



# FLAT ROOF PHOTOVOLTAIC SYSTEMS

BauderSOLAR

# SOLAR POWER ON YOUR FLAT ROOF

Renewable energies are derived from natural processes that are replenished constantly and are becoming an ever more important part of our energy mix. A combination of the environmental impacts associated with burning fossil fuels and the spiralling costs of energy are driving a focus towards dealing with climate change by increasing renewable energy legislation backed with Government incentives.

The UK government has set ambitious targets for its reduction of gas emissions, aiming to cut these by 48% by 2050 compared to 2008 figures, when they expect the UK's carbon sector to be carbon neutral.

Photovoltaic (PV) is a method of generating electrical power by converting solar radiation in to electrical energy; it is clean and environmentally-friendly as CO<sub>2</sub> is not a by-product of PV energy production.

The power generation takes place in what are known as solar cells, connected together to form solar panels or modules which are arranged in 'arrays'. The solar cells produce direct current (DC) electricity from daylight which can be used locally, stored in batteries, or transformed by an inverter in to an alternating current (AC) and fed into electricity networks or grids.



Solar PV is one of the world's fastest growing renewable energy technologies. This is due to its flexibility in both size and location, ease of installation to both new build and retrofit buildings and low operating and maintenance costs.

Not surprisingly, a flat roof is the ideal place for a PV installation as it provides an unobstructed space that is perfectly positioned to catch as much sunlight as possible. By and large, rooftops are often an unused resource and the electrical production from the installed PV arrays is at the point of use, so there is every reason to convert your roof into a small power plant.

## BREEAM

BREEAM is the world's foremost environmental assessment method, setting the standard for best practice in sustainable building design, construction and operation and has become one of the most comprehensive and widely recognised measures of a building's environmental performance.

As sustainability becomes more and more important in a client's list of priorities BREEAM has become a standard for almost all new build schemes. The use of renewable energies such as PV can significantly improve a buildings ability to achieve higher ratings within BREEAM and Code for Sustainable Homes.

## FINANCIAL INCENTIVE

Installing Solar PV to your building can not only reduce your carbon footprint it can also make sound economic sense. In April 2010, under the Energy Act 2008, the UK government introduced the feed in tariff (FIT) incentive scheme to encourage the uptake of renewable energies. Under the scheme, energy produced through renewable sources such as solar PV and wind power is incentivised and potentially large financial yields can be achieved on both domestic and commercial rooftops. FIT's are guaranteed for 25 years and are inflationary linked, providing a sound investment for anyone wishing to secure their energy supply and reduce their impact on the environment.

In 2011, the incentive scheme was reviewed as a result of the substantial uptake of PV installations creating strain on the Department of Energy and Climate Change (DECC) funding allocation which was in danger of being exceeded. A further reason was that the cost of installing PVs was reducing since the launch of the scheme, and that tariffs originally offered were leading to typical rates of return for investors well in excess of the 5% the tariffs were intended to deliver.

For up to date information on feed in tariff rates please visit the Department of Energy and Climate Change website [www.decc.gov.uk](http://www.decc.gov.uk)

# BAUDERSOLAR

As the UK's leading flat roof supplier, Bauder's reputation for quality, service and innovation is second to none. Teaming up with Europe's leading manufacturer of photovoltaic systems allows us to apply this ethos to BauderSOLAR photovoltaics, providing an integrated, single source solution that brings peace of mind through all aspects of a flat roof.

## SINGLE POINT RESPONSIBILITY

This single-source approach to flat roofing will allow clients to feel confident that all aspects of their flat roof are being considered. An integrated approach to the roof ensures that clients can be confident that from conception to completion our UK wide team of technical managers will be able to assist.

## ADDED VALUE

Our technical managers play a vital role in the successful delivery of a watertight roof with photovoltaic installation. They will draw up a project specific waterproofing specification and PV proposal including CAD drawings and plans, overhead mapping programmes and 3D modelling which explores various PV configurations to optimise the roof surface.

