

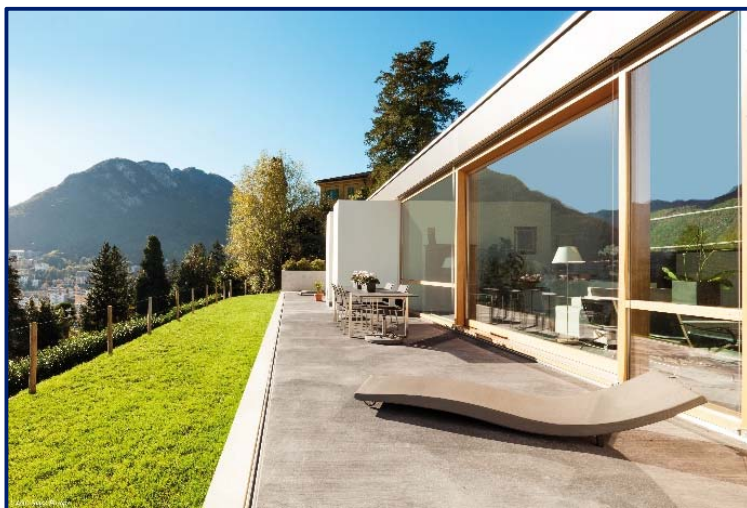
# AGC GLASS EUROPE

## ENVIRONMENTAL AND HEALTH PRODUCT DECLARATION

### Solar control magnetron coated glass (ipasol, Stopray)

*In accordance with ISO 14025:2010, EN 15804+A1:2014 and its French national complement NF EN15804/CN:2016*

*March 2019*



## 1. Warning

Information from this declaration are provided under AGC Glass Europe responsibility according to the standards EN 15804+A1:2014 and the French national complement NF EN15804/CN:2016.

Any total or partial use of the information provided in this document shall at least be accompanied by an explicit reference to this EPD as well as its issuer. The latter can provide the original document upon request.

EN 15804+A1:2014 from CEN has been used as Product Category Rules (PCR).

## 2. Reading guide

Environmental impacts results, resource use indicators as well as waste and output flows are presented in scientific writing with three significant digits.

All positive values ( $> 0$ ) reflect environmental impacts and negative values ( $< 0$ ) refer to environmental benefits. This approach applies to all modules, including module D. Where module D has a results higher than zero, it is an additional impact.


## 3. Comparability of EPD for construction products

Environmental product declarations may not be comparable if they do not comply with EN15804+A1:2014.

Chapter 5.3 *Comparability of EPD construction products* from EN15804+A1:2014 norm defines the required conditions under which the construction products can be compared, on the basis of the information provided by the EPD:

*A comparison of the environmental performance of construction products, based on their EPDs, shall be based on the use of the products and their impacts on the building, and shall account for the entire life cycle of the product (i.e. include all information modules).*

#### 4. General information

<b>Name and address of the manufacturer</b>	AGC Glass Europe Avenue Jean Monnet 4 B-1348 Louvain-la-Neuve sustainability@eu.agc.com
<b>Production sites</b>	This EPD is representative of solar control magnetron-coated glass sold by AGC Glass Europe / AGC Interpane in France. AGC Glass Europe operates 4 production sites in Europe providing solar control magnetron-coated glass to French and European market. Results from this EPD reflects data collected from all these sites, representing 100% of the production.
<b>Type of EPD</b>	<input type="checkbox"/> Cradle to factory gate <input type="checkbox"/> Cradle to grave <input checked="" type="checkbox"/> Cradle to grave + module D
	<input type="checkbox"/> Collective <input checked="" type="checkbox"/> Individual, covering AGC and AGC Interpane range of products
<b>Verifier name</b>	Cécile Beaudard (Solinnen)
<b>Program operator</b>	<p><b>FDES INIES</b> <a href="http://www.inies.fr">www.inies.fr</a></p>  <p>Address : Association HQE, 4 avenue du Recteur Poincaré – 75016 Paris - FRANCE</p>
<b>Publication date</b>	March 2019
<b>Expiration date</b>	March 2024
<b>Target audience</b>	This EPD is primarily intended for business-to-business communication. Indeed, magnetron-coated glass has to be further integrated in an insulating glazing unit.
<b>Commercial references covered by the EPD</b>	Reference product is a solar control magnetron-coated glass of 6 mm non toughened. It is a real product representative of the average range of solar control magnetron-coated glass from AGC Glass Europe. The EPD covers all the range of solar control magnetron-coated glass from AGC Glass Europe / AGC Interpane detailed in the table below.

Regular solar control magnetron-coated glass	Solar control magnetron-coated glass toughenable
ipasel bright neutral	ipasel bright neutral
ipasel bright white	ipasel bright white
ipasel light grey	-
ipasel neutral 50/27	-
ipasel neutral 60/33	-
ipasel neutral 69/37	-
ipasel neutral 70/37	-
ipasel neutral 70/39	-
ipasel platin 25/17	-
ipasel platin 47/29	-
ipasel shine 40/22	-
ipasel sky 30/17	-
ipasel ultraselect 62/29	-
-	Stopray Smart 30/20
-	Stopray Smart 51/33
Stopray Ultra-50	-
Stopray Ultra-60	Stopray Ultra 60 <sup>T</sup>
Stopray Ultraselect-50	-
Stopray Vision-40	Stopray Vision-40 <sup>T</sup>
Stopray Vision-50	Stopray Vision-50 <sup>T</sup>
Stopray Vision-51	Stopray Vision-51 <sup>T</sup>
Stopray Vision-60	Stopray Vision-60 <sup>T</sup>
Stopray Vision-61	Stopray Vision-61 <sup>T</sup>
Stopray Vision-72	Stopray Vision-72 <sup>T</sup>
Silverflex	Silverflex

This EPD also covers product of 4 mm, 5 mm and 8 mm thickness. These products have environmental impacts within a range of +/-40% compared to the reference product studied. The table below summarizes products covered as regards thickness.

