Environmental Product Declaration

according to ISO 14025 and EN 15804

This declaration is for:

eyrise® s350 DGU

Provided by:

eyrise B.V.

program operator

Stichting MRPI®

publisher

Stichting MRPI®

www.mrpi.nl

MRPI® registration

1.1.00332.2022

date of first issue

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COMPANY INFORMATION

eyrise B.V.
De Run 5432
5504 DE
Veldhoven

eyrisesupport@merckgroup.com
https://www.eyrise.com/

MRPI® REGISTRATION

1.1.00332.2022

DATE OF ISSUE

05-08-2022

EXPIRY DATE

05-08-2027

PRODUCT

eyrise® s350 DGU

DECLARED UNIT/FUNCTIONAL UNIT

A glass build-up of 1230x1480 mm, calculated back to 1m², for a double glass unit (DGU), with a Ug-value of 1.0-1.1 W/m²K and a lifetime of 30 years.

DESCRIPTION OF PRODUCT

eyrise® s350 is a double glass build-up consisting of Liquid Crystals (LC) molecules embedded between two glass sheets.

VISUAL PRODUCT

MORE INFORMATION

https://www.eyrise.com/

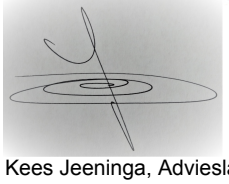
SCOPE OF DECLARATION

This MRPI®-EPD certificate is verified by **Anne Kees Jeeninga, Advieslab vof.**
The LCA study has been done by **Elsemieke Juffer, NIBE BV.**
The certificate is based on an LCA-dossier according to ISO14025 and EN15804+A2. It is verified according to the 'MRPI®-EPD verification protocol November 2020.v4.0'. EPDs of construction products may not be comparable if they do not comply with EN15804+A2. Declaration of SVHC that are listed on the 'Candidate List of Substances of Very High Concern for authorisation' when content exceeds the limits for registration with ECHA.

PROGRAM OPERATOR

Stichting MRPI®
Kingsfordweg 151
1043GR
Amsterdam

ir. J-P den Hollander, Managing director MRPI®

DEMONSTRATION OF VERIFICATION
CEN standard EN15804 serves as the core PCR[a]
Independent verification of the declaration and data, according to EN ISO 14025:2010: internal: external: X
Third party verifier:  Anne Kees Jeeninga, Advieslab vof
[a] PCR = Product Category Rules

DETAILED PRODUCT DESCRIPTION

eyrise® s350 instant solar glass is a laminated Insulating Glass Unit (IGU), which consists of Liquid Crystals (LC) molecules embedded between two glass sheets having a coating of transparent conductive oxide.

A typical double-glazed unit consists of a laminated inner pane and a laminated outer pane separated each of them by a cavity (1 cavity in total). The outer pane is a laminate of heat-strengthened cover glass and two identical eyrise® cells. The eyrise® cells constitute the core of the dynamic tinting in an eyrise® IGU, each eyrise cell has a thickness of 8mm. A low voltage changes the orientation of liquid crystal molecules and hence it's light and heat transmittance. This change in orientation determines the tint of solar glass.

The weight per square meter, with the DGU buildup, is approximately 97 kg/m². Reference service life is based on the EN-17074 and on information from the manufacturer (Durability_EPD). The PCR is followed and 30 years is adhered to.

The total weight for a window with a size of 1,23m x 1,48m is 174 kg (this includes the weight of the glass and PVB only).

The power consumption for the cells is ® 1 W/m². The eyrise® IGU is driven by an eyrise® driver through a driver cable – pigtail connection. The computer modules that are needed as the control panels for the sun protection function have a lifetime expectancy of 10 years and a warranty of 5 years.

Specifications on the build-up are confidential and will not be disclosed.

