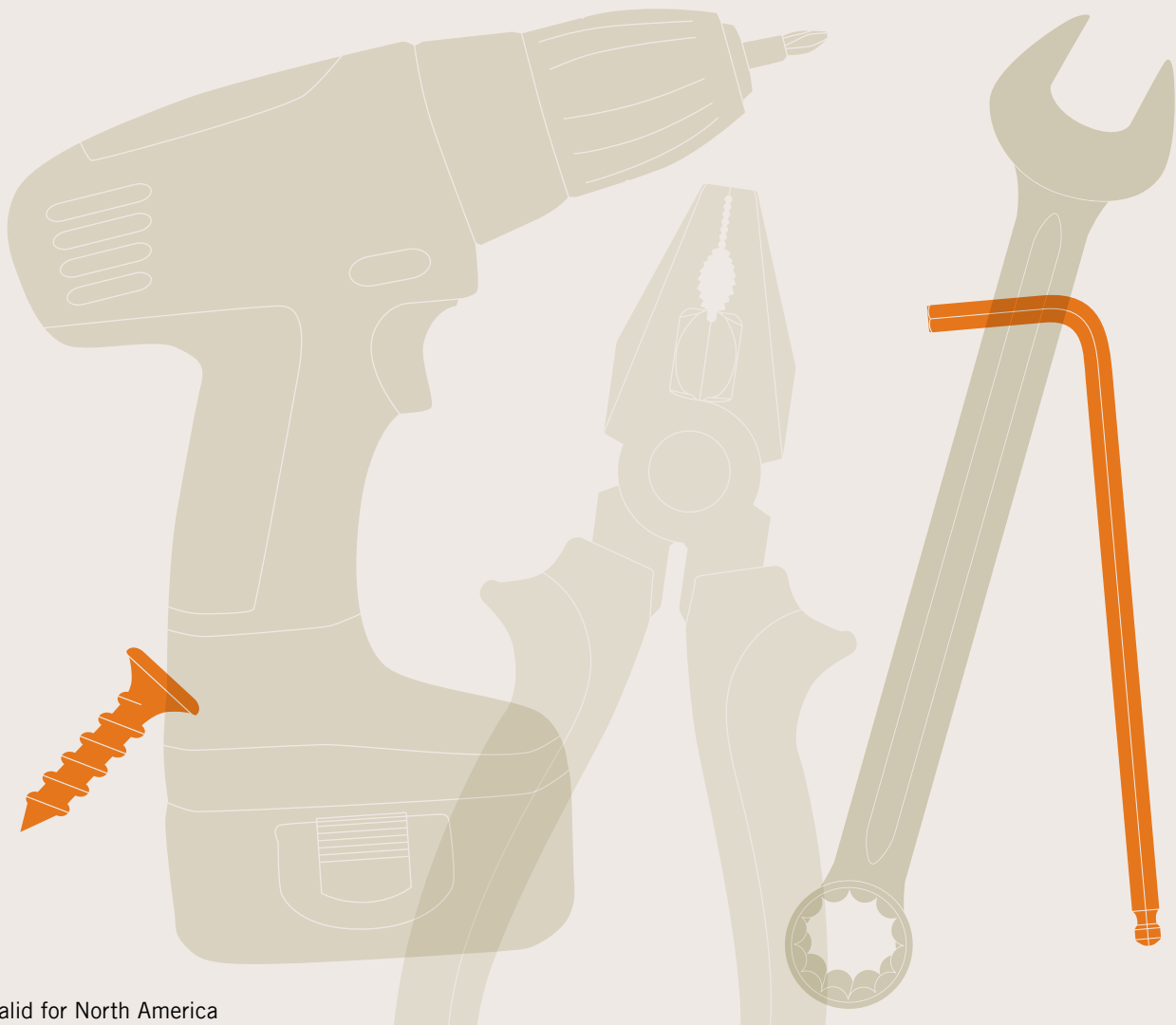


INSTALLATION AND OPERATION MANUAL

Q.PRO-G4 · Q.PRO BFR-G4.1 · Q.PRO BLK-G4 · Q.PLUS BFR-G4.1



Valid for North America

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Document Revision 04
 This Installation Manual is valid for North America as of February 1st 2016 for Q.PRO-G4, Q.PRO BFR-G4.1 and Q.PRO BLK-G4, Q.PLUS BFR-G4.1 solar modules, and replaces all earlier versions.

Technical parameters and the design are subject to change. The data sheets and customer information valid at the point in time when the relevant module was manufactured apply to the installation, mounting, and maintenance procedures for the respective solar modules.

With solar modules from Hanwha Q CELLS (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 completely and carefully and observe all guidelines. Non-compliance may result in damage and/or physical injury.

This installation manual provides instructions for the safe installation 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 installation manual is available to the operator at all times.
- ➔ This installation manual should be given to all subsequent owners or users of the solar modules.
- ➔ All supplements received from the manufacturer should be included.
- ➔ Please observe all other applicable documents.
- ➔ 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 in North America for Q CELLS solar modules. These instructions contain information regarding the safe handling and use of quality crystalline solar modules from Q CELLS and for their installation, mounting, wiring, and maintenance.

Symbols and Labels

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

SYMBOL	DESCRIPTION
➔	Procedure with one or more steps.
•	Lists of items
✓	Ensure that when carrying out a procedure, you check the results of said procedure.
⊘	Prohibited.
	Beware of possible danger or damage. Categories: <ul style="list-style-type: none"> • Danger: Risk of fatal injury • Attention: Risk of serious injury or damage to property • Note: Risk of damage to product

Units

Where both metric and U.S. units (for example inches) are shown, metric units are definitive. References to "Data Sheet" or "Module Data Sheet" refer to the Module Data Sheet applicable to the module being used.

Safety Regulations

The installer and solar module operator are responsible for compliance with all applicable statutory requirements and regulations.

➔ The following regulations and standards must be upheld at all times during the installation, operation, and maintenance of the solar modules:

- Installation and Operation Manual.
- Other applicable documents (such as country-specific regulations for pressure equipment, operational safety, hazardous goods, and environmental protection).
- Regulations and requirements specific to the system.
- Applicable country-specific laws, regulations, and provisions governing the planning, installation, and operation of solar power systems and work on roofs.
- 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.
- Accident-prevention regulations.

Certified Personnel

Both, the operator and installer are responsible for ensuring that installation, maintenance, connection to the grid, and dismantling are carried out by trained and qualified electricians and engineers 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 applicable safety standards, accident prevention regulations, and the regulations of the local energy provider.

Validity

These instructions are only valid for crystalline solar modules from 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 contractual agreements or 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.
 - ➔ 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.

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

This installation manual is only valid in combination with the following technical information.

DOCUMENT TYPE
Product data sheet
Packaging and transport information

MISUSE OR INCORRECT USE OF SOLAR MODULES VOIDS THE LIMITED WARRANTY AND MAY CREATE A SAFETY HAZARD AND RISK PROPERTY DAMAGE. THIS INCLUDES IMPROPER INSTALLATION OR CONFIGURATION, IMPROPER MAINTENANCE, UNINTENDED USE, AND UNAUTHORIZED MODIFICATION.

For the electrical data and additional information of the solar modules please refer to the respective currently valid data sheets available at www.q-cells.com.

