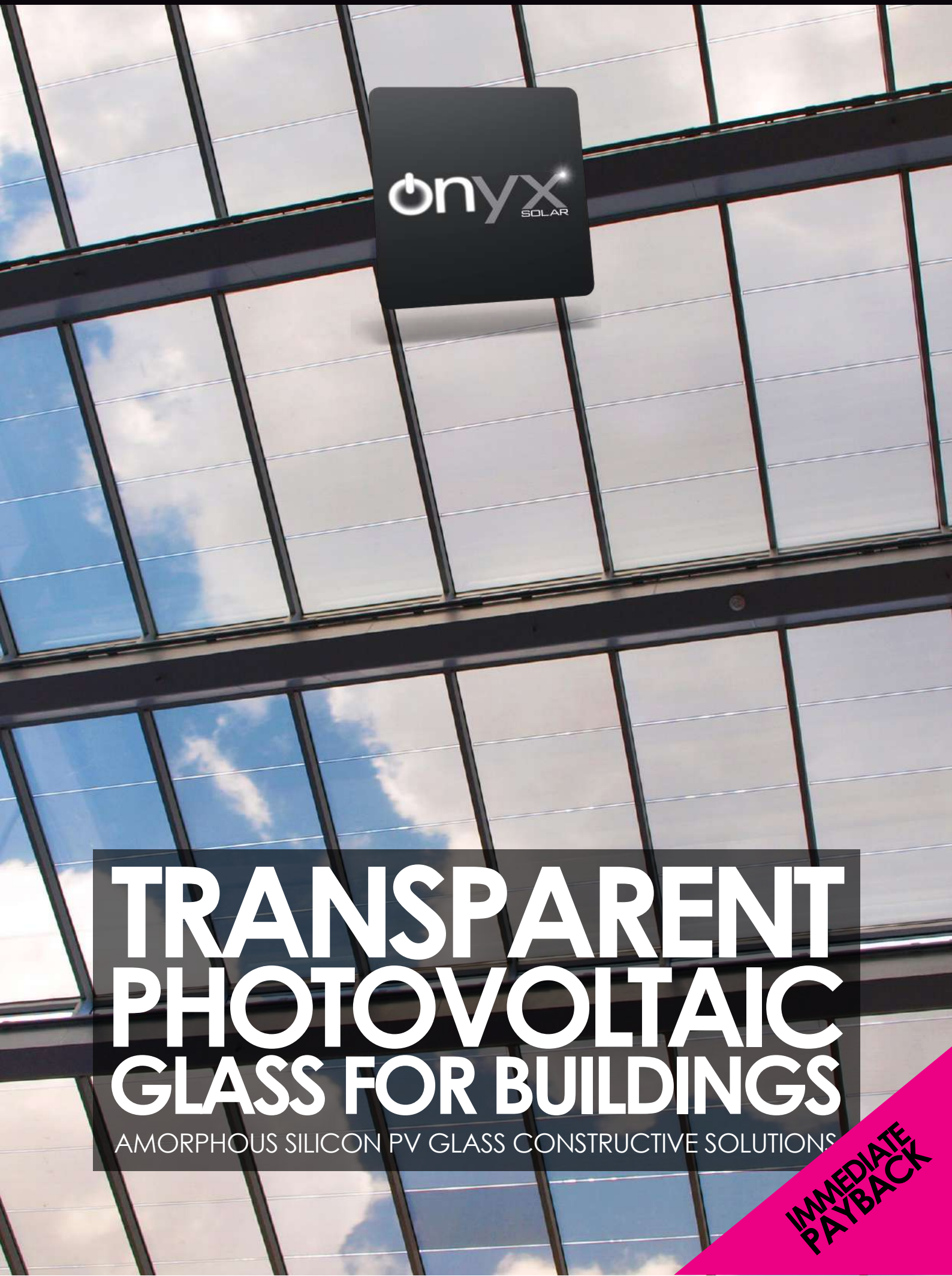
TURN ENTIRE BUILDINGS INTO VERTICAL POWER GENERATORS



TRANSPARENT PHOTOVOLTAIC GLASS FOR BUILDINGS

AMORPHOUS SILICON PV GLASS CONSTRUCTIVE SOLUTIONS

IMMEDIATE PAYBACK

FIND OUT MORE ABOUT
CONSTRUCTIVE SOLUTIONS WITH OUR PV GLASS

OFFSET ALL YOUR BUILDING'S ENERGY DEMAND BY USING OUR TRANSPARENT LOW-E PHOTOVOLTAIC GLASS

Onyx Solar has developed the first transparent, low-emissivity photovoltaic glass in the market. Our PV glass shows the same mechanical properties as a conventional, architectural glass used in construction. However, in addition, it also generates free and clean energy thanks to the sun. Moreover, its optimized solar factor enhances thermal comfort inside the building,; it completely offsets the energy demand for indoor air conditioning; and it drastically reduces the cost of electricity. Photovoltaic glass developed by Onyx Solar also filters 99% of ultraviolet radiation (UV), which may have a harmful effect on interiors, furniture and humans; and it reduces the transmission of infrared radiation by up to 90%. Given these properties, **our PV Glass maximizes the performance of the building's envelope, enabling buildings to become vertical power generators.**

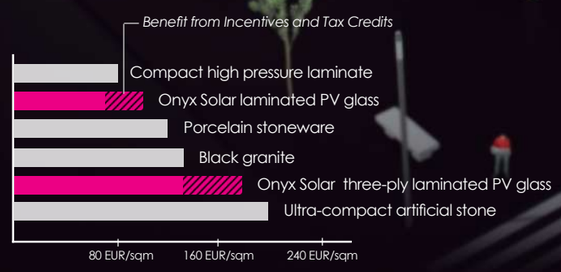
TECHNICAL DATASHEET

	no transparency		low transparency		medium transparency		high transparency	
Glass lites	2	3	2	3	2	3	2	3
Max. Power IEC 60904-1	57.6 Wp/sqm		40 Wp/sqm		34 Wp/sqm		28 Wp/sqm	
