CanadianSolar

INSTALLATION MANUAL OF PHOTOVOLTAIC MODULE

For professional use only

CONTENTS

1 GENERAL INFORMATION

This general manual provides important safety information relating to the installation, maintenance, and handling of Canadian Solar modules.

Professional installers must read these guidelines carefully and strictly follow these instructions. Failure to follow these instructions may result in death, injury, or property damage. The installation and handling of PV modules require professional skills and should only be performed by qualified professionals. Installers must inform end-users (consumers) of the aforesaid information accordingly.

The word “module” or “PV module” used in this manual refers to one or more Canadian Solar modules. This manual is valid for the solar modules listed in the table below. Please retain this manual for future reference. We recommend visiting www.csisolar.com regularly for the most updated version of this installation manual.

	Single glass	Double glass
Monofacial	CS6L-MS, CS6R-MS CS6RA-MS CS6RB-MS CS6R-MS-HL CS6W-MS,CS7L-MS CS7L-MS-R CS7N-MS CS6W-T, CS6R-T	CS6R-H-AG CS6RA-H-AG
Bifacial	/	CS6W-MB-AG CS7L-MB-AG CS7N-MB-AG CS7L-TB-AG CS7N-TB-AG CS6W-TB-AG

All above module types meet IEC1000V and IEC1500V in compliance with Australia CEC.

1.1 INSTALLATION MANUAL DISCLAIMER

The information contained in this manual is subject to change by Canadian Solar without prior notice. Canadian Solar gives no warranty of any kind whatsoever, either explicitly or implicitly, with respect to the information contained herein.

In the event of any inconsistency among different language versions of this document, the English version shall prevail.

Please refer to our product lists and documents published on our website at www.csisolar.com as these lists are updated on a regular basis.

1.2 LIMITATION OF LIABILITY

Canadian Solar shall not be held responsible for damages of any kind, including – without limitation – bodily harm, injury, or property damage, in connection with handling PV modules, system installation, or compliance or non-compliance with the instructions set forth in this manual.

2 SAFETY PRECAUTIONS

WARNING

Before attempting to install, wire, operate, and/or service the module and other electrical equipment, all instructions should be read and understood. PV module connectors pass direct current (DC) when exposed to sunlight or other light sources. Contact with electrically active parts of the module, such as terminals, can result in injury or death, irrespective of whether or not the module and the other electrical equipment have been connected.

AVERTISSEMENT

Toutes les instructions devront être lues et comprises avant de procéder à l’installation, le câblage, l’exploitation et/ou l’entretien des panneaux.

Les interconnexions des panneaux conduisent du courant continu (CC) lorsque le panneau est exposé à la lumière du soleil ou à d’autres sources lumineuses. Tout contact avec des éléments sous tension du panneau tels que ses bornes de sortie peut entraîner des blessures ou la mort, que le panneau soit connecté ou non.

GENERAL SAFETY

All modules must be installed by licensed electricians in accordance with the applicable electrical codes such as the latest National Electrical Code (USA) or Canadian Electric Code (Canada), or other national or international applicable electrical codes.

Protective clothing (non-slip gloves, clothes, etc.) must be worn during installation to prevent direct contact with 30 V_{DC} or greater, and to protect hands from sharp edges.

Prior to installation, remove all metallic jewelry to prevent accidental exposure to live circuits.

When installing modules in light rain, or morning dew, take appropriate measures to prevent water ingress into the connector.

Do not allow children or unauthorized persons near the installation site or module storage area.

- Use electrically insulated tools to reduce the risk of electric shock.
- If the disconnects and over-current protection devices (OCPDs) cannot be opened or the inverter cannot be powered down, cover the fronts of the modules in the PV array with an opaque material to stop the production of electricity when installing or working on a module or wiring.
- **Do not** install modules in strong wind.
- **Do not** use or install broken modules.
- **Do not** contact the module surface if the front or rear glass is broken. This may cause electric shock.
- **Do not** attempt to repair any part of the module. The PV module does not contain any serviceable parts.
- **Do not** open the cover of the junction box at any time.
- **Do not** disassemble a module or remove any module part.
- **Do not** artificially concentrate sunlight on a module.
- **Do not** connect or disconnect modules when current from the modules or an external source is present.

3 MECHANICAL / ELECTRICAL SPECIFICATIONS

Module electrical ratings are measured under Standard Test Conditions (STC) of 1000 W/m^2 irradiance, with an AM1.5 spectrum, and a cell temperature of 25°C. Detailed electrical and mechanical characteristics of Canadian Solar crystalline silicon PV modules can be found in datasheets and on www.csisolar.com. The main electrical characteristics at STC are also stated on each module label. Please refer to the datasheet or the product nameplate for the maximum system voltage.

Under certain conditions, a module may produce more current or voltage than its Standard Test Conditions rated power. As a result, electrical calculations and design must be performed by a qualified engineer or consultant.

A correction factor should be applied to the open-circuit voltage (see Table 1 below), when determining component ratings and capacities.

Table 1: Low-temperature correction factors for open-circuit voltage

Lowest Expected Ambient Temperature (°C/°F)	Correction Factor
24 to 20 / 76 to 68	1.02
19 to 15 / 67 to 59	1.04
14 to 10 / 58 to 50	1.06
9 to 5 / 49 to 41	1.08
4 to 0 / 40 to 32	1.10
-1 to -5 / 31 to 23	1.12
-6 to -10 / 22 to 14	1.14
-11 to -15 / 13 to 5	1.16
-16 to -20 / 4 to -4	1.18
-21 to -25 / -5 to -13	1.20
-26 to -30 / -14 to -22	1.21
-31 to -35 / -23 to -31	1.23
-36 to -40 / -32 to -40	1.25

Alternatively, the correction factor for the open-circuit voltage can be calculated using the following formula:

$$C_{Voc} = 1 - \alpha_{Voc} \times (25 - T)$$

T (°C) is the lowest expected ambient temperature at the system installation site.

α_{Voc} (%/°C) is the voltage temperature coefficient of the selected module (refer to the corresponding datasheet).
Please contact Canadian Solar's technical support team for a more accurate correction factor if necessary.

The module short-circuit current under STC should be multiplied by 1.25 × 1.25 (i.e., 1.56), when determining appropriate wire and fuse specifications. For bifacial modules, short-circuit current is related to specific installation conditions. It varies with different mounting heights and mounting surfaces with different reflectivity. Consequently, short-circuit current of bifacial modules should be multiplied by 1.56 and then by 1.2. For bifacial modules mounted close to the roof surface, no significant bifacial gain can be

obtained, and therefore, the 1.2 additional coefficient is not applicable and can be ignored.OCPD rating selection should be done per the following guidance, where the minimum OCPD rating possible is determined by calculating the expected maximum circuit current for the PV system, and the maximum OCPD rating constrained by the IEC 61215: 2016 and UL 61730 standard requirements for the certified PV modules.

For monofacial modules, the string fuse rating should not exceed the maximum sting fuse rating listed in the corresponding datasheet.

For bifacial modules, the following method can be applied to determine an appropriate rating (X):

Minimum string fuse rating < X ≤ Maximum string fuse rating.

The maximum string fuse ratings can be found in datasheets and nameplates for all the certified Canadian Solar module types.

The minimum string fuse rating for compliance with NEC: 2017 code and IEC 62548: 2016 requirement is suggested to be determined as follows:

Minimum string fuse rating = Isc_{STC} x 1.25 x Max (1.175, $Impp_{\alpha}$ ÷ $Impp_{STC}$).

$Impp_{\alpha}$ = the highest 3-hour current average resulting from the simulated local simultaneous irradiances on the front and rear sides of the PV array accounting for elevation and orientation.

Isc_{STC} = the listed short circuit current at 0% bifacial gain on the PV module datasheet or nameplate label.

$Impp_{STC}$ = the listed MPP operating current at 0% bifacial gain on the PV module datasheet or nameplate label.

An assembly, together with its overcurrent device(s), that is listed for continuous operation at 100% of its rating shall be permitted to be used at 100% of its rating, and therefore shall not require the additional 1.25 multiplier.

Please contact Canadian Solar's technical support team for additional information pertaining to engineering optimization and approval of project specific module string lengths.

4 UNPACKING AND STORAGE

NOTICE

PRECAUTIONS

- Modules should be stored in a dry and ventilated environment to avoid direct sunlight and moisture. If modules are stored in an uncontrolled environment, the storage time should be less than 3 months and extra precautions should be taken to prevent connectors from being exposed to moisture or sunlight, like using connector endcaps. Protect the package from damage. In any circumstances, pallets with landscape-oriented module packaging shall not be stacked vertically more than two high; with the N-bracket wood bracing installed on the bottom pallet for CS6-series modules (marked with red lines in the following figure). And for pallets with portrait-oriented module packaging, stacking is not allowed.

When unloading module pallets from a flatbed truck, please use a crane or a forklift to remove the module pallets. When unloading module pallets from containers, please use a forklift to remove the module pallets from the container or trailer. Do not move any pallets within the container or trailer without properly lifting them first. The forklift should be close to the ground in order to avoid the top of module pallets from touching the top of the cabinet door. The thickness of forklift blades should be less than 80 mm when unloading the pallets. The length of the forklift blades should be longer than 2300 mm when unloading pallets of CS6W modules from the short side. For unloading pallets of CS7N and CS7L modules, the length of the forklift blades should be longer than 1250 mm and the distance between the forklift blades should be wider

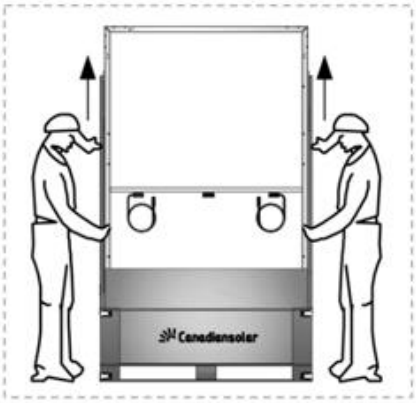
than 600 mm (from middle to middle of the forklift blades). Visit our website or consult your Canadian Solar representative for more detailed CS7N and CS7L unpacking instructions.

- Unpack module pallets carefully, following the steps shown on the pallet. Unpack, transport and store the modules with care.
- Modules must always be unpacked and installed by at least two people. Always use both hands when handling modules with gloves.

For modules vertically packed (CS7L and CS7N), one person must be present to prevent the unpacked modules from falling during the unpacking process. Do not unpack the pallet without using an unpacking rack (an example shown in the picture below). Please carefully follow the applicable unpacking instructions, which can be found on our website at www.csisolar.com or via the QR codes.

Unpacking instructions PDF, video, and unpacking rack video, respectively.

- During unpacking, the unpacked modules should be properly fixed. After unpacking, it is recommended to place the remaining uninstalled modules horizontally on a pallet. Stacking of modules should be limited to no more than 12 modules and frames should be aligned with one another on the pile. Visit our website or contact your Canadian Solar representative for more detailed unpacking requirements.



- **Do not** lift modules by their wires or junction box, lift them by the frame.
- **Do not** allow the modules to sag or bow due to external forces other than gravity when being carried.
- **Do not** place excessive loads on the module or twist the module.
- **Do not** carry modules on your head.
- **Do not** drop or place objects (such as tools) on the modules.
- **Do not** use sharp instruments on the modules. For single glass modules with polymer backsheets, particular care should be taken to avoid module backsheets being damaged by sharp objects, as scratches may directly affect product safety.
- **Do not** leave modules unsupported or unsecured.
- **Do not** support the module by its backsheet or back glass when carrying or mounting it.

- **Do not** stand, step, walk, and/or jump on modules under any circumstances. Localized heavy loads may cause severe micro-cracks at the cell level, which in turn may compromise module reliability and void Canadian Solar's warranty.

- **Do not** change the wiring of the bypass diodes.
- Keep all electrical contacts clean and dry at all times.
- **Do not** expose the modules and their electrical contacts (junction boxes, connectors) to any unauthorized chemical substance (e.g. oil, lubricant, pesticide, petrol, white flower oil, activating collaterals oil, mold temperature oil, machine oil (such as KV46), grease (such as Molykote EM-SOL, etc.), lubricating oil, anti-rust oil, stamping oil, butter，cooking oil, propyl alcohol, ethyl alcohol, essential oil, bone-setting water, Tianna water, mold release agent (such as Pelicoat S-6, etc.), glue and potting glue that can generate oxime gas (such as KE200, CX-200, Chemlok, etc.), TBP (plasticizer), cleaning agents, pesticide, paint strippers, adhesives, antirust agent, disincrustant, emulsifying agent, cutting oils and cosmetics, etc.) as modules may incur damages. Please contact your Canadian Solar representative for more detailed requirements.

PRODUCT IDENTIFICATION

Each module has three identical barcodes (one in the laminate under the front glass, the second on the rear side of the module, and the third on the frame) that act as a unique identifier. Each module has a unique serial number containing 14 or 16 digits.

A nameplate is also affixed to the rear of each module. This nameplate specifies the model type, as well as the main electrical and safety characteristics of the module. It also includes the barcode with the module's unique serial number as mentioned above.

5 MODULE INSTALLATION

PRECAUTIONARY MEASURES AND GENERAL SAFETY

- Prior to installing modules, please obtain information about any requirements and necessary approvals for the site, installation, and inspection from the relevant authorities.
- Check applicable building codes to ensure that the construction or structure (roof, facade, support, etc.) can bear the module system load.
- Canadian solar modules have been qualified for Application Class A (equivalent to Safety Class II requirements). Modules rated under this class should be used in systems operating at voltage above 50V or power above 240W, where general contact access is anticipated.
- Canadian Solar double glass modules have been certified as Type 29 according to UL 61730 and as Class C according to IEC 61730-2 for fire performance. Single glass monofacial modules have been certified as Type 1 or Type 2 according to UL 61730 and Class C according to IEC 61730-2. Please refer to the datasheet or the product nameplate for the detailed types.
- Consult your local authority for guidelines and requirements for building or structural fire safety.

UL 61730 SYSTEM FIRE RATING REQUIREMENTS

- The fire rating of this module is only valid when the product is installed as specified in the mechanical mounting instructions.
- When installing the modules, ensure the assembly is mounted over a fire-resistant roof covering rated for the application.
- Photovoltaic systems composed of UL 61730 certified modules mounted on a UL 2703 certified mounting system should be evaluated in combination with roof coverings in accordance with UL 61730 standard, with respect to meeting the same fire classification as the roof assembly.
- Mounting systems with a System Fire Class Rating, tested in conjunction with 'type 1', 'type 2' or 'type 29' fire-rated modules, are considered acceptable for using with Canadian Solar modules, providing the mounting system

does not violate any other requirements of this manual.

- Any mounting system limitations on inclination or accessories required to maintain a specific System Fire Class Rating should be clearly specified in the installation instructions and UL 2703 certification of the mounting system supplier.

ENVIRONMENTAL CONDITIONS

- PV modules are intended for use in general open-air climates, as defined in IEC 60721-2-1: Classification of environmental conditions Part 2-1: Environmental conditions appearing in nature-Temperature and humidity.
- It is recommended that PV modules be installed in an environment with ambient temperature ranging from -40 °C to +40 °C. The 98th-percentile of the module operational temperature should be of 70 °C or lower under any mounting conditions. If the application where the 98th-percentile of the module operational temperature of 80 °C is needed, please request IEC 63126 Level 1 module types.
- This environmental temperature range encompasses many locations and installation methods. Annex A provides the reader with modeled PV module temperature examples, at the 98th-percentile depending on the different worldwide locations.
- Please consult the Canadian Solar technical support department for more information on the use of modules in special climates, such as an altitude greater than 2000 m, heavy snow, severe hail storm, hurricane, etc.
- **Do not** install modules near open flames or flammable materials.
- **Do not** immerse modules in water or constantly expose modules to water (either fresh or salt, e.g. from fountains, sea spray).
- Exposing modules to salt (i.e. marine environments) or sulfur (i.e. sulfur sources, volcanoes) incurs the risk of module corrosion.
- Do not expose modules and their connectors to any unauthorized chemical substances (e.g. oil, lubricant, pesticide, etc.), as modules may incur damages.
- Canadian solar modules have passed the salt mist corrosion resistance test according to IEC 61701, but the corrosion may still occur where the modules frame is connected to the bracket or where the grounding is connected. Should the installation location be near the ocean, Canadian solar recommends stainless steel or aluminum materials be used in the areas with direct contact with the PV modules, and the connection point should be protected with anti-corrosion measures. For more information, please contact Canadian solar technical support team.

INSTALLATION REQUIREMENTS

- Ensure that the module meets the general technical system requirements.
- Ensure that other systems components do not damage the module mechanically or electrically.
- Modules can be wired in series to increase voltage or in parallel to increase current. To connect modules in series, connect the cables from the positive terminal of one module to the negative terminal of the next module. To connect in parallel, connect the cables from the positive terminal of one module to the positive terminal of the next module.
- The quantity of bypass diodes in the module junction box provided may vary depending on the model series.
- Only connect the quantity of modules that corresponds to the voltage specifications of the inverters used in the system. In addition, modules must not be connected together to create a voltage higher than the maximum permitted system voltage stated on the module nameplate, even under the worst local temperature conditions (see Table 1 for the correction coefficients that apply to open-circuit voltage).
- A maximum of two strings can be connected in parallel without using an over-current protection device (fuses, etc.) incorporated in series within each string. Three or more strings can be connected in parallel if an appropriate and certified over-current protection device is installed in series within each string. And it shall be ensured in the PV system design that the reverse current of any particular string is lower than the module maximum fuse rating under any circumstances.
- Only modules with similar electrical parameters should be connected in the same string to avoid or minimize

mismatch effects in arrays.

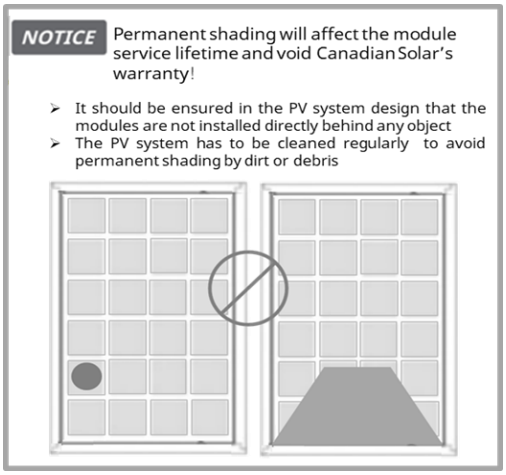
- To minimize risk in the event of an indirect lightning strike, avoid forming loops with the wiring when designing the system.
- Modules should be safely fixed to bear all expected loads, including wind and snow loads.
- A minimum clearance of 6.5 mm (0.25 in) between modules is required to allow thermal expansion of the frames and modules.
- The drain holes should not be blocked.

