

Product Data Sheet

SOLAR PV_{FLEX}

Flexible thin-film photovoltaic system combining CIGS (Copper Indium Gallium Selenide) panels bonded to Axter waterproofing membrane

Axter SOLAR PV_{FLEX} flexible, thin-film photovoltaic system is a lightweight integrated solution where the solar PV module and the waterproofing are combined, and the PV module is secured to the roof system without the need for mechanical restraint and penetration of the waterproofing layer.

Recent technological advances have resulted in the development of Axter's Solar PV_{FLEX} system that utilises CIGS (Copper Indium Gallium Selenide) technology. Our next generation thin-film solar PV module achieves production efficiency rates in excess of 16%, comparable to the most efficient rigid PV panels.

As a result, Axter SOLAR PV_{FLEX} modules are the solar industry's most efficient flexible, lightweight, integrated thin-film solution and now provide the specifier with a clear alternative to traditional rigid panel systems.

The system is more than 60% lighter than the closest rigid panel competitor and designed for use with Axter Excel® bitumen or Ecoflex® single-ply waterproofing membranes.



Key benefits

- Lightweight, less than 2.0kg/m² (6.6kg/module)
- No roof penetrations; waterproofing integrity maintained as installation requires no mechanical restraint
- Compatible with both bitumen and synthetic PVC-p waterproofing systems.
- High energy generation; minimum 16.1% module efficiency
- Can be installed on curved surfaces not suitable for rigid panels
- Shade tolerant CIGS technology; higher absorption coefficient than any other semiconductor
- BIPV system integrated to 1:80 roof slope; ideal for areas with restrictive planning conditions
- Flexible modules suitable for all roof system types
- Hail resistant and shatter proof; certified to IEC 61646
- Low maintenance and anti-glare due to self-cleaning surface coating
- Easy to install



Performance

Axter SOLAR PV_{FLEX} is a flexible polymer encapsulated thin-film solar module based on advanced CIGS (Copper Indium Gallium Selenide) technology. The photovoltaic modules are lightweight (2.0 kg/m²), shatterproof, hail resistant, compatible with bitumen and synthetic waterproofing systems and being flexible are suitable for all roof shapes with no requirement for orientation, plinths, or ventilation.

Increased energy output is achieved when compared to rigid panel systems especially in low level light or indirect light conditions. Axter SOLAR PV_{FLEX} (CIGS) modules have the highest absorption coefficient of any existing semi-conductor and a diffusion length of 1 micron. Just 1 micron of this material absorbs more than 90% of sunlight.

Axter SOLAR PV_{FLEX} thin-film solar cells also have a small temperature coefficient (-0.24%), which means every 1% increase in temperature will result in a 0.24% decrease in energy conversion efficiency. When the ambient temperature is 28°C, the operating temperature of the solar PV system will increase to approximately 75°C. During this temperature range, Axter SOLAR PV_{FLEX} thin-film solar PV modules have an energy production efficiency 10-12% greater than rigid panel systems, resulting in like for like higher annual productivity.

Installation

SOLAR PV_{FLEX} modules use peel and stick application. This eliminates penetration into the structure and simplifies installation on roofs. The modules conform to curved surfaces, enabling solar power generation on surfaces where traditional rigid silicon panels are not suitable.

Accreditations

Manufactured in full compliance with EN 61646 and EN 61730 and meets all EU standards.

Compliant with BS EN 62446 *Grid Connected Photovoltaics* and BS EN 61853-1 *Defining Solar Photovoltaic Power*.

Technical Specification

Physical and Mechanical Specification	
Length	2585mm
Width	1293mm
Module thickness	2.5mm, with adhesive
Maximum thickness at J-box*	17mm, including output cable on the upper side
Weight (module without adhesive)	5.5
Weight (module with adhesive)	6.6 kg
Weight / area (module without adhesive)	1.7kg/m ²
Weight / area (module with adhesive)	2.0kg/m ²
Junction box type	IP68
Cable connections	Amphenol H ₄
Cell type	Copper Indium Gallium Selenide (CIGS)
Certifications	UL 1703, IEC 61646, IEC 61730

*2.5 mm for the rest of the module with adhesive

*1.5 mm for the rest of module without adhesive

Electrical connection: 4mm² - length 1200mm with multi-contact connectors pre-assembled on the upper side.

Bypass diodes: connect all solar cells in parallel for a total of 84 diodes.