PRODUCT LINE	Q.PRO-G4 / Q.PRO BFR-G4 / Q.PRO BLK-G4 / Q.PRO BFR-G4.1	Q.PLUS BFR-G4.1
Cell type	Polycrystalline	Q.ANTUM
Length [in (mm)]	65.7 (1670)	65.7 (1670)
Width [in (mm)]	39.4 (1000)	39.4 (1000)
Height [in (mm)]	1.26 (32)	1.26 (32)
Area [yd ² (m ²)]	2 (1.67)	2 (1.67)
Weight [lbs (kg)]	41.45 (18.8)	41.45 (18.8)
Max. system voltage V _{sys} [V]	1000	1000
Max. series fuse rating [A]	20	20
Permissible operating temperature range [°F (°C)]	-40 to +185 (-40 to +85)	
Junction box protection class	IP67 with bypass diode	
Connector protection class	IP68	IP68
Fire protection class	C, Type 1	C, Type 1
Snow load [Pa] ¹	5,400	5,400
Wind load [Pa] ¹	4,000	4,000
Certificates	UL 1703; VDE Quality Tested; CE-compliant; IEC 61215 (Ed.2) ² see page 9 et sqq.; IEC 61730 (Ed.1) Application Class A	

¹ Test-load in accordance with IEC 61215

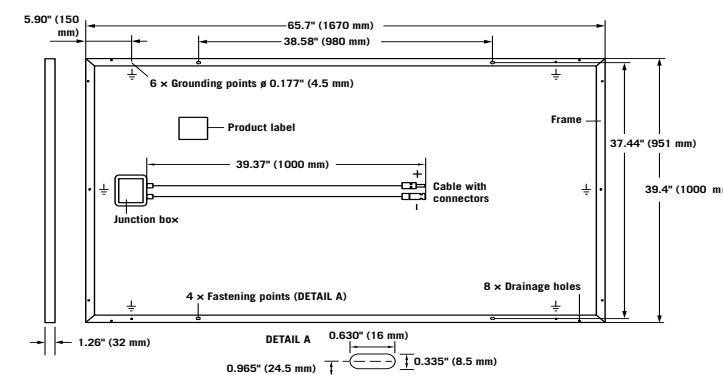


Fig. 1: External dimensions (in inch (mm)) and components for Q.PRO-G4, Q.PRO BFR-G4, Q.PRO BLK-G4, Q.PRO BFR-G4.1, Q.PLUS BFR-G4.1

Installation Site

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

- The modules have been tested according to UL 1703 and IEC 61215 for operation in a temperate climate.
- 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 enclosed space.
- ➔ Do not install modules in locations where they may be submerged in water for lengthy periods.
- ➔ Do not use modules as a substitute for the normal roofing (e.g. modules are not rainproof).

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 shadowing (due to objects such as buildings, chimneys or trees).
- ➔ Avoid partial shading (for example through overhead lines, dirt, snow).

Limitations

The solar modules are designed for the following applications:

- Operating temperatures from $-40\text{ }^{\circ}\text{F}$ to $+185\text{ }^{\circ}\text{F}$.
- Wind loads up to max. 4000 Pa and snow loads up to max. 5,400 Pa (Test-load in accordance with IEC 61215, see chapter 2.3 mounting options).
- Installation using a mounting frame for solar modules.

Mounting Frame Requirements

Requirements for the mounting frame:

- Conform to the necessary structural requirements.
- Compliant with local snow and wind loads.
- 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 of different metals to prevent contact corrosions.
- Allows for stress-free expansion and contraction due to temperature fluctuations.
- ➔ Ensure that no mechanical stresses (e.g., caused by vibrations, twisting, or expansion) are generated on the module.
- ➔ Ensure that the clamps and the mounting frame are compatible.

Clamp System Requirements

Use customary clamps that satisfy the following requirements:

- Clamp width: $\geq 1.57\text{ in}$ (40 mm).
- Clamp height compliant with a 1.26 in (32 mm) frame height.
- Clamp depth: 0.28–0.47 in (7–12 mm).
- Clamps are not in contact with the front glass.
- Clamps do not deform the frame.
- Clamps that satisfy the structural requirements of the installation site.
- Long-term stable clamps that securely affix the module to the mounting frame.

Module Orientation Requirements

- Vertical or horizontal installation is permitted.
- Installation with a junction box at the bottom is permitted for modules with junction boxes classified as IP67.
- ➔ 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.

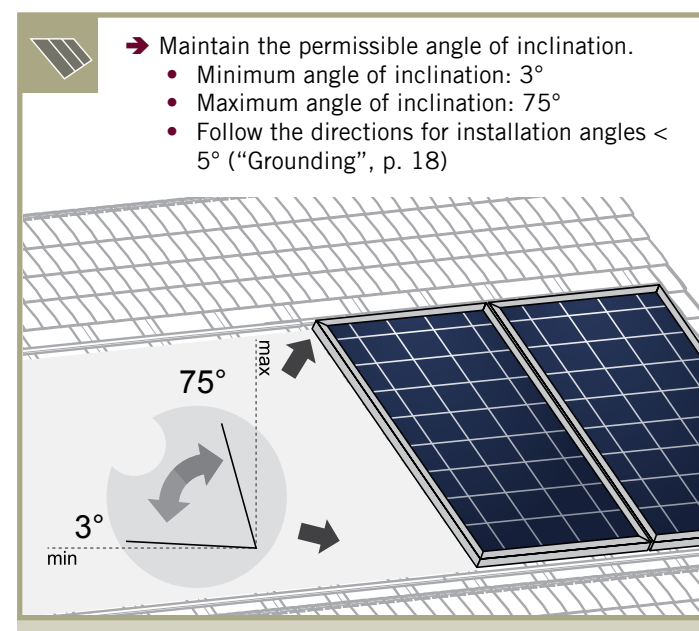


Fig. 2: Installation options for crystalline Q CELLS modules. All dimensions are given in inch (mm in brackets). Also observe the allowed static loads and clamping range as specified on the following page. The illustrated installation options apply for both horizontal and vertical module orientation.

Module Clamp Subconstruction Mounting profile

TYPE OF INSTALLATION	MODULE	POINT MOUNTING SYSTEM	LINEAR MOUNTING SYSTEM
INSTALLATION WITH CLAMPS	Q.PRO-G4 Q.PRO BFR-G4.1 Q.PLUS BFR-G4.1 Q.PRO BFR-G4 Q.PRO BLK-G4	 CL1 CL2	 CL3 CL4
HYBRID CLAMPING	Q.PRO-G4 Q.PRO BFR-G4.1 Q.PLUS BFR-G4.1 Q.PRO BFR-G4 Q.PRO BLK-G4	 CL5	
INSTALLATION ON MOUNTING POINTS*	Q.PRO-G4 Q.PRO BFR-G4.1 Q.PLUS BFR-G4.1 Q.PRO BFR-G4 Q.PRO BLK-G4	 FB1	 FB2
INSTALLATION WITH INSERTION PROFILES	Q.PRO-G4 Q.PRO BFR-G4.1 Q.PLUS BFR-G4.1 Q.PRO BFR-G4 Q.PRO BLK-G4	NOT PERMITTED	 IP1 IP2

