These installation instructions contain important information on safety matters and the installation of the Plug-In Solar kit. Please read this guide carefully to ensure safe installation and operation.

*Installations are undertaken at the customer’s own risk. This Installation manual is to be used as a guide only, and your discretion must be used when installing the Plug-In Solar kit. You MUST follow ALL local regulations and consult a professional in the appropriate field if you are in any doubt with any aspect of the installation. Plug-In Solar Ltd takes no responsibility for incorrect installation of our kits.
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## Step by Step Plug-In Solar Installation Guide

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## Inspecting, Testing and Commissioning

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TOOL REQUIREMENTS

Please note, this is just a guide, and you may require additional tools than listed here.

8mm Socket Tool

6mm Hex (Allen) Key

9,10,13,17,19mm Spanners

Drill with Torx30 (AW30 Bit)

Voltage Tester

Wire Strippers

Flathead Screwdriver

Phillips Screwdriver

Angle Grinder (with Stone Disk)
COMPONENT GUIDE

The number of components you receive will depend on the type of kit you have purchased. Please unpack all your items, and check you have all the correct components based on your Delivery Note.

Solar Panel

Slate/Tile Roof Mount System
Including all fixings (see Appendix 10 for more information)

Micro-Inverter (with 2M Cable)

Micro-Inverter End Cap

MC4 Sealing Caps
(If required)

Plug-In Solar Connection Unit
SAFETY INSTRUCTIONS

Before installing or using a Plug-In Solar kit, please read all instructions and cautionary markings in this document and on the Micro-Inverters and Solar Panels.

The installation of a Plug-In Solar kit shall be carried out by a competent person with sufficient skills and training to apply safe methods of work, in compliance with G98 Engineering Recommendations.

The installation of a Plug-In Solar kit will be carried out to no lower a standard than that required in the Manufacturer’s installation instructions, as provided here.

No parameter relating to the electrical connection and subject to type verification certification will be modified unless previously agreed in writing between the DNO (Distribution Network Operator) and the Customer.

All electrical installations shall be performed in accordance with local electrical codes.

All appropriate health and safety regulations must be observed and required safety precautions taken.

Be aware that installation of this equipment includes the risk of electric shock.

Be aware that the body of the Micro-Inverter is the heat sink and can reach a temperature of 80°C. To reduce risk of burns, do not touch the body of the Micro-Inverter.

DO NOT disconnect the PV module from the Micro-Inverter without first disconnecting the AC power. In no circumstances, connect a DC input when an AC connector is unplugged.

DO NOT attempt to repair a Micro-Inverter. If it fails, contact Hoymiles Customer Support to obtain an RMA number and start the replacement process. Damaging or opening a Micro-Inverter will void the warranty.

CAUTION! The external protective earthing conductor is connected to the micro-inverter protective earthing terminal via an AC connector. When connecting; connect the AC connectors first to ensure the micro-inverter earthing then undertake the DC connections. When disconnecting; disconnect the AC by opening the branch circuit breaker. Whilst maintaining the protective earthing conductor in the branch circuit breaker, connect to the micro-inverter, then disconnect the DC inputs.

You MUST follow the IET Wiring Regulations at all times and consult a professional electrician if you are in any doubt.
WARNINGS

Never disconnect the DC wire connectors under load. Ensure that no current is flowing in the DC wires prior to disconnecting. An opaque covering may be used to cover the module prior to disconnecting the module.

Do not touch any live parts in the system, including the Solar array, when the system has been connected to the electrical grid.

Prior to installing any of the Micro-Inverters, verify that the utility voltage at the point of common connection matches the voltage rating on Micro-Inverter label.

Do not mount the Micro-Inverter in a location that allows exposure to direct sunlight. Allow a minimum of 3/4” (1.5cm.) between the roof and the bottom of the Micro-Inverter to allow proper airflow.

Always disconnect AC power before disconnecting the PV module wires from the Micro-Inverter. The AC connector of the first Micro-Inverter in a branch circuit is suitable, as a disconnecting means, once the AC branch circuit breaker in the load center has been opened.

The Micro-Inverter is powered by PV module DC power. Make sure you disconnect and reconnect the DC connections to watch for the five short flashes.
SOLAR PANEL INSTALLATION

When installing the solar panels included in your Plug-In Solar Kit, you must abide by a number of safety requirements:

Do not operate solar panels near highly flammable gas and vapors (e.g. gas tanks, gas stations).

Do not install solar panels in enclosed space.

Do not install solar panels in locations where they may be submerged in water.

Do not use solar panels as a substitute for normal roofing (solar panels are not watertight).

Do not install solar panels in close proximity to air conditioning systems.

Do not install solar panels above 4000 m (13120 ft) altitude above sea level.

Do not allow any chemical substance (e.g. oil, solvent etc.) to come into contact with any part of the solar panels.

The solar panel operating temperature must be between –40 °C to +85 °C (–40 °F to +185 °F).

Prevent solar panel shadowing. Optimal solar irradiation leads to maximum energy output. Install the solar panels so that they face the sun.

Avoid shadowing (due to objects such as buildings, chimneys or trees).

Avoid partial shading (for example through overhead lines, dirt, snow).

Ensure you conform to the necessary structural requirements where you are installing the solar panels.

Ensure the solar panels are properly fastened to the ground, the roof, or the facade, using the mounts provided.

Ensure sufficient rear ventilation of the module.

Follow grounding procedures set out in the roof mount installation manual.

Please see the following instructions for further information on how to handle and install your solar panels.

Refer to the Micro-Inverter installation section of this installation manual for information on how to wire your solar panels to the Micro-Inverters.
- Ensure that all personnel are aware of and adhere to accident-prevention and safety regulations.
- While working wear clean gloves.

DANGER! Risk of fatal injury due to electric shock!
- Do not install damaged modules.

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

DANGER! Risk of fatal injury due to electric shock!
- Cover the modules with an opaque material during installation.

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

WARNING! Fire Risk!
- Do not install modules indoors.
- Do not install modules on moving objects.
NOTE! Module damage may occur!
- Never lift or move the module with the connection cables or junction box.
- Carry modules upright and horizontally as shown.

NOTE! Module damage may occur!
- Never step on modules.
- Do not subject modules to any mechanical stress.
- Do not allow any objects to fall onto modules.

NOTE! Module damage may occur!
- Do not drop modules.

DANGER! Risk of fatal injury due to electric shock!
- Block off the installation zone.
- Keep children and unauthorized individuals away from the solar power system.

NOTE! Module damage may occur!
- Do not stack modules.
- Do not install modules near flammable gas/vapors.
- Do not install modules in close proximity to air conditioning systems.
**DANGER! Risk of fatal injury due to electric shock!**
- Only use dry, insulated tools.

**WARNING! Risk of injury due to falling modules!**
- Secure modules during installation.
- Do not install modules in windy or wet weather.

**DANGER! Risk of fatal injury due to electric shock!**
- Ensure that modules and tools are not subject to moisture or rain at any time during installation.

**Do not carry out the installation alone.**

**- Only install undamaged modules and components.**
- Do not modify the module (e.g., do not drill any additional holes).**
DANGER! Risk of fatal injury due to electric shock!

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

DANGER! Risk of fatal injury due to electric shock!

- Never touch live contacts with bare hands.
- Cover connectors by suitable protective caps until installation.

DANGER! Risk of fatal injury due to electric shock!

- Insulate any exposed cable ends.
- Only connect cables with plugs.
SLATE/TILE ROOF MOUNT SYSTEM INSTALLATION

For installation instructions for a Slate/Tile Roof, please refer to the Roof Mount Manual provided in Appendix 10.

*Plug-In Solar takes no responsibility for the method by which you choose to install your mounting system. This is a guide only. Please consult a roofing expert if you are in any doubt on how to safely and correctly install your system. It is your responsibility to ensure the roof is watertight.*

Once you have completed the installation on your roof, please return to the Micro-Inverter installation section of this manual for information on how to wire your solar panels to the Micro-Inverters.
1. System Wiring Diagram

2. Once you have completed installing the roof mount system, attach the Micro-Inverters to Solar Panel Frames, or railing system, using nuts, bolts or Z-Modules provided. The silver cover side should be up. You will need your Hex key and Spanner. Ensure the bolts are tightened securely. The Micro-Inverter must be under the module, out of long-term exposure to direct sunlight or rain.

Each Micro-Inverter has serial number labels affixed. Once the micro-inverters are installed, please peel one label off each micro-inverter and stick them to the warranty card (please refer to the ‘Completing Your Warranty Card’ section of this installation manual for more information).
3. Connect the Micro-Inverters to the AC Bus Trunk Cable

Plug the AC connector of the first Micro-Inverter into the connector of the next Micro-Inverter, and so forth, to form a continuous AC branch circuit. Do this for each Micro-Inverter in your system. Ensure a click is heard as connectors engage. Ensure that all connections are properly closed.

**WARNING**: Do NOT exceed a maximum of (5) five Micro-Inverters in an AC branch circuit when using the Plug-In Solar System.

Install the End Cap on the open AC connector of the last Micro-Inverter in the AC branch circuit. Ensure a click is heard as connectors engage. Ensure that all connections are properly closed.
4. Connect Micro Inverters to Solar Panels (PV Modules)

Connect each Solar Panel to the Micro-Inverter DC cables to feed PV power into the Micro inverter, following the polarity direction marked on each Micro inverter. Ensure a click is heard as connectors engage.

When plugging in the DC cables, the Micro-Inverter should immediately blink green three times. This will happen as soon as the cables are plugged in and will show that the Micro-Inverter is functioning correctly. This entire check function will start and end within 5 seconds of plugging in the unit, so pay careful attention to these lights when connecting the DC cables.

WARNING: Ensure that all AC and DC wiring is correct. Ensure that none of the AC and DC wires are pinched or damaged. Ensure that all connections are properly closed.

WARNING: If you are installing an odd number of Solar panels, ensure you use the MC4 sealing caps provided with your kit to seal the exposed MC4 connectors on the Micro-Inverter.
5. If you need to extend the length of AC Bus Trunk Cable, we can supply extra lengths on request. If you provide your own cable please be sure to use the correct cable wire size (AWG) depending on distance of the last Micro-Inverter to the connection point and the number of Micro-Inverters in the branch, as shown in the table below. Please be aware, the longer the cable run, the greater the power loss.

<table>
<thead>
<tr>
<th>External Wire size(AWG)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>370.7</td>
<td>237.1</td>
<td>167.9</td>
<td>124.3</td>
<td>93.6</td>
<td>70.2</td>
<td>51.4</td>
<td>35.7</td>
</tr>
<tr>
<td>10</td>
<td>593.1</td>
<td>379.4</td>
<td>268.6</td>
<td>198.9</td>
<td>149.7</td>
<td>112.3</td>
<td>82.3</td>
<td>57.1</td>
</tr>
<tr>
<td>8</td>
<td>926.8</td>
<td>592.9</td>
<td>419.6</td>
<td>310.7</td>
<td>233.9</td>
<td>175.5</td>
<td>128.6</td>
<td>89.3</td>
</tr>
<tr>
<td>6</td>
<td>1462.8</td>
<td>948.6</td>
<td>671.4</td>
<td>497.1</td>
<td>374.3</td>
<td>260.8</td>
<td>205.7</td>
<td>142.9</td>
</tr>
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</table>

Follow the instructions outlined below to connect the AC Bus Trunk Cable to your extension cable, using an AC Cable Connector, or similar.
WIRING THE SOLAR TO THE EXISTING MAINS CIRCUIT

IMPORTANT SAFETY INFORMATION – FOR YOUR PROTECTION

Before installation please read these instructions carefully and use the Plug-In Solar Connection Unit in accordance with these safety wiring instructions.

In older houses, you may find a variety of old fuse boxes where the mains supply comes in. You may also have wiring and fittings of an older style. These may not be up to the standard required today. If this is the case, have it all checked and tested by a professional electrician BEFORE carrying out any work on it. Some old installations may now be dangerous.

Electricity is dangerous. Always disconnect from mains supply before any inspection or repair to equipment. Safety must always be given top priority. Do not allow children to tamper with electrical devices.

ALWAYS FOLLOW THE IET WIRING REGULATIONS.

You must NOT install the Plug-In Solar Connection Unit in the following locations as set out by Part P:

(a) within a room containing a bath or shower, the space surrounding a bath tap or shower head, where the space extends —

(i) vertically from the finished floor level to —

(aa) a height of 2.25 metres; or

(bb) the position of the shower head where it is attached to a wall or ceiling at a point higher than 2.25 metres from that level; and

(ii) horizontally —

(aa) where there is a bath tub or shower tray, from the edge of the bathtub or shower tray to a distance of 0.6 metres; or

(bb) where there is no bath tub or shower tray, from the centre point of the shower head where it is attached to the wall or ceiling to a distance of 1.2 metres; or

(b) a room containing a swimming pool or sauna heater.

As an additional precaution, wear rubber-soled shoes. This will provide a measure of insulation between you and the ground!

IF YOU ARE NOT ABSOLUTELY CERTAIN ABOUT ANY ASPECT OF ELECTRICAL WORK, SEEK PROFESSIONAL ADVICE

1.1. Switch off the power and remove the fuse for the relevant circuit before carrying out any work, or inspecting, either it, or the appliances connected to it. Never inspect, or carry out work on, any part of the system with the power on. Make sure that power cannot be inadvertently restored by someone else.

