INSTALLATION AND OPERATION MANUAL

G4-G5 SOLAR MODULES

Valid for Africa, Asia, Europe, Latin America, South America
INTRODUCTION

With solar modules from Hanwha Q CELLS GmbH (hereafter referred to as "Q CELLS") you can directly transform the sun’s limitless energy into environmentally-friendly solar electricity.

In order to ensure the maximum performance of your Q CELLS solar modules, please read the following instructions carefully and observe all guidelines. Non-compliance may result in damage and/or physical injury.

This installation and operation manual (hereafter also referred to as the “Manual”) provides instructions for the safe installation and operation of crystalline solar modules.

Please read these instructions carefully before proceeding with your installation.

Please retain these instructions for the life of the solar modules.

Please ensure that this Manual is available to the operator at all times.

This Manual should be given to all subsequent owners or users of the solar modules.

All supplements received from the manufacturer should be included.

If your questions are not satisfactorily answered in the manual, please contact your system supplier.

Additional information can be found on our website at www.q-cells.com.

Intended Use

This manual is valid for Africa, Asia, Europe, Latin America, South America. These instructions contain the safe installation and operation of crystalline solar modules from Q CELLS and for their installation, mounting, wiring, maintenance and disposal.

Symbols and Labels

The following symbols and labels are used throughout the Manual for ease of use.

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>➔</td>
<td>Procedure with one or more steps.</td>
</tr>
<tr>
<td>•</td>
<td>Lists of items.</td>
</tr>
<tr>
<td>✔️</td>
<td>Ensure that when carrying out a procedure, you check the results of said procedure.</td>
</tr>
<tr>
<td>☑️</td>
<td>Prohibited.</td>
</tr>
</tbody>
</table>

Safety Regulations

In particular, the installer as well as the operator of a module is responsible for compliance with all applicable statutory requirements and regulations.

Unless otherwise specified by any laws or regulations, the following stipulations must be upheld at all times during the installation, operation, and maintenance of the solar modules:

- This manual.
- Other applicable stipulations (such as country-specific regulations for pressure equipment, operational safety, hazardous goods, and environmental protection).
- Regulations and requirements specific to the system.
- Any applicable laws and requirements, in particular international, country specific, regional laws and stipulations governing the planning, installation, and operation of solar power systems and work on roofs.
- Any valid international, national and regional regulations governing work with direct current, especially those applicable to the installation of electrical devices and systems, and regulations issued by the respective energy provider governing the parallel operation of solar power systems.
- Any international, country specific and regional accident-prevention regulations.
- Other applicable stipulations provided by the relevant national institutions regarding safety in the installation and operation of electrical items. For example, in Germany the Bau-Berufsgenossenschaft (German institution for statutory accident insurance and prevention in the building trade).

Qualified & Skilled Personnel

Both, the installer and operator are responsible for ensuring that installation (including connection to the grid), maintenance and dismantling are carried out by trained and qualified specialists with approved training certificates (issued by a state or federal organization) for the respective specialist trade.

Electrical work may only be performed by an officially certified tradesperson in accordance with the stipulations applicable in the relevant country with regard to norms and regulations (in Germany e.g. DIN norms, VDE regulations) and the stipulations of the local grid operator and/or energy provider.
Validity
These instructions are only valid for crystalline solar modules from the company Q CELLS. Q CELLS assumes no liability for damage resulting from failure to observe these instructions.
- Please observe the wiring and dimensioning of the system.
- The installer of the system is responsible for compliance with all necessary safety regulations during set-up and installation.
Q CELLS assumes no liability on the basis of these instructions. Q CELLS is only liable in the context of accepted guarantees. Q CELLS accepts no other responsibility for the functionality and safety of the modules.
- Please observe the instructions for any other system components that may be part of the complete solar power system. It may be necessary to carry out a structural analysis for the entire project.

