

Environmental Product Declaration (EPD)



Declaration code: EPD-SIB-75.0.01

Note: This EPD was made based on a LCA-tool.



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SIEGENIA-AUBI KG

Hardware

Turn-and-tilt hardware for windows



Basis:

DIN EN ISO 14025
EN 15804 + A2
Company-EPD
Environmental
Product Declaration

Publication date:
19.09.2023

Valid until
19.09.2028



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Environmental Product Declaration (EPD)



Declaration code: EPD-SIB-75.0.01

Programme operator	ift Rosenheim GmbH Theodor-Gietl-Straße 7-9 D-83026 Rosenheim		
Tool creator / LCA practitioner	Sphera Solutions GmbH Hauptstraße 111-113 D-70771 Leinfelden-Echterdingen		
Tool-Inhaber / Declaration holder	SIEGENIA-AUBI KG Industriestraße 1-3 D-57234 Wilnsdorf www.siegenia.com		
Declaration code	EPD-SIB-75.0.01		
Designation of declared product	Turn-and-tilt hardware for windows		
Scope	Turn-and-tilt hardware for timber, PVC and aluminum windows with 16 mm fitting groove		
Basis	This EPD was prepared on the basis of EN ISO 14025:2011 and DIN EN 15804:2012+A2:2019. 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 PCR documents "PCR Part A" PCR-A-0.2:2018 and "Schloss und Beschlag" PCR-SB-3.0:2022.		
Validity	Publication date:	Last revision:	Valid until:
	19.09.2023	10.12.2025	19.09.2028
	This verified company Environmental Product Declaration applies solely to the specified products and is valid for a period of five 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 SIEGENIA-AUBI KG and the generic data from the „Sphera - LCA for Expert Content version 2023.1“. The calculations were made by the LCA-Tool Sphera - LCA for Expert Content version 2023.1. The LCA calculations were carried out for the 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.		

Christian Kehrer Head of Certification and Surveillance Body	Dr. Torsten Mielecke Chairman of Expert Committee ift-EPD and PCR	Susanne Volz External verifier

1 General product information

Product definition The EPD relates to the product group hardware and applies to:

**1 piece of hardware
made by SIEGENIA-AUBI KG**

The declared unit is obtained as follows:

Assessed product	Declared unit	Unit weight
TITAN axxent 24+	1 piece	4,08 kg/piece

Table 1: Product groups

The average unit is declared as follows:

Directly used material flows are determined using masses (kg) produced and assigned to the declared unit. All other inputs and outputs in the production are assigned to the declared unit in their entirety because they cannot be related to the average size. The reference period is the year 2022.

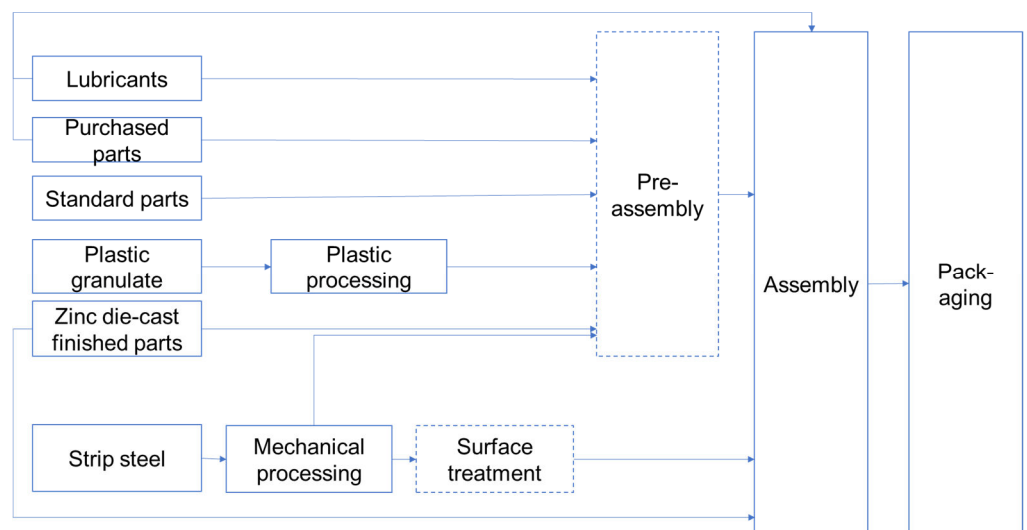
The validity of the EPD is restricted to the following models:

- TITAN axxent 24+
- TITAN iP/AF
- ALU 16

Product description Hardware for wooden/plastic windows and French doors with (depending on the set) a concealed or exposed hinge side. Opening type depending on the set: turn-tilt, turn, tilt, tilt-before-turn (TBT). The hardware are galvanized or otherwise coated in accordance with DIN 50960 Bd and meet the highest corrosion protection class „5“ in accordance with DIN EN 1670.