1.2. Use a voltage tester to check the power to the wires or connections are off before touching them.

1.3. Once the power is disconnected, wire the Plug-In Solar Connection Unit using the following
a) If using the Plug-In Solar Connection Unit to replace an old socket (or similar), note the cable connections and wire up the Plug-In Solar Connection Unit the same way as the replaced item, with earthing as stated in these instructions.

b) Route the cable through the appropriate entry point of the mounting box (this is usually at the rear).

c) Cables should be prepared so sufficient conductor length reaches the terminals. Strip the ends of the individual conductors so that an adequate length enters the terminals.

d) Carefully arrange the wiring to lie along the edges of the product or box, keeping the central area clear.

e) Wire the Plug-In Solar Connection Unit using the following diagram (a larger version can be found in Appendix 1):

f) When connecting the Plug-In Solar Connection Unit ensure that only the bare end of the wire enters the terminal, and no bare wires are visible. Always tighten the terminal screws, but don’t over tighten. An earth connection should always be made between the mounting box earth terminal and the fused connection unit terminal. If the earth wire is bare, it must be sleeved with appropriate green/yellow sleeving.

g) If you are in any doubt about connecting this product consult a qualified electrician.

1.4. Wiring insulation tests should be completed to avoid misleading instrument readings and possible internal damage to the unit. Check your work thoroughly before restoring power to the circuit. If you are not certain, seek professional advice.

1.5. Once power has been restored, after around a two minute initialisation time, your Plug-In Solar kit will be feeding FREE electricity into your mains circuit.
ISOLATION/ISOLATOR REQUIREMENTS

Under G98 requirements, it must be possible to isolate a Plug-In Solar kit from the DNO’s Distribution System, using a Double Pole Isolator. This is the function of the Plug-In Solar Connection Unit.

The Plug-In Solar Connection Unit is a double pole Switched Fused Connection Unit, that adheres to British Standard BS1363-4, and offers on load isolation from the grid.

G98 regulations also state that the Plug-In Solar Connection Unit is lockable in the OFF position only. This ensures isolation under maintenance. The Fuse carrier of the Plug-In Solar Connection Unit can be locked open (the OFF position), as per the image below, in order to meet this requirement (padlock not provided).
PLACING WARNING LABELS

When installing a Plug-In Solar kit you must place labelling at the Plug-In Solar Connection Unit, Existing Consumer Unit and at all points of isolation between the Plug-In Solar Connection Unit and the Solar Panels within your premises. This is to indicate the presence of a Small Scale Embedded Generation installation (SSEG). The labelling should fixed in place to ensure that it remains legible and secure for the lifetime of the installation. The following labels must be used and have been provided with your Plug-In Solar kit.

Dual supply labelling should be placed at the Plug-In Solar Connection Unit between the PV system and Existing Consumer Unit to indicate the presence of on-site generation and indicating the position of the main A.C switch disconnector.

A Micro-Inverter should be labelled stating "Inverter - isolate A.C. and D.C. before carrying out work". The Micro-Inverters also have this warning label as standard.

An AC isolator Label should be placed next to the Plug-In Solar Connection Unit and all other AC switches/disconnects (if applicable). ON and OFF positions should be clearly labelled.

To ensure the Fire and Rescue Service are aware that Solar is installed on the roof the following sign shall also be fitted next to the existing consumer unit in the building. You do not need this label for Ground Mount systems.

In addition to this safety labelling, you must also display an electrical schematic diagram next to the existing consumer unit in the property. You will have been provided with an electrical schematic diagram relevant to your kit, but can see an example in Appendix 2. Please note the diagram in Appendix 2 is non-prescriptive and is for illustrative purposes only.
INSPECTING AND TESTING YOUR PLUG-IN SOLAR INSTALLATION

As part of the G98 on-site commissioning tests you shall carry out a functional check of the loss of mains protection, for example by removing the supply to the Plug-In Solar kit during operation and checking that the Plug-In Solar Connection Unit operates to disconnect the Plug-In Solar Kit from the DNO’s Distribution System.

In the UK the installation of a Plug-In Solar Kit is considered non-notifiable electrical work under Part P of the Building Regulations 2013, as it is an alteration to an existing installation (the mains grid).

“Regulation 12(6A) sets out electrical installation work that is notifiable. All other electrical installation work is not notifiable – namely additions and alterations to existing installations outside special locations, and replacements, repairs and maintenance anywhere.”

Installation of a non-notifiable Plug-In Solar kit should still be designed, installed, inspected, tested and certificated in accordance with BS 7671.

For more information on how to do this, you can find a copy of Part P building regulations here: http://www.planningportal.gov.uk/uploads/br/BR_PDF_AD_P_2013.pdf
COMMISSIONING YOUR PLUG-IN SOLAR INSTALLATION

Once you have installed, inspected and tested your Plug-In Solar kit, it is a requirement that you complete and return a G98 Engineering Recommendation Form to your Distribution Network Operator (DNO) within 28 days.

Distribution Network Operators (DNOs) own and operate the distribution network of towers and cables that bring electricity from the national transmission network to homes and businesses. They don’t sell electricity to consumers, this is done by the electricity suppliers. Informing the DNO of your installation allows them to manage the grid more effectively.

There are 9 different DNO’s across the UK, so you must make sure you submit your form to the correct DNO in your area. You can find your DNO by entering your postcode using this website: https://www.ssepdc.co.uk/Whoismynetworkoperator/

Once you have identified your DNO you must download a G98 Engineering Recommendation Form from their website (or request that they e-mail one to you).
Completing G98 Engineering Recommendation Form

An example G98 Engineering Recommendation Form can be found in Appendix 4 of this Installation Manual. Please note G98 forms differ between DNO’s, this is an example only.

The G98 Engineering Recommendation Form is relatively self-explanatory, however there are a number of sections that you must complete correctly:

Installation Address Details Section

A Meter Point Administration Number, also (MPAN), is a 21-digit reference used in the UK to uniquely identify electricity supply points. You must correctly fill in your own MPAN in this section of the form.

Your MPAN can be found on your electricity bill and often looks like the image on the left.

SSEG Micro-Generator Details Section

Within the SSEG Details section of the form, fill in the details of your installation. The capacity will be the size of the Plug-In Solar kit you purchased, i.e. 1kW. The Primary Energy Source must always be filled as ‘Solar PV’. If you have any existing SSEG’s (e.g. wind/solar) you must also declare these here.

SSEG Installer Details Section

As Plug-In Solar kits are DIY, self installed solar systems you should complete this section as the installer. In the Accreditation/Qualification section you should fill this in as ‘N/A (Self-Installed)’, unless you have an appropriate accreditation. This section of the form also needs to be signed.
Along with the completed G98 Engineering Recommendation Form, you must also supply the DNO with the following:

1. An electrical schematic diagram for your installation (A relevant electrical schematic diagram will be provided with your Plug-In Solar Kit). An example can be seen in Appendix 3.
2. A copy of the G98 Type Verification Test Report Certificate for the Micro-Inverters (This can be found in Appendix 7)
3. A photograph of your existing electricity meter (be sure to include the make and model of the meter)

Email/Fax/Post the information above to your DNO using the contact supplied on the Commissioning Form. Do not send it to Plug-In Solar, we cannot apply to the DNO on your behalf.

When the DNO has received your form and it has been processed, you will get a confirmation email/letter to say it has been accepted.

**Notifying the DNO of changes to a Plug-In Solar kit**

If during the lifetime of the Plug-In Solar kit it is necessary to replace a major component of the Plug-In Solar kit, it is only necessary to notify the DNO if the operating characteristics of the Plug-In Solar kit or the Plug-In Solar Connection Unit have been altered when compared against the unit that was originally commissioned.

**Notifying the DNO of the decommissioning of a Plug-In Solar kit**

In the event that a Plug-In Solar kit is to be decommissioned and will no longer operate as a source of electrical energy in parallel with the DNO’s Distribution System, you must notify the DNO by completing a G98 Decommissioning Confirmation Form. Please contact your DNO for a copy of this form.
COMPLETING YOUR WARRANTY CARD

In order to fulfill the requirements of the manufacturers, you must complete Warranty Cards for the Micro-Inverters, which provide system information and installation maps to Hoymiles. A Warranty Card can be found in Appendix 6.

Each Micro-Inverter has serial number labels affixed. Once the inverters are installed, please peel one of the labels off each Micro-Inverter and affix them to the warranty card.

Fill in the warranty card with each of the labels according to the layout on the roof/ground. The DC inputs are identified by A and B. The left input is A and the right one is B, as shown below.

If you have purchased an online monitoring system, please refer to the User Manual provided with this guide for detailed instructions on how to install it correctly, and use these installation maps to set it up.
COMPLETING YOUR SOLAR INSTALLATION

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

**NOTE! Module damage may occur!**
- Ensure that the plug connections are secured away from any water channelling surface.

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

**WARNING! Fire Risk!**
- Do not use light concentrators (e.g., mirrors or lenses).

- Ensure that the cabling is not exposed and/or hanging and is protected from dirt, moisture and mechanical friction.
APPENDIX 1. PLUG-IN SOLAR CONNECTION UNIT – WIRING DIAGRAM

ALWAYS FOLLOW THE IET WIRING REGULATIONS

IF YOU ARE NOT ABSOLUTELY CERTAIN ABOUT ANY ASPECT OF ELECTRICAL WORK, SEEK PROFESSIONAL ADVICE

LIVE (brown or red)
NEUTRAL (blue or black)
EARTH (Green/Yellow)

FROM MAINS (GRID) SUPPLY

ALL EARTH WIRES MUST BE SLEEVED AND TERMINATED TO BACK BOX

TO PLUG IN SOLAR KIT

NEUTRAL (blue or black)
LIVE (brown or red)
EARTH (Green/Yellow)
APPENDIX 2. EXAMPLE ELECTRICAL SCHEMATIC DIAGRAM

This is non-prescriptive and is for illustrative purposes only.

### Electrical Schematic Diagram for 1kW (1000W) Domestic Solar PV System

**Solar PV Installation**
Illustrative purposes only. Solar panels may be installed in a different layout to that shown.

- 4 x 250W MCS certified Solar PV Panels
- 2 x G98 certified Dual Micro-Controllers

**Domestic Solar PV System**
Located behind every two solar panels is an DC/AC Dual Micro-inverter.

- Micro-inverters connect to each other using only AC Cabling.
- Solar PV system can be isolated at any time using the Lockable DP Main A.C Isolator.
- Solar PV System connected into protective devices in Switched Fused Connection Unit and existing consumer unit.

Mr No. Body
1 The Road
One Place
Sussex
AB12 3CD

01234 567891

**Existing Distribution Board - Consumer Unit**

- Existing House A.C Installation

**New A.C Installation**

- Lockable DP Main A.C Isolator
- Switched Fused Connection Unit
  - 113AMP BS 1363-A
APPENDIX 3. TROUBLESHOOTING MICRO-INVERTERS

**Status Indications and Error Reporting**

**Startup LED**
When DC power is first applied to the Micro-Inverter: Five short green blinks indicate a successful Micro-Inverter startup.

**Operation LED**
- **Flashing Slow Green (4s gap)** - Producing power and communicating with DTU
- **Flashing Fast Green (2s gap)** – Producing power and not communicating with ECU
- **Flashing Red** – Not producing power (AC Grid Invalid – Voltage or Frequency out of range).

**GFDI Error**
A solid red LED indicates the Micro-Inverter has detected a ground fault (GFDI) error in the PV system. Unless the GFDI error has been cleared, the LED will remain red and the ECU will keep reporting the fault.

After the ground fault error is fixed, follow the instructions in the *ECU Installation and Operation Manual* to clear this GFDI error reporting.

**Non-Operating Micro-Inverters**

1. To troubleshoot a non-operating Micro-Inverter, follow the steps below in order:

2. Check the connection to the utility grid. Verify utility power is present at the inverter in question by removing AC, then DC power. **Never disconnect the DC wires while the Micro-Inverter is producing power.** Re-connect the DC module connectors and watch for three short green LED flashes.

3. Check the AC branch circuit interconnection between all the Micro-Inverters. Verify each micro-inverter is energised by the utility grid as described in the previous step.

4. Make sure that any AC breakers are functioning properly and are closed.

5. Check the DC connections between the Micro-Inverter and the PV module.

6. If the problem persists, please contact Hoymiles customer support on (+44) 028 2076 9210 or email support_ie@hoymiles.com. DO NOT attempt to repair the Micro-Inverter. If troubleshooting methods fail, please return the Micro-Inverter to your distributor for replacement.
# Engineering Recommendation G98 Form B

## Form B: Installation Document for connection under G98

Please complete and provide this document for each premises, once Micro-generator installation is complete.

