

ENVIRONMENTAL PRODUCT DECLARATION

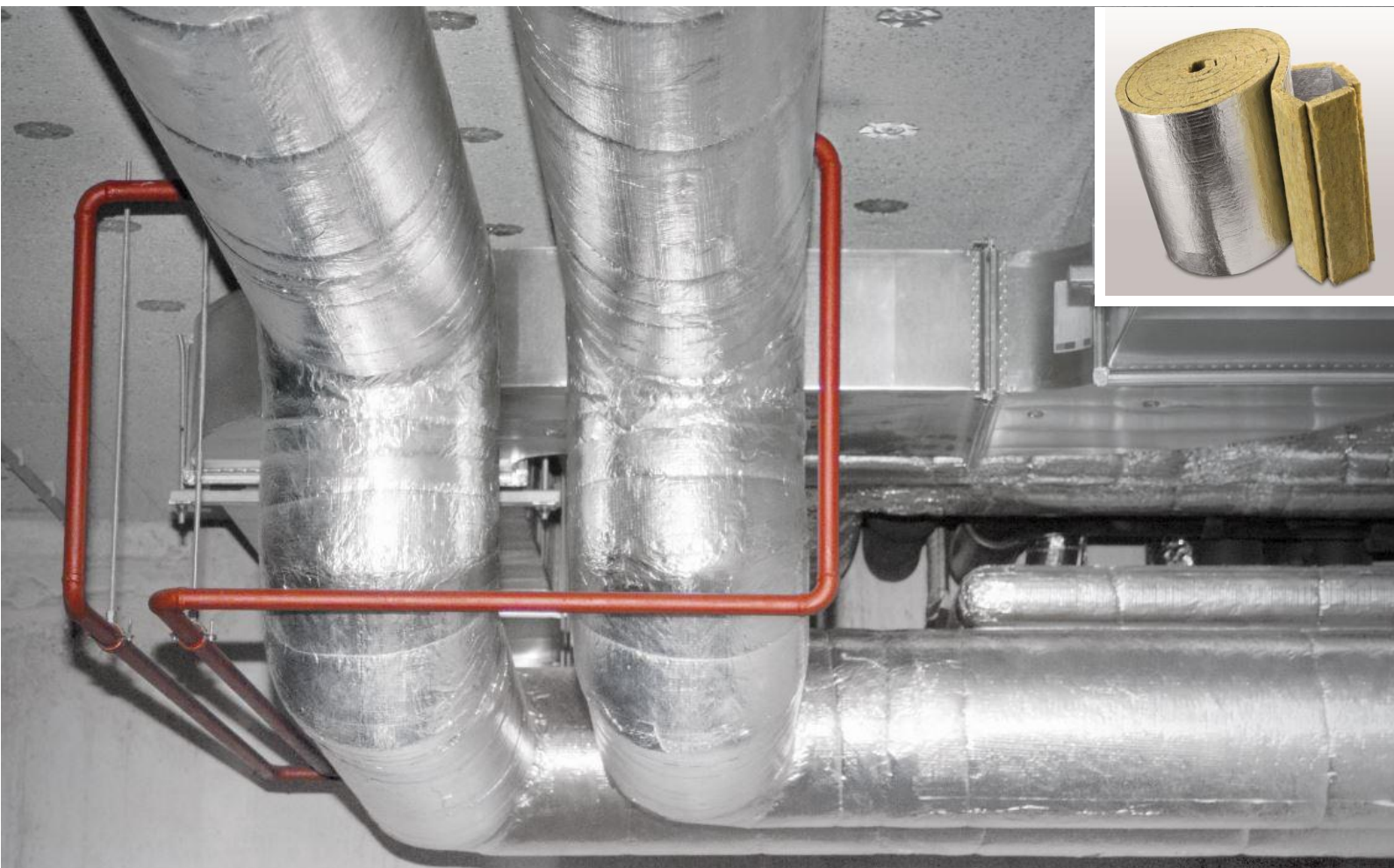
as per ISO 14025 and EN 15804

Owner of the Declaration	Knauf Insulation
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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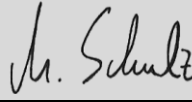
Lamella Mat Forte LMF AluR
Rock Mineral Wool

