



Smart Modules Installation Guide

For Europe and APAC

Version 2.1

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The images contained in this document are for illustrative purposes only and may vary depending on product models.

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This equipment has been tested and found to comply with the limits applied by the local regulations.

These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, you are encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance may void the user's authority to operate the equipment.

Version History

- Version 2.1 (November 2022)
 - Updated module types table.
- Version 2.0 (November 2022)
 - New module type supported: Smart Half-Cut 54 Cell Mono PERC Module.
- Version 1.9 (June 2022)
 - Added a list of module types and production numbers.
 - Reorganized the mechanical installation section.
 - Improved generic module images.
 - The Module Wiring illustrations now reflect the S-Series Power Optimizers.
- Version 1.8 (August 2021)
 - Removed suffixes from model numbers.
 - Changed Mechanical load to Test load.
 - Added SPV370-R60JWMG and SPV375-R60JWMG.
 - Removed descriptions of vertical installations.
- Version 1.7- (July 2021)
 - Updated PV module installation three rails section.
 - Updated production numbers and module dimensions for SPVxxx-R60DWMG / SPVxxx-R60DBMG.
 - Added support for Aalex mounting systems for SPVxxx-R60DWMG and SPVxxx-R60DBMG modules.
 - Removed references to PVxxx-60MMJ modules.
- Version 1.6 - (December 2020)
 - Removed step in Mapper Application and added PV module installation three rails section.
- Version 1.5 - (September 2020)
 - Add PV Modules: SPVxxx-R60DWMG / SPVxxx-R60DBMG.
- Version 1.4 - (July 2020)
 - Add to Chapter 3 Electrical Installation - Modules Wiring.

- Version 1.3 - (March 2020)
 - Modified Chapter 2 Mechanical Installation.
 - Add Chapter 4 - Reporting and Monitoring Installation Data.
- Version 1.2 - (March 2020)
 - Modified Chapter 2 Mechanical Installation - Adding Smart Module Half-cut Cell Mono PERC Module with Integrated Power Optimizer.
 - Modified Technical Specifications - Adding Smart Module Half-cut Cell Mono PERC Module with Integrated Power Optimizer.
- Version 1.1 - (September 2019)
 - Added Appendix A - Module Mechanical and Electrical Rating is STC.
 - Modified Technical Specifications for Europe.
- Version 1.0 - (November 2018) initial release

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Important Safety Instructions

SAVE THESE INSTRUCTIONS

General Safety

NOTE

- Consult and follow local codes and other applicable laws concerning required permitting as well as installation & inspection requirements, rules, and regulations.
- Modules and PV systems should be installed by authorized and qualified personnel.
- Follow all safety precautions of all components used in the system.
- Long periods of shading on the modules surface from the sun can result in cell power dissipation and overheating.
- Do not clean the glass surface with chemicals.
- Do not drop the PV module or drop objects onto the module.
- Do not attempt to disassemble the modules, and do not remove any attached components from the modules.
- Do not scratch or otherwise harm the back sheet, the glass or the junction box. Do not pull or twist the cables or touch them with bare hands.
- Do not drill holes in the frame or scratch the insulating coating of the frame.
- Keep the module packed in the package until installation.
- Do not use modules near equipment or in places where gases, liquids or other flammable materials may be generated.
- External or otherwise artificially concentrated sunlight shall not be directed onto the front or back face of the module.



Installation Safety

NOTE

- Wear protective head gear, insulating gloves, safety shoes, and insulated tools when installing the modules.
- Do not install the modules in rain, snow, or otherwise wet or windy conditions.
- Modules may be covered with an opaque material during module installation and wiring to reduce risk of charge buildup and electrical shocks or burns.
- When mating connectors, make sure they are firmly connected.
- Due to the risk of electrical shock, do not perform any work if the junction box is wet.
- Do not touch the junction box and the end of output connectors with bare hands.
- Do not unplug the connectors under load.
- It is recommended not to work alone.
- Wear a safety belt if working far above the ground.
- Do not wear metallic jewelry, which can cause electric shock, while installing or troubleshooting the PV system.
- Follow the safety regulations for any and all other system components, including wires, connectors, charging regulators, batteries, inverters, etc.
- The cables must be protected from direct sunlight and away from areas of water collection.
- Do not damage the surrounding modules or mounting structure when replacing a module.
- Do not change any module components (diode, junction box, plug connectors, etc.).