Coating type	4mm	5mm	6mm	8mm	10mm	12mm
Solar control coating	X	X	X	X		
Toughenable solar control coating	X	X	X	X		

## 5. Functional unit and product description

### 5.1. Description of the functional unit

The functional unit is to ensure 1 m<sup>2</sup> of facade glazing with a thermal insulation  $U_g \leq 3,2 \text{ W/(m}^2\cdot\text{K)}$  and a direct energy transmission  $T_e \leq 70\%$  over 30 years.

The associated reference flow is:

- A 6 mm thick float glass of 15 kg
- A I emissivity coating layer of 2780 mg

**Note:** The reference service life of the product is set to 30 years. This period does not reflect real product lifetime, which is generally defined by building refurbishment. It does not refer to product guarantee neither. This period reflects a standard duration of use considered in glazing EPDs.

### 5.2. Product description

The reference product is a 6 mm thick solar control magnetron-coated glass. This product is representative of ipasol and Stopray range of products.



This product conform to EN 1096-4 :2005 " Glass in building – Coated glass – Part 4: Evaluation of conformity/product standard".

All products from iplus, Planibel AS and Energy are CE marked in accordance with EN 1096-4:2005 and are produced in ISO 9001 and ISO 14001 certified plants.

More information available on [www.yourglass.com](http://www.yourglass.com).

### 5.3. Description of the product usage

Solar control magnetron-coated glass is meant to be used in insulating glazing unit production used for building facades and construction projects. It can also be used in a wide range of other construction applications. In that case, glass can be delivered with technical properties fitting with specific use requirements.

**Table 1 : Product characteristics**

Properties	Symbol	Value
Thermal transmission (according to EN 673)	$U_g$ (W/m <sup>2</sup> .K)	3,2
Light Transmission (EN 410)	T <sub>v</sub> (%)	27 à 81
Light Reflection (EN 410)	ρ <sub>v</sub> (%)	8 à 30
Direct Energy transmission (EN 410)	T <sub>e</sub> (%)	17 à 65
Direct airborne sound insulation (EN 12578)	R <sub>w</sub> (C;Ctr) (dB)	31 (-2;-3)

Products from ipasol and Stopray ranges have no specific properties as regards resistance to falls, burglary, fire, fire arms or explosion. No performance is declared for these aspects.

### 5.4. Other technical features not included in the functional unit

Not applicable.

### 5.5. Description of the product main components and/or material

Despite differences regarding properties depending on product range, all solar control magnetron-coated glass are produced according to a similar process. Magnetron-coated glass is produced through deposition of several very thin layers of metals and metallic oxides. The sputtering is a physical vapour deposition that involves a magnetron sputter in which atoms from a solid metallic target are ejected from that target surface by bombardment with high energy ions of an inert gas. Specific solar control magnetron-coated glass can be thermally toughened.

**Table 2 : Low-e magnetron coated glass composition**

Product composition	6 mm
<b>Flat glass</b>	
Mass (kg)	15 kg
Mass (% final product)	99.98%
<b>Coating layer</b>	
Composition	Metals and metallic oxides
Mass (mg)	2780 mg
Mass (% final product)	0.02%
<b>Packaging</b>	
Wood	11,7 g/m <sup>2</sup>
Cardboard	7,5 g/m <sup>2</sup>
Interleavant powder (PMMA)	0,33 g/m <sup>2</sup>
Stillage (Steel)	3 g/m <sup>2</sup> (depreciation of reusable stillages)

5.6. Substances from REACH candidate list

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Solar control magnetron-coated glass products covered by this EPD do not contain any substance from REACH candidate list according to REACH regulation (more than 0.1%)

5.7. Reference service life description

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The reference service life (RSL) of solar control magnetron-coated glass is 30 years.

