

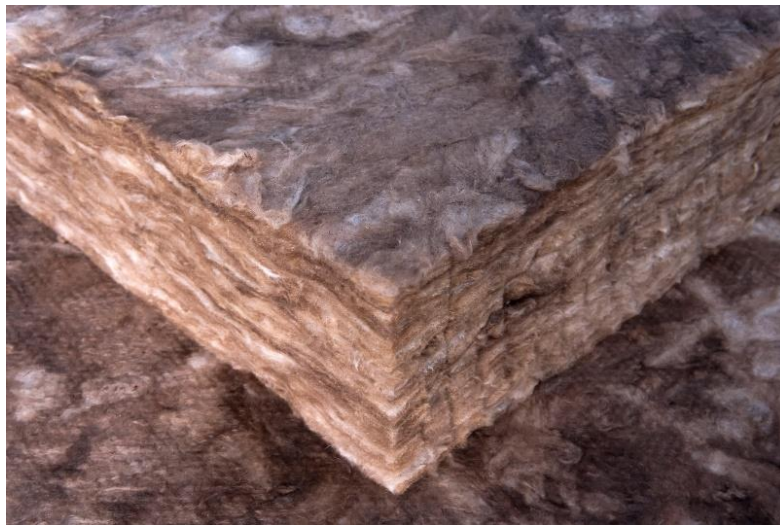
ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025, ISO 21930 and EN 15804+A2 for:

**FCB 035, TP 120 A, TPM 135, SCS 135,
FHP 034, TP 435 B, TP 430 KD, FCB 035,
EARTHWOOL SLABS UNFACED, Ecobatt 35**

From

KNAUFINSULATION



Program:	The International EPD® System www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	S-P-10369
Publication date:	2023-08-18
Validity date:	2028-08-18
Date of Update:	2024-10-28
Version Number	3



challenge.
create.
care.

Programme-related information and verification

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804+A2. For further information about comparability, see EN 15804+A2 and ISO 14025.

Programme:	The International EPD® System EPD International AB Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com info@environdec.com
EPD registration number:	S-P-10369
Published:	2023-08-18
Valid until:	2028-08-18
EPD owner	Knauf Insulation Sprl Rue de Maestricht 95 4600 Visé (Belgium)
Product Category Rules:	PCR 2019 :14. Construction products (EN 15804+A2) Version 1.2.5 Sub-PCR-005 Thermal insulation products (EN 16783: 2017) Version: 2019-12-20
Product group classification:	UN CPC 37
Reference year for plant data:	Visé (2022), Bernburg (2022) and Krupka (2022)
Geographical application scope:	Europe

CEN standard EN 15804+A2 serves as the Core Product Category Rules (PCR)
Product category rules (PCR): PCR 2019:14. Construction products (EN 15804+A2) Version 1.2.5 Sub-PCR-005 Thermal insulation products (EN 16783: 2017) Version: 2019-12-20
PCR review was conducted by: The Technical Committee of the International EPD@ System
Independent third-party verification of the declaration and data, according to ISO 14025:2006. <input checked="" type="checkbox"/> EPD verification by EPD Process Certification*
Third-party verification: <i>Viktor Hakkarainen, Bureau Veritas (Certificate number: SE008541-1)</i> an approved certification body accountable for third-party verification. Third-party verifier is accredited by: <i>SWEDAC - Sverige AB 1236</i>
*For EPD Process Certification, an accredited certification body certifies and reviews the management process and verifies EPDs published on a regular basis. For details about third-party verification procedure of the EPDs, see the GPI.
Procedure for follow-up of data during EPD validity involves third party verifier: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com.

General information

Information about the company

Description of the organisation:

Knauf Insulation is a leading provider of glass and rock mineral wool, as well as wood wool insulation solutions. With more than 40 years of experience in the insulation industry, it is one of the most respected names in insulation worldwide.

As part of the Knauf Group, a €15.4bn turnover family-owned global manufacturer of building materials and construction systems, Knauf Insulation employs more than 6,000 employees and has 28 manufacturing sites in 15 countries, with a turnover of €2.5bn.

Knauf Insulation's mission is to challenge conventional thinking and create innovative insulation solutions that shape the way we live and build in the future, with care for the people who make them, the people who use them and the world we all depend on. Its vision is to lead the change in smarter insulation solutions for a better world.



