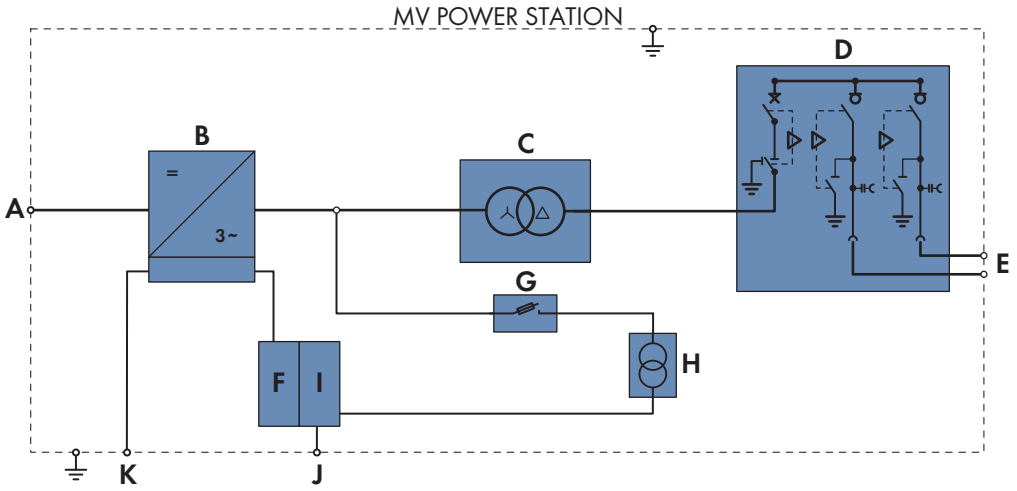



Figure 15: Circuitry principle of the MV Power Station (example)

### Setup of 2 MV Power Stations with 1 medium-voltage switchgear

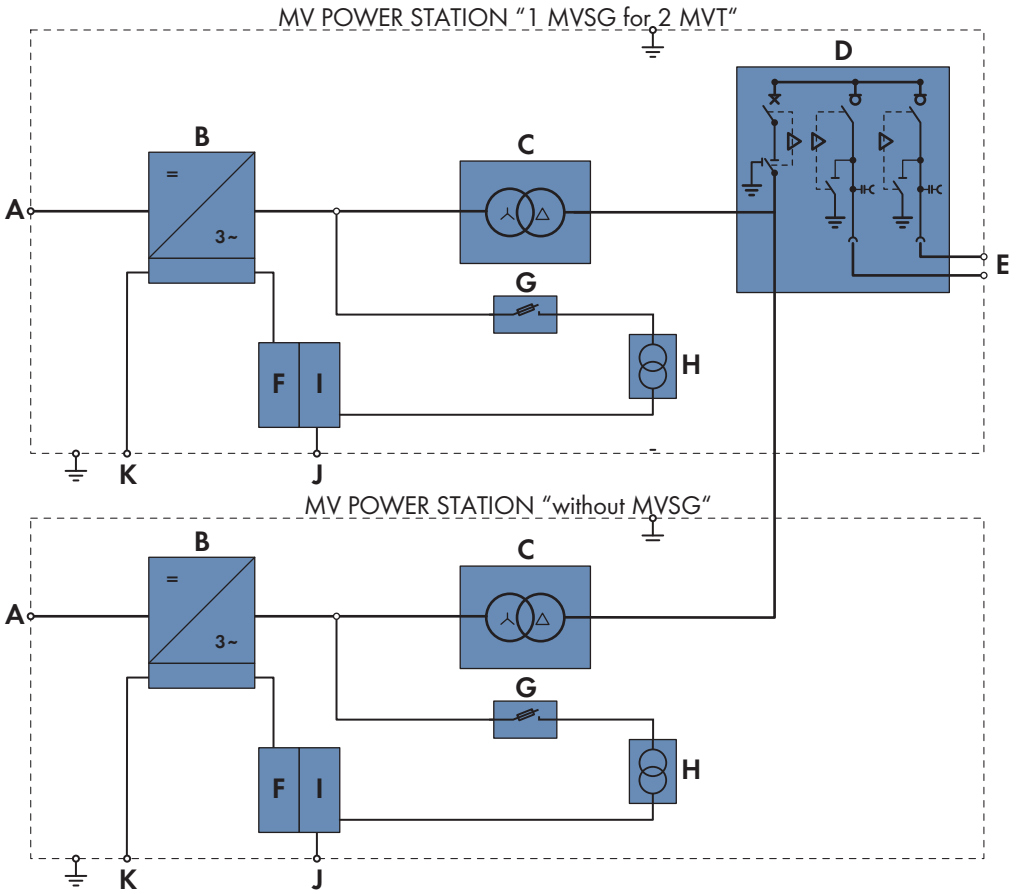



Figure 16: Circuitry principle of 2 MV Power Stations with 1 medium-voltage switchgear (example)

