Environmental Product Declaration

Declaration Code: EPD-AFT-34.0

HUECK

HUECK System GmbH & Co. KG

Frame profiles for windows and doors

WS/DS 075, WS/DS 090, Lambda 110, Volato, Lava

Basis:

DIN EN ISO 14025
EN15804

Company EPD **E**nvironmental **P**roduct **D**eclaration

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Practitioner of the LCA	ift Rosenheim GmbH Theodor Gietl Straße 7-9 D-83026 Rosenheim		
Declaration holder	HUECK System GmbH & Co. KG Loher Straße 9 58511 Lüdenscheid		
Declaration code	EPD-AFT-34.0		
Designation of declared product	Frame profile for aluminium windows and doors WS 075, DS 075, WS 090, DS 090, Lambda 110, Volato, Lava		
Scope	Aluminium window and door systems for all building classes		
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 II Umweltproduktdeklarationen" (Guidance on preparing Type III Environmental Product Declarations) applies. The Declaration is based on the PCR documents “PCR Part A” PCR-A-0.2:2018 and “Profiles for windows, doors and façades” PCR-PR-2.1:2018.		
Validity	Publication date: 05.11.2019	Last revision: 05.11.2019	Next revision: 05.11.2024
	This verified Company Environmental Product Declaration (company EPD) 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.		
LCA basis	The LCA was prepared in accordance with DIN EN ISO 14040 and DIN EN ISO 14044. The base data includes both the data collected at the production site of HUECK System GmbH & Co. KG and the generic data derived from the “GaBi 9” database. LCA calculations were carried out for the included “cradle to gate life cycle with options” (cradle to gate with options) including all upstream processes (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.		

Prof. Ulrich Sieberath Director of Institute	Patrick Wortner External verifier

1 General product information

Product definition

The EPD relates to the product group windows and doors and applies to:

1 running metreFrame profile for aluminium windows and doors made by HUECK System GmbH & Co. KG

The functional unit is obtained as follows:

Assessed product	Declared unit	Metre weight
WS/DS 075 (windows-doors) Depth 75 mm	1 running metre	3.13 kg/m
WS/DS 090 (windows-doors) Depth 90 mm	1 running metre	3.15 kg/m
Lava (fire / smoke control doors)	1 running metre	4.63 kg/m
Volato (lifting-sliding)	1 running metre	3.25 kg/m

The average unit is declared as follows:
Directly used material flows are determined using the average sizes (windows: 1.23 m x 1.48 m, doors: 1.23 m x 2.18 m, lifting-sliding unit: 3.00 m x 2.18 m) in accordance with prEN 17213 and 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 2018.

The validity of the EPD is restricted to the following models:

Product groups			
PG 1 WS/DS 075	**PG2 WS/DS 090**	**PG 3 Lava**	**PG4 Volato**
WS 075	**WS 090 SA**	**Lava 77-90**	**Volato M+**
WS 075 OU	WS 090 IS	Lava 77-30 (CE)	
WS 075 CD/RD	WS 090	Lava 77-S	
WS 075 FC	WS 090 Duo	Lava 65-S	
WS 075 IS	Lambda 110		
DS 075 FD	DS 090		
DS 075	DS 090 Duo		

*bold = reference products

Product description

HUECK Lambda window and door system with different profile depths and profile geometries with variable thermal insulation

HUECK Lava fire protection system for thermally insulated fire doors and fixed lights up to fire resistance class T90/F90 (EI90). Optionally with smoke control version in accordance with DIN 18095 (RS), escape door systems in accordance with DIN EN 179 and DIN EN 1125.

HUECK Volato sliding system for a range of design versions of thermally insulated sliding and lifting-sliding systems.

