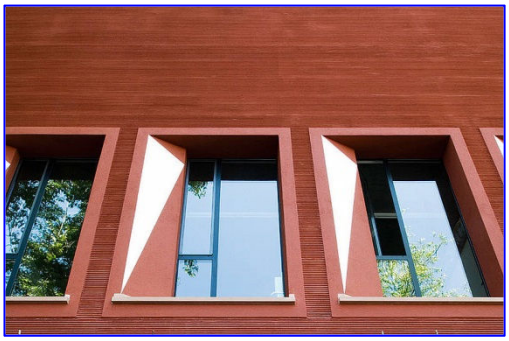
Environmental Product Declaration

Declaration Code: M-EPD-FE-GB-000

Note: This EPD is based on the model EPD steel / stainless steel façades. The EPD becomes valid with transmission to the manufacturer by the ift.



Verband Fenster + Fassade

Windows

Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel

Basis:

DIN EN ISO 14025
EN15804

Company EPD
Environmental
Product **D**eclaration

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Environmental Product Declaration

Declaration Code: M-EPD-FE-GB-000

Programme operator	ift Rosenheim GmbH Theodor Gietl Straße 7-9 D-83026 Rosenheim
Practitioner of the LCA	ift Rosenheim GmbH Theodor Gietl Straße 7-9 D-83026 Rosenheim
Supported by	Verband Fenster + Fassade Walter-Kolb-Straße 1-7 60594 Frankfurt am Main
Declaration code	M-EPD-FE-GB-000
Designation of declared product	Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel
Scope	Steel/stainless steel windows for use in office and administration buildings, public buildings as well as private buildings.
Basis	This 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 III Umweltproduktdeklarationen" (Guidance on preparing Type III Environmental Product Declarations) applies. The Declaration is based on the document prEN 17213:2018 “PCR for windows and doors”, as well as on the PCR documents ““PCR Part A“ PCR-A-0.1:2018 and “Windows” PCR-FE-2.1:2018.”
Validity	Publication date: 26.11.2018 / Last revision: 18.03.2022 / Next revision: 26.11.2023 This verified Model Environmental Product Declaration applies solely to the specified products in accordance with the systems from Forster Profilsysteme AG, Jansen AG, RP Technik GmbH, Ottostumm SA and is valid for a period of 5 years from the date of publication in accordance with DIN EN 15804.
LCA basis	The LCA was prepared in accordance with DIN EN ISO 14040 and DIN EN ISO 14044. The base data includes the data collected at different manufacturing plants, generic data derived from the “GaBi 8” database as well as from the EPDs “Float glass / TSG / LSG” or “Insulating glass units” and “Window hardware”. LCA calculations were carried out for the specified “cradle to gate with options” life cycle including all upstream chains (e.g. raw material extraction, etc.).
Notes	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.

Note: Declaration holders can be found on page 3.

Prof. Ulrich Sieberath Director of Institute	Patrick Wortner External verifier

Declaration holder

The currently valid EPDs are published according to the following list on www.ift-service.de/epd:

- M-EPD-FE-GB-001
  FERRO-MECCANICA 81 SNC
  Via Strada di Fort 8
  23037 Tirano
- M-EPD-FE-GB-003
  SECCO SISTEMI S.p.A.
  Via Terraglio 195
  31022 Pregnaziol

1 General product information

Product definition

The EPD relates to the product group ”Windows” and applies to:

1 m² Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel with transparent and/or opaque infill panels

The average unit is declared as follows:
Directly used material flows are determined using the average sizes (window: 1.23 m x 1.48 m, lift-and-slide units: 3.00 m x 2.10 m) and assigned to the declared unit. All other inputs and outputs in the production were scaled to the declared unit in their entirety since no direct assignment to the average size is possible. The reference period is the year 2017.

Product description

Profile system
Steel profile with and without thermal break, rebate insulators; total installation depth 50 – 120 mm and/or for door height sliding/folding units (e.g. lift-and-slide units) up to 220 mm (frame member depth plus casement overlap).

System supplier/licensor
Forster Profilsysteme AG, Jansen AG, RP Technik GmbH, Ottostumm SA.

Type and direction of opening
All types of opening incl. fixed lights.

Frame material
Steel/stainless steel with and without thermal break made of polyamide, polypropylene, ABS, GRP or stainless steel.

Overall dimensions of frame member
Independent of dimensions.

Rebate design – rebate gasket
Internal / centre and external: gasket made of EPDM, CR, TPE, TPV or silicone.

Finish
Powder coated, wet paint, mechanical surface treatment.
Options: covers in structural bronze.

Infill panel
Single glass or insulating glass units (double or triple) in accordance with the EPD “Insulating glass units”. TSG/LSG in accordance with the EPD “Float glass/TSG/LSG or opaque infill panel”.

Mounting of infill panels – glazing gaskets
Internal: gunnable sealing material made of silicone or EPDM/TPE/TPV.
External: sealing material made of silicone or EPDM/TPE/TPV.

Hardware – type
Hardware in accordance with the EPD “Window hardware”.

This EPD does not apply to:

- Roof windows because their design differs too much from the declared windows.
- Bonded glass systems
- Windows in structural bronze

Supplementary components such as external/internal shutters e.g. roller shutters, solar shading devices, roller shutter boxes, etc. shall be considered separately.

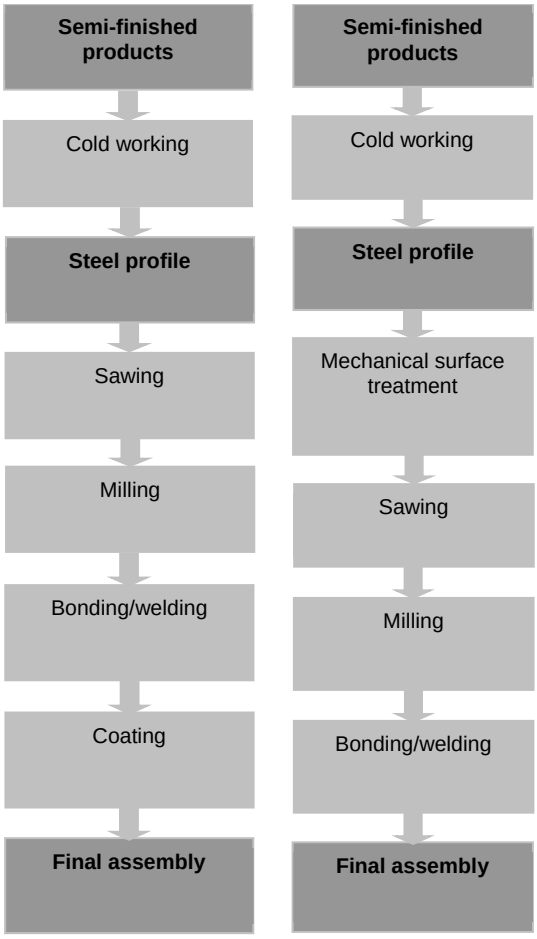
Additional information for architects

- Frame face width: approx. 40 mm to 160 mm and up to 220 mm for lift-and-slide doors
- Seals/gaskets: central seal and, if required, internal overlap gasket, additional external gasket possible.

Observe also the relevant manufacturer system descriptions.

For a detailed product description refer to the manufacturer specifications or the product specifications of the respective offer/quotation.