| Position | Designation |
|---|---|
| A | DC Input |

| Position | Designation |
|---|---|
| B | Inverter |
| C | Medium-voltage transformer |
| D | Medium-voltage switchgear[20] |
| E | AC output |
| F | Station subdistribution |
| G | Fuse holder with thermal fuse of the low-voltage transformer[20] |
| H | Low-voltage transformer[20] |
| I | Surge protection device, load-break switch and EMC filtering device of the low-voltage transformer and miniature circuit breakers for tracker motors[20] |
| J | Connection of additional components (e.g. tracker motors)[20] |
| K | Customer connection point[21] |

[20] Optional

[21] Depending on the order option, the terminal for the external communication is located on the station subdistribution or inverter.

# 4 Transport and Mounting

## 4.1 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" without the order option "1 MVSG for 2 MVT": suitable protective relay for the medium-voltage transformer
- ☐ 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
- ☐ Cable for the external fast-stop function
- ☐ Ladder
- ☐ Drainage channel for rainwater that has penetrated the oil filter
- ☐ 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
- ☐ 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
- ☐ To protect the electronic components against moisture, the desiccant bag in the inverter must be replaced every 2 months after their arrival at the construction site or in storage until commissioning. If necessary, desiccant bags can be ordered from SMA Solar Technology AG using the following material number: 85-0081.
- ☐ 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.
- ☐ For safe commissioning, the requirements for mounting must be fulfilled.
- ☐ After maritime 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
- ☐ Removal of the supporting struts of the lower right bracket corner in front of the medium-voltage cabinet

If you have any questions, please contact us (see Section 5, page 33).

## 4.2 Design of Entire System

**Closed electrical operating area**

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

- 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.

## 4.3 External dimensions and weights

### With oil spill containment

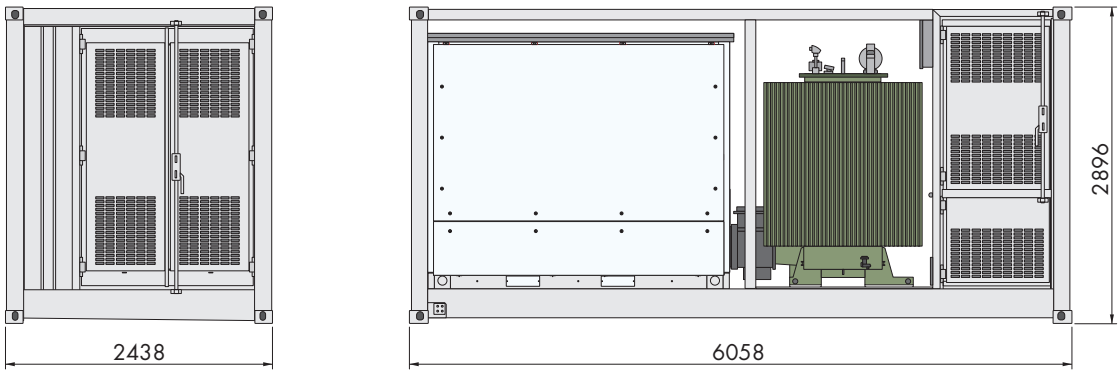



Figure 17: Dimensions of the MV Power Station(Dimensions in mm)

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

## 4.4 Minimum Clearances

Observe the following 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.

The minimum clearances must be ensured for servicing. 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 mobile platform must be provided for servicing.

### Shorter minimum clearances for servicing

The minimum clearances for servicing around the station can be reduced to 2500 mm 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, converter 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.