	Windows	Doors
Profile system	Highly thermally insulating aluminium designs with different depths of 75 mm and 90 mm and/or lifting-sliding units with profile depth up to 148 mm.	Highly thermally insulating aluminium designs with two depths of 75 mm and 90 mm and, for LAVA fire doors, highly thermally insulating aluminium designs with two depths of 65 mm and 77 mm.
Type of opening / opening direction	Side-hung, tilt&turn, tilt-first, top-hung sliding-turning, sliding projecting top hung, parallel sliding, parallel opening projecting, inward and partly outward opening. Sliding and lifting sliding units with types of opening (Scheme) A, D, G, C, K, F also as monorail.	Single and double leaf, inward- and outward-opening doors. Plus fixed lights for fire protection.
Frame material	Composite profiles in aluminium and PA/Noryl GTX and/or lifting-sliding units in aluminium and PA.	Composite profiles in aluminium and PA/Noryl GTX and/or for Lava fire doors in aluminium and PA.
Overall frame dimensions	Frame face widths from 55 mm to 225 mm and/or for lifting-sliding units from 35 mm to 115 mm.	Frame face widths from 65 mm to 75 mm and/or for fire protection from 51.5 mm to 200 mm.
Rebate seal	Glazing rebate insulation in PE.	
Finish	Surface coating	
Glazing gasket	Sealing material in EPDM	
Accessories and seals/gaskets	Parts and compounds according to the HUECK system.	Parts and compounds according to the HUECK system.

This EPD does not apply to:

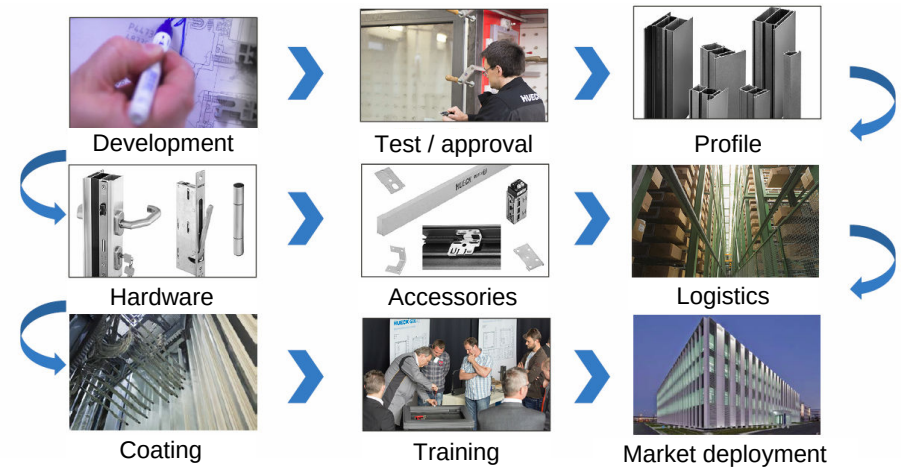
- Roof windows, as their design differs too greatly from the declared windows.
- Bonded glass systems

Supplementary components such as external/internal shutters, e.g. roller shutters, solar shading devices, roller shutter boxes, etc. must be dealt with separately".

Additional information for architects:
Observe also the relevant system descriptions by the manufacturers.

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

Product manufacture



Application

Aluminium window and door systems, e.g. for

- Residential and non-residential buildings
- Office and administrative buildings
- Commercial and industrial buildings
- Sports and culture buildings
- Single and multi-family housing

Management systems

The following management systems are in place:

- Quality management system as per DIN EN ISO 9001:2015
- Environmental management system as per DIN EN ISO 14001:2015

Additional information

For additional evidence of fitness for use or certificates of conformity, if applicable, please 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

The product contains no substances from the REACH candidate list (declaration dated 25.05.2019).

All relevant safety data sheets are available from HUECK System GmbH & Co. KG.

3 Construction process stage

Processing recommendations, installation

Observe the instructions for assembly/installation, operation, service/maintenance and disassembly. See www.hueck.com

4 Use stage

Emissions to the environment

No emissions to indoor air, water and soil are known (if applicable, VOC emissions may occur).