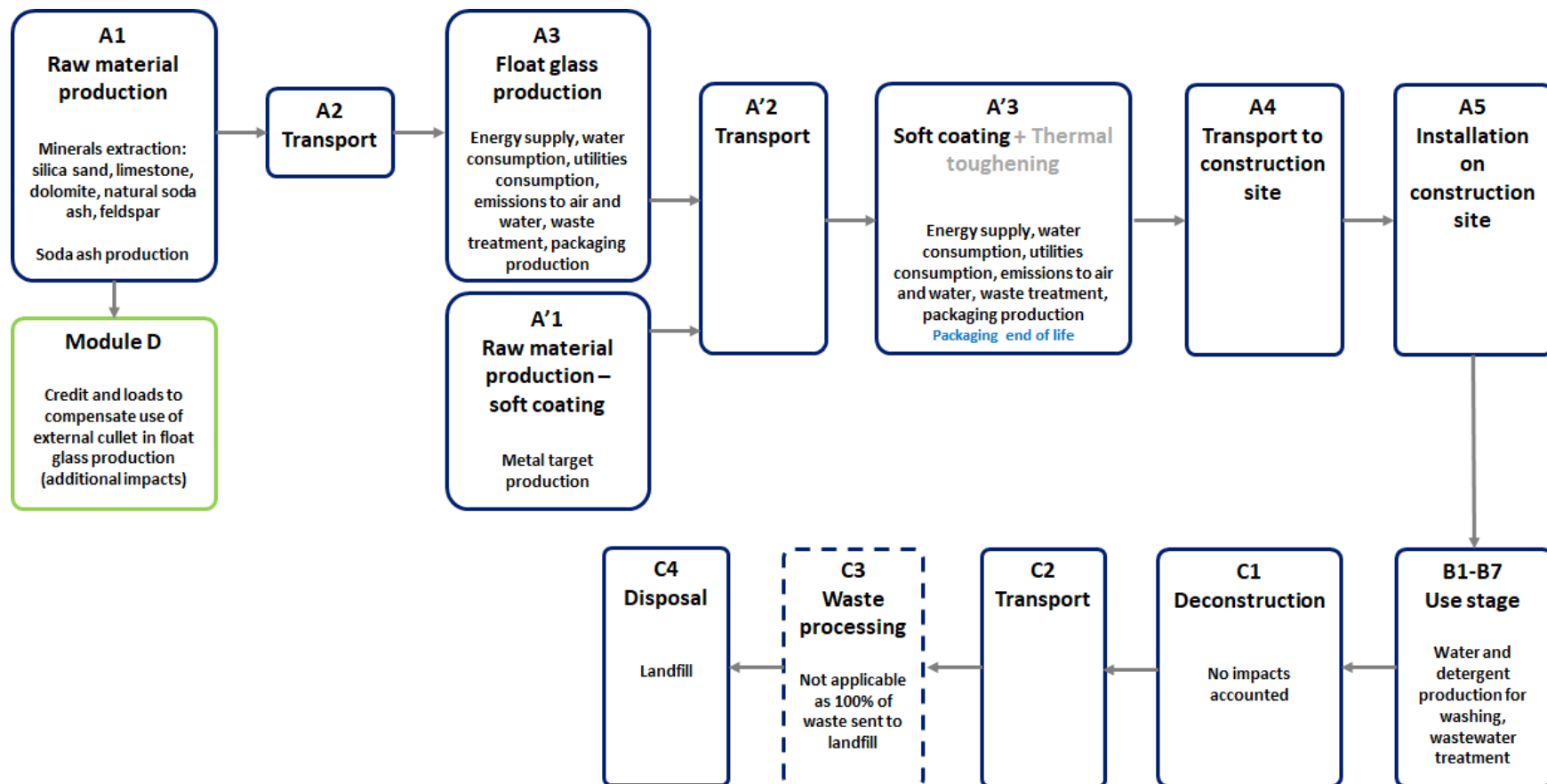
**Table 3 : Reference conditions of product use justifying RSL**

Parameter	Value
Reference service life	30 years
Declared product properties (when leaving the production site) and finishing	These properties are defined in laminated glass definition standard EN 1096-4:2005 <i>Glass in building. Coated glass. Evaluation of conformity</i>
Theoretical application parameters (if imposed by the producer), including references to the appropriate use practices	
Alleged quality of the construction work, when the installation is made in accordance with the manufacturer's instructions	These information are detailed in the standard NF DTU 39:2006 <i>Building works – Glazing and Mirror Glass Works</i> , which defines the specifications for the implementation of glazing and installation of glazing products (new construction, renovation, refurbishment, maintenance) performed on site in all types of buildings.
Exterior environment (for exterior applications), e.g. weather resistance, pollutants, UV and wind exposure, building orientation, shade, temperature	
Interior environment (for interior applications), e.g. temperature, humidity, chemicals exposure	
Use conditions, e.g. usage frequency, mechanical exposure	
Maintenance, e.g. required frequency, type and quality and replacement of replaceable components	

## 6. Life cycle stages

This EPD is a cradle to grave study with module D (benefits beyond the system boundaries).

Life cycle stages regarding product installation (A5) and product use (B1-B7) are modelled based on Glass in building product category rules prEN17074:2017.





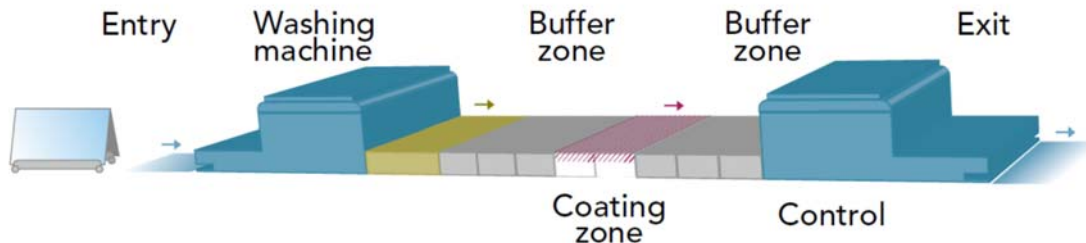
### 6.1. Production stage, module A1-A3

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Module A1-A3 covers the production and transport of raw materials used for solar control magnetron coated glass production. It also covers consumptions and emissions from coating process such as energy and water consumption, water effluents, wastes treatment.

Magnetron-coated glass production process involves the following steps:

- Float glass loading
- Float washing in order to prevent any impurity and to remove interleavant powder used for float transport
- Deposition of metals and metallic oxides under inert gas atmosphere



#### **Allocations**

A1: Float glass production impacts are allocated based on mass. Impacts per m<sup>2</sup> are then derived based on float glass thickness and glass density.

A3: Magnetron coating impacts are allocated based on area. The production process does not generate coproduct.

These allocation comply with the flat glass product category rule prEN 17074 :2017.

### 6.2. Construction stage, module A4-A5

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Transport distance to construction sites (module A4) considers the weighted average distance between AGC Glass Europe plants producing low-e magnetron-coated glass and Paris.

