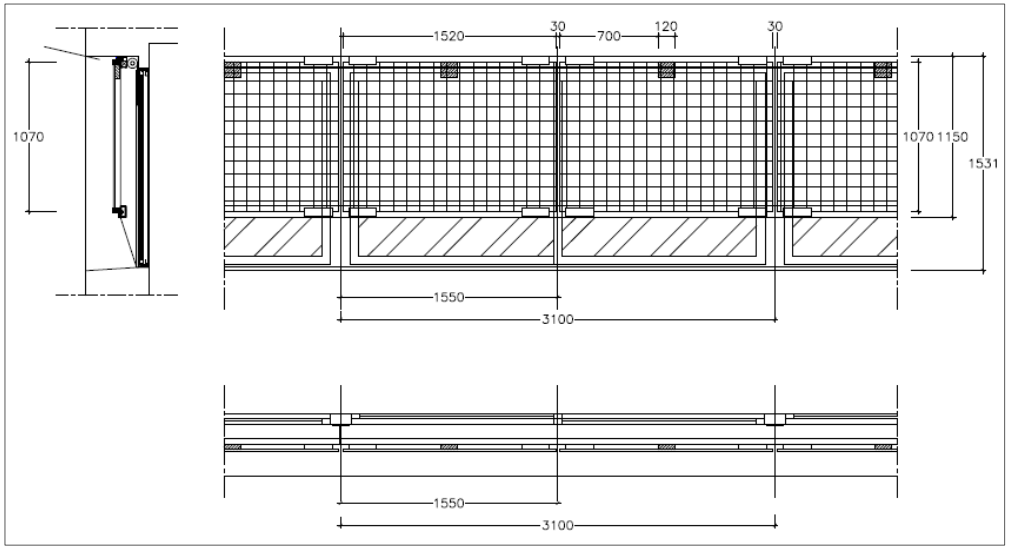
STILORMADE BIPV shading element for facades

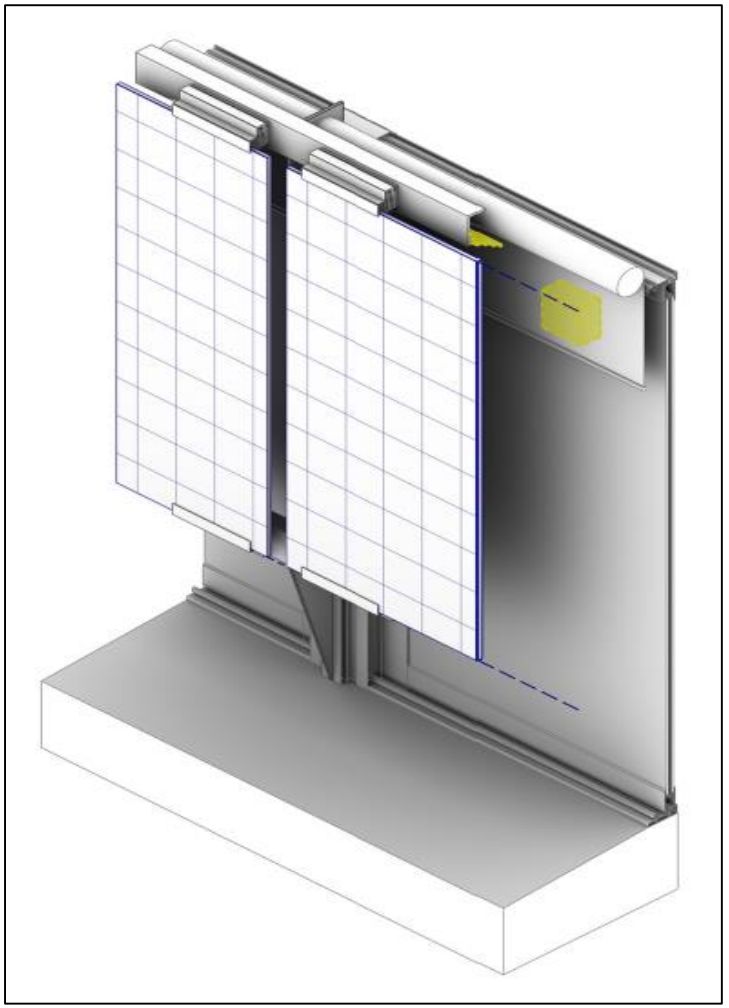
The STILORMADE BIPV shading element has been specially designed to improve the energy performance of the buildings through the renewable energy production and the thermal charges reduction. The customized design allows a great mechanical and aesthetical integration in the building facade. The optimized electrical configuration strategy and the advanced manufacturing procedure, implemented by the French manufacturer S'Tile and the University of Wien, achieve a high power performance through the active area increase, the hidden of the inter-cell connections and the improved effectiveness of the cells' ribbon pattern, with a good aesthetical result.

