

ENVIRONMENTAL PRODUCT DECLARATION

Knauf Insulation unfaced rolls with a density of 20.5kg/m^3 and a thermal conductivity of:

- **0.037W/mK at 23°C (AU, JP)**
- **0.037W/mK at 20°C (MY & SG)**
- **0.035W/mK at 15°C (NZ)**



In accordance with:

ISO 14025, ISO 21930, EN15804+A2:2019/AC:2021

Programme:	The International EPD® System www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	EPD-IES-0026438
Publication date:	2026-01-13
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An EPD may be updated or depublished if conditions change. To find the latest version of the EPD and to confirm its validity, see www.environdec.com.

Knauf Insulation EPDs are EPD of multiple products, based on a representative product.

Please note that any ancillary materials used for the installation of the product are excluded from the LCA calculations.

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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 registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterization factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Programme:	The International EPD® System EPD International AB Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com supportat@environdec.com
EPD registration number:	EPD-IES-0026438
Published:	2026-01-13
Valid until:	2031-01-13
EPD owner	Knauf Insulation Sprl Rue de Maestricht 95 4600 Visé (Belgium)
Product Category Rules:	PCR 2019:14. Construction products (EN 15804+A2) Version 2.0.1 C-PCR-005 Thermal insulation products (EN 16783: 2024) Version: 2025-04-08
Product group classification:	UN CPC 37
Reference year for plant data:	2023
Geographical application scope:	Asia Pacific

CEN standard EN 15804 and ISO standard ISO 21930 serve as the Core Product Category Rules (PCR)
Product category rules (PCR): PCR 2019:14. Construction products (EN 15804+A2) Version 2.0.1, UN CPC 37 C-PCR-005 Thermal insulation products (EN 16783: 2024) Version: 2024-05-03
PCR review was conducted by: Rob Rouwette (chair), Noa Meron (co-chair) A full list of members is available on www.environdec.com . The review panel may be contacted via supportat@environdec.com .
External and independent ("third-party") verification of the declaration and data, according to ISO 14025:2006, via EPD verification through: ☒ EPD process certification* without a pre-verified LCA/EPD tool Third-party verification, accountable for the certification: Bureau Veritas Certification Sverige ABV, Fabriksgatan 13, Göteborg, 41250 Accredited by: SWEDAC – Sverige AB 1236 *EPD process certification involves an accredited certification body certifying and periodically auditing the EPD process and conducting external and independent verification of EPDs that are regularly published. More information can be found in the General Programme Instructions on www.environdec.com .
Procedure for follow-up of data during EPD validity involves third party verifier: ☒ Yes ☐ No

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 is 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 sites considered 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 intended application of this product in the construction industry is within the Asia Pacific region. The data utilized for the production stage life cycle assessment is related to production plant located in Johor Bahru (Malaysia).

Address: Jln Teruntum 4, Kawasan Perindustrian Tanjung Langsat, 81700 Pasir Gudang, Johor, Malaysia. Jln Teruntum 4, Kawasan Perindustrian Tanjung Langsat, 81700 Pasir Gudang, Johor, Malaysia

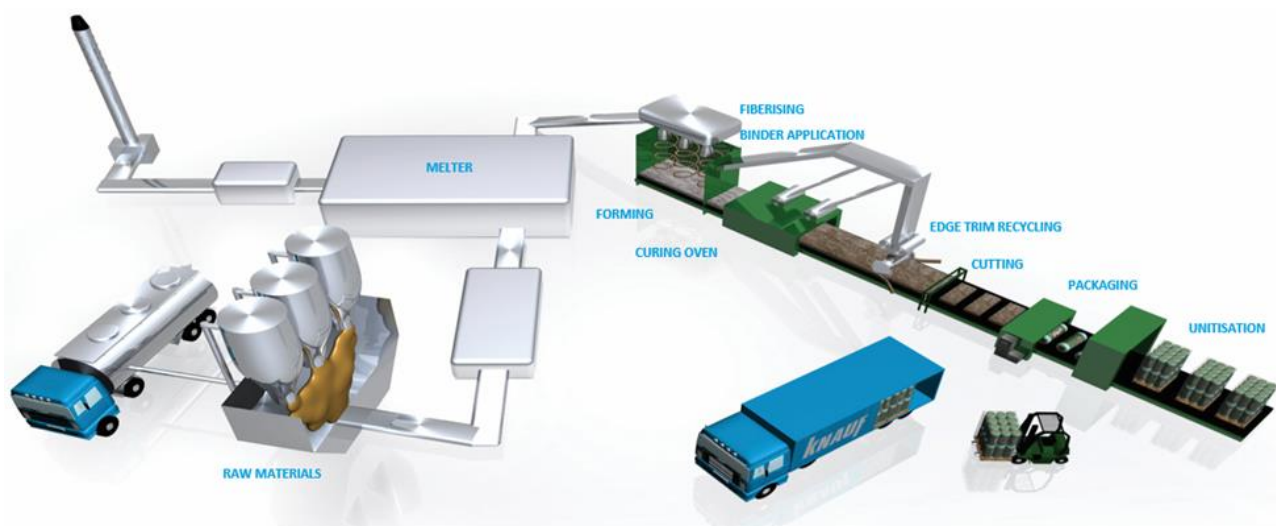
Information about Glass Mineral Wool production

