

BauderSOLAR Installation Guide



BauderSOLAR Flat Roof Systems Installation Guide

This guide describes the correct installation of the BauderSOLAR F and BauderSOLAR F XL photovoltaic mounting systems for flat roofs.

Prerequisites

- 1. This guide **MUST** be read in conjunction with the specification to confirm the products used and layout of the scheme.
- 2. The project specific PV array design scheme **MUST** be to hand and followed on site to ensure correct design layout is achieved.
- **3.** Section one of this guide **MUST** be read and fully understood before the installation works commence.

Conditions

The Bauder guarantee may not be issued if:

- **1.** The waterproofing fails to meet inspection standards.
- 2. Any component is incorrectly installed.

The BauderSOLAR system should always be installed and maintained as outlined in these installation guidelines.

Disclaimer

For any damage caused by improper use, faulty planning, installation by operatives without sufficient training, or use for unintended purposes, no warranty, product guarantee or liability is accepted by the manufacturer.

Standards & regulations

Our products are built in accordance with applicable standards and technical regulations and therefore correspond to all relevant technical standards. This applies to both material selection and structural design.

For the use of this product, all locally applicable standards, current legal requirements, building regulations, and applicable accident prevention regulations must be observed.

The formal and technical requirements of the relevant district network operator are also to be observed for the connection and operation of photovoltaic systems.



Technical Support

If you require support or advice on the PV scheme, or products within the specification please contact:

Tom Raftery PV Product Manager	+44 (0)7788 311602
Technical Department	+44 (0)1473 257671
	technical@bauder.co.uk

- BS EN 62446 Grid Connected Photovoltaics
- BS EN 61853-1 Defining Solar Photovoltaic Power
- BS EN 1991-1-4 Wind Actions on Structures
- I.E.T standards

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1.1 Scope of use

The BauderSOLAR flat roof systems are designed for the construction of solar photovoltaic arrays on Bauder flat roofs with bitumen or single-ply roof membranes.

The BauderSOLAR mounting unit is installed using a membrane sleeve that is welded to the roof membrane. Sprung module clamps with locking pins then secure the photovoltaic modules to the mounting units.

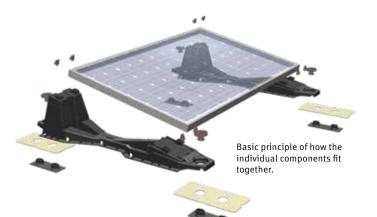
BauderSOLAR can be installed in both a southfacing and east-west array as defined in the project specification.

1.2 Using this instruction manual

Read this manual thoroughly before commencing any installation, operation or maintenance. Failure to do so can result in personal injuries, damage to property, or impairment to operational safety. Keep this guide in a safe place for the entire lifespan of the product and give to the end user. Bauder reserves the right to make changes to the installation of the system without prior notice.

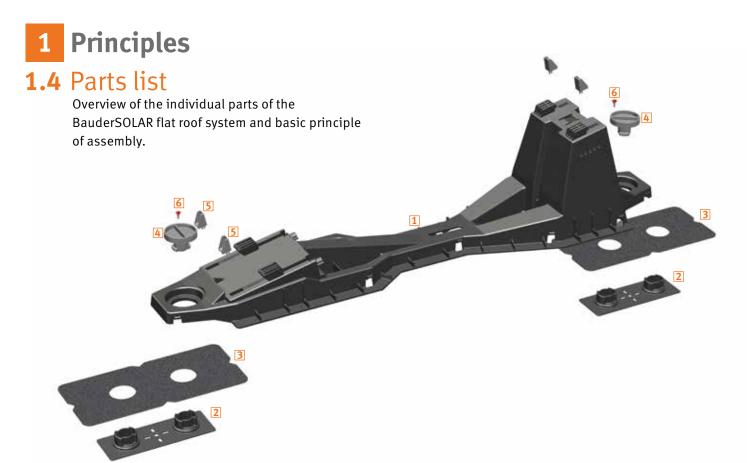
1.3 Installation precautions

- **1:** Symbols used in the manual
- 2: Hot works; the installation of the welding sleeves will require heat for application which may require a hot works permit.
 - Gas torch (for bituminous systems)
 - Hot air gun (for single ply systems)
 - Associated fixing tools





Non compliance could result in injury to health, or serious property damage, or impairment to operational safety.