Knauf Insulation

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



General Information

<p>Knauf Insulation</p> <hr/> <p>Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany</p> <hr/> <p>Declaration number EPD-KIN-20150029-CBB1-EN</p> <hr/> <p>This Declaration is based on the Product Category Rules: Mineral insulating materials, 07.2014 (PCR tested and approved by the SVR)</p> <hr/> <p>Issue date 22.04.2015</p> <hr/> <p>Valid to 21.04.2020</p> <hr/> <p></p> <hr/> <p>Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)</p> <hr/> <p></p> <hr/> <p>Dr. Burkhard Lehmann (Managing Director IBU)</p>	<p>Lamella Mat Forte LMF AluR</p> <hr/> <p>Owner of the Declaration Knauf Insulation rue E. Franqui,7 1435 Mont-Saint-Guibert Belgium</p> <hr/> <p>Declared product / Declared unit 1 m² Lamella Mat Forte LMF AluR</p> <hr/> <p>Scope: The declared insulation product is Lamella Mat Forte LMF AluR faced of 1 m² with 30 mm thickness. It is medium density, non-combustible rock mineral wool roll with a tear resistant glass-fiber-reinforced aluminium foil. It complies with the requirements of /EN 14303/. The manufacturing company is Knauf Insulation - plant Novi Marof (Croatia). 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.</p> <hr/> <p>Verification</p> <table border="1"> <tr> <td colspan="2">The CEN Norm /EN 15804/ serves as the core PCR</td> </tr> <tr> <td colspan="2">Independent verification of the declaration according to /ISO 14025/</td> </tr> <tr> <td><input type="checkbox"/> internally</td> <td><input checked="" type="checkbox"/> externally</td> </tr> </table> <hr/> <p></p> <hr/> <p>Matthias Schulz (Independent verifier appointed by SVR)</p>	The CEN Norm /EN 15804/ serves as the core PCR		Independent verification of the declaration according to /ISO 14025/		<input type="checkbox"/> internally	<input checked="" type="checkbox"/> externally
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Product

Product description

Knauf Insulation manufactures rock mineral wool insulation products. They are available in the form of pipe sections, lamellas, mats, slabs or boards, and also rolls. The density for rock mineral wool ranges from 25 to 200 kg/m³. In terms of composition, inorganic rocks are the main components (typically 98%), with a remaining fraction of organic content which is generally a thermosetting resin binder. The binder typically contains less than 4% and/or around 2%. The inorganic part is made of volcanic rocks, typically basalt, also dolomite and with an increasing proportion of recycled material in the form of briquettes, a mix of stone wool scrap and cement.

With their low thermal conductivity, lamella mats are especially suitable for thermal insulation. They also have positive acoustic properties. The orientation of rock mineral wool lamellas ensures good compressive strength, while keeping flexibility and ease of handling. It is available in thicknesses from 20mm to 120mm and widths of 500 or 1000mm. The product is faced with glass-fiber reinforced aluminum.

For the placing on the market of construction products in the European Union/EFTA (with the exception of

Switzerland), the Regulation/ (EU) No 305/2011/ applies. The products need a Declaration of Performance taking into consideration the harmonized product standard /EN 14303/ and the /CE-mark/. For the applications and use, national regulations apply, in Germany the /Allgemeine bauaufsichtliche Zulassung Z-23.15-1475/ (building inspection approval).

Application

The main application for Lamella Mat Forte LMF AluR is thermal insulation for heating, ventilation, air conditioning (HVAC) and technical equipment applications such as: pipe and duct works, tanks and heat storages. . For these applications, the product provides excellent thermal conductivity and is also a noise buffer.

Technical Data

The rock mineral wool lamella mat and its technical characteristics meet a number of technical requirements. The most important ones are summarized in the table below, which also includes references to testing methods.