OPTIMUM ORIENTATION AND TILT

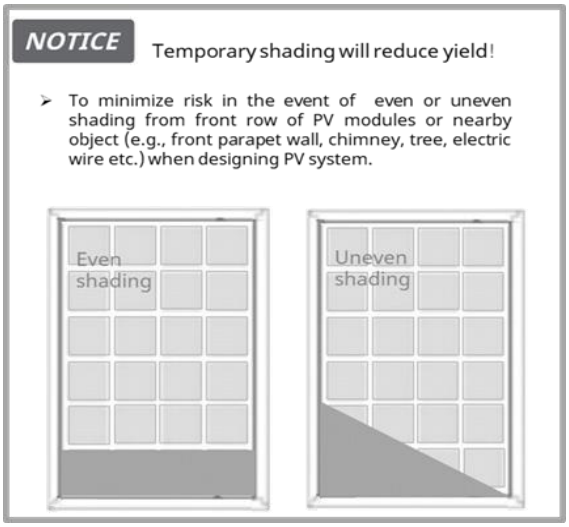
- To maximize the annual yield, please calculate the optimum orientation and tilt for PV modules in that specific installation site. The highest yields are achieved when sunlight shines perpendicularly onto the PV modules.

AVOID SHADING

- Modules shall not be permanently shaded (including partial shading, spot shading, even shading or uneven shading) under any circumstances. Permanent shading includes shading of the same cell, cell row, or module portion for extended and repeated periods of time (e.g. more than 200 daylight hours over the warrantied service lifetime). Power dissipated in fully or partially shaded cells will result in power loss, reduced yield and can cause localized overheating, which in turn may negatively impact the module service lifetime. Permanent shading may cause accelerated ageing of the encapsulation material and place thermal stress on the bypass diodes. This would void the module's warranty unless properly mitigated through the use of Module Level Power Electronic (MLPE) devices.



- Regular maintenance is required to keep modules clean. Particular measures should be taken to avoid permanent shading from dirt or debris (e.g., plants, bird droppings, etc.).
- Do not install modules directly behind any object (e.g., tree, antenna, etc.) to prevent occurrence of permanent shading.
- Even temporary partial shading will reduce the energy yield. A module can be considered to be unshaded if its entire surface is free from shading all year round, including on the shortest day of the year.



- For optimizing the power generation of the rear side of bifacial modules, obstacles between modules and the mounting ground should be avoided as much as possible.

RELIABLE VENTILATION

- Bifacial modules use direct, reflected, or diffuse sunlight on the backside to generate additional power. Therefore, bifacial modules are not suggested to be used in building

attached photovoltaic systems (BAPV).

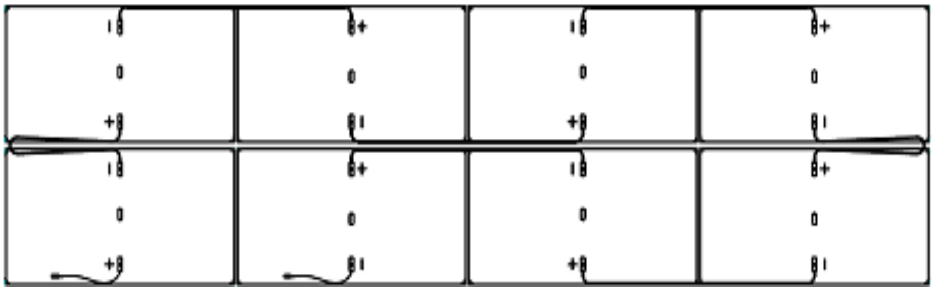
- Sufficient clearance of at least 10.2 cm (4.0 in) between the module bottom side and the surface of roof or wall needs to be provided to allow cooling air to circulate around the back of the module. This also allows condensation or moisture to dissipate. In particular, the minimum clearance of any modules applied in BWh area (please refer to Annex A Figure A.2) should be determined by Canadian Solar's technical service team.
- According to UL 61730, any other specific clearance required for maintaining a system fire rating should prevail. Detailed clearance requirements pertaining to system fire ratings must be provided by your racking supplier.

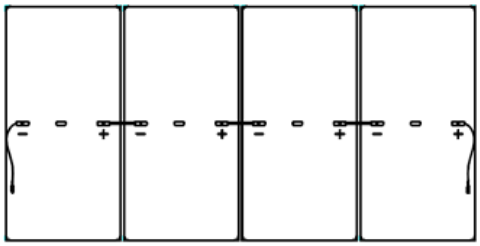
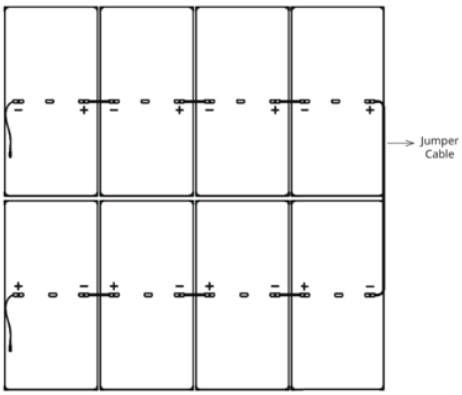
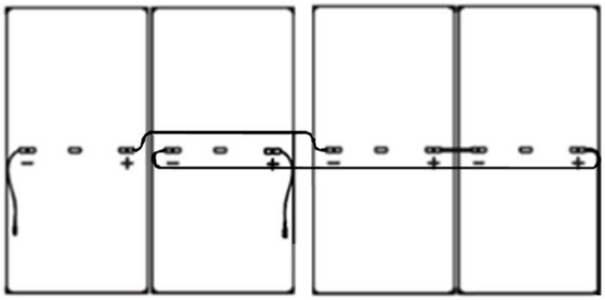
5.1 MODULE WIRING

CORRECT WIRING SCHEME

- Cable management scheme should be reviewed and approved by the EPC contractor. Required cable lengths should be cross-checked and account for tracker structure particularities e.g. bearing house gaps. If longer cables or additional jumper cables are required, please contact Canadian Solar's sales representative in advance.
- Ensure that the wiring is correct before starting up the system. If the measured open circuit voltage (Voc) and short-circuit current (Isc) differ from the specifications, this indicates that there is a wiring fault.
- When modules have been installed, but the system has not been connected to the grid yet, each module string should be kept under open-circuit conditions and proper actions should be taken to avoid dust and moisture penetration inside the connectors.
- For double glass modules, Canadian Solar offers several cable length options to match various system configurations, in case a jumper cable is needed, please contact your Canadian Solar sales representative.
- Cables should always be fastened on module frames or mounting rails, in order to avoid shading on the rear side of bifacial modules.
- For different module types, recommended system cable schemes are shown in table 2 below. On below figures, bold lines represent cable installation pathways, while + and - connector correspond to positive and negative module terminals respectively.

Table 2: System Cable Scheme for CS6L, CS6W, CS6R, CS6RA, CS7N and CS7L modules

Module types	Recommended wiring configurations
CS6L-MS **CS6R-MS** **CS6R-MS-HL** **CS6W-MS** **CS7N-MS** **CS7L-MS** **CS7L-MS-R** **CS6W-T** **CS6R-T** **CS6R-H-AG** **CS6RA-H-AG** **CS6W-MB-AG**	**Landscape installation two rows:**  Note: Adjacent modules in the same row need to be rotated 180 degrees for proper installation.

CS7N-MB-AG **CS7L-MB-AG** **CS6W-TB-AG** **CS7N-TB-AG** **CS7L-TB-AG**	**Portrait installation one row:** 
	Portrait installation two rows:  Note: Modules in adjacent rows need to be rotated 180 degrees for proper installation.
CS6W-MB-AG **CS6W-TB-AG**	**Portrait installation one row Leap-frog** (for single-axis tracker): 

The maximum distance between two adjacent module frames should be within 50 mm (1.96 in) for the side with mounting clamps, and within 25 mm (0.98in) for the side without mounting clamps, in order to meet the system cable scheme.

CORRECT CONNECTION OF CONNECTORS

- Make sure that all connections are safe and properly mated. The PV connector should not be subject to stress from the exterior. Connectors should only be used to connect the circuit. They should never be used to turn the circuit on and off.
- Connectors are not waterproof when unmated. When installing modules, connectors should be connected to each other as soon as possible or appropriate measures (like using connector endcaps) should be taken to avoid moisture and dust penetrating into the connector.
- If end caps are present on un-mated connectors, carefully remove by hand the end caps before connecting the connectors. Do not use any sharp tool which may damage the connector. The use of tools is not needed.

Positive connector endcap

Negative connector endcap

- **Do not** connect different connectors (brand and model) together.
- **Do not** clean or precondition the connectors using lubricants or any unauthorized chemical substances.

USE OF SUITABLE MATERIALS

- Only use dedicated solar cable and suitable connectors (wiring should be sheathed in a sunlight-resistant conduit or, if exposed, should itself be sunlight-resistant) that meet local fire, building and electrical regulations. Please ensure that all wiring is in perfect electrical and mechanical condition.
- Installers may only use single-conductor cable listed and labeled as PV wire which is 90°C wet rated in North America, and single conductor cable with a cross section area of at least 4 mm² (12 AWG), 90°C wet rated in other areas (i.e. IEC 62930: 2017 approved), with proper insulation which is able to withstand the maximum possible system open-circuit voltage.
- Only copper conductor material should be used. Select a suitable conductor gauge to minimize voltage drop and ensure that the conductor ampacity complies with local regulations (e.g. NEC 690.8(D)).

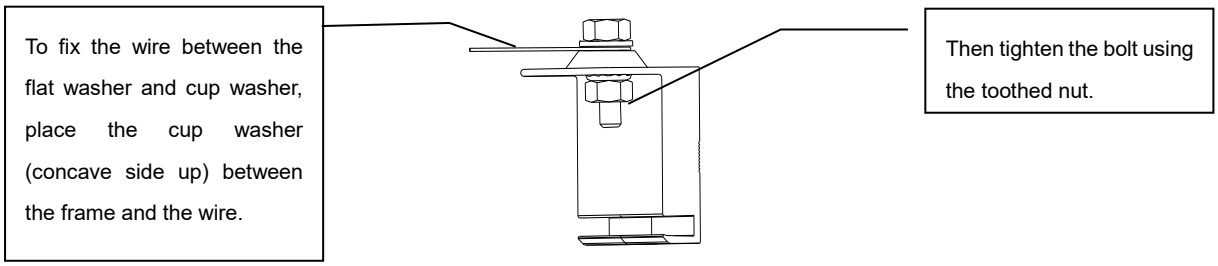
CABLE AND CONNECTOR PROTECTION

- Secure the cables to the mounting system using UV-resistant cable ties. Protect exposed cables from damage by taking appropriate precautions (e.g. placing them inside a metallic raceway like EMT conduit). Avoid exposure to direct sunlight.
- A minimum bending radius of 60 mm (2.36 in) is required when securing the junction box cables to the racking system.
- Protect exposed connectors from weathering damage by taking appropriate precautions. Avoid exposure to direct sunlight.
- Do not place connectors in locations where water could easily accumulate.

5.2 GROUNDING

- For grounding requirements in North America, a module with exposed conductive parts is considered to comply with UL 61730 only when it is electrically grounded in accordance with both the instructions presented below and the requirements of the National Electrical Code. Any grounding means used with Canadian Solar modules should be NRTL certified to UL 467 and UL 2703 standards. Please consult our technical service team for the formal approval process.
- For grounding requirements in other areas, although the modules are certified to Safety Class II, we recommend them to be grounded and that module installation should comply with all applicable local electrical codes and regulations. Minimum size of equipment grounding conductors for ground raceway and equipment from NEC 690.8(D) should be considered. Grounding connections should be installed by a qualified electrician. Connect module frames together using adequate grounding cables: we recommend using 4-14 mm² (AWG 6-12) copper wire. Holes provided for this purpose are identified with a grounding symbol ⏚ (IEC 61730-1). All conductive connection junctions must be firmly fixed.
- Do not drill any extra ground holes for convenience as this will void the module's warranty.
- All bolts, nuts, flat washers, lock washers and other relevant hardware should be made of stainless steel, unless otherwise specified.
- Canadian Solar does not provide grounding hardware.
- The grounding method described below is recommended for Canadian Solar.

GROUNDING METHOD: BOLT + TOOTHED NUT + CUP WASHER.



- A grounding kit containing an M5 (3/16") SS cap bolt, an M5 (3/16") SS flat washer, an M5 (3/16") SS cup washer, and an M5 (3/16") SS nut (with teeth) is used to attach copper grounding wire to a pre-drilled grounding hole on the frame (see image above).
- Place the wire between the flat washer and the cup washer. Ensure that the cup washer is positioned between the frame and the wire with the concave side up to prevent galvanic corrosion. Tighten the bolt securely using the SS toothed nut. A wrench may be used to do this. The tightening torque is 3-7 Nm (2.2-5.2 ft-lbs).
- For bifacial modules, mounting rail designs should be such to allow easy access to the grounding holes located on the long side of the frame, in order to enable the equipment grounding function when required.

6 MOUNTING INSTRUCTIONS

The applicable regulations pertaining to work safety, accident prevention and securing the construction site must be observed. Workers and third-party personnel shall wear or install fall arrest equipment. Any third party need to be protected against injuries and damages.

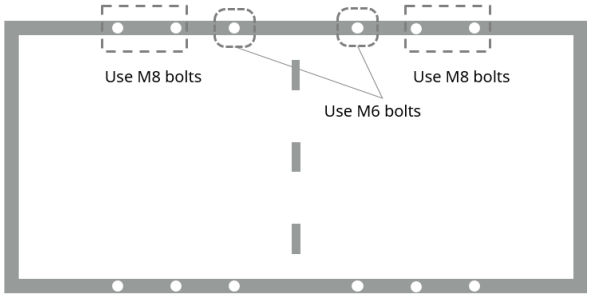
- The mounting design must be certified by a registered professional engineer. The mounting design and procedures must comply with all applicable local codes and requirements from all relevant authorities.
- The module is considered to be in compliance with UL 61730 and IEC 61215/61730 only when the module is mounted in the manner specified by the mounting instructions included in this installation manual or when specially approved by Canadian Solar in writing.
- The system designer and installer are responsible for load calculations and for proper design of support structure.
- The mechanical load tests in this manual are only valid when coupled to mounting and support structures that are capable of withstanding equal or greater mechanical loads. The mounting system supplier is responsible for the strength and stability of the mounting structure, which must meet the requirements of the relevant design specifications.
- The loads described in this manual correspond to test loads. For installations complying with UL 61730 and IEC 61215/61730, a safety factor of 1.5 should be applied for calculating the equivalent maximum authorized design loads. Project design loads depend on construction, applicable standards, location and local climate. Determination of the design loads is the responsibility of the racking suppliers and/or professional engineers. For detailed information, please follow local structural code or contact your professional structural engineer.
- Use a torque wrench for installation.
- Do not drill additional holes or modify the module frame. Doing so will void the module's warranty.
- This manual includes preliminary loading capability data which might be subject to change in the coming versions. Please check for the latest version of this manual.
- Use appropriate corrosion-proof fastening materials. All mounting hardware (bolts, spring washers, flat washers, nuts) should be hot dip galvanized or stainless steel.
- Install and tighten the module clamps to the mounting rails using the torque stated by the mounting hardware manufacturer. Recommended accessories are shown below.

Accessory	Model	
Bolt	M8 x 1.25-Grade 8.8 (5/16"-18 Grade B7) galvanized or A2-70 stainless steel coarse thread bolts.	M6 X 1 (1/4") coarse thread bolts
Washer	2 pcs, thickness ≥1.5mm and outside diameters = 16mm	2 pcs, thickness ≥1.5mm and outside diameters = 12-16mm
Spring washer	8	6
Nut	M8	M6

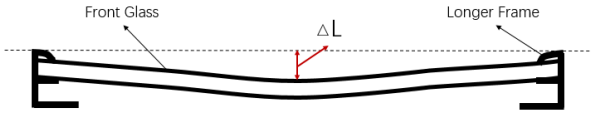
Note that: 1) M8 and M6 bolt tightening torques must be within 16~20 Nm (11.8~14.75 ft-lbs) and 6~9 Nm (4.5~6.6 ft-lbs), respectively, depending on bolt classes. For the bolt grade, the technical guidelines from the fastener suppliers should be followed. Different recommendations from specific clamping hardware suppliers should prevail. 2) The yield strength of the

bolt and nut should not be less than 450 MPa.

Bolt locations on the module, where M6 bolts are used only in single-axis tracker



- The laminate of the PV modules will sink downward to varying degrees due to gravity, with the center of module being the maximum deflection position. While using bolting or clamping mounting method or insertion system, the maximum allowable deflection (ΔL shown in the picture below) is 20 mm (in the absence of external forces caused by, for example, wind and snow). Note that applying pressure to the module surface during storage, transportation and installation will lead to more severe deflection.



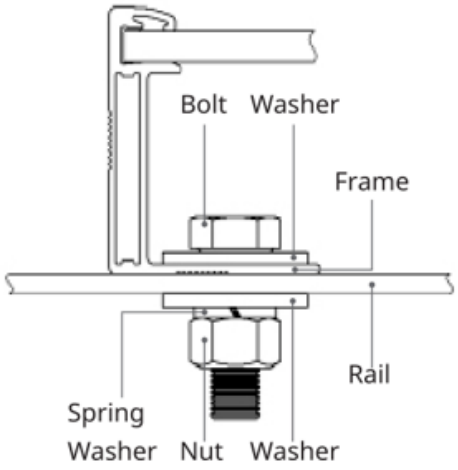
6.1 MOUNTING METHOD: BOLTING

- The mechanical load test with these mounting methods were performed according to IEC 61215.
- Modules should be bolted to supporting structures through the mounting holes in the rear frame flanges only.
- Each module must be securely fastened at a minimum of 4 points on two opposite sides.

NOTICE Suitable bolt length should be chosen based on actual module frame height. For double glass module with 30 mm frame height, our recommended maximum bolt length is 20 mm in order to properly insert the bolts through the mounting hole. The system designer is responsible to check that the racking supplier specified bolt length complies with above requirement and will not affect installation.

