

# Environmental product declaration

in accordance with ISO 14025 and EN 15804+A2

## Toughened Laminated - 88.3



GLASEKSPERTEN

The Norwegian EPD Foundation

**Owner of the declaration:**

Glaseksperten A/S

**Product:**

Toughened Laminated - 88.3

**Declared unit:**

1 m<sup>2</sup>

**This declaration is based on Product Category Rules:**

CEN Standard EN 15804:2012+A2:2019 serves as core PCR

NS-EN 17074 Glass in building PCR

**Program operator:**

The Norwegian EPD Foundation

**Declaration number:**

NEPD-8465-8126-EN

**Registration number:**

NEPD-8465-8126-EN

**Issue date:** 12.12.2024

**Valid to:** 12.12.2029

**EPD software:**

LCAno EPD generator ID: 705044

## General information

### Product

Toughened Laminated - 88.3

### Program operator:

The Norwegian EPD Foundation  
Post Box 5250 Majorstuen, 0303 Oslo, Norway  
Phone: +47 977 22 020  
web: [www.epd-norge.no](http://www.epd-norge.no)

### Declaration number:

NEPD-8465-8126-EN

### This declaration is based on Product Category Rules:

CEN Standard EN 15804:2012+A2:2019 serves as core PCR  
NS-EN 17074 Glass in building PCR

### Statement of liability:

The owner of the declaration shall be liable for the underlying information and evidence. EPD Norway shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

### Declared unit:

1 m<sup>2</sup> Toughened Laminated - 88.3

### Declared unit with option:

A1-A3,A4,A5,C1,C2,C3,C4,D

### Functional unit:

### General information on verification of EPD from EPD tools:

Independent verification of data, other environmental information and the declaration according to ISO 14025:2010, § 8.1.3 and § 8.1.4. Verification of each EPD is made according to EPD-Norway's guidelines for verification and approval requiring that tools are i) integrated into the company's environmental management system, ii) the procedures for use of the EPD tool are approved by EPD-Norway, and iii) the process is reviewed annually by an independent third party verifier. See Appendix G of EPD-Norway's General Programme Instructions for further information on EPD tools

### Verification of EPD tool:

Independent third party verification of the EPD tool, background data and test-EPD in accordance with EPDNorway's procedures and guidelines for verification and approval of EPD tools.

Third party verifier:

Elisabet Amat, GREENIZE projects

(no signature required)

### Owner of the declaration:

Glaseksperten A/S  
Contact person: Mikkel Holm Larsen  
Phone: +45 98 92 19 11  
e-mail: [quality@glaseksperten.dk](mailto:quality@glaseksperten.dk)

### Manufacturer:

Glaseksperten A/S

### Place of production:

Glaseksperten A/S  
Sprogøvej 13  
9800 Hjørring, Denmark

### Management system:

### Organisation no:

918946411

### Issue date:

12.12.2024

### Valid to:

12.12.2029

### Year of study:

2023

### Comparability:

EPD of construction products may not be comparable if they not comply with EN 15804 and seen in a building context.

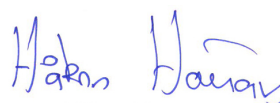
### Development and verification of EPD:

The declaration is created using EPD tool lca.tools ver EPD2022.03, developed by LCA.no. The EPD tool is integrated in the company's management system, and has been approved by EPD Norway. NEPD93

Developer of EPD: Mikkel Holm Larsen

Reviewer of company-specific input data and EPD: Louise Jepsen

### Approved:



Håkon Hauan  
Managing Director of EPD-Norway

## Product

### Product description:

Toughened Laminated Glass; 1m<sup>2</sup> of 88.3 edge-processed, thermally toughened glass laminated with PVB film. Toughened Laminated Glass is used in applications requiring personal safety, such as exterior and interior glass railings, glass doors, glass panels, and free-standing glass walls. 88.3 refers to two layers of 8mm thermally toughened glass with 1.14mm PVB interlayers, resulting in a total thickness of 17.14mm for the finished glass.