The Headquarters are located in Visé, in Belgium.



Product-related or management system-related certifications:

All Knauf Insulation sites which are covered by EPD process certification system, including the related site for this EPD, are ISO 9001, ISO 14001, ISO 50001 and ISO 45001 certified under the scope "Design, Development and Production of Insulation Materials and Systems".

Knauf Insulation supports the Ten Principles of the United Nations Global Compact on human rights, labor, environment and anti-corruption.

Name and location of production site:

The application in construction of the concerned product is Europe. The data utilized for the production stage life cycle assessment is related to production plants located in Visé (Belgium), Bernburg (Germany) and Krupka (Czech Republic).

Rue de Maestricht 95, 4600 Visé, Belgium
Weststraße 1, 06406 Bernburg (Saale), Germany
Pod dolní drahou 110, 417 42 Krupka, Czech Republic

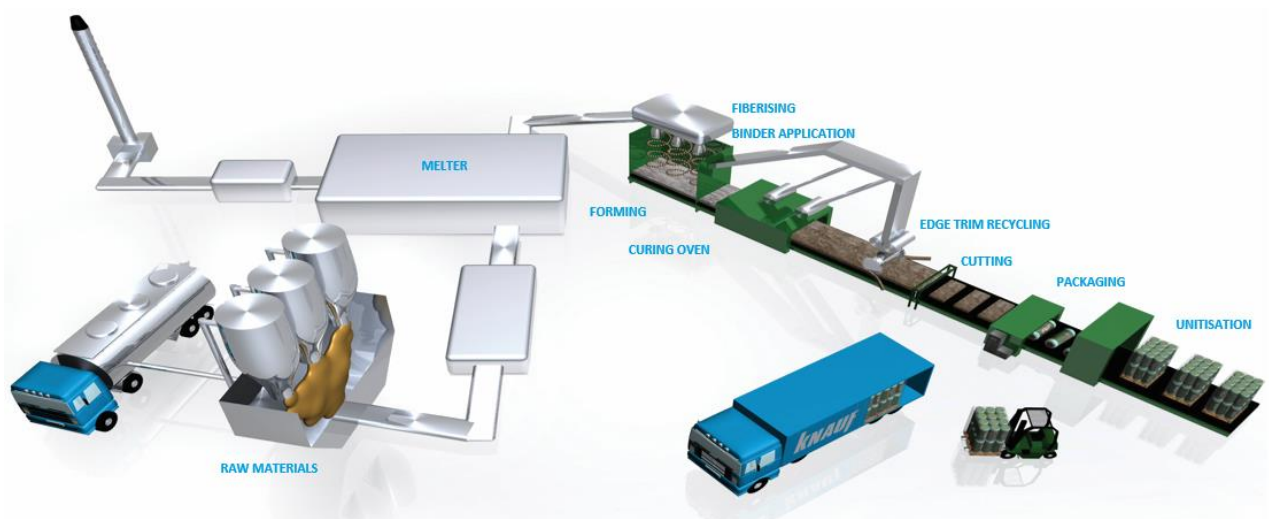
Information about Glass Mineral Wool production

Knauf Insulation glass mineral wool products (GMW) are available in the form of rolls, slabs and blowing wool.

In general, the density for glass mineral wool ranges from 10 to 85 kg/m³; glass mineral wool consists of at least 92% inert material. The inert part is made of recycled glass (external cullet, up to 80% of the composition) to which sand and dolomite are added before being melted in a furnace.

Blowing wool is an un-bonded, virgin fibrous insulation, produced as a loose-fill product whilst rolls and slabs are bonded and cured in an oven.

The remaining fraction for slabs and rolls (less than or equal to 8%) is made of bio-based binder components. At Knauf Insulation, the binder used for the glass mineral wool products is the ECOSE® Technology binder. ECOSE® Technology contains no added formaldehyde or phenol. Its origin is plant starch.



Product information

Product name: FCB 035, TP 120 A, TPM 135, SCS 135, FHP 034, TP 435B, TPM 135, TP 430 KD, FCB 035, EARTHWOOL UNFACED SLABS, Ecobatt 35.

Product identification: The declared insulation consists of FCB 035, TP 120 A, TPM 135, SCS 135, FHP 034, TP 435B, TPM 135, TP 430 KD, FCB 035, EARTHWOOL UNFACED SLABS, Ecobatt 35 a glass mineral wool, unfaced slabs of 1m² (considered for this EPD).

