ENVIRONMENTAL PRODUCT DECLARATION

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

Supafil Max Frame

From

KNAUF INSULATION

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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-01716
Published:	2019-12-20
Valid until:	2024-12-20
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). Version 2018-11-22
Product group classification:	UN CPC 37
Reference year for manufacturing data:	2018
Geographical application scope:	Global

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, UN CPC 37. Sub-PCR-I Thermal insulation products (EN 16783), version 2018-11-22,
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
Accredited 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 Headquarters are located in Visé, in Belgium.

Product-related or management system-related certifications:
All Knauf Insulation sites, including the related site for this EPD, are ISO 9001, ISO 14001, ISO 5001 and OHSAS 18001 certified under the scope "Design, Development and Production of Insulation Materials and Systems".

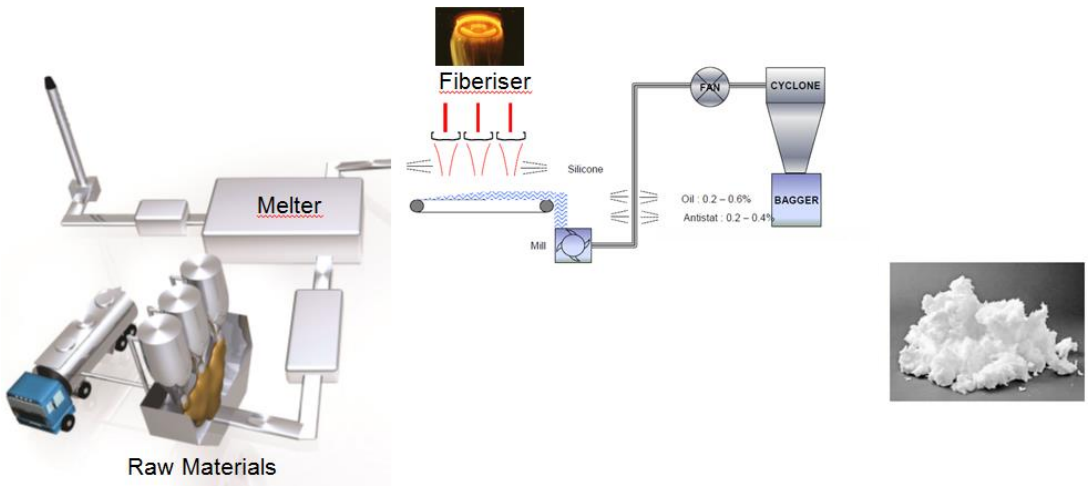
Name and location of production site:
The application in construction of the concerned product is mainly European. The data utilized for the production stage life cycle assessment are related to a production plant located in Visé (Belgium).

Knauf Insulation, Rue de Maestricht 95, 4600 Visé, Belgium

Information about Glass Mineral Wool production

The Glass Mineral Wool Products (GMW) with binder are available in the form of slabs, rolls and boards. The concerned product into this EPD is without any binder application. GM BW (Glass Mineral Blowing Wool) is a loose-fill, binder-free, factory made mineral wool insulation. It is manufactured in the form of flocks of unbounded virgin mineral wool and complies with the requirements of EN 14064. In general, glass mineral blowing wool consists of at least 99% of 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 1%) is dedicated to obtain anti-dust, anti-static and water repellent properties.



Product information

Product name: Supafil Max Frame

Product identification: The declared insulation product is Supafil Max Frame, an unbonded, non-combustible blown glass mineral wool insulation of one square meter (considered for this EPD). It needs a Declaration of Performance taken into consideration the harmonized product standard EN 14064 and the CE mark.

Product description: The main application for Supafil Max Frame are in frame walls, frame roofs (flat roofs or pitched roofs, between rafters of in open lofts) and loft floors.

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 produced in Visé (Belgium) with Belgian energy mix for electricity and Belgian natural gas for gas consumption. Regarding the market area, the product is mainly marketed in Europe.

Technical Characteristics:

Parameter	Value
Thermal conductivity/ EN 12667	0.033 W/(mK) at 10°C
Water vapor diffusion resistance (EN 13162)	1
Reaction to fire (EN 13501-1)	A1 (EN 1350-1)
Declared density range/ EN 1602	33- 37 kg/m³
Melting point of fibers DIN 4102-17	≥ 1000°C

LCA information

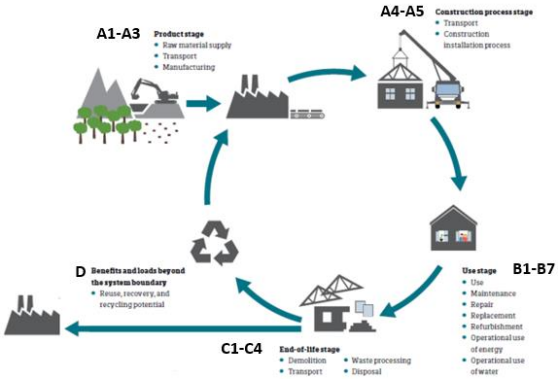
Functional unit / declared unit:
The declared unit is one square meter of Glass Mineral Wool Supafil Max Frame with a thickness of 240 mm. The declared lambda is 0.033 W/mK at 10°C. The density used for the calculation of this specific LCA is 35 kg/m³.

Reference service life: The RSL or durability of Supafil Max Frame is as long as the lifetime of the building equipment in which it is used (at least 50 years).

Time representativeness:
Plant production data for the complete year 2016.