<table>
<thead>
<tr>
<th>Customer Details:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Customer</strong> (name)</td>
<td>Mr No. Body</td>
</tr>
</tbody>
</table>
| Address | 1 The Road  
One Place  
Sussex |
| Post Code | AB12 3CD |
| Contact person (if different from Customer) |  |
| Telephone number | 01234 567891 |
| E-mail address | nobody@pmail.com |
| Customer signature |  |

## Installer Details:

| Installer | Mr No. Body |
| Accreditation / Qualification | N/A (Self-Installed) |
| Address | 1 The Road  
One Place  
Sussex |
| Post Code | AB12 3CD |
| Contact person | Mr No. Body |
| Telephone Number | 01234 567891 |
| E-mail address | nobody@pmail.com |
| Installer signature |  |

To ABC electricity distribution DNO  
99 West St, Imaginary Town, ZZ99 9AA  
abcd@wxyz.com
## Installation details

<table>
<thead>
<tr>
<th>Address</th>
<th>1 The Road One Place Sussex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Code</td>
<td>AB12 3CD</td>
</tr>
<tr>
<td>MPAN(s)</td>
<td>17 123456789000</td>
</tr>
<tr>
<td>Location within Customer's Installation</td>
<td>Garage</td>
</tr>
<tr>
<td>Location of Lockable Isolation Switch</td>
<td>Utility Room</td>
</tr>
</tbody>
</table>

## Details of Micro-generator

| Manufacturer / Reference | Hoymiles Converter Technology Co., Ltd |
| Date of Installation | 01/01/2021 |
| Primary Energy source | Solar PV |
| Power Factor | >0.99 |
| Manufacturer's reference number | MI-600 |

Emerging technology classification (if applicable)

<table>
<thead>
<tr>
<th>Micro-generator Registered Capacity in kW</th>
<th>3-Phase Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PH1 1kW</td>
</tr>
<tr>
<td></td>
<td>PH2</td>
</tr>
<tr>
<td></td>
<td>PH3</td>
</tr>
</tbody>
</table>

### Declaration – to be completed by Installer for Micro-generators Tested to EREC G98

I declare that the relevant Micro-generators and the installation which together form a Micro-generating Plant within the scope of EREC G98 at the above address, conform to the requirements of EREC G98. This declaration of compliance is confined to Micro-generating Plant tested to EREC G98 or EREC G83 as applicable at the time of commissioning.

Signature:  

Date: 01/01/2021
Summary details of Micro-generators - where multiple Micro-generators will exist within one premises.

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Date of Installation</th>
<th>Technology Type</th>
<th>Manufacturer’s Ref No (this number should be registered on the ENA Type Test Verification Report Register as Product ID)</th>
<th>Micro-generator Registered Capacity in kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hoymiles Converter Technology Co., Ltd</td>
<td>01/01/2021</td>
<td>Solar PV</td>
<td>MI-600</td>
<td>1kW</td>
</tr>
</tbody>
</table>

Use a separate line for new and existing installations and for different Primary Energy sources above. Use PH 1 column for single phase supply.
Warranty Regulations and Liability

1. Warranty Period

Hoymiles products are designed to withstand normal operating conditions when used for its originally intended purpose in compliance with the Hoymiles User Manual supplied with the originally shipped system. The Hoymiles limited warranty ("Limited Warranty") covers defects in workmanship and materials of the Hoymiles products ("Defective Product"). Hoymiles provide both default warranty and extended warranty as follows which starts from the shipping date.

<table>
<thead>
<tr>
<th>Model</th>
<th>Standard (extended)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI-250</td>
<td>12(20/25)</td>
</tr>
<tr>
<td>MI-300</td>
<td>12(20/25)</td>
</tr>
<tr>
<td>MI-500</td>
<td>12(20/25)</td>
</tr>
<tr>
<td>MI-600</td>
<td>12(20/25)</td>
</tr>
<tr>
<td>MI-700</td>
<td>12(20/25)</td>
</tr>
<tr>
<td>MI-1000</td>
<td>12(20/25)</td>
</tr>
<tr>
<td>MI-1200</td>
<td>12(20/25)</td>
</tr>
<tr>
<td>DTU</td>
<td>2</td>
</tr>
</tbody>
</table>

Note: Additional fee (based on FOB price) for extended warranty period: 20% for 8 years, or 30% for 13 years.

During the Warranty Period, if Hoymiles establishes, through inspection, the existence of a defect that covered by the Limited Warranty, Hoymiles will, at its option, either

1) Repair or replace the Defective Product free of charge, or

2) Issue a credit or refund for the Defective Product to the Warranty Holder in an amount up to its actual value at the time the Warranty Holder notifies Hoymiles of the defect, as determined by Hoymiles.

If Hoymiles elects to repair or replace the Defective Product, Hoymiles will, at its option, use new and/or reconditioned parts in repairing or replacing the Defective Product. Hoymiles reserves the right to use parts or products of original or improved design in the repair or replacement of Defective Product. If Hoymiles repairs or replaces a Defective Product, the Limited Warranty continues on the repaired or replacement product for the remainder of the original Warranty Period or ninety (90) days from the date of Hoymiles’ return shipment of the repaired or replacement product, whichever is later.

© 2018 Hoymiles Converter Technology Co., Ltd
2. Limited Liability

The Limited Warranty covers both parts and labor necessary to repair the Defective, but does not include labor costs related to un-installing the Defective Product or re-installing the repaired or replacement product. The Limited Warranty also covers the costs of shipping repaired or replacement product from Hoymiles, via a non-expedited freight carrier selected by Hoymiles. The Limited Warranty does not cover, and Hoymiles will not be responsible for, shipping damage or damage caused by mishandling by the freight carrier and any such damage is the responsibility of the freight carrier.

The Limited Warranty does not apply to, and Hoymiles will not be responsible for, any defect in or damage to any Hoymiles product:

1) That has been misused, neglected, tampered with, altered, or otherwise damaged, either internally or externally;
2) Normal appearance wear out, including discolor and scratch;
3) The defective has no impact on the power generation, including LED indicator failure;
4) That has been improperly installed, operated, handled or used, including use under conditions for which the product was not designed, use in an unsuitable environment, or use in a manner contrary to the Hoymiles User Manual or applicable laws or regulations;
5) That has been subjected to fire, water, generalized corrosion, biological infestations, or input voltage that creates operating conditions beyond the maximum or minimum limits listed in the Hoymiles product specifications, including high input voltage from generators or lightning strikes;
6) That has been subjected to incidental or consequential damage caused by defects of other components of the solar system; or
7) If the original identification markings (including trademark or serial number) of such product have been defaced, altered, or removed. The Limited Warranty does not cover costs related to the removal, installation or troubleshooting of the customer’s electrical systems. The Limited Warranty does not extend beyond the original cost of the Hoymiles product.
3. RMA & Replacement

To obtain repair or replacement service, credit or refund (as applicable) under this Limited Warranty, you must comply with the following policy and procedure:

- All Defective Product must be returned with a Return Merchandise Authorization Number (RMA) which customer must request from Hoymiles. Before requesting the RMA, however, the customer should contact Hoymiles technical support representative to evaluate and troubleshoot the problem while the Hoymiles products in the field, since many problems can be solved in the field.

- If in-field troubleshooting does not solve the problem, Customer may request the RMA number, with following information:
  - Proof-of-purchase of the Defective Product in the form of (1) the dated purchase receipt from the original purchase of the product at point of sale to the end user, or (2) the dated dealer invoice or purchase receipt showing original equipment manufacturer (OEM) status, or (3) the dated invoice or purchase receipt showing the product exchanged under warranty.
  - Model number of the Defective Product
  - Serial number of the Defective Product
  - Detailed description of the defect
  - Shipping address for return of the repaired or replacement product

- Upon issuance of the RMA, Hoymiles will ship the replacement unit to the address where the Hoymiles product is installed.
- All Defective Product authorized for return must be returned in the original shipping container or other packaging that is equally protective of the product.
- The returned Defective Product must not have been disassembled or modified without the prior written authorization of Hoymiles.
- If defective device is replaced by a distributor according to warranty conditions, Hoymiles will compensate labor costs to related distributor by USD50 for 1st unit, USD25 for 2nd unit and USD25 for 3rd unit, total compensation for one residential system less than 30kW up to USD150.
- If the allegedly faulty microinverter is found by Hoymiles to be ineligible for exchange under this policy, the compensation payment will not be made and the distributor/installer will be charged for the repair of the unit. In order to receive the compensation payment, the distributor/installer must provide proof of a valid warranty for the microinverter, a correctly issued and fully completed invoice.
4. Limited Warranty

THE LIMITED WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY HOYMILES AND, WHERE PERMITTED BY LAW, IS MADE EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF TITLE, QUALITY, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OR WARRANTIES AS TO THE ACCURACY, SUFFICIENCY OR SUITABILITY OF ANY TECHNICAL OR OTHER INFORMATION PROVIDED IN MANUALS OR OTHER DOCUMENTATION. IN NO EVENT WILL HOYMILES BE LIABLE FOR ANY SPECIAL, DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, COSTS OR EXPENSES HOWEVER ARISING, WHETHER IN CONTRACT OR TORT, INCLUDING WITHOUT LIMITATION ANY ECONOMIC LOSSES OF ANY KIND, ANY LOSS OR DAMAGE TO PROPERTY, OR ANY PERSONAL INJURY.

To the extent any implied warranties are required under applicable law to apply to the Hoymiles products, such implied warranties shall be limited in duration to the Warranty Period, to the extent permitted by applicable law. Some regions do not allow limitations or exclusions on implied warranties or on the duration of an implied warranty or on the limitation or exclusion of incidental or consequential damages, so the above limitation(s) or exclusion(s) may not apply. This Limited Warranty gives the Warranty Holder specific legal rights, and the Warranty Holder may have other rights that may vary from region to region.
<table>
<thead>
<tr>
<th>N S E W (circle one)</th>
<th>Panel Group: Azimuth: Tilt: Sheet___of___</th>
<th>Customer Information:</th>
<th>DTU Serial Number:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7 8 9 10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**G98 Type Verification Test Report**

Type Approval and Manufacturer declaration of compliance with the requirements of G98.
This form should be used when making a Type Test submission to the Energy Networks Association (ENA).
If the Micro-generator is Fully Type Tested and already registered with the ENA Type Test Verification Report Register, the Installation Document should include the Manufacturer’s Reference Number (the Product ID), and this form does not need to be submitted.
Where the Micro-generator is not registered with the ENA Type Test Verification Report Register this form needs to be completed and provided to the DNO, to confirm that the Microgenerator has been tested to satisfy the requirements of this EREC G98.

<table>
<thead>
<tr>
<th>SSEG Type reference number</th>
<th>MI-1200, MI-1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSEG Type</td>
<td>Photovoltaic Microinverter</td>
</tr>
<tr>
<td>System Supplier name</td>
<td>Hoymiles Converter Technology Co., Ltd.</td>
</tr>
<tr>
<td>Address</td>
<td>No.18 Kangjing road, Hangzhou, Zhejiang Province, P.R. China</td>
</tr>
<tr>
<td>Tel</td>
<td>+86 15088682210</td>
</tr>
<tr>
<td>Fax</td>
<td>+86 571 28056137</td>
</tr>
<tr>
<td>E:mail</td>
<td><a href="mailto:zhangxingyao@hzconverter.com">zhangxingyao@hzconverter.com</a></td>
</tr>
<tr>
<td>Web site</td>
<td><a href="http://www.hoymiles.com">www.hoymiles.com</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum rated capacity, use separate sheet if more than one connection option.</th>
<th>Connection Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2/1.0</td>
<td>kW single phase, single, split or three phase system</td>
</tr>
<tr>
<td>NA</td>
<td>kW three phase</td>
</tr>
<tr>
<td>NA</td>
<td>kW two phases in three phase system</td>
</tr>
<tr>
<td>NA</td>
<td>kW two phases split phase system</td>
</tr>
</tbody>
</table>

**SSEG manufacturer/supplier declaration**

Manufacturer Type Test declaration. - I certify that all products supplied by the company with the above Type Tested reference number will be manufactured and tested to ensure that they perform as stated in this document, prior to shipment to site and that no site modifications are required to ensure that the product meets all the requirements of EREC G98.

Signed

On behalf of Hoymiles Converter Technology Co., Ltd

TRP-18120706
Note that testing can be done by the Manufacturer of an individual component or by an external test house. Where parts of the testing are carried out by persons or organisations other than the Manufacturer then that person or organisation shall keep copies of all test records and results supplied to them to verify that the testing has been carried out by people with sufficient technical competency to carry out the tests.

### Operating Range

<table>
<thead>
<tr>
<th></th>
<th>Test 1</th>
<th>Test 2</th>
<th>Test 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI-1200</td>
<td>195.5 V, 47.5 Hz</td>
<td>253 V, 51.5 Hz</td>
<td>253 V, 52.0 Hz</td>
</tr>
<tr>
<td>MI-1000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Power Quality – Harmonics: These tests should be carried out as specified in BS EN 61000-3-2.

