ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	**Knauf Insulation**
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-KIN-20140162-CBB1-EN
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Issue date	22.09.2014
Valid to	21.09.2019

Glass Mineral Wool 040 unfaced rolls

Classic 040, TI 140, TI 140 Decibel, Naturoll 040, EXPERT LRR 040, EXPERT LFR 040, Ekoroll LFR 040

with ECOSE® Technology

Knauf Insulation

www.bau-umwelt.com / https://epd-online.com

General Information

Knauf Insulation

Programme holder

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10178 Berlin
Germany

Declaration number

EPD-KIN-20140162-CBB1-EN | ECO-00000003

This Declaration is based on the Product Category Rules:

Mineral insulating materials, 07.2014
(PCR tested and approved by the independent expert committee)

Issue date

22.09.2014

Valid to

21.09.2019

Prof. Dr.-Ing. Horst J. Bossenmayer
(President of Institut Bauen und Umwelt e.V.)

Dr. Burkhart Lehmann
(Managing Director IBU)

GMW 040 unfaced rolls with ECOSE

Owner of the Declaration

Knauf Insulation
rue E. Franqui, 7
1435 Mont-Saint-Guibert
Belgium

Declared product / Declared unit

1 m³ of GMW 040 rolls

Scope:

GMW (Glass Mineral Wool) 040 rolls are unfaced insulation products. They comply with the requirements of /EN 13162/. The thickness is ranging from 40 mm to 300 mm. The manufacturing company is Knauf Insulation - plants Krupka (Czech Republic), Lannemezan (France) and Visé (Belgium). Indicators are calculated using 2013 data.The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

Verification

The CEN Norm EN 15804 serves as the core PCR
Independent verification of the declaration according to ISO 14025
☐ internally ☒ externally

Matthias Schulz
(Independent tester appointed by SVA)

Product

Product description

Knauf Insulation manufactures glass mineral wool insulation products such as Classic 040, TI 140, TI 140 Decibel, Naturoll 040, EXPERT LRR 040, EXPERT LFR 040, Ekoroll LFR 040 with ECOSE® Technology. They are available in the form of slabs or rolls, and also boards. The density for glass mineral wool ranges from 10 to 85 kg/m³. In general, glass mineral wool consists of >= 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 <= 7.5% are 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.
GMW 040 unfaced rolls are products used for their thermal, acoustical and fire characteristics. A representative product out of a particular group of produts was selected for the calculation.

For the placing on the market of construction products in the European Union and EFTA /Regulation (EU) No 305/2011/ applies. The products need a Declaration of performance (DoP) taking into consideration the harmonized product standard /EN 13162/ and the CE-mark /Regulation (EC) No 765/2008/.

Application

Main applications for GMW 040 unfaced roll are in pitched roofs, partition walls and timber frames. For the applications and use national regulations apply, in Germany the /*Allgemeine bauaufsichtliche Zulassung Z-23.15-1461/ (building inspection approval) issued by the Deutsches Institut für Bautechnik (DIBt), Berlin*.

Technical Data

GMW 040 un faced rolls and their technical characteristics meet a number of technical requirements. The most important ones are summarized in the table here below, which also includes references to testing methods.

Technical characteristics

Name	Value	Unit
Thermal conductivity /EN 12667/	0.04	W/(mK)
Water vapour diffusion resistance factor /EN 13162/	1	-
Gross density /EN 1602/	10.5 - 12.5	kg/m³
Longit. air-diffusion resist. /EN 29053/	not relevant	kNs/m^4
Water absorption Wp /EN 1609/	< 1	kg/m²
Water absorption Wlp /EN 12087/	< 3	kg/m²

Reaction to fire /EN 13501-1/	A1	-
Specific heat capacity /EN ISO 10456/	850	J/kgK
Acoustic absorption	not relevant	
Compression strength/resistance	not relevant	

Base materials / Ancillary materials
GMW is an insulation material of mostly inorganic origin intended for thermal and acoustic insulation, as well as for fire prevention in construction and industry. Raw materials used in the production of GMW are sand, limestone, soda ash and a high level of recycled glass (up to 80%). A bio-based binder, ECOSE, is spread on the fibers which polymerisation contributes to fix the product dimensions. The cured binder bonds the fibres together thus providing the necessary mat stability and mechanical strength.

Reference service life
The RSL or durability of GMW 040 unfaced rolls is as long as the lifetime of the building in which it is used.

LCA: Calculation rules

Declared Unit
The declared unit is 1 m³ of glass mineral wool. The density used for the calculation of the LCA is 11.5 kg/m³.

Declared unit

Name	Value	Unit
Declared unit	1	m^3
Gross density	11.5	kg/m^3
Conversion factor to 1 kg	0.087	-

System boundary
The system boundary of the EPD follows the modular approach defined by /EN 15804/.
The type of EPD is cradle-to-gate-with options.

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 their 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**.

The construction process stage includes:
- A4 - transport to the construction site and
- A5 - installation into the building.

The transport to the building site (A4) is included in the LCA calculation. For GMW 040 unfaced rolls, the average transport distance is assumed to be 600 km with a truck capacity utilization of 70%.
Module A5 has neither been included nor declared in this EPD, since it depends on the application, and method or tools used which can be very diverse, as GMW 040 unfaced rolls are used in different applications. Therefore, the treatment of the packaging waste after the installation of the product has not been considered.

