

INSTALLATION AND OPERATION MANUAL

Q.PEAK DUO ML-G9.X / AC solar module series

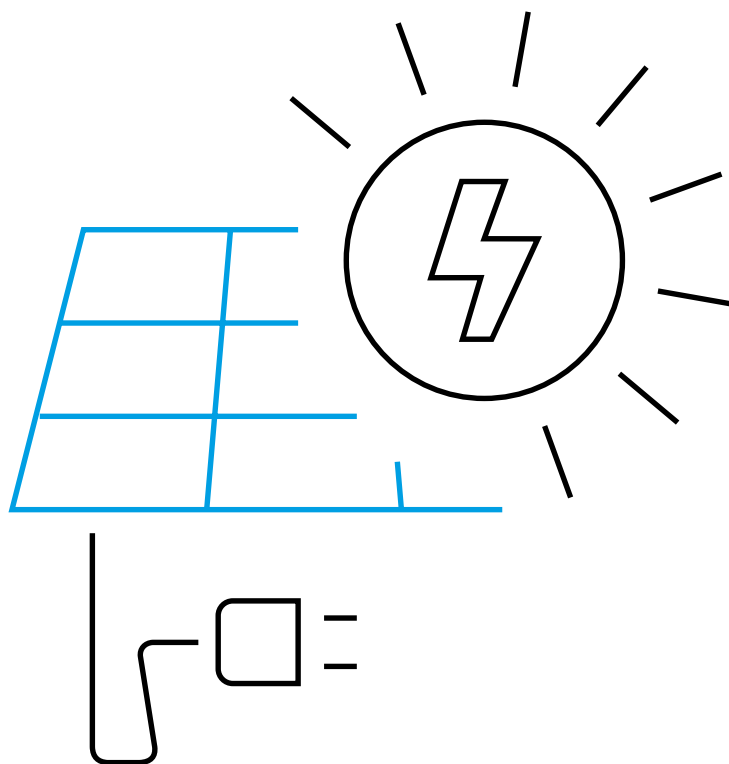


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DOCUMENT REVISION 01

This Manual is valid for Africa, Asia, Europe, Latin America and South America as of June 1st 2021 for Q.PEAK DUO ML-G9+ / AC, Q.PEAK DUO BLK ML-G9 / AC and Q.PEAK DUO BLK ML-G9+ / AC solar modules, and replaces all earlier versions.

This manual is 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, as far as no updated document is provided.

1 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.
- ➔ 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 for Africa, Asia, Europe, Latin America, South America. These instructions contain information regarding the safe handling and use of quality crystalline solar modules from Q CELLS and their installation, mounting, wiring, maintenance and disposal.

Symbols and Labels

The following symbols and labels are used throughout the 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:

- Danger: Risk of fatal injury
- Attention: Risk of serious injury or damage to property
- Note: Risk of damage to product

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.

Qualified and Skilled Personnel

Both, the installer and operator are responsible for ensuring that the 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 standard and regulations (in Germany e.g. DIN standards, VDE regulations) and the stipulations of the local grid operator and / or energy provider. Only qualified personnel should install, troubleshoot, or replace Enphase Microinverters or Enphase Q Cable and Accessories.

1 INTRODUCTION

Validity

These instructions are only valid for crystalline solar modules from the company Q CELLS as specified at chapter „2.1 Technical Specifications“. 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.

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

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.

DO NOT ATTEMPT TO REPAIR THE ENPHASE MICROINVERTER; IT CONTAINS NO USER-SERVICEABLE PARTS. IF IT FAILS, CONTACT ENPHASE CUSTOMER SERVICE TO OBTAIN A RETURN MERCHANDISE AUTHORIZATION (RMA) NUMBER AND START THE REPLACEMENT PROCESS. TAMPERING WITH OR OPENING THE ENPHASE MICROINVERTER WILL VOID THE WARRANTY.

2 PLANNING

2.1 TECHNICAL SPECIFICATIONS

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

PRODUCT LINE	Q.PEAK DUO ML-G9+ / AC	Q.PEAK DUO BLK ML-G9 / AC Q.PEAK DUO BLK ML-G9+ / AC
Type	Q.ANTUM DUO Z	Q.ANTUM DUO Z
Length	1840 mm	1840 mm
Width	1030 mm	1030 mm
Frame height	40 mm	40 mm
Area	1.90 m²	1.90 m²
Weight	20.6 kg	20.6 kg
Max. system voltage V _{sys}	1000 V	1000 V
Max. reverse current	20 A	20 A
Permissible temperature range	-40 °C to +85 °C (-40 °F to +185 °F)	
Junction box protection class	IP67 with bypass diode	
Connector protection class	IP68	
Fire rating based on ANSI / UL 61730	C / Type 2	C / Type 2
Max. test load Push / Pull ¹	5,400 Pa / 4,000 Pa	5,400 Pa / 4,000 Pa
Max. design load Push / Pull ¹	3,600 Pa / 2,660 Pa	3,600 Pa / 2,660 Pa
Certificates	CE-compliant; IEC 61215:2016; IEC 61730:2016; PV module classification: Class II; UL 61730	

¹ Test and design load in accordance with IEC 61215:2016, depending on mounting options (see section „2.5 Mounting Options“)

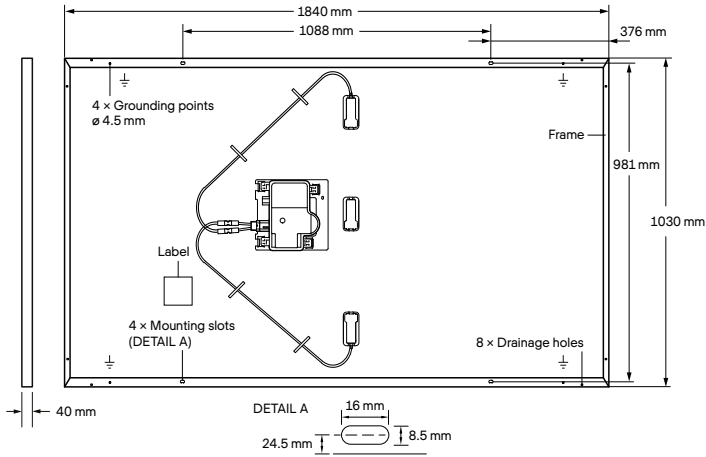


Fig. 1: External dimensions and components for Q.PEAK DUO ML-G9+ / AC, Q.PEAK DUO BLK ML-G9 / AC and Q.PEAK DUO BLK ML-G9+ / AC

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PLANNING

2.1 TECHNICAL SPECIFICATIONS

Microinverter

For additional information see the relevant datasheet of the microinverter provided at www.enphase.com.

ENPHASE IQ7PLUS-72-ACM-INT MICROINVERTER PARAMETERS				
Topic	Unit	Min	Typical	Max
DC PARAMETERS				
Peak Power Tracking Voltage	V	27		45
Operating Voltage Range	V	16		60
Maximum Input DC Voltage	V			60
Minimum / Maximum Start Voltage	V	22		60
Maximum DC Input Short Circuit Current (module I _{SC})	A			15
Overvoltage Class DC Port			II	
DC Port Backfeed under Single Fault	A			0
PV Array Configuration	1x1 ungrounded array; No additional DC side protection required; AC side protection requires max 20 A per branch circuit			
AC PARAMETERS				
Maximum Continuous AC Output Power (−40 °C to +65 °C)	VA		290	
Peak Output Power	VA		295	
Power Factor (adjustable)		0.8 leading ... 0.8 lagging		
Nominal AC Output Voltage Range ¹ 230 VAC (single phase)	Vrms	184		276
Nominal Output Current 230 VAC (single phase)	A		1.26	
Nominal Frequency	Hz		50	
Extended Frequency Range	Hz	45		55
Maximum AC Output over Current Protection Device	A	20		
Overvoltage Class AC Port			III	
AC Port Backfeed under Single Fault	A		0	
Power Factor Setting			1.0	
1 Nominal Voltage Range can be extended if required by the utility.				

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PLANNING

2.1 TECHNICAL SPECIFICATIONS

Topic	Unit	Min	Typical	Max
MISCELLANEOUS PARAMETERS				
Maximum ² Microinverters per 20 A Branch Circuit 230 VAC (single phase)	A	13 (single-phase) 39 (multiphase)		
EN 50530 (EU) weighted efficiency 230 VAC (single phase)	%	96.5		
Static MPPT Efficiency (weighted, ref EN 50530)	%	99.5		
Total Harmonic Distortion	%			5
Ambient Temperature Range	°C	−40		+65
Night Tare Loss	mW			50
Storage Temperature Range	°C	−40		+85
FEATURES AND SPECIFICATIONS				
Dimensions Excluding Mounting Bracket (approximate)	212 mm × 175 mm × 30.2 mm			
Connector Type	Stäubli MC4 (or Amphenol H4 UTX with additional Q-DCC-5 adaptor)			
Weight	1.08 kg			
Environmental Category / UV Exposure Rating	IP67 / outdoor			
Torque specifications for fasteners (Do not over torque)	• 6 mm mounting hardware: 5 Nm • 8 mm mounting hardware: 9 Nm • When using earthing hardware, use the manufacturer’s recommended torque value			
Cooling	Natural convection - no fans			
Relative Humidity Range	4 % to 100 % condensing			
Approved for Wet Locations	Yes			
Pollution Degree	PD3			
Maximum Altitude	2000 meters			
Compliance	AS 4777.2, RCM, IEC / EN 61000-6-3, IEC / EN 62109-1, IEC / EN 62109-2			
Grounding	The DC circuit meets the requirements for ungrounded PV arrays. Ground fault protection (GFP) is integrated into the class II double insulated microinverter.			
Monitoring	Enlighten Manager and MyEnlighten monitoring options require an Enphase Envoy-S			
Communication	Power line			
Integrated DC Disconnect	The DC connector has been evaluated and approved for use as the load-break disconnect.			
Integrated AC Disconnect	The AC connector has been evaluated and approved for use as the load-break disconnect.			
2 Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.				

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PLANNING

2.1 TECHNICAL SPECIFICATIONS

Enphase Q Cable


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

SPECIFICATION	VALUE
Voltage Rating	450 / 750 V (connector rating up to 250 V)
Voltage Withstand Test (kV / 1 min)	AC 3.0
Max DC Conductor Resistance (20 °C) (Ω / km)	5.433
System Temperature Range (ambient)	−40 °C to +65 °C
Cable temperature rating	90 °C Dry / 90 °C Wet
Cable rating	H07BQ-F
Certification	EN 50525-2-21
Flame rating	IEC 60332-1-2
Cable conductor insulator rating	H07BQ-F
Environmental protection rating	IEC 60529 IP67
UV resistance	1008 h
UV exposure rating	IEC60068-2-5
Compliance	RoHS, OIL RES I, CE, UV Resistant
Maximum loop size	12 cm

Enphase Connector Ratings

Enphase connectors in the following table have a maximum current of 20 A, a maximum OCPD of 20 A, and an ambient temperature range of −40 °C to +79 °C.

PART NUMBER	MODEL	MAXIMUM VOLTAGE
840-00387	Q-12-10-240	277 VAC
840-00388	Q-12-17-240	277 VAC
840-00389	Q-12-20-200	277 VAC

 **NOTE!**

Only Enphase connectors/ solar cables are permitted.

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PLANNING

2.2 THE ENPHASE IQ SYSTEM

The Enphase IQ System includes:

- The smart grid ready IQ Series Microinverters convert the DC output of the PV module into grid-compliant AC power.
- **Enphase IQ Envoy-S™** Use model ENV-S-WM-230 for multi-phase installations or ENV-S-WB-230-F, -G, or -I for single-phase installations. The Enphase Envoy-S is a communication device that provides network access to the PV array. The Envoy-S collects production and performance data from the Enphase IQ Microinverters over on-site AC power lines and transmits the data to Enlighten through an Internet or cellular connection. The Envoy-S is capable of monitoring up to 600 Enphase IQ Microinverters and up to 39 Enphase IQ Batteries. For details, refer to Enphase Envoy-S Installation and Operations Manual.
 - **Enphase Enlighten™** web-based monitoring and management software. Installers can use Enlighten Manager to view detailed performance data, manage multiple PV systems, and remotely resolve issues that might impact system performance. Find out more at enphase.com/enlighten.
 - **Enphase Installer Toolkit™** mobile app for iOS and Android devices. It allows installers to configure the system while onsite, eliminating the need for a laptop and improving installation efficiency. You can use the app to:
 - Connect to the Envoy-S over a wireless network for faster system setup and verification
 - View and email a summary report that confirms a successful installation
 - Scan device serial numbers and sync system information with Enlighten monitoring software
 - **Enphase Battery(ies)** offer energy storage solutions.
 - **Enphase Field Wireable connectors** (Q-CONN-R-10F and Q-CONN-R-10M) make connections from any Q Cable, or open Field Wireable connector.