For the placing on the construction products market in the European Union/ EFTA (with exception of Switzerland), the Regulation/ (EU) No 305/2011/ applies. The concerned products need Declarations of Performance /DoP G4335MPCPR, G4335LPCPR, G4222MPCPR, G4220MPCPR taking into consideration the harmonized product standard /EN 13162/ and the /CE-mark/.

Product description: The main application for FCB 035, TP 120 A, TPM 135, SCS 135, FHP 034, TP 435B, TPM 135, TP 430 KD, FCB 035, EARTHWOOL UNFACED SLABS, Ecobatt 35 is ceiling.

Geographical scope: The manufacturing is in Visé (Belgium), Bernburg (Germany) and Krupka (Czech Republic). Energy-related information is described in the next chapter. Regarding the market area, the product is mainly marketed in Europe.

Technical Characteristics:

Parameter	Value
Thermal conductivity/ EN 12667	0.034W/(mK) at 10°C
Water vapor diffusion resistance (EN 12086)	1
Thermal Resistance (ISO 8301)	2.94 m ² K/W
Reaction to fire (EN 13501-1)	A1
Declared density range/ EN 1602	21.6 kg/m ³ (+/-10%)

UN CPC code:

37990: Non-metallic mineral products (including mineral wool, expanded mineral materials, worked mica, articles of mica, non-electrical articles of graphite or other carbon and articles of peat).

LCA information

Functional unit / declared unit

The declared unit is 1m² of unfaced glass mineral wool FCB 035, TP 120 A, TPM 135, SCS 135, FHP 034, TP 435B, TPM 135, TP 430 KD, FCB 035, EARTHWOOL UNFACED SLABS, Ecobatt 35 with a R-value of 2.94 m²K/W (for a thickness of 100 mm and a declared lambda of 0.034W/mK).

Reference service life: The RSL or durability of FCB 035, TP 120 A, TPM 135, SCS 135, FHP 034, TP 435B, TPM 135, TP 430 KD, FCB 035, EARTHWOOL UNFACED SLABS, Ecobatt 35 is as long as the lifetime of the building equipment in which it is used (at least 50 years).

Time representativeness & Information on Specific Data:

Plant production data for the complete year are used (Visé (2022), Bernburg (2022) and Krupka (2022)). The reference product group considered in this EPD are produced in multiple Knauf Insulation manufacturing sites with equal weight.

The data which is used to carry out the LCA calculations contains >90 % specific data and less 10 % generic data.

Database(s) and LCA software used:

The LCA model, the data aggregation and environmental impacts are calculated with the software LCA for Experts (GaBi) 10.7 and its content version 2023.1. The impact models used are those indicated in EN 15804:2012+A2:2019.

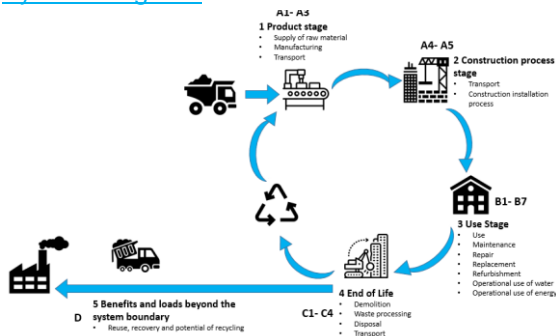
Gas information

Gas input (reference year: 2019) from Belgium and Germany and Czech Republic is selected for Visé (Belgium), Bernburg (Germany) and Krupka (Czech Republic).

Electricity information

Plants (countries)	Electricity mixes	Locations (electricity)	Dataset Reference Year	Impact (kg CO ₂ /kwh)
Visé	Renewable Energy	Europe	2019	0.026
Bernburg			2019	0.014
Krupka			2019	0.014

System diagram:



Description of system boundaries:

The system boundary of the EPD follows the modularity approach defined by the EN 15804:2012+A2:2019.

The type of EPD is cradle-to-grave.

List and explanation of the modules declared in the EPD.

The product stage (A1-A3) includes:

- A1 - raw material extraction and processing, processing of secondary material input (e.g. recycling processes),
- A2 - transport to the manufacturer and
- A3 - manufacturing.

