

# Environmental Product Declaration (EPD)



Declaration code: M-EPD-MIG-GB-002027

**Note:** This EPD is based on the model EPD Glass.



Flachglas  
Wernberg  
GmbH

## Glass

### Insulating glass units (IGU) Double and triple glass configurations



**Basis:**

DIN EN ISO 14025  
EN15804  
Model EPD  
Environmental Product  
Declaration

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18.12.2022



[www.ift-rosenheim.de/  
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# Environmental Product Declaration (EPD)



Declaration code: M-EPD-MIG-GB-002027

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<b>Practitioner of the LCA</b>	ift Rosenheim GmbH Theodor Gietl Straße 7-9 83026 Rosenheim		
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<b>Declaration code</b>	M-EPD-MIG-GB-002027		
<b>Designation of declared product</b>	Insulating glass units Double and triple glass configurations		
<b>Scope</b>	Insulating glass units for installation in windows, doors, curtain walling, roofs and partitions.		
<b>Basis</b>	This model EPD was prepared on the basis of EN ISO 14025:2011 and EN 15804:2012+A1:2013. In addition, the "Allgemeiner Leitfaden zur Erstellung von Typ II Umweltproduktdeklarationen" (Guidance on preparing Type III Environmental Product Declarations) applies. The Declaration is based on the PCR Documents "Flachglas" (Flat Glass) PCR-FG-1.3:2016 and "PCR Teil A" (Part A) PCR-A-0.1:2018.		
<b>Validity</b>	Publication date: 18.12.2017	Last revision: 12.02.2019	Next revision: 18.12.2022
	This verified Environmental Product Declaration applies solely to the specified products and is valid for a period of 5 years from the date of publication in accordance with DIN EN 15804.		
<b>LCA basis</b>	The LCA was prepared in accordance with DIN EN ISO 14040 and DIN EN ISO 14044. The base data include both the data collected at the Flachglas Wernberg GmbH production site and the generic data derived from the "Gabi ts" database. LCA calculations were based on the "cradle to gate with options" life cycle including all upstream processes (e.g. raw material extraction, etc.).		
<b>Notes</b>	The "Conditions and Guidance on the Use of ift Test Documents" apply. The declaration holder assumes full liability for the underlying data, certificates and verifications.		

Prof. Ulrich Sieberath  
Director of Institute

Patrick Wortner  
External verifier

## 1 General product information

### Product definition

The EPD relates to the product group “flat glass” and applies to:

**1 m<sup>2</sup> area and 1 mm glass thickness**

**Insulating glass units - Double and triple glass configurations**

The declared unit relates to the product and end-of-life stages of 1 m<sup>2</sup> area and 1 mm thickness of coated insulating glass units.

The average unit is declared as follows:

Directly used material flows are determined using average area (1 m<sup>2</sup>) or produced masses (kg) and assigned to the declared unit. All other inputs and outputs in the manufacture were scaled to the declared unit as a whole, since no direct assignment to the average size is possible. The reference period is 2016.

### Product description

This EPD applies to insulating glass units as per EN 1279-5 “Glas im Bauwesen - Mehrscheiben-Isolierglas” (Glass in building - Insulating glass units)

Glass unit consisting of two or several glass panes separated from each other by one or several cavities containing an air or gas filling. The edges of the panes are hermetically sealed (air/gas and moisture proof) using e.g. organic sealing compounds.

The configuration of the insulating glass units presented in this EPD is as follows:

- Double insulating glass units 4/12/4 - made of flat glass
- Triple insulating glass units 4/12/4/12/4 - made of flat glass

Insulating glass configurations with alternative glass thicknesses and/or cavity widths can be evaluated in accordance with this EPD as follows:

Example: triple insulating glass unit 4/12/4/12/6 - primary energy non-renewable for ESG:

Insulating glass unit:	515.62 MJ
- 4 mm flat glass:	4 x 45.47 MJ
+ 6 mm ESG:	6 x 64.92 MJ

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723.26 MJ

The spacer/cavity are negligible for the calculation.

The data for flat glass/ESG/VSG are given in the EPD flat glass/ESG/VSG.

The same approach applies to other glass thicknesses. In this context, e.g. the values for 1 mm of flat glass must be added.

This EPD does not cover insulating glass units with devices installed in the cavity (mid-pane devices).

For a detailed product description refer to the manufacturer specifications at [www.glas-ist-gut.de](http://www.glas-ist-gut.de) or the product specifications of the respective offer/quotation.

### Product manufacture

Glass panes are positioned the desired distance apart using one or several spacer profiles made from aluminium, stainless steel or plastic/metal combinations, or containing organic materials, and are joined and sealed in a gas-proof manner using two sealing planes, following the filling of the cavities with inert gas (generally

argon).

### Application

Insulating glass units for installation in windows, doors, curtain walling, roofs and partitions.

### Quality assurance

The following verifications are held:

- Quality assurance in accordance with RAL GZ 520

### Additional information

For detailed structural characteristics refer to the CE marking, declaration of performance, documents accompanying the product or the product data sheets.

