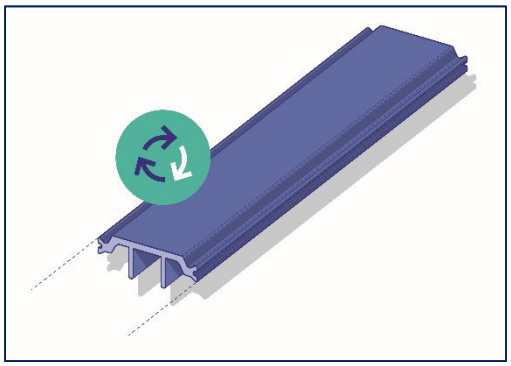
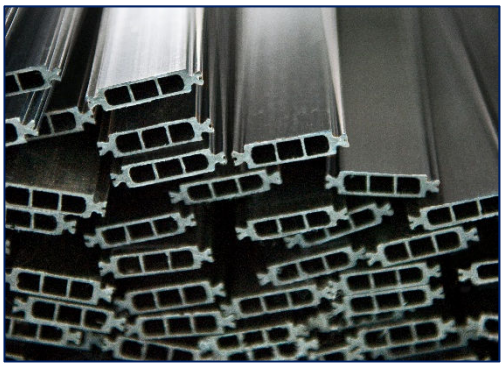
Environmental Product Declaration

Declaration Code: EPD-TIR-GB-20.1



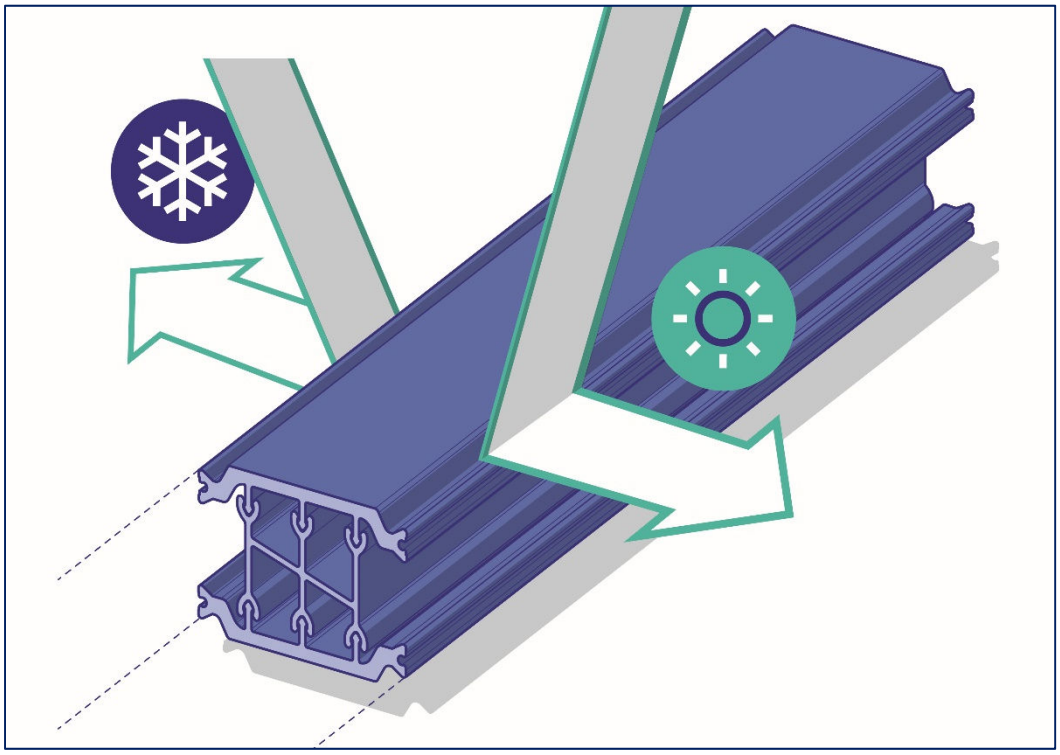


TECHNOFORM

Technoform Bautec Kunststoffprodukte GmbH

Insulating Profiles

Insulating Bars Made of recycled PA 66 GF25



Basis:

DIN EN ISO 14025
EN15804

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

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Declaration holder	Technoform Bautec Kunststoffprodukte GmbH Hannoversche Straße 2 34134 Kassel, Germany		
Declaration code	EPD-TIR-GB-20.1		
Designation of declared product	Insulating bars made of recycled PA 66 GF25		
Scope	Thermal break of aluminium window, door and facade systems		
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 Document “PCR Part A" PCR-A-0.3:2018 and "Semifinished products" PCR-HZ-2.2:2018.		
Validity	Publication date: 16.12.2022	Last revision: 16.12.2022	Next revision: 16.12.2027
	This verified Company Environmental Product Declaration (company EPD) 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 include both the data collected at the production site of Technoform Bautec Kunststoffprodukte GmbH and the generic data derived from the “GaBi 10” database. LCA calculations were carried out for the relevant “cradle to gate” 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.		

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1 General product information

Product definition

The EPD relates to the product group “Insulating bars” and applies to the product:

1 kg of insulating bar made of recycled PA 66 GF25
with or without finishing
made by Technoform Bautec Kunststoffprodukte GmbH
(short: Technoform)

The functional unit is obtained by summing up:

Assessed product	Density
Insulating bars made of recycled PA 66 GF25	1.3+/ -0,05 kg/dm^3
Insulating bars made of recycled PA 66 GF25 with finishing	1.3+/ -0,05 kg/dm^3

Table 1: Product groups

The average unit is declared as follows:
Directly used material flows are determined using the masses produced (kg), 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 typical functional unit was available due to the great diversity of variants. The reference period is the year 2020.

The validity of the EPD applies to insulating bars made of recycled PA 66 GF25 with the following types of finishing:

- glue wire
- aluminium wire
- adhesive film
- Low-e foil
- laser marking
- sand blasting

It does not apply to insulating bars with PU foam finishing.

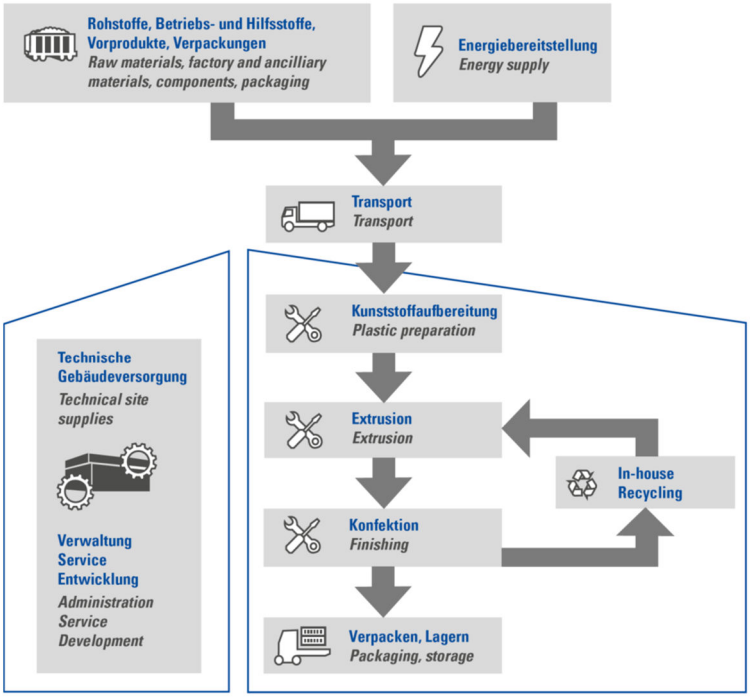
Product description

Technoform's polyamide-based, glass fiber reinforced insulating profiles connect aluminum components of window, door and facade systems and separate them thermally. The profiles minimize heat or cold losses and ensure the stability of the systems.

By using recycled PA 66 GF25, fewer emissions are generated during production and fossil fuels are saved.

For a detailed product description, please refer to the manufacturer's specifications or the product descriptions of the particular offer.