This includes provision of all materials, products and energy, packaging processing and its transport, as well as waste processing up to the end-of-waste state or disposal of final residues during the product stage.

The LCA results are given in an aggregated form for the product stage, meaning that the modules A1, A2 and A3 are considered as a unique module A1-A3.

Product Parameters	Value
Glass mineral wool weight	2.16 kg
Surface	1m ²
Thickness	100 mm
Volume	0.10 m ³
Packaging Plastic sheet	0.07 kg
Packaging Wooden pallet	0.12 kg

The construction process stage includes:

- A4 - transport to the construction site and
- A5 - installation into the building.

The transport to the building site (A4) and installation (A5) included in this LCA use the following parameters:

Parameter	Value
Average transport distance (truck)	600 km
Type of fuel and vehicle used for transport (truck)	Truck Euro 6 (28 – 32 t / 22 t payload).
Truck capacity utilization (including 30% of empty returns)	20.35 % of the weight capacity
Loss of materials in construction site	2%
Packaging Wooden pallet	40% recycled, 60% incinerated
Packaging Plastic sheet	40% recycled, 60% incinerated

The treatment and the transport of the packaging waste after the installation of the product (A5) has been considered.

The Use stage (B1-B7) includes:

- B1: Use
- B2: Maintenance
- B3: Repair
- B4: Replacement
- B5: Refurbishment
- B6: Operational Energy Use
- B7: Operational Water Use

Once installation is complete, no actions or technical operations are required during the use stages until the end of life. Therefore, the mineral wool has no impact (excluding potential energy savings) on this stage.

The end-of-life stage includes:

- C1 - de-construction, demolition,
- C2 - transport to waste processing,
- C3 - waste processing for reuse, recovery and/or recycling and
- C4 - disposal.

This includes provision of all transports, materials, products and related energy and water use. The common manual dismantling impact of insulation is considered as very small and can be neglected in C1.

Although glass mineral wool products from Knauf Insulation are partly recycled at their end-of-life, an established collection system does not yet exist. Therefore, the assumption chosen in this study, 100% landfill (C4) after the use phase, is the most conservative approach.

Parameter	Value
Disposal type (mineral wool)	100% landfill
Average transport distance waste (C2)	50 km
Type of fuel and vehicle consumption or type of vehicle used for transport.	Truck-trailer, Euro 6, 34 - 40t gross weight / 27t payload capacity/ 40 L for 100 km. (if 100 % utilization).
Truck capacity utilization	50 % of the weight capacity

Module D includes reuse, recovery and/or recycling potentials. According to EN 15804:2012+A2:2019 any declared benefits and loads from net flows leaving the product system not allocated as co-products and having passed the end-of waste state shall be included in module D. Benefits considered in module D originate from packaging recycling or incineration.

Recycled material

The mineral wool waste that is originating from the manufacturing process in the cutting lines is recycled internally and reinjected into the mineral wool production mattress.

Recycled content average for the considered plants for this product was calculated at 73% in Visé (2022), Bernburg (2022) and Krupka (2022) according to the cullet market availability. The calculation is done following EN 15804+A2 Use of Resources indicator Secondary Material (SM), taking into account the % of secondary materials from external supply input into the batch against virgin raw materials supply. The external waste considerations are also following the ISO 14021 norm.

Additional information:

All raw materials for the manufacturing of the declared product, the required energy, water consumption and the resulting emissions are considered into the LCA. Consecutively, the recipe components with a share even less than 1% are included. All neglected processes contribute less than 5% to the total mass or less than 5% to the total energy consumption. For information, the impact of the glass mineral

wool plant construction or manufacturing equipment is not taken into account in the life cycle assessment. Allocation criteria with by-products (mineral wool for ceiling tiles) are based on cost.

Materials for fixation and installation are not included into this LCA scope. This may lead to the need of additional construction products or materials for which the impact is not included in this EPD and which shall be taken into account at building level. Regarding installation this EPD only includes the environmental impact related to the product itself like material losses and packaging end of life.

Knauf Insulation adopts a conservative approach into its EPDs.

Conversion factor for this EPD is a multiplication of the results by 0.46 to get indicators results for 1 kg. In principal, an insulation product should always be characterized by its thickness and an R value, only taking into account the product's weight could lead to wrong interpretation.