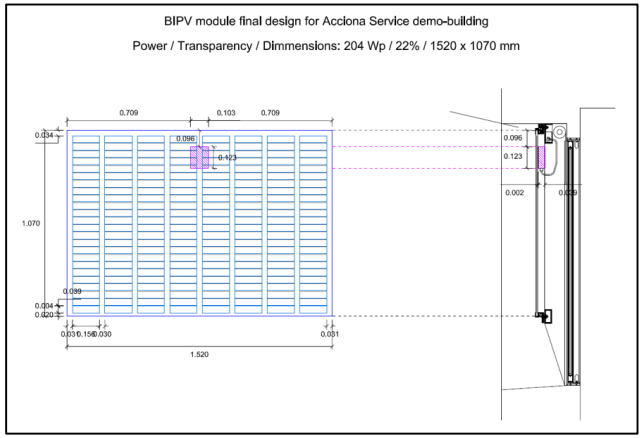
STILORMADE BIPV shading element	
Physical specifications	
Dimension / weight	1520 x 1070 x (aprox) 11 mm / 44 kg
Front glass / Rear glass	High Transmission solar tempered Glass / Tempered glass
Encapsulating material	EVA
Module transparency	13.1 %
Hiding of the PV laminate's internal elements	White enamelling
Frame	Frameless
Electrical specifications	
Power output	204 Wp (+/- 3%)
Voc: Open-circuit voltage	60.7 V
Isc: Short-circuit current	4.56 A
Vmpp: Voltage at Pmax	48.8 V
Impp: Current at Pmax	4.19 A
Geometrical module efficiency	12.5 %
Solar cell technology	Multi-crystalline Si
Cell dimension	156.75 X 39.2 mm
Design pattern	Sunrays
Cell efficiency	17.2 %
Electrical configuration (a x bP x cS)	4 x 2 P x 24 S = 192 cells
Distance from cells to the upper edges	33.5 mm
Distance from cells to the lower edges	20.0 mm
Distance from cells to the side edges	31.0 mm
Distance between adjacent vertical PV cells rows	30.0 mm
Junction box (JB) / Dimensions/ Location	x1 (single) JB "QC JB 083965 Series" / Dimensions: 123 x 103x 39 mm / Horizontally centred, vertically distanced 96 mm from the module's upper edge
Cables / lenght/ connectors	PV cable 4.0 mm2 / 1200 mm / MC4

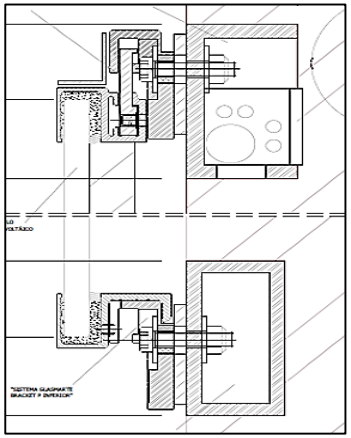
Mounting structure for the STILORMADE BIPV shading elements

An specific mounting structure has been designed for the demonstration of the BIPV shading elements. PV modules have been installed in the chosen demo-building using 4 punctual clamps to attach them to the structure, which is composed of a set of horizontal standardized aluminium profiles and vertical mounting pieces with a specific design. Due to the open space between the modules and the sill and the space between them and the windows row, natural ventilation of modules is guarantied.