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

Product manufacture





Product group: Hardware

Scope	Tilt-turn hardware for wooden, plastic or aluminum windows with 16mm hardware grove
Management systems	<p>The following management systems are in place:</p> <ul style="list-style-type: none"> • Quality management system in accordance with DIN EN ISO 9001:2015 • Environmental management systems in accordance with 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 specified in Section 6.2 Inventory analysis (Inputs).
Declarable substances	<p>The product contains substances from the REACH candidate list (declaration dated 04. may 2023).</p> <p>All relevant safety data sheets as well as die Konformitätserklärung RoHS-REACH are available from SIEGENIA-AUBI KG. Therefore see also https://www.siegenia.com.</p>

3 Construcion process stage

Processing recommendations, installation	Observe the instructions for mounting/installation, operation, maintenance and disassembly, provided by the manufacturer. See https://www.siegenia.com .
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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)	<p>The RSL information was provided by the manufacturer. The RSL shall be specified under defined reference in-use conditions and shall refer to the declared technical and functional performance of the product within the building. It shall be established in accordance with any specific rules given in European product standards, or, if not available, in accordance with a c-PCR. It shall also take into account ISO 15686-1, -2, -7 and -8. Where European product standards or a c-PCR provide guidance on deriving the RSL, such guidance shall have priority.</p> <p>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.</p>

For this EPD the following applies:
 For a “Cradle to gate with options” EPD with the modules C1-C4 and module D (A1-A3 + C + D and one or more additional modules from A4 to B7), the reference



service life (RSL) can only be stated if the reference in-use conditions are specified.

According to the manufacturer, an optional service life of 40 years is specified for turn-and-tilt hardware made by SIEGENIA-AUBI KG

The reference service life is dependent on the characteristics of the product and the reference in-use conditions. The in-use conditions described in the EPD are applicable, in particular the characteristics listed below:

- Outdoor environment: Climatic influences may have a negative impact on the reference service life
- Indoor environment: No factors (e.g. humidity, temperature) known that may have a negative effect on the reference service life.

5 End-of-life stage

Possible end-of-life stages

The turn-and-tilt hardware are shipped to central collection points. There the products are generally 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. Observe the locally applicable regulatory requirements.

This EPD shows the end-of-life modules according to the market situation. Specific components of steel and plastics are recycled. Residual fractions are sent to landfill or partially thermally recycled.

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 for electric drive for windows, serving as the basis. The LCA is in conformity with the requirements set out in DIN EN 15804 and the international standards DIN EN ISO 14040, DIN EN ISO 14044 and EN ISO 14025 as well as based on ISO 21930.

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 the products. In accordance with DIN EN 15804, the environmental impacts covered by this Environmental Product Declaration are presented for the entire product life cycle in the form of basic information. Apart from these, no other environmental impacts are specified
Data quality, data availability and geographical and time-related system boundaries	<p>The specific data originate exclusively from the 2022 fiscal year. They were collected on-site at the plant located in DE-57234 Wilnsdorf and in PL-46-203 Kluczbork and come in parts from company records and partly from values directly obtained by measurement. Validity of the data was checked the tool creator /LCA practitioner.</p> <p>The generic data come from the "Sphera - LCA for Expert Content version 2023.1" professional and building materials databases. The last update of both databases was in 2023. Data from before this date come also from these databases and are not more than five years old. No other generic data were used for the calculation.</p> <p>The generic data selected are as accurate as possible in terms of geographical reference. If no country-specific datasets are available or regional reference cannot be established, European or global datasets are used.</p> <p>Data gaps were either filled with comparable data or conservative assumptions, or the data were cut off in compliance with the 1% rule.</p> <p>The life cycle was modelled using the sustainability software tool "Sphera - LCA for Experts; Content version 2023.1".</p>
Scope/ system boundaries	<p>The system boundaries refer to the supply of raw materials and purchased parts, manufacture, use and end-of-life stage turn-and-tilt hardware.</p> <p>No additional data from pre-suppliers or other sites were taken into consideration.</p>
Cutt-off criteria	All the data that the company records, i.e. all commodities/input and raw materials used, the thermal energy used and electricity consumption, were taken into consideration.