	Name	Quantity	Item	Description
1	BauderSOLAR F or F XL mounting unit	Subject to design		Substructure with integrated module clamps (Polypropylene PP)
2	BauderSOLAR GF baseplate	Subject to design		Receivers for the bayonet twist lock fitting (Polyamide PA6-GF30)
3	BauderSOLAR MST-BIT BauderSOLAR MST-PVC BauderSOLAR MST-FPO welding sleeve	Subject to design	•••	Roof membrane for welding to the roof (Bitumen, PVC or FPO)
4	BauderSOLAR BJT bayonet cap	2 pieces		Twist lock for securing the BauderSOLAR F or F XL to the base plate (Polyamide PA6-GF30)
5	BauderSOLAR MDS locking pin	4 pieces	4	Module securing device with two snap-in hooks (Polypropylene PP)
6	BauderSOLAR BSP bayonet safety pin	2 pieces		Safety pin to prevent removal of bayonet cap without correct tooling. (Nylon 6/6)

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1.5 Packaging

The system will be delivered as follows:

Pallet, dimensions 1500 x 1000 x 146mm, with skidboards and overhanging deck boards, packed with 3 stacks of 24 pieces each of the mounting unit; in total 72 units. The substructures are secured by two straps (front and rear). Associated small parts are in boxes / plastic bags and are on the stacks. The entire packaging unit is finally packed with stretch film as a means of securing and stabilising the contents.

The weight of the entire packing unit is approximately 255kg, for a full pallet of BauderSOLAR F and 303Kg for a full pallet of BauderSOLAR F XL.

1.6 Checking delivery

Check delivery upon receipt of the goods against the accompanying delivery note. Bauder will not be liable for further costs in the case of subsequent deliveries if you later discover that any material is missing or damaged.

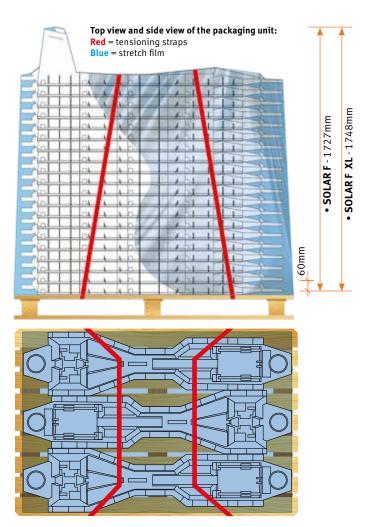
Check the goods visually for any external damage. Bauder must be contacted within 24 hours of receipt of delivery.

1.7 Transport and storage

The product can be used and stored in the temperature range of -40°C to +85°C, but must not be exposed in the packaging to moisture, direct weathering, or aggressive environments. It is strictly prohibited to stack up the packaging units containing the BauderSOLAR F and F XL mounting units. For shipping the product, only the original packing is to be used, and suitable load securing devices must be used on the transport vehicle. Lifting devices must be attached or applied only to the shipment base.

1.8 Product guarantee

Please contact our technical department for a sample of the BauderSOLAR warranty document. **technical@bauder.co.uk**



For further information on delivery options please contact Bauder Ltd.

2 Planning the Installation

2.1 Installation conditions

On-site checklist:

Roof type:

Flat roofs of existing buildings or new construction with approved Bauder bitumen or single ply membranes.

Roof pitch:

Up to a maximum of 5° for bitumen membrane systems and up to a maximum of 10° for single ply membrane systems.