Visible Light Transmittance UNE-EN 410:1998	0.2%	0.0%	10.8%	10.1%	17.3%	16.3%	28.4%	26.7%
SHGC UNE-EN 410:1998	22% 5%*	23% 5%*	29% 12%*	29% 10%*	34% 15%*	32% 12%*	41% 21%*	37% 17%*
U - Value (W/m^2K)	5.7 1.2*	5.2 1.2*	5.7 1.2*	5.2 1.2*	5.7 1.2*	5.2 1.2*	5.7 1.2*	5.2 1.2*
UV Transmittance UNE-EN 410:1998	0.0%	0.0%	1.5%	0.1%	1.5%	0.3%	4.7%	0.4%
Exterior reflectance UNE-EN 410:1998	7.6%	7.3%	8.3%	7.3%	7.6%	7%	8.2%	7.1%
Acoustic insulation UNE-EN 12578:2002	32(-1;-3) 37(-1;-5)*	34(-1;-3) 37(-1;-5)*	32(-1;-3) 37(-1;-5)*	34(-1;-3) 37(-1;-5)*	32(-1;-3) 37(-1;-5)*	34(-1;-3) 37(-1;-5)*	32(-1;-3) 37(-1;-5)*	34(-1;-3) 37(-1;-5)*

* Values of photovoltaic glass with isolated glass units (IGU) composed of 12 mm argon chamber and low emissive interior glass. The isolated glass units (IGU) are customized in all cases according to the requirements of the project and can reach U values of up to 0.7 W/m^2K. Visit the thermal transmittance calculation tool available on our website.

COMPARISON BETWEEN A CONVENTIONAL LOW-E GLASS AND ONYX SOLAR LOW-E PHOTOVOLTAIC GLASS

FACT: USING ONYX SOLAR PV GLASS IN VENTILATED FAÇADES IS NOT MORE EXPENSIVE THAN OTHER ALTERNATIVE BUILDING MATERIALS



OUR PV GLASS MAXIMIZES YOUR BUILDING'S ENVELOPE PERFORMANCE AND TURNS IT INTO A VERTICAL POWER GENERATOR

Add photovoltaic properties to your building and **obtain over 700 € worth of energy per square meter**. In addition, benefit from incentives and Tax Credits, O&M cost decrease and a great return on investment while increasing your building's value!

