ENVIRONMENTAL-PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A1*

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)
Declaration number	EPD-DRW-20180118-IBC2-EN
Issue date	27.08.2018
Valid to	26.08.2024

ROCKWOOL stone wool insulation materials in the medium bulk density range

DEUTSCHE ROCKWOOL GmbH & Co. KG

Institut Bauen und Umwelt e.V.

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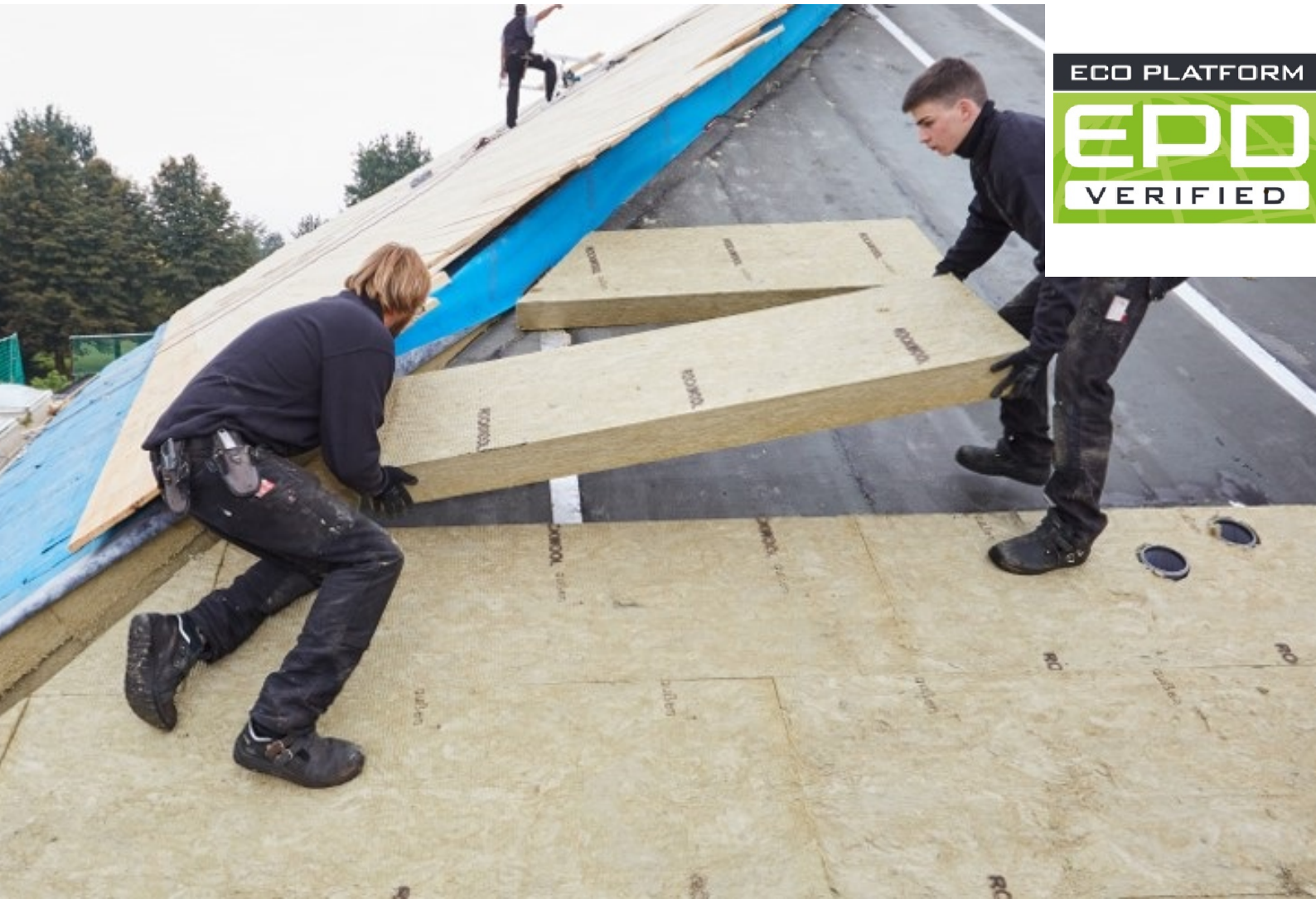


1. General Information

DEUTSCHE ROCKWOOL GmbH & Co. KG

Programme holder

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

Declaration number

EPD-DRW-20180118-IBC2-EN

This declaration is based on the product category rules:

Mineral insulating materials, 08.03.2023
(PCR checked and approved by the SVR)

Issue date

27.08.2018

Valid to

26.08.2024

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

Dr. Alexander Röder
(Managing Director Institut Bauen und Umwelt e.V.)

ROCKWOOL stone wool insulation materials in the medium bulk density range

Owner of the declaration

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

Declared product / declared unit

1 m^3 unfaced
and/or uncoated synthetic resin-bonded stone wool insulating material in the medium bulk density range (61-120 kg/m^3) produced by ROCKWOOL. In addition, the
environmental impacts of seven facings based on 1 m^2 are shown in Appendix 1.

Scope:

The lifecycle assessment
shown in the EPD relates to the lifecycle of unfaced or uncoated synthetic resin-bonded stone wool insulating material
in the medium bulk density range from ROCKWOOL. The stone wool is produced in the Gladbeck, Neuburg and Flechtingen works in which the production data for 2016 was recorded. The key LCA results for the facings are to be found in Appendix 1. This was produced and verified in 2015. The
LCA thus represents 100% of the stone wool produced by ROCKWOOL. The products covered by this EPD are listed in Annex 2.This document is a translation from the German Environmental Product Declaration into English. It is based on the German original version EPD-DRW-20180118-IBC2-DE.
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+A1. In the following, the standard will be simplified as *EN 15804 bezeichnet*.

Verification

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

Dr. Frank Werner,
(Independent verifier)

2. Product

2.1 Product description/Product definition

The definition
of mineral wool (stone or glass wool) in accordance with German hazardous
substances law (Chemicals Prohibition Order, Hazardous Substances Ordinance) is
as follows: "Artificial vitreous (silicate) fibres with random orientation and a mass content of more than 18 % of sodium, potassium, calcium,
magnesium and barium oxides".

Stone wool insulation is a fibre insulation material. A major component is stone wool insulation fibres. These are monofilament artificial mineral fibres of a
non-crystalline structure which are obtained from a silica-based molten mass. The
mean fibre diameter is 3-6 µm. The fibres can be several centimetres in length.

The artificial resin-bonded stone wool insulation described in this declaration is
manufactured in the form of medium-density sheets, mats or rolls (61-120 kg/m^3).
The products are supplied in thicknesses of between 20 mm and 350 mm, for
example as compression-proof sheets, treadable two-layer sheets or felting and
rolls.

For
certain application areas, the insulation is provided with a functional facing on one or both sides. /EU
Regulation no. 305/2011/CPR/ (with the exception of Switzerland) applies for
placing the product on the market in the EU/EFTA. The product requires a Declaration
of Performance taking into account /DIN EN 13162/ (Thermal insulation products
for buildings) and /DIN EN 14303/ (Thermal insulation products for building
equipment and industrial installations) and CE-labelling. The respective national regulations
apply to its use.