NOTE

- When installing the modules on a roof, it is recommended to install over a fireproof and insulating roof covering.
- Do not touch connectors and modules while the system is on.
- Do not stand, walk, drop or put objects on the module.
- Damaged modules (broken glass, torn back sheet, broken junction box, broken connectors, etc.) can be electrical hazards as well as laceration hazards. Contact with damaged module surfaces or module frame can cause electric shock. In such cases, remove the damaged module from array and contact the supplier for disposal instructions.
- Do not block draining holes. When working above ground level, wear a safety belt.
- Avoid use of sharp objects and tools that might damage the module.



Chapter 1: Introduction

This document provides detailed instructions and safety information regarding the installation, electrical connection, and maintenance of SolarEdge smart modules. Integrated with power optimizers, these high-performance modules are based on Smart Half-cut Cell Mono PERC technology. The module is powered by high-efficiency cells providing an effective solution for lowering the cost of the power produced over time in large and small PV systems.

The document provides installation instructions for the listed modules:

Module Type	Model Numbers	Clamping Instructions
Smart 60 cell Mono PERC Module	SPVxxx-60MMJ	See page 14
Smart Half-cut 60 Cell Mono PERC Module	SPVxxx-R60JWVG	See page 14
	SPVxxx-R60LWVG	See page 16
	SPVxxx-R60LBVG	See page 16
	SPVxxx-R60DWVG	See page 18
	SPVxxx-R60DBVG	See page 18
Smart Half-cut 54 Cell Mono PERC Module - White/Black	SPVxxx-R54JWML	See page 14
	SPVxxx-R54DBML	See page 14
	SPVxxx-R54DWML	See page 14

All instructions, mechanical and electrical requirements should be read and understood before attempting installation.

When installing the module, installers must conform to all safety precautions detailed in this guide.

Limitation of Liability

Because the use of this manual and the conditions or methods of installation, operation, use and maintenance of photovoltaic (PV) products are beyond SolarEdge control, SolarEdge does not accept responsibility and expressly disclaims liability for loss, damage, or expense arising out of or in any way connected with such installation, operation, use or maintenance. SolarEdge reserves the right to change the manual without prior notice.

Modules rated for use in this application class may be used in systems operating at greater than 50V DC or 240W, where general contact access is anticipated. Modules

qualified for safety through IEC 61730-1 and this part of IEC 61730 within this application class are considered to meet the requirements for safety class II.

Where common grounding hardware (nuts, bolts, star washers, split-ring lock washers, flat washers, etc.) is used to attach a listed grounding/bonding device, the attachment must be made in conformance with the grounding device manufacturer's instructions.

Chapter 2: Mechanical Installation

Installation Considerations and Environmental Conditions

The Smart Modules shall be installed under the following conditions:

- Ambient temperature: -40 to 85 °C.
- Maximum installation altitude: 3000m.
- To maintain the modules' Class C fire rating, the fire class of the roof and building materials should be higher than Class C. The fire safety rating of this module is valid only when mounted in the manner specified in the mechanical mounting instructions.
- Do not install modules at locations that come in direct contact with water collections, salt water or any aggressive environmental condition.
- Modules should be installed no closer than 50m/164ft to the shoreline of the ocean or any other saline environment, as long as there is no direct contact from salt water splashes or spray on the module.
- Do not install the modules near flames or flammable materials or locations with hazardous materials.
- You can use the Aelex mounting system for the SPVxxx-R60DWMG and SPVxxx-R60DBMG range of modules. For more information refer to <https://aelex.nl/>.