<table>
<thead>
<tr>
<th>Harmonic</th>
<th>SSEG rating per phase (rpp)</th>
<th>1.2 kW</th>
<th>NV=MV*3.68/rpp</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At 45-55% of rated output</td>
<td>100% of rated output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Normalised Value (NV)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Measured Value (MV) in Amps</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Normalised Value (MV) in Amps</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Limit in BS EN 61000-3-2 in Amps</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Higher limit for odd harmonic 21 and above</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Harmonic</th>
<th>Measured Value (MV) in Amps</th>
<th>Normalised Value (NV) in Amps</th>
<th>Normalised Value (MV) in Amps</th>
<th>Normalised Value (MV) in Amps</th>
<th>Limit in BS EN 61000-3-2 in Amps</th>
<th>Higher limit for odd harmonic 21 and above</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0.0182</td>
<td>0.0558</td>
<td>0.0375</td>
<td>0.1150</td>
<td>1.080</td>
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</tr>
<tr>
<td>3</td>
<td>0.0108</td>
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<td>0.1012</td>
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<tr>
<td>4</td>
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<td>0.0242</td>
<td>0.0121</td>
<td>0.0371</td>
<td>0.430</td>
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</tr>
<tr>
<td>5</td>
<td>0.0135</td>
<td>0.0414</td>
<td>0.0435</td>
<td>0.1334</td>
<td>1.140</td>
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</tr>
<tr>
<td>6</td>
<td>0.0051</td>
<td>0.0156</td>
<td>0.0091</td>
<td>0.0279</td>
<td>0.300</td>
<td></td>
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<tr>
<td>7</td>
<td>0.0193</td>
<td>0.0592</td>
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<td>0.1138</td>
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<tr>
<td>8</td>
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<td>0.0141</td>
<td>0.0061</td>
<td>0.0187</td>
<td>0.230</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0.0142</td>
<td>0.0435</td>
<td>0.0373</td>
<td>0.1144</td>
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<td></td>
</tr>
<tr>
<td>10</td>
<td>0.0033</td>
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<td>0.0156</td>
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<tr>
<td>11</td>
<td>0.0074</td>
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<td>0.1248</td>
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<td></td>
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<tr>
<td>12</td>
<td>0.0023</td>
<td>0.0071</td>
<td>0.0042</td>
<td>0.0129</td>
<td>0.153</td>
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<tr>
<td>13</td>
<td>0.0071</td>
<td>0.0218</td>
<td>0.032</td>
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<td>0.210</td>
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<td>---</td>
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<tr>
<td>14</td>
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<tr>
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<td>0.0089</td>
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<td>0.102</td>
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<td>0.0071</td>
<td>0.0044</td>
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<tr>
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<td>0.0374</td>
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<tr>
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<tr>
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<td>0.0082</td>
<td>0.0251</td>
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<td>0.0435</td>
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<td></td>
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<td>0.0067</td>
<td>0.0072</td>
<td>0.0221</td>
<td>0.077</td>
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<td>0.0187</td>
<td>0.0174</td>
<td>0.0534</td>
<td>0.090</td>
<td></td>
</tr>
<tr>
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<td>0.0026</td>
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<td>0.0261</td>
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<td></td>
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<tr>
<td>31</td>
<td>0.0027</td>
<td>0.0083</td>
<td>0.0118</td>
<td>0.0362</td>
<td>0.073</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>0.002</td>
<td>0.0061</td>
<td>0.0104</td>
<td>0.0319</td>
<td>0.058</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>0.0066</td>
<td>0.0202</td>
<td>0.0127</td>
<td>0.0389</td>
<td>0.068</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>0.0006</td>
<td>0.0018</td>
<td>0.0066</td>
<td>0.0202</td>
<td>0.054</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>0.0077</td>
<td>0.0236</td>
<td>0.0112</td>
<td>0.0343</td>
<td>0.064</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>0.001</td>
<td>0.0031</td>
<td>0.0071</td>
<td>0.0218</td>
<td>0.051</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>0.0048</td>
<td>0.0147</td>
<td>0.0078</td>
<td>0.0239</td>
<td>0.061</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>0.0017</td>
<td>0.0052</td>
<td>0.0092</td>
<td>0.0282</td>
<td>0.048</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>0.0064</td>
<td>0.0196</td>
<td>0.008</td>
<td>0.0245</td>
<td>0.058</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>0.0005</td>
<td>0.0015</td>
<td>0.0091</td>
<td>0.0279</td>
<td>0.046</td>
<td></td>
</tr>
</tbody>
</table>
Note the higher limits for odd harmonics 21 and above are only allowable under certain conditions, if these higher limits are utilised please state the exemption used as detailed in part 6.2.3.4 of BS EN 61000-3-2 in the box below.

### Power Quality. Voltage fluctuations and Flicker.

<table>
<thead>
<tr>
<th></th>
<th>Starting</th>
<th>Stopping</th>
<th>Running</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>dmax [%]</td>
<td>dc [%]</td>
<td>d(t) [%]</td>
</tr>
<tr>
<td>Measured Values</td>
<td>0.1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Normalised to standard impedance and 3.68kW for multiple units</td>
<td>0.3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Limits set under BS EN 61000-3-2</td>
<td>4%</td>
<td>3.30%</td>
<td>3.3% 500ms</td>
</tr>
</tbody>
</table>

| Test start date | 2017-08-20 | Test end date | 2017-08-20 |
| Test location   | No.8 Chunxin East Road, Wuxi, Jiangsu |

### Power quality – DC injection: This test should be carried out in accordance with EN 50438 Annex D.3.10

<table>
<thead>
<tr>
<th>Test power level</th>
<th>20%</th>
<th>50%</th>
<th>75%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recorded value(mA)</td>
<td>0.262</td>
<td>1.03</td>
<td>1.74</td>
<td>1.35</td>
</tr>
<tr>
<td>as % of rated AC</td>
<td>0.025%</td>
<td>0.039%</td>
<td>0.044%</td>
<td>0.026%</td>
</tr>
<tr>
<td>Limit</td>
<td>0.25%</td>
<td>0.25%</td>
<td>0.25%</td>
<td>0.25%</td>
</tr>
</tbody>
</table>

### Power Quality – Power factor: This test shall be carried out in accordance with EN 50538 Annex D.3.4.1 but with nominal voltage -6% and +10%. Voltage to be maintained within ±1.5% of the stated level during the test.
<table>
<thead>
<tr>
<th>Function</th>
<th>Setting</th>
<th>Trip test</th>
<th>“No trip tests”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Time delay</td>
<td>Frequency</td>
</tr>
<tr>
<td>U/F stage 1</td>
<td>47.5Hz</td>
<td>20s</td>
<td>47.5Hz</td>
</tr>
<tr>
<td>U/F stage 2</td>
<td>47Hz</td>
<td>0.5s</td>
<td>47Hz</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O/F stage 2</td>
<td>52Hz</td>
<td>0.5s</td>
<td>52Hz</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Protection. Frequency tests** These tests should be carried out in accordance with EN 50438 Annex D.2.4 and the notes in EREC G98 Annex A1 A 1.3.2 (Inverter connected) or Annex A2 A.2.2.2 (Synchronous)

<table>
<thead>
<tr>
<th>Function</th>
<th>Setting</th>
<th>Trip test</th>
<th>“No trip tests”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Voltage</td>
<td>Time delay</td>
<td>Voltage</td>
</tr>
<tr>
<td>U/V stage 2</td>
<td>184V</td>
<td>2.5s</td>
<td>183.4V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O/V stage 1</td>
<td>262.2V</td>
<td>1.0s</td>
<td>263.2V</td>
</tr>
<tr>
<td>O/V stage 2</td>
<td>273.7V</td>
<td>0.5s</td>
<td>274.4V</td>
</tr>
</tbody>
</table>
Note for Voltage tests the Voltage required to trip is the setting ±3.45 V. The time delay can be measured at a larger deviation than the minimum required to operate the protection. The No trip tests need to be carried out at the setting ±4 V and for the relevant times as shown in the table above to ensure that the protection will not trip in error.

### Protection. Loss of Mains test

For PV Inverters shall be tested in accordance with BS EN62116. Other Inverters should be tested in accordance with EN 50438 Annex D.2.5 at 10%, 55% and 100% of rated power.

Note: Inverter tested according to BS EN 62116.

<table>
<thead>
<tr>
<th>Test Power and imbalance</th>
<th>33% -5% Q</th>
<th>66% -5% Q</th>
<th>100% -5% P</th>
<th>33% +5% Q</th>
<th>66% +5% Q</th>
<th>100% +5% P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trip time, Limit is 0.5s</td>
<td>82.5ms</td>
<td>173.6ms</td>
<td>227.4ms</td>
<td>84.8ms</td>
<td>171.3ms</td>
<td>237.8ms</td>
</tr>
</tbody>
</table>

### Protection. Frequency change, Stability test

This test should be carried out in accordance with EREC G98 Annex A1 A 1.3.5 (Inverter connected) or Annex A2 A.2.2.5 (Synchronous).

<table>
<thead>
<tr>
<th>Start Frequency</th>
<th>Change</th>
<th>End Frequency</th>
<th>Confirm no trip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive Vector Shift</td>
<td>49.5Hz</td>
<td>+50 degrees</td>
<td>No trip</td>
</tr>
<tr>
<td>Negative Vector Shift</td>
<td>50.5Hz</td>
<td>- 50 degrees</td>
<td>No trip</td>
</tr>
</tbody>
</table>

### Protection – Frequency change, RoCoF Stability test

The requirement is specified in section 11.3, test procedure in Annex A 1.3.5 (Inverter connected) or Annex A2 A.2.2.5 (Synchronous).

<table>
<thead>
<tr>
<th>Ramp range</th>
<th>Test frequency</th>
<th>Test Duration</th>
<th>Confirm no trip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive Frequency drift</td>
<td>49Hz to 51Hz</td>
<td>+0.95Hz/sec</td>
<td>2.1s</td>
</tr>
<tr>
<td>Negative Frequency drift</td>
<td>51Hz to 49Hz</td>
<td>-0.95Hz/sec</td>
<td>2.1s</td>
</tr>
</tbody>
</table>

### Protection – Limited Frequency Sensitive Mode – Overfrequency test

This test should be carried out in accordance with EN 50438 Annex D.3.3 Power response to over-frequency. The test should be carried out using the specific threshold frequency of 50.4 Hz and drop of 10%.

<table>
<thead>
<tr>
<th>Test sequence at Registered Capacity &gt;80%</th>
<th>Measured Active Power Output</th>
<th>Frequency</th>
<th>Primary Power Source</th>
<th>Active Power Gradient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step a) 50.00</td>
<td>1199.4W</td>
<td>50Hz</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Step</td>
<td>Frequency</td>
<td>Active Power Output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
<td>---------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>50 Hz ± 0.01 Hz</td>
<td>613.2W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>50.45 Hz ± 0.05 Hz</td>
<td>609.6W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td>50.70 Hz ± 0.10 Hz</td>
<td>594.7W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d)</td>
<td>51.15 Hz ± 0.05 Hz</td>
<td>567.3W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e)</td>
<td>50.70 Hz ± 0.10 Hz</td>
<td>593.5W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f)</td>
<td>50.45 Hz ± 0.05 Hz</td>
<td>609.8W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g)</td>
<td>50.00 Hz ± 0.10 Hz</td>
<td>613.3W</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Protection – Power output with falling frequency test**: This test should be carried out in accordance with EN 50438 Annex D.3.2 active power feed in at under-frequency.

<table>
<thead>
<tr>
<th>Test sequence</th>
<th>Measured Active Power Output</th>
<th>Frequency</th>
<th>Primary power source</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>1198.7W</td>
<td>50 Hz</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>1197.9W</td>
<td>49.55Hz</td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td>1197.8W</td>
<td>47.55Hz</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**: The operating point in Test (b) and (c) shall be maintained for at least 5 minutes.
Protection. Re-connection timer.

Test should prove that the reconnection sequence starts after a minimum delay of 20 s for restoration of voltage and frequency to within the stage 1 settings of Table 2.

<table>
<thead>
<tr>
<th>Time delay setting</th>
<th>Measured delay</th>
<th>No reconnection when voltage or frequency is brought to just outside stage 1 limits of table 1.</th>
</tr>
</thead>
<tbody>
<tr>
<td>40s</td>
<td>40.1s</td>
<td>Measured delay at 266.2V, 180V, 47.4Hz, 52.1Hz</td>
</tr>
<tr>
<td>Confirmation that the SSEG does not re-connect.</td>
<td>No reconnection</td>
<td>No reconnection</td>
</tr>
</tbody>
</table>

Fault level contribution. The requirement is specified in section 5.7, test procedure in Annex A or B 1.4.6

For a directly coupled SSEG                      For a Inverter SSEG

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Time after fault</th>
<th>Volts</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Short Circuit current</td>
<td>ip</td>
<td>N/A</td>
<td>20ms</td>
<td>17.3V</td>
<td>0.257A</td>
</tr>
<tr>
<td>Initial Value of aperiodic</td>
<td>A</td>
<td>N/A</td>
<td>100ms</td>
<td>6.68V</td>
<td>0.149A</td>
</tr>
<tr>
<td>Initial symmetrical</td>
<td>lk</td>
<td>N/A</td>
<td>250ms</td>
<td>6.22V</td>
<td>0.138A</td>
</tr>
<tr>
<td>Decaying (aperiodic)</td>
<td>iDC</td>
<td>N/A</td>
<td>500ms</td>
<td>5.59V</td>
<td>0.125A</td>
</tr>
<tr>
<td>Reactance/Resistance Ratio</td>
<td>X/R</td>
<td>N/A</td>
<td>Time to trip</td>
<td>0.0039s</td>
<td>(in seconds)</td>
</tr>
</tbody>
</table>

Self-Monitoring solid state switching: No specified test requirements. Refer to EREC G98 Annex A1 A 1.4.6 (Inverter connected). Yes/or NA

It has been verified that in the event of the solid state switching device failing to disconnect the Micro-generator, the voltage on the output side of the switching device is reduced to a value below 50 V within 0.5 s. N/A

Additional comments
Limited Warranty

Changzhou Trina Solar Energy Co., Ltd (“Trina Solar”) hereby grants the following Limited Warranty to the first customer installing (for its own use) (the “Buyer”) any of the specified (and no other) brand models listed below (the “Products”):

1) Warranted Products

This Limited Warranty shall only apply to the following Products:

a) Polycrystalline Products
TSM-***PA03, TSM-***PA05, TSM-***PA05.05, TSM-***PA05.08, TSM-***PA05A, TSM-***PA05A.05, TSM-***PA05A.08, TSM-***PA14, TSM-***PA14A, TSM-***PA05.10, TSM-***PA05.15, TSM-***PA05.18, TSM-***PA05A.10, TSM-***PA05A.15, TSM-***PA05A.18, TSM-***PA05.002, TSM-***PA05.052, TSM-***PA05.082, TSM-***PA05.102, TSM-***PA05.182, TSM-***PA05.20, TSM-***PA05.25, TSM-***PA05.28, TSM-***PA14.20;