In principal, an insulation product should always be characterized by its thickness and an R value, only taking into account the product's weight could lead to wrong interpretation.

Differences versus previous versions

In response to marketing requirements, the names of TP 435 B, TP 430 KD, FCB 035, EARTHWOOL SLABS UNFACED and Ecobatt 35 have been added to the previous version. No changes have been made to the results.

More information:

www.knaufinsulation.com

Name and contact information of LCA practitioner:

Clara del Val
Knauf Insulation Sprl
Rue de Maestricht 95
4600 Visé
Belgium

Contact : sustainability@knaufinsulation.com

Content Declaration

The product does not contain substances on the "Candidate List of Substances of Very High Concern for Authorisation" under the REACH regulation (if above 0.1% of the mass).

Product components	Weight %	Pre-consumer material, weight - % (out of total)	Post- consumer % (out of total)	Renewable material, weight- % (out of total)
Mineral Materials	20 – 60	0	0	0
Recycled Glass	40 - 80	0-25	75-100	0
Bio - based binder	2 - 15	0	0	0
Additives	< 1	0	0	0
Packaging Materials	Weight, kg/ DU or FU	Weight -% (versus the product)		
Polyethylene film (0-50% recycled content)	0.07	3.15		
Wooden pallet	0.12	5.56		
TOTAL	0.19	8.70		

Declared Modules, geography, share of specific data (in GWP-GHG indicator) & data variation

Life cycle stages as defined in the European standard EN 15978 :2011 and the description of the system boundaries for the reference product LCA (X = included in the LCA, MND = module is not declared)

	Product stage			Construction process stage		Use stage							End of life stage			Resource recovery stage		
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing		Disposal	
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	
Modules declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Geography	Europe	Europe	Europe	Europe	Europe	Europe	Europe	Europe	Europe	Europe	Europe	Europe	Europe	Europe	Europe	Europe	Europe	Europe
Specific data used	> 90 %																	
Variation* – products	<10 %																	
Variation** – Visé	10.3%																	
Variation** – Bernburg	-7.9%																	
Variation** – Krupka	-2.4%																	

*Variation regarding the average EPD result in terms of GWP-GHG indicator amongst products covered with this EPD

**Variation regarding the average EPD result in terms of GWP-GHG indicator

Environmental performance

Potential environmental impacts: 1m² of glass mineral wool FCB 035, TP 120 A, TPM 135, SCS 135, FHP 034, TP 435B, TPM 135, TP 430 KD, FCB 035, EARTHWOOL UNFACED SLABS, Ecobatt 35 with a thickness of 100 mm and the R value of 2.94 m²K/W.

The results communicated is representable for all the products mentioned in this EPD.

ENVIRONMENTAL IMPACTS										
Parameter	Unit	A1-3***	A4	A5	B1-B7	C1	C2	C3	C4	D**
GWP-fossil	kg CO ₂ eq.	2.07E+00	2.94E-01	1.59E-01	0.00E+00	0.00E+00	8.45E-03	0.00E+00	3.54E-02	-1.15E-01
GWP-biogenic	kg CO ₂ eq.	-4.81E-01	0.00E+00	1.10E-01	0.00E+00	0.00E+00	-2.37E-05	0.00E+00	3.26E-01	8.17E-02
GWP-luluc	kg CO ₂ eq.	1.45E-03	2.62E-03	1.16E-04	0.00E+00	0.00E+00	7.53E-05	0.00E+00	1.51E-04	-8.80E-06
GWP-total	kg CO ₂ eq.	1.60E+00	3.01E-01	2.69E-01	0.00E+00	0.00E+00	8.50E-03	0.00E+00	3.61E-01	-3.31E-02
ODP	kg CFC 11 eq.	1.66E-11	3.68E-14	3.71E-13	0.00E+00	0.00E+00	1.06E-15	0.00E+00	1.99E-14	-5.47E-13
AP	mol H ⁺ eq.	1.33E-02	3.19E-04	3.19E-04	0.00E+00	0.00E+00	8.69E-06	0.00E+00	2.58E-04	-1.91E-04
EP-freshwater	kg P eq.	2.91E-05	1.03E-06	6.50E-07	0.00E+00	0.00E+00	2.97E-08	0.00E+00	7.42E-07	1.63E-08
EP-marine	kg N eq.	2.35E-03	1.04E-04	6.15E-05	0.00E+00	0.00E+00	2.72E-06	0.00E+00	7.12E-05	-6.10E-05
EP-terrestrial	mol N eq.	4.95E-02	1.24E-03	1.20E-03	0.00E+00	0.00E+00	3.28E-05	0.00E+00	7.59E-04	-6.73E-04
POCP	kg NMVOC eq.	4.66E-03	3.17E-04	1.34E-04	0.00E+00	0.00E+00	8.43E-06	0.00E+00	2.08E-04	-2.17E-04
ADP-minerals&metals*	kg Sb eq.	9.93E-07	1.86E-08	2.12E-08	0.00E+00	0.00E+00	5.35E-10	0.00E+00	3.66E-09	-5.65E-09
ADP-fossil*	MJ	3.30E+01	3.85E+00	8.79E-01	0.00E+00	0.00E+00	1.11E-01	0.00E+00	4.66E-01	-3.02E+00
WDP	m ³	1.24E-01	3.41E-03	2.53E-02	0.00E+00	0.00E+00	9.82E-05	0.00E+00	2.67E-03	-1.33E-02
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption									