Product manufacture



Scope

Thermal break of aluminium window, door and facade systems

Verifications

The following verifications are held:

- The mechanical strength parameters of the compound set out in EN 14024 for the profile category CW / TC2 / A are fulfilled
- The mechanical strength parameters of the compound as per DIBt-Guideline are fulfilled
- The threshold values of VOC emissions set out in the AgBB scheme are adhered to.

The bonding characteristics of the insulating bars made of recycled PA 66 GF 25 can be found in expert statement 15-001076-PR03 (GAS-K20-09 en-01).

Management systems

The following management systems are in place:

- quality management system to DIN EN ISO 9001:2015
- energy management system to DIN EN ISO 50001:2018
- environmental management system to DIN EN ISO 14001:2015
- occupational health and safety management system to DIN ISO 45001: 2018

Additional information

The company Technoform is member of “A|U|F” (“Aluminium and the environment in the window and curtain walling industry”), an initiative that promotes the sustainable disposal and recycling of dismantled aluminium building elements/profile sections, windows, doors and facades for material re-use.

2 Materials used

Primary materials

The primary materials used are listed in the LCA (see Section 6).

Declarable substances

The product contains no substances from the REACH candidate list (declaration dated October 2019).

All relevant safety data sheets are available from Technoform.

3 Construction process stage

Processing recommendations, installation

Further processing/finishing of the insulating profiles is governed by the relevant operating instructions for storage, painting and rolling which are available from Technoform.

4 Use stage

Emissions to the environment

Verified by test chamber tests (2012) in accordance with the AgBB scheme, the product is free from VOC emissions and thus suitable for indoor use.

- No cancerogens specified in the AgBB scheme were detected.
- The emission limits for formaldehyde are complied with (see DIBt approval principles)
- The product fulfils the requirements of the AgBB scheme for the indoor use of construction products.
- The product complies with the French VOC regulation for the emission class A+.

The analytic methods were based on DIN ISO 16000-9 and DIN ISO 16000-6.

Reference service life (RSL)

The reference service life (RSL) of the recycled PA 66 GF25 insulating bars made by Technoform is not specified, because they are semifinished products.

5 End-of-life stage

Possible end-of-life stages

Windows and facade parts made of aluminium, including the installed recycled PA 66 GF25 insulating bars, are sent to central collection points. There the material compound is shredded and sorted, if necessary, with the main objective of the material recycling of aluminium. The plastic fractions are usually 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 life cycle assessments were developed as the basis for insulating bars made of recycled PA66 GF25. They are in conformity with the requirements set out in DIN 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 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. 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 fiscal year 2020. They were collected on-site at the Technoform manufacturing sites in Germany, Italy and Spain, 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 10” professional and building materials databases. The last update of both databases was in 2022. Data from before this date originate also from these databases and are not more than ten 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 ts” for the development of Life Cycle Assessments.

Scope / system boundaries

The system boundaries refer to the supply of raw materials, manufacture/production and end-of-life stage of the recycled PA 66 GF25 insulating bars.
No additional data from pre-suppliers/subcontractors 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 were taken into consideration as a function of 100% of the mass of 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. This way 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/functional units.

Life cycle stages

The life cycle of the recycled PA 66 GF25 insulating bars is illustrated in the Annex. Product stage (A1 – A3) and 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 DIN EN 15804:

- benefits (thermal and electrical) from incineration

Allocation of co-products

Manufacture does not give rise to any allocations of co-products.

Allocations for re-use, recycling and recovery

The polyamide 66 required for the production of insulating bars from recycled PA 66 GF 25 is obtained 100% from post-industrial waste material, the preparation of which in the form of grinding and compounding consumes electrical energy. The environmental impacts are largely calculated from this energy consumption; no environmental impacts are assumed for the material used. The environmental impacts of the electrical energy are calculated on the basis of the shares of country-specific electricity mixes in electricity consumption.

Allocations beyond life cycle boundaries

An allocation beyond the life cycle boundaries was not carried out.