Specifications

MODULE TYPE	MOUNTING OPTION	CLAMPING AREA ¹ [IN (MM)]		ALLOWED STATIC LOAD ² [PA]	TEST-LOAD ACC. IEC 61215 PUSH/PULL [PA]	
Q.PRO-G4 Q.PRO BFR-G4.1 Q.PLUS BFR-G4.1 Q.PRO BFR-G4 Q.PRO BLK-G4	CL1	Push	9.84 - 13.78 (250 - 350)	2700	5400/4000	
			>13.78 - 17.72 (>350 - 450)	1900		
	Pull	9.84 - 17.72 (250 - 450)	2400			
		9.84 - 13.78 (250 - 350)	3600			
	CL1 extended (min. 0.79 in)	Push	9.84 - 13.78 (250 - 350)	3600		
			>13.78 - 17.72 (>350 - 450)	3300		
	Pull	9.84 - 17.72 (250 - 450)	2400			
		9.84 - 17.72 (250 - 450)	2400			
	CL3	Push	9.84 - 17.72 (250 - 450)	3300		5400/4000
			9.84 - 17.72 (250 - 450)	2400		
	CL4	Push	0 - 11.81 (0 - 300)	1350	2400/2400	
			0 - 11.81 (0 - 300)	1200		
	FB1	Push	13.58 (345)	2200	5400/4000	
			13.58 (345)	2800		
	FB2	Push	13.58 (345)	3200	5400/4000	
			13.58 (345)	2800		
	FB1 (9.84 in (250mm))	Push	9.84 (250)	2900	5400/4000	
			9.84 (250)	2800		
	FB2 (9.84 in (250mm))	Push	9.84 (250)	3200	5400/4000	
			9.84 (250)	2800		
IP1	Push	-	3200	5400/4000		
		-	3000			
IP2	Push	-	1350	2400/2400		
		-	1200			
CL5 hybrid clamping	Push	11.81 - (300 - 400)	2700	2400/2400		
		11.81 - (300 - 400)	2700			
CL2 without substructure support	Push	0 - 3.94 (0 - 100)	1200	2400/2400		
		0 - 3.94 (0 - 100)	1100			

¹ Distance between outer edge of module and middle of the clamp.

² Describes the maximum module surface load (vertical to the module surface) regarding safety factors (e.g. EUROCODE). For this purpose, the load value determined by load tests according to various criteria: laminate overlay, plastic deformation, module failure, and were divided with a safety factor. The minimum calculated load value corresponds to the maximum permitted load.

MOUNTING OPTION CL1

- ➔ Ensure, that the subconstruction does not run below the junction box.
- ➔ Ensure, that the connection cables of the junction box don't run between laminate and substructure.

MOUNTING OPTION CL1 EXTENDED

- ➔ Ensure, that there's distance of minimum 1.77 in (45 mm) between laminate backside and subconstruction respectively that the distance between module frame backside and substructure is minimum 0.79 in (20 mm).
- ➔ Ensure, that the connection cables of the junction box don't run between laminate and substructure.

MOUNTING OPTION CL4

- ➔ Ensure, that the subconstruction runs exactly below the frame, not below the laminate (module less frame).

MOUNTING OPTIONS FB1 AND FB2

- ➔ Ensure, that the connection cables of the junction box don't run between laminate and substructure.
- Use M8 corrosion-proof screws and washers (diameter 0.63 in (16 mm)).

Module Selection

For detailed key electrical data, please refer to the product data sheet for the respective product.

→ Only connect modules of the same type and the same power class.

Safety Factor

During normal operation, a module may generate a greater current and/or higher voltage than that determined under standardized test conditions. Accordingly, the values of I_{sc} and V_{oc} marked on the module should be multiplied by a factor of 1.25 when determining:

- the component voltage ratings,
- conductor ampacities,
- fuse sizes,
- size of controls connected to the PV output.

Refer to Section 690-8 of the National Electrical Code for an additional multiplying factor of 125 percent (80 percent derating) which might be applicable.

→ Please follow the valid national guidelines for the installation of electrical systems (refer to section 690-8 of the NEC for an additional multiplying factor of 125 percent [80 percent derating] which may be applicable).

Series Connection

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

→ Take into account all possible operating situations and all relevant technical norms and regulations when designing the system. This will ensure 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.

Parallel Connection

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

→ Ensure that the maximum reverse current load capacity indicated in the data sheet is met.

In order to limit reverse currents that may occur, we recommend using the following safety options:

1) Layout with a limited number of parallel connected strings:

Without undertaking further current blocking measures, a maximum of two module strings may be operated in parallel on an inverter or MPP tracker.

2) Layout with string fuses:

place fuses for each string of modules at the plus and minus ends. Observe the maximum permitted number of strings as indicated in the specifications provided by the respective string fuse manufacturer and the technical guidelines.

NOTE!

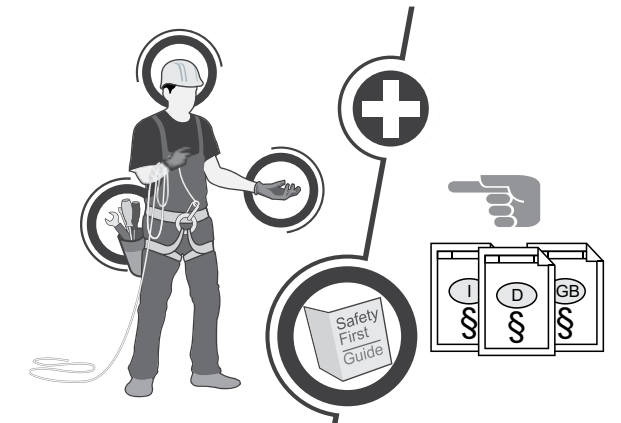
When installing different product versions, the lowest minimum permitted reverse current load capacity applies.

Inverters

Inverters with or without transformers may be used.

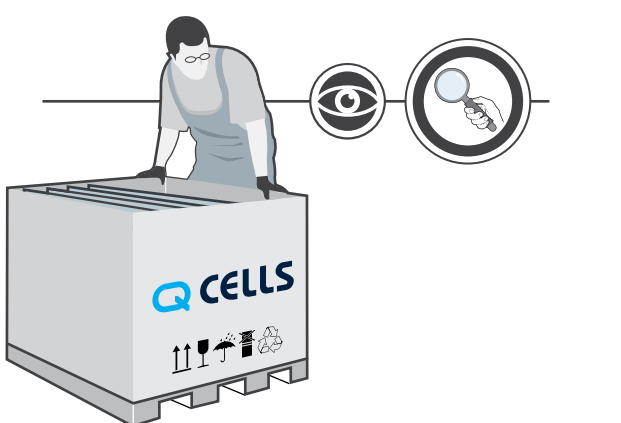
⚠️

- Ensure that all personnel are aware of and adhere to accident-prevention and safety regulations.
- While working wear clean gloves.



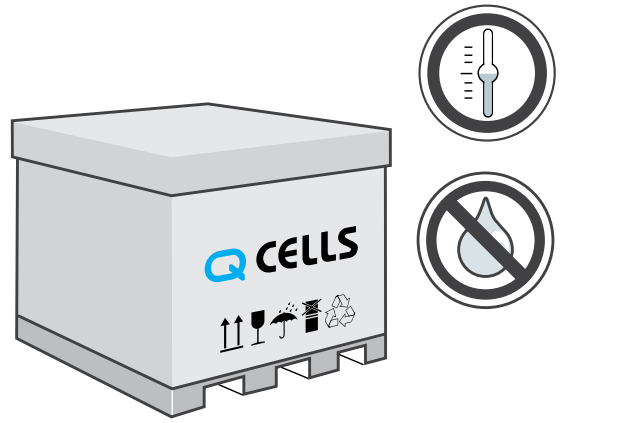
⚠️

- Inspect the packaging for damages.
- Contact the transport company regarding any damage to the packaging.
- Follow any instructions on the packaging.