2.2 Application

- All applications
  according to /DIN 4108-10/ for application areas of walls, ceilings and roofs with
  the requirements set out therein with regard to heat and noise insulation and
  mechanical properties
- Domestic technology (insulation of heating and hot water pipes)
- Technical insulation (insulation of pipes, district heating piping, boilers and equipment)
- Industrial further processing (air conditioning ducts, fire protection
  doors, prefabricated house elements and chimney systems)
- Fire protection elements (cable insulation and elements for steel constructions)

2.3 Technical Data

Constructional Data

Name	Value	Unit
Thermal conductivity /DIN EN 13162/ /DIN EN 14303/	0.032 - 0.05	W/mK
Calculation value for thermal conductivity according to /DIN 4108-4/	0.033 - 0.049	W/mK
Water vapour diffusion resistance factor µ according to /DIN EN 12086/	1	-
Water vapor diffusion equivalent air layer thickness µ x component thickness [m]	µ x d	m
Sound absorption coefficient αS depending on the frequency is to be found in the data sheets for the relevant products.	-	%
Gross density according to /DIN EN 1602/	61-120	kg/m^3
Formaldehyde emissions acc. to EN 717-1	-	µg/m^3
Compressive stress (at 10 % deformation) according to /DIN EN 826/	0.5 to 40	kPa

Performance
data for the product in accordance with the declaration of performance in relation
to its essential characteristics in accordance with:

- /DIN EN 13162:2015-04/, Thermal insulation products for buildings – Factory-made
  mineral wool (MW) products – Specification; German version, and
- /DIN EN 14303:2016-08/, Thermal insulation products for building
  equipment and industrial installations – Factory-made mineral wool (MW) products –
  Specification; German version EN 14303:2015.

2.4 Delivery status

The artificial resin-bonded stone wool
insulation described in this declaration is manufactured in the form of medium-density sheets, mats or rolls (61-120 kg/m^3). The
products are supplied in thicknesses of between 20 mm and 350 mm, for example
as compression-proof sheets, treadable two-layer sheets or felting and rolls.

2.5 Base materials/Ancillary materials

The raw materials are
the naturally occurring rocks diabase and
basalt (27-50 mass %) and cement-bonded bricks (50-73 mass %). These
are supplemented by up to 3-5 % binding agent (urea-modified phenol formaldehyde
resin with glucose) and also a maximum of 0.2 % mineral oil and max. 0.1 % of
bonding agent.

The basic and ancillary materials for the facings are:

facing	g/m² (one-sided)	components
glass fleece	100 g	glass fibres, binder
glass silk	102 g	glass fibres, binder
mineral fleece	346 g	glass fibres, mineral based primer, binder
mineral based primer	250 g	silicious emulsion
aluminium sandwich foil	94.8 g	aluminium foil, glass fabrics, PE foil
anorganic fiber-reinforced coating based on magnesium oxide	5450 g	magnesium cement, glass fibres
RockTect facing	145 g	PP fibres, thermoplastic elastomer ether ester (TEEE)

The
secondary material content of the product is 24.7%, of which 24.6% are
pre-consumer and 0.1% post-consumer recycled content. This secondary material
content was calculated according to EN ISO 14021 considering all
relevant flows of inputs and outputs in the production process and does not
consider any fuels used.

No Substances of Very High Concern (SVHC), biocides or carcinogenic, mutagenic
or reproduction-toxic substances (CMR substances) are used in production or in the facings:

1) This product/article/at least one partial article contains substances listed in the candidate list (status:
06/08/2018) exceeding 0.1 percentage by mass: no.

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

3) 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 (EU) Ordinance on Biocide Products No. 528/2012): no.

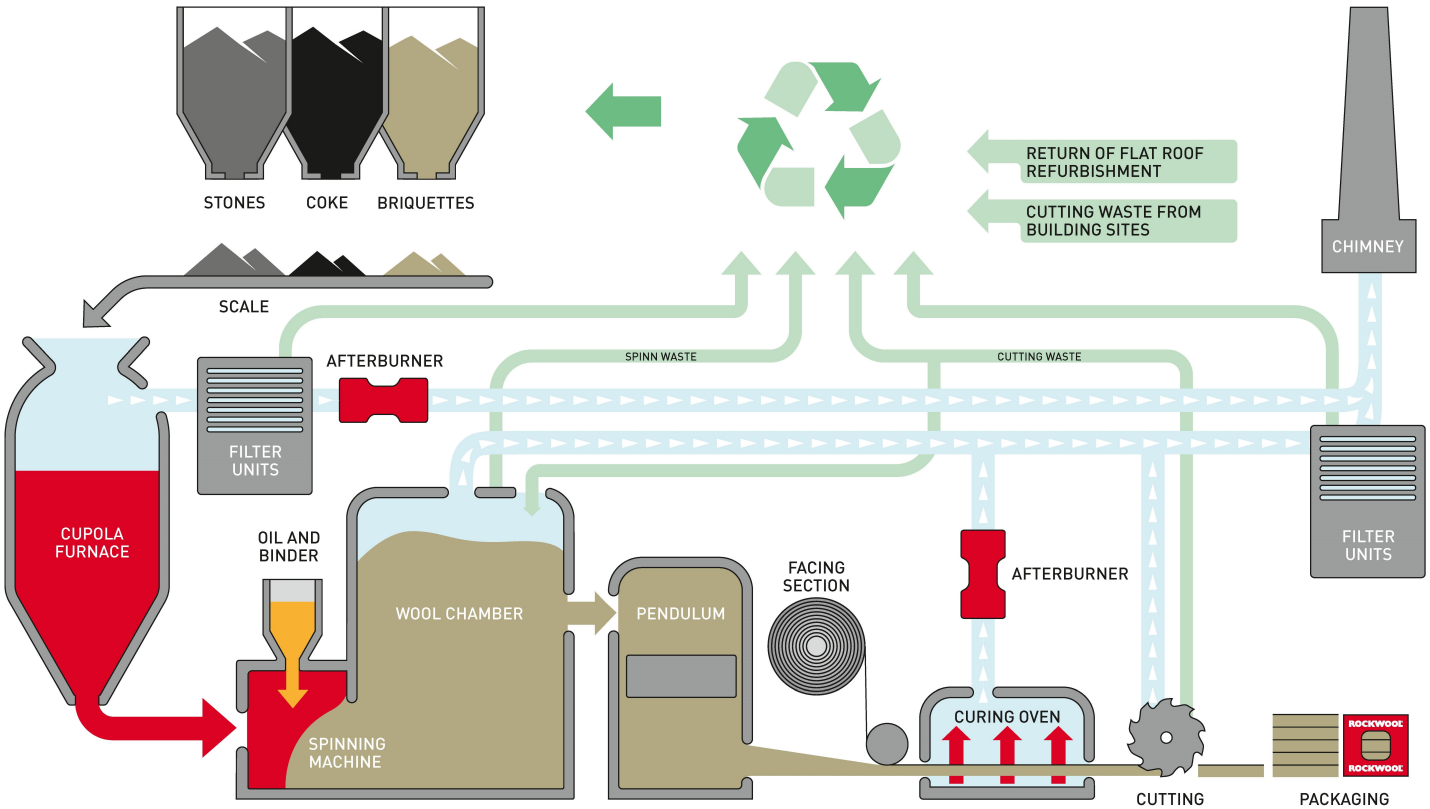
2.6 Manufacture

Diabase or basalt as well as cement-bonded
bricks are melted using coke as the energy carrier in a cupola furnace at
approximately 1,400-1,500°C and frayed out by means of roller spinning. Immediately
afterwards, mineral oil and binding agent are sprayed on as a watery solution. The
binding agent serves to guarantee binding and dimensional stability and the
mineral oil to reduce dust and to increase hydrophobisation. The bonding agent also
contained in the watery solution supports the adhesion of the binding agent to
the fibres.