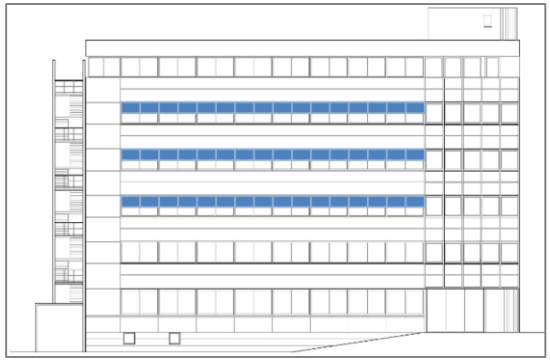






STILORMADE BIPV shading demo-systems

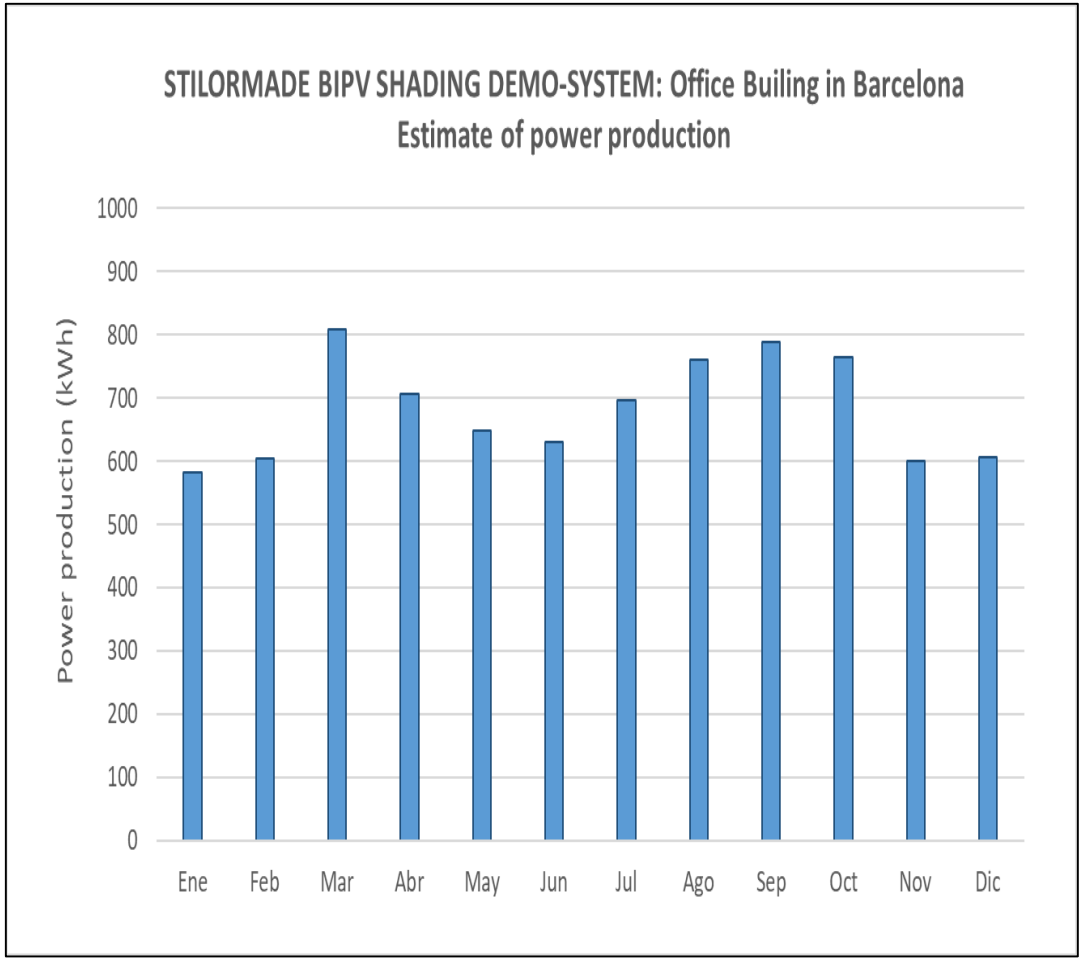
The STILORMADE BIPV shading element for facades has been installed and is currently tested in a real office building in Barcelona, owned by ACCIONA. The BIPV shading demo-system consist of the partial occupation of 3 windows galleries with 16 BIPV shading elements each one and a total number of 48 modules. Total power of the system is 9.8 kWp. The generated energy will be consumed in-situ under a self-consumption regimen with injection of surplus production to the public grid. Due to the opacity of the PV cells the module will significantly reduce the solar impact, and consequently the thermal charges, inside the building; although the transparent areas between the cells rows will allow the entry of certain quantity of natural light. The open concept of the system design allows the natural ventilation of galleries and PV modules. The clean appearance of the module design results in a great aesthetic solution for an office building's facade.