COMPONENT >1% of total mass	[kg / %]
Glass	90-95%
PVB layer	4%
Others (copper, technical module)	2-5%

(*) > 1% of total mass

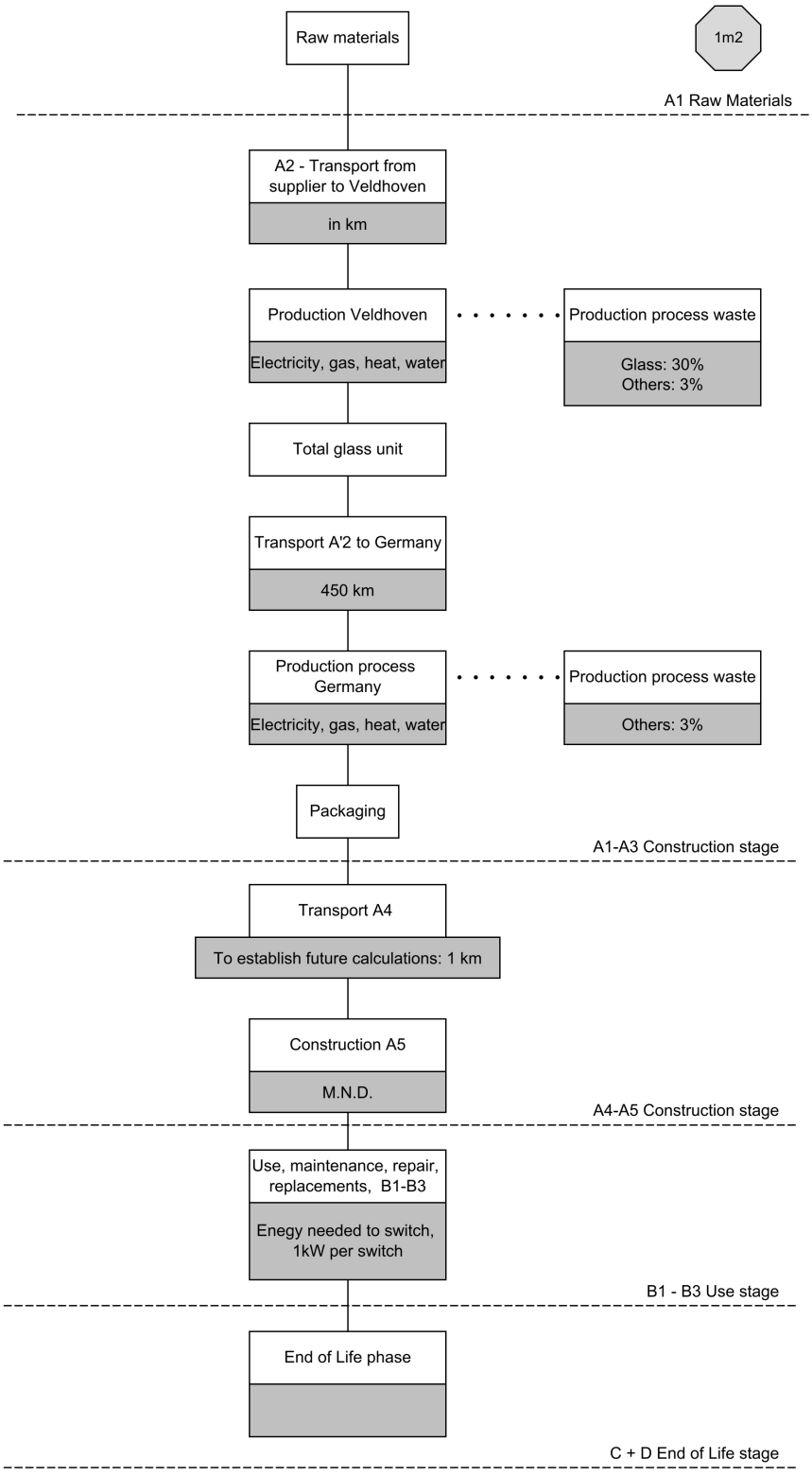
SCOPE AND TYPE

The product specific EPD for eyrise s350 DGU is a Cradle-to-Gate with options EPD. The product is produced in the Netherlands and partly in Germany. The software is Simapro 9.1 and NIBE's R<THiNK application are used to perform the LCA. The Ecoinvent 3.6 database was used. The validity of this EPD is in correspondence with the specifications of the LCA project report. The target groups of this LCA study are users of EPD's (business to business) in accordance with the EN 15804:2019 +A2. The LCA is intended for publication at MRPI and EcoPlatform.
The input data are representative for eyrise s350 DGU, a product of eyrise B.V. The data are representative for production in the Netherlands for the European market.

