Required tools and fixings

- Electric drill (non-impact setting)
- T-25 Torq bit (wedge type)
- Pozi head drill bit
- Tape measure
- Pencil/pen
- Hammer
- Tin snips
- Angle grinder (to cut tiles down to the correct size)
- Roofing Nails
- No.4 x 70mm Screws (Zinc Coated)
General health and safety

The Construction (Design and Management) Regulations 2015* and general construction site training must be followed.

Safe working at heights training must be adhered to.

Anybody handling photovoltaic (PV) modules should be trained in correct manual handling practice.

All appropriate health and safety regulations should be followed correctly.

Avoid installing the system in poor weather conditions, including strong wind, rain, ice or snow.

Tile courses should be laid in accordance with BS 5534:2014* unless told otherwise.

All components as specified in this manual must be used and instructions followed fully to ensure a safe and weather tight installation.

Product has been designed to meet the requirements of the UK Building Regulations. Installation must also meet UK Building Regulation requirements.

Artificially concentrated sunlight shall not be directed on the module or panel.

*latest at time of print
Electrical hazards

WARNING: PV modules produce a DC voltage whenever exposed to light. This voltage cannot be switched off. PV modules are pre-wired with touch proof connectors to prevent an electric shock during general handling.

WARNING: Care must be taken not to cut or damage cable insulation or expose bare wire.

Each Sunstation module is factory fitted with three bypass diodes. Please see the product data-sheet for specifications. No additional bypass diodes are necessary. Removal or replacement of any diode without written authority of Solarcentury will invalidate the Solarcentury product warranty. Whenever necessary to comply with local codes, use a listed fuse or circuit breaker, rated for the maximum series fuse rating of the module and system voltage.

Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. Accordingly, the values of ISC and VOC marked on this module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor current ratings, fuse sizes, and size of controls connected to the PV output.

All work must be carried out with the Sunstation system disconnected from the mains electrical supply.

Please see appendix for grounding guidelines. Any grounding connections made must be in accordance with the requirements in BS EN 61557-2:2007

Electrical installations should be designed and installed in accordance with BS 7671:2008 incorporating Amendment No 1:2011*. *Latest at time of print.
Installation limitations

Sunstation has been designed to integrate with a variety of roof and tile types. However depending upon the age, type and location of the roof some strengthening work may be necessary; i.e. changing or adding extra battens. The following are minimum recommendations for the roof construction:

- Residential buildings with a truss rafter roof
- Duo pitch or hip roof construction
- A roof pitch between 25° and 55°
- For integration with profiled or flat single lapped tiles
- Additionally information of roof coverings types are specified in the datasheet available at:
  www.gosunstation.com
- Rafter gauge must be no more than 600mm
- Batten gauge must no more than 330mm*
- Battens must meet the requirements of BS 5534:2014** or BS 5534:2004**
- Battens must be 50x25mm in size
- Battens, rafters, and the general state of the roof must be in good condition and not subject to rot or other degradation

* Details of any additional battening that may be required to strengthen the roof can be found at the Sunstation configurator available at www.gosunstation.com

**Sunstation must be installed using battens that are graded to BS 5534. In some cases this may require replacing the battens where the modules are to be mounted.

For roof constructions that fall outside the above limitations then please contact Solarcentury for installation requirements.
Environmental limitations

Sunstation is intended for use in terrestrial applications only.

Modules must not be installed where they could be submerged in water

The recommended ambient temperature should be within -20°C (-4°F) to 46°C (115°F). The temperature limits are defined as the monthly average high and low of the installation site. The limit operating temperature should be -40°C (-40°F) to 85°C (185°F).

Ensure modules are not subject to wind or snow loads exceeding the maximum permissible loads.

The modules should be installed in a location where there is no shading throughout the year. Ensure there are no obstacles to block light near the installation site.

Modules should not be installed in a location that is within 50m of the sea.

Lightning protection is recommended for PV systems that are to be installed in locations with high probability of lightning strikes.

Do not use modules near equipment or in locations where flammable gasses may be generated or collected.

Modules must not be installed nor operated in areas where hail, snow, sand, dust, air pollution, soot, etc., are excessive. Modules must not be sited in locations where aggressive substances such as salt, salt mist, salt-water, chemically active vapours, acid rain, any other type of corrosive agent, could affect the safety and/or performance of the module.