In the collecting chamber, the raw wool is placed on transport conveyors under
negative pressure. Optionally, facings can then be applied. (The corresponding environmental
impacts for this are specified in the Appendix.). The possibly faced raw fleece
is fed into hardening furnaces in which hot air at 200-300°C is sucked through
the wool mass whilst the binding agents link to thermosets. Finally, the
product is shaped using saws.

Quality control:

- Internal and external monitoring in accordance with CE labelling in
  accordance with European regulations.
- KEYMARK in accordance with insulation KEYMARK Scheme Rules 2.0/; for technical
  insulation products in accordance with VDI 2055 equivalent to Keymark Scheme
  rules and /AGI Q 132/.
- All products in accordance with /RAL-GZ 388/.
- Quality management system in accordance with /DIN EN ISO 9001/.



2.7 Environment and health during manufacturing

Since 01/06/2000, a ban on the manufacture, putting on the market
and use of stone wool insulating materials which do not fulfil the exemption criteria
of Appendix II of Section 16 of the Hazardous Substances Ordinance and
Appendix 1 of Section 3 of the Chemicals Prohibition Order has been in force in Germany.

The prescriptions in Section 5.4.5.2.1 of /TA Luft/, the German Technical
Regulations on Emissions, apply in addition (regulations for total dust and phenol/formaldehyde
for old facilities).

ROCKWOOL has an environmental management system which is certified to /DIN EN
ISO 14001/ and places great value on the environmental friendliness of its
production facilities:

- Exhaust air produced during manufacture is mechanically filtered and most of it thermally combusted. The heat released is
  used to pre-heat the blast air via heat exchangers. The separated dust is
  reused as a raw material.
- Waste water produced during manufacturing is mainly processed internally and returned to production.
- Noise protection measurements have shown that all values recorded inside and outside the production facilities are below the
  requirements which apply in Germany. Noise-intensive parts of the facility such
  as defibration are encapsulated accordingly with constructional measures.

2.8 Product processing/Installation

The
recommendations on product processing depend on the product and system and are
described in the brochures and data sheets (www.rockwool.de). Health and safety
measures in accordance with Section 3 of the instruction manual "handling stone
wool insulation materials – glass wool, stone wool" /BG BAU/ must be observed:

- Favour pre-prepared stone wool insulation. This can be either supplied by the manufacturer or cut to size centrally on the
  building site.
- Unpack packaged insulation only at the workplace.
- Do not throw the materials.
- 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 blow off dust and dust deposits with compressed air or sweep them up dry but pick them up with an industry standard (category
  M) vacuum cleaner or wet-clean them.
- Keep the workplace clean and clean it regularly. Collect offcuts and waste immediately in suitable containers such as bins or
  plastic sacks.
- Wear loose-fitting closed work clothing and leather protective gloves or nitrite-coated cotton gloves.
- Rinse off building dust with water on finishing work.

- Work with your back to the wind and ensure that no employee stands in the dust trail during outdoor activities which create dust, for example during tipping processes.

2.9 Packaging

Wooden pallets, cardboard and paper and PE foil are used as packaging material. The packaging is disposed of via Interseroh AG, Cologne.

2.10 Condition of use

No changes occur to the material composition during the use phase except in the case of extraordinary effects (see 2.13).

2.11 Environment and health during use

Stone wool fibre dust indoors:
As with all dust, stone wool dust can cause irritations to the skin, eyes and respiratory tract and trigger allergic reactions.

Some general work hygiene principles which apply to handling all kinds of dust should be observed in order to prevent such temporary, reversable phenomena.

ROCKWOOL insulating materials do not fall into the area of application of Appendix II of Section 16 Paragraph 2 of the Hazardous Substances Ordinance and Appendix 1 of Section 3 of the Chemicals Prohibition Order. They are therefore not subject to the manufacturing and use ban for fibre dust classified as carcinogenic in the workplace. According to the Federal Environmental Agency's text 30/94 ‘Investigations into indoor contamination through fibrous fine dust from installed stone wool’ ,the concentration of fibre dust indoors is

- Generally not increased in the use phase if it is properly installed heat insulation; 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 the like
- Generally only moderately increased if the stone wool products are installed in such a manner that there is a direct exchange of air with the interior; this occurs mainly in rooms with suspended (acoustic) ceilings without a functional trickle protection
- Significantly increased (up to several thousand fibres per m^3 room air) in isolated cases e.g. with structural deficiencies or with constructions which no longer reflect the current state of technology, or temporarily during construction measures being performed on components which contain stone wool products

Release of formaldehyde and VOC:
Formaldehyde and VOC emissions can cause health problems such as headaches and nausea or the irritation of mucous membranes which is why low-emission building materials should be used. The formaldehyde and VOC emissions recorded for the declared stone wool products lie below the detection and assessment thresholds.
No carcinogenic substances were detected. Use is therefore to be classified as safe (see Chapter 7.4).

2.12 Reference service life

No reference service life (RSL) in accordance with /ISO 15686/ was determined.
Details of average service life in accordance with /BBSR 2017/ are to be found in Chapter 4 in the section on use (B1-B7). The service life of ROCKWOOL stone wool is unlimited if used correctly and is exclusively limited by the service life of the building components and the entire building. Insulation performance is sustained without limitations throughout the service life. The thermal insulation function can be impaired by extraordinary effects and damage to the construction (see Chapter 2.13).
The thermal performance characteristics of heat insulation is normally based on a minimum period of 50 years in accordance with /DIN EN 16783/.

2.13 Extraordinary effects

Fire
Information on the fire performance according to *EN 13501:1* or established national standards. According to *EN 13501:1*:

- The classes of building products regarding their fire performance are predefined as: A1, A2, B, C, D, E, and F;
- The classes of flaming droplets/particles are pre-defined as: d0, d1, or d2;
- The classes for smoke density are pre-defined as: s1, s2, or s3

Name	Value
Building material class acc. /DIN EN 13501-1/	A1 (not flammable)

Water
Moisture impairs the insulation properties. Stone wool insulating materials are breathable and dry out of their own accord in case of minor moisture penetration. The insulation material should be replaced following the long-term influence of water (e.g. flooding).

Mechanical destruction
Not relevant.

2.14 Re-use phase

Stone wool insulation is not re-usable. It can be returned to the manufacturing process if it is homogenous. Ground stone wool can also be used as an additive in brick

manufacture.

2.15 Disposal

The waste key
for stone wool insulation building site waste is 17 06 04.

2.16 Further information

Further information on ROCKWOOL stone wool insulation can be found online at www.rockwool.de.