#### Structural data:

The following technical characteristics are relevant to insulating glass units:

- Thermal transmittance
- Total energy transmittance
- Light transmittance
- Sound reduction index

Characteristics	Designation	Product standard	Unit
Thermal transmittance	$g$ -value	EN 1279	W/(m <sup>2</sup> *K)
Total energy transmittance	$g$ -value	EN 1279	%
Light transmittance	$\tau_v$	EN 1279	%
Sound reduction index	$R_w$ value	EN 1279	dB

## 2 Materials used

### Primary materials

#### Glass:

The pre-product is soda lime silicate glass (float glass). The main components are the naturally occurring raw materials sand (silicon carbonate, 58%), soda (sodium carbonate, 18%), dolomite (15%), lime (calcium carbonate, 5%) and sulphate (1%).

**Spacers:** conventional or thermally optimised spacers

**Sealing:** polyurethane, polysulfide, butyl, silicone, polyisobutylene

**Desiccant:** zeolithes

**Inert gases:** generally argon, (or rarely krypton) is used for filling the cavity (SZR)

Further base materials used can be found in the Life Cycle Assessment (see chapter 6).

### Declarable substances

The product contains no substances from the REACH candidate list (declaration dated 08. june 2018).



All relevant safety data sheets are available from Flachglas Wernberg GmbH.

### 3 Construction process stage

#### Processing recommendations, installation

Insulating glass units are installed in windows or facades. The Guidance Sheet 002/2008 "Richtlinie zum Umgang mit Mehrscheiben-Isolierglas" (Guidance on handling insulating glass units) by Bundesverband Flachglas (German Flat Glass Association) should be observed.

The instructions for installation, operation, maintenance and disassembly must be noted. See [www.glas-ist-gut.de](http://www.glas-ist-gut.de) for more information.

### 4 Use stage

#### Emissions to the environment

If used according to their intended use, insulating glass units are not known to have an increased impact on the environment/health.

There are no known emissions to indoor air, water and soil. There may be VOC emissions.

#### Reference service life (RSL)

RSL information to be declared in an EPD covering the use stage shall be provided by the manufacturer. The RSL shall refer to the declared technical and functional performance of the product within a building. It shall be established in accordance with any specific rules given in European product standards and shall take into account ISO 15686-1, -2, -7 and -8. Where European product standards provide guidance on deriving the RSL, such guidance shall have priority.

If the reference service life can't be determined according to ISO 15686, the BBSR table „Nutzungsdauern von Bauteilen zur Lebenszyklusanalyse nach BNB“ can be used. For further information visit [www.nachhaltigesbauen.de](http://www.nachhaltigesbauen.de)

The reference service life (RSL) can be determined for a "cradle to gate - with options" EPD only if all the modules A1- A3 and B1-B5 are specified;

The service life of the Insulating glass units from Flachglas Wernberg GmbH is optionally specified at 30 years according to BBSR-Tabelle (glazing).

The service life depends on the characteristics of the product and the terms of use. The features described in the EPD are applied, in particular the following:

- Outdoor conditions: Weather conditions can have a negative effect on the service life.
- Indoor conditions: There are no known impacts that have a negative effect on the service life.

The reference service life is for the features, which are reported in this EPD or the relevant references for this purpose.

The RSL does not reflect the actual life time, which is usually determined by the service life and the redevelopment of a building. It represents no statement about service life, guarantee of performance or promise of guarantee.

### 5 End-of-life stage

#### Possible end-of-life stages

Insulating glass units are not specifically designed for reuse, although reuse is by all means possible.

According to prEN 17074, Insulating glass units are collected up to 30%, shipped to central collection points and recycled, for example for the production of container



glass, glass wool or foam glass.

The end-of-life stage depends on the site where the products are used and is therefore subject to local regulations. Observe the locally applicable regulatory requirements.

### Disposal routes

The average disposal routes were taken into account in the LCA.

Approximately 70% of the glass share and 100% of the glass-free materials are disposed of at a construction waste landfill.

Waste code glass waste:

- 170202, 170204, 170902 for glass from construction and demolition waste
- 190401, 191205 for glass from waste treatment plants

**All life cycle scenarios are detailed in the Annex.**

## 6 Life Cycle Assessment (LCA)

Environmental product declarations are based on life cycle analyses (LCAs) which use material and energy flows for the calculation and subsequent representation of environmental impacts.

As the basis for this, an LCA was prepared for Insulating glass units. The LCA was developed in accordance with EN 15804 and the requirements set out by the international standards DIN EN ISO 14040, DIN EN ISO 14044, ISO 21930 and EN ISO 14025.

The LCA is representative of the products presented in the Declaration and the specified reference period.

### 6.1 Definition of goal and scope

#### Goal

The goal of the LCA is to demonstrate the environmental impacts of Insulating glass units. In accordance with EN 15804, the environmental impacts covered by this Environmental Product Declaration are presented for the entire product life cycle in the form of basic information. Apart from these, no other environmental impacts have been specified.

#### Data quality, data availability and geographical and time-related system boundaries

The specific data originate from the fiscal year 2013. The production-specific data of flat glass manufacture are taken from data collected at various typical, European manufacturer plants and statistics from 2013. In 2016, these data were verified for currentness by member companies of the Bundesverband Flachglas e.V. (German Flat Glass Association). The average values determined are based on the volumes produced by the plants. All relevant data for the insulating glass units were supplied by the Bundesverband Flachglas (German Flat Glass Association). Typical data for the coating system were supplied by a manufacturer. The quantity data for raw materials, energy, ancillary materials used are annual averages. The data originates partly from company records and partly from values directly obtained by measurement. Data were additionally collected by the ift Rosenheim in 2017 to verify representativeness.