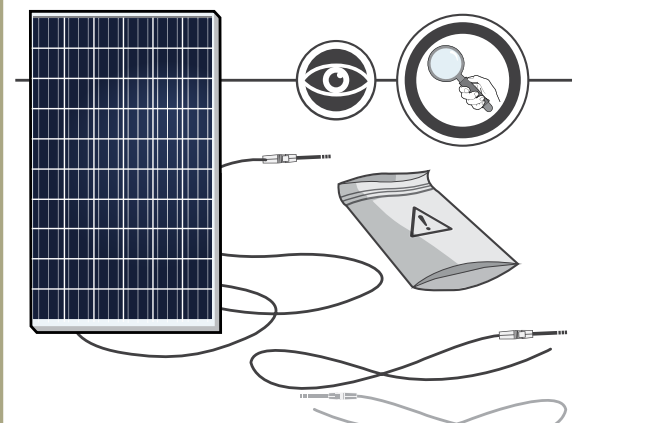
⚠️

- Leave modules in their original packaging until installation.
- Store the modules securely in cool and dry rooms. The packaging is not weatherproof.



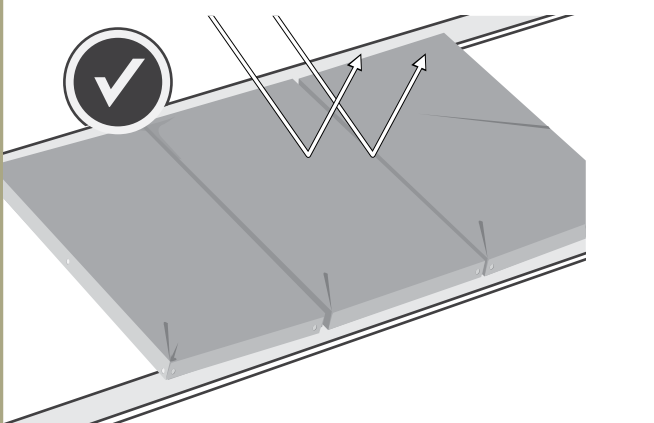
⚠️ **DANGER! Risk of fatal injury due to electric shock!**

- Do not install damaged modules.
- Inform your vendor of any damages immediately.



⚠️ **DANGER! Risk of fatal injury due to electric shock!**

- Cover the modules with an opaque material during installation.



⚠️ **WARNING! Fire Risk!**

- Do not install modules indoors.
- Do not install modules on moving objects.



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!

- Do not drop modules.

NOTE! Module damage may occur!

- Do not stack modules.

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!

- Only make modifications to the module which have been confirmed in writing by Q CELLS.

NOTE! Module damage may occur!

- Do not install modules near flammable gas/vapors.
- Do not install modules in close proximity to air conditioning systems.

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.

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.

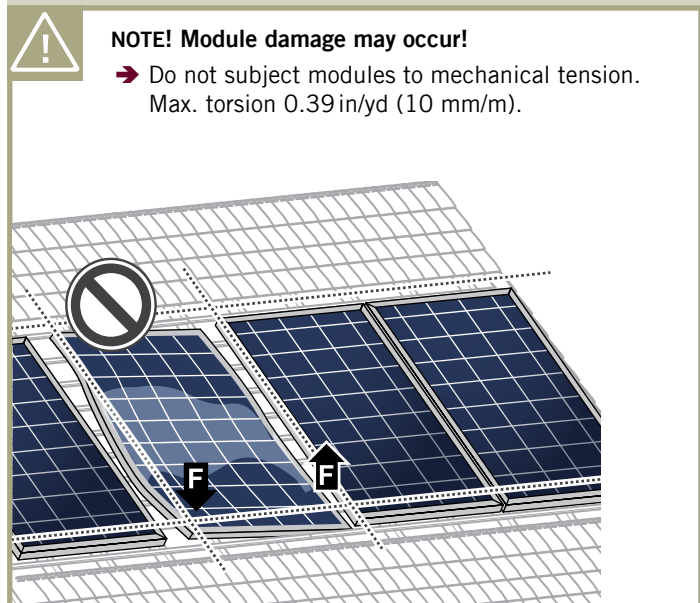
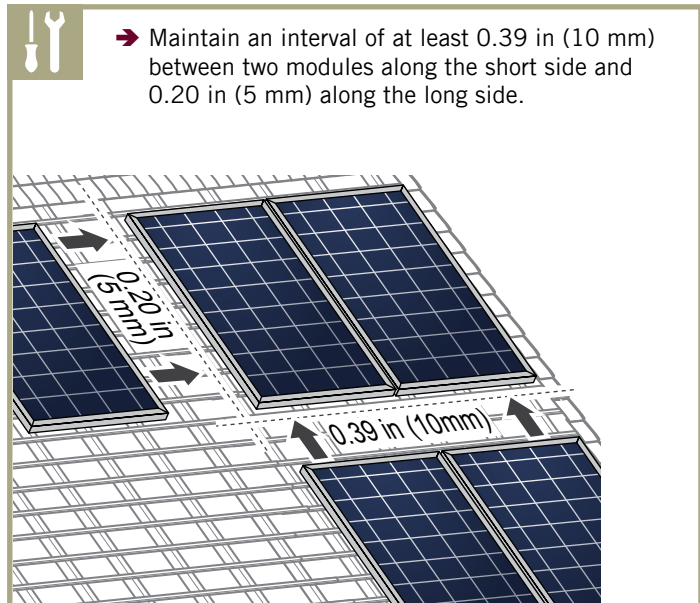
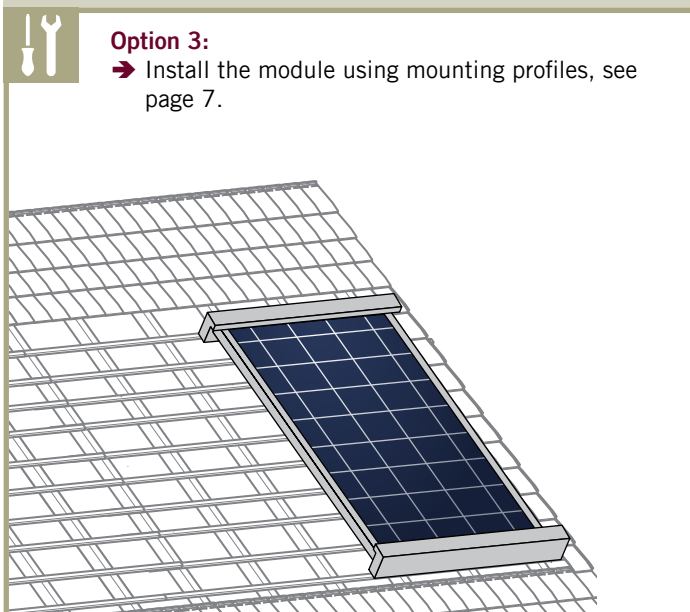
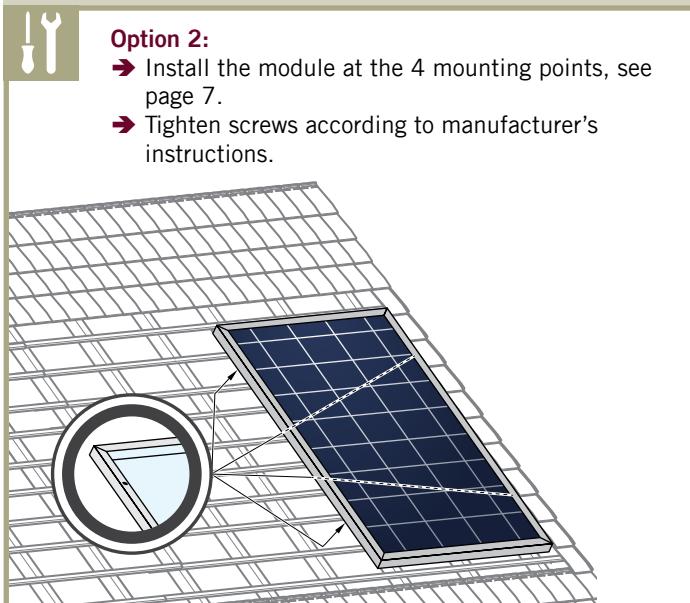
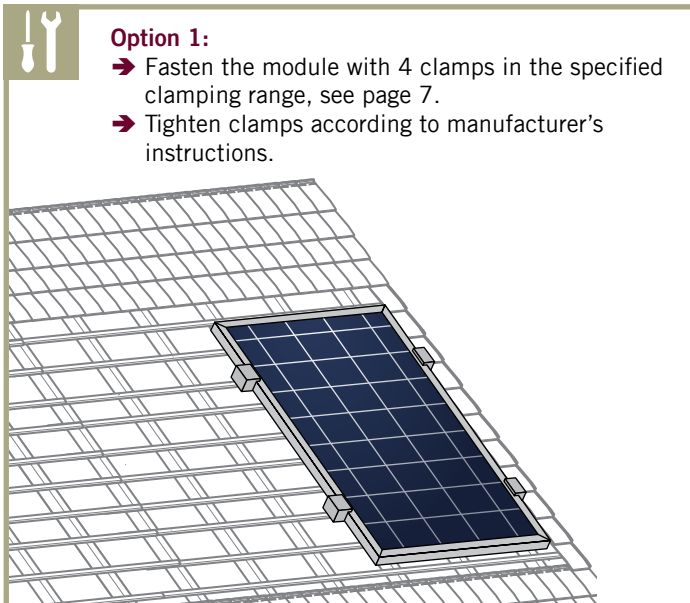
WARNING! Risk of injury due to falling modules!