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

Typically, the density of glass mineral wool falls within the range of 7.5 to 85 kg/m³, and it comprises a minimum of 92% inert materials. The inert part primarily comprises recycled glass (external cullet), which constitutes up to 80% of the composition. Sand and dolomite are introduced to the mix, and the entire blend is melted together in a furnace.

For slabs/batts and rolls, the residual fraction, which accounts for up to 8%, is composed 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. Additionally, this binder is derived from rapidly renewable natural raw materials, specifically plant starch.

Blowing wool insulation is a non-bonded, virgin fibrous insulation material, manufactured as a loose-fill product without the use of binders. In contrast, rolls and slabs/batts of insulation are bonded and cured in an oven.



Product information

Product name(s)

Knauf Insulation unfaced rolls with a density of 20.5kg/m³ and a thermal conductivity of 0.037W/mK at 23°C (AU, JP) | 0.037W/mK at 20°C (MY & SG) | 0.035W/mK at 15°C (NZ) covers the following product range: Metal roof roll, Multi-use roll and Wall Insulation.

Product identification

The declared insulation consists of Knauf Insulation unfaced rolls with a density of 20.5kg/m³ and a thermal conductivity of 0.037W/mK at 23°C (AU, JP) | 0.037W/mK at 20°C (MY & SG) | 0.035W/mK at 15°C (NZ), a glass mineral wool, unfaced rolls of 1m² (considered for this EPD).

Thermal conductivity is tested at varying temperatures in various countries dependent on local industry standards.

Product description

The main application for Knauf Insulation unfaced rolls with a density of 20.5kg/m³ and a thermal conductivity of 0.037W/mK at 23°C (AU, JP) | 0.037W/mK at 20°C (MY & SG) | 0.035W/mK at 15°C (NZ) is roofs, multi-use and walls.

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).

Geographical scope

The manufacturing is in Johor Bahru (Malaysia). Energy-related information is described in the next section. Regarding the market area, the product is mainly marketed in the Asia Pacific region.

Technical Characteristics

Parameter	Value
Thermal conductivity/ EN 12667	0.037 W/(mK) at at 23°C (AU, JP) and 20° (MY, SG) 0.035 W/mK at 15°C (NZ)
Water vapor diffusion resistance (EN 12086)	1
Thermal Resistance (ISO 8301)	1.25 m ² K/W at at 23°C (AU, JP) and 20° (MY, SG) 1.20 m ² K/W at 15°C (NZ)
Declared density range/ EN 1602	20.5 kg/m ³ (+/-10%)

The density specified in this document is provided solely and exclusively for the purpose of Life Cycle Assessment (LCA) calculations and should not be relied on for safety or any other technical requirements or specifications. Additional technical characteristics of the product can be found in the Declaration of Performance (DoP).

LCA information

Functional unit / declared unit

The declared unit is 1m² of unfaced glass mineral wool Knauf Insulation unfaced rolls with a density of 20.5kg/m³ and a thermal conductivity of 0.037W/mK at 23°C (AU,JP) | 0.037W/mK at 20°C (MY & SG) | 0.035W/mK at 15C (NZ) with R-value of 1.25 m²K/W m2K/W (for a declared lambda of 0.037 W/mK at 23°C (AU, JP) and at 20°C (MY & SG) or 1.20 m²K/W (for a declared lambda of 0.035W/mK at 15°C (NZ)), and a thickness of 45 mm.

Reference service life

The RSL or durability of Knauf Insulation unfaced rolls with a density of 20.5kg/m³ and a thermal conductivity of 0.037W/mK at 23°C (AU,JP) | 0.037W/mK at 20°C (MY & SG) | 0.035W/mK at 15C (NZ) is as long as the lifetime of the building equipment in which it is used (at least 60 years).

Time representativeness & Information on Specific Data

The complete reference year used for the plant(s) production data is 2023. The product group/s considered in this EPD is produced in one single manufacturing plant; therefore, variations issue for sites is not relevant.

