Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

GUARDIAN SELECT® INSULATING GLASS UNIT: Guardian Sun® LamiGlass 44.1/6-24/4

From

GUARDIAN SELECT® GROUP LIMITED

EPD of multiple products, based on a representative product.

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	S-P-11872
Publication date:	2023-12-14
Valid until:	2028-12-14

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
E-mail:	info@environdec.com

Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): **PCR 2019:14** Construction products (EN 15804+A2.2019) Version 1.3.1 **PCR 2019:14-c-PCR-009 -** Flat glass products (EN 17074:2019) Version 2021-01-25 **EN 17074:2019** Glass in building. Environmental product declaration. Product category rules for flat glass products.
PCR review was conducted by: The Technical Committee of the International EPD® System. A full list of members available on www.environdec.com. The review panel may be contacted via info@environdec.com.
Life Cycle Assessment (LCA)
LCA accountability: APPLUS – LGAI Technological Center S.A
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification by individual verifier Third-party verifier: Marcel Gómez Ferrer Approved by: The International EPD® System

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD:

Guardian Select® Group Limited. Represented by Guardian Glass España Central Vidriera, S.L.
Calle José Matía, 36-01400 Llodio (Álava)
Contact: Ana Martínez De Lecea Noaim
Email: guardianselect@guardian.com
Web: www.guardianglass.com

Description of the organisation:

Guardian Glass, the core business unit of Guardian Industries, is one of the world's largest manufacturers of float and coated glass. In its 24 float glass lines worldwide, Guardian Glass manufactures high-performance glass for use in exterior architectural applications (both residential and non-residential) and interior applications, as well as for transportation and technical products. Guardian Glass glass can be found in homes, offices, automobiles and some of the world's most iconic buildings. The Guardian Glass Science & Technology Centre is constantly working to develop new glass products and solutions using the latest technology to help customers- see what's possible®.

Guardian Select®

is the registered trademark for insulating glass units, whose use Guardian Glass grants to double and triple glazing manufacturing companies in Spain and Portugal selected for their manufacturing quality, which ensures that our glass arrives at your home in optimum condition. The licensees of the GUARDIAN SELECT® insulating glass brand certify their quality in compliance with the CE Marking (EN 1279 standard) and through voluntary quality seals accredited by ENAC (Spain) and IPQ (Portugal).

Product-related or management system-related certifications:

CE Marking of the Construction product Regulation (EU) No. 305/2011, according to EN 1279-5:2018 Glass in building. Insulating glass units. Part 5: Product standard.

Certification according EN 1279-1:2018 Glass in building. Insulating glass units. Part 1: Generalities, system description, rules for substitution, tolerances and visual quality. Certificated by voluntary brands Applus+/ N, accredited by ENAC.

Name and location of production site(s):
The input data are representative of the IGU Guardian Sun® LamiGlass 44.1/6-24/4, as an average of the data obtained from the **13 Spanish companies** that make up this group EPD, all belonging to the **Guardian Select® group**;

Factory name	Location of production site
Al-to Cristal, S.L.	Torredonjimeno (Jaén)
Barnaglass, S.A.	Lliça de Vall (Barcelona)
Control Glass Acústico y Solar, S.L.	Teruel (Teruel)
Cristaleria Crevillente, S.L.	Loriguilla (Valencia)
Cristaleria Joma (Jose Luis Jimenez Casapie)	Fuente el Saz de Jarama (Madrid)*
Cristaleria Lorca, S.L.	Valverde del Camino (Huelva)
Cristalerias A. lopez utiel, S.L	Cenizate (Albacete)
Diaz Herrero, S.L. Industrias del Vidrio	Fuenlabrada (Madrid)
Nazan Aluminium, S.L.	Villacañas (Toledo)
Sedatec Corporation, S.L.	Pulpi (Almería)
Unión Vidriera Levante S.L	Vall de Uxo (Castellón)
Vidrios del Valle Manufacturas, S.L.	Pozoblanco (Córdoba)
Vitralba, S.L.	Vigo (Pontevedra)

* Change of location of the company to Alalpardo (Madrid) in 2023.