Product manufacture



Applications

Steel/stainless steel windows for use in office and administration buildings, public buildings as well as private buildings.

Additional information

For detailed performance characteristics relating to building physics refer to the CE marking and the documents accompanying the product.

2 Materials used

Primary materials

The primary materials used are listed in the LCA (see Section 7).

Declarable substances

REACH conformity is queried when transferred to the manufactrer.

All relevant safety data sheets are available from the maunfacturer.

3 Construction process stage

Processing recommendations, installation

Observe the processing instructions as well as the instructions for assembly/installation, operation, service/maintenance and disassembly in accordance with the WP series of the VFF guidance sheets as well as the installation guidance.

4 Use stage

Emissions to the environment

No emissions to indoor air, water or soil are known. There may be VOC emissions.

Reference service life (RSL)

The RSL information was provided by the manufacturer. The RSL shall refer to the declared technical and functional performance of the product within the building. It shall be established in accordance with specific rules set out in the European product standards and shall also take into account ISO 15686-1, -2, -7 and -8. Where European product standards provide guidance on determining RSL, such guidance shall have priority. If it is not possible to determine the service life as the RSL in accordance with ISO 15686, the BBSR table “Nutzungsdauer von Bauteilen zur Lebenszyklusanalyse nach BNB” (service life of building components for life cycle assessment in accordance with the sustainable construction evaluation system) can be used. For further information and explanations refer to www.nachhaltigesbauen.de.

For this EPD the following applies:
According to the BBSR table, an optional service life of 50 years is specified for Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel.

The average was calculated from the data recorded and is therefore representative. The material and energy flows for 2017 were divided by the numbers of units manufactured to produce average figures for use in the LCA calculations. The service life is dependent on the characteristics of the product and in-use conditions. The characteristics described in the EPD are applicable, in particular the characteristics listed below:

- Outdoor environment: climatic influences may have a negative impact on the service life.
- Indoor environment: no impacts known that have a negative effect on the service life

The service life solely applies to the characteristics specified in this EPD or the corresponding references.
The reference service life (RSL) does not reflect the actual life span, which is usually determined by the service life and the refurbishment of a building. It does not

give any information on the useful life, warranty referring to performance characteristics or guarantees.

5 End-of-life stage

Possible end-of-life stages

The Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel are shipped to central collection points. There the products are usually shredded and sorted into their original constituents. The end-of-life stage depends on the site where the products are used and is therefore subject to the local regulations. The locally applicable regulatory requirements should be considered.

This EPD shows the end-of-life modules according to the market situation.
For building assessment 100% versions of the disposal process are used. The percentages by mass of the material groups are specified in Section 6.2.

Disposal routes

The LCA includes the average disposal routes.

All life cycle scenarios are detailed in the Annex.

6 Life Cycle Assessment (LCA)

Environmental product declarations are based on life cycle assessments (LCAs) which use material and energy flows for the calculation and subsequent representation of environmental impacts.
Such a life cycle assessment was developed as the basis for Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel.
The LCA is in conformity with EN 15804 and 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 Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel. 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. No other additional environmental impacts are specified.

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

The specific data originate exclusively from the research project "EPDs für transparente Bauelemente“ (EPDs for transparent building components) and from surveys of various manufacturers or system suppliers. For the research project the data were collected on-site and originate in parts from company records and partly from values directly obtained by measurement. Furthermore, for the first issue, a series of measurements was carried out in various manufacturing plants and compared with the 2017 fiscal year data. Validity of the data was checked by the ift.

The generic data originate from the “GaBi 8” software "Professional Datenbank und Baustoff Datenbank" (professional data base and building materials data

base). 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/production, use and end-of-life stage of Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel (cradle to gate – with options).
No additional data from pre-suppliers/subcontractors or other sites were taken into consideration.

Cut-off criteria

All company data collected, i.e. all commodities/input and raw materials used, the thermal energy and electricity consumption, were taken into consideration.

The boundaries cover only the product-relevant data. Building sections/parts of facilities that are not relevant to the manufacture of the products, were excluded.

The transport distances of the pre-products used were taken into consideration as a function of 100% of the mass of the Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel. The transport mix is composed as follows and originates from the research project "EPDs für transparente Bauelemente" (EPDs for transparent building components).

- Truck, 26 – 28 t total weight / 18.4 t payload, Euro 6, freight, 85% capacity used, 100 km;
- Truck-trailer, 28 – 34 t total weight / 22t payload, Euro 6, 50% capacity used, 50 km;
- Freight train, electrical and diesel driven; D 60%, E 51% capacity used, 50 km
- Seagoing vessel, 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.

Life cycle stages

The Annex shows the entire life cycle of Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel. Product stage "A1 – A3", construction process stage "A4 – A5", use stage "B2– B3 and B6 – B7", end-of-life

stage "C1 – C4" and the benefits and loads beyond the system boundaries "D" were taken into consideration.

Benefits

The below benefits have been defined as per EN 15804:

- Benefits from recycling
- Benefits (thermal and electrical) from incineration

Allocation of co-products

The manufacture of Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel does not produce any allocations.

Allocations for re-use, recycling and recovery

If the Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel are reused/recycled and recovered during the product stage (rejects), the components are shredded and then sorted into single constituents, if required. This is done by various process plants, e.g. magnetic separators. The system boundaries of the Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel were set following their disposal, when the end of their waste status had been reached.

Allocations beyond life cycle boundaries

Use of recycled materials in the manufacturing process was based on the current market-specific situation. In parallel to this, a recycling potential was taken into consideration that reflects the economic value of the product after recycling (recyclate). The system boundary set for the recycled material refers to collection.

Secondary material

The use of secondary material in Module A3 was considered. Secondary material is not used.

Inputs

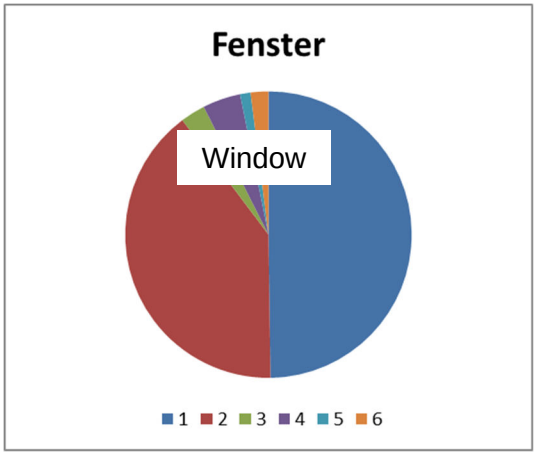
The LCA includes the following production-relevant inputs:

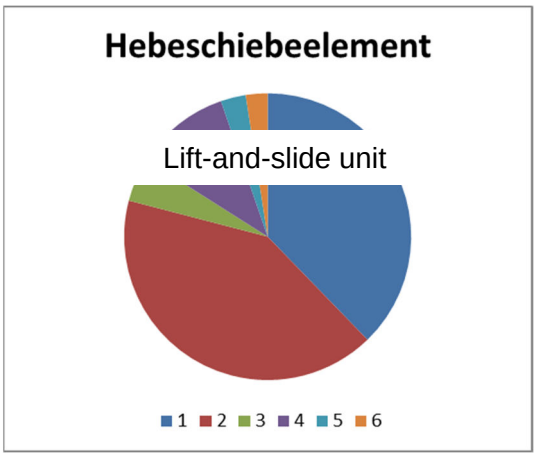
Energy
The electricity mix is based on “Strommix Europa” (Europe electricity mix).