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 39 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	35 kg/m³
Glass mineral wool weight (without facing weight)	8.4 kg
Surface	1 m²
Thickness	240 mm
Volume	0.1 m³
Facing	NA
Packaging Plastic sheet	0.0415 kg
Packaging Wooden pallet	0.177 kg
Packaging galvanized steel	NA

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)	52 % of the weight capacity
Loss of materials in site	2%
Packaging Wooden pallet	100% incinerated
Packaging Plastic sheet	40% recycled, 60% incinerated
Packaging galvanized steel	NA

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

External cullet input to the specified production site in 2016 is accounted for in the assessment.

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.

More information:

www.knaufinsulation.com
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Name and contact information of LCA practitioner:

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Environmental performance

Potential environmental impacts: 1 m² of Blown Glass Mineral Wool Supafil Max Frame with a thickness of 240 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.	6.15	0.49	0.608	0	0	0.0255	0	0.135	-0.203
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC 11 eq.	1.3E-011	8.08E-017	7.08E-011	0	0	4.21E-018	0	1.37E-013	-1.95E-014
Acidification potential (AP)	kg SO_2 eq.	0.0308	0.000389	0.000806	0	0	2.29E-005	0	0.000802	-0.000307
Eutrophication potential (EP)	kg PO_4^{3-} eq.	0.00253	8.75E-005	7.48E-005	0	0	5.28E-006	0	0.000109	-3.53E-005
Formation potential of tropospheric ozone (POCP)	kg C_2H_4 eq.	0.00176	6.56E-005	4.89E-005	0	0	-1.2E-007	0	6.31E-005	-2.75E-005
Abiotic depletion potential – Elements	kg Sb eq.	0.000513	3.77E-008	1.05E-005	0	0	1.96E-009	0	4.85E-008	-3.97E-008
Abiotic depletion potential – Fossil resources	MJ, net calorific value	93.6	6.63	2.6	0	0	0.345	0	1.75	-3.53

*: *[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].*

Use of resources: 1 m² of Blown Glass Mineral Wool Supafil Max Frame with a thickness of 240 mm.

PARAMETER		UNIT	TOTAL A1-A3	A4	A5	C2	C4	D*
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	17.6	0.386	0.663	0.0201	0.212	-0.604
	Used as raw materials	MJ, net calorific value	0	0	0	0	0	0
	TOTAL	MJ, net calorific value	17.6	0.386	0.663	0.0201	0.212	-0.604
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	112	6.65	3.26	0.346	1.82	-4.1
	Used as raw materials	MJ, net calorific value	0	0	0	0	0	0
	TOTAL	MJ, net calorific value	112	6.65	3.26	0.346	1.82	-4.1
Secondary material		kg	6.69		0.137	0	0	0
Renewable secondary fuels		MJ, net calorific value	6.03E-022	0	1.23E-023	0	0	-4.99E-025
Non-renewable secondary fuels		MJ, net calorific value	7.08E-021	0	1.45E-022	0	0	-5.86E-024
Net use of fresh water		m3	0.0175	0.000652	0.00172	3.4E-005	0.000345	-0.000765

Waste production and output flows: 1 m² of Blown Glass Mineral Wool Supafil Max Frame with a thickness of 240 mm.

Waste production

PARAMETER	UNIT	TOTAL A1-A3	A4	A5	C2	C4	D*
Hazardous waste disposed	kg	1.57E-007	3.72E-007	1.18E-008	1.93E-008	2.87E-008	-1.55E-009
Non-hazardous waste disposed	kg	0.189	0.000541	0.179	2.82E-005	8.41	-0.00138
Radioactive waste disposed	kg	0.00707	9.03E-006	0.000262	4.7E-007	2.48E-005	-0.000227

*: *[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].*

Output flows

PARAMETER	UNIT	TOTAL A1-A3	A4	A5	C2	C4	D*
Components for reuse	kg	0	0	0	0	0	0
Material for recycling	kg	0	0	0	0	0	0
Materials for energy recovery	kg	0	0	0.214	0	0	0
Exported energy, electricity	MJ	0	0	0.627	0	0	0
Exported energy, thermal	MJ	0	0	1.33	0	0	0

*: *[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].*

LCA interpretation

ENVIRONMENTAL IMPACTS

All impact categories except the ADPE and the 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) is clearly dominated by the production, mostly due to energy consumption (electricity and natural gas).

The Ozone layer Depletion Potential (ODP) seems highly influenced by the installation step, mostly due to plastics incineration 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 and nitrogen oxides.

The Eutrophication Potential (EP) is significantly influenced by production due to emissions from curing oven, furnace and other unit processes.

The Photochemical Ozone Creation Potential (POCP) is dominated by 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 have also a non-negligible impact. The installation stage has a “positive” contribution thanks to energy recovery from incineration of a percentage of plastic packaging and the avoidance new plastic production thanks to a percentage of recycling plastics 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

International EPD® System

General Programme Instructions of the International EPD® System. Version 2.5.
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ISO 14025
DIN EN ISO 14025:2011-10: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

EN 15804
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GaBi 9.2
GaBi 9.2: Software and database for life cycle engineering. LBP, University of Stuttgart and PE INTERNATIONAL AG, 2018.

EN 14064 - Part1
EN 14064:2010 Thermal insulation products for buildings - In-situ formed loose fill mineral wool products - Part 1: Specification for the loose fill products before installation

EN 14064 - Part2
EN 14064:2010 Thermal insulation products for buildings - In-situ formed loose fill mineral wool products - Part 2: Specification for the installed products

EN 1602
EN 1602: 2013 Thermal insulating 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 13501-1
EN 13501-1: 2009 Fire classification of construction products and building elements - Part 1: Classification using test data from reaction to fire tests.

DIN 4102 / T17
DIN 4102 / T17: 1990 Fire behaviour of building materials and elements; determination of melting point of mineral fibre insulating materials; concepts, requirements and testing.

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