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 “Nutzungsdauern von Bauteilen zur Lebenszyklusanalyse nach BNB” (Service life of building components for life cycle analysis 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:
The reference service life (RSL) can be determined for a “cradle to gate with options” EPD only if all of the modules A1- A3 and B1-B5 are specified;
According to the BBSR table, the frame profile for aluminium windows and doors of HUECK System GmbH & Co. KG has an optional service life of 50 years.

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 (e.g., humidity, temperature) known that may 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 guarantee.

5 End-of-life stage

Possible end-of-life stages

The Frame profile for aluminium windows and doors is shipped to central collection points. There the products are generally shredded and sorted into their original pure components. The end-of-life stage depends on the site where the products are used and is therefore subject to the local regulations. Observe the locally applicable regulatory requirements.

This EPD shows the end-of-life modules based on prEN 17213 (aluminium windows/doors – Figure B.1). Metals and glass are recycled into specific components, most plastics are thermally recycled. Residual fractions are sent to landfill.

Disposal routes

The LCA includes the average disposal routes.

All calculated 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.

Such a Life Cycle Analysis (LCA) was developed as the basis for assessing Frame profile for aluminium windows and doors . 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 Frame profile for aluminium windows and doors. 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.

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

The specific data originate exclusively from the fiscal year 2018. They were collected on-site at the plant located in Lüdenscheid and originate in parts from company records and partly from values directly obtained by measurement. Validity of the data was checked by the ift Rosenheim.
The generic data originate from the “GaBi 9” software, "Professional Datenbank und Baustoff Datenbank" (professional data base and building materials data base). The last update of both databases was in 2019. Data from before this date originate also from this 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 9” 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 and end-of-life stage of frame profiles for aluminium windows and doors (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 frame profile for aluminium windows and doors.
The transport mix is composed as follows and originates from the research project “EPDs für transparente Bauelemente” (EPDs for transparent building components).

- Truck, 26 - 28t total weight / 18.4t payload, Euro 6, freight, 85 % capacity used, 100 km;
- Truck-trailer, 28 - 34t 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, 50km

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 frame profiles for aluminium windows and doors. Product stage (A1 – A3), end-of-life stage (C1 – 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 • Benefits (thermal and electrical) from incineration
Allocation of co-products	The manufacture of Frame profile for aluminium windows and doors does not produce any allocations.
Allocations for re-use, recycling and recovery	If the Frame profile for aluminium windows and doors is reused/recycled and recovered during the product stage (rejects), the components are shredded and then sorted into their original pure components, if necessary. This is realised by various process plants, e.g. magnetic separators. The system boundaries of the frame profiles for aluminium windows and doors were set following their disposal, reaching the end of waste status.
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 by the company HUECK System GmbH & Co. KG was not considered. Secondary material is not used.

Inputs

The LCA includes the following production-relevant inputs:

Energy
The production of the frame profiles is based on the “HUECK” electricity mix (see following table), fabrication/further processing on “Strommix EU-28” (EU-28 electricity mix). Gas is based on “Erdgas Deutschland” (German natural gas). Diesel is based on “Diesel Deutschland” (German Diesel).

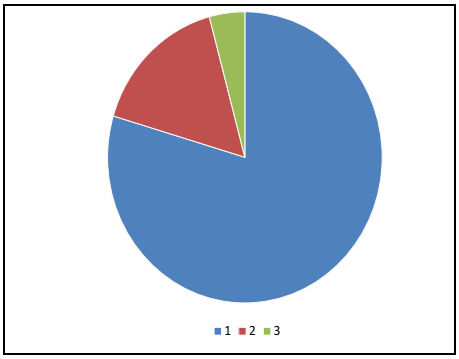
“HUECK” electricity mix	Shares in %
Renewable energies	71.6
Natural gas	7.6
Coal	15.4
Other fossil resources	0.8
Nuclear energy	4.6

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.