The generic data originates from the GaBi ts software, "Professional Datenbank und Baustoff Datenbank" (professional database and building materials database). The last update of both databases was in 2018. Data from before this date originate also from these databases and are not more than 4 years old. No other generic data were used for the calculation.

Data gaps were either filled with comparable data or conservative assumptions, or

the data were cut off in compliance with the 1 % rule.

The life cycle was modelled using the sustainability software tool "GaBi 8" for the development of Life Cycle Assessments.

### Scope / System boundaries

The system boundaries refer to the supply of raw materials and purchased parts, manufacture and end-of-life stage of Insulating glass units (cradle to gate - with options).

No additional data from pre-suppliers/subcontractors or other sites were taken into consideration.

**Due to the wide range of possible applications and designs, the use stage is not taken into account in the calculation.**

### Cut-off criteria

All company data collected, i.e. all commodities/input and raw materials used, the thermal energy, the electricity consumption and all results of the available emission measurements from the plants were taken into consideration.

The transport distances of the pre-products were taken into consideration as a function of 100% of the mass of the products. The transport mix is consisted as follows and is derived from the research project "EPDs for transparent components":

- Lorry, 26 - 28 t gross weight / 18.4 t payload, Euro 6, freight, 85% utilization, 100 km;
- Road train, 28 - 34 t gross weight / 22 t payload, Euro 6, 50% utilization, 50 km;
- Freight train, electric and diesel-operated, D 60%, E 51% utilization, 50 km;
- Sea ship consumption mix, 50 km

The criteria for the exclusion of inputs and outputs as set out in EN 15804 are fulfilled. It can be assumed that the total of negligible processes per life cycle stage does not exceed 1 percent of the mass/primary energy. This way the total of negligible processes does not exceed 5 percent of the energy and mass input. The life cycle calculation also includes material and energy flows that account for less than 1 percent.

## 6.2 Inventory analysis

### Goal

All material and energy flows are described below. The processes covered are presented as input and output parameters and refer to the declared/functional units.

The models of the unit processes used for the LCA have been documented in a transparent manner.

### Life cycle stages

The Annex shows the entire life cycle of Insulating glass units. Product stage "A1 – A3", end-of-life stage "C3 – C4" and benefits and loads beyond the system boundaries "D" are considered.

### Benefits

The below benefits have been defined as per EN 15804:

- Benefits from recycling

### Allocation procedures Allocation of co-products

During the manufacture of Insulating glass units no allocations occur.



**Allocations for re-use, recycling and recovery**

Allocations for the use of recycled materials/secondary raw materials can be found in the GaBi database documentation.

**Allocations beyond life cycle boundaries**

If Insulating glass units is reused / recycled during the product stage (rejects), the elements are shredded, as necessary, and then sorted into their original pure components. The system boundaries for the manufacture of Insulating glass units were set following their disposal, with termination of their waste characteristics.

**Secondary material**

The use of secondary materials in Module A3 was considered. A small proportion of secondary material is used across industry boundaries.

**Inputs**

**Energy:**

The electricity mix is based on "Strommix Europa" (European electricity mix). Gas is based on "Erdgas Europa" (European natural gas).

A portion of the process heat is used for space heating. This can however not be quantified, hence a "worst case" figure was taken into account for the product.

**Water:**

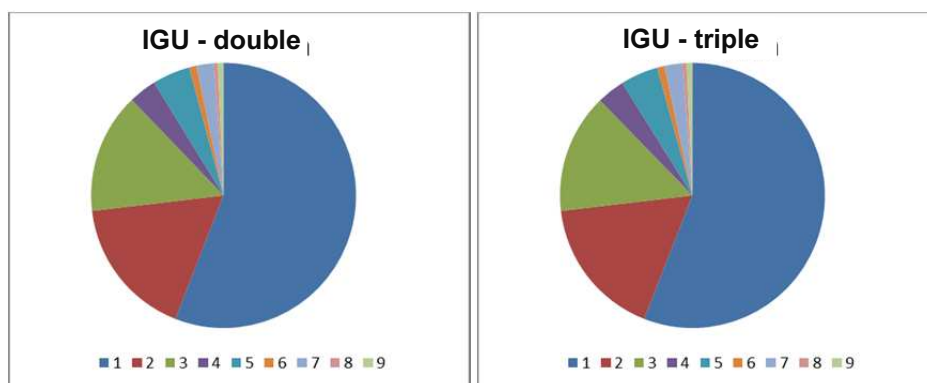
The water consumed by the individual process steps for the manufacture of Insulating glass units is 11.0 l per m<sup>2</sup> element.

The consumption of fresh water specified in Section 6.3 originates (among others) from the upstream processes of the pre-products.

**Raw material/Pre-products:**

The main non-renewable material resources used are siliceous sand and waste rock.

The chart below shows the use of raw materials/pre-products per cent.



Nr.	Material	Mass in %	
		IGU - double	IGU - triple
1	Sand	56.0	56.0
2	Soda	17.2	17.2
3	Dolomite	14.7	14.6
4	Broken glass	3.4	3.4



5	Chalk	4.6	4.6
6	Sulphate	0.9	0.9
7	Sealant	2.1	2.2
8	Spacers	0.5	0.5
9	Other	0.7	0.7

Sand, dolomite and limestone are direct ingredients in the manufacture of the flat glass, while the consumption of the material resource copper-silver-gold ore is due to the coating components. Waste rock is the commercially worthless mass of stone obtained during the mining of ores and energy resources such as coal, etc.

