Environmental Product Declaration

as per ISO 14025 and EN 15804

Owner of the declaration:	ASTISGLASS S.L.
Publisher:	Kiwa BCS Öko-Garantie GmbH - Ecobility Experts
Programme holder:	Kiwa BCS Öko-Garantie GmbH - Ecobility Experts
Declaration number:	EPD-ASTIGLAS S.L.-092-EN
Issue date:	11.09.2020
Valid to:	10.09.2025

Insulating glass unit |Guardian Sun 4 // 16 // Float 4

This Environmental Product Declaration (EPD) refers to 1 m^2 of an insulating glass unit manufactured by Astiglass S.L.

1. General information

Manufacturer

Programme holder
Kiwa BCS Öko-Garantie GmbH
- Ecobility Experts
Marientorbogen 3-5
90402 Nürnberg
Deutschland/Germany

Declaration number
EPD-ASTIGLAS S.L.-092-EN

This declaration is based on the Product Category Rules
EN17074:2019 – Glass in building. Environmental product declaration. Product category rules for flat glass products.
Complementary to EN 15804:2012+A1:2013 - Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products.

Issue date
11.09.2020

Valid to
10.09.2025

Signature
Ppa. Frank Huppertz
(President of Kiwa BCS Öko-Garantie GmbH -Ecobility Experts GmbH)

Signature
Prof. Dr. Frank Heimbecher
(Chairman of the independent expert committee BCS Öko-Garantie GmbH – Ecobility Experts GmbH)

Product name

Owner of the declaration
Astiglass S.L.
Pol. Ind. La Campiña fase IV
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41400 Écija
Sevilla

Declared product / declared unit
1 m^2 of an insulating glass unit

Scope
This EPD refers to the insulating glass unit: Guardian Sun 4 // 16 // Float 4. The scope includes all products with similar compositions manufactured in the Astiglass S.L. factory in Écija – Sevilla (Spain).

BCS Öko-Garantie GmbH – Ecobility Experts shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

Verification
The CEN Norm EN 15804:2012-04 serves as the core PCR

Independent verification of the declaration and data according to ISO 14025:2011-10

☐internally ☒externally

Signature
Susana Tecante / Ecomatters
(External verifier)

2. Product

2.1 Product description

This environmental product declaration describes the environmental impacts of one square meter (m^2) functional unit of an insulating glass unit (IGU).

The insulating glass units (IGU) consist of two or more sheets of glass sealed at the edges with a perimeter spacer that creates an intermediate cavity forming a single unit. The IGU obtains its insulation properties mainly from the cavity introduced between the two panes of glass. This type of insulating glass unit is the most effective in reducing air-to-air heat transfer through itself.

There are several types of insulating glass units depending on the materials used in its manufacturing, as well as the treatments carried out on the glass.

These treatments can be superficial, such as the coating that cover the glass, which improves thermal insulation as well as it conserves energy and meets the requirements of the various standards on efficient energy use.

Tempered glass is annealed glass that goes through a process that involves heating the glass and then quickly cooling it again, thus changing its performance, making it more mechanically resistant and safe by breaking it into small pieces.

Laminated glass is the result of permanently bonding two or more sheets of glass with one or more intermediate layers, e.g. polyvinyl butyral (PVB), by means of heat and pressure. Laminated glass can be broken, but the fragments adhere to the PVB layer and remain largely intact, thus reducing the risk of injury and making it a safety glass.

The composition studied in this EPD is described in the next table:

Name	Guardian Sun 4 // 16 // Float 4
Glass 1	Coated glass 4 mm – Guardian Sun
Sealant 1	Polybutadiene GD 115
Separator	Aluminum 16 mm
Sieve	Zeolite
Gas cavity	Argon
Sealant 2	Silicone IG25 HM
Glass 2	Glass float 4mm

Table 1. Composition Insulating Glass Unit.

Astiglass can produce IGU between maximum dimensions of 6000x3300 mm and minimum dimensions of 350x180 mm. The thickness of the IGU may vary from 12 mm to 100 mm.

2.2 Application

According to EN 1279:2018 the main intended uses of insulating glass units are installations in windows, doors, curtain walling, bonded glazing for doors, windows and curtain walling, roofs and partitions.

The achieving of the requirements of this standard means that the insulating glass units meet the needs of the intended uses and ensures through the conformity assessment that the visual, energy, acoustic and safety parameters do not change significantly over time.

2.3 Technical Data

The technical data for insulating glass units varies mainly from the type of glass used and whether or not the insulating glass unit contains gas.