### Product specification

88.3 Toughened Laminated Glass with PVB film.

Materials	kg	%
Glass	40,00	97,04
Plastic - Polyvinyl butyral (PVB)	1,22	2,96
Total	41,22	100,00

Packaging	kg	%
Packaging - Wood	0,60	100,00
Total incl. packaging	41,82	100,00

### Technical data:

Complies with the requirements of DS-EN 12150-1:2015 Glass in building. Thermally toughened soda lime silicate safety glass - Part 1. DS-EN 14449:2005 Bygningsglas - Lamineret glas og lamineret sikkerhedsglas.  
DS-EN 12600:2003 Glass in building. Pendulum test - Impact test method for float glass.

### Market:

Scandinavia and the UK

### Reference service life, product

The reference service life of this product is 40 years.

### Reference service life, building or construction works

The approximate lifespan of a building is 50 years.

## LCA: Calculation rules

### Declared unit:

1 m<sup>2</sup> Toughened Laminated - 88.3

### Cut-off criteria:

All major raw materials and all the essential energy is included. The production processes for raw materials and energy flows with very small amounts (less than 1%) are not included. These cut-off criteria do not apply for hazardous materials and substances.

### Allocation:

The allocation is made in accordance with the provisions of EN 15804. Incoming energy and water and waste production in-house is allocated equally among all products through mass allocation. Effects of primary production of recycled materials is allocated to the main product in which the material was used. The recycling process and transportation of the material is allocated to this analysis.

### Data quality:

Specific data for the product composition are provided by the manufacturer. The data represent the production of the declared product and were collected for EPD development in the year of study. Background data is based on EPDs according to EN 15804 and different LCA databases. The data quality of the raw materials in A1 is presented in the table below.

Materials	Source	Data quality	Year
Glass	EPD-GLS-20230184-IBB2-DE	EPD	2021
Packaging - Wood	ecoinvent 3.6	Database	2019
Plastic - Polyvinyl butyral (PVB)	EPD-KUR-20230072-CC11-EN	EPD	2022

## System boundaries (X=included, MND=module not declared, MNR=module not relevant)

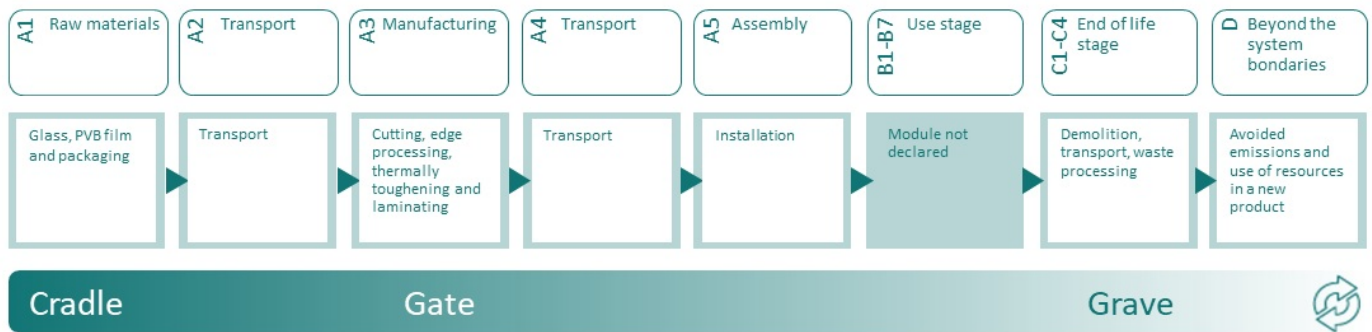
Product stage			Construction installation stage		Use stage								End of life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	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	X	X	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X	

### System boundary:

Modules A1-A5 are included in the analysis. It includes the extraction and production of raw materials, transportation to the factory, the production process itself and transportation and assembly.