## Outputs

The LCA includes the following production-relevant outputs per 1 m<sup>2</sup> Insulating glass units:

### Waste:

See Section 6.3 - Impact assessment.

### Waste water

The manufacture of Insulating glass units produces 6.2 l waste water per 1 m<sup>2</sup>.

## 6.3 Impact assessment

### Goal

The impact assessment covers inputs and outputs. The impact categories applied are named below:

### Impact categories

The models for impact assessment were applied as described in EN 15804-A1. The impact categories presented in the EPD are as follows:

- Depletion of abiotic resources (fossil fuels);
- Depletion of abiotic resources (elements);
- Acidification of soil and water;
- Ozone depletion;
- Global warming;
- Eutrophication;
- Photochemical ozone creation.

### Waste

The waste generated during the production of 1 m<sup>2</sup> of Insulating glass units is evaluated and shown separately for each of the three main fractions, namely trade wastes, special wastes and radioactive wastes. Since waste handling is modelled within the system boundaries, the amounts shown refer to the deposited wastes. A portion of the waste indicated is generated during the manufacture of the pre-products.



Product group: flat glass

Results per 1 m <sup>2</sup> of Insulating glass units (Part 1)	Unit	Double insulating glass units						Triple insulating glass units					
		A1-A3	C1	C2	C3	C4	D	A1-A3	C1	C2	C3	C4	D
<b>Environmental impacts</b>													
Global warming potential (GWP)	kg CO <sub>2</sub> equiv.	31.63	26.70	0.24	0.08	0.34	0.23	40.36	0.36	0.12	0.52	0.35	-4.66
Depletion potential of stratospheric layer (ODP)	kg R11 equiv.	9.78E-09	9.66E-09	1.06E-12	2.15E-15	1.53E-12	5.28E-14	1.92E-08	1.59E-12	3.23E-15	2.30E-12	7.93E-14	-2.71E-12
Acidification potential of soil and water (AP)	kg CO <sub>2</sub> equiv.	31.96	0.29	6.74E-04	4.56E-04	9.79E-04	1.38E-03	0.44	1.01E-03	6.86E-04	1.47E-03	2.07E-03	-2.55E-02
Eutrophication potential (EP)	kg PO <sub>4</sub> <sup>3-</sup> equiv.	2.25	2.31E-02	6.32E-05	1.17E-04	9.17E-05	1.90E-04	3.47E-02	9.49E-05	1.76E-04	1.38E-04	2.86E-04	-3.28E-03
Formation potential of tropospheric ozone (POCP)	kg C <sub>2</sub> H <sub>4</sub> equiv.	1.38	1.58E-02	4.22E-05	-2.04E-04	6.13E-05	1.07E-04	2.42E-02	6.34E-05	-3.07E-04	9.19E-05	1.61E-04	3.57E-03
Abiotic depletion potential - non-fossil resources (ADP - elements)	kg Sb equiv.	7.11E-04	7.06E-04	1.26E-07	6.46E-09	1.83E-07	8.93E-08	1.31E-03	1.89E-07	9.70E-09	2.75E-07	1.34E-07	-1.01E-05
Abiotic depletion potential - fossil fuels (ADP - fossil resources)	MJ	484.4	480.04	2.53	1.07	3.67	3.01	725.11	3.80	1.61	5.50	4.52	-63.31
<b>Use of resources</b>	<b>Unit</b>	<b>A1-A3</b>	<b>A1-A3</b>	<b>C1</b>	<b>C2</b>	<b>C3</b>	<b>C4</b>	<b>A1-A3</b>	<b>C1</b>	<b>C2</b>	<b>C3</b>	<b>C4</b>	<b>D</b>
Use of renewable primary energy - excluding renewable primary energy resources used as raw materials	MJ	31.56	29,54	-	-	-	-	42.56	-	-	-	-	-
Use of renewable primary energy resources used as raw materials (material use)	MJ	0	0,00	-	-	-	-	0.00	-	-	-	-	-
Total use of renewable primary energy resources (primary energy and renewable primary energy resources used as raw materials) (energy + material use)	MJ	31.56	29.54	1.63	0.06	2.37	0.39	42.56	2.45	0.09	3.55	0.58	-4.56
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials.	MJ	515.62	498,39	-	-	-	-	749.58	-	-	-	-	-
Use of non-renewable primary energy resources used as raw materials (material use)	MJ	0	9,76	-	-	-	-	15.44	-	-	-	-	-
Total use of non-renewable primary energy resources (primary energy and non-renewable primary energy resources used as raw materials) (energy + material use)	MJ	515.62	508.15	4.34	1.07	6.30	3.12	765.02	6.51	1.61	9.45	4.69	-68.10
Use of secondary materials	kg	0.88	0.88	0.00	0.00	0.00	0.00	1.32	0.00	0.00	0.00	0.00	0.00