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

** : [Life Cycle D stage covers benefits and loads beyond the system boundary stage (reuse, recovery and recycling potential) therefore, when summing up results, this stage should be considered separately].

***: The indicators results are calculated with a reference product based on equal weight repartition between plants. The indicators results span between the reference product and the 100% sourced product from each dedicated plant may vary more than 10% (concerning A1- A3).

Potential environmental impact – additional mandatory and voluntary indicators

Indicator	Unit	Tot.A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
GWP-GHG [2]	kg CO ₂ eq.	2.08E+00	2.95E-01	1.59E-01	0.00E+00	0.00E+00	8.47E-03	0.00E+00	3.52E-02	-1.15E-01

[2] The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

Use of resources: 1m² of glass mineral wool FCB 035, TP 120 A, TPM 135, SCS 135, FHP 034, TP 435B, TPM 135, TP 430 KD, FCB 035, EARTHWOOL UNFACED SLABS, Ecobatt 35 with a thickness of 100 mm and the R value of 2.94 m²K/W.

The results communicated is representable for all the products mentioned in this EPD.

RESOURCES USE										
Parameter	Unit	A1-3***	A4	A5	B1-B7	C1	C2	C3	C4	D*
PERE [MJ]	MJ	2.17E+01	2.80E-01	4.72E-01	0.00E+00	0.00E+00	8.06E-03	0.00E+00	5.44E-02	-1.43E+00
PERM [MJ]	MJ	5.18E+00	0.00E+00	1.04E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT [MJ]	MJ	2.68E+01	2.80E-01	5.76E-01	0.00E+00	0.00E+00	8.06E-03	0.00E+00	5.44E-02	-1.43E+00
PENRE [MJ]	MJ	3.02E+01	3.86E+00	8.22E-01	0.00E+00	0.00E+00	1.11E-01	0.00E+00	4.67E-01	-3.02E+00
PENRM [MJ]	MJ	2.94E+00	0.00E+00	5.89E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT [MJ]	MJ	3.31E+01	3.86E+00	8.81E-01	0.00E+00	0.00E+00	1.11E-01	0.00E+00	4.67E-01	-3.02E+00
SM	kg	1.57E+00	0.00E+00	3.21E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	6.82E-03	3.07E-04	6.85E-04	0.00E+00	0.00E+00	8.82E-06	0.00E+00	8.88E-05	-4.55E-04
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water									

*: [Life Cycle D stage covers benefits and loads beyond the system boundary stage (reuse, recovery and recycling potential) therefore, when summing up results, this stage should be considered separately].

***: The indicators results are calculated with a reference product based on equal weight repartition between plants. The indicators results span between the reference product and the 100% sourced product from each dedicated plant may vary more than 10% (concerning A1- A3).

Waste production and output flows: 1m² of glass mineral wool FCB 035, TP 120 A, TPM 135, SCS 135, FHP 034, TP 435B, TPM 135, TP 430 KD, FCB 035, EARTHWOOL UNFACED SLABS, Ecobatt 35 with a thickness of 100 mm and the R value of 2.94 m²K/W.

The results communicated is representable for all the products mentioned in this EPD.

