# *Installation Instructions*


# *Single-Phase PV Systems*

## *Silhouette Modules*

*Solahart PV Systems must be installed and serviced by a suitably qualified person.*

⚠ **Warning:** For continued safety of this PV System, it must be installed, operated and maintained in accordance with these instructions and the installation guide supplied with the PV inverter.

⚠ **Caution:** Only qualified and accredited personnel should perform work on PV systems, such as design, installation, commissioning, maintenance and repairs. Be sure to follow the safety instructions for all system components. It is also important to observe relevant local codes and regulations for health and safety and accident prevention.

**Only Solahart parts and Solahart approved parts may be used. No substitute parts may be used without prior approval from Solahart Industries Pty Ltd. Only parts supplied by Solahart Industries Pty Ltd are covered by the Solahart warranty.**

**The warranty can become void if safety devices are tampered with or if the installation is not in accordance with these instructions.**

# CONTENTS

# OVERVIEW

The following installation instructions detail installation procedures for photovoltaic modules, power optimizers, inverter, module racking systems and balance of system (BOS) components.

Prior to the installation of any grid connected PV system, a Site Visit shall be performed in accordance with the Clean Energy Council's "Grid-Connected Solar PV Systems - Design Guidelines for Accredited Installers".

**SAFETY REQUIREMENTS**

The voltages and currents produced by a single module or modules connected in series (voltages added together) or in parallel (currents added together) can be dangerous.

Although module DC plug connectors are insulated to provide touch safe protection, the following points must be observed when handling modules in order to avoid the risk of sparking, fire hazard, burn risk, and lethal electric shocks:

- Exercise extreme caution when wiring modules and look out for damaged or split cable ends.
- Do not perform wiring work in rainy or damp conditions.
- Never insert metallic or otherwise conductive objects into plugs or sockets.
- Ensure that all electrical connections are completely dry and free from contaminants before they are assembled.
- Ensure that connections are tight and correctly made.
- Keep all materials, tools and work areas clean and dry.
- Do not connect any exposed cable ends. Do not touch poles at the same time.
- Always use appropriate safety equipment such as insulated tools and wear personal protective equipment such as insulated gloves.
- Solar modules produce current when exposed to sunlight. It is recommended that the system is shielded with an opaque cover during installation, maintenance or repair work.

The installation shall not be carried out alone.

**INSTALLER RESPONSIBILITIES**

The installer is solely responsible for:

- Observing and conforming to all relevant Australian Standards, all relevant Clean Energy Council Accreditation guidelines and all applicable laws, ordinances, regulations, codes of practice and local or national building codes, including any that may have superseded these Installation Instructions.
- Ensuring that the installation complies with AS/NZS 3000, AS/NZS 5033, AS/NZS 1170.2, AS/NZS 1562.1, AS 4777.1, AS/NZS 1768, AS/NZS 3008, AS 2050 and any relevant electrical service and installation rules for the state or territory where the system is installed.
- Ensuring that the PV System and associated components are appropriate for the particular installation and the installation environment.
- Ensure the system is integrated into any existing lightning protection system in accordance with the applicable local regulations.
- Ensuring that the roof, roof rafters, battens, purlins, connections, and other structural support members can support the total assembly under building live load conditions. The roof on which the PV system is to be installed must have the capacity to resist the combined Design Dead Load and Live Load at each mounting point.
- Ensuring only parts supplied by Solahart Industries and installer supplied parts as specified by Solahart Industries are utilised (substitution of parts may void the warranty and invalidate certification).
- Ensuring that lag screws have adequate pull-out strength and shear capacities to suit the installation.
- Maintaining the waterproof integrity of the roof, including selection of appropriate flashing.
- Ensuring safe installation of all electrical aspects of the PV system.

**DISCLAIMER OF LIABILITY AND WARRANTY**

Solahart assumes no responsibility for loss, damage or expense resulting from improper installation, handling or misuse of PV modules. Refer to your system's Solahart Owner's Guide for full warranty terms and conditions.

**IEC 61730 INFORMATION**

Modules supplied by Solahart are designed to fulfil the criteria of application Class A requirements according to IEC 61730. Modules are qualified for application Class A: Hazardous voltage (Higher than 50 V DC) and hazardous power (higher than 240 W) applications where general contact access is anticipated. For the purposes of AS/NZS 3000, modules are classified as Class I equipment.

**FIRE GUIDELINES**

Utilise the following fire safety guidelines when installing modules supplied by Solahart:

- Modules supplied by Solahart have a Class C Fire Rating.
- Check with local authorities for guidelines and requirements concerning fire safety for any building or structure on to which the modules will be installed.
- The system design should ensure that firefighting personnel can access the system in the event of a building fire. Check with local authorities for any applicable regulations concerning setbacks or other placement restrictions that may apply for roof-mounted PV arrays.
- Any electrical equipment can pose a fire risk. Modules must therefore be mounted over a fire retardant roof covering rated for the application and a sufficient distance between the module and the mounting surface must be maintained to allow free circulation of air beneath the module.

**ENVIRONMENTAL FACTORS**

Solahart's limited warranty is based upon modules being installed in accordance with the following conditions:

- Modules are not suitable for installation in potentially hazardous locations.
- Modules shall not be installed in locations:
  - near sources of flammable gases, vapours or open flames.
  - in proximity to air conditioning systems.
  - in enclosed spaces (i.e. indoor), or on moving objects.
  - in direct contact with salt water/spray. Avoid installing in areas subject to high salt mist content.
  - which experience extreme hail and/or snow.
  - where they may be exposed to sulphur e.g. near sulphur springs or volcanoes
  - where they may be exposed to harmful chemicals.

**WARNINGS**

⚠**Warning:** This document provides sufficient information for system installation heights up to 20 m. If the installation site is more than 20 m in height contact Solahart Industries for further advice.

⚠**Warning:** This system has not been certified for, and should not be installed in, wind region D.

⚠**Warning:** During installation and when working on the roof, be sure to observe the appropriate OH&S safety regulations and relevant regulations of your local region.

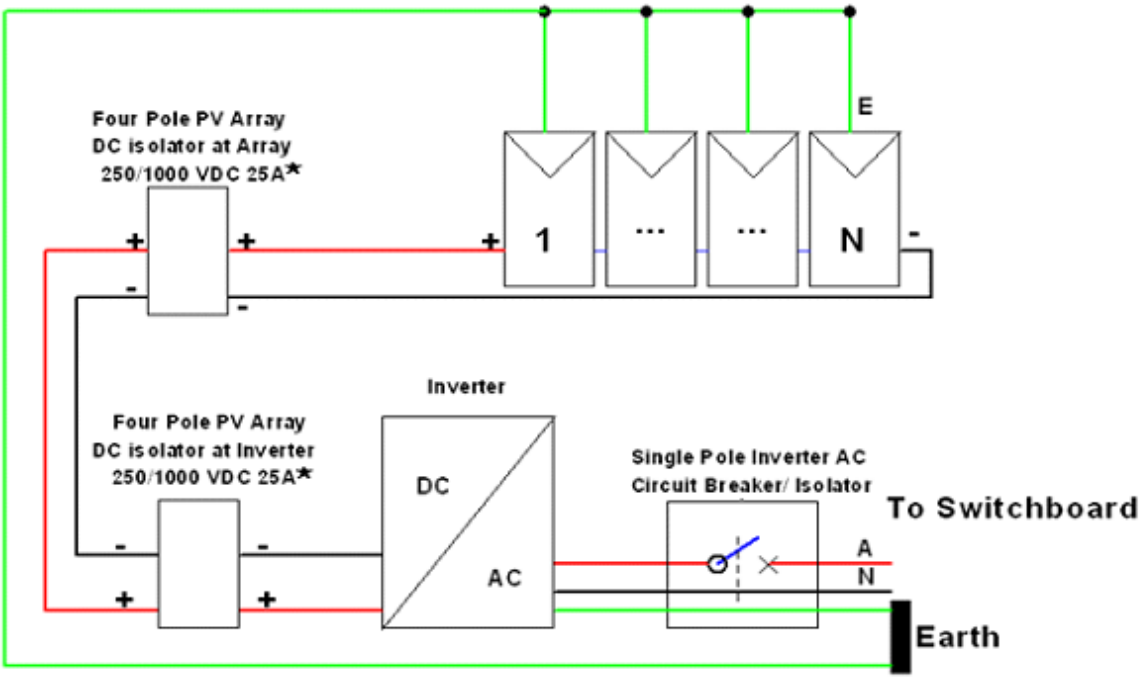
⚠**Warning:** Ensure electrical connection/ disconnection is performed only when the relevant circuit is isolated. Do not connect / disconnect wiring under load conditions.

⚠**Warning:** Do not expose the PV modules to artificially concentrated light.

⚠**Warning:** Do not drill holes in the modules as this will void product warranty.

# WIRING DIAGRAMS

## SINGLE INPUT INVERTER SYSTEMS WITH SINGLE STRING – EXTERNAL DC ISOLATOR




*For DC Isolator Wiring refer to "DC Isolator Wiring" on page 35.

**Note:** The recommended circuit breaker rating for each inverter model is provided in the table below.

| SOLAHART415S5 Modules | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Inverter | Min No of Modules | Max No of Modules per String*** | Max No of Strings | Max No of Modules per Inverter | Max System Power Rating (W)* | AC Circuit Breaker Rating ** | $I_{sc}$ (A)* per String | $V_{oc}$ (V)* |
| - | - | - | - | - | - | - | - | Refer to Voltage Tables on page 14 |
| - | - | - | - | - | - | - | | |

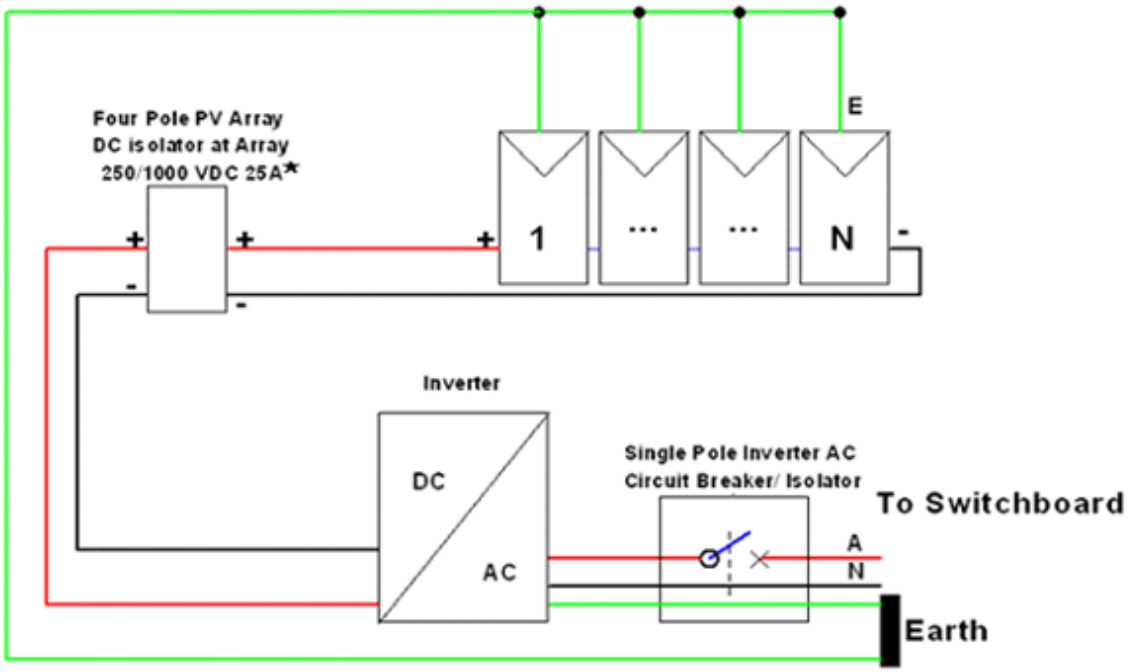
* Values measured at standard test conditions (STC) defined as: irradiance of 1000 W/m$^2$, Spectrum AM 1.5 and cell temperature 25°C. Variations from STC values will affect actual $I_{sc}$ and $V_{oc}$ and should be allowed for.

**The current rating of the circuit breaker must be no greater than the current carrying capacity of the AC cable, refer to AS/NZS 3000.

*** -2°C is used to calculate maximum V. If minimum temperatures lower than -2°C are experienced at the installation site, maximum number of modules per String must be re-evaluated.

For earthing arrangement and wiring diagram refer to "Earthing Arrangements – All Systems" on page 15.

## SINGLE INPUT INVERTER SYSTEMS WITH SINGLE STRING – INTERNAL DC ISOLATOR




★For DC Isolator Wiring refer to "DC Isolator Wiring" on page 35.
**Note:** The recommended circuit breaker rating for each inverter model is provided in the table below.
**Note:** Do not install additional external PV array DC Isolators adjacent to the inverter.

| SOLAHART415S5 Modules | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Inverter | Min No of Modules | Max No of Modules per String*** | Max No of Strings | Max No of Modules per Inverter | Max System Power Rating (W)* | AC Circuit Breaker Rating** | $I_{sc}$ (A)* per String | $V_{oc}$ (V)* |
| GW1500-XS | 2 | 4 | 1 | 4 | 1660 | 10 | 13.76 | Refer to Voltage Tables on page 14 |
| GW2500-XS | 2 | 8 | 1 | 8 | 3320 | 16 | | |

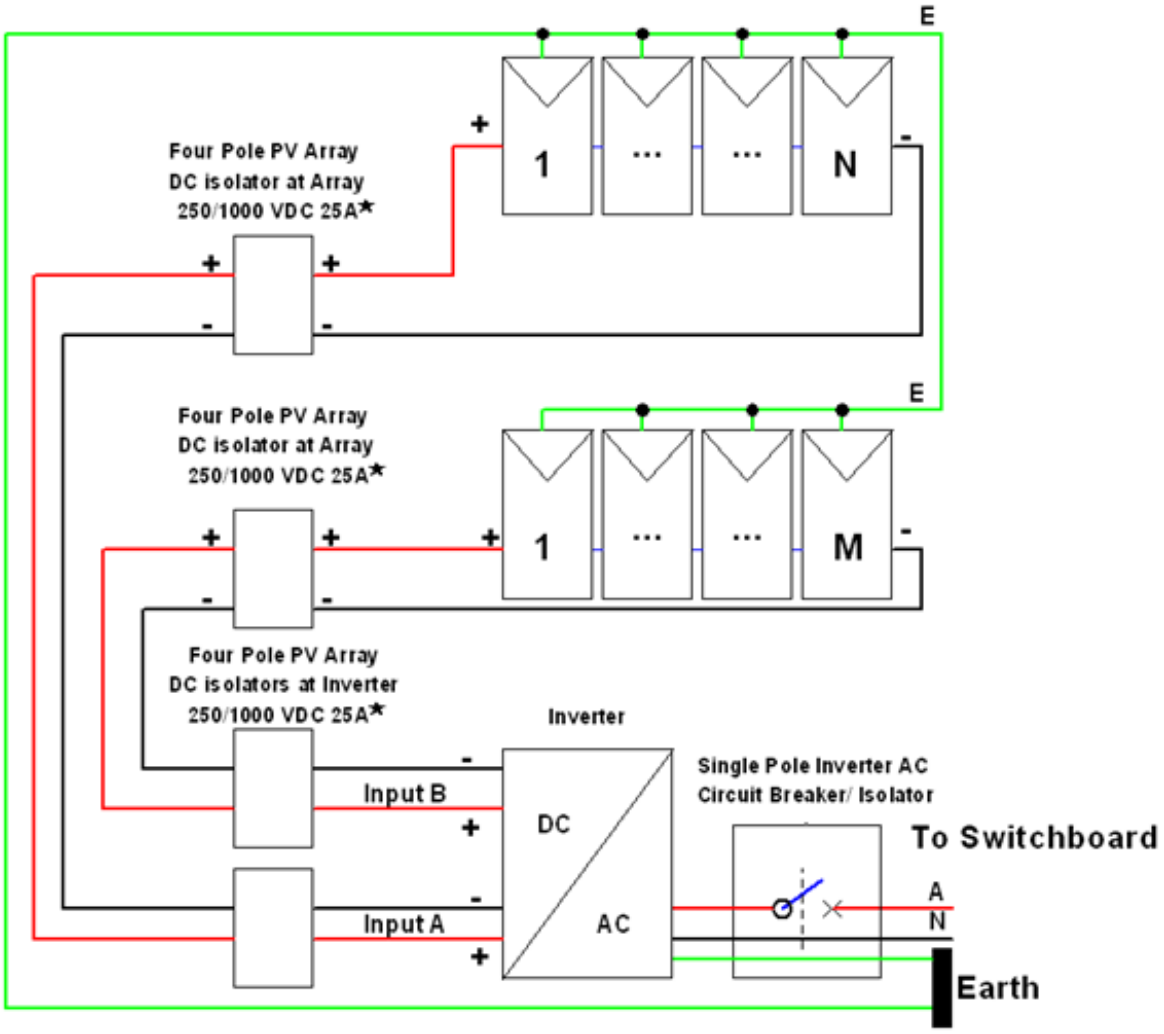
* Values measured at standard test conditions (STC) defined as: irradiance of 1000 W/m$^2$, Spectrum AM 1.5 and cell temperature 25°C. Variations from STC values will affect actual $I_{sc}$ and $V_{oc}$ and should be allowed for.

**The current rating of the circuit breaker must be no greater than the current carrying capacity of the AC cable, refer to AS/NZS 3000.

*** -2°C is used to calculate maximum V. If minimum temperatures lower than -2°C are experienced at the installation site, maximum number of modules per String must be re-evaluated.

For earthing arrangement and wiring diagram refer to "Earthing Arrangements – All Systems" on page 15.

## MULTIPLE INPUT INVERTER SYSTEMS – EXTERNAL DC ISOLATOR(S)




*For DC Isolator Wiring refer to "DC Isolator Wiring" on page 35.

**Note:** The recommended circuit breaker rating for each inverter model is provided in the table below.

| SOLAHART415S15 Modules | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Inverter | Min No of Modules | Max No of Modules per String** | Max No of Strings per input | Max No of Modules per Inverter | Max System Power Rating (W)* | AC Circuit Breaker Rating (A)*** | $I_{sc}$ (A)* per String | $V_{oc}$ (V)* |
| GW5048D-ES | 5 | 14 | 1/1 | 16 | 6640 | 50 | 13.76 | Refer to Voltage Tables on page 14 |

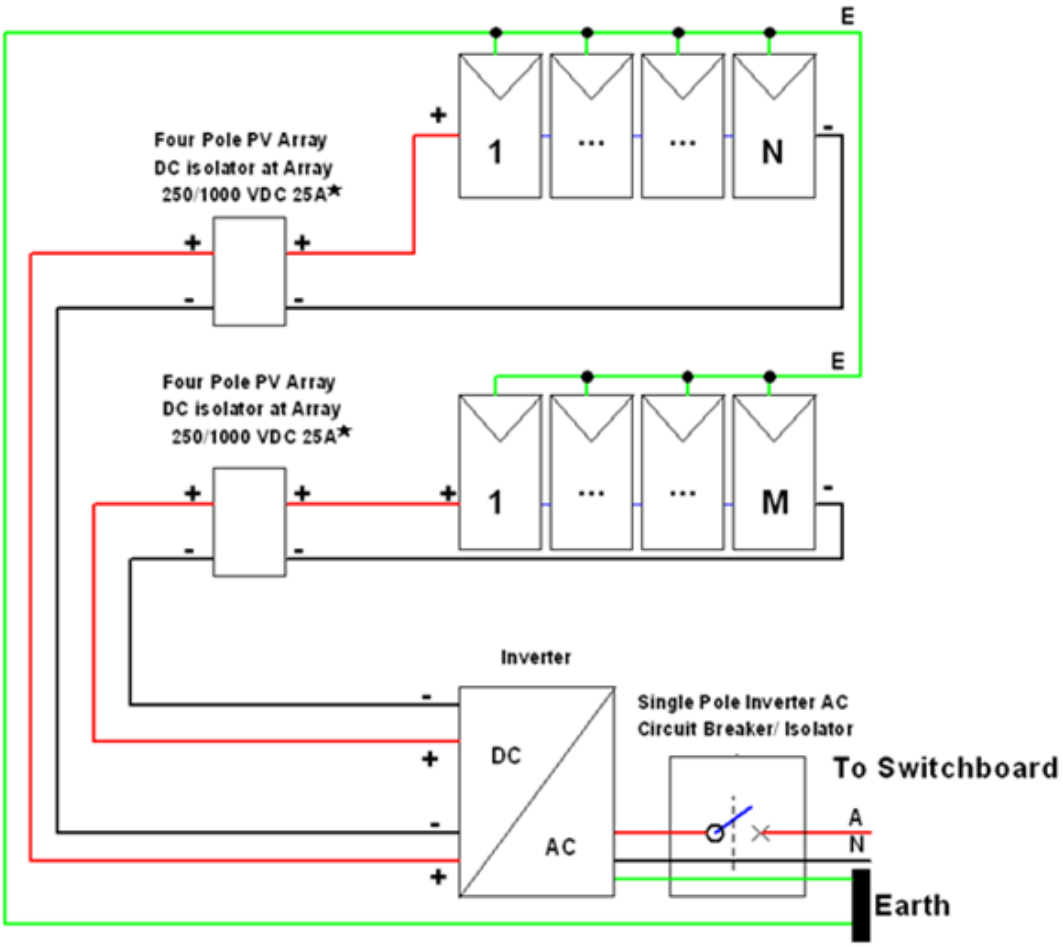
* Values measured at standard test conditions (STC) defined as: irradiance of 1000 W/m$^2$, Spectrum AM 1.5 and cell temperature 25°C. Variations from STC values will affect actual $I_{sc}$ and $V_{oc}$ and should be allowed for.