The following data were cut off:

- Packaging production of preliminary products
- Packaging transportation of final product
- Auxiliary and operating materials

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 were taken into consideration as a function of 100% of the mass of the products.

The criteria for the exclusion of inputs and outputs as set out in DIN EN 15804 are fulfilled. From the data analysis it can be assumed that the total of negligible processes per life cycle stage does not exceed 1% of the mass/primary energy. All in all, the total of negligible processes does not exceed 5% of the energy and mass input. The life cycle calculation also includes material and energy flows that account for less than 1%.

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 unit.
Life cycle stages	The Annex shows the entire life cycle of turn-and-tilt hardware. The „Product Stage“ (A1 – A3), „Construction process stage“ (A4 – A5), „Use stage“ (B2 and B6), „End-of-life“ (C1 – C4) and the „Benefits and loads beyond the system boundaries“ (D) are considered.
Benefits	The below benefits have been defined in accordance with DIN EN 15804: <ul style="list-style-type: none"> • Benefits from recycling • Benefits (thermal and electrical) from incineration
Allocation of co-products	No allocation occur during manufacturing.
Allocations for reuse, recycling and recovery	<p>If the products are reused/recycled and recovered during the product stage (rejects) the components are shredded if necessary and then sorted into their single constituents. This is done by various process plants, e.g. magnetic separators.</p> <p>The system boundaries were set following their disposal, reaching the end-of-waste state.</p>
Allocations beyond life cycle boundaries	<p>The use of recycled materials in the manufacturing process was based on the current market-specific situation. A recycling potential that reflects the economic value of the product after recycling (recyclate) was also taken into account .</p> <p>Secondary material stated as input into the production of turn-and-tilt hardware, is calculated in module 1 without loads. No benefits are allocated to module D, but consumption is allocated to module/modules C3 and C4 (worst case scenario).</p> <p>The system boundary set for the recycled material refers to collection.</p>

Secondary material The use of secondary materials in Module A3 was examined at SIEGENIA-AUBI KG. Secondary material is used:

- Scrap metal in the production of steel, stainless steel and brass
- Waste paper in the production of packaging cardboard

Inputs The LCA includes the following production-relevant inputs per 1 piece of turn-and-tilt hardware:

Energy

The gas input material is based on „Erdgas Deutschland“ (natural gas Germany) and „Erdgas Polen“ (natural gas Poland). Diesel is based on „Diesel Europa“. The electricity mix is based on „Strommix Deutschland“ (electricity mix Germany) and „Strommix „Polen““ (electricity mix Poland). The light heating oil input material is based on „leichtes Heizöl Deutschland“ (light heating oil Germany) and the biogas input is based on „Biogas Deutschland“ (biogas Germany).

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

Water

No water is consumed by the individual process steps for the production. The consumption of freshwater specified in Section 6.3 Impact assessment 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 %.

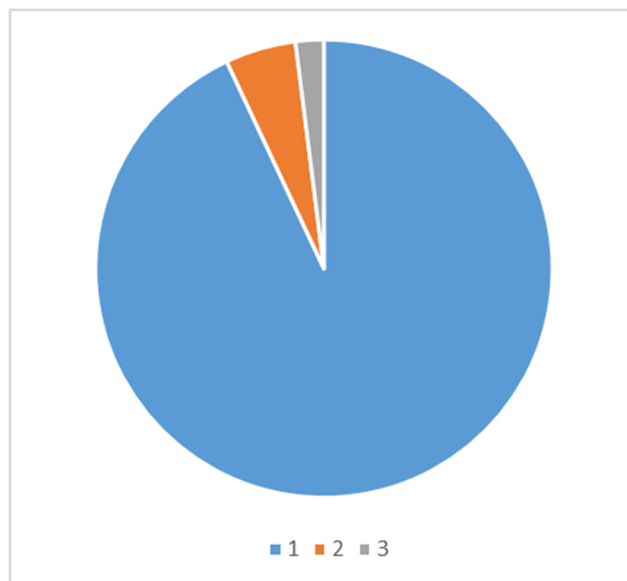


Figure 1: Percentage of individual materials per declared unit

No.	Material	Mass in %
1	Steel/Stainless steel	93 %
2	Zinc die casting	5 %
3	plastic	2 %

Table 2: Percentage of individual materials per declared unit

Ancillary materials and consumables

Ancillary materials and consumables are cut off.