3. LCA: Calculation rules

3.1 Declared Unit

The declaration relates to the lifecycle of 1 m^3 stone wool insulation material produced by DEUTSCHE ROCKWOOL GmbH & Co. KG . The products are manufactured in three factories which exhibit no technology differences for stone wool manufacture. The average was formed on the basis of production quantities. The bulk density of the declared products can be 61-120 kg/m^3. An average bulk density of 96 kg/m^3 is determined for the medium-density stone wool insulation for which the LCA results are shown below. The transfer of the results to other bulk densities is possible via a linear scale.

Declared unit

Name	Value	Unit
Declared unit	1	m^3
Gross density	96	kg/m^3
Conversion factor to 1 kg	0.01042	-

In addition, the environmental profiles of seven facings which are based on the specifications mentioned in Chapter 2.5 are shown in the Appendix. To apply the facing data, the results based on the results for 1 m^3 for the stone wool must first be converted to the desired thickness. The results for the facings for 1m² are then to be added. The environmental profiles of the facings were calculated for one-sided application. In case of both-sided application, the environmental effects of the facings have to be doubled or added in case of different facings. Additional adhesive is not needed for the facing process.

3.2 System boundary

EPD type: Cradle to grave with options

The LCA includes the lifecycle phases of stone wool manufacture (A1-A3), transport to the building site (A4), the recycling and disposal of packaging and offcuts which accrue during installation (Module A5) and the end of life phase of the stone wool (Modules C1 to C4). Benefits as a result of thermal recycling of packaging were assigned to Module D.

Specifically, the following processes were included in the production stage (A1-A3):

- Provisioning processes of pre-production and energy
- Transport of raw materials and pre-products to the works
- Manufacturing process in the factory including energy-related uses, disposal of accruing residual materials and emissions
- Manufacture of packaging

Secondary materials which enter the system which have already reached the end of the waste characteristic before they are delivered were included free of loads but including the transports necessary for delivery. Waste used as alternative fuel also enters the system without loads. In accordance with the polluter-pays principle, the transport of this waste to the factory has to be added to the preceding product lifecycle and was not included in the LCA.

The quantities of packaging material included are annual usage or purchase quantities in which pallet rotations are already included. When selecting recycling processes for the calculation it was ensured that CO_2 stored in den packaging materials is released as an emission during the recovery process.

Emissions and loads as a result of the recycling of packaging are allocated to Module A5 and resultant benefits were added to Module D.

The recycling and disposal of the stone wool at end of life include truck transport back to the factory of manufacture or a dumping ground (C2) and also the final disposal of the corresponding share (C4). The quantity of stone wool waste delivered from building sites which was deployed in the relevant year was included as the recycling quantity at end of life which is why no net quantities for recycling result and thus no benefits can be included in Module D.

The scope of investigation of the facings covers Modules A1-A3, A4, A5, C1 to C4 and D. Since no additional packaging is included for the facing, no environmental loads or benefits ensue for facings in Modules A5 and D.

3.3 Estimates and assumptions

As far as possible, all data from the collection of operating data was included. However, no works-specific figures were available for some emission figures and waste so that these had to be estimated on the basis of the data from other ROCKWOOL factories in Germany and abroad.

There was no record for diabase in the background database used so that the diabase quantity used was calculated with the data for basalt.

ROCKWOOL produces its binder in one of its factories but uses pre-made binder in the other two factories. ROCKWOOL is not familiar with the formulae for this bought-in binders in detail which is why the composition was estimated based on the data sheets and formulae of the internal formulae.

3.4 Cut-off criteria

All mass, volume or energy-based data from the collection of operating data, i.e. all initial materials deployed as per the formula, the thermal energy used, internal fuel consumption and electricity consumption, all direct production waste and all available emission measurements were included in the assessment. Assumptions for transport impacts for all relevant inputs and outputs were made. This means that material and energy flows with a share of less than 1% were also included.

It can be assumed that the neglected processes would have contributed less than 5% respectively to the declared impact categories.

3.5 Background data

Programme version 8.5.0.79 and database version 8.7 including Service Pack 35 of the /GaBi/ software system for integrated life cycle assessments developed by THINKSTEP AG was used to model the lifecycle of the declared stone wool products (/GaBi/). All /GaBi/ records which were used to model the stone wool lifecycle can be viewed online in the /GaBi documentation/.

In order to guarantee the comparability of the results only background data from the GaBi database was used in the LCA. Since the production locations are in Germany, records for Germany were selected insofar as they existed. European or international records were used insofar as there was no data for Germany. Corresponding or sufficiently suitable equivalent records were available in the GaBi database for almost all relevant pre-products and ancillary materials used.

3.6 Data quality

According to THINKSTEP, the programme developer, the data for the pre-chains is based on industry data which was collected under consistent temporal and methodical framework conditions and was revised less than ten years ago. Records which were no longer valid according to the /GaBi documentation/ only had to be used for the plastic manufacturing and incineration processes. Since the packaging quantities are low compared to the raw materials and fuel used for manufacturing, the database can be seen as good to excellent overall with regard to its time-related, technological and geographical representativeness.

3.7 Period under review

The database for this LCA is based on data recordings for stone wool manufacture from 2016 at ROCKWOOL. The quantities of raw materials, energy and ancillary and operating materials used are included as mean values from 12 successive months in the factories reviewed.

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

Various forms of waste, secondary raw materials and co-products are deployed in this product system. These were treated differently depending on their allocation:

- Waste is included in the product system without loads and without transports as the effects thereof are to be allocated to the previous lifecycle according to the polluter-pays principle.
- Secondary materials which have already reached the end of the waste characteristic are also included in the system free of loads. The transport of these materials to the factory were, however, included in the LCA.
- Steelworks slag is regarded as a co-product of the steel industry and is to be included with accordingly allocated loads. Since the contribution of this slag to the operating income of the steel producers is, however, extremely low, the environmental effects they cause can be neglected. The transport of the co-products to the factory was, however, included in Module A2.

Pig iron is produced whilst the raw materials and pre-products are being melted in the cupola furnace. Pig iron as a co-product fulfils the *End-of-waste* criteria in accordance with Chapter 5.5.5 of the PCR Part A and should therefore be included as a co-product. No allocation was made due to the low contribution of the iron ore to operating income.

Multi-input processes occurred especially in the recycling of materials in waste incineration plant. However, corresponding recovery processes

were available in
/GaBi/ for individual types of waste so that a realistic calculation of the
resulting environmental effects was possible.

As described
above, energetic recovery was assumed for some production waste (A3) and also
the packaging materials (A5). Both electricity and heat are produced by
combustion. In the model, these recovery processes are modelled in the modules
in which the waste occurs. Since the resulting benefits in A3 lay below the
energy requirement necessary for production they were modelled as a *closed loop*
and there were no benefits here for Module D. The recycling of the packaging
(A5), on the other hand, led to excess thermal and electrical energy which is
used in other product systems and is therefore shown as a benefit in Module D.

Stone wool waste which accrues during the individual production steps is collected by
the manufacturer and returned to production. This brings economic advantages and
savings potential in relation to primary material. Furthermore, stone wool waste
accrues during installation and after dismantling which is partly returned to
the factory and is also recycled there. Since no reliable scenarios for the
future return of this waste were available it was assumed that cutting waste is
completely disposed of in landfill sites. The tonnage used in the period under
review was assumed as the quantity of waste recycled after dismantling so that
no net quantities accrue and thus also no benefits can be offset in Module D.