C1-C4 are included in the analysis. It includes the end of life stage.

Section D is also included it describes the Reuse-Recovery-Recycling-potential.



### Additional technical information:

Visit our website for detailed product information, technical documentation, and support.

An operation and maintenance guide is available, outlining proper handling and care for the glass to ensure long-lasting performance and appearance.

## LCA: Scenarios and additional technical information

The following information describe the scenarios in the different modules of the EPD.

In section A4, a weighted average of transport distributed across countries is calculated.

The figures in section A5 originate from data that refer to waste management.














In section C2, it is expected that 70% of the glass is sent to landfill and 30% is sent for recycling, while the remaining materials are either sent for sorting and subsequent recycling, in reference to EN17213:2020.

In section C3, C4 and D-RRR, data from the relevant EPDs pertaining to the materials used is directly referenced.

Transport from production place to user (A4)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy Consumption	Unit	Value (Liter/tonne)
Ship, Ferry, Sea (km)	50,0 %	43	0,034	l/tkm	1,46
Truck, 16-32 tonnes, EURO 6 (km) - Europe	36,7 %	430	0,043	l/tkm	18,49
Assembly (A5)		Unit	Value		
Waste, packaging, pallet, EUR wooden pallet, single use, average treatment (kg)	kg	0,60			
Transport to waste processing (C2)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy Consumption	Unit	Value (Liter/tonne)
Truck, 16-32 tonnes, EURO 6 (km) - Europe	36,7 %	50	0,043	l/tkm	2,15
Truck, 16-32 tonnes, EURO 6 (km) - Europe	36,7 %	615	0,043	l/tkm	26,45
Waste processing (C3)		Unit	Value		
Materials to recycling (kg)	kg	38,99			
Waste treatment per kg Glass, incineration with fly ash extraction (kg)	kg	2,08			
Waste treatment per kg Non-hazardous waste, incineration with fly ash extraction - C3 (kg)	kg	0,06			
Disposal (C4)		Unit	Value		
Landfilling of ashes from incineration of Glass, process of ashes and residues (kg)	kg	2,08			
Waste, glass, to landfill, inert material landfill (kg)	kg	0,08			
Landfilling of ashes from incineration of Non-hazardous waste, process per kg ashes and residues - C4 (kg)	kg	0,02			
Waste, polyvinylchloride, to landfill (kg) - C4	kg	0,00			
Benefits and loads beyond the system boundaries (D)		Unit	Value		
Substitution of electricity (MJ)	MJ	0,41			
Substitution of thermal energy, district heating (MJ)	MJ	6,26			
Substitution of electricity (MJ)	MJ	0,07			
Substitution of thermal energy, district heating (MJ)	MJ	0,99			
Substitution of primary glass with net scrap (kg) - GLO	kg	37,84			

## LCA: Results

The LCA results are presented below for the declared unit defined on page 2 of the EPD document.