The IGUs manufacturers in this study, comply with the Construction Products Regulation (EU) 305/2011, as well as with the CE marking requirements according to the harmonized standard EN 1279-5:2018 and have a quality mark accredited by ENAC.

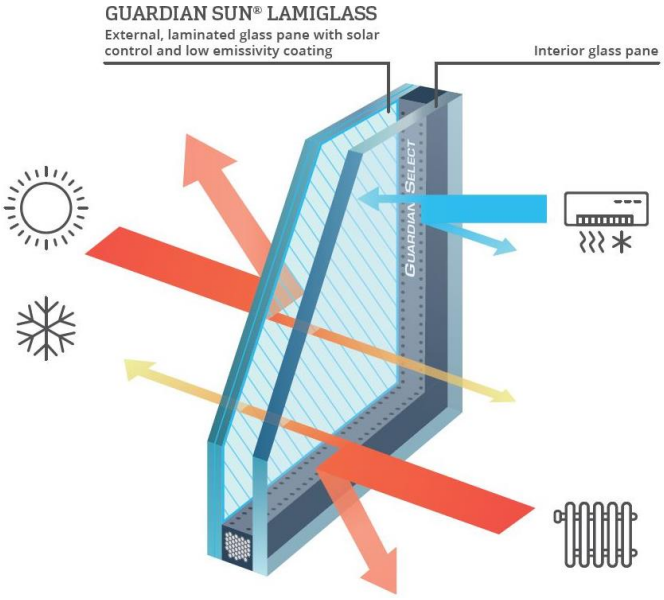
Product information

Product name:
Guardian Select® Insulating glass unit; Guardian Sun® LamiGlass 44.1/6-24/4.
Include profiles of 6, 8, 10, 12, 14, 16, 18, 20, 22 and 24 mm. The EPD is an EPD of multiple products, based on a representative product Guardian Sun® LamiGlass 44.1/16/4.

Product description:

An **insulating glass unit (IGU)**, also called double (or triple) glazing, is the assembly of two (or three) panes of glass separated by a spacer profile and sealed together, creating tight chamber inside. This chamber can include air or gas, in our case gas is not included. This unit provides greater thermal and acoustic insulation than single glazing. Adding Guardian Glass high performance glass to this unit further enhances the thermal insulation and solar control performance of double or triple glazed units, contributing to a more efficient enclosure. Provided this insulating glass unit is properly manufactured. Gas is not included in this study.

Guardian Sun® LamiGlass 44.1/16/4



Guardian Select® Insulating Glass unit consisting of Guardian Sun® high performance glass assembled in a 44.1 laminated glass plus a 16 mm thick air gap and a 4 mm float glass.

Guardian Sun® is a neutral-looking glass that provides thermal insulation and solar control. This means that it contributes to improving the energy efficiency of homes*, provides thermal comfort during winter and summer, letting in natural light and the ability to enjoy outside views.

When Guardian Sun® glass is assembled into Guardian LamiGlass® laminated glass, it adds security features against burglary attempts and impacts in case of accidents. Guardian LamiGlass® is composed of two sheets of glass that have been bonded together with an interlayer film (called PVB). We obtain a set that has the appearance of a single glass and that, in case of breakage, the

glass fragments remain attached to this film, thus providing greater security. In addition, Guardian LamiGlass® absorbs 99% of UV rays.

**Results obtained in a study carried out by Tecnalia, for a 100 m² house in Madrid with north-west orientation built before 2006, where 4/6/4 double glazing with aluminium carpentry without thermal break was replaced by double glazing with Guardian Sun®, thermal break and argon. Heating and air conditioning by heat pump system.*

In this case the unit of study is 1m² of IGU, with a total weight of 30,78 kg/m².

The results obtained are valid for profile ranges from 6mm to 24mm, maintaining the composition of the glasses: a laminated glass with Guardian Sun coating of 8mm thickness (44.1) and a float glass of 4mm thickness.

IGUs are a definitive building element and can be adapted to every project, there is almost no limit to what can be created with glass.