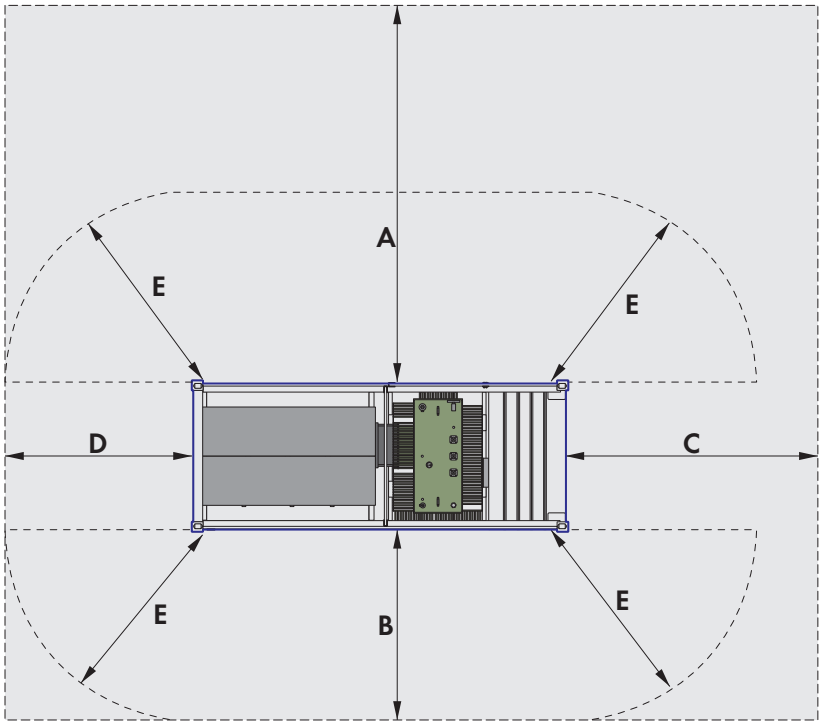



Figure 18: Minimum clearances

| Position | Minimum clearance for servicing | Minimum clearance for trouble-free operation<br>Shorter minimum clearances for servicing |
|---|---|---|
| A | 6000 mm | 2500 mm |
| B | 3000 mm | 2500 mm |
| C | 4000 mm | 2500 mm |
| D | 3000 mm | 2500 mm |
| **Internal arc pressure safety areas to be observed during MV switchgear switching operations** | | |
| E | Minimum clearance for inflammable materials: 1000 mm<br>Minimum clearance for personnel: 3000 mm[22)] | |

[22)] The work area intended for switching in front of the medium-voltage switchgear is excluded

### 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.

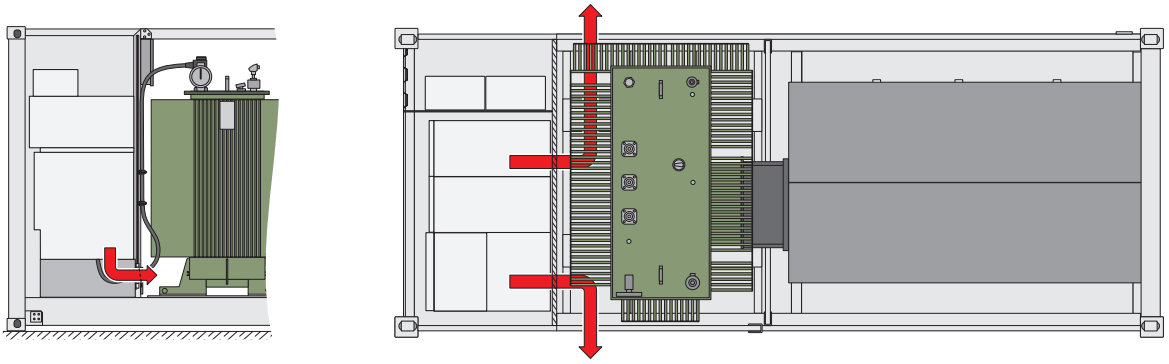


Figure 19: Internal arc pressure at the MV Power Station

## 4.5 Ambient Conditions

**Requirements for the mounting location:**

- ☐ The mounting location must be freely accessible at all times.
- ☐ The permissible maximum value for non-condensing relative humidity must not be exceeded. The permissible range is: 0% to 95%.
- ☐ 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 m³/h.
- ☐ The mounting location must be below the maximum installation altitude.
- ☐ 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.

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

| Component / order option | Class |
|---|---|
| Inverter standard | C5M / C4M / C3H (depending on the order option) |
| MV Power Station standard | C3 / 4S12 as per IEC 60721-3-4 (2019) or ISO 12944-2 / ISO 9223 |
| MV Power Station Option Harsh | C5 / 4S13 as per IEC 60721-3-4 (2019) or ISO 12944-2 / ISO 9223 |

## 4.6 Dependence of the nominal current on the 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.

| Ambient temperature of the MV Power Station | Nominal current at 1000 m |
|---|---|
| 30°C | 630 A |

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

For nominal currents at an installation height greater than 1000 m, please contact us.