Secondary material

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

Inputs

The LCA includes the following production-relevant inputs per 1 kg of recycled PA 66 GF25 insulating bar:

Energy
The gas energy input is based on “EU-28: Thermal energy from natural gas”. Diesel is based on “EU-28: diesel mix”. The electricity mix is based on the “Technoform” electricity mix (see Table 2) .

Electricity disclosure of energy supplier	Shares in %		
	Germany	Italy	Spain
Renewable energies*	100*	44.6**	37.8**
Natural gas	0	42.9	12.1
Black/brown coal	0	8.5	15
Other fossil resources	0	0.5	3.8
Nuclear energy	0	3.5	21.4
CHP	-	-	9.9
CO_2 emissions [g/kWh]	0	not specified	270
Radioactive waste [g/kWh]	0	not specified	0.00053

*Hydropower; **biogas/ -mass, waste, wind power, photovoltaics, hydropower, geothermal systems

Table 2: “Technoform” electricity mix

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 amounts to 0.15 l per kg insulating bar as process water for cooling the extrusion tools and for cleaning purposes.

The consumption of fresh water specified in Section 6.3 originates mainly from the process chain of the pre-products.

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

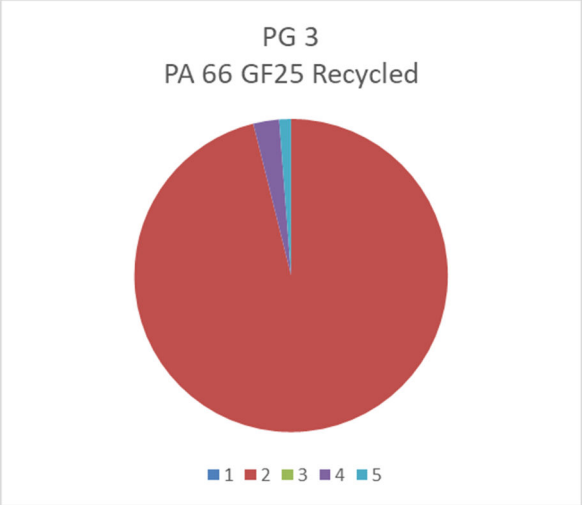


Figure 1: Percentage of individual materials per declared unit

No.	Material	Mass in %
1	Polyamide incl. share of glass fibre	-
2	Recycled polyamide 66 incl. glass fiber content	96
3	PBT	-
4	Additives	3
5	Other	1

Table 3: Percentage of individual materials per declared unit

Ancillary materials and consumables
0.065 g of ancillary materials and consumables are used.

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

No.	Material	Mass in kg
1	Cardboard	0
2	Wood	43,4
3	PE-tape	5,0
	Total	**48,4**

Table 4: Weight in kg of packaging per declared unit

Biogenic carbon content
The total mass of substances containing biogenic carbon is less than 5% of the total mass of the product and associated packaging. According to EN 16449, packaging produces the following amounts of biogenic carbon:

No.	Component	Content in kg C
1	In the associated packaging	0.019

Table 5: Biogenic carbon content of packaging at gate

Outputs

The LCA includes the following production-relevant outputs per 1 kg of recycled PA 66 GF25 insulating bar:

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

Waste water
Manufacture produces 0.15 l waste water.

6.3 Impact assessment

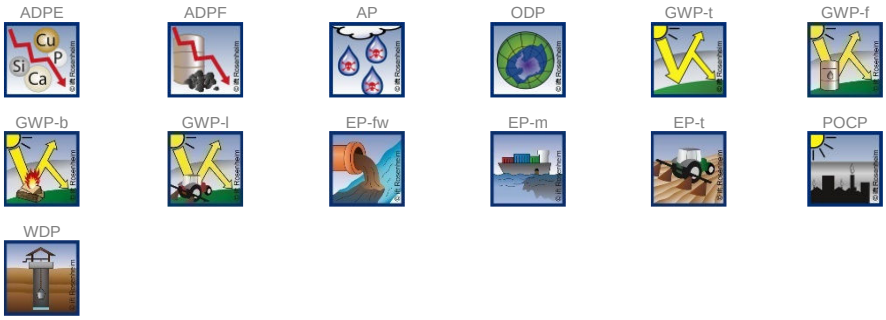
Goal

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 DIN EN 15804-A2.
The impact categories presented in the EPD are as follows:

- depletion of abiotic resources – minerals and metals;
- depletion of abiotic resources– fossil fuels;
- acidification;
- ozone depletion;
- climate change - total
- climate change - fossil;
- climate change - biogenic;
- climate change – land use and land use change
- eutrophication aquatic fresh water;
- eutrophication aquatic marine;
- eutrophication terrestrial;
- photochemical ozone creation;
- water use.