CLEAN ENERGY GENERATION (PEAK POWER)
up to 57.6 Wp/Sqm
VALUE OF THE ENERGY GENERATED
up to 704 €/Sqm
NATURAL LIGHT
up to 29 % VLT
THERMAL INSULATION
up to 0.7 W/m^2K
UV & IR FILTER
up to 99 %
ACOUSTIC INSULATION
up to 37 (-1;-5)

ENERGY GENERATION
ELECTRICITY COST REDUCTION
ENERGY DEMAND REDUCTION FOR INDOOR AIR CONDITIONING

OFFSET ALL YOUR BUILDING'S ENERGY DEMAND BY USING OUR PV GLASS

Choose between our different transparency degrees and start generating free and clean electricity thanks to the sun.


Low Transparency


Medium Transparency

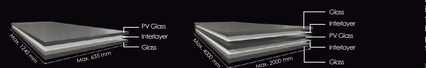

High Transparency

Note that depending on the intensity of the incident light, the perception of transparency varies. Our PV glass is optimized so that the perception of transparency is higher from the inside of the building.

HOW MUCH ENERGY WILL MY BUILDING PRODUCE WHEN INSTALLING ONYX SOLAR'S PV GLASS?

Visit our website and find out: www.onyxsolar.com/photovoltaic-estimation-tool

SELECT YOUR PV GLASS



LAMINATED GLASS

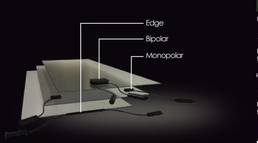
THREE-PLY LAMINATED GLASS

	SIZE (mm)		THICKNESS CONFIGURATION* (mm)		WEIGHT (Kg/sqm)	CAN IT BE CUT ON-SITE?**	IGU COMPATIBLE***	JUNCTION BOX
STANDARD 1245 x 300 1200 x 600 1245 x 635	CUSTOMIZED from 600 x 300 to 1245 x 635	LAMINATED GLASS	3 + 4		17	NO YES**	YES NO	Bipolar Monopolar
			3 + 5T		22	NO	YES	
		THREE-PLY LAMINATED GLASS	4T + 3 + 4T		30	NO YES**	YES NO	Bipolar Monopolar
			5T + 3 + 5T		35	NO	YES	Edge
			6T + 3 + 6T		41	NO	YES	
STANDARD 1245 x1242 2462 x 635 1245 x 1849 1245 x 2456	CUSTOMIZED from 1245 x 635 to 4000 x 2000 (The biggest of the market)	THREE-PLY LAMINATED GLASS	4T + 3 + 4T 5T + 3 + 5T 6T + 3 + 6T 8T + 3 + 8T		30 35 42 52	NO	YES	Bipolar Monopolar Edge
RAISED ACCESS PHOTOVOLTAIC FLOOR TILE								
STANDARD 600 x 600	CUSTOMIZED from 600 x 600 to 4000 x 2000	THREE-PLY LAMINATED GLASS	6T + 3 + 6T		42	NO	NO	Bipolar Monopolar

* Dimensions in mm. T= tempered glass according to UNE-EN12150.
** Only non-heat treated, inactive glass can be cut to size on-site. When the glass is cut it losses its photovoltaic properties and it cannot be connected electrically.
***The IGU glazing is customized in all cases according to the requirements of the project.

CUT-TO-SIZE THE GLASS ON-SITE TO ADAPT IT TO ANY SURFACE AVAILABLE

TYPES OF JUNCTION BOX



CUSTOMIZE YOUR PV GLASS WITH COLOR

If there is something that characterizes Onyx Solar, that is flexibility in design. We offer a wide range of solutions and colors to enhance your building's aesthetics.

