ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	DEUTSCHE ROCKWOOL GmbH & Co. KG
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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Valid to	29.08.2029

ROCKWOOL stone wool insulation (low bulk density range)

DEUTSCHE ROCKWOOL GmbH & Co. KG

Institut Bauen und Umwelt e.V.

ECO PLATFORM EPD VERIFIED

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1. General Information

DEUTSCHE ROCKWOOL GmbH & Co. KG

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-DRW-20240315-IBC3-EN

This declaration is based on the product category rules:

Mineral insulating materials, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

30.08.2024

Valid to

29.08.2029

Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)

Florian Pronold
(Managing Director Institut Bauen und Umwelt e.V.)

ROCKWOOL stone wool insulation (low bulk density range)

Owner of the declaration

DEUTSCHE ROCKWOOL GmbH & Co. KG
Rockwool Straße 37-41
45966 Gladbeck
Germany

Declared product / declared unit

This EPD describes the environmental impacts of 1 m³ unfaced or uncoated stone wool insulation material from DEUTSCHE ROCKWOOL GmbH & Co. KG in the low bulk density range up to 60 kg/m³, with a declared bulk density of 38 kg/m³. In addition, the environmental impacts of nine facings based on 1 m² are listed in appendix 1.

Scope:

This Environmental Product Declaration refers to a declared unit of 1 m³ unfaced or uncoated, resin-bonded stone wool from ROCKWOOL in the low bulk density range (≤ 60 kg/m³).
It is produced at the sites in Gladbeck, Neuburg and Flechtingen (Germany) for which the production data for the year 2022 were collected and weighted according to the mass-based production quantity. The declared average considers the total amount of stone wool in the defined bulk density range produced at the three sites. The averaging results in an average bulk density of 38 kg/m³ for stone wool insulations in the low bulk density range.
The environmental impacts of the facings can be found in appendix 1. The life cycle assessment therefore represents 100 % of the stone wool produced by ROCKWOOL. The products represented by this EPD are listed in appendix 2.

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.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025:2011
☐ internally ☒ externally

Angela Schindler,
(Independent verifier)

2. Product

2.1 Product description/Product definition

Stone wool is a non-combustible insulating material consisting mainly of amorphous fibres obtained from a silicate melt.

The stone wool insulation materials described in this declaration are produced in the form of rolls, boards, mats, lamella mats, pipe sections, moulded parts as well as loose-fill insulation and blowing wool in the low bulk density range (up to 60 kg/m³). The ready-made products are supplied in thicknesses between 10 mm and 400 mm.

For certain applications, the insulation materials are provided with a functional facing or coating on one or both sides. The environmental effects of the facings and coatings are shown in appendix 1 on the basis of 1 m².

For the placing on the market of the product in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) *Regulation (EU) No. 305/2011 (CPR)* applies. The products require a declaration of performance taking into account *EN 13162* (Thermal insulation products for buildings), *EN 14303* (Thermal insulation products for building equipment and industrial installations) or *EN 14064-1* (Thermal insulation products for buildings - In-situ formed loose-fill mineral wool (MW) products - Part 1: Specification for the loose-fill products before installation) in combination with *EAD 040729-00-1201* (Thermal insulation made of loose-fill mineral wool) and the CE marking. The respective national regulations apply to its use.

2.2 Application

Stone wool insulation materials are used in buildings and industrial plants for thermal insulation as well as noise and fire protection. The main application areas of the products declared in this EPD are:

- All areas of application according to *DIN 4108-10* for wall, ceiling and roof applications with the specified requirements regarding thermal and sound insulation and the mechanical properties
- Blowing wool and loose-fill insulation
- Technical insulation and building services (e.g. insulation of pipes for ventilation, heating and hot water, district heating pipelines, boilers and equipment)
- Fire protection elements and industrial applications (e.g. air-conditioning ducts, fire protection doors, prefabricated components, chimney systems, cable penetration sealing)

2.3 Technical Data

Technical data

Name	Value	Unit
Bulk density	≤ 60	kg/m3
Thermal conductivity according to EN 13162, EN 140641, EN 14303 or EAD 040729-00-1201	0.032 - 0.05	W/(mK)
Calculation value for thermal conductivity according to DIN 4108-4	0.033 - 0.051	W/(mK)
For technical insulation data according to EN 14303	please refer to product data sheets	
For faced or coated products, the respective data sheets must be observed.		
Water vapour diffusion equivalent air layer thickness	µ x component thickness in [m]	m
Sound absorption coefficients αS depending on the frequency are to be found in the data sheets for the relevant products.		
Formaldehyde emissions according to EN 16516	<= 120	µg/m^3
Compressive strength / compressive stress according to EN 13162, EN 14303 or EN 14064-1	0.5 - 5	kPA
Fire behaviour of unfaced or uncoated stone wool according to EN 13501-1	A1	
Fire behaviour of faced or coated stone wool	please refer to product data sheets	
Continuous glowing combustion	does not show propensity for continuous glowing combustion according to EN 16733	

The product-specific technical data can be found in the respective product data sheets.

The performance data of the products correspond to the respective declaration of performance with regard to their essential characteristics in accordance with the applicable harmonised standard:
- *EN 13162*, Thermal insulation products for buildings – Factory-made mineral wool (MW) products
- *EN 14303*, Thermal insulation products for building equipment and industrial installations – Factory-made mineral wool (MW) products – Specification
- *EN 14064-1*, Thermal insulation products for buildings – In-situ formed loose-fill mineral wool (MW) products – Part 1: Specification for the loose-fill products before installation in combination with *EAD 040729-00-1201*, Thermal insulation made of loose-fill mineral wool

2.4 Delivery status

The stone wool insulation materials described in this declaration are manufactured in the form of rolls, boards, mats, lamella mats, pipe sections, moulded parts as well as loose wool (stuffing wool) and blowing wool in the low bulk density range (up to 60 kg/m³). The products are supplied in thicknesses between 10 mm and 400 mm, for example as pressure-resistant boards, impact-resistant two-layer boards or highly compressible felts and rolls.