****** -2°C is used to calculate maximum V. If minimum temperatures lower than -2°C are experienced at the installation site, maximum number of modules must be re-evaluated.

*** The current rating of the circuit breaker must be no greater than the current carrying capacity of the AC cable, refer to AS/NZS 3000.

For earthing arrangement and wiring diagram refer to "Earthing Arrangements – All Systems" on page 15.

## MULTIPLE INPUT INVERTER SYSTEMS – INTERNAL DC ISOLATOR




*For DC Isolator Wiring refer to "DC Isolator Wiring" on page 35.
**Note:** The recommended circuit breaker rating for each inverter model is provided in the table below.
**Note:** Do not install additional external PV array DC Isolators adjacent to the inverter.

| SOLAHART415S5 Modules | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Inverter | Min No of Modules | Max No of Modules per String** | Max No of Strings per Input | Max No of Modules per Inverter | Max System Power Rating (W) * | AC Circuit Breaker Rating (A)*** | $I_{sc}$ (A)* per String | $V_{oc}$ (V)* |
| GW3000D-NS | 3 | 9 | 1/1 | 9 | 3735 | 20 | 13.76 | Refer to Voltage Tables on page 14 |
| GW5000D-NS | 3 | 14 | 1/1 | 16 | 6640 | 30 | | |
| GW3000-DNS-30 | 2 | 9 | 1/1 | 9 | 3735 | 25 | | |
| GW5000-DNS-30 | 2 | 14 | 1/1 | 16 | 6640 | 32 | | |
| GW6000-DNS-30 | 2 | 14 | 1/1 | 19 | 7885 | 40 | | |
| GW8500-MS | 3 | 14 | 1/1/0 | 27 | 11205 | 63 | | |
| UNO-DM-3.3-TL-SBQ | 4 | 10 | 1/1 | 10 | 4150 | 25 | | |
| UNO-DM-4.0-TL-SBQ | 4 | 12 | 1/1 | 12 | 4980 | 25 | | |
| UNO-DM-5.0-TL-SBQ | 4 | 14 | 1/1 | 16 | 6640 | 32 | | |
| UNO-DM-6.0-TL-SBQ | 4 | 14 | 1/1 | 19 | 7885 | 32 | | |
| GEH8.6-1U-10 | 3 | 14 | 1/1/1/1 | 27 | 11205 | 95 | | |
| GEH10-1U-10 | 3 | 14 | 1/1/1/1 | 32 | 13280 | 95 | | |
| GW5000N-EH | 4 | 14 | 1/1 | 16 | 6640 | 50 | | |
| GW5000-ES-20 | 3 | 14 | 1/1 | 16 | 6640 | 55 | | |
| GW6000-ES-20 | 3 | 14 | 1/1 | 19 | 7885 | 55 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| GW10K-MS | 3 | 14 | 1/1/0 | 28 | 11620 | 50 | 13.76 | |

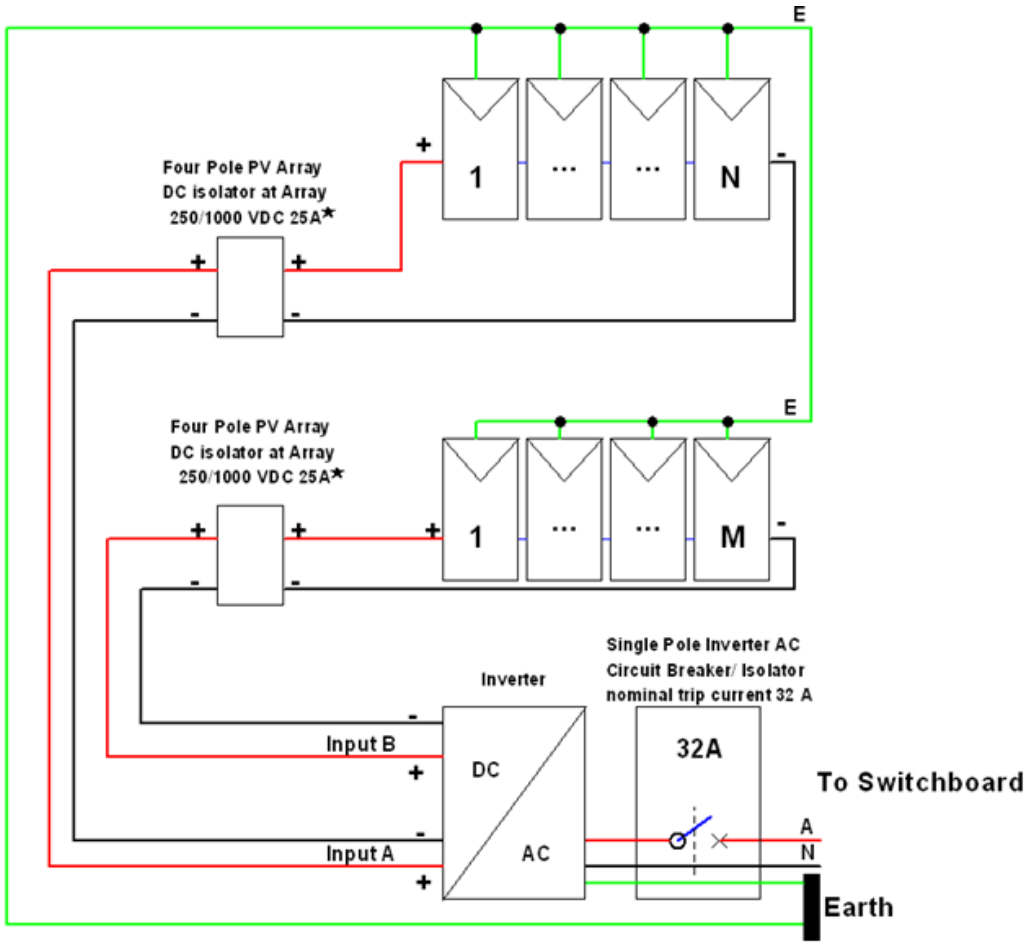
* Values measured at standard test conditions (STC) defined as: irradiance of 1000 W/m$^2$, Spectrum AM 1.5 and cell temperature 25°C. Variations from STC values will affect actual $I_{sc}$ and $V_{oc}$ and should be allowed for.

****** -2°C is used to calculate maximum V. If minimum temperatures lower than -2°C are experienced at the installation site, maximum number of modules must be re-evaluated.

***The current rating of the circuit breaker must be no greater than the current carrying capacity of the AC cable, refer to AS/NZS 3000.

For earthing arrangement and wiring diagram refer to “Earthing Arrangements – All Systems” on page 15.

## SE3000H, SE5000H AND SE6000H INVERTER SYSTEMS




★ For DC Isolator Wiring refer to "DC Isolator Wiring" on page 35.

**Note:** Do not install additional external PV array DC Isolators adjacent to the inverter.

| SOLAHART415S5 Modules | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Inverter | Min No of Modules | | Max No of Modules per String | Max No of Strings | Max No of Modules per Inverter | Max System Power Rating (W) * | Max Inverter Input Current (A)* | Max Inverter Voltage (V)* | AC Circuit Breaker Size (A) *** |
| Optimiser | S440 | P505 | | | | | | | |
| SE3000H-xxxxxxxxx** | 8 | 6 | 9 | 1 | 9 | 3735 | 14 | 480 | 32 |
| SE5000H-xxxxxxxxx** | 8 | 6 | 13 | 2 | 16 | 6640 | 23 | 480 | 32 |
| SE6000H-xxxxxxxxx** | 8 | 6 | 13 | 2 | 19 | 7885 | 27.5 | 480 | 32 |

* Values measured at standard test conditions (STC) defined as: irradiance of 1000 W/m$^2$, Spectrum AM 1.5 and cell temperature 25°C. Variations from STC values will affect actual $I_{sc}$ and $V_{oc}$ and should be allowed for.

** This model may have suffixes indicating different options and functionality.

***The current rating of the circuit breaker must be no greater than the current carrying capacity of the AC cable, refer to AS/NZS 3000.

For earthing arrangement and wiring diagram refer to "Earthing Arrangements – All Systems" on page 15.

## SE8250H AND SE10000H INVERTER SYSTEMS

**Note:** Ensure the single phase inverter limit, as set by your local electricity distributor, is larger than or equal to the inverter's rated AC power output as shown in the following table below.

| SOLAHART415S5 Modules | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Inverter | Rated AC Power Output (W) | Max Number of DC Inputs | Number of Modules per String | | | Max Number of Strings | Max Number of Modules per Inverter | Max System Power Rating (W)* | Max Inverter Input Current (A)* | AC Circuit Breaker Size (A) *** |
| | | | Min | | Max | | | | | |
| Optimiser | | | S440 | P505 | | | | | | |
| SE8250H-xxxxxxxxx** | 8250 | 2 | 8 | 6 | 26 | 4 | 26 | 10790 | 37.5 | 50 |
| SE10000H-xxxxxxxxx** | 10000 | 2 | 8 | 6 | 14 | 4 | 32 | 13280 | 45.5 | 50 |

* Values measured at standard test conditions (STC) defined as: irradiance of 1000 W/m$^2$, Spectrum AM 1.5 and cell temperature 25°C. Variations from STC values will affect actual $I_{sc}$ and $V_{oc}$ and should be allowed for.

** This model may have suffixes indicating different options and functionality.

*** The current rating of the circuit breaker must be no greater than the current carrying capacity of the AC cable, refer to AS/NZS 3000.

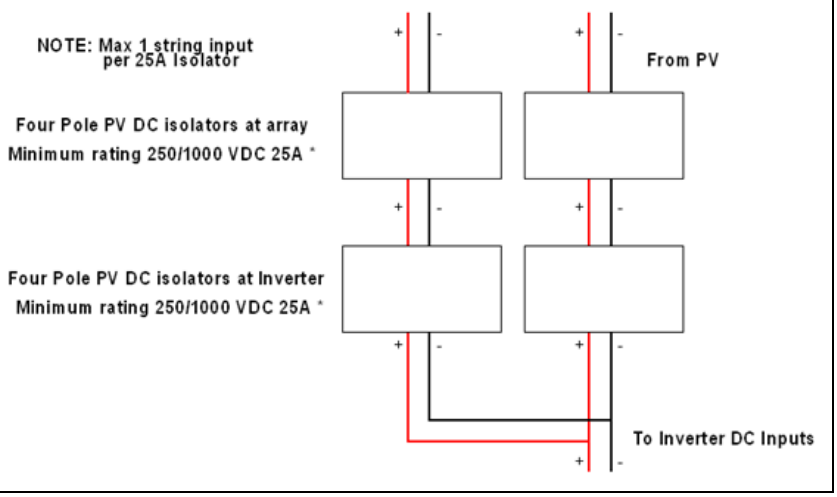
## STRING COMBINATION RULES FOR SE8250H and SE10000H

The following design rules must be followed:

1. The number of modules per string must satisfy the minimum and maximum requirements as indicated in the table above.
2. The number of strings per inverter must satisfy the maximum as indicated in the table above.
3. The maximum DC input limitations of the inverter are met.
4. Strings may be combined on the roof or at the ground.

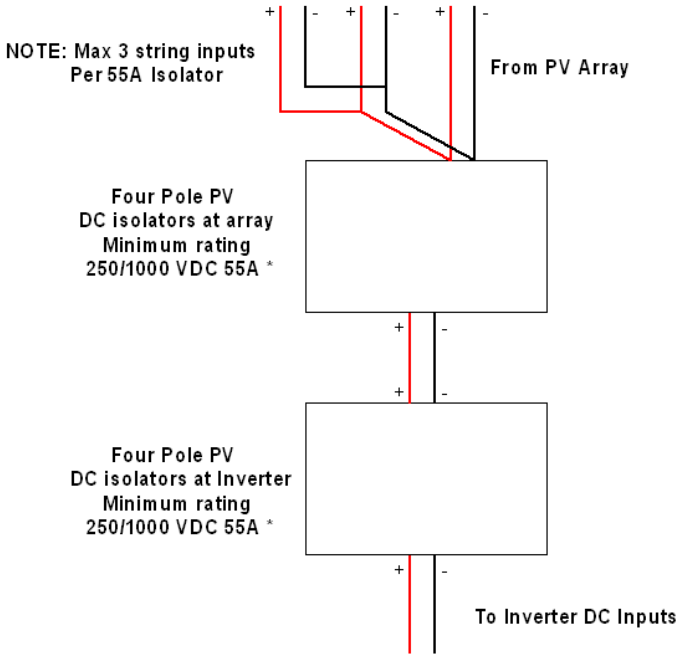
**For combining strings at the ground:**

- 25 A DC Isolators can be used
- A maximum of 2 strings can be combined
- Use the supplied branch connectors to join strings at the inverter



**For combining strings at the roof:**

- 55 A DC isolator must be used.
- A maximum of 3 strings can be combined per 55 A DC isolator.
- Use the supplied branch connectors




For earthing arrangement and wiring diagram refer to “Earthing Arrangements – All Systems” on page 15.

## VOLTAGE TABLES FOR FIMER AND GOODWE SYSTEMS

| SOLAHART415S5 ($V_{oc}$ = 37.8 V) | | | |
|---|---|---|---|
| No of Modules per String | $V_{oc}$ * of the String (V) | No of Modules per String | $V_{oc}$* of the String (V) |
| 2 | 75.6 | 8 | 302.4 |
| 3 | 113.4 | 9 | 340.2 |
| 4 | 151.2 | 10 | 378.0 |
| 5 | 189.0 | 11 | 415.8 |
| 6 | 226.8 | 12 | 453.6 |
| 7 | 264.6 | 13 | 491.4 |

* Values measured at standard test conditions (STC) defined as: irradiance of 1000 W/m$^2$, Spectrum AM 1.5 and cell temperature 25°C. Variations from STC values will affect actual $V_{oc}$ and should be allowed for.

## VOLTAGE TABLES FOR SOLAREDGE SYSTEMS

**Note:** SolarEdge Inverters operate on a fixed string voltage. The $V_{oc}$ of the string is fixed to the nominal DC voltage of the inverter regardless of the panel $V_{oc}$.

| Inverter Model | Nominal DC Voltage | $V_{oc}$ of string |
|---|---|---|
| SE5000H-xxxxxxxxx* | 380 Vdc | 380 Vdc |
| SE6000H-xxxxxxxxx* | 380 Vdc | 380 Vdc |
| SE8250H-xxxxxxxxx* | 400 Vdc | 400 Vdc |
| SE10000H-xxxxxxxxx* | 400 Vdc | 400 Vdc |

* This model may have suffixes indicating different options and functionality.

## DC ISOLATOR SIZING FOR SOLAREDGE SYSTEMS

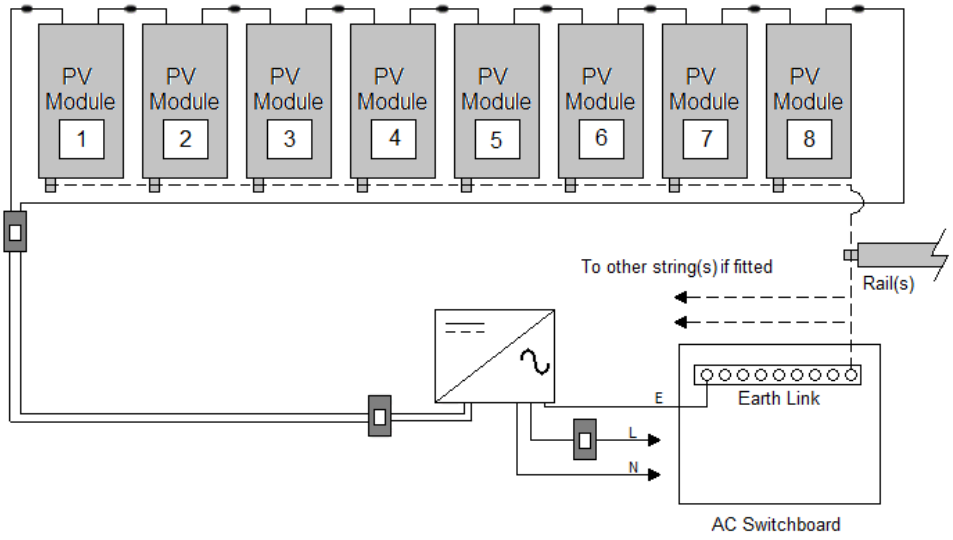
As SolarEdge Systems have a constant $V_{oc}$ for each string, and a variable $I_{sc}$, which is dependent on the number of modules per string, there are multiple DC isolator options which will work on its systems. It is vital to correctly size these DC Isolators to safely install and operate the PV system.

For each of the available DC Isolators follow this guide to correctly select the DC isolator required for the system.

⚠ **Warning:** Ensure string configuration is correct and compliant with the table below.

| DC Isolator | Maximum allowable current | Maximum current per string | No of allowable Strings on each isolator |
|---|---|---|---|
| 1000 V 25 A | 17.6 A | 15 A | 1 |
| 1000 V 32 A | 19.2 A | 15 A | 1 |
| 1000 V 55 A | 40 A | 15 A | 3 |

# EARTHING ARRANGEMENTS – ALL SYSTEMS



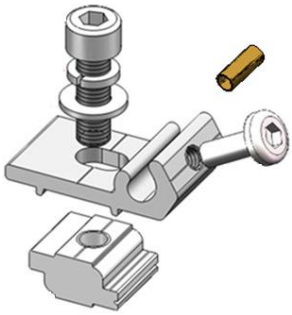

Earthing connections must be made so the removal of one component (e.g. a module) does not interrupt the earthing to other parts of a system (e.g. other modules). Daisy chaining is not permitted. The PV system earth connection must be directly connected to the switchboard earth link, not via the inverter earth connection. If the earth cable could be exposed to direct sunlight, it must have a physical barrier to protect the earth cable from this exposure.

Earth wires must be sized in accordance with requirements set out in Earthing and bonding arrangements of AS/NZS 5033.

Solahart approved Universal clamp with built-in earthing plates may be used to earth modules via the racking, instead of wiring directly to the module frames. Refer to “Earthing” on page 40 for more information.

⚠ **Warning:** Do not drill holes in the modules as this will void product warranty.

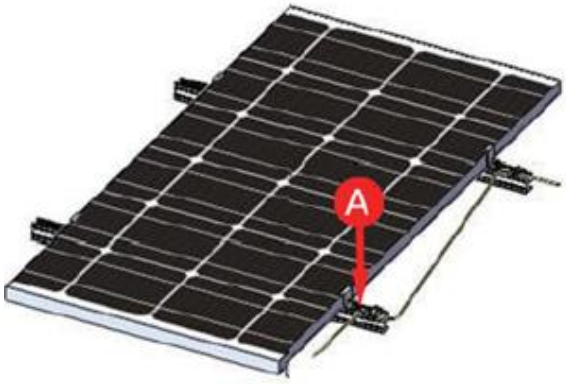
Where it is necessary to make an earthing connection to a rail, a Clenergy Earthing Lug may be used.

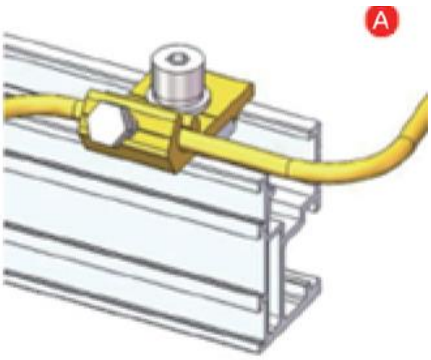


**Clenergy Earthing Lug**

Follow the steps below to attach the earthing cable to Clenergy ECO rail.

1. Slide Z-module into the top channel on the ECO rail and tighten the bolt to 13.5N.m.
2. Strip 20mm of earthing cable and insert the conductor into the provided copper tube.
3. Place the copper tube into the cable channel on the earthing lug and tighten the bolt to 10N.m. Pull the cable to ensure it is tight.
4. Check Resistance between rail and earthing cable conductor to ensure the bonding is made.




Note: the maximum earthing cable cross section area is 10mm$^2$.

# INSTALLATION PROCEDURE

1. Planning – Design the system and layout. Refer to “Planning” on page 18.

Determine the spacing of the Rail Supports, using tables in section “Maximum Rail Support Spacing for Metal and Tile Roofs” starting on page 24, or “Maximum Rail Support Spacing for Tilt Leg Systems” starting on page 26, and considering the following factors (refer to “Planning” on page 18):

   a. Wind Region
   b. Terrain Category
   c. Roof Type
   d. Roof Pitch
   e. Roof Area
   f. Building Height
   g. Array Orientation

2. Install the Racking (Rail and Rail Supports). Refer to “Racking” on page 23.
3. Install the remainder of the roof top components as follows:
   a. Rooftop Isolator. Refer to “Rooftop Isolator” on page 33.
   b. Rooftop Wiring. Refer to “Wiring” on page 34.
   c. Power Optimizers. Refer to “Power Optimizers (SolarEdge only)” on page 36.
   d. PV modules. Refer to “PV Modules” on page 39.
4. Install the inverter. Refer to “Inverter” on page 44.
5. Install the energy meter (optional component). Refer to “Meter (SolarEdge Only)” on page 47.
6. Install the system labels. Refer to “Labelling” on page 50.
7. Commission the PV system. Refer to “Commissioning” on page 54.