Product packaging

The amounts used for product packaging are as follows:

No.	Material	Mass in g
1	Wood	6,58
2	Cardboard	156,55
3	PE-film	0,39

Table 3: Weight in g of packaging per declared unit

Biogenic carbon content

Only the biogenic carbon content of the associated packaging is specified, as the total mass of substances containing biogenic carbon is less than 5% of the total mass of the product and associated packaging. In accordance with EN 16449, packaging produces the following amounts of biogenic carbon:

No.	Component	Content in kg C per m ²
1	Associated packaging	0,072

Table 2: Biogenic carbon content of the product at gate

Outputs

The LCA includes the following production-relevant outputs per 1 piece of hardware:

Waste

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

Waste water

The manufacture does not produce any waste water.

6.3 Impact assessment

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

Core indicators The models for impact assessment were applied as described in DIN EN 15804+A2.

The impact categories presented in the EPD as core indicators are as follows:

- Climate change – total (GWP-t)
- Climate change – fossil (GWP-f)
- Climate change – biogenic (GWP-b)
- Climate change - land use and land use change (GWP-l)
- Ozone depletion (ODP)
- Acidification (AP)
- Eutrophication aquatic freshwater (EP-fw)
- Eutrophication aquatic marine (EP-m)
- Eutrophication terrestrial (EP-t)
- Photochemical ozone creation (POCP)
- Depletion of abiotic resources - fossil fuels (ADPF)
- Depletion of abiotic resources - minerals and metals (ADPE)
- Water use (WDP)

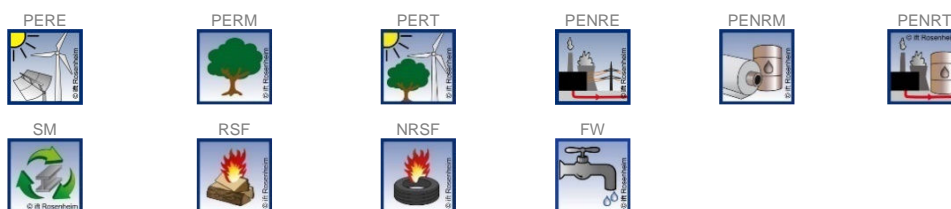


Use of resources

The models for impact assessment were applied as described in DIN EN 15804-A2.

The following parameters for the use of resources are shown in the EPD:

- Renewable primary energy as energy source (PERE)
- Renewable primary energy for material use (PERM)
- Total use of renewable primary energy (PERT)
- Non-renewable primary energy as energy resource (PENRE)
- Non-renewable primary energy for material use (PENRM)
- Total use of non-renewable primary energy (PENRT)
- Use of secondary materials (SM)
- Use of renewable secondary fuels (RSF)
- Use of non-renewable secondary fuels (NRSF)
- Net use of freshwater resources (FW)



Waste

The waste generate during the production of 1 piece of hardware 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.

The models for impact assessment were applied as described in DIN EN 15804-A2.

The waste categories and indicators for output material flows presented in the EPD are as follows:

- Hazardous waste disposed (HWD)
- Non-hazardous waste disposed (NHWD)
- Radioactive waste disposed (RWD)
- Components for reuse (CRU)
- Materials for recycling (MFR)
- Materials for energy recovery (MER)
- Exported electrical energy (EEE)
- Exported thermal energy (EET)

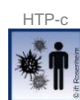
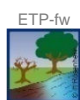
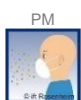


Additional environmental impact indicators

The models for impact assessment were applied as described in DIN EN 15804-A2.