As regards installation on site (module A5), no ancillary materials is considered for the glass to be installed in accordance with prEN17074:2017.

No breakage during transport and installation has been considered, following prEN17074:2017.

#### **1. Transport to the construction site**

Transport to construction site considers an average distance of 610 km. This value reflects the weighted average distance between AGC plants and Paris. Magnetron-coated glass is transported by road in diesel trucks of 24.7 tonnes net load.

**Table 4 : Transport to construction site**

Parameter	Value	Unit
Vehicle description	25	Tonne   Diesel truck - EURO 5 – cargo, 40 t gross payload
Distance to construction site	610	km
Utilisation rate (including empty return)	50%	%
Volumetric mass	2500	kg/m <sup>3</sup>
Coefficient of utilisation of the volume capacity	0.6	

Average load and utilisation rate correspond to the use of “inloaders” trucks dedicated to glass transportation. These trucks are loaded at full capacity when leaving factories but have no possibility to transport other goods than glass when traveling back. The utilisation rate of 50% reflects thus a 100% utilisation for the outbound journey and an utilisation rate of 0% for the inbound journey.

## 2. Installation on site

No ancillary materials is considered for the glass to be installed in accordance with prEN17074:2017. Packaging end of life is accounted in module A3 as detailed in prEN17074:2017 product category rule.

### 6.3. Use stage, module B1-B7

#### 1. Description

The only module from the use stage considered is B2 “maintenance”. This stage corresponds to glass cleaning with water and detergent.

Repair (B3), replacement (B4) and refurbishment (B5) are not considered. Under normal conditions of use, float glass does not need any of these operations.

Finally, magnetron-coated glass does not emit any substances neither to the air nor to water during its use (B1).

#### 2. Maintenance parameters

Following prEN17074:2017, the average annual water consumption is 0.2 litres per square meter of glass (i.e. 6 litres/m<sup>2</sup> over the whole life cycle) and an annual consumption of detergents of 10 g/m<sup>2</sup> (300 g/m<sup>2</sup> over the whole life cycle). The majority of this water (75%) is considered as discharged to sewer grid and further treated in a wastewater treatment plant. The remaining 25% is considered as evaporated.

**Table 5 : Glass maintenance**

Parameter (whole life cycle)	Value	Unit
Water consumption for maintenance	6	litres
Detergent consumption	300	g
Waste water discharge to WWTP	4.5	litres

#### 6.4. End of life stage, module C1-C4

No mechanical operation is considered as regards dismantling and demolition (module C1).

End of life includes:

- C2: transport to waste treatment site ;
- C3: waste treatment ;
- C4: landfilling of demolition wastes.

End of life scenario is based on worst case scenario, considering that 100% of the magnetron-coated glass is sent to landfill for inert material in the end of life.

**Table 6 : End of life scenarios**

Parameter	Value	Unit
Waste glass sent to landfill	100	%
Transport to landfill (truck)	50	km
Waste glass recycled	0	%

All glass wastes are transported by diesel truck with a net payload of 22 tonnes.

#### 6.5. Benefits and loads beyond system boundaries, module D

Coating process generates float glass losses, metal wastes (used targets) as well as packaging wastes sent to recycling. However, these outputs are not accounted within module D, according to EN 158074+A1.

Moreover, end of life scenario considers a 100% landfilling worst case scenario. Hence, there is no output flow considered in module D.

In this EPD, module D is a negative net output flow, referring to the cullet used during float glass production. Module D is thus an additional impact corresponding to the net consumption of cullet, which is not compensated during other life cycle stages.

Recycling benefits and loads covers:

- Avoided production of batch raw materials
- Avoided decarbonisation at melting furnace
- Avoided energy consumption due to 25% energy reduction from glass melting while using cullet instead of raw materials

NF EN15804/CN:2016 details the calculation rule of material recovery.

$$\text{BenefNetRecycl} = \text{MS}_{\text{val}} (\text{IV}_{\text{val}} - \text{IS}_{\text{val}}) - \text{MS} (\text{IV} - \text{IS})$$

With:

Symbol	Description	Value
MS <sub>val</sub>	Mass of secondary material actually recovered from the mass of collected stock	0 kg/kg float glass
IV <sub>val</sub>	Inventory of production of the material substituted by the recovered secondary material in the downstream system using the material	Not assessed (worst case scenario for the end of life)
IS <sub>val</sub>	Inventory of production of secondary material ready for use in the downstream system from the stock	Not assessed (worst case scenario for the end of life)
MS	Mass of secondary material introduced into the product object of assessment during its manufacture	0.854 kg/kg float glass
IV	Inventory of production of the blank material used to produce the product object of assessment in the absence of material recovery of the material	See details below
IS	Inventory of production of the secondary material ready for use to produce the product objects of assessment	

IV – IS normally refers to the inventory of production of the virgin raw materials minus the production of the secondary raw material. In case of flat glass, the point of substitution, i.e. when recycled material and virgin ones have similar properties, is achieved, when the glass has been (re)melted. Indeed, next to the avoided raw material production, the use of cullet also has an influence on the melting process (lower energy consumption and no decarbonisation), as described in annex D from prEN 17074:2017.