This manual describes the safe installation and operation of the Enphase Microinverter.

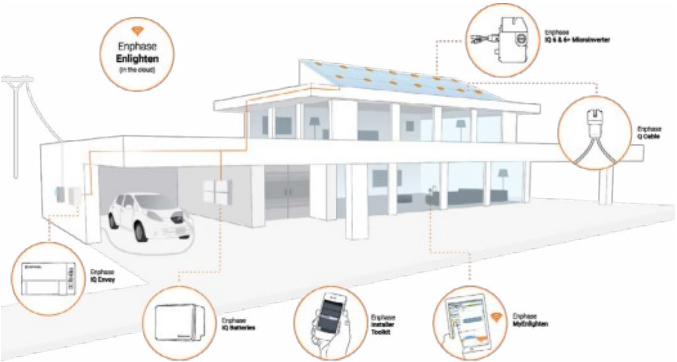
 **NOTE!**

To ensure optimal reliability and to meet warranty requirements, the Enphase Microinverter must be installed according to the instructions in this manual.

How the Enphase IQ Series Micros Work

The Enphase Microinverter maximizes energy production by using a sophisticated Maximum Power Point Tracking (MPPT) algorithm. Each Enphase Microinverter individually connects to one PV module in your array.

This configuration enables an individual MPPT to control each PV module, ensuring that maximum power available from each PV module is exported to the utility grid regardless of the performance of the other PV modules in the array. While an individual PV module in the array may be affected by shading, soiling, orientation, or PV module mismatch, each Enphase Microinverter ensures top performance for its associated PV module.



System Monitoring

Once you install the Enphase Envoy-S and provide an internet connection through a broadband router or modem, the Enphase IQ Microinverters automatically begin reporting to Enlighten. Enlighten presents current and historical system performance trends and informs you of PV system status.

Optimal Reliability

Microinverter systems are inherently more reliable than traditional inverters. The distributed nature of a microinverter system ensures that there is no single point of system failure in the PV system. Enphase Microinverters are designed to operate at full power at ambient temperatures as high as 65 °C.

Ease of Design

PV systems using Enphase Microinverters are very simple to design and install. You will not need string calculations or cumbersome traditional inverters. You can install individual PV modules in any combination of PV module quantity, type, age and orientation. Each microinverter quickly mounts on the PV racking, directly beneath each PV module. Low voltage DC wires connect from the PV module directly to the co-located microinverter, eliminating the risk of personnel exposure to dangerously high DC voltage.

2 PLANNING

2.3 REQUIREMENTS

Installation Site

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

- 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 (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 2000 m (13120 ft) altitude above sea level.
- ➔ Contact with saline water (e.g. spray water from the sea) and salt aggregation on the modules must be avoided.
- ➔ 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. 4,000 Pa and push loads up to max. 5,400 Pa (see chapter „Mounting Options“).
 - Installation using a mounting structure for solar modules.

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).

Mounting Structure Requirements

- The Modules shall be installed and operated on mounting structures 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.

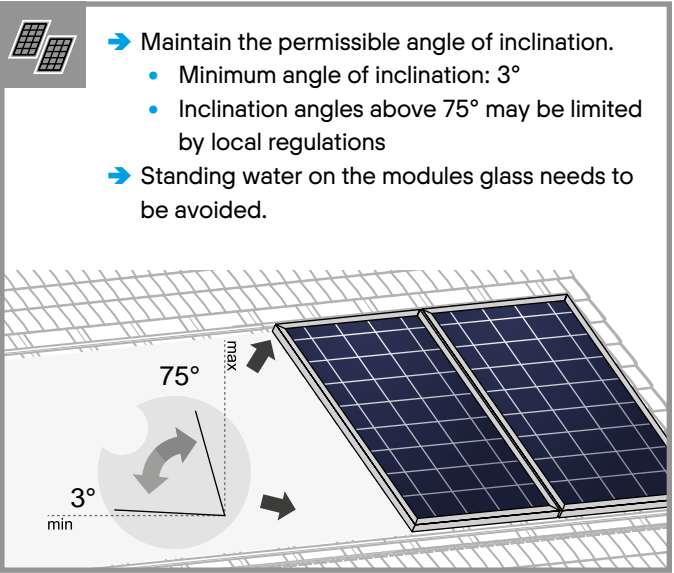
- Forces acting on the module are relayed to the mounting substructure.
- Ensures sufficient rear ventilation of the module.
- Avoid the usage of different metals to prevent contact corrosion.
- Allows for stress-free expansion and contraction due to temperature fluctuations.
- ➔ Ensure that no additional forces are applied through the mounting system into the module except for the wind and snow loads. Additional forces and moments of torque at the mounting positions caused by torsions, displacements or vibrations in the mounting system are not allowed.
- ➔ Ensure that the clamps and the mounting frame are compatible.

Clamp System Recommendations

- Use customary clamps that satisfy the following requirements:
- Clamp width: ≥40 mm.
 - Clamp height compliant with a 40 mm frame height.
 - Clamp depth: 7-12 mm. (applicable for all CL clamping mounting options at section „2.5 Mounting Options“)
 - Clamps are not in contact with the front glass.
 - Clamps do not deform the frame.
 - Clamps that satisfy the structural requirements based on the conditions of the installation site according to the applicable regulations and technical standards.
 - Long-term stable clamps that securely affix the module to the mounting frame.

Module Orientation Requirements

- 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.



2 PLANNING

2.4 MICROINVERTER PLANNING

Installation Site

The microinverter housing is designed for outdoor installation and complies with the IP67 environmental enclosure rating standard:

NOTE!
IP67 rating definition:

Indoor or outdoor use primarily to provide a degree of protection against hose-directed water, the entry of water during occasional temporary submersion at a limited depth, and damage from external ice formation

The Enphase Q Cable is available in multiple connector spacing options for landscape and portrait orientations to meet varying site requirements. For Enphase Q Cable ordering information, see “Enphase Q Cable Planning and Ordering” on page 44.

Compatibility

The Enphase IQ Series Micros are electrically compatible with PV modules as listed in the following table. For specifications, see “Technical Data” on page 45 of this manual. You can refer to the Enphase Compatibility Calculator at: module-compatibility to verify PV module electrical compatibility. To ensure mechanical compatibility, be sure to order the correct connector type for both microinverter and PV module from your distributor.

WARNING!
Fire risk!

The PV module DC conductors must be labeled "PV Wire" or "PV Cable" to comply with NEC for Ungrounded PV Power Systems.

NOTE!

Some Enphase Microinverters will not begin exporting power until the Envoy is installed and has detected all of the microinverters at the site. In addition, the grid profile may need to be configured and the Envoy must have propagated these settings to the microinverters. For instructions on this procedure, refer to the Envoy Installation and Operation Manual at enphase.com/support.

Grounding Considerations

The IQ Series Micros do not require grounding electrode conductors (GEC) or equipment grounding conductors (EGC). Your Authority Having Jurisdiction (AHJ) may require you to bond the mounting bracket to the racking. If so, use earthing hardware or star washers. The microinverter itself has a Class II double-insulated rating, which includes ground fault protection (GFP). To support GFP, use only PV modules equipped with DC cables labeled PV Wire or PV Cable.

Branch Circuit Capacity

Plan your AC branch circuits to meet the following limits* for maximum number of microinverters per branch when protected with a 20 A over-current protection device (OCPD). For most multiphase installations, use a 3-pole 20 A OCPD. If installing the IQ 7A, use a 3-pole 25 A OCPD.

MAXIMUM* IQ 7+ MICROS PER AC BRANCH CIRCUIT SINGLE-PHASE
13
MAXIMUM* IQ 7+ MICROS PER AC BRANCH CIRCUIT MULTIPHASE
39

NOTE!

*Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

Utility Service Requirements

The Enphase Microinverters work with single-phase or three-phase service. Measure AC line voltage at the electrical utility connection to confirm that it is within range:

SINGLE-PHASE SERVICE	
L1 to N	207 to 253 VAC
THREE-PHASE SERVICE	
L1 to L2 to L3	360 to 440 VAC
L1, L2, L3 to N	207 to 253 VAC

Wire Lengths and Voltage Rise

When planning the system, you must select the appropriate AC conductor size to minimize voltage rise. Select the correct wire size based on the distance from the beginning of the microinverter AC branch circuit to the breaker in the load center. Enphase recommends a voltage rise total of less than 2% for the sections from the microinverter AC branch circuit to the breaker in the load center.

Enphase provides guidance about choosing wire size and maximum conductor lengths in the Voltage Rise Technical Brief at enphase.com/support. Refer to this brief for voltage rise values in Enphase Q Cables and on how to calculate voltage rise in other wire sections of the system.

Standard guidelines for voltage rise on feeder and AC branch circuit conductors might not be sufficient for microinverter AC branch circuits that contain the maximum allowable microinverters. This is due to high inherent voltage rise on the AC branch circuit.

2 PLANNING

2.4 MICROINVERTER PLANNING

NOTE!

Best practice:

Center-feed the branch circuit to minimize voltage rise in a fully-populated branch. This practice greatly reduces the voltage rise as compared with an end-fed branch. To center-feed a branch, divide the circuit into two sub-branch circuits protected by a single OCPD.

Lightning and Surge Suppression

- Enphase Microinverters have integral surge protection, greater than most traditional inverters. However, if the surge has sufficient energy, the protection built into the microinverter can be exceeded, and the equipment can be damaged. For this reason, Enphase recommends that you protect your system with a lightning and / or surge suppression device. In addition to having some level of surge suppression, it is also important to have insurance that protects against lightning and electrical surges.

NOTE!

Protection against lightning and resulting voltage surge must be in accordance with local standards.

Parts and Tools Required

In addition to the microinverters, PV modules, and racking, you will need the following:

Enphase Equipment

- Enphase Envoy-S** gateway required to monitor solar production. For installation information, refer to the Enphase Envoy-S Installation and Operations Manual.
- Enphase Installer Toolkit:** Download the Enphase Installer Toolkit mobile app and open it to log in to your Enlighten account. With this app, you can scan microinverter serial numbers and connect to the Envoy-S to track system installation progress. To download, go to [enphase.com / toolkit](https://enphase.com/toolkit).
- Enphase Q Relay**, single phase (Q-RELAY-1P-INT) or Enphase Q Relay, multiphase (QRELAY- 3P-INT)
- Tie wraps or Cable Clips (ET-CLIP-100)
- Enphase Sealing Caps** (Q-SEAL-10) for any unused drops on the Enphase Q Cable (optional)
- Enphase Terminator** (Q-TERM-R-10 for single phase or Q-TERM-3P-10 for multiphase) One for each AC cable segment end; typically two needed per branch circuit.
- Enphase Disconnect Tool (Q-DISC-10)

- Enphase Q Cable:

CABLE MODEL	CONNECTOR SPACING	PV MODULE ORIENTATION	CONNECTOR COUNT PER BOX
Q-12-10-240	1.3 m	Portrait	240
Q-12-17-240	2.0 m	Landscape (120-cell)	240

NOTE!

Only Enphase connectors / solar cables are permitted.