A portion of the process heat is used for space heating. Quantification is not possible, however.

Water
The water consumed by the individual process steps for the production of Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel amounts to a total of 0.379 l per m² of unit.
The consumption of fresh water specified in Section 6.3 originates (among others) from the process chain of the pre-products.

Raw material / pre-products
The chart below shows the share of raw materials/pre-products in %.





No.	Material	Windows Mass in %	Sliding units Mass in %
1	Steel / stainless steel / weather resistant steel	49.8	37.8
2	Glass	40.0	41.3
3	Hardware	2.8	4.9
4	Insulation	4.3	10.7
5	Aluminium	1.2	2.8
6	Other	2.0	2.5

Ancillary materials and consumables
0.454 kg of ancillary materials and consumables are required for 1 m² ofWindows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel .

Product packaging
0.65 kg of product packaging (PE films) are used.

Outputs

The LCA includes the production-relevant outputs per 1 m² of Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel:

Waste
Secondary raw materials were included in the benefits.
See Section 6.3 Impact assessment.

Waste water
0.379 l waste water is produced for the manufacture of 1 m² of Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel .

6.3 Impact assessment

Goal

The impact assessment covers both 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 m² of Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel is evaluated and shown separately for the fractions 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.

Results per 1 m² of Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel (windows)													
Environmental impacts	**Unit**	**A1-A3**	**A4**	**A5**	**B2**	**B3**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Global warming potential	kg CO_2 eq.	152.46	7.75	0.82	193.18	38.42	0.00	0.00	5.76E-02	1.07	8.63	1.61	-44.42
Depletion potential of stratospheric ozone layer	kg R11 eq.	1.01E-06	2.12E-13	2.76E-14	1.75E-11	1.01E-06	0.00	0.00	2.56E-13	2.93E-14	1.64E-13	9.11E-14	-2.13E-11
Acidification potential of soil and water	kg SO_2 eq.	0.66	1.86E-02	3.32E-04	0.23	0.35	0.00	0.00	1.64E-04	2.23E-03	1.03E-02	2.14E-03	-0.12
Eutrophication potential	kg PO_4^{3-} eq.	5.63E-02	4.67E-03	6.13E-05	3.29E-02	2.72E-02	0.00	0.00	1.53E-05	5.58E-04	2.70E-03	1.57E-03	-1.12E-02
Formation potential of tropospheric ozone	kg C_2H_4 eq.	4.99E-02	-6.23E-03	1,95E-05	5.33E-02	1.98E-02	0.00	0.00	1.02E-05	-6.95E-04	6.10E-04	4.64E-04	-8.68E-03
Depletion of abiotic resources (ADP elements)	kg Sb eq.	3.83E-03	6.38E-07	3.74E-08	3.93E-05	3.53E-03	0.00	0.00	3.06E-08	8.81E-08	9.05E-08	1.34E-07	-1.92E-03
Depletion of abiotic resources (ADP fossil fuels)	MJ	2060.75	105.79	0.33	5695.42	663.08	0.00	0.00	0.61	14.60	4.40	5.14	-445.10
Use of resources	**Unit**	**A1-A3**	**A4**	**A5**	**B2**	**B3**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	
Renewable primary energy as energy source	MJ	310.22	5.86	5.72E-02	67.94	51.57	0.00	0.00	0.40	0.81	0.35	0.59	-55.42
Renewable primary energy for material use	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
Total use of renewable primary energy	MJ	310.22	5.86	5.72E-02	67.94	51.57	0.00	0.00	0.40	0.81	0.35	0.59	-55.42
Non-renewable primary energy as energy source	MJ	2232.10	106.16	13.72	5737.36	729.52	0.00	0.00	1.05	14.65	86.16	9.62	-482.73
Non-renewable primary energy for material use	MJ	103.65	0.00	-13.33	0.00	0.00	0.00	0.00	0.00	0.00	-81.45	-4.29	0.00
Total use of non-renewable primary energy	MJ	2335.75	106.16	0.38	5737.36	729.52	0.00	0.00	1.05	14.65	4.71	5.33	-482.73
Use of secondary materials	kg	0.95	0.00	0.00	0.00	0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Renewable secondary fuels	MJ	4.47E-09	5.73E-28	2.95E-23	5.40E-21	1.71E-12	0.00	0.00	0.00E+00	7.91E-29	1.90E-23	6.83E-23	-2.82E-11
Non-renewable secondary fuels	MJ	5.26E-08	8.70E-27	3.47E-22	6.35E-20	2.01E-11	0.00	0.00	1.56E-30	1.20E-27	2,23E-22	8.02E-22	-3.31E-10
Use of fresh water resources	m^3	0.62	1.08E-02	2.42E-03	1.14	0.15	0.00	0.00	5.39E-04	1.49E-03	2.13E-02	9.25E-04	-7.38E-02
Waste categories and output material flows	**Unit**	**A1-A3**	**A4**	**A5**	**B2**	**B3**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Disposed hazardous waste	kg	3.43E-03	6.14E-06	1.76E-09	1.59E-06	3.42E-03	0.00	0.00	4.94E-10	8.47E-07	2.15E-09	7.56E-08	-3.20E-07
Disposed non-hazardous waste	kg	29.37	8.89E-03	0.11	0.81	24.62	0.00	0.00	7.42E-04	1.23E-03	1.03E-02	20.13	-1.73
Radioactive waste	kg	0.11	1.45E-04	1.98E-05	1.66E-02	2.42E-02	0.00	0.00	1.74E-04	2.01E-05	1.21E-04	7.66E-05	-1.50E-02
Components for further use	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
Materials for recycling	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29.71	0.00	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	3.77	0.00	0.00
Exported electrical energy	MJ	1.04	0.00	0.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.17	0.00
Exported thermal energy	MJ	1.85	0.00	1.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31.62	0.00