Our photovoltaic glass is laser-etched to remove thin lines of active solid cells; this is a process aimed to let the light pass thru the glass and gain transparency. The PV active material is black by nature (faces the sun) while the interior of the glass displays an aluminum-like color. Then, when we follow this process and laminate afterwards the glass using a colored interlayer (PVB), we get the color from both sides of the glass.

This is not however, the only process we follow to offer you a wide range of colors. Besides using colored PVB interlayers – this process results in transparent colored PV Glass, we also follow other techniques to get to the desired color. We can offer solid colors through screen-printing processes and ceramic-frits too. In this case, we can get to beautiful colors with non-transparent photovoltaic glass. Depending on the light intensity, the color shade may vary both in reflection and transmittance.

Keep in mind that depending on the intensity of the light (in reflection or transmision) the color will vary on both sides. In order to ease the color selection, we have crated these two selectors:

1. Onyx Solar + Vanceva

For transparent color PV glass, ask for your Onyx Solar+Vanceva Color Selector, in which you could see over 2.000 different color combinations.

2. Onyx Solar + Ral

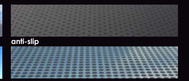
For non-transparent color PV glass, ask for your Onyx Solar+RAL Color Selector, in which you could see over 213 different colors.

OUR PV GLASS IS 100% CUSTOMIZED IN

SHAPE, THICKNESS, COLOR, TRANSPARENCY-DEGREE, SIZE, AND FINISHES

gloss or matt

metallic hint glass



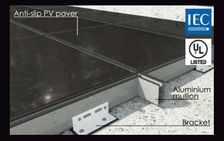
anti-slip

frit patterns

PHOTOVOLTAIC GLASS, THE ONLY BUILDING MATERIAL THAT PAYS FOR ITSELF

RAISED ACCESS PHOTOVOLTAIC FLOOR TILE

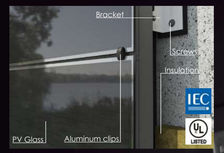
Onyx Solar has developed the first anti-slip, "walkable" PV paver. PV pavers allow building owners to install solar energy in rooftops, while preserving their habitability. They can be combined with a backlit system, providing courtesy lighting and improving the landscape design. They comply with the highest and most stringent quality standards.



no transparency | 57.6 Wp/Sqm | obtain 547 €/Sqm*

PV VENTILATED FAÇADE AND ROOF

Onyx Solar has designed a photovoltaic ventilated façade and roof system which provide undeniable aesthetics, great thermal performance, and a new source of free & clean electricity.

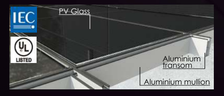


Façade: no transparency | 57.6 Wp/Sqm | obtain 449 €/Sqm*

Roof: no transparency | 57.6 Wp/Sqm | obtain 547 €/Sqm*

PHOTOVOLTAIC CANOPY

A photovoltaic canopy constitutes a constructive solution which combines energy generation, sun protection and shelter. PV glass on canopies can be supported using a variety of structural systems.

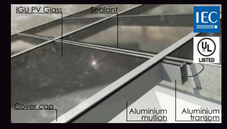


low transparency | 40 Wp/Sqm | obtain 444 €/Sqm*

PHOTOVOLTAIC SKYLIGHT

Skylights are an ideal application for photovoltaic glass. They are normally well exposed to the sunlight, allowing for optimal energy yields. Semi-transparent PV glass reduces the need for artificial lighting, generates power, and provides thermal and sound insulation. In other words, PV skylights combine active and passive properties that improve the overall efficiency of the building.

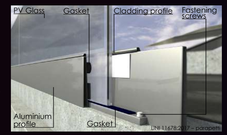
low transparency | 40 Wp/Sqm | obtain 463 €/Sqm*



PHOTOVOLTAIC BALUSTRADE

PV glass in balustrades offers safety for users and unobstructed views thanks to its high visible light transmittance. Also, it generates clean and free electricity!

high transparency | 28 Wp/Sqm | obtain 224 €/Sqm*



PHOTOVOLTAIC CURTAIN WALL

Thanks to PV curtain walls, buildings become a real power plant, keeping their design appeal, aesthetics, efficiency and functionality. PV Glass for curtain walls comes frameless, and it can be assembled into any commercial system. The transparency of the PV glass allows the natural lighting and unobstructed views.