*Note:*

*Environmental impacts reported in module D as a positive value (> 0) are additional environmental impacts to be added to the cradle to grave results. Conversely, negative values (< 0) are environmental benefits reducing the cradle to grave impacts.*

## 7. Information regarding life cycle assessment calculation

<b>PCR used</b>	EN 15804+A1 :2014 NF EN 15804/CN :2016 prEN17074 :2017
<b>System boundaries</b>	Cradle to grave, including module D
<b>Allocations</b>	A1: mass based A3: area based
<b>Primary data representativeness</b>	<p><u>Geographical representativeness</u>  Primary data collected from the 4 sites from AGC Glass Europe/AGC Interpane producing solar control magnetron-coated glass, representing 100% of the production.  Distribution in France.</p> <p><u>Time representativeness</u>  Primary data collected refer the whole 2016 calendar year.</p> <p><u>Technological representativeness</u>  Primary data collected from all the AGC Glass Europe/AGC Interpane sites.</p>
<b>Background data representativeness</b>	GaBi version 8.7.1.30 and the associated Service Pack 37 database have been used for the modelling and the calculation of this EPD. All background data have been created or updated during the last 10 years.
<b>Cut-off criteria</b>	All product components and packaging have been considered in the study. In case of insufficient input data, proxy have been used to estimate environmental impacts. Cut-off processes for this EPD are transport of packaging waste from the construction site to the waste treatment as well as the sorting/shredding of metallic target waste sent to recycling. The cumulative impact of these excluded processes is : <ul style="list-style-type: none"> <li>- Less than 0.1% in mass and for primary energy consumption compared to the cradle to grave life cycle (excluding module D)</li> <li>- Less than 0.5% in mass and for primary energy consumption compared to the affected modules</li> </ul>
<b>Variability</b>	Results variability for the products covered by this EPD is lower than 40% for the reference indicators. Next to mandatory reference indicators stated in NF EN 15804/CN :2016, all environmental indicators have been considered as reference indicators. Mandatory NF EN 15804/CN:2016 reference indicators: <ul style="list-style-type: none"> <li>- Global Warming Potential</li> <li>- Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials</li> <li>- Non-hazardous wastes disposed</li> </ul> Additional reference indicators considered in this EPD <ul style="list-style-type: none"> <li>- Ozone layer depletion potential</li> <li>- Acidification</li> <li>- Eutrophication</li> <li>- Photochemical oxidant creation potential</li> <li>- Abiotic resource depletion – Fossil</li> <li>- Abiotic depletion resource – Elements</li> <li>- Air pollution (NF EN 15804/CN:2016 indicator)</li> <li>- Water pollution (NF EN 15804/CN:2016 indicator)</li> </ul>

## 8. Life cycle assessment results

Environmental impacts	Production stage	Construction stage		Use stage							End of life stage				Total life cycle	D Benefits and loads beyond system boundaries
	Total A1-A3 Production	A4 Transport	A5 Installation	B1 Usage	B2 Maintenance	B3 Repairation	B4 Replacement	B5 Refurbishment	B6 Use of enerav	B7 Use of water	C1 Deconstruction	C2 Transport	C3 Waste processing	C4 Disposal		
<b>Global warming Potential</b> kg CO <sub>2</sub> eq/FU	2.26E+01	7.12E-01	0	0	7.68E-03	0	0	0	0	0	0	7.64E-02	0	2.23E-01	2.36E+01	9.37E-01
<b>Ozone layer depletion potential</b> kg CFC 11 eq/FU	1.85E-08	1.17E-16	0	0	2.69E-09	0	0	0	0	0	0	1.28E-17	0	1.30E-15	2.11E-08	1.15E-09
<b>Acidification</b> kg SO <sub>2</sub> eq/FU	8.91E-02	1.73E-03	0	0	2.16E-04	0	0	0	0	0	0	4.49E-04	0	1.33E-03	9.28E-02	1.76E-03
<b>Eutrophication</b> kg (PO <sub>4</sub> ) <sup>3-</sup> eq/FU	1.26E-02	4.15E-04	0	0	1.25E-04	0	0	0	0	0	0	1.13E-04	0	1.50E-04	1.34E-02	3.12E-04
<b>Photochemical oxidant creation potential</b> Ethene eq/FU	5.81E-03	1.75E-04	0	0	9.47E-05	0	0	0	0	0	0	3.58E-05	0	1.03E-04	6.22E-03	1.36E-04
<b>Abiotic resource depletion - Elements</b> kg Sb eq/FU	7.07E-04	5.02E-08	0	0	1.76E-07	0	0	0	0	0	0	5.46E-09	0	1.98E-08	7.07E-04	1.02E-07
<b>Abiotic resource depletion - Fossil</b> MJ/FU	2.99E+02	9.63E+00	0	0	3.96E-01	0	0	0	0	0	0	1.05E+00	0	3.12E+00	3.13E+02	9.54E+00
<b>Water pollution</b> m <sup>3</sup> /FU	7.30E+00	2.31E-01	0	0	1.49E-01	0	0	0	0	0	0	2.52E-02	0	4.43E-02	7.74E+00	4.23E-01
<b>Air pollution</b> m <sup>3</sup> /UF	1.40E+03	3.21E+01	0	0	1.62E+01	0	0	0	0	0	0	4.69E+00	0	2.67E+01	1.48E+03	5.12E+01