Residual load bearing capacity of roof:

9-12.5 kg/m² depending on the type of photovoltaic module used. It should be noted that due to weather conditions (wind / snow load), significantly higher loads and lifting forces than the rated weight can arise. The stability of the roof must be checked by a static calculation (Euro Code 1 (BS EN 1991-1-3 and BS EN 1991-1-4 with national annexes).

Structural analysis:

Demonstration of the stability of the building construction (structural engineering) in conjunction with the photovoltaic system to be constructed. For existing buildings, additional load will be placed on the structure and a structural engineer should be consulted and their recommendations followed.

Roof deflection:

Differences of no more than 20mm are permitted for on-site tolerances of the roof finish. Where changes in level or tapered insulation schemes are present a maximum permitted variation of 20mm is allowable.



Roof insulation:

Compressive strength of the insulation ≥120kPa according to BS EN 12430

Roof height:

See project specific wind uplift calculations for confirmation of stability.

Roof membranes:

The condition of the waterproofing system must be confirmed before installing the PV array.



The waterproofing layer must be suitable for welding and be approved by Bauder. Age not exceeding 10 years, with a minimum level of quality from Bauderflex upwards.

In the case of bitumen membranes that are older than 10 years or have visible defects, a site inspection by a Bauder representative must be carried out (quality level from Bauderflex upwards).

• Single ply

The Bauder single ply must be suitable for welding, be secure against wind uplift, and be approved by Bauder.

Not older than 4 years (quality level BauderTHERMOPLAN T 1.5mm or thicker; BauderTHERMOFOL 1.5mm or thicker). If the membranes are older than 4 years, the approval may, be given by a Bauder representative following a site survey to confirm suitability.

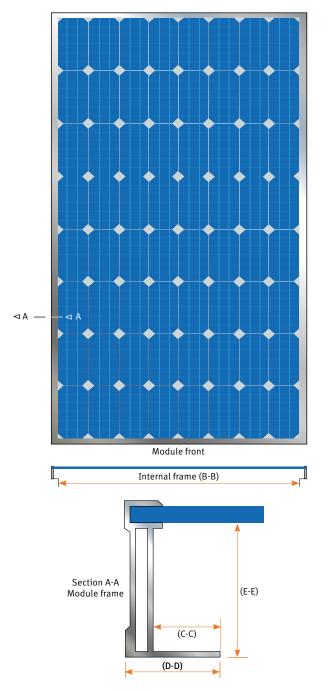


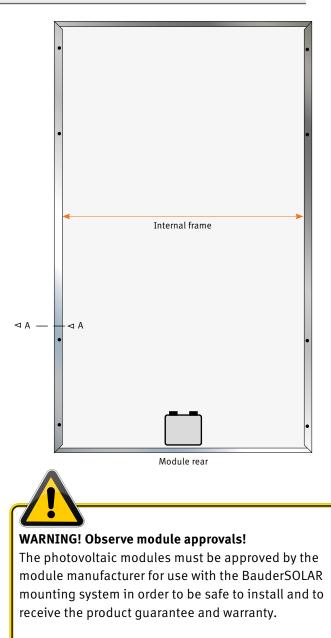


2 Planning the Installation

2.2 PV Module Parameter checklist

On-site checklist	Minimum	Maximum
Module length	-	ca. 2000mm
Internal frame (B-B) BauderSOLAR F	915mm	984mm
Internal frame (B-B) BauderSOLAR F XL	979mm	1080mm
Internal flange width (C-C)	10mm	
External flange width (D-D)	12mm	35mm
Module depth (E-E)	25mm	-





Please observe the specifications and processing guidelines of the manufacturer.

2 Planning the Installation

2.3 Setting out the scheme

Refer to the Bauder specification and roof plan layout prior to setting out the scheme.

To install the BauderSOLAR flat roof mounting system, the layout of the baseplate grid must first be calculated.

Grid Row Spacing:

Fixed row spacing, as detailed on project specification, and crossing points with the roof fastenings (baseplate with welding sleeves).