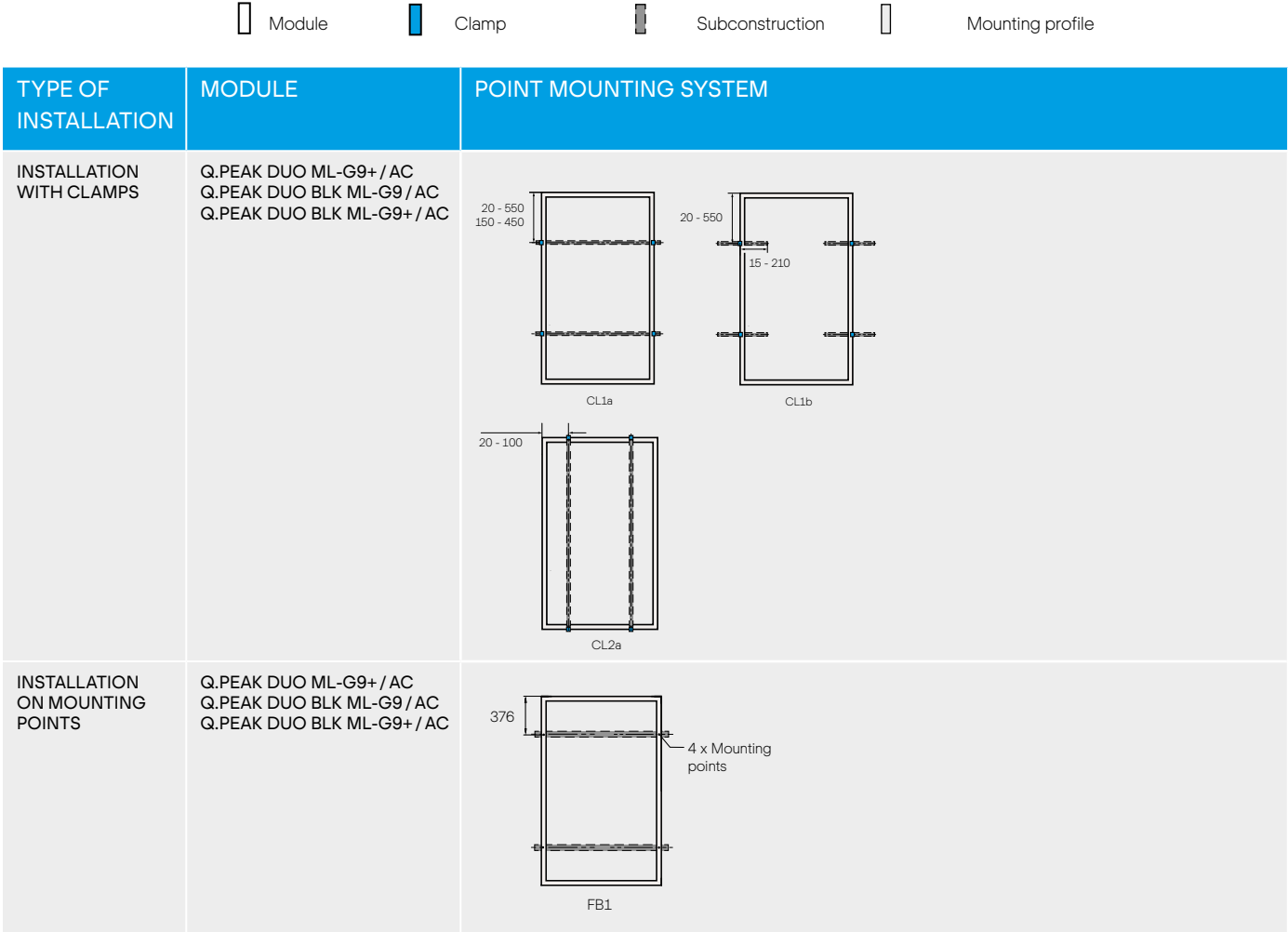
Other Items

- Field Wireable Connectors (Q-CONN-R-10M and Q-CONN-R-10F): optional male and female connectors (optional)
- Tools:
 - Number 2 and 3 screwdrivers
 - wire cutter
 - voltmeter
 - torque wrench
 - sockets and wrenches for mounting hardware

2 PLANNING

2.5 MOUNTING OPTIONS

Fig. 2: Installation options for crystalline Q CELLS modules. All dimensions are given in mm. Also observe the maximum test loads and clamping range as specified on the following page. The illustrated installation options apply for horizontal module orientation.



2 PLANNING

2.5 MOUNTING OPTIONS

Specifications

MOUNTING OPTION	POSITION OF CLAMPS* [MM]	TEST LOAD PUSH / PULL** [PA]	DESIGN LOAD PUSH / PULL** [PA]	SAFETY FACTOR
CL1a	150 - 450	5400 / 4000	3600 / 2660	1.5
FB1	376			
CL1a	20 - 550	2400 / 2400	1600 / 1600	
CL1b	20 - 550			

➔ The below mounting options are only possible under certain conditions.

MOUNTING OPTION	POSITION OF CLAMPS* [MM]	TEST LOAD PUSH / PULL*** [PA]	DESIGN LOAD PUSH / PULL*** [PA]	SAFETY FACTOR
CL2a (with rails)	20 - 100	2400 / 2000	1600 / 1330	1.5

*	Distance between outer edge of module and middle of the clamp; consider further details below.
**	Loads according to IEC 61215-2:2016 and UL 61730.
***	Test procedure according to IEC 61215-2:2016 and UL 61730. Loads for these mounting options do not fulfill the requirements of the standards.

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 Q CELLS listed test load values were determined with the following clamp parameters: clamp width = 40 mm and clamp depth = 10 mm. The system installer is responsible for the determination of location-specific load requirements.

➔

Maintain a minimum distance (clearance) of ≥50 mm between frame bottom edge and roof top.

➔

CL1a at high loads (5400 / 4000 Pa): The clamp position is variable in the given range but the distance between the clamps along the long side of the module (span) must not be larger than 1250 mm.

➔

CL1b: Using of short mounting rails are permissible, if they overlap with the module less than 210 mm.

➔

Ensure, that the subconstruction does not touch the junction box and / or the microinverter (even under load). Ensure that the clamps or insertion profiles etc. do not touch the glass (even under load).

➔

Ensure, that the connection cables of the junction box and / or the microinverter do not run between laminate and mounting rails.

➔

CL1a, CL2a: Ensure that module frame is fixed directly on the rail of the substructure (no spacer allowed between the module and substructure).

➔

Module bends under load. Therefore, sharp objects (e.g. screws) must not be mounted near the module backside.

➔

Unbalanced snow loads (e.g. snow overhangs, snowdrifts) which result in locally significantly increased loads must be removed or avoided by technical measures.

➔

Use M8 corrosion-proof screws and washers (diameter ≥15.8 mm or ≥0.62 in) for FB1 mounting. Mounting screws and washers should have the same material properties.

2 PLANNING

2.6 ELECTRICAL LAYOUT

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).

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.

Module Connection

Detailed information about interconnecting modules are specified in section „9 Appendix“ on page 26.

NOTE!

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

3 INSTALLATION

3.1 SAFETY AND TRANSPORT

→ Ensure that all personnel are aware of and adhere to accident-prevention and safety regulations.

→ While working wear clean gloves.

Danger! Risk of fatal injury due to electric shock!

→ Do not install damaged modules.

→ Inform your distributor of any damages immediately.

→ Inspect the packaging for damages.

→ Contact the transport company regarding any damage to the packaging and follow their instructions.

→ Follow any instructions on the packaging.

Warning! Fire Risk!

→ Do not install modules indoors.

→ Do not install modules on moving objects.

→ Do not use Enphase equipment in a manner not specified by the manufacturer. Doing so may cause death or injury to persons, or damage to equipment.

→ Leave modules in their original packaging until installation.

→ Store the modules securely in cool and dry rooms. The packaging is not weatherproof.

3 INSTALLATION

3.1 SAFETY AND TRANSPORT

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 drop 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 stack modules.

Note! Module damage may occur!

→ Do not install modules near flammable gas / vapors.

→ Do not install modules in close proximity to air conditioning systems.

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.

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.
- ➔ Only use electrical system components approved for wet locations.

Warning! Risk of injury due to falling modules!

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

➔ Do not carry out the installation alone.

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

3 INSTALLATION

3.3 MODULE INSTALLATION

Option 1:

- ➔ Fasten the module with 4 clamps in the specified clamping range, see Fig. 2, p. 13.
- ➔ Tighten clamps according to manufacturer's instructions.

Option 2:

- ➔ Install the module at the 4 mounting points, see Fig. 2, p. 13.
- ➔ Tighten screws according to manufacturer's instructions.

Option 3:

- ➔ Install the module using mounting profiles, see Fig. 2, p. 13.

➔ Maintain an interval of at least 10 mm between two modules along the short side and 5 mm along the long side.


Note! Module damage may occur!

- ➔ Do not subject modules to mechanical tension. Max. torsion 10 mm/m.

NOTE! The Enphase Microinverter Installation Manual can be found in the appendix. Installing the Enphase IQ Microinverter involves several key steps. Each step is listed in detail, please see pages 27-48.

4 ELECTRICAL CONNECTION

4.1 SAFETY




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.
- Electrical work may only be performed by qualified and skilled personnel (see page 3).

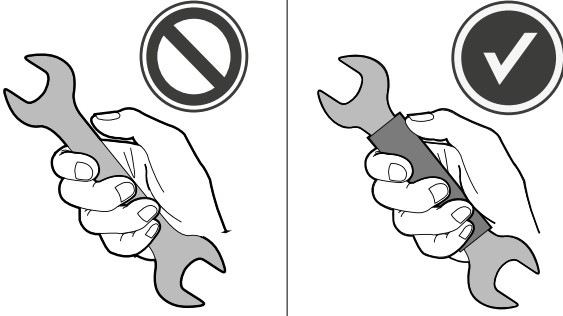
A solar module generates electrical current and voltage even at a low intensity of illumination. Sparks and electric arcs may result from the separation of a closed circuit. These can result in life-threatening injuries. The danger increases when several modules are connected in series.


- 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 safety 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 time intervals specified by Enphase.
- Make sure that the plugs cannot be connected unintentionally.
- Before working on the contacts, check them for safety extra-low voltage.
- Do not exceed the maximum number of microinverters in an AC branch circuit as listed in the manual. You must protect each microinverter AC branch circuit with a 20A maximum breaker or fuse as appropriate.
- Do not connect Enphase Microinverters to the grid or energize the AC circuit(s) until you have completed all of the installation procedures and have received approval from the electrical utility company.
- When the PV array is exposed to light, DC voltage is supplied to the power conversion equipment (PCE).
- The AC and DC connectors on the cabling are rated as a disconnect only when used with an Enphase Microinverter.
- The Enphase Microinverter is not protected from damage due to moisture trapped in cabling systems. Never mate microinverters to cables that have been left disconnected and exposed to wet conditions. This will void Enphase's warranty.



Danger! Risk of fatal injury due to electric shock!

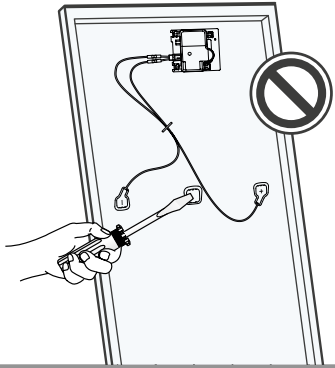
→ Only use dry, insulated tools for electrical work.






Danger! Risk of fatal injury due to electric shock!

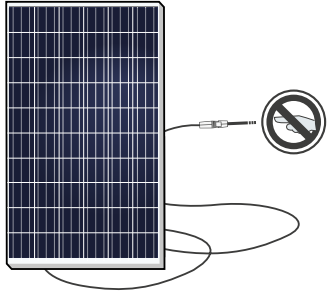
→ Never open the junction box.
→ Do not remove bypass diodes.






Danger! Risk of fatal injury due to electric shock!

→ Never touch live contacts with bare hands.
→ Cover connectors by suitable protective caps until installation.
→ The DC conductors of this photovoltaic system are ungrounded and may be energized.



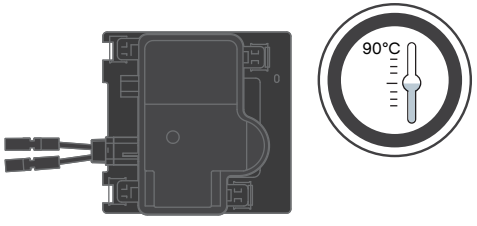
4 ELECTRICAL CONNECTION


4.2 ELECTRICAL INSTALLATION SAFETY



WARNING! Fire Risk!

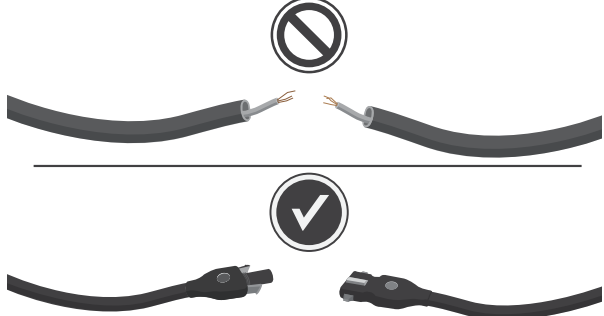
→ The body of the Enphase Microinverter is a heat sink. Under normal operating conditions, the temperature could be 20 °C above ambient, but under extreme conditions the microinverter can reach a temperature of 90 °C. To reduce risk of burns, use caution when working with microinverters.






DANGER! Risk of fatal injury due to electric shock!

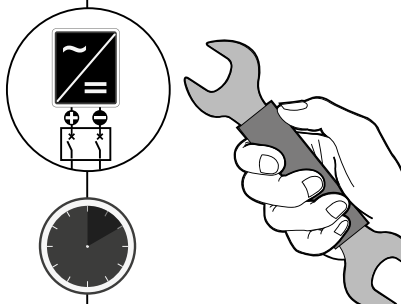
→ Use the terminator to seal the conductor end of the Enphase Q Cable; no other method is allowed.
→ Only connect cables with plugs.