The main uses of insulating glass units in building construction are in windows, doors, curtain walling, roofing, partitions, etc.

Technical data:

The CE marking applies to the IGU according to the harmonised standard EN 1279-5:2018.

The declared performance of the most representative composition of the range studied, and the most efficient composition in terms of thermal perfomance has been declared, **Guardian Sun® LamiGlass 44.1/16/4 Float,** according to the information provided by the manufacturers, is given bellow:

Declared performance for: **Guardian Sun® LamiGlass 44.1/16/4 Float**	
Essential Characteristics	**Classes and/or threshold levels**
Fire resistance	NPD
Bullet resistance	NPD
Bursting strength	NPD
Pendulum body impact resistance	2(B)2/NPD
Resistance to sudden temperature variations and temperature differentials [K]	40K/40K
Resistance against wind, snow, permanent load and/or imposed loads of the glass unit [Mpa]	45/45-45
Sound attenuation to direct airborne noise [dbA]	36 (-1; -5)
Thermal properties (Uv value) [W/(m2-K)]	1,3
Light transmittance	0,69
Light reflectance	0,19/0,17
Solar energy transmittance	0,38
Solar energy reflectance	0,32/0,40
Solar factor	0,41

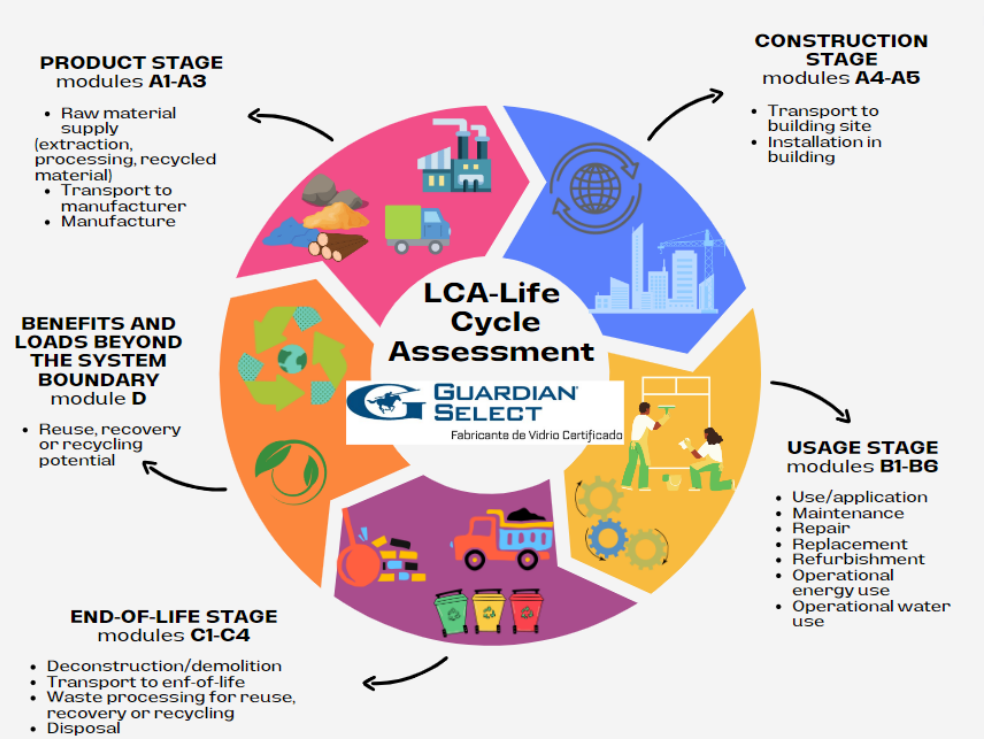
NPD: Non Performance Determined

LCA information

Declared Unit	1 m^2 of insulating glass Guardian Sun® LamiGlass 44.1/16/4, measuring 1x1 m and 28 cm thick, weighs 30,78 kg
Reference service life	30 years
Time representativeness	Data were collected for the calendar year 2021
UN CPC code	These are classified CPC 37116 under the UN CPC classification system V2.1.
Database(s) and LCA software used	The LCA database profile is EcoInvent version 3.6 and the LCA software is SimaPro 9.1.1 with the characterization method based in EN 15804 + A2 Method v1.0.
Organisation carrying out the underlying LCA study	Applus- Lgai Technological Center, is the organisation carrying out the underlying LCA study.
System boundaries	This is a **Cradle to gate with options**, modules A1–A3 + A4 + C1–C4 and D.
Geographical scope	The input data are representative of the European Union.
Assumptions	The IGU composition on which this EPD is based in a Guardian Sun® LamiGlass 44.1/16/4 as it is the most representative on the market in terms of insulation and solar control. The EPD is an EPD of multiple products (profile range 6-24 mm), based on a representative product Guardian Sun® LamiGlass 44.1/16/4. For the glass, the profiles of laminated 44.1, uncoated float glass 4 mm and Guardian Sun® 1m^2 coating profile, obtained from the Guardian EPD (Declaration code: EPD-GFEV_GB_19.2) and Guardian as supplier, are considered. As this is a group EPD consisting of 13 Spanish Guardian Select® Group companies, data has been collected from each company and averaged.