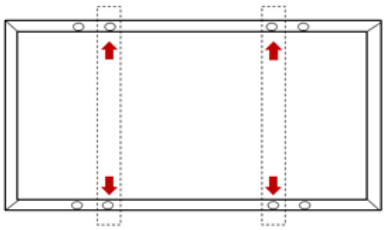
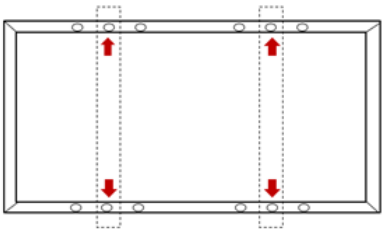
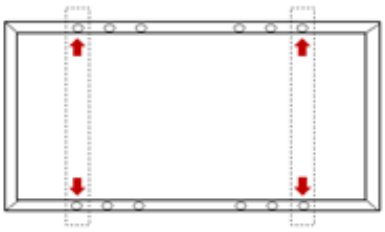
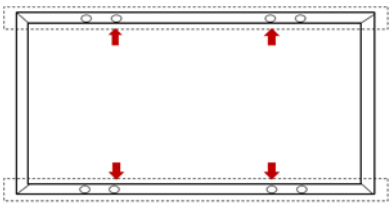
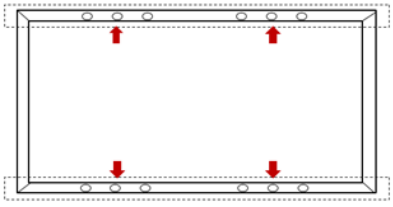
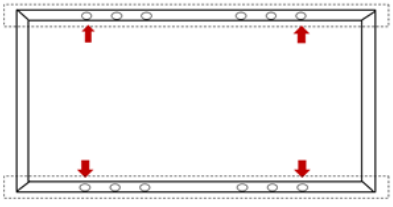
- In areas with heavy wind loads, additional mounting points should be used. The system designer and the installer are responsible for correctly calculating the loads and ensuring that the supporting structure meets all the applicable requirements.

Mounting method: Bolting



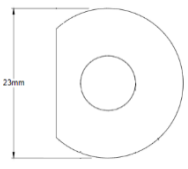
- Modules should be bolted at the following hole locations depending on the configuration and loads, which is shown in table 3.

Table 3: Approved bolting methods

Inner four holes installation method I-A	Middle four holes installation method M-A	Outer four holes installation method O-A
		
Inner four holes installation method I-B	**Middle four holes installation method M-B**	**Outer four holes installation method O-B**
		

Installation Method / Module Types	I-A	I-B	M-A	M-B	O-A	O-B
CS6R-MS/CS6RB-MS	+5400Pa/-2400Pa	/	/	/	+5400Pa/-2400Pa	/
CS6RA-MS	+5400Pa/-2400Pa	/	/	/	/	/
CS6R-MS-HL☆	+5400Pa/-3200Pa	+5400Pa/-3200Pa	/	/	/	/
CS6W-MS/CS7L-MS/CS7N-MS/CS6W-T	/	/	/	/	+5400Pa/-2400Pa	/
CS6R-T (Preliminary)	+5400Pa/-2400Pa	/	/	/	+5400Pa/-2400Pa	/
CS6W-MB-AG (F42 & F47* frame)**	/	/	/	/	+5400Pa/-2400Pa	
CS7N-MB-AG (F43 Frame)/ CS7L-MB-AG (F43 Frame)****	/	/	/	/	+5400Pa/-2400Pa	+3600Pa/-2400Pa
CS7N-MB-AG (F46 Frame)*/ CS7L-MB-AG (F46 Frame)****	/	/	/	/	+5400Pa/-2400Pa	+2800Pa/-2400Pa
CS6W-TB-AG	/	/	/	/	+5400Pa/-2400Pa	/
CS7N-TB-AG/ CS7L-TB-AG	/	/	/	/	+5400Pa/-2400Pa	+2800Pa/-2400Pa
CS6R-H-AG/ CS6RA-H-AG	+5400Pa/-2400Pa	+3600Pa/-2400Pa	/	/	/	/

Note: The installation method of bolt is based on the experimental results, "/" means not tested. ☆: D-type washer (as shown on the right) with outer diameter 23mm should be used when uplift load 4000 Pa is required; *: with 30 mm height frame; **: with 35mm height frame; ***: with 33mm height frame

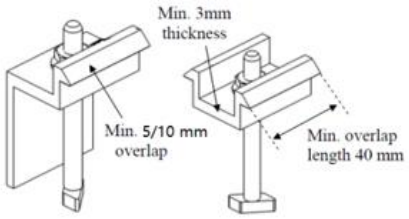


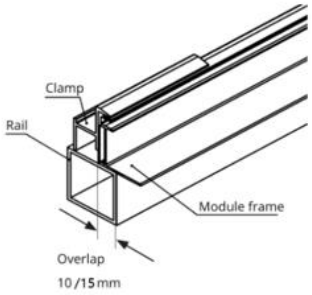
D-type washer

6.2 MOUNTING METHOD: CLAMPING

- The mechanical load test with these mounting methods were performed according to IEC 61215.
- Clamping methods will vary and are dependent on the mounting structures. Please follow the mounting guidelines recommended by the mounting system supplier.
- Each module must be securely fastened at a minimum of four points on two opposite sides. The clamps should be positioned symmetrically. The clamps should be positioned according to the authorized position ranges defined in the tables below. Install and tighten the module clamps to the mounting rails using the torque stated by the mounting hardware manufacturer.
- The system designer and the installer are responsible for load calculations and for proper design of support structure.
- For bifacial modules, the mounting rails shall be designed to limit as much as possible the shade on module rear side cells.
- Canadian Solar's warranty may be void in the cases where improper clamps (For example, the clamp height does not match with the frame height) or unsuitable installation methods are found. When installing inter-modules or end-type clamps, please take the following measures into account:

  1. Do not bend the module frame.
  2. Do not touch or cast shadows on the front glass.
  3. Do not damage the surface of the frame (to the exception of the clamps with bonding pins).
  4. Ensure the clamps overlap the module frame as specified in table 4. For configurations where the mounting rails run parallel to the frame, precautions should be taken to ensure the bottom flange of the module frame overlaps the rail as specified in table 4 as well.





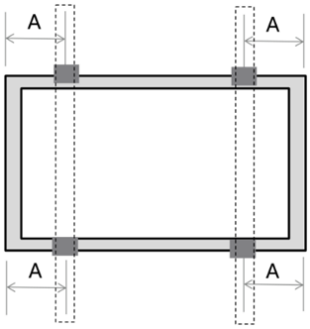
  5. Ensure the clamp thickness is at least 3 mm (0.12 in).

- Clamp material should be anodized aluminum alloy or stainless steel.
- Clamp positions are of crucial importance for the reliability of the installation. The clamp centerlines must only be positioned within the ranges indicated in the tables below, depending on the configuration and load.

Table 4: Overlap depth and length in clamp mounting method

Overlap between	Dimension type	Minimum overlap dimension	Applies to
Module frame and clamp	Depth	10 mm (0.4 in)	CS6W, CS7L and CS7N types
		5 mm (0.2 in)	Other module types
	Length	80 mm (3.15 in)	Uplift load > 2400 Pa
		40 mm (1.57 in)	Uplift load ≤ 2400 Pa
Module frame bottom flange and mounting rail	Depth	15 mm (0.59 in)	CS6W-MB-AG, CS7L-MB-AG, CS7N-MB-AG
		10 mm (0.4 in)	Other double glass modules
		15 mm (0.59 in)	All single glass modules

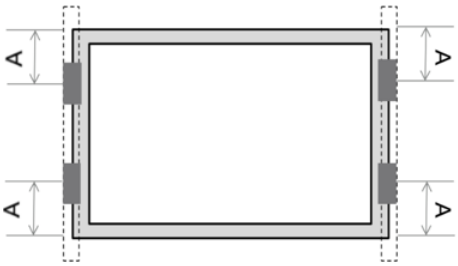
6.2.1 Clamp mounting on long side of frame and rails perpendicular to the long side frame



Module Types	Max Mechanical Load (Pa)					
	+2000/-2000	+2400/-2400	+3600/-2400	+5400/-2400	+5400/-3600	+7000/-5000
	A Range (mm)					
CS6L-MS (Preliminary)	/	/	/	400-500	/	/
CS6R-MS/CS6RB-MS	0-100	100-600	200-500	300-400	/	/
CS6RA-MS	/	/	0-100	200-400	/	/
CS6R-MS-HL	/	0-100	100-600	250-550	/	400-500
CS6W-MS/CS6W-T/ CS7N-MS	/	300-600	/	450-550	/	/
CS7L-MS	/	300-600	/	400-500	/	/
CS6R-T (Preliminary)	/	/	/	300-400	/	/
CS6W-MB-AG (F42 & F47* frame)**	/	/	300-600	400-500	/	/
CS7N-MB-AG (F43 & F46*** frame)**	/	/	/	450-550	/	/
CS7L-MB-AG (F43 & F46*** frame)**	/	/	/	400-500	/	/
CS6W-TB-AG	/	/	300-600	400-500	/	/
CS7N-TB-AG	/	/	/	450-550	/	/
CS7L-TB-AG	/	/	/	400-500	/	/
CS6R-H-AG	/	/	400-550	/	400-500	/
CS6RA-H-AG	/	/	300-450	/	350-400	/

*: with 30 mm height frame; **: with 35 mm height frame; ***: with 33 mm height frame

6.2.2 Clamp mounting on short side of frame and rails perpendicular to the long side frame.

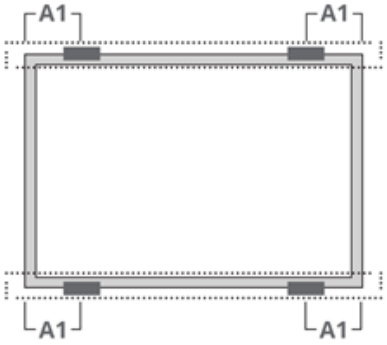


Module Types	A Range (mm)			
	0-200	0-250	20-200	200-250
	Max Mechanical Load (Pa)			

CS6L-MS (Preliminary)	+1000/-1000	/	/	+1200/-1200
CS6R-MS*/CS6RA-MS	+2200/-2200	/	/	+2400/-2400
CS6RB-MS	+2400/-2400	/	/	/
CS6R-MS-HL	+2400/-2400	/	/	+2600/-2400
CS6W-MS/CS6W-T	/	+1800/-1800	/	/
CS6R-H-AG◊/CS6RA-H-AG	/	/	+2200/-2200	+2400/-2400◊
CS6W-MB-AG (F42* frame)	+1000/-1000	/	/	/

◊: clamp overlap length should be at least 80 mm; *: with 35 mm height frame

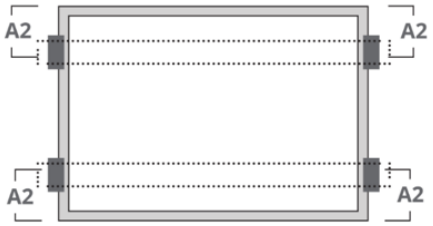
6.2.3 Clamp mounting on long side of frame and rails parallel to the long side frame.



Module Types		Max Mechanical Load (Pa)						
	+1600/-1600	+1800/-1800	+2800/-2400	+3200/-2400	+3600/-2400	+4000/-2400	+4000/-3200	+5400/-2400
		A1 Range (mm)						
CS6L-MS (Preliminary)	0-200	/	/	/	300-500	/	/	/
CS6R-MS/CS6RB-MS	/	/	/	200-600	/	200-300	/	/
CS6RA-MS	/	/	/	/	/	200-400	/	/
CS6R-MS-HL	/	/	/	/	/	100-600	/	450-550
CS6W-MS/CS6W-T	/	0-250	400-500	/	/	/	/	/
CS6W-MB-AG (F42 & F47* frame)**	/	0-250	/	/	/	/	400-500	/
CS7N-MB-AG (F43 frame)/ CS7L-MB-AG (F43** frame)/ CS6R-H-AG**	/	/	/	/	400-500	/	/	/
CS7N-MB-AG (F46* frame)/ CS7L-MB-AG (F46*** frame)**	/	/	400-500	/	/	/	/	/
CS6W-TB-AG	/	/	/	/	/	/	400-500	/
CS7N-TB-AG CS7L-TB-AG	/	/	400-500	/	/	/	/	/
CS6RA-H-AG	/	/	/	/	300-400	/	/	/

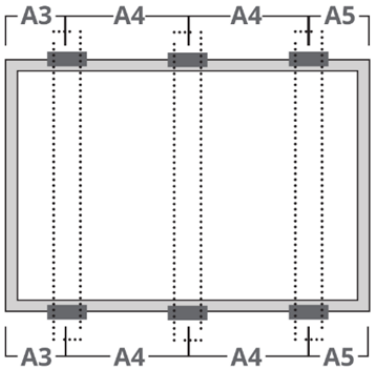
*: with 30 mm height frame; **: with 35 mm height frame; ***with 33 mm height frame

6.2.4 Four clamps on short side of frame and rails parallel to the long side frame.



Module Types	A2 Range (mm)		
	0-200	200-250	250-300
	Max Mechanical Load (Pa)		
CS6R-MS/CS6RA-MS/CS6RB-MS	+2200/-2200	+2400/-2400	/
CS6R-MS-HL	+2400/-2400	/	+5400/-2400
CS6R-H-AG	+2200/-2200	+2400/-2400	/
CS6RA-H-AG	+2400/-2400	/	/

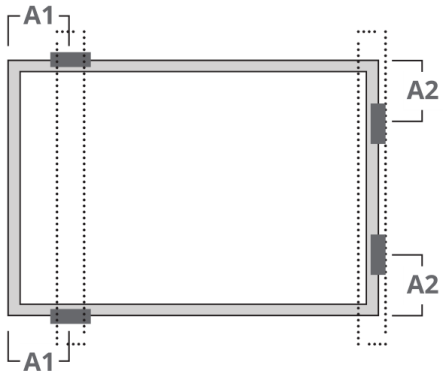
6.2.5 Six clamps on long side of frame and rails perpendicular to the long side frame



Module Types	Max Mechanical Load (Pa)				
	+5400/-2400	+5400/-2800	+6000/-3600	+6000/-4000	+8100/-5000
	A3 & A5 Range (mm)				
CS6R-MS/CS6RA-MS/CS6RB-MS	/	/	80-380	/	/
CS6R-MS-HL	100-600	/	/	300-550	350-450
CS6W-MB-AG (F47* frame)	/	/	300-500	/	/
CS6W-MB-AG (F42 frame)**	/	350-450	/	/	/
CS6W-TB-AG	/	/	300-500	/	/
CS6R-H-AG	/	/	80-380	/	/
CS6RA-H-AG	/	/	60-300	/	/

*: 30 mm height frame; **: with 35 mm height frame

6.2.6 Two clamps on the long side and two clamps on the short side of frame. Rails run perpendicular to the long side frame.



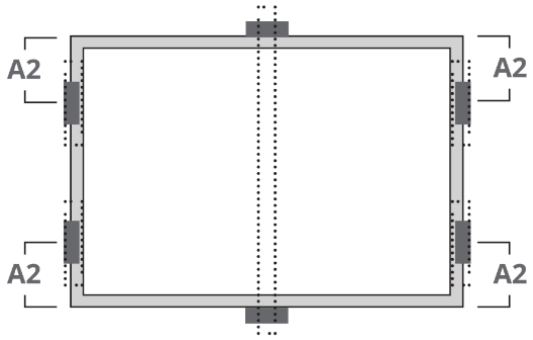
Module Types	Max Mechanical Load (Pa)					
	+2400/-2000		+2400/-2200		+2400/-2400	
	A1 Range (mm)	A2 Range (mm)	A1 Range (mm)	A2 Range (mm)	A1 Range (mm)	A2 Range (mm)
CS6R-MS	/	/	/	/	400-600	200-250
CS6RA-MS	/	/	/	/	300-450	200-250
CS6RB-MS	/	/	/	/	400-600	100-200
CS6R-MS-HL	/	/	/	/	350-650	100-300
CS6W-MS/CS6W-T	600-800	200-250	/	/	/	/
CS6W-MB-AG (F42 frames)**	/	/	600-700	200-250	/	/
CS6R-H-AG	/	/	/	/	400-600	200-250

**: with 35mm height frame

6.2.7 Four clamps mounting on the short side of frame.

Module Types	Max Mechanical Load (Pa)				
	+1200/-1200	+1800/-1800	+2200/-2200	+2400/-2400	+2600/-2400
	A2 Range (mm)				
CS6L-MS (Preliminary)	0-250	/	/	/	/
CS6R-MS/CS6RA-MS	/	/	0-200	200-250	/
CS6RB-MS	/	/	/	0-200	/
CS6R-MS-HL	/	/	/	0-200	200-250
CS6W-MS/CS6W-T	/	0-250	/	/	/
CS6R-H-AG	/	/	20-200	200-250	/

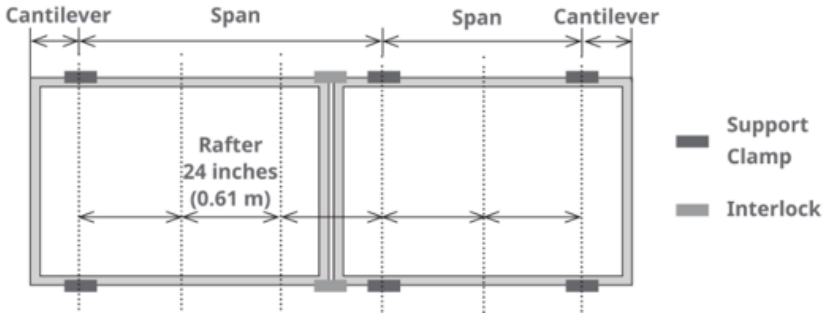
6.2.8 Four clamps mounting on short side of frame, and an additional support bar placed below the center of the module.



Module Types	Max Mechanical Load (Pa)		
	+4000/-3000	+4000/-4000	+5400/-3000
	A2 Range (mm)		
CS6R-MS/CS6RA-MS/CS6RB-MS	0-200	/	
CS6R-MS-HL	/	0-200	
CS6R-H-AG			200-250

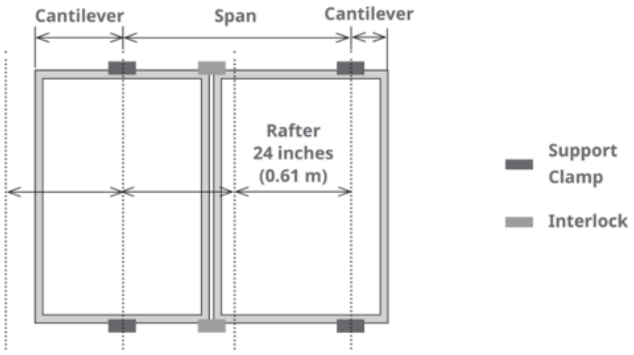
6.2.9 Rail-less clamping

The following methods are recommended only for single glass monofacial modules. Note that clamp overlap length of 40mm (or 1.50 in) when uplift load > 2400 Pa is allowed.