- Secure modules during installation.
- Do not install modules in windy or wet weather.

NOTE! Do not carry out the installation alone.

NOTE!

- Only install undamaged modules and components.
- Do not modify the module (e.g. do not drill any additional holes).



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.

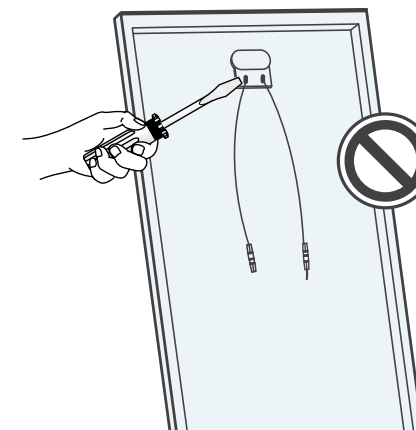
A solar module generates electrical current and voltage even at a low intensity of illumination. Sparks and electric arcs may result from the separation of a closed circuit. These can result in life-threatening injuries. The danger increases when several modules are connected in series.

- Please be aware of 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.



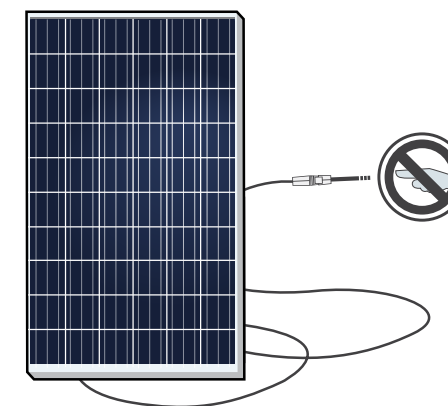
DANGER! Risk of fatal injury due to electric shock!

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



DANGER! Risk of fatal injury due to electric shock!

- Never touch live contacts with bare hands.
- Do not touch the poles at the same time.
- Cover connectors by suitable protective caps until installation.



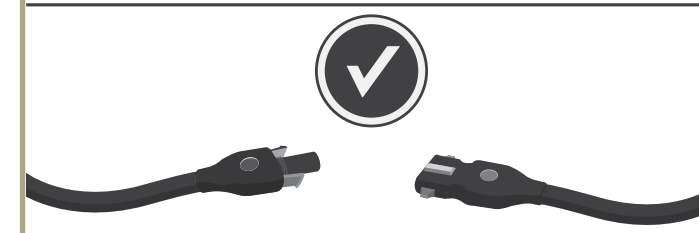
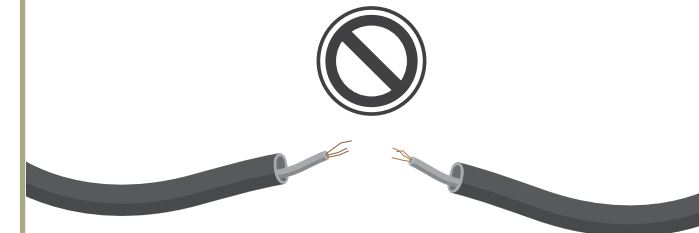
DANGER! Risk of fatal injury due to electric shock!

- Only use dry, insulated tools for electrical work.

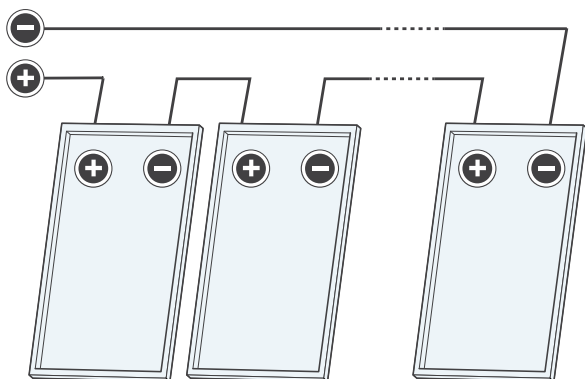


DANGER! Risk of fatal injury due to electric shock!

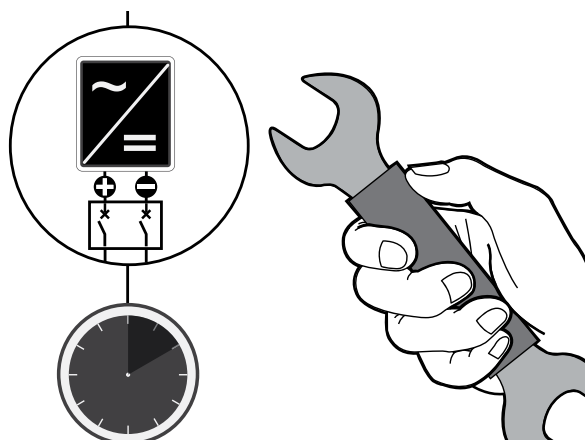
- Insulate any exposed cable ends.
- Only connect cables with plugs.



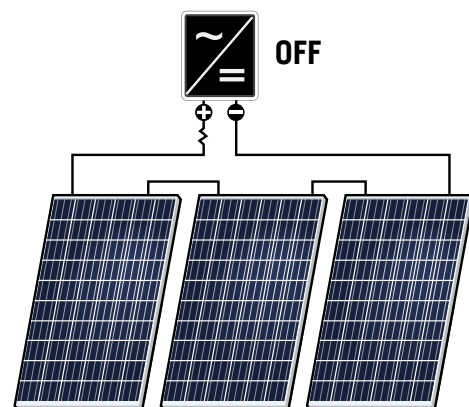
⚠ DANGER! Risk of fatal injury due to electric shock!
 → Ensure correct polarity.