# PLANNING

## INSTALLATION TOOLS

- 4,5 & 6 mm Allen keys or 4,5 & 6 mm Allen Key fittings to suit torque adjustable drill (for racking components and inverter)
- Torx T20 screwdriver (FIMER inverter systems only)
- Cordless torque adjustable drill
- Angle grinder with stone disk (for tile cutting if required)
- Electricians hand tools (screwdrivers, pliers etc.)
- String line
- Timber to shim tile roof interfaces (if required)
- An Android or IOS smart device

## STRUCTURAL ASSESSMENT

The installer is responsible for ensuring that the building and building structures are capable of withstanding the additional loads and forces generated as a result of installing the PV system. For domestic dwellings, it is recommended that a structural engineering assessment is completed. For all other installations, a structural assessment is required to be completed by a qualified structural engineer.

## COMMUNICATIONS DEVICES

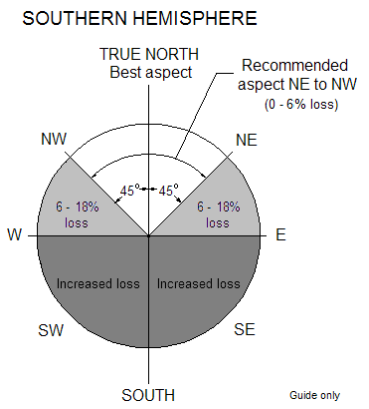
Complete installation of inverter communications devices requires the installer to register the communication device and inverter on the inverter manufacturer's web portal. Hence, to complete the communications equipment installation, the installer must have access to the PV system owner's internet connection. An example of items that should be organised prior to onsite installation are:

- Confirmation that an internet accessible network port is available
- Length of networking cable required from inverter to networking port
- Wi-Fi access including SSID and password
- PV system owner's network administrator permission and assistance to adjust firewall, network address translation (NAT) and port forwarding settings.

## PV MODULE ORIENTATION AND INCLINATION

To maximize system output, install modules at optimum orientation and inclination (tilt) angles. The specifics of this will depend on the installation location and must be calculated by a qualified system designer. The ideal angle for mounting a module should result in the sun's rays falling perpendicular (i.e. at a 90° angle) to the module surface.

**Note:** All modules in each series string must have the same orientation and inclination to ensure that modules do not underperform due to a mismatching of each module's output.




Modules should be installed in a shade free position. Even minor or partial shading of the modules/array will reduce array/system output. A module is considered shade free when it is both:

- Free from shade or shadows all year round.
- Exposed to several hours of direct sunlight, even during the shortest days of the year.
- Modules must have an inclination between 3° and 75°. If installed in tropical regions, the minimum module inclination angle is 5°.

**Note:** The following information is provided as a guide only:

- Modules should be installed facing toward true north. Where this orientation is not practical, a system facing up to 45° (NW or NE) from true north is satisfactory however losses of up to approximately 6% will occur. A module facing due east or due west will experience a loss in performance of approximately 18%.

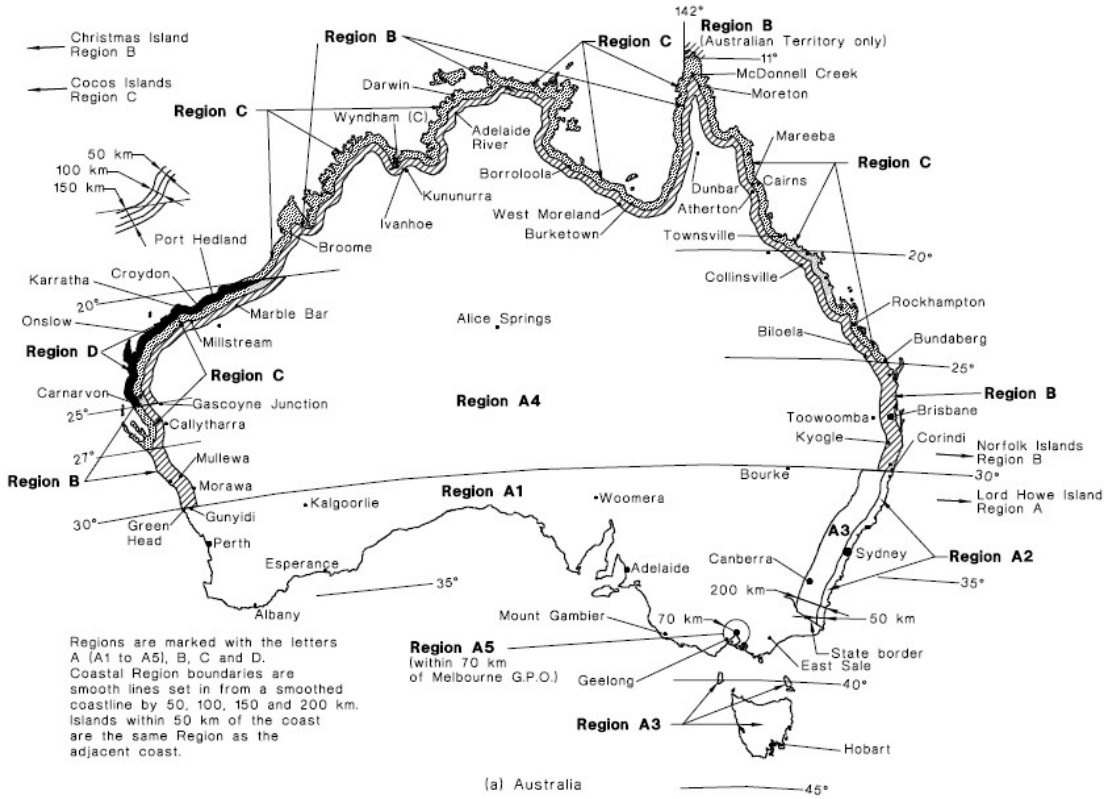
- Inclination of modules should be approximately equal to the local latitude angle. The latitude of some Australian cities is shown in the “Latitude of Some Australian Cities” on page 19. Modules may be installed at the roof angle for simplicity of installation and appearance, however, if inclination varies by ±15° or more from the correct inclination, performance losses of 4% or more will occur.
- Modules should be inclined at an angle of at least 10° to support the self-cleaning function of the glass.
- Losses for incorrect orientation and incorrect inclination will be compounded.
- If the roof angle is flat, adjustable or fixed tilt legs should be considered to optimise inclination depending upon area.
- For an installation at right angles to (across) a tile roof pitch, landscape tile roof hooks are required.
- Each module and its fittings including racking weighs approximately 25 kg.

**LATITUDE OF SOME AUSTRALIAN CITIES**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Adelaide | 35°S | Cairns | 17°S | Hobart | 42°S | Port Hedland | 20°S |
| Alice Springs | 24°S | Canberra | 35°S | Mildura | 34°S | Rockhampton | 24°S |
| Brisbane | 27°S | Darwin | 12°S | Melbourne | 38°S | Sydney | 34°S |
| Broken Hill | 31°S | Geraldton | 28°S | Perth | 32°S | Townsville | 19°S |

**WIND REGION**

Use the wind region diagram shown below to determine the wind region of the installation site.




Wind region notes:

- Wind regions are predefined for all of Australia by Australian Standard AS/NZS 1170.2. The Wind Region has nothing to do with surrounding topography or buildings.
- Most of Australia is designated Region A which indicates a Regional Ultimate Basic Wind Velocity of 45 m/s.
- Some areas are designated Region B (57 m/s). Local authorities will advise if this applies in your area.
- Region C areas (66 m/s) are generally referred to as Cyclonic and are generally limited to northern coastal areas. Most Region C zones end 100 km inland.
- Region D (80 m/s) Australia's worst Cyclonic Region between Carnarvon and Pardoo in WA.
- This document only covers wind regions A, B and C.

**TERRAIN CATEGORY**

The terrain over which the approaching wind flows towards a structure must be assessed on the basis of the following category descriptions. For details refer to AS 1170.2 – 2011 Amdt 2-2012.

Terrain Category 2: Open terrain, including grassland, with well-scattered obstructions having heights generally from 1.5 m to 5 m, with no more than two obstructions per hectare, e.g. farmland and cleared subdivisions with isolated trees and uncut grass.

Terrain Category 3: Terrain with numerous closely spaced obstructions having heights generally from 3 m to 10 m. The minimum density of obstructions shall be at least the equivalent of 10 house-size obstructions per hectare, e.g. suburban housing or light industrial estates.

**ROOF TYPE**

Determine the roof type of the building where the PV modules are to be installed and select the appropriate rail support.

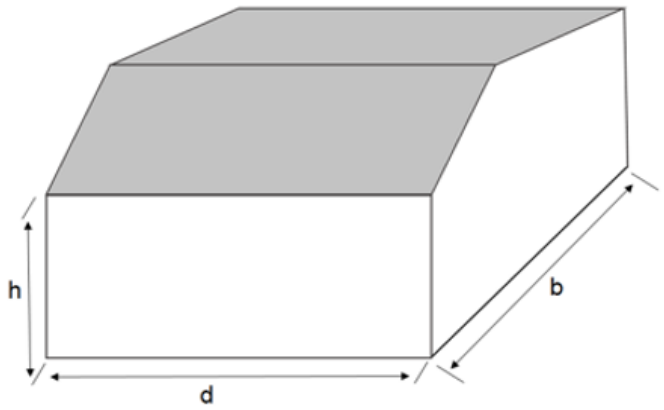
Rail support systems are available as follows:

| Roof Type | Roof Pitch | Rail Support Category | Rail Support Name (Options) |
|---|---|---|---|
| Standard tile | 5 - 30° | Tile roof interface | Tile interface (Portrait) |
| | | | Tile interface (Landscape) |
| Low profile tile | | | Flat tile interface |
| Slate | | | Slate interface |
| Metal | 5 - 30° | Metal roof interface | Metal roof interface |
| Metal Corrugated | < 10° or < Latitude minus 15° | Tilt leg interface | 10 - 15° adjustable tilt legs |
| | | | 15 - 30° adjustable tilt legs |
| | | | 30 - 60° adjustable tilt legs (for reverse tilt systems) |

**Note:** For roof pitch more than 30°, consult Clenergy or Solahart for details on the design.

**ROOF AREA**

Assess the building dimension and determine the installation area on the roof (roof position area).




h = height, b = width and d = length.

⚠ **Warning:** If any part of the system array is located in one of the edge zones, the entire array must use the support spacing specified for the edge zones.

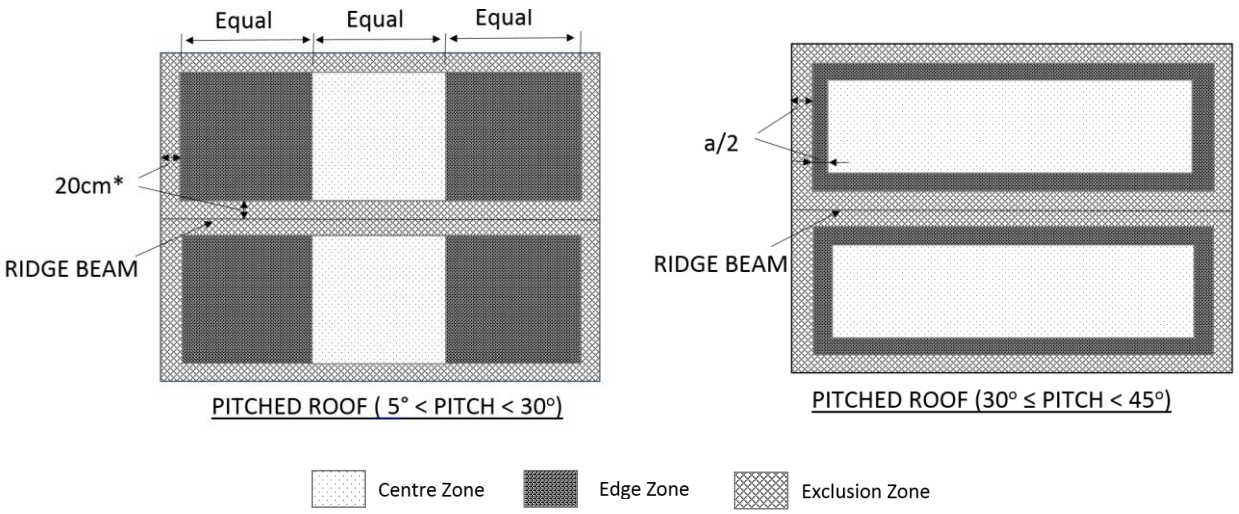
**Note:** In the diagrams below, a = minimum of 0.2d, 0.2b and 0.2h.

**For flush mount system installed on a pitched roof (tile or metal):**

The diagrams below show roof position areas designated as “Edge Zone” areas and “Centre Zone” areas for tile and metal roofs.

**Note:** the PV modules shall not be installed in “exclusion zone” areas.

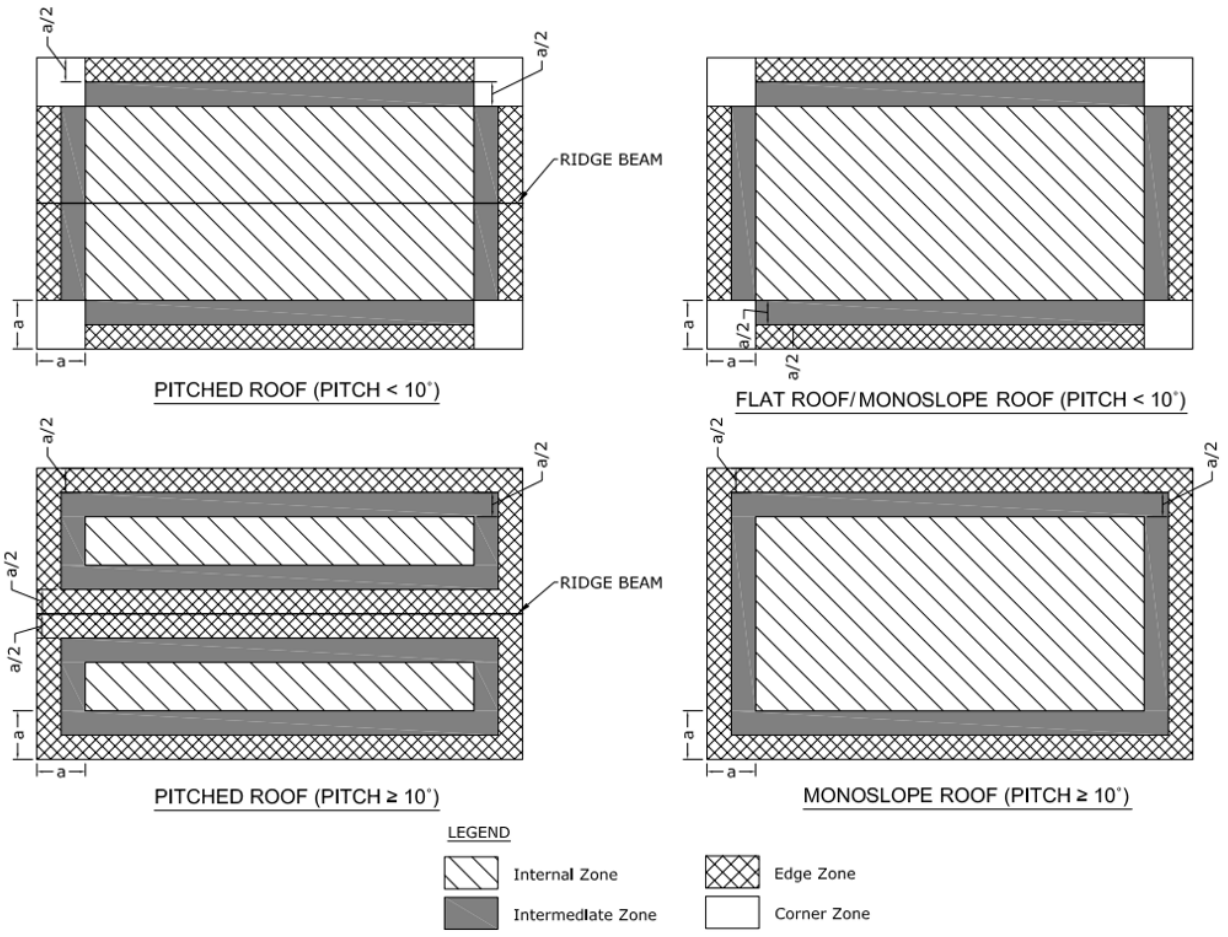
Edge zone areas are subject to higher wind loadings and therefore will require closer rail support spacing.




*This distance is twice the spacing between solar panel and roof (estimated spacing = 10 cm).

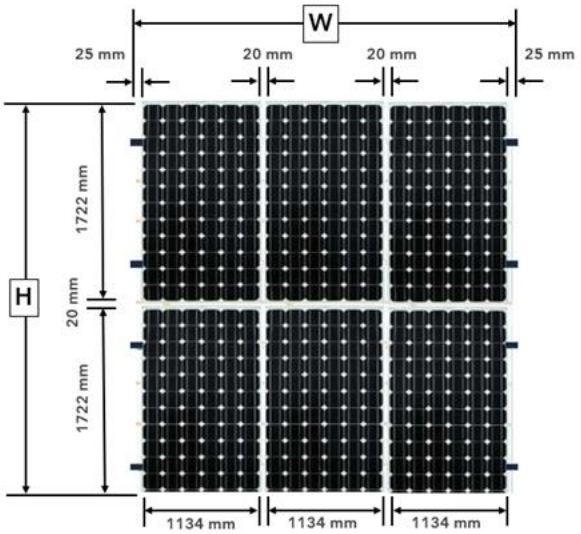
**For tilt array systems:**

The diagrams below show roof position areas designated as “Internal Zone” areas, “Edge Zone” areas, “Intermediate Zone” areas and “Corner Zone” areas.



Use the following diagram, tables and worked example to determine the minimum required roof area for the array when designing and installing SOLAHART415S15 modules.

**Module spacing and dimensions**




H = Number of rows x (1722 mm + 20 mm) - 20 mm

W = Number of modules per row x (1134 mm + 20 mm) + (2 x 25 mm) - 20 mm

**Worked Example:**

Number of rows: 2
Number of modules per row: 10
Total number of modules = 20

Calculating H:

$$H=N_{rows}\times(1{,}722+20)-20$$
$$H=2\times1{,}742-20$$
$$H=3{,}464 \text{ mm}$$

Calculating W:

$$W=N_{modules/row}\times(1{,}134+20)+(2\times25)-20$$
$$W=10\times1{,}154+50-20$$
$$W=11{,}570 \text{ mm}$$

Calculating $Area_{Roof}$ in $mm^2$:

$$Area_{Roof}=H\times W$$
$$Area_{Roof}=3464\times11{,}570$$
$$Area_{Roof}=40{,}078{,}480 \text{ mm}^2$$

Converting $Area_{Roof}$ in $mm^2$ to $m^2$:

$$Area_{Roof}=\frac{40{,}078{,}480}{1{,}000{,}000}=40.07 \text{ m}^2$$

**Notes:**

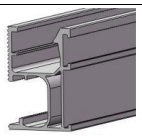
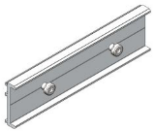
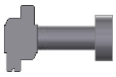
- Modules installed in portrait as per diagram.
- For tilt leg systems, row spacing must prevent shading of one row by another and needs to be calculated on an individual site basis, taking into account orientation, roof pitch and module inclination.
- All dimensions are in mm, unless otherwise stated.