2.5 Base materials/Ancillary materials

Stone wool consists mainly of naturally occurring stones such as diabase, basalt, dolomite (max. 50 mass%) and moulded bricks (max. 100 mass%). The moulded bricks contain cement, production residues, recycled stone wool waste (construction site cuttings and dismantling waste) and other (secondary) raw materials.

The cross-linking of the fibres is achieved by using up to 5.5 % binder (urea-modified phenol-formaldehyde resin). Furthermore, small amounts (< 0.5 %) of adhesive agents and mineral oil are used as hydrophobising agents.

The base and auxiliary materials of the facings are listed below. The weights shown are averaged values.

facing/coating	g/m² (one-sided)	components
glass fleece	100	glass fibres, binder
glass silk	100	glass fibres, binder
mineral fleece	346	glass fibres, mineral based primer, binder
mineral based primer	110	silicate emulsion
aluminium foil resp. aluminium sandwich foil	94.8	aluminium foil and – if necessary - glass scrims and PE film
facing for Masterrock (Toprock)	283	PP fibres, adhesive, siliconised PP film, acrylate
fiberglass reinforced cementitious coating	5,250	cement, gypsum, water, aggregates, PE, glass fibres
PE foil	20	PE foil
wired mat	302	galvanised steel or stainless steel

Co-products from other industries and secondary materials are used in production. The average proportion of reclaimed materials is 20.52 % and is broken down into:
- "Pre-consumer" (secondary materials without internal waste): 6.17 %
- "Post-consumer" (e.g. construction waste and demolition waste): 0.01 %
- Co-products' (including processed slag): 14.34 %

The product/article/at least one partial article contains substances listed in the ECHA Candidate List (status: 16.01.2020) exceeding 0.1 percentage by mass: no.

This product/article/at least one partial article contains other CMR substances in categories 1A or 1B which are not on the ECHA Candidate List, exceeding 0.1 percentage by mass: no.

Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the Biocidal Products Regulation): no.

2.6 Manufacture

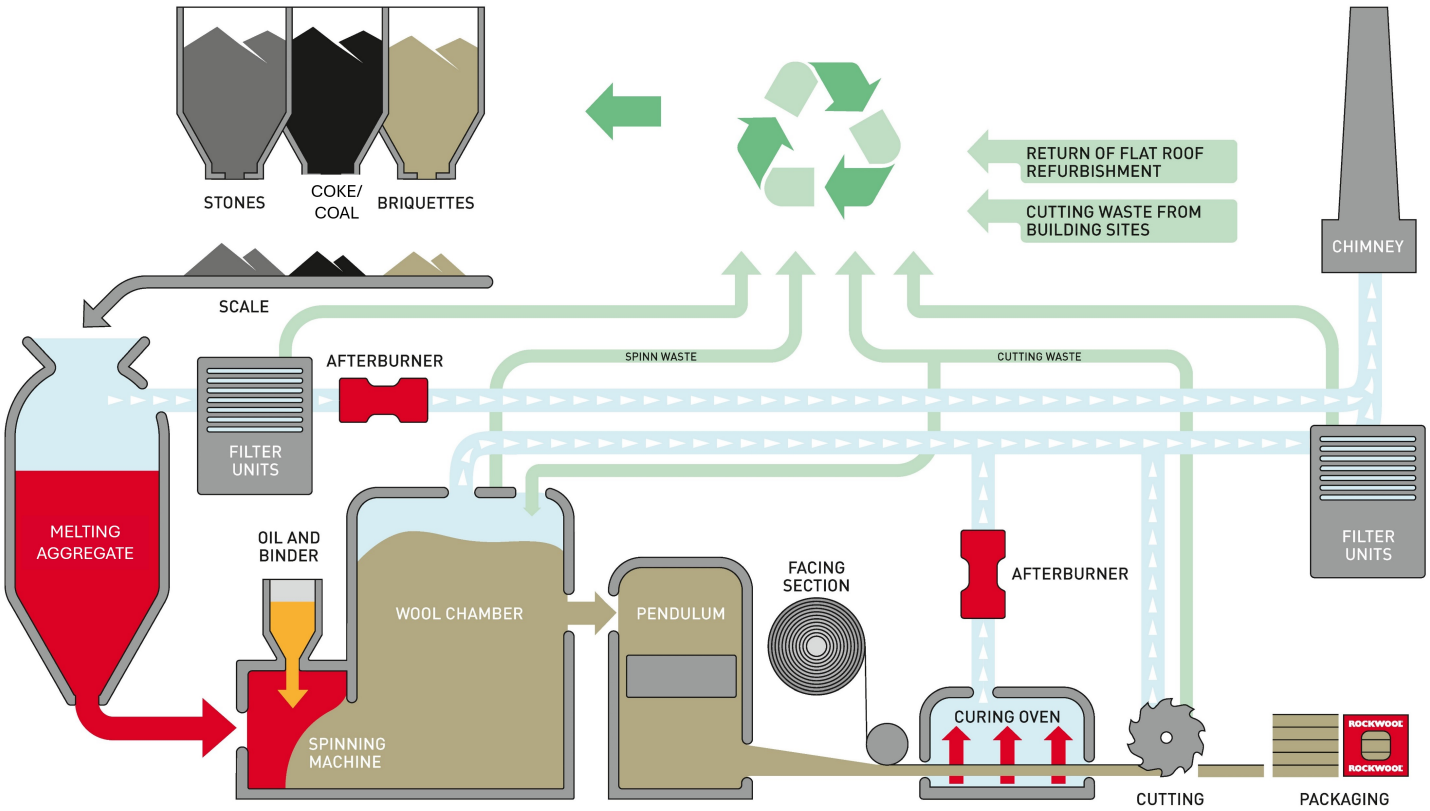
For production, the required quantities of the raw materials are weighed, mixed and fed into a melting unit. The raw materials are melted at temperatures of approx. 1,400-1,500 °C.