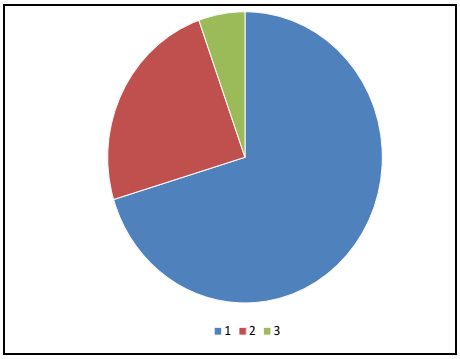
Water
The water consumed by the individual process steps for the production of frame profiles for aluminium windows and doors amounts to a total of 0.02 l per running metre of the unit.

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

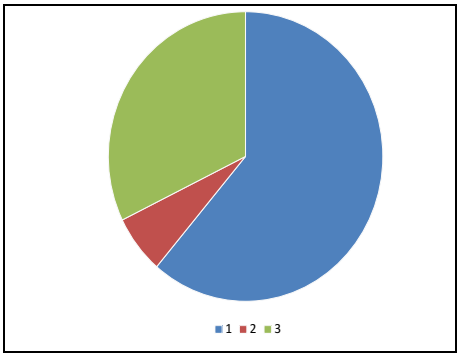
Raw material/pre-products
The chart below shows the share of raw materials/pre-products in %.



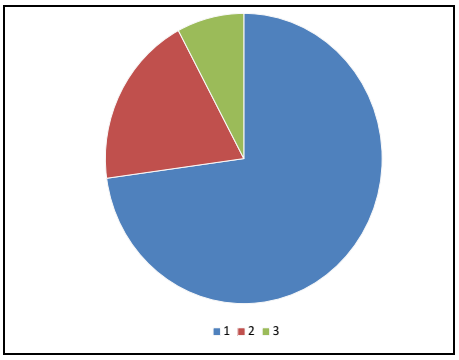
WS/DS 075



WS/DS 090



Lava



Volato

		Mass in %			
No.	Material	WS/DS090	WS/DS 090	Lava	Volato
1	Metals	79.58	70.31	61.22	72.82
2	Plastics	16.26	24.23	6.56	19.35
3	Other	4.16	5.45	32.22	7.83

Ancillary materials and consumables
0.27 kg or 0.27 kg or 0.24 kg or 0.11 kg ancillary materials and consumables are required for 1 running metre of Frame profile for aluminium windows and doors.

Product packaging
The amounts used for product packaging are as follows:

		Mass in g			
No.	Material	WS/DS090	WS/DS 090	Lava	Volato
1	Corrugated cardboard	0.32	0.29	0.29	0.14
2	Cardboard	0.06	0.06	0.06	0.03
3	PE film	0.13	0.12	0.12	0.05

Outputs

The LCA includes the following production-relevant outputs per running metre of Frame profile for aluminium windows and doors :

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

Waste water
The waste water consumed for the production of frame profiles for aluminium windows and doors amounts to 1.32E-4 l or 1.20E-4 l or 1.19E-4 l or 5.58E-5 l.