## 4.7 Grounding

### 4.7.1 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 recommend 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.

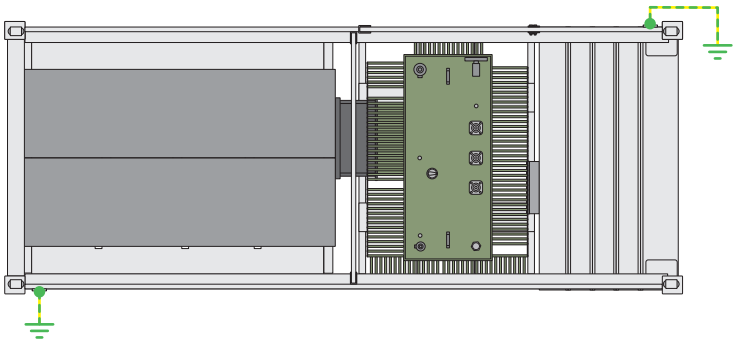


Figure 20: Grounding concept (example)

**Double grounding of the MV Power Station**

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

### 4.7.2 Requirements for the Grounding Arrangement

**Cable Requirements for the Grounding Connection:**

- ☐ All cables must be suitable for temperatures of up 90°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 cable cross-sections of the grounding conductor connections depend on the installed overcurrent protective device. Calculating the required cross-sections depends on the national standards and directives.
- ☐ The grounding of the system must be designed in accordance with the national standards and directives and is the responsibility of the installer.

**Requirements for the cable connection with terminal lugs:**

- ☐ All terminal lugs used must be suitable for temperatures of up 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: 22.5 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 torques are effective over the whole surface.
☐ Use only tin-plated terminal lugs made from copper or aluminum.
☐ The specified torques must always be complied with.

**Requirements for the grounding arrangement design:**

☐ Use copper or aluminum cables only.
☐ 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 mm²
  – For aluminum cable, at least: 300 mm²
☐ Depending on the design of the equipment, an additional grounding must be planned for a YNd11 / YNy0 transformer.

## 4.8 Foundation

### 4.8.1 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.

### 4.8.2 Pea gravel ground

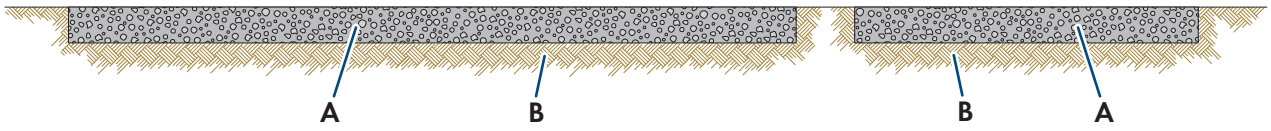



Figure 21: Structure of the support surface

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

The subgrade must meet the following minimum requirements:

☐ The load capacity of the subgrade must be given.
☐ Minimum clearances for servicing operations must be observed(see Section 4.4, page 21).
☐ Access roads and areas must be accessible and passable, without any obstructions, for service vehicles (e.g. forklift or crane truck).

### 4.8.3 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.

### 4.8.4 Mounting options

**Foundation properties:**

- ☐ 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 45 mm ±1.5 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.
- ☐ A visual inspection of the underside of the oil spill containment must be possible in order to detect leaks at an early stage.

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.

