ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 and EN 15804+A1 for:

KI FIT 032, KI Multifit 032, Naturoll 032, UNIFIT 032

From

KNAUF INSULATION



Program:	The International EPD® System www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	S-P-01890
Publication date:	2020-11-12
Validity date:	2025-11-12

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Programme-related information and verification

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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-01890
Published:	2020-11-12
Valid until:	2025-11-12
EPD owner	Knauf Insulation Sprl Rue de Maestricht 95 4600 Visé Belgium
Product Category Rules:	PCR 2012:01. Construction products and construction services. Version 2.3 Sub-PCR-I Thermal insulation products (EN 16783: 2017)
Product group classification:	UN CPC 37
Reference year for plant data:	2019
Geographical application scope:	Europe

CEN standard EN 15804+A1 serves as the Core Product Category Rules (PCR)
Product category rules (PCR): Construction products and Construction services, 2012:01, version 2.3. Sub-PCR-I Thermal insulation products (EN 16783: 2017)
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: ☒ EPD process certification ☐ EPD verification
Certified by: Bureau Veritas certification Sverige AB SE006629-1
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 has more than 40 years of experience in the insulation industry and is one of the most respected names in insulation worldwide. Knauf Insulation is manufacturing products and solutions mainly in glass and rock mineral wool as well as wood wool. We operate more than 37 manufacturing sites globally in 15 countries and employ more than 5,000 people.

The Group Headquarters are based in Visé in Belgium where the biggest glass wool manufacturing plant in Europe is located.



Product-related or management system-related certifications:
All Knauf Insulation sites, including the related sites 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".

Name and location of production site:
The use in dedicated building applications of the concerned product is Europe. The data utilized for the production stage life cycle assessment are related to production plants located in Visé (Belgium), Lannemezan (France) and Krupka (Czech Republic).

Rue de Maestricht 95, 4600 Visé, Belgium

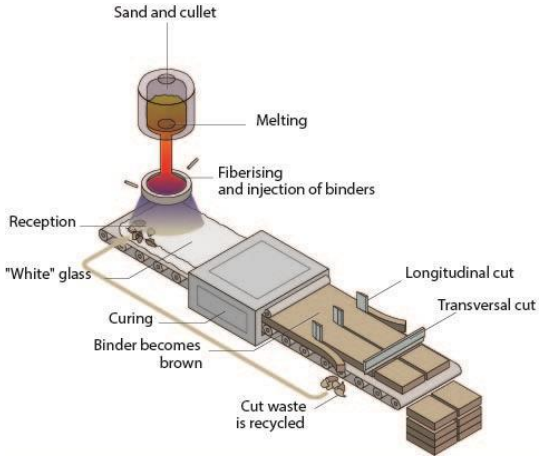
501 Voie Napoleon Iii, 65300 Lannemezan, France

Pod dolní drahou 110, 417 42 Krupka, Czechia

Information about Glass Mineral Wool production

The Glass Mineral Wool Products for (GMW) are available in the form of slabs, rolls and boards. In general, the density for glass mineral wool ranges from 10 to 85 kg/m³ and glass mineral wool consists of at least 92.5% inert material. The inert part is made of recycled glass (external cullet, up to 80% of the composition) and mainly sand and dolomite.

The remaining fraction (less than or equal to 7.5%) is made of bio-based binder components. At Knauf Insulation, the binder used for the GMW products is the ECOSE binder whose origin is plant starch.



Product information

Product name: KI FIT 032, KI Multifit 032, Naturoll 032, UNIFIT 032

Product identification: The declared insulation products are KI FIT 032, KI Multifit 032, Naturoll 032, UNIFIT 032 unfaced glass mineral wool of 1 m^2 and 120 mm thickness (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 G4220OPCPR,G4232OPCPR, G4222OPCPR, taking into consideration the harmonized product standard /EN 13162/ and the /CE-mark/.

Product description: The main application for KI FIT 032, KI Multifit 032, Naturoll 032, UNIFIT 032 are for the thermal and acoustic insulation of inclined roofs with regular or irregular frames

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 product is manufactured in Visé (Belgium), Lannemezan (France) and Krupka (Czech Republic) with related country energy mix for electricity. Regarding the market area, the product is mainly marketed in Europe.

Energy:
Electricity mix and gas inputs are taken from related country values taken from reference year 2015.