The data which is used to carry out the LCA calculations contains more than 45% specific data and less than 55% generic data. Data quality information used in this EPD is compliant with EN 15941.

Database(s) and LCA software used

The LCA model, the data aggregation and environmental impacts are calculated with the software LCA for Experts (GaBi) 10.9 and its content version 2025.2. MLC datasets from the same content version are utilized for these calculations. The impact models used are those indicated in EN 15804:2012+A2:2019 and EF 3.1 (February 2023).

Gas information

Gas input (residual mix reference year: 2021) from Malaysia is selected for Johor (Malaysia).

Electricity information

Plants (countries)	Electricity mixes	Locations (electricity)	Dataset Reference Year	Impact (kg CO ₂ eq/kwh)
Johor Bahru (Malaysia)	REC's (100% hydropower)	Malaysia	2021	0.060

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 and module D.

For a comprehensive assessment, it is strongly recommended to consider the results from all the modules. The results of the end-of-life stage (modules C1-C4) should be considered when using the results of the product stage (modules A1-A3). Relying exclusively on Modules A1-A3 may lead to incomplete conclusions.

A comprehensive list and detailed explanations of each stage within the EPD are available as follows.

The product stage (A1-A3) includes:

- A1 – raw material extraction and processing, processing of secondary material input (e.g. recycling processes), for the processing of recycled glass into cullet, only the use of electricity is considered,
- 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. For the processing/sorting of recycled glass into cullet, the use of electricity is considered.

The LCA results are presented in an aggregated format for the product stage, where modules A1, A2, and A3 are consolidated into a single module, denoted as A1-A3.

Product Parameters	Value
Glass mineral wool weight	0.92 kg
Area	1m ²
Thickness	45 mm
Volume	0.045m ³
Packaging – PE film	0.01 kg
Packaging – PP film	0.03 kg
Packaging – Wooden pallet	0.09 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	300 km
Type of fuel and vehicle consumption or type of vehicle used for transport	Truck Euro 6 (28 – 32 t / 22 t payload)
Truck capacity utilisation (including 30% of empty returns)	35 % of the weight capacity
Average transport distance (ship)	7000 km
Type of ship used for transport	Container ship (5000 to 200000 dwt payload capacity)
Loss of materials on site	2%
Packaging – PE film, PP masterbag	15% recycled, 85% incinerated
Packaging – Wooden pallets	15% recycled, 85% 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 transport, 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.

While Knauf Insulation's glass mineral wool products are partially recycled at the end of their life through the Resulation recycling system in Visé (Belgium), an established collection system does not yet exist in all countries. 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 potential. 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. The benefits considered in module D originate from packaging recycling or incineration.

Recycled material

The mineral wool scrap generated during the manufacturing process is recycled internally and fed back into the mineral wool production process at multiple stages.

The average product recycled content for the considered plant(s), excluding internal recycling, was calculated at 66 % in 2023. The calculation is taking into account the % of secondary materials from external supply input into the batch against virgin raw materials supply. The external waste considerations and the calculation methodology applied are also in accordance with the ISO 14021 standard.

Content Declaration

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

Product components	Weight %	Post-consumer recycled material % (out of total)	Biogenic material % (out of total)	Biogenic material, kg C/product (out of total)
Mineral Materials	20 – 60	0	0	0
Recycled Glass	40 – 80	50-100	0	0
Bio – based binder	2 – 10	0	80	0.02
Additives	< 1	0	0	0

Packaging Materials	Weight, kg/ DU or FU	Weight % (versus the product)	Biogenic material, kg C/product (out of total)
Packaging – PE film (0-50% recycled content)	0.011	1.19	0
Packaging – PP film	0.03	0.31	0
Packaging – Wooden pallet	0.091	9.86	0.05
TOTAL	0.1	11.37	0.05

Note: This content declaration table applies to all product thicknesses covered in this EPD. Knauf Insulation EPDs are EPD of multiple products, based on a representative product (Knauf Insulation unfaced rolls with a density of 20.5kg/m³ and a thermal conductivity of 0.037W/mK at 23°C (AU, JP) | 0.037W/mK at 20°C (MY & SG) | 0.035W/mK at 15°C (NZ) 45 mm).

Conversion to mass

The conversion factor used in this EPD involves multiplying the results by 1.08 to obtain Environmental Impact Indicator results for 1 kg. Please note, an insulation product should always be defined by both its thickness and R-value. Focusing only on the product's weight could result in misinterpretations.