Landscape installation, clamping on long side frame

Modyle Type	Max Span	Max Cantilever length	Downforce	Uplift
CS6R-MS-HL	72 inches (1.83 m)	24 inches (0.61 m)	2650 Pa	2400 Pa
	64 inches (1.63 m)	21.3 inches (0.54 m)	2800 Pa	2400 Pa
	48 inches (1.22 m)	16 inches (0.41 m)	3600 Pa	3600 Pa
	32 inches (0.81 m)	10.7 inches (0.27 m)	4000 Pa	3600 Pa

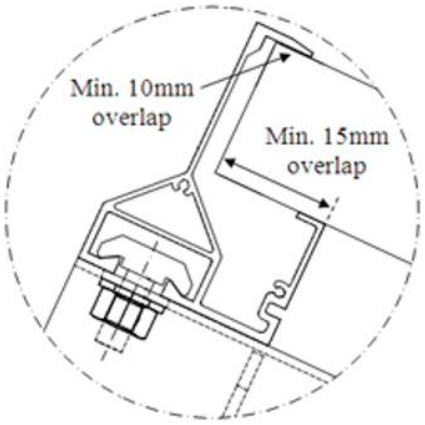


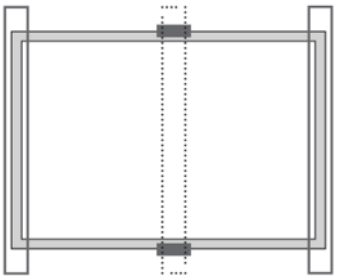
Portrait installation, clamping on short side frame

Modyle Type	Max Span	Max Cantilever length	Downforce	Uplift
CS6R-MS-HL	48 inches (1.22 m)	16 inches (0.41 m)	1800 Pa	1800 Pa
	32 inches (0.81 m)	10.7 inches (0.27 m)	1800 Pa	1800 Pa
	24 inches (0.61 m)	8 inches (0.2 m)	2000 Pa	2000 Pa

6.3 INSERTION SYSTEM

- Insertion Method C shown below is recommended only for monofacial modules.
- The mechanical load test with these mounting methods were performed according to IEC 61215.
- Insertion methods can vary and depend on the mounting structures. The installer needs to follow the mounting guidelines recommended by the mounting system supplier. Each module must be securely maintained through all its length on two opposite sides. Install and tighten the insertion profiles to the support structure using the hardware and instructions provided by the mounting system manufacturer. The system designer and installer are solely responsible for load calculations and for the proper design of support structure.
- When installing insertion profiles, please take the following measures into account:
  1. Do not bend the module frame.
  2. Do not touch the front glass or cast shadows onto it.
  3. Do not damage the surface of the frame.
  4. Ensure that the insertion profiles overlap the module frame by at least 10 mm (0.39 in).
  5. Ensure that the module frame (C-shape) overlaps the insertion profiles by at least 15 mm (0.59 in).
  6. Ensure insertion profile thickness and tolerances suit module thickness.
- Canadian Solar warranty may be void in cases where improper insertion systems or unsuitable installation methods are used.



Insertion Method A	Insertion Method B	Insertion Method C
		
Two insertion profiles run parallel to long side frame.	Two insertion profiles run perpendicularly to long side frame.	An additional support bar used with clamps

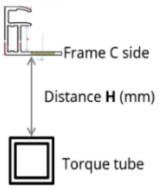
Installation Method / Module Types	Insertion Method A	Insertion Method B	Insertion Method C
CS6L-MS (Preliminary)	+3600Pa/-2400Pa	+1200Pa/-1200Pa	/
CS6W-MS (F35A Frame)	+4000Pa/-2400Pa	+1500Pa/-1200Pa	+5400Pa/-2400Pa
CS6R-MS/CS6RA-MS/CS6RB-MS	+4000Pa/-2400Pa	+2200Pa/-2200Pa	/
CS6R-MS-HL	+5400Pa/-2400Pa	+2400Pa/-2400Pa	+5400Pa/-2400Pa
CS6W-MB-AG	+3600Pa/-2400Pa*	/	/
CS6R-H-AG/CS6RA-H-AG	+3600Pa/-2400Pa	+2400Pa/-2400Pa	/

*: Just for CWF 0% overhang- insertion profile completely wraps the frame without cantilever. Rail distance must be ≥50% frame

from the short end of one side of the module.

6.4 MOUNTING METHOD: SINGLE-AXIS TRACKER

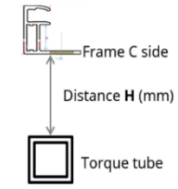
- The following mounting methods are only recommended for double glass modules.
- The bolts and clamps used in this section should follow the requirements described in chapter 6.0.
- Under any conditions the junction box should not come in contact with the subjacent racking structure except for the torque tube under high loading. For any single axis tracker installation configured with one module in portrait rows, bearing houses cannot be located under the module junction boxes.
- If any racking structures, especially bearing house, must be located under the modules, any racking structure shall not be higher than frame C side.

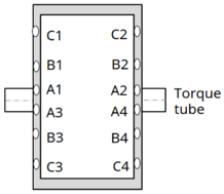


- If your tracker design cannot meet the above distance requirement, please contact Canadian Solar technical support department in writing for advice.

Tracker 1P Bolting method

- Install and tighten the module clamps to the mounting rails using the torque stated by the mounting hardware manufacturer. M6 × 1 (1/4") or M8 × 1.25 (5/16") bolt and nut are used for this bolting method.
- The tightening torques should be 6~9 Nm (4.5~6.6 ft-lbs) M6 × 1 (1/4") coarse thread bolts for 10 × 7 mounting hole, depending on bolt class. M8 × 1.25 (5/16") for 14 × 9 mounting hole.

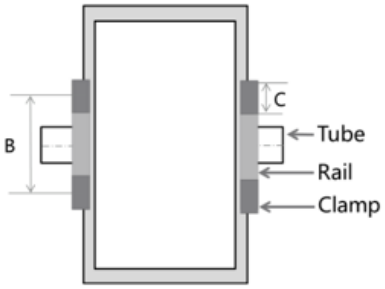




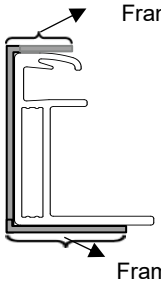
Module type	Mounting hole space (mm)	Fixed mounting hole location	Plain washer outer diameter (mm)	Distance H (mm)	Test load (Pa)
CS6W-MB-AG (F42** frame)	A1-A3: 400 B1-B3: 790	A1, A2, A3, A4	16	65±5	+2000/-1800
		B1, B2, B3, B4	16	65±5	+2400/-2200
CS6W-MB-AG (F47* frame)	A1-A3: 400 B1-B3: 790	A1, A2, A3, A4	16	65±5	+2100/-2100
		B1, B2, B3, B4	16	65±5	+2800/-2400
CS6W-TB-AG	A1-A3: 400 B1-B3: 790	A1, A2, A3, A4	16	65±5	+2100/-2100
		B1, B2, B3, B4	16	65±5	+2800/-2400
CS7L-TB-AG	A1-A3: 400 B1-B3: 790	A1, A2, A3, A4	16	65±5	+2100/-1900
		B1, B2, B3, B4	16	65±5	+2500/-1900
CS7N-TB-AG		A1, A2, A3, A4	16	65±5	+2100/-1900
		B1, B2, B3, B4	16	65±5	+2300/-1900
CS7L-MB-AG (F43** & F46*** frame)	A1-A3: 400 B1-B3: 790	A1, A2, A3, A4	16	65±5	+2100/-1900
		B1, B2, B3, B4	16	65±5	+2500/-1900
CS7N-MB-AG (F43** & F46*** frame)		A1, A2, A3, A4	16	65±5	+2100/-1900
		B1, B2, B3, B4	16	65±5	+2300/-1900

*: with 30 mm height frame; **: with 35 mm height frame; ***: with 33 mm height frame

Tracker 1P Clamping method



Overlap width between clamp and frame:
Frame top side ≥ 10 mm
Frame bottom side ≥ 15 mm

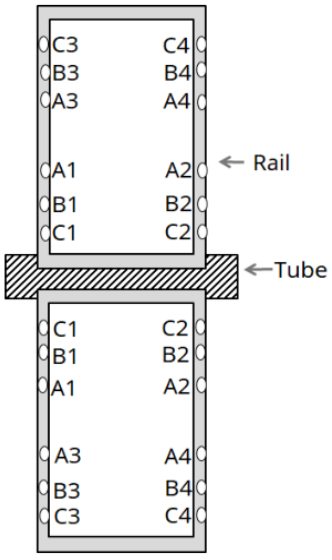


Module type	B Value (mm)	Clamp length C (mm)	Test load (Pa)
CS6W-MB-AG (F42** & F47* frame)	≥400	≥40	+1800/-1800
CS7L-MB-AG (F43** & F46*** frame)	≥400	≥40	+1600/-1600
CS7N-MB-AG (F43** & F46*** frame)	≥400	≥40	+1500/-1500
CS6W-TB-AG	≥400	≥40	+1800/-1800
CS7L-TB-AG	≥400	≥40	+1600/-1600
CS7N-TB-AG	≥400	≥40	+1500/-1500

*: with 30 mm height frame; **: with 35 mm height frame; ***: with 33 mm height frame.

The height of the rail should be 50±10 mm.

Tracker 2P Bolting method



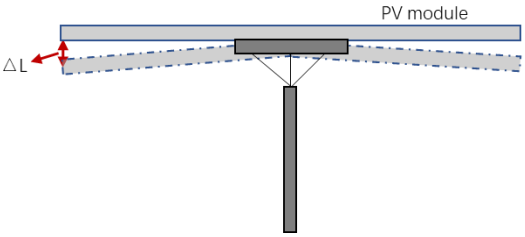
Module type	Mounting hole space (mm)	Mounting hole location	Plain washer outer diameter (mm)	Test load (Pa)
CS6W-MB-AG (F47* Frame)	A1-A3: 400 B1-B3: 790	B1, B2, A3, A4	16	+1900/-1900
		B1, B2, B3, B4	16	+2600/-2200
CS6W-MB-AG (F42** Frame)	A1-A3: 400 B1-B3: 790	B1, B2, A3, A4	16	+1800/-1600
		B1, B2, B3, B4	16	+2200/-2000
CS7L-MB-AG (F43** & F46*** frame) CS7N-MB-AG (F43** & F46*** frame) CS7L-TB-AG CS7N-TB-AG	A1-A3: 400 B1-B3: 790	B1, B2, A3, A4	16	+1800/-1600
		B1, B2, B3, B4	16	+2000/-1800
CS6W-TB-AG	A1-A3: 400 B1-B3: 790	B1, B2, A3, A4	16	+1900/-1900
		B1, B2, B3, B4	16	+2600/-2200

*: with 30mm height frame; **: with 35mm height frame; ***: with 33 mm height frame

- The maximum allowable twist angle of the module is 0.5 degree.
- Please contact the tracker manufacturer and Canadian Solar's technical support department for details in regard to

specific projects.

- Please verify the approved loads in the table with the racking suppliers.
- The maximum deflection (ΔL shown in the below picture) is measured at the module corners under its own weight with a typical tracker mounting system. The maximum allowable deflection of the module is 25mm.



7 MAINTENANCE

- **Do not** make modifications to any component of the PV module (diode, junction box, connectors or others).
- Regular maintenance is required to keep modules clear of snow, bird droppings, seeds, pollen, leaves, branches, dirt spots, and dust.
- Modules with sufficient tilt (at least 15°), generally may not require cleaning (rain will have a self-cleaning effect). If the module has become soiled, wash with water and a non-abrasive cleaning implement (sponge) during the cool part of the day. Do not scrape or rub dry dirt away, as this may cause micro scratches.
- Snow should be removed using a soft brush.
- Periodically inspect the system to check the integrity of all wiring and supports.
- To protect against electric shock or injury, electrical or mechanical inspections and maintenance should be performed by qualified personnel only.

8 MODULE CLEANING GUIDELINES

This manual covers the requirements for the cleaning procedure of Canadian Solar photovoltaic modules. The purpose of these cleaning guidelines is to provide general information for cleaning Canadian Solar modules. System users and professional installers should read these guidelines carefully and strictly follow these instructions.

Failure to follow these instructions may result in death, injury or damage to the photovoltaic modules. Damages induced by inappropriate cleaning procedures will void Canadian Solar warranty.

SAFETY WARNING

- Cleaning activities create a risk of damaging the modules and array components, as well as increasing the potential electric shock hazard.
- Cracked or broken modules represent an electric shock hazard due to leakage currents, and the risk of shock is increased when modules are wet. Before cleaning, thoroughly inspect modules for cracks, damage, and loose connections.
- The voltage and current present in an array during daylight hours are sufficient to cause a lethal electrical shock.
- Ensure that the circuit is disconnected before starting the cleaning procedure, as contact with leakage of electrically active parts can result in injury.
- Ensure that the array has been disconnected to other active components (such as inverter or combiner boxes) before starting with the cleaning.
- Wear suitable protection (clothes, insulated gloves, etc.).
- **Do not** immerse the module, partially or totally, in water or any other cleaning solution.
- Rear side cleaning of the modules is not required, if cleaning the rear of a module is desired, care should be taken to ensure there is no damage caused to the module, especially the soft surface of the backsheet, by simply clearing the contaminant by hand or with a soft sponge.

HANDLING NOTICE

NOTICE

- Use a proper cleaning solution and suitable cleaning equipment.
- **Do not** use abrasive or electric cleaners on the module.
- Particular attention should be taken to avoid the module rear glass or frame coming in contact with sharp objects, as scratches may directly affect product safety.
- **Do not** use abrasive cleaners, de-greasers or any unauthorized chemical substance (e.g. oil, lubricant,

pesticide, Gasoline, white flower oil, active oil, mold temperature oil, machine oil (such as KV46), grease (such as Molykote EM-SOL, etc.), lubricating oil, anti-rust oil, stamping oil, butter， cooking oil, propyl alcohol, ethyl alcohol, essential oil, bone-setting water, Tianna water, mold release agent (such as Pelicoat S-6, etc.), glue and potting glue that can generate oxime gas (such as KE200, CX-200, Chemlok, etc.), TBP (plasticizer), cleaning agents, pesticide, paint strippers, adhesives, antirust agent, disincrustant, emulsifying agent, cutting oils and cosmetics, etc.) on the module.

- **Do not** use cleaning corrosive solutions containing hydrofluoric acid, alkali, acetone, or industrial alcohol. Only substances explicitly approved by Canadian Solar are allowed to be used for cleaning modules.
- For cleaning methods using rotating brush, please consult with Canadian Solar's technical support before using.
- Dirt must never be scraped or rubbed away when dry, as this will cause micro-scratches on the glass surface. The module damage due to improper dry cleaning method will void Canadian Solar’s warranty.
- Improper cleaning equipment design may cause localized heavy loads onto the module. Localized heavy loads may cause severe micro-cracks at cell level, which in turn may compromise module reliability and void Canadian Solar’s warranty. Please consult the Canadian Solar technical support department for information on the use of cleaning solutions and loading specifications. .

OPERATION PREPARATION

- Noticeable dirt must be rubbed away by gentle cleaning implement (soft cloth, sponge or brush with soft bristles).
- Ensure that brushes or agitating tools are not abrasive to glass, EPDM, silicone, aluminum, or steel.
- Avoid cleaning during the hottest hours of the day, in order to prevent thermal stress on the module.

CLEANING METHODS

Method A: Compressed Air

Canadian Solar recommends cleaning the soft dirt (like dust) on modules just with air pressure. This technique can be applied as long as the method is efficient enough considering the existing conditions.

Method B: Wet cleaning

If excessive soiling is present on the module surface, a non-conductive brush, sponge, or other mild agitating method may be used with caution.

- Ensure that any brushes or agitating tools are constructed with non-conductive materials to minimize risk of electric shock and that they are not abrasive to the glass or the aluminum frame.
- If grease is present, an environmentally friendly cleaning agent may be used with caution.
- Canadian Solar recommends the following to be used:
    - Water with low mineral content
    - Near neutral pH water
    - The maximum water pressure recommended is 4 MPa (40 bar)

ANNEX A: GUIDANCE ON MODULE TEMPERATURE FOR SEVERAL LOCATIONS

- The operational temperature of a PV module changes during the day and also from day to day throughout the year. The 98th-percentile temperature represents the temperature that is larger than 98% of all the temperatures, and consequently it is met or exceeded only 2% of the time.
- The 98th-percentile temperature is to be determined from measurements taken on hourly-basis, or even more frequently. For a standard year, the 98th-percentile temperature would be met or exceeded 175.2 hours.
- The operational module temperature is influenced by the environmental temperature but also by how the module is installed (e.g. mounting distance to roof, array size, array spacing and anti-nesting features), as it may allow a more efficient ventilation. The graphics below from IEC 63126 show this influence, the maps presented here are a general guidance and assumed conservative, please contact your local sales representative for further information.
- The operational temperature is influenced by the minimum distance between the module bottom and the surface of roof or wall. And the distance is related to the climate. Figure A.2 shows climate area distribution of the Köppen climate types for the period from 1901 to 2010. In any climate regions except for BWh area, the minimum distance should be 10.2 cm (4.0 in). If you want to determine a specific distance on your project located in the BWh climate area, please contact Canadian Solar's technical service team. For more information about Köppen climate types, please refer to http://hanschen.org/koppen.