Installation Method

Use the following guidelines when installing the Smart module:

- Do not make any modifications to the module frame.
- Clamping material should be anodized aluminum alloy or stainless steel.
- Each module must be securely fastened at a minimum of four points on two opposite sides with clamps positioned symmetrically.
- Modules placed on rails, can either be positioned on the long or short side of the module frame.

Module Clamp Location and Mechanical Load Thresholds

Depending on the module type, it may be positioned and clamped to the mounting rails in one of two arrangements. The schematic illustrations in *Figure 1* and *Figure 2* show the positioning of the module with respect to the mounting rails. The schematics also indicate the clamping range, **B** and **C**, for each arrangement. *Table 1* lists the module types, their dimensions, clamping range values and provides the tested mechanical load thresholds for each module type.

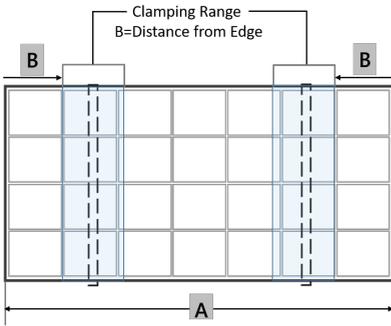


Figure 1: Mounting rails located perpendicular to the module's long side

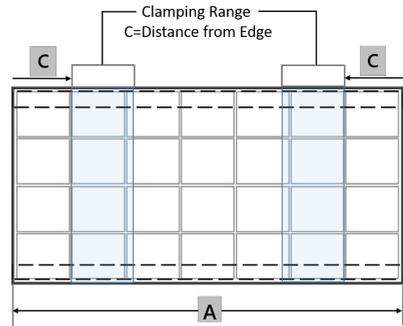


Figure 2: Mounting rails located beneath the module's long side

Table 1 lists the Module Types and their dimensions, clamping range and provides the mechanical load thresholds for each module type.

Module Type	Series Dimension	A	Clamping Range (mm)	Front Load	Rear Load
SPVxxx-60MMJ	1650*992*40 mm	1650 mm	$200 \leq B \leq 410$	5400 Pa	3600 Pa
SPVxxx-R60JWMG	1755*1038*40 mm	1755 mm	$284 \leq B \leq 594$	3600 Pa	2400 Pa
SPVxxx-R60LWMG	1776*1052*40 mm	1776 mm	$340 \leq B \leq 550$	5400 Pa	2400 Pa
			$410 \leq C \leq 490$		
SPVxxx-R60LBMG	1776*1052*40 mm	1776 mm	$340 \leq B \leq 550$	5400 Pa	2400 Pa
			$410 \leq C \leq 490$		
SPVxxx-R60DWMG	1755*1038*40 mm	1755 mm	$284 \leq B \leq 594$	3600 Pa	2400 Pa
SPVxxx-R60DBMG	1755*1038*40 mm	1755 mm	$284 \leq B \leq 594$	3600 Pa	2400 Pa
SPVxxx-R54JWML	1722*1134*30 mm	1722 mm	$380 \leq B \leq 480$	5400 Pa	2400 Pa
SPVxxx-R54DWML	1708*1134*30 mm	1708 mm	$292 \leq B \leq 391$	5400 Pa	2400 Pa
SPVxxx-R54DBML	1708*1134*30 mm	1708 mm	$292 \leq B \leq 391$	5400 Pa	2400 Pa