The additional impact categories presented in the EPD are as follows:

- Particulate matter emissions (PM)
- Ionising radiation, human health (IRP)
- Ecotoxicity – freshwater (ETP-fw)
- Human toxicity - cancer effect (HTP-c)
- Human toxicity - non-cancer effect (HTP-nc)
- Land use related impacts / soil quality (SQP)






Results per 1 piece of TITAN hardware

Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	
Core indicators																
GWP-t	kg CO ₂ eq	12,09	3,41E-02	0,26	ND	0,00	ND	ND	ND	0,00	ND	1,29E-03	1,64E-02	6,32E-02	0,00	-7,53
GWP-f	kg CO ₂ eq	12,22	3,38E-02	3,34E-03	ND	0,00	ND	ND	ND	0,00	ND	1,29E-03	1,63E-02	6,32E-02	0,00	-7,54
GWP-b	kg CO ₂ eq	-0,18	3,53E-06	0,26	ND	0,00	ND	ND	ND	0,00	ND	6,44E-07	1,70E-06	1,09E-05	0,00	1,10E-02
GWP-l	kg CO ₂ eq	5,44E-03	3,13E-04	6,18E-06	ND	0,00	ND	ND	ND	0,00	ND	1,18E-07	1,50E-04	6,73E-07	0,00	-3,12E-03
ODP	kg CFC-11 eq	2,21E-11	4,39E-15	1,38E-14	ND	0,00	ND	ND	ND	0,00	ND	1,27E-14	2,11E-15	1,30E-14	0,00	1,65E-11
AP	mol H ⁺ eq	3,08E-02	4,94E-05	4,51E-06	ND	0,00	ND	ND	ND	0,00	ND	1,97E-06	2,38E-05	7,30E-05	0,00	-1,90E-02
EP-fw	kg P eq	2,06E-05	1,23E-07	3,92E-09	ND	0,00	ND	ND	ND	0,00	ND	1,28E-09	5,94E-08	4,95E-09	0,00	-2,82E-06
EP-m	kg N eq	7,38E-03	1,79E-05	1,35E-06	ND	0,00	ND	ND	ND	0,00	ND	5,56E-07	8,59E-06	3,61E-05	0,00	-4,20E-03
EP-t	mol N eq	7,92E-02	2,12E-04	1,66E-05	ND	0,00	ND	ND	ND	0,00	ND	5,87E-06	1,02E-04	4,10E-04	0,00	-4,54E-02
POCP	kg NMVOC eq	3,05E-02	4,32E-05	3,60E-06	ND	0,00	ND	ND	ND	0,00	ND	1,54E-06	2,08E-05	9,22E-05	0,00	-1,41E-02
ADPE*2	kg Sb eq	4,17E-04	2,22E-09	1,14E-10	ND	0,00	ND	ND	ND	0,00	ND	6,27E-11	1,07E-09	1,13E-10	0,00	-3,19E-04
ADPF*2	MJ	137,18	0,46	3,97E-02	ND	0,00	ND	ND	ND	0,00	ND	2,84E-02	0,22	3,20E-02	0,00	-60,00
WDP*2	m ³ world eq deprived	0,68	4,08E-04	1,22E-03	ND	0,00	ND	ND	ND	0,00	ND	1,09E-04	1,96E-04	8,13E-03	0,00	-0,27
Use of resources																
PERE	MJ	21,21	3,35E-02	2,92	ND	0,00	ND	ND	ND	0,00	ND	3,89E-03	1,61E-02	6,97E-03	0,00	5,71
PERM	MJ	0,00	0,00	-2,92	ND	0,00	ND	ND	ND	0,00	ND	0,00	0,00	0,00	0,00	0,00
PERT	MJ	21,21	3,35E-02	5,14E-03	ND	0,00	ND	ND	ND	0,00	ND	3,89E-03	1,61E-02	6,97E-03	0,00	5,71
PENRE	MJ	134,49	0,46	5,79E-02	ND	0,00	ND	ND	ND	0,00	ND	2,84E-02	0,22	1,14	0,00	-60,60
PENRM	MJ	0,00	0,00	-1,81E-02	ND	0,00	ND	ND	ND	0,00	ND	0,00	0,00	-1,10	0,00	0,00
PENRT	MJ	134,49	0,46	3,97E-02	ND	0,00	ND	ND	ND	0,00	ND	2,84E-02	0,22	3,20E-02	0,00	-60,60
SM	kg	0,87	0,00	0,00	ND	0,00	ND	ND	ND	0,00	ND	0,00	0,00	0,00	0,00	3,62
RSF	MJ	0,00	0,00	0,00	ND	0,00	ND	ND	ND	0,00	ND	0,00	0,00	0,00	0,00	0,00
NRSF	MJ	0,00	0,00	0,00	ND	0,00	ND	ND	ND	0,00	ND	0,00	0,00	0,00	0,00	0,00
FW	m ³	2,87E-02	3,67E-05	3,31E-05	ND	0,00	ND	ND	ND	0,00	ND	6,52E-06	1,76E-05	1,92E-04	0,00	-9,25E-03
Waste categories																
HWD	kg	3,96E-06	1,43E-12	1,73E-12	ND	0,00	ND	ND	ND	0,00	ND	1,65E-12	6,87E-13	2,49E-12	0,00	2,43E-10
NHWD	kg	0,80	7,04E-05	1,89E-04	ND	0,00	ND	ND	ND	0,00	ND	6,27E-06	3,38E-05	1,84E-03	0,00	-7,75E-02
RWD	kg	3,90E-03	8,64E-07	4,58E-06	ND	0,00	ND	ND	ND	0,00	ND	4,43E-06	4,15E-07	1,02E-06	0,00	3,46E-04
Output material flows																
CRU	kg	0,00	0,00	0,00	ND	0,00	ND	ND	ND	0,00	ND	ND	ND	0,00	0,00	0,00
MFR	kg	0,33	0,00	0,00	ND	0,00	ND	ND	ND	0,00	ND	ND	ND	4,03	0,00	0,00
MER	kg	0,00	0,00	0,00	ND	0,00	ND	ND	ND	0,00	ND	ND	ND	0,00	0,00	0,00
EEE	MJ	0,00	0,00	1,51E-02	ND	0,00	ND	ND	ND	0,00	ND	ND	ND	9,15E-02	0,00	0,00
EET	MJ	0,00	0,00	2,72E-02	ND	0,00	ND	ND	ND	0,00	ND	ND	ND	0,17	0,00	0,00