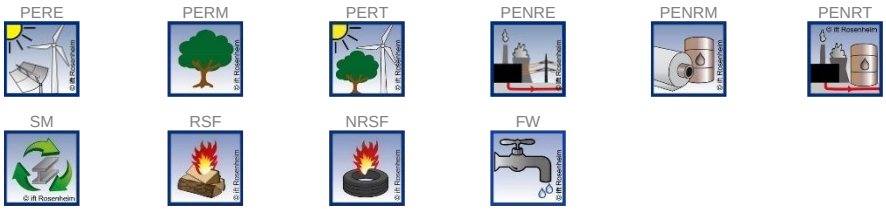


Use of resources

The models for impact assessment were applied as described in DIN EN 15804-A2.
The EPD presents the following indicators for the use of resources:

- renewable primary energy as energy resource;
- renewable primary energy for material use;
- total use of renewable primary energy;
- non-renewable primary energy as energy resource;

- renewable primary energy for material use;
- total use of non-renewable primary energy;
- use of secondary materials;
- use of renewable secondary fuels;
- use of non-renewable secondary fuels;
- net use of fresh water resources.

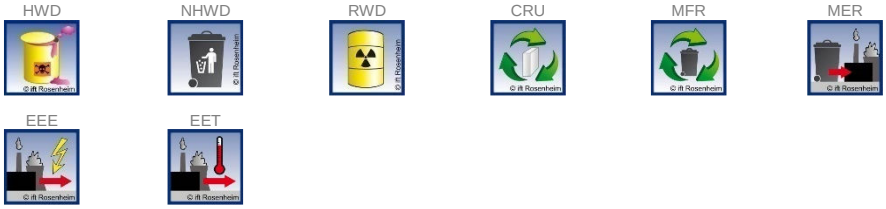


Waste

The waste generated during the production of 1 kg of recycled PA 66 GF25 insulating bars is 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;
- non-hazardous waste disposed;
- radioactive waste
- components for further use;
- materials for recycling;
- materials for energy recovery;
- exported electrical energy;
- exported thermal energy.



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
- ionising radiation, human health
- ecotoxicity (fresh water)
- human toxicity - carcinogenic effect
- human toxicity - non-carcinogenic effect
- land use related impacts / soil quality

Uncertainty penalties

No uncertainty penalties have been applied.