A jet of the molten liquid then hits rapidly rotating metal rollers and is spun into fibres.

To ensure dimensional stability, dust reduction and hydrophobisation, the fibres are sprayed with an aqueous solution of binder, mineral oil and bonding agent and then placed on conveyor belts under negative pressure. Optionally, laminations or coatings can then be applied. (The corresponding environmental impacts are listed in Appendix 1).

The binder is cured above 200 °C in a continuous curing oven. The structure and density of the product can thereby be adapted to the exact application requirements.

The stone wool is cut to the desired size and shape. The finished products are packaged and prepared for despatch. Any stone wool left over from the production process is fed back into the production process.



Quality assurance:
- All products according to *RAL-GZ 388*
- Factory production control and third-party monitoring in accordance with European regulations
- KEYMARK according to *Insulation KEYMARK Scheme Rules 2.1*; for technical insulation according to *VDI 2055* according to *Insulation KEYMARK Scheme Rules 2.1* and *AGI-Q 132*
- EUCEB
- Quality management system according to *ISO 9001*

2.7 Environment and health during manufacturing

Since 01.06.2000, a ban on the production, placing on the market and use of mineral wool insulation materials which do not fulfil the exemption criteria of Annexe II to § 16 Paragraph 2 of the Ordinance on Hazardous Substances (*GefStoffV*) and Appendix 1 to § 3 of the Chemicals Prohibition Ordinance (*ChemVerbotsV*) has been in force in Germany.
At the same time, the exemption criteria of Note Q of the *CLP Regulation* (EC) No 1272/2008 must be fulfilled. Regarding the production, the regulations of the Technical Instructions on Air Quality
Control (*TA Luft*) apply.

During the entire manufacturing process, no health protection measures exceeding the legally defined health and safety measures for commercial enterprises are required.

ROCKWOOL has an environmental management system certified according to *ISO 14001* and attaches high importance to the environmental friendliness of its production facilities:
- The exhaust air produced during manufacture is cleaned by various filter systems and partially treated in an afterburner system. Heat exchangers are used to recover the energy for the production process. Separated dust is reused as raw material.
- Production-related waste water is treated internally and returned to the production process
- Noise protection measurements have shown that all values determined inside and outside the production facilities are below the requirements which apply in Germany. Noise-intensive parts of the facility, such as the fiberizing process, are encapsulated accordingly with constructional measures.

2.8 Product processing/Installation

The recommendations on product usage depend on the product and system and are described in the brochures, technical data sheets and the Safe Use Instruction Sheet (SUIS) and are available at **www.rockwool.de**.

The occupational health and safety measures according to section 3 of the instructions 'Activities with mineral wool insulation materials (glass wool, stone wool)' (*DGUV Information 213-031*) must be observed:

- Prefer prefabricated mineral wool insulation materials. These can either be supplied by the manufacturer or cut to size centrally at the construction site.
- Unpack insulation materials only in the workplace.
- Do not throw the material.
- Do not use fast-running motor-driven saws without dust extraction.
- Cut on a solid surface with a knife or scissors, do not tear.
- Ensure good ventilation at the workplace. Avoid raising dust.
- Do not sweep dry or blow off dust and dust deposits with compressed air but pick them up with an industry-standard vacuum cleaner (category M) or wet-clean them.
- Keep the workplace clean and clean regularly. Collect offcuts and waste immediately in suitable containers, e.g. bins or plastic bags.
- Wear loose-fitting, closed work clothing and protective gloves made of leather, nitrile-coated cotton or similar.
- Rinse off building dust with water on finishing work.
- When working outdoors where dust is generated, ensure that the working method is low-dust, e.g. by using covered disposal containers with extraction (e.g. air purifiers) at the emission source.

2.9 Packaging

PE films (waste code 15 01 02 according to *2014/955/EU*, cardboard (waste code 15 01 01), as well as disposable and reusable wooden pallets (waste code 15 01 03), are used as packaging materials.
With the exception of the reusable wooden pallets, all packaging materials are utilised by Interzero Circular Solutions Germany GmbH. The reusable wooden pallets are recycled.

2.10 Condition of use

If used as intended, no changes in the composition are to be expected during the use phase. Possible effects caused by extraordinary impacts are described in 2.13.

2.11 Environment and health during use

According to the current state of knowledge, hazards to water, air and soil are not to be expected if the products described are used as intended.

According to *UBA-Text 30/94* 'Investigations regarding indoor contamination through fibrous fine dust from installed stone wool', the concentration of fibrous dust indoors during the use phase is:

- Generally not increased if the thermal insulation is properly installed; this requires the insulation to be clearly separated from the interior (e.g. insulation on exterior walls or insulation behind an impervious moisture barrier and cladding consisting of gypsum board, wooden panels or similar);
- Generally only moderately increased if the mineral wool products are installed in such a manner that there is a direct air exchange with the interior; this is mainly the case in rooms with suspended (acoustic) ceilings without a functional trickle protection;
- Significantly increased (up to several thousand fibres per m³ room air) in isolated cases, e.g. in the case of structural defects or constructions that do not correspond to the state of the art, or temporarily during construction measures being performed on components that contain mineral wool products.