Data quality	The data are obtained from the 13 spanish companies, analyzed by APPLUS - LGAI Technological Center S.A. The generic data are taken from the EcoInvent database (version 3.6). The data quality assessment covers geographical representativeness, technological representativeness and temporal representativeness,

	and is based on the data quality criteria of Annex E, Table E.1 of EN 15804+A2:2019. The overall data quality can be classified as good or very good. Geographically, the data are Spanish or, failing that, European. Temporally, the data are current, thus qualifying as very good. Technically, they all follow the same manufacturing system with the same type of machinery. The calculation of the system LCA did not consider flows related to the installation into the building, use or application of the installed product, maintenance and repair.
Allocation	The allocation, based on physical mass criteria for inputs of materials, such as raw materials or packaging materials, for consumption, such as energy and water and for production waste, have been allocated from 2021 production-weighted averages of 13 Spanish factories that are part of the Guardian Select® Group.
Substances of very high concern	The raw materials that make up IGU do not contain any substances of very high concern (SVHC) or are not relevant, at less than 0.1% by weight of the product. All relevant safety data sheets are available from the suppliers.

System diagram:



Cut-off criteria:

The life cycle analysis is based on the EN 15804:2012 + A2:2019 standard, where the following cutting criteria are applied:

A cut-off rule of 1% is applied. It means that 99% of the mass of the product content and 99% of the energy use of the product life cycle are accounted for.
The polluter pays principle, the modularity principle and the exclusions from the study (long-term emissions) have been considered.

Stages

Product Stage (A1-A3): The production stage consists of the extraction of raw materials, transportation of the raw materials, processing the raw materials into materials and the production of the product. The required energy for production, external treatments, ancillary materials, packaging material and production emissions are included. The energy consumed comes from the Spanish electricity mix differentiating the two types of energy used renewable 2,23E-02 kg CO_2 eq./kWh and non-renewable 5,40E-01 kg CO_2 eq./kWh. The data used are the result of the weighted averages of all participants with respect to their production.

In Module A2 to calculate the distances from the raw materials to the IGU production site, the weighted average distance between the origin of the raw materials and the 13 manufacturing companies that make up this Group EPD has been taken into account.