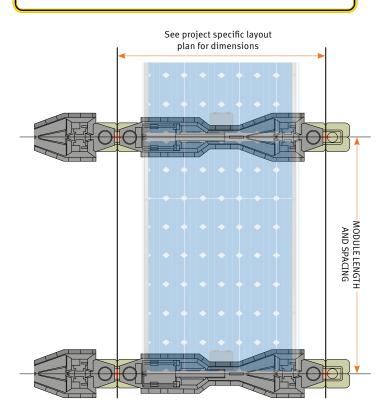
The axial distance of the module rows (as illustrated below) is calculated using the module manufacturer's specified separation distance between the photovoltaic modules and the length of the module (external dimension). In order to achieve a secure seating of the module frames on the mounting structure, the separation distance **must not exceed 20mm.**

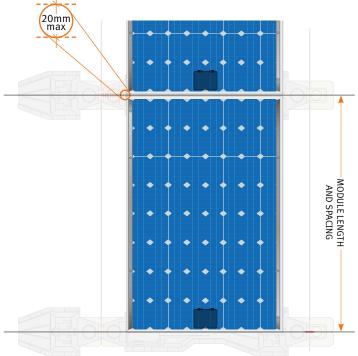
Instructions for setting the array

- Row spacing = as detailed on project specification.
- Axial distance = $\frac{1}{2}$ separation distance + module length + $\frac{1}{2}$ separation distance.
- Separation distance of modules (max) = 20mm.
- Distances to roof structures (minimum) = 500mm.
- Distances to the roof edges (minimum) = 1 m.
- Distances to lightning protection equipment = please contact a lightning conductor specialist for a project specific calculation.



Bauder will provide a dimensioned grid layout for all projects. Do not proceed with the installation of the array without a copy of this project specific layout.





Grid axial distance: determining the centre distance within the rows of the module fields.

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3.1 Required tools

General Items

Chalk line - red chalk provides best visibility on most roofing membranes.

- Tape measure.
- Pen, chalk, markers.
- Try-square 90° tool (carpenter's square).
- Cable ties.

3.2 Preparatory measures

Remove coarse dirt and loose debris from the roof surface. Surfaces must be dry and free from adhesion-reducing substances.

3.3 Marking out the grid layout

- 1: Locate reference/start point 1 (corner of array) using Bauder dimensioned roof layout.
- 2: Using a tape measure mark out reference points2 for a string line for either of the axes.
- **3:** Mark off with chalk line.
- 4: The outer edge of the reference point on the marked lines, 3 extending them the length of the array. Follow the same procedure on the alternative axis.
- 5: Mark centre distances of the fixed row width of 1450mm on the first outer edge. 4 (Initially, mark only 2 3 grid lines, you should first check that the grid is square).
- 6: Mark the axial separation within the module rows on the second outer edge according to the project specific installation plan 5 (initially, mark only 2 3 grid lines here as well).

7: Using the 3 - 4 - 5 rule or a carpenter's square ensure that the first 2 datum lines are square.

8: Measure out the rest of the grid using the 2 grid dimensions. The intersection points of the layout grid are now set up.

It is possible to measure the diagonals of the resulting rectangles. If these are the same length, the marking out has been correctly calibrated at right angles.

9: Follow steps 1-6 to mark off the extended outer edges of the entire module field.

10: Check distances to existing roof structures according to Bauder roof layout.

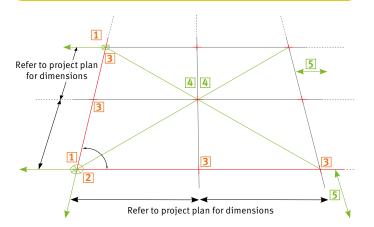
Hot Works - for fixing welding sleeves

- Gas torch (for bituminous systems).
- Hot air gun (for single ply systems).
- Associated fixing tools (such as pressure rollers).