The complete proposal will give the clearest possible view of what to expect of the new roof, its thermal insulation value and energy capacity, along with financial data on investment required and payback periods.

Bauder's service package does not stop there. In-house BREEM assessors, landscape architects and CAD technicians combined with our highly experienced team of MCS approved installers provide a service package and technical support facility unrivalled throughout the industry.

## BENEFITS OF SPECIFYING BAUDERSOLAR

- Strongest offer for an integrated rooftop PV solution.
- High level of technical service and expertise.
- Single source for integrated design of waterproofing and PV system.
- Clear accountability to reduce risk
- Fully backed guarantees on waterproofing, mounting components and PV installation.
- Broad range of flat roof waterproofing, integrated insulation, green roofs and PV systems.

The BauderSOLAR photovoltaic solution features the integrated SOLfixx system in which the module and the substructure are combined to form a single unit which is secured to the roof without any penetration of the waterproofing. This ensures that the integrity of the roof is upheld throughout the installation of the PV array.



# RISK-FREE INSTALLATION

The distinctive element of the BauderSOLAR system is in the installation of the scheme which does not require any penetration of the waterproofing or roof deck, even in a non-ballasted arrangement.

This unique installation method sets the system ahead of others and safeguards the integrity of the waterproofing and roof deck; additionally the attachment of the SOLfixx components is very stable so that even in extreme weather the entire array is secure on the roof. Any minor movement of the panels, which is generally created by wind uplift, is easily tolerated and does not affect the fixings, or waterproofing system.

Assembly of the units is carried out in two ways to suit the roof, its waterproofing system and the desired finish. The two main methods of installation are ballasting and 'welding' with membrane fixing techniques to either our reinforced bitumen or single ply systems. The units are lightweight delivering only 13Kg/m<sup>2</sup> and can be installed on concrete, plywood or metal profiled roof decks.

The substructure base units are designed to create a 10° angle on to which each PV module is secured; this allows for optimum energy generation per square metre across the roof area.

- No penetration of waterproofing or roof deck
- No tools / sharp fixings
- Secure and simple interlocking installation

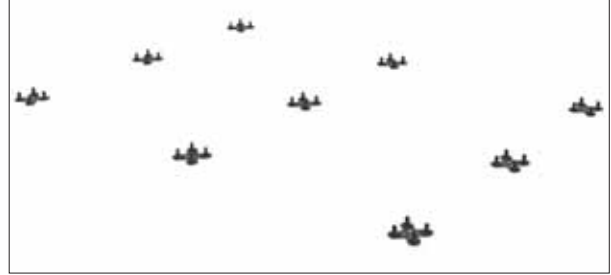


Base Plate



The exclusive characteristic for our lightweight non-ballasted installation is the pre-fabricated Bauder membrane sleeves which slip over the mounting plates and are welded in to position, anchoring the plates to the surface of the Bauder waterproofing system. Once this is completed, the rest of the PV installation is simply locked in to place without any requirement for tools or sharp fixings.

## NON-PENETRATIVE INSTALLATION



### 1. Positioning the Base Plates

The first row of mounting plates are arranged on the roof according to the array design.

### 2. Attaching to Roof Surface

The waterproofing membrane sleeve is placed over the top of each base plate and welded in to place. (as shown left)