TSM-***PC03, TSM-***PC05, TSM-***PC05.01, TSM-***PC05.05, TSM-***PC05.08, TSM-***PC05A, TSM-***PC05A.05, TSM-***PC05A.08, TSM-***PC05B, TSM-***PC05B.05, TSM-***PC05B.08, TSM-***PC14, TSM-***PC14.08, TSM-***PC14A, TSM-***PC14.05, TSM-***PC14.10, TSM-***PC14.15, TSM-***PC14.18, TSM-***PC05A.10, TSM-***PC05A.15, TSM-***PC05A.18, TSM-***PC05A.002, TSM-***PC05A.052, TSM-***PC08A.082, TSM-***PC08A.003, TSM-***PC14.002, TSM-***PC14.082, TSM-***PC06, TSM-***PC06.08, TSM-***PC05A.50, TSM-***PC05A.20, TSM-***PC05A.25, TSM-***PC05A.28, TSM-***PC05A(II), TSM-***PC05A.05(II), TSM-***PC05A.08(II), TSM-***PC14(II), TSM-***PC14.08(II), TSM-***PC05A.10(II), TSM-***PC05A.15(II), TSM-***PC05A.18(II), TSM-***PC05A.002(II), TSM-***PC05A.052(II), TSM-***PC05A.082(II), TSM-***PC14.002(II), TSM-***PC14.082(II);

TSM-***PD05, TSM-***PD05.05, TSM-***PD05.08, TSM-***PD05.10, TSM-***PD05.15, TSM-***PD05.18, TSM-***PD05.50, TSM-***PD05.002, TSM-***PD05.052, TSM-***PD05.082, TSM-***PD14, TSM-***PD14.08, TSM-***PD14.10, TSM-***PD14.15, TSM-***PD14.18, TSM-***PD14.002, TSM-***PD05(II), TSM-***PD05.05(II), TSM-***PD05.08(II), TSM-***PD05.10(II), TSM-***PD05.15(II), TSM-***PD05.18(II), TSM-***PD14(II), TSM-***PD14.08(II), TSM-***PD05.005, TSM-***PD05.055, TSM-***PD05.08S, TSM-***PD05.05U, TSM-***PD05.08U, TSM-***PD05.00C, TSM-***PD05.05C, TSM-***PD05.08C, TSM-***PD05.00D, TSM-***PD05.05D, TSM-***PD05.08D, TSM-***PD14.00C;
PS LIMITED

http://www.trinasolar.com

- M

Warranty

modules are set forth above in a) and b).

Mounting products contained in Trinamount

Product Data Sheet (for example “TSM

Note: The “***” placeholder stands in each case for the power indication set out in the relevant

Product Data Sheet (for example “TSM-260PD05”).

c) Mounting Products

Mounting products contained in Trinamount I, Trinamount II and Trinamount 3 D10. Applicable

modules are set forth above in a) and b).

2) Warranty

a) 10 Year Limited Product Warranty

Trina Solar warrants that for a period of ten years commencing on the Warranty Start Date (as

defined below) the Product(s)

- will be free from defects in design, material, workmanship or manufacture that materially

impede their functioning, and

- will conform to the specifications and the drawings applicable thereto.

Page 2 of 8

Address: No.2 Trina Road, Trina PV Industrial Park, New District, Changzhou, Jiangsu, P.R. China, 213031
Fax: 0086-519-85485936
This Limited Product Warranty covers glass breakage provided that there was no external cause of breakage (i.e. only breakage caused by the glass itself or the module is covered).

Any deterioration in the appearance of the Product(s) (including, without limitation, any scratches, stains, mechanical wear, rust, or mold) or any other changes to the Product(s) which occur after delivery (Incoterm 2010) to the Buyer, do not constitute a defect under this Limited Warranty. The rights of the Buyer under Sec. 2 b) shall remain unaffected.

b) 25 Year Limited Power Output Warranty
In addition, Trina Solar warrants that for a period of twenty-five years commencing on the Warranty Start Date, the loss of power output relating to the initial guaranteed power which is defined as Peak Power Watts Pmax(Wp) plus Peak Power Watts Pmax(Wp) multiplied by the lower limit of the Power Output Tolerance Pmax(%) as specified in the relevant Product Data Sheet and measured at Standard Test Conditions (STC) for the Product(s) shall not exceed

- For Polycrystalline Products (as defined in Sec. 1 a): 2.5% in the first year, thereafter 0.7% per year, ending with 80.7% in the 25th year after the Warranty Start Date,

- For Monocrystalline Products (as defined in Sec. 1 b): 3.0% in the first year, thereafter 0.68% per year, ending with 80.68% in the 25th year after the Warranty Start Date.

3) Warranty Start Date
The Warranty Start Date is the date of delivery (Incoterms 2010) of the Product(s) to the Buyer or 12 months after the date of production of the Product(s) as indicated in the serial number (digit no. 4 – 7 (YYMM), starting from the left side of the serial number), whichever date is earlier.

4) Exclusions and Limitations
The aforementioned “Limited Warranty” does not apply to any Products which have been subjected to

a) Failure to pay the purchase price towards Trina Solar or its subsidiaries which have put the modules on the market even though (i), the payment was due and (ii) the direct customer who has obtained the modules from Trina Solar or its subsidiary (“Direct Customer”) is not entitled to withhold the purchase price or parts of the purchase price. Trina Solar must inform the Buyer about the non-payment and provide the name and the full address of the Direct Customer which has failed to pay the modules. In case that Trina Solar can reject the claim under this warranty based on this provision, the Buyer can deposit the amount not paid in order to trigger the warranty claims;

b) Failure to comply with Trina Solar’s installation manual applicable during the Validity of this Limited Warranty pursuant to Sec 10;

c) Service by service technicians who are not qualified under the relevant law and/or applicable regulations at the place of installation;
d) The Product's type, nameplate or module serial number is changed, erased or made illegible (other than by any act or omission of Trina Solar);

e) The Product’s installation on mobile units (except photovoltaic tracking system), such as vehicles, ships or offshore-structures;

f) Exposure to voltage in excess to the maximum system voltage or power surges;

g) Defective components in the construction on which the module is mounted;

h) exposure to mold discoloration or similar external effects;

i) exposure to any of the following: extreme thermal or environmental conditions or rapid changes in such conditions, corrosion, oxidation, unauthorized modifications or connections, unauthorized opening, servicing by use of unauthorized spare parts, accident, force of nature (such as lightning strike, earthquake), influence from chemical products or other acts beyond Trina Solar’s reasonable control (including damage by fire, flood, etc.);

j) use of the Products in such a manner as to infringe Trina Solar’s or any third party’s intellectual property rights (e.g. patents, trademarks). Parallel importation, which is defined as subsequent sale without the consent of Trina Solar from the country in which the Product(s) were first put on the market to another country, is regarded as an infringement of Trina Solar's intellectual property rights. This does not apply for sales within the European Union: such sales from one Member State to another Member State do not require the consent of Trina Solar; whereas sales from outside the European Union into the European Union require such consent of Trina Solar

k) Only for buyers located in Australia applies: The "Limited Warranty" is only valid for products from authorized Australian resellers. Buyers may contact the Customer Support office in their region (as detailed in clause 7) for details of authorized Australian resellers.

l) Only for buyers located in the US applies: The "Limited Warranty" is only valid for products from authorized US resellers. Buyers may contact the Customer Support office in their region (as detailed in clause 7) for details of authorized US resellers.

5) Repair, Replacement or Refund Remedy

a) As Buyer’s sole and exclusive remedy under this Limited Warranty (though Buyer should note paragraph 5(d) below regarding the potential existence of other statutory rights and paragraph 5(e) below for Australian Buyers) Trina Solar will, at its sole discretion, either, with regard to the applicable Product (or component thereof in the case of Mounting Product):

i) refund the current market price of the relevant Product(s) (or its successor product); or

ii) repair the defective Product(s) at no charge (subject to the following paragraph); or

iii) replace the defective Product(s) or part thereof by a new or remanufactured equivalent at no charge (subject to the following paragraph).

In the event that Trina Solar opts for options ii) or iii), Trina Solar shall bear all insurance and transportation charges (except air freight), customs clearance and any other costs for returning the defective Product(s) to Trina Solar and shipping the repaired or replaced Product(s) to Buyer (a Buyer may claim reimbursement by Trina for these charges by providing proof to Trina Solar that these charges were incurred, e.g. an invoice from the relevant service provider). The costs and expenses for the removal, installation or reinstallation shall remain with Buyer.
b) The warranty period(s) as defined in Sec. 2 a) and b) shall not extend or renew upon the repair or replacement of a defective Product by Trina Solar. The warranty period for replaced or repaired Product(s) is the remainder of the warranty on the original new Product(s).

c) All other claims under this Limited Warranty against Trina Solar shall be excluded. Under this Limited Warranty, Trina Solar is not responsible for any special, incidental or consequential damages (including loss of profits, harm to goodwill or business reputation, or delay damages) whether such claims are based in contract, warranty, negligence or strict tort. This exclusion applies to the extent permissible by law, and even if the remedies set forth below herein are deemed to have failed of their essential purpose.

d) YOU MAY HAVE SPECIFIC LEGAL RIGHTS OUTSIDE THIS WARRANTY, AND YOU MAY ALSO HAVE OTHER RIGHTS THAT VARY FROM STATE TO STATE. THIS LIMITED WARRANTY DOES NOT AFFECT ANY ADDITIONAL RIGHTS YOU HAVE UNDER LAWS IN YOUR JURISDICTION GOVERNING THE SALE OF CONSUMER GOODS, INCLUDING WITHOUT LIMITATION, NATIONAL LAWS IMPLEMENTING EC DIRECTIVE 99/44 OR PURSUANT TO THE MAGNUSON MOSS WARRANTY ACT. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE LIMITATIONS OR EXCLUSIONS IN THIS LIMITED WARRANTY STATEMENT MAY NOT APPLY.

e) The following statement applies to customers that are ‘consumers’ within the meaning of the Australian Consumer Law:

“Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and for compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.”

6) Rights and Remedies against Third Parties
This Limited Warranty shall be construed as a separate warranty and independent from any other contractual arrangement with third parties relating to the Product(s). It shall not affect any rights, obligations and remedies of the Buyer, if any, with regard to third parties for defects or non-conformity or non-compliance of the Products, notwithstanding its legal basis. The rights and remedies provided hereunder are in addition to any other rights and remedies against third parties to which Buyer may be entitled by agreements with such third parties or by law.

a) Buyer shall notify Trina Solar under this Limited Warranty using Trina Solar’s Customer Service Portal at the web address http://customerservice.trinasolar.com; alternatively by letter or
facsimile specifying each alleged claim including evidence of the claims and the serial numbers of the Product(s) at issue. The contact customer support center for the regions are:

**Europe Customer Support**
Trina Solar (Schweiz) AG
Richtistrasse 11,
8304 Wallisellen, Switzerland
T +41 43 299 68 00
F +41 43 299 68 10
[http://customerservice.trinasolar.com](http://customerservice.trinasolar.com)

**Americas Customer Support**
Trina Solar (U.S.), Inc.
100 Century Center, Suite 501,
San Jose CA 95112, USA
T +1 800 696 7114
F +1 800 696 0166
[http://customerservice.trinasolar.com](http://customerservice.trinasolar.com)

**Australia Customer Support**
Trina Solar Australia Pty Ltd
Level 35, 60 Margaret Street,
Sydney NSW 2000, Australia
T +61 (0)2 9199 8500
F +61 2 9199 8006
[http://customerservice.trinasolar.com](http://customerservice.trinasolar.com)

**Japan Customer Support**
Trina Solar (Japan) Limited
World Trade Center Building 21F
4-1, Hamamatsu-cho, 2-chome,
Minato-ku, Tokyo, Japan, 105-6121
T +81-3-3437-7000
F +81-3-3437-7001
[http://customerservice.trinasolar.com](http://customerservice.trinasolar.com)

**Rest of World (ROW) Customer Support**
Changzhou Trina Solar Energy Company Limited
No. 2 Trina Road, Trina PV Industrial Park,
New District, Changzhou, Jiangsu,
P.R. China, 213031
T +86 519 8548 2008
F +86 519 8517 6021
[http://customerservice.trinasolar.com](http://customerservice.trinasolar.com)

b) Any dispute on technical facts relating to claims brought under this Limited Warranty for defects of Products shall be determined by expert determination. Trina Solar and the Buyer will, at the Buyer’s or Trina Solar’s request, appoint as independent expert and appraiser a reputable researcher from a first-class international test-institute such as Fraunhofer ISE in Freiburg/Germany, TÜV (e.g. TÜV Rheinland, TÜV SUD or Shanghai TÜV) or ASU Arizona State University, and so on (“Technical Expert”). The determination by such Technical Expert shall be final, conclusive, binding and enforceable in any proceeding brought hereunder. The Technical Expert shall (i) act as an expert; (ii) allow the parties a reasonable opportunity to make representations and counter-representations; (iii) take those representations and counter-representations into account; and (iv) if required by either party give written reasons for his or her determination.
c) Any claim for breach of this Limited Warranty must be brought within two (2) months after discovery of the breach.

d) The return of any defective Product(s) will not be accepted unless prior written authorization has been given by Trina Solar.

8) Force Majeure
Trina Solar shall not be responsible or liable in any way to the Buyer for any non-performance or delay in performance under this Limited Warranty due to occurrences of force majeure such as, war, riots, strikes, unavailability of suitable and sufficient labor, material, or capacity or technical or yield failures and any unforeseen event beyond its control, including, without limitation, any technological or physical event or condition which is not reasonably known or understood at the time of the sale of the defective Product(s) or the notification of the relevant warranty claim under this Limited Warranty.