Technical Characteristics:

Parameter	Value
Thermal conductivity/ EN 12667 (KI FIT 032, Unifit 032, KI Multifit 032, Naturoll 032)	0.032 W/(mK) at 10°C
Thermal Resistance (ISO 8301)	3.75 m^2K/W
Water vapor diffusion resistance (EN 12086)	1
Reaction to fire (EN 13501-1)	A1 (EN 1350-1)
Declared density range/ EN 1602	30.5 kg/m³ (+/- 10%)

LCA information

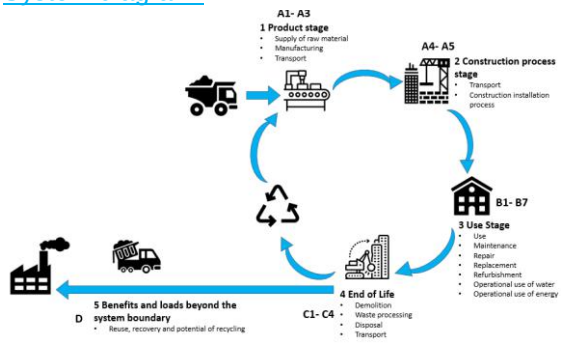
Functional unit / declared unit:
The declared unit is one square meter of Glass Mineral Wool unfaced KI FIT 032, KI Multifit 032, Naturoll 032, UNIFIT 032 with a thickness of 120 mm. The declared lambda is 0.032 W/mK at 10°C except for the UNIFIT 032 where the lambda is 0.032 The density used for the calculation of this specific LCA is 30.5 kg/m³.

Reference service life: The RSL or durability of KI FIT 032, KI Multifit 032, Naturoll 032, UNIFIT 032 is as long as the lifetime of the building equipment in which it is used (at least 50 years).

Time representativeness:
Plants production data for the complete year 2019.

Database(s) and LCA software used:
The LCA model, the data aggregation and environmental impacts are calculated with the software GaBi 9.2 and its Service Pack 40 databases.

System diagram:



Description of system boundaries:
The system boundary of the EPD follows the modularity approach defined by the /EN 15804+A1/.
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
Declared Density	30.5 kg/m³
Glass mineral wool weigth (without facing/ coating weight)	3.68 kg
Surface	1 m²
Thickness	120 mm
Volume	0.12 m³
Packaging Plastic sheet	0.07 kg
Packaging Wooden pallet	0.16 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	600 km
Type of fuel and vehicle consumption or type of vehicle used for transport.	Truck Euro 6 (28 – 32 t / 22 t) payload.(33 L for 100 km)
Truck capacity utilization (including 30% of empty returns)	25 % 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 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 impacts (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 3, 34 - 40t gross weight / 27t payload capacity/ 40 L for 100 km. (if 100 % utilization).
Truck capacity utilization	70 % of the weight capacity

Module D includes reuse, recovery and/or recycling potentials. According to /EN 15804+A1/, 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.

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).

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 for this product was calculated at 76 % in 2019 according to the cullet market availability.

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

Knauf Insulation adopts a “worst case” approach into its EPDs.

More information:
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Declared Modules

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 materials	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
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Environmental performance

Potential environmental impacts: 1 m² of Glass Mineral Wool KI FIT 032, KI Multifit 032, Naturoll 032, UNIFIT 032 with a thickness of 120 mm.

PARAMETERS	UNIT	TOTAL A1-A3**	A4	A5	TOTAL B1-B2-B3-B4-B5-B6-B7	C1	C2	C3	C4	D*
Global warming potential (GWP)	kg CO_2 eq.	3.33E+00	4.20E-01	9.58E-01	0.00E+00	0.00E+00	1.10E-02	0.00E+00	5.94E-02	-4.38E-01
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC 11 eq.	1.49E-13	6.83E-17	2.53E-10	0.00E+00	0.00E+00	1.82E-18	0.00E+00	6.01E-14	-7.53E-15
Acidification potential (AP)	kg SO_2 eq.	2.83E-02	3.15E-04	6.82E-04	0.00E+00	0.00E+00	2.05E-03	0.00E+00	3.52E-04	-6.94E-04
Eutrophication potential (EP)	kg PO_4^{3-} eq.	6.49E-03	6.61E-05	1.52E-04	0.00E+00	0.00E+00	5.32E-04	0.00E+00	4.79E-05	-1.15E-04
Formation potential of tropospheric ozone (POCP)	kg C_2H_4 eq.	2.24E-03	5.45E-05	5.49E-05	0.00E+00	0.00E+00	1.16E-04	0.00E+00	2.77E-05	-1.45E-04
Abiotic depletion potential – Elements	kg Sb eq.	2.19E-04	3.46E-08	4.49E-06	0.00E+00	0.00E+00	9.21E-10	0.00E+00	2.13E-08	-8.41E-08
Abiotic depletion potential – Fossil resources	MJ, net calorific value	6.45E+01	5.67E+00	1.77E+00	0.00E+00	0.00E+00	1.51E-01	0.00E+00	7.69E-01	-8.44E+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 annual production volume (following the dedicated market share). 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).*

Use of resources: 1 m² of Glass Mineral Wool KI FIT 032, KI Multifit 032, Naturoll 032, UNIFIT 032 with a thickness of 120 mm.