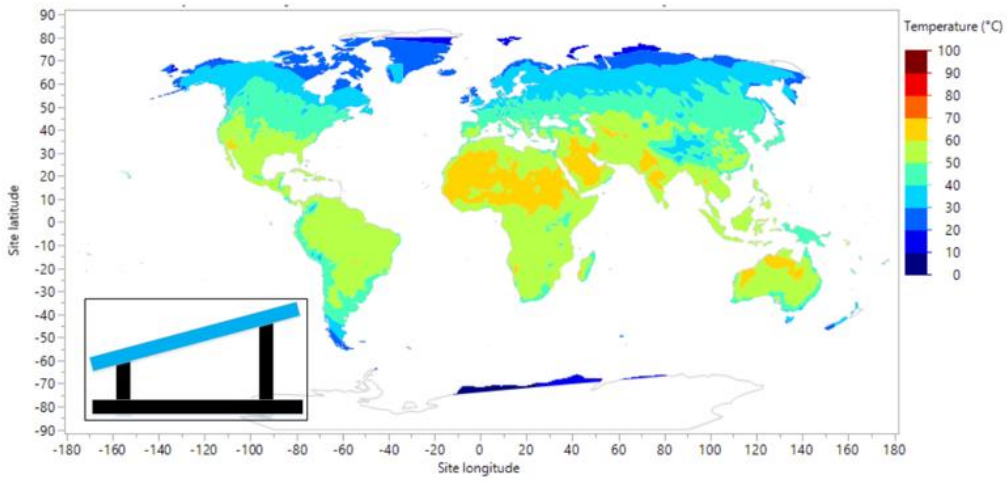


Figure A.1 – 98th-percentile temperature for an open-rack, or thermally unrestricted

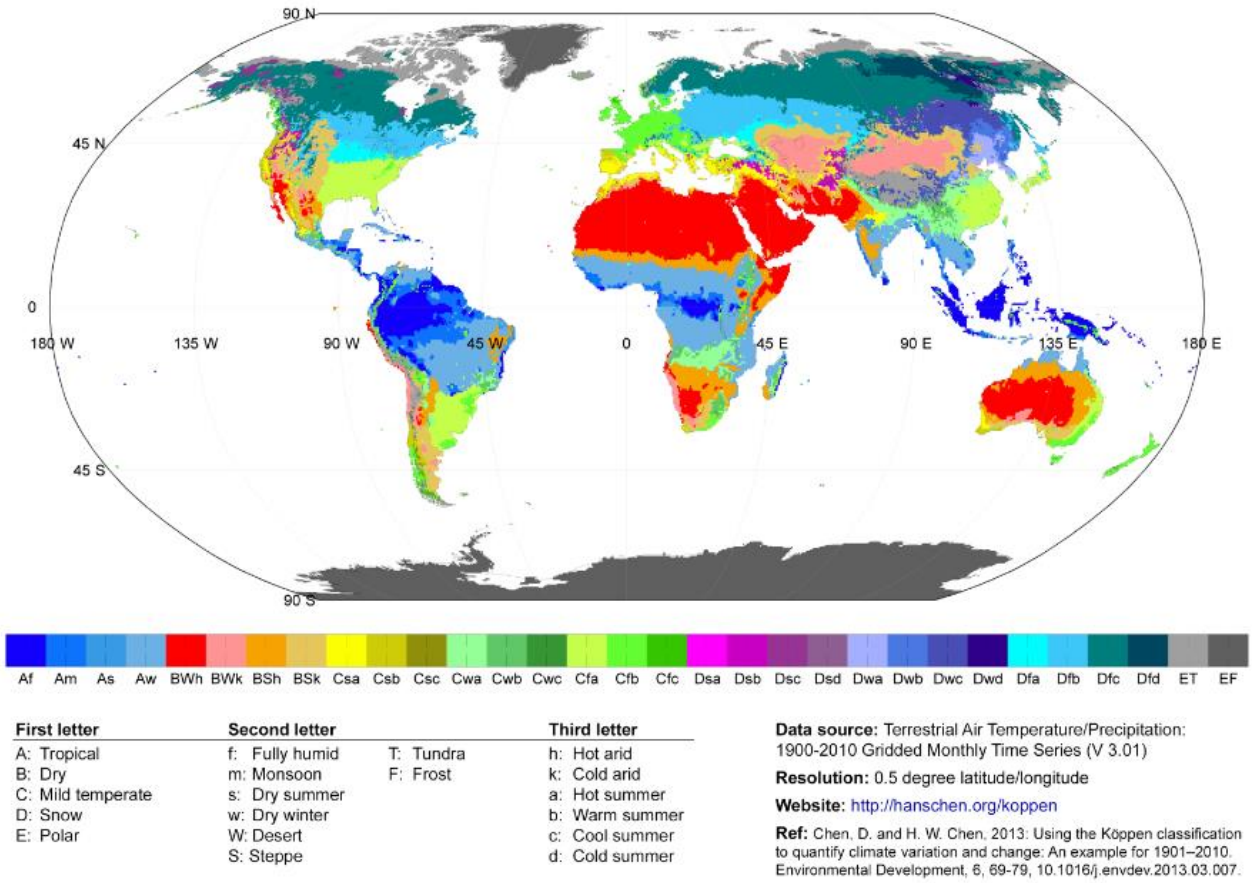


Figure A.3 Spatial distribution of the Köppen climate types for the period from 1901 to 2010

ANNEX B: INSTALLATIONS USING MODULE LEVEL POWER ELECTRONICS

- This section is applicable to CS6R-MB-HL and all Canadian Solar monofacial module types referred to in this installation manual.
- Module-level power electronics (MLPE) are devices that can be incorporated into a solar system to improve its performance in certain conditions (especially where shade is present) and to reduce shock hazard for emergency responders. MLPE devices can be supplied as a 'retro-fit' system made by third-party supplier.
- Module certification testing does not include MLPE devices.
- When installing MLPE devices with Canadian Solar modules, follow the instructions of the MLPE supplier and the specific requirements given below. Ensure electrical parameters and limitations of the MLPE devices and the Canadian Solar modules are suitable for one another.
- Failure to comply with these instructions will void the Canadian Solar warranty.

INSTALLATION

- When choosing to mount the MLPE device to the module frame, follow the MLPE supplier instructions to ensure optimal mounting of the MLPE device and prevent any slippage during operation.
- Canadian Solar recommends the MLPE device be installed close to a corner of the module frame.
- When choosing to mount the MLPE device to the mounting structure, please refer to the instructions provided by the MLPE supplier.
- **Do not** cover the module nameplate or junction boxes when installing the MLPE devices on the rear of the modules.
- **Do not** use frame mounting holes to install the MLPE device.
- **Do not** drill extra holes in the frame to install the MLPE device.
- The distance between the MLPE device and the module backsheet should be larger than 20mm.

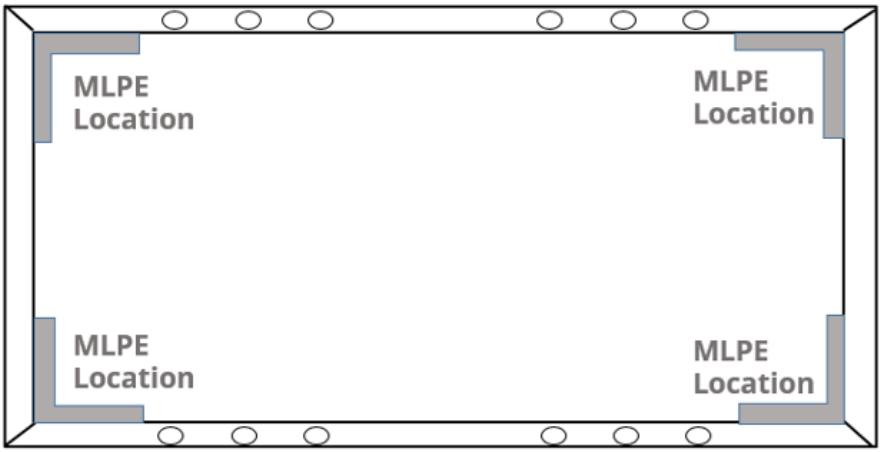


Figure B.1 - MLPE device installation zones

ANNEX C: COASTAL AREA ANTI-CORROSION INSTALLATION GUIDELINES

C.1.0 GENERAL INFORMATION

- According to the specific conditions stipulated in the Canadian Solar installation manual and general warranty statement, Canadian Solar PV modules are not allowed install in coastal areas. Coastal areas state that the places located within 100m of the defined coastline.
- This annex has been created to facilitate approval for customer PV installations located within 20 m and 100 m of the coastline. It lays down general requirements to ensure that Canadian Solar PV modules are installed properly and reliably in coastal areas, which include but are not limited to relevant anti-corrosion principles for both the modules and associated mounting systems. This annex summarizes the key technical requirements stipulated by well-known international standards and explains how they apply to photovoltaic systems.
- Please read this annex carefully and strictly follow any relevant instructions prior to installing Canadian Solar modules in coastal areas. Failure to follow these instructions and other general anti-corrosion principles may result in corrosion damage to the photovoltaic modules and/or their racking systems, and will void the Canadian Solar limited product and performance warranty. For further inquiries, please contact our customer service department or our local representatives for more information.
- The reliability of photovoltaic modules strongly depends on their distance from the coastline. Different coastal land areas are defined according to how far away from the coastline they are; Canadian Solar generally classifies seashore PV installations according to four different groups:

Distance from the coastline (X: meters)	Requirements
X ≤ 20 m	Installations are strictly prohibited by Canadian Solar due to concerns over salt-mist corrosion.
20m < X ≤ 100 m	Installations must comprise Canadian Solar "special-anti-corrosion" modules. These installations must comply with the instructions listed under sections C.2.1/C.2.2/C.2.3/C3.0.
100m < X ≤ 500 m	Installation of Canadian Solar "special-anti-corrosion" modules is recommended. It is recommended to follow the instructions listed under sections C.2.1/C.2.2/C.2.3/C.3.0.
> 500 m	Please follow section 7.0

- Local conditions strongly influence the salt deposition rate, which is particularly, but not exclusively, dependent on specific regions and local wind patterns. Canadian Solar reserves the right to adapt the above definition to individual cases. Please contact your local representative to confirm which category your PV system falls under.
- The word “coastline” in this manual refers to the area where the land meets the sea during high tide.
- In this manual, “distance to the coastline” refers to the shortest distance between the photovoltaic module array and the coastline.
- Please consult the Canadian Solar technical support department or your local representative for more information on installing "special anti-corrosion” modules.

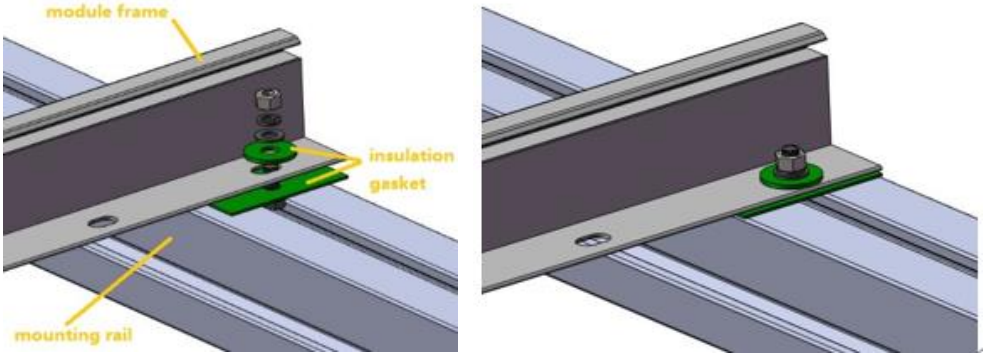
C.2.1 GENERAL ANTI-CORROSION METHODS

- Do not scratch or break the corrosion-resistant coating on the modules or mounting systems during installation.
- Do not change the structure of the module, e.g. by drilling holes into the module frame.

- Process specifications for the different components must comply with relevant international anti-corrosion standards.
- All general requirements listed in the Canadian Solar manual should be applied when installing “special-anti-corrosion” modules.

C.2.2 SPECIAL ANTI-CORROSION METHODS FOR MOUNTING

- Use mounting components that contain the same metals or metals with a similar electrochemical potential. The metal’s coating also should be taken into account. There may be a big difference between the electrochemical potentials of two different coating materials.
- If mounting components consist of two metals with a big difference in electrochemical potential, please add insulating washers (e.g. bi-metallic washers or insulation gaskets) to isolate the metals from each other.
- Copper/aluminum bi-metallic washers are commonly available to prevent electrochemical corrosion. These washers are made in a process called explosion welding.
- Concerning insulation gaskets, we recommend mica laminate, or other silicone or fluoride-based insulating materials.

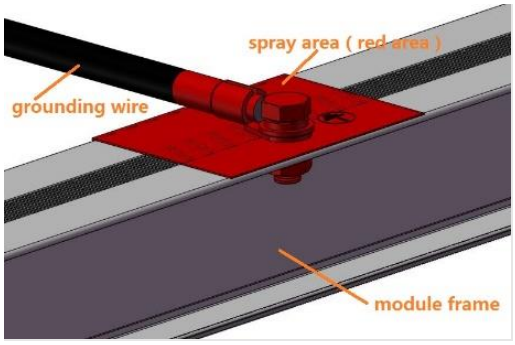


C.2.3 ANTI-CORROSION METHOS FOR GROUNDING

- We recommend two special anti-corrosion methods for protecting the system’s grounding devices. Please refer to the instructions in the table below:

Item	Method A	Method B
Coating components	Fluorocarbon varnish (one layer)	Layer 1 (metal side): epoxy zinc rich primer Layer 2 (middle layer): fluorocarbon finish paint Layer 3 (air side): fluorocarbon varnish
Coating thickness	40 μm	Layer 1 (metal side): 40 μm Layer 2 (middle layer): 40 μm Layer 3 (air side): 40 μm
Painting interval	/	Follow the supplier’s general requirements when painting the three coating layers. Apply the middle layer 24 hours after painting layer 1. Paint the air side layer 6 hours later after painting the middle layer.
General requirements	Clean the grounding components and make sure that they are dry and clean. The coating must cover all the grounding components and junction areas of the module frame or mounting system. Please refer to the figure below for more details.	

	The coating should be applied in a dry atmosphere (at least 24 hours) under the following conditions: relative humidity RH≤75%, ambient temperature T>5°C.	
Maintenance period	Three months	Five years



C.3.0 ANTI-CORROSION SUGGESTIONS FOR THE RACKING SYSTEM

- Suggestions for the racking system are provided below. The warranty does not cover the damage to the mounting system caused by corrosion if the mounting system is not provided by Canadian Solar. The requirements below apply to two main mounting systems: aluminum alloy-based racking for rooftops and galvanized steel-based structures for ground-mounted solar farms. To prevent salt-mist corrosion, Canadian Solar requires strict compliance with the following principles:
- Use approved corrosion-resistant materials (e.g. stainless steel SUS 316 or carbon steel with a hot-dip galvanized coating) for any racking or BOS components used in coastal areas.
- Process specifications for the different components must comply with relevant international anti-corrosion standards.
- Minimum coating thicknesses for hot-dip galvanized and anodizing oxide components must comply with the standard minimum requirements stipulated in JIS8641 and JIS8601.

Process	Minimum coating thickness	Standard
Hot-dip galvanizing (carbon steel)	HDZ55 (76um)	ISO 1461 JIS8641
Anodizing oxide (aluminum alloy)	AA20 (20um)	ISO 7599 JIS8601

- Use mounting components that contain the same metals or metals with a similar electrochemical potential. The metal's coating should also be taken into account. There may be a big difference between the electrochemical potentials of two different coating materials.

C.4.0 Precautions and General Safety

Before installing any modules, contact the appropriate authorities to obtain any relevant approvals and learn of any site, installation and inspection requirements.

- When applying coating materials, workers must follow applicable health and safety legislation and apply all respective preventive and proactive measures described within.

C.5.0 LIMITATION OF LIABILITY

- Canadian Solar shall not be held responsible for damages

of any kind, including but not limited to, bodily harm, injury and damage to property as a result of handling modules, installing systems, or compliance or non-compliance with the instructions set forth in this manual.

AMENDED EDITIONS AND DATES

Rev 1.0 integrated version first release in January, 2023

Rev 1.1 is released in March, 2023

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Transportation and Installation Requirements

MEDIUM VOLTAGE POWER STATION
SUNNY CENTRAL-US
Sunny Central UP-US
SUNNY CENTRAL STORAGE -US
SUNNY CENTRAL STORAGE UP-US

ENGLISH

MVPS-S2-UP-US-A4-TA-en-12 | Version 1.2

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

Inverters as of firmware version 8.00.##.R

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

Inverters as of firmware version 8.00.##.R

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

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

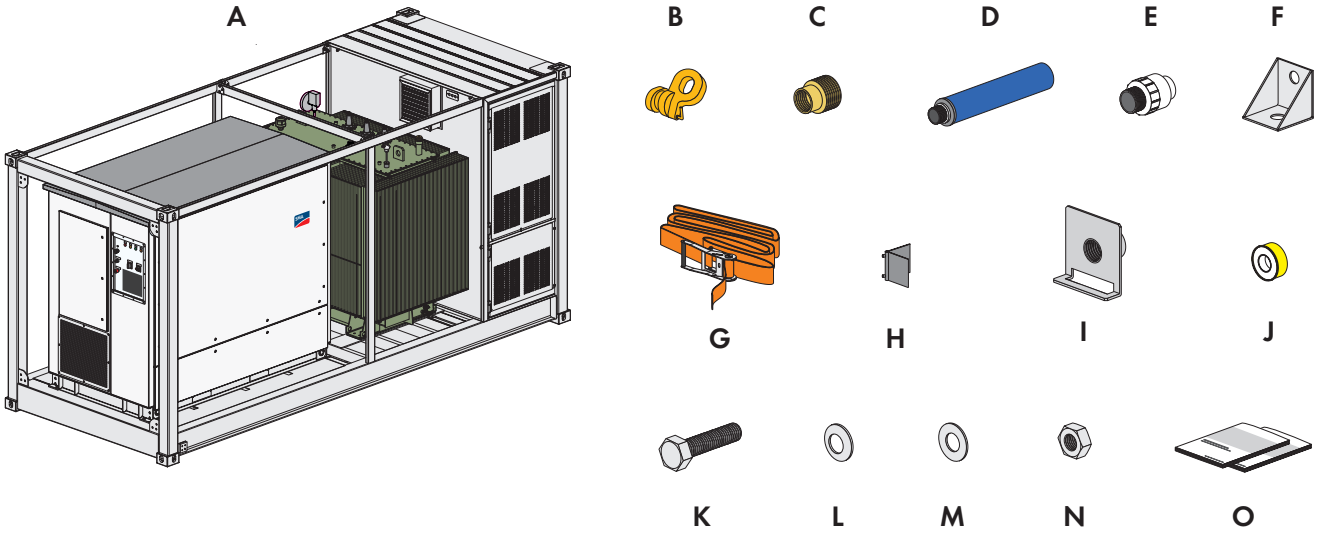


Figure 1: Scope of delivery of the MV Power Station

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	Hurricane Kit[3)]
H	8	Edge protection angle[3)]
I	depending on the order option	Mounting brackets for DC fuses
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)] In case of the order option "Earthquake and Storm Package"

Position	Quantity	Designation
N	8	Nut M12 for the grounding connection
O	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.

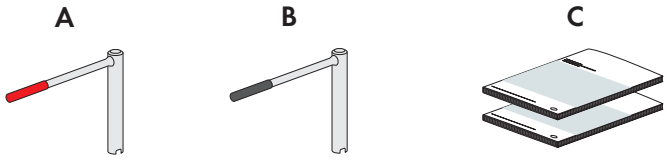


Figure 2: Scope of Delivery of the Medium-Voltage Switchgear

Position	Quantity	Designation
A	1	Actuation lever for grounding switch
B	1 / 2[4)]	Actuation lever for disconnection unit, load-break switch and circuit breaker
C	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.