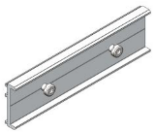
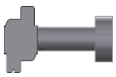
| | | | Number of modules per row | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | … |
| Number of rows | 1 | H | 1722 | 1722 | 1722 | 1722 | 1722 | 1722 | 1722 | 1722 | 1722 | 1722 | |
| | | X | X | X | X | X | X | X | X | X | X | X | |
| | | W | 1184 | 2338 | 3492 | 4646 | 5800 | 6954 | 8108 | 9262 | 10416 | 11570 | |
| | 2 | H | 3464 | 3464 | 3464 | 3464 | 3464 | 3464 | 3464 | 3464 | 3464 | 3464 | |
| | | X | X | X | X | X | X | X | X | X | X | X | |
| | | W | 1184 | 2338 | 3492 | 4646 | 5800 | 6954 | 8108 | 9262 | 10416 | 11570 | |
| | ⋮ | | | | | | | | | | | | |

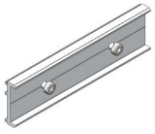
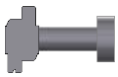
| | | | Number of modules per row | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | … |
| Number of Rows | 1 | Area | 2.03 | 4.02 | 6.01 | 8.00 | 9.98 | 11.97 | 13.96 | 15.95 | 17.94 | 19.92 | |
| | 2 | Area | 4.10 | 8.10 | 12.10 | 16.09 | 20.09 | 24.09 | 28.09 | 32.08 | 36.08 | 40.08 | |
| | ⋮ | | | | | | | | | | | | |

# RACKING

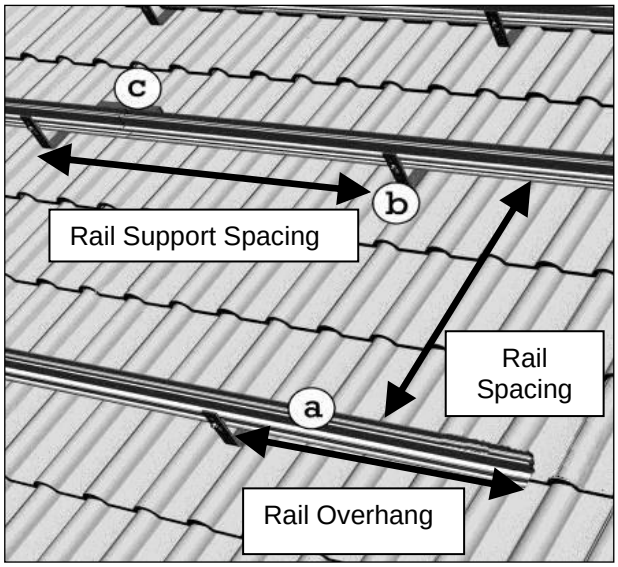
**OVERVIEW OF RACKING COMPONENTS**

| Overview of components for tile roof | | | | |
|---|---|---|---|---|
|  |  |  |  |  |
| Rail (a) | Rail splices (c) | Tile roof Interfaces (b) | Z-modules with Allen head bolt | Wood screws M6 x 80 |

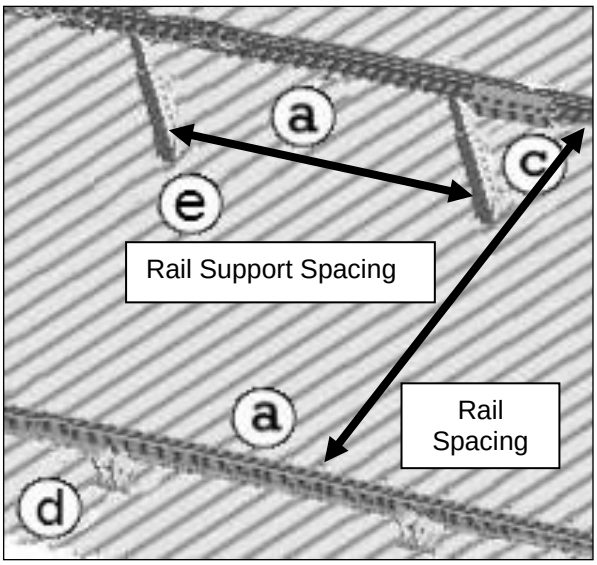
| Overview of components for metal roof | | | | |
|---|---|---|---|---|
|  |  |  |  |  |
| Rail (a) | Rail splices (c) | Metal roof interfaces (b) | Z-modules with Allen head bolt | Wood screws M6 x 90 * |

| Overview of components for adjustable tilt legs | | | | | |
|---|---|---|---|---|---|
|  |  |  |  |  |  |
| Rail (a) | Rail splices (c) | Z-modules with Allen head bolt | Front rail & leg foot (d) | Adjustable tilt leg (e) | Wood Screws M6x90 * |

* **Note:** Screws must be fit for purpose e.g. screws used in metal purlins must be suitable for metal structures and have a TPI (threads per inch) of 14.




Tile & Metal Roof Diagram (Tile Roof shown)




Tilt Leg Diagram (Adjustable Tilt Leg shown)

**MAXIMUM RAIL SUPPORT SPACING FOR METAL AND TILE ROOFS**

Use the following tables to determine the rail support spacing for the relevant roof type based on the previously determined wind region, terrain category, roof pitch, roof position area (Edge Zone or Centre Zone) and maximum height of the installation. The spacing values below are in mm.

⚠ **Warning:** the following tables cover the only installations permitted for SOLAHART415S5 modules based on mechanical design load of 3600/1600 Pa.

⚠ **Warning:** Installation is prohibited if the spacing is N/A.

| Roof Type | Terrain Category | Roof Pitch | **Wind Category A** | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Roof Height | | | | | |
| | | | H≤10 | | 10<H≤15 | | 15<H≤20 | |
| | | | Edge | Centre | Edge | Centre | Edge | Centre |
| Tile Roof Interface | 2 | <10° | 1444 | 1588 | 1369 | 1506 | 1354 | 1489 |
| | | 10° -20° | 1415 | 1557 | 1342 | 1476 | 1327 | 1460 |
| | | 20°-30° | 1400 | 1540 | 1328 | 1461 | 1314 | 1445 |
| | 3 | <10° | 1615 | 1777 | 1532 | 1685 | 1515 | 1667 |
| | | 10° -20° | 1583 | 1741 | 1501 | 1651 | 1485 | 1634 |
| | | 20°-30° | 1567 | 1724 | 1486 | 1635 | 1470 | 1617 |
| Tin Roof Interface | 2 | <10° | 1496 | 1646 | 1469 | 1616 | 1432 | 1575 |
| | | 10° -20° | 1492 | 1641 | 1460 | 1606 | 1423 | 1565 |
| | | 20°-30° | 1487 | 1636 | 1460 | 1606 | 1418 | 1560 |
| | 3 | <10° | 1735 | 1909 | 1671 | 1838 | 1597 | 1757 |
| | | 10° -20° | 1726 | 1899 | 1666 | 1833 | 1588 | 1747 |
| | | 20°-30° | 1662 | 1828 | 1597 | 1757 | 1524 | 1676 |

| Roof Type | Terrain Category | Roof Pitch | **Wind Category B** | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Roof Height | | | | | |
| | | | H≤10 | | 10<H≤15 | | 15<H≤20 | |
| | | | Edge | Centre | Edge | Centre | Edge | Centre |
| Tile Roof Interface | 2 | <10° | 997 | 1097 | 893 | 982 | 819 | 901 |
| | | 10° -20° | 977 | 1075 | 875 | 963 | 802 | 882 |
| | | 20°-30° | 967 | 1064 | 866 | 953 | 794 | 873 |
| | 3 | 5°-10° | 1116 | 1228 | 999 | 1099 | 916 | 1008 |
| | | 10° -20° | 1093 | 1202 | 979 | 1077 | 898 | 988 |
| | | 20°-30° | 1082 | 1190 | 969 | 1066 | 888 | 977 |
| Metal Roof Interface | 2 | <10° | 1157 | 1273 | 1047 | 1152 | 964 | 1060 |
| | | 10° -20° | 1157 | 1273 | 1042 | 1146 | 955 | 1051 |
| | | 20°-30° | 1148 | 1263 | 1037 | 1141 | 950 | 1045 |
| | 3 | <10° | 1524 | 1676 | 1423 | 1565 | 1285 | 1414 |
| | | 10° -20° | 1519 | 1671 | 1418 | 1560 | 1276 | 1404 |
| | | 20°-30° | 1423 | 1565 | 1368 | 1505 | 1248 | 1373 |

| Roof Type | Terrain Category | Roof Pitch | Wind Category C | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Roof Height | | | | | |
| | | | H≤10 | | 10<H≤15 | | 15<H≤20 | |
| | | | Edge | Centre | Edge | Centre | Edge | Centre |
| Tile Roof Interface | 2 | <10° | 647 | 712 | N/A | N/A | N/A | N/A |
| | | 10° -20° | 634 | 697 | N/A | N/A | N/A | N/A |
| | | 20°-30° | 628 | 691 | N/A | N/A | N/A | N/A |
| | 3 | <10° | 724 | 796 | 633 | 696 | 575 | 633 |
| | | 10° -20° | 710 | 781 | 620 | 682 | 563 | 619 |
| | | 20°-30° | 703 | 773 | 614 | 675 | 557 | 613 |
| Metal Roof Interface | 2 | <10° | 734 | 807 | N/A | N/A | N/A | N/A |
| | | 10° -20° | 730 | 803 | N/A | N/A | N/A | N/A |
| | | 20°-30° | 725 | 798 | N/A | N/A | N/A | N/A |
| | 3 | <10° | 1092 | 1201 | 946 | 1041 | 845 | 930 |
| | | 10° -20° | 1088 | 1197 | 936 | 1030 | 840 | 924 |
| | | 20°-30° | 1065 | 1172 | 918 | 1010 | 826 | 909 |
| Metal Roof Interface (0.55 mm steel purlin) | 2 | <10° | 551 | 606 | N/A | N/A | N/A | N/A |
| | | 10° -20° | 548 | 602 | N/A | N/A | N/A | N/A |
| | | 20°-30° | 544 | 598 | N/A | N/A | N/A | N/A |
| | 3 | <10° | 819 | 901 | 710 | 780 | 634 | 697 |
| | | 10° -20° | 816 | 898 | 702 | 772 | 630 | 693 |
| | | 20°-30° | 799 | 879 | 689 | 757 | 620 | 681 |

**MAXIMUM RAIL SUPPORT SPACING FOR TILT LEG SYSTEMS**

Use the following tables to determine the rail support spacing for the relevant roof type based on the previously determined wind region, terrain category, roof pitch, roof position area (Corner Zone, Edge Zone, Intermediate Zone or Internal Zone) and maximum height of the installation. The spacing values below are in mm.

⚠ **Warning:** the following tables cover the only installations permitted for SOLAHART415S15 modules based on mechanical design load of 3600/1600 Pa.

⚠ **Warning:** Installation is prohibited if the spacing is N/A.

| **Wind Region A, Roof Pitch between 1° and 10°** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Angle against horizontal (Φ)** | | | (Φ) <15° | | 15° ≤ (Φ) ≤ 30° | | 30° < (Φ) < 60° | |
| **Terrain Catogory** | | | 2 | 3 | 2 | 3 | 2 | 3 |
| **Roof Height** | H<5m | Corner | 648 | 693 | N/A | 480 | N/A | N/A |
| | | Edge | 982 | 1051 | N/A | 734 | N/A | N/A |
| | | Intermediate | 1297 | 1387 | N/A | 960 | N/A | N/A |
| | | Internal | 1588 | 1699 | N/A | 1248 | N/A | N/A |
| | 5m<H<10m | Corner | 583 | 624 | N/A | 393 | N/A | N/A |
| | | Edge | 884 | 945 | N/A | 602 | N/A | N/A |
| | | Intermediate | 1167 | 1248 | N/A | 787 | N/A | N/A |
| | | Internal | 1459 | 1560 | N/A | 1023 | N/A | N/A |
| | 10m<H<15m | Corner | 545 | 582 | N/A | 384 | N/A | N/A |
| | | Edge | 825 | 882 | N/A | 587 | N/A | N/A |
| | | Intermediate | 1089 | 1165 | N/A | 768 | N/A | N/A |
| | | Internal | 1361 | 1456 | N/A | 998 | N/A | N/A |
| | 15m<H<20m | Corner | 459 | 491 | N/A | 302 | N/A | N/A |
| | | Edge | 696 | 745 | N/A | 462 | N/A | N/A |
| | | Intermediate | 919 | 983 | N/A | 605 | N/A | N/A |
| | | Internal | 1149 | 1229 | N/A | 786 | N/A | N/A |

| **Wind Region B, Roof Pitch between 1° and 10°** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Angle against horizontal (Φ)** | | | (Φ) <15° | | 15° ≤ (Φ) ≤ 30° | | 30° < (Φ) < 60° | |
| **Terrain Catogory** | | | 2 | 3 | 2 | 3 | 2 | 3 |
| **Roof Height** | H<5m | Corner | 461 | 493 | N/A | N/A | N/A | N/A |
| | | Edge | 698 | 747 | N/A | N/A | N/A | N/A |
| | | Intermediate | 922 | 986 | N/A | N/A | N/A | N/A |
| | | Internal | 1152 | 1232 | N/A | N/A | N/A | N/A |
| | 5m<H<10m | Corner | 392 | 419 | N/A | N/A | N/A | N/A |
| | | Edge | 593 | 635 | N/A | N/A | N/A | N/A |
| | | Intermediate | 783 | 838 | N/A | N/A | N/A | N/A |
| | | Internal | 979 | 1047 | N/A | N/A | N/A | N/A |
| | 10m<H<15m | Corner | 332 | 355 | N/A | N/A | N/A | N/A |
| | | Edge | 503 | 538 | N/A | N/A | N/A | N/A |
| | | Intermediate | 664 | 710 | N/A | N/A | N/A | N/A |
| | | Internal | 829 | 887 | N/A | N/A | N/A | N/A |
| | 15m<H<20m | Corner | 323 | 346 | N/A | N/A | N/A | N/A |
| | | Edge | 490 | 524 | N/A | N/A | N/A | N/A |
| | | Intermediate | 647 | 692 | N/A | N/A | N/A | N/A |
| | | Internal | 809 | 865 | N/A | N/A | N/A | N/A |

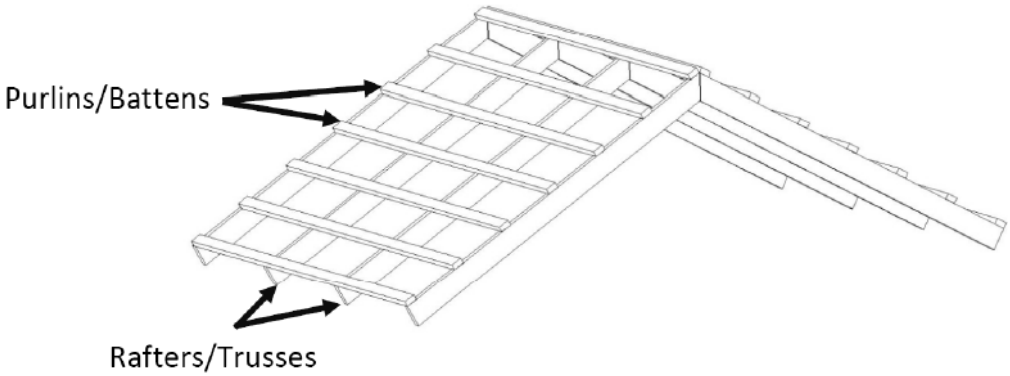
| Wind Region C, Roof Pitch between 1° and 10° | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Angle against horizontal (Φ)** | | | (Φ) <15° | | 15° ≤ (Φ) ≤ 30° | | 30° < (Φ) < 60° | |
| **Terrain Catogory** | | | 2 | 3 | 2 | 3 | 2 | 3 |
| **Roof Height** | H<5m | Corner | 408 | 437 | N/A | N/A | N/A | N/A |
| | | Edge | 619 | 662 | N/A | N/A | N/A | N/A |
| | | Intermediate | 817 | 874 | N/A | N/A | N/A | N/A |
| | | Internal | 1021 | 1092 | N/A | N/A | N/A | N/A |
| | 5m<H<10m | Corner | N/A | 310 | N/A | N/A | N/A | N/A |
| | | Edge | N/A | 470 | N/A | N/A | N/A | N/A |
| | | Intermediate | N/A | 621 | N/A | N/A | N/A | N/A |
| | | Internal | N/A | 776 | N/A | N/A | N/A | N/A |
| | 10m<H<15m | Corner | N/A | 235 | N/A | N/A | N/A | N/A |
| | | Edge | N/A | 356 | N/A | N/A | N/A | N/A |
| | | Intermediate | N/A | 469 | N/A | N/A | N/A | N/A |
| | | Internal | N/A | 587 | N/A | N/A | N/A | N/A |
| | 15m<H<20m | Corner | N/A | 202 | N/A | N/A | N/A | N/A |
| | | Edge | N/A | 305 | N/A | N/A | N/A | N/A |
| | | Intermediate | N/A | 403 | N/A | N/A | N/A | N/A |
| | | Internal | N/A | 504 | N/A | N/A | N/A | N/A |

Steel purlins must meet the following minimum requirements:

| Roof interface | Minimum steel purlin specification |
|---|---|
| Metal roof interface | 0.55 mm BMT 550 Grade or 0.75 mm BMT 450 Grade |
| Tilt leg interface | 1.0 mm BMT 500 Grade |

Roof interfaces must be fixed to rafters or purlins under the roof cladding. Screw minimum embedment into timber rafters or battens is 35 mm.

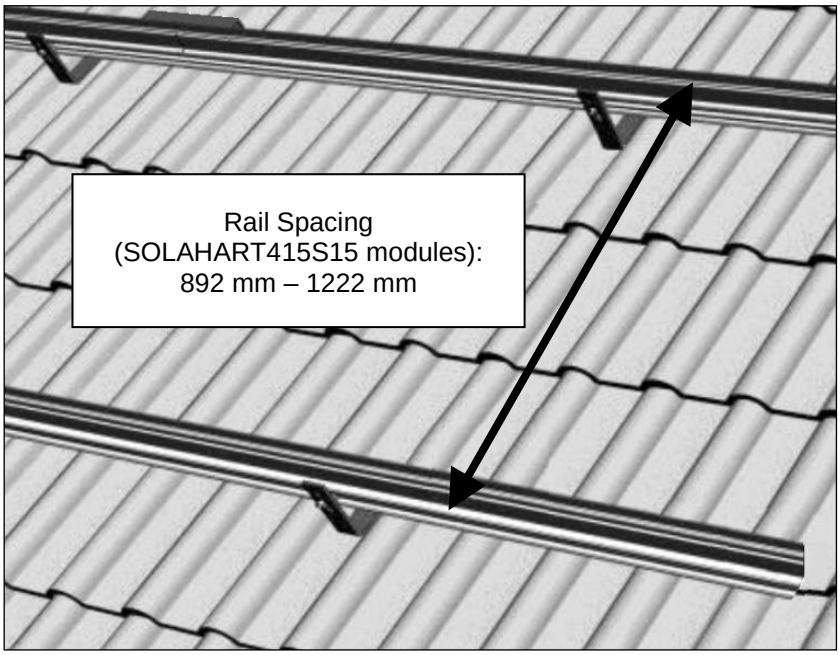
**Note:** Screws supplied with the roof interfaces are wood screws suitable for timber only. Screws used in metal purlins must be suitable for metal structures and have a TPI (threads per inch) of 14.



**RAIL SPACING**

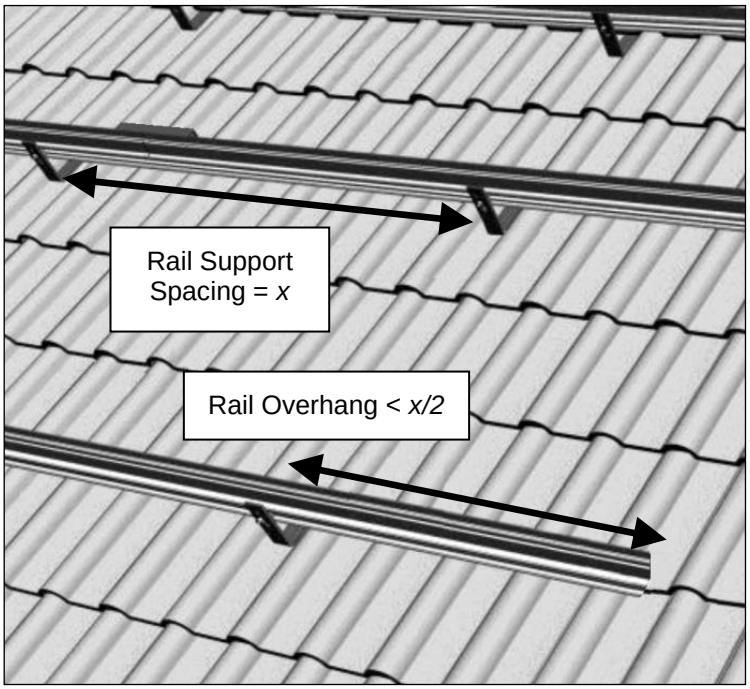
Rails should be spaced so that the module is clamped in the correct positions. Refer to “Module Mounting” on page 41.

In general, the rails may be spaced between 892 mm and 1222 mm apart.




**RAIL OVERHANG**

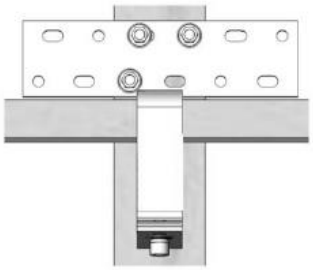
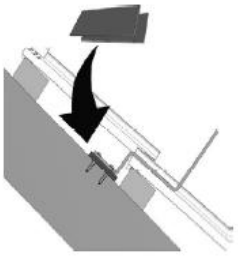
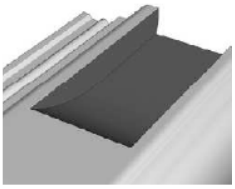
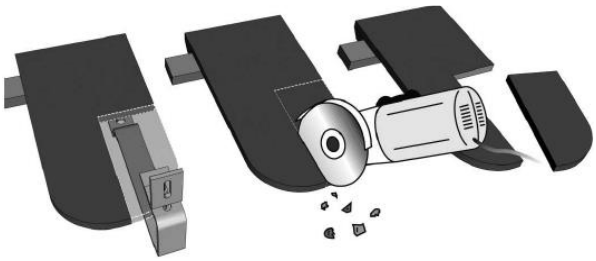
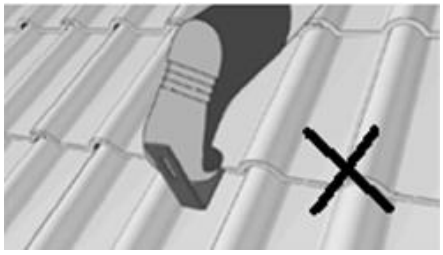
Rail end overhang must be no greater than 50% of rail support spacing. For example; if rail support spacing is 1200 mm, rail end overhang can be up to 600 mm. In this case, two rail support brackets can support a rail up to 2400 mm in length (1200 mm between brackets and 600 mm of overhang at each end).