DANGER! Risk of fatal injury due to electric shock!

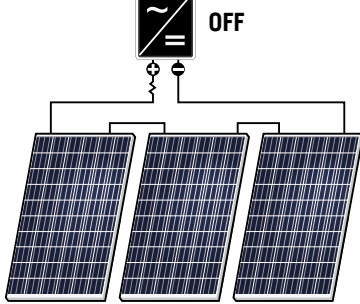
→ Be sure to maintain the time intervals as specified by the inverter manufacturer between switching off the inverter and beginning any further work.





DANGER! Risk of fatal injury due to electric shock!

→ Never plug or unplug the cable when under load. Modules must not carry any current.
→ Switch off the Enphase microinverter, please see section „9 Appendix“ on page 26.



4 ELECTRICAL CONNECTION

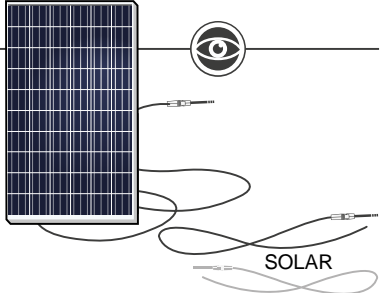
4.3 CONNECTION OF MODULES

!

→ Only use connector and solar cables provided from Enphase (Q Cable, please see page 8).

→ Only interconnect connectors of the same type and manufacturer.

→ Use minimum No. 12 AWG copper wires insulated for a minimum of 90 °C for field connections.

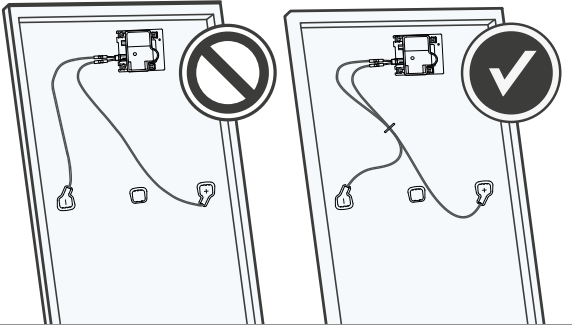


!

Note! Module damage may occur!

→ Ensure that the cabling is not under mechanical stress (Comply with bending radius of ≥60 mm).

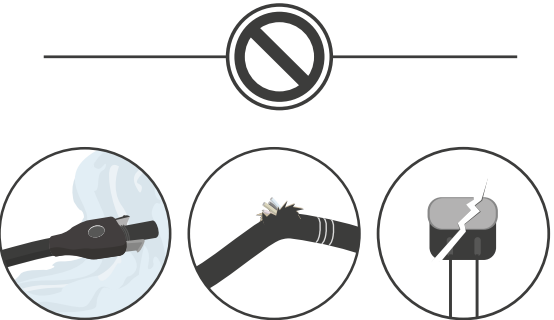
→ Ensure that the cables do not run between module and mounting rail or structure (danger of pinch).



!

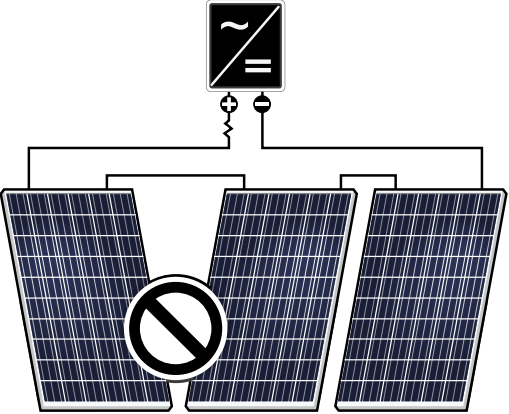
DANGER! Risk of fatal injury due to electric shock!

→ Ensure that all electrical components are in a proper, dry, and safe condition.



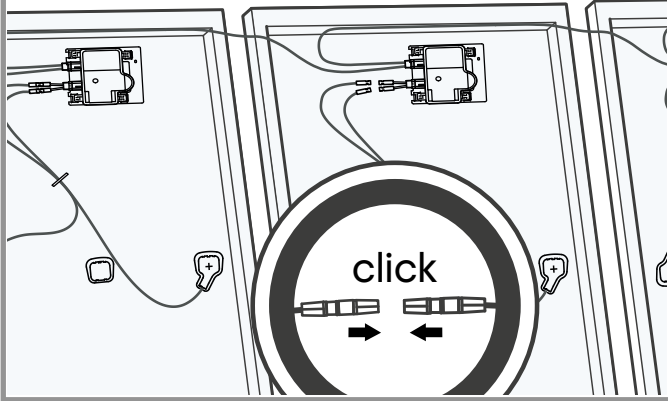
!

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



!

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

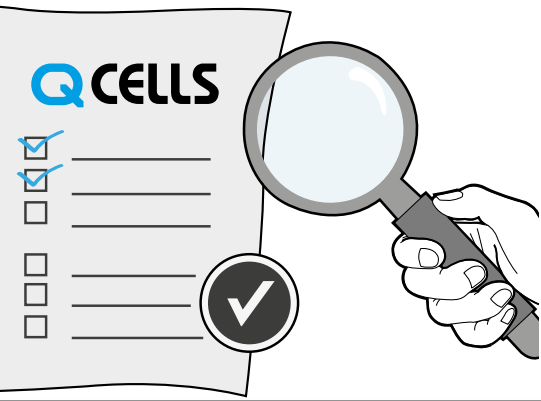


4 ELECTRICAL CONNECTION

4.4 AFTER INSTALLATION

!

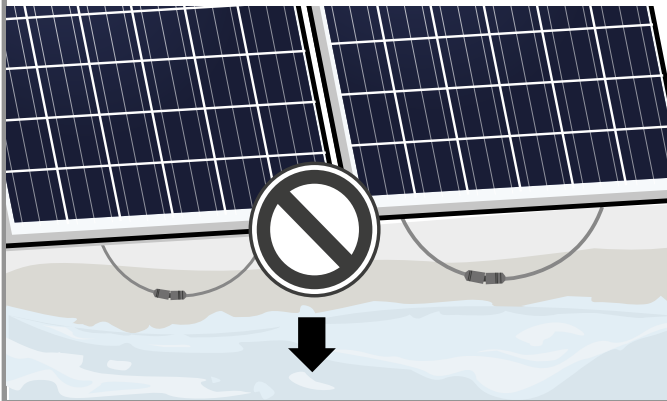
→ Ensure that all necessary safety and functional tests have been carried out according to applicable standards.



!

Note! Module damage may occur!

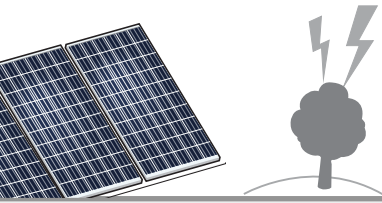
→ Ensure that the plug connections are secured away from any water-channelling surface.



!

→ Integrate the system into the existing lightening protection system in accordance with the applicable local regulations.

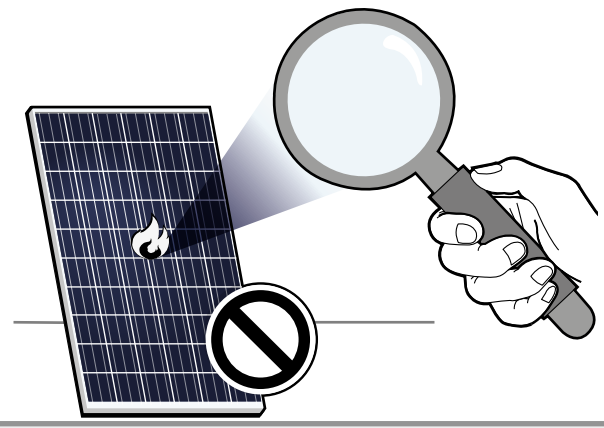
→ The Enphase Microinverter has field-adjustable voltage and frequency trip points that may need to be set, depending upon local requirements. Only an authorized installer with the permission and following requirements of the local electrical authorities should make adjustments.



!

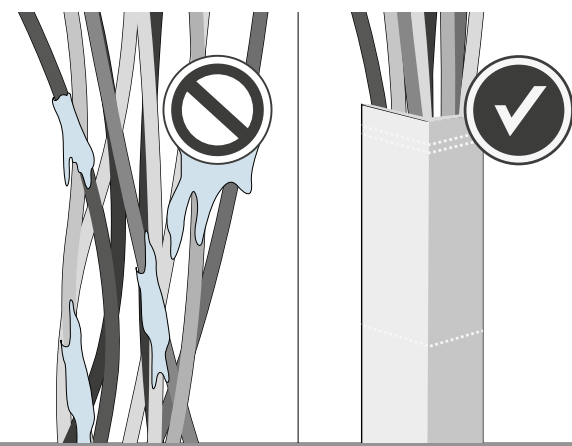
Warning! Fire Risk!

→ Do not use light concentrators (e.g. mirrors or lenses).



!

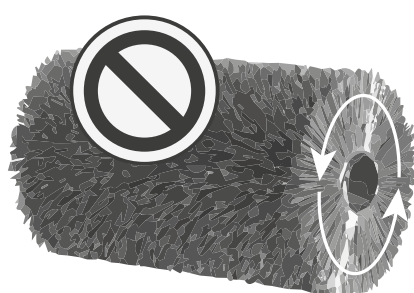
→ Ensure that the cabling is not exposed and / or hanging and is protected from dirt, moisture, sun and mechanical friction.



!


→ No dry cleaning or use of rotating brushes.

→ Modules must be cleaned manually and only with sufficient water.



Protective Grounding

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



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.

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.



NOTE!
Module surface damage may occur!

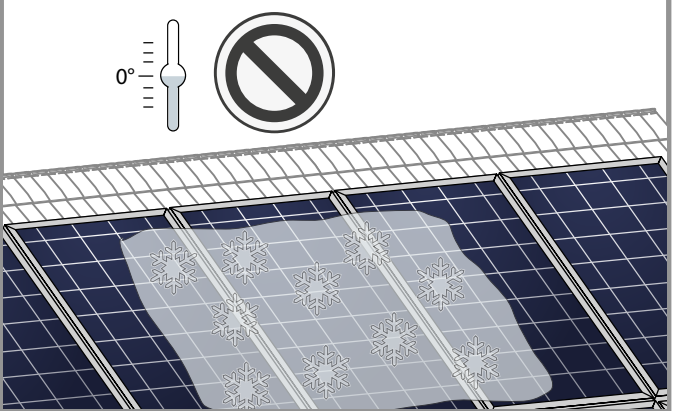
- ➔ Remove snow and ice carefully without force (e.g. with a very soft broom).
- ➔ Do not scratch off dirt.
- ➔ Rinse dirt (dust, leaves, etc.) off with lukewarm water or use an alcohol based glass cleaner. Do not use abrasive detergents or surfactants.
- ➔ Use a soft cellulose cloth (kitchen roll) or 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.



Note! Module damage may occur!


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



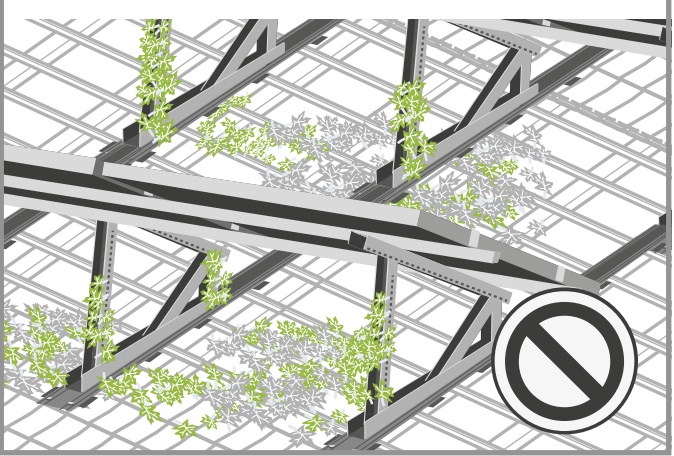


- ➔ Remove dirt with lukewarm water or alcohol based glass cleaner, a broom, or a soft cloth.
- ➔ Do not use surfactants, rotating brushes, scrapers, or any high-pressure water cleaning equipment.





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



Important Safety Information


Read this First


This manual contains important instructions for use during installation and maintenance of the IQ 7™ Series Microinverters.


IMPORTANT: Enphase IQ Series Microinverters require the Q Cable and are not compatible with previous Enphase cabling. An Envoy-S is required to monitor performance of the IQ Microinverters. The Q Accessories work only with Enphase IQ Series Microinverters.