Key:

GWP-t – global warming potential - total **GWP-f** – global warming potential fossil fuels **GWP-b** – global warming potential - biogenic **GWP-l** – global warming potential - land use and land use change **ODP** – ozone depletion potential **AP** - acidification potential **EP-fw** - eutrophication potential - aquatic freshwater **EP-m** - eutrophication potential - aquatic marine **EP-t** - eutrophication potential - terrestrial **POCP** - photochemical ozone formation potential **ADPF*2** - abiotic depletion potential – fossil resources **ADPE*2** - abiotic depletion potential – minerals&metals **WDP*2** – Water (user) deprivation potential **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 piece of TITAN hardware														
		Einheit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
Additional environmental impact indicators																
PM	Disease incidence	4,12E-07	4,25E-10	3,66E-11	ND	0,00	ND	ND	ND	0,00	ND	1,78E-11	2,04E-10	2,47E-10	0,00	-2,71E-07
IRP*1	kBq U235 eq	0,45	1,29E-04	6,89E-04	ND	0,00	ND	ND	ND	0,00	ND	6,65E-04	6,20E-05	1,38E-04	0,00	3,76E-02
ETP-fw*2	CTUe	37,07	0,33	1,56E-02	ND	0,00	ND	ND	ND	0,00	ND	8,14E-03	0,16	1,12E-02	0,00	-13,60
HTP-c*2	CTUh	2,74E-08	6,69E-12	3,79E-13	ND	0,00	ND	ND	ND	0,00	ND	1,47E-13	3,21E-12	6,29E-13	0,00	-7,47E-09
HTP-nc*2	CTUh	2,65E-07	3,56E-10	2,10E-11	ND	0,00	ND	ND	ND	0,00	ND	7,52E-12	1,71E-10	2,82E-11	0,00	3,15E-07
SQP*2	dimensionless.	29,64	0,19	8,28E-03	ND	0,00	ND	ND	ND	0,00	ND	3,85E-03	9,24E-02	7,49E-03	0,00	3,99

Key:
PM – particulate matter emissions potential **IRP*1** – ionizing radiation potential – human health **ETP-fw*2** - Eco-toxicity potential – freshwater **HTP-c*2** - Human toxicity potential – cancer effects **HTP-nc*2** - Human toxicity potential – non-cancer effects **SQP*2** – soil quality potential

Disclaimers

*1 This impact category deals mainly with the eventual impact of low-dose ionising radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionising radiation from the soil, from radon and from some building materials is also not measured by this indicator

*2 The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator

6.4 Interpretation, LCA presentation and critical review

Interpretation

It is recognizable that the manufacturing phase is dominant in the product stage. (module A1-A3). The end-of-life phase has little impact due to the high proportion of recyclable materials, only the thermal treatment of some plastic parts is taken into account. The recycling of metal parts and the avoided burdens contribute considerably to the credits in module D. The modules A4, A5, C1 and C2 also contribute with negligible impacts.