The use stage.
Because they are specific for the building, its use and location, none of the modules related to building mintenanceandoperation (B1 to B7) have been taken into account in this EPD.

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, but only modules C2 and C4 are reported, as they are considered the most relevant scenarios for glass mineral wool products.
Although glass mineral wool products from Knauf Insulation are partly recycled at end-of-life, there is not yet an established collection system and as such the assumption chosen in this study,100% landfilled after the use phase, is the most conservative approach.

Module D includes re-use, recovery and/or recycling potentials.
According to /EN 15804/, 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.
No benefits and loads are considered so module D is not included in the background model.

Comparability
Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to /EN 15804/ and the building context, respectively the product-specific characteristics of performance, are taken into account.

LCA: Scenarios and additional technical information

The following technical information can be used for the development of specific scenarios in the context of a building assessment.

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel	0.0025	l/100km
Transport distance	600	km
Capacity utilisation (including empty runs)	70	%
Gross density of products transported	11.5	kg/m^3

Reference service life

Name	Value	Unit
Reference service life	50	a

End-of-life (C1 - C4)

Name	Value	Unit
Landfilling	11.5	kg
Transport distance	50	km
Capacity utilization	50	%

LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARYS
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	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	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	MND	X	MND

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m³ GMW 040 unfaced rolls

Parameter	Unit	A1 - A3	A4	C2	C4
Global warming potential	[kg CO_2-Eq.]	11.400	0.642	0.038	0.156
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	9.300E-9	3.070E-12	1.830E-13	2.120E-12
Acidification potential of land and water	[kg SO_2-Eq.]	1.080E-1	1.770E-3	1.160E-4	9.910E-4
Eutrophication potential	[kg $(PO_4)^{3-}$- Eq.]	1.840E-2	3.640E-4	2.460E-5	1.360E-4
Formation potential of tropospheric ozone photochemical oxidants	[kg Ethen Eq.]	5.940E-3	-4.540E-4	-3.300E-5	9.300E-5
Abiotic depletion potential for non fossil resources	[kg Sb Eq.]	7.150E-4	2.410E-8	1.430E-9	5.840E-8
Abiotic depletion potential for fossil resources	[MJ]	184.000	8.850	0.527	2.050

RESULTS OF THE LCA - RESOURCE USE: 1 m³ GMW 040 unfaced rolls

Parameter	Unit	A1 - A3	A4	C2	C4
Renewable primary energy as energy carrier	[MJ]	23.700	-	-	-
Renewable primary energy resources as material utilization	[MJ]	0.000	-	-	-
Total use of renewable primary energy resources	[MJ]	23.700	0.349	0.021	0.177
Non renewable primary energy as energy carrier	[MJ]	230.000	-	-	-
Non renewable primary energy as material utilization	[MJ]	16.200	-	-	-
Total use of non renewable primary energy resources	[MJ]	246.000	8.870	0.528	2.140
Use of secondary material	[kg]	9.830	-	-	-
Use of renewable secondary fuels	[MJ]	0.000	0.000	0.000	0.000
Use of non renewable secondary fuels	[MJ]	0.000	0.000	0.000	0.000
Use of net fresh water	[m³]	7.750E-2	2.460E-4	1.460E-5	-8.170E-3

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m³ GMW 040 unfaced rolls

Parameter	Unit	A1 - A3	A4	C2	C4
Hazardous waste disposed	[kg]	1.200E-2	2.020E-5	1.200E-6	9.610E-5
Non hazardous waste disposed	[kg]	4.740E-1	1.120E-3	6.640E-5	1.150E+1
Radioactive waste disposed	[kg]	2.450E-2	1.160E-5	6.920E-7	3.740E-5
Components for re-use	[kg]	-	-	-	-
Materials for recycling	[kg]	-	-	-	-
Materials for energy recovery	[kg]	-	-	-	-
Exported electrical energy	[MJ]	-	-	-	0.000
Exported thermal energy	[MJ]	-	-	-	0.000

INTERPRETATION

ENVIRONMENTAL IMPACT

All impacts category except the abiotic ADPe and ODP are dominated by the production (A3). This is due to the consumption of energy (electricity and thermal energy) during the production of glass mineral wool products.
The **ADPe** (non fossil resources) is dominated by raw material production.
The **GWP** is dominated by the production, mostly due to energy consumption (gas and electricity). The raw materials and the transport to site also have some impact. The binder (bio-based) has overall no impact.
The **ODP** is influenced by raw materials, production and packaging.
The **AP** is dominated by the production due to the emissions related to the processes and the energy consumption. Mostly, the impact refers to emissions to air: sulphur dioxide, ammonia and nitrogen oxides.
The **EP** is significantly influenced by the production due to emissions from the furnace, curing oven, electricity consumption, and binder production.
The **POCP** is particularly dominated by the production (emissions in curing oven, electricity consumption). The results from the transport are negative due to the NO emissions; NO counteracts the POCP.

RESOURCES USE

The primary energy demand from non-renewable resources 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. The renewable energy demand is dominated by the binder (bio-based), the production (electricity mix) and the packaging (wood pallets).

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