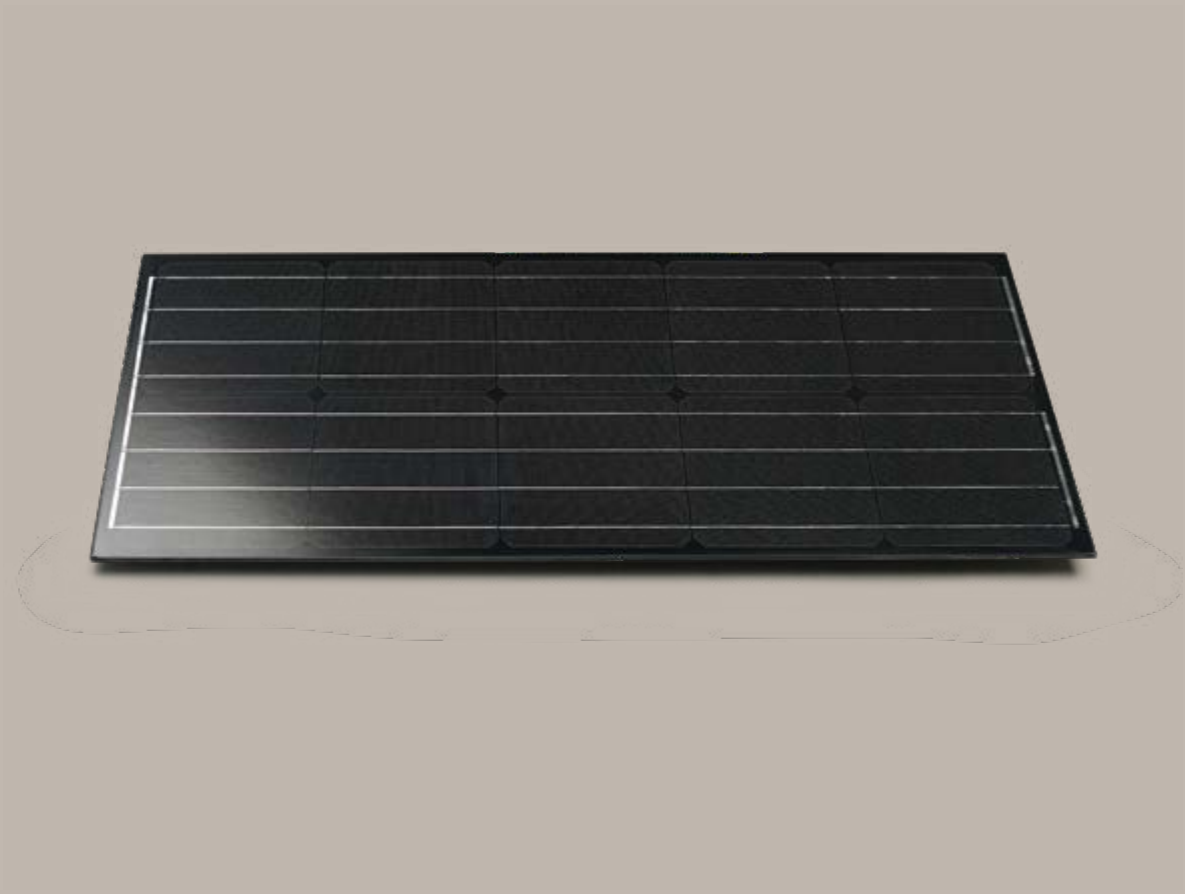
2019 VERSION 1

INSTALL MANUAL

BRISTILE **SOLAR**



bristileroofing

INSTALLATION MANUAL

BRISTILE **SOLAR**

a beautiful way to save

Table of contents

1. Disclaimer of Liability **3**

2. Introduction **3**

3. Safety precautions **3**

Environmental, health and safety 3

Shut down procedure 4

4. Receipt of goods and unpacking **4**

5. Design and installation considerations ... **4**

Wind and structural design 5

Photovoltaic design 5

Orientation and pitch 5

Array location 5

Inverter and inverter location 5

DC cabling 5

Reverse current protection/string fusing 6

DC String & Electrical Design & Installation 6

DC Isolators 6

6. Installation **6**

Sarking 7

Batten Installation 7

DC Isolator 8

Solar Tile Installation – Planum 8

Solar Tile Installation – Prestige 9

DC Cable Installation 9

Installation of Cable to Integrated Isolator 9

Fixing the Solar Tile to the Batten 10

Final Setout 10

7. Maintenance **11**

Cabling 11

Isolation 11

Invertor 11

Panels 11

Operation 11

General 11

Reporting 11

8. Recycling End Of Life Photovoltaic Products **11**

9. Specifications - Building Integrated Photovaltaic Module **12**

1. Disclaimer of liability

The installation, handling and use of Bristile Roofing solar tile components and photovoltaic (PV) modules are the responsibility of the contractor. Bristile Roofing does not assume any responsibility for loss, damage, injury or expense resulting from improper installation, handling, use or maintenance of Bristile Roofing solar tile products.