In this case the insulating glass unit does contain gas and one of the glasses contains a coating. The following simulation is for a specific coating, although the environmental impact is not affected by the use of different coatings.

Characteristics	Unit	Guardian Sun 4 // 16 // Float 4
Fire resistance		NPD
Reaction to fire		NPD
External fire performance		NPD
Bullet resistance		NPD
Explosion resistance		NPD
Fracture resistance		NPD
Impact resistance of pendulum body		NPD
Resistance to sudden temperature variations and temperature differentials	K	40K / 40K
Resistance to wind, snow, load in m/ma	mm	4/16/4
Acoustic attenuation to direct airborne noise	dbA	36 (-1; -5)
Emissivity	e_d	NPD
Thermal properties (U-value)	$W/(m^2 \cdot K)$	1,3
Light transmittance τ_V		0,7
Light reflection ρ_V		0,19 / 0,17
Solar energy transmittance τ_e		0,41
Solar energy reflection ρ_e		0,39 / 0,40
Solar factor g		0,43

Table 2. Technical Data.

2.4 Placing on the market / Application rules

The quality requirements for Insulating Glass Units are in accordance with the harmonized standard EN 1279-5:2018 (IGU) according to the CE marking of the Construction Product Regulation (EU) No. 305/2011.

Astiglass holds, for this product, the Applus Quality mark in accordance with the SPC-021 (IGU) Particular Certification Systems.

This product has the CE marking and the Applus quality mark.

2.5 Base materials / Ancillary materials

The following table shows the percentages of the main components for an insulating glass unit.

In the composition studied, at the date of issue of this statement, no substance is listed in the "candidate list of substances of very high concern (SVHC) for authorization" in concentration above 0.1% weight by weight, following the European REACH regulation.

Components	Guardian Sun 4 // 16 // Float 4 Weight (%)	Comments
Glass	94.3	CAS No.: 65997-17-3
Layer	<0.01	Metal oxides, which provide thermal properties to the glazing
Separator (Aluminium or plastic)	0.7	Aluminum or plastic
Sealant 1 (Butyl)	0.1	Polymer
Sieve	0.5	Zeolite
Gas	0.1	Argon
Sealant 2 (Silicone, polyurethane or polysulphide)	4.3	Polymer

Table 3.Raw materials.

2.6 Manufacture

During the manufacture we can differentiate between several stages:

1. CUTTING – Information on dimensions and units from "Production Planning" is provided to the cutting tables and their optimization, if necessary. The glasses are cut, then the cuts are opened and finally the glasses are placed on the racks according to the indications of the optimization program. Depending on the size of the glass, the excess material is either stored in a waste container or thrown away. The trestles, identified with the batch number and the material they contain, are placed in the cut material warehouse.

2. WASHING – The material is washed with demineralized water.

3. PROFILE CUTTING – The aluminium profile is cut and joined with brackets. Once cut, it is hung on racks until the next process.

4. SALT FILLING – The profile is drilled in one of its corners and the two sides adjacent to that corner are filled with the molecular sieve. Once filled, the holes are sealed with butyl.

5. BUTYLING – Application of the first sealant or first barrier. Each of the frames that are to make up the chamber receives a continuous adhesive bead on each of the sides where they shall adhere to the glass.

6. ASSEMBLY – The profile with the adhesive butyl is placed on the first glass. Then the second glass is placed on the face of the free profile. The assembly is pressed so that the profile adheres perfectly to the glass.

7. ARGON FILLING – Once the insulating glass is formed, the argon gas is filled.

8. SEALING – Application of the second sealant. The formed glass goes to the sealer where the second sealant is filled covering the space between the profile and the edge of the glass. Once the entire perimeter is filled, the glass is placed on trestles where the sealant hardens.

2.7 Reference Service Life

The reference service life (RSL) for this type of product is 30 years as specified in the standard EN 17074.

3. LCA: Calculation rules

3.1 Declared unit

The declared unit is one square meter (m^2) of an insulating glass unit (IGU).

	Guardian Sun 4 // 16 // Float 4 Value	Unit
Declared unit	1	m^2
Specific weight	21.209	kg/m^2

Table 4. Declared unit.

3.2 System boundary

This is an environmental product declaration from cradle to factory gate. It takes into consideration the impact of all the previous stages and the manufacturing stage of double glazing. All transport processes (to the factory) are within the limits of the system. Therefore, the system boundary of the manufacturing stage is the finished product at the factory door. According to EN 15804 this corresponds to product stage A1 to A3.