The following figure shows the results of the individual modules as an example of the global warming potential:

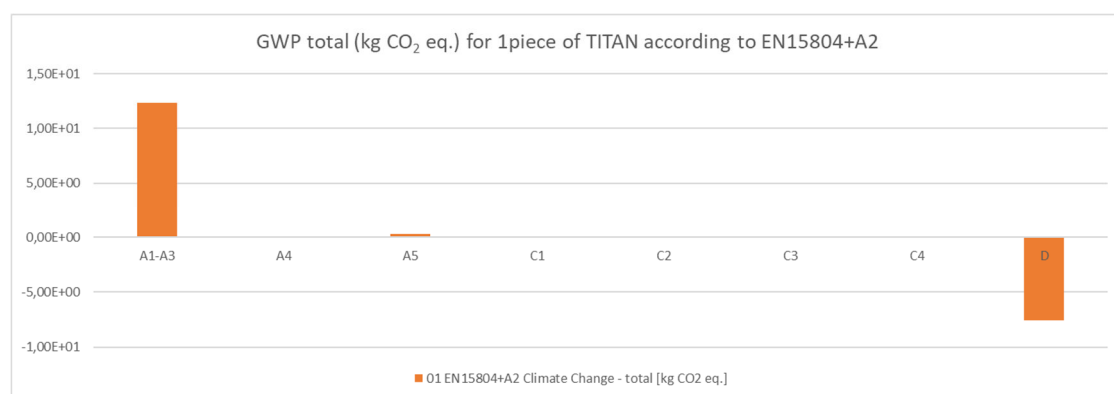


Figure 2: Percentage of the modules in selected environmental impact categories

The values obtained from the LCA calculation are suitable for the certification of buildings.

Report

The LCA report underlying this EPD was developed according to the requirements of DIN EN ISO 14040 and DIN EN ISO 14044 as well as DIN EN 15804 and DIN 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 was carried out by Dipl. Wirtschaftsjuristin (FH) Susanne Volz, M Sc. Environmental Sciences, an independent ift verifier.



7 General information regarding the EPD

Comparability This EPD was prepared in accordance with DIN EN 15804 and is therefore only comparable to those EPDs that also comply with the requirements set out in DIN 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 DIN EN 15804 (Clause 5.3) apply.

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 DIN 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 DIN EN ISO 14025.

The declaration is based on the PCR documents "PCR Teil A" PCR-A-0.2:2018 und "Schloss und Beschlag" (lock and hardware) PCR-SB-3.0:2022.

The European standard EN 15804 serves as the core PCR ^{a)}
Independent external verification of the Declaration and statement according to EN ISO 14025:2010
Independent third party verifier: ^{b)} Susanne Volz
^{a)} Product category rules ^{b)} Optional for business-to-business communication Mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)

Revision of this document

No.	Date	Note	Practitioner	Verifier
1	19.09.2023	External verification	Seehauser / Dellawalle	Volz
2	10.12.2025	Correction ADPE, ADPF	Brechleiter	-

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9 Annex

Description of the life cycle scenarios for turn-and-tilt hardware for windows:

Product stage			Construction process stage		Use stage*							end-of-life stag				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 process	Use	Maintenance	Repair	Replacement	Modification/refurbishment	Operational use	Operational water use	Deconstruction/demolition	Transport	Waste processing	Disposal	Reuse Recovery Recycling potential
✓	✓	✓	✓	✓	—	✓	—	—	—	✓	—	✓	✓	✓	✓	✓

* For the declared B modules, the calculation of the results is based on the specified RSL related to one year.

Table 5: Overview of applied life cycle stages

Calculation of the scenarios was based on a defined RSL (see Section 4 Use stage).

The scenarios were based on information provided by the manufacturer.