Bristile Roofing assumes no responsibility for any infringement of patents or other rights of third parties that may result from use of the solar tile components and PV modules. No licence is granted by implication or under any patent or patent rights. Specifications are subject to change without notice.

Design, installation and compliance of the Bristile Roofing solar tile and its components is governed by the Australian Codes and Standards and all State Codes and Standards including but not limited to the following:

- AS 1170
- AS 1170.2:2002
- AS 1170.3:2003
- AS 4777.1
- AS 4777.2
- AS 4777.3
- AS 5033
- AS 3000
- AS 3008

Please refer to the appropriate Bristile Roofing Manual for all information regarding the installation of the roofing tile and BMC frame. Both this installation manual and the standard Bristile Roof Tile Installation Manual must be read in conjunction.

2. Introduction

The Bristile Roofing Integrated Solar Power System complies with Australian building, electrical and photovoltaic Standards. The system provides renewable energy generation with a seamless roof aesthetic and a compliant and warrantied sealed tile roof. The solar module is integrated into a BMC solar frame using high efficiency solar cells and the highest quality inverters and components.

Product specifications are provided separately and are subject to change without notice. This manual shall be read in conjunction with all product specifications and the Bristile Roofing Roof Tile Technical Manual.

3. Safety Precautions

Environmental, Health and Safety

Health, safety and the environment are recognised as an integral part of our business. We are all responsible for:

- Preventing injury and occupational illness
- Minimising negative environmental impacts
- Complying with all legal requirements

The Bristile Roofing Environment, Health and Safety policies detail our defined responsibilities.

The Bristile Roofing Solar Tile System can only be installed by licenced electricians who are accredited to install photovoltaic systems by the Clean Energy Council (CEC). All contractors must be inducted into both the Bristile Roofing and Leeson Solar safety and compliance systems and be an accredited installer as per the Leeson Solar subcontractor and employee safety, quality and environmental management systems.

- Potentially lethal DC voltages can be generated whenever PV modules are exposed to a light source; avoid contact with electrically active parts and be sure to isolate live circuits before attempting to make or break any connections
- Only authorised Leeson Solar trained personnel should have access to or perform work on the modules or solar system
- Do not stand/step on, damage or scratch the front or back surfaces of the solar module
- Broken modules cannot be repaired and contact with any module surface can cause electrical shock. Do not use a module with broken glass or damaged back sheet
- Do not disassemble the modules or remove any part of the module
- Appropriate personal protective equipment (PPE) should be worn when working on electrical connections
- Ensure that all MC4 connectors are free from debris and moisture before connecting
- Never disconnect connectors under load
- Do not install or handle modules when they are wet or during periods of high wind
- Ensure that all connections are securely made with no gaps between the contacts. Gaps can cause electrical arcing that may result in fire and/or electric shock
- Ensure the polarity of each module or string is not reversed considering the rest of the modules or strings

- Do not artificially concentrate sunlight on solar modules
- Bristile Roofing solar tile systems manufactured by EC Solar are certified for operating in Class A installations at voltages below 1000Vdc. This maximum voltage should not be exceeded at any time and, allowance in calculations must include the temperature coefficient and voltage rise at temperatures below 25° Celsius as per AS 5033
- Do not use water to extinguish fires of an electrical origin
- Under normal conditions, a solar PV module is likely to produce more current and/or voltage than reported under standard test conditions. Accordingly, the value of Isc marked on this module should be multiplied according to AS 5033

Shut Down Procedure

Please note that the PV modules will produce a DC voltage and current which can be deadly if exposed to any type of light source. Care must be taken when working on PV modules. The PV array isolator will not switch off the PV modules, it will only isolate the array cabling or inverter.

1. Turn off the AC "Solar Supply Main Switch" located in the switchboard
2. Turn off the DC "PV Array Isolator" located next to, or integrated into the inverter. Under no circumstances should the DC connectors or PV array isolators be operated under load

Under no circumstances should an unqualified person carry out work on a photovoltaic system. Only qualified and certified persons with Bristile Roofing and Leeson Solar installer training are permitted to work on a Bristile Roofing Solar Power System.

4. Receipt of Goods and Unpacking

Care must be taken when handling PV modules, isolators and components due to the fragile nature of the product.