Table 1: module dimensions, clamping range and mechanical load thresholds

Clamping the Smart Module SPVxxx-60MMJ / SPVxxx-R60JWMG / SPVxxx-R54xxxx

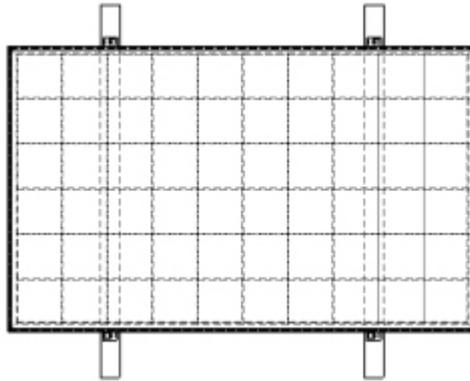


Figure 3: Connecting SPVxxx-60MMJ/SPVxxx-R60JWMG/SPVxxx-R54xxxx modules using clamps on the long side of the frame

Attach each aluminum mounting clamp with an M8 bolt, a plain washer, a spring washer, and an M8 nut. Use at least 4 clamps to fasten the modules to the supporting rails.

NOTE

Make sure to use clamps with the following properties:



The dimensions for the middle clamps are: $a \geq 40$ mm, $b \geq 26$ mm, $c = 8$ mm, $d \geq 28$ mm, and $\varnothing = 9$ mm (See *Figure 4*).

The recommended torque for tightening the bolts and nuts is 28 N*m when the bolts and nuts have property is Class 8.8.

► To fasten the module:

1. Place the module on two or three supporting rails (not provided). The rails should be made from stainless material or treated with an anti-corrosion process (e.g. anodic oxidation treatment).
2. If the rail does not have grooves compatible with M8 bolts, suitable holes should be drilled for securing the module frame.
3. Secure each clamp by attaching a plain washer, spring washer, and nut, in that order. The clamp must overlap the module frame by at least 5mm.
4. Close -ups of the middle clamps and the side clamps are indicated in *Figure 4* and *Figure 5*.

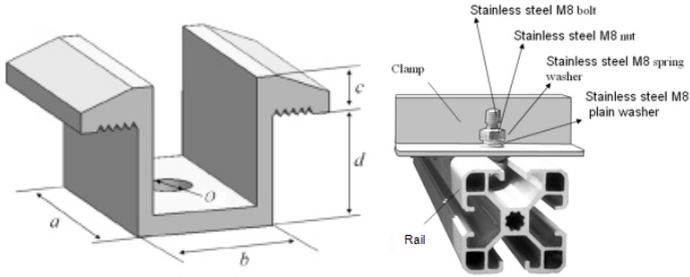
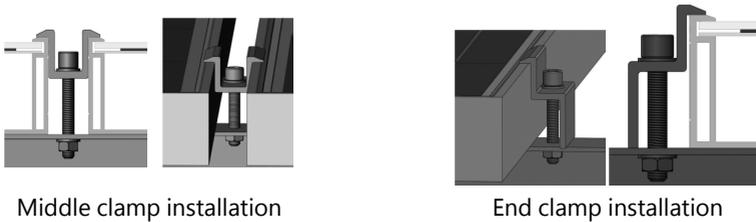


Figure 4: Middle clamps (left) and side clamps (right) of modules SPVxxx-60MMJ / SPVxxx-R60JWMG



Middle clamp installation

End clamp installation

Figure 5: End clamp and middle clamp installation of modules SPVxxx-60MMJ / SPVxxx-R60JWMG

5. For mounting the supporting rails on the long side of the frame, slide bolts through the rail grooves next to the 4 clamp locations. The module may be clamped only in the permitted clamping range.

For exact frame clamping locations refer to area B in *Figure 1* and the Clamping Range as indicated in *Table 1*.

Clamping the Smart Module SPVxxx-R60LWMG / SPVxxx-R60LBMG

Modules can be placed on the long side of the frame (See *Figure 6*).