Product group: flat glass

Results per 1 m <sup>2</sup> of Insulating glass units (Part 2)	Unit	Double insulating glass units						Triple insulating glass units					
		A1-A3	C1	C2	C3	C4	D	A1-A3	C1	C2	C3	C4	D
<b>Use of resources</b>													
Use of renewable secondary fuels	MJ	1.55E-12	0.00	5.80E-30	0.00	4.73E-23	-1.95E-21	2.38E-12	0.00	8.71E-30	0.00	7.11E-23	-2.92E-21
Use of non-renewable secondary fuels	MJ	1.82E-11	6.44E-30	8.80E-29	9.36E-30	5.55E-22	-2.29E-20	2.80E-11	9.68E-30	1.32E-28	1.40E-29	8.35E-22	-3.43E-20
Use of net fresh water	m <sup>3</sup>	0.11	2.22E-03	1.09E-04	3.22E-03	5.96E-04	-6.54E-03	0.17	3.33E-03	1.64E-04	4.84E-03	8.96E-04	-9.81E-03
<b>Waste categories</b>	<b>Unit</b>	<b>A1-A3</b>	<b>C1</b>	<b>C2</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>A1-A3</b>	<b>C1</b>	<b>C2</b>	<b>C3</b>	<b>C4</b>	<b>D</b>
Hazardous waste disposed	kg	2.94E-03	2.03E-09	6.21E-08	2.95E-09	5.37E-08	-4.75E-08	4.77E-03	3.06E-09	9.33E-08	4.43E-09	8.07E-08	-7.12E-08
Non-hazardous waste disposed (municipal waste)	kg	22.86	3.05E-03	9.00E-05	4.44E-03	14.64	-0.42	34.30	4.59E-03	1.35E-04	6.66E-03	22.00	-0.63
Radioactive waste	kg	1.10E-02	7.18E-04	1.47E-06	1.04E-03	4.52E-05	-1.27E-03	1.56E-02	1.08E-03	2.21E-06	1.56E-03	6.80E-05	-1.90E-03
<b>Output material flows</b>	<b>Unit</b>	<b>A1-A3</b>	<b>C1</b>	<b>C2</b>	<b>C3</b>	<b>C4</b>	<b>D</b>	<b>A1-A3</b>	<b>C1</b>	<b>C2</b>	<b>C3</b>	<b>C4</b>	<b>D</b>
Components for re-use	kg	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	-
Materials for recycling	kg	2.08	0.00	0.00	5.98	0.00	-	3.12	0.00	0.00	8.97	0.00	-
Materials for energy recovery	kg	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	-
Exported energy (electricity)	MJ	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	-
Exported energy (thermal energy)	MJ	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	-

## 6.4 Interpretation, LCA presentation and critical review

### Evaluation

Some of the environmental effects differ considerably. The differences arise on the one hand from changed background data in the GaBi ts software and through the use of more suitable data sets. On the other hand, the reduced energy consumption in the manufacture of flat glass leads to differences between the assessments from 2012 and 2018.

The environmental effects of Insulating glass units arise in the range of production, mainly due to the discharging emissions as well as from the use of soda or its precursors in flat glass.

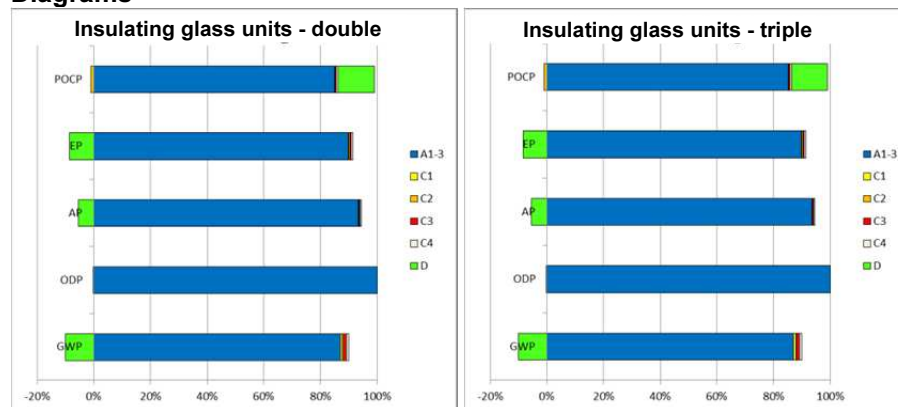
In scenario C4, only marginal expenditures for the physical pretreatment and the landfill operation are to be expected.

During the recycling of the glasses, approximately one-tenth of the environmental impact of manufacturing can be credited to Scenario D.

The breakdown of the major environmental impacts is shown in the diagram below.

**The values obtained from the LCA calculation are suitable for the certification of buildings, as necessary.**

### Diagrams



### Report

The LCA underlying this EPD was developed according to the requirements set out in DIN EN ISO 14040 and DIN EN ISO 14044 as well as EN 15804 and EN ISO 14025. It is not addressed to third parties for confidentiality reasons. It is deposited with the ift Rosenheim. The results and conclusions reported to the target group are complete, correct, without bias and transparent. The results of the study are not designed to be used for comparative statements intended for publication.

### Critical review

The critical review of the LCA and the report took place in the course of verification of the EPD by the external verifier Patrick Wortner, MBA and Eng., Dipl.-Ing. (FH).

## 7 General information regarding the EPD

### Comparability

This EPD was prepared in accordance with EN 15804 and is therefore only comparable to those EPDs that also comply with the requirements set out in EN 15804.



Any comparison must refer to the building context and the same boundary conditions of the various life cycle stages.

For comparing EPDs of construction products, the rules set out in EN 15804 (Clause 5.3) apply.