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 running metre of Frame profile for aluminium windows and doors 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 running metre of WS/DS 075							
Environmental impacts	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP	kg CO_2-equiv.	25.99	0.00	0.15	1.57	4.17E-03	-12.57
ODP	kg R11-equiv.	2.10E-08	0.00	2.43E-17	1.76E-15	2.43E-17	-2.60E-14
AP	kg SO_2-eqv.	0.12	0.00	3.02E-04	2.62E-04	2.50E-05	-5.89E-02
EP	kg PO_4^{3-}-equiv.	7.35E-03	0.00	7.45E-05	3.60E-05	2.84E-06	-3.47E-03
POCP	kg C_2H_4-equiv.	6.72E-03	0.00	-9.11E-05	2.04E-05	1.92E-06	-3.23E-03
ADPE	kg Sb-equiv.	1.46E-05	0.00	1.14E-08	2.67E-08	1.54E-09	-4.49E-06
ADPF	MJ	316.07	0.00	2.00	0.78	5.85E-02	-139.20
Use of resources	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	132.15	0.00	0.12	0.45	7.67E-03	-69.39
PERM	MJ	6.14E-03	0.00	0.00	0.00	0.00	0.00
PERT	MJ	132.16	0.00	0.12	0.45	7.67E-03	-69.39
PENRE	MJ	362.16	0.00	2.00	11.15	0.58	-166.40
PENRM	MJ	10.44	0.00	0.00	-9.92	-0.52	0.00
PENRT	MJ	372.60	0.00	2.00	1.23	6.05E-02	-166.40
SM	kg	0.00	0.00	0.00	0.00	0.00	0.00
RSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00
FW	m^3	0.33	0.00	1.97E-04	3.77E-03	1.52E-05	-0.18
Waste categories and output material flows	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
HWD	kg	2.57E-07	0.00	1.12E-07	6.51E-10	1.03E-09	-1.20E-07
NHWD	kg	6.24	0.00	1.63E-04	6.77E-03	0.28	-3.47
RWD	kg	2.21E-02	0.00	2.72E-06	1.80E-04	8.13E-07	-1.07E-02
Cru	kg	0.00	0.00	0.00	0.00	0.00	0.00
MFR	kg	0.00	0.00	0.00	2.37	0.00	0.00
MER	kg	0.00	0.00	0.00	0.00	0.00	0.00
EEE	MJ	1.43E-06	0.00	0.00	3.23	0.00	0.00
EET	MJ	3.07E-06	0.00	0.00	5.75	0.00	0.00

Key:

GWP – global warming potential **ODP** – ozone depletion potential **AP** - acidification potential of soil and water **EP** - eutrophication potential **POCP** - photochemical ozone creation potential **ADPE** - abiotic depletion potential – non fossil resources **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

Results per 1 running metre of WS/DS 090							
Environmental impacts	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP	kg CO_2-equiv.	25.15	0.00	0.15	2.33	4.77E-03	-11.64
ODP	kg R11-equiv.	2.42E-08	0.00	2.45E-17	1.83E-15	2.77E-17	-2.95E-14
AP	kg SO_2-eqv.	0.11	0.00	3.04E-04	3.11E-04	2.86E-05	-5.32E-02
EP	kg PO_4^{3-}-equiv.	7.16E-03	0.00	7.50E-05	4.64E-05	3.24E-06	-3.17E-03
POCP	kg C_2H_4-equiv.	6.49E-03	0.00	-9.17E-05	2.54E-05	2.20E-06	-2.94E-03
ADPE	kg Sb-equiv.	1.70E-05	0.00	1.14E-08	3.08E-08	1.76E-09	-4.08E-06
ADPF	MJ	320.25	0.00	2.01	0.86	6.68E-02	-130.32
Use of resources	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	120.13	0.00	0.12	0.47	8.76E-03	-63.38
PERM	MJ	5.57E-03	0.00	0.00	0.00	0.00	0.00
PERT	MJ	120.14	0.00	0.12	0.47	8.76E-03	-63.38
PENRE	MJ	357.42	0.00	2.02	16.21	0.85	-156.19
PENRM	MJ	15.66	0.00	0.00	-14.88	-0.78	0.00
PENRT	MJ	373.08	0.00	2.02	1.33	6.91E-02	-156.19
SM	kg	0.00	0.00	0.00	0.00	0.00	0.00
RSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00
FW	m^3	0.30	0.00	1.98E-04	5.41E-03	1.74E-05	-0.16
Waste categories and output material flows	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
HWD	kg	2.42E-07	0.00	1.13E-07	7.26E-10	1.18E-09	-1.10E-07
NHWD	kg	5.56	0.00	1.64E-04	9.78E-03	0.32	-3.09
RWD	kg	2.07E-02	0.00	2.74E-06	1.87E-04	9.29E-07	-1.02E-02
Cru	kg	0.00	0.00	0.00	0.00	0.00	0.00
MFR	kg	0.00	0.00	0.00	2.11	0.00	0.00
MER	kg	0.00	0.00	0.00	0.00	0.00	0.00
EEE	MJ	1.30E-06	0.00	0.00	4.85	0.00	0.00
EET	MJ	2.78E-06	0.00	0.00	8.63	0.00	0.00