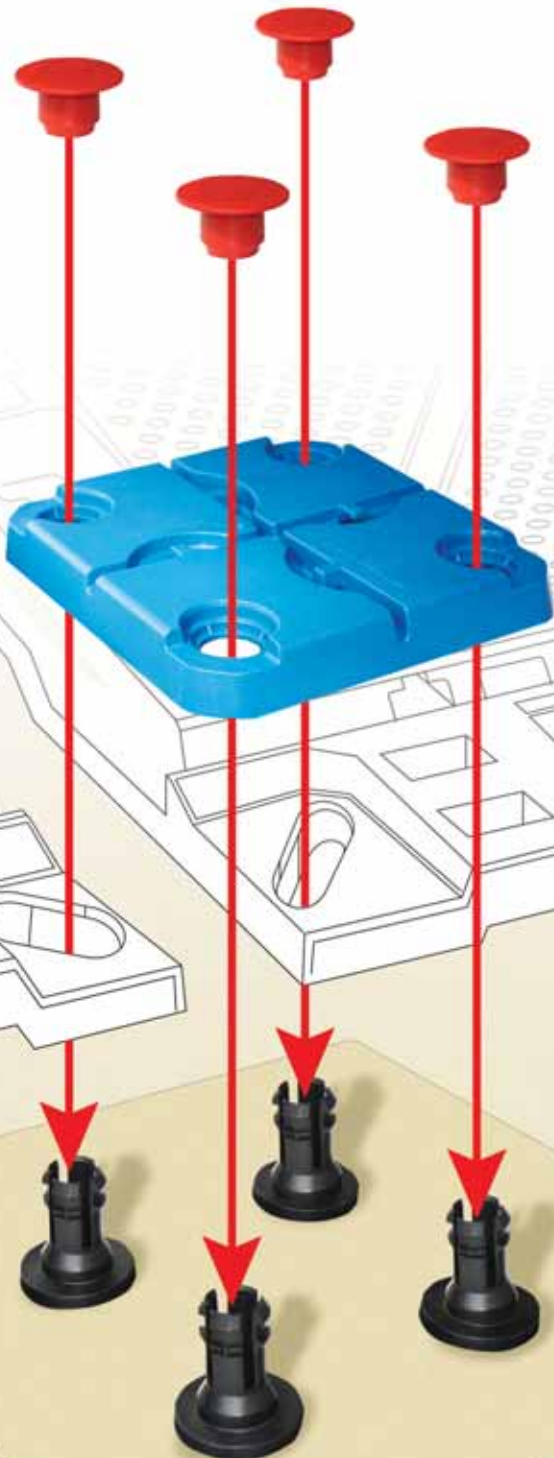


### 3. Installing the Substructures

The substructure bases are positioned over the mounting plates and the cover-plates clipped and secured in to place. If the system is to be ballasted, the substructures are fortified with the specified ballast.

### 4. Placement of the PV Modules

The PV modules are placed on to the base units and held in place from the back, the electric cables are connected and the installation is complete.



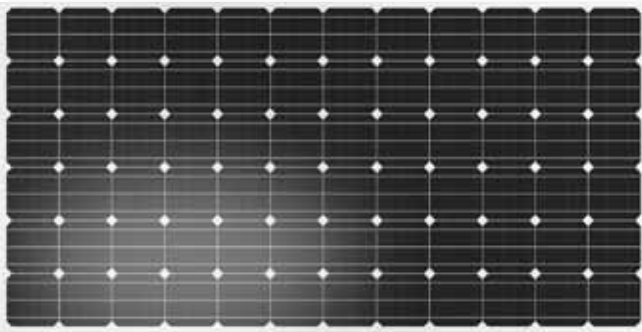
Tool-free installation complete

# THE BAUDER SOLAR SOLFIXX SYSTEM

The BauderSOLAR photovoltaic solution features the innovative SOLfixx system in which the module and the substructure are combined to form a single unit which is secured to the roof without any penetration of the waterproofing. This ensures that the integrity of the roof is upheld throughout the installation of the PV array.

There are two methods of installation, neither of which require any penetration of the waterproofing system or the concrete, plywood or metal profiled roof deck. In a ballasted situation, the polypropylene substructures are filled with the specified ballast to hold down the units from wind forces and stabilise the PV array. The other option, which is a lightweight solution, is to use membrane to membrane welding techniques to secure the base plates to the reinforced bitumen or single ply waterproofing system; the substructures and PV panels are then locked in to place.

The base units are designed to create a 10° angle on to which each PV module is secured; this allows for optimum energy generation per square metre across the roof area and reduces impact of wind load.