Tests have shown that mineral wool products are a negligible source of formaldehyde in buildings and therefore pose no health risk to residents or installers.

2.12 Reference service life

No reference service life (RSL) according to ISO 15686 was determined.

Information on the average service life according to BBSR 2017 can be found in chapter 4, section "Use phase (B1-B7)".

The service life of stone wool is not limited when used properly and is only determined by the service life of the building components or the complete building. The insulation performance remains fully intact over the service life. The performance of the insulation can be impaired by extraordinary effects and damage to the construction (see 2.13).

2.13 Extraordinary effects

Fire

The stone wool insulation materials declared in this EPD are non-combustible and do not show any risk potential regarding smoke production, flaming droplets or toxicity of combustion gases.

Unfaced or uncoated stone wool insulation materials are assigned to building material class A1. For faced or coated products, the information on the building material class can be found in the respective technical data sheets.

Fire safety

Name	Value
Building material class according to EN 13501-1	A1 | A2
Classification for smoke production	- | s1
Classification for formation of flaming droplets/particles	- | d0

Water

Exposure to moisture impairs the insulation properties. ROCKWOOL stone wool is vapour permeable and dries out on its own when exposed to low levels of moisture.

After longer lasting exposure to water (e.g. in the event of flooding or as a result of a water pipe burst), the insulation material must be replaced.

There are no known environmental impairments or harmful effects on water quality caused by stone wool.

Mechanical destruction

Not relevant.

2.14 Re-use phase

Stone wool insulation materials can be reused. Furthermore, they can be returned to the manufacturing process if they are separated by material type. Ground-up stone wool can also be used as an additive in the manufacture of bricks, fibre cement boards and roof tiles.

ROCKWOOL offers the Rockcycle® system for taking back the stone wool insulation materials.

2.15 Disposal

Construction site waste and demolition waste from stone wool insulation materials are collected under waste code 17 06 04 according to *2014/955/EU.*

ROCKWOOL offers the Rockcycle® system for taking back the stone wool insulation materials.

2.16 Further information

Further information on ROCKWOOL stone wool insulation materials can be found on the Internet at **www.rockwool.de**.

3. LCA: Calculation rules

3.1 Declared Unit

This EPD refers to a declared unit of 1 m³ unfaced stone wool insulation material with a declared bulk density of 38 kg/m³ (low bulk density range < 60 kg/m³).

Declared Unit

Name	Value	Unit
Declared unit	1	m^3
Gross density	38	kg/m^3

Other declared units are allowed if the conversion is shown transparently.

The declared unit refers to the saleable and packaged end product delivered in mats, boards or rolls.
The data collected for the average, refers to the mass produced. Except for packaging, this approach is regarded representative, as for production the same manufacturing steps are necessary in the respective plants. Thus, the conversion of the declared unit into a specific product is possible via a mass-related scaling factor.

Facings that are not linearly scalable with the product weight but based on 1 m² are not included in the average and are listed in a separate appendix.

3.2 System boundary

The life cycle assessment of stone wool insulation material includes a *cradle-to-gate* analysis of the products' environmental impacts with the modules C1-C4 and module D (A1-A3 + C + D). Subsequent life cycle phases are part of the analysis:

Module A1–A3 | Production stage
The production stage includes the upstream burdens of raw material supply (basalt, dolomite, sand, secondary raw materials, binding agents, etc.), and of energy carriers, the respective transports to the ROCKWOOL sites. The system boundary for secondary raw materials used in production is set after the end of waste status has been reached. The system boundary for secondary raw materials is defined according to *EN 15804*. During production, melting in the melting furnace, fiberization, injection of binder, compacting, curing, cutting and packaging of the stone wool are considered.
The manufacturing process is modelled based on the primary data of all sites considered.

The production of the facings of stone wool products is declared in a separate appendix to the EPD.

Module A4 | Transport to construction site
The transport from the plants to the customer is considered as a weighted average based on a representative scenario (350 km truck transport).

Module A5 | Assembly
For installation in the building, a scenario of 2 % waste is declared according to *EURIMA* (2019). The losses during installation are highly dependent on the building geometry and the specific application. Thus, the percentage of waste can vary greatly in the building context and must be adjusted at the building level according to the actual conditions. In addition to the losses during installation, module A5 includes the environmental impacts from the processing of the packaging of the products.

Module C1 | Deconstruction and demolition
For the disassembly of the stone wool products, a manual dismantling was assumed. Referring energy demand is considered to be negligible.

Module C2 | Transport to disposal
Module C2 includes the transport to waste treatment. In this case, transport by truck over a transport distance of 50 km is assumed. This corresponds to the recommendations according to *EURIMA* (2019).

Module C3 | Waste processing
The declared scenario assumes landfilling of the stone wool, therefore no environmental impacts from the waste treatment of the products are declared in C3.

Module C4 | Disposal
Module C4 refers to the emissions from the disposal of the insulation material. The chosen scenario, therefore, includes the environmental burdens of landfilling of the product. The biogenic carbon in the binder of the products is treated as emissions of biogenic CO_2 from the technosphere into the natural environment.

Module D | Benefits and loads beyond the system boundary
In module D the substitution potential from the energy recovery of the packaging is declared.

3.3 Estimates and assumptions

Assumptions and approximations are applied in case of a lack of representative data. All assumptions and approximations are documented precisely and represent a best-guess representation of reality. In case of uncertainty, a conservative approach is chosen.