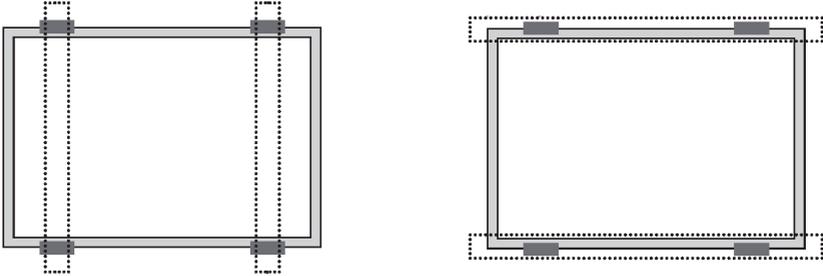


Figure 6: Connecting the SPVxxx-R60LWMG / SPVxxx-R60LBMG modules by clamps to a frame

Attach each aluminum mounting clamp with an M8 (5/16") bolt, nut (See *Figure 7*).

Tightening torque should be within 17~23 Nm (12.5~17.0 ft-lbs) coarse thread bolts.

Secure each clamp by attaching a plain washer, spring washer, and nut, in that order, see *Figure 8*

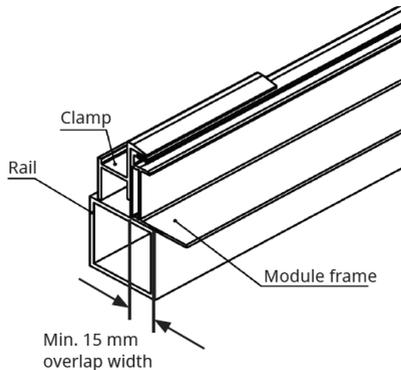


Figure 7: Attaching mounting clamp to modules SPVxxx-R60LWMG / SPVxxx-R60LBMG

- Ensure the clamps overlap the module frame by at least 5 mm (0.2 in).
- Ensure the clamps overlap length is at least 40 mm (1.57 in).
- Ensure the clamp's thickness is at least 3 mm (0.12 in).

NOTE



For configurations where the mounting rails run parallel to the frame, precautions should be taken to ensure the bottom flange of the module frame overlaps the rail by 15 mm (0.59 in) or more.

► **To fasten the module:**

1. Place the module on two supporting rails (not provided). The rails should be made from stainless material or treated with an anti-corrosion process (e.g. anodic oxidation treatment).
2. If the rail does not have grooves compatible with M8 bolts, suitable holes should be drilled for securing the module frame.
3. Secure each clamp by attaching a plain washer, spring washer, and nut, in that order.

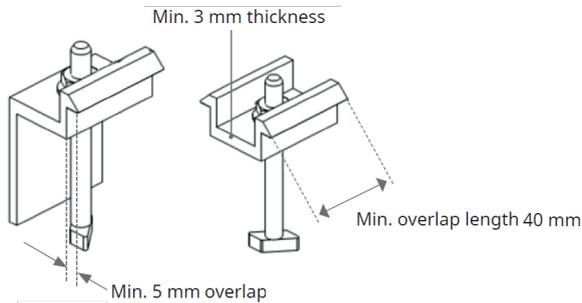


Figure 8: Clamping the SPVxxx-R60LWMG / SPVxxx-R60LWMG modules

4. For mounting the supporting rails on the frame, slide bolts through the rail grooves next to the four clamp locations. Clamp positions are of crucial importance for the reliability of the installation. The clamp center lines must only be positioned within the ranges indicated in *Figure 1*, *Figure 2*, and *Table 1*, depending on the configuration and load.

Clamping the Smart Module SPVxxx-R60DWMG/ SPVxxx-R60DBMG

Clamping the modules

Modules can be placed on rails, either on the long side of the frame or on the short side of the frame.

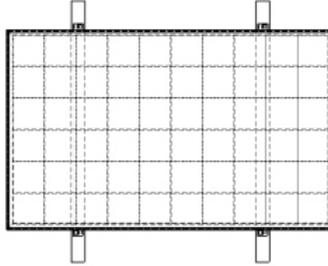
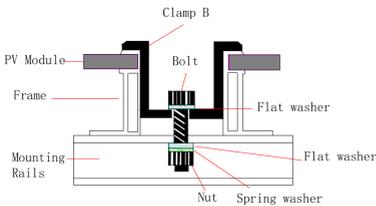


Figure 9: Clamping the long side of modules SPVxxx-R60DWMG / SPVxxx-R60DBMG

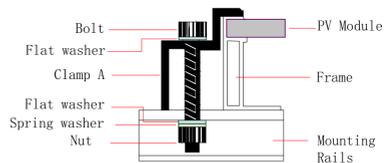
Attach each aluminum mounting clamp with an M8 bolt, flat washers and a spring washer. At least 4 clamps should be used to fasten the modules on the supporting rails.