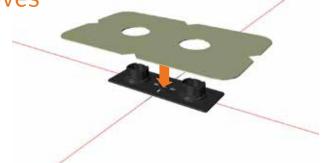
Achieving an accurate grid layout

The intersections of the system axes for the roof fastenings (base plates with welding sleeves) have to be precisely measured and executed with extended lines (chalk line) in order to be able to position, align, and fasten the welding sleeves with their slotted sides at the correct location. Check that this is done accurately before proceeding to the next step.



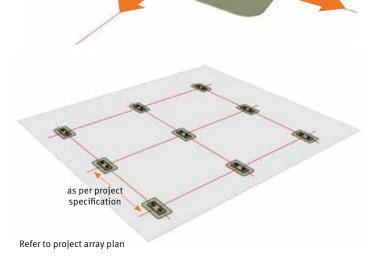
3.4 Positioning the welding sleeves

1: Place welding sleeve over baseplate.



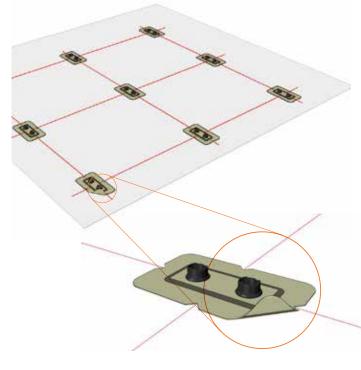
2: Using notched sides of the welding sleeve, locate the welding sleeve and baseplate over string line as shown.

3: Repeat throughout grid – referring to the project array plan.



3.5 Welding the sleeves

- 1: For bituminous systems, use a gas torch to weld the sleeve membrane-to-membrane and ensure a bitumen bead is visible around the perimeter.
- 2: For single ply applications use a hot air gun to create a standard 30mm weld around all perimeters.

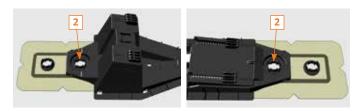


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3.6 Installation of the mounting units

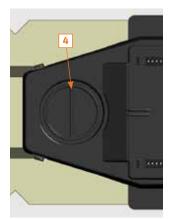
 Position the eyelet openings of the mounting unit 1 above the appropriate locators of the baseplate 2.

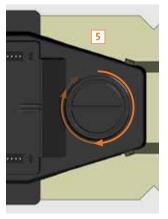




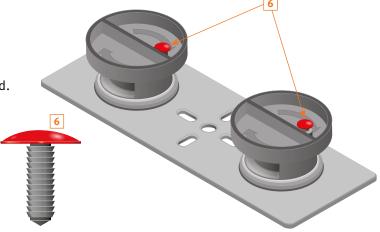
2: Insert bayonet fittings 3 through the eyelet openings of the mounting unit 4 into the two sockets of the baseplate and lock into place by turning the bayonet clockwise 90°. A clicking sound in the closure can be heard when the handle of the bayonet is in position.







- **3:** A bayonet locking pin **6** secures the bayonet cap in place as per image.
- **4:** Repeat until all mounting units are secured.



3.7 Installing the photovoltaic modules

- Standing behind the mounting units, place the module on the abutment surface on the lower edge of the mounting unit 1.
- **2:** The module should sit inside the vertical raised profile **2**.

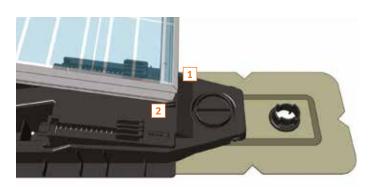
The raised profiles on the contact surfaces **1** serve as positioning aids and facilitate alignment of the photovoltaic module on two mounting units.

3: Rotate the module downwards on the contact surface (pivot point) until it is close to the mounting unit angle of 12° 3 and pull the module horizontally backwards so that the frame return engages the sprung fixing hook. Then pull the module frame at the upper edge 4 so that the spring mechanism pulls the frame into place on the upper hooks/ clamps.