**ENVIRONMENTAL PRODUCT DECLARATION**  
in accordance with ISO 14025 and EN 15804+A1

Resource use	Production stage	Construction stage		Use stage							End of life stage				Total life cycle	D Benefits and loads beyond system boundaries
	Total A1-A3 Production	A4 Transport	A5 Installation	B1 Usage	B2 Maintenance	B3 Repairation	B4 Replacement	B5 Refurbishment	B6 Use of energy	B7 Use of water	C1 Deconstruction	C2 Transport	C3 Waste processing	C4 Disposal		
Renewable primary energy as energy carrier (MJ/FU)	3.10E+01	5.60E-01	0	0	1.33E+00	0	0	0	0	0	0	6.10E-02	0	0.4096346	3.33E+01	1.90E-01
Renewable primary energy resources used as raw materials (MJ/FU)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of renewable primary energy resources (MJ/FU)	3.10E+01	5.60E-01	0	0	1.33E+00	0	0	0	0	0	0	6.10E-02	0	4.10E-01	3.33E+01	1.90E-01
Non-renewable primary energy resources as energy carrier (MJ/FU)	3.35E+02	9.66E+00	0	0	6.58E-01	0	0	0	0	0	0	1.05E+00	0	3.23E+00	3.49E+02	9.73E+00
Non-renewable primary energy resources used as raw materials (MJ/FU)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of non-renewable primary energy resources (MJ/FU)	3.35E+02	9.66E+00	0	0	6.58E-01	0	0	0	0	0	0	1.05E+00	0	3.23E+00	3.49E+02	9.73E+00
Use of secondary material (kg/FU)	1.39E+00	0	0	0	0	0	0	0	0	0	0	0	0	0	1.39E+00	0
Use of renewable secondary fuels (MJ/FU)	7.65E-21	0	0	0	0	0	0	0	0	0	0	0	0	0	7.65E-21	1.98E-25
Use of non-renewable secondary fuels (MJ/FU)	8.98E-20	0	0	0	0	0	0	0	0	0	0	0	0	0	8.98E-20	2.32E-24
Use of net fresh water (m <sup>3</sup> /FU)	5.95E-02	9.48E-04	0	0	8.35E-03	0	0	0	0	0	0	1.03E-04	0	8.15E-04	6.97E-02	2.07E-03





## 9. Additional information

### 9.1. Release of hazardous substances into indoor air, soil and water during the use stage

#### 9.1.1. Indoor air

- **VOC and formaldehyde emissions**

Not applicable.

- **Reaction to fungal and bacterial growth**

Not tested. Glass is a mineral inert material. It is not by itself a medium for micro-organisms growth.

- **Natural radioactive emissions from construction products**

Not tested.

- **Emission of particulates and fibres emissions**

Not tested.

#### 9.1.2. Water and soil

Not tested. The product is not in contact with water intended for human consumption.

### 9.2. Product contribution to indoor wellbeing

#### 9.2.1. Product characteristics regarding hygrothermal comfort

The relevant technical characteristics for a 6mm solar control magnetron-coated glass are given in the table below.

Properties	Symbol	Value
Thermal transmission (according to EN 673)	$U_g$ (W/m <sup>2</sup> .K)	3,2
Light Transmission (EN 410)	$T_v$ (%)	27 à 81
Light Reflection (EN 410)	$\rho_v$ (%)	8 à 30
Direct Energy transmission (EN 410)	$T_e$ (%)	17 à 65

Source: CE marking

*9.2.2. Product characteristics regarding acoustics*

A 6 mm solar control magnetron-coated glass has a direct airborne sound insulation  $R_w (C; C_{tr}) = 31 (-2; -3)$  dB.

This characteristic can be improved by using thicker glass panes. For example, a 8 mm solar control magnetron-coated glass has a direct airborne sound insulation  $R_w (C; C_{tr}) = 32 (-1; -2)$  dB.

Source: CE marking

*9.2.3. Product characteristics regarding visual comfort*

Being part of the building envelope, glass contributes to visual comfort by providing natural light and reducing artificial lighting needs. The light transmission value of a 6 mm solar control magnetron-coated glass is between 27% and 81% (25% to 72% when assembled in an IGU).

Source: CE marking

*9.2.4. Product characteristics as regarding odours*

Not tested. Glass is a mineral inert material, not able to release any odour during its use.

## 10. Extrapolation rules

Solar control magnetron-coated glass not covered by this EPD (10 mm and 12 mm) can be assessed by using extrapolation rules. These rules are applicable for any solar control magnetron-coated glass thickness from ipasol and Stopray range.

The intended use of these extrapolation rules is to allow industrial customer using solar control magnetron-coated glass from AGC Glass Europe/AGC Interpane to assess the environmental impacts of a specific product bought.

The upper and lower range are described below.

Product composition	Lower range ipasol, Stopray	Upper range Ipasol, Stopray
Float glass		
Thickness	4 mm	12 mm
Mass (kg)	10 kg	30 kg
Toughened	No	yes
Mass (% final product)	99.97%	99.99%
Low-e coating		
Mass (mg)	2780 mg (maximum)	
Mass (% produit fini)	0.03%	0.01%
Packaging		
Wood	11,7 g/m <sup>2</sup>	
Cardboard	7,5 g/m <sup>2</sup>	
Interleavant powder (PMMA)	0,33 g/m <sup>2</sup>	
Stillage (metal)	3 g/m <sup>2</sup> (depreciation of reusable stillages)	

The technical characteristics of the upper and lower range are given in the following table.