Results per 1 m^2 of Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel (lift-and-slide doors)													
Environmental impacts	**Unit**	**A1-A3**	**A4**	**A5**	**B2**	**B3**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Global warming potential	kg CO_2 eq.	171.89	8.36	0.83	193.18	46.20	0.00	0.00	5.76E-02	1.16	16.66	1.71	-48.89
Depletion potential of stratospheric ozone layer	kg R11 eq.	1.91E-06	2.29E-13	2.79E-14	1.75E-11	1.90E-06	0.00	0.00	2.56E-13	3.18E-14	3.18E-13	9.94E-14	-3.48E-11
Acidification potential of soil and water	kg SO_2 eq.	0.75	2.00E-02	3.36E-04	0.23	0.38	0.00	0.00	1.64E-04	2.43E-03	1.99E-02	2.34E-03	-0.14
Eutrophication potential	kg PO_4^{3-} eq.	6.32E-02	5.03E-03	6.21E-05	3.29E-02	2.92E-02	0.00	0.00	1.53E-05	6.07E-04	5.21E-03	1.67E-03	-1.25E-02
Formation potential of tropospheric ozone	kg C_2H_4 eq.	5.50E-02	-6.71E-03	1.97E-05	5.33E-02	2.19E-02	0.00	0.00	1.02E-05	-7.57E-04	1.18E-03	4.96E-04	-8.90E-03
Depletion of abiotic resources (ADP elements)	kg Sb eq.	6.40E-03	6.88E-07	3.79E-08	3.93E-05	5.87E-03	0.00	0.00	3.06E-08	9.57E-08	1.74E-07	1.47E-07	-1.69E-03
Depletion of abiotic resources (ADP fossil fuels)	MJ	2394.22	113.98	0.33	5695.42	763.03	0.00	0.00	0.61	15.86	8.00	5.61	-513.77
Use of resources	**Unit**	**A1-A3**	**A4**	**A5**	**B2**	**B3**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Renewable primary energy as energy source	MJ	388.07	6.31	5.79E-02	67.94	69.62	0.00	0.00	0.40	0.88	0.68	0.65	-91.48
Renewable primary energy for material use	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
Total use of renewable primary energy	MJ	388.07	6.31	5.79E-02	67.94	69.62	0.00	0.00	0.40	0.88	0.68	0.65	-91.48
Non-renewable primary energy as energy source	MJ	2668.92	114.38	13.86	5737.36	862.81	0.00	0.00	1.05	15.92	53.38	8.18	-574.55
Non-renewable primary energy for material use	MJ	60.63	0.00	-13.48	0.00	0.00	0.00	0.00	0.00	0.00	-44.79	-2.36	0.00
Total use of non-renewable primary energy	MJ	2729.55	114.38	0.38	5737.36	862.81	0.00	0.00	1.05	15.92	8.59	5.82	-574.55
Use of secondary materials	kg	1.06	0.00	0.00	0.00	0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Renewable secondary fuels	MJ	1.09E-07	6.18E-28	2.99E-23	5.40E-21	1.71E-12	0.00	0.00	0.00E+00	8.60E-29	3.67E-23	7.50E-23	-7.24E-11
Non-renewable secondary fuels	MJ	1.38E-06	9.37E-27	3.51E-22	6.35E-20	2.01E-11	0.00	0.00	1.56E-30	1.30E-27	4.31E-22	8.81E-22	-8.51E-10
Use of fresh water resources	m^3	0.76	1.16E-02	2.45E-03	1.14	0.17	0.00	0.00	5.39E-04	1.62E-03	4.12E-02	1.01E-03	-0.16
Waste categories and output material flows	**Unit**	**A1-A3**	**A4**	**A5**	**B2**	**B3**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Disposed hazardous waste	kg	3.82E-03	6.61E-06	1.78E-09	1.59E-06	3.42E-03	0.00	0.00	4.94E-10	9.20E-07	3.98E-09	8.31E-08	-3.71E-07
Disposed non-hazardous waste	kg	34.69	9.58E-03	0.11	0.81	24.62	0.00	0.00	7.42E-04	1,33E-03	1.98E-02	22.15	-3.02
Radioactive waste	kg	0.13	1.57E-04	2.00E-05	1.66E-02	3.56E-02	0.00	0.00	1.74E-04	2.18E-05	2.34E-04	8.36E-05	-2.41E-02
Components for further use	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
Materials for recycling	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.32	0.00	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	7.29	0.00	0.00
Exported electrical energy	MJ	1.09	0.00	0.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34.73	0.00
Exported thermal energy	MJ	1.96	0.00	1.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	61.17	0.00

6.4 Interpretation, LCA presentation and critical review

Evaluation

The environmental impacts of windows originate mainly from the use of steel and insulating glass units and/or their upstream chains. The use-stage values originate mainly from the use of cleaning agents and replacement of components during a period of 50 years.

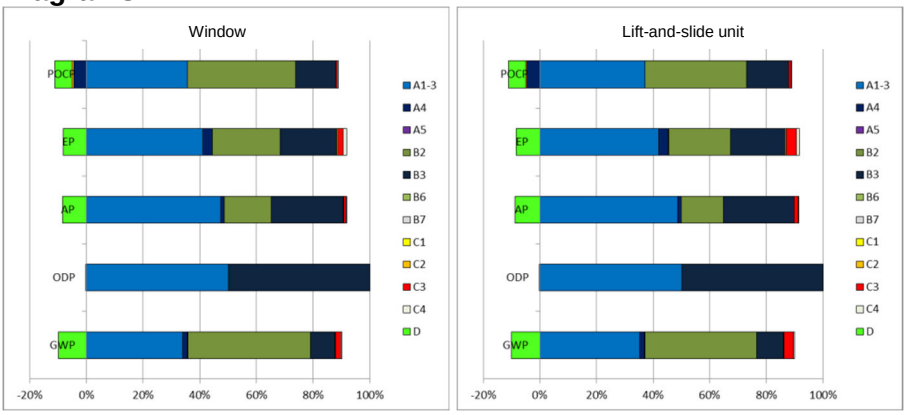
For scenario C4 only marginal consumptions arising from the physical pre-treatment and management of the disposal site are expected. Allocation to individual products is almost impossible for site disposal.

As regards the recycling of Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel, for metals almost two thirds of the environmental impacts during manufacture can be assigned as benefits to scenario D.

The chart below show the allocation of the main environmental impacts.

The values obtained from the LCA calculations are suitable for building certification if required.

Diagrams



Report

The LCA underlying this EPD was developed according to the requirements of 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 reasons of confidentiality. 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 of the report took place in the course of verification of the EPD and was carried out by Patrick Wortner, an external verifier.

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.

prEN 17213 “PCR for windows and doors“, “PCR Part A“ PCR-A-0.1:2018 and “Windows” PCR-FE-2.1:2018.

The European standard EN 15804 serves as the core PCR [a)]
Independent verification of the Declaration and statement according to EN ISO 14025:2010 ☐ internal ☒ external
Independent third party verifier: [b)] Patrick Wortner
[a)] Product category rules [b)] 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
1	18.10.2018	External Verification	Stich / Zwick	Wortner
2	19.06.2019	Revision	Zwick	Wortner

Bibliography

[1] Ökologische Bilanzierung von Baustoffen und Gebäuden – Wege zu einer ganzheitlichen Bilanzierung (LCA of building materials and buildings - Routes to integrated LCA)
Published by: Eyerer, P.; Reinhardt, H.-W.
Birkhäuser Verlag, Basel, 2000

[2] Leitfaden Nachhaltiges Bauen (Guidance on Sustainable Building)
Published by: Bundesministerium für Verkehr, Bau- und Wohnungswesen (German Federal Ministry of Transport, Building and Housing).
Berlin, 2013

[3] GaBi ts: Software and database for LCA.
Published by: IKP Universität Stuttgart and PE Europe GmbH.
Leinfelden-Echterdingen, 1992 – 2014

[4] Ökobilanzen (LCA).
Klöpffer, W.; Grahl, B.
Wiley-VCH-Verlag, Weinheim, 2009

[5] EN 15804:2012+A1:2013
Sustainability of construction works - Environmental product declarations - Rules for the product categories.
Beuth Verlag GmbH, Berlin

[6] EN 15942:2011
Sustainability of construction works – Environmental product declaration – Communication format business-to-business
Beuth Verlag GmbH, Berlin

[7] ISO 21930:2007-10
Sustainability in building construction - Environmental declaration of building products
Beuth Verlag GmbH, Berlin

[8] Leitfaden zur Planung und Ausführung der Montage von Fenstern und Haustüren (Guide on planning and implementing the installation of windows and external pedestrian doorsets).
Published by: RAL-Gütegemeinschaft Fenster und Haustüren e.V. (Quality Assurance Association Windows and Doors)
Frankfurt, 2014