**Note:** Drawings not to scale

**TILE ROOF INSTALLATION**

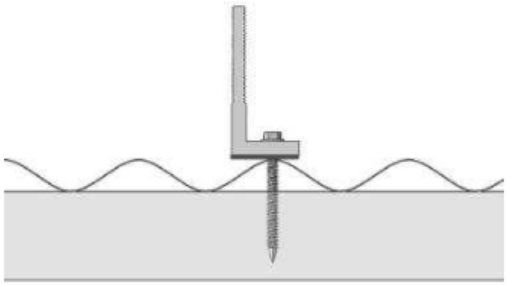
**Note:** The tile roof interface is only suitable for installation on timber rafters.

| | |
|---|---|
| 1. Determine and mark the position of the tile roof interfaces according to your plans. Remove the roof tiles at marked positions or, if possible, simply move the tiles up slightly. |  |
| 2. Fix the tile roof interfaces to rafters using three M6 X 80 mm wood screws. Ensure a 50 mm minimum screw embedment into the rafters.<br><br>**Warning:** Tile roof interfaces must not press against roof tiles and must be fixed parallel with rafters. If necessary, pack underneath tile roof interfaces with timber. |   |
| 3. For thick tiles (such as grooved tiles), if necessary, use an angle grinder to chase a recess (or remove raised groves) on the tile that covers the tile roof interface at the point where the interface protrudes through so that the tile lies flat.<br><br>For thick tiles it may also be necessary to cut a recess into the tile located below the tile roof interface.<br><br>Now proceed to installation of the rails. Refer to “Rail Installation” on page 32. |    |
| 4. For thin tiles (such as slate, shingles), a portion of tile must be cut and removed from the tile above the tile roof interface, creating a recess.<br><br>Suitable flashing must then be installed around the tile roof interface, with an overlap of at least 150 mm at the edges of the recess.<br><br>Now proceed to installation of the rails. Refer to “Rail Installation” on page 32. |  |
| **Warning:** Do not use tile roof interfaces as a climbing support as extreme loading of this point could cause damage to the tile below. |  |

**METAL ROOF INSTALLATION**

**Note:** Screws supplied with the roof interfaces are wood screws suitable for timber only. Screws used in metal purlins must be suitable for metal structures and have a TPI (threads per inch) of 14.

1. Determine and mark position of the metal roof interfaces according to your plans. Pre drill through roof cladding (on top of crest) at planned locations. Place the supplied rubber gasket under the metal roof interface and ensure that a weatherproof seal is made between the interface and the roof cladding.



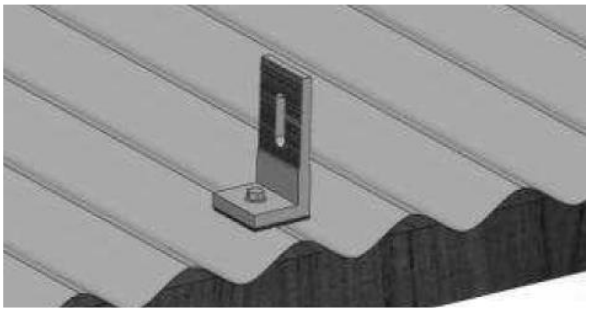
2. Fix the metal roof interface to the timber batten or rafter using the M6 x 90 mm screw supplied.

   Ensure a 35 mm minimum screw embedment for timber battens and rafters.

   If the interface is being fixed to metal purlins use screws suitable for metal structures with a TPI of 14.

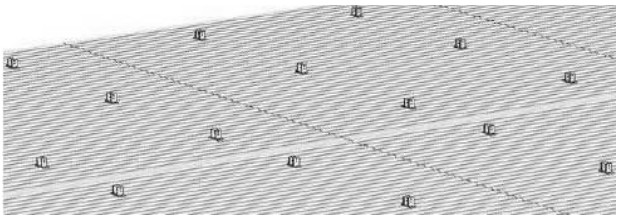
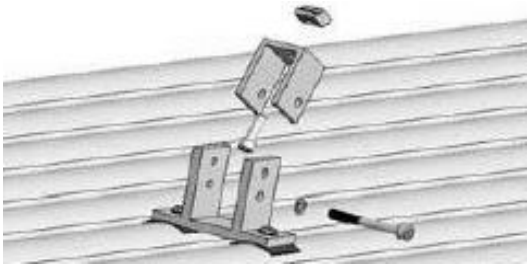
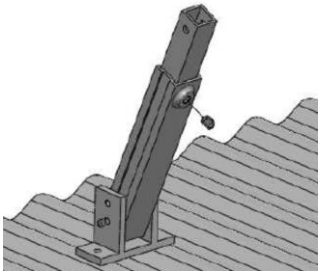
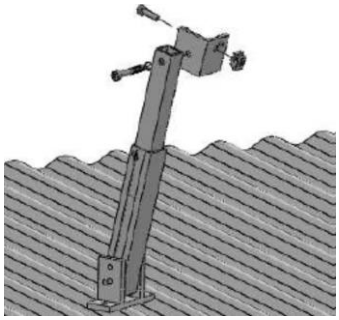
3. Check the metal roof interface to ensure that the fastening screw tightly fixes sealing gasket without damaging roof cladding.

   Now proceed to installation of the rails. Refer to “Rail Installation” on page 32.

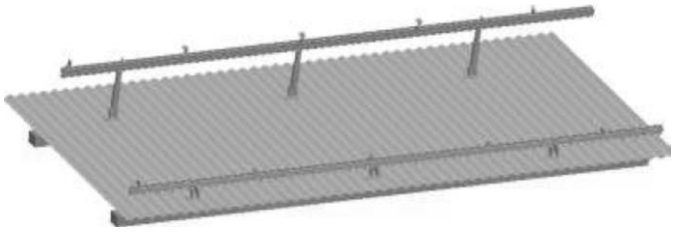
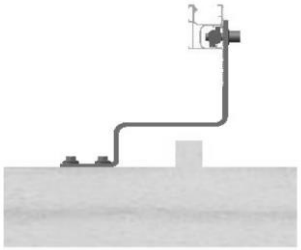
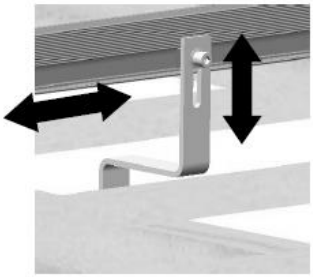
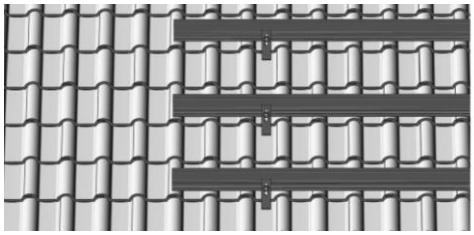
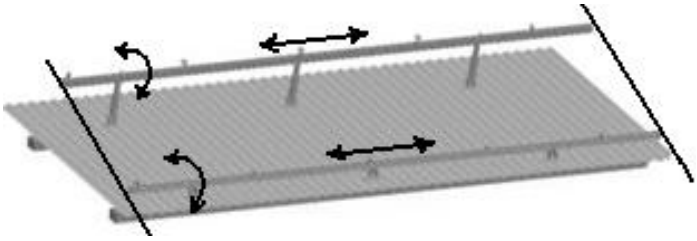
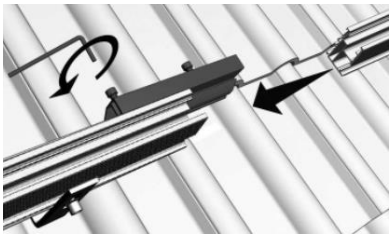
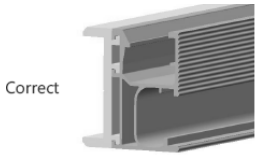


**TILT LEG INSTALLATION**

**Note:** Screws supplied with the tilt legs are wood screws suitable for timber only. Screws used in metal purlins must be suitable for metal structures and have a TPI (threads per inch) of 14.

| | |
|---|---|
| 1. Determine and mark position of front feet according to your plans. Pre drill through roof cladding (on top of crest) at planned locations. Place the supplied rubber gaskets under each foot and ensure that a weatherproof seal is made between the foot and the roof cladding. |  |
| 2. Fix the foot to the timber batter or rafter using a minimum of two M6 X 80 mm screws.<br><br>Ensure a minimum screw embedment of 35 mm for timber battens and rafters.<br><br>If the interface is being fixed to metal purlins use screws suitable for metal structures with a TPI of 14.<br><br>Check the foot to ensure that the fastening screws tightly fix the sealing gaskets without damaging roof cladding. |  |
| 3. The U Bracket comes preassembled with the front foot. Loosely fasten Allen head bolt and nut to allow for later adjustment. Allen head bolt and Z-module on top of U bracket is utilised to attach rails in next step. |  |
| 4. Place rear legs into feet, insert Allen head bolt, washer, retaining washer and nut and fasten loosely to allow for later adjustment. |  |
| 5. Loosen the leg telescopic section Allen head grub screws. Adjust the leg length according to your plans and tighten the grub screws to 17 Nm. |  |
| 6. Fix the leg L bracket to the leg using the Allen head bolt, washer, retaining washer and nut and fasten loosely to allow for later adjustment.<br><br>• Minimum back leg angle to horizontal is 30°.<br><br>• Maximum back leg angle to horizontal is 90°. |  |

**RAIL INSTALLATION**

| | |
|---|---|
| 1. Install rails onto the roof interfaces. If the assembly consists of rails of different lengths, always begin with the shortest piece. Install the rail loosely onto the roof interfaces using the Allen head bolt, washer, retaining washer and Z-modules supplied (2 to 3 turns of the bolt are adequate for loose installation). Refer to step 2 for method of inserting Z-module into rail. |  |
| 2. For easy use of Z-modules ensure that Allen head bolt threads do not project through lower side of Z-module so that the Z-module is free to move. Position Z-modules in rail channel as shown and fasten loosely with 2 to 3 turns of Z-module Allen head bolt. The rail can then be freely moved along Z-modules. |  |
| 3. Adjust the vertical and horizontal position of the rail by taking advantage of the long hole in the tile and metal roof interfaces and the still loose connection of the rail Z-modules. |  |
| 4. Align all rail ends.<br><br>Align the rail tilt orientation (use a string line if necessary).<br><br>Tighten all previously loosely installed rail and feet Z-module Allen head bolts to a torque of 18-20 Nm. |  <br>  |
| 5. To connect multiple rails together, slide a splice on to the rear side of the previously assembled rail. Tighten the first splice Allen head bolt to 18-20 Nm. Slide the next rail segment into the splice. An expansion gap at the rail joints is recommended. Leave a gap of approximately 10 mm between the rail joints and then tighten the second Allen head bolt to 18-20 Nm. |  <br>  |

# ROOFTOP ISOLATOR

The rooftop DC isolator must be mounted to the rail by following the steps below. To help prevent UV degradation, the rooftop isolator should be mounted as far from the north side of the array as possible.

When installing the rooftop isolator the following points should be observed:

- Ensure the IP rating of the isolator enclosure is maintained and that no moisture can enter.
- Cable glands and conduit adapters must be chosen to suit the type of cable or conduit used. E.g. cable glands designed for figure-8 cables must be chosen where figure-8 type solar DC cables are utilised.
- Any conduit adapters should be installed so that the conduit slopes downwards from the enclosure to prevent water ingress in adverse weather conditions.
- If water and/or condensation can form in the isolator enclosure, provision must be made for its harmless escape through suitably located drainage points in accordance with AS/NZS 3000 Clause 3.3.2.3. Conduit entering the isolator enclosure must have a drainage hole installed at the lowest point to facilitate the escape of any moisture.

**Note:** Install rooftop isolators before installing any PV modules.

| | |
|---|---|
| Step 1: Mount the isolator enclosure onto the bracket using 4 x M4 12mm stainless steel bolts, nuts and washers as illustrated in Figure 1.<br><br>Install screw cover caps and seal all mounting holes with silicon to prevent water ingress. |  <br>Figure 1 |
| Step 2: Mount the Z-modules loosely onto the isolator bracket as shown in Figure 2.<br><br>Note: If the clearance below the PV modules is less than 110 mm, the Z-modules can be fitted onto the bottom two slots on the isolator bracket as shown in Figure 3. |  <br>Figure 2<br>  <br>Figure 3 |
| Step 3: Insert Z-modules into the channel of the rail and move the isolator bracket to the desired location. Insert an earthing plate in between the rail and the bracket as shown in figure 4. Tighten the bolts to 13-14 Nm.<br><br>Note: Both Z-modules must be secured to the rail. Extend the rail if required. |  <br>Figure 4 |

**Note -** Installations without DC Isolators will instead use a Disconnection Point (DP) in accordance with the AS/NZS 5033:2021. Label and signage requirement of DP type installation is different, refer the Labelling section for more details.

# WIRING

**WIRING**

Only UV-resistant cables and connectors approved for outside use should be used. PV cable must be marked or labelled in accordance with AS/NZS 5033.

To minimise the risk of indirect lightning strikes, avoid forming closed loops when designing the system. Check to ensure that system wiring is correct before commissioning modules. If the measured open circuit voltage ($V_{oc}$) and short circuit current ($I_{sc}$) differ from specifications, a wiring fault may be present.

Recommended cable size for plug connectors is 4 – 6 $mm^2$, with an operating temperature range of -40 to +120°C. Plug connectors are polarised and should be firmly connected. All connections should be secure, tight and electrically and mechanically sound. Correct DC polarity should be observed at all times. Plug connectors should never be used to turn the system on or off (i.e. do not connect or disconnect plug connectors under load conditions).

Only use plug connectors supplied with your Solahart PV system, or which are the same type/model and from the same manufacturer as those on the PV module. Ensure that all plug connectors and plug wiring are in good electrical and mechanical condition and are not subjected to mechanical stress.

Ensure that all materials meet system requirements such as maximum voltage, current, moisture and temperature when exposed to sunlight.

Electrical ratings of the PV modules are within 3% of measured values at Standard Test Conditions (STC). Under normal conditions, a photovoltaic module may experience conditions that produce more current and/or voltage than that reported under STC. When designing a system, allow for increased output of a module as a result of conditions different to STC in accordance with the Clean Energy Council's "Grid-Connected Solar PV System - Design Guidelines for Accredited Installers" and AS/NZS 5033.

Ensure cables are fixed to the mounting structure and are not in contact with the roof or rear surface of module(s) by using restraining devices which are sunlight and UV-resistant.

**Note:** Plastic cable ties are not to be used as primary means of support.

A roof flashing such as a Dektite® must be used where wiring penetrates tile or metal roofing. Flashings must be sealed using an appropriate waterproofing compound such as silicone.

All wiring must be protected from mechanical damage and external wiring must be protected from UV and mechanical damage in such a manner that it will last the life of the system. All conduits shall comply with AS/NZS 2053.1 and if exposed to sunlight must be suitably UV rated and marked with the letter "T". Do not install wiring such that it is subject to permanent tension.

**COMPONENT PLUG AND DC CABLE SIZING TABLE**

| Cabling | Plug | Cable Size | Plug Rating |
|---|---|---|---|
| Module fly leads | Pre crimped on fly leads | 4 $mm^2$ | IP67 |
| Module DC extension leads | Supplied in BOS Kit | Min 4 $mm^2$ | IP67 |
| Wiring – Roof isolator to inverter isolator [(a)] | Not required – hard wired | Min 4 $mm^2$ | N/A |
| Wiring – Inverter isolator to inverter | Supplied in BOS Kit | Min 4 $mm^2$ | IP67 |

[(a)] = DC cable supplied by installer.

All cables/wiring are double insulated Solar DC type cable.

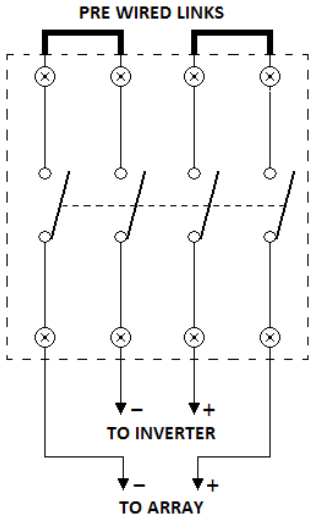
It is recommended the maximum voltage drop between the PV array and the inverter is 3%.

**DC ISOLATOR WIRING**

The DC isolators utilised in Solahart PV Systems are not polarity sensitive (non polarised type) however for uniformity they should be wired as shown in the DC isolator wiring diagram below.

⚠ **Warning:** DC isolator terminal screws must be tightened by hand only. Do not use power tools.

DC isolator wiring diagram




Once wired, the DC isolator should be left in the open position until system commissioning.

# POWER OPTIMIZERS (SOLAREDGE ONLY)

⚠ **Warning:** Input and output connectors are not watertight until mated. Open connectors should be mated to each other or plugged with appropriate watertight caps.

⚠ **Warning:** Cutting the power optimizer input or output cables is prohibited and will void product warranty.

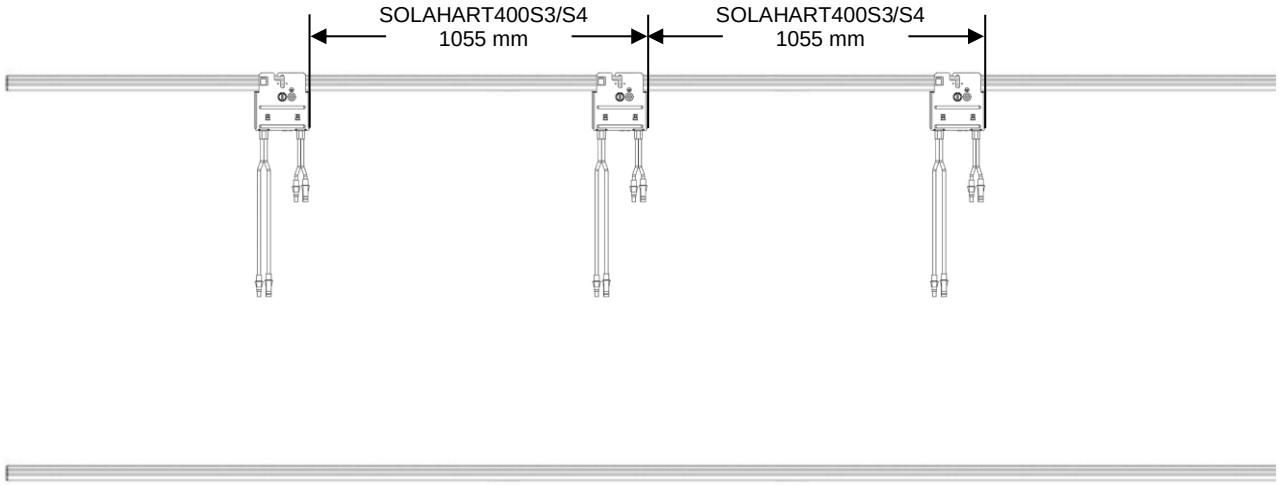
⚠ **Warning:** Do not connect / disconnect DC connectors or wiring while under load.

⚠ **Warning:** Only connectors of the same make and model may be connected together.

**Note:** Modules with SolarEdge power optimizers output a low safety voltage before the inverter is turned ON. As long as the power optimizers are not connected to the inverter or the inverter is turned OFF, each power optimizer will output a safe voltage of 1 V (±0.1 V).

**MOUNTING THE POWER OPTIMIZERS**

1. Determine and mark the power optimizer mounting locations on the rail:
    a. Power optimizers should be spaced approximately 1055 mm apart on the rail. See figure below.

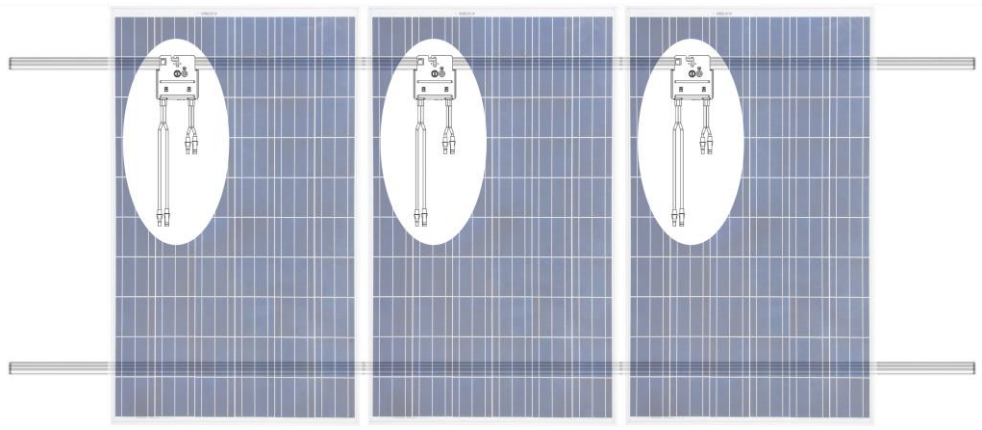



**Note:** Figure is not to scale.

    b. Power optimizers must be positioned so that they maintain a 25 mm clearance distance between the power optimizer and other surfaces to allow for heat dissipation.

**Note:** Ensure the junction box of each PV module is near the side of rail where the optimisers are mounted.

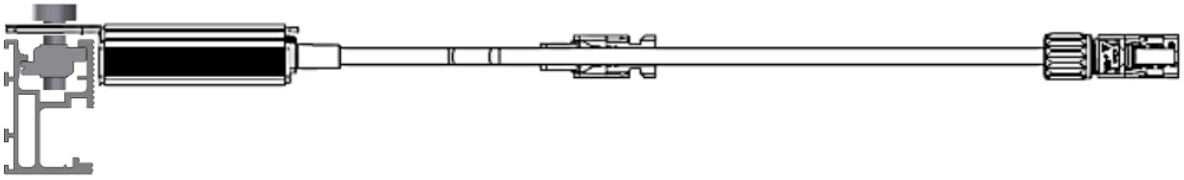
**Note:** Ensure clearance between power optimizers and PV module junction boxes.