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport gate to site	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	ND	ND	x	ND	ND	ND	ND	x	x	x	x	x

X = Modules Assessed

ND = Not Declared



LCA process diagram according to EN 15804 (7.2.1)

REPRESENTATIVENESS

Data collection period

All data (materials, production amount and total energy) is collected in 2021-2022 and relate to the year 2020. The amounts of electricity and gas use for production are based on consumption data in the year 2020.

ENVIRONMENTAL IMPACT per functional unit or declared unit (core indicators A2)

	UNIT	A1	A2	A3	A1-A3	A4	A5	B3	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	1.26 E+2	1.33 E+1	6.84 E+1	2.08 E+2	1.30 E-2	8.87 E-1	2.58 E+1	0.00	8.95 E-1	1.20 E+1	1.58 E-1	-2.85 E+1
GWP-fossil	kg CO2 eq.	1.26 E+2	1.33 E+1	6.68 E+1	2.06 E+2	1.30 E-2	8.87 E-1	2.60 E+1	0.00	8.95 E-1	1.15 E+1	1.58 E-1	-2.82 E+1
GWP-biogenic	kg CO2 eq.	4.58 E-1	7.99 E-4	1.58 E+0	2.04 E+0	6.01 E-6	1.41 E-4	-1.78 E-1	0.00	4.13 E-4	5.16 E-1	4.52 E-4	-3.12 E-1
GWP-luluc	kg CO2 eq.	7.27 E-2	7.14 E-3	7.95 E-2	1.59 E-1	4.77 E-6	7.31 E-5	4.19 E-2	0.00	3.28 E-4	3.83 E-3	2.55 E-5	-1.24 E-2
ODP	kg CFC11 eq.	1.75 E-5	2.80 E-6	6.36 E-6	2.66 E-5	2.87 E-9	2.84 E-8	2.19 E-6	0.00	1.97 E-7	1.40 E-6	5.80 E-8	-1.47 E-6
AP	mol H+ eq.	1.31 E+0	2.64 E-1	4.07 E-1	1.98 E+0	7.55 E-5	4.36 E-4	2.05 E-1	0.00	5.19 E-3	1.79 E-2	1.18 E-3	-1.32 E-1
EP-freshwater	kg PO4 eq.	6.63 E-3	9.23 E-5	4.05 E-3	1.08 E-2	1.31 E-7	2.69 E-6	4.74 E-3	0.00	9.02 E-6	1.44 E-4	9.67 E-7	-1.40 E-5
EP-marine	kg N eq.	1.96 E-1	6.87 E-2	7.18 E-2	3.36 E-1	2.66 E-5	1.24 E-4	3.18 E-2	0.00	1.83 E-3	4.23 E-3	4.50 E-4	-1.65 E-2
EP-terrestrial	mol N eq.	2.41 E+0	7.63 E-1	8.52 E-1	4.03 E+0	2.93 E-4	1.37 E-3	3.79 E-1	0.00	2.02 E-2	4.52 E-2	4.84 E-3	-3.17 E-1
POCP	kg NMVOC eq.	6.01 E-1	2.01 E-1	3.08 E-1	1.11 E+0	8.37 E-5	3.70 E-4	1.05 E-1	0.00	5.75 E-3	1.24 E-2	1.39 E-3	-4.99 E-2
ADP-minerals & metals	kg Sb eq.	2.33 E-2	2.12 E-4	9.26 E-4	2.44 E-2	3.30 E-7	1.29 E-6	1.33 E-2	0.00	2.27 E-5	7.81 E-5	1.08 E-6	5.42 E-4
ADP-fossil	MJ, net calorific value	1.58 E+3	1.85 E+2	9.23 E+2	2.69 E+3	1.96 E-1	7.87 E-1	3.17 E+2	0.00	1.35 E+1	3.78 E+1	3.87 E+0	-2.53 E+2
WDP	m3 world eq. deprived	4.65 E+1	4.71 E-1	8.05 E+0	5.50 E+1	7.02 E-4	4.52 E-2	6.40 E+0	0.00	4.83 E-2	2.47 E+0	1.64 E-2	-1.07 E+1