Technical characteristics

Name	Value	Unit
Thermal conductivity /EN 12667/	0.135	W/(mK)
Water vapour diffusion resistance factor /EN 12086/	NA	-
Water vapor diffusion equivalent air layer thickness /EN 13469/	1000	m
Sound absorption coefficient	NA	%
Gross density /EN 13470/	36 - 44	kg/m ³
Compressive strength	NA	N/mm ²
Reaction to fire /EN 13501-1/	A2-s1,d0	-
Melting point /DIN 4102 / T17/	> 1000	°C
Maximum service temperature /EN 14706/	300	°C
Water absorption /AGI Q 132/	<=1	kg/m ²
AS-Quality /EN 13468/	<=10	mg/kg

Base materials / Ancillary materials

The main raw materials are volcanic rocks (60-70%), briquettes (up to 30%), the remaining are dolomite and slags. The briquette is made of rock mineral wool waste (internal or external) and cement. Additionally, coke is also added in the cupola as an energy carrier. Further down the manufacturing line, a binder (thermosetting resin) is spread on the fibers which polymerization contributes to fix the products dimensions and mechanical properties.

Reference service life

The RSL or durability of Lamella Mat Forte LMF AluR is as long as the lifetime of the building equipments in which it is used.

LCA: Calculation rules

Declared Unit

The declared unit is 1 m² of Rock Mineral Wool Faced Lamella Mat with a thickness of 30 mm . The density used for the calculation of the LCA is 40 kg/m³.

Declared unit

Name	Value	Unit
Gross density	40	kg/m ³
Surface	1	m ²
Weight	1,2	Kg
Conversion factor to 1 kg	0,833	-

System boundary

The system boundary of the EPD follows the modular approach defined by the /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 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**.

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 the Lamella Mat Forte LMF AluR product, the average transport distance is assumed to be 1100 km with a truck capacity utilization of 15%.

The treatment of the packaging waste after the installation of the product (A5) has been considered. The product losses during the construction process stage have not been directly taken into account into this LCA as this depends of the installer experience and represents very low impacts (less than 1%). If relevant, the losses can be taken into account by increasing the production impacts A1-A3 with the loss percentage and transfer the additional impact to A5.

The use stage.

Because they are specific for the building, its use and location, none of the modules related to the building fabric (B1-B5) neither the operation of the building (B6 and 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 rock mineral wool products.

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

Module D includes reuse, 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.

Benefits considered in module D mainly originate from packaging incineration.

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 software utilized for setting up the LCA model and for the calculation of indicator results, is /GaBi version 6/ developed by PE International.

The following technical information forms the basis for declared modules or 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	0.0016	l/100km
Transport distance	1100	km
Capacity utilisation (including empty runs)	15	%
Gross density of products transported	40	kg/m ³

Installation into the building (A5)

Name	Value	Unit
Output substances following waste treatment on site : wooden and plastics packaging	0.6978	kg

Reference service life

Name	Value	Unit
Reference service life	50	a

End of life (C2 - C4)

Name	Value	Unit
Landfilling	1.2	kg
Transport distance	50	km
Capacity utilization	50	%

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Name	Value	Unit
wooden pallet incinerated	0.63	Kg
plastic foil incinerated	0.0678	Kg

LCA: Results

Environmental impacts associated with losses from installation of the product in A5 are not included in the LCA results. This is due to the fact that installation losses vary depending on installation practice and building project specifics. In order to include the potential environmental impacts associated with installation losses, a factor can be applied to the LCA results. E.g. installation losses = 1%, multiplication of EPD results with 1.01.