## Mounting option with pile foundation

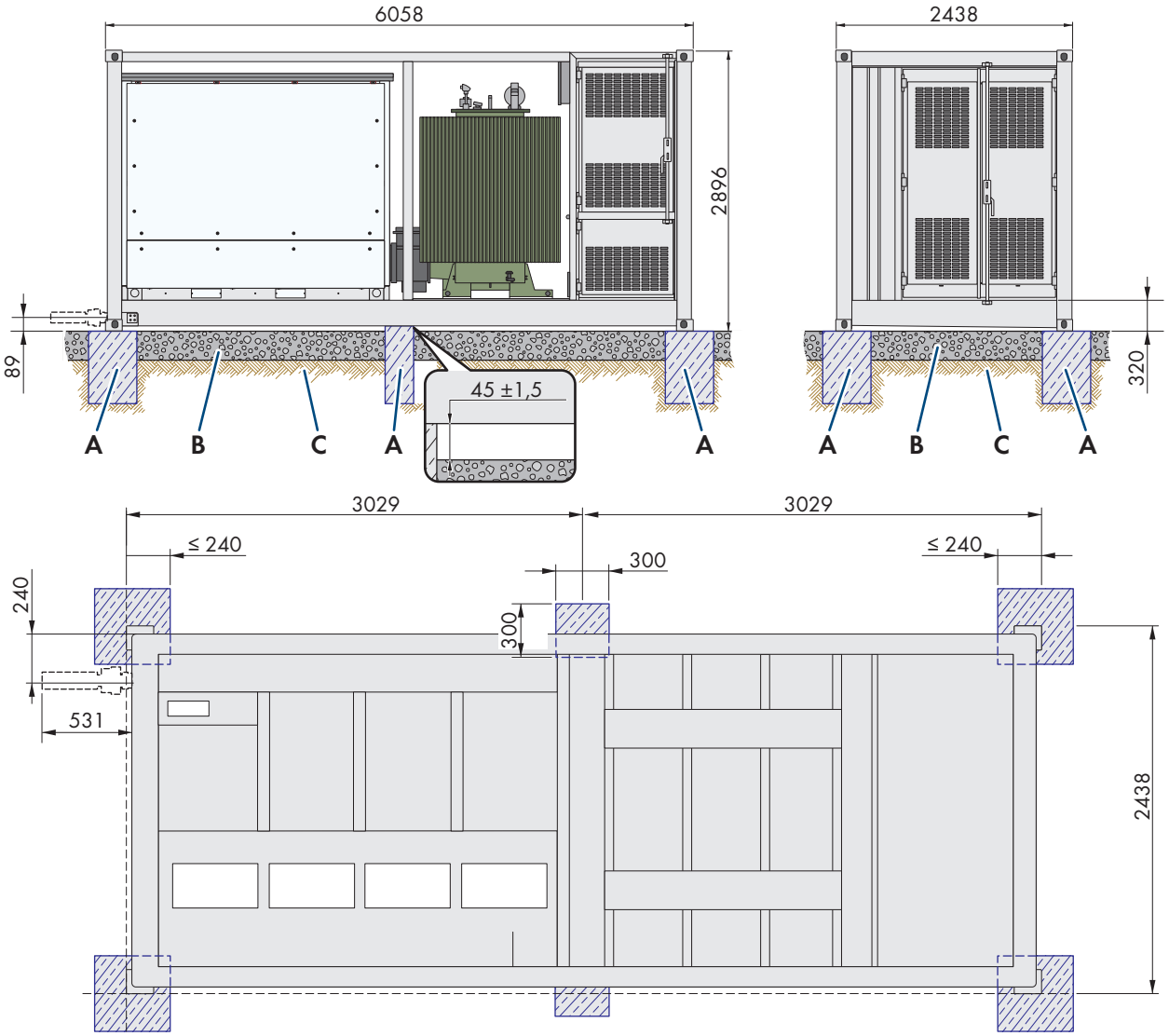



Figure 22: Mounting option with pile foundation (Dimensions in mm)

| Position | Designation |
|---|---|
| A | Support point foundation |
| B | Pea gravel ground |
| C | Solid ground, e.g., gravel |