3.4 Cut-off criteria

The LCA model covers all available input and output flows, which can be represented based on robust data. Data gaps are filled with conservative assumptions from average data (when available) or with generic data and are documented accordingly. Only data with a contribution lower than 1 % were cut off. Thus, no data were neglected, of which a substantial impact is to be expected. All relevant data were collected comprehensively. Cut-off material and energy flows were chosen carefully based on their expected quantitative contribution as well as potential environmental impacts. Thus, it can be assumed that the sum of all neglected input flows does not account for more than 5 % of the total material, water and energy flows. Environmental impacts from the production of machines and infrastructure were not taken into account.

3.5 Background data

This study uses generic background data for the evaluation of upstream environmental impacts from *MLC*-databases as well as recognised literature sources.

3.6 Data quality

Data collection is based on industry-specific questionnaires. It follows an iterative process clarifying questions via e-mail, telephone calls or in web-meetings. Intensive discussions between DEUTSCHE ROCKWOOL GmbH & Co. KG and Daxner & Merl result in an accurate mapping of product-related material and energy flows. This leads to a high quality of foreground data collected. Data collection relies on a consistent process according to *ISO 14044*.
The technological, geographical and time-related representativeness of the database was kept in mind when selecting background data. Whenever specific data were missing, either generic datasets or representative average data were used instead. The implemented *MLC* background datasets refer to the latest versions available (not more than ten years old) and are carefully chosen.

3.7 Period under review

In the course of data collection the site specific life cycle inventories for the production year 2022 were collected. The data is based on annual input and production quantities.

3.8 Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Germany

3.9 Allocation

Upstream processes in the supply chain are mainly based on *MLC* background data sets. In stone wool production, co-products from other production processes, secondary materials as well as internal and external waste are used. These input materials are taken into account according to the specifications of *EN 15804* - Annex A. Co-products from other production processes (e.g. slag) were allocated according to the recommendations of *EURIMA* (2019).

Secondary material is assumed as burden-free. Environmental impacts from transport to the stone wool plants were taken into account on a site-specific basis.
External wastes do not reach the end of waste status at the factory gate. Resulting environmental burdens are allocated to the upstream product system in accordance with a consistent polluter-pays principle.

Co-products (e.g. pig iron) are produced in the considered plants. Due to the small quantities and thus minor contribution to overall revenue, no co-product allocation of environmental burdens is applied.

3.10 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.
The *MLC* 2023.2 background database in the *LCA FE*-software version 10 was used to calculate the LCA.

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

The biogenic carbon content quantifies the amount of biogenic carbon in the declared building product.

Information on the biogenic carbon content at the gate

Name	Value	Unit
Biogenic carbon content (in the product)	0.018	kg/m³
Stored carbon dioxide (in the product)	0.69	kg/m³
Biogenic carbon content (in the packaging)	0.82	kg/m³
Stored carbon dioxide (in the packaging)	3.0	kg/m³

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2.

Transport to construction site (A4)

Name	Value	Unit
Transport distance	350	km
Means of transport	truck	
Capacity utilisation (including empty runs)	61	%

Assembly (A5)

Name	Value	Unit
Loss of material	2	%
Transport distance to landfilling	50	km
Output substances following waste treatment on site - loss of material	0.77	kg
Output substances following waste treatment on site - PE-foil	0.53	kg
Output substances following waste treatment on site - wooden pallets	1.66	kg
Output substances following waste treatment on site - paper/cardboard	0.19	kg

The use phase of stone wool insulation materials depends on the respective application and has not been declared. During use, no expenses for inspection, maintenance, servicing, repair or replacement are required. The following table shows the average service lives according to *BBSR 2017*.

Service lifes according to BBSR 2017

Name	Value	Unit
Code 335.611: Cavity wall insulation	≥ 50	a
Code 335.641: External thermal insulation composite system (ETICS)	40	a
Code 345.316: Special cladding: Thermal insulation (interior)	≥ 50	a
Code 352.121: Impact sound insulation	≥ 50	a
code 352.122: Floor insulation, including insulation of the top floor	≥ 50	a
Code 353.421: Insulation of the cellar ceiling	≥ 50	a
Code 363.531: Insulation above and between rafters	≥ 50	a
Code 364.211: Insulation above, between and under rafters	≥ 50	a

End-of-Life (C1-C4)

Name	Value	Unit
Collected separately waste type	38	kg
Landfilling	38	kg

5. LCA: Results

The following table contains the LCA results for a declared unit of 1 m³ unfaced or uncoated stone wool insulation material with a declared bulk density of 38 kg/m³ (low bulk density range < 60 kg/m³) based on the publication 3.1 of the European Comissions *JRC*.

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

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	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	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m³ stone wool insulation material (38 kg/m³)