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. Zur Berechnung der LCA wurde die Software und Datenbank zur Ganzheitlichen
Bilanzierung /GaBi/ in der Programmversion 8.5.0.79 und der Datenbank-Version 8.7 inkl. Service Pack 35 verwendet.

4. LCA: Scenarios and additional technical information

The scenarios on which the assumptions in
Modules A4, A5, C1-C4 and D are based are described below. The information on
modules B1-B7 which are not declared can be used to develop specific scenarios
in the context of a building assessment.

Transport to building site (A4)

No material losses occur during transport, i.e. only the transport process is declared in Module A4. The average transport distance calculated by ROCKWOOL
for 2016, the year under review, was 315 km.

Name	Value	Unit
Transport distance	315	km
Gross density of products transported	96	kg/m^3

Installation into building (A5)

Generally, no or only an extremely small amount
of energy is required for installing the stone wool products. The products are
normally wedged in (e.g. sloping roof) or laid out (e.g. flat roof). The
products are partly secured with screws, for example with ETIC-systems. The amount
of equipment and energy necessary for this is, however, extremely small so that
it can be neglected.

The transport packaging specified is recycled to a large extent according to
the waste disposal company, Interseroh. Since no adequate data was available to
model the necessary treatment processes, energetic recovery had to be assumed
for the calculation of the benefits from recycling (see assumptions for Module
D).

The accruing cutting waste (approx. 2 %) is partly recycled in the
manufacturing works. Due to the low percentage and a lack of data on precise
recycling quantities this recycling was not modelled and it was assumed that
the cutting waste was disposed of completely in landfill sites.

Name	Value	Unit
Material loss through cutting	2	%
Transport distance to landfill	50	km
Output substances following waste treatment on site - PE-foil	0.64224	kg
Output materials as a consequence of waste treatment on the building site - wooden pallets	2.928	kg
Output materials as a consequence of waste treatment on the building site - paper cardboards	0.22752	kg
Transport distance to recycling plant	100	km

Use phase (B1-B7)

The use phase of the stone wool insulating materials depends on the respective use and
was not declared.

No inspection, servicing, maintenance, repair or replacement are necessary during
the use phase. The following table shows the service life in accordance
with /BBSR 2017/.

service life in accordance with BBSR 2017

Name	Value	Unit
Code 335.611: insulation layer as core insulation	≥ 50	a
Code 335.641: ETIC-system	40	a
Code 345.316: Special cladding: thermal insulation (Interior insulation)	≥ 50	a
Code 352.121: Footfall sound insulation	≥ 50	a
Code 352.122: Floor insulation including insulation of ceiling of the topmost storey	≥ 50	a
Code 353.421: cellar ceiling insulation	≥ 50	a
Code 363.531: Insulation layer as on-rafter and between-rafter insulation	≥ 50	a
Code 364.211: between-, on- and under-rafter insulation	≥ 50	a

Betriebliche Energie (B6) und Wassereinsatz (B7)

Name	Value	Unit
Water consumption	-	m^3
Electricity consumption	-	kWh
Other energy carriers	-	MJ
Equipment output	-	kW

End of life (C1-C4)

Normally, only a very small amount of energy or no energy at all is required to dismantle the stone wool products. The normally clamped-in or laid-out products can be removed manually without problems. The products are partly also fixed with screws. The amount of equipment and energy required to loosen the screws is, however, extremely small so that it can be neglected.

It was assumed that the stone wool waste is sorted on the building site. In this case no further treatment is necessary for recycling or disposal.

In the year under review, approximately 0.3 percent of cutting and dismantling waste was recycled in the assumed disposal scenario.

The environmental effects of depositing the stone wool waste accruing after dismantling on an inert material dump are declared in Module C4.

Name	Value	Unit
Recycling	0.27	kg
Landfilling	95.73	kg
Transport distance to landfill	50	km
Transport distance to recycling facility	315	km
Collected and sorted stone wool waste	100	%

Reuse, recovery and recycling potential (D), relevant scenario information

Benefits from the energetic recovery of the packaging materials are offset in Module D. Thermal energy from a natural gas and electricity mix were substituted for the calculation of the amount of benefits in the GaBi model.

Name	Value	Unit
Transport distance to energetic recovery	100	km

5. LCA: Results

The following tables contain the depiction of the environmental effects for 1 m^3 unfaced stone wool with an average bulk density of 96 kg/m^3, manufactured by DEUTSCHE ROCKWOOL GmbH & Co. KG. The following table shows the results of impact assessment indicators, resource use and waste and other output flows relating to 1 m^3 stone wool insulating material. The modules marked with an x in accordance with /DIN EN 15804/ are thus addressed. The environmental effects and LCA indicators for the different facings are to be found in the appendix.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE 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+A1: 1 m³ ROCKWOOL stone wool, 96 kg/m³

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	kg CO_2-Äq.	121.79	1.96	10.21	0	0.32	0	1.52	-3.36
ODP	kg CFC11-Äq.	1.56E-10	8.13E-14	3.21E-12	0	1.31E-14	0	3.45E-13	-2.56E-12
AP	kg SO_2-Äq.	5.85E-01	1.7E-03	1.28E-02	0	2.74E-04	0	9.02E-03	-3.6E-03
EP	kg PO_4^3-Äq.	6.52E-02	3.95E-04	1.54E-03	0	6.36E-05	0	1.25E-03	-6.03E-04
POCP	kg Ethen-Äq.	2.89E-02	-1.37E-05	6.5E-04	0	-2.2E-06	0	7.01E-04	-3.07E-04
ADPE	kg Sb-Äq.	2.52E-05	1.73E-07	6.17E-07	0	2.79E-08	0	5.85E-07	-1.27E-06
ADPF	MJ	1.07E+03	26.58	24.28	0	4.28	0	19.69	-43.21

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

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A1: 1 m³ ROCKWOOL stone wool, 96 kg/m³

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	99.3	1.39	58.86	0	0.22	0	2.53	-10.58
PERM	MJ	73.25	0	-55.01	0	0	0	0	0
PERT	MJ	175.66	1.39	3.91	0	0.22	0	2.53	-10.58
PENRE	MJ	897.3	26.72	51.35	0	4.3	0	20.44	-48.85
PENRM	MJ	143.55	0	-27.39	0	0	0	0	0
PENRT	MJ	1.14E+03	26.72	25.84	0	4.3	0	20.44	-48.85
SM	kg	22.99	0	0.46	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	2.84E-01	2.57E-03	2.4E-02	0	4.14E-04	0	3.9E-03	-6.75E-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+A1: 1 m³ ROCKWOOL stone wool, 96 kg/m³

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	2.15E-06	1.41E-06	1.06E-07	0	2.27E-07	0	3.52E-07	-2.77E-08
NHWD	kg	7.47E+00	2.15E-03	2.09E+00	0	3.46E-04	0	9.59E+01	-2.68E-02
RWD	kg	2.56E-02	5.58E-05	5.84E-04	0	8.99E-06	0	2.96E-04	-2.23E-03
CRU	kg	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0

EEE	MJ	0	0	10.63	0	0	0	0	0
EET	MJ	0	0	24.51	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

6. LCA: Interpretation

Interpretation of the environmental impact

The product stage (Modules A1-A3) dominates all environmental impacts. Module A5 is only noticeable because of its global warming potential (**GWP**). The release of formerly bonded carbon appears here as a result of the energetic recovery of the packaging (wooden pallets).