### Mounting option with strip foundations

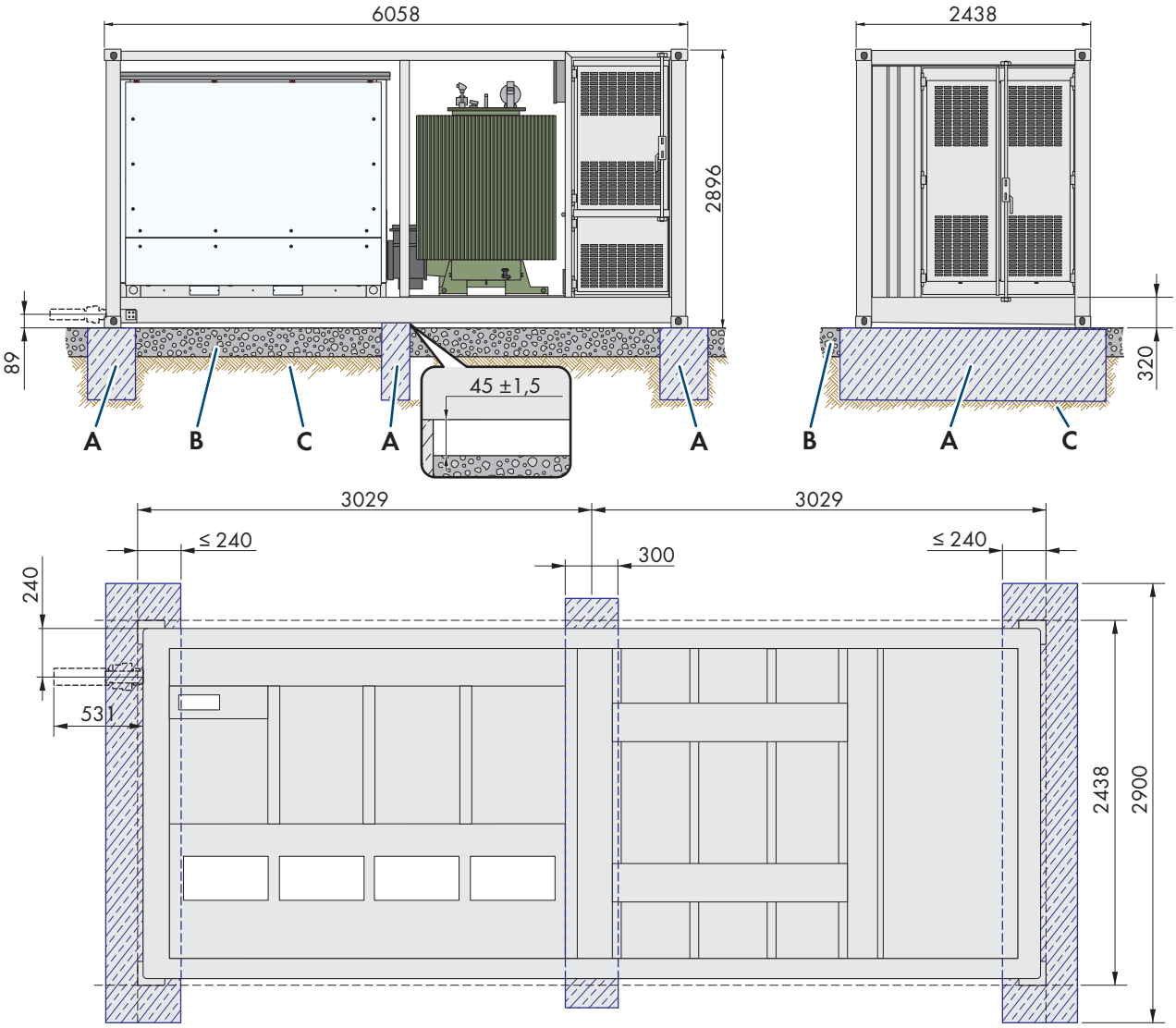



Figure 23: Mounting option with strip foundations (Dimensions in mm)

| Position | Designation |
|---|---|
| A | Strip foundation |
| B | Pea gravel ground |
| C | Solid ground, e.g., gravel |