- PV modules are frameless glass and will break if not shipped and handled correctly
- On receipt of the product and before shipping to site, the packaging should be checked for damage. If packaging is damaged, all modules must be checked and photographs should be taken and uploaded to the Leeson Solar operating system
- Packaging should be stored in a clean, dry environment and not transported for more than the time necessary to travel to the installation site. Never store packaging where it can be affected by weather or become wet
- Do not stack photovoltaic module boxes
- Once on site, the modules must be kept clean and dry due to the adhesive fixing method. Do not unpack modules onto the ground

Each solar module has a unique serial number on the front and back, which should be recorded during the unpacking process. Use the Leeson Solar operating system to upload the serial numbers to the appropriate project referencing the address at all times.

5. Design and Installation Considerations

Wind and Structural Design

Photovoltaic design, electrical design and structural and wind loads must be taken into consideration when designing an integrated solar power system. When designing the roof and its photovoltaic components, the following must be taken into consideration:

a. Regional design wind speeds
b. Terrain category of a building site
c. Technical Record 440 (TR440) extension of this code, believed to be the standard for the design of products for most cyclonic areas. Applicable in Australia to areas north of the latitude 250 south, and within 50 kilometres of the coast (including off shore islands)
d. State and/or local statutory authority requirements and covenants

NOTE: Exceptional considerations may apply to the site in relation to items (a), (b) and (c).

The installation specifications given in this manual are based on a basic wind speed for greatest strength of 60m/s at a height of six metres from ground level, and suitable for sites in wind regions A and B. It is advisable to consult both Bristile Roofing and a building engineer in relation to designated cyclonic area installation specification areas i.e. regions C and D. This section will cover Bristile Roofing recommended installing specifications based on the design gust wind speed, as well as:

a. Minimum roof pitch of 22.5°

b. Maximum roof pitch requirements

c. Batten requirements and truss spacings

d. Batten installation requirements

e. Sarking installation and requirements

Specifiers are advised to determine local requirements before proceeding, noting that relevant local authorities may implement special specifications to the final structure. It is also advisable to consult Bristile Roofing for recommended specifications for regional areas.

To comply with Australian Standard AS 5033 and CEC guidelines, the design and installation of PV modules, BMC solar frames, fixings and support structures must consider the following standards:

- AS 1170
- AS 1170.2:2002
- AS 1170.3:2003

Photovoltaic Design

Design of the electrical and photovoltaic system must comply with AS 5033 Installation of Photovoltaic Arrays, AS 4509.1 and AS 4509.2 Stand Alone Power Systems and AS 3000 Electrical Installations. All standards and the standards referred to therein must be adhered to. Bristile Roofing and Leeson Solar will provide the photovoltaic and electrical designs for each project. The accredited installer is required to adhere to the supplied designs and ensure the designs comply with all standards referred to in this manual.

Orientation and Pitch

The Bristile Roofing Solar Tile System is designed for a pitch 22.5° and above. The orientation of the roof must be on the north, east or west and in no situation be designed or installed between 90° and 270° unless specifically approved by Bristile Roofing on a project specific case.

Array Location

The array location should be situated away from any shading. If for any reason the array is shaded, a shade analysis must be carried out and a yield calculation (including month by month graph) sent to the client and uploaded to the Leeson Solar ERP.

Inverter and Inveter Location

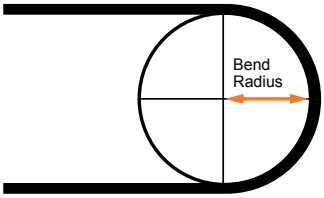
The inverter selection will be controlled by Leeson Solar and will be included in the individual installation design. The inverter should be installed as close as possible to the main switchboard or metre panel to reduce AC cabling. The location should generally be under the eave or out of direct sunlight if possible. If required the DC isolator must be adjacent to the inverter. The Bristile Roofing Solar Tile System must not be altered or increased in any way without written permission from Bristile Roofing and Leeson Solar.

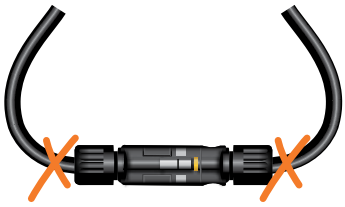
DC Cabling

DC cabling should not have a voltage drop of more than 3%. DC cabling must be installed within the BMC solar frame cable containment system with heavy duty flexible conduit protecting the cable between tiles and be fixed with stainless steel cable tie as per the installation instructions. DC cable installed within the BMC solar frame must adhere to the bending radius of the manufacturer's specification as detailed below and must not make contact with any adhesive glue.

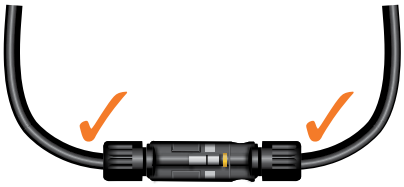
NOTE: The bending radius of the cable shall be no less than six times the outside diameter of the cable.