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 Exceedence
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 Exceedence
POCP = Formation potential of tropospheric ozone photochemical oxidants
ADP-minerals&metals = Abiotic Depletion Potential for non fossil resources [2]
ADP-fossil = Abiotic Depletion for fossil resources potential [2]
WDP = Water (user) deprivation potential, deprivation-weighted water consumption [2]

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 experience with the indicator.

ENVIRONMENTAL IMPACT per functional unit or declared unit (additional indicators A2)

	UNIT	A1	A2	A3	A1-A3	A4	A5	B3	C1	C2	C3	C4	D
PM	Disease incidence	1.16 E-5	7.83 E-7	2.82 E-6	1.52 E-5	1.17 E-9	3.84 E-9	1.32 E-6	0.00	8.05 E-8	1.64 E-7	2.50 E-8	-1.21 E-6
IRP	kBq U235 eq.	4.32 E+0	7.82 E-1	1.93 E+0	7.03 E+0	8.22 E-4	3.25 E-3	1.19 E+0	0.00	5.65 E-2	1.70 E-1	1.67 E-2	-4.63 E-1
ETP-fw	CTUe	5.57 E+3	1.42 E+2	1.13 E+3	6.84 E+3	1.75 E-1	1.11 E+1	2.38 E+3	0.00	1.20 E+1	7.72 E+2	9.33 E+0	-1.00 E+3
HTP-c	CTUh	7.67 E-8	6.71 E-9	4.43 E-8	1.28 E-7	5.68 E-12	1.69 E-10	3.09 E-8	0.00	3.90 E-10	7.08 E-9	4.76 E-11	-1.43 E-8
HTP-nc	CTUh	3.07 E-6	1.39 E-7	1.02 E-6	4.23 E-6	1.91 E-10	3.57 E-9	1.39 E-6	0.00	1.32 E-8	1.56 E-7	1.50 E-9	-8.04 E-7
SQP	---	5.80 E+2	9.46 E+1	2.36 E+2	9.10 E+2	1.70 E-1	3.57 E-1	1.53 E+2	0.00	1.17 E+1	1.68 E+1	8.53 E+0	-1.99 E+2

PM = Potential incidence of disease due to PM emissions
IRP = Potential Human exposure efficiency relative to U235 [1]
ETP-fw = Potential Comparative Toxic Unit for ecosystems [2]
HTP-c = Potential Comparative Toxic Unit for humans [2]
HTP-nc = Potential Comparative Toxic Unit for humans, non-cancer [2]
SQP = Potential soil quality index [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 experience with the indicator.

RESOURCE USE per functional unit or declared unit (A1 / A2)