Product Labels


The following symbols appear on the **product label** and are described here:

**WARNING:** Hot surface.

**DANGER:** Refer to safety instructions.





**DANGER:** Risk of electrical shock.

**Refer to manual**

**Double-insulated**


Safety and Advisory Symbols




To reduce the risk of electric shock, and to ensure the safe installation and operation of the Enphase IQ System, the following safety symbols appear throughout this document to indicate dangerous conditions and important safety instructions.

	DANGER:	This indicates a hazardous situation, which if not avoided, will result in death or serious injury.
	WARNING:	This indicates a situation where failure to follow instructions may be a safety hazard or cause equipment malfunction. Use extreme caution and follow instructions carefully.
	WARNING:	This indicates a situation where failure to follow instructions may result in burn injury.
	NOTE:	This indicates information that is very important for optimal system operation. Follow instructions closely.







IQ 7 Series Microinverter Safety Instructions

General Safety





	DANGER: Risk of electric shock. Risk of fire.	Only use electrical system components approved for wet locations.
		Only qualified personnel should install, troubleshoot, or replace Enphase Microinverters or Enphase Q Cable and Accessories.
		Ensure that all AC and DC wiring is correct and that none of the AC or DC wires are pinched, shorted or damaged. Ensure that all AC junction boxes are properly closed.
		Do not exceed the maximum number of microinverters in an AC branch circuit as listed in the manual. You must protect each microinverter AC branch circuit with a 20 A maximum breaker or fuse as appropriate.

	DANGER: Risk of electric shock.	Do not use Enphase equipment in a manner not specified by the manufacturer. Doing so may cause death or injury to persons, or damage to equipment.
		Be aware that installation of this equipment includes risk of electric shock.
		The DC conductors of this photovoltaic system are ungrounded and may be energized.
		Always de-energize the AC branch circuit before servicing. While connectors are rated for disconnect under load, Enphase does not recommend disconnecting the DC connectors under load.
	WARNINGS:	Before installing or using the Enphase Microinverter, read all instructions and cautionary markings in the technical description, on the Enphase equipment and on the photovoltaic (PV) equipment.
		Do not connect Enphase Microinverters to the grid or energize the AC circuit(s) until you have completed all of the installation procedures and have received approval from the electrical utility.
		When the PV array is exposed to light, DC voltage is supplied to the power conversion equipment (PCE).
		Risk of equipment damage. Enphase male and female connectors must only be mated with the matching male/female connector.
	NOTES:	To ensure optimal reliability and to meet warranty requirements, install the Enphase equipment according to the instructions in this manual.
		The AC and DC connectors on the cabling are rated as a disconnect only when used with an Enphase Microinverter.
		Protection against lightning and resulting voltage surge must be in accordance with local standards.
		Perform all electrical installations in accordance with all applicable local electrical codes.

Microinverter Safety

	WARNING: Risk of skin burn.	The chassis of the Enphase Microinverter is the heat sink. Under normal operating conditions, the temperature could be 20° C above ambient, but under extreme conditions the microinverter can reach a temperature of 90° C. To reduce risk of burns, use caution when working with microinverters.
	DANGER: Risk of fire.	The DC conductors of the PV module must be labeled “PV Wire” or “PV Cable” when paired with the Enphase Microinverter.
	DANGER: Risk of electric shock. Risk of fire.	Only qualified personnel may connect the Enphase Microinverter to the utility grid.
	WARNING: Risk of equipment damage	Do not attempt to repair the Enphase Microinverter; it contains no user-serviceable parts. If it fails, contact Enphase customer service to obtain a return merchandise authorization (RMA) number and start the replacement process. Tampering with or opening the Enphase Microinverter will void the warranty.
		Install the microinverter under the PV module to avoid direct exposure to rain, UV, and other harmful weather events. Always install the microinverter bracket side up. Do not mount the microinverter upside down. Do not expose the AC or DC connectors (on the Enphase Q Cable, PV module, or the microinverter) to rain or condensation before the connectors are mated.
		The maximum open circuit voltage of the PV module must not exceed the specified maximum input DC voltage of the Enphase Microinverter.
	WARNING: Risk of equipment damage	You must match the DC operating voltage range of the PV module with the allowable input voltage range of the Enphase Microinverter.
		The Enphase Microinverter is not protected from damage due to moisture trapped in cabling systems. Never mate microinverters to cables that have been left disconnected and exposed to wet conditions. This voids the Enphase warranty.
		The Enphase Microinverter functions only with a standard, compatible PV module with appropriate fill-factor, voltage, and current ratings. Unsupported devices include smart PV modules, fuel cells, wind or water turbines, DC generators, and non-Enphase batteries, etc. These devices do not behave like standard PV modules, so operation and compliance are not guaranteed. These devices may also damage the Enphase Microinverter by exceeding its electrical rating, making the system potentially unsafe.
	NOTES:	The Enphase Microinverter has field-adjustable voltage and frequency trip points that may need to be set, depending upon local requirements. Only an authorized installer with the permission and following requirements of the local electrical authorities should make adjustments.

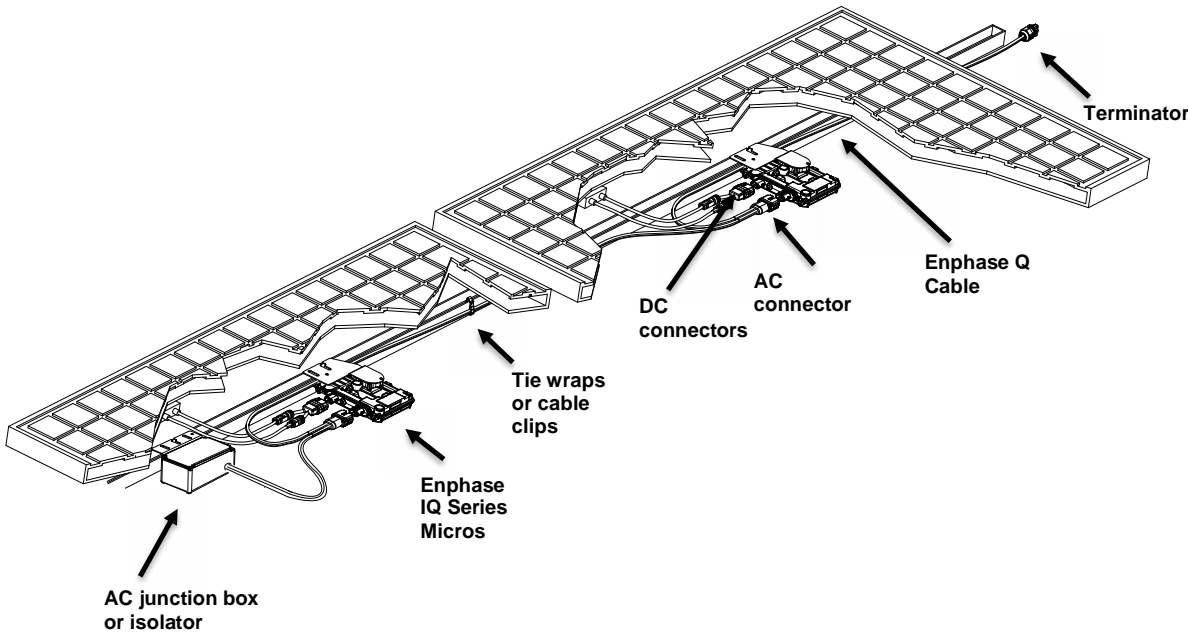
Enphase Q Cable Safety

	DANGER: Risk of electric shock.	Do not install the Enphase Q Cable terminator while power is connected.
	WARNING: Risk of electric shock. Risk of fire.	<p>When stripping the sheath from the Q Cable, make sure the conductors are not damaged. If the exposed wires are damaged, the system may not function properly.</p> <p>Do not leave AC connectors on the Q Cable uncovered for an extended period. You must cover any unused connector with a sealing cap.</p> <p>Make sure protective sealing caps have been installed on all unused AC connectors. Unused AC connectors are live when the system is energized.</p>
	WARNING:	<p>Use the terminator only once. If you open the terminator following installation, the latching mechanism is destroyed. If the latching mechanism is defective, do not use the terminator. Do not circumvent or manipulate the latching mechanism.</p> <p>When installing the Enphase Q Cable, secure any loose cable to minimize tripping hazard.</p>
	NOTES:	<p>When looping the Enphase Q Cable, do not form loops smaller than 4.75" (12 cm) in diameter.</p> <p>Provide support for the Enphase Q-Cable every 1.8m (6 feet).</p> <p>If you need to remove a sealing cap, you must use the Enphase disconnect tool.</p> <p>When installing the Enphase Q Cable and accessories, adhere to the following:</p> <ul style="list-style-type: none">• Do not expose the terminator cap or cable connections to directed, pressurized liquid (water jets, etc.).• Do not expose the terminator or cable to continuous immersion.• Do not expose the terminator cap or cable connections to continuous tension (e.g., tension due to pulling or bending the cable near the connection).• Use only the connectors provided.• Do not allow contamination or debris in the connectors.• Use the terminator cap and cable connections only when all parts are present and intact.• Do not install or use in potentially explosive environments.• Do not allow the terminator to come into contact with open flame.• Fit the terminator cap using only the prescribed tools and in the prescribed manner.• Use the terminator to seal the conductor end of the Enphase Q Cable; no other method is allowed.

Enphase Microinverter Installation

Installing the Enphase IQ Series Micros involves several key steps. Each step listed here is detailed in the following pages.

- Step 1:** Position the Enphase Q Cable
- Step 2:** Position the Junction Box
- Step 3:** Mount the Microinverters
- Step 4:** Prepare the AC Modules
- Step 5:** Create an Installation Map
- Step 6:** Manage the Cabling
- Step 7:** Connect the Microinverters
- Step 8:** Terminate the Unused End of the Cable
- Step 9:** Complete Installation of the Junction Box
- Step 10:** Connect the PV Modules
- Step 11:** Energize the System



Step 1: Position the Enphase Q Cable

- A. Plan each cable segment to allow drop connectors on the Enphase Q Cable to align with each PV module. Allow extra length for slack, cable turns, and any obstructions.
- B. Mark the approximate centers of each PV module on the PV racking.
- C. Lay out the cabling along the installed racking for the AC branch circuit.
- D. Cut each segment of cable to meet your planned needs.



WARNING: When transitioning between rows, secure the cable to the rail to prevent cable damage or connector damage. Do not count on connector to withstand tension.

Step 2: Position the Junction Box

- A. Verify that AC voltage at the site is within range.

Single-Phase Service		Three-Phase Service	
L1 to N	207 to 253 VAC	L1 to L2 to L3	360 to 440 VAC
		L1, L2, L3 to N	207 to 253 VAC (most models) 219 to 264 (IQ 7A models)

- B. Install a junction box at a suitable location on the racking.
- C. Provide an AC connection from the junction box back to the electricity network using equipment and practices as required by local jurisdictions.

Step 3: Mount the Microinverters

- A. If the Enphase DC bulkhead connectors are not already attached to the microinverters, attach them now. Make sure they are fully seated.
- B. **Mount the microinverter bracket side up (as shown) and under the PV module, away from rain and sun.** Allow a minimum of 1.9 cm between the roof and the microinverter. Also allow 1.3 cm between the back of the PV module and the top of the microinverter.



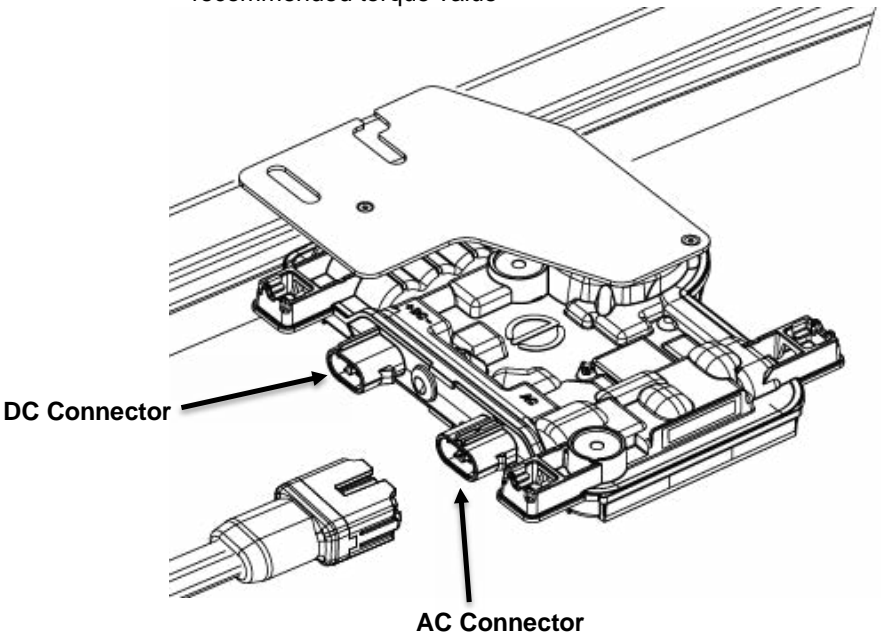
WARNING: Install the microinverter under the PV module to avoid direct exposure to rain, UV and other harmful weather events. Do not mount the microinverter upside down.