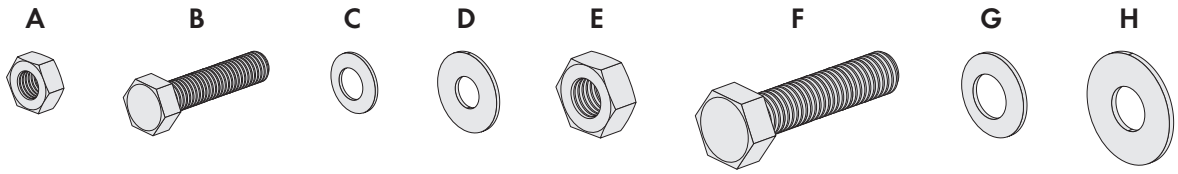


Figure 3: Scope of Delivery

Position	Designation	Application
A	Nut M8	-
B	Bolt M8	
C	Spring washer M8	
D	Fender washer M8	
E	Nut M12	Connection of the DC inputs
F	Bolt M12	
G	Spring washer M12	
H	Fender washer M12	

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

Scope of delivery of the order option "DC fuse"

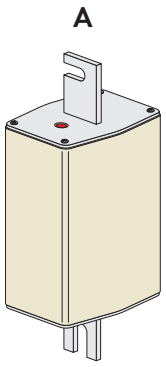


Figure 4: Scope of delivery

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.

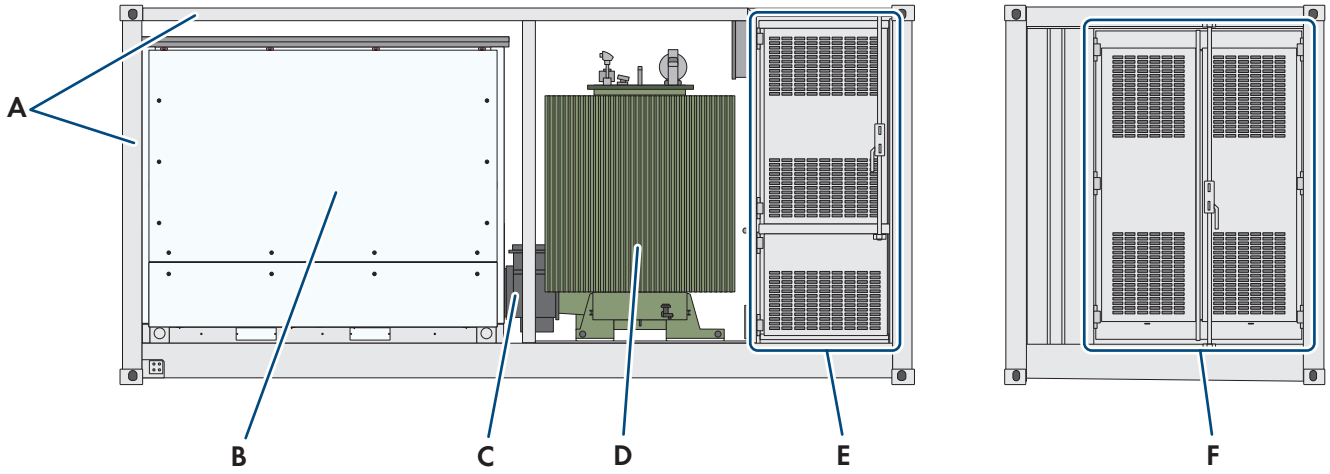


Figure 5: Design of the MV Power Station

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. 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

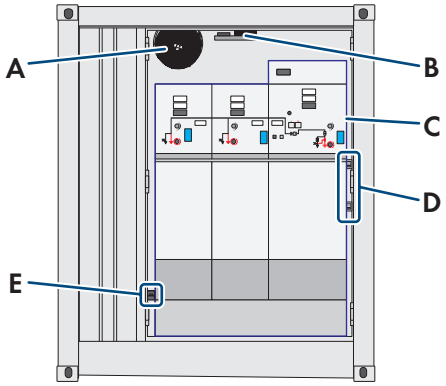


Figure 6: Components of the medium-voltage cabinet (example)

Position	Designation
A	Fan[5]
B	Lighting[5]/ heat detector[5]
C	Medium-voltage switchgear[5]
D	Thermostats for heating and safety shutdown of the medium-voltage switchgear[6]
E	Heating[6]

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.

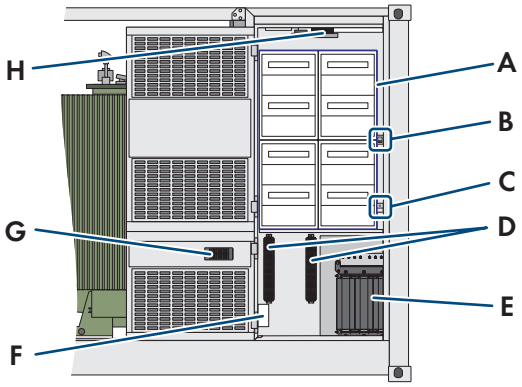


Figure 7: Components of the low-voltage cabinet (example)

Position	Designation
A	Station subdistribution[7]
B	Thermostat for fan control[8]

[5] Optional

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

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

[8] Optional

Position	Designation
C	Hygrostat[9)]
D	Fuse holder with thermal fuse for the low-voltage transformer[7)]
E	Low-voltage transformer[7)]
F	Terminal blocks for the connection of external loads such as tracker motors, DC-DC converters or the supply of battery containers[7)]
G	Heating[9)]
H	Lighting[8)]

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

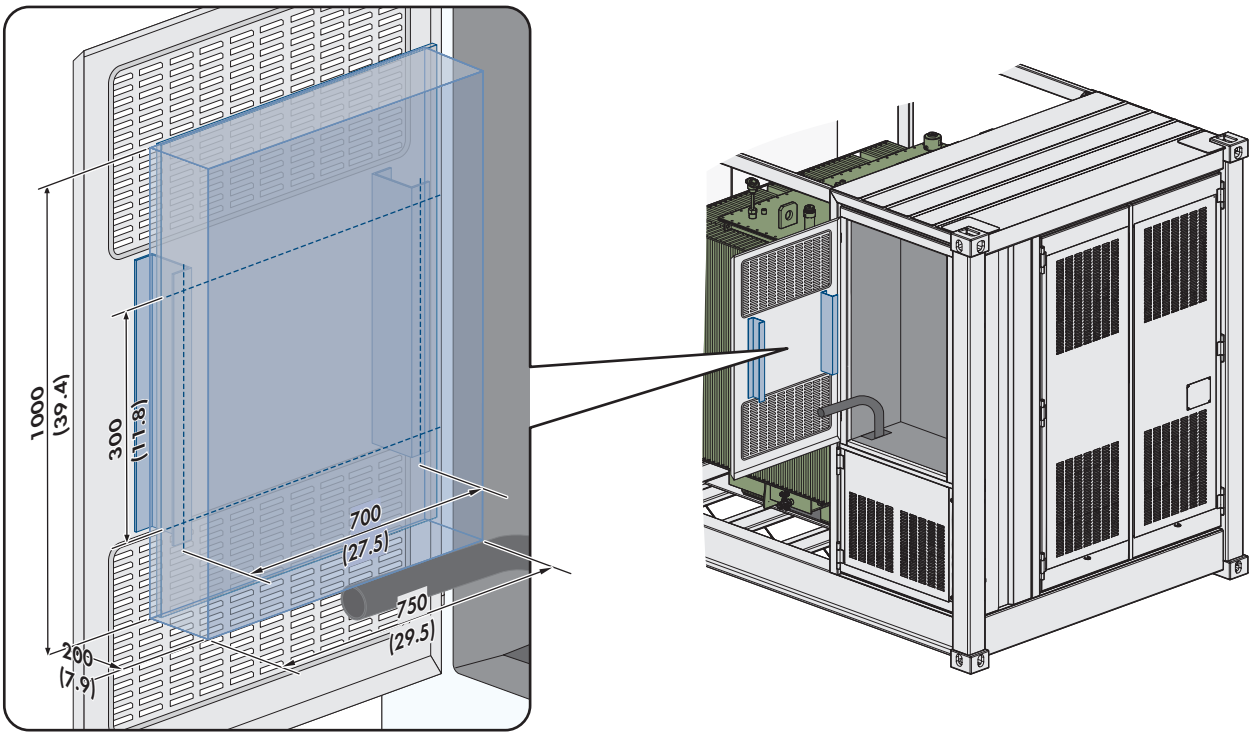


Figure 8: Position of customer installation location

The customer installation location on the inside of the door of the low-voltage cabinet is reserved for customer-supplied devices. Brackets are provided on the mounting plate for mounting customer devices.

9) With order option "Ambient Temperature: -40 °C to +45 °C"

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 (39.4 in x 29.5 in x 7.9 in) (height x width x depth).
- ☐ Narrow units with higher depth must not exceed 800 mm x 600 mm x 210 mm (31.4 in x 23.6 in x 8.2 in) (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 is 80 kg (176 lb)
- ☐ The 4 anchoring points for the brackets have the following distances: width 700 mm, height 340 mm, hole diameter 10 mm for bolts with 8 mm diameter
- ☐ Input voltage for customer installations: 120 V ±10% tolerance, 60 Hz
- ☐ Maximum power loss of customer installations: 300 W
- ☐ Maximum power available for connection of customer equipment depending on the order option: 2500 VA
- ☐ 2 miniature circuit breakers of type C16A are available to protect the customer equipment.
- ☐ Depending on application, the customer installations must be designed for temperatures from -40°C (-40°F) to 60°C (140°F).
- ☐ 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 (1.77 in)) 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

- ☐ Input voltage for customer installations: 120 V ±10% tolerance, 60 Hz
- ☐ Maximum power loss of customer installations: 300 W
- ☐ In addition, 2 miniature circuit breakers of type C16A (120 V) are available to protect the customer equipment.
- ☐ The maximum power available for connection of customer equipment depending on the order option:
  - As standard: 2500 VA

The following powers must be taken into consideration:

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"	200 W
Lighting in the medium-voltage and low-voltage cabinet	"Lighting"	50 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.

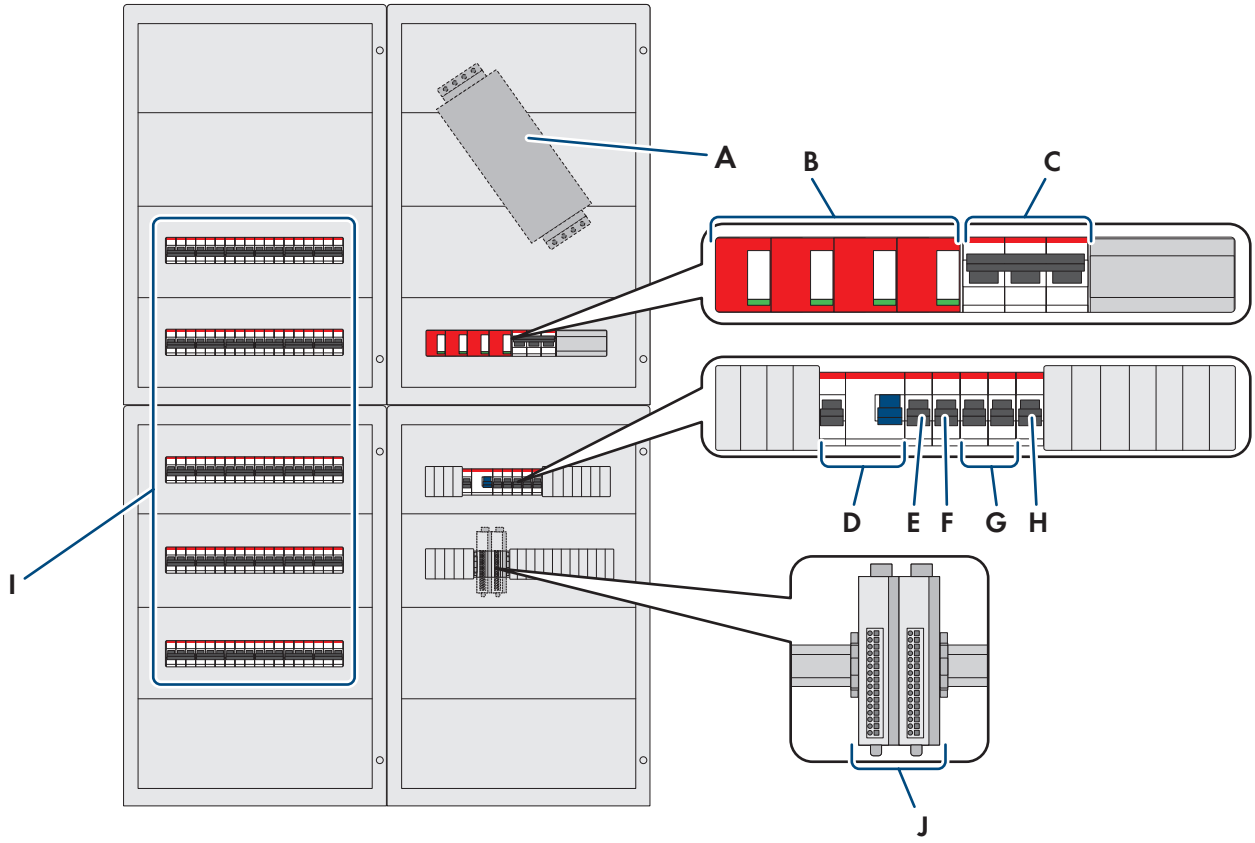


Figure 9: Devices in the station subdistribution (example)

Position	Designation
A	Low-voltage transformer EMC filtering device[10]
B	Surge arrester **-F1** for tracker motors and DC-DC Converter[10]
C	Main miniature circuit breaker **-F101** for tracker motors and DC-DC Converter[10]
D	Miniature circuit breaker **-F32** and residual-current device **-F32D** for lighting systems[10]
E	Miniature circuit breaker **-F34** for the fan[10]
F	Miniature circuit breaker **-F36** for monitoring and communication in terms of order option "Monitoring Package"[10]
G	Miniature circuit breaker **-F41** and **-F42** for protection of the customer equipment
H	Miniature circuit breaker **-F50**[11] or **-F51**[12] for the heating

[10] Optional

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

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

Position	Designation
I	Miniature circuit breakers for external loads such as tracker motors, DC-DC converters or the supply of battery containers **-F2** to **-F25**[10)] For the order option "Ambient Temperature: -35°C to +55°C": 2 heaters and 2 thermostats
J	I/O System Monitoring Package[10)]

Further details are to be found in the circuit diagram.

3.6 Design of the Inverter

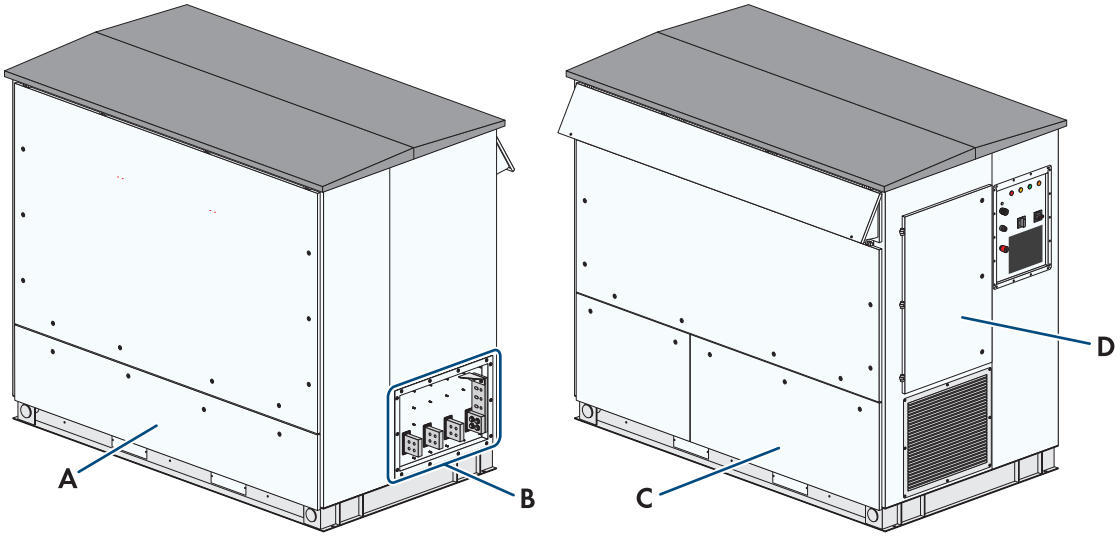


Figure 10: Design of the inverter

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

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.

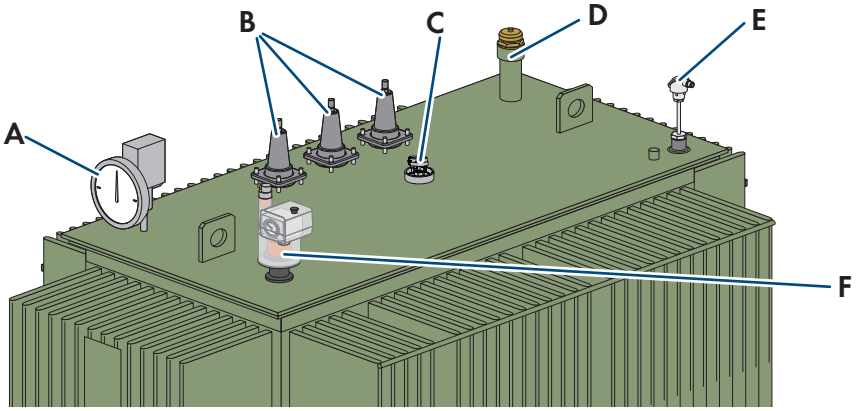


Figure 11: Components of the medium-voltage transformer (example)

Position	Designation
A	Oil pressure gauge
B	Medium-voltage bushings for connecting the AC cables
C	Tap changer for adjusting the turn ratio[13)]
D	Oil filler neck with pressure relief valve
E	Oil temperature (thermometer PT100)
F	Hermetic protection device (pressure and oil level)

[13)] 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.