All array or string cabling from the isolator to the inverter must be encased in heavy duty conduit. The cabling installation must be installed at frame stage when the solar modules are installed.





Incorrect routing of cable



Correct routing of cable

All cable and cable containment must be kept at least 50mm from any surface, for example:

- Conduit for the array or string cable needs to be fixed to the underside of the trusses
- Conduit for the array cable when run down the wall internally must be at least 50mm from the internal surface or installed between the bricks and the wall frame

NOTE: Twin DC cable must not be separated and used as a single DC cable at any time. This procedure will result in the cable insulation not being compliant with manufacturer's testing standards.

Reverse Current Protection/String Fusing

At no stage should strings be paralleled to an array unless string fuses are used in both negative and positive poles. The string fuse should be installed at the inverter if required but the design recommendation is to install each string to separate MPPT inputs of the inverter.

DC String and Electrical Design and Installation

The DC strings/arrays and electrical design and installation must adhere to the Leeson Solar design that will be issued with each individual installation. The string voltage is variable as per local weather conditions and must be designed to suit the characteristics of the selected inverter allowing for all minimum and maximum voltages at VMP and VOC. All string and electrical designs must adhere to the current standards referred to in this manual.

DC Isolators

Only the Leeson Solar Integrated DC Isolator can be used for the roof installation. DC isolators will be supplied with each project and should not be altered or tampered with in any way.

- The DC isolator must be labelled with which array it is isolating
- All DC isolators must have an earth run to the exposed earth terminal of the DC isolator to support the monitoring of isolator faults
- If any damage occurs to the tile to which the DC isolator is fixed it must be replaced with a new DC isolator

6. Installation

Overview

There are two different types of the Bristile solar tile, the Planum and Prestige versions. Whilst the electrical and mechanical characteristics of the solar laminate and solar laminate containments area are identical, the nose, water course and head of the solar tile are slightly different.

Due to the requirements from the tiles, the Planum solar tile does not require sarking to be installed however the Prestige solar tile does require sarking. When the Planum solar tile is installed the roof tiler can install the entire roof and the electrician can complete the electrical installation the following day. For installation of the Prestige solar tile the electrician must be onsite to complete the solar tile installation with the roof tiler.

The modules and frames do not have any conductive parts and do not need to be earthed.

Sarking

Installation of ProctorWrap is required on all concrete Prestige tile installations but no on the Planum solar tile installations. The ProctorWrap must be installed on all roof sections containing solar tiles from the ridge to the valley and gutters. Installation and fixing is as per the Bristile Roofing Tile Installation Manual. (Fig. 1)

Figure. 1

Batten Installation

Batten installation spacing required is exactly 370mm.
No tolerance is allowed. (Fig. 2)

Figure. 2

DC Isolator

Firstly the DC Isolator must be installed as per the layout drawings provided for the project. The DC Isolator will always be installed at the end of a row of tiles. The DC isolator for the Planum solar tile will have the leads hanging into the roof cavity. The electrician will install and wire the DC Isolator for the Planum solar tile as this needs to be done during installation. (Fig. 3)

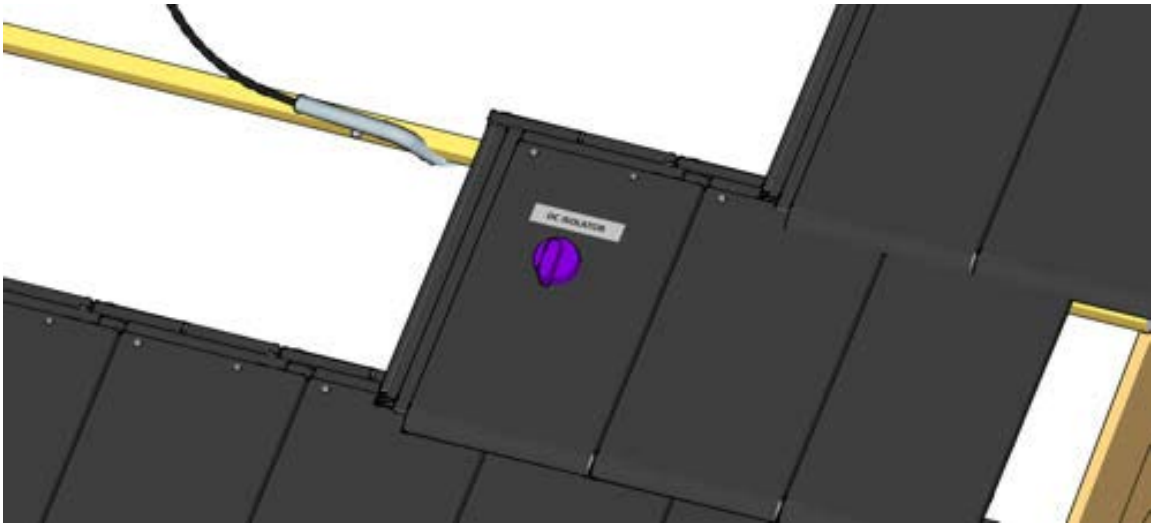


Figure. 3

Solar Tile Installation – Planum

The Planum solar tile is installed as per the standard Planum roof tile. It is three and a half tiles wide and must be installed in multiples of two only. The offset is set standard and each row must start and finish with a minimum of two standard tiles. (Fig. 4)