[9] EN ISO 14025:2011-10
Environmental labels and declarations - Type III environmental declarations -
Principles and procedures.
Beuth Verlag GmbH, Berlin

[10] EN ISO 16000-9:2006-08
Indoor air - Part 9: Determination of the emission of volatile organic compounds from building products and furnishing - Emission test chamber method
Beuth Verlag GmbH, Berlin

[11] EN ISO 16000-11:2006-06
Indoor air - Part 11: Determination of the emission of volatile organic compounds from building products and furnishing - Sampling, storage of samples and preparation of test specimens.
Beuth Verlag GmbH, Berlin

[12] DIN ISO 16000-6:2004-12
Indoor air – Part 6: Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA® sorbent, thermal desorption and gas chromatography using MS/FID.
Beuth Verlag GmbH, Berlin

[13] DIN EN ISO 14040:2009-11
Environmental management - Life cycle assessment - Principles and framework.
Beuth Verlag GmbH, Berlin

[14] DIN EN ISO 14044:2006-10
Environmental management - Life cycle assessment - Requirements and guidelines
Beuth Verlag GmbH, Berlin

[15] prEN 14351-2:2009-05
Windows and doors - Product standard, performance characteristics - Part 2: Internal pedestrian doorsets without resistance to fire/or smoke leakage characteristics.
Beuth Verlag GmbH, Berlin

[16] prEN 16034:2010-01
Pedestrian doorsets, industrial, commercial, garage doors and windows - Product standard, performance characteristics - Fire resistance and/or smoke control characteristics.
Beuth Verlag GmbH, Berlin

[17] DIN EN 12457-1:2003-01
Characterization of waste - Leaching; Compliance test for leaching of granular waste materials and sludges - Part 1: One stage batch test at a liquid to solid ratio of 2 l/kg and with particle size below 4 mm (without or with size reduction).
Beuth Verlag GmbH, Berlin

[18] DIN EN 12457-2:2003-01
Characterization of waste - Leaching; Compliance test for leaching of leaching of granular waste materials and sludges - Part 2: One stage batch test at a liquid to solid ratio of 10 l/kg and with particle size below 4 mm (without or with size reduction).
Beuth Verlag GmbH, Berlin

[19] DIN EN 12457-3:2003-01
Characterization of waste - Leaching; Compliance test for leaching of granular waste

materials and sludges - Part 3: Two stage batch test at a liquid to solid ratio of 2 l/kg and 8 l/kg for materials with high solid content with particle size below 4 mm (without or with size reduction).
Beuth Verlag GmbH, Berlin

[20] DIN EN 12457-4:2003-01
Characterization of waste - Leaching; Compliance test for leaching of granular waste materials and sludges - Part 4: One stage batch test at a liquid to solid ratio of 10 l/kg and with particle size below 10 mm (without or with size reduction).
Beuth Verlag GmbH, Berlin

[21] DIN EN 13501-1:2010-01
Fire classification of construction products and building elements –
Part 1: Classification using test data from reaction to fire tests
Beuth Verlag GmbH, Berlin

[22] DIN EN 14351-01:2010-08
Windows and doors– Product standard, performance characteristics– Part 1: Windows and external pedestrian doors without resistance to fire and/or smoke leakage characteristics.
Beuth Verlag GmbH, Berlin

[23] DIN 4102-1:1998-05
Fire behaviour of building materials and building components - Part 1: Building materials; concepts, requirements and tests.
Beuth Verlag GmbH, Berlin

[24] OENORM S 5200:2009-04-01
Radioactivity in building materials.
Beuth Verlag GmbH, Berlin

[25] DIN/CEN TS 14405:2004-09
Characterization of waste - Leaching behaviour tests - Up-flow percolation test (under specified conditions).
Beuth Verlag GmbH, Berlin

[26] VDI 2243:2002-07
Recyclingorientierte Produktentwicklung (Recycling oriented product development).
Beuth Verlag GmbH, Berlin

[27] Commission Directive 2009/2/EC amending, for the purpose of its adaptation to technical progress, for the 31st time, Council Directive 67/548/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances (15 January 2009).

[28] ift Guideline NA-01/3
Allgemeiner Leitfaden zur Erstellung von Typ III Umweltproduktdeklarationen (Guidance on preparing Type III Environmental Product Declarations).
ift Rosenheim, November 2015

[29] Arbeitsschutzgesetz – ArbSchG (Safety at Work - Law)
Gesetz über die Durchführung von Maßnahmen des Arbeitsschutzes zur Verbesserung der Sicherheit und des Gesundheitsschutzes der Beschäftigten bei der Arbeit (Law on the implementation of occupational health and safety measures to improve the safety and health protection of employees at work), 5 February 2009 (BGBl. I p.160, 270)

[30] Bundesimmissionsschutzgesetz – BImSchG (Federal Immission Law)
Gesetz zum Schutz vor schädlichen Umwelteinwirkungen durch Luftverunreinigungen, Geräusche, Erschütterungen und ähnlichen Vorgängen (Law on harmful environmental impacts by air contamination, noise, vibrations and similar processes), 26 September 2002 (BGBl. I p. 3830)

[31] Chemikaliengesetz – ChemG (Chemicals Act)
Gesetz zum Schutz vor gefährlichen Stoffen (Law on protection against hazardous substances
Unterteilt sich in Chemikaliengesetzt und eine Reihe von Verordnungen; hier relevant (subdivided into Chemicals Law and a series of regulations; of relevance here: Gesetz zum Schutz vor gefährlichen Stoffen (Law on protection against hazardous substances), 2 July 2008 (BGBl. I p. 1146)

[32] Chemikalien-Verbotsverordnung – ChemVerbotsV (Chemicals Prohibition Regulation)
Verordnung über Verbote und Beschränkungen des Inverkehrbringens gefährlicher Stoffe, Zubereitungen und Erzeugnisse nach dem Chemikaliengesetz (Regulation on bans and restrictions of the placing on the market of hazardous substances, formulations and products covered by the Chemicals Law), 21 July 2008 (BGBl. “Federal Gazette” I p. 1328)

[33] Gefahrstoffverordnung – GefStoffV (Hazardous substances regulation)
Verordnung zum Schutz vor Gefahrstoffen (Regulation on protection against hazardous substances), 23 December 2004 (BGBl. I p. 3758)

[34] “PCR Part A: General product category rules for environmental product declarations as per EN ISO 14025 and EN 15804."
ift Rosenheim, January 2018

[35] “PCR Windows. Product Category Rules as per ISO 14025 and EN 15804.”
ift Rosenheim, January 2018

[36] Research project "EPDs für transparente Bauelemente" (EPDs for transparent building components).
ift Rosenheim, 2011

[37] prEN 17213:2018-01
“Windows and doors” - Environmental product declarations - Product category rules for windows and doors
Beuth Verlag GmbH, Berlin

8 Annex 1

Description of the life cycle scenarios Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel

Product stage			Con-struction stage		Use stage							End-of-life stage				Benefits and loads from 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, clean-ing	Repair	Exchange / Replacement	Improvement / Modernisation	Operational energy use	Operational water use	Deconstruction	Transport	Waste management	Disposal	Re-use Recovery Recycling potential
✓	✓	✓	✓	✓	—	✓	✓	—	—	✓	✓	✓	✓	✓	✓	✓

Calculation of the scenarios was based on a building service life of 50 years (in accordance with RSL of Section 4 Use stage).