Results per 1 kg of recycled PA 66 GF25 insulating bar without finishing																
	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.	1,75	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	2,38E-03	1,60	7,25E-04	0,00
GWP-f	kg CO_2 eq.	1,81	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	2,37E-03	1,60	7,46E-04	0,00
GWP-b	kg CO_2 eq.	-5,47E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	-3,26E-06	6,49E-04	-2,21E-05	0,00
GWP-l	kg CO_2 eq.	6,08E-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	1,32E-05	2,82E-05	1,38E-06	0,00
ODP	kg CFC -11 eq.	1,40E-11	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	1,41E-16	9,42E-13	1,75E-15	0,00
AP	mol H^+ eq.	2,66E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	2,74E-06	2,89E-03	5,29E-06	0,00
EP-fw	kg P eq.	3,51E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	7,05E-09	2,76E-07	1,26E-09	0,00
EP-m	kg N eq.	7,59E-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	9,62E-07	1,45E-03	1,35E-06	0,00
EP-t	mol N eq.	6,85E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	1,13E-05	1,60E-02	1,49E-05	0,00
POCP	kg NMVOC eq.	2,49E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	2,41E-06	3,70E-03	4,11E-06	0,00
ADPF*²	MJ	34,01	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	3,15E-02	1,81	9,77E-03	0,00
ADPE*²	kg Sb eq.	2,61E-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	1,97E-10	2,03E-08	7,65E-11	0,00
WDP*²	m^3 world eq. deprived	0,05	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	2,11E-05	0,20	8,16E-05	0,00
Use of resources																
PERE	MJ	6,16	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	1,79E-03	0,62	1,47E-03	0,00
PERM	MJ	0,69	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	0,00E+00	0,00E+00	0,00E+00	0,00
PERT	MJ	6,85	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	1,79E-03	0,62	1,47E-03	0,00
PENRE	MJ	18,41	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	3,16E-02	16,53	0,78	0,00
PENRM	MJ	15,60	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	0,00	-14,72	-0,77	0,00
PENRT	MJ	34,01	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	3,16E-02	1,81	9,79E-03	0,00
SM	kg	0,83	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	0,00	0,00	0,00	0,00
RSF	MJ	0,00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	0,00	0,00	0,00	0,00
NRSF	MJ	0,00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	0,00	0,00	0,00	0,00
FW	m^3	6,81E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	2,03E-06	5,00E-03	2,48E-06	0,00
Waste categories																
HWD	kg	3,64E-09	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	1,51E-13	2,19E-10	5,03E-13	0,00
NHWD	kg	0,01	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	4,53E-06	0,15	0,05	0,00
RWD	kg	4,50E-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	3,89E-08	1,68E-04	1,09E-07	0,00
Output material flows																
CRU	kg	0,00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	0,00	0,00	0,00	0,00
MFR	kg	1,10E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	0,00	0,00	0,00	0,00
MER	kg	0,00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	0,00	0,00	0,00	0,00
EEE	MJ	2,39E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	0,00	3,00	0,00	0,00
EET	MJ	4,78E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	0,00	5,41	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** - feutrophication potential - terrestrial **POCP** - photochemical ozone formation potential **ADPF*²** - abiotic depletion potential – fossil resources **ADPE*²** - abiotic depletion potential –miner-als&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 kg of recycled PA 66 GF25 insulating bar without finishing																
	Unit	**A1 - A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Additional environmental impact indicators																
PM	Disease incidence	9.59E-08	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	1.65E-11	9.32E-09	6.51E-11	-7.27E-09
IRP*[1]	kBq U235 eq.	0.32	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	5.71E-06	2.79E-02	1.21E-05	-0.15
ETP-fw*[2]	CTUe	58.72	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	2.19E-02	0.72	5.48E-03	-2.49
HTP-c*[2]	CTUh	1.68E-09	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	4.41E-13	2.92E-11	8.36E-13	-1.15E-10
HTP-nc*[2]	CTUh	6.92E-08	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	2.32E-11	1.41E-09	9.25E-11	-4.4E-09
SQP*[2]	Dimensionless	17.39	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	1.09E-02	0.47	2.03E-03	-2.02

Key:
PM – particulate matter emissions potential **IRP*[1]** – ionising 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