3.3 Estimates and assumptions

The following estimates have been taken into account for the calculations:

I. For the following raw materials: molecular sieve, sealants and gas, an estimate has been made based on the average expense of the Astiglass company.

II. For the raw materials used in the manufacture of the insulating glass unit that do not come directly from the factory of origin (supplier) but from a distributor, the distance between the factory of origin and the distributor and from the latter to the company Astiglass has been taken into account in order to estimate the actual full distance from the origin.

III. The calculation of energy is determined by the consumption of the machinery between the actual hours of operation during the year 2018.

3.4 Cut-off criteria

All process-specific data are collected for production modules A1 to A3. All flows that contribute more than 1% to the total mass, energy or environmental impact of the system are considered in the LCA. The sum of all omitted processes of mass and energy does not exceed 5% per module.

3.5 Period under review

The data used for this report is based on the 2018 production.

3.6 Comparability

In principle, a comparison or evaluation of EPD data is only possible if all data sets to be compared have been created in accordance with EN 15804 and the building context or the product-specific performance characteristics have been taken into account.

The specific characteristics of the product should be considered. Secondary data for modelling the environmental impacts of the production stage are based on the Eco Invent 3.4 database except for the profiles that come from Guardian as they have their own DAP based on Gabi 6.

4. LCA: Results

The following tables show the results of the impact assessment indicators, resource use, waste and other output streams. The results presented here refer to the declared average product.

Description of the system boundary (X = Included in LCA; MND = Module not declared)															
Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from manu-facturer to place of use	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishmen	Operational energy use	Operational water use	De-construction / demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Results of the LCA –Environmental impact:
1m² of insulating glass unit: Guardian Sun 4 // 16 // Float 4

Parameter	Unit	A1-A3
Global warming potential	[kg CO_2-Eq.]	3.63E+1
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	5.50E-6
Acidification potential of land and water	[kg SO_2-Eq.]	2,70E-01
Eutrophication potential	[kg $(PO_4)^3$-Eq.]	2,65E-02
Formation potential of tropospheric ozone photchemical oxidants	[kg Ethen-Eq.]	1,70E-02
Abiotic depletion potential for non fossil resources	[kg Sb-Eq.]	1,24E-04
Abiotic depletion potential for fossil resources	[MJ]	4,67E+02

Results of the LCA –Resource use:
1m² of insulating glass unit: Guardian Sun 4 // 16 // Float 4

Parameter	Unit	A1 - A3
Renewable primary energy as energy carrier	[MJ]	INA
Renewable primary energy resources as material utilization	[MJ]	INA
Total use of renewable primary energy resources	[MJ]	4,05E+01
Non renewable primary energy as energy carrier	[MJ]	INA
Non renewable primary energy as material utilization	[MJ]	INA
Total use of non renewable primary energy resources	[MJ]	4,84E+02
Use of secondary material	[kg]	0,00E+00
Use of renewable secondary fuels	[MJ]	0,00E+00
Use of non renewable secondary fuels	[MJ]	0,00E+00
Use of net fresh water	[m³]	1,82E-01

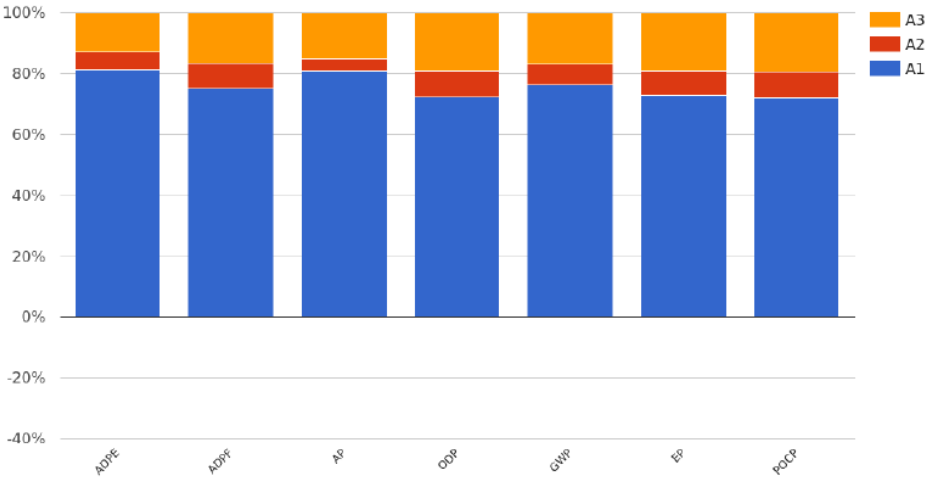
Results of the LCA –Output flows and waste categories:
1m² of insulating glass unit: Guardian Sun 4 // 16 // Float 4