9) Warranty Assignment
This Limited Warranty is transferrable when the Products remain installed in their original installation location.

10) Validity
This Limited Warranty shall apply to Product(s)
   a) manufactured after 1st of January 2015 and
   b) delivered to Buyer from 1st of April 2016 (Incoterms 2010).
This Limited Warranty shall be valid until a new revision is issued by Trina Solar.

11) No Other Express Warranty
Except as otherwise provided by applicable statutory law (cf. Sec. 5 d) and 5 e) above) or unless modified in writing and signed by an officer of Trina Solar, the Limited Warranty set forth herein is the only express warranty (whether written or oral) by Trina Solar applicable to the Products and no one is authorized to restrict, expand or otherwise modify this Limited Warranty.

12) Miscellaneous
If any provision of this Limited Warranty is held invalid, unenforceable or contrary to law then the validity of the remaining provisions of this Limited Warranty shall remain in full force and effect.

13) Applicable Law and Jurisdiction
The validity of this Limited Warranty, the construction of its terms and the interpretation and enforcement of the rights and duties of the Buyer and Trina Solar shall be governed by the laws of the country of the original installation location of the Product(s), to the exclusion of that country’s conflicts of law rules as well as of the United Nations Convention on the International Sale of Goods dated 11 April 1980 (CISG) and of any other uniform law.
All disputes arising out of or in connection with this Limited Warranty shall be finally settled before the ordinary courts of the country of the original installation location of the Product(s).
Certificate of Approval
Certificate Number: MCS PV0183  Issue: 10

Trina Solar Co., Ltd.
No.2 TianHe Road, Trina PV Industrial Park,
New District, Changzhou,
Jiangsu 213031,
P. R. China

having complied with the requirements of the following:

MCS 010: Issue 1.5
Generic Factory Production Control (FPC) Requirements
and
MCS 005: Issue 3.0
Product Certification Scheme Requirements: Photovoltaic Panels

is authorised to use the BRE Global Certification Mark and the MCS Certification Mark in association with
the following products:

Products

Please see Appendix for details

This certificate and appendix is maintained and held in force through periodic review and verification.
The products listed in this certificate and appendix are certified through the agreement between
BRE Global Ltd. and TÜV Rheinland Energy GmbH

Signed for BRE Global Ltd. 13 December 2018 04 April 2014

Laura Critien MCS Operations Manager Date of Issue Date of First Issue

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To check the validity of this certificate please visit www.greenbooklive.com/check or contact us.
BRE Global Ltd., Garston, Watford WD25 9XX.
T: +44 (0)333 321 8811 F: +44 (0)1923 664603 E: enquiries@breglobal.com
MCS is the Certification Mark for Onsite Sustainable Energy Technologies

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# Appendix to Certificate No: MCS PV0183

**Trina Solar Co., Ltd.**

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<th>Description</th>
<th>Reference No.</th>
</tr>
</thead>
<tbody>
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<td>TSM-335DEG14(II) 1998×995×5.5±1.0</td>
<td>Monocrystalline Module</td>
<td>MCS PV0183/1631</td>
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<tr>
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<td>TSM-290PE05H 1675×992×35</td>
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<td>MCS PV0183/1653</td>
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<td>MCS PV0183/1661</td>
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<td>Monocrystalline Module</td>
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The products listed in this certificate and appendix are certified through the agreement between BRE Global Ltd. and TÜV Rheinland Energy GmbH.

Signed for BRE Global Ltd.: Laura Critien  
Date of Issue: 13 December 2018  
Date of First Issue: 04 April 2014

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To check the validity of this certificate please visit [www.greenbooklive.com/check](http://www.greenbooklive.com/check) or contact us.

BRE Global Ltd., Garston, Watford WD25 9XX.  
T: +44 (0)333 321 8811 F: +44 (0)1923 664603 E: enquiries@breglobal.com  
MCS is the Certification Mark for Onsite Sustainable Energy Technologies.
GS-ROOF
TILE ROOF, TIN ROOF AND TILT ROOF SYSTEM

INSTALLATION GUIDE
GS-ROOF SYSTEM
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Thank you for choosing the Fastensol solar panel roof mounting system. Made from custom-designed aluminium extrusions and components, Fastensol's streamlined design and improved frame strength greatly simplify solar panel installation.

Offering a high level of adjustability for module width and depth Fastensol’s versatile design makes it suitable for a wide variety of building types and zones including residential, commercial and remote environments.


⚠️ INSTALLATION OF THIS PRODUCT IS TO BE PERFORMED ONLY BY PROFESSIONALLY TRAINED INSTALLERS.

Any attempt by an unqualified person to install this product could result in death or serious injury.

Part I. SAFETY AND INSTALLER RESPONSIBILITIES

Handling and Installing Fastensol
It is critically important that safety practices are observed when installing

✓ Do not throw or roughly handle any Fastensol components.
✓ Do not bring Fastensol system into contact with sharp or heavy objects.
✓ Do not modify Grace solar components in any way. The exchange of bolts, drilling of holes, bending or any other physical changes not described in standard installation procedure will void the warranty.
✓ It is the installer’s responsibility to verify the integrity of the structure to which Fastensol components is fixed. Roofs or structures with rotten/rusted bearers, undersized bearers, excessively spaced bearers, or any other unsuitable substructure cannot be used with Fastensol components, and installation on such structures will void the warranty, and could result in death or serious injury.

Wind and Climate Design
A Fastensol frame installed in accordance with this installation manual is compliant with AS/NZS 1170.2:2011/Amrdt 2:2012.

This manual (including the drawings) cannot cover all types of buildings and eventualities.

AS/NZS 1170.2:2011/Amrdt 2:2012 provides guidance on determining the wind pressures applicable to your Fastensol install site, taking into account roof shape and geographic location. Sufficient guidance is given in this document, but you may wish to procure a copy of these standards if your company installs Australia/New Zealand wide.

✓ REMEMBER average wind speeds are higher for structures mounted closer to the roof perimeter zone (edge).
✓ Make sure your installation complies with local and national building codes. Take into account relevant design parameters (wind speed, exposure and topographic factor) when determining the loading for the installation.
✓ If alternative fasteners are used to fix the framing to the roof (assuming supplied fasteners are unsuitable for any reason), all screw fasteners must conform to corrosion resistance Class 4 Australian Standard AS3566 and be of equal or greater strength to those supplied with your Fastensol order.
Part II. TOOLS REQUIRED FOR INSTALLATION

✓ T-bar Allen Key or 6 mm hexagonal driver bit
If using a 6 mm driver bit, make sure the cordless power tool used for driving has a hand-tight clutch setting and a fine (soft) impact drive to prevent damage to the fragile glass panels and threads on the SunLock framing.

✓ Cordless drill
Drill or impact driver for driving roof material fixings.

✓ Angle grinder
For terracotta tile roof installation, and angle grinder fitted with a continuous edge diamond tipped tile cutting blade; gloves, hearing protection, a face protection mask, and a suitably rated breathing protection mask for all people in proximity of grinding.

✓ Gloves
Protect the hazard of the sharp corners.

✓ Cord or color pen
Mark the installation position;

✓ Spirit level

✓ Rule
Part III. DESIGNING YOUR FRAMING SYSTEM

Step 1: Determine the wind region of your installation site

Region A:
- Callytharra Springs
- Gascoyne Junction
- Green Head
- Kununurra
- Lord Howe Island
- Morawa
- Toowoomba
- Wittanoom
- Bourke

Region B:
- Adelaide River
- Atherton
- Biloela
- Brisbane
- Christmas Island
- Collinsville
- Corindi
- Geraldton
- Ivanhoe
- Kyogle
- Marble Bar
- Mullewa
- Norfolk Island
- Torres Strait Islands
- Wyndham

Region C:
- Borroloola
- Broome
- Bundaberg
- Burketown
- Cairns
- Cocos Islands
- Darwin
- Derby
- Karumba
- Mackay
- Mareeba
- Millstream
- Moreton

Region D:
- Nhulunbuy
- Normanton
- Rockhampton
- Townsville

Region
- Carnarvon
- Exmouth
- Karratha
- Onslow
- Port Hedland
Step 2: Determine Roof Installation Roof Areas

Solar panels can be installed anywhere on the roof, as long as sufficient fixings are used. Higher wind speeds are encountered at the edges of roofs and therefore more fixings are required in these areas.

For a flush mounted array, a roof can be divided into two zones, the central zone and the end zone. The width of these zones can be determined based on the length of the building.

For a tilted array, a roof can be divided into three zones, the internal zone, intermediate zone and the edge zone. The width of these outer zones can be determined based on the length, width and average height of the building.

If fixings are located in the intermediate, edge or end zones, then the maximum spacing to the next fixing must be reduced, as per the table in the drawings.

**Determining the width of the central and end zones, ‘B/3’**

The width of the central and end zones is determined by calculating the roof length and dividing this result by 3.

An exclusion zone of 200 mm must be made on the edges of the roof.

**Determining the width of the edge and intermediate zones, ‘A’**

The width of the edge and intermediate zones, ‘A’, is determined by calculating each of the following values, and then using the smallest:

\[ \text{\textgreater} 0.2 \times B \quad \text{\textgreater} 0.2 \times D \quad \text{\textgreater} H \]

\[ A = \text{MINIMUM OF} \ 0.2 \times B, \quad 0.2 \times D \quad \text{OR} \ \frac{1}{3} \times H \]

**Determine the height of the of your installation site:**

- This document provides sufficient information for Fastensol system installation height less than 20 meters. If your installation site is more than 20 meters in height, please contact Fastensol to obtain engineering data to support your installation.

**Determine Roof slope:**

- Fastensol’s system can be used for roof slope up to 60 degrees. Please verify the Installation site roof slope should be between 0 degrees and 60 degrees.
**Step 3: Determine the Maximum Rail Support Spacing**

**FASTEN SOLAR FR RAIL 2 FOR PITCHED ROOFS**

### Maximum Fixing Spacing Table

**Tiled Roof With Roof Hook Fixed to Rafter with minimum of 2x12 gauge (5.5 mm minimum diameter, 10 tpi) screws with 50 mm minimum embedment into timber**

<table>
<thead>
<tr>
<th>Height above Ground</th>
<th>Wind Region A</th>
<th>Wind Region B</th>
<th>Wind Region C</th>
<th>Wind Region D</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Remote from Roof Edge</td>
<td>Adjacent to Roof Edge</td>
<td>Remote from Roof Edge</td>
<td>Adjacent to Roof Edge</td>
</tr>
<tr>
<td>5 metres</td>
<td>2,250</td>
<td>1,590</td>
<td>1,480</td>
<td>950</td>
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<tr>
<td></td>
<td>2,015</td>
<td>1,300</td>
<td>1,200</td>
<td>780</td>
</tr>
<tr>
<td></td>
<td>1,820</td>
<td>1,165</td>
<td>1,080</td>
<td>700</td>
</tr>
<tr>
<td></td>
<td>1,700</td>
<td>1,100</td>
<td>1,020</td>
<td>660</td>
</tr>
</tbody>
</table>

*Wind Region to AS Code 1170.2 - 2011*

### Maximum Fixing Spacing Table

**Pitched Metal Roof with "L" Bracket Fixed to Purlin with minimum of 1x12 gauge (5.5 mm minimum diameter, 14 tpi & 10 tpi) screws for fixing to steel & timber respectively**

<table>
<thead>
<tr>
<th>Height above Ground</th>
<th>Wind Region A</th>
<th>Wind Region B</th>
<th>Wind Region C</th>
<th>Wind Region D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Remote from Roof Edge</td>
<td>Adjacent to Roof Edge</td>
<td>Remote from Roof Edge</td>
<td>Adjacent to Roof Edge</td>
</tr>
<tr>
<td>5 metres</td>
<td>2,250</td>
<td>1,530</td>
<td>1,420</td>
<td>915</td>
</tr>
<tr>
<td></td>
<td>1,950</td>
<td>1,240</td>
<td>1,155</td>
<td>750</td>
</tr>
<tr>
<td></td>
<td>1,750</td>
<td>1,120</td>
<td>1,040</td>
<td>675</td>
</tr>
<tr>
<td></td>
<td>1,640</td>
<td>1,050</td>
<td>980</td>
<td>640</td>
</tr>
</tbody>
</table>

*Wind Region to AS Code 1170.2 - 2011*

**FASTEN SOLAR FR RAIL 2 FOR FLAT METAL ROOFS**

### Maximum Fixing Spacing Table

**Fixing at between 10 to 15 degrees**

Fixed to Flat Metal Roof with minimum of 2x12 gauge (5.5 mm minimum diameter, 14 tpi & 10 tpi) screws for fixing to steel & timber respectively Screwed through to 1.2 mm minimum BMT steel or 50 mm minimum embedment into timber

<table>
<thead>
<tr>
<th>Wind Region A</th>
<th>Wind Region B</th>
<th>Wind Region C</th>
<th>Wind Region D</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 metres</td>
<td>1,300</td>
<td>800</td>
<td>500</td>
</tr>
<tr>
<td>10 metres</td>
<td>1,100</td>
<td>650</td>
<td>450</td>
</tr>
<tr>
<td>15 metres</td>
<td>900</td>
<td>600</td>
<td>400</td>
</tr>
<tr>
<td>20 metres</td>
<td>800</td>
<td>550</td>
<td>350</td>
</tr>
</tbody>
</table>

*Wind Region to AS Code 1170.2 - 2011*

### Maximum Fixing Spacing Table

**Fixing at between 10 to 15 degrees**

Fixed to Flat Metal Roof with Klip-Loc Clamp

<table>
<thead>
<tr>
<th>Wind Region A</th>
<th>Wind Region B</th>
<th>Wind Region C</th>
<th>Wind Region D</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 metres</td>
<td>1,300</td>
<td>800</td>
<td>500</td>
</tr>
<tr>
<td>10 metres</td>
<td>1,100</td>
<td>650</td>
<td>450</td>
</tr>
<tr>
<td>15 metres</td>
<td>900</td>
<td>600</td>
<td>400</td>
</tr>
<tr>
<td>20 metres</td>
<td>800</td>
<td>550</td>
<td>350</td>
</tr>
</tbody>
</table>

*Wind Region to AS Code 1170.2 - 2011*
### Maximum Fixing Spacing Table

#### Fixing at between 15 to 30 degrees

Fixed to Flat Metal Roof with minimum of 2x12 gauge (5.5 mm minimum diameter, 14 tpi & 10 tpi) screws for fixing to steel & timber respectively. Screwed through to 1.2 mm minimum BMT steel or 50 mm minimum embedment into timber.