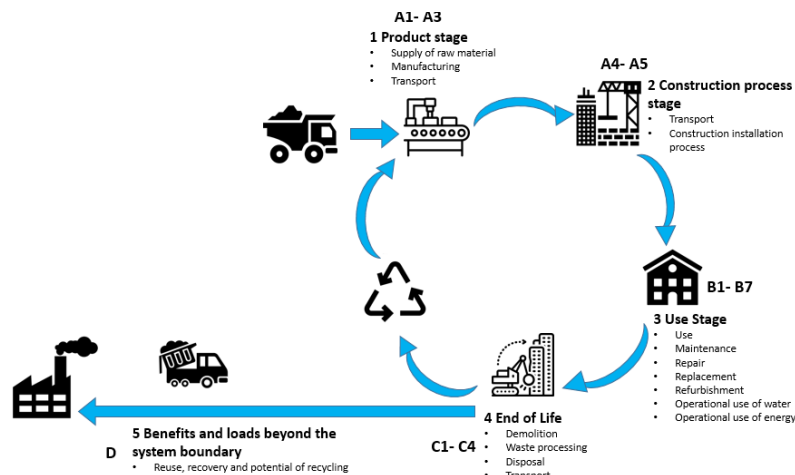
More information:

www.knauf.com

Name and contact information of LCA practitioner:

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Knauf Insulation Sprl
Rue de Maestricht 95
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Contact: sustainability@knaufinsulation.com

Process flow diagram, declared Modules, geography, share of specific data (in GWP–GHG indicator) & data variation



Life cycle stages 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	Reuse-Recovery-Recycling-potential
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
Geography	APAC	APAC	APAC	APAC	APAC	APAC	APAC	APAC	APAC	APAC	APAC	APAC	APAC	APAC	APAC	APAC	APAC
Share of specific data	> 45 %																
Variation* – products	<10 %																
Variation** – Site	0%																

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

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

Data quality declaration of material processes:

- Components in GMW: secondary data | MLC 2025.2
- Process energy: secondary data | MLC 2025.2

The share of primary data is calculated based on GWP–GHG results. It is a simplified indicator for data quality that supports the use of more primary data, to increase the representativeness of and comparability between EPDs. Note that the indicator does not capture all relevant aspects of data quality and is not comparable across product categories.

The declaration of data sources, reference years, data categories, and share of primary data is summarized in the table below.

Process	Source type	Source	Version number	Reference Year
Energy for manufacturing	Collected data	Knauf Insulation	-	2023
	Database	Sphera	MLC 2025.2	2025
Glass mineral wool + packaging manufacturing	Collected data	Knauf Insulation	-	2023
	Database	Sphera	MLC 2025.2	2025

According to PCR 2019:14 v1.3.3 infrastructure should be outside of the system boundary. However, infrastructure impacts could have been considered in some GaBi background datasets.

Additional environmental information

All raw materials used in the manufacture of the declared product, the required energy, water consumption and the resulting emissions are considered in the LCA. As a result, recipe components with a share of 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 mineral wool plant construction or manufacturing equipment is not taken into account in the life cycle assessment.

Materials required for fixing and installation are not included in the scope of this LCA. The impact of any additional construction products or materials not included in this EPD should be accounted for at building level. Regarding installation, this EPD only includes the environmental impacts relating to the product itself, such as material losses and packaging disposal.

Knauf Insulation adopts a conservative approach in its EPDs.

Conversion factors to specific thicknesses

The results of this EPD apply to a thickness of 45 mm, with an R-value of 1.25 m²K/W. To adjust the results for all indicators across all modules to different thicknesses, multiply the values in this EPD by the corresponding conversion factor, calculated by dividing the target product thickness by 45 (mm), as the results scale linearly.

Potential environmental impacts: 1m² of glass mineral wool Knauf Insulation unfaced rolls with a density of 20.5kg/m³ and a thermal conductivity of 0.037W/mK at 23°C (AU,JP) | 0.037W/mK at 20°C (MY & SG) | 0.035W/mK at 15°C (NZ) with a thickness of 45 mm and the R-value of 1.25 m²K/W m²K/W (for a declared lambda of 0.037 W/mK at 23°C (AU, JP) and at 20°C (MY & SG) or 1.20 m²K/W (for a declared lambda of 0.035W/mK at 15°C (NZ)), and a thickness of 45 mm

These results are representative of all the products mentioned in this EPD.