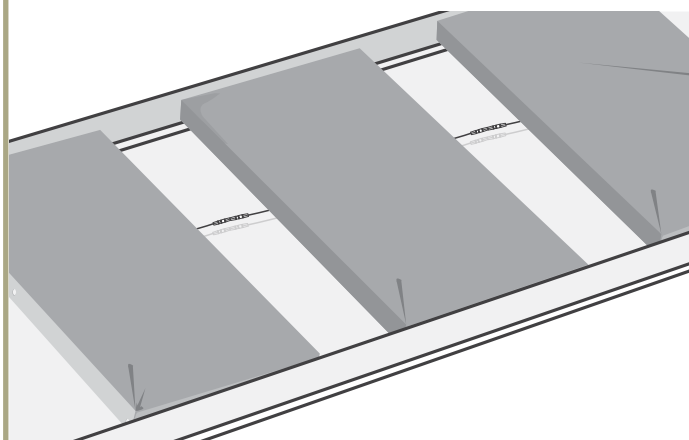
⚠ DANGER! Risk of fatal injury due to electric shock!
 → Be sure to maintain the time intervals as specified by the inverter manufacturer between switching off the inverter and beginning any further work.



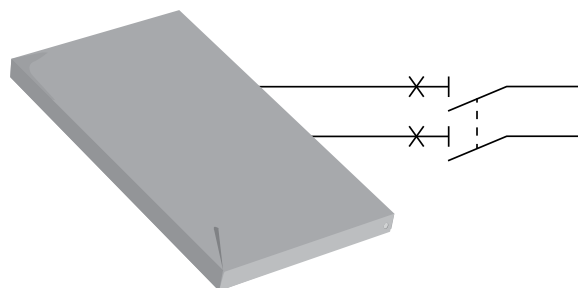
⚠ DANGER! Risk of fatal injury due to electric shock!
 → Never unplug the cable when under load.
 1. Switch off the inverter.



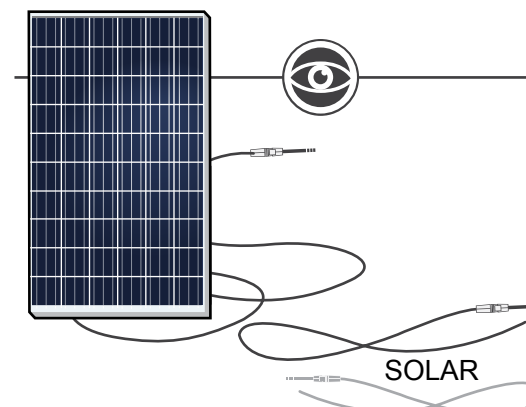
⚠ 2. Cover the modules to be disconnected.



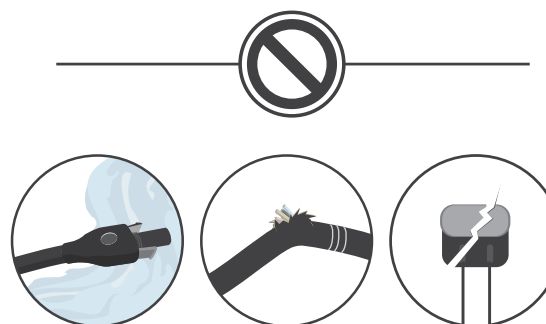
⚠ 3. Switch off the DC circuit breaker.
 → Disconnect plugs by the use of appropriate and qualified tools of the manufacturer Tyco, Amphenol or Multicontact.



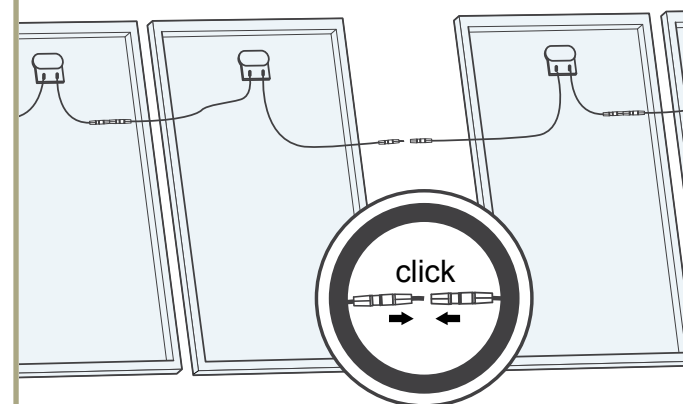
⚠ → Use solar cables for the connection at the junction box outlet.
 → Use the same, inverter-compatible plugs.



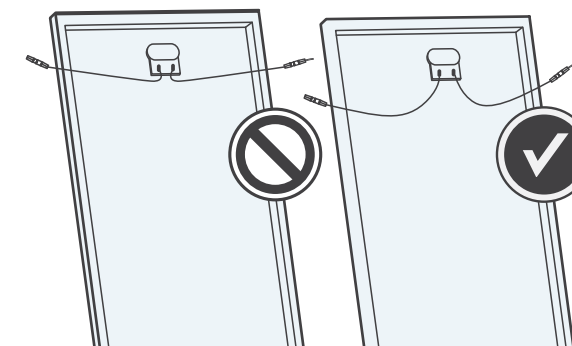
⚠ DANGER! Risk of fatal injury due to electric shock!
 → Ensure that all electrical components are in a proper, dry, and safe condition.



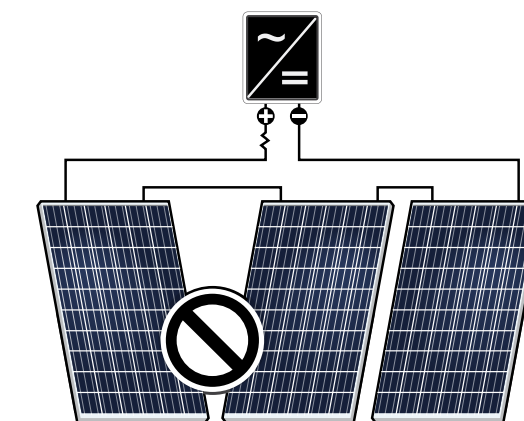
⚠ → Ensure for a tight connection between the plugs. Plugs click together audibly.



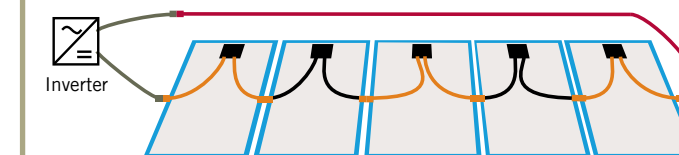
⚠ NOTE! Module damage may occur!
 → Ensure that the cabling is not under stress.
 → Ensure that the cables do not run between module and subconstruction (danger of pinch).