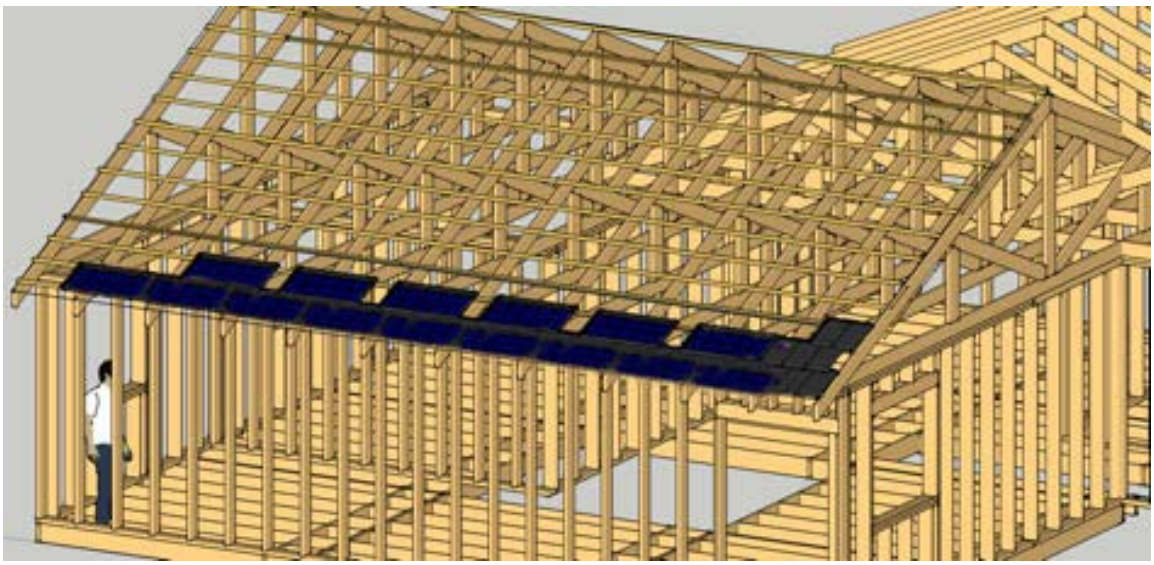


Figure. 4

Solar Tile Installation – Prestige

The Lodge solar tile is installed as per the standard Lodge roof tile. It is three tiles wide so it does not need to be installed in multiples of two. The installation is done on sarked roofs so the electrician will be onsite installing the solar tiles with the roof tiler. Once the DC isolator is installed the first solar tile is laid and connected by the MC4 connector to the DC isolator.

The cabling is then inserted into the cable tray of the solar tile so only the heavy duty conduit is exposed. The conduit is then tied with a stainless steel cable tie to through the cable tie hole located next to the cable entry hole on the rear of the solar tile. (Fig. 5)