Wind Region to AS Code 1170.2 - 2011

<table>
<thead>
<tr>
<th>Wind Region A</th>
<th>Wind Region B</th>
<th>Wind Region C</th>
<th>Wind Region D</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 metres</td>
<td>650</td>
<td>400</td>
<td>250</td>
</tr>
<tr>
<td>10 metres</td>
<td>550</td>
<td>325</td>
<td>220</td>
</tr>
<tr>
<td>15 metres</td>
<td>500</td>
<td>300</td>
<td>200</td>
</tr>
<tr>
<td>20 metres</td>
<td>450</td>
<td>275</td>
<td>N/S</td>
</tr>
</tbody>
</table>

### Maximum Fixing Spacing Table

#### Fixing at between 15 to 30 degrees

Fixed to Flat Metal Roof with Klip-Loc Clamp.

Wind Region to AS Code 1170.2 - 2011

<table>
<thead>
<tr>
<th>Wind Region A</th>
<th>Wind Region B</th>
<th>Wind Region C</th>
<th>Wind Region D</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 metres</td>
<td>650</td>
<td>400</td>
<td>250</td>
</tr>
<tr>
<td>10 metres</td>
<td>550</td>
<td>325</td>
<td>220</td>
</tr>
<tr>
<td>15 metres</td>
<td>500</td>
<td>300</td>
<td>200</td>
</tr>
<tr>
<td>20 metres</td>
<td>450</td>
<td>275</td>
<td>N/S</td>
</tr>
</tbody>
</table>

### Maximum Fixing Spacing Table

#### Fixing at between 30 to 60 degrees

Fixed to Flat Metal Roof with minimum of 2x12 gauge (5.5 mm minimum diameter, 14 tpi & 10 tpi) screws for fixing to steel & timber respectively. Screwed through to 1.2 mm minimum BMT steel or 50 mm minimum embedment into timber.

Wind Region to AS Code 1170.2 - 2011

<table>
<thead>
<tr>
<th>Wind Region A</th>
<th>Wind Region B</th>
<th>Wind Region C</th>
<th>Wind Region D</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 metres</td>
<td>650</td>
<td>400</td>
<td>250</td>
</tr>
<tr>
<td>10 metres</td>
<td>550</td>
<td>325</td>
<td>220</td>
</tr>
<tr>
<td>15 metres</td>
<td>500</td>
<td>300</td>
<td>200</td>
</tr>
<tr>
<td>20 metres</td>
<td>450</td>
<td>275</td>
<td>N/S</td>
</tr>
</tbody>
</table>

### Maximum Fixing Spacing Table

#### Fixing at between 30 to 60 degrees

Fixed to Flat Metal Roof with Klip-Loc Clamp.

Wind Region to AS Code 1170.2 - 2011

<table>
<thead>
<tr>
<th>Wind Region A</th>
<th>Wind Region B</th>
<th>Wind Region C</th>
<th>Wind Region D</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 metres</td>
<td>650</td>
<td>400</td>
<td>250</td>
</tr>
<tr>
<td>10 metres</td>
<td>550</td>
<td>325</td>
<td>220</td>
</tr>
<tr>
<td>15 metres</td>
<td>500</td>
<td>300</td>
<td>200</td>
</tr>
<tr>
<td>20 metres</td>
<td>450</td>
<td>275</td>
<td>N/S</td>
</tr>
</tbody>
</table>
Part IV. System Overview and Components

[4.1.] Tile roof mounting system

1. **Standard Rail** – Supports PV modules. Use two per row of modules. Aluminum extrusion, anodized.

<table>
<thead>
<tr>
<th>Standard Rail Length</th>
<th>808–826mm wide panels</th>
<th>990–1020mm wide panels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2560mm</td>
<td>4200mm</td>
</tr>
<tr>
<td></td>
<td>3405mm</td>
<td></td>
</tr>
</tbody>
</table>

2. **Rail splice** – Extend Fastensol Rails to any length as required by the quantity or width of the solar panels.

   Tapping screw for Rail splice - st6.3*25 ×4pcs.

3. **Mid Clamp Kit** – Standard pre-assembly for the usual panels with thickness 30, 35, 40, 46, 50, 57mm

4. **End Clamp Kit** – Standard pre-assembly for the usual panels with thickness 30, 35, 40, 46, 50, 57mm

5. **Stainless Steel Tile Hook** - Roof mounts secure the railing to tile roofs.

   **Aluminum Tile Hook** - Roof mounts secure the railing to tile roofs.

6. **Wood screw** - st6.3*80 ×3pcs

7. **Grounding Lug** - To ensure the entire system grounded and safe.

8. **Bonding Jumper** - Electrically connect spliced rails.

9. **Grounding Clip** - Cooperated with mid Clamp to install under the Rail.
[4.2.] Tin roof mounting system

1. **Standard Rail** – Supports PV modules. Use two per row of modules. Aluminum extrusion, anodized.

<table>
<thead>
<tr>
<th>Standard Rail Length</th>
<th>808~826mm wide panels</th>
<th>990~1020mm wide panels</th>
</tr>
</thead>
<tbody>
<tr>
<td>2560mm</td>
<td>4200mm</td>
<td></td>
</tr>
</tbody>
</table>

2. **Rail splice** – Extend Fastensol Rails to any length as required by the quantity or width of the solar panels.


4. **Mid Clamp Kit** – Standard pre-assembly for the usual panels with thickness 30, 35, 40, 46, 50, 57mm

5. **End Clamp Kit** – Standard pre-assembly for the usual panels with thickness 30, 35, 40, 46, 50, 57mm

6. **L-foot** - Roof mounts secure the railing to steel roofs. Each L-foot is supplied with a potable grade EPDM washer to prevent water ingress or galvanic corrosion with the roof material.

7. **Tapping screw for L-foot** - st6.3*80 ×1pc

8. **Grounding Lug** - To ensure the entire system grounded and safe.

9. **Grounding Clip** - Cooperated with mid Clamp to install under the Rail
[4.3.] Tilt roof mounting system

**Standard Rail** – Supports PV modules. Use two per row of modules. Aluminum extrusion, anodized.

<table>
<thead>
<tr>
<th>Standard Rail Length</th>
<th>808–826mm wide panels</th>
<th>990–1020mm wide panels</th>
</tr>
</thead>
<tbody>
<tr>
<td>2560mm</td>
<td>4200mm</td>
<td></td>
</tr>
</tbody>
</table>

**Rail splice** – Extend Fastensol Rails to any length as required by the quantity or width of the solar panels.

**Tapping screw for Rail splice** - M6*25 ×4pcs.

**Mid Clamp Kit** – Standard pre-assembly for the usual panels with thickness 30, 35, 40, 46, 50, 57mm.

**End Clamp Kit** – Standard pre-assembly for the usual panels with thickness 30, 35, 40, 46, 50, 57mm.

**Tilt Front Leg / Tilt Rear Leg** - 10/15°, 15/30° and 30/60° tilt solutions. Each base is supplied with a potable grade EPDM washer to prevent water ingress or galvanic corrosion with the roof material.

**Tapping screw** - M6*80 ×3pcs

**Grounding Lug** - To ensure the entire system grounded and safe.

**Bonding Jumper** - Electrically connect spliced rails.

**Grounding Clip** - Cooperated with mid Clamp to install under the Rail.
[4.4.] Triangle roof mounting system

1. **Standard Rail** – Supports PV modules. Use two per row of modules. Aluminum extrusion, anodized.

2. **Rail splice** – Extend Fastensol Rails to any length as required by the quantity or width of the solar panels.
   - **Tapping screw for Rail splice** - st6.3*25 ×4pcs.

3. **Mid Clamp Kit** – Standard pre-assembly for the usual panels with thickness 30, 35, 40, 46, 50, 57mm.

4. **End Clamp Kit** – Standard pre-assembly for the usual panels with thickness 30, 35, 40, 46, 50, 57mm.

5. **Triangle bracket** – Mount the module tilt a certain angle on a roof. Each Tri-bracket include 2 pcs L connector to connect with rail.
   - **Tapping screw** - st6.3*80 ×2pcs

6. **Grounding Lug** – To ensure the entire system grounded and safe.

7. **Bonding Jumper** – Electrically connect spliced rails.

8. **Grounding Clip** – Cooperated with mid Clamp to install under the Rail.
[4.5.] Klip-loc roof mounting system

1. **Standard Rail** – Supports PV modules. Use two per row of modules. Aluminum extrusion, anodized.

<table>
<thead>
<tr>
<th>Standard Rail / Cable Rail Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>808–826mm wide panels</td>
</tr>
<tr>
<td>990–1020mm wide panels</td>
</tr>
<tr>
<td>2560mm</td>
</tr>
<tr>
<td>3405mm</td>
</tr>
<tr>
<td>4200mm</td>
</tr>
</tbody>
</table>

2. **Rail splice** – Extend Fastensol Rails to any length as required by the quantity or width of the solar panels.

   - **Tapping screw for Rail splice** - st6.3*25 ×4pcs.

3. **Mid Clamp Kit** – Standard pre-assembly for the usual panels with thickness 30, 35, 40, 46, 50, 57mm.

4. **Grounding Clip** – Cooperated with mid Clamp to install under the Rail

5. **End Clamp Kit** – Standard pre-assembly for the usual panels with thickness 30, 35, 40, 46, 50, 57mm.

6. **L-foot / Tilt Front Leg &Tilt Rear Leg** - Fixed with the clamps. (no need the EPDM washer and tapping screw).

7. **Grounding Lug** - To ensure the entire system grounded and safe.

8. **Bonding Jumper** - Electrically connect spliced rails.

9. **klamp Lock 406** - For klip-Lok 406;
   **klamp Lock 700** - For klip-Lok 700\Speed Deck Ultra
   KingKlip 700;

10. **Sand seam Clamp** - For Butler roof.
**Part IV. Installation**

[5.1.] Installing tile roof mounting system

**Step 1: Designing the module field**

According to the specification of modules, calculate the length of rails, distance and span between two hooks. Details and drawings is as below:

1. Height of the module field: module height x number of modules vertically
2. Width of the module field: number of modules horizontally x (width of the module + 18 mm)+32 mm
3. Distance between roof connections vertically (according to the clamping points pre-defined by the module producer): Quarter-points of the modules, about 1/2 of module height.
4. Distance between roof connections horizontally: Depending on the distance between rafters and on the static requirements (please see the Part III on page 6).
5. Distance between modules: 17 mm

When positioning the modules, please take into consideration
- That the values above are
- That dimensions of tiles or other roof covering and the position of the rafters define the precise actual horizontal distance between roof connections
- That the distance between roof laths defines the precise actual vertical distance between roof connections.
Part IV. Installation

[5.1.] Installing tile roof mounting system

Step 2: Installing tile bracket
Remove the roof tiles at the marked positions or simply lift them up slightly. Input the roof hook to the wooden beam. Fix the roof hooks with 3pcs wood screws (st6.3x80).

Note: Minimum 2 pcs wooden screws

Cover the hooks by the removed tile

If necessary, use an angle grinder or hammer to cut a concavity in the tile that covers the roof hook at the point where the roof hook comes through. (Caution! Must not use fixed roof hook as a ladder, as this extreme point load could damage the tile below.

⚠️ To minimize risk of injury, exercise caution when operating tile cutting tool, and follow tool manufacturer’s safety instructions. Failure to follow appropriate safety procedures could result in severe lacerations of dismemberment.
Step 2: Installing the rail
Fix the rail to tile hook by inserting the Tbolt into the rail channel, and then fasten the flange nut. The rail can be adjusted vertically within the roof attachment slot when bolts are loosely fastened.

Installation of the splice to connect multiple rails together. Slide the splices on the rear side of the pre-assembled rails halfway to the side. Fasten the first M8 bolt firmly using the Allen key. Now slide the next rail segment into the splice. Tighten the second M8 bolt. The connection is finished.

Step 3. Installing the End Clamp
Insert Tbolt of the end clamp into the rail channel. Using a 10 mm hex driver, secure the first solar panel to the railing starting as close to the end of the row as possible. A minimum of 50 mm between the end of the rail and edge of the first solar panel is required (recommended torque is 15-20Nm).

Step 4. Installing the Mid Clamp
Insert the T-clip of the mid clamp into the rail channel and position the clamp against the first panel frame. Hand-tighten the screw 2-3 turns to loosely hold the clamp in position. Ensure the EarthLock washer is placed between the rail and the frame of the panel (pls refer to the chapter [5.6.] if you have any questions about the grounding installation).