2. Attach each power optimizer to the mounting rail using the Z-module assembly provided in the BOS kit. See figure below. Apply a tightening torque of 9.5 Nm.

Z-module assembly

**Note:** It is recommended that the power optimizers be placed face down to ensure clearance between the back of modules and power optimizers. See figure below.



**Note: Figure is not to scale.**

3. Verify that each power optimizer is securely attached to the rail.

4. Record power optimizer serial numbers and locations. This can be achieved through the use of a paper template or SolarEdge smartphone application. Refer to SolarEdge supplied documentation for more information.

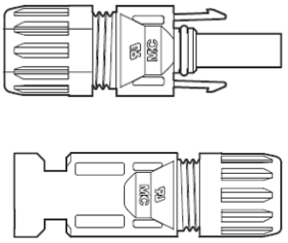
**POWER OPTIMIZER WIRING PROCEDURE**

⚠ **Warning:** Use insulated tools and wear PPE when performing wiring to prevent the risk of electric shock. It is suggested that modules be covered with an opaque material during wiring to reduce the voltage generated by the string.

PV Module and power optimizer DC plug connectors are connected as follows:

Firmly push positive (+) plug into negative (-) plug until an audible "click" is heard, and then try to pull plugs apart. Incorrectly connected plugs will come apart whilst correctly connected plugs will not come apart unless the locking latches on either side of the positive (+) plug are depressed using an unlocking tool whilst plugs are pulled apart.

**Note:** Pull on plugs, do not pull on wiring.



+

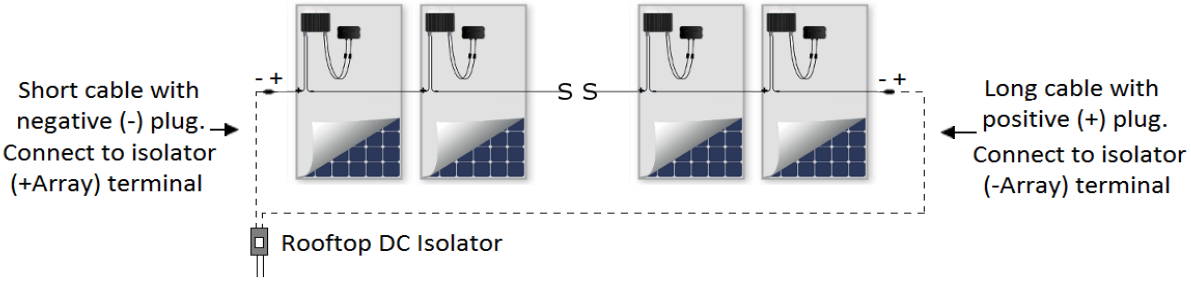
-

⚠ **Warning:** Do not connect / disconnect DC connectors or wiring while under load.

⚠ **Warning:** Only connectors of the same make and model may be connected together.

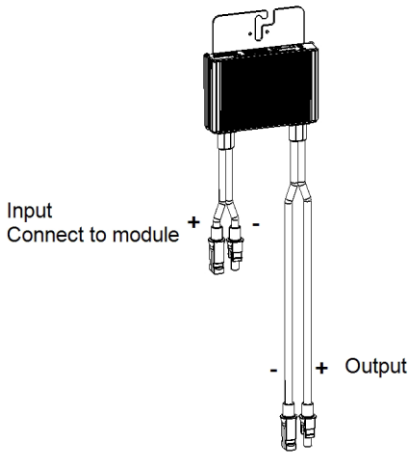
The following procedure should be adhered to whilst wiring power optimizer strings to prevent the risk of electric shock or inadvertent short circuiting of live cables whilst wiring the Rooftop DC Isolator:

1. Two extension leads per string should be constructed using the DC extension cable provided in the BOS Kit. One should be short to connect from the first power optimizer in the string to the DC isolator. The other should be sufficiently long to plug the end power optimizer in the string to the DC isolator (see the example schematic below).




2. Ensure the Rooftop DC Isolator is in the OFF position, strip 12 mm of insulation from the end of each extension lead and connect the two extension leads to the Rooftop DC Isolator terminals. The Rooftop DC Isolator should be wired in a consistent manner. Refer to “DC Isolator Wiring” on page 35.

3. Connect the first power optimizer’s positive output (+) cable plug to the Rooftop DC Isolator extension cable negative (-) plug. See figure below for power optimizer cable plug illustration.




**Note:** Image is for illustration purposes only. Refer to the label on the product to identify the plus and minus input and output connectors.

4. Connect each power optimizer’s negative output (-) cable to the following power optimizer’s positive output (+) cable.

5. Connect the last power optimizer’s negative output (-) cable to the Rooftop DC Isolator extension cable positive (+) plug.

6. Connect the first power optimizer’s input connectors to the first module’s connectors.

7. Repeat Step 6 for each module and power optimizer in the string.

8. Verify proper power optimizer connection by measuring the voltage of each string individually.

**Note:** Each power optimizer in the string will output a safe voltage of 1 V (±0.1 V). For example: 9 power optimizers connected in a single string should output a safe voltage of 9 V (±0.9 V).

**Note:** Ensure the modules are exposed to sunlight during this process; otherwise, the power optimizers may not be powered.

9. Repeat Steps 1 - 8 for each string in the PV array.

10. Your PV array wiring is now complete.

**Note:** The Rooftop DC Isolator should still be in the OFF position at the completion of this stage of the installation. It should not be turned ON until the correct stage of commissioning. Refer to “Solar Isolation Device(s) Test – Rooftop DC Isolator(s)” on page 55.

# PV MODULES

**PV MODULES**

PV modules generate electricity as soon as they are exposed to sunlight and as such they can represent a danger. All warnings in this manual must be observed when handling solar modules to avoid the risk of fire, sparking and/or electrocution.

If modules are connected in series (summing voltage) the combined voltage must not exceed the inverter's maximum input voltage rating. For the maximum number of series connected modules permissible, refer to the relevant wiring diagram in this document for the inverter model installed.

The Solahart mounting system requires the use of modules of equal thickness for correct clamping.

**Note:** Ensure only modules of the same type (model & thickness) are clamped side-by-side and electrically connected.

**MODULE HANDLING**

Modules should be handled with care and protected from damage at all times. All warnings and instructions on the packaging should be observed. Follow these guidelines when unpacking, transporting or storing the modules:

- Store modules in a dry and properly ventilated room. The packaging is not weatherproof.
- Leave the PV modules in the original packaging until installation.
- Inspect the packaging and modules prior to installation. Report any damage to Solahart immediately.
- Note module serial numbers before installation and record serial numbers in the system documentation.
- Do not stack, step on, or drop modules. Do not allow any subject to fall on modules.
- Carry modules with the short side vertical using both hands and do not use the junction box or connection cables as a grip.
- Do not subject modules or backsheets to loads or stresses. Max torsion 10 mm/m.
- Do not use modules that have been dropped.
- Keep all electrical contacts clean and dry.
- Do not modify the module or drill additional holes in any part of the module. This will void the product warranty.
- Do not install modules in windy or wet weather.

⚠ **Warning:** Do not use modules which are broken or damaged. If the module front glass is broken or laminate back sheet is damaged in any way, hazardous voltages may be exposed.

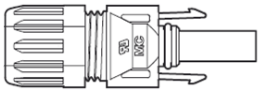
**STRING WIRING PROCEDURE**

**Note:** If you have completed the "Power Optimizer Wiring Procedure" on page 37, proceed to "Earthing" on page 40.

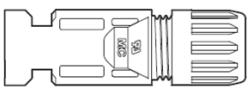
⚠ **Warning:** Use dry, insulated tools and wear PPE when performing wiring to prevent the risk of electric shock. It is suggested that modules be covered with an opaque material during wiring to reduce the voltage generated by the string.

PV Modules can only be connected with DC plug connectors as follows:

Firmly push positive (+) plug into negative (-) plug until an audible "click" is heard, and then try to pull plugs apart. Incorrectly connected plugs will come apart whilst correctly connected plugs will not come apart unless the locking latches on either side of the positive (+) plug are depressed using an unlocking tool whilst plugs are pulled apart.



+



-

**Note:** Pull on plugs, do not pull on wiring.
**Note:** Ensure that the cabling is not under stress.

⚠ **Warning:** Do not connect / disconnect DC connectors or wiring while under load.

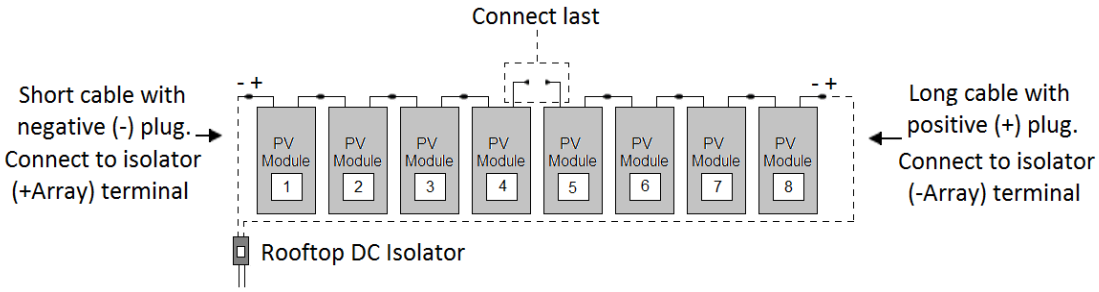
⚠ **Warning:** Do not connect any exposed cable ends. Do not touch "+" and "-" poles at the same time.

⚠ **Warning:** Only connectors of the same make and model may be connected together.

Use minimum 4 mm$^2$ copper wires insulated for minimum 90°C for field connections.

The following procedure should be adhered to whilst wiring module strings to prevent the risk of electric shock or inadvertent short circuiting of live cables whilst wiring the Rooftop DC Isolator:

1. Two extension leads per string should be constructed using the DC extension cable provided in the BOS Kit. One should be short to connect from the first module in the string to the DC isolator. The other should be sufficiently long to plug the end module in the string to the DC isolator (see the example schematic below).
2. Ensure the Rooftop DC Isolator is in the OFF position, strip 12 mm of insulation from the end of each extension lead and connect the two extension leads to the Rooftop DC Isolator terminals. The Rooftop DC Isolator should be wired in a consistent manner. Refer to “DC Isolator Wiring” on page 35.
3. Connect the first module positive (+) cable plug to the Rooftop DC Isolator extension cable negative (-) plug.
4. Connect each module’s negative (-) cable to the following module’s positive (+) cable as modules are being installed until the halfway point is reached i.e. fourth module in an eight module string.
5. Install and connect the remaining modules, but do not make the halfway connection, i.e. in an eight module string do not connect the fourth module negative (-) cable to the fifth module positive (+) cable (refer to wiring diagram below). These two cables will be connected at the end of this procedure.
6. Connect the last module’s negative (-) cable to the Rooftop DC Isolator extension cable positive (+) plug.
7. Complete the circuit by connecting the two string halves together by connecting the positive (+) and negative (-) cables of the two modules left previously disconnected in step 5.




**Note:** Modules may be connected in a different order provided that all modules in a string are connected in series.

**Note:** The Rooftop DC Isolator should still be in the OFF position at the completion of this stage of the installation. It should not be turned ON until the correct stage of commissioning. Refer to “Solar Isolation Device(s) Test – Rooftop DC Isolator(s)” on page 55.

⚠ **Caution:** Ensure all the plug connections are secured away from any water carrying surfaces.

**EARTHING**

All modules and rails must be earthed. Refer to “Earthing Arrangements – All Systems” on page 15. Earthing connections must be made by a suitably qualified person according to the relevant standards outlined on page 4. It is also recommended that a reliable lightning protection system be installed.

Stainless steel serrated washers must be used so the rail anodising is pierced, providing good electrical continuity. Stainless steel nuts, bolts and washers must be used and all ferrous metal in conductive connections should be specially treated to prevent corrosion (i.e. by spray painting or coating with a galvanising paint). Refer also to “Earthing Arrangements – All Systems” on page 15.

**Universal Clamp with earthing plate**

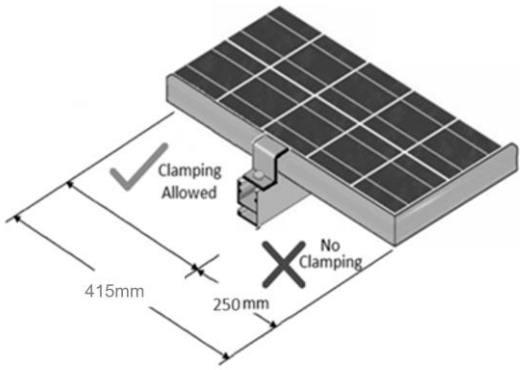
To earth modules and rails, use universal clamps with earthing plates when mounting modules. Install the clamps in accordance with the following instructions. When installed correctly, earthing plates will provide earth bond continuity between rails and modules whilst allowing removal of a module without affecting the earthing integrity of other components in the system. The rails must then be earthed by connecting a suitably sized earth wire. Refer to “Earthing Arrangements – All Systems” on page 15.

Universal clamps with Earthing Plate

⚠ **Warning:** If rails are not of a continuous length, or rail splices do not provide satisfactory earth continuity, earth bond jumper cables must be used across rails or rail splices or each section of rail must have a separate earth wire connection.
⚠ **Warning:** All inverters supplied by Solahart are transformerless, functional earthing of PV array is strictly prohibited. Refer to AS/NZS 5033 for details.

**MODULE MOUNTING**

**Fastening the modules to the mounting structure**
Each module must be securely fixed to the mounting structure at a minimum of four points. The distance between the end clamp and the end of the rail should be a minimum of 25 mm. The mounting clamps must be fastened so the clamp lies completely within the range shown below for each type of module.




**Note: Figure is not to scale**

Wind Zone - A R-200

| Terrain Category | Roof Angle | Building Height | Clamping Zone (mm) |
|---|---|---|---|
| 2 open terrain | 5° ≤ α ≤ 30° | <5m | 100 - 415 |
| 2 open terrain | 5° ≤ α ≤ 30° | <10m | 100 - 415 |
| 3 nearby obstruction | 5° ≤ α ≤ 30° | <10m | 0 - 415 |

Wind Zone - B R-200

| Terrain Category | Roof Angle | Building Height | Clamping Zone (mm) |
|---|---|---|---|
| 2 open terrain | 5° ≤ α ≤ 30° | <5m | 200 - 415 |
| 2 open terrain | 5° ≤ α ≤ 30° | <10m | 200 - 415 |
| 3 nearby obstruction | 5° ≤ α ≤ 30° | <10m | 100 - 415 |

Wind Zone - C R-200

| Terrain Category | Roof Angle | Building Height | Clamping Zone (mm) |
|---|---|---|---|
| 2 open terrain | 5° ≤ α ≤ 30° | <5m | - |
| 2 open terrain | 5° ≤ α ≤ 30° | <10m | - |
| 3 nearby obstruction | 5° ≤ α ≤ 30° | <10m | 300 - 415 |

⚠ **Caution:** Ensure the clamps are not in contact with the front glass of the PV modules.

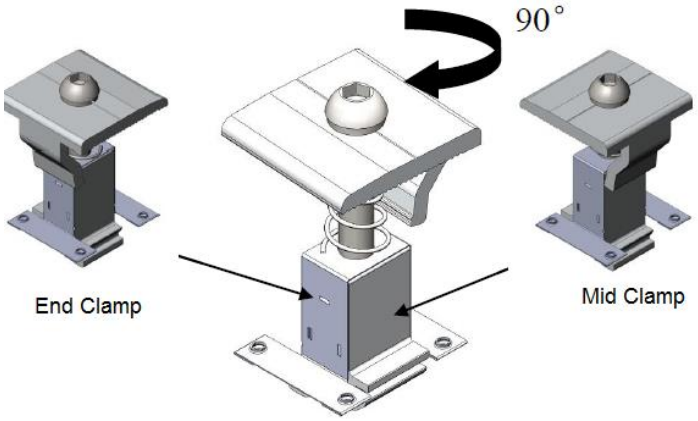
⚠ **Caution:** Ensure the junction box does not touch the structure under the panel.

⚠ **Caution:** PV modules can bend under load. Ensure there is no sharp object installed near the back side of the PV modules.

- ⚠ **Caution:** Ensure all the drainage holes on module frame are not covered.
- ⚠ **Caution:** Ensure all modules are secured during installation.

### Black Universal Clamps

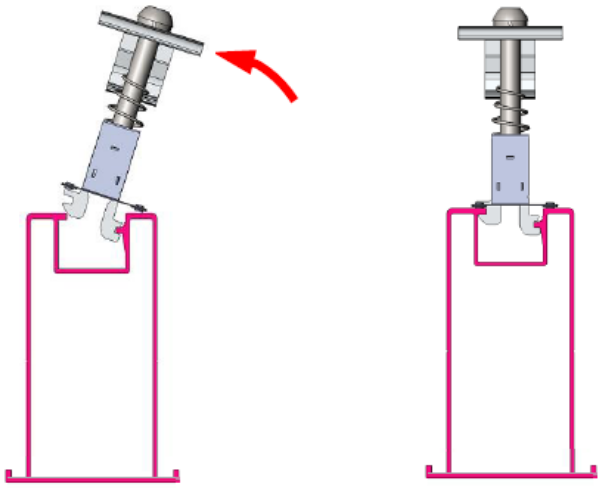
Black Universal Clamps with built-in earthing plates suit PV modules of thickness between 30 mm and 46 mm and can be used as either mid clamps or end clamps.



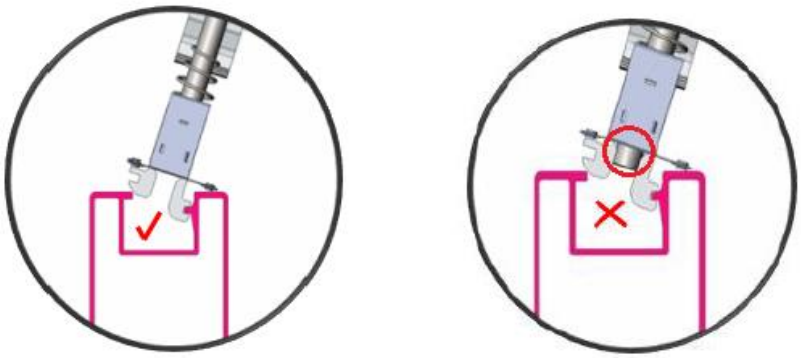

Twisting the head of Universal Clamp changes the functionality from end clamp to mid clamp.

### Inserting the clamps

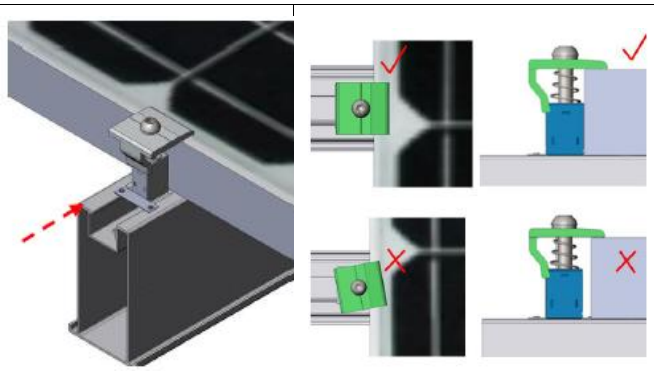
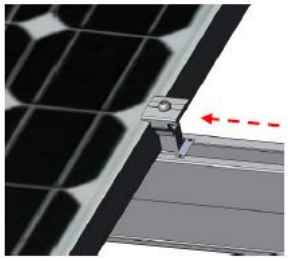
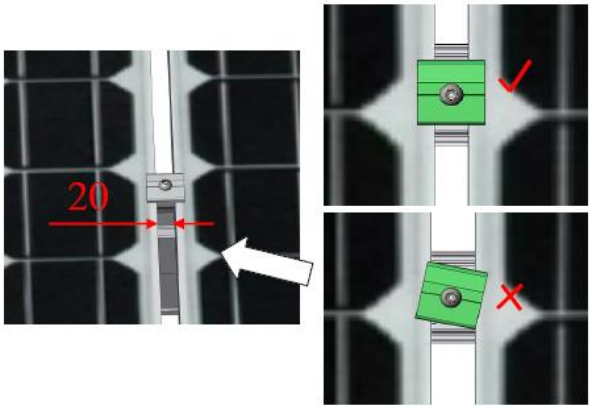
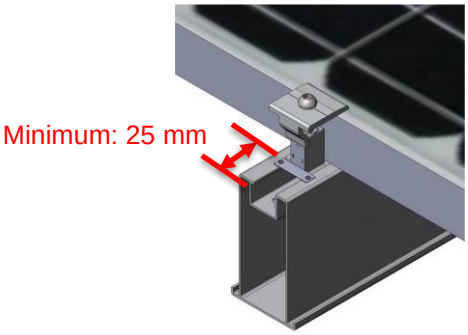
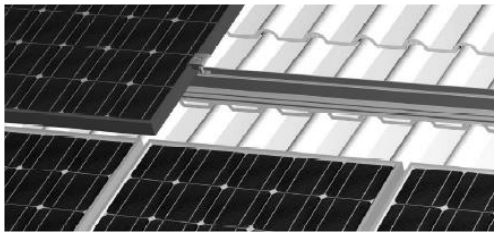
The universal clamp can be installed by inclining it to engage the channel on its lower part with the lower feature of the rail, and press down the universal clamp towards the other side to engage the channel on its upper part with the upper feature of the rail as shown in the figure below.