Module D appears proportionately to the greatest extent in the potential for depletion of non-fossil resources (**ADPE**) and in the potential for depletion of fossil fuels (**ADPF**) which are significantly reduced as a result of the benefits for packaging materials.

The global warming potential of stone wool manufacture results largely from the CO2 emissions during production. A further third is attributable to energy provision (electricity, coke and natural gas). The cement used to manufacture the cement-bonded bricks also influences the result. The carbon bound in the wooden pallets, on the other hand, leads to a slight reduction of the **GWP** in Modules A1-A3.

The ozone depletion potential (**ODP**) is mainly caused (approx. 78 %) by the incineration of plastic wastes accruing in the factory. A further 16 % originates from the electricity provision pre-chains. 84 % of the acidification potential (**AP**) of stone wool production (Modules A1-A3) is attributable to emissions in the factory. Major contributions to **AP** are caused specifically by ammonia, sulphur dioxide and hydrogen sulphide.

The emissions caused in the factory form 72 % of the eutrophication potential (**EP**). Here again, the ammonia emissions which occur during hardening of the bonding agent play a significant role. Furthermore, the **EP** is influenced by the provision of coke and electricity.

The emissions caused in the factory are also the main contributor to the potential for formation of tropospheric ozone (**POCP**). Formaldehyde released from the bonding agent and other NMVOC emissions make a decisive contribution here. In addition, SO2 produced during coke burning causes a high **POCP** value.

When examining the **ADPE** it is noticeable that the pre-chains for cement production (41 %) and the use of electricity (46 %) constitute some 87 % of this indicator.

The **ADPF** values are mainly attributable to electricity, coke and natural gas.

Interpretation of primary energy use

A differentiation is made between renewable and non-renewable and also energetically and materially used shares in the depiction of primary energy use:

Of the renewable primary energy used (**PERT**) in production some 43 % is used materially, whereby a large proportion of this materially bound primary energy (**PERM**) is stored in the packaging materials. Only a small proportion is attributable to the stone wool or the (glucose-containing) binding agent contained in the stone wool.

The largest proportion of renewable energetically used primary energy (**PERE**) in the manufacturing phase comes from the German electricity mix. The energetic recovery of packaging in Module D also causes the reclassification of the primary energy used materially up to that point as an energetically used share.

The use of non-renewable primary energy (**PENRT**) dominates the overall use of energy. It is also dominated by the energy needs of production. The coke and natural gas used for melting dominate here. These two energy carriers influence some 55 % of the **PENRT** in Modules A1-A3. The non-regenerative share of the German electricity mix contributes a further 19 %. A large contribution (approx.

15 %) is also made by the binding agent, although it constitutes just 3-4
% of the weight of the end product. Primary energy use to extract and prepare
the further raw materials, for example basalt, is comparably low.

It must,
however, be remembered that the load-free waste and secondary materials
included in the calculation make up a significant proportion of the raw
materials used (recycled
content of around 25%). Considerable
quantities of raw materials are saved due to these materials being included
load-free in the production process.

Interpretation of further indicators

Approximately
2.96 litres of fresh water resources (**FW**) are used for the manufacture
of one kilogram of stone wool. Thereof, the proportion of drinking water used in the
factories is on average 38 %. Considerable amounts of water are also required in
the provision of electricity and packaging materials and in the bonding agent pre-chains.
Waste
production is assessed separately for the three fractions of hazardous waste
disposed, non-hazardous waste disposed and radioactive waste disposed:

Half of the hazardous
waste accruing in the stone wool lifecycle (**HWD**) is attributed to the production process. The main influencing factor here is the provision of
diesel for production and raw material transports. Further relevant quantities
of hazardous waste accrue in the pre-chains for electricity, basalt and coke.

The non-hazardous
waste (**NHWD**) represents the largest proportion in the lifecycle of stone wool. The disposal of insulating materials at the end of their service life dominates
here. Less than 10% of the **NHWD** occurs during the production phase (A1-A3),
of which in turn a large proportion is attributable to pre-chains for basalt. In
addition, the disposal of waste accruing in the factory also has an effect on
this indicator.

Radioactive
waste (**RWD**) accrues exclusively in the pre-chains of raw materials and
energy provision, above all in electricity production. The production of cement
also has a visible effect on the result but is of secondary importance compared
to electricity production.

7. Requisite evidence

As a general rule, all statements must be documented with measured data (presented by the corresponding test certificates). The methods of evidence and the test conditions have to be described together with the results.

If substances are not detected, the limit of detection must be included in the declaration.

Interpreting statements such as "… free of …" or "… are entirely harmless …" are not allowed.

If evidence required by the specific PCR part B is not provided, this has to be justified under the respective title for the required evidence.

If relevant for the scope of application of the declared product, or if derivable from its material composition, it is recommended to provide additional adequate evidence.

7.1 Biopersistence:

Measurement agency / Date: RCC Ltd,
Wölferstrasse 4, CH-4414 Füllinsdorf, Switzerland, May-Dec. 1999

Procedure: Test of the biopersistence of artificial mineral fibres through
endotracheal instillation in accordance with the German Hazardous
Substances Ordinance.

Result: Award certificate for the /RAL GZ-388/ quality mark dated 26th
April 2017.

Verification
of conformity with quality and test regulations from the Gütegemeinschaft
Mineralwolle e. V. dated July 2017 (see www.mineralwolle.de)

7.2 Radioactivity

Measurement agency / Date: North Rhine-Westphalia Material Testing Authority, 21/09/1999
Procedure: Gamma spectroscope analysis of three stone wool

samples.

Result: Radium 226 = 26-70 Bq/kg, Radium 228 = 25-65 Bq/kg,
Thorium 228 = 29-70 Bq/kg. The
nuclides are naturally occurring radioactive substances. No artificial radioactive
substances were found. **7.3 Leaching**

Measurement agency / Date: ACB GmbH environmental laboratory, 13/03/2014

Procedure: Determination of eluate values in accordance with /DIN EN
12457-4/

result: On the basis of the results stone wool insulation is to be classified as disposal class II in accordance with the Disposal Directive of 27/09/2017.
In individual cases it can be classified as Class I waste with the approval of
the competent authorities.

Name	Value	Unit
Conductivity	116	µS/cm
pH-value	9.9	-
Total dissolved substance content	12	mg/l
Ignition loss	3.89	%
Dry matter	99.7	%
Non-volatile lipophilic matter	<0.05	%
Antimony	<0.005	mg/l
Arsenic	<0.005	mg/l
Barium	0.010	mg/l
Lead	<0.005	mg/l
Cadmium	<0.0005	mg/l
Chloride	2.51	mg/l
Total chrome	<0.005	mg/l
Easily purgeable cyanide	<0.002	mg/l
Fluoride	2.38	mg/l
Dissolved organic carbon (DOC)	9.0	mg/l
Total organic carbon (TOC)	2.40	%
Copper	<0.005	mg/l
Molybdenum	<0.005	mg/l
Nickel	<0.01	mg/l
Phenol index	0.012	mg/l
Mercury	<0.0001	mg/l
Selenium	<0.005	mg/l
Sulphate	6.27	mg/l
Zinc	<0.02	mg/l

7.4 Formaldehyde and VOC emissions

Measurement agency / Date: Eurofins Product Testing A/S Smedeskovvej 38,
DK-8464 Galten, Denmark, various tests

Procedure: Test of product emissions in accordance with the German
Committee for Health-Related Evaluation of Building Products /AgBB/

Results:

No carcinogenic substances were detected after 3 and 28 days.