## KEY FEATURES

### Roof Protection

- Non-penetrating installation design
- Roof protecting design made of polypropylene
- Raised maintenance walkways are an integral part of the system

### Higher Efficiency

- PV module with an efficiency of 15.7%
- Maximum output per square metre of roof area used due to 10° inclination

### Simple and Fast Installation

- Time saving plug-in system with tool-free assembly
- Module and substructure from a single unit
- Flexible installation solutions for various roof systems
- Ideal for reinforced bitumen membrane or single ply systems
- Separation of mechanical and electrical installation possible
- Cable channel already integrated

### Reliable Loading Calculations

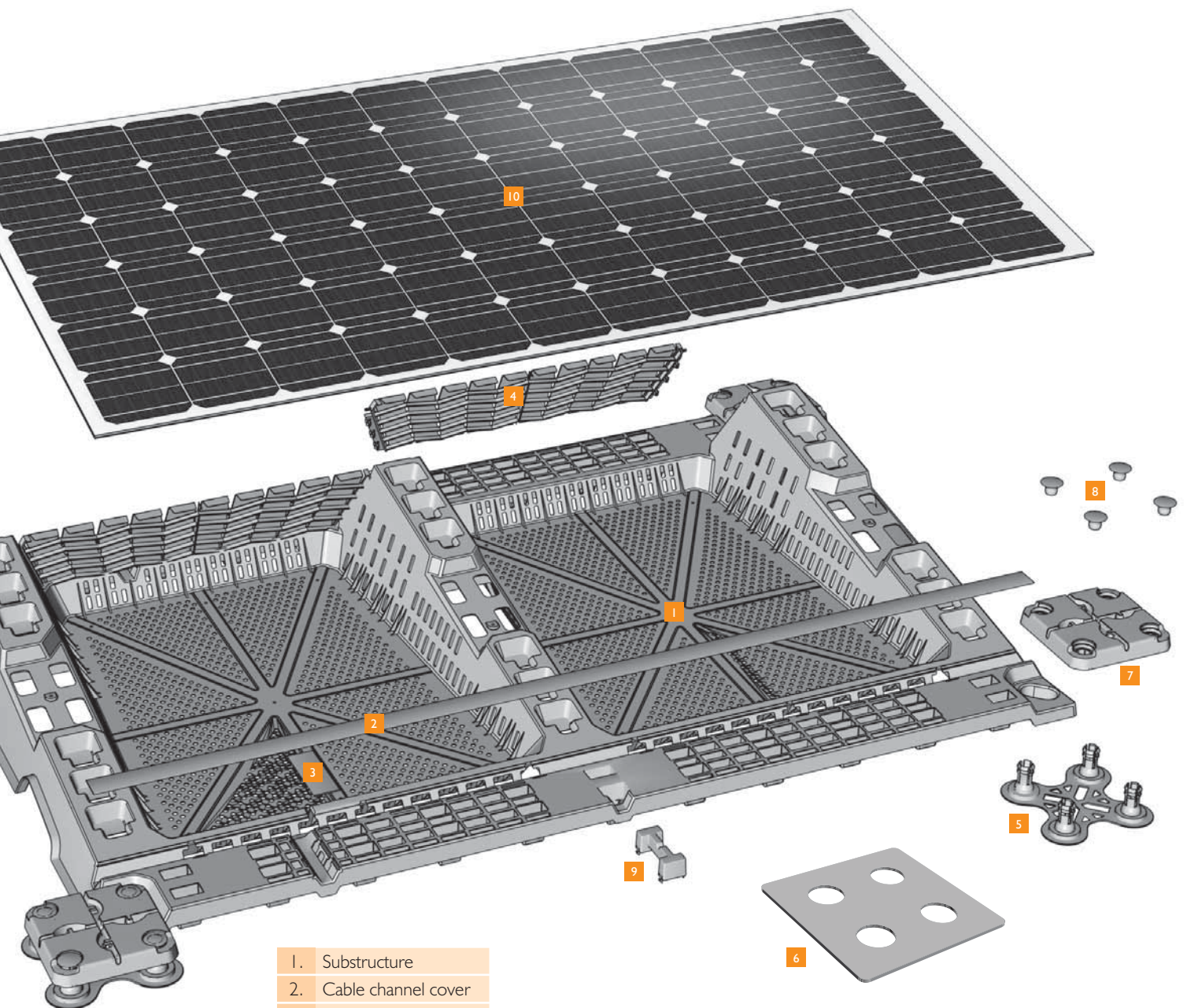
- System weight of only 12.9kg/m<sup>2</sup> making it perfect for lightweight roofs
- Static glass certified in accordance with German standard DIN 18008-1, -2
- Also tested in a wind tunnel