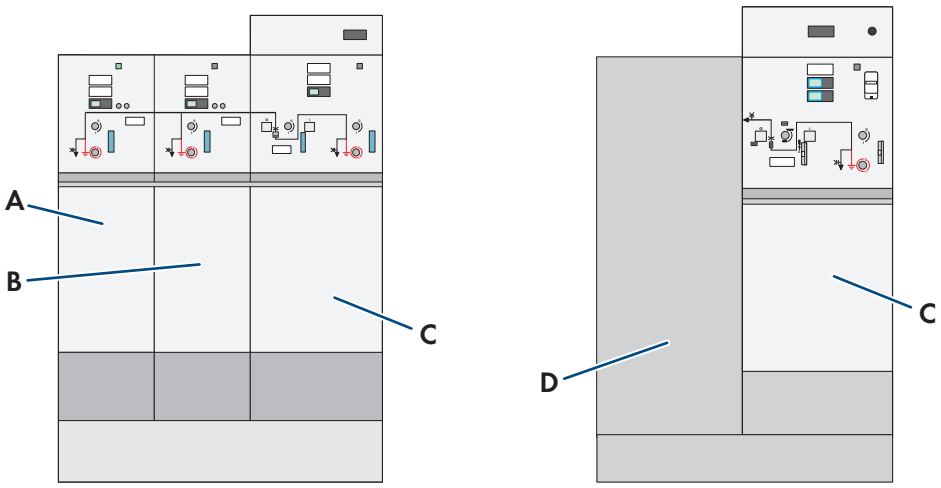


Figure 12: Components of the medium-voltage switchgear (example)

Position	Designation
A	Outer cable compartment with load-break switch[14)]
B	Central cable compartment with load-break switch[14)]
C	Transformer compartment with disconnector
D	Side cable compartment[14)]

[14)] Optional

3.9 Connection Area of the Medium-Voltage Switchgear

Overview of the connection area of the MV switchgear

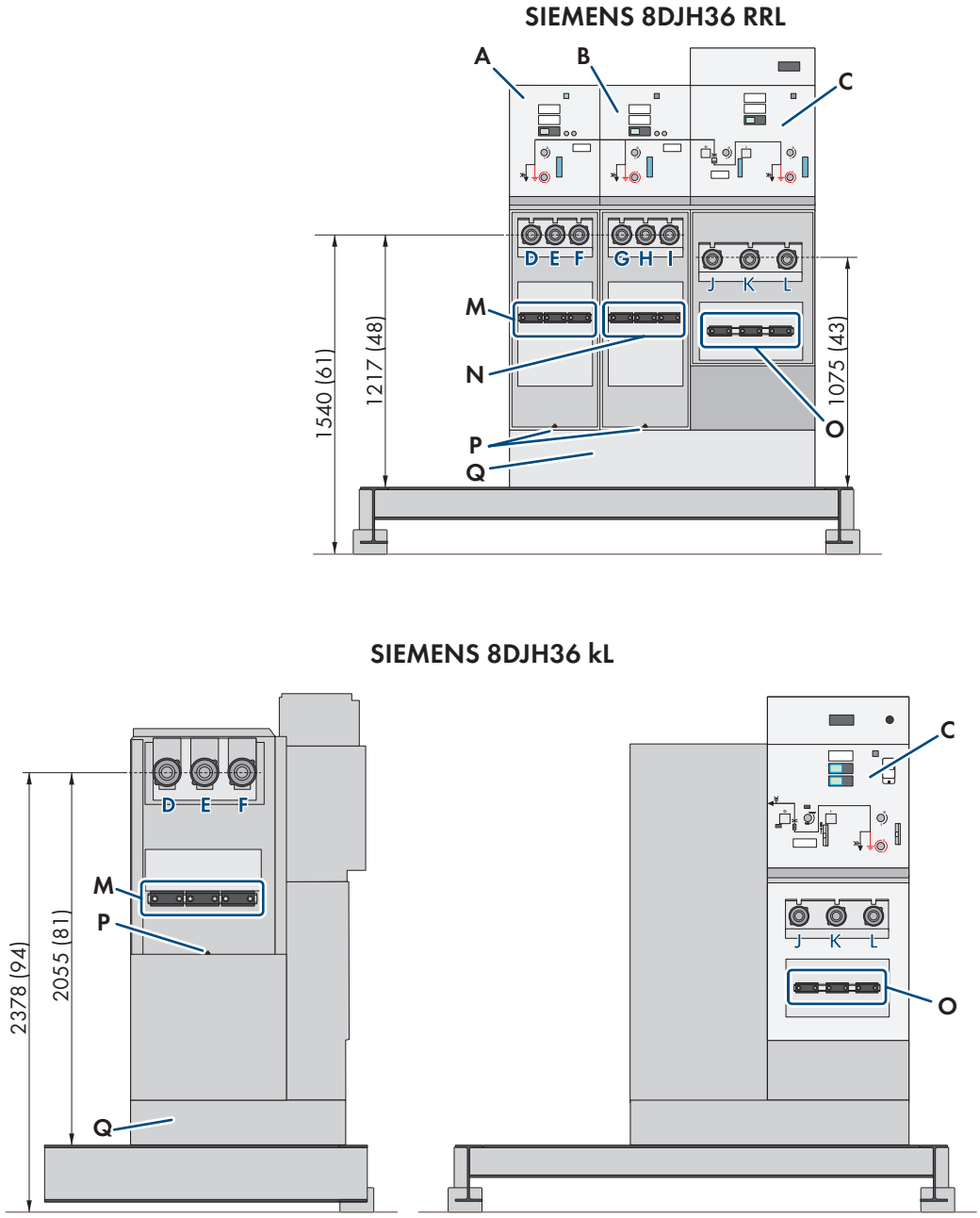


Figure 13: Connection area of medium-voltage switchgear (example) (Dimensions in mm (in))

Position	Designation
A	Cable compartment 1
B	Cable compartment 2
C	Transformer compartment
D	Line conductor L1 from cable compartment 1
E	Line conductor L2 from cable compartment 1
F	Line conductor L3 from cable compartment 1

Position	Designation
G	Line conductor L1 from cable compartment 2
H	Line conductor L2 from cable compartment 2
I	Line conductor L3 from cable compartment 2
J	Line conductor L1 from transformer compartment
K	Line conductor L2 from transformer compartment
L	Line conductor L3 from transformer compartment
M	Cable support rail cable compartment 1[15)]
N	Cable support rail cable compartment 2[15)]
O	Cable support rail from transformer compartment[16)]
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.

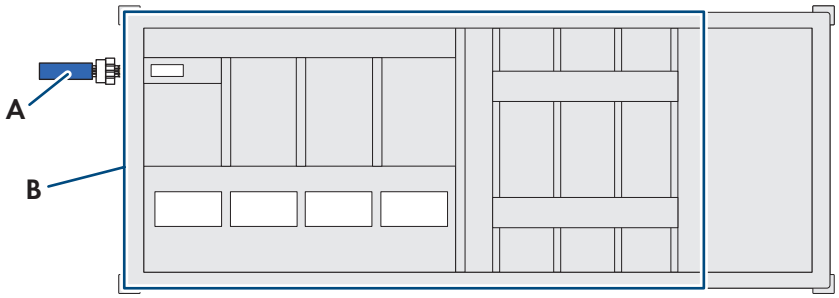


Figure 14: Position of the oil spill containment

Position	Designation
A	Oil filter[17)]
B	Integrated oil spill containment[17)]

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.

15) 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 upon request.

16) With the order option "1 MVSG for 2 MVT"

17) In case of order option "Oil Containment"

3.11 Circuitry Principle of the MV Power Station

Setup of 1 MV Power Station

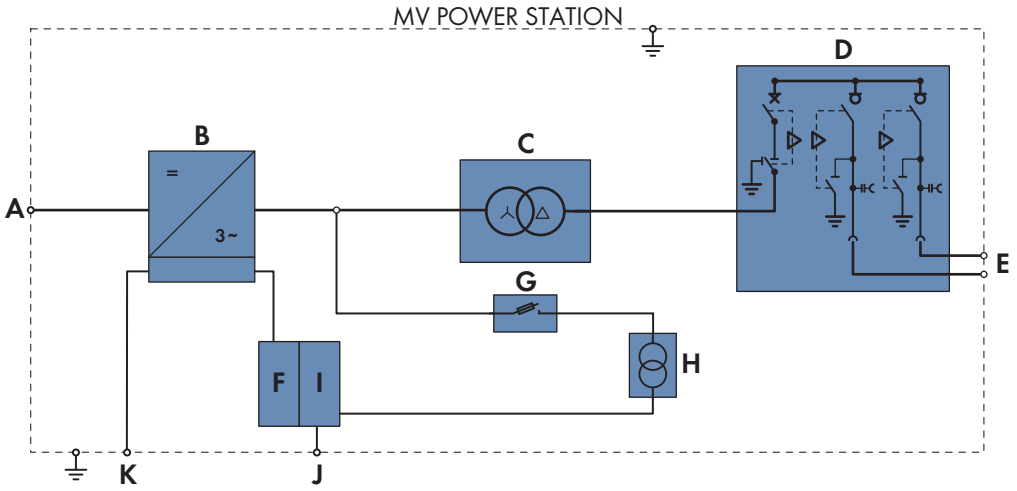


Figure 15: Circuitry principle of the MV Power Station (example)

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

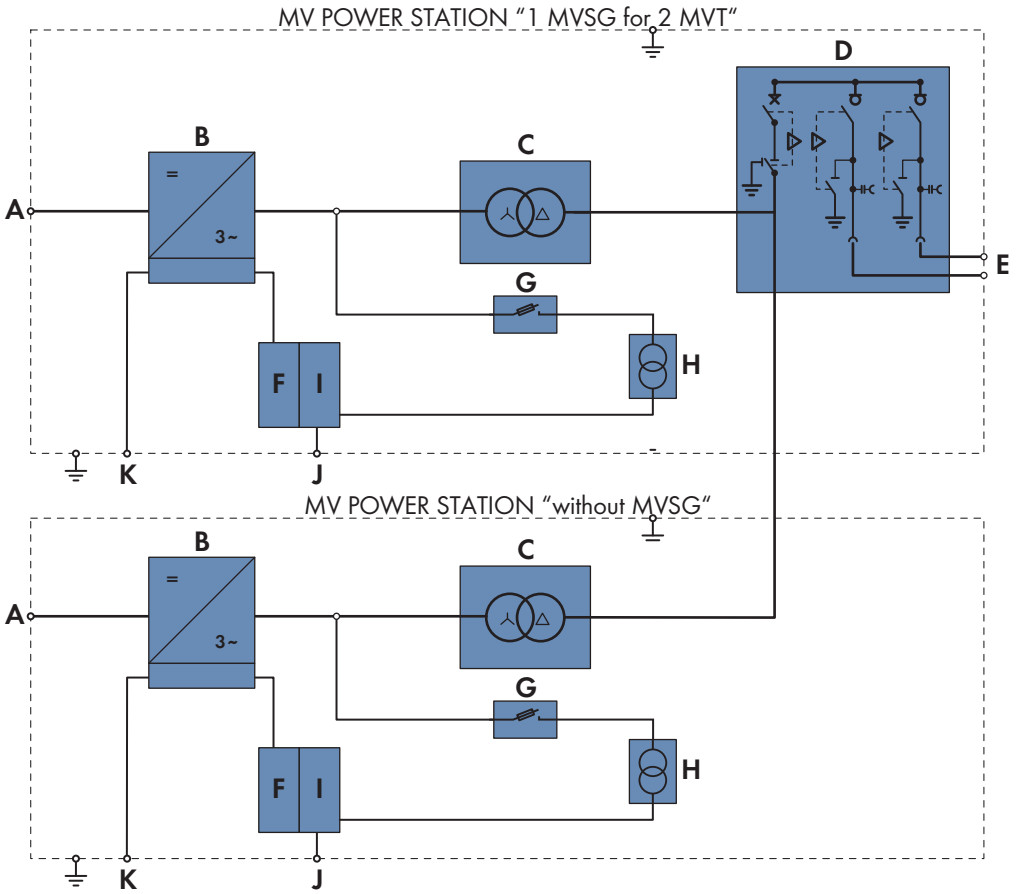


Figure 16: Circuitry principle of 2 MV Power Stations with 1 medium-voltage switchgear (example)

Position	Designation
A	DC Input

Position	Designation
B	Inverter
C	Medium-voltage transformer
D	Medium-voltage switchgear[18)]
E	AC output
F	Station subdistribution
G	Fuse holder with thermal fuse of the low-voltage transformer[18)]
H	Low-voltage transformer[18)]
I	Surge protection device, load-break switch and EMC filtering device of the low-voltage transformer and miniature circuit breakers for tracker motors[18)]
J	Connection of additional components (e.g. tracker motors)[18)]
K	Customer connection point[19)]

18) Optional

19) 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
- ☐ 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: Connector (depending on the cable cross-section M800PB-58 / M804PB-58) for connection to the transformer compartment of the medium-voltage switchgear of another MV Power Station
- ☐ For connection of customer's own AC cables: Connectors with 35 kV, 600 A (Inferface 13, see IEEE Standard 386)
- ☐ 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 arrival on 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.
- ☐ Wash down the station after sea freight with clear water within 3 days of arrival at the site or storage facility.
- ☐ Cleaning of all components after completion of assembly and installation work before commissioning
- ☐ Removal of the supporting struts in front of the inverter and medium-voltage cabinet
- ☐ Removal of the lower corner support in front of the medium-voltage cabinet

If you have any questions, please contact us (see Section 5, page 34).

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.

- The entire system must be enclosed by a fence.
- Access must be restricted by a door or gate in the fence and it must only be possible to open it with a key or other tool.
- The closed electrical operating area must be clearly marked with warning messages in accordance with country-specific requirements.
- 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

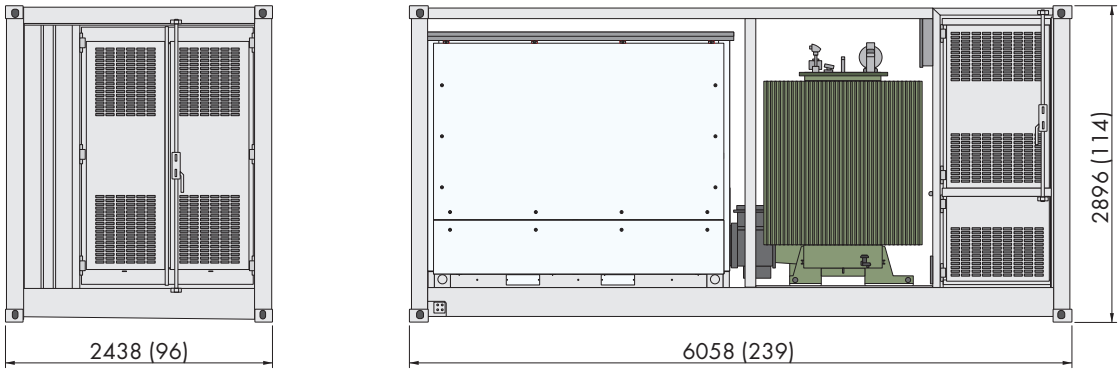


Figure 17: Dimensions of the MV Power Station(Dimensions in mm (in))

Width	Height	Depth	Weight
6058 mm (238.5 in)	2896 mm (114 in)	2438 mm (96 in)	< 18 t (39683 lb)

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 ground level. If an elevated installation is required, this must be approved in advance by SMA Technology AG. If the MV Power Station is elevated, a mobile platform must be provided for service operations. The platform must comply with OSHA.

Shorter minimum clearances for servicing

The minimum clearances for servicing around the station can be reduced to 2500 mm (98.4 in) 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.

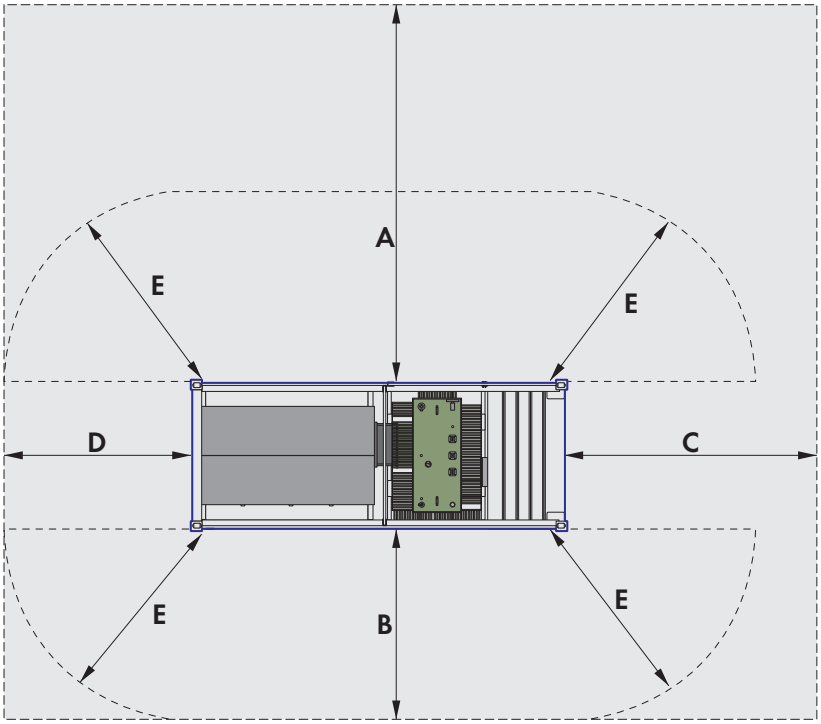


Figure 18: Minimum clearances

Position	Minimum clearance for servicing	Minimum clearance for trouble-free operation
A	6000 mm (236.2 in)	2500 mm (98.4 in)
B	3000 mm (118.1 in)	2500 mm (98.4 in)
C	4000 mm (157.5 in)	2500 mm (98.4 in)
D	3000 mm (118.1 in)	2500 mm (98.4 in)
Internal arc pressure safety areas to be observed during MV switchgear switching operations		
E	Minimum clearance for inflammable materials: 1000 mm (40 in) Minimum clearance for personnel: 3000 mm (119 in)[20)]	

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

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.

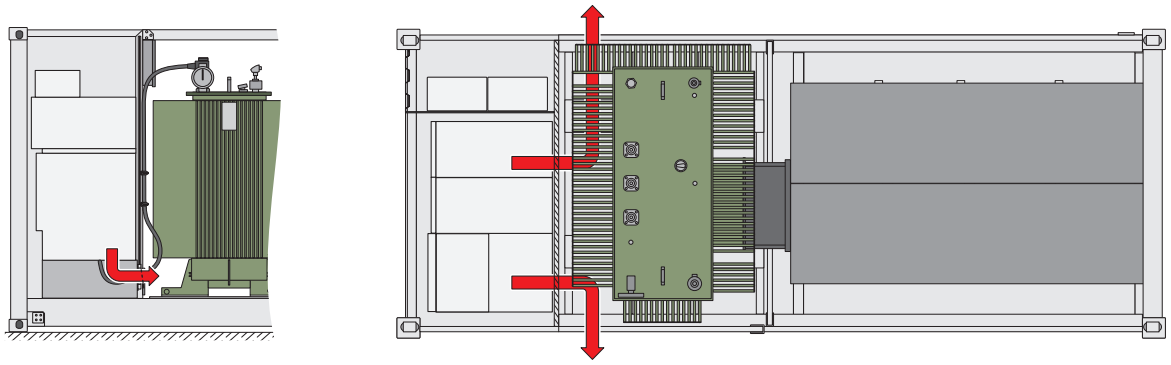


Figure 19: Internal arc pressure at the MV Power Station

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 m^3/h.
- ☐ The mounting location must be below the maximum installation altitude.
- ☐ The system must have a minimum clearance of 30 m (100 ft) 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.
- ☐ If the inverter is deployed at locations with ambient conditions rating C5 according to ISO 12944-2 / ISO 9223, it will be subject to a higher concentration of chemically active substances which can affect the surface of the inverter. Such changes to the surface do not have any effect on the functionality of the inverter.