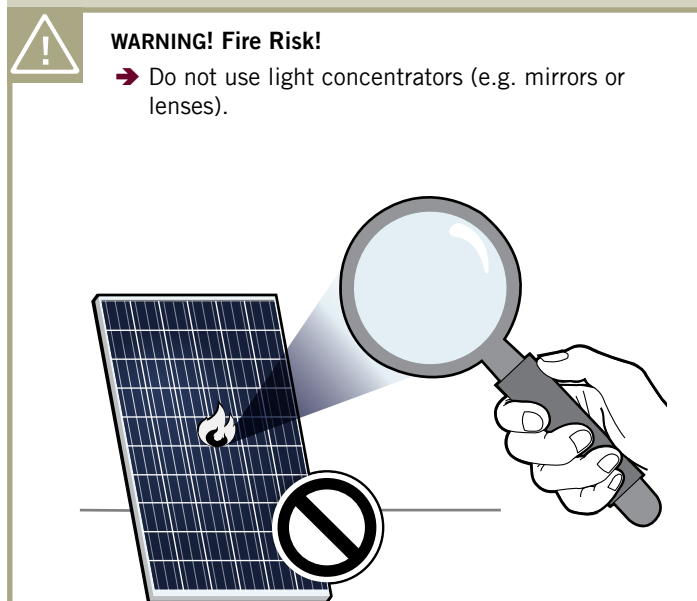
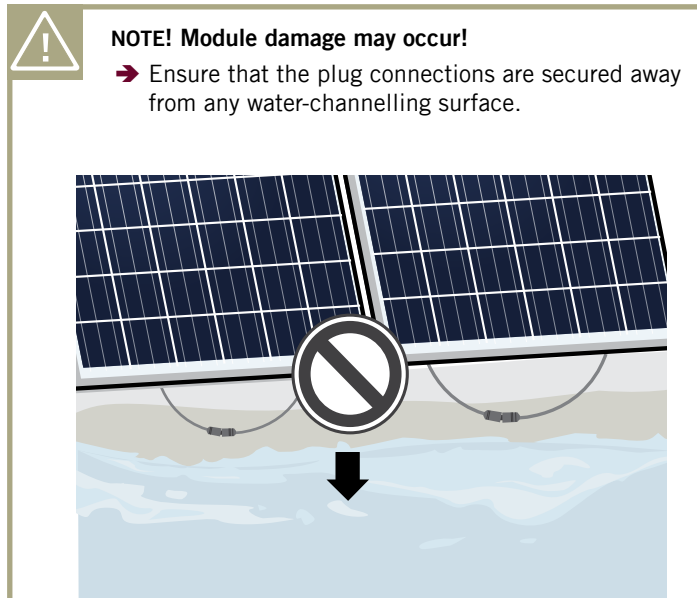
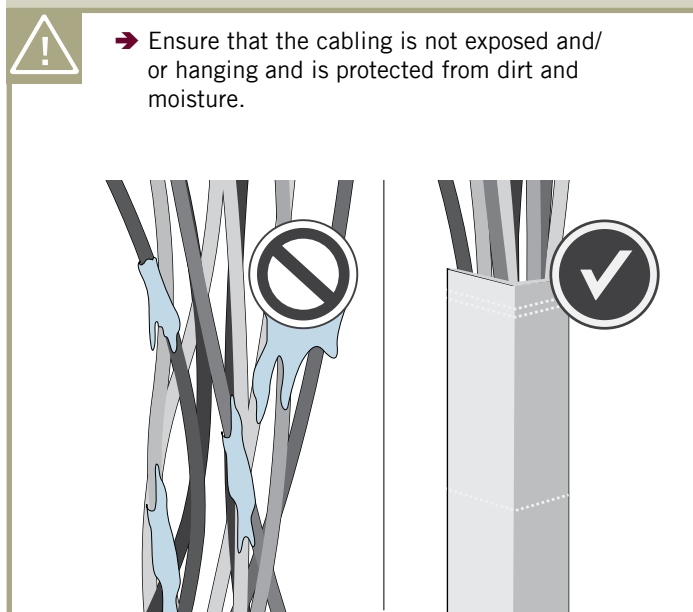
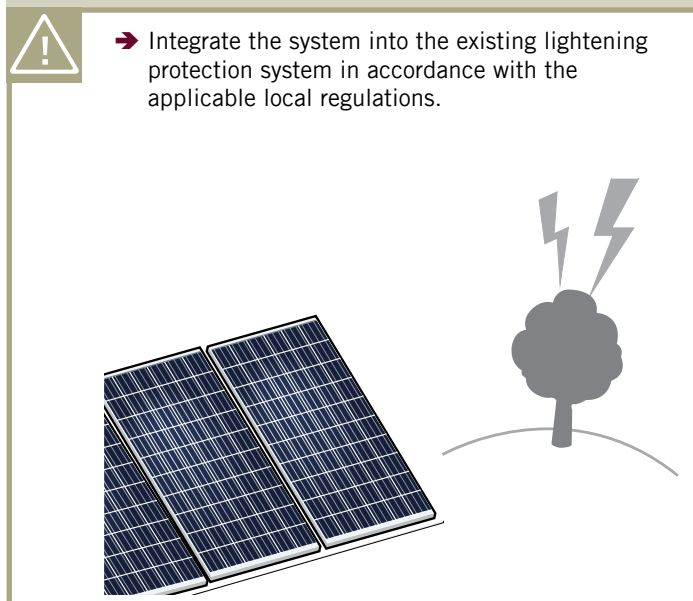
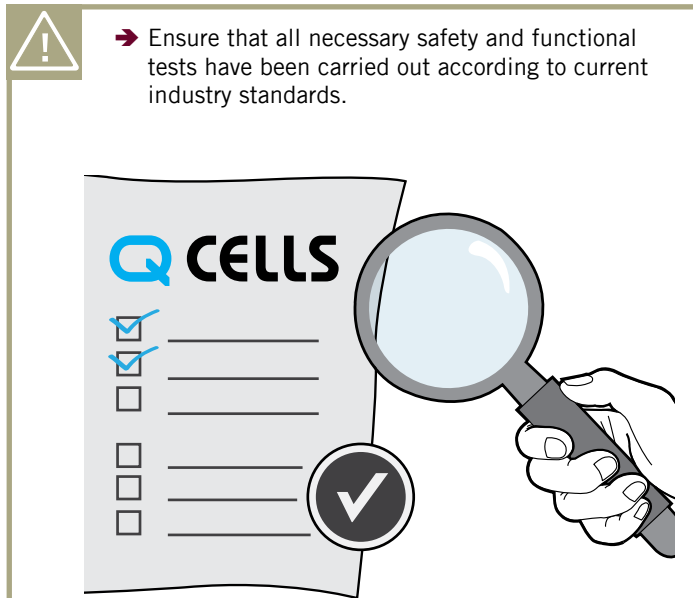


⚠ → Do not connect modules with different orientations or angles of inclination in the same string.



▨ → Standard wiring with a return cable.





Functional grounding

- When using an installation tilt of $<5^\circ$ a functional grounding at the negative generator connection 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.
- Only use inverters which include licensed grounding kits.

Protective Grounding

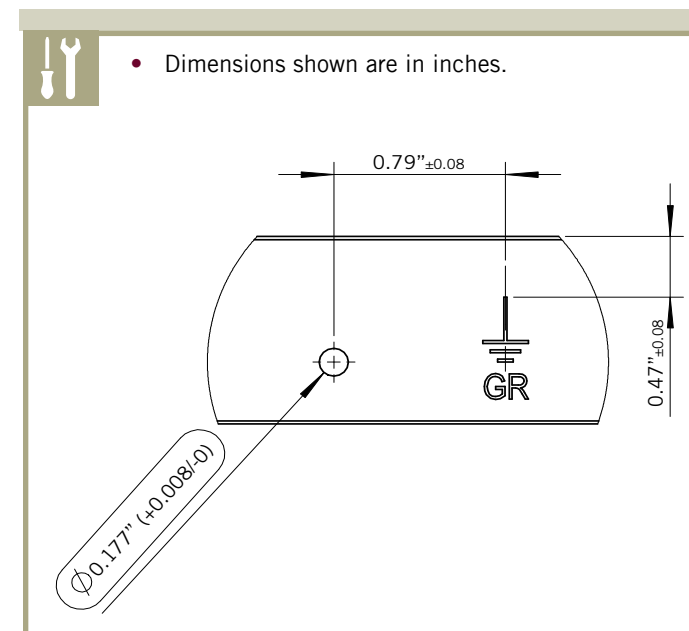
In order to prevent electrical shock or fire, the frame of the module as well as any non-current-carrying metal parts of the system must be grounded. While this section provides some information about grounding the Q CELLS frames and modules, reference should be made to local statutes and regulations for specific requirements on grounding. The U.S. National Electrical Code addresses these issues in Article 250.