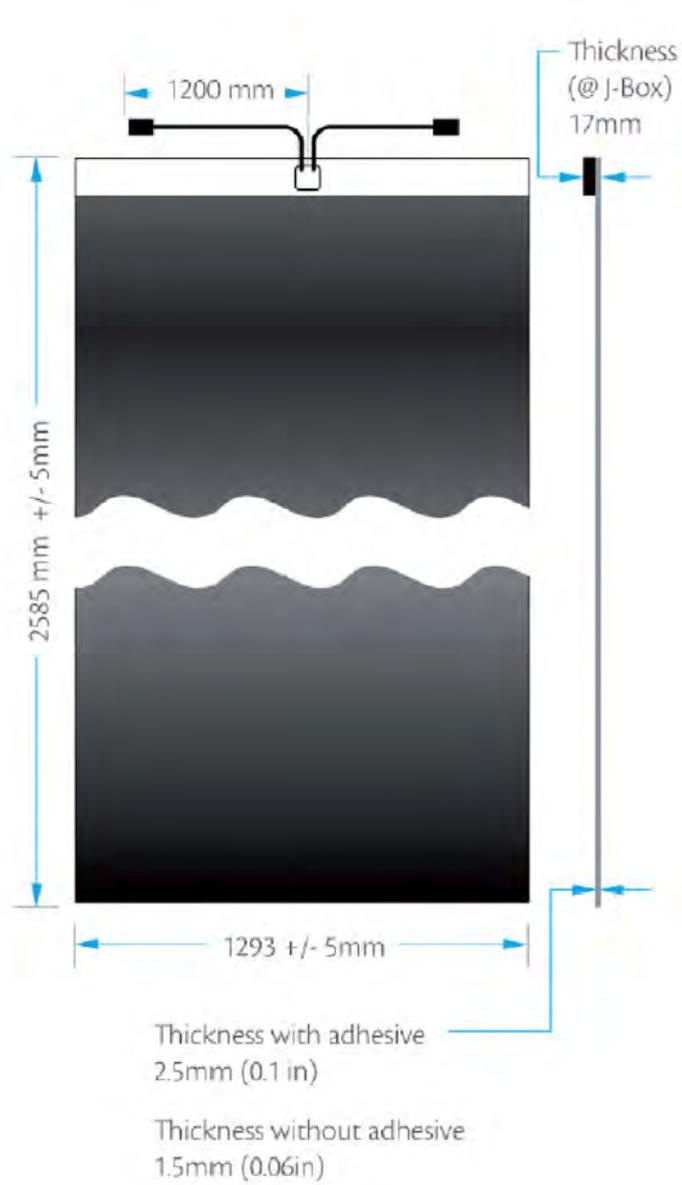
Encapsulation: ETFE polymer on the upper surface, highly transparent and resistant to UV rays and to atmospheric agents

Typology of cell: 168 solar cells connected in series.

Standard Electrical Configuration of Laminates

Flexible photovoltaic laminates with output cables pre-assembled on the upper side with fast connectors Amphenol 3mm, type MC4.

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Thermal Characteristics		
NOCT	[°C]	48
Temperature Coefficient of P _{MPP}	[%°C]	-0.40
Temperature Coefficient of VOC	[%°C]	-0.36
Temperature Coefficient of I _{SC}	[%°C]	0.003

Solar PV_{FLEX} Electrical Performance at STC*

			470W	480W	490W	500W
Nominal Power	P_{max}	[W]	470	480	490	500
Aperture Efficiency	η	[%]	15.3%	15.7%	16.1%	16.6%
Power Output Tolerance		[W]	+10/-0	+10/-0	+10/-0	+10/-0
Maximum Power Voltage	V_{MP}	[V]	61.4	62.4	63.4	64.4
Maximum Power Current	I_{MP}	[A]	7.66	7.70	7.74	7.78
Open Circuit Voltage	V_{OC}	[V]	76.6	77.6	78.7	79.8
Short Circuit Current	I_{SC}	[A]	8.66	8.68	8.70	8.72
Maximum Series Fuse Rating		[A]	25			
Maximum System Voltage	(IEC/UL)	[V]	1000/600			

* Standard Test Conditions (STC): 1000 W/m² , 25°C cell temperature, AM 1.5 spectrum

Excel®SOLAR PV_{FLEX}

A unique integrated solution providing robust and durable bitumen waterproofing and the production of clean efficient electrical energy within a single flat roof system configuration.

Excel®Solar PV_{FLEX} combines Excel® Solar high-performance reinforced bitumen waterproofing membranes, manufactured with the patented ALPA-MIX polymeric binder with fully bonded SOLAR PV_{FLEX} CIGS flexible photovoltaic modules. Excel®Solar PV_{FLEX} modules are prefabricated with a self-adhesive under surface that adheres directly to the Excel®Solar waterproofing membrane without the requirement for heat or additional mechanical restraint.

Excel®Solar is designed for installation in either a multi or single layer application using hot air welding, torch-on or mechanical fastening techniques. With exceptional ageing characteristics and excellent bond strength, Excel®Solar has been technologically developed to be flexible and durable and is suitable for use on all new build and refurbishment Solar PV projects.