Please adopt appropriate measures to ensure the performance and safety of the modules when they are installed in extreme conditions.
Installation considerations

The system should not be installed within 2 tile widths and 2 tile heights from the edge of the roof.

Do NOT walk on the surface of the module.

Ensure no cable ends are left exposed to the weather during work breaks or after completion of works. Units must be kept in a weatherproof environment before installation.

Do not leave tools or unsecured materials above the module installation area, to avoid potential damage to the units.

Only load as many modules onto the roof as you expect to install during the installation time you have available.

Modules should be handled carefully to avoid any damage before installation.

Ensure all cable connectors are dry and free of dirt before making connections.
WARNING: PV modules produce a DC voltage whenever exposed to light. This voltage cannot be switched off. PV modules are pre-wired with touch proof connectors to prevent an electric shock during general handling.

Wiring considerations

Sunstation PV panels should be connected in series in strings. Strings can be connected horizontally or vertically.
Beware of partial shading

Position your array to reduce partial shading. When arrays are connected in strings if one panel is under shading this will effect the efficiency of the whole array.

WARNING
Cables must not be trapped between panels and battens
Pre installation check list

Before you go on to the roof, check that:

- **Roof tiles are compatible with sunstation**
  For the up to date list of compatible tiles see the Sunstation datasheet, available at: www.gosunstation.com

- **Roof can accommodate array**
  (see page ‘iii’)

- **Accessories box contains the correct number of parts**
  (see your configurator bill of materials)

- **Modules are undamaged, check surface and cables**

- **Roof is facing south**
  (between east & west)

- **You have all the required tools ready**
  (see inside cover)

- **You have read and understood this guide fully**
Positioning the array

Find the ‘A’ size of your array in the table below

‘A’ dimensions show the visible area of the array once tiles are re-laid. This is marked with a dashed red line:

A width
(for example 327cm)

Number of columns | A width of array
--- | ---
2 | 223cm
3 | 327cm
4 | 431cm
5 | 536cm
6 | 640cm
7 | 744cm
8 | 849cm

**Width of array**

Number of rows | A height of array
--- | ---
1 | 180-200cm
2 | 360-380cm
3 | 530-550cm
4 | 720-740cm

**Height of array**
Measure the size of the roof

Decide on the approximate position of the array, considering shading and minimum tile restrictions:

There must be a minimum of 2 complete tiles in all directions surrounding the array
Positioning the array

The complete ‘B’ size of the array is shown below:

235mm (from min A height)

A width

146mm

Flexible flashing

146mm

250mm

‘B’ dimensions are marked with a dotted green line
All tiles within the B area must be removed for installation. Additional tiles may need to be removed to install the flexible flashing.

Ensure there are no clashes with flumes or other components on the roof within this area.
Finalise position

Remove the tiles from the bottom right hand corner of the array and mark the ‘A’ line on a batten.

Desired position (for example centre of roof)

Remove corner tile to reveal batten

Detail on sheet 7
Shift position to reduce tile cutting

Consider tile cutting when positioning the array. You may want to align the ‘A’ line with a full tile (excluding interlock) on one side to reduce cutting or shift the array to have equal cutting on both sides.

Detail from page 6

Array shifted to reduce tile cutting

Check both sides of the array and mark final A line on batten
Remove tiles and reinforce battens

Remove all tiles within the ‘B’ area. Ensure there are no clashes with flumes or other components on the roof within this area.

Additional tiles may need to be removed as battens must be screwed to one rafter beyond the array.
Reinforce battens

All battens within the B area must be screwed to every rafter within

Battens

Recommended Screw Min No.4 x 70mm Zinc - Coated

Battens must be reinforced on both sides when they meet on a rafter. Screw using a skew screwing technique.
Batten requirements

Measure batten spacing. If batten spacing is less than 330mm skip to page 11

If batten spacing is greater than 330mm add an additional batten above every batten:
Build up support for flexible flashing

‘A’ line

250mm

Approx 420mm

Bottom edge of tile below
Build up a support structure for the flexible flashing using battens or feather board.

Keep the angled section as shallow as possible but at a minimum of 5° from horizontal to stop water pooling.