Step 5. Finish installing all the panels
Repeat doing last step till finish installing all the panels. Check the whole system and re-fix all outer screws after finish installing the panels.
[5.2.] Installing tin roof mounting system

**Step 1: Installing L foot**
Fasten the first L foot with the purlin using 1 pc st6.3 x 80 tapping screw; fix other L foot to the rafter according to your plans. (Note: The EPDM rubber pad play the role of waterproof).

Fix the last L foot and then wire those two feet. Please make sure the two L feet are in the same height. Repeat the above solutions, Make sure all L feet are in a straight line and in the same height.

**Step 2: Installing the Rail**
Connect the rail to L foot by inserting the T-clip into the rail channel. Make sure the ridged rail surface faces the ridged surface of L foot. Fasten the cap screw on the keylock 2-3 turns to loosely hold the rail in position. The rail can be adjusted vertically within the roof attachment slot when bolts are loosely fastened.

**Step 3. Installing the End Clamp**
Insert T-clip of the end clamp into the rail channel. Using a 6 mm hex driver/Allen key, secure the first solar panel to the railing starting as close to the end of the row as possible. A minimum of 50 mm between the end of the rail and edge of the first solar panel is required (recommended torque is 15-20Nm).

**Step 4. Installing the Mid Clamp**
Insert the T-clip of the mid clamp into the rail channel and position the clamp against the first panel frame. Hand-tighten the screw 2-3 turns to loosely hold the clamp in position. Ensure the EarthLock washer is placed between the Fastensol rail and the frame of the panel (pls refer to the chapter [5.6.] if you have any questions about the grounding installation).

**Step 5. Finish installing all the panels**
Repeat doing last step till finish installing all the panels. Check the whole system and re-fix all outer screws after finish installing the panels.
[5.3.] Installing tilt roof mounting system (adjustable)

Step 1: Designing the module field

According to the specification of modules, calculate the length of rails, distance and span between two support leg. Details and drawings is as below:

1. Width of the module
2. Length of Rail: number of modules horizontally x (width of the module + 18 mm) + 32 mm
3. Distance between roof connections horizontally: Depending on the distance between rafters and on the static requirement.
4. Cantilever Length: less than half of dimension 3
5. Distance between modules: 17 mm
6. Length of the module
7. Length of support: similar with the dimension 8
8. Front and Rear Space: 1200~1400 mm
**Step 2: Installing the Front Leg**
Determine the position of the front leg according to your plans. Shim the front leg with rubber. Fix the front leg to the rafter using 2pcs st6.3”80 tapping screws.

![Front Leg Kit](image1)

**Step 3: Installing the Rear Leg**
Determine the position of the rear leg according to your plans. Shim the rear leg with rubber. Fix the rear leg to the rafter using 2pcs st6.3”80 tapping screws.

![Rear Leg Kit](image2)

Finish the remaining of the front leg and rear leg to the rafters according to your plans. Please make sure the legs are in one line.

![Legs Alignment](image3)

Loosen the 2 Hex screws in the rear leg and adjust the length of rear legs as per demanding angle (recommended torque is 15-20Nm).

![Hex Bolt](image4)
Step 4: Installing the rail
Connect the rail to rail clamp of the front leg and rear leg by inserting the T bolt into the rail channel (recommended torque is 15-20Nm).

Installation of the splice to connect multiple rails together. Slide the splices on the rear side of the pre-assembled rails halfway to the side. Fasten the first M8 bolt firmly using the Allen key. Now slide the next rail segment into the splice. Tighten the second M8 bolt. The connection is finished.

Step 5. Installing the End Clamp
Insert T bolt of the end clamp into the rail channel. Using a 6 mm hex driver/Allen key, secure the first solar panel to the railing starting as close to the end of the row as possible. A minimum of 50 mm between the end of the rail and edge of the first solar panel is required (recommended torque is 15-20Nm).

Step 6. Installing the Mid Clamp
Insert the T bolt of the mid clamp into the rail channel and position the clamp against the first panel frame. Hand-tighten the screw 2-3 turns to loosely hold the clamp in position. Ensure the grounding clip is placed between the Fastensol rail and the frame of the panel (pls refer to the chapter [5.6.] if you have any questions about the grounding installation).

Step 7. Finish installing all the panels
Repeat doing last step till finish installing all the panels. Check the whole system and re-fix all outer screws after finish installing the panels.
[5.4.] Installing tilt roof mounting system (fixed)

**Step 1: Designing the module field**

According to the specification of modules, calculate the length of rails, distance and span between two triangle brackets. Details and drawings is as below:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Rail Length = (Module width B +18)*Module Qty + 32 mm</td>
</tr>
<tr>
<td>B</td>
<td>Module Width</td>
</tr>
<tr>
<td>C</td>
<td>Cantilever Length &lt;= Span D / 2</td>
</tr>
<tr>
<td>D</td>
<td>Triangle Bracket Span</td>
</tr>
<tr>
<td>E</td>
<td>Module Length</td>
</tr>
<tr>
<td>F</td>
<td>Foundation Bolts Spacing, Please look the 2.6 to plan</td>
</tr>
</tbody>
</table>
Step 2. Installing the triangle bracket
Fix the tri-bracket to the rafter using 2 pcs 6.3*80mm tapping screws.

Fix the tri-bracket to the rafter using 2 pcs hanger bolt.

Step 3. Installing the Rail
Connect the rail to L connector of the tri-bracket by inserting the T-clip into the rail channel (recommended torque is 15-20Nm).
Installation of the splice to connect multiple rails together. Slide the splices on the rear side of the pre-assembled rails halfway to the side. Fasten the first M8 bolt firmly using the Allen key. Now slide the next rail segment into the splice. Tighten the second M8 bolt. The connection is finished.

**Step 4. Installing the End Clamp**

Insert T-clip of the end clamp into the rail channel. Using a 6 mm hex driver/Allen key, secure the first solar panel to the railing starting as close to the end of the row as possible. A minimum of 50 mm between the end of the rail and edge of the first solar panel is required *(recommended torque is 15-20Nm)*.

**Step 5. Installing the Mid Clamp**

Insert the T-clip of the mid clamp into the rail channel and position the clamp against the first panel frame. Hand-tighten the screw 2-3 turns to loosely hold the clamp in position. Ensure the EarthLock washer is placed between the Fastensol rail and the frame of the panel *(pls refer to the chapter [5.6.] if you have any questions about the grounding installation)*.

**Step 6. Finish installing all the panels**

Repeat doing last step till finish installing all the panels. Check the whole system and re-fix all outer screws after finish installing the panels.
[5.5.] Installing Klip-loc roof mounting system

**Step 1. Determine the type of concealed roof**

The best way to identify the type of concealed roof installed is to check the label normally located underneath the roofing sheet. Otherwise, you can contact the builder or check the building plan to find out the exact type of the roofing sheet.

⚠️ THE USE OF THE KLIP-LOC TYPE BRACKET IS NOT ACCREDITED ON ANY OTHER ROOF TYPES THAN THE FOUR LISTED BELOW.

**Step 2. Installing the stand seam roof clamp**

*Installing the Klamp 406*
Installing the Klamp 700

Step 3. Installing the End Camp

Step 4. Installing the Mid Camp

Step 5. Finish installing all the panels
Repeat doing last step till finish installing all the panels. Check the whole system and re-fix all outer screws after finish installing the panels.

Also, you could connect the tilt front leg and rear leg with the klip-lok roof clamps (pls refer to the chapter of the [5.3.] Installing tilt roof mounting system(adjustable).
[5.6.] Grounding

Connect system to equipment ground conductor

Grounding Lug

Grounding Washer

Ribs will penetrate module and rail anodization and create grounding path through rail

Use Grounding Clip to bond module to Rail

[5.7.] Installing Isolator Bracket

Isolator Bracket

T bolt

PV Isolator

Rail
WARRANTY

12 year limited Product Warranty, 5 year limited Finish Warranty

Fastensol co. Ltd warrants to the original purchaser (“Purchaser”) of product(s) that it manufactures (“Product”) at the original installation site that the Product shall be free from defects in material and workmanship for a period of ten (10) years, except for the anodised finish, which finish shall be free from visible peeling, or cracking or chalking under normal atmospheric conditions for a period of five (5) years, from the earlier of 1) the date the installation of the Product is completed, or 2) 30 days after the purchase of the Product by the original Purchaser (“Finish Warranty”).

The Finish Warranty does not apply to any foreign residue deposited on the finish. All installations in corrosive atmospheric conditions are excluded. The Finish Warranty is VOID if the practices specified by AAMA 609 & 610-02 – “Cleaning and Maintenance for Architecturally Finished Aluminum” (www.aamanet.org) are not followed by Purchaser. This Warranty does not cover damage to the Product that occurs during its shipment, storage, or installation.

This Warranty shall be VOID if installation of the Product is not performed in accordance with Fastensol’s written installation instructions, or if the Product has been modified, repaired, or reworked in a manner not previously authorized by Fastensol IN WRITING, or if the Product is installed in an environment for which it was not designed. Fastensol shall not be liable for consequential, contingent or incidental damages arising out of the use of the Product by Purchaser under any circumstances.

If within the specified Warranty periods the Product shall be reasonably proven to be defective, then Fastensol shall repair or replace the defective Product, or any part thereof, in Fastensol’s sole discretion. Such repair or replacement shall completely satisfy and discharge all of Fastensol’s liability with respect to this limited Warranty. Under no circumstances shall Fastensol be liable for special, indirect or consequential damages arising out of or related to use by Purchaser of the Product.

Manufacturers of related items, such as PV modules and flashings, may provide written warranties of their own. Fastensol’s limited Warranty covers only its Product, and not any related items.
CONSUMER GUARANTEES

In addition to our Warranty against Defects, the Frame also comes with guarantees that cannot be excluded under the Australian Consumer Law (Consumer Guarantees).

In the event that the Frame fails to satisfy a Consumer Guarantee, you are entitled to a replacement or refund for a major failure and compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the Frame repaired or replaced if the Frame fails to be of acceptable quality and the failure does not amount to a major failure.

Please note that in addition to the rights and remedies set out in this document, you may also have other rights and remedies available to you under the law.

CONTACT DETAILS

Xiamen Fasten Solar Technology Co., Ltd
Address: Room4B, No.16 Xiangxing 3 Road, Huli Bonded District, Huli District, Xiamen, China 361006
Sales and Service: 0086-592-5685378
Fax: 0086-592-5215070
Email: info@fastensolar.com
MAINTENANCE AND CLEANING

6005-T5 aluminium is largely maintenance free. Only in highly polluted or marine conditions is rinsing with clean water required, during scheduled panel cleaning.

REFERENCES

AS/NZS 1170.2:2011/Amdt 2:2012 on wind actions
AS/NZS16641.1:1997 on aluminium structures
AS1720.1:2012 on timber structures AS/
NZS4600:2005 on cold-formed steel structures
AS3566-2011, self-drilling screws for the building and construction industries.
Xiamen Fasten Solar Technology Co., Ltd  
31 Xiangxing 1st Road  
Huli District 361006 Xiamen  
China

Dear Sirs

FASTEN SOLAR T RAIL 2 FOR PITCHED ROOFS

As requested we have calculated the Maximum Fixing Spacing’s for Fasten Solar Rail 2 as outlined in the attached Tables.

The tables have been calculated for Australian conditions based on the following criteria:-

- Wind Loads are in accordance with AS Code 1170.2:2011.
- Wind average recurrence interval of 500 years.
- Wind Terrain Category 2.
- Shielding and topographic multipliers, Ms and Mt taken as unity.
- Racks mounted on roofs of enclosed buildings of nominal rectangular shape.
- Roof slopes from 0 degrees up to 45 degrees from horizontal.
- Maximum solar panel length of 2.00 metres.
- Maximum solar panel width of 1.20 metres.
- Minimum of 2 rails per panel.
- Maximum panel weight of 15 kilograms per square metre.
- Roof structure to be checked and certified as suitable for applied rack loads prior to installation.
- Solar panels to be certified by Manufacturer as able to resist wind loads in accordance with AS Code 1170.2:2011.

I certify that that installations in accordance with these attached Tables will be structurally sufficient for Australian conditions provided the above conditions are adhered to.

Yours faithfully,

Don Moore  
FIE Aust. FiStructE. CPEng. NER.  
Registered Building Practitioner No. EC-1106
30 May, 2016

Reference 2169.15

Xiamen Fasten Solar Technology Co., Ltd
31 Xiangxing 1st Road
Huli District 361006 Xiamen
China

Dear Sirs

FASTEN SOLAR T RAIL 2 FOR FLAT METAL ROOFS

As requested we have calculated the Maximum Fixing Spacing’s for Fasten Solar Rail 2 as outlined in the attached Tables.

The tables have been calculated for Australian conditions based on the following criteria:-

- Wind Loads are in accordance with AS Code 1170.2:2011.
- Wind average recurrence interval of 500 years.
- Wind Terrain Category 2.
- Shielding and topographic multipliers, Ms and Mt taken as unity.
- Racks mounted on roofs of enclosed buildings of nominal rectangular shape.
- Roof slopes from 0 degrees up to 45 degrees from horizontal.
- Maximum solar panel length of 2.00 metres.
- Maximum solar panel width of 1.20 metres.
- Minimum of 2 rails per panel.
- Maximum panel weight of 15 kilograms per square metre.
- Roof structure to be checked and certified as suitable for applied rack loads prior to installation.
- Solar panels to be certified by Manufacturer as able to resist wind loads in accordance with AS Code 1170.2:2011.

I certify that that installations in accordance with these attached Tables will be structurally sufficient for Australian conditions provided the above conditions are adhered to.

Yours faithfully,

Don Moore
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