Environmental impact										
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D	
 GWP-total	kg CO <sub>2</sub> -eq	5,93E+01	3,14E+00	9,26E-01	0	1,50E+00	1,57E-01	2,29E-02	-3,86E+01	
 GWP-fossil	kg CO <sub>2</sub> -eq	5,95E+01	3,13E+00	1,61E-02	0	1,50E+00	1,57E-01	2,29E-02	-3,82E+01	
 GWP-biogenic	kg CO <sub>2</sub> -eq	-2,97E-01	1,27E-03	9,10E-01	0	6,21E-04	2,09E-04	1,73E-05	-3,63E-01	
 GWP-luluc	kg CO <sub>2</sub> -eq	2,37E-02	1,17E-03	4,14E-06	0	5,34E-04	5,09E-06	6,98E-06	-1,18E-02	
 ODP	kg CFC11 -eq	3,06E-06	7,05E-07	2,58E-09	0	3,40E-07	1,70E-09	7,31E-09	-3,07E-03	
 AP	mol H+ -eq	2,95E-01	1,49E-02	1,30E-04	0	4,31E-03	5,30E-05	1,65E-04	-4,03E-01	
 EP-FreshWater	kg P -eq	1,89E-03	2,42E-05	1,94E-07	0	1,20E-05	3,53E-07	2,22E-07	-6,76E-04	
 EP-Marine	kg N -eq	4,82E-02	3,29E-03	5,57E-05	0	8,53E-04	1,55E-05	5,93E-05	-6,34E-02	
 EP-Terrestrial	mol N -eq	7,37E-01	3,66E-02	5,97E-04	0	9,54E-03	1,62E-04	6,53E-04	-7,79E-01	
 POCP	kg NMVOC -eq	1,68E-01	1,18E-02	1,53E-04	0	3,65E-03	5,95E-05	1,89E-04	-1,89E-01	
 ADP-minerals&metals <sup>1</sup>	kg Sb-eq	5,37E-04	8,25E-05	2,62E-07	0	4,14E-05	9,74E-08	4,02E-07	-3,26E-03	
 ADP-fossil <sup>1</sup>	MJ	7,89E+02	4,69E+01	1,90E-01	0	2,27E+01	1,06E-01	5,38E-01	-4,07E+02	
 WDP <sup>1</sup>	m <sup>3</sup>	1,44E+03	4,34E+01	2,92E-01	0	2,19E+01	-1,07E-01	9,82E-01	-3,58E+02	

GWP-total = Global Warming Potential total; 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







"Reading example: 9,0 E-03 = 9,0\*10<sup>-3</sup> = 0,009"

\*INA Indicator Not Assessed

1. 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

## Remarks to environmental impacts

**Additional environmental impact indicators**


Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
 PM	Disease incidence	7,30E-04	1,85E-07	1,59E-09	0	9,18E-08	3,68E-09	3,06E-09	-4,02E-06
 IRP <sup>2</sup>	kgBq U235 -eq	1,67E+00	2,05E-01	6,88E-04	0	9,91E-02	3,56E-04	2,16E-03	-9,86E-01
 ETP-fw <sup>1</sup>	CTUe	1,18E+03	3,44E+01	2,16E-01	0	1,68E+01	6,77E-01	3,13E-01	-8,18E+02
 HTP-c <sup>1</sup>	CTUh	2,92E-08	0,00E+00	2,40E-11	0	0,00E+00	5,20E-11	1,00E-11	-8,73E-09
 HTP-nc <sup>1</sup>	CTUh	7,20E-07	3,78E-08	1,15E-09	0	1,84E-08	6,24E-10	2,73E-10	-2,80E-07
 SQP <sup>1</sup>	dimensionless	5,16E+02	3,14E+01	1,06E-01	0	1,59E+01	2,65E-02	1,17E+00	-1,98E+02

PM = Particulate Matter emissions; IRP = Ionizing radiation – human health; ETP-fw = Eco toxicity – freshwater; HTP-c = Human toxicity – cancer effects; HTP-nc = Human toxicity – non cancer effects; SQP = Potential Soil Quality Index (dimensionless)

"Reading example: 9,0 E-03 = 9,0\*10<sup>-3</sup> = 0,009"

\*INA Indicator Not Assessed

1. 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
2. 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.