Additional information for the Operator
- Please keep this manual for the entire life of the solar power system.
- Please contact your system supplier for information concerning the formal requirements for solar power systems.
- Please be sure to contact the relevant local authorities and energy providers regarding regulations and permit requirements prior to installation of the solar power system. Your financial success depends on the fulfillment of these requirements.

Other applicable documents
In addition to this Manual following technical information are relevant:

**DOCUMENT TYPE**

- Product data sheet
- Packaging and transport information

For additional information see the relevant datasheet of the module provided at www.q-cells.com.

### Technical specifications

<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Type</td>
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<td>Q.ANTUM</td>
<td>Q.ANTUM</td>
<td>Q.ANTUM</td>
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<tr>
<td>Area [m²]</td>
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<td>1.67</td>
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<td>Frame height [mm]</td>
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<td>Weight [kg]</td>
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<td>Max. system voltage $V_{sys}$ [V]</td>
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<td>1500</td>
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<td>Max. reverse current [A]</td>
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<td>20</td>
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<td>20</td>
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<td>Permissible temperature range</td>
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<td>-40 °C to +85 °C (-40 °F to +185 °F)</td>
<td>-40 °C to +85 °C (-40 °F to +185 °F)</td>
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<td>Junction box protection class</td>
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<td>IP67 with bypass diode</td>
<td>IP67 with bypass diode</td>
<td>IP67 with bypass diode</td>
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<td>Connector protection class</td>
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<td>IP67 or IP68</td>
<td>IP67 or IP68</td>
<td>IP67 or IP68</td>
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<tr>
<td>Fire protection class</td>
<td>C</td>
<td>C</td>
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<td>C</td>
</tr>
<tr>
<td>Max. test load push/pull [Pa]</td>
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<td>5,400/4,000</td>
<td>5,400/4,000</td>
<td>5,400/4,000</td>
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<tr>
<td>Max. design load push/pull [Pa]</td>
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<td>3,600/2,667</td>
<td>3,600/2,667</td>
<td>3,600/2,667</td>
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<td>Certificates</td>
<td>VDE Quality Tested; CE-compliant; IEC 61215:2016; IEC 61730:2016; Application Class A</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Test and design load in accordance with IEC 61215:2016, depending on mounting options (see section „2.3 Mounting options“)
**Installation Site**

Please note the following guidelines that apply to the installation site:

- The modules have been tested according to IEC 61215.
- Solar modules are not explosion-proof and are not suitable for use in explosive environments.
- Do not operate solar modules near highly flammable gas and vapors (e.g. gas tanks, gas stations).
- Do not install modules in encased space.
- Do not install modules in locations where they may be submerged in water (e.g. floodplains).
- Do not use modules as a substitute for the normal roofing (e.g. modules are not watertight).
- Do not install modules in close proximity to air conditioning systems.
- Do not install modules above 4000 m (13120 ft) altitude above sea level.
- In locations with increased salt content in the air (e.g. close to the sea) special precautions must be taken (see "Grounding" and "Maintenance").
- Do not bring any chemical substance (e.g. oil, solvent etc.) into contact with any part of the panel. Only substances, which are released by Q CELLS, are allowed to be used during installation, operation and maintenance.
- Any installation of modules on surfaces of water is prohibited. This includes installations on floating as well as pile-based platforms. Q CELLS may extend the coverage of its warranty to such installations, based on a case by case assessment of the system design and location. A prior written consent by the warrantor is required in any case.
- The solar modules are designed for the following applications:
  - Operating temperatures from -40 °C to +85 °C (-40 °F to +185 °F).
  - Pull loads up to max. 4000 Pa and push loads up to max. 5400 Pa (see chapter 2.3 mounting options).
  - Installation using a mounting frame for solar modules.
  - In locations with increased salt content in the air (e.g. close to the sea) special precautions must be taken (See "Grounding" Seite 18 and "Maintenance" Seite 19).
- Installation Site:
  - Please note the following guidelines that apply to the installation site:
  - Mounting Structure Requirements
  - Ensure that no mechanical stresses (e.g., caused by vibrations, twisting, or expansion) applied to the module.
  - Do not operate solar modules near highly flammable gas and vapors (e.g. gas tanks, gas stations).
  - Properly fastened to the ground, the roof, or the façade.
  - Forces acting on the module are relayed to the mounting substructure.
  - Ensures sufficient rear ventilation of the module.
  - Guarantees long-term stability.
  - Avoid using different metals to prevent contact corrosion.
  - Allows for stress-free expansion and contraction due to temperature fluctuations.
  - Ensure that no mechanical stresses (e.g., caused by vibrations, twisting, or expansion) applied to the module.
  - Do not install modules in enclosed space.
  - To avoid shadowing (due to objects such as buildings, chimneys or trees).
  - Avoid partial shading (for example through overhead lines, dirt, snow).
  - The modules have been tested according to IEC 61215.
  - Maximum angle of inclination: 75°
  - Minimum angle of inclination: 3°
  - For this reason, install the modules so that they face the sun.