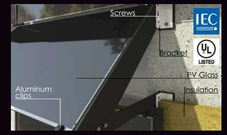
Vision Glass: medium transparency | 34 Wp/Sqm | obtain 272 €/Sqm*

Spandrel Glass: no transparency | 57.6 Wp/Sqm | obtain 449 €/Sqm*

PHOTOVOLTAIC LOUVER

This is a constructive solution that combines great energy yields alongside sun control. It filters out harmful solar radiation, and it can be combined with other building systems such as rainscreen cladding systems, which creates areas of greater visibility.

no transparency | 57.6 Wp/Sqm | obtain 704 €/Sqm*



ELECTRICAL INSTALLATION

Photovoltaic glass produces a very low current intensity at a specific voltage; therefore, the PV Glass units are grouped together in series or parallel connection to increase voltage and intensity respectively, according to the electrical installation needs. This current is directed by an electrical circuit and through the corresponding protections to a solar inverter that converts this direct current into alternating current. The alternating current has the same electrical characteristics as the network to which the consumption elements are connected, so that the two inputs can coexist without any problem. Our electrical installation process is as simple as a traditional PV panel installation.

*Price of the electricity: 0.24 EUR/kWh. Building located in Madrid (Spain). This estimation has been calculated as an approx. reference. A most accurate estimation can be calculated upon request, based on the building's real location, orientation and inclination.

CERTIFICATIONS AND TESTS

Our PV Glass has earned the UL Listed Mark and has been tested according to IEC standards successfully. We can adapt our glass to every building code and the structural requirements of the project. Our glass has been installed in buildings all over the world.

General certifications:
IEC 61646:2009. Thin-film terrestial photovoltaic (PV) modules. Design qualification and type approval.
IEC 61730-1:2007. Safety qualification for PV modules for constructive use.
UL 1703. Flat-Plate Photovoltaic Modules and Panels.
EN 14449. Glass in building. Laminated glass and laminated safety glass. Evaluation of conformity/product standard

Our PV glasses have been tested under more restrictive conditions of temperature, humidity, mechanical loads and impacts than any other building material. They are completely suitable for their architectural integration.

Temperature Cycling Test (TC200):
200 cycles of temperature from -40°C to + 85 °C.

Humidity Test (HF10):
10 cycles of humidity-freezing as 10 cycles of +85 °C following by freezing stage as 85% relative humidity at -40°C.

Damp Heat test (DHT1000):
1000 hours at + 85 °C; and 85% relative humidity.

Mechanical Loading Test:
Our system can support up to a tested load of 5400 Pa (540 kg/m²). The deflection of the system (structure and glass) is below L/240 where L is equal to the clear span length in feet of the deflected member.

Hail test:
Ice ball in diameter 25 mm at 23 m/s, directed against 11 points of impact.

Light soaking Test:
Exposure to light cycles from 600 W-1000 W/sqm until the maximum power of the given units stabilized at +/-2%.

Surface Burning Characteristics of Building Materials (ASTM E84-16): Class A (best classification).
Flame spread index 25; smoke-developed index 180.

Onyx Solar provides similar warranty terms compared to the standard warranties offered by the glass fabricator industry and the photovoltaic industry. Depending on the final Solution requested, warranties may change. The Onyx Solar standard warranty offers a five-year term for manufacturing defects, and 20 years power output (80%). Extended warranty may be granted upon case by case, upon request.

We have a global network of accredited installers and distributors trained to offer turnkey solutions

OUR FACTORY

Our state-of-the-art facilities located in Ávila (Spain), alongside our processes, have received the ISO 9001 and ISO 14001 certifications, attesting to our Quality and Environmental Management Systems in place.
From PECVD to lamination, our vertically-integrated production lines are fully operative with a production capacity of over 200,000 sqm.

The most awarded photovoltaic company ever

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