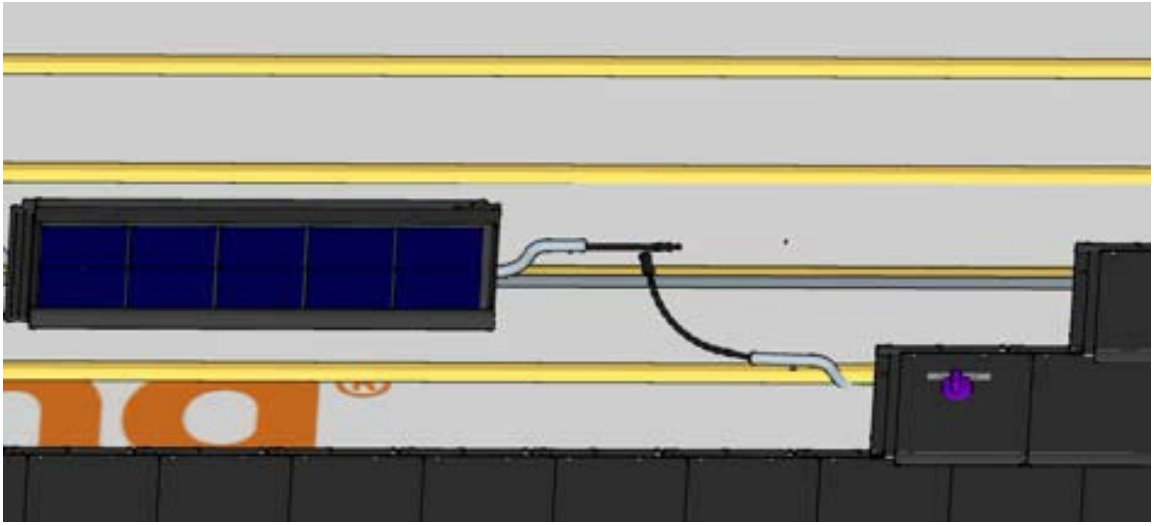


Figure. 5

DC Cable Installation

- DC cables enter cable channel at top of tile
- The longer negative plug is inserted through the channel hole and into the next tile
- The positive plug connects the negative which was previously placed into the current tile
- Complete DC connections and check that all connectors have made full contact
- Cable tie flexible HD conduit with stainless steel cable tie
- Cut off excess tie flush, with no sharp edges

NOTE: The system must be tested for VOC and Isc before Tonsan 1527 PV Sealant is applied

Installation of Cable to Integrated Isolator

The DC cable will remain in the cable containment system at the first and last solar module of each string. A lead and same make connector made on site is run in flexible and solid HD conduit between the isolator and the first and last module to complete the circuit.

The isolator is to be installed next to the first photovoltaic module of every string at the lowest row. Wiring is run in series from row to row working up the roof.

Before any sealant is applied the completed, the PV circuit must be tested for VOC and Isc and logged into the solar testing documentation.

Fixing the Solar Tile to the Batten

Each solar tile is fixed with two x 50mm stainless steel screws through the marked counter-sunk holes in the top section of the BMC tile. Each row shall have one clip at the bottom of each BMC tile except for the first row and edge BMC tiles. (Fig. 6)

Final Setout

The BMC tile is laid on the second row upwards and shall be centre of the roof with an even number of tiles either side. (Fig. 7)