**Prevention of Shadowing Effects**

Optimal solar irradiation leads to maximum energy output:

- For this reason, install the modules so that they face the sun.
- Avoid shading (due to objects such as buildings, chimneys or trees).
- Avoid partial shading (for example through overhead lines, dirt, snow).

**Mounting Structure Requirements**

The modules shall be installed and operated on mounting frames that comply with any applicable laws and stipulations as well as with the following:

- Conform to the necessary structural requirements.
- Compliant with local snow and wind loads.
- Properly fastened to the ground, the roof, or the façade.
- Do not install modules in close proximity to air conditioning systems.
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**Module Orientation Requirements**

- Vertical or horizontal installation is permitted.
- Ensure that rain and melting snow can run off freely.
- No water accumulation.
- Ensure that the drainage holes in the frame are not covered. No sealing.

**Clamp System Requirements**

Use customary clamps that satisfy the following requirements:

- Clamp width: ≥ 40 mm.
- Clamp height compliant with a 32 mm frame height.
- Clamp depth: 7-12 mm. (applicable for all CL clamping options)
- Clamps that satisfy the structural requirements of the installation site.
- Long-term stable clamps that securely affix the module to the mounting frame.
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![Maintain the permissible angle of inclination](image)

- Minimum angle of inclination: 3°
- Maximum angle of inclination: 75°
- Follow the directions for installation angles < 5° ("Grounding", p. 18)
2 PLANNING 2.3 Mounting options

Specifications

<table>
<thead>
<tr>
<th>MODULE TYPE</th>
<th>MOUNTING OPTION</th>
<th>POSITION OF CLAMPS* (MM)</th>
<th>TEST LOAD PUSH/PULL** (PA)</th>
<th>DESIGN LOAD PUSH/PULL** (PA)</th>
<th>SAFETY FACTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q.PLUS-G4.X</td>
<td>CL1 / CL3</td>
<td>250 - 450</td>
<td>5400/4000</td>
<td>3600/2670</td>
<td></td>
</tr>
<tr>
<td>Q.PLUS BFR-G4.X</td>
<td>FB1 / FB2</td>
<td>345</td>
<td>1600/1600</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Q.PEAK-G4.X</td>
<td>CL1</td>
<td>0 - 250 450 - 550</td>
<td>2400/2400</td>
<td>1600/1600</td>
<td></td>
</tr>
<tr>
<td>Q.PEAK BLK-G4.X</td>
<td>CL2a (with rails) / CL2b (without rails)</td>
<td>0 - 250</td>
<td>4000/4000</td>
<td>2670/2670</td>
<td></td>
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<tr>
<td>Q.PEAK-G5.X</td>
<td>CL4</td>
<td>0 - 300</td>
<td></td>
<td></td>
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<tr>
<td>Q.PLUS-G4.X</td>
<td>CL5</td>
<td>short side: 0 - 250 long side: 300 - 400</td>
<td>4000/4000</td>
<td>2670/2670</td>
<td></td>
</tr>
</tbody>
</table>

The below mounting options are only possible under certain conditions.