Properties	Symbol	Lower range 4 mm not toughened	Upper range 12 mm toughened
Thermal transmission (according to EN 673)	Ug (W/m <sup>2</sup> .K)	3,2	3,2
Light Transmission (EN 410)	T <sub>v</sub> (%)	45 à 81	26 à 80
Light Reflection (EN 410)	p <sub>v</sub> (%)	8 à 30	8 à 30
Direct Energy transmission (EN 410)	T <sub>e</sub> (%)	28 à 70	16 à 68
Direct airborne sound insulation (EN 12578)	Rw (C;Ctr) (dB)	30 (-2;-4)	35 (-2 ; -3)

Environmental impacts of solar control magnetron-coated glass depend on the combination of three parameters:

- A fix impact
- An impact proportional to the float thickness
- An impact linked to an eventual thermal toughening

The environmental impacts are thus:

$$Env = I_{\text{coater}} + (FT * I_{1\text{mm float}}) + TG * (I_{\text{toughening fix}} + FT * I_{\text{toughening variable}})$$

With:

Env	Environmental impacts of a specific solar control magnetron-coated glass
I <sub>coater</sub>	Fix impacts from coating process
FT	Float thickness (in mm)
I <sub>1mm float</sub>	Impacts per mm of float glass
TG	Boolean linked to thermal toughening (1 if toughened 0 otherwise)
I <sub>toughening fix</sub>	Fix impacts from thermal toughening
I <sub>toughening variable</sub>	Impacts from thermal toughening proportional to float thickness

For example, in case of a 8 mm solar control magnetron-coated glass, environmental impacts will be calculated as:

$$Env = I_{\text{coater}} + (8 * I_{1\text{mm float}}) + 1 * (I_{\text{toughening fix}} + 8 * I_{\text{toughening variable}})$$

Environmental impacts I<sub>coater</sub>, I<sub>1mm float</sub>, I<sub>toughening fix</sub> and I<sub>toughening variable</sub> are presented in the next tables. Note that only modules to which solar control magnetron-coated glass contributes are presented. All other modules are considered as null (A5,B1, B3, B4, B5, B6, B7, C1).

**ENVIRONMENTAL PRODUCT DECLARATION**  
in accordance with ISO 14025 and EN 15804+A1

Environmental impacts		Production stage	Construction stage	Use stage	End of life stage			Total life cycle	Module D Benefits and loads beyond system boundaries
		Total A1-A3 Production	A4 Transport	B2 Maintenance	C2 Transport	C3 Waste treatment	C4 Disposal		
<b>Global Warming Potential</b> kg CO <sub>2</sub> eq/FU	coater	3.70E+00	8.88E-04	7.68E-03	0	0	0	3.71E+00	0
	1mm float	3.15E+00	1.19E-01	0	1.27E-02	0	3.72E-02	3.32E+00	1.56E-01
	toughening fix	1.47E+00	0	0	0	0	0	1.47E+00	0
	toughening variable	5.05E-02	0	0	0	0	0	5.05E-02	0
<b>Ozone layer Depletion Potential</b> kg CFC 11 eq/FU	coater	4.00E-10	1.46E-19	2.69E-09	0	0	0	3.09E-09	0
	1mm float	3.01E-09	1.95E-17	0	2.13E-18	0	2.16E-16	3.01E-09	1.92E-10
	toughening fix	3.94E-14	0	0	0	0	0	3.94E-14	0
	toughening variable	1.36E-15	0	0	0	0	0	1.36E-15	0
<b>Acidification</b> kg SO <sub>2</sub> eq/FU	coater	1.04E-02	2.16E-06	2.16E-04	0	0	0	1.06E-02	0
	1mm float	1.31E-02	2.88E-04	0	7.48E-05	0	2.21E-04	1.37E-02	2.93E-04
	toughening fix	3.67E-03	0	0	0	0	0	3.67E-03	0
	toughening variable	1.27E-04	0	0	0	0	0	1.27E-04	0
<b>Eutrophication</b> kg (PO <sub>4</sub> ) <sup>3</sup> eq/FU	coater	9.15E-04	5.17E-07	1.25E-04	0	0	0	1.04E-03	0
	1mm float	1.94E-03	6.91E-05	0	1.88E-05	0	2.50E-05	2.06E-03	5.20E-05
	toughening fix	3.68E-04	0	0	0	0	0	3.68E-04	0
	toughening variable	1.27E-05	0	0	0	0	0	1.27E-05	0
<b>Photochemical Oxidant Creation Potential</b> Ethene eq/FU	coater	6.88E-04	2.18E-07	9.47E-05	2.24E-19	0	0	7.83E-04	0
	1mm float	8.54E-04	2.91E-05	0	5.96E-06	0	1.71E-05	9.06E-04	2.27E-05
	toughening fix	2.59E-04	0	0	0	0	0	0.000259	0
	toughening variable	8.93E-06	0	0	0	0	0	8.93E-06	0

**ENVIRONMENTAL PRODUCT DECLARATION**  
in accordance with ISO 14025 and EN 15804+A1

Environmental impacts		Production stage	Construct ion stage	Use stage	End of life stage			Total life cycle	Module D Benefits and loads beyond system boundaries
		Total A1-A3 Production	A4 Transport	B2 Maintenance	C2 Transport	C3 Waste treatment	C4 Disposal		
Abiotic resource depletion - Elements kg Sb eq/FU	coater	6.95E-04	6.30E-11	1.77E-07	0	0	0	6.95E-04	0
	1mm float	2.05E-06	8.41E-09	0	9.16E-10	0	3.70E-09	2.07E-06	1.72E-08
	toughening fix	4.19E-07	0	0	0	0	0	4.19E-07	0
	toughening variable	1.45E-08	0	0	0	0	0	1.45E-08	0
Abiotic resource depletion – Elements French EN15804/CN kg Sb eq/FU	coater	6.95E-04	6.26E-11	1.76E-07	0	0	0	6.95E-04	0
	1mm float	2.05E-06	8.36E-09	0	9.11E-10	0	3.29E-09	2.06E-06	1.70E-08
	toughening fix	4.16E-07	0	0	0	0	0	4.16E-07	0
	toughening variable	1.44E-08	0	0	0	0	0	1.44E-08	0
Abiotic resource depletion - Fossil MJ/UF	coater	4.27E+01	1.20E-02	3.96E-01	0	0	0	4.31E+01	0
	1mm float	4.27E+01	1.60E+00	0	1.75E-01	0	5.21E-01	4.50E+01	1.59E+00
	toughening fix	1.61E+01	0	0	0	0	0	1.61E+01	0
	toughening variable	5.56E-01	0	0	0	0	0	5.56E-01	0
Water pollution m <sup>3</sup> /UF	coater	1.01E+00	2.88E-04	1.49E-01	0	0	0	1.16E+00	0
	1mm float	1.05E+00	3.85E-02	0	4.19E-03	0	7.38E-03	1.10E+00	7.06E-02
	toughening fix	3.64E-01	0	0	0	0	0	3.64E-01	0
	toughening variable	1.26E-02	0	0	0	0	0	1.26E-02	0
Air pollution m <sup>2</sup> /UF	coater	2,11E+02	4,00E-02	1,62E+01	0	0	0	2,27E+02	0
	1mm float	1,99E+02	5,34E+00	0	7,81E-01	0	4,45E+00	2,09E+02	8,53E+00
	toughening fix	9,35E+01	0	0	0	0	0	9,35E+01	0
	toughening variable	3,22E+00	0	0	0	0	0	3,22E+00	0