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 BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement ¹⁾	Refurbishment ¹⁾	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	MND	MND	MND	MND	MND	MND	MND	MND	X	MND	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m² LMF AluR

Parameter	Unit	A1-A3	A4	A5	C2	C4	D
Global warming potential	[kg CO ₂ -Eq.]	1.82E+0	3.53E-1	5.29E-1	4.43E-3	1.74E-2	-2.14E-1
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	3.92E-9	1.45E-12	3.73E-11	1.82E-14	2.88E-13	-6.82E-11
Acidification potential of land and water	[kg SO ₂ -Eq.]	1.23E-2	1.12E-3	5.92E-5	2.87E-5	1.08E-4	-5.44E-4
Eutrophication potential	[kg (PO ₄) ³⁻ -Eq.]	1.45E-3	2.80E-4	1.08E-5	7.35E-6	1.55E-5	-3.75E-5
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	9.08E-4	-3.56E-4	5.25E-6	-1.18E-5	1.05E-5	-4.58E-5
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	7.30E-6	1.38E-8	4.21E-9	1.73E-10	6.17E-9	-1.91E-8
Abiotic depletion potential for fossil resources	[MJ]	2.70E+1	4.87E+0	9.67E-2	6.11E-2	2.28E-1	-3.04E+0

RESULTS OF THE LCA - RESOURCE USE: 1 m² LMF AluR

Parameter	Unit	A1-A3	A4	A5	C2	C4	D
Renewable primary energy as energy carrier	[MJ]	6.84	-	-	-	-	-
Renewable primary energy resources as material utilization	[MJ]	0.00	-	-	-	-	-
Total use of renewable primary energy resources	[MJ]	6.84E+0	2.73E-1	1.06E-2	3.42E-3	2.28E-2	-3.44E-1
Non-renewable primary energy as energy carrier	[MJ]	2.84E+1	-	-	-	-	-
Non-renewable primary energy as material utilization	[MJ]	1.01	-	-	-	-	-
Total use of non-renewable primary energy resources	[MJ]	2.94E+1	4.88E+0	1.16E-1	6.13E-2	2.37E-1	-3.65E+0
Use of secondary material	[kg]	0.00	-	-	-	-	-
Use of renewable secondary fuels	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00
Use of non-renewable secondary fuels	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00
Use of net fresh water	[m ³]	8.12E-3	4.78E-4	1.21E-3	6.01E-6	4.39E-5	-6.96E-4

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES:

1 m² LMF AluR

Parameter	Unit	A1-A3	A4	A5	C2	C4	D
Hazardous waste disposed	[kg]	3.51E-4	2.33E-6	3.19E-8	2.91E-8	7.51E-8	-1.00E-6
Non-hazardous waste disposed	[kg]	5.88E-1	7.00E-4	1.09E-2	8.73E-6	1.29E+0	-1.03E-3
Radioactive waste disposed	[kg]	9.04E-4	6.72E-6	7.51E-6	8.38E-8	3.63E-6	-2.47E-4
Components for re-use	[kg]	-	-	-	-	-	-
Materials for recycling	[kg]	-	-	-	-	-	-
Materials for energy recovery	[kg]	-	-	-	-	-	-
Exported electrical energy	[MJ]	-	-	-	-	0.00	0.00
Exported thermal energy	[MJ]	-	-	-	-	0.00	0.00

INTERPRETATION

RESOURCES USE

The primary energy demand from non-renewable resources is dominated by the production of rock mineral wool products (especially due to the energy carrier, coke, and energy consumption), the aluminum facing and the thermosetting resin binder. The renewable energy demand is dominated by the production, mostly due to electricity consumption, and the wood and cardboard packaging.

ENVIRONMENTAL IMPACT

Every impact category, except the Abiotic Depletion Potential elements, is dominated by the production. This is due to the consumption of energy (electricity and thermal energy) during the production of rock mineral wool products.

The **Abiotic Depletion Potential element (ADPe)** is dominated by the binder (57%), followed by the cement of the briquettes (18%).

The **Global Warming Potential (GWP)** is dominated by the production, mostly due to CO₂ emissions from cupola and energy consumption. The binder as raw material represents about 10% and the aluminum facing about 20%.

The **Ozone Depletion Potential (ODP)** is most notably influenced by the binder and the packaging.

The **Acidification Potential (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: 75% from sulphur dioxide and 20% from nitrogen oxides.

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

The **Potential Ozone Photochemical Oxidants (POCP)** is particularly dominated by the production (emissions in the cupola furnace and other unit processes). The results from the transport are negative due to the NO emissions; NO counteracts the POCP.

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