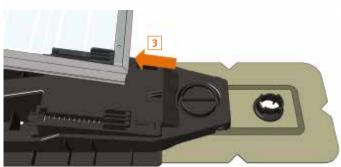


Risk of breakage to the module frame when rotating It is important to not rotate the module vertically when the hook has been engaged **1**. There is a risk that the bar of the module frame will be permanently bent or that the clamping hook will break off.











3.7 Installing the

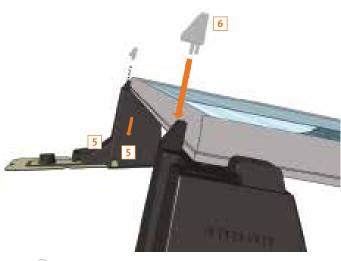
photovoltaic modules

continued...

- 4: The module should now be locked into place on all four clamps. Ensure this is the case before moving on to the next step.
- 5: When selecting which openings on the clamp to use, select the opening closest to the module whilst ensuring a minimum gap to the module frame of 2mm.
- **6:** Insert locking pins **6** with the two snap hooks into the corresponding openings of the upper fixed clamps **5**.
- 7: Push in far enough until the hooks click audibly into place.
- 8: Insert locking pins with the two snap hooks into the corresponding openings of the lower flexible clamps.
- **9:** Push in far enough until the hooks click audibly into place.

Repeat assembly steps 1 to 9 for each photovoltaic module until the entire array is installed securely.

Example of south-facing orientation





Correct position of the locking pin

When installing the locking pins it is important to note that the shortest possible distance to the module frame should always be selected. However, there must still be a gap of at least 2mm between the frame and the locking pin to compensate for thermal expansion of the module.

The locking pin must, under no circumstances, be subjected to pressure from the module frame either during installation or when installed.

The BauderSOLAR PV array can also be installed in an east-west facing orientation, for further information, please contact our technical department.



3.8 Cable management

For the module wiring (DC side) the norms and legal requirements as well as the individual specifications of the module manufacturer apply. (see page 2 Standards and Regulations) Cable tie holders are available as a cable mounting option on the side of the mounting units and should be utilised for north/south cable runs.

Cable tie holders: position and orientation of the cable tie holders on the main structure and dimensions of a cable tie holder.

The BauderSOLAR flat roof mounting system consists of polypropylene and polyamide as well as single ply or bitumen welding seals that are not conductive and are therefore not to be put in protective earthing, or protective or functional equipotential bonding.



Manufacturer's instructions for cable laying

The cable containment method must match the module manufacturer's specifications.

Please see project specific final technical report for cable layouts and string diagrams.

Cable laying above the water-bearing layer Solar cables with connectors and equipotential bonding cables must not rest on the waterproofing layer and care must be taken to ensure they are

contained/fixed correctly.



4 Operation and Maintenance

4.1 Safe operation

The BauderSOLAR flat roof system has an operating life of 20 to 25 years assuming proper planning, installation, commissioning, and maintenance as specified in this manual.

It is recommended to maintain permanent operational data monitoring with fault detection of the electrical components.

4.2 Maintenance and

cleaning

In order to maintain the continued safe operation of the BauderSOLAR system, the following should be carried out during the planned period of use:

- Annual visual and strength tests.
- Regular inspections of electrical safety.
- Annual inspections of the roof waterproofing.
- Regular cleaning operations.

5 Inspections

5.1 Regular inspections

Regular inspections are to be carried out to determine obvious damage and impairments.

Refer to specific maintenance guides for waterproofing system and PV array available on our website bauder.co.uk/technical-centre/ maintenance-advice.

5.2 Electrical equipment

These must be carried out by a qualified electrician to all electrical plant components which are operated in combination with the BauderSOLAR flat roof system, in particular for the sake of preventive fire protection, as per DIN VDE 0105-100 and DIN VDE 0126-23, at intervals of four years maximum.