Tip
Featherboard or battens can be used.
Lay flexible flashing

Use self-adhesive back to attach to tiles

Fold over top edge for extra water barrier

Keep nails within the top 30mm when securing flashing to built up support
Lay flexible flashing

Fold over top and side 20mm (min) for extra water barrier
Nail to top of support
Use self adhesive back adhere to tiles

Tip
Ensure flashing taught and fold over top edge for extra water proofing
Position starter rail

Position starter rail using template, see below:

Detail on page 16

WARNING - Position is critical this determines the position of the array, ensure a minimum overlap of 150mm is achieved
If any point touches the flexible flashing or tiles below shift starter rail up

Align line with end of starter rail

Ensure there are no clashes

Die cut removed area
Die cut removed area

Place edge of starter rail here

47mm Line up with marked ‘A’ line, see page 8

Template can be used to position starter rail
Screw bottom of starter rail to batten

37mm
See template

Use 1x Screw A and batten buddy
Position Starter Rail

A line / tile cut line (see page 7)
Square the starter rail

**Tip**
Square to the bottom row of tiles using the 3,4,5 rule
Batten buddies

Every time screw A is used a batten buddy must also be used. Choose 5 equally spaced battens with one at the top and one at the bottom.
Screws over rafters

If the screw is over a rafter and a batten buddy cannot be used, use screw B. Screw used to reinforce batten must be removed first.
Screw starter rail to battens and mark position

Screw to 5 battens using screw A and batten buddies

Mark position of starter rails on battens
Prepare first right perimeter

To avoid the perimeter from damaging the flexible flashing, the end needs to be folded at an angle.

1. Use tin snips to cut along 70mm perforated section
2. Fold bottom section up
3. Fold side section back

70mm
Fit right perimeter and fix using perimeter clips.

Align top of perimeter like this.

3 perimeter clips must be used, one at the top, one at the bottom and one in the middle of the perimeter.
If possible, position foam in the highest point on the tile.
Replace tiles

Replace tiles over perimeter, lip on perimeter may need to be flattened by hand to stop tiles kicking up. Remove interlock from tiles.

WARNING
Tiles must be replaced in accordance with BS 5534:2014
Check panel cables

WARNING
Panels are live, they cannot be switched off

Panel must be returned if cables are damaged

Electrical installation must be in accordance with the national regulations of the country where the installation shall be installed.
Fit panel

Ensure panel is fully engaged

Align bottom of panel with bottom of perimeter

Use float to square panel to bottom row of tiles
Screw panel to all battens

Screw to 5 battens using screw A and batten buddies.

Tip
Move the cables to one side so they can be accessed easily

WARNING - Panel must be screwed to at least 5 battens. If battens are spaced more than 330mm apart additional battens must be added (see page 10)
Fit corner, slide into right perimeter

If array is only 1 row tall skip to page 37
Fit next starter rail

Screw to 5 battens using screw A and batten buddies. Screw through drill line.

WARNING - Panel must be screwed to at least 5 battens. If battens are spaced more than 330mm apart additional battens must be added (see page 10)
Fit next right perimeter

Perimeter clips (x3) using screw C

3 perimeter clips must be used, top, middle and bottom.
Fit foam

Double up foam over corner
Replace tiles

WARNING
Tiles must be replaced in accordance with BS 5534:2014
Fit panel, consider wiring to previous panel

There is 10mm of adjustment within the joint. Use this ‘float’ to square panel.

Tip
Move the cables to one side so they can be accessed easily
Screw to battens using Screw A and batten buddies. Screw through drill line.

**WARNING** - Panel must be screwed to at least 5 battens. If battens are spaced more than 330mm apart additional battens must be added (see page 10)
If array is more than 2 rows tall repeat steps 28 - 34 to top of column.

Fit next corner (see 28)

Fit next starter rail using screw A and batten buddies (see 29)
Fit next right perimeter (see 28)

Fit foam and replace tiles (see 29)

Fit next panel (see 30 and 31)
Screw batten for top perimeter

Top edge of panel

Batten must start and finish on a rafter

Use existing batten if possible

180mm
Fit last right corner and slide into right perimeter

WARNING
Tiles must be replaced in accordance with BS 5534:2014
Fit foam and replace tiles on right side

WARNING
Tiles must be replaced in accordance with BS 5534:2014
Fit top perimeter

Ensure it fully engages with a Click!

Align vertically with PV panel. If needed, use 3x wedges to level tiles.