► **To fasten the module:**

1. Place the module on two supporting rails (not provided). The rails should be made from stainless material or treated with an anti-corrosion process (e.g., anodic oxidation treatment).
2. If the rails do not have grooves compatible with M8 bolts, suitable holes should be drilled for securing the module frame.
3. Secure each clamp by placing a flat washer under the bolt head and a flat and spring washer under the nut. The clamp must overlap the module frame by at least 7mm but not more than 12mm. (Figure 10).



Middle clamp installation



End clamp installation

Figure 10: Installation of middle and end clamps of modules SPVxxx-R60DWMG / SPVxxx-R60DBMG

4. For mounting the supporting rails on the long side of the frame, slide bolts through the rail grooves next to the 4 clamp locations. The module may be clamped only in the permitted clamping range.

For the permitted location of the clamps on the long side of module frame, refer to *Figure 1* and *Table 1*.

Chapter 3: Electrical Installation

Details for electrical installation in accordance with the IEC61730-1.

Installation

- The maximum system voltage of the Smart Module.

P/N	Maximum System Voltage
SPVxxx-60MMJ	1000V
SPVxxx-R60LBMG	
SPVxxx-R60DWMG	
SPVxxx-R60JWMG	
SPVxxx-R60DBMG	
SPVxxx-R60LWMG	
SPVxxx-R54JWML	
SPVxxx-R54DWML	
SPVxxx-R54DBML	

- The power optimizers regulate the string voltage at a constant level, regardless of string length and environmental conditions.
- Under normal conditions, a module might produce more current and/or voltage than reported at standard test conditions⁽¹⁾. The requirements of the National Electrical Code (NEC) in Article 690 shall be followed to address these increased outputs. In installations not under the requirements of the NEC, the values of I_{sc} and V_{oc} marked on this module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor capacities, over current device ratings, and size of controls connected to the PV output.
- Each series-connected string of modules shall be provided with the maximum series overcurrent protective device, specified as 15A for the Smart Module 60-cell Mono PERC module with Integrated Power Optimizer series and 20A for the Smart Module Half-cut Cell Mono PERC Module with Integrated Power Optimizer series.

⁽¹⁾Standard Test Conditions (STC): 1000 W/m², cell temperature 25°C, air mass AM 1.5

- Use a cable with a cross section of 4 mm² (12AWG) that can withstand the maximum possible system open-circuit voltage and make sure that all connections are safe and tight.
- The cable minimum bending radius should be 43 mm.
- Bypass diodes are included in module junction boxes to avoid decreased module performance. Check the relevant specifications for the specific diodes of the junction box.
- For the smart module electrical data and temperature coefficients, refer to the technical specification sections in this manual.

Grounding

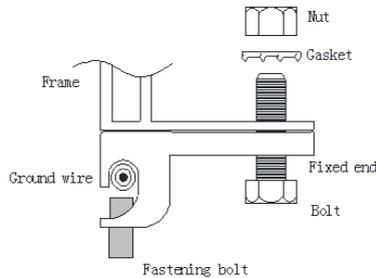


Figure 11: Grounding the aluminum frame with a copper wire

- Use the marked 5.5 mm grounding holes to ground the anodized aluminum frame. Use an M5 nut, an M5 gasket, and an M5 bolt, fastening bolt and a ground wire. All nuts, bolts, and gasket should be made of stainless steel. See *Figure 11*.
- Secure the ground wire on fixed end through fastening bolt (note that the copper wire cannot be attached directly to the aluminum).
- Insert the bolt through the fixed end and then through the hole in the aluminum frame.
- Add the gasket and nut on the other side of the bolt and tighten to secure all parts. The tightening torque should be $2.1 \pm 0.1 \text{ N} \cdot \text{m}$.