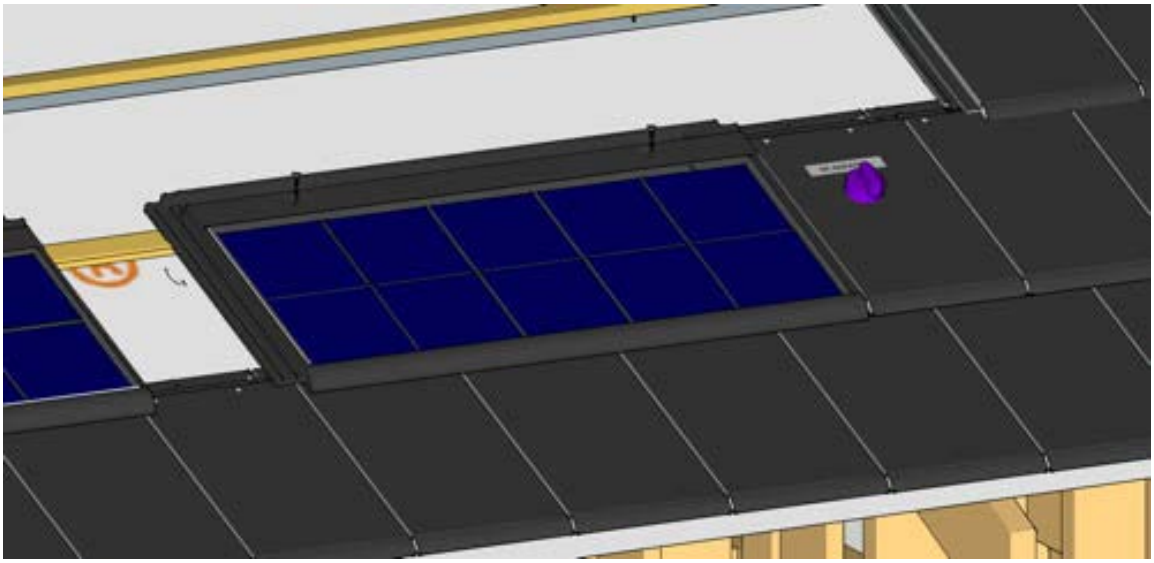


Figure. 6

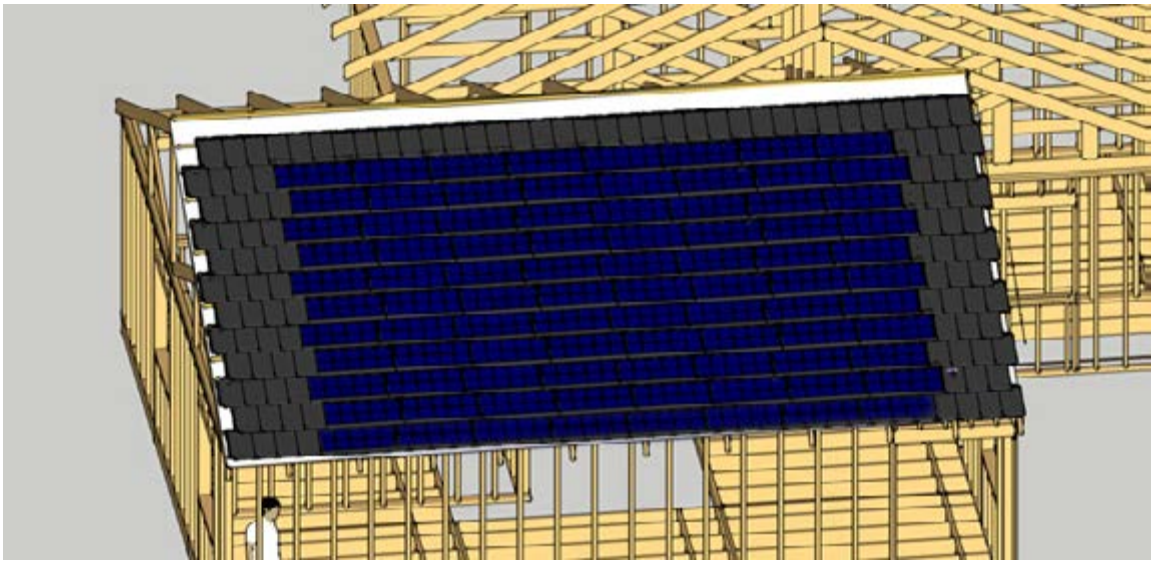


Figure. 7

7. Maintenance

A full maintenance check should be carried out yearly to check system operation and safety and clean the photovoltaic modules. It is not recommended that any system owner clean the photovoltaic modules. The Bristile Roofing Integrated Solar Power System can be connected to the internet by WI-FI, instructions for this process can be found in the inverter installation manual. Each system should be connected for monitoring and maintenance purposes. All system owners will be advised of this in the hand over documentation.

The Bristile Roofing Integrated Solar Power System is a very low maintenance photovoltaic system and requires a small amount of maintenance. Items for periodic maintenance (listed below) are a minimum and all Australian Standards and Clean Energy Council Guidelines are to be adhered to.

Cabling

- Visual inspection of containment
- Minor repairs to any loose or misplaced cabling
- Check all cabling is mechanically protected where required
- LV, DC and AC cabling is readily distinguishable

Isolation

- Isolator voltage and current ratings comply with system design
- Enclosures have suitable IP rating for installation location
- Enclosures are installed and sealed correctly
- Lockable isolators
- Isolator labelling correct
- The installation DC and AC segmentation is correct
- If required string fuses or blocking diodes are installed and operational

Panels

- Visual inspection of all panels for damage and corrosion
- Visual inspection of panel junction boxes leads and plugs where accessible

Invertor

- Shutdown procedure is fixed to inverter
- Operating correctly
- Check history for fault codes (if available with inverter)

Operation

- Log system yield since last service
- Log daily yield averages (depending on inverter)
- Check yield differences between arrays
- Voltage test and report voltages and current are within the system design parameters
- Operation overview

General

Advise client of any vegetation which may shade the solar array thus impacting performance.

Reporting

A report comparing expected versus actual generation of electricity from the PV system will be compiled. Any down time or system faults must be noted.

During the maintenance service the solar panels require cleaning for optimum performance. Once the service is completed the maintenance log should be completed signed and dated.

8. Recycling End of Life Photovoltaic Products

In line with Bristile Roofing sustainability and environmental practices, all photovoltaic products should be recycled at the end of their service life. For all photovoltaic product recycling enquiries please email contact@reclaimpv.com.au or visit reclaimpv.com for further information.

9. Specifications - Building Integrated Photovaltic Module

BREC 45S-Rab & BREC 47S-Rab : *Bristile Roofing*

10 Cells *Monocrystalline*

45/47W *Power Output Peak*

17% *Maximum Efficiency*

0~+3% *Power Output Guarantee*

Solar cell: High efficiency multicrystalline solar cell. Even if under the weak light, the solar module can produce maximum power output.

Tempered glass: Anti-reflecting coating and high transmission rate glass increasing the power output and mechanical strength of solar module.

EVA and TPT: Using high quality EVA and TPT to prevent destroying and water.

Junction box: Multi-functional and water-proof junction box.

Good performance of preventing from atrocious weather such as wind and hails.

Resisting moisture and etching effectively, not effected by geology.

Certificates issued by international authorities: ISO Quality Management system, CE, TUV (IEC61215 and IEC61730).