Top perimeter
Panel
Batten
Rafter
WARNING
Screws must not pierce membrane

Screw top perimeter to batten using guide holes

If not using a wedge use ‘Screw C’

If using a wedge use ‘Screw C’

25mm

35mm
Fit foam over top perimeter
Apply foam and tile over top perimeter

Don’t tile over left most screw hole on top perimeter

WARNING - Tiles must be replaced in accordance with BS 5534:2014, ensure tile overlap is between a minimum of 165mm and a maximum of 250mm
Fit first panel on next column, consider wiring and screw to 5 battens

Ensure panel is fully engaged and aligned with adjacent panel, use float to square panel
Screw to 5 battens using screw A and batten buddies.

![WARNING - Panel must be screwed to at least 5 battens. If battens are spaced more than 330mm apart additional battens must be added (see page 10)]
Fit soak tray

IF array is only 1 row tall skip to page 50

Slide soak tray under previous panel and align centrally with notch

Ensure it fully engages with a Click!
Fully secure previous panel

Screw previous panel to final batten using screw ‘A’ and batten buddy. Screw through the soak tray if necessary.
If array is more than 2 rows, continue up column

Fit next panel, wire to previous

Screw panel to battens using screw ‘A’ and batten buddies

Do not screw to bottom batten until installing panel on next column
Slide soak tray into position centrally align and Click!

Screw previous panel to final batten using screw ‘A’ and batten buddy

If array is more than 3 rows repeat steps 47 and 48
Fit top panel & screw to battens

Fit next panel, wire to previous

Screw panel to battens using screw ‘A’

Do not yet screw to bottom batten
Add extra batten if needed

**WARNING**
Batten must start and finish on a rafter

see page 37 for more details
Slide in soak tray

Slide soak tray under previous panel and align centrally with notch

Ensure it fully engages with a Click!
Fit top perimeter and screw to batten

see pages 40 to 42 for more details
Fit foam and tile over top perimeter.

Repeat steps 44 to 53, stop before installing the first panel on the last column.

WARNING
Tiles must be replaced in accordance with BS 5534:2014.
To avoid the perimeter from damaging the flexible flashing, the end needs to be folded at an angle.

1. Use tin snips to cut along 70mm perforated section

2. Fold bottom section up

3. Fold side section back

End
Fit next panel

Screw to 5 battens using screw A and batten buddies.

Consider cabling when fitting panels

WARNING - Panel must be screwed to at least 5 battens. If battens are spaced more than 330mm apart additional battens must be added (see page 10)
Fit soak tray and screw previous panel

Click!
Screw previous panel to final batten using screw A and batten
Perimeter clips (x3) using screw B

3 perimeter clips must be used, top, middle and bottom.
Fit left corner, foam and replace tiles

WARNING
Tiles must be replaced in accordance with BS 5534:2014

Bend lip and cut tiles if required
For arrays 2 or more rows tall continue up column

Fit next panel, screw to 5 battens using batten buddies and screw A see page 55 for more details

Fit next soak tray see page 56 for more details
If array is more than 2 rows repeat steps 59 and 60.

Fit next left perimeter using 3 evenly spaced perimeter clips. See page 57 for more details.

Fit left corner, foam and replace tiles. See page 58 for more details.
Fit final corner

Add top batten if necessary
Fit final top perimeter and screw to batten
Fit foam and replace any remaining tiles to complete array.
Earth bonding

To comply with building regulations and the requirements of IET BS 7671:2008 Sunstation modules may be required to be bonded or earthed. The recommendations in IET Guidance note 8 should be followed to determine if bonding or grounding of the system is required.

If bonding or grounding is necessary then terminals should be attached in the locations shown below:
Attaching terminals to the module outside of the areas shown may reduce weather tightness of the system. Grounding connectors should be studs or bolts with a suitable clamping arrangement of the correct size for the grounding cable being used. A hole should be drilled through the section of the frame shown slightly larger than the bolt or stud to be fitted. Toothed washers must be used on one side of the joint to ensure a good electrical contact is made through the anodised surface.

The head of the connector should not be deeper than 12mm as this may interfere with installation.

Connectors must be tightened in accordance with the supplier’s recommendations to ensure a permanent electrical joint is maintained for the lifetime of the product.

Any grounding connections made must be in accordance with the requirements in BS EN 61557-2:2007
Screw guide

Screw ‘A’
(must be used with batten buddy)

Included washer must be used with screws A and B

Screw ‘B’

Screw ‘C’

25mm

Screw ‘D’

35mm