## 4.9 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.

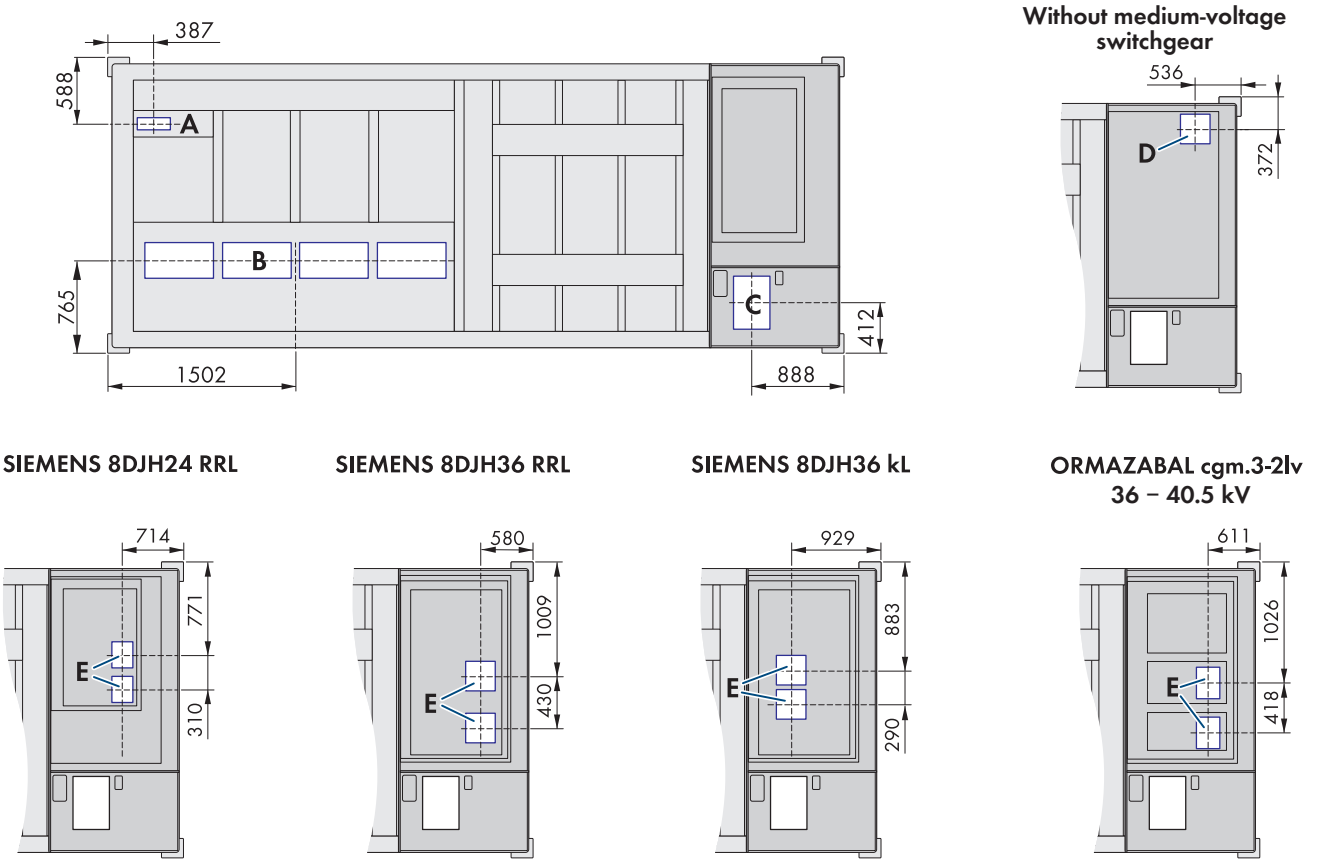



Figure 24: Positions of the openings for cable entry (Dimensions in mm)

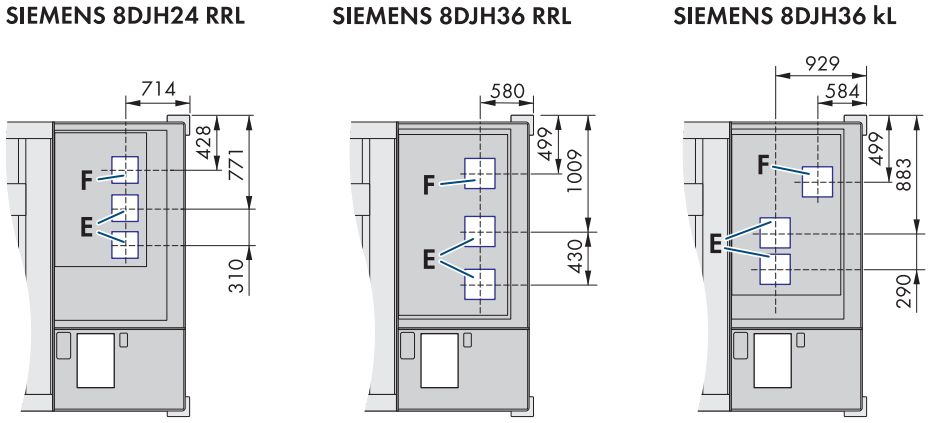



Figure 25: Positions of the openings for cable entry with order option "1 MVSG for 2 MVT" (Dimensions in mm)

| Position | Designation | Recommended dimensions Width x depth |
|---|---|---|
| A | Opening underneath the inverter for insertion of the cables for communication, control, and monitoring<br>With the order option "Cable Entry Kit", the opening is fitted with 2 sliding panels. | 210 mm x 95 mm |

| Position | Designation | Recommended dimensions Width x depth |
|---|---|---|
| B | Opening underneath the inverter for insertion of the DC cables<br>With the order option "Cable Entry Kit", the opening is fitted with 4 sliding panels. | Left: 560 mm x 386 mm<br>Center: 578 mm x 386 mm<br>Right: 544 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<br>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<br>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<br>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"<br>With the order option "Cable Entry Kit", the openings are fitted with cable support sleeves. | 255 mm x 255 mm |

## 4.10 Requirements for Transport Routes and Means of Transport

**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.
- ☐ 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 external temperature during transport must be greater that -25°C.
- ☐ There must be no obstacles above the unloading site (e.g., live overhead power lines).