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

ENVIRONMENTAL IMPACTS										
Parameter	Unit	A1-3***	A4	A5	B1-B7	C1	C2	C3	C4	D**
GWP-fossil	kg CO2 eq.	1.24E+00	1.38E-01	8.36E-02	0.00E+00	0.00E+00	4.13E-03	0.00E+00	1.48E-02	-1.55E-01
GWP-biogenic	kg CO2 eq.	-3.35E-01	2.23E-03	2.93E-01	0.00E+00	0.00E+00	1.71E-04	0.00E+00	1.12E-01	0.00E+00
GWP-luluc	kg CO2 eq.	2.99E-03	2.28E-06	7.19E-05	0.00E+00	0.00E+00	1.02E-07	0.00E+00	6.47E-05	-7.53E-05
GWP-total	kg CO2 eq.	9.07E-01	1.40E-01	3.77E-01	0.00E+00	0.00E+00	4.30E-03	0.00E+00	1.27E-01	-1.55E-01
ODP	kg CFC 11 eq.	1.82E-12	1.11E-14	7.79E-14	0.00E+00	0.00E+00	6.17E-16	0.00E+00	8.52E-15	-1.26E-12
AP	mol H+ eq.	5.25E-03	2.91E-03	2.22E-04	0.00E+00	0.00E+00	6.28E-06	0.00E+00	1.10E-04	-6.44E-04
EP-freshwater	kg P eq.	3.29E-06	2.14E-08	8.07E-08	0.00E+00	0.00E+00	6.53E-10	0.00E+00	3.17E-07	-3.42E-08
EP-marine	kg N eq.	1.76E-03	7.29E-04	6.73E-05	0.00E+00	0.00E+00	2.64E-06	0.00E+00	3.04E-05	-1.81E-04
EP-terrestrial	mol N eq.	2.09E-02	7.99E-03	8.22E-04	0.00E+00	0.00E+00	2.95E-05	0.00E+00	3.24E-04	-1.98E-03
POCP	kg NMVOC eq.	3.86E-03	2.07E-03	1.67E-04	0.00E+00	0.00E+00	7.71E-06	0.00E+00	8.87E-05	-5.01E-04
ADP-minerals & metals*	kg Sb eq.	3.43E-07	1.46E-09	7.54E-09	0.00E+00	0.00E+00	4.22E-11	0.00E+00	1.54E-09	-9.58E-09
ADP-fossil*	MJ	1.80E+01	1.74E+00	5.27E-01	0.00E+00	0.00E+00	5.69E-02	0.00E+00	1.99E-01	-2.26E+00
WDP*	m ³ world eq.	6.07E-02	3.28E-04	3.39E-02	0.00E+00	0.00E+00	1.57E-05	0.00E+00	1.14E-03	-3.96E-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 2: 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 indicator's results are calculated using a reference product, with equal weighting between plants, if this is a single plant, it means 100% for that plant

Potential environmental impact – additional mandatory and voluntary indicators

Indicator	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
GWP-GHG [2]	kg CO ₂ eq.	1.28E+00	1.38E-01	8.45E-02	0.00E+00	0.00E+00	4.13E-03	0.00E+00	1.49E-02	-1.56E-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.

Use of resources: 1m² of glass mineral wool Knauf Insulation unfaced rolls with a density of 20.5kg/m³ and a thermal conductivity of 0.037W/mK at 23°C (AU,JP) | 0.037W/mK at 20°C (MY & SG) | 0.035W/mK at 15°C (NZ) with a thickness of 45 mm and the R-value of 1.25 m²K/W m²K/W (for a declared lambda of 0.037 W/mK at 23°C (AU, JP) and at 20°C (MY & SG) or 1.20 m²K/W (for a declared lambda of 0.035W/mK at 15°C (NZ)), and a thickness of 45 mm.

These results are representative of all the products mentioned in this EPD.

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

RESOURCES USE

Parameter	Unit	A1-3***	A4	A5	B1-B7	C1	C2	C3	C4	D*
PERE [3]	MJ	5.66E+00	4.62E-03	-9.31E-01	0.00E+00	0.00E+00	2.52E-04	0.00E+00	2.32E-02	0.00E+00
PERM [3]	MJ	2.58E+00	0.00E+00	5.15E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT [3]	MJ	8.24E+00	4.62E-03	-8.79E-01	0.00E+00	0.00E+00	2.52E-04	0.00E+00	2.32E-02	0.00E+00
PENRE [3]	MJ	1.75E+01	1.74E+00	1.85E+01	0.00E+00	0.00E+00	5.69E-02	0.00E+00	1.99E-01	0.00E+00
PENRM [3]	MJ	4.86E-01	0.00E+00	9.73E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT [3]	MJ	1.80E+01	1.74E+00	1.85E+01	0.00E+00	0.00E+00	5.69E-02	0.00E+00	1.99E-01	0.00E+00
SM	kg	6.04E-01	0.00E+00	1.23E-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	6.39E-03	6.47E-06	9.00E-04	0.00E+00	0.00E+00	3.18E-07	0.00E+00	3.79E-05	-5.70E-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 indicator's results are calculated using a reference product, with equal weighting between plants, if this is a single plant, it means 100% for that plant.