WARNING: IQ7A installs are not recommended with bi-facial modules, and use of such may impact the limited warranty.

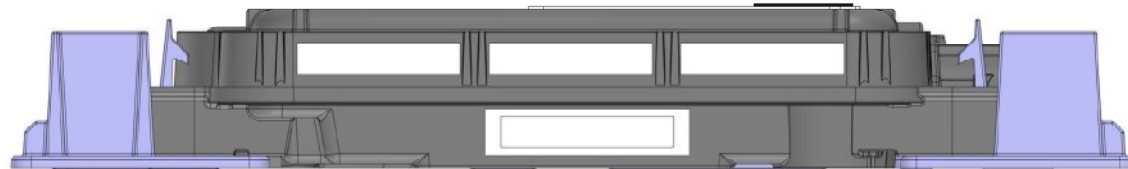
- C. Torque the microinverter fasteners as follows. **Do not over torque.**

- 6 mm mounting hardware: 5 N m
- 8 mm mounting hardware: 9 N m
- When using UL 2703 mounting hardware, use the manufacturer's recommended torque value

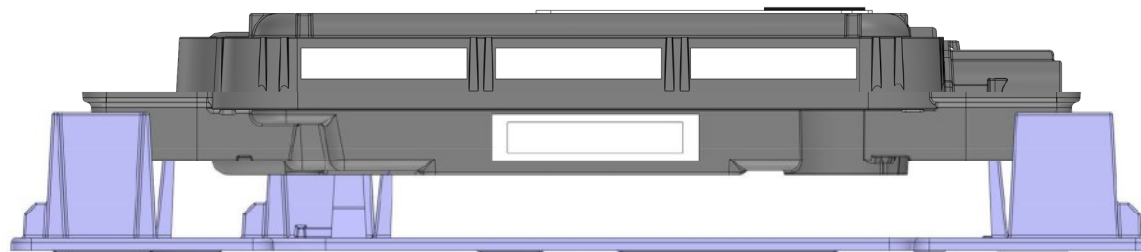


Step 4: Prepare the AC Modules

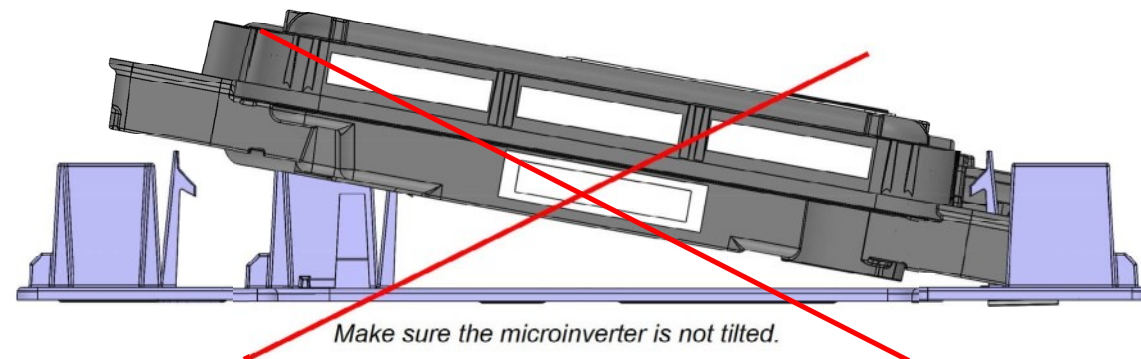
- A. Before installing the AC module, the microinverters must be lifted from the shipping position. On the ground, turn the AC Module so that the microinverter faces you. Using both hands, lift the microinverter up. You will hear four clicks as the microinverter locks into the installation position. Ensure the four latches are locked, and the microinverter is not tilted.



The Microinverter is in the shipping position.



The Microinverter is lifted and ready for installation.



NOTE: If you need to move the module, you can return the microinverter to the shipping position using the Enphase Disconnect Tool. Use the tool to depress the four locking mechanisms on each corner of the microinverter to return it to the shipping position.

- B. Installer has to scan the microinverter Serial Number using the Enphase Installer Toolkit mobile app.
C. Position the AC Modules as planned on the rail.



Use this end of the disconnect tool to depress the locking mechanisms.

Step 5: Create an Installation Map

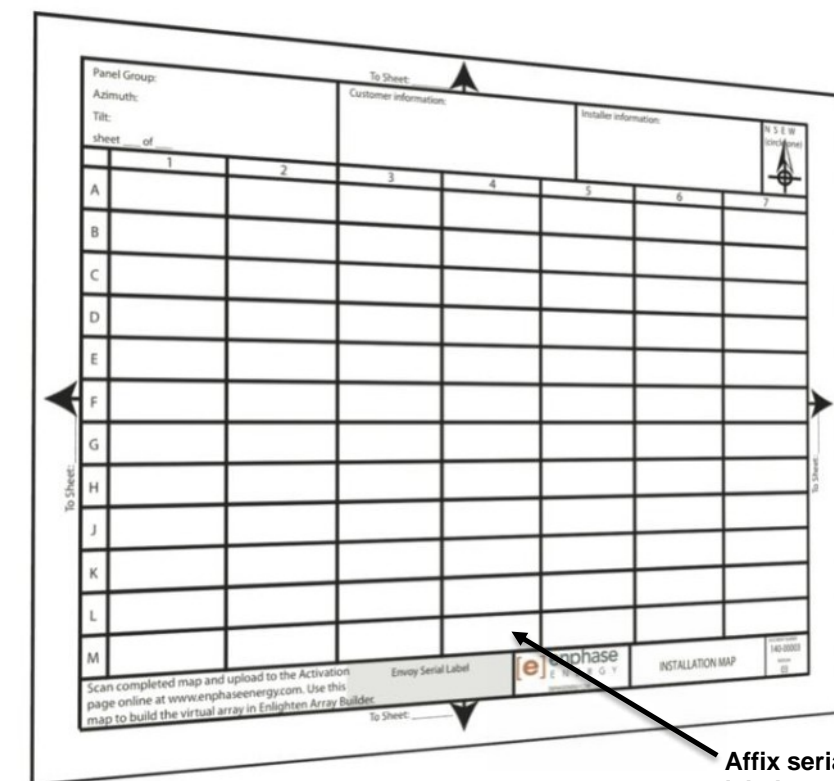
The Enphase Installation Map is a diagram of the physical location of each microinverter in your PV installation. Copy or use the blank map on page 37 to record microinverter placement for the system or provide your own layout if you require a larger or more intricate installation map.

Each Enphase Microinverter, Envoy, and Battery have a removable serial number label. Build the installation map by peeling the serial number labels from the microinverter mounting plates and placing the labels on the map. You will also place the Enphase Envoy-S and IQ Battery serial number on the map after installation.

After you have created the installation map, use the Enphase Installer Toolkit mobile app to record serial numbers and configure the system.

For Installer Toolkit details refer to “Detect the Microinverters” in the help topics of the Installer Toolkit app.

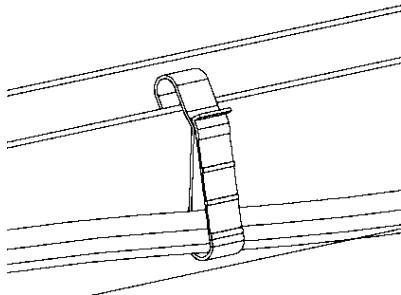
- Peel the removable serial number label from each microinverter and affix it to the respective location on the paper installation map.
- Peel the label from the Envoy-S and any Enphase Battery, if installed) and affix it to the installation map.
- Always keep a copy of the installation map for your records.



Affix serial number labels

Step 6: Manage the Cabling

- A. Use cable clips or tie wraps to attach the cable to the racking. Leave no more than 1.8 m between cable clips or tie wraps.



Cable clip

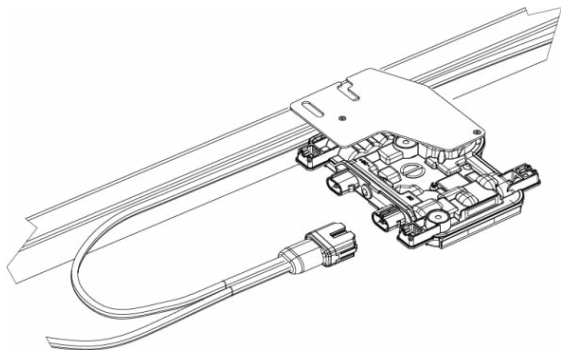
- B. Dress any excess cabling in loops so that it does not contact the roof. Do not form loops smaller than 12 cm in diameter.



WARNING: Tripping Hazard. Loose cables can become a tripping hazard. Dress the Enphase Q Cable to minimize this potential.

Step 7: Connect the Microinverters

- A. Connect the microinverter. Listen for a click as the connectors engage.
- B. Cover any unused connector with Enphase Sealing Caps. Listen for a click as the connectors engage.



WARNING: Risk of electric shock. Risk of fire. Install sealing caps on all unused AC connectors as these connectors become live when the system is energized. Sealing caps are required for protection against moisture ingress.



NOTE: If you need to remove a sealing cap, you must use the Enphase Disconnect Tool. See “Disconnect a Microinverter” on page 23.

Step 8: Terminate the Unused End of the Cable

Terminate the unused end of the Enphase Q Cable as follows:

Single-phase Q Cable	Three-phase Q Cable
<p>A. Remove 13 mm of the cable sheath from the conductors. Use the terminator body loop to measure.</p>	<p>A. Remove 20 mm of the cable sheath from the conductors.</p>
<p>B. Slide the hex nut onto the cable. The grommet inside the terminator body must remain in place.</p>	<p>B. Slide the hex nut onto the cable. The grommet inside the terminator body must remain in place.</p>
<p>C. Insert the cable into the terminator body so that the two wires land on opposite sides of the internal separator.</p>	<p>C. Insert the cable into the terminator body so that the four wires land on separate sides of the internal separator.</p>
<p>D. Insert a screwdriver into the slot on the top of the terminator to hold it in place. Hold the terminator body stationary with the screwdriver and turn only the hex nut to prevent the conductors from twisting out of the separator. Torque the nut to 7.0 Nm.</p>	<p>D. Bend the wires down into the recesses of the terminator body and trim as needed. Place the cap over the terminator body. Insert a screwdriver into the slot on the terminator cap to hold it in place. Rotate the hex nut with your hand or a wrench until the latching mechanism meets the base. Do not over torque.</p>
<p>E. Attach the terminated cable end to the PV racking with a cable clip or tie wrap so that the cable and terminator do not touch the roof.</p>	<p>E. Attach the terminated cable end to the PV racking with a cable clip or tie wrap so that the cable and terminator do not touch the roof.</p>



NOTE: Turn only the hex nut to prevent conductors from twisting out of the separator.



WARNING: The terminator cannot be re-used. If you unscrew the nut, you must discard the terminator.

Step 9: Complete Installation of the Junction Box

- A. Connect the Enphase Q Cable into the junction box.
- B. Refer to the wiring diagrams on page 39 for more information. Q Cable uses the following color code:

Single-Phase	Three-Phase
Brown – L1 Blue – N	Brown – L1 Black – L2 Grey – L3 Blue – N



NOTE: The Q Cable internally rotates L1, L2, and L3 to provide balanced 400 VAC (three-phase), thus alternating phases between microinverters.



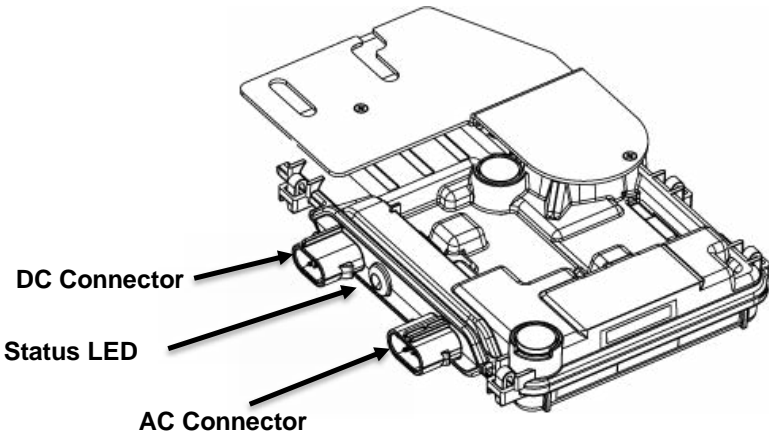
NOTE: Minimise the number of unused Q Cable connectors with three-phase systems. When cable connectors are left unused on a three-phase system, it creates a phase imbalance on the branch circuit. If multiple cable connectors are skipped over multiple branch circuits, the imbalance can multiply.