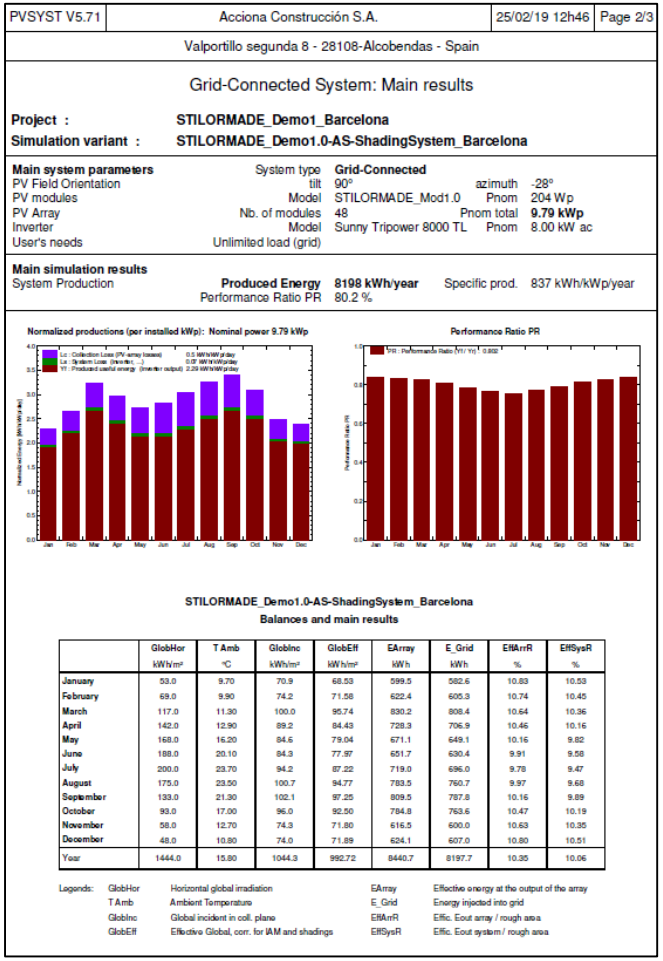


STILORMADE BIPV shading demo-systems, installed in the south-east facade of an office building located in Barcelona

Estimate of production of STILORMADE BIPV shading demo-systems

The yearly power production estimated for the STILORMADE BIPV shading demo-system, an office building located in Barcelona, reaches 8,198 kWh/year. The system will contribute to decrease the electricity power bill; not only through the photovoltaic power generation, but also by the reduction of the power consumption for cooling, thanks to the shading effect of the opaque PV cells on the facade where the system has been installed.





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Grid-Connected System: Main results

Project : STILORMADE_Demo1_Barcelona
Simulation variant : STILORMADE_Demo1.0-AS-ShadingSystem_Barcelona

Main system parameters	System type	**Grid-Connected**			
PV Field Orientation	tilt	90°	azimuth	-28°	
PV modules	Model	STILORMADE_Mod1.0	Pnom	204 Wp	
PV Array	Nb. of modules	48	Pnom total	**9.79 kWp**	
Inverter	Model	Sunny Tripower 8000 TL	Pnom	8.00 kW ac	
User's needs	Unlimited load (grid)				

Main simulation results
System Production — **Produced Energy** **8198 kWh/year** Specific prod. 837 kWh/kWp/year
Performance Ratio PR 80.2 %

Normalized productions (per installed kWp): Nominal power 9.79 kWp

Performance Ratio PR

STILORMADE_Demo1.0-AS-ShadingSystem_Barcelona
Balances and main results

	GlobHor kWh/m²	T Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray kWh	E_Grid kWh	EffArrR %	EffSysR %
January	53.0	9.70	70.9	68.53	599.5	582.6	10.83	10.53
February	69.0	9.90	74.2	71.58	622.4	605.3	10.74	10.45
March	117.0	11.30	100.0	95.74	830.2	808.4	10.64	10.36
April	142.0	12.90	89.2	84.43	728.3	706.9	10.46	10.16
May	168.0	16.20	84.6	79.04	671.1	649.1	10.16	9.82
June	188.0	20.10	84.3	77.97	651.7	630.4	9.91	9.58
July	200.0	23.70	94.2	87.22	719.0	696.0	9.78	9.47
August	175.0	23.50	100.7	94.77	783.5	760.7	9.97	9.68
September	133.0	21.30	102.1	97.25	809.5	787.8	10.16	9.89
October	93.0	17.00	96.0	92.50	784.8	763.6	10.47	10.19
November	58.0	12.70	74.3	71.80	616.5	600.0	10.63	10.35
December	48.0	10.80	74.0	71.89	624.1	607.0	10.80	10.51
Year	1444.0	15.80	1044.3	992.72	8440.7	8197.7	10.35	10.06

Legends: GlobHor Horizontal global irradiation; T Amb Ambient Temperature; GlobInc Global incident in coll. plane; GlobEff Effective Global, corr. for IAM and shadings; EArray Effective energy at the output of the array; E_Grid Energy injected into grid; EffArrR Effic. Eout array / rough area; EffSysR Effic. Eout system / rough area

***Estimate of power production of the* STILORMADE BIPV shading demo-systems of Barcelona**