The scenarios were based on information provided by the manufacturer. The scenarios were furthermore based on the research project “EPDs for transparent building components” [36].

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

A4 Transport to the construction site		
No.	**Scenario**	**Description**
A4.1	Small series Direct marketing	7.5 t truck, 20% capacity used, approx. 50 km to site and empty return trip
A4.2	Small series via local manufacturers	7.5 t truck, full capacity used, approx. 50 km and 7.5 t truck, 20% load approx.50 km and empty return trip
A4.3	**Small series via distributors**	**40 t truck, full capacity used, 150 km and 7.5 t truck, 20% load approx. 50 km and empty return trip**
A4.4	Large-scale project	40 t truck, full capacity used, approx. 150 km

A4 Transport to the construction site					
Environmental impacts per 1 kg	**Unit**	A4.1	A4.2	**A4.3**	A4.4
Global warming potential	kg CO_2 eq.	0.14	0.15	**0.14**	6.32E-03
Depletion potential of stratospheric ozone layer	kg R11 eq.	3.77E-15	3.98E-15	**3.94E-15**	1.73E-16
Acidification potential of soil and water	kg SO_2 eq.	3.36E-04	3.54E-04	**3.44E-04**	8.28E-06
Eutrophication potential	kg PO_4^{3-} eq.	8.46E-05	8.92E-05	**8.66E-05**	2.02E-06
Formation potential of tropospheric ozone	kg C_2H_4 eq.	-1.14E-04	-1.20E-04	**-1.16E-04**	-1.64E-06
Depletion of abiotic resources (ADP elements)	kg Sb eq.	1.13E-08	1.20E-08	**1.18E-08**	5.19E-10
Depletion of abiotic resources (ADP fossil fuels)	MJ	1.88	1.98	**1.96**	8.60E-02
Use of resources	**Unit**	A4.1	A4.2	**A4.3**	A4.4
Renewable primary energy as energy source	MJ	0.10	0.11	**0.11**	4.76E-03
Renewable primary energy for material use	MJ	0.00	0.00	**0.00**	0.00
Total use of renewable primary energy	MJ	0.10	0.11	**0.11**	4.76E-03
Non-renewable primary energy as energy source	MJ	1.88	1.99	**1.97**	8.63E-02
Non-renewable primary energy for material use	MJ	0.00	0.00	**0.00**	0.00
Total use of non-renewable primary energy	MJ	1.88	1.99	**1.97**	8.63E-02
Use of secondary materials	kg	0.00	0.00	**0.00**	0.00
Renewable secondary fuels	MJ	1.02E-29	1.07E-29	**1.06E-29**	4.66E-31
Non-renewable secondary fuels	MJ	1.54E-28	1.63E-28	**1.61E-28**	7.07E-30
Use of fresh water resources	m^3	1.92E-04	2.02E-04	**2.00E-04**	8.77E-06
Waste categories and output material flows	**Unit**	A4.1	A4.2	**A4.3**	A4.4
Disposed hazardous waste	kg	1.09E-07	1.15E-07	**1.14E-07**	4.99E-09
Disposed non-hazardous waste	kg	1.58E-04	1.67E-04	**1.65E-04**	7,23E-06

Radioactive waste	kg	2.58E-06	2.72E-06	**2.70E-06**	1.18E-07
Components for further use	kg	0.00	0.00	**0.00**	0.00
Materials for recycling	kg	0.00	0.00	**0.00**	0.00
Materials for energy recovery	kg	0.00	0.00	**0.00**	0.00
Exported electrical energy	MJ	0.00	0.00	**0.00**	0.00
Exported thermal energy	MJ	0.00	0.00	**0.00**	0.00

A5 Construction/Installation

No.	Scenario	Description
A5.1	**Manually**	**The Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel are installed without the use of additional lifting devices**
A5.2	Small lifting trolley / lifting platform	A small lifting platform/lifting trolley is required for the installation of the units
A5.3	Crane	A crane is required for the installation of the units

The production/installation of the Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel forms part of site management and is covered at the building level.

B2 Inspection, maintenance, cleaning

B2.1 Cleaning

No.	Scenario	Description
B2.1.1	Rarely manually (facade)	Manually using suitable detergents, annually (2.5 l per 1 m² - 125 l / 50 yr)
B2.1.2	Installation using machines	With elevating platforms, crane systems, maintenance platform, etc. – annually, 10 l per 1 m² and cleaning (500 l / 50 yr) and 2.5 kWh / 50 yr
B2.1.3	**Frequently manually (windows and doors)**	**Manually using suitable detergents, every three months, 2.5 l per 1 m² and cleaning (500 l / 50 yr)**
B2.1.4	Frequently, using machines	With elevating platforms, crane systems, maintenance platform, etc. – every three months, 10 l per 1 m² and cleaning (2,000 l / 50 yr) and 2.5 kWh / 50 yr

Consumables and waste materials as well as transport distances during cleaning are negligible.

B2.1 Cleaning					
Environmental impacts	**Unit**	B2.1.1	B2.1.2	**B2.1.3**	B2.1.4
Global warming potential	kg CO_2 eq.	48.26	2.09	**193.05**	5.24
Depletion potential of stratospheric ozone layer	kg R11 eq.	4.37E-12	6.70E-12	**1.75E-11**	1.30E-11
Acidification potential of soil and water	kg SO_2 eq.	5.75E-02	5.21E-03	**0.23**	1.20E-02
Eutrophication potential	kg PO_4^{3-} eq.	8.22E-03	1.04E-03	**3.29E-02**	3.32E-03
Formation potential of tropospheric ozone	kg C_2H_4 eq.	1,33E-02	3.42E-04	**5.33E-02**	8.13E-04
Depletion of abiotic resources (ADP elements)	kg Sb eq.	9.83E-06	7.12E-06	**3.93E-05**	2.68E-05
Depletion of abiotic resources (ADP fossil fuels)	MJ	1422.26	20.48	**5689.03**	48.80
Use of resources	**Unit**	B2.1.1	B2.1.2	**B2.1.3**	B2.1.4
Renewable primary energy as energy source	MJ	16.97	11.18	**67.87**	23.36
Renewable primary energy for material use	MJ	0.00	0.00	**0.00**	0.00
Total use of renewable primary energy	MJ	16.97	11.18	**67.87**	23.36
Non-renewable primary energy as energy source	MJ	0.00	0.00	**0.00**	0.00
Non-renewable primary energy for material use	MJ	0.00	0.00	**0.00**	0.00
Total use of non-renewable primary energy	MJ	1432.72	32.14	**5730.89**	71.70
Use of secondary materials	kg	0.00	0.00	**0.00**	0.00
Renewable secondary fuels	MJ	1.35E-21	7.27E-22	**5.40E-21**	2,91E-21
Non-renewable secondary fuels	MJ	1.59E-20	8.54E-21	**6.35E-20**	3.42E-20
Use of fresh water resources	m^3	0.28	0.52	**1.14**	2.04

Waste categories and output material flows	Unit	B2.1.1	B2.1.2	**B2.1.3**	B2.1.4
Disposed hazardous waste	kg	3.97E-07	3.96E-08	**1.59E-06**	1.32E-07
Disposed non-hazardous waste	kg	0.20	0.11	**0.81**	0.41
Radioactive waste	kg	4.14E-03	4.62E-03	**1.66E-02**	9.08E-03
Components for further use	kg	0.00	0.00	**0.00**	0.00
Materials for recycling	kg	0.00	0.00	**0.00**	0.00
Materials for energy recovery	kg	0.00	0.00	**0.00**	0.00
Exported electrical energy	MJ	0.00	0.00	**0.00**	0.00
Exported thermal energy	MJ	0.00	0.00	**0.00**	0.00

B2.2 Maintenance

No.	Scenario	Description
B2.2.1	**Little use**	**Functional check every two years, visual inspection, greasing/lubrication of hardware, check for damage and maintenance work if required 0.125 kg of grease per 50 yr.**
B2.2.2	Normal use	Annual functional check, visual inspection, greasing/lubrication and repair if required 0.250 kg of grease per 50 yr.
B2.2.3	Heavy use	Semi-annual functional check, visual inspection, greasing/lubrication and, if necessary, repair. 0.500 kg of grease per 50 yr.