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 LA
- Not included in the LCA



A4 Transport to construction site								
No.	Scenario	Description						
A4	Small series direct marketing	40 t LKW (Euro 6), diesel, 24,7 t payload, 61 % capacity used, about 50 km to site and empty return						
<table border="1"> <thead> <tr> <th>Transport to the construction site</th> <th>Transport weight [kg/pc]</th> <th>Density [kg/m³]</th> </tr> </thead> <tbody> <tr> <td>PG1</td> <td>4,24</td> <td>77,81</td> </tr> </tbody> </table>			Transport to the construction site	Transport weight [kg/pc]	Density [kg/m ³]	PG1	4,24	77,81
Transport to the construction site	Transport weight [kg/pc]	Density [kg/m ³]						
PG1	4,24	77,81						
<p>Since only one scenario is used, the results are shown in the relevant summary table.</p>								
A5 Construction/installation process								
No.	Scenario	Description						
A5	Manual with power tools	<p>According to the manufacturer the products are installed without using additional lifting and auxiliary devices</p> <p>Power consumption of power tools: 0,011 MJ/ pc</p>						
<p>In case of deviating consumption during installation/assembly of the products which forms part of the site management, they are covered at the construction works level.</p> <p>Ancillary materials, consumables, use of energy and water, use of other resources, material losses, direct emissions as well as waste materials during installation are negligible.</p> <p>It is assumed that the packaging material in the module “construction / installation” is sent to waste handling. Waste is only thermally recycled or disposed of in line with the conservative approach. Films/foils / protective covers, wood and cardboard in waste incineration plants. Benefits from A5 are specified in module D. Benefits from waste incineration: electricity replaces electricity mix (EU 28); thermal energy replaces thermal energy from natural gas (EU 28). Transport to the recycling plants is not taken into account.</p> <p>Since only one scenario is used, the results are shown in the relevant summary table.</p>								
B2 Cleaning, servicing and maintenance								
<p>According to the manufacturer, no inspection, maintenance or repair is necessary for the products under consideration. Auxiliary materials, operating materials, energy/water use, waste material, material loss and transport routes can be neglected</p> <p>Since only one scenario is used, the results are shown in the relevant summary table.</p>								

B6 Operational energy use

There is no energy consumption during normal use. The products are opened by manual operation.

There is no transport consumption during the energy use in buildings. Ancillary materials, consumables and water, waste materials and other scenarios are negligible.

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

C1 Deconstruction, demolition

No.	Scenario	Description
C1	Deconstruction	<p>Hardware: 100 % deconstruction</p> <p>The product deconstruction is done with power tools. The total power usage is 0,011 MJ.</p> <p>Further deconstruction rates are possible, give adequate reasons.</p>

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

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

C2 Transport

No.	Scenario	Description
C2	Transport	<p>Transport to collection point using 40 t truck (Euro 6), diesel, 24,7 t payload, 61 % capacity used, 50 km</p>

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

C3 Waste management

No.	Scenario	Description
C3	Recycling	<p>Share for recirculation of materials</p> <ul style="list-style-type: none"> • Metal: 100 % Recycling • Plastic: 100 % thermal recycling

Average costs for separating and sorting the materials are assumed.

As the products are placed on the European market, the disposal scenario is based on average European datasets, respectively based on German datasets when there are no european datasets.

The 100% scenarios differ from today's average recovery shown here. The evaluation of the individual scenarios is presented in the background reports

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

C4 Disposal

No.	Scenario	Description
C4	Disposal	Materials without heat value (except metals) and the non-recordable amounts and losses within the reuse/recycling chain (C1 and C3) are modelled as “disposed” (EU-28)

The 100% scenarios differ from today’s average recovery shown here. The evaluation of the individual scenarios is presented in the background reports

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 relevant summary table.

D Benefits and loads from beyond the system boundaries

No.	Scenario	Description
D	Recycling potential	Debits and credits from recycling metals Benefits from waste incineration: electricity replaces electricity mix (EU-28); thermal energy replaces thermal energy from natural gas (EU-28)

The values in module „D“ result from both the recycling of the packaging material in module A5 and the dismantling at the end of the useful life.

The 100% scenarios differ from today’s average recovery shown here. The evaluation of the individual scenarios is presented in the background reports

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



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Notes

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

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Layout

ift Rosenheim GmbH – 2021

Photographs (front page)

SIEGENIA-AUBI KG

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