ATTENTION

- Ensure that the subconstruction does not touch the junction box (even under load).
- Ensure that the clamps or insertion profiles do not touch the glass (even under load).
- Ensure that the connection cables of the junction box do not run between laminate and mounting rails.
- Ensure, minimum support depth of 1.5 mm on the back side of the module for IP1, IP2, CL2b, CL3, CL4 and CL5.
- Ensure minimum support depth of 10 mm on the front side of the module for IP1 and IP2.
- CL1 and CL2a with rails: Ensure that module frame is fixed directly on the rail of the substructure (no spacer allowed between the module and substructure).
- Module bend under loads. Therefore, sharp objects (e.g. screws) must not be mounted near the module backside.
- Use M8 corrosion-proof screws and washers (diameter ≥ 15.8 mm or ≥ 0.62 in) for FB1 and FB2 mounting.

Parallel Connection

Modules may be damaged by the occurrence of reverse currents (caused by module defects, ground leaks, or defective insulation).

- Only connect modules of the same type and the same power class.
- Ensure that the maximum reverse current load capacity indicated in the data sheet is met.

Safety Factor

During normal operation, a module may generate a greater current and/or higher voltage than that determined under standardized test conditions. Please use a safety factor of 1.25 for the following:

- Calculating the voltage measurement values \( V_{oc} \) of components
- Calculating the current measurement values \( I_{sc} \) of conductors
- Sizing of control systems connected to the outlets of the solar modules

Please follow the valid national guidelines for the installation of electrical systems.

Series Connection

Connection of modules in series is only permitted up to the maximum system voltage as listed in the applicable data sheet of all the relevant modules to be installed.

- Take into account all possible operating situations and all relevant technical norms and regulations when designing the system. It has to be ensured that the maximum system voltage, including all necessary safety margins, is not exceeded.
- Take the voltage limit of the inverter into account when determining the maximum number of modules in the string.

Module Selection

For detailed key electrical data, please refer to the actual data sheet referring to the relevant Module (available at www.q-cells.com).

Inverters

- Inverters with or without transformers may be used.

ATTENTION

- The loads in the table are related to the mechanical stability of the solar modules. The mechanical stability of the mounting system including clamps has to be evaluated by the system supplier. The system installer is responsible for the determination of location-specific load requirements.

- Ensure, minimum support depth of 10 mm on the front side of the module for IP1 and IP2.

NOTE!

When installing different product versions, the lowest minimum permitted reverse current load capacity applies.
### Installation and Safety

- **Warning!** Fire Risk!
  - Ensure that all personnel are aware of and adhere to accident-prevention and safety regulations.
  - While working, wear clean gloves.

- **Warning!** Risk of fatal injury due to electric shock!
  - Do not install damaged modules.
  - Inform your distributor of any damages immediately.

- **DANGER!** Risk of fatal injury due to electric shock!
  - Cover the modules with an opaque material during installation.

- **DANGER!** Risk of fatal injury due to electric shock!
  - Do not drop modules.

- **DANGER!** Risk of fatal injury due to electric shock!
  - Do not install modules near flammable gas / vapors.
  - Do not install modules in close proximity to air conditioning systems.

- **Note!** Module damage may occur!
  - Never lift or move the module with the connection cables or junction box.
  - Carry modules upright and horizontally as shown.

- **Note!** Module damage may occur!
  - Never step on modules.
  - Do not subject modules to any mechanical stress.
  - Do not allow any objects to fall onto modules.

- **Note!** Module damage may occur!
  - Do not stack modules.

- **Note!** Module damage may occur!
  - Only make modifications to the module which have been confirmed in writing by Q CELLS.

- **Note!** Module damage may occur!
  - Do not install modules in close proximity to air conditioning systems.