The total VOC (TVOC) after 3 days was below the assessment threshold of 10 mg/m^3.

The total VOC (TVOC) after 28 days was below the assessment threshold of 1 mg/m^3.

The total SVOC (TSVOC) after 28 days was below the assessment threshold of 0.1 mg/m^3.

A rating figure R below the threshold of 1 resulted from the individual VOC
substances with more than 5 µg/m^3 detected after 28 days.

The total individual VOC substances without a NIK value after 28 days was below
the assessment threshold of 0.1 mg/m^3.

The formaldehyde concentration after 28 days was below the assessment threshold
of 120 µg/m^3.

VOC Emissionen

Name	Value	Unit
Overview of Results (28 Tage)	-	µg/m^3
TVOC (C6 - C16)	-	µg/m^3
Sum SVOC (C16 - C22)	-	µg/m^3
R (dimensionless)	-	-
VOC without NIK	-	µg/m^3
Carcinogenic Substances	nicht nachgewiesen	µg/m^3

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

Name	Value	Unit
TVOC (C6 - C16)	-	µg/m^3
Sum SVOC (C16 - C22)	-	µg/m^3
R (dimensionless)	-	-
VOC without NIK	-	µg/m^3
Carcinogenic Substances	-	µg/m^3

8. References

**Institut Bauen
und Umwelt e.V.** (ed.): Product
category rules for building-related products and services – Part A: Calculation
rules for the LCA and requirements for the background report.
Version 1.6 dated
11/04/2017, Berlin

**Institut Bauen
und Umwelt e.V.** (ed.): Product
category rules for building-related products and services – Part B: Requirements

of the EPD for mineral-based insulation. Version 1.6 dated 30/11/2017, Berlin

/AgBB/

Assessment
scheme for VOC from construction products; procedure for the health-based
assessment of emissions of volatile organic compounds (VOC and SVOC) from
construction products, status as of July 2004

/AGI Q 132/

AGI worksheet Q132
on stone wool as insulation material for industrial installations, Arbeitsgemeinschaft Industriebau e.V., Bensheim, 12-2016

/BBSR 2017/

Service life of
components for lifecycle analysis in accordance with the national standard for
sustainable building, version dated 24/02/2017

/BG BAU/
Instruction
manual entitled 'Handling mineral wool insulation materials (glass wool, stone wool)'. Berufsgenossenschaft der Bauwirtschaft, Berlin, edition dated 04/2015

/Biocide Products Directive/

The European
Parliament and Council's EU Directive No. 528/2012 dated 22nd May 2012 on the placing
on the market and the use of biocide products

/Chemicals Prohibition Order (ChemVerbotsV)/

Directive on
bans and limitations on the placing on the market of hazardous substances, formulations
and products in accordance with the Chemicals Act. Version dated 20th January
2017

/Landfill Ordinance (DepV)/

Landfill
Ordinance dated 27th April 2009 (Federal Legal Gazette. I p. 900) which was
last amended by Article 2 of the Directive dated 27th September 2017 (Federal
Legal Gazette. I p. 3465)

/GaBi/

/GaBi/ software
system and database for integrated life cycle assessments, Copyright 1992-2018, thinkstep
AG. Programme version 8.5.0.79, database version 8.7 including Service Pack 35

/GaBi documentation/

Thinkstep AG:
GaBi 6 life cycle inventory data documentation, 2018.
http://www.gabi-software.com/support/gabi/gabi-6-lci-documentation

/Hazardous Substances Ordinance (GefStoffV)/

Directive on
protection against hazardous substances dated 26th November 2010, last modified
by Article 148 of the Law dated 29th March 2017

/Insulation Keymark Scheme Rules 2.0/

European
INSULATION KEYMARK Scheme for Thermal Insulation Products; Revision: 2.0, CEN,
21.11.2016

/RAL-GZ 388/

/RAL quality
mark (RAL-GZ 388)/ Mineral Wool Products, RAL German

Institute for Quality
Assurance and Labelling.

**/Technical
Instructions on Air Quality (TA Luft)/**

Technical instructions
on air quality: first general administrative regulation on the Federal
Emissions Protection Act dated 24th June 2002

**/German Federal
Environment Agencies (UBA)-Text 30/94/**

Federal
Environment Protection Agency (Ed.): investigations of indoor contamination by
fibrous fine dust from installed mineral wool products; UBA Text 30/94, Federal
Environment Protection Agency, 1994, Berlin

/VDI 2055/

Thermal
insulation of heated and refrigerated operational installations in industry and
in building services – calculation rules

**/EU Regulation No.
305/2011/**

The European
Parliament's and Council's EU Regulation No. 305/2011 dated 9th March 2011 to
define harmonised conditions for marketing building products and to revoke Council
Directive 89/106/EEC

STANDARDS:

/DIN 4108-4/

/DIN
4108-4:2017-03/, Thermal insulation and energy economy in buildings – Part 4: Hygrothermal
design values

/DIN 4108-10/

/DIN
4108-10:2015-12/, Thermal insulation and energy economy in buildings – Part 10: Application-related
requirements for thermal insulation materials – Factory-made products

/DIN EN 826/

/DIN EN 826:2013-05/, Thermal insulating products for building applications – Determination
of compression behaviour; German version EN 826:2013

/DIN EN 1602/

/DIN EN
1602:2013-05/, Thermal insulating products for building applications – Determination
of the apparent density; German version EN 1602:2013

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12086:2013-06/, Thermal insulating products for building applications –
Determination of water vapour transmission properties; German version EN 12086:2013

/DIN EN 12457-4/

/DIN EN
12457-4:2003-01/, Characterisation of waste – Leaching; Compliance test for
leaching of granular waste materials and sludges – Part 4: One-stage batch test
at a liquid to solid ratio of 10 l/kg for materials with particle size below 10 mm (with or without limited size reduction); German version EN 12457-4:2002

/DIN EN 13162/

/DIN EN
13162:2015-04/, Thermal insulation products for buildings – Factory-made mineral wool

(MW) products – Specification; German version EN 13162:2012+A1:2015

/DIN EN 13501-1/

/DIN EN 13501-1:2010-01/, Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests; German version EN 13501-1:2007+A1:2009

/DIN EN 14303/

/DIN EN 14303:2016-08/, Thermal insulation products for building equipment and industrial installations – Factory-made mineral wool (MW) – Specification; German version EN 14303:2015

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/DIN EN ISO 354/

/DIN EN ISO 354: 2003-12/, Acoustics – Measurement of sound absorption in a reverberation room (ISO 354:2003); German version EN ISO 354:2003

/DIN EN ISO 9001/

/DIN EN ISO 9001:2015-11/, Quality management systems – Requirements (ISO 9001:2015); German and English version EN ISO 9001:2015

/DIN EN ISO 14001/

/DIN EN ISO 14001:2015-11/, Environmental management systems – Requirements with guidance for use (ISO 14001:2015); German and English versions EN ISO 14001:2015

/ISO 15686/

/ISO 15686 standard series/, Buildings and constructed assets – Service life planning; various parts and issue dates

The literature referred to in the Environmental Product Declaration must be listed in full.Standards already fully quoted in the EPD do not need to be listed here again.
The current version of PCR Part A and PCR Part B of the PCR document on which they are based must be referenced.