Resource use										
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D	
 PERE	MJ	1,21E+02	6,52E-01	3,90E-03	0	3,25E-01	7,11E-03	9,56E-03	-2,25E+01	
 PERM	MJ	8,33E+00	0,00E+00	-8,33E+00	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00	
 PERT	MJ	1,30E+02	6,52E-01	-8,32E+00	0	3,25E-01	7,11E-03	9,56E-03	-2,25E+01	
 PENRE	MJ	7,54E+02	4,69E+01	1,90E-01	0	2,27E+01	1,13E-01	5,38E-01	-4,07E+02	
 PENRM	MJ	3,90E+01	0,00E+00	0,00E+00	0	0,00E+00	-3,90E+01	0,00E+00	0,00E+00	
 PENRT	MJ	7,94E+02	4,69E+01	1,90E-01	0	2,27E+01	-3,89E+01	5,38E-01	-4,07E+02	
 SM	kg	0,00E+00	0,00E+00	0,00E+00	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00	
 RSF	MJ	2,76E+00	2,31E-02	1,14E-04	0	1,16E-02	1,46E-04	2,53E-04	-6,50E-04	
 NRSF	MJ	2,22E-01	8,13E-02	1,30E-03	0	4,15E-02	0,00E+00	6,95E-03	-2,20E-01	
 FW	m <sup>3</sup>	1,01E+00	4,87E-03	1,38E-04	0	2,42E-03	1,28E-04	4,88E-04	-2,15E-01	

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 resources; SM = Use of secondary materials; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water

\*Reading example: 9,0 E-03 = 9,0\*10<sup>-3</sup> = 0,009

\*INA Indicator Not Assessed








End of life - Waste										
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D	
 HWD	kg	3,31E-02	2,39E-03	0,00E+00	0	1,17E-03	0,00E+00	2,09E+00	-1,41E-01	
 NHWD	kg	1,33E+01	2,17E+00	6,00E-01	0	1,10E+00	2,14E+00	9,61E-02	-2,56E+00	
 RWD	kg	3,26E-03	3,20E-04	0,00E+00	0	1,54E-04	0,00E+00	3,27E-06	-1,34E-03	

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed

\*Reading example: 9,0 E-03 =  $9,0 \cdot 10^{-3} = 0,009$

\*INA Indicator Not Assessed

End of life - Output flow										
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D	
 CRU	kg	0,00E+00	0,00E+00	0,00E+00	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00	
 MFR	kg	3,84E+00	0,00E+00	1,41E-05	0	0,00E+00	3,90E+01	0,00E+00	0,00E+00	
 MER	kg	6,08E-02	0,00E+00	5,95E-01	0	0,00E+00	2,14E+00	0,00E+00	0,00E+00	
 EEE	MJ	3,61E-02	0,00E+00	4,14E-01	0	0,00E+00	2,78E-02	0,00E+00	0,00E+00	
 EET	MJ	5,46E-01	0,00E+00	6,26E+00	0	0,00E+00	4,20E-01	0,00E+00	0,00E+00	

CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported energy electrical; EET = Exported energy thermal

\*Reading example: 9,0 E-03 =  $9,0 \cdot 10^{-3} = 0,009$

\*INA Indicator Not Assessed

Biogenic Carbon Content		
Indicator	Unit	At the factory gate
Biogenic carbon content in product	kg C	0,00E+00
Biogenic carbon content in accompanying packaging	kg C	2,48E-01

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO<sub>2</sub>

## Additional requirements

### Greenhouse gas emissions from the use of electricity in the manufacturing phase

National production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process (A3).

Electricity mix	Source	Amount	Unit
Electricity, Denmark (kWh)	ecoinvent 3.6	338,20	g CO <sub>2</sub> -eq/kWh

### Dangerous substances

The product contains substances given by the REACH Candidate list that are less than 0,1 % by weight.

### Indoor environment






## Additional Environmental Information

Additional environmental impact indicators required in NPCR Part A for construction products									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWPIOBC	kg CO <sub>2</sub> -eq	6,21E+01	3,14E+00	1,61E-02	0	1,50E+00	8,82E-02	2,30E-02	-3,86E+01

GWPI-IOBC: Global warming potential calculated according to the principle of instantaneous oxidation. In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator GWP-IOBC is required as it declares climate impacts calculated according to the principle of instantaneous oxidation. GWP-IOBC is also referred to as GWP-GHG in context to Swedish public procurement legislation.

## Bibliography

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	ECO Platform ECO Portal	web: <a href="http://www.eco-platform.org">www.eco-platform.org</a> web: ECO Portal