Parameter	Unit	A1 – A3
Hazardous waste disposed	[kg]	2,48E-03
Non hazardous waste disposed	[kg]	6,03E+00
Radioactive waste disposed	[kg]	1,64E-03
Building materials for re-use	[kg]	0,00E+00
Materials for recycling	[kg]	2,55E+00
Materials for energy recovery	[kg]	0,00E+00
Exported energy	[MJ]	0,00E+00

INA – Indicator Not Assessed

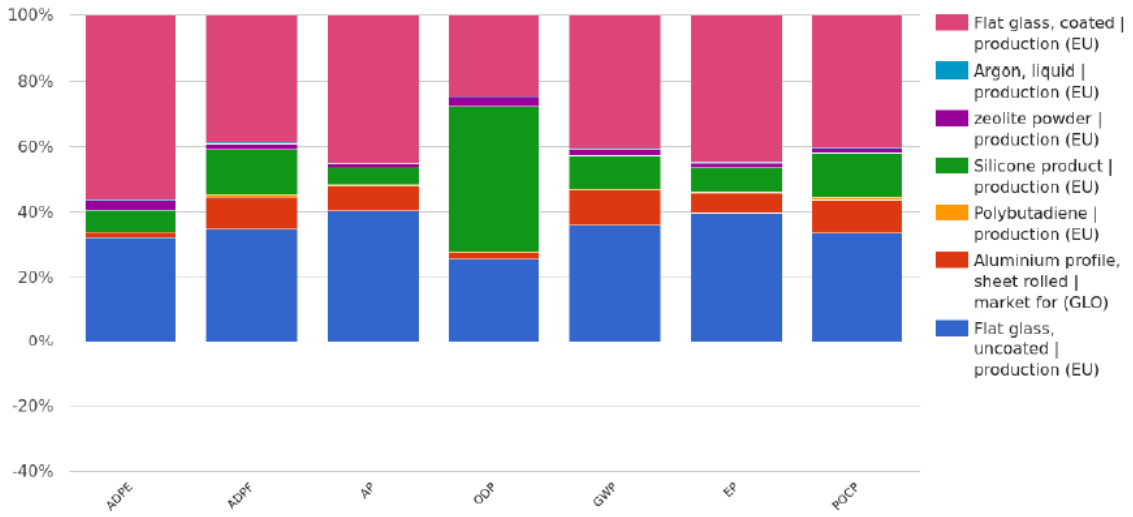
5. LCA: Interpretation

Percentage graphics have been obtained for the composition estudied. In them you can see the influence of each stage or of each raw material for each of the main environmental impacts.



Graphic 1. Contribution by stages of composition Guardian Sun 4 // 16 // float 4

The environmental impact generated in the composition of the Guardian Sun 4 // 16 // float 4 insulating glass unit is determined by the extraction and processing of the raw materials (module A1), followed by the manufacturing energy cost as well as the waste generated during the process (module A3). The stage that generates the least environmental impact is that corresponding to the transport of the materials (module A2).



Graphic 2. Contribution of raw material to composition Guardian Sun 4 // 16 // float 4.

As for the contribution to the environmental impact by each of the materials used, the contribution of silicone (sealant 2) stands out, as we must bear in mind that the insulating glass units studied are made up of more than 90% by mass of glass and less than 5% by mass of silicone.

Silicone is the product that most affects the depletion of the ozone layer (ODP). This impact is strongly related to the use of fossil fuels. The substitution of silicones for other sealants, such as polysulfides, can be beneficial to reduce this environmental impact.

The spacer, in this case made of aluminium, also has a significant impact in that it is less than 1% by mass.

6. References

LCA Method – Ecobility Experts
LCA Software – Simapro 9.0.0
Characterization method – CML-IA (Baseline) version 4.1, dated October 2012
LCA database profiles – EcoInvent version 3.5
Used protocol – 25.011.151214 – Protocol NIBE's EPD application, December 2015
Version database – v2.94 (2020-07-13)

EN 1279:2018 - Glass in Building - Insulating glass units

ISO 14025 Environmental labels and declarations - Type III environmental declarations - Principles and procedures.

EN 15804:2012+A1 - Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

EN 17074:2019 - Glass in building. Environmental product declaration. Product category rules for flat glass products.

Guardian flat, laminated and coated glass. Declaration code: EPD-GFEV-GB19.0. Publication: 01.07.2016.

Allgemeine Produktkategorieregeln für Bauprodukte 2017-06-05 - Ecobility Experts

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