Module Wiring

When planning PV modules installation, consider cable lengths on the roof and other facets, extension cables and branch cables if requested.

Before powering up the inverter, verify that the wiring cross sections are correct. Ensure that the measured open circuit Voltage (Voc) and short-circuit current (Isc) do not exceed the specifications.

If modules have been pre-installed but the string has not been connected to the inverter yet, the module connectors should be connected to each other or kept covered to avoid dust and moisture penetration inside the connectors.

NOTE



To minimize electromagnetic interference (EMI), make sure to minimize the distance between the positive and negative DC cables.

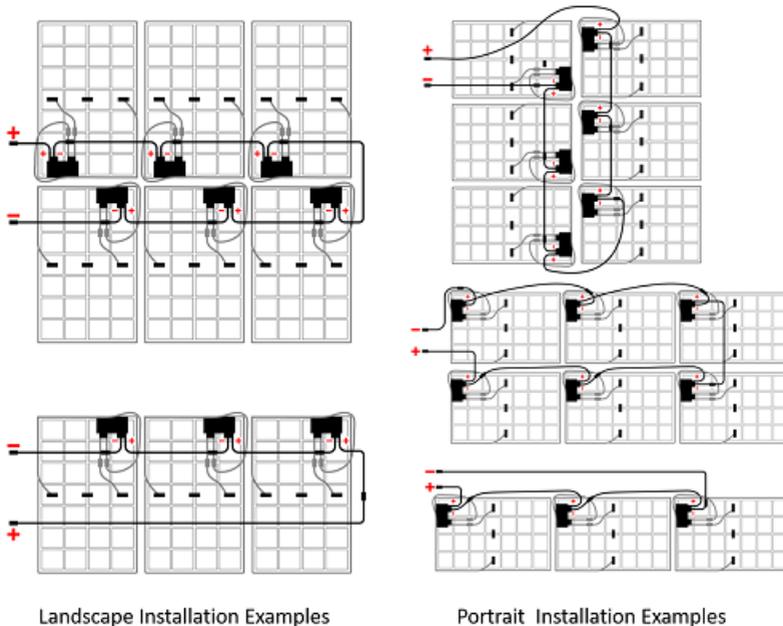


Figure 12: Wiring Schemes of PV modules

Chapter 4: Reporting and Monitoring Installation Data

The Monitoring Platform

The monitoring platform provides enhanced PV performance monitoring and yield assurance through immediate fault detection and alerts at the module, string and system level.

Using the platform, you can:

- View the latest performance of specific components.
- Find under-performing components, such as modules, by comparing their performance to that of other components of the same type.
- Pinpoint the location of alerted components using the physical layout.

The monitoring platform enables accessing site information, including up-to-date information viewed in a physical or logical view:

- **Logical Layout:** Shows a schematic tree-layout of the components in the system, such as: inverters, strings, modules, meters, and sensors, as well as their electrical connectivity. This view enables you to see which modules are connected in each string, which strings are connected to each inverter, and so on.
- **Physical Layout:** Provides a bird's eye view of the actual placement of modules in the site and allows pinpoint issues to the exact location of each module on a virtual site map.

If you do not report the mapping of the installed power optimizers, the monitoring platform will show the logical layout indicating which power optimizers are connected to which inverter, but will not show strings or the physical location of power optimizers.

The monitoring platform includes a built-in help system, that guides you through the monitoring functionality.

For more information, refer to <https://www.solaredge.com/products/pv-monitoring#/>.



Creating Logical and Physical Layout using Installation Information

To display a logical layout after the inverter was installed, insert the inverter serial number in the new site created in the monitoring platform. When the communication between the inverter and the monitoring server is established, the logical layout is displayed.