**ENVIRONMENTAL PRODUCT DECLARATION**  
in accordance with ISO 14025 and EN 15804+A1

Resource use		Production stage	Construct ion stage	Use stage	End of life stage			Total life cycle	Module D Benefits and loads beyond system boundaries
		Total A1-A3 Production	A4 Transport	B2 Maintenance	C2 Transport	C3 Waste treatment	C4 Disposal		
<b>Total use of non-renewable primary energy resources (MJ/FU)</b>	lcoater	6.57E+01	1.20E-02	6.58E-01	0	0	0	6.64E+01	0
	l1mm float	4.48E+01	1.61E+00	0	1.75E-01	0	5.39E-01	4.72E+01	1.62E+00
	ltoughening fix	2.65E+01	0	0	0	0	0	2.65E+01	0
	ltoughening variable	9.13E-01	0	0	0	0	0	9.13E-01	0
<b>Use of secondary material (kg/FU)</b>	lcoater	6.96E-03	0	0	0	0	0	6.96E-03	0
	l1mm float	2.31E-01	0	0	0	0	0	2.31E-01	0
	ltoughening fix	0	0	0	0	0	0	0	0
	ltoughening variable	0	0	0	0	0	0	0	0
<b>Use of renewable secondary fuels (MJ/FU)</b>	lcoater	7.64E-21	0	0	0	0	0	7.64E-21	0
	l1mm float	3.53E-25	0	0	0	0	0	3.53E-25	3.30E-26
	ltoughening fix	0	0	0	0	0	0	0	0
	ltoughening variable	0	0	0	0	0	0	0	0
<b>Use of non-renewable secondary fuels (MJ/FU)</b>	lcoater	8.98E-20	0	0	0	0	0	8.98E-20	0
	l1mm float	4.15E-24	0	0	0	0	0	4.15E-24	3.87E-25
	ltoughening fix	0.00E+00	0	0	0	0	0	0.00E+00	0
	ltoughening variable	0.00E+00	0	0	0	0	0	0.00E+00	0
<b>Use of net fresh water (m<sup>3</sup>/FU)</b>	lcoater	2.55E-02	1.18E-06	8.35E-03	8.67E-19	0	2.26E-17	3.38E-02	-1.65E-17
	l1mm float	5.67E-03	1.58E-04	0	1.72E-05	0	1.36E-04	5.98E-03	3.45E-04
	ltoughening fix	1.21E+01	0	0	0	0	0	1.21E+01	0
	ltoughening variable	4.16E-01	0	0	0	0	0	4.16E-01	0

Waste categories		Production stage	Construction stage	Use stage	End of life stage			Total life cycle	Module D Benefits and loads beyond system boundaries
		Total A1-A3 Production	A4 Transport	B2 Maintenance	C2 Transport	C3 Waste treatment	C4 Disposal		
<b>Hazardous waste disposal (kg/FU)</b>	lcoater	2.29E-06	6.73E-10	8.93E-11	0	0	0	2.29E-06	0
	l1mm float	1.71E-07	8.98E-08	0.00E+00	9.79E-09	0	9.19E-09	2.80E-07	4.16E-09
	ltoughening fix	1.25E-08	0	0	0	0	0	1.25E-08	0
	ltoughening variable	4.32E-10	0	0	0	0	0	4.32E-10	0
<b>Non-hazardous waste disposal (kg/FU)</b>	lcoater	6.30E-02	9.79E-07	4.29E-03	0	0	0	6.73E-02	0
	l1mm float	6.11E-02	1.31E-04	0.00E+00	1.42E-05	0	2.50E+00	2.56E+00	5.05E-03
	ltoughening fix	1.87E-02	0	0	0	0	0	1.87E-02	0
	ltoughening variable	6.44E-04	0	0	0	0	0	6.44E-04	0
<b>Radioactive waste disposal (kg/FU)</b>	lcoater	9.06E-03	1.63E-08	3.14E-06	0	0	0	9.06E-03	0
	l1mm float	7.71E-04	2.18E-06	0	2.38E-07	0	7.23E-06	7.81E-04	6.95E-06
	ltoughening fix	4.10E-03	0	0	0	0	0	4.10E-03	0
	ltoughening variable	1.41E-04	0	0	0	0	0	1.41E-04	0





More information available on [www.yourglass.com](http://www.yourglass.com)

And in the « Sustainability » section of our environmental website [www.agc-glass.eu/en/sustainability](http://www.agc-glass.eu/en/sustainability)