- **Note!** Module damage may occur!
  - Do not install damaged modules.

- **Note!** Module damage may occur!
  - Inform your distributor of any damages immediately.

- **Note!** Module damage may occur!
  - Do not install modules indoors.
  - Do not install modules on moving objects.

- **Note!** Module damage may occur!
  - Leave modules in their original packaging until installation.
  - Store the modules securely in cool and dry rooms. The packaging is not weatherproof.

- **Note!** Module damage may occur!
  - Inspect the packaging for damages.
  - Contact the transport company regarding any damage to the packaging.
  - Follow any instructions on the packaging.

- **Note!** Module damage may occur!
  - Carry modules upright and horizontally as shown.

- **Note!** Module damage may occur!
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- **Note!** Module damage may occur!
  - Do not install modules near flammable gas / vapors.
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3 INSTALLATION

3.2 Preparation of installation

**DANGER! Risk of fatal injury due to electric shock!**
- Block off the installation zone.
- Keep children and unauthorized individuals away from the solar power system.

**WARNING! Risk of injury due to falling modules!**
- Secure modules during installation.
- Do not install modules in windy or wet weather.

**DANGER! Risk of fatal injury due to electric shock!**
- Only use dry, insulated tools.

**DANGER! Risk of fatal injury due to electric shock!**
- Ensure that modules and tools are not subject to moisture or rain at any time during installation.

**WARNING! Risk of injury due to falling modules!**
- Do not carry out the installation alone.

**DANGER! Risk of fatal injury due to electric shock!**
- Only install undamaged modules and components.
- Do not modify the module (e.g., do not drill any additional holes).

**INFORMATION! Module damage may occur!**
- Do not subject modules to mechanical tension. Max. torsion 10 mm/m.

### Option 1:
- Fasten the module with 4 clamps in the specified clamping range, see Fig. 2, p. 7.
- Tighten clamps according to manufacturer’s instructions.

### Option 2:
- Install the module at the 4 mounting points, see Fig. 2, p. 7.
- Tighten clamps according to manufacturer’s instructions.

### Option 3:
- Install the module using mounting profiles, see Fig. 2, p. 7.

### Maintenance:
- Maintain an interval of at least 10 mm between two modules.
DANGER! Risk of fatal injury due to electric shock!

When disconnecting an electric circuit carrying direct current, electric arcs can occur that may result in life-threatening injuries.

- Do NOT unplug the cable when under load.
- Do NOT connect any exposed cable ends.
- Do NOT touch the poles at the same time.

A solar module generates electrical current and voltage even at a low intensity of illumination. Sparks and electric arcs may result from the separation of a closed circuit. These can result in life-threatening injuries. The danger increases when several modules are connected in series.

- Please be aware that the entire open circuit voltage is active even at low levels of solar irradiation.
- Please follow the valid national regulations and safety guidelines for the installation of electrical devices and systems.
- Please make sure to take all necessary safety precautions. With module or phase voltages of more than 120 V, the extra-low voltage range is exceeded.
- Carry out work on the inverter and the wiring with extreme caution.
- Ensure that the modules are disconnected at the inverter prior to separation.
- Be sure to observe the specified time intervals after switching off the inverter. High-voltage components need time to discharge.

DANGER! Risk of fatal injury due to electric shock!

- Never open the junction box.
- Change of bypass diodes is only allowed by qualified and trained personnel in disconnected and covered state.

4.1 Safety

4.2 Electrical installation safety

DANGER! Risk of fatal injury due to electric shock!

- Never unplug the cable when under load.

1. Switch off the inverter.

2. Cover the modules to be disconnected.

3. Switch off the DC circuit breaker.

DANGER! Risk of fatal injury due to electric shock!

- Insulate any exposed cable ends.
- Only connect cables with plugs.

DANGER! Risk of fatal injury due to electric shock!

- Only use dry, insulated tools for electrical work.

DANGER! Risk of fatal injury due to electric shock!