### Communication

The communications format of this EPD meets the requirements of EN 15942:2011 and is therefore the basis for B2B communication. Only the nomenclature has been changed according to EN 15804.

### Verification

Verification of the Environmental Product Declaration is documented in accordance with the ift "Richtlinie zur Erstellung von Typ III Umweltproduktdeklarationen" (Guidance on preparing Type III Environmental Product Declarations) in accordance with the requirements set out in EN ISO 14025.

This Declaration is based on the ift PCR documents "PCR Teil A" (Part A) PCR-A-0.2:2018 and "Flachglas" (Flat glass) PCR-FG-1.3:2016.

The European standard EN 15804 serves as the core PCR <sup>a)</sup>
Independent verification of the Declaration and statement according to EN ISO 14025:2010 <input type="checkbox"/> internal <input checked="" type="checkbox"/> external
Independent third party verifier: <sup>b)</sup> Patrick Wortner
<sup>a)</sup> Product category rules <sup>b)</sup> Optional for business-to-business communication, mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)

### Revisions of this document

No.	Date	Note:	Practitioner of the LCA	Verifier/s
1	18.12.2017	First internal verification and approval	Stich	Stöhr
2	07.08.2018	Review	Zwick	Stöhr
3	18.12.2017	External verification	Zwick	Wortner
4				

## Bibliography

- [1] Ökologische Bilanzierung von Baustoffen und Gebäuden – Wege zu einer ganzheitlichen Bilanzierung.  
Hrsg.: Eyerer, P.; Reinhardt, H.-W.  
Birkhäuser Verlag, Basel, 2000
- [2] Leitfaden Nachhaltiges Bauen.  
Hrsg.: Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit  
Berlin, 2016
- [3] GaBi 8: Software und Datenbank zur Ganzheitlichen Bilanzierung.  
Hrsg.: IKP Universität Stuttgart und PE Europe GmbH  
Leinfelden-Echterdingen, 2017
- [4] „Ökobilanzen (LCA)“.  
Klöpper, W.; Grahl, B.  
Wiley-VCH-Verlag, Weinheim, 2009
- [5] EN 15804:2012+A1:2013  
Nachhaltigkeit von Bauwerken –  
Umweltdeklarationen für Produkte – Regeln für  
Produktkategorien.  
Beuth Verlag GmbH, Berlin
- [6] EN 15942:2012-01  
Nachhaltigkeit von Bauwerken –  
Umweltproduktdeklarationen –  
Kommunikationsformate zwischen Unternehmen  
Beuth Verlag GmbH, Berlin
- [7] ISO 21930:2017-7  
Hochbau – Nachhaltiges Bauen –  
Umweltproduktdeklarationen von Bauprodukten  
Beuth Verlag GmbH, Berlin
- [8] EN ISO 14025:2011-10  
Umweltkennzeichnungen und -  
deklarationen Typ III Umweltdeklarationen –  
Grundsätze und Verfahren.  
Beuth Verlag GmbH, Berlin
- [9] EN ISO 16000-9:2006-08  
Innenraumlufiverunreinigungen – Teil 9: Bestimmung  
der Emissionen von flüchtigen organischen  
Verbindungen aus Bauprodukten und  
Einrichtungsgegenständen – Emissionsprüfkammer-  
Verfahren.  
Beuth Verlag GmbH, Berlin
- [10] EN ISO 16000-11:2006-06  
Innenraumlufiverunreinigungen – Teil 11:  
Bestimmung der Emissionen von flüchtigen  
organischen Verbindungen aus Bauprodukten und  
Einrichtungsgegenständen – Probenahme, Lagerung  
der Proben und Vorbereitung der Prüfstücke.  
Beuth Verlag GmbH, Berlin
- [11] DIN ISO 16000-6:2012-11  
Innenraumlufiverunreinigungen – Teil 6: Bestimmung  
von VOC in der Innenraumluft und in Prüfkammern,  
Probenahme auf TENAX TA®, thermische  
Desorption und Gaschromatografie mit MS/FID.  
Beuth Verlag GmbH, Berlin
- [12] DIN EN ISO 14040:2018-05  
Umweltmanagement – Ökobilanz – Grundsätze und  
Rahmenbedingungen.  
Beuth Verlag GmbH, Berlin
- [13] DIN EN ISO 14044:2006-10  
Umweltmanagement – Ökobilanz – Anforderungen  
und Anleitungen.  
Beuth Verlag GmbH, Berlin
- [14] DIN EN 12457-1:2003-01  
Charakterisierung von Abfällen – Auslaugung;  
Übereinstimmungsuntersuchung für die Auslaugung  
von körnigen Abfällen und Schlämmen – Teil 1:  
Einstufiges Schüttelverfahren mit einem Flüssigkeits-  
/Feststoffverhältnis von 2 l/kg und einer Korngröße  
unter 4 mm (ohne oder mit Korngrößenreduzierung).  
Beuth Verlag GmbH, Berlin
- [15] DIN EN 12457-2:2003-01  
Charakterisierung von Abfällen – Auslaugung;  
Übereinstimmungsuntersuchung für die Auslaugung  
von körnigen Abfällen und Schlämmen – Teil 2:  
Einstufiges Schüttelverfahren mit einem Flüssigkeits-  
/Feststoffverhältnis von 10 l/kg und einer Korngröße  
unter 4 mm (ohne oder mit Korngrößenreduzierung).  
Beuth Verlag GmbH, Berlin
- [16] DIN EN 12457-3:2003-01  
Charakterisierung von Abfällen – Auslaugung;  
Übereinstimmungsuntersuchung für die Auslaugung  
von körnigen Abfällen und Schlämmen – Teil 3:  
Zweistufiges Schüttelverfahren mit einem  
Flüssigkeits/Feststoffverhältnis von 2 l/kg und 8 l/kg  
für Materialien mit hohem Feststoffgehalt und einer  
Korngröße unter 4 mm (ohne oder mit  
Korngrößenreduzierung).  
Beuth Verlag GmbH, Berlin
- [17] DIN EN 12457-4:2003-01  
Charakterisierung von Abfällen – Auslaugung;  
Übereinstimmungsuntersuchung für die Auslaugung  
von körnigen Abfällen und Schlämmen – Teil 4:  
Einstufiges Schüttelverfahren mit einem Flüssigkeits-  
/Feststoffverhältnis von 10 l/kg für Materialien mit  
einer Korngröße unter 10 mm (ohne oder mit  
Korngrößenreduzierung).  
Beuth Verlag GmbH, Berlin
- [18] DIN EN 13501-1:2010-01  
Klassifizierung von Bauprodukten und Bauarten zu  
ihrem Brandverhalten –  
Teil 1: Klassifizierung mit den Ergebnissen aus den  
Prüfungen zum Brandverhalten von Bauprodukten.  
Beuth Verlag GmbH, Berlin
- [19] EN 572-1  
Glas im Bauwesen – Basiserzeugnisse aus Kalk-  
Natronsilicatglas – Teil 1: Definitionen und