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	4.41E+01	9.68E-01	5.32E+00	0	1.38E-01	0	1.24E+00	-1.46E+00
GWP-fossil	kg CO_2 eq	4.71E+01	9.57E-01	2.7E+00	0	1.37E-01	0	5.68E-01	-1.45E+00
GWP-biogenic	kg CO_2 eq	-2.97E+00	2.19E-03	2.61E+00	0	3.13E-04	0	6.68E-01	-6.67E-03
GWP-luluc	kg CO_2 eq	1.58E-02	8.96E-03	5.72E-04	0	1.28E-03	0	1.79E-03	-9.51E-05
ODP	kg CFC11 eq	5.54E-11	1.26E-13	1.46E-12	0	1.8E-14	0	1.47E-12	-1.15E-11
AP	mol H^+ eq	3.11E-01	1.94E-03	6.92E-03	0	2.78E-04	0	4.09E-03	-1.83E-03
EP-freshwater	kg P eq	2.17E-04	3.54E-06	4.53E-06	0	5.05E-07	0	1.16E-06	-2.37E-06
EP-marine	kg N eq	3.49E-02	8.02E-04	8.86E-04	0	1.15E-04	0	1.06E-03	-5.33E-04
EP-terrestrial	mol N eq	8.92E-01	9.13E-03	2.07E-02	0	1.31E-03	0	1.16E-02	-5.71E-03
POCP	kg NMVOC eq	1.08E-01	1.74E-03	2.67E-03	0	2.48E-04	0	3.19E-03	-1.48E-03
ADPE	kg Sb eq	7.78E-06	6.42E-08	1.61E-07	0	9.16E-09	0	2.67E-08	-1.05E-07
ADPF	MJ	5.47E+02	1.32E+01	1.22E+01	0	1.88E+00	0	7.68E+00	-2.69E+01
WDP	m^3 world eq deprived	5.75E-01	1.17E-02	4.32E-01	0	1.67E-03	0	6.33E-02	-1.39E-01

GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential)

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m³ stone wool insulation material (38 kg/m³)

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	3.13E+01	9.59E-01	3.08E+01	0	1.37E-01	0	1.25E+00	-7.85E+00
PERM	MJ	3.83E+01	0	-2.92E+01	0	0	0	0	0
PERT	MJ	6.95E+01	9.59E-01	1.64E+00	0	1.37E-01	0	1.25E+00	-7.85E+00
PENRE	MJ	4.9E+02	1.32E+01	3.44E+01	0	1.89E+00	0	7.69E+00	-2.69E+01
PENRM	MJ	5.78E+01	0	-2.22E+01	0	0	0	0	0
PENRT	MJ	5.48E+02	1.32E+01	1.22E+01	0	1.89E+00	0	7.69E+00	-2.69E+01
SM	kg	3.7E+00	0	7.41E-02	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0
FW	m^3	1.13E-01	1.05E-03	1.22E-02	0	1.5E-04	0	1.94E-03	-6.36E-03

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 resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m³ stone wool insulation material (38 kg/m³)

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	1.08E-07	4.1E-11	2.19E-09	0	5.85E-12	0	1.67E-10	-1.42E-09
NHWD	kg	3.12E+00	2.02E-03	8.85E-01	0	2.88E-04	0	3.84E+01	-1.33E-02
RWD	kg	1.48E-02	2.48E-05	3.45E-04	0	3.54E-06	0	8.75E-05	-2.08E-03
CRU	kg	0	0	0	0	0	0	0	0
MFR	kg	0	0	1.97E-01	0	0	0	0	0

MER	kg	0	0	0	0	0	0	0	0
EEE	MJ	0	0	6.93E+00	0	0	0	0	0
EET	MJ	0	0	1.24E+01	0	0	0	0	0

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 m³ stone wool insulation material (38 kg/m³)

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	Disease incidence	ND	ND	ND	ND	ND	ND	ND	ND
IR	kBq U235 eq	ND	ND	ND	ND	ND	ND	ND	ND
ETP-fw	CTUe	ND	ND	ND	ND	ND	ND	ND	ND
HTP-c	CTUh	ND	ND	ND	ND	ND	ND	ND	ND
HTP-nc	CTUh	ND	ND	ND	ND	ND	ND	ND	ND
SQP	SQP	ND	ND	ND	ND	ND	ND	ND	ND

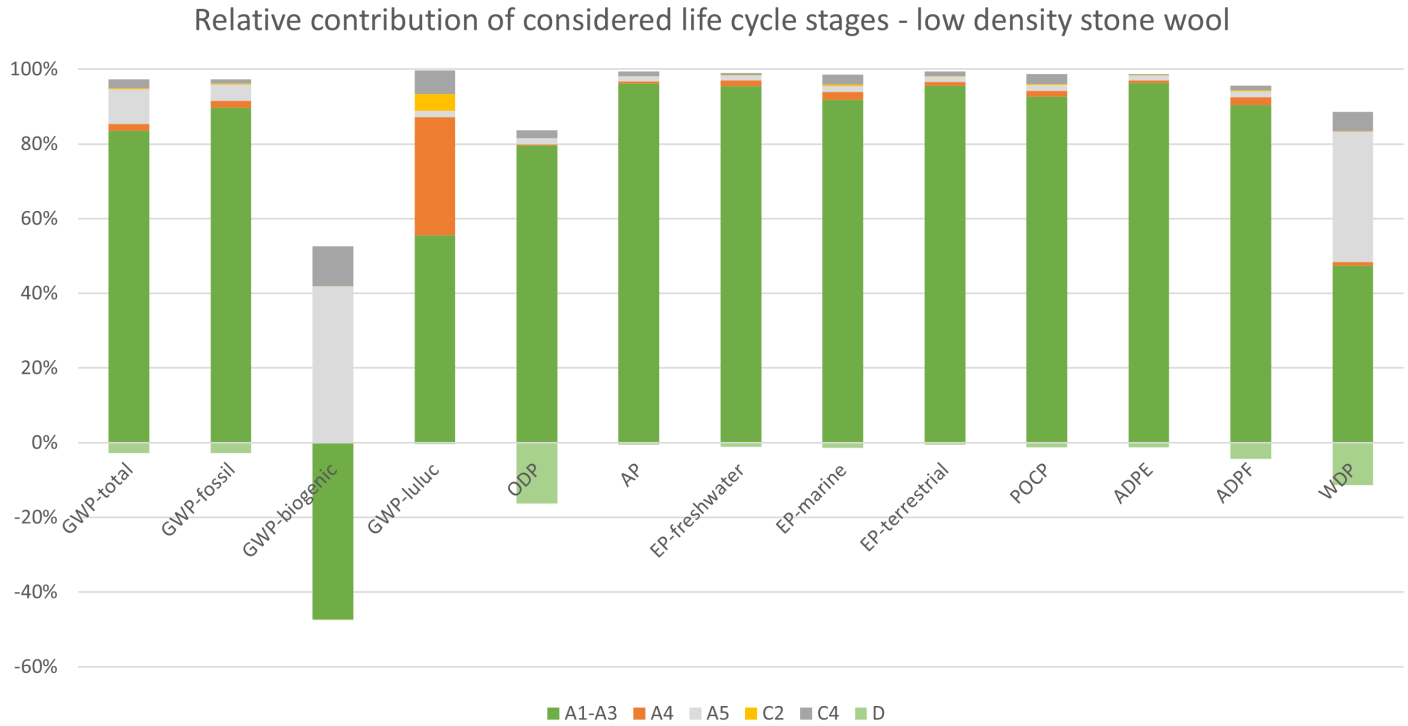
PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