### Total Stability

- Weather and UV resistance
- Stable polymer materials for long-term durability



The attaching of the Bauder SOLfixx system is unique and very stable so that even in extreme weather the entire array is secure on the roof. Any minor movement of the panels that is generally created by wind uplift is easily tolerated and does not affect the fixing components.



- 1. Substructure
- 2. Cable channel cover
- 3. Cable channel
- 4. Wind deflector
- 5. Base plate
- 6. Waterproofing sleeve
- 7. Cover plate
- 8. Safety caps
- 9. Bridge connector
- 10. Photovoltaic module

# SEVEN STEPS TO SUCCESS

Successful on-roof solar project management requires experience; Bauder combines technical knowledge and business acumen to work with clients and project partners to achieve the best possible outcome.

## 1

### CONSULTATION AND INITIAL SITE SURVEY

Following your enquiry you will be contacted by your local Bauder technical manager who will arrange to meet with you in your office or on site.

Fully experienced in waterproofing, insulation and PV options they will be able to identify the most appropriate roofing system for the building and ascertain the suitability of roof areas for a PV installation and the probable number and positioning of the PV panels.

- Simple explanation
- Information gathering
- Honest appraisal
- Clear technical descriptions
- Generic technical drawings
- Realistic budgetary figures

## 2

### DESIGN AND SPECIFICATION PACKAGE

Shortly after your initial consultation your Bauder technical manager will provide a combined detailed specification package covering the waterproofing of the roof, the interface between the roof and the PV array, and a technical layout of the PV units and system engineering.

Clearly illustrated with CAD drawings, plans and 3D mapping programs the proposal will provide the clearest possible view of what to expect of the new roof, its thermal insulation value and energy capacity, along with financial data on investment required and payback periods.

- Roofing Specification
- Bespoke detailed drawings
- Unique Bauder mounting system
- Full PV system design and proposal
- Accurate yield analysis calculations
- All inclusive budget costings
- PI insurance

## 3

### PLANNING ISSUES AND FUNDING OPTIONS

The Bauder PV team has an in depth understanding of energy efficiency funding and finance solutions available and can help you navigate the labyrinth of options to find the finance package that best suits your circumstances.

The team can initiate the planning process from the building plans and electricity consumption data supplied. Also assisting with paperwork to register the solar installation with the national electricity network.

- Feed in tariff (FIT) details
- Pay back periods



# 4

## CONTRACTOR SELECTION AND TENDERING

Your Bauder technical manager will assist in the selection of appropriate contractors from a national network of MCS accredited contractors who are approved in the installation of Bauder's various roof systems and PV system.

- National contractor networks
- Installation by Bauder and MCS accredited contractors
- Contractors familiar with both Bauder roof systems and PV installation
- Contractors of all sizes suited to your project large or small.

# 5

## INSTALLATION

Once a Bauder approved contractor is appointed a pre-contract meeting will be arranged by the Bauder project team with the client to ensure a coordinated project delivery. The works are closely monitored by Bauder technicians with regular inspections to ensure quality and integrity of the final scheme.

- Regular inspection reports provided for the client
- Single contractor able to install both the roof and PV systems.
- Contractors charter to ensure consistent level of service throughout the project

# 6

## FINAL SIGN OFF AND GUARANTEES

A final inspection is undertaken by the Bauder PV team on completion of the works with the energy performance of the array assessed. Comprehensive guarantees for the roof and PV system are provided.

- Comprehensive guarantees
- Complete peace of mind

# 7

## MONITORING AND MAINTENANCE

Proactive monitoring systems enables us to ensure the maximum possible energy and financial return over the system's lifespan, and to identify faults or maintenance requirements remotely.