## Product group: flat glass

- allgemeine physikalische und mechanische Eigenschaften;  
Beuth Verlag GmbH, Berlin
- [20] EN 12150-1:2000-6  
Glas im Bauwesen – Thermisch vorgespanntes Kalknatron-Einscheibensicherheitsglas – Teil 1: Definitionen und Beschreibung;  
Beuth Verlag GmbH, Berlin
- [21] EN 18631-1:2011  
Glas im Bauwesen – Teilvorgespanntes Kalknatronglas – Teil 1: Definition und Beschreibung;  
Beuth Verlag GmbH, Berlin
- [22] EN 14449:2005  
Glas im Bauwesen – Verbundglas und Verbund-Sicherheitsglas –  
Konformitätsbewertung/Produktnorm  
Beuth Verlag GmbH, Berlin
- [23] ift QM332  
Zertifizierungsprogramm für Verbund und Verbundsicherheitsglas (VSG) nach EN 14449  
ift Rosenheim, Rosenheim
- [24] ift QM333  
Zertifizierungsprogramm für thermisch vorgespanntes Kalknatron-Einscheiben-Sicherheitsglas (ESG) nach EN 12150-2  
ift Rosenheim, Rosenheim
- [25] ift QM334  
Zertifizierungsprogramm für heißgelagertes thermisch vorgespanntes Kalknatron-Einscheiben-Sicherheitsglas (ESG-H) nach EN 14179-2  
ift Rosenheim, Rosenheim
- [26] ift QM335  
Zertifizierungsprogramm für teilvorgespanntes Kalknatronglas (TVG) nach EN 1863-2  
ift Rosenheim, Rosenheim
- [27] ift QM327  
Zertifizierungsprogramm für Mehrscheiben-Isolierglas nach EN 1279-5  
ift Rosenheim, Rosenheim
- [28] RAL GZ 520  
Mehrscheiben-Isolierglas  
Gütesicherung  
RAL Deutsches Institut für Gütesicherung und Kennzeichnung e. V., Sankt Augustin
- [29] DIN 4102-1:1998-05  
Brandverhalten von Baustoffen und Bauteilen – Teil 1: Baustoffe; Begriffe, Anforderungen und Prüfungen.  
Beuth Verlag GmbH, Berlin
- [30] OENORM S 5200:2009-04-01  
Radioaktivität in Baumaterialien.  
Beuth Verlag GmbH, Berlin
- [31] OENORM EN 14405:2017-05-15  
Charakterisierung von Abfällen –  
Auslaugungsverhalten – Perkolationsprüfung im Aufwärtsstrom (unter festgelegten Bedingungen).  
Beuth Verlag GmbH, Berlin
- [32] VDI 2243:2002-07  
Recyclingorientierte Produktentwicklung.  
Beuth Verlag GmbH, Berlin
- [33] Richtlinie 2009/2/EG der Kommission zur 31. Anpassung der Richtlinie 67/548/EWG des Rates zur Angleichung der Rechts- und Verwaltungsvorschriften für die Einstufung, Verpackung und Kennzeichnung gefährlicher Stoffe an den technischen Fortschritt (15. Januar 2009)
- [34] ift-Richtlinie NA-01/3  
Allgemeiner Leitfaden zur Erstellung von Typ III Umweltproduktdeklarationen.  
ift Rosenheim, November 2015
- [35] Arbeitsschutzgesetz – ArbSchG  
Gesetz über die Durchführung von Maßnahmen des Arbeitsschutzes zur Verbesserung der Sicherheit und des Gesundheitsschutzes der Beschäftigten bei der Arbeit, 2015 (BGBl. I S. 160, 270)
- [36] Bundesimmissionsschutzgesetz – BImSchG  
Gesetz zum Schutz vor schädlichen Umwelteinwirkungen durch Luftverunreinigungen, Geräusche, Erschütterungen und ähnlichen Vorgängen, 2017 (BGBl. I S. 3830)
- [37] Chemikaliengesetz – ChemG  
Gesetz zum Schutz vor gefährlichen Stoffen  
Unterteilt sich in Chemikaliengesetz und eine Reihe von Verordnungen; hier relevant: Gesetz zum Schutz vor gefährlichen Stoffen, 2. Juli 2008 (BGBl. I S.1146)
- [38] Chemikalien-Verbotsverordnung – ChemVerbotsV  
Verordnung über Verbote und Beschränkungen des Inverkehrbringens gefährlicher Stoffe, Zubereitungen und Erzeugnisse nach dem Chemikaliengesetz, 2017 (BGBl. I S. 1328)
- [39] Gefahrstoffverordnung – GefStoffV  
Verordnung zum Schutz vor Gefahrstoffen, 23. Dezember 2017 (BGBl. I S. 3758)
- [40] „PCR Teil A: Allgemeine Produktkategorieeregeln für Umweltproduktdeklarationen nach EN ISO 14025 und EN 15804“.  
ift Rosenheim, Januar 2018
- [41] „PCR Flachglas. Product Category Rules nach ISO 14025 und EN 15804“.  
ift Rosenheim, November 2016
- [42] Forschungsvorhaben „EPDs für transparente Bauelemente“.  
ift Rosenheim, 2011