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 PV power plant design, the maximum ampacity must be considered at high temperatures.

Ambient temperature of the MV Power Station	Nominal current at 1000 m (3280 ft)
30°C (86°F)	630 A
35°C (95°F)	600 A
40°C (104°F)	565 A
45°C (113°F)	530 A
50°C (122°F)	430 A
55°C (131°F)	0 A

At an ambient temperature above 55°C (131°F) operation is only permissible for a maximum of 3 hours per day.

For nominal currents at an installation height greater than 1000 m (3280 ft), 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.

The inverter is grounded via the station frame. The installer is responsible for the grounding of the station frame according to Section 250 of the *National Electrical Code®*, ANSI/NFPA 70.

The AC output circuits are isolated from the enclosure. The AC system must be grounded during installation if required by the Canadian Electrical Code, Part I.

The installer is responsible for the grounding of the PV modules according to Section 690.41 to 690.47 of the *National Electrical Code®* ANSI/NFPA 70.

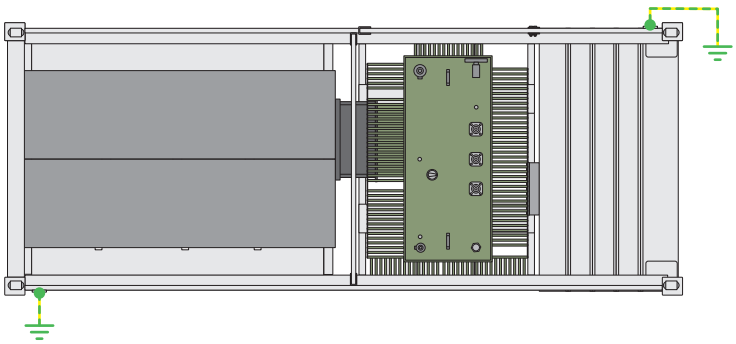


Figure 20: Grounding concept (example)

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 (194°F) 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 (194°F) 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 (0.89 in)
  - When connecting with 2 terminal lugs: 11.25 mm (0.44 in)
- ☐ 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 (350 kcmil)
  - For aluminum cable, at least: 300 mm² (600 kcmil)
- ☐ 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

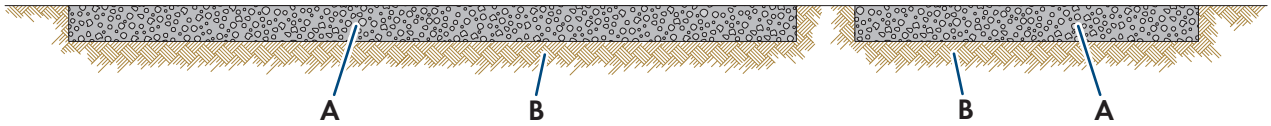


Figure 21: Structure of the support surface

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 (1.77 in) ±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.
- ☐ 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

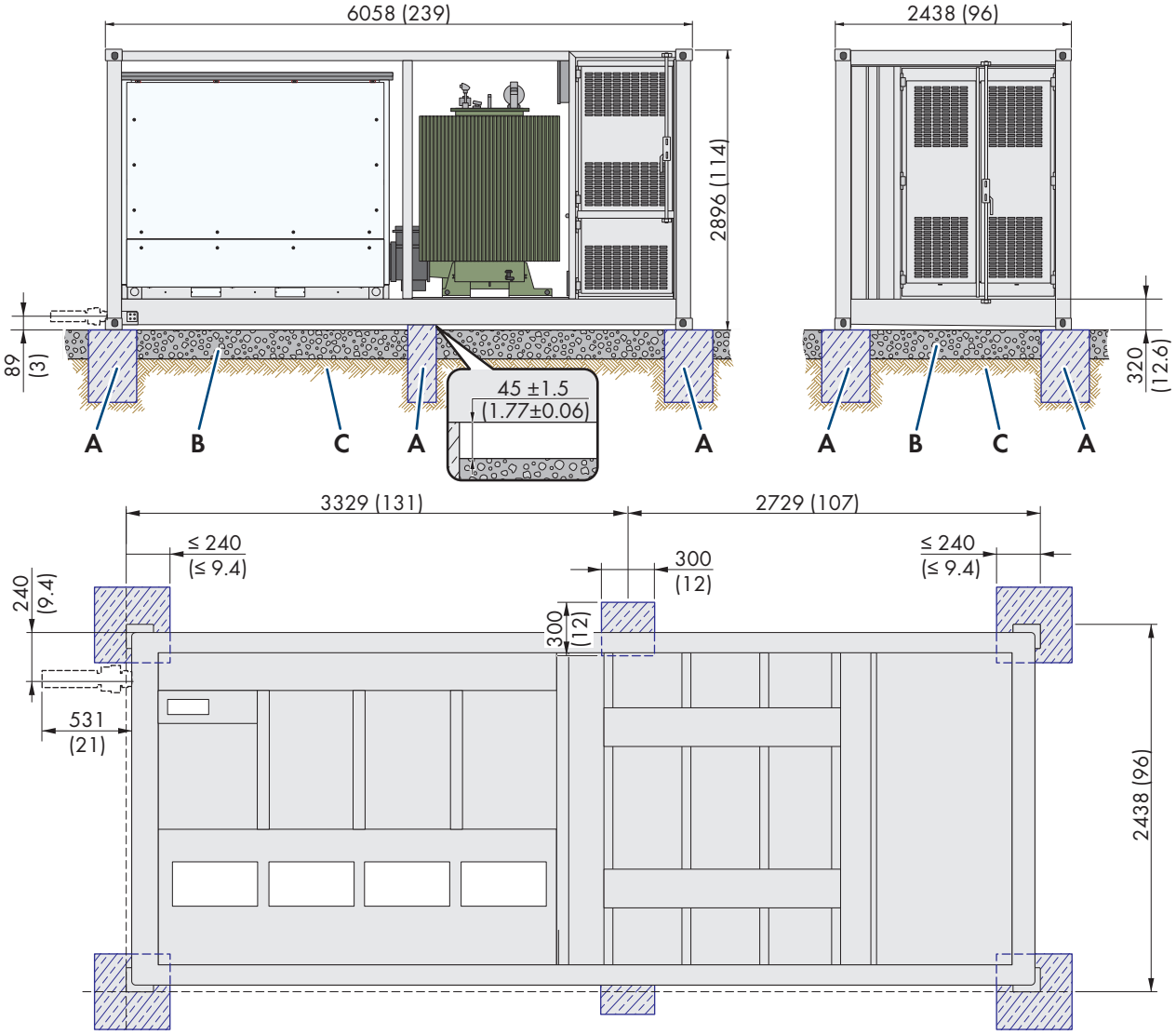


Figure 22: Mounting option with pile foundation (Dimensions in mm (in))

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

Mounting option with strip foundations

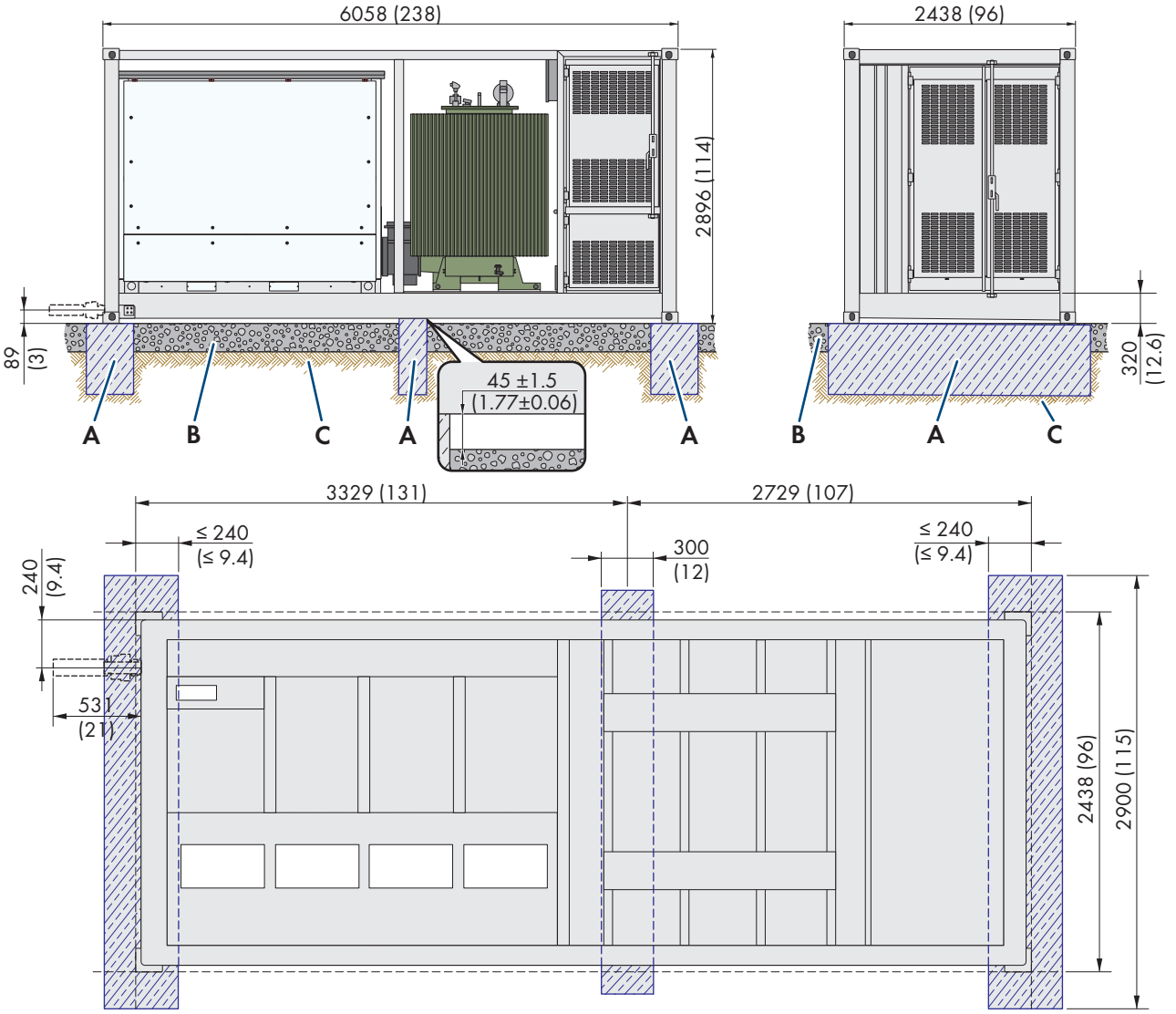


Figure 23: Mounting option with strip foundations (Dimensions in mm (in))

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.

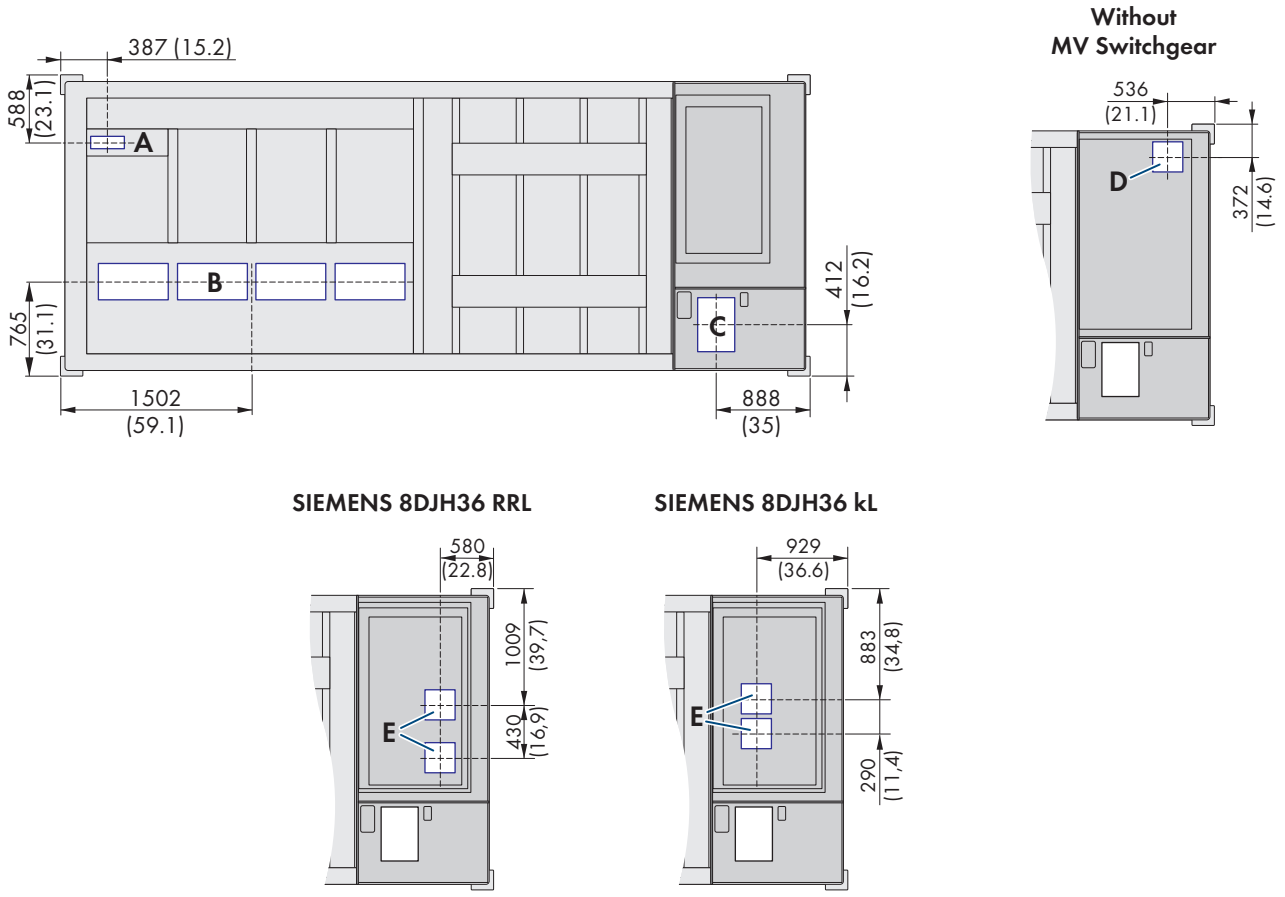


Figure 24: Position of the openings (Dimensions in mm (in))

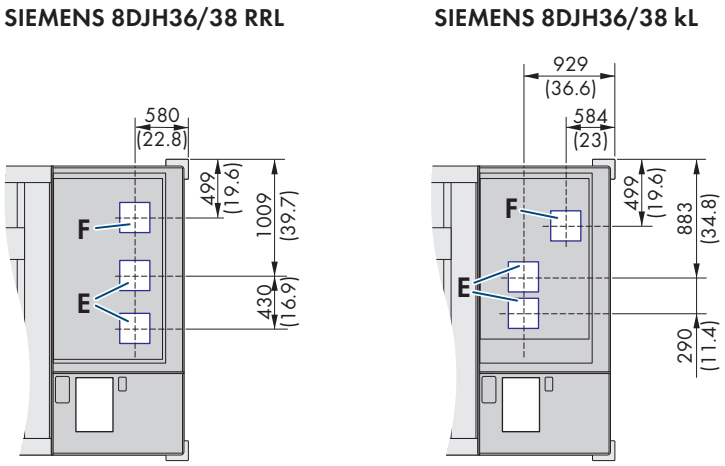


Figure 25: Positions of the openings for cable entry with order option "1 MVSG for 2 MVT" (Dimensions in mm (in))

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 (8.27 in x 3.74 in)
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.	Outside: 549 mm x 382 mm (21.61 in x 15.04 in) Inside: 575 mm x 382 mm (22.63 in x 15.04 in)
C	Opening for insertion of the communication and connection cables 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 two sliding panels.	300 mm x 430 mm (11.81 in x 16.93 in)
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 (10.03 in x 10.03 in)
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 (10.03 in x 10.03 in)
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 (10.03 in x 10.03 in)

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 (6.5 ft) 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 (-13°F).
- ☐ 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 (629.9 in) length, 2.7 m (106.3 in) width, 5 m (196.85 in) 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.

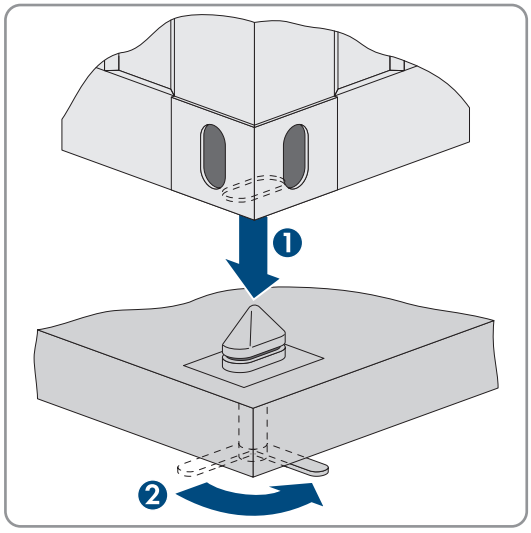
Transport and unloading may cause damage to the surface (hot-dip galvanizing of the station frame or painting of low and medium voltage cabinet). Damage to the surface does not impair the function, but must be repaired after 3 weeks at the latest Servicing Schedule for General Work.

The transport packaging was not assessed by UL.

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.

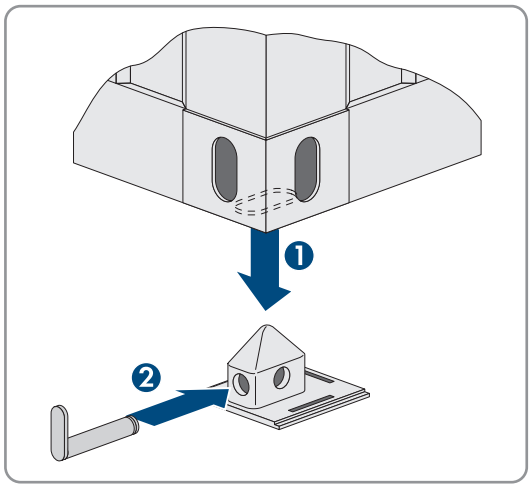
Twistlock

– 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 checklists 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.
- With the order option "Sea Freight", the film 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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