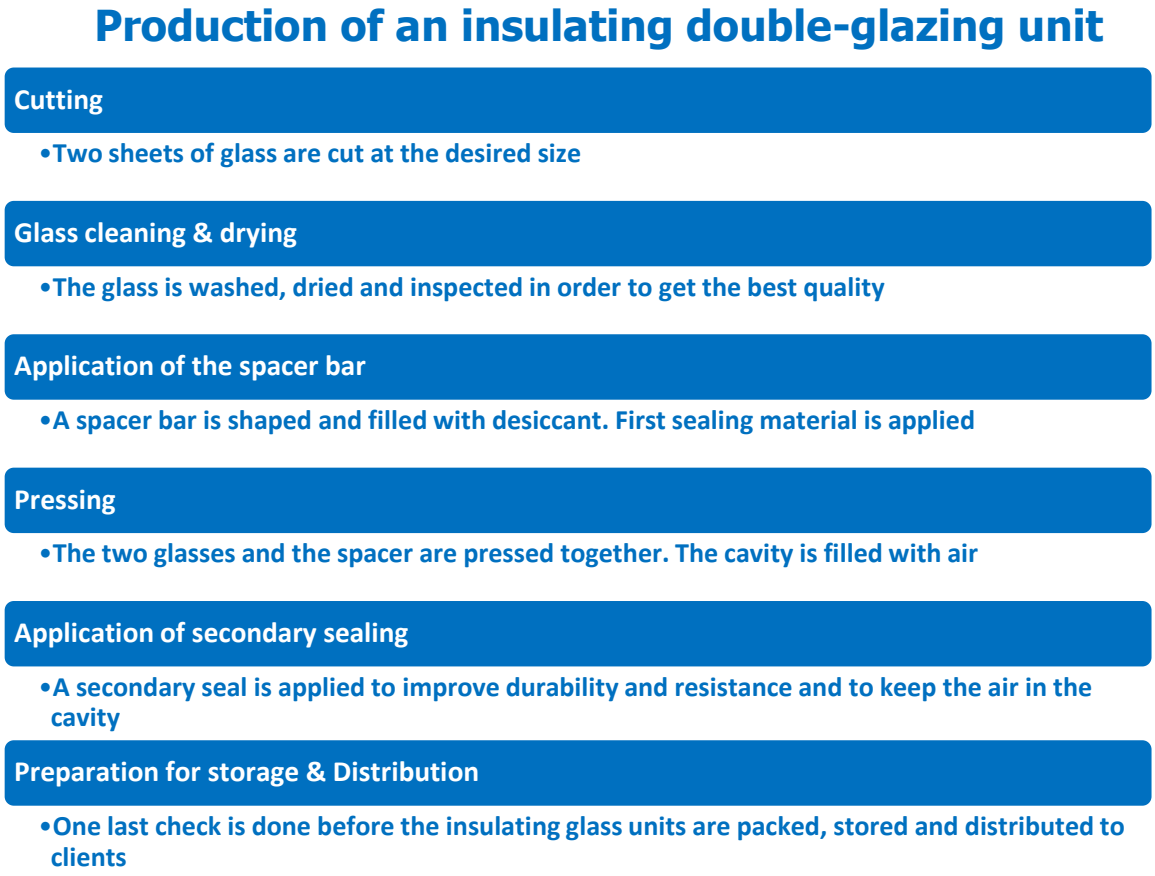
Where there are distributors, these have also been taken into account. The default truck has been used.

Production process

The production process that companies manufacturing IGU can have is detailed in a generic way:

1. Reception and storage of raw materials
2. Cutting of the glass and pickling by optimising the sheets.
3. Cutting and filling of the spacer profile with molecular sieve. Filling of at least two adjacent sides. Closing of the profile with corner keys or gaskets.
4. Glazing if required, washing of the glass with demineralised water and drying.
5. Hot butyl is applied to the spacer profile, as a first sealing barrier.
6. Double glazing assembly. The butyl profile is positioned on the first pane and assembled with the second pane automatically.
7. The two panes are then pressed together to ensure better adhesion of the butyl. Gas filling is optional at this stage. (Gas is not included in this study).
8. The second sealant is applied between the two panes of glass and the profile to guarantee its watertightness.
9. The piece is removed, the appropriate corks are placed on it and it is placed on an easel, where it will remain until it is cured.
10. Prepare for dispatch.

The production process is represented in the following diagram:



Construction stage (A4): This stage consists the transport of the product from production plant to the construction site.
An average distance of 100km is considered as sales are usually local.