OUTPUT FLOWS AND WASTE CATEGORIES										
Parameter	Unit	A1-3***	A4	A5	B1-B7	C1	C2	C3	C4	D*
Hazardous waste disposed	kg	-7.68E-09	1.20E-11	-6.32E-11	0.00E+00	0.00E+00	3.44E-13	0.00E+00	7.38E-09	-1.64E-10
Non-hazardous waste disposed	kg	9.65E-02	5.89E-04	5.79E-02	0.00E+00	0.00E+00	1.69E-05	0.00E+00	2.16E+00	1.98E-03
Radioactive waste disposed	kg	3.25E-04	7.23E-06	1.03E-05	0.00E+00	0.00E+00	2.08E-07	0.00E+00	6.37E-06	-9.90E-05
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	0.00E+00	0.00E+00	7.52E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	1.13E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	3.51E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal	MJ	0.00E+00	0.00E+00	6.29E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

*: [Life Cycle D stage covers benefits and loads beyond the system boundary stage (reuse, recovery and recycling potential) therefore, when summing up results, this stage should be considered separately].

***: The indicators results are calculated with a reference product based on equal weight repartition between plants. The indicators results span between the reference product and the 100% sourced product from each dedicated plant may vary more than 10% (concerning A1- A3).

ADDITIONAL IMPACT CATEGORIES AND INDICATORS										
Parameter	Unit	A1-3***	A4	A5	B1-B7	C1	C2	C3	C4	D*
PM	Disease Incidence	1.70E-07	2.29E-09	3.88E-09	0.00E+00	0.00E+00	6.39E-11	0.00E+00	3.14E-09	-2.59E-09
IRP	kBq U235 eq.	3.73E-02	1.08E-03	1.30E-03	0.00E+00	0.00E+00	3.10E-05	0.00E+00	6.16E-04	-1.64E-02
ETP- fw	CTUe	5.22E+01	2.73E+00	1.20E+00	0.00E+00	0.00E+00	7.86E-02	0.00E+00	2.86E-01	-1.15E+00
HTP-c	CTUh	1.95E-09	5.60E-11	4.50E-11	0.00E+00	0.00E+00	1.61E-12	0.00E+00	3.58E-11	-3.37E-11
HTP- nc	CTUh	1.47E-07	2.98E-09	3.41E-09	0.00E+00	0.00E+00	8.53E-11	0.00E+00	3.98E-09	-1.15E-09
SQP	dimensionless	6.29E+01	1.61E+00	1.35E+00	0.00E+00	0.00E+00	4.63E-02	0.00E+00	1.10E-01	-8.41E-01
Acronyms	PM = Particulate matter emissions; IRP= Ionising radiation, human health; ETP-fw: Ecotoxicity (freshwater); ETP-c: Human toxicity, cancer effects; HTP-nc: Human toxicity, non-cancer effects; SQP: Land use related impacts / soil quality									

[Information on biogenic carbon content](#)

Results per functional or declared unit		
BIOGENIC CARBON CONTENT	Unit	QUANTITY
Biogenic carbon content in product	kg C	5.22E-02
Biogenic carbon content in packaging	kg C	6.00E-02

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO₂.

*: [Life Cycle D stage covers benefits and loads beyond the system boundary stage (reuse, recovery and recycling potential) therefore, when summing up results, this stage should be considered separately].

***: The indicators results are calculated with a reference product based on equal weight repartition between plants. The indicators results span between the reference product and the 100% sourced product from each dedicated plant may vary more than 10% (concerning A1- A3).

LCA interpretation

ENVIRONMENTAL IMPACTS

All impact categories except the Abiotic Depletion Potential for Non-Fossil Resources (ADP- minerals & metals) and the Depletion Potential of the Stratospheric Ozone layer (ODP) are dominated by the production. This is mainly due to the consumption of energy (electricity and natural gas) during the production of glass mineral wool.

The Global Warming Potential (GWP-total) is clearly dominated by the production, mostly due to energy consumption but significantly reduced through the use of electricity from renewable sources.

The Depletion Potential of the Stratospheric Ozone layer (ODP) is mostly influenced by the manufacturing phase (module A1-A3) and significantly influenced using electricity.