The additional and optional impact categories according to *EN 15804* are not declared, as the uncertainty of these indicators is to be classified as high.

Disclaimer – for the indicators 'abiotic depletion potential for non-fossil resources', 'abiotic depletion potential for fossil resources', 'water (user) deprivation potential, deprivation-weighted water consumption', 'potential comparative toxic unit for ecosystems', 'potential comparative toxic unit for humans – cancerogenic', 'Potential comparative toxic unit for humans - not cancerogenic', 'potential soil quality index'.
The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

6. LCA: Interpretation

The following interpretation contains a summary of the LCA results referenced to a declared unit of 1 m³ unfaced or uncoated stone wool insulation material.



The comparison of the product's life cycle phases shows a clear dominance of the production phase of stone wool (modules A1–A3) in all environmental impact categories. Regarding the contribution of biogenic emissions to climate change (GWP-biogenic), the carbon storage effect of the glucose in the product and the packaging made from renewable raw materials is visible as a negative value in modules A1–A3. During landfilling of the stone wool in module C4 and energy recovery of the packaging in module A5, the stored carbon is released again in terms of a closed carbon balance.

The direct emissions from the production processes of the products at the ROCKWOOL sites can be identified as the main influencing factor of the potential contribution to climate change (fossil), acidification, eutrophication of marine and terrestrial ecosystems and photochemical ozone creation. The potential

contribution to climate change is additionally influenced by the upstream chains of the energy used in production (electricity, natural gas, coke, etc.).

The supply chains of the raw materials and energy sources used represent the dominant factors in the other environmental indicators considered. In particular, the potential abiotic fossil resource use and potential depletion of stratospheric ozone layer are dominated by the provision of the electrical energy used and the upstream chain of the respective energy sources.

All insulating material produced in the considered bulk density range were included in the average analysis of this EPD in the form of an annual average. The analysis of specific results for the sites identifies a variation of the Carbon Footprint of < 3 %. The potential acidification and terrestrial eutrophication vary more strongly due to the direct emissions from the production process. However, the representativity of the results for the declared product group is still to be considered as high, as the products are placed on the market indipendent of the production site.

Due to the homogeneous structure of the products their environmental impact correlates directly with the product mass.

7. Requisite evidence

7.1 Biopersistence

The biopersistence of the declared mineral wool fibres is proven by the *RAL* quality mark "Products made of mineral wool" under the registration number *RAL-GZ 388*. The requirements of *RAL*-GZ correspond to the exemption criteria of the *ChemVerbotsV* (Appendix 1 to § 3 entry 4 column 3) and the *German GefStoffV* (Appendix II to § 16 paragraph 2 number 5).

Compliance with the requirements of the *CLP Regulation* (Note Q) is verified by the EUCEB quality mark.
Proof of conformity with the quality and test specifications of Gütegemeinschaft Mineralwolle e. V. from July 2017 (see www.mineralwolle.de).

7.2 Radioactivity

There are currently no legally defined limit values for the assessment of the radioactivity of building materials in Germany. The nuclides found during measurements are naturally occurring radioactive substances. No artificial radioactive substances were found.

7.3 Leaching

Not relevant, as the products are not used in areas permanently exposed to water.

7.4 Formaldehyde- and VOC-emissions

Eurofins Product Testing A/S Smedeskovvej 38, DK-8464 Galten, Denmark, various tests
Procedure: Testing of product emissions according to *AgBB* (German Committee for Health-Related Evaluation of Building Products)

AgBB results overview (28 days [µg/m³])

Name	Value	Unit
TVOC (C6 - C16)	<= 1	mg/m³
Total SVOC (C16 - C22)	<= 0.1	mg/m³
R (dimensionless)	< 1	
VOC without NIK	<= 0.1	mg/m³
Carcinogens	<= 0.001	mg/m³
Formaldehyde	<= 120	µg/m³

AgBB results overview (3 days [µg/m³])

Name	Value	Unit
TVOC (C6 - C16)	<= 10	mg/m³
Carcinogens	<= 0.01	mg/m³

8. References

Standards

DIN 4108-4
DIN 4108-4:2020-11, Thermal insulation and energy economy in buildings – Part 4: Hygrothermal design values.

DIN 4108-10
DIN 4108-10:2021-11, Thermal insulation and energy saving in buildings – Part 10: Application-related requirements for thermal insulation materials

EN 13501-1
EN 13501-1:2019-05, Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire test.

EN 13162
EN 13162:2015-04, Thermal insulation products for buildings - Factory made mineral wool (MW) products - Specification.