SCENARIO INFORMATION	VALUE/DESCRIPTION
Type of vehicle used for transport	Lorry (Truck), unspecified
Vehicle lead capacity	Default value from Ecoinvent 3.6
Fuel type and consumption	Default value from Ecoinvent 3.6
Distance to the site	100 km
Capacity of utilization (including empty returns)	Default value from Ecoinvent 3.6
Bulk density of transported products	109,9 kg/m^3
Volume capacity utilization factor	Not Applicable

Use stage (B1-B7): This stage consists of the impacts arising from components of the building and construction works during their use. These stages are not included in the scope of this EPD.

End of life stage (C1-C4): When the end of the life stage of the building is reached, the de-construction/demolition begins. This EPD includes de-construction/demolition (C1), the necessary transport (C2) from the demolition site to the sorting location and distance to final disposal. The end of life stage includes the final disposal to landfill (C4), incineration (C3) and needed recycling processes up to the end-of-waste point (C3). Loads and benefits of recycling, re-use and exported energy are part of module D.

SCENARIO INFORMATION	VALUE/DESCRIPTION
Collection process specified by type	Aluminium, plastics, polyolefines, finishes, steel and glass.
Recovery system specified by type	0,645 kg for Incineration 21,128 kg for Recycling 0 kg for re-Use
Elimination specified by type	9,009 kg disposal to landfill
Assumptions for scenario development	Lorry (Truck), unspecified (default) | market group for (GLO) Distance to landfill 100 km, to incineration 150 km and to recycling 50 km

Benefits and Loads beyond the system boundary (Module D): This stage contains the potential loads and benefits of recycling and re-use of raw materials/products. The loads contain the needed recycling processes from end-of-waste-point up to the point-of-equivalence of the substituted primary raw material and a load for secondary material that will be lost at the end-of-life stage.

The loads and benefits of recycling and reuse are included in this module. The benefits are calculated based on the primary content and the primary equivalent.

In addition, the benefits of energy recovery are granted at this stage. The amount of avoided energy is based on the Lower Heating Values of the materials and the efficiencies of the incinerators as mentioned in the NMD Determination method v1.0 or EcoInvent 3.6 (2019).

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	EU	EU	ES	ES	-	-	-	-	-	-	-	-	EU	EU	EU	EU	EU
Specific data used	>90% GWP			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	< 10%*			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	<10%			100 km	-	-	-	-	-	-	-	-	-	-	-	-	-

X= included in LCA, ND=not declared

*The product variations, taking into account profiles from 6 to 24 mm, are less than 10%, with the exception of Eutrophication in freshwater (EP-fw) with a 21% and results of Human toxicity, Cancer (HTP-c), Resource use minerals and metals (ADP-mm) and Water use (WDP). The last ones should be used with caution according to EN 15804. See "Classification of disclaimers to the declaration of core and additional environmental impact indicators" on page 19.

Content information

Product components	Weight, %	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Aluminium profile 16 mm	0,6% - 0,4%	74,0%	0
Inner sealant - Butyl	<0,1%	0	0
Molecular sieve - Zeolite	0,6% - 0,4%	0	0
Outer sealant - Polysulfide	2,1% - 0,8%	0	0
Outer sealant - Silicone	0,2% - 0,1%	0	0
Corner keys - polypropylene	<0,1%	0	0
Profile gaskets - steel	<0,1%	29,6%	0
Laminated safety glass- Guardian Sun® LamiGlass 44.1	65,7% - 64,2%	21,2%	0
Float glass 4 mm	32,9% - 32,1%	23,2%	0
TOTAL (Kg)	**30,782 kg**	**6,660 kg**	**0**
Packaging materials	**Weight, kg/UD**	**Weight-% (versus the product)**	**Weight biogenic carbon, kg C/kg**
Film - polyester	0,055	0,1%	0
Cork pieces	0,008	<0,1%	0,50
Cardboard	0,100	0,1%	0,50
TOTAL	**0,163 kg**	**0,2%**	

Environmental Information

Insulating glass Guardian Sun® 44.1/6-24/4

GUARDIAN SELECT
Fabricante de Vidrio Certificado

The results presented below correspond to the results for 1 m^2 of insulating glass Guardian Sun® 44.1/16/4, measuring 1x1 m and 28 cm thick, weighs 30,78 kg.