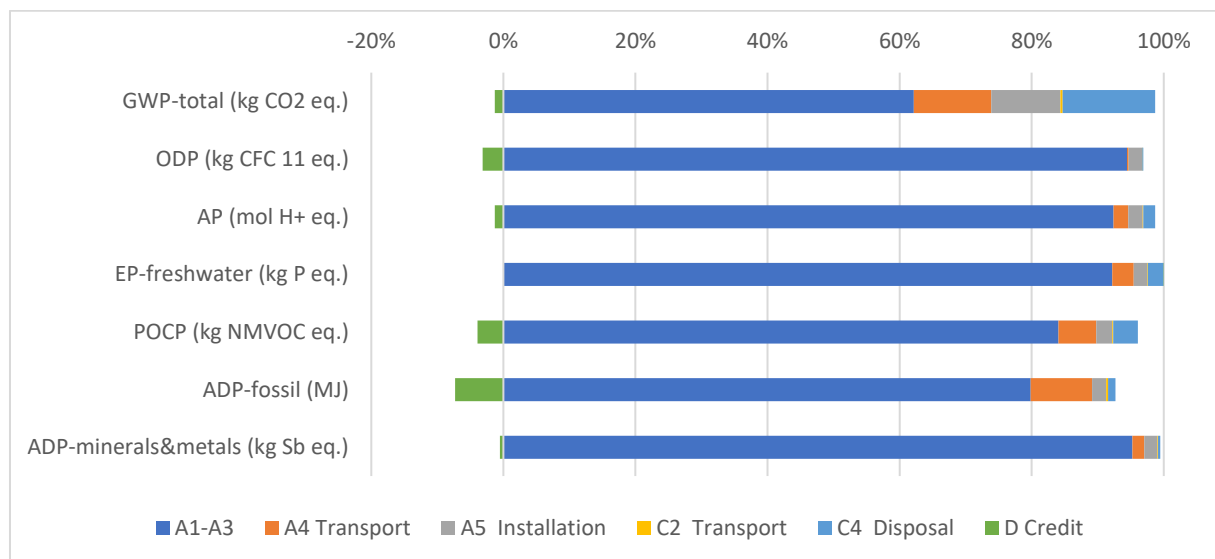
The Acidification Potential (AP) is also dominated by the production due to the process's emissions and the electricity consumption. Most of the impact is by emissions of sulphur dioxide, ammonia and nitrogen oxides.

The Eutrophication Potential (all EP indicators in total) is significantly influenced by production due to emissions from the curing oven, furnace and other unit processes. The glucose for the binder production also has an impact because of crops fertilizers use.

The Formation Potential of Tropospheric Ozone (POCP) is dominated by the production due to emissions in the curing oven and in other unit processes but also energy consumption.

The Abiotic Depletion Potential for Non-Fossil Resources (ADP- minerals & metals) is dominated by the raw materials production.

The Abiotic Depletion Potential for Fossil Resources Potential (ADP-fossil) is dominated by energy consumption for the production. The packaging and the binder have also a non-negligible impact.



The difference in results for GWP (A1 - A3) between each manufacturing site covered with this EPD and the average results goes from -7.9% in Bernburg, to -2.4% in KK and reaching 10.3% in Visé, which reflects that Visé is the most impactful plant, followed by Krupka, and that the better results are obtained in Bernburg. This deviation comes from the differences between production processes and the amount of energy and raw materials consumed, as described below.

In relation with the ratio between the energy consumed registered during 2022 by net output actual, we can point on Visé highest ratio in both, electricity, and natural gas, as the responsible of the highest impact results. Bernburg on its side, has the best ratio for natural gas, that explain the better results of this plant.

RESOURCES USE

Total Use of Non-Renewable Primary Energy Resources (PENRT) is dominated by the production of glass mineral wool products (especially due to the energy consumption) and with little influence of raw materials, binder and packaging.

Total Use of Renewable Primary Energy Resources (PERT) is dominated by the binder (bio-based) and the production.

For the Use of Secondary Material (SM), there is a lot of external cullet used into the batch process (recycled glass from windows, bottles and jars) up to 80% depending on plants.

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I-report is an interactive report created with GaBi based on the scenario. More details on the product characteristics, plant allocation and scenario can be found in the i-report.

BR_GMW_2023 (Background Report)

Calculation rules for the Life Cycle Assessment and Requirements and more details about the production on the Background Report.

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