**Note:** before installing, ensure the Allen head bolt thread does not project through the lower side of the module.



**Module Mounting Procedure**

| | |
|---|---|
| 1. When using as end clamp, slide the universal clamp to the position to be fastened. Ensure there is at least 25 mm from the rail end. Then slightly slide the PV Module frame onto the earthing plate of universal clamp. Make sure the frame of PV Module is fully in contact with the universal clamp. Ensure that the end clamps are tight against the module. Then tighten the universal clamp bolt to 13-14 Nm. |  |
| 2. Inserting the clamps. Ensure the frame of PV module is fully in contact with the universal clamp. |  |
| 3. Slightly slide the next PV Module into the other side of universal clamp, ensure the frame of PV Module is closely in contact with the universal clamp. Visually check to ensure the universal clamp and PV module are properly positioned. Then tighten the universal clamp bolt to 18-20 Nm.<br><br>Ensure both module frame edges are located on top of the protrusions of the earthing plate.<br><br>Repeat steps 2 and 3 for each remaining module in the row. |  |
| 4. Place a universal clamp into the end of each rail. Ensure that the end clamps are tight against the module and are at least 25 mm from the rail ends.<br><br>Ensure the frame of module is located on top of the protrusions of the earthing plate. Tighten the universal clamp bolts to 13-14 Nm. |  |
| 5. Repeat steps 1 - 4 for each row of modules.<br><br>**Note:** Universal clamps may be temporarily placed between rows to ensure 20 mm uniform spacing between rows. |  |

Module installation is now complete.

# INVERTER

For inverter installation instructions and warranty exclusions refer to the documents supplied with the inverter. The following points must also be observed when installing the inverter:

⚠ **Warning:** Inverters have masses between 7 kg and 30 kg. Proper safe handling procedures must be employed when installing or handling these inverters.

- Inverters must be sheltered from direct sunlight and other sources of heat.
- Inverters must be installed in a well-ventilated place so as to allow good circulation of air around the unit. Avoid places where air cannot circulate freely around the unit.
- The inverter must not be installed in a location accessible to children.
- The mounting structure must be capable of supporting the inverter weight.
- If the inverter is to be mounted on a combustible surface such as wood, a heat resistant backing (such as a fibre cement board) must be installed behind the inverter. Backing must extend a minimum of 20 mm past all edges and sides of the inverter.
- Inverter mounting clearances and requirements outlined in the relevant inverter documentation must be adhered to. Ignoring recommended mounting instructions can cause permanent damage to the inverter from water ingress and can reduce inverter efficiency due to inadequate heat dissapation.
- Sealing plugs provided with the inverter must be inserted into any unused string inputs to maintain the inverter's IP rating. Verify the presence of watertight rubber cap seals on DC input connectors and install them should they be absent.
- When installing an inverter with a StorEdge Connection Unit, do not install fuses if a battery is not installed. Leave all fuses in their original packaging behind the plastic cover inside the StorEdge Connection Unit, clear from all electrical wires and components.

**MULTI-CONTACT DC CONNECTIONS**

Multi-Contact Safety Locking Clips must be installed over the negative connectors of all Multi-Contact DC connections at the inverter. The purpose of these devices is to prevent accidental disconnection of live DC at the inverter. When the Safety Locking Clip is in place, a custom tool is required to separate the connectors.

| Multi-Contact (MC)<br>Positive (+) Connector: PV-KBT4 | Multi-Contact (MC)<br>Negative (-) Connector: PV-KST4 | Multi-Contact (MC)<br>Safety Locking Clip: PV-SSH4 |
|---|---|---|
|  |  |  |

**AC CABLE SIZING TABLE**

Inverter AC cabling must be sized and installed in accordance with AS/NZS 3000, AS/NZS 3008.1.1 and any local applicable codes. Cables selected must have an appropriate current carrying capacity for the maximum current output of the inverter, and the Inverter AC isolator, taking into consideration relevant de-rating factors. For the nominal trip current of the AC breaker, refer to the "Wiring Diagrams" beginning on page 6.

| Inverter Model | Maximum AC Output Current (A) | Inverter Model | Maximum AC Output Current (A) |
|---|---|---|---|
| GW1500-XS | 7.2 | GW5048D-ES | 40.0** |
| UNO-DM-2.0-TL-BQ | 10.0 | UNO-DM-5.0-TL-SBQ | 22.0 |
| GW2500-XS | 12.0 | SE5000H-xxxxxxxxx* | 23.0 |
| GW3000D-NS | 13.5 | UNO-DM-6.0-TL-SBQ | 30.0 |
| GW3048-EM | 23.6 | SE6000H-xxxxxxxxx* | 27.5 |
| UNO-DM-3.3-TL-SBQ | 14.5 | SE8250H-xxxxxxxxx* | 37.5** |
| UNO-DM-4.0-TL-SBQ | 19.0 | SE10000H-xxxxxxxxx* | 45.5** |
| GW5000D-NS | 22.8 | GW10K-MS | 45.5** |

* This model may have suffixes indicating different options and functionality.

** For these inverter models, phase ratings on three phase homes must be checked for circuit breaker ratings larger than the inverter's Maximum AC Fault Current.

Inverter AC cabling must have a voltage drop or rise less than 1% in accordance with AS/NZS 5033. For common PVC/PVC cable types operating at 75°C on a 230 V single-phase circuit, the following table provides for a voltage variation of less than 1%.

| Inverter Model | Conductor cross section | | | | |
|---|---|---|---|---|---|
| | 2.5 $mm^2$ | 4.0 $mm^2$ | 6.0 $mm^2$ | 10.0 $mm^2$ | 16.0 $mm^2$ |
| | Maximum cable length (m) | | | | |
| GW1500-XS | 17.8 | 28.5 | 42.5 | N/A | N/A |
| GW2500-XS | 10.7 | 17.1 | 25.5 | 42.9 | N/A |
| GW3048-EM | N/A | N/A | 13.0 | 21.8 | N/A |
| GW3000D-NS | 9.5 | 15.2 | 22.7 | 38.1 | N/A |
| GW5000D-NS | N/A | N/A | 13.4 | 22.6 | N/A |
| GW5048D-ES | N/A | N/A | N/A | 12.9 | 20.5 |
| SE5000H-xxxxxxxxx* | N/A | N/A | 13.3 | 22.4 | 35.6 |
| SE6000H-xxxxxxxxx* | N/A | N/A | 11.1 | 18.7 | 29.7 |
| SE8000H-xxxxxxxxx* | N/A | N/A | 8.2 | 13.7 | 21.8 |
| SE10000H-xxxxxxxxx* | N/A | N/A | N/A | 11.3 | 18.0 |
| GW10K-MS | N/A | N/A | N/A | 11.3 | 18.0 |

* This model may have suffixes indicating different options and functionality.

**Notes:**

- For FIMER inverters, refer to FIMER Quick Installation Guide for AC Cable sizing.
- If the installation requires different cabling or has installation conditions different to those specified above, the installer must undertake appropriate calculations to ensure the cabling is correctly sized.
- The installer must determine the current carrying capacity in accordance with AS/NZS 3008.1.1.

**FIMER INVERTER CHANNEL CONFIGURATION**

For FIMER inverters ensure that the input channel configuration ('independent' or 'parallel') is correct for the arrangement of stings in the PV array. Refer to FIMER Product Manual for details.

**EARTH FAULT ALARMS**

The installation of an earth fault alarm compliant with AS/NZS 5033 requirements is mandatory for all arrays. Inverters supplied by Solahart are able to communicate an earth fault in four different ways:

1. Inverter display
    - Some inverters supplied by Solahart display an Earth Fault Alarm message on the inverter display when an earth fault is present. Consult the specific inverter installation manual for details of the error message display on the inverter
    - Examples:
        - FIMER inverter display
2. Inverter Built-in Audible Alarm
    - Some inverters supplied by Solahart come with built-in audible alarm which is triggered when an earth fault is present.
    - Examples:
        - GoodWe inverters
3. External alarm – Email Alert
    - Some inverters supplied by Solahart are able to communicate with a web portal that can be configured to send an email alert to the system owner when an earth fault is present.
    - Examples:
        - FIMER built-in Wi-Fi
        - SolarEdge Wi-Fi kit or integrated Ethernet
4. External alarm – Audible or Visual Alarm
    - Some inverters supplied by Solahart can switch a relay when an earth fault is present. The relay can be connected to an audible or visual alarm that meets AS/NZS 5033 requirements.
    - Examples:
        - FIMER configurable relay

**FIMER Inverter Display**

It may be possible to comply with earth fault alarm requirements without additional components. In this instance, the visual warning light and error information on the graphical display can be relied upon; however, this method of compliance requires the inverter be installed in a compliant location according to AS/NZS 5033 and/or local regulator.

**FIMER configurable relay**

All FIMER inverters currently supplied by Solahart are delivered with a configurable relay connection that on the occurrence of an inverter fault can be used to trigger an external audio and/or visual alarm. Please follow the instructions provided in the inverter product manual for maximum ratings, requirements and instructions on how to utilise the configurable relay connection.

**GoodWe inverter display**

It may be possible to comply with earth fault alarm requirements without additional components. In this instance, the visual warning light and error information on the graphical display can be relied upon; however, this method of compliance requires the inverter be installed in a compliant location according to AS/NZS 5033 and/or local regulator.

**GoodWe built-in audible alarm**

All Goodwe inverters currently supplied by Solahart are delivered with an audible fault alarm. In the occurrence of an Earth Fault, the internal audible alarm in the inverter will continue ringing for 1 minute and again every 30 minutes until the earth fault is resolved.

**SolarEdge DC Safety Unit**

The SolarEdge HD Wave inverter has a built in DC Safety Unit. This unit provides cabling connections and isolation from the PV string(s) to the inverter.

⚠ **Warning:** Turning off the DC Safety Unit Switch does not discharge the capacitors inside the inverter. High DC voltage is still present. The inverter On/Off toggle switch must be turned off before removing the inverter cover(s).

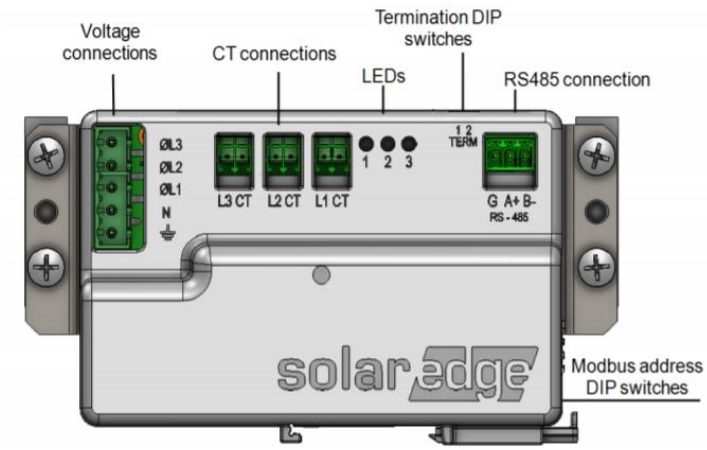
# METER (SOLAREDGE ONLY)

**Note:** The meter is an optional accessory for use in battery systems and for zero export requirements.

**Note:** SolarEdge Energy Hub meters (SE####H-AUS3MBX14 models) come with the built-in meter and only require CT run to the inverters.

**Note:** Refer to Installation Guide Energy Meter with Modbus Connection for Inverter firmware requirements.

Below is a diagram of this meter.




**MOUNTING**

⚠ **Warning:** Protect the meter from temperatures below -30°C or above 55°C, excessive moisture, dust salt spray, or other contamination, using an IP rated enclosure if necessary

⚠ **Warning:** Meter must be installed in an enclosure.

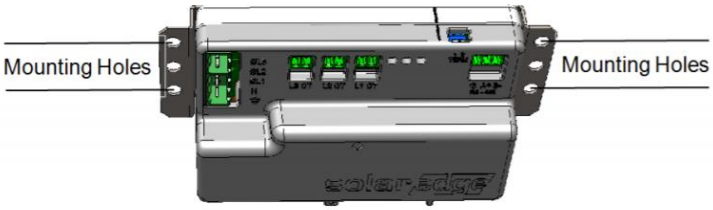
⚠ **Warning:** Do **NOT** use the meter as a drilling guide; the drill chuck can damage the screw terminals and metal shavings may fall into the connectors

**NOTE:** For Comms Cabling, the following cables requirements must be met.

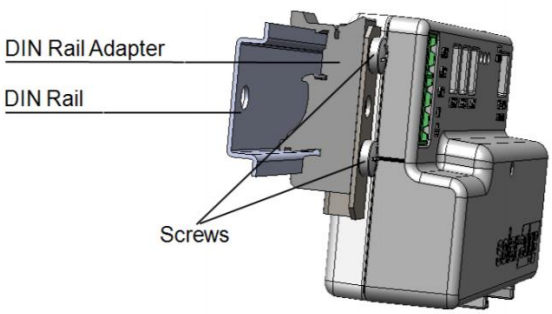
| Cable Description | Cable Type | Conductor Size |
|---|---|---|
| Monitoring and control | Shielded data cable with minimum 2 twisted pairs, 600 V insulated. (Max Length: 10 m) | 0.2 $mm^2$ – 1.5 $mm^2$ |

The SolarEdge meter can be mounted in one of two methods:

1. Attached directly onto a substrate through the four mounting holes marked in the figure below.




2. Attached to a DIN rail via the 2 DIN rail adaptors and 4 screws supplied with the meter.



**WIRING AT METER**

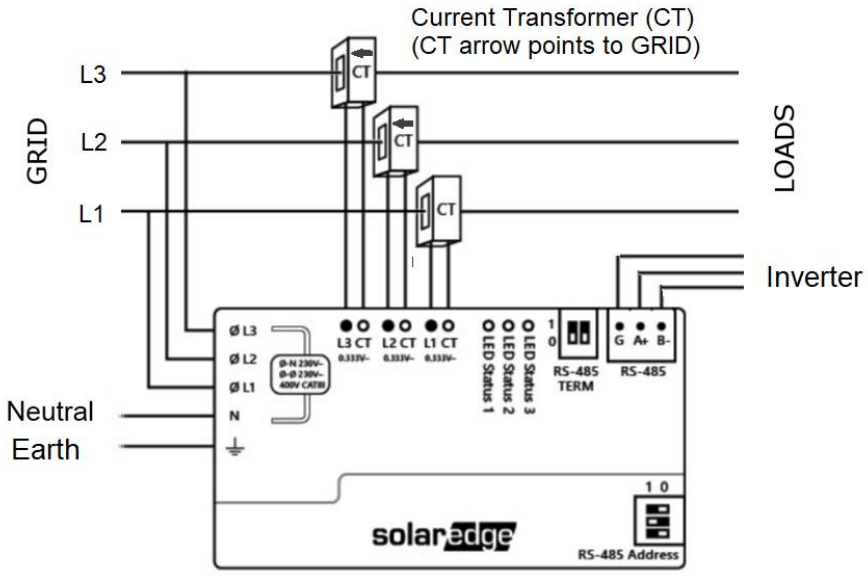
⚠ **Warning:** Isolate all sources of supply before attempting to wire the meter.
⚠ **Warning:** Do not place more than one voltage wire in a screw terminal.

The wiring procedure for SolarEdge meters is as follows:

1. Install cabling for neutral and earth.
2. Install cabling for each line voltage to the appropriate phase.

**Note:** The meter draws 10-30 mA and it shall be protected by a circuit breaker rated for 20 A or less.
**Note:** The meter is a final subcircuit and shall be protected by a RCD/RCBO in accordance with AS/NZS 3000.

3. Install cabling for the current transformers (CTs).
    a. To minimize current measurement noise, minimise the length of the CT wires.
    b. Match the CTs with their corresponding voltage phases.
4. Install each CT around the conductor to be measured with the arrow or label "THIS SIDE TOWARD SOURCE" pointing towards the grid, and secure with a nylon cable tie.Install cabling for the RS485 communications line
    a. Take note of the difference between the inverter and SolarEdge connector labelling.




**SETTING DIP SWITCHES**

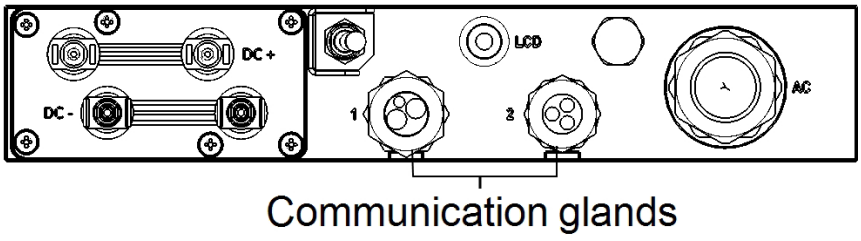
Set DIP switches on the meter as described below.

1. Set the termination DIP switches for Termination. Both switch 1 and switch 2 should be in position 0.
2. Set the address DIP switches for Modbus Address 2: Set switch 2 to position 1, and set switches 1 and 3 to position 0.

**Note:** Position 0 indicates the tab is set towards the front side of the meter; position 1 indicates the tab is set towards the back of the meter.

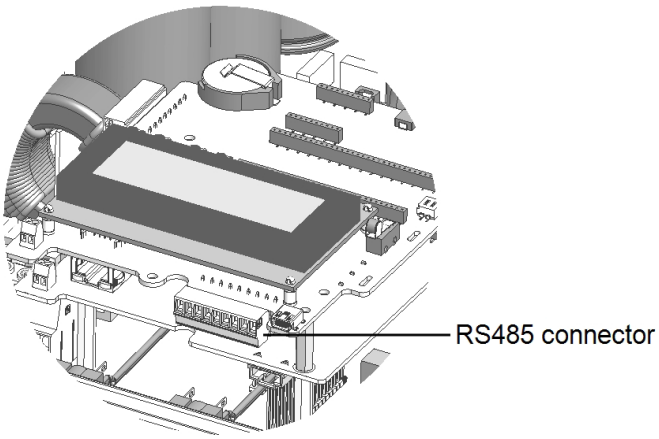
**WIRING AT INVERTER**

1. Remove the seal from one of the openings in the communication gland #2 at the bottom of the inverter and insert the RS485 wires from the meter through the opening.

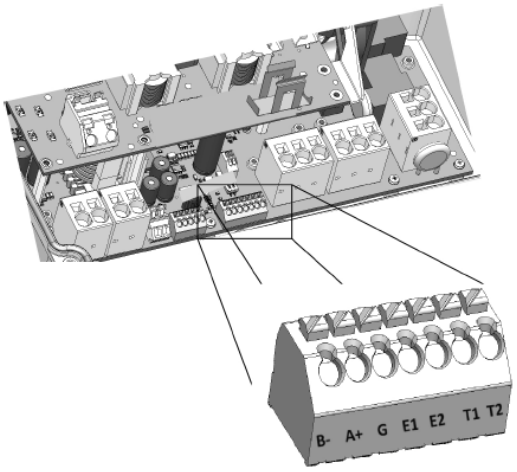



For an inverter with conduit entries, route the RS485 wires from the meter through the opening in the right hand side of the unit.

2. Remove the 9-pin RS485 connector located on the communication board.

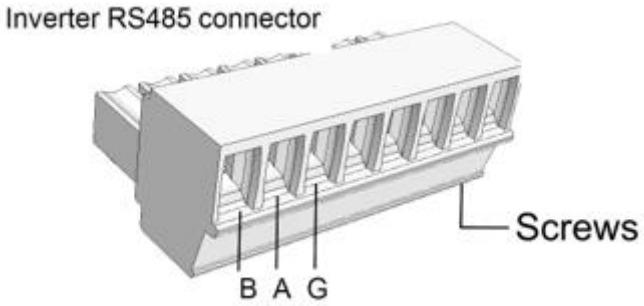



SolarEdge Inverter




SolarEdge Inverter with StorEdge Connection Unit

3. Remove the RS485 connector located on the communication board.




4. For configuration of other SolarEdge Devices including Inverter(s), refer to Installation Guide Energy Meter with Modbus Connection.

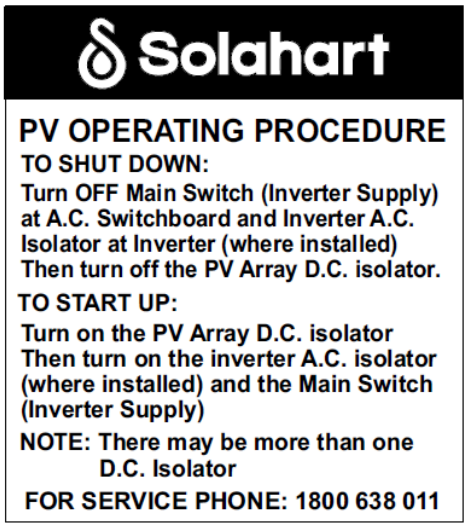
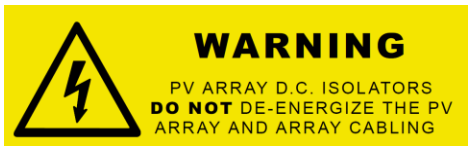
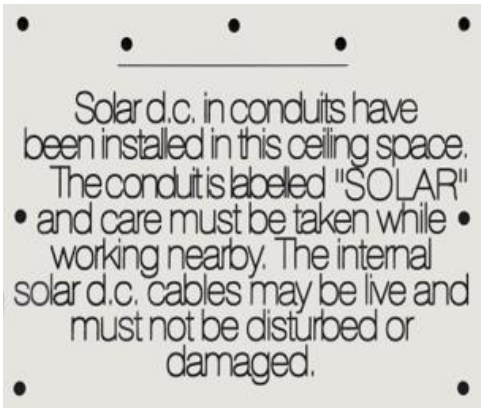
# LABELLING

This information is supplied here as a guide only. Additional labels may be required depending upon the installation and local requirements. Labels must be constructed to AS 1319 and installed according to AS 4777.1, AS/NZS 5033 and any local regulations. Refer to aforementioned standards for more information.