The results of the impact assessment are only relative statements that do not make any statements about end-points of the impact categories, exceedance of threshold values, safety margins or risks.

Results:

Potential environmental impact – mandatory indicators according to EN 15804

Results per functional or declared unit																
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-fossil	kg CO_2 eq.	5,96E+01	4,18E-01	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,77E-01	1,85E+00	3,94E-02	-7,22E+00
GWP-biogenic	kg CO_2 eq.	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
GWP-luluc	kg CO_2 eq.	3,06E-02	1,53E-04	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,02E-04	1,67E-04	7,74E-06	-7,43E-03
GWP-total	kg CO_2 eq.	5,99E+01	4,18E-01	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,77E-01	2,02E+00	3,95E-02	-7,28E+00
ODP	kg CFC 11 eq.	5,33E-05	9,22E-08	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	6,12E-08	3,27E-08	1,88E-08	-3,28E-07
AP	mol H^+ eq.	1,80E-01	2,42E-03	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,61E-03	1,35E-03	3,78E-04	-3,54E-02
EP-freshwater	kg P eq.	2,45E-04	4,21E-06	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,80E-06	7,00E-06	2,94E-07	-2,74E-04
EP-marine	kg N eq.	3,58E-02	8,53E-04	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	5,67E-04	4,69E-04	1,42E-04	-5,08E-03
EP-terrestrial	mol N eq.	4,52E-01	9,41E-03	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	6,25E-03	4,60E-03	1,56E-03	-8,02E-02
POCP	kg NMVOC eq.	1,10E-01	2,69E-03	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,78E-03	1,30E-03	4,46E-04	-1,55E-02
ADP-minerals&metals*	kg Sb eq.	6,02E-04	1,06E-05	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	7,02E-06	9,17E-06	3,43E-07	-2,42E-04
ADP-fossil*	MJ	7,95E+02	6,30E+00	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,18E+00	2,95E+00	1,25E+00	-6,80E+01
WDP*	m^3	5,03E+00	2,25E-02	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,50E-02	1,10E-01	3,88E-03	-2,21E+00
Acronyms	**GWP-fossil** = Global Warming Potential fossil fuels; **GWP-biogenic** = Global Warming Potential biogenic; **GWP-luluc** = Global Warming Potential land use and land use change; **ODP** = Depletion potential of the stratospheric ozone layer; **AP** = Acidification potential, Accumulated Exceedance**; EP-freshwater** = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; **EP-marine** = Eutrophication potential, fraction of nutrients reaching marine end compartment; **EP-terrestrial** = Eutrophication potential, Accumulated Exceedance; **POCP** = Formation potential of tropospheric ozone; **ADP-minerals&metals** = Abiotic depletion potential for non-fossil resources; **ADP-fossil** = Abiotic depletion for fossil resources potential; **WDP** = Water (user) deprivation potential, deprivation-weighted water consumption															

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

Potential environmental impact – additional mandatory and voluntary indicators

Results per functional or declared unit																
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[1]	kg CO_2 eq.	5,97E+01	4,18E-01	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,77E-01	1,85E+00	3,94E-02	-7,23E+00
ETP - fw	CTUe	1,56E+03	5,62E+00	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,73E+00	7,73E+01	3,20E+00	-2,31E+02
PM	disease incidence	3,25E-06	3,76E-08	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,49E-08	1,95E-08	8,05E-09	-3,18E-07
HTP - c	CTUh	1,53E-08	1,82E-10	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,21E-10	2,55E-09	1,46E-11	-2,55E-09
HTP - nc	CTUh	6,07E-07	6,14E-09	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,08E-09	1,11E-08	3,80E-10	-7,70E-08
IR	kBq U235 eqv.	1,85E+00	2,64E-02	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,75E-02	1,49E-02	5,41E-03	-2,01E-01
SQP	Pt	9,94E+01	5,46E+00	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,63E+00	2,61E+00	2,75E+00	-4,08E+01
Acronyms	**ETP-fw** = Ecotoxicity, freshwater; **PM** = Particulate Matter; **HTP-c** = Human toxicity, cancer; **HTP-nc** = Human toxicity, non-cancer; **IR** = Ionising radiation, human health; **SQP** = Land use.															