PARAMETER		UNIT	TOTAL A1-A3**	A4	A5	TOTAL B1-B2-B3-B4-B5-B6-B7	C1	C2	C3	C4	D*
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	1.41E+01	3.19E-01	4.31E-01	0.00E+00	0.00E+00	8.50E-03	0.00E+00	9.28E-02	-1.72E+00
	Used as raw materials	MJ, net calorific value	8.27E+00	0.00E+00	1.18E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	TOTAL	MJ, net calorific value	2.24E+01	3.19E-01	5.49E-01	0.00E+00	0.00E+00	8.50E-03	0.00E+00	9.28E-02	-1.72E+00
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	7.89E+01	5.69E+00	2.21E+00	0.00E+00	0.00E+00	1.51E-01	0.00E+00	7.96E-01	-9.30E+00
	Used as raw materials	MJ, net calorific value	3.20E+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
	TOTAL	MJ, net calorific value	8.21E+01	5.69E+00	2.21E+00	0.00E+00	0.00E+00	1.51E-01	0.00E+00	7.96E-01	-9.30E+00
Secondary material		kg	2.75E+00	0.00E+00	5.60E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.12E-01
Renewable secondary fuels		MJ, net calorific value	2.14E-22	0.00E+00	4.36E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels		MJ, net calorific value	2.51E-21	0.00E+00	5.12E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water		m3	2.36E-02	3.70E-04	2.08E-03	0.00E+00	0.00E+00	9.85E-06	0.00E+00	1.51E-04	-1.62E-03

*: *[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 annual production volume (following the dedicated market share). 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: 1 m² of Glass Mineral Wool KI FIT 032, KI Multifit 032, Naturoll 032, UNIFIT 032 with a thickness of 120 mm.

Waste production

PARAMETER	UNIT	TOTAL A1-A3**	A4	A5	TOTAL B1-B2-B3-B4-B5-B6-B7	C1	C2	C3	C4	D*
Hazardous waste disposed	kg	7.38E-08	2.65E-07	8.22E-09	0.00E+00	0.00E+00	7.05E-09	0.00E+00	1.26E-08	-3.26E-09
Non-hazardous waste disposed	kg	2.37E-01	8.70E-04	8.49E-02	0.00E+00	0.00E+00	2.32E-05	0.00E+00	3.69E+00	-6.89E-03
Radioactive waste disposed	kg	6.91E-03	7.04E-06	1.72E-04	0.00E+00	0.00E+00	1.87E-07	0.00E+00	1.09E-05	-3.41E-04

*: *[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 annual production volume (following the dedicated market share). 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).*

Output flows

PARAMETER	UNIT	TOTAL A1-A3**	A4	A5	TOTAL B1-B2-B3-B4-B5-B6-B7	C1	C2	C3	C4	D*
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	3.03E-01	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	2.87E-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	9.93E-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	2.50E+00	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 annual production volume (following the dedicated market share). 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 ADPE and the ODP are dominated by the manufacturing. 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) is clearly dominated by the production, mostly due to energy consumption (electricity and natural gas). The high cullet content is helping to reduce the energy use in the melting furnace.

The Ozone layer Depletion Potential (ODP) seems highly influenced by the installation step, mostly due to plastics packaging incineration scenario resulting in emissions of halogenated compounds.

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

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

The Photochemical Ozone Creation Potential (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 Element (ADPe) is dominated by the raw materials production.

The Abiotic Depletion Potential Fossil (ADPf) is dominated by natural gas use and the electricity consumption for the production. The packaging and the binder have also a non-negligible impact. The installation stage has a “positive” contribution due to the energy recovery from incineration of a percentage of plastic packaging and the avoidance production of new plastic production thanks to a percentage of recycling plastic packaging.

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 the 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, (electricity mix) 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 and bottles) up to 80% depending on plants.

References

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www.dopki.com.

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ISO 10456
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EN 1609:2013
Thermal insulating products for building applications. Determination of short-term water absorption by partial immersion

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