1. Mechanical Characteristics

Cell Size (mm)	156 x 156
No. of cells	10(2 x 5)
Module Size (without frame) (mm)	823 x 340 x 61
Overall dimensions (mm)	934.5 x 435 x 55.5
Module Weight (KG)	11.2

2. Packaging Characteristics

Number of modules per pallet	22
Number of pallets per 20' /40'/ 40HC container	24/48/60
Packaging box dimensions (mm)	1450 x 900 x 560
Box Weight (KG)	290

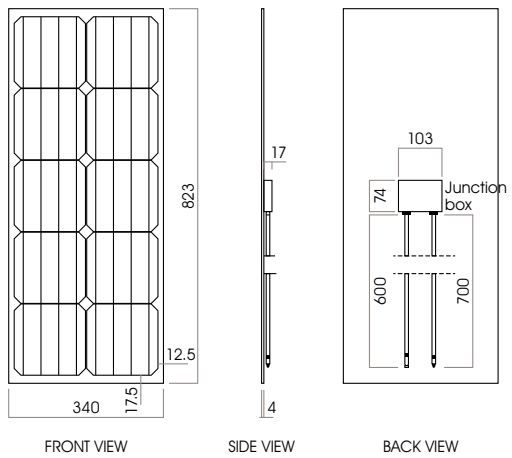
3. Construction Materials

Front Glass	3.2mm, Low Iron, Tempered Glass
Junction Box	IP 67 Rated (Black)
Output Cables	TUV 1×4mm², length: 600/700mm
Connector	Hengda PV-ST01
Encapsulation Material	EVA (0.45±0.03mm thickness)
Back Foil	Black TPT (0.32±0.03mm thickness)
Fixing Adhesive	Silicone Sealant (Black)

4. Temperature Coefficient

Power Tolerance	0~+3%
Temperature Coefficient of Pmax	(-0.41±0.05)%/°C
Temperature Coefficient of Voc	(-0.34±0.02)%/°C
Temperature Coefficient of Isc	(0.05±0.01) %/°C
NOTC (°C)	(47±2) °C

5. Module Diagram (without frame)



6. Operating Conditions

Max. system voltage	1000DVC (IEC)
Max. system fuse rating (A)	15
Operating temperature (°C)	-40~85

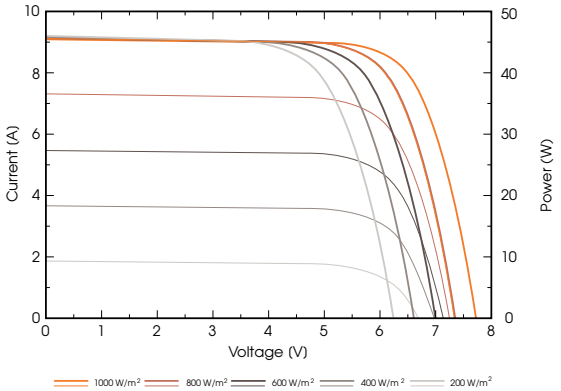
7. Electrical Parameters at Standard Test Conditions (STC)

Module type	BREC47S-Rab	BREC45S-Rab
Rated Maximum Power (Pmax/W)	47	45
Open Circuit Voltage(Voc)	6.67	6.67
Short Circuit Current(Isc)	9.68	9.31
Voltage at Pmax(Vmp)	5.18	5.21
Current at Pmax(Imp):	9.09	8.65
Tolerance of Pmax:	0-3%	0-3%
Tolerance of Isc:	±3%	±3%
Tolerance of Voc:	±3%	±3%

STC: Irradiance 1000W/M² Module Temperature: 25°C AM=1.5

8. IV Curve

Current-Voltage & Power-Voltage Curve (BREC47S-Rab)



Made in China

IEC61215: 2016
IEC61730: 2016

Registered
ISO 9001:2008

This publication summarises product warranty and specification, which is subject to change without notice.

bristileroofing.com.au | 1300 274 784

Design Studios

Sydney
2 Barrack Street,
Sydney,
NSW 2000

Brisbane
27 James Street,
Fortitude Valley,
QLD 4006

Adelaide
Ground Floor,
70 Hindmarsh
Square,
Adelaide SA 5000

Perth
67 King St,
Perth,
WA 6000

Melbourne
Shop T1,
367 Collins Street,
Melbourne,
VIC 3000

Hobart
9 Franklin Wharf,
Hobart,
TAS 7000

Proud Supporters

Children's Cancer Institute

BRICKWORKS
BUILDING PRODUCTS

Bristile Roofing is part of the Brickworks Group

The product images shown in this brochure give a general indication of product colour for your preliminary selection.
Bristile Roofing recommends all customers see actual product samples at a selection centre prior to making final selections.

BR 9023 brownink.com.au