Key:

GWP – global warming potential **ODP** – ozone depletion potential **AP** - acidification potential of soil and water **EP** - eutrophication potential **POCP** - photochemical ozone creation potential **ADPE** - abiotic depletion potential – non fossil resources **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

Results per 1 running metre of Lava							
Environmental impacts	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP	kg CO_2-equiv.	28.25	0.00	0.22	0.96	2.45E-02	-13.70
ODP	kg R11-equiv.	2.17E-08	0.00	3.60E-17	1.70E-15	1.43E-16	-2.42E-14
AP	kg SO_2-eqv.	0.13	0.00	4.46E-04	2.22E-04	1.47E-04	-6.55E-02
EP	kg PO_4^{3-}-equiv.	8.03E-03	0.00	1.10E-04	2.77E-05	1.67E-05	-3.83E-03
POCP	kg C_2H_4-equiv.	7.33E-03	0.00	-1.35E-04	1.64E-05	1.13E-05	-3.58E-03
ADPE	kg Sb-equiv.	3.12E-05	0.00	1.68E-08	2.33E-08	9.03E-09	-1.08E-05
ADPF	MJ	331.78	0.00	2.95	0.72	3.44E-01	-150.73
Use of resources	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	145.87	0.00	0.17	0.44	4.51E-02	-76.04
PERM	MJ	5.52E-03	0.00	0.00	0.00	0.00	0.00
PERT	MJ	145.88	0.00	0.17	0.44	4.51E-02	-76.04
PENRE	MJ	386.20	0.00	2.96	8.17	0.73	-179.73
PENRM	MJ	7.38	0.00	0.00	-7.01	-0.37	0.00
PENRT	MJ	393.58	0.00	2.96	1.16	3.56E-01	-179.73
SM	kg	0.00	0.00	0.00	0.00	0.00	0.00
RSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00
FW	m^3	0.36	0.00	2.91E-04	2.45E-03	8.96E-05	-0.20
Waste categories and output material flows	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
HWD	kg	3.00E-07	0.00	1.66E-07	5.90E-10	6.06E-09	-1.36E-07
NHWD	kg	6.96	0.00	2.41E-04	4.35E-03	1.65	-3.87
RWD	kg	2.42E-02	0.00	4.02E-06	1.76E-04	4.78E-06	-1.14E-02
Cru	kg	0.00	0.00	0.00	0.00	0.00	0.00
MFR	kg	0.00	0.00	0.00	2.69	0.00	0.00
MER	kg	0.00	0.00	0.00	0.00	0.00	0.00
EEE	MJ	1.29E-06	0.00	0.00	1.93	0.00	0.00
EET	MJ	2.76E-06	0.00	0.00	3.43	0.00	0.00

Key:

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Results per 1 running metre of Volato							
Environmental impacts	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP	kg CO_2-equiv.	26.86	0.00	0.15	1.93	6.00E-03	-12.07
ODP	kg R11-equiv.	2.94E-08	0.00	2.52E-17	1.79E-15	3.49E-17	-2.77E-14
AP	kg SO_2-eqv.	0.12	0.00	3.13E-04	2.84E-04	3.60E-05	-5.59E-02
EP	kg PO_4^{3-}-equiv.	7.75E-03	0.00	7.72E-05	4.09E-05	4.08E-06	-3.32E-03
POCP	kg C_2H_4-equiv.	6.91E-03	0.00	-9.44E-05	2.27E-05	2.76E-06	-3.08E-03
ADPE	kg Sb-equiv.	2.64E-05	0.00	1.18E-08	2.86E-08	2.21E-09	-6.11E-06
ADPF	MJ	334.10	0.00	2.07	0.82	8.40E-02	-134.47
Use of resources	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	126.83	0.00	0.12	0.46	1.10E-02	-66.13
PERM	MJ	2.59E-03	0.00	0.00	0.00	0.00	0.00
PERT	MJ	126.83	0.00	0.12	0.46	1.10E-02	-66.13
PENRE	MJ	377.32	0.00	2.08	13.51	0.73	-160.90
PENRM	MJ	12.87	0.00	0.00	-12.23	-0.64	0.00
PENRT	MJ	390.19	0.00	2.08	1.28	8.69E-02	-160.90
SM	kg	0.00	0.00	0.00	0.00	0.00	0.00
RSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00
FW	m^3	0.32	0.00	2.04E-04	4.54E-03	2.19E-05	-0.17
Waste categories and output material flows	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
HWD	kg	1.67E-06	0.00	1.16E-07	6.86E-10	1.48E-09	-1.16E-07
NHWD	kg	5.91	0.00	1.69E-04	8.17E-03	0.40	-3.27
RWD	kg	2.19E-02	0.00	2.82E-06	1.83E-04	1.17E-06	-1.04E-02
Cru	kg	0.00	0.00	0.00	0.00	0.00	0.00
MFR	kg	0.00	0.00	0.00	2.25	0.00	0.00
MER	kg	0.00	0.00	0.00	0.00	0.00	0.00
EEE	MJ	6.05E-07	0.00	0.00	3.99	0.00	0.00
EET	MJ	1.29E-06	0.00	0.00	7.09	0.00	0.00

Key:

GWP – global warming potential **ODP** – ozone depletion potential **AP** - acidification potential of soil and water **EP** - eutrophication potential **POCP** - photochemical ozone creation potential **ADPE** - abiotic depletion potential – non fossil resources **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

6.4 Interpretation, LCA presentation and critical review

Evaluation

The environmental impacts of

- WS/DS 075
- WS/DS 090
- Lava
- Volato

differ greatly from each other. The differences are due mainly to the amount of pre-products and raw materials used. This was to be expected for the aluminium profiles in particular. The impact of the different pre-products and raw materials should also be taken into account. The additional fire resistant materials used for the Lava fire protection systems are another reason for the generally higher environmental impacts.

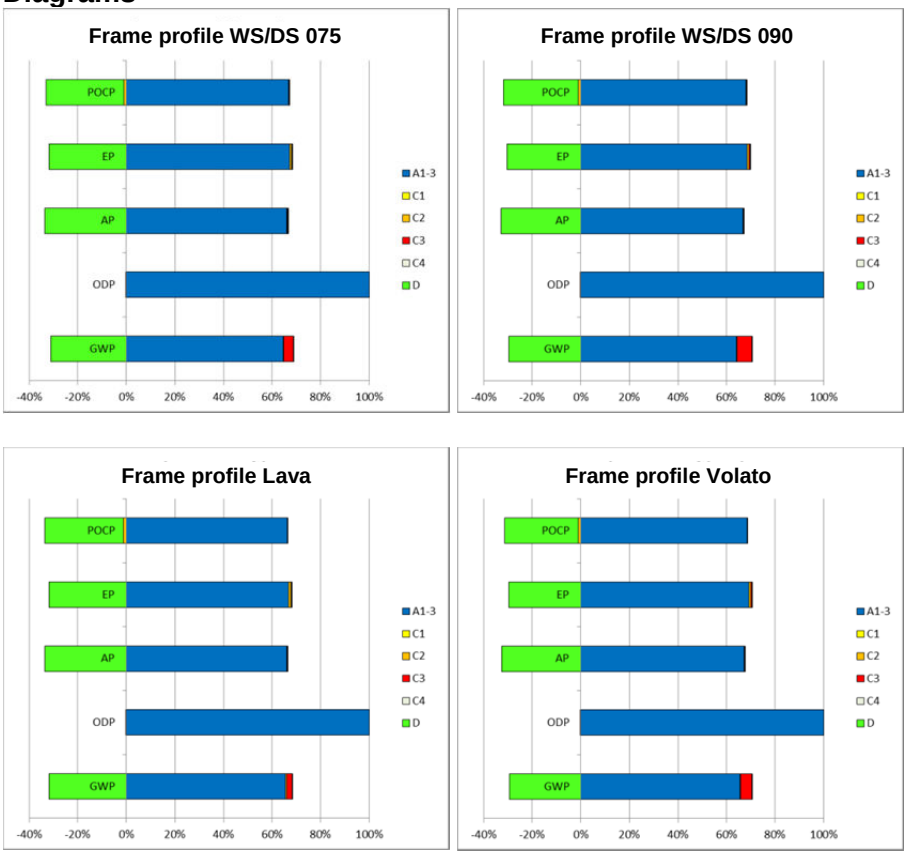
The environmental impacts during the manufacture originate mainly from the use of aluminium / its upstream chains. Another significant environmental impact originates from the use of polyamide and its upstream chains.