Step 10: Connect the PV Modules



WARNING: Electrical shock hazard. The DC conductors of this photovoltaic system are ungrounded and may be energized.

- A. Connect the DC leads of each PV module to the DC input connectors of the corresponding microinverter.



- B. Check the LED on the connector side of the microinverter. The LED flashes six times when DC power is applied.
- C. Mount the PV modules above the microinverters.

Step 11: Energize the System

- A. Turn ON the AC disconnect or circuit breaker for the branch circuit.
- B. Turn ON the main utility-grid AC circuit breaker. Your system starts producing power **after a five-minute wait time.**
- C. Check the LED on the connector side of the microinverter:

LED color	Indicates
Flashing green	Normal operation. AC grid function is normal there is communication with the Envoy-S.
Flashing orange	The AC grid is normal but there is no communication with the Envoy-S.
Flashing Red	The AC grid is either not present or not within specification.
Solid Red	There is an active “DC Resistance Low, Power Off Condition.” To reset, see “DC Resistance Low – Power Off Condition” on page 20.

Set Up and Activate Monitoring

Refer to the *Enphase Envoy-S Quick Install Guide* to install the Envoy-S and set up system monitoring and grid management functions. This guide leads you through the following:

- Connecting the Envoy
- Detect devices
- Connecting to Enlighten
- Registering the system
- Building the virtual array



NOTE: When the utility requires a profile other than the profile resident on the microinverter, you must select an appropriate grid profile for your installation. You can set the grid profile through Enlighten, during system registration, or through Installer Toolkit at any time. You must have an Enphase Envoy to set or change the grid profile. For more information on setting or changing the grid profile, refer to the *Enphase Envoy-S Installation and Operation Manual* at enphase.com/support.

Troubleshooting

Follow all the safety measures described throughout this manual. Qualified personnel can use the following troubleshooting steps if the PV system does not operate correctly.



WARNING: Risk of electric shock. Do not attempt to repair the Enphase Microinverter; it contains no user-serviceable parts. If it fails, contact Enphase customer service to obtain an RMA (return merchandise authorization) number and start the replacement process.

Status LED Indications and Error Reporting

The following section describes LED indications.

LED Operation

LED color	Indicates
Flashing green	Normal operation. AC grid function is normal there is communication with the Envoy-S.
Flashing orange	The AC grid is normal but there is no communication with the Envoy-S.
Flashing red	The AC grid is either not present or not within specification.
Solid red	There is an active “DC Resistance Low, Power Off Condition.” To reset, see “DC Resistance Low – Power Off Condition” on page 20.

The status LED on each microinverter lights green about six seconds after DC power is applied. It remains lit solid for two minutes, followed by six green blinks. After that, red blinks indicate that no grid is present if the system is not yet energized.

Any short red blinks after DC power is first applied to the microinverter indicate a failure during microinverter startup.

DC Resistance Low – Power Off Condition

For **all IQ Series models**, a solid red status LED when DC power has been cycled indicates the microinverter has detected a DC Resistance Low – Power Off event. The LED will remain red and the fault will continue to be reported by the Envoy until the error has been cleared.

An insulation resistance (IR) sensor in the microinverter measures the resistance between the positive and negative PV inputs to ground. If either resistance drops below a threshold, the microinverter stops power production and raises this condition. This may indicate defective module insulation, defective wiring or connectors, moisture ingress, or a similar problem. Although the cause may be temporary, this microinverter condition persists until the sensor is manually reset.

An Envoy-S is required to clear this condition. The condition clears on operator command unless its cause is still present.

If a microinverter registers a “DC Resistance Low - Power Off” condition, you can attempt to clear this condition. If the condition does not clear after you perform the following procedure, contact Customer Support at <https://enphase.com/en-us/support/global-contact>.



There are two ways to send a clear message to the microinverter. Note that the condition will not clear after sensor reset if the cause of the failure is still present. If the condition persists, contact your installer or Enphase for possible replacement.

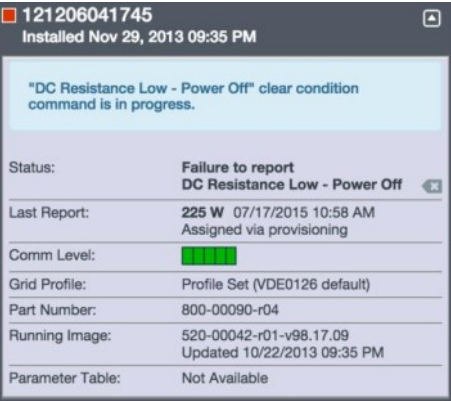
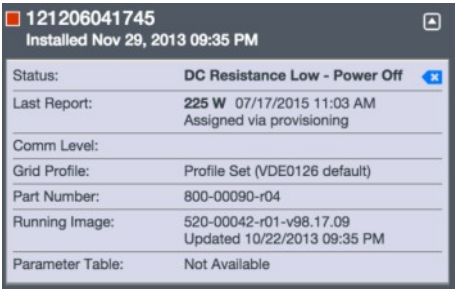
Method 1: Clear this Error Using Enlighten

- Log in to Enlighten and access the system.
- Click the **Events** tab. The next screen shows a current “DC Resistance Low - Power Off” condition for the system.
- Click **DC Resistance Low - Power Off**.
- Where “n” is the number of affected devices, click **n devices (show details)**.
- Click the serial number of the affected microinverter.
- Click **Reset DC Resistance Low - Power Off Sensor**.
The system displays, “A DC Resistance Low- Power Off reset task was issued on [date and time] for this microinverter and is still pending.”

Method 2: Use Installer Toolkit to Clear the Condition

On the list of detected microinverters, a green dot or red square appears to the left of each microinverter serial number. A green dot indicates Status OK. A red square indicates an event for that microinverter.

- Tap the  to the left of the serial number to view details for a microinverter event.
- If the microinverter status shows that there is an active **DC Resistance Low – Power Off** condition, tap the  to send the clear message to the affected microinverter. The app then indicates that a clear message was sent.



Other Faults

All other faults are reported to the Envoy. Refer to the *Enphase Envoy-S Installation and Operation Manual* at enphase.com/support for troubleshooting procedures.

Troubleshoot an Inoperable Microinverter

To troubleshoot an inoperable microinverter, follow the steps in the order shown.



WARNING: Risk of electric shock. Always de-energize the AC branch circuit before servicing. Never disconnect the DC connectors under load.



WARNING: The Enphase Microinverters are powered by DC power from the PV modules. Make sure you disconnect the DC connections and reconnect DC power and then watch for the solid green about six seconds after connection to DC power.

- A. Make sure AC breakers and disconnects are closed.
- B. Check the connection to the utility grid and verify that the utility voltage is within allowable ranges.
- C. Verify that AC line voltages at all solar power circuit breakers at the load center and subpanels are within the ranges shown in the following table.
- D. Verify that AC line voltage at the junction box for each AC branch circuit at the site is within range:

Single-Phase Service		Three-Phase Service	
L1 to N	207 to 253 VAC	L1 to L2 to L3	360 to 440 VAC
		L1, L2, L3 to N	207 to 253 VAC (most models) 219 to 264 (IQ 7A models)

- D. Using an Enphase disconnect tool, disconnect the AC cable for the microinverter in question from the Enphase Q Cable.
- E. Verify that utility power is present at the microinverter by measuring line to line and line to ground at the Enphase Q Cable connector.
- F. Visually check that the AC branch circuit connections (Enphase Q Cable and AC connections) are properly seated. Reseat if necessary. Check also for damage, such as rodent damage.
- G. Make sure that any upstream AC disconnects, as well as the dedicated circuit breakers for each AC branch circuit, are functioning properly and are closed.
- H. Disconnect and re-connect the DC PV module connectors. The status LED of each microinverter will light solid green a few seconds after connection to DC power and then blink green six times to indicate normal start-up operation about two minutes after connecting to DC power. The LED subsequently resumes normal operation if the grid is present. See page 20 for normal LED operation.
- I. Attach an ammeter clamp to one conductor of the DC cables from the PV module to measure microinverter current. This will be under one amp if AC is disconnected.
- J. Verify the PV module DC voltage is within the allowable range shown in “Specifications” on page 28 of this manual.
- K. Swap DC leads with a known good, adjacent PV module. If after checking Enlighten periodically (this may take up to 30 minutes), the problem moves to the adjacent module, this indicates that the PV module isn’t functioning correctly. If it stays in place, the problem is with the original microinverter. Contact [Enphase Customer Support](#) for help in reading the microinverter data and for help in obtaining a replacement microinverter, if needed.
- L. Check the DC connections between the microinverter and the PV module. The connection may need to be tightened or resealed. If the connection is worn or damaged, it may need replacement.
- M. Verify with your utility that line frequency is within range.
- N. If the problem persists, contact Customer Support at <https://enphase.com/en-us/support/global-contact>.

Disconnect a Microinverter

If problems remain after following the troubleshooting steps listed previously, contact Customer Support at <https://enphase.com/en-us/support/global-contact>.

If Enphase authorizes a replacement, follow the steps below. To ensure the microinverter is not disconnected from the PV modules under load, follow the disconnection steps in the order shown:

- A. De-energize the AC branch circuit breaker.
- B. Enphase AC connectors are tool-removable only. To disconnect the microinverter from the Enphase Q Cable, insert the disconnect tool and remove the connector.
- C. Cover the PV module with an opaque cover.
- D. Using a clamp-on meter, verify there is no current flowing in the DC wires between the PV module and the microinverter. If current is still flowing, check that you have completed steps one and two above.



NOTE: Take care when measuring DC current as most clamp-on meters must be zeroed first and tend to drift with time.

- E. Disconnect the PV module DC wire connectors from the microinverter using the Enphase disconnect tool.
- F. If present, loosen and/or remove any bonding hardware.
- G. Remove the microinverter from the PV racking.





WARNING: Risk of electric shock. Risk of fire. Do not leave any connectors on the PV system disconnected for an extended period. If you do not plan to replace the microinverter immediately, you must cover any unused connector with a sealing cap.


Install a Replacement Microinverter

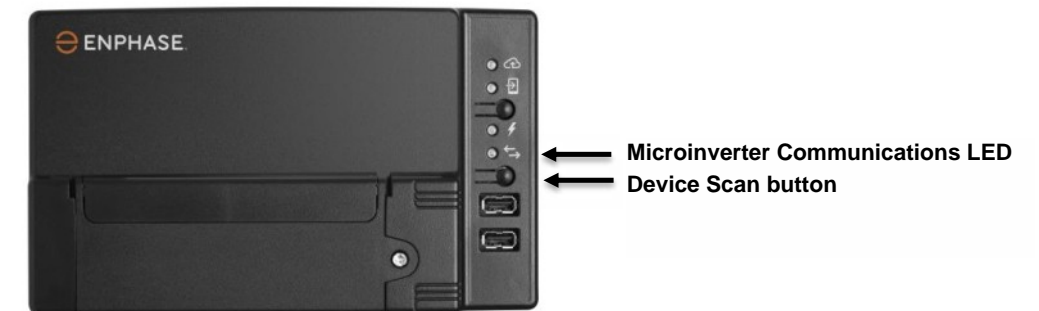
- A. When the replacement microinverter is available, verify that the AC branch circuit breaker is de-energized.
- B. Mount the microinverter bracket side up and under the PV module, away from rain and sun. Allow a minimum of 1.9cm between the roof and the microinverter. Also allow 1.3cm between the back of the PV module and the top of the microinverter



WARNING: Risk of equipment damage. Mount the microinverter under the PV module.