Results per 1 kg of recycled PA 66 GF25 insulating bar with finishing

	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.	1,82	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	2,38E-03	1,60	7,25E-04	0,00
GWP-f	kg CO_2 eq.	1,87	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	2,37E-03	1,60	7,46E-04	0,00
GWP-b	kg CO_2 eq.	-5,46E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	-3,26E-06	6,49E-04	-2,21E-05	0,00
GWP-l	kg CO_2 eq.	6,13E-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	1,32E-05	2,82E-05	1,38E-06	0,00
ODP	kg CFC -11 eq.	1,64E-11	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	1,41E-16	9,42E-13	1,75E-15	0,00
AP	mol H^+ eq.	2,79E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	2,74E-06	2,89E-03	5,29E-06	0,00
EP-fw	kg P eq.	4,40E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	7,05E-09	2,76E-07	1,26E-09	0,00
EP-m	kg N eq.	7,98E-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	9,62E-07	1,45E-03	1,35E-06	0,00
EP-t	mol N eq.	7,26E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	1,13E-05	1,60E-02	1,49E-05	0,00
POCP	kg NMVOC eq.	2,63E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	2,41E-06	3,70E-03	4,11E-06	0,00
ADPF*[2]	MJ	35,32	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	3,15E-02	1,81	9,77E-03	0,00
ADPE*[2]	kg Sb eq.	2,64E-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	1,97E-10	2,03E-08	7,65E-11	0,00
WDP*[2]	m^3 world eq. deprived	0,06	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	2,11E-05	0,20	8,16E-05	0,00
Use of resources																
PERE	MJ	6,20	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	1,79E-03	0,62	1,47E-03	0,00
PERM	MJ	0,69	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	0,00	0,00	0,00	0,00
PERT	MJ	6,89	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	1,79E-03	0,62	1,47E-03	0,00
PENRE	MJ	19,48	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	3,16E-02	16,76	0,80	0,00
PENRM	MJ	15,84	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	0,00	-14,95	-0,79	0,00
PENRT	MJ	35,32	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	3,16E-02	1,81	9,79E-03	0,00
SM	kg	0,83	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	2,03E-06	5,00E-03	2,48E-06	0,00
RSF	MJ	0,00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	0,00	0,00	0,00	0,00
NRSF	MJ	0,00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	0,00	0,00	0,00	0,00
FW	m^3	7,10E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	2,03E-06	5,00E-03	2,48E-06	0,00
Waste categories																
HWD	kg	3,68E-09	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	1,51E-13	2,19E-10	5,03E-13	0,00
NHWD	kg	0,01	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	4,53E-06	0,15	0,05	0,00
RWD	kg	4,59E-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	3,89E-08	1,68E-04	1,09E-07	0,00
Output material flows																
CRU	kg	0,00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	0,00	0,00	0,00	0,00
MFR	kg	1,10E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	0,00	0,00	0,00	0,00
MER	kg	0,00	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	0,00	0,00	0,00	0,00
EEE	MJ	2,39E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	0,00	3,00	0,00	0,00
EET	MJ	4,78E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	0,00	5,41	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** - feutrophication 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 kg of recycled PA 66 GF25 insulating bar with finishing																
	Unit	**A1 - A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Additional environmental impact indicators																
PM	Disease incidence	2,95E-08	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	1,65E-11	9,32E-09	6,51E-11	0,00
IRP*[1]	kBq U235 eq.	0,04	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	5,71E-06	2,79E-02	1,21E-05	0,00
ETP-fw*[2]	CTUe	16,04	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	2,19E-02	0,72	5,48E-03	0,00
HTP-c*[2]	CTUh	5,59E-10	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	4,41E-13	2,92E-11	8,36E-13	0,00
HTP-nc*[2]	CTUh	2,05E-08	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	2,32E-11	1,41E-09	9,25E-11	0,00
SQP*[2]	Dimensionless	15,15	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00	1,09E-02	0,47	2,03E-03	0,00

Key:
PM – particulate matter emissions potential **IRP*[1]** – ionizing radiation potential – human health **ETP-fw*[2]** - Ecotoxicity 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

Evaluation

The LCA results do not refer to a specific type of insulating bar but represent the average values of all types of insulating bar with the same material composition produced by Technoform.

The insulating bar types with the material composition

- Recycled PA 66 GF25 without finishing
- Recycled PA 66 GF25 with finishing (glue wire)

were considered. They differ insignificantly because the difference lies only in the finishing version of the adhesive cord used.

In the area of production, the environmental impact of insulating bars made from recycled PA 66 GF25 is mainly caused by the energy consumption and the additives required and the respective upstream chains. The raw material used, which comes from post-industrial recycling, is not included in the life cycle assessment.
In the end-of-life phase, thermal recycling of the products plays a key role.

For scenario C4 only marginal consumptions arising from the physical pretreatment and management of the disposal site are expected. Allocation to individual products is almost impossible for site disposal (landfilling).