- Ensure correct polarity.

- Disconnect plugs by the use of appropriate and qualified tools of the manufacturer Tyco, Amphenol or Multicontact.
1. Use solar cables for the connection at the junction box outlet.
2. Ensure that all electrical components are in a proper, dry, and safe condition.
3. Do not connect modules with different orientations or angles of inclination in the same string.
4. Integrate the system into the existing lightning protection system in accordance with the applicable local regulations.

**NOTE! Module damage may occur!**
- Ensure that the cabling is not under stress.
- Ensure that the cables do not run between module and subconstruction (danger of pinch).
- Ensure that the plug connections are secured away from any water-channelling surface.
- Do not use light concentrators (e.g. mirrors or lenses).

**DANGER! Risk of fatal injury due to electric shock!**
- Ensure that all necessary safety and functional tests have been carried out according to current industry standards.

**WARNING! Fire Risk!**
- Ensure that the cabling is not exposed and/or hanging and is protected from dirt and moisture.

Ensure for a tight connection between the plugs. Plugs click together audibly.

Standard wiring with a return cable.
5 GROUNDING

Protective Grounding
- The modules must be grounded in accordance with the local statutory regulations.

Functional grounding
- For installations located in tropic regions (between 23.5° N and 23.5° S) with a module tilt of < 5°, functional grounding at the negative generator connection on the DC side must be implemented.
- Ensure that the difference of potential between the negative generator connection and the PE(N) of every MPP tracker of the respective inverters is 0 V.
- Follow the directions of the inverter manufacturer and local statutory regulations.
- Only use inverters which include licenced grounding kits.
- Functional grounding has also to be implemented in installation sites with increased salt content in the air (e.g., close to the sea).

6 FAULTS AND DEFECTS

DANGER!
Risk of fatal injury due to electric shock!
- Do not attempt to fix any problems yourself (e.g., glass cracks, damaged cables).
- Please contact an installer or Q CELLS Technical Customer Service Department.

7 DISPOSAL

- Do not disconnect modules by yourself.
- Please contact an installer or Q CELLS Technical Customer Service Department.
- Dispose of modules in accordance with the local disposal regulations.

8 MAINTENANCE AND CLEANING

Q CELLS solar modules are known for a long operating life and minimal maintenance effort and expense. Dirt and grime are usually washed away by rain. If the module is fully or partially shaded by dirt or debris (e.g., plants, bird droppings), it needs to be cleaned to prevent a loss of performance.

Maintenance
- The PV system has to be inspected regularly by certified personnel.
- The time intervals and extent of the inspection can depend on local circumstances (e.g., salt, ammonia content in the air, high humidity etc.). The customer/operator must inform himself about time intervals and extend of necessary inspections.
- Inspections have to be performed especially after extraordinary events (e.g., storm, hail, high snow loads etc.).
- During the inspections it has to be checked that the components are secure, undamaged and clean.

Cleaning

WARNING!
Risk of injury due to hot and live modules!
- Only clean modules that have cooled down.
- Do not carry or wear any electrically conductive parts.

WARNING!
Risk of falling due to unsecured access!
- Never access the installation area alone or without taking adequate security precautions.
- Please commission a trade specialist.

Clean the modules as follows:

NOTE!
Module surface damage may occur!
- Remove snow and ice carefully without force (e.g., with a very soft broom).
- Do not scratch off dirt.
- Rinse dirt (dust, leaves, etc.) off with lukewarm water or use an alcohol based glass cleaner. Do not use abrasive detergents or tensides.
- Use a soft cellulose cloth (kitchen roll) or sponge to carefully wipe off stubborn dirt. Do not use micro fleece wool or cotton cloths.
- Isopropyl alcohol (IPA) can be used selectively to remove stubborn dirt and stains within one hour after emergence.
- Please follow the safety guidelines provided by the IPA manufacturer.
- Do not let IPA run down between the module and the frame or into the module edges.