[3] From International EPD PCR 1.3.3. for Construction Products, the option B, mentioned in Annex 3, was used for the calculation if the primary energy use indicators.

Waste production and output flows: 1m² of glass mineral wool Knauf Insulation unfaced rolls with a density of 20.5kg/m³ and a thermal conductivity of 0.037W/mK at 23°C (AU,JP) | 0.037W/mK at 20°C (MY & SG) | 0.035W/mK at 15°C (NZ) with a thickness of 45 mm and the R-value of 1.25 m²K/W m²K/W (for a declared lambda of 0.037 W/mK at 23°C (AU, JP) and at 20°C (MY & SG) or 1.20 m²K/W (for a declared lambda of 0.035W/mK at 15°C (NZ)), and a thickness of 45 mm.

These results are representative of all the products mentioned in this EPD.

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

OUTPUT FLOWS AND WASTE CATEGORIES

Parameter	Unit	A1-3***	A4	A5	B1-B7	C1	C2	C3	C4	D*
Hazardous waste disposed	kg	2.07E-09	2.28E-11	1.52E-10	0.00E+00	0.00E+00	7.50E-13	0.00E+00	3.15E-09	-2.29E-10
Non-hazardous waste disposed	kg	9.92E-02	2.82E-05	3.03E-02	0.00E+00	0.00E+00	1.18E-06	0.00E+00	9.24E-01	-2.58E-04
Radioactive waste disposed	kg	1.10E-04	2.22E-07	6.45E-06	0.00E+00	0.00E+00	1.10E-08	0.00E+00	2.72E-06	-1.98E-06
Components for reuse	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	3.11E-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	0.00E+00	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	4.43E-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	7.97E-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 indicator's results are calculated using a reference product, with equal weighting between plants, if this is a single plant, it means 100% for that plant.

Additional impact categories and indicators: 1m² of glass mineral wool Knauf Insulation unfaced rolls with a density of 20.5kg/m³ and a thermal conductivity of 0.037W/mK at 23°C (AU,JP) | 0.037W/mK at 20°C (MY & SG) | 0.035W/mK at 15°C (NZ) with a thickness of 45 mm and the R-value of 1.25 m²K/W m²K/W (for a declared lambda of 0.037 W/mK at 23°C (AU, JP) and at 20°C (MY & SG) or 1.20 m²K/W (for a declared lambda of 0.035W/mK at 15°C (NZ)), and a thickness of 45 mm.

These results are representative of all the products mentioned in this EPD.

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

ADDITIONAL IMPACT CATEGORIES AND INDICATORS

Parameter	Unit	A1-3****	A4	A5	B1-B7	C1	C2	C3	C4	D***
PM	Disease Incidence	1.06E-07	5.20E-08	3.66E-09	0.00E+00	0.00E+00	8.55E-11	0.00E+00	1.34E-09	-6.22E-09
IRP*	kBq U235 eq.	1.36E-02	2.48E-05	9.22E-04	0.00E+00	0.00E+00	1.37E-06	0.00E+00	2.63E-04	-3.12E-04
ETP-fw**	CTUe	2.46E+01	4.88E-01	5.67E-01	0.00E+00	0.00E+00	2.22E-02	0.00E+00	1.20E-01	-6.95E-01
HTP-c**	CTUh	5.58E-10	7.80E-12	1.54E-11	0.00E+00	0.00E+00	3.47E-13	0.00E+00	1.53E-11	-2.20E-11
HTP-nc**	CTUh	1.93E-08	1.40E-10	6.22E-10	0.00E+00	0.00E+00	5.78E-12	0.00E+00	1.62E-09	-3.10E-10
SQP**	dimensionless	4.67E+01	2.07E-03	9.78E-01	0.00E+00	0.00E+00	1.01E-04	0.00E+00	4.68E-02	-7.48E-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									

* Disclaimer 1: This impact category deals mainly with the eventual impact of low dose ionizing 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 ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

** Disclaimer 2: 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 indicator's results are calculated using a reference product, with equal weighting between plants, if this is a single plant, it means 100% for that plant.

Information on biogenic carbon content

Results per functional or declared unit		
BIOGENIC CARBON CONTENT	kg C	kg CO ₂ eq.
Biogenic carbon content in product	1.84E-02	6.76E-02
Biogenic carbon content in packaging	4.55E-02	1.67E-01

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

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.