5.3 Photovoltaic modules

Allowance should be made for annual cleaning of the solar modules.

Please see module manufacturer's guidelines for further information.



Follow the guidance for operation and maintenance of all ancillary components

To ensure safe operation, maintenance, and cleaning, observe the manufacturer's instructions, warnings, and installation conditions for installed connection components (photovoltaic modules, cable support systems, solar cables, power optimisers, etc).

For all electrical elements which are operated with the BauderSOLAR flat roof system, successful commissioning tests should be provided according to MCS requirements.





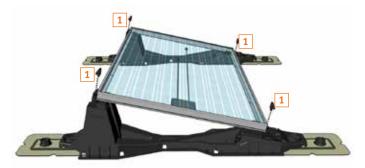
DANGER! Disconnect the electrical connections!

Before the dismantling of photovoltaic modules and/ or the BauderSOLAR mounting system all electrical connectors must be disconnected by a trained operative. For the safe execution of the dismantling processes, at least 2 operatives should be in attendance.

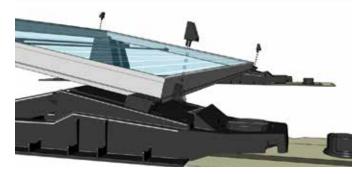
6.1 Removing safety pins

To dismantle a disconnected photovoltaic module, all 4 safety pins 1 must first be removed.

To do this, remove the safety pins 1 using a long flat screwdriver. Please note that the safety pins are no longer re-usable after they have been removed and should be recycled appropriately. see 7.1







6 Dismantling

6.2 Removing a PV module

The PV module is clamped between the lower 1 and upper terminals 2 of the mounting unit. The module clamping is therefore hidden under the module.

The clamp attachment is under tension from the compression springs of the lower terminals. It is therefore essential to carry out a controlled removal process.



RISK OF CRUSHING!

Risk of crushing when pulling on the module frame. Use protective gloves to reduce mechanical hazards.

> Holding the photovoltaic module in the middle of the frame, pull it back in the angle of inclination of the main structure (12°) only so far that the module frame is just released from the hooks of the upper terminals 3 . Slide the module at a flat angle until the bottom edge of the module hits the stop surfaces on the mounting unit 4 just above the upper terminals. Be sure to release the photovoltaic module carefully.

There is an active clamping pressure from the lower terminals on the photovoltaic module, which must be overcome.

Ensure a secure stance to prevent slipping or falling or damage to the module.

Lift the photovoltaic module out of the stop surfaces 5.

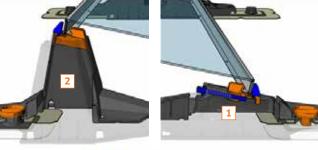


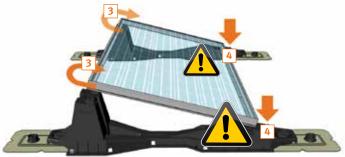
WARNING! Risk of damage to the module frame due to angle of removal!

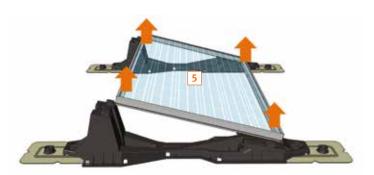
It is essential to remove the photovoltaic modules as described above at a flat angle of inclination on the supporting structure.

Due to the leverage effect, if removed incorrectly there is a risk that the bridge of the module frame will bend permanently, or the clamping hooks will break off.









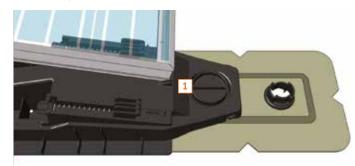
6 Dismantling

6.3 Removing the

substructure

To dismantle the substructure, first open the bayonet locks 190° by turning to the left 2 and then pull the bayonet out of the baseplates 3.

Note: the main structures are no longer secured by the membrane sleeve on the roof.



Lift the mounting units from the baseplate 4.