For scenario C4 only marginal consumptions arising from the physical pre-treatment and management of the disposal site are expected. Allocation to specific products is almost impossible for site disposal.
As regards the recycling of the products, between 15 and 50 percent of the environmental impacts during manufacture can be assigned to aluminium by product group as benefits to scenario D.

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

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 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, MBA and Eng., Dipl.-Ing. (FH), 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.

The detailed individual results of the products were summarised on the basis of conservative assumptions and differ from the average results. Identification of the product groups and the resulting variations are documented in the background report.

Communication

The communications format of this EPD meets the requirements of EN 15942:2012 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.

The Declaration is based on the PCR documents "PCR Part A" PCR-A-0.2:2018 and "Profiles for windows, doors and façades" PCR-PR-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	05.11.2019	External verification	Zwick	Wortner

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9 Annex

Description of life cycle scenarios for Frame profile for aluminium windows and doors

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” (1).

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

A5 Construction/Installation

No.	Scenario	Description
A5	Disposal of packaging	Packaging is disposed of according to the local waste management system.

In the selected scenario environmental impacts result from the use of packaging material.

For the amounts of product packaging calculated in A1-A3, refer to Section 6.2 “Inputs”.

C1 Deconstruction

No.	Scenario	Description
C1	Deconstruction	Based on prEN 17213 (aluminium windows/doors – Figure B.1): 95% deconstruction of non-glass materials; remainder sent to landfill. Further deconstruction rates are possible, give adequate reasons. The energy consumed for deconstruction is negligible.

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

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 (Euro 0-6 mix), full load, approx. 50 km to collection point and empty return trip. From collection point to recycling plant using 34 - 40 t truck (Euro 0-6 mix), 27 t payload, full load, approx. 150 km to recycling plant and empty return trip.

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% metals in steel melt • Plastics 100% thermal recycling in waste incinerator (R1>0,6) • Remainder (e.g. fire resistant material) sent to landfill

As the frame profiles for aluminium windows and doors are placed on the European market, the disposal scenario is based on average European data sets.

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.

C3 Disposal	Unit	WS/DS 075	WS/DS 090	Lava	Volato
Collection process, collected separately	kg	2.98	3.00	4.40	3.08
Collection process, collected as mixed construction waste	kg	0.16	0.16	0.23	0.16
Recovery system, for re-use	kg	0.00	0.00	0.00	0.00
Recovery system, for recycling	kg	2.37	2.11	2.69	2.25
Recovery system, for energy recovery	kg	0.48	0.73	0.29	0.60
Disposal	kg	0.28	0.32	1.65	0.40

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

C4 Disposal

No.	Scenario	Description
C4	**Disposal**	**The non-recordable amounts and losses of the re-use/recycling chain (C1 and C3) are modelled as "disposed".**

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.

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 excluding the recyclate used in A3 replaces 60 % of aluminium compound; Stainless steel scrap from C3 excluding the scrap used in A3 replaces 60 % of steel; Benefits from waste incinerator: electricity replaces EU-28 European electricity mix; thermal energy replaces thermal energy from European natural gas (EU-28).**

The values in module D result from de-construction at the end-of-service life.

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

Imprint

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Notes
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