Proper grounding is achieved by bonding all exposed non-current-carrying metal equipment to the appropriately sized equipment grounding conductor (EGC) or racking system that can be used for integrated grounding.

Q CELLS frames are protected from corrosion with an anodized coating, which has to be penetrated in order to ensure proper bonding. The different methods listed below are suggested methods for an appropriate bond between the frame and the EGC or racking system (that will have to be properly grounded). The method appropriate for any individual installation will depend on multiple factors.

Option A: Use of a grounding lug

A listed grounding lug can be bonded to the frame using the grounding holes pre-drilled in the frame. These holes are marked

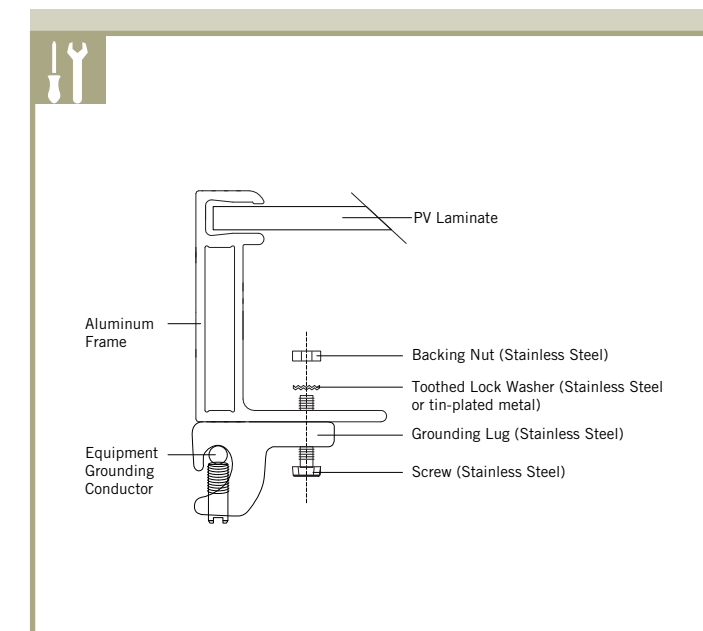


with a ground symbol, as shown below on the frame section drawing: To install the grounding lug, follow the specified instructions of the manufacturer. The grounding lug should be made of stainless steel or tin plated metals such as aluminum to avoid corrosion. The grounding lug should be attached to the frame grounding hole using a stainless steel screw, toothed lock washer or KEPS nut (in order to penetrate the anodized layer) and backing nut. Care should be taken to avoid the use of grounding hardware of dissimilar metals, which may lead to corrosion

Option B: Integrated grounding methods

The Q CELLS modules can be bonded with the racking system using UL1703 or UL2703 certified integrated grounding methods. The racking system will then have to be grounded so that the overall system is properly grounded. The listed racking system and grounding device should be installed in accordance with the manufacturers' instructions. An example of such integrated grounding method is the use of a WEEB clip or Schletter plate between the module and the racking system, when mounting the module. The WEEB washers are generally compatible with Q CELLS modules, however each combination module / racking system requires a specific WEEB washer size. Note that WEEB clips are intended for single use only; they must not be reused after removal or loosening. Refer to Wiley's installation instructions for the specific use of WEEB washers.

An example of such integrated grounding method is the use of a washer recognized as meeting UL2703 requirements between the module and the racking system, when mounting the module. For example, WEEB washers are generally compatible with Q CELLS modules, however each combination module / racking system requires a specific WEEB washer size. Note that WEEB washers are intended for single use only; they must not be reused after removal or loosening. Refer to Wiley's installation instructions for the specific use of WEEB washers.





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 yourself.
- Please commission a trade specialist.
- Dispose of modules in accordance with the local disposal regulations.

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 system should be inspected by an installer annually to check the following:
 - all system components sit securely and are corrosion free.
 - the connection is secure and all electrical components are clean and undamaged.

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 without force (e.g. with a very soft broom)
- Do not scratch off dirt.
- Rinse dirt off with lukewarm water (dust, leaves, etc.)
- Use a soft cellulose cloth (kitchen roll) or sponge to carefully wipe off stubborn dirt. Do not use micro fleece wool or cotton cloths.
- Use an alcohol based glass cleaner. Do not use abrasive detergents or tensides.

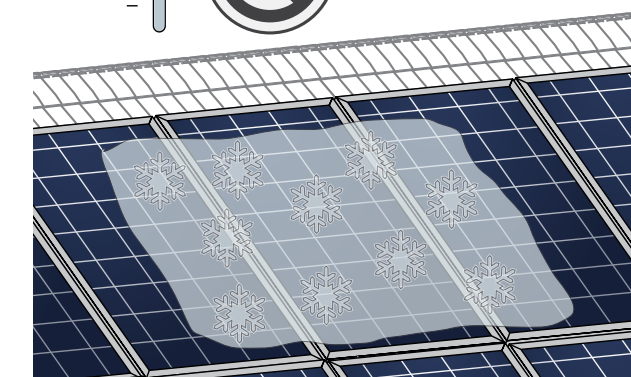
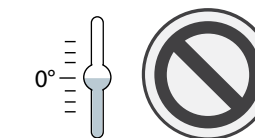
Isopropyl alcohol (IPA) can be used selectively to remove stubborn dirt and stains within one hour after emergence.

- 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.

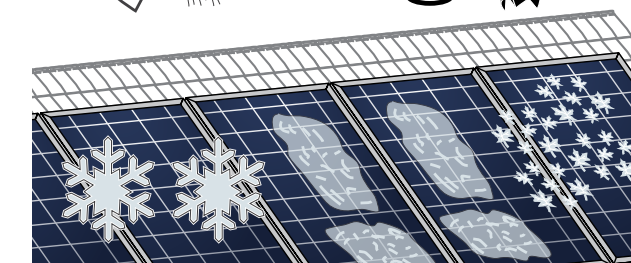


NOTE! Module damage may occur!

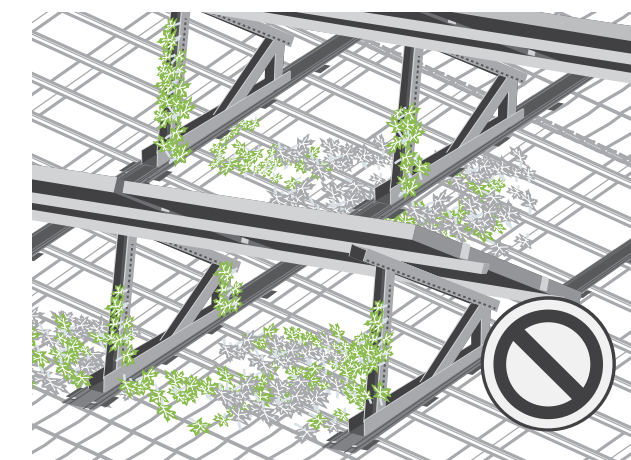
- Do not clean modules with water if there is a risk of frost.



- Remove dirt with lukewarm water, a broom, or a soft cloth.
- Do not use tensides, scrapers, or any high-pressure water cleaning equipment.



- Free the substructure from any dirt and debris (leaves, bird nests, etc.).



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