	UNIT	A1	A2	A3	A1-A3	A4	A5	B3	C1	C2	C3	C4	D
PERE	MJ	1.01 E+2	1.79 E+0	9.98 E+2	1.10 E+3	2.46 E-3	1.02 E-2	3.52 E+1	0.00	1.69 E-1	3.78 E-1	8.98 E-1	-7.24 E+0
PERM	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERT	MJ	1.01 E+2	1.79 E+0	9.95 E+2	1.10 E+3	2.46 E-3	6.99 E-2	3.53 E+1	0.00	1.69 E-1	3.82 E+0	6.05 E-2	-2.11 E+1
PENRE	MJ	1.69 E+3	1.96 E+2	1.01 E+3	2.90 E+3	2.08 E-1	2.46 E-1	3.37 E+2	0.00	1.43 E+1	8.33 E+0	1.63 E+1	-1.34 E+2
PENRM	MJ	1.47 E+1	0.00	1.66 E+1	3.13 E+1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-4.52 E+0
PENRT	MJ	1.70 E+3	1.96 E+2	1.00 E+3	2.90 E+3	2.08 E-1	8.36 E-1	3.38 E+2	0.00	1.43 E+1	4.01 E+1	4.10 E+0	-2.74 E+2
SM	MJ	2.96 E-1	0.00	6.89 E-3	3.03 E-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	m3	1.13 E+0	1.63 E-2	3.39 E-1	1.48 E+0	2.39 E-5	1.33 E-3	2.40 E-1	0.00	1.64 E-3	6.80 E-2	4.59 E-3	-2.68 E-1

PERE = Use of renewable energy excluding renewable primary energy resources
PERM = Use of renewable energy resources used as raw materials
PERT = Total use of renewable primary energy resources
PENRE = Use of non-renewable primary energy resources excluding non-renewable 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 = Use of net fresh water

OUTPUT FLOWS AND WASTE CATEGORIES per functional unit or declared unit (A1 / A2)

	UNIT	A1	A2	A3	A1-A3	A4	A5	B3	C1	C2	C3	C4	D
HWD	kg	5.67 E-3	3.23 E-4	3.13 E-3	9.13 E-3	4.97 E-7	1.57 E-6	1.83 E-3	0.00	3.42 E-5	1.95 E-3	4.35 E-6	2.48 E-3
NHWD	kg	1.13 E+1	6.25 E+0	1.62 E+1	3.37 E+1	1.24 E-2	6.15 E-2	3.62 E+0	0.00	8.56 E-1	2.61 E+0	2.75 E+1	-3.18 E+0
RWD	kg	4.95 E-3	1.25 E-3	2.52 E-3	8.72 E-3	1.29 E-6	3.17 E-6	9.16 E-4	0.00	8.86 E-5	1.57 E-4	2.62 E-5	-4.69 E-4
CRU	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFR	kg	0.00	0.00	1.32 E+1	1.32 E+1	0.00	1.92 E-2	3.25 E-2	0.00	0.00	6.40 E+1	0.00	0.00
MER	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EEE	MJ	0.00	0.00	1.01 E-1	1.01 E-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.87 E+1
ETE	MJ	0.00	0.00	1.74 E-1	1.74 E-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.22 E+1

HWD = Hazardous Waste Disposed
NHWD = Non Hazardous Waste Disposed
RWD = Radioactive Waste Disposed
CRU = Components for reuse
MFR = Materials for recycling
MER = Materials for energy recovery
EEE = Exported Electrical Energy
ETE = Exported Thermal Energy

BIOGENIC CARBON CONTENT per functional unit or declared unit (A1 / A2)

	UNIT	A1	A2	A3	A1-A3	A4	A5	B3	C1	C2	C3	C4	D
BCCpr	kg C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BCCpa	kg C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

BCCpr = Biogenic carbon content in product
BCCpa = Biogenic carbon content in packaging

CALCULATION RULES

Cut-off criteria

There is no cut-off of inputs and outputs in any of the processes during the life cycle stage, unit processes of each declared life cycle stage are considered.

Allocation

The energy use per kilogram product is determined by allocating the total energy use of 2020 to the total amount of produced products in kilogram.

In this LCA study the following is included:
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.

Construction process stage (A4-A5)

The construction stage (A5) is not considered, transport to the construction site (A4) is considered. The computer modules, which are officially transported from Veldhoven to the construction site directly, are added in the A4 transportation because of the small weight this has little impact on the total of the environmental emissions.Â Transportation in A4 is modelled for 1 km, the results can be multiplied by the distance that is required for the specific project. Hence, the users can determine for their respective project what the value must be, and find their sources accordingly.