- Install the microinverter under the PV module to avoid direct exposure to rain, UV, and other harmful weather events.
 - Always install the microinverter bracket side up.
 - Do not mount the microinverter upside down.
 - Do not expose the AC or DC connectors (on the Enphase Q Cable connection, PV module, or the microinverter) to rain or condensation before the connectors are mated.
- C. Torque the mounting fasteners to the values shown. **Do not over torque.**
 - 6 mm mounting hardware: 5 N m
 - 8 mm mounting hardware: 9 N m
 - When using earthing mounting hardware, use the manufacturer's recommended torque value
 - D. If you are using bonding hardware, the old bonding hardware should be discarded, and new bonding hardware must be used when installing the replacement microinverter.
 - E. Connect the microinverter to the Q Cable connector. Listen for a click as connectors engage.
 - F. Connect the DC leads of each PV module to the DC input connector of the microinverter.
 - G. Re-mount the PV module above the microinverter.
 - H. Energize the AC branch circuit breaker and verify operation of the replacement microinverter by checking the Status LED on the connector side of the microinverter.
 - I. Use the Installer Toolkit mobile app to delete the old microinverter serial number from the Enphase Envoy-S database. In Installer Toolkit, once connected to the Envoy:
 - a. Tap **Micros > Manage**.
 - b. Tap the checkbox  to the right of the microinverter serial number replaced.
 - c. Tap  to delete the microinverter from the Envoy-S database.

- J. Add the new microinverter serial number to the Envoy database by initiating a device scan using one of the following methods:
 - a. **Method 1: Initiate a scan using the Installer Toolkit mobile app**
 - In Installer Toolkit, once connected to the Envoy-S, navigate to the Overview screen.
 - From the Overview screen, tap **Detected > Start Device Scan** to start a new 30-minute device scan.
 - If device scanning on the Envoy-S is inhibited, the app displays **Scan Inhibited**. If you need to add more microinverters to the system when device scanning is inhibited on the Envoy-S, you must use the Installer Toolkit scanning tool to provision them on the Envoy-S, rather than using the Envoy-S's device scanning function to discover them. If this is not possible and you need to enable device scanning on the Envoy-S, contact Customer Support at <https://enphase.com/en-us/support/global-contact>.
 - b. **Method 2: Use an Envoy-S**
 - Press the **Device Scan** button on the Envoy-S. The Envoy-S begins a 15-minute scan to identify all of the microinverters deployed at the site. The Microinverter Communications LED  flashes green during the scan.



- K. Log in to Enlighten to use Enlighten's Array Builder to add the newly detected microinverter to the virtual array.
- L. Ship the old microinverter to Enphase using the supplied return-shipping label.

Ordering Replacement Parts

Replacement adaptors for the Microinverter include:

- **Q-DCC-2:** Cable Assembly, DC adaptor to MC-4
- **Q-DCC-5:** Cable Assembly, DC adaptor to Amphenol UTX

These parts are available from your Enphase distributor.

Enphase Q Cable Planning and Ordering

The Enphase Q Cable is a continuous length of double insulated, outdoor-rated cable with integrated connectors for microinverters. These connectors are preinstalled along the Q Cable at intervals to accommodate varying PV module widths. The microinverters plug directly into the cable connectors.

The Q Cble is compatible with many PV racking systems. For a list of approved PV racking systems, see the PV Racking Compatibility document on the Enphase website at enphase.com/support.

Connector Spacing Options

Q Cable is available in three connector spacing options. The gap between connectors on the cable can be 1.3 meters, 2.0 meters, or 2.3 meters. The 1.3 meter spacing is best suited for connecting PV modules installed in portrait orientation, while the 2.0 meter and 2.3 meter spacing allows you to install 60-cell and 72-cell PV modules in landscape orientation, respectively.

Cabling Options

Ordering options include:

Cable Model	Connector spacing	PV module orientation	Connector count per box
Q-25-10-240 / Q-25-10-240-A*	1.3m	Portrait	240
Q-25-17-240 / Q-25-17-240-A*	2.0m	Landscape (60-cell)	240
Q-25-20-200 / Q-25-20-200-A*	2.3m	Landscape (72-cell)	200

* Models with "-A" designation for use only in Australia and New Zealand.

The Cabling System is flexible enough to adapt to almost any solar design. To determine the cable type, you need, apply the following considerations:

- When mixing PV modules in both portrait and landscape orientation, you may need to transition between cable types. See the preceding table for available cable types.
- To transition between cable types, install a Field Wireable connector pair.
- In situations where portrait modules are widely spaced, you may need to use landscape spaced cables for the portrait-oriented PV modules and create loops of excess cable, if needed.



WARNING: Do not form loops smaller than 12 cm (4.75") in diameter.

Enphase Q Cable Accessories

The Enphase Q Cable is available with several accessory options for ease of installation, including:

- Raw Q Cable:** (Q-25-RAW-300 / Q-25-RAW-300-A) Length 300 meters. Raw cable with no connectors.
- Field Wireable connectors** (male): (Q-CONN-R-10M) Make connections from any open female Q connector or Field Wireable female connector
- Field Wireable connectors** (female): (Q-CONN-R-10F) Make connections from any Q Cable open connector or Field Wireable male connector
- Cable clips:** (E-CLIP-100) Used to fasten cabling to the racking or to secure looped cabling
- Disconnect Tool:** (Q-DISC-10) Disconnect tool for Q Cable connectors, DC connectors, and AC module mount
- Q Cable sealing caps** (female): (Q-SEAL-10) One needed to cover each unused connector on the cabling
- Terminator:** (Q-TERM-R-10) Terminator cap for cut cable ends

Technical Data

Technical Considerations

Be sure to apply the following when installing the Enphase IQ-Series Micro System:



WARNING: Risk of equipment damage. You must match the DC operating voltage range of the PV module with the allowable input voltage range of the Enphase Microinverter.



WARNING: Risk of equipment damage. The maximum open circuit voltage of the PV module must not exceed the specified maximum input voltage of the Enphase Microinverter.

- PV modules must have conductors labeled "PV Wire" or "PV Cable" to comply with NEC for Ungrounded PV Power Systems.
- Verify that the voltage and current specifications of the PV module match those of the microinverter.
- The maximum short circuit current rating of the PV module must be equal to or less than the maximum input DC short circuit current rating of the microinverter.

The output voltage and current of the PV module depends on the quantity, size and temperature of the PV cells, as well as the insolation on each cell. The highest PV module output voltage occurs when the temperature of the cells is the lowest and the PV module is at open circuit (not operating).

Compliance Data

Anti-Islanding

Enphase IQ 7 Series Microinverters use the following anti-islanding functions:

- Rate of Change of Frequency (RoCoF)
- Vector Shift
- Harmonic injection (soon to be replaced by VAR injection)

PQ Capability Curve

If needed, Enphase IQ 7 Series Microinverters have the capability to absorb or inject reactive power, provided that current and voltage ratings are not exceeded. Below is an active power (P) capabilities curve relative to reactive power (Q) related to the power rating in the operating voltage range for Enphase IQ 7 Series.

- Maximum power factor (pf) adjustability = -0.8 to +0.8
- Reactive power capability = $\pm 50\%$ (over / under excited) Provision or absorption of reactive energy



Enphase Installation Map

To sheet / Vers la page / Al foglio / Zu Blatt / Naar pagina: _____

Panel Group / Groupe de modules / Gruppo di moduli / Modulgruppe / Modulegroep:
Azimuth / Azimut:
Tilt / Inclinaison / Inclinazone / Neigungswinkel / Helling:
sheet / page / foglio / Blatt / pagina _____ / _____

Client / Cliente / Kunde / Cliënt: _____


Installer / Installateur / Installatore: _____

N S E W / N S E O
N S O W / N Z O W

	1	2	3	4	5	6	7
A							
B							
C							
D							
E							
F							
G							
H							
J							
K							

To sheet / Vers la page / Al foglio / Zu Blatt / Naar pagina: _____

Envoy serial label /
étiquette de numéro de série /
etichetta di serie Envoy /
Serien Nummer / Label seriennummer: _____

 **ENPHASE.**
ENPHASE.COM

INSTALLATION MAP / PLAN D'INSTALLATION
MAPPA INSTALLAZIONE / INSTALLATIONSPLAN
INSTALLATIE KAART

To sheet / Vers la page / Al foglio / Zu Blatt / Naar pagina: _____

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INSTALLATION AND OPERATION MANUAL SOLAR MODULES Q.PEAK DUO ML-G9.X/AC – Q CELLS

Sample Wiring Diagram – single-phase:

NOTE: The IQ 7 Micro and the IQ 7+ Micro have integrated ground (earth) and double insulation, so no GEC or EGC is required. Verify that the DC circuit is isolated and insulated from ground (earth) and meets local requirements.

NOTE: The IQ 7 Micros or 13 IQ 7+ Micros, or 12 IQ 7X Micros per 230 AC branch circuit, must be within acceptable range (207 to 253 VAC).

IMPORTANT: Make sure to measure the line-to-neutral voltage at the electrical utility connection prior to installing any solar equipment. The voltages for the 230 VAC rated microinverters must be within acceptable range (207 to 253 VAC).

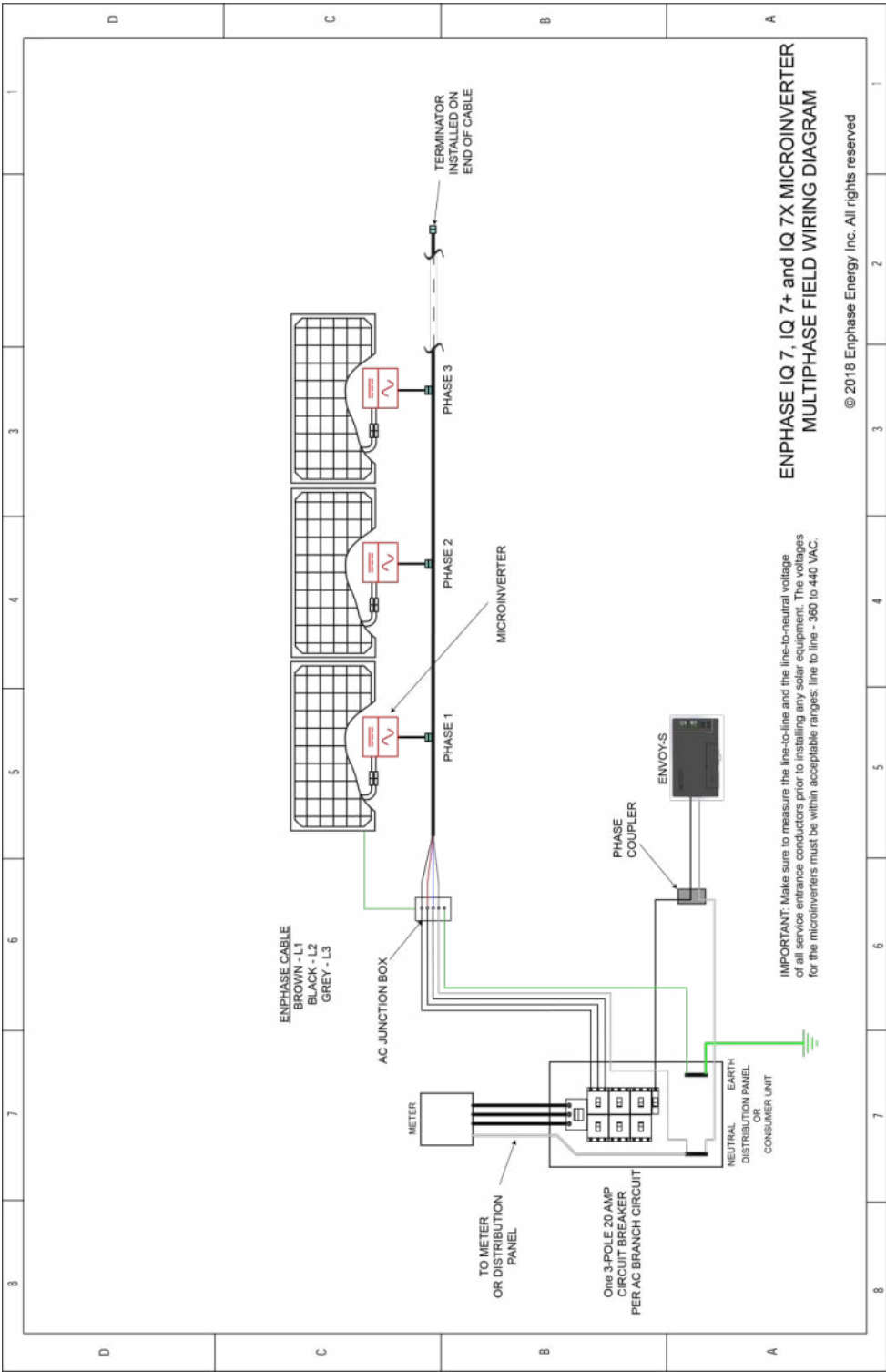
ENPHASE IQ 7 and IQ 7+ MICROINVERTER
FIELD WIRING DIAGRAM

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INSTALLATION AND OPERATION MANUAL SOLAR MODULES Q.PEAK DUO ML-G9.X/AC – Q CELLS

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Sample Wiring Diagram – multiphase:



HANWHA Q CELLS GMBH

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