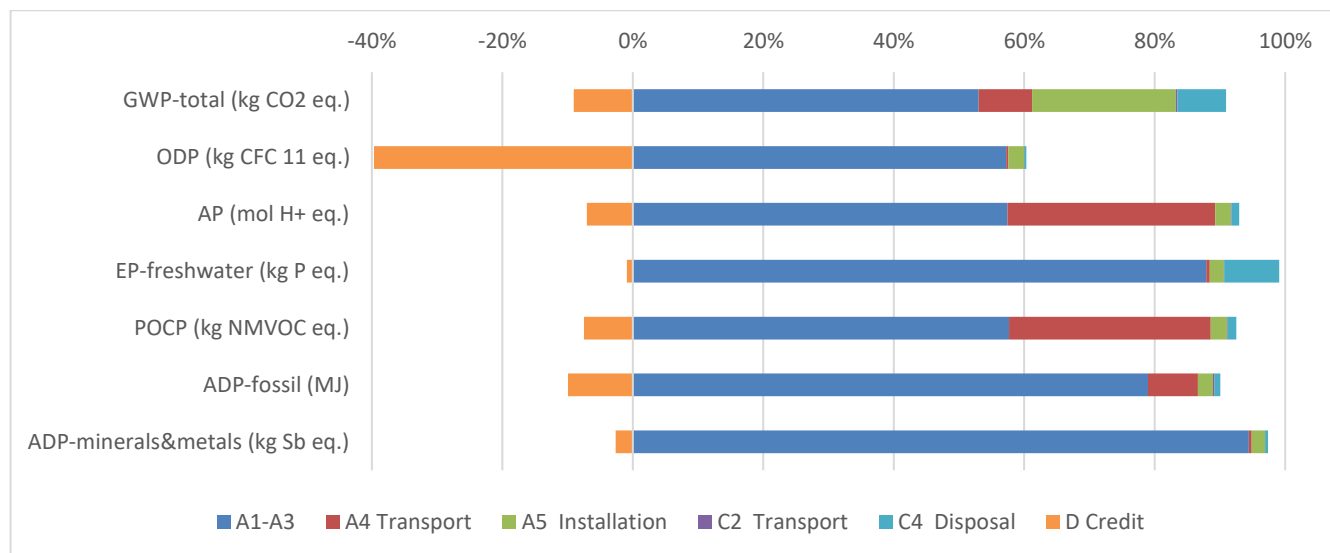
The Acidification Potential (AP) is also dominated by the production due to the process's emissions and the electricity consumption. Most of the impact is by emissions of sulphur dioxide, ammonia and nitrogen oxides.

The Eutrophication Potential Fresh Water (all EP indicators in total) is mainly 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 emissions from the manufacturing processes (including energy use) and raw materials.

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 (plastic) and the binder have also a non-negligible impact.



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), the production and the packaging (wooden pallets).

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).

Version history

Version	Date	Difference(s) versus previous version(s)
Original	[202X-XX-XX]	-

Abbreviations

Abbreviation	Definition
General Abbreviations	
EN	European Norm (Standard)
EPD	Environmental Product Declaration
EF	Environmental Footprint
GPI	General Programme Instructions
ISO	International Organization for Standardization
LCA	Life Cycle Assessment
PCR	Product Category Rules
c-PCR	Complementary Product Category Rules
CEN	European Committee for Standardization
CLC	Co-location centre
CPC	Central product classification
GHS	Globally harmonized system of classification and labelling of chemicals
GRI	Global Reporting Initiative
Environmental Impact Indicators (EN 15804)	
GHG	Greenhouse gas
GWP	Global Warming Potential (kg CO ₂ eq.)
GWP-fossil	Global Warming Potential from fossil sources (kg CO ₂ eq.)
GWP-biogenic	Global Warming Potential from biogenic sources (kg CO ₂ eq.)
GWP-luluc	Global Warming Potential from land use and land use change (kg CO ₂ eq.)
GWP-total	Total Global Warming Potential (kg CO ₂ eq.)
GWP-GHG	Global Warming Potential for greenhouse gases (kg CO ₂ eq.)
ODP	Ozone Depletion Potential (kg CFC-11 eq.)
AP	Acidification Potential (mol H ⁺ eq.)
EP	Eutrophication Potential
EP-freshwater	Freshwater eutrophication potential (kg P eq.)
EP-marine	Marine eutrophication potential (kg N eq.)
EP-terrestrial	Terrestrial eutrophication potential (mol N eq.)
POCP	Photochemical Ozone Creation Potential (kg NMVOC eq.)
ADP	Abiotic Depletion Potential
ADP-minerals&metals	Abiotic depletion potential for non-fossil resources (kg Sb eq.)
ADP-fossil	Abiotic depletion potential for fossil resources (MJ)
WDP	Water Deprivation Potential (m ³)
Resource Use Indicators	
PERE	Use of renewable primary energy excluding renewable primary energy resources used as raw materials (MJ)
PERM	Use of renewable primary energy resources used as raw materials (MJ)
PERT	Total use of renewable primary energy resources (MJ)
PENRE	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (MJ)
PENRM	Use of non-renewable primary energy resources used as raw materials (MJ)
PENRT	Total use of non-renewable primary energy resources (MJ)
SM	Use of secondary material (kg)
RSF	Use of renewable secondary fuels (MJ)
NRSF	Use of non-renewable secondary fuels (MJ)
FW	Use of net fresh water (m ³)
Waste Indicators	
HW	Hazardous Waste (disposed) (kg)
NHW	Non-Hazardous Waste (disposed) (kg)