After the project has been successfully completed Bauder can continue to support you with after care advice and post occupancy evaluation. Advice can also be provided to the building occupants to ensure most benefit is achieved from the Bauder Roof and PV installation.

- Remote installation monitoring
- Training and advice provided to end users
- Ability to monitor daily output
- Ensured power output throughout life of PV system

# BAUDER SOLFIXX TECHNICAL SPECIFICATIONS

## SOLON BLACK 280 / 17 SOLAR PANEL

Dimensions (H x W x D)	1,973 x 993 x 5.3mm
Weight	23.8 kg
Junction box	1 junction box with 3 bypass diodes
Cable	Solar cable, length 1,500mm, 3.2mm <sup>2</sup> , prefabricated with MC4-combinable plug
Application class	Application class A (according to IEC 61730)
Front glass	Transparent toughened safety glass, 4mm
Solar cells	72 cells, monocrystalline Si 6.2" (156 x 156mm)
Cell encapsulation	EVA (Ethylene Vinyl Acetate)
Underside	Composite film
Frame	Frameless
Backrails	6 backrails reinforced with glassfibre PA (290 x 50 x 38mm)

## PERMISSIBLE OPERATING CONDITIONS

Temperature range	-40 °C to + 85 °C
Maximum surface load capacity 61215	Tested up to 2,400 Pa according to IEC
Resistance against hail speed of 83 km/h	Maximum diameter of 25mm with impact

## SUBSTRUCTURE

Dimensions (H x W x D)	2,100 x 1,430 x 253mm
Weight	Lightweight system – just 5.1 kg/m <sup>2</sup>
Material	Polypropylene, UV and weather resistant
Material thickness	2.5 to 4mm
Colour	Anthracite / black
Module level inclination	10°
Cable channel	Integrated (UV protection)
Maintenance walkway	Integrated in substructure
Guarantee	10 years guarantee on substructure, guarantee extension up to 25 years available

## SYSTEM SPECIFICATIONS

System weight	12.9 kg/m <sup>2</sup>
Output per area	100 W/m <sup>2</sup>
Suction (4mm ESG/ optional 5mm safety glass)	1.3 kN/m <sup>2</sup>
Windload/snowload (4mm safety glass)	1.3 kN/m <sup>2</sup>

## SOLON BLACK 280 / 17 (MONOCRYSTALLINE) SOLAR PANEL

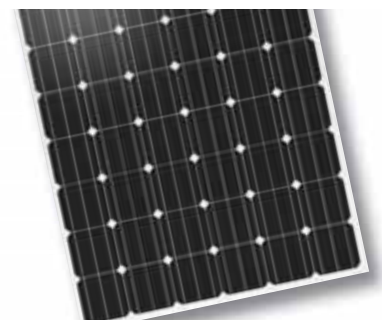
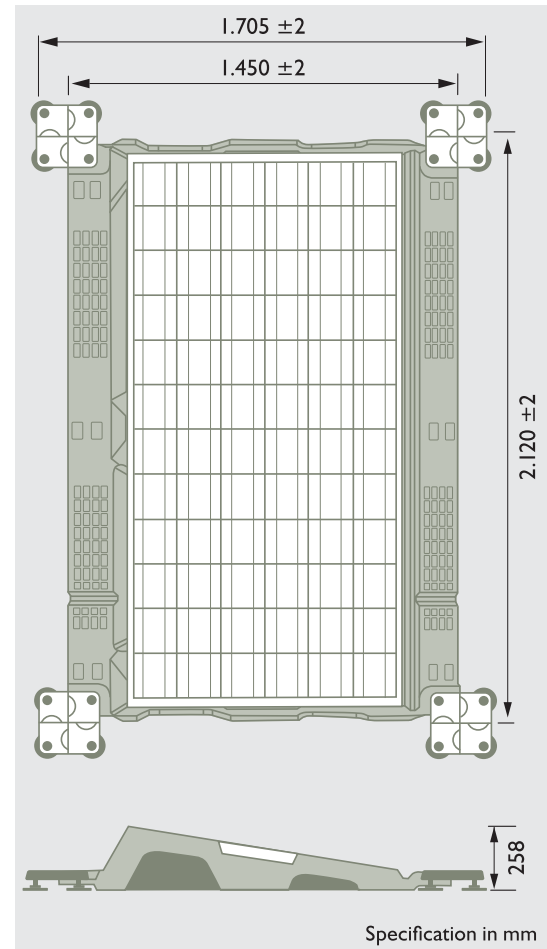
### Electrical data – typical (STC)