The purpose of labelling is to clearly indicate that the electrical installation has multiple supplies and which circuits are affected by these supplies. Labelling also identifies the components that isolate the various supplies. Labels relating to the PV system must be placed on the switchboard to which the PV system is directly connected. If the PV system is directly connected to a distribution board, additional labels must also be placed on the main switchboard and all intermediate distribution boards. Installations using the DC Isolators must use the DC Isolator labels however installations using Disconnection Points will require extra set of labels for disconnection points, warnings for ceiling access and cables etc. The following table details labels that are supplied in Solahart PV Systems.

| Label | Colour | Location |
|---|---|---|
|  | Black text<br>on<br>yellow background | Prominent position on the switchboard where the inverter is connected to |
|  | White text<br>on<br>red background | Adjacent to main switch to grid supply |
|  | White text<br>on<br>red background | Adjacent to the isolator for normal supply to the distribution board (applicable only when the inverter is connected to a distribution board) |
|  | White text<br>on<br>red background | Solar inverter main switch if inverter is located adjacent to switchboard<br>OR<br>Solar inverter main switch if inverter is not located adjacent to main switchboard |
|  <br>Solar plant location to be entered by installer | White text<br>on<br>red background | |

| Label | Colour | Location |
|---|---|---|
| SOLAR ARRAY ON ROOF<br>Open circuit voltage ____ V<br>Short circuit current ____ A<br>Values to be entered by installer<br><br>**SOLAREDGE SYSTEMS ONLY:**<br>Open circuit voltage: Inverter maximum DC operating voltage<br>Short circuit current: Inverter maximum input current | White text on red background | Prominent position adjacent to meter box and building's main switchboard |
| PV SW | Reflective white text on reflective green background | Prominent position on or adjacent to the meter box (only for isolator type installation)<br><br>OR |
| PV DP | Reflective white text on reflective green background | Prominent position on or adjacent to the meter box (only for disconnection point type installation) |
| PV ARRAY D.C. ISOLATOR | Black text on white background | Rooftop and inverter Solar DC isolators |
| ↓ | Black text on white background | Next to "PV ARRAY D.C. ISOLATOR" label, pointing to the location of Inverter built-in DC Isolator (if Applicable) |
| INVERTER A.C. ISOLATOR | Black text on white background | Inverter AC isolator |
| WARNING<br>MULTIPLE SUPPLIES<br>ISOLATE INVERTER SUPPLY AT DISTRIBUTION SWITCHBOARDS LOCATION: _____<br>Distribution board number to be entered by installer i.e. DB1 | Black text on yellow background | Main switchboard (applicable when the inverter is connected to a distribution board) |

| Label | Colour | Location |
|---|---|---|
|  | Black and white | Prominent position adjacent to the inverter |
|  | Black text on yellow background | Added below the shutdown sign (Solahart PV Operating Procedure) |
|  | Black text on yellow background | Prominent position adjacent to the inverter (where multiple isolators/disconnection devices are used) |
|  | Black text on yellow background | Prominent position adjacent to the inverter (where multiple isolators/disconnection devices are used) |
|  | Black text on yellow background | Signs for junction boxes containing PV d.c. cable terminations (only for disconnection point type installation) |
|  | Black text on yellow background | Attached to the PV module or structure within 300mm of the disconnection point |
|  | Black and white | Adjacent to the access point (for disconnection point type installation) |

| Label | Colour | Location |
|---|---|---|
|  | Black text<br>on<br>yellow background | Added on the ceiling access sign |
|  | Black text<br>on<br>yellow background | On the cable within 100mm of the disconnection point |

s

# COMMISSIONING

Systems must be commissioned according to AS/NZS 5033. Commissioning tests are required to ensure that the system complies with the aforementioned standard. Commissioning information is provided here as a guide only and it is the installer's responsibility to ensure that the requirements of AS/NZS 5033 are met. A copy of the relevant commissioning documents must be provided to the owner and a copy kept by the installer.

Before starting any of the tests below, ensure that:

- The Main Switch (Inverter Supply) at the AC switchboard is in the OFF position.
- The Inverter AC Isolator at the inverter is in the OFF position (if installed).
- The Inverter DC Isolator(s) at the inverter are in the OFF position.
- The Rooftop DC Isolator(s) are in the OFF position.

⚠ **Warning:** Dangerous DC voltages may be present during the following commissioning procedure. Appropriate personal protective equipment should be used.

**VERIFICATION OF MODULE AND RAIL EARTH RESISTANCE**

This test is performed to ensure modules, rails and other mounting components are correctly earthed.

8. Using a multimeter set on the ohms scale, measure between each module and the system earth wire. Earth resistance must be 0.5 Ω or less.
9. Using a multimeter set on the ohms scale, measure between each rail and the system earth wire. Earth resistance must be 0.5 Ω or less.
10. Using a multimeter set on the ohms scale, measure between each mounting component and the system earth wire. Earth resistance must be 0.5 Ω or less.

**STRING OPEN CIRCUIT VOLTAGE ($V_{OC}$) TEST**

This test is performed to ensure the wiring polarity and continuity of the PV array is correct. Measurements should be made under stable irradiance conditions close to solar noon if possible. Where multiple strings are installed, this test procedure must be repeated for each string.

The voltage measurement obtained should be the number of modules in the string multiplied by the $V_{oc}$ of one module. For example: For a string with 9 X SOLAHART415S5 modules: String $V_{oc}$ = 9 X 37.80 V DC ≈ 340.2 V DC. Refer to "Voltage Tables for GoodWe and FIMER Systems" or "Voltage Tables for SolarEdge Systems" on page 14.

1. Ensure that the Inverter AC Isolator(s) are in the OFF position.
2. Ensure that the Inverter DC Isolator(s) are in the OFF position.
3. Ensure that the Rooftop DC Isolator(s) are in the OFF position.
4. Using a multimeter set on the DC voltage scale, measure between the string positive and negative terminals at the module side of the string Rooftop DC Isolator and compare the value obtained with the table below. For SolarEdge systems see note below.

   **Note (SolarEdge systems only):** Each power optimizer in a string will output a voltage of 1 V (±0.1 V). For example: 9 power optimizers connected in a string should output a voltage of 9 V (±0.9 V).
5. Repeat for each string.

The open-circuit voltage ($V_{oc}$) of every string must be measured before switching on the inverter and must be within 5% of the calculated value. If readings are outside the calculated value by more than ±5%, then connections must be verified for polarity, continuity and possible faults and repaired where necessary. Once verification has been satisfactorily completed, strings may then be connected to the inverter.

**SOLAR ISOLATION DEVICE(S) TEST – ROOFTOP DC ISOLATOR(S)**

This test is performed to ensure the Rooftop DC Isolator(s) are isolating the string(s) from the inverter when in the OFF position.

1. Ensure that the Inverter AC Isolator(s) are in the OFF position.
2. Switch all string DC Isolators to the ON position (Rooftop and Inverter DC Isolators).
3. Ensure that the PV system is operating under irradiance conditions greater than 500 W/m$^2$.
4. Switch the string Rooftop DC Isolator to the OFF position.
5. Disconnect string positive and negative DC plug connectors from inverter.
6. Using a multimeter set on the DC voltage scale, connect multimeter leads between the disconnected string plugs. Ensure leads are firmly connected. If a DC voltage is present, the Rooftop DC Isolator or system wiring is faulty and will require replacing or repairing.

   **Note (SolarEdge systems only):** Each power optimizer in a string will output a voltage of 1 V (±0.1 V). For example: 9 power optimizers connected in a string should output a voltage of 9 V (±0.9 V).
7. Switch the string Rooftop DC Isolator to the ON position. If a DC voltage is not present, the Rooftop DC Isolator or system wiring is faulty and will require replacing or repairing.
8. Switch the string Rooftop DC Isolator to the OFF position.
9. Reconnect string positive and negative DC plug connectors to inverter.
10. Repeat for each string.

**SOLAR ISOLATION DEVICE(S) TEST – INVERTER DC ISOLATOR(S)**

This test is performed to ensure the Inverter DC Isolator(s) are isolating the string(s) from the inverter when in the OFF position.

1. Ensure that the Inverter AC Isolator(s) is in the OFF position.
2. Switch all string DC Isolators to the ON position (Rooftop and Inverter DC Isolators).
3. Ensure that the PV system is operating under irradiance conditions greater than 500 W/m$^2$.
4. Switch the string Inverter DC Isolator to the OFF position.
5. Disconnect string positive and negative DC plug connectors from inverter.
6. Using a multimeter set on the DC voltage scale, connect multimeter leads between the disconnected string plugs. Ensure leads are firmly connected. If a DC voltage is present, the Inverter DC Isolator or system wiring is faulty and will require replacing or repairing.

   **Note (SolarEdge systems only):** Each power optimizer in a string will output a voltage of 1 V (±0.1 V). For example: 9 power optimizers connected in a string should output a voltage of 9 V (±0.9 V).
7. Switch the string Inverter DC Isolator to the ON position. If a DC voltage is not present, the Inverter DC Isolator or system wiring is faulty and will require replacing or repairing.
8. Switch the string Inverter DC Isolator to the OFF position.
9. Reconnect string positive and negative DC plug connectors to inverter.
10. Repeat for each string.

**INSULATION RESISTANCE TEST**

This test is performed to verify the insulation resistance between the positive DC string wiring and earth and the negative DC string wiring and earth are both greater than or equal to 1 Megaohm (1 MΩ) as required by AS/NZS 5033.

An insulation tester capable of applying test voltages of 500 V and 1000 V is required to perform this test.

⚠ **Warning:** Live voltages of up to 600 VDC will be present during this test. Wear personal protective equipment to prevent the risk of electric shock and treat DC string wiring as if it were live at all times.

⚠ **Warning:** Do not permit any person to touch any part of the array whist the insulation test is being performed.

1. Ensure that the Inverter AC Isolator is in the OFF position.
2. Switch the Rooftop DC Isolator(s) to the ON position.
3. Switch the Inverter DC Isolator(s) to the OFF position.
4. Disconnect string positive and negative DC plug connectors from inverter.
5. Connect the insulation tester leads between the disconnected positive string plug and earth. Ensure test leads are firmly fixed in position.
6. Select the appropriate test voltage on the insulation tester according to the number of modules in the string (500 V for a string of 6-10 modules; 1000 V for a string of 11-14 modules).
7. Switch the Inverter DC Isolator to the ON position.

⚠ **Warning:** The positive and negative string wiring is now live and will have up to 600 VDC present.

8. Activate insulation tester. The resistance measured must be greater than or equal to 1 MΩ.
9. Switch the Inverter DC Isolator to the OFF position.
10. Connect insulation tester leads between the disconnected negative string plug and earth. Ensure test leads are firmly fixed in position.
11. Switch the Inverter DC Isolator to the ON position.

⚠ **Warning:** The positive and negative string wiring is now live and will have up to 600 VDC present.

12. Activate insulation tester. The resistance measured must be greater than or equal to 1 MΩ.
13. Switch the Inverter DC Isolator to the OFF position.
14. Reconnect string positive and negative DC connectors to the inverter.
15. For the Two String Configuration, repeat this procedure for the second string.

**VERIFICATION OF INVERTER WIRING**

This verification is performed to ensure the inverter is correctly and safely wired. Check the Positive and Negative connectors are fully engaged at the Inverter and any unused inputs have connectors with sealing plugs installed.

**INVERTER COMMISSIONING**

⚠ **Warning:** Do not turn on the inverter until all of the previous commission procedure tests/checks have been satisfactorily completed.

Turn on the PV system (refer to “To Turn PV System On” in the Solahart PV Systems Owner’s Guide) then commission the inverter according to the commissioning procedure described in the relevant inverter installation guide for the model inverter installed.

FIMER UNO-DM-TL-PLUS-Q series inverters must be commissioned through the inverter Built-in Wifi Web User Interface (UI). For details refer to FIMER instruction “Solar Inverter UNO-DM-1.2/2.0/3.0/3.3/4.0/4.6/5.0-TL-PLUS-Q Quick Installation Guide” and “Quick Installation Guide UNO-DM-6.0-TL-PLUS-Q”.

GoodWe XS, DNS and MS series inverters are commissioned using the button or 'key' and inverter LED screen. For details refer to "GoodWe Inverter Commissioning for Single Phase PV Inverters" on page 58.

GoodWe EM and ES series inverters are commissioned using inverter built-in Web UI. For details refer to "GoodWe Inverter Commissioning for Single Phase Storage InvertersGoodWe Inverter Commissioning for Single Phase Storage Inverters" on page 58.

**SOLAREDGE INVERTER COMMISSIONING USING SETAPP**

The following inverter models are commissioned using the SolarEdge Inverter SetApp:

- SE5000H-xxxxxxxxx
- SE6000H-xxxxxxxxx
- SE8000H-xxxxxxxxx
- SE10000H-xxxxxxxxx

Prepare the inverter for commissioning

1. Ensure all circuit breakers, inverter and cables are correctly rated, mounted and installed.

2. Switch on the AC Circuit Breaker.

Follow the steps below to commission inverter:

1. Download the SolarEdge app "SetApp" onto an Android or IOS smart device from Play Store or App Store, respectively.

2. Open SetApp and log in using the SolarEdge monitoring Username and password provided by your Solahart dealership.

3. Scan inverter QR code; for multiple-inverter configuration, scan the master inverter first.

4. Follow the SetApp instructions to enable Wi-Fi connection between the smart device and the inverter.

5. Follow the SetApp instructions to upload firmware.

6. Follow the SetApp instructions to set country and language.

7. Follow the SetApp instructions to set communication and enable remote monitoring.

Note: If multiple inverters are connected in Master-Slave configuration, the master inverter protocol shall be set to "SolarEdge Master" under menu "Communication" -> "RS485-1". Then select "Slave Detect". Ensure all slave inverters are listed.

8. Follow the SetApp instructions to pair the power optimisers.

9. Select "Status" to verify if all parameters display correctly.

10. Repeat step 3-9 for all the other inverters.

**GOODWE INVERTER COMMISSIONING FOR SINGLE PHASE PV INVERTERS**

The following inverter models are commissioned using the button or 'key' and inverter LED screen:

- GW1500-XS
- GW2500-XS
- GW3000D-NS
- GW5000D-NS
- GW10K-MS

Prepare the inverter for commissioning

1. Ensure all circuit breakers, inverter and cables are correctly rated, mounted and installed.
2. Switch on the DC Isolator(s).
3. Switch on the AC Circuit Breaker.

Follow the steps below to commission inverter:

1. Wait for the inverter to start up. The inverter screen will settle on 'Configure Safety'
2. Long press the key to proceed to a menu of country settings.
3. Short press the key to scroll through the menu to the setting appropriate to the installation location.
4. To confirm the setting, do not press the key for 20 seconds.
5. Once confirmed, 'Normal' will be displayed. A green stable LED light indicates the inverter is active and running normally.

**GOODWE INVERTER COMMISSIONING FOR SINGLE PHASE STORAGE INVERTERS**

The following inverter models are commissioned using GoodWe mobile APP "PV Master":

- GW5000D-ES
- GW3048-EM

Prepare the inverter for commissioning

1. Ensure all circuit breakers, inverter and cables are correctly rated, mounted and installed.
2. Switch on the DC Isolator(s).
3. Switch on the AC Circuit Breaker.

Follow the steps below to commission inverter:

1. Download the GoodWe app "PV Master" onto an Android or IOS smart device from Play Store or App Store, respectively.
2. Connect to Wi-Fi network of the inverter named "Solar-WiFi"
3. Enter the Wi-Fi Password:12345678
4. Open APP "PV Master" and click on "Local configuration".
5. Check and confirm the work status of the inverter is in "Check Mode" and click on "Set" and choose "basic setting".
6. Type in the Installer password "goodwe2010" the click "Login".
7. Select country setting to be "Australia".
8. Select the appropriate work mode from "General Mode", "Back-yup Mode" or "Economical Mode".

   Warning: Don not Choose "Off-Grid Mode".
9. Select the correct battery model if applicable and click "set" then "yes" to restart the inverter automatically.

**VERIFICATION OF SYSTEM OPERATION**

This step is performed to verify the PV system is operating correctly.

1. Ensure all DC Isolators are in the ON position (Rooftop and Inverter DC Isolators).
2. Ensure the AC Isolator is in the ON position.
3. Ensure the PV system is operating under irradiance conditions greater than 500 W/m$^2$.

   **Note (SolarEdge systems only):** Follow system verification procedure outlined in the inverter installation manual supplied with the inverter. Skip Step 4 below.

4. After waiting for the inverter to connect to the grid, record the 'Input Voltage' for each string which will be alternately displayed on the inverter LCD screen. Check this 'Input Voltage' is within ±5% of the value for the number of modules in each string, according to the following table:

| **SOLAHART415S5 modules** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Number of modules** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| Indicative String $V_{mp}$ * | 64 | 95 | 127 | 159 | 191 | 222 | 254 | 286 | 318 | 349 | 381 |

*Values measured at standard test conditions (STC) defined as: irradiance of 1000 W/m$^2$, Spectrum AM 1.5, and cell temperature 25°C. Variations from STC values will affect actual $V_{mp}$ and should be allowed for.

# ENGINEERING CERTIFICATION

MW Engineering
Melbourne

CIVIL & STRUCTURAL ENGINEERS
RESIDENTIAL - INDUSTRIAL - COMMERCIAL - PRODUCT DEVELOPMENT

info@mwengineering.melbourne
Phone: 1300 MWENG-0 (1300 69364-0)
www.mwengineering.melbourne
ABN 37 605 815 585

14 July 2021

Clenergy Australia
1/10 Duerdin Street
Clayton, VIC 3168

## CERTIFICATION LETTER

Clenergy PV-ezRack Solar Roof Certification – TC2, 2.5, 3 – Wind Region A, B, C, D. Internal REF: **00115.** Project REF: **CL-10088-SM-REV-I.**

MW Engineering Melbourne, being Structural Engineers within the meaning of Australian regulations, have calculated the maximum spacings for the PV ez-Rack rail system for the following conditions:

- **Wind Loads to AS 1170.2-2011 AMDT 4-2016**
  - **Wind Terrain Category 2, 2.5 and 3**
  - **Wind average recurrence of 200 years**
  - **Wind Region A, B, C, D**
- **Solar panel length up to 2.4m**

Attached are the tables showing the spacings according to Wind Region, roof pitch, and building height.

The values shown on these tables will be valid unless an amendment is issued on any of the following codes:

| | |
|---|---|
| - **AS/NZS 1170.0- 2002 AMDT 4-2016** | **General Principles** |
| - **AS/NZS 1170.1- 2002 AMDT 4-2016** | **Imposed Loadings** |
| - **AS/NZS 1170.2- 2011 AMDT 4-2016** | **Wind Loadings** |
| - **AS/NZS 1664.1- 1997 AMDT 1:1999** | **Aluminium Code** |

Should you have any queries, do not hesitate to contact us.

Best Regards,

Alberto Escobar
Civil/Structural Engineer
**BEng MIEAust NER**
BRP EC 46542
RPEQ 18759
info@mwengineering.melbourne

July 2021

MW Engineering
Melbourne

CIVIL & STRUCTURAL ENGINEERS
RESIDENTIAL - INDUSTRIAL - COMMERCIAL - PRODUCT DEVELOPMENT

info@mwengineering.melbourne
Phone: 1300 MWENG-0 (1300 69364-0)
www.mwengineering.melbourne
ABN 37 605 815 585

14 July 2021

Clenergy Australia
1/10 Duerdin Street
Clayton, VIC 3168

## CERTIFICATION LETTER

Clenergy PV-ezRack Solar Roof Certification – TC2, 2.5, 3 – Wind Region A, B, C, D. Internal REF: **00563.** Project REF: **CL-693-S.**

MW Engineering Melbourne, being Structural Engineers within the meaning of Australian regulations, have calculated the maximum spacings for the PV ez-Rack rail system for the following conditions:

- **Wind Loads to AS 1170.2-2011 AMDT 4-2016**
  - **Wind Terrain Category 2, 2.5 and 3**
  - **Wind average recurrence of 500 years**
  - **Wind Region A, B, C, D**
- **Solar panel length up to 2.4m**

Attached are the tables showing the spacings according to Wind Region, roof pitch, and building height.

The values shown on these tables will be valid unless an amendment is issued on any of the following codes:

| | |
|---|---|
| - **AS/NZS 1170.0- 2002 AMDT 4-2016** | **General Principles** |
| - **AS/NZS 1170.1- 2002 AMDT 4-2016** | **Imposed Loadings** |
| - **AS/NZS 1170.2- 2011 AMDT 4-2016** | **Wind Loadings** |
| - **AS/NZS 1664.1- 1997 AMDT 1:1999** | **Aluminium Code** |

Should you have any queries, do not hesitate to contact us.

Best Regards,

Alberto Escobar
Civil/Structural Engineer
**BEng MIEAust NER**
BRP EC 46542
RPEQ 18759
info@mwengineering.melbourne

July 2021

**Solahart Industries Pty Ltd** (A.B.N. 45064945848)
Registered Office
1 Alan Street (PO Box 7508, Silverwater, 2128)
Rydalmere New South Wales 2116
Australia

For SERVICE Telephone - **1800 638 011**
or your nearest Solahart Dealer
For Sales Telephone - **1300 769 475**
or your nearest Solahart Dealer
**www.solahart.com.au**

Revision date: 2023 January

122332G