Output Flow Indicators

CFR	Components for Reuse (kg)
MR	Material for Recycling (kg)
MER	Materials for Energy Recovery (kg)
EEE	Exported Energy, Electricity (MJ)
EET	Exported Energy, Thermal (MJ)

Lifecycle Stages / Modules

A1	Raw material supply
A2	Transport
A3	Manufacturing
A4	Transport to site
A5	Construction/Installation
B1	Use
B2	Maintenance
B3	Repair
B4	Replacement
B5	Refurbishment
B6	Operational energy use
B7	Operational water use
C1	Deconstruction/Demolition
C2	Transport to waste processing
C3	Waste processing
C4	Disposal
D	Reuse-Recovery-Recycling potential

Other Relevant Terms

CAS No.	Chemical Abstracts Service Number
CFC-11 eq.	Chlorofluorocarbon-11 Equivalents
CO ₂ eq.	Carbon Dioxide Equivalents
DoP	Declaration of Performance
EAC's	Energy Attribute Certificate
EC No.	European Community Number
GMW	Glass Mineral Wool
kg	Kilogram
kg C	Kilograms of Carbon
kg CO ₂ eq.	Kilograms of Carbon Dioxide Equivalent
m ² K/W	Meter Squared Kelvin per Watt
m ³	Cubic Meter
MJ	Megajoule
MLC	Managed Life Cycle Content (formerly GaBi databases)
N eq.	Nitrogen Equivalents
ND	Not Declared
NMVOC	Non-Methane Volatile Organic Compounds
P eq.	Phosphorus Equivalents
PE	Polyethylene
PET	Polyethylene Terephthalate
PU	Polyurethane
RMW	Rock Mineral Wool
RSL	Reference Service Life
R-value	Thermal Resistance
Sb eq.	Antimony Equivalents
SVHC	Substances of Very High Concern
W/(mK)	Watts per Meter-Kelvin

References

International EPD® System

General Programme Instructions of the International EPD® System. Version 5.0.1

Product category rules (PCR): PCR 2019:14 v.2.0.1 Construction products (EN 15804+A2)

C-PCR-005 Thermal insulation products (EN 16783: 2024) Version: 2025-04-08

LCA for Experts 10.9

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Thermal insulation products – Environmental Product Declarations (EPD) – Product Category Rules (PCR) complementary to EN 15804 for factory made and in-situ formed products

EN 12086

EN 12086: 2013 Thermal insulating products for building applications –determination of water vapour transmission properties

EN 15978: 2011

EN 15978: 2011 Sustainability of construction works – Assessment of environmental performance of buildings – Calculation method.

ISO 21930:2017

Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services

ISO 14021

ISO 14021:2016 Environmental labels and declarations – Self-declared environmental claims (Type II environmental labelling)

ISO 14025

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EN 15804:2012+A2:2019/AC:2021

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EN 1602:

EN1602: 2013 Thermal insulation products for building applications – Determination of the apparent density

EN 12667

EN 12667: 2001 Thermal performance of building materials and products – Determination of thermal resistance by means of guarded hot plate and heat flow meter methods – Products of high and medium thermal resistance

EN 13162

EN 13162:2012 Thermal insulation products for buildings – Factory made mineral wool (MW) products – Specification

EN 12086

EN 12086: 2013 Thermal insulating products for building applications –determination of water vapour transmission properties

ISO 8301:1991

Thermal insulation – Determination of steady-state thermal resistance and related properties – Heat flow meter apparatus

EN 15941:2024

Sustainability of construction works – Data quality for environmental assessment of products and construction work – Selection and use of data

2025_12_08 APAC unfaced rolls density 20kgm3 - JB (I-report)

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

BR_GMW_2025 (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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