To display a physical layout, you need to map the locations of the installed modules or power optimizers. To map the locations, use one of the methods described in the next sections.

Designer

Designer recommends inverter and power optimizer selection per site size and enables report generation. You can create a project in Designer and export the site design with the string layout to the monitoring platform.

For more information, refer to <https://www.solaredge.com/products/installer-tools/designer#/>.



Mapper Application

Use the Mapper smart phone application to create a virtual map of a PV site for enhanced monitoring and easier maintenance. To start creating a virtual map, scan the smart module's 2D bar-code located on the front of the module.

The Mapper application is integrated with the monitoring platform and enables:

- Simple on-site registration of new systems.
- Creating, editing and verifying system physical layout.
- Scanning and assigning the module and power optimizer serial numbers in the system physical layout.

For detailed information, refer to the *Mapper* demo movies:

- [Scanning a smart panel using the SolarEdge Mapper App](#)



Upon scanning the smart module or the power optimizer, the Mapper activates a dedicated mapping process to ensure that the power optimizer inputs are assigned to their module(s). You can approve each input assignment separately.

Physical Layout Editor

If you are a registered installer, access the monitoring platform site creation page at <https://monitoring.solaredge.com/solaredge-web/p/home#createSites>



If you have not yet signed up, go to <https://monitoring.solaredge.com/solaredge-web/p/createSelfNewInstaller>



Fill out all required information in the screen, which includes information about your installation, as well as details about its logical and physical mapping. Fill out the Physical Layout Template (downloadable from the SolarEdge website <http://www.solaredge.com/files/pdfs/physical-layout-template.pdf>) using the detachable 2D barcode stickers on each power optimizer.



Once the form is completed, use the Mapper to scan the 2D codes and create the map in the monitoring platform. Optionally, you can send the sticker sheet to SolarEdge Support for physical layout creation.

Chapter 5: Maintenance

Solar PV modules are generally cleaned naturally by rain. In particularly dry areas or where panel tilt is minimal, dust and other substances, such as bird droppings, can build up over time and impact on the amount electricity generated by a module.

NOTE



Dirt can cause a 7.5% to 10% degradation in performance – cleaning the modules regularly results in better system performance.

- Regularly carry out a visual inspection for dirt, dust, bird dropping, leaves, and other detritus covering the module. Inspection frequency will be determined according to the environmental conditions in your area.
- If there is a build-up of dirt or dust on the module surface, wash the module with clean non-heated water and a gentle implement (a sponge for example).
- If there is snow, use a soft-bristled brush to clean the surface of the modules.
- Regular dish soap is allowed
- Clean your PV modules on an overcast day, early in the morning or in the evening. If the sun is beating down on the panels, any water used can quickly evaporate and dirt will become smeared.
- To remove oil stains, use isopropyl alcohol as a spot-cleaning substance.
- Use safety gear if the modules are being washed from the roof and not from the ground.
- Never use harsh chemicals (e.g. bleach) on the surface of the module.
- Never use high pressure stream of water to avoid damaging the PV module surface.
- Never use abrasive tools or metal objects that could scratch PV glass.
- Do not step on the PV modules.
- Regular electrical and mechanical inspection by a licensed professional will keep the system safe and operating at optimal efficiency.

NOTE



Perform a regular electrical and mechanical inspection by a licensed professional will keep the system safe and operating at optimal efficiency.

Support Contact Information

If you have technical problems concerning SolarEdge products, please contact us:



<https://www.solaredge.com/service/support>

Before contact, make sure to have the following information at hand:

- Model and serial number of the product in question.
- The error indicated on the SetApp mobile application, LCD screen, on the monitoring platform, or by the LEDs, if there is such an indication.
- System configuration information, including the type and number of modules connected and the number and length of strings.
- The communication method to the SolarEdge server, if the site is connected.
- The product's software version as it appears in the ID status screen.

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