Compared to the EPD from five years ago, the GWP results as well as the primary energy demand are almost identical. Some LCA results in other categories differ considerably. The reasons for the deviations are as follows:

- Current very detailed recording of transport kilometres by the declaration holder
- Cardboard boxes are now used as packaging, which increases the ODP value.
- The use of newer and more suitable GaBi data sets influences the values for POCP, ADPE and PERT
- Adjustments in the material compositions influence the values for POCP
- Update to background data in GaBi

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

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

Charts

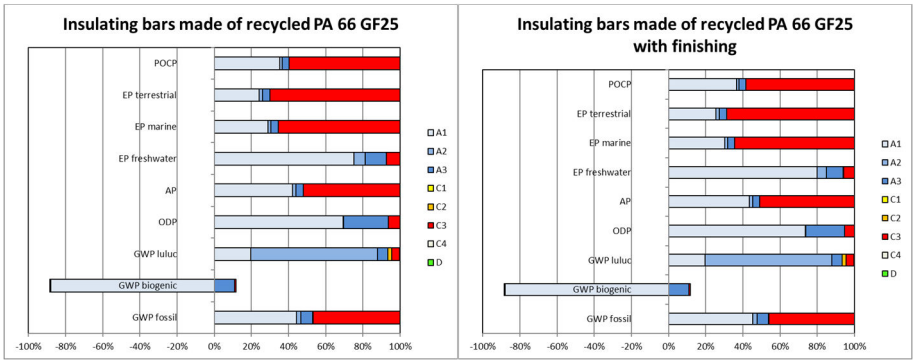


Figure 2: Percentage of the modules in selected environmental impact categories

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 and the report took place in the course of verification of the EPD and was carried out by Susanne Volz, an external 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.

The detailed individual results of the products were summarised on the basis of conservative assumptions and differ form 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 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 Part A" PCR-A-0.3:2018, \.

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)] [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)

Revisions of this document

No.	Date	Note:	Practitioner of the LCA	Verifier
1	16.12.2022	External Verification	Seehauser	Volz
2				
3				

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9 Annex

Description of life cycle scenarios for Insulating bar made of recycled PA 66 GF25

Product stage			Con-struction phase		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 process	Use	Maintenance	Repair	Replacement	Modification/refurbishment	Operational energy use	Operational water use	Deconstruction	Transport	Waste processing	Disposal	Re-use Recovery Recycling potential
✓	✓	✓	—	—	—	—	—	—	—	—	—	✓	✓	✓	✓	✓

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

✓ Included in the LCA

— Not included in the LCA

C1 Deconstruction

No.	Scenario	Description
C1	Deconstruction	as per EN 17213: Metal windows: 95% deconstruction non-glass shares 30% deconstruction glass Further deconstruction rates are possible, give adequate reasons.

No relevant inputs or outputs apply to the scenario selected. The energy consumed for deconstruction is negligible. Any arising consumption is marginal.

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 40 t truck (Euro 0-6 mix), diesel, 27 t payload, 80% capacity used, 50 km

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

C3 Waste management

No.	Scenario	Description
C3	Disposal	Share for recirculation of materials as per EN 17213 (see C1), of which: plastics 100% thermal recycling

As the products 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	C3
Collection process, collected separately	kg	0.95
Collection process, collected as mixed construction waste	kg	0.05
Recovery system, for re-use	kg	0
Recovery system, for recycling	kg	0
Recovery system, for energy recovery	kg	0.95
Disposal	kg	0.05

The alternative disposal routes (100% material recycling / 100% disposal (landfilling)) are presented in the LCA report and are available upon request. The standard disposal route corresponds to the 100% thermal recycling scenario

C4 Disposal		
No.	**Scenario**	**Description**
C4	**Disposal (standard scenario)**	**The non-recordable amounts and losses within the re-use/recycling chain (C3) are modelled as "disposed" (EU-28).**
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.		

D Benefits and loads from beyond the system boundaries		
No.	**Scenario**	**Description**
D	**Recycling potential**	**Benefits from waste incineration: electricity replaces electricity mix (EU) or (DE); thermal energy replaces thermal energy from natural gas (EU) or (DE)**

The values in Module D result from recycling of the production waste in Module A3 and from disposal at the end of service life.

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

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Notes
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