Use stage (B1-B7)

The use stage (B1 to B7) is not considered.

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 considers 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. The default end-of-life scenarios of the annex (november 2020) to the NMD Determination method v1.0 have been used for the various materials in the product.

Benefits and Loads beyond the system boundary (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).

Data quality
The data quality is decribed below by theme:

Geographical coverage
The input data is representative for s350 DGU of eyrise B.V. The data are representative for production in the Netherlands, and partly Germany, for the European market.

Time period covered
Production data concerning the material composition are collected in the period 2021-2022 and relate to the year 2020. The amounts of electricity and gas use for production are based on consumption data in the year 2020.

Technology coverage
The (current) technology for the production of raw materials in the year 2020 is used.

Attention was paid to the accuracy, completeness, representativeness, consistency and reproducibility of the data, as follows:

Precision
Production Data are collected from financial statements, bill of materials, calculations, measurements and estimates. The collected data has sufficient accuracy for true outcomes.

Completeness
The aim was to obtain complete data of materials, transportation, energy, emissions and waste. All relevant environmental interventions are included in the inventory.

Representativeness
The representativeness of the data is good, because they are based on the processes that occur mainly in one factory. The origin of the materials is properly inventoried. The input data are representative for the actually produced glass-unit.

Consistency
The consistency is guaranteed by only using one database, EcoInvent 3.6.

Reproducability
The values on which this LCA is performed, can be found in this report and the corresponding project file. The way on which the data are collected and where the information is based on, is included. As a result, the preformed LCA is reproducable.

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

End-of-life stage (C2-C4)

At the end-of-life stage scenarios are used for waste processing. The scenarios on which the LCA is based are outlined in more detail below.

Name: glass	Value	Unit
Transport distance for recycling (module C2)	50	km
Transport distance for landfill (module C2)	100	km
Recycling	70	%
Landfill	30	%

Name: Technical modules (polyolefines (i.a. pe,pp))	Value	Unit
Transport distance for recycling (module C2)	50	km
Transport distance for landfill (module C2)	100	km
Transport distance for incineration (module C2)	150	km
Recycling	5	%
Landfill	10	%
Incineration	85	%

Name: PVB layer	Value	Unit
Transport distance for recycling (module C2)	50	km
Transport distance for landfill (module C2)	100	km
Transport distance for incineration (module C2)	150	km
Landfill	10	%
Incineration	85	%
Recycling	5	%

Name: Copper, mixed (electricity cables)	Value	Unit
Transport distance for recycling (module C2)	50	km
Transport distance for landfill (module C2)	100	km
Transport distance for incineration (module C2)	150	km
Recycling	85	%
Landfill	10	%
Incineration	5	%

DECLARATION OF SVHC

The product does not contain SVHC.

REFERENCES

ISO 14040

ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework; EN ISO 14040:2006

ISO 14044

ISO 14044:2006-10, Environmental management - Life cycle assessment - Requirements and guidelines; EN ISO 14040:2006

ISO 14025

ISO 14025:2011-10: Environmental labels and declarations – Type III environmental declarations – Principles and procedures

EN 15804+A1

EN 15804+A1: 2013: Sustainability of construction works – Environmental Product Declarations – Core rules for the product category of construction products

EN 15804+A2

EN 15804+A2: 2019: Sustainability of construction works – Environmental Product Declarations – Core rules for the product category of construction products

EN 17074

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

EN 17213

EN 17213:2020: Windows and doors – Environmental Product Declarations – Product category rules for windows and pedestrian doorsets

SBK-verification protocol

SBK-verification protocol – inclusion data in the Dutch environmental database, Final Version 3.0, January 2019, SBK

NMD Determination method

NMD Determination method Environmental performance Construction works v1.0 July 2020, foundation NMD

REMARKS

Framing, fastening materials, adjusting frame, hinges and locks, silencing box, doorstep or water barrier are not included in this LCA, it is purely the glass.