Key benefits

- Exceptional ageing characteristics
- Excellent bond strength
- Multi-layer or single layer application
- Approved for all structural deck types (concrete, metal, timber)
- 60-year manufacturer service life
- 30-year insured guarantee, covering materials, design, workmanship and insolvency

Accreditations

Compliant with British Board of Agrément (BBA) Certificate No 94/3037.

Compliant with BS 6229: 2018 - Flat Roofs with continuously supported flexible waterproof coverings – Code of Practice.

CE Marked and assessed to meet high safety, health, and environmental protection requirements.

Guarantee

Excel®SOLAR PV_{FLEX} modules are supplied with a manufacturer's linear electrical energy production guarantee and combined product performance guarantee of 20 years.

Further information is given in the Axter Excel Solar Technical Datasheet.

Ecoflex®SOLAR PV_{FLEX}

An integrated solution providing robust single-ply PVC-p waterproofing and the production of clean efficient electrical energy within a single flat roof system configuration.

Ecoflex®Solar PV_{FLEX} combines Ecoflex® high-performance PVC-p waterproofing membranes, with SOLAR PVFLEX CIGS flexible photovoltaic modules, anchored to the waterproofing using Axter's BandFix® non-penetrative attachment method.

Ecoflex®Solar PV_{FLEX} waterproofing membranes can be installed either mechanically fixed (FM) or adhered (ADH) as part of a warm roof installation using hot air welding techniques without the requirement for naked flames.

With exceptional performance characteristics, Ecoflex®Solar has been specifically designed to be flexible and durable and is suitable for use on all roofing projects including domestic, commercial and industrial structures.

Key benefits

- Recycled polymers
- Weathering and UV resistance
- Design flexibility
- High strength and mechanical resistance
- Low temperature flexibility
- Cost-effective solutions
- Vapour permeability
- Superior weld characteristics
- Quick installation and detailing
- Zero flame – hot air welded installation
- Wide range of aesthetic choices
- 35 year manufacturer service life

Accreditations

Compliant with British Board of Agrément (BBA) Certificate No 15/5261.

Compliant with BS 6229: 2018 - Flat Roofs with continuously supported flexible waterproof coverings – Code of Practice.

Compliant with BS EN 13956:2012 - Flexible sheets for waterproofing. Plastic and rubber sheets for roof waterproofing. Definitions and characteristics

CE Marked and assessed to meet high safety, health, and environmental protection requirements.

Guarantee

Ecoflex®SOLAR PV_{FLEX} modules are supplied with a manufacturer's linear electrical energy production guarantee and combined product performance guarantee of 20 years.

Further information is given in the Axter Ecoflex FM and ADH Technical Datasheets.

BandFix®

A lightweight non-penetrative fastening system for use with Axter SOLAR PV_{FLEX} (CIGS) photovoltaic modules on to Ecoflex® single ply, synthetic PVC-p roof waterproofing membranes. BandFix® comprises a VELCRO loop tape which is factory bonded to the surface of a 100mm wide strip of Axter's ECO R single ply, polyester reinforced PVC-p waterproofing membrane.

BandFix® does not require any mechanical fasteners or washers and does not penetrate the roof waterproofing system, ensuring the waterproofing system remains watertight during and post installation of the Solar PV solution.

Key benefits

- Fast simple installation
- No mechanical fasteners required
- Preserves the integrity of the waterproofing during and post installation.
- Weathering and UV resistance
- High strength and mechanical resistance
- Superior weld characteristics
- Zero flame – hot air welded installation
- 35 year manufacturer service life guarantee, covering materials, design, workmanship and insolvency

Further information is given in the Axter BandFix® Product Datasheet.

Axter Universal Fixing Point (UFP)

When a crystalline Solar PV panel array is required it is essential that a secure and warranted attachment method is achieved without the risk of waterproofing failure or membrane degradation over time.

The universal fixing point (UFP) photovoltaic solution for flat roofs has been specifically developed to provide a secure connection to the building structure whilst maintaining 100% waterproofing integrity.

Key benefits

- The UFP system is extremely versatile and is compatible with all Axter waterproofing systems
- The connection point provides 2no. x M10 female threads to which a variety of brackets, rails and support systems can be bolted
- The UFP utilises innovative and patented technology to provide a warranted seal between the fixing point and the factory fitted Axter waterproofing membrane
- Ensures direct attachment to the roof structure without compromising watertightness
- The use of Constant Pressure Technology ensures load forces applied to the UFP in service do not adversely affect or compress the waterproofing membrane

Further information is given in the Axter UFP Product Datasheet.

Axter Ltd reserves the right to make changes without notice at any time to the above products. The values given are indicative and correspond to nominal results obtained in laboratories and testing institutes. Final determination of the suitability of any information is the sole responsibility of the user. Consult Axter to discuss the use of this or any other product but responsibility for selection of a material and its application in any specific project remains with the user.