STC (Standard Test Conditions): 1,000 W/m<sup>2</sup>, (25 ± 2)°C, AM 1.5 in accordance with EN 60904-3

	P <sub>max</sub>	310 Wp <sup>3)</sup>	305 Wp <sup>3)</sup>	300 Wp	295 Wp	290Wp	285Wp	280 Wp
Capacity rating								
Module efficiency		15.66 %	15.40 %	15.15 %	14.90 %	14.65 %	14.39 %	14.14 %
Rated voltage	V <sub>mpp</sub>	36.43 V	36.22 V	36.00 V	35.80 V	35.60 V	35.40 V	35.20 V
Rated current	I <sub>mpp</sub>	8.55 A	8.45 A	8.36 A	8.26 A	8.16 A	8.06 A	7.96 A
Open circuit voltage	V <sub>OC</sub>	45.24 V	44.98 V	44.77 V	44.50 V	44.23 V	43.96 V	43.69 V
Short circuit current	I <sub>SC</sub>	8.86 A	8.79 A	8.74 A	8.66 A	8.59 A	8.51 A	8.44 A
Maximum reverse current	I <sub>R</sub>	20 A	20 A	20 A	20 A	20 A	20 A	20 A
Maximum system voltage		1,000 V	1,000 V	1,000 V	1,000 V	1,000 V	1,000 V	1,000 V

Measuring tolerance for P<sub>max</sub>: ± 3 %

Reduction of module efficiency from 1,000 W/m<sup>2</sup> to 200 W/m<sup>2</sup>: < 4 %



# QUALITY ASSURANCE

## QUALITY OF INSTALLATION

Our approved contractors, engineers and installers are the only people fully trained and certified to install our rooftop solutions as excellent workmanship is crucial to the guarantees that accompany all works on the roof. Our selection of contracting companies is given detailed attention as they must possess the technical expertise required for a fault-free installation and the organisational facilities to maintain a proficient site.



## GUARANTEES

### Roof Performance

The Bauder waterproofing system is guaranteed for up to 25 year and covers liability for our waterproofing design, products and installation. The issue of guarantees are not reliant on roof size or contract value and are noted throughout the industry for their level of cover.

### PV Performance

All elements of the PV modules and inverters are guaranteed by our PV partner. The system carries a 10 year product guarantee and the PV energy performance guaranteed for 5 years at 95% nominal power, 10 years for 90% at nominal power and 25 years at 80% nominal power.

Further information of our PV guarantee can be provided on request.

*Credible guarantees are vital, but never calling on them is our aim*



## OPERATIONS & MAINTENANCE CONTRACTS

Once installation is complete and the project handed-over support can continue with a post installation full maintenance and operating contract should this be required.

## PV CYCLE

Bauder is proud that our panels are covered within the PV CYCLE framework which is a not-for-profit association managing a fully operational collection and recycling scheme for end-of-life photovoltaic modules throughout Europe.

Bauder continues to drive its environmental policy forward by assessing the environmental impact of its operations from conception to conclusion so as to prevent pollution of the external environment and to commit to using recycled materials or those with low environmental impact.

As a result of this focus, this publication has been printed by The Colchester Print Group using vegetable based inks on alcohol free presses and is ISO 14001 and FSC accredited.

Additionally, by working with the World Land Trust the paper used for this publication has been carbon balanced saving 220kgs of carbon and preserving 18 square metres of land.



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