EN 14064-1
EN 14064-1:2019-04, Thermal insulation products for buildings - In-situ formed loose-fill mineral wool (MW) products – Part 1: Specification for the loose-fill products before installation.

EN 14303
EN 14303:2016-08, Thermal insulation products for building equipment and industrial installations - Factory made mineral wool (MW) products - Specification.

EN 15804
EN 15804:2020-03. Sustainability of construction works - Environmental Product Declarations - Core rules for the product category of construction products.

EN 16516
EN 16516:2020-10, Construction products: Assessment of release of dangerous substances - Determination of emissions into indoor air.

EN 16733
EN 16733:2016-07, Reaction to fire tests for building products - Determination of a building product's propensity to undergo continuous smouldering.

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ISO 9001:2015-11, Quality management systems - Requirements.

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ISO 14001:2015-11, Environmental management systems - Requirements with guidance for use.

ISO 14025
ISO 14025:2011-10, Environmental labels and declarations - Type III environmental declarations - Principles and procedures.

ISO 14044
ISO 14044:2006-10, Environmental management – Life cycle assessment – Requirements and guidelines.

ISO 15686
ISO 15686, Buildings and constructed assets - Service life planning, various parts.

Further references

AgBB
Ausschuss zur gesundheitlichen Bewertung von Bauprodukte (AgBB) (Committee for health-related evaluation of building products): Vorgehensweise bei der gesundheitlichen Bewertung der Emissionen von flüchtigen organischen Verbindungen (VOC und SVOC) aus Bauprodukten.

AGI-Q 132
AGI worksheet Q132 on mineral wool as insulation material for industrial installations, Arbeitsgemeinschaft Industriebau e.V., Bensheim, December 2016.

BBSR 2017
Service life of building components for lifecycle analysis in accordance with BNB, version dated 24 February 2017.

Biocidal Products Regulation
Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products.

ChemVerbotsV
Chemicals Prohibition Ordinance (German designation: Chemikalien-Verbotsverordnung – ChemVerbotsV) of 20 January 2017 (Federal Law Gazette I p. 94; 2018 I p. 1389), last amended by Article 300 of the Ordinance of 19 June 2020 (Federal Law Gazette I p. 1328).

CLP Regulation
Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December
2008 on classification, labelling and packaging of substances and mixtures, last amended by Commission Delegate Regulation (EU) No 2020/217 of 4 October 2019 (OJ L 44, 18.02.2020, p. 1-14).

DGUV Information 213-031
Deutsche Gesetzliche Unfallversicherung e. V.: DGUV Information 213-031 "Activities with mineral wool insulation materials (glass wool, stone wool)", July 2019.

EAD 040729-00-1201
European Assessment Document (EAD) 040729-00-1201, Thermal insulation made of loose fill mineral wool, September 2017.

ECHA Candidate List
Candidate List of Substances of Very High Concern (ECHA Candidate List), published in accordance with Article 59 (10) of the REACH Regulation Helsinki: European Chemicals Agency.

EURIMA
EURIMA, 2019. Common Scenarios for developing LCA for mineral wool. A EURIMA internal Document. Version 1. 09.09.2019.

GefStoffV
Ordinance on Hazardous Substances (German designation: Gefahrstoffverordnung – GefStoffV) of 26 November 2010 (Federal Law Gazette I p. 1643, 1644), last amended by Article 2 of the Law of 21 July 2021 (Federal Law Gazette I p. 3115).

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European INSULATION KEYMARK Scheme for Thermal Insulation Products; Revision: 2.1, CEN,
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LCA for Experts Software System and Database for Life Cycle Engineering; Sphera Solutions GmbH, Leinfelden-Echterdingen, 1992-2023

MLC
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PCR Part A
Institut Bauen und Umwelt e.V. (IBU), 2022. Product Category Rules for Building-Related Products and Services. Part A: Calculation Rules for the Life Cycle As-sessment and Requirements on the Project Report according to EN 15804+A2:2019. Version 1.3. Berlin: Institut Bauen und Umwelt e.V., 2022.

PCR: Mineral insulating materials
Institut Bauen und Umwelt e.V., 2024. Product Category Rules for Building-Related Products and Services. Part B: Requirements on the EPD for Mineral insulating materials. Version 10 Berlin: Institut Buaen und Umwelt e.V., 2024.

RAL-GZ 388
RAL Deutsches Institut für Gütesicherung und Kennzeichnung e.V.: Products made of mineral wool; Quality assurance RAL-GZ 388. Bonn, May 2024

TA Luft
New version of the First General Administrative Regulation to the Federal Immission Control Act (Technical Instructions on Air Quality Control - TA Luft) of 18 August 2021.

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Federal Environment Agency (Ed.): Investigations on indoor contamination by fibrous fine dust from installed mineral wool products; UBA text 30/94, Federal Environmental Agency (Umweltbundesamt – UBA), 1994, Berlin.

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Thermal insulation of heated and refrigerated operational installations, various sheets.

Regulation (EU) No 305/2011 (*CPR*)
Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC.

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Commission Decision 2014/955/EU of 18 December 2014 amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC.

Publisher

Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

Programme holder

Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

Author of the Life Cycle Assessment

Daxner & Merl GmbH
Schleifmühlgasse 13/24
1040 Wien
Austria

+43 676 849477826
office@daxner-merl.com
www.daxner-merl.com

Owner of the Declaration

DEUTSCHE ROCKWOOL GmbH & Co. KG
Rockwool Straße 37-41
45966 Gladbeck
Germany

+49 (0)2043 408-0
info@rockwool.de
www.rockwool.de