Ancillary materials, energy use and waste materials as well as transport distances during maintenance are negligible.

B2.2 Maintenance				
Environmental impacts	**Unit**	**B2.2.1**	B2.2.2	B2.2.3
Global warming potential	kg CO_2 eq.	**0.13**	0.26	0.52
Depletion potential of stratospheric ozone layer	kg R11 eq.	**4.40E-14**	8.80E-14	1.76E-13
Acidification potential of soil and water	kg SO_2 eq.	**4.11E-04**	8.22E-04	1.64E-03
Eutrophication potential	kg PO_4^{3-} eq.	**3,23E-05**	6.47E-05	1.29E-04
Formation potential of tropospheric ozone	kg C_2H_4 eq.	**5,91E-05**	1.18E-04	2.36E-04
Depletion of abiotic resources (ADP elements)	kg Sb eq.	**1.77E-08**	3.54E-08	7.08E-08
Depletion of abiotic resources (ADP fossil fuels)	MJ	**6.39**	12.79	25.58
Use of resources	**Unit**	**B2.2.1**	B2.2.2	B2.2.3
Renewable primary energy as energy source	MJ	**6.99E-02**	0.14	0.28
Renewable primary energy for material use	MJ	**0.00**	0.00	0.00
Total use of renewable primary energy	MJ	**6.99E-02**	0.14	0.28

Non-renewable primary energy as energy source	MJ	**6.47**	12.94	25.88
Non-renewable primary energy for material use	MJ	**0.00**	0.00	0.00
Total use of non-renewable primary energy	MJ	**6.47**	12.94	25.88
Use of secondary materials	kg	**0.00**	0.00	0.00
Renewable secondary fuels	MJ	**0.00**	0.00	0.00
Non-renewable secondary fuels	MJ	**0.00**	0.00	0.00
Use of fresh water resources	m^3	**1.19E-04**	2.38E-04	4.76E-04
Waste categories and output material flows	**Unit**	**B2.2.1**	B2.2.2	B2.2.3
Disposed hazardous waste	kg	**8.53E-10**	1.71E-09	3.41E-09
Disposed non-hazardous waste	kg	**1.40E-04**	2.80E-04	5.59E-04
Radioactive waste	kg	**3.02E-05**	6.03E-05	1.21E-04
Components for further use	kg	**0.00**	0.00	0.00
Materials for recycling	kg	**0.00**	0.00	0.00
Materials for energy recovery	kg	**0.00**	0.00	0.00
Exported electrical energy	MJ	**0.00**	0.00	0.00
Exported thermal energy	MJ	**0.00**	0.00	0.00

B3 Repair

No.	Scenario	Description
B3	Normal use and heavy use	One replacement*): maintenance/repair of hardware, seals/gaskets, glass incl. glazing gasket and other wearing parts, if required.

*Assumptions for evaluation of possible environmental impacts; statements made do not constitute any guaranty or warranty of performance.

For updated information refer to the respective instructions for assembly/installation, operation and maintenance of Verband Fenster + Fassade

Since only one scenario is used, the results are shown in the summary table.

B6 Operational energy use

No.	Scenario	Description
B6.1	**Manually operated**	**No energy consumed when used**
B6.2	Power-operated	Windows: per drive mechanism: 0.09 kW (0,0015 kWh); open and close once a day -> 1.35 kWh / 50 yr.

There is no energy used during normal use. The Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel are opened manually.
There is no consumption in terms of transport during the energy use in buildings. Ancillary materials, waste materials and other scenarios are negligible.

B6 Energy demand during use			
Environmental impacts	**Unit**	**B6.1**	B6.2
			Windows
Global warming potential	kg CO_2 eq.	**0.00**	0.90
Depletion potential of stratospheric ozone layer	kg R11 eq.	**0.00**	1.19E-012
Acidification potential of soil and water	kg SO_2 eq.	**0.00**	1.22E-03
Eutrophication potential	kg PO_4^{3-} eq.	**0.00**	1.98E-04
Formation potential of tropospheric ozone	kg C_2H_4 eq.	**0.00**	8.07E-05
Depletion of abiotic resources (ADP elements)	kg Sb eq.	**0.00**	5.45E-07
Depletion of abiotic resources (ADP fossil fuels)	MJ	**0.00**	7.74
Use of resources	**Unit**	**B6.1**	B6.2
Renewable primary energy as energy source	MJ	**0.00**	4.83
Renewable primary energy for material use	MJ	**0.00**	0.00
Total use of renewable primary energy	MJ	**0.00**	4.83
Non-renewable primary energy as energy source	MJ	**0.00**	10.32
Non-renewable primary energy for material use	MJ	**0.00**	0.00
Total use of non-renewable primary energy	MJ	**0.00**	10.32
Use of secondary materials	kg	**0.00**	0.00
Renewable secondary fuels	MJ	**0.00**	0.00
Non-renewable secondary fuels	MJ	**0.00**	2.86E-29
Use of fresh water resources	m^3	**0.00**	3.07E-03
Waste categories and output material flows	**Unit**	**B6.1**	B6.2
Disposed hazardous waste	kg	**0.00**	7.87E-09
Disposed non-hazardous waste	kg	**0.00**	1.06E-02
Radioactive waste	kg	**0.00**	1.02E-03
Components for further use	kg	**0.00**	0.00
Materials for recycling	kg	**0.00**	0.00
Materials for energy recovery	kg	**0.00**	0.00
Exported electrical energy	MJ	**0.00**	0.00
Exported thermal energy	MJ	**0.00**	0.00

B7 Operational water use

No water consumption when used as intended. Water consumption for cleaning is specified in Module B2.1.

There is no consumption referring to transport for use of water in buildings. Ancillary materials, consumables, waste materials and other scenarios are negligible.

C1 Deconstruction

No.	Scenario	Description
C1	Deconstruction	Based on prEN 17213 (aluminium windows/doors – Figure B.1). Deconstruction (disposal) 50% glass; deconstruction (disposal) 5% glass-free materials, remainder recycled. The energy consumed for deconstruction is negligible. Any arising consumption is marginal. Further deconstruction rates are possible, give adequate reason.

No relevant inputs or outputs apply to the scenario selected. In case of deviating consumption, the removal of the products forms part of the site management and is covered at the building level.

C2 Transport

No.	Scenario	Description
C2	Transport	Transport to collection point using 7.5 t truck, full capacity used 50 km, from collection point to recycling plant using 40 t truck, full capacity used, approx. 150 km

Since only one scenario is used, the results are shown in the summary table.