[1] This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero.

Use of resources

Results per functional or declared unit																
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	3,53E+01	7,89E-02	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	5,23E-02	2,02E-01	1,93E-02	-7,07E+00
PERM	MJ	3,55E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	3,88E+01	7,89E-02	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	5,23E-02	2,02E-01	1,93E-02	-7,07E+00
PENRE	MJ	7,46E+02	6,69E+00	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,44E+00	3,13E+00	1,32E+00	-7,29E+01
PENRM	MJ	5,56E+01	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-8,54E-03
PENRT	MJ	8,01E+02	6,69E+00	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,44E+00	3,13E+00	1,32E+00	-7,29E+01
SM	kg	7,33E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m^3	1,42E-01	7,67E-04	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	5,09E-04	3,52E-03	1,48E-03	-6,53E-02
Acronyms	**PERE** = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; **PERM** = Use of renewable primary energy resources used as raw materials; **PERT** = Total use of renewable primary energy resources; **PENRE** = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; **PENRM** = Use of non-renewable primary energy resources used as raw materials; **PENRT** = Total use of non-renewable primary energy re-sources; **SM** = Use of secondary material; **RSF** = Use of renewable secondary fuels; **NRSF** = Use of non-renewable secondary fuels; **FW** = Use of net fresh water															

Waste production and output flows

Waste production

Results per functional or declared unit															
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	5,86E-03	1,60E-05	ND	ND	ND	ND	ND	ND	ND	ND	1,06E-05	8,46E-04	1,39E-06	9,76E-04	1,06E-05
Non-hazardous waste disposed	kg	4,73E+00	4,00E-01	ND	ND	ND	ND	ND	ND	ND	ND	2,65E-01	7,26E-01	9,00E+00	-7,48E-01	2,65E-01
Radioactive waste disposed	kg	7,36E-03	4,14E-05	ND	ND	ND	ND	ND	ND	ND	ND	2,75E-05	1,75E-05	8,48E-06	-1,66E-04	2,75E-05

Output flows

Results per functional or declared unit																
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material for recycling	kg	3,06E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	2,11E+01	0,00E+00	0,00E+00
Materials for energy recovery	kg	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, electricity	MJ	1,43E-01	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,50E+00
Exported energy, thermal	MJ	1,02E-01	0,00E+00	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,61E+00

The result tables shall only contain values or the letters "ND" (Not Declared). It is not possible to specify ND for mandatory indicators. ND shall only be used for voluntary parameters that are not quantified because no data is available.

Other environmental performance indicators

Results per functional or declared unit		
BIOGENIC CARBON CONTENT	**Unit**	**QUANTITY**
Biogenic carbon content in product	kg C	0,00E+00
Biogenic carbon content in accompanying packaging	kg C	5,40E-02

Classification of disclaimers to the declaration of core and additional environmental impact indicators

According to EN 15804 point 7.2.3.3 -table 5- Notice 2, there are a number of indicators for which; The results of this environmental impact indicator should be used with caution, as the uncertainties of the results are high and experience with this parameter is limited.

ILCD classification	Indicator	Disclaimer
ILCD type / level 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None
ILCD type / level 2	Acidification potential, Accumulated Exceedance (AP)	None
	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	None
	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD type / level 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2

Disclaimer 1 – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

Differences versus previous versions

This is the first version of the EPD

References

General Program Instructions of the International EPD® System. Version 4.0.

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EN 1279, EN 1279-1 to -6:2018 Glass in Building- Insulating glass units

"**Comparison and analysis of energy consumption and comfort of GUARDIAN products in different climate regions in Spain**". Tecnalia (2017). Document nº 057686-IN-CT-17/01(V03)

GUARDIAN Europe S.à r.l.. Environmental Product Declaration – Flat glass. Uncoated flat glass, laminated safe glass and coated flat glass. EPD-GFEV-GB-19.2, June 2021.

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