Note: The mounting units are stackable for transport **5** up to a maximum height of 24 pieces.

Recycle the bayonet locks and mounting units appropriately. See 7.1

6.4 Removing the welding sleeve and base plate

To remove the base plate **1** from the roof surface, the welding sleeve made of bitumen or single-ply material must be expertly detached from the roof waterproofing with a sharp blade **2** and completely removed **3**.

Disposal according to information detailed in 7.1.



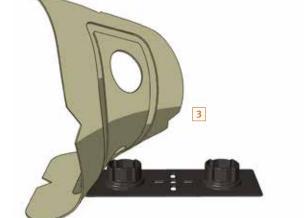












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6 Dismantling

6.5 Dismantling the mounting unit components

When dismantling the mounting unit for disassembly into the individual components proceed as follows:

Open spring shaft on the lock to 45° 1.

Then pull spring shaft with the retracted compression spring out of the mounting unit 2

Then pull the module clamp out of the guide of the mounting unit 3.

Repeat the process of removing the second spring shaft.

Separate and sort the module clamps and compression springs and recycle appropriately. See 7.1

6.6 Removing the module clamps

Upper module clamp 1 can be removed from the mounting unit by means of a hammer tool 2 striking the module clamp until it detaches and falls down through the main structure 3 Repeat the process of removing the second module clamp.

Note: the module terminals and the main structure are no longer reusable after removal and should be recycled. See 8.1

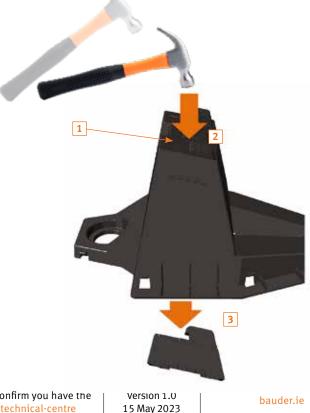


RISK OF CRUSHING when removing the module clamp! Risk of injury. Wear work gloves and proceed carefully when removing.





WARNING! Clamp fastening under compressive stress! The compression spring is under tension. Pay attention to the compressive stress during removal!



7 Recycling and Disposal

7.1 The components of the BauderSOLAR mounting system can be dismantled individually and recycled.

You will find the recycling code of the plastic components embossed on the individual elements using the recycling symbols for return to the recycling cycle.

The table shows an overview of all individual components with the associated materials and the markings if available.

Name	Item	Material	Symbol
BauderSOLAR MDS BauderSOLAR BJT	40	Polyamide PA6-GF30	
BauderSOLAR BSP		Nylon 6/6	
BauderSOLAR MST-BIT		Bitumen with polyester composite fleece backing	EWC number 170302*
BauderSOLAR MST-PVC		PVC with synthetic fibre carrier insert	EWC number 57116*
BauderSOLAR MST-FPO	2003	FPO with synthetic fibre carrier insert	EWC number 57116*
BauderSOLAR GF	00	Polyamide PA6-GF30	

Name	Item	Material	Symbol
BauderSOLAR F or F XL (without built-in parts)		Polypropylene PP	PP PP
Module terminal - top (Built-in part main structure)		Polyamide PA6-GF30	
Module terminal - bottom (Built- in part main structure)		Polyamide PA6-GF30	
Spring channel (Built-in part main structure)	*	Polyamide PA6-GF30	
Compression spring	www.mmo	X10CrNi18-8	N/A
PV module		Contact manufact regarding recyclin or take back oppo	ng scheme

^r Can be disposed of with household waste or commercial waste similar to household waste (European Waste Catalogue EWC).

PLEASE NOTE

Bauder does not currently provide a disposal service for any elements of BauderSOLAR solutions. As the owner, when the product reaches the end of its service life, please ensure that the individual components are recycled wherever possible. Recycling and disposal must always be carried out in accordance with the legal provisions in force at the time.

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Notes		

Notes	



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Respecting the planet

Reducing use of materials



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