C3 Waste management

No.	Scenario	Description
C3	Disposal	Based on prEN 17213 (aluminium windows/doors – Figure B.1). Share for recirculation of materials: 100% steel in melt, 100% aluminium in melt, 100% plastics thermal recycling in waste incineration plant, 100% glass in melt Recycling efficiency: 90%

Since only one scenario is used, the results are shown in the summary table.

The below table presents the disposal processes and their percentage by mass/weight. The calculation is based on the above mentioned shares in percent related to the declared unit of the product system. For calculating the 100% scenarios, the percentage in mass of the material groups can be used, as described in Section 6.2.

C3 Disposal			
	Unit	Windows	Lift-and-slide door
Collection process, collected separately	kg	37.19	39.56
Collection process, collected as mixed construction waste	kg	16.69	18.49
Recovery system, for re-use	kg	0.00	0.00
Recovery system, for recycling	kg	29.71	28.32
Recovery system, for energy recovery	kg	3.77	7.29
Disposal	kg	20.41	22.44
Assumptions for scenario development, e.g. for transport	Appropriate units		

C4 Disposal

No.	Scenario	Description
C4	Disposal	The non-recordable amounts and losses within the re-use/recycling chain (C1 and C3) are modelled as "disposed". The consumption is marginal and cannot be quantified.

The consumption in 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.

Since only one scenario is used, the results are shown in the summary table.

D Benefits and loads from beyond the system boundaries

No.	Scenario	Description
D	Recycling potential	Aluminium recyclate from C3.1 excluding the recyclate used in A3 replaces 100 % of aluminium compound; Steel scrap from C3.1 excluding the scrap used in A3 replaces 100 % of steel; Glass recyclate from C3.1 excluding the glass shards used in A3 replace 100 % of glass; Benefits from waste incineration: electricity replaces the German electricity mix, thermal energy replaces thermal energy from natural gas

The values in Module D result from deconstruction at the end of service life.

9 Annex 2

Description of life cycle scenarios per running metre of frame profile for Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel

Results per running metre of frame profile for windows and lift-and-slide units		Windows	Lift-and-slide units
Environmental impacts	**Unit**	**A1-A3**	**A1-A3**
GWP	kg CO_2 eq.	38.19	86.20
ODP	kg R11 eq.	7.03E-10	1.17E-06
AP	kg SO_2 eq.	0.10	0.25
EP	kg PO_4^{3-} eq.	9.71E-03	2.19E-02
POCP	kg C_2H_4 eq.	1.00E-02	2.21E-02
ADPE	kg Sb eq.	1.01E-04	3.31E-03
ADPF	MJ	481.11	1120.35
Use of resources	**Unit**	**A1-A3**	**A1-A3**
PERE	MJ	86.14	218.65
PERM	MJ	0.00	0.00
PERT	MJ	86.14	218.65
PENRE	MJ	516.34	1270.31
PENRM	MJ	34.27	37.45
PENRT	MJ	550.61	1307.76
SM	kg	0.00	0.00
RSF	MJ	0.00	0.00
NRSF	MJ	0.00	0.00
FW	m^3	0.16	0.38
Waste categories and output material flows	**Unit**	**A1-A3**	**A1-A3**
HWD	kg	5.71E-07	1.30E-06
NHWD	kg	1.57	4.50
RWD	kg	2.70E-02	7.08E-02
Cru	kg	0.00	0.00
MFR	kg	0.00	0.00
MER	kg	0.00	0.00
EEE	MJ	0.34	0.67
EET	MJ	0.61	1.21

Key:
GWP – global warming potential **ODP** – ozone depletion potential **AP** - acidification potential of soil and water **EP** - eutrophication potential **POCP** - photo-chemical ozone creation potential **ADPE** - abiotic depletion potential – non fossil ressources **ADPF** - abiotic depletion potential – fossil resources **PERE** - Use of renewable primary energy **PERM** - use of renewable primary energy resources **PERT** - total use of renewable primary energy resources **PENRE** - use of non-renewable primary energy **PENRM** - use of non-renewable primary energy resources **PENRT** - total use of non-renewable primary energy resources **SM** - use of secondary material **RSF** - use of renewable secondary fuels **NRSF** - use of non-renewable secondary fuels **FW** - net use of fresh water **HWD** - Hazardous waste disposed **NHWD** - Non-hazardous waste disposed **RWD** - Radioactive waste disposed **CRU** - Components for re-use **MFR** - Materials for recycling **MER** - Materials for energy recovery **EEE** - Exported electrical energy **EET** - Exported thermal energy

10 Annex 3

Description of life cycle scenarios per 1 m² of frame profile for Windows and lift-and-slide units made of steel, stainless steel or weather resistant structural steel

Results per 1 m² of face width per frame profile for windows and lift-and-slide units		Windows Face width 120 mm	Lift-and-slide units Face width 220 mm
Environmental impacts	**Unit**	**A1-A3**	**A1-A3**
GWP	kg CO_2 eq.	49.18	45.42
ODP	kg R11 eq.	9.05E-10	6.15E-07
AP	kg SO_2 eq.	0.13	0.13
EP	kg PO_4^{3-} eq.	1.25E-02	1.16E-02
POCP	kg C_2H_4 eq.	1.29E-02	1.16E-02
ADPE	kg Sb eq.	1.30E-04	1.74E-03
ADPF	MJ	619.49	590.35
Use of resources	**Unit**	**A1-A3**	**A1-A3**
PERE	MJ	110.92	115.21
PERM	MJ	0.00	0.00
PERT	MJ	110.92	115.21
PENRE	MJ	664.86	669.37
PENRM	MJ	44.12	19.73
PENRT	MJ	708.98	689.10
SM	kg	0.00	0.00
RSF	MJ	1.90E-09	3.54E-08
NRSF	MJ	2.24E-08	4.48E-07
FW	m^3	0.20	0.20
Waste categories and output material flows	**Unit**	**A1-A3**	**A1-A3**
HWD	kg	7.35E-07	6.86E-07
NHWD	kg	2.03	2.37
RWD	kg	3.47E-02	3.73E-02
Cru	kg	0.00	0.00
MFR	kg	0.00	0.00
MER	kg	0.00	0.00
EEE	MJ	0.44	0.35
EET	MJ	0.79	0.64

Key:
GWP – global warming potential **ODP** – ozone depletion potential **AP** - acidification potential of soil and water **EP** - eutrophication potential **POCP** - photo-chemical ozone creation potential **ADPE** - abiotic depletion potential – non fossil ressources **ADPF** - abiotic depletion potential – fossil ressources **PERE** - Use of renewable primary energy **PERM** - use of renewable primary energy resources **PERT** - total use of renewable primary energy resources **PENRE** - use of non-renewable primary energy **PENRM** - use of non-renewable primary energy resources **PENRT** - total use of non-renewable primary energy resources **SM** - use of secondary material **RSF** - use of renewable secondary fuels **NRSF** - use of non-renewable secondary fuels **FW** - net use of fresh water **HWD** - Hazardous waste disposed **NHWD** - Non-hazardous waste disposed **RWD** - Radioactive waste disposed **CRU** - Components for re-use **MFR** - Materials for recycling **MER** - Materials for energy recovery **EEE** - Exported electrical energy **EET** - Exported thermal energy

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