- [43] FprEN 17074:2018 D  
Glas im Bauwesen - Umweltproduktdeklaration -  
Produktkategorieregeln für Flachglasprodukte  
Beuth Verlag, GmbH, Berlin



## 8 Annex

### Description of life cycle scenarios for Insulating glass units

Product stage			Con- struction stage		Use stage							End-of-life stage				Benefits and loads beyond the system boundaries
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material supply	Transport	Manufacture	Transport	Construction/Installation	Use	Inspection, maintenance, cleaning	Repair	Exchange / Replacement	Improvement / Modernisation	Operational energy use	Operational water use	Deconstruction	Transport	Waste management	Disposal	Re-use Recovery Recycling potential
✓	✓	✓	—	—	—	—	—	—	—	—	—	✓	✓	✓	✓	✓

The scenarios were based on information provided by the manufacturer. The scenarios were furthermore based on the research project “EPDs for transparent building components” [40].

**Note:** The standard scenarios selected are presented in bold type. They were also used for calculating the indicators in the summary table.

- ✓ Included in the LCA
- Not included in the LCA

#### C1 Deconstruction



Product group: flat glass

No.	Scenario	Description
C1	Deconstruction	In dependence on prEN 17074 (9.8.4 Disposal phase (C1 to C4)). Residues (landfill) 70% for glass; Residues (landfill) glass-free materials 100%; Rest in the recovery.  Further dismantling rates possible, appropriately substantiates

In case of deviating consumption the removal of the products forms part of the site management and is covered at the building level.

Since this is the only scenario, the results are shown in the overall table.

C2 Transport		
No.	Scenario	Description
C2	Transport	Transport to collecting point using 28 - 34 t truck, 50% capacity used, 50 km distance

Since this is the only scenario, the results are shown in the overall table.

C3 Waste management		
No.	Scenario	Description
C3	Disposal	In dependence on prEN 17074 (9.8.4 Disposal phase (C1 to C4)).  Share for the return of materials: Glass 100% in melting, glass-free materials 100% in landfill.

The below table presents the disposal processes and their percentage by mass/weight. The calculation is based on the above mentioned shares in per cent related to the declared unit of the product system.

Since this is the only scenario, the results are shown in the overall table.

C3 Disposal	C3		
	Unit	IGU - double	IGU - triple
Collection process, collected separately	kg	0.75	0.75
Collection process, collected as mixed construction waste	kg	1.75	1.75
Recovery system, for re-use	kg	0.00	0.00
Recovery system, for recycling	kg	0.75	0.75
Recovery system, for energy recovery	kg	0.00	0.00
Disposal	kg	1.75	1.75

C4 Disposal
-------------

## Product group: flat glass

No.	Scenario	Description
C4	Disposal	The non-measurable quantities and losses of the re-use/recycling chain (C1 and C3) are modelled as “disposed”. The consumption is marginal and cannot be quantified.
<p>The consumption of scenario C4 results from physical pre-treatment, waste recycling and management of the disposal site. The benefits obtained here from the substitution of primary material production are allocated to module D, e.g. electricity and heat from waste incineration.</p> <p>Since this is the only scenario, the results are shown in the overall table.</p>		
<b>D Benefits and loads beyond the system boundaries</b>		
No.	Scenario	Description
D	Recycling potential	Glass recycle from C3 excluding the recycle used in A3 replaces 60 % of container glass;
<p>The values in module D result from de-construction at the end of service life.</p>		

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### **Notes**

This EPD is mainly based on the work and findings of the Institut für Fenstertechnik e.V., Rosenheim (ift Rosenheim) and specifically on the ift-Richtlinie NA-01/3 Allgemeiner Leitfaden zur Erstellung von Typ III Umweltproduktdeklarationen. (Guideline NA.01/3 - Guidance on preparing Type III Environmental Product Declarations)

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