## 4.11 Transport Using a Crane

- ☐ The crane and hoist must be suitable for the weight.
- ☐ The hoist 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.
- ☐ The MV Power Station must be transported to its final position as close to the ground as possible.
- ☐ The MV Power Station must be set down with as little vibration as possible.
- ☐ The support surface must be suitable for the weight of the MV Power Station in accordance with the requirements (see Section 4.3, page 21).

## 4.12 Transport by truck or ship

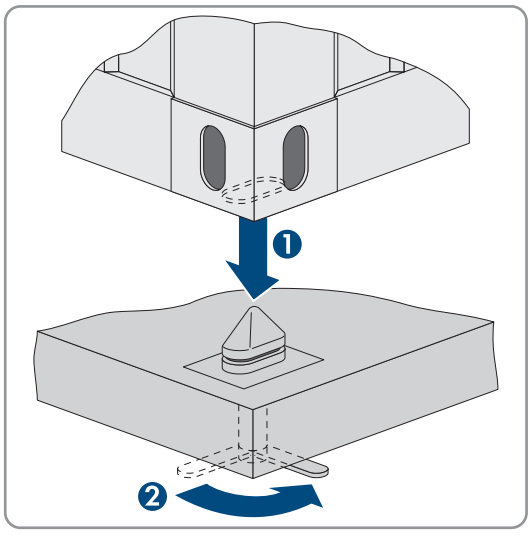
The dimensions of the MV Power Station correspond to those of an ISO container (High Cube Container). It can be transported by truck or ship. A truck with 16 m length, 2.7 m width, 5 m height, and with a total weight of 50 t is capable of transporting up to 2 MV Power Stations. Transport by railroad is not permitted.

Transport and unloading may cause damage to the surface (hot-dip galvanizing of the station frame or paint of the low or medium-voltage cabinet). Damage to the surface does not impair the function, but must be repaired after 3 weeks at the latest Servicing Schedule for General Work.

For transportation by truck or ship, the MV Power Station 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.

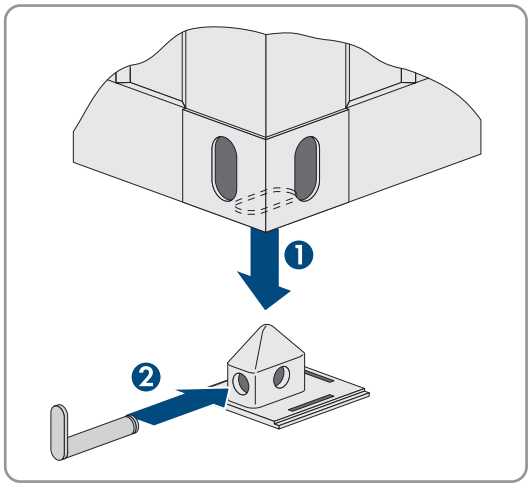
### Twistlock

– The MV Power Station is set down on the locking mechanisms. By turning the twistlock, an interlocking is made.




### Pinlock

– The MV Power Station is set down on the locking mechanisms. Any slippage of the load is prevented by inserting the pinlock.



- After the MV Power Station has arrived at the construction site, the transport checklist must be completed and sent to the SMA project manager. The transport checklist can be requested from the SMA project manager.

## 4.13 Storage

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

**NOTICE**

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

Sand, dust and moisture penetration can damage 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.

**Desiccant bag in the inverter**

The desiccant bag in the inverter protects the electronic components from moisture. The desiccant bag must be replaced by a new desiccant bag included in the scope of delivery one day before commissioning.

The commissioning is delayed by one day if the desiccant bag has not been replaced in the 24 hours prior to commissioning. Additional travel costs for SMA service personnel must be paid by the customer.

**Storage more than 2 months**

In order to protect the electronic components against moisture, the desiccant bag in the inverter must be replaced every 2 months. If necessary, desiccant bags can be ordered from SMA Solar Technology AG using the following material number: 85-0081.

**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.

For storage of the MV Power Station note the following points:

- Do not place the MV Power Station on an unstable, uneven surface.
- 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.

# 5 Contact

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

- Device type
- Serial numbers
- Firmware version
- Event message
- Type of communication
- Type and number of PV modules
- Type and size of additional energy sources
- 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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