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

Ingenieurbüro Fischer
Breiten Dyk 76
47803 Krefeld
Germany

+49 2151 4462719
info@fisch-ing.de
www.fisch-ing.de

thinkstep AG
Hauptstraße 111- 113
70771 Leinfelden-Echterdingen
Germany

+49 711 341817-0
info@thinkstep.com
www.thinkstep.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

ANNEX 1 – LCA results of the facings

In the following the environmental impacts and life cycle inventory indicators of ROCKWOOL facings are shown. These serve as basis for the calculation of the environmental profiles of faced stone-wool insulation boards.
It is assumed that the facing will be landfilled after usage. This scenario corresponds to the disposal scenario of the unfaced stone-wool products.
After recalculating the volume-based values for the desired thickness, the environmental results for the stone-wool boards and their facings can be added together separately per module.

The environmental profiles of the facings are shown for one-sided attachment.

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	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: 1 m² glass fleece

Para-meter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	[kg CO_2-Eq.]	2.42E-01	2.34E-03	0.00E+00	0.00E+00	3.72E-04	0.00E+00	1.61E-03	0.00E+00
ODP	[kg CFC11-Eq.]	1.14E-11	2.89E-15	0.00E+00	0.00E+00	4.59E-16	0.00E+00	2.58E-14	0.00E+00
AP	[kg SO_2-Eq.]	1.03E-03	1.03E-05	0.00E+00	0.00E+00	1.63E-06	0.00E+00	9.79E-06	0.00E+00
EP	[kg $(PO_4)^{3-}$-Eq.]	1.21E-04	2.81E-06	0.00E+00	0.00E+00	4.46E-07	0.00E+00	1.34E-06	0.00E+00
POCP	[kg ethene-Eq.]	8.75E-05	-3.53E-06	0.00E+00	0.00E+00	-5.61E-07	0.00E+00	9.18E-07	0.00E+00
ADPE	[kg Sb-Eq.]	8.26E-06	1.21E-10	0.00E+00	0.00E+00	1.92E-11	0.00E+00	5.99E-10	0.00E+00
ADPF	[MJ]	3.50E+00	3.19E-02	0.00E+00	0.00E+00	5.07E-03	0.00E+00	2.11E-02	0.00E+00

Caption	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

RESULTS OF THE LCA - RESOURCE USE: 1 m² glass fleece

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	4.25E-01	2.44E-03	0.00E+00	0.00E+00	3.88E-04	0.00E+00	2.16E-03	0.00E+00
PERM	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERT	[MJ]	4.25E-01	2.44E-03	0.00E+00	0.00E+00	3.88E-04	0.00E+00	2.16E-03	0.00E+00
PENRE	[MJ]	3.90E+00	3.21E-02	0.00E+00	0.00E+00	5.09E-03	0.00E+00	2.19E-02	0.00E+00
PENRM	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PENRT	[MJ]	3.90E+00	3.21E-02	0.00E+00	0.00E+00	5.09E-03	0.00E+00	2.19E-02	0.00E+00
SM	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RSF	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	[m³]	1.51E-03	1.41E-06	0.00E+00	0.00E+00	2.24E-07	0.00E+00	4.15E-06	0.00E+00

Caption	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 – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m² glass fleece

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	1.54E-06	2.58E-08	0.00E+00	0.00E+00	4.10E-09	0.00E+00	6.80E-09	0.00E+00
NHWD	[kg]	1.99E-02	8.00E-06	0.00E+00	0.00E+00	1.27E-06	0.00E+00	1.00E-01	0.00E+00
RWD	[kg]	1.57E-04	4.26E-08	0.00E+00	0.00E+00	6.76E-09	0.00E+00	3.49E-07	0.00E+00
CRU	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFR	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MER	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EEE	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EET	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Caption	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; EEE = Exported thermal energy

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	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: 1 m² glass silk

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	[kg CO_2-Eq.]	2.05E-01	2.39E-03	0.00E+00	0.00E+00	3.80E-04	0.00E+00	1.65E-03	0.00E+00
ODP	[kg CFC11-Eq.]	9.86E-12	2.95E-15	0.00E+00	0.00E+00	4.68E-16	0.00E+00	2.63E-14	0.00E+00
AP	[kg SO_2-Eq.]	9.96E-04	1.05E-05	0.00E+00	0.00E+00	1.67E-06	0.00E+00	9.98E-06	0.00E+00
EP	[kg $(PO_4)^{3-}$-Eq.]	1.08E-04	2.87E-06	0.00E+00	0.00E+00	4.55E-07	0.00E+00	1.37E-06	0.00E+00
POCP	[kg ethene-Eq.]	6.42E-05	-3.60E-06	0.00E+00	0.00E+00	-5.72E-07	0.00E+00	9.36E-07	0.00E+00
ADPE	[kg Sb-Eq.]	9.34E-06	1.23E-10	0.00E+00	0.00E+00	1.96E-11	0.00E+00	6.11E-10	0.00E+00
ADPF	[MJ]	2.65E+00	3.26E-02	0.00E+00	0.00E+00	5.17E-03	0.00E+00	2.15E-02	0.00E+00

Caption	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

RESULTS OF THE LCA - RESOURCE USE: 1 m² glass silk

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	4.25E-01	2.44E-03	0.00E+00	0.00E+00	3.88E-04	0.00E+00	2.16E-03	0.00E+00
PERM	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERT	[MJ]	4.25E-01	2.44E-03	0.00E+00	0.00E+00	3.88E-04	0.00E+00	2.16E-03	0.00E+00
PENRE	[MJ]	3.90E+00	3.21E-02	0.00E+00	0.00E+00	5.09E-03	0.00E+00	2.19E-02	0.00E+00
PENRM	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PENRT	[MJ]	3.90E+00	3.21E-02	0.00E+00	0.00E+00	5.09E-03	0.00E+00	2.19E-02	0.00E+00
SM	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RSF	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	[m^3]	1.51E-03	1.41E-06	0.00E+00	0.00E+00	2.24E-07	0.00E+00	4.15E-06	0.00E+00

Caption	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 – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m² glass silk

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	1.54E-06	2.58E-08	0.00E+00	0.00E+00	4.10E-09	0.00E+00	6.80E-09	0.00E+00
NHWD	[kg]	1.99E-02	8.00E-06	0.00E+00	0.00E+00	1.27E-06	0.00E+00	1.00E-01	0.00E+00
RWD	[kg]	1.57E-04	4.26E-08	0.00E+00	0.00E+00	6.76E-09	0.00E+00	3.49E-07	0.00E+00
CRU	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFR	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MER	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EEE	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EET	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Caption	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; EEE = Exported thermal energy

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	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: 1 m² mineral fleece

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	[kg CO_2-Eq.]	5.88E-01	8.13E-03	0.00E+00	0.00E+00	1.29E-03	0.00E+00	5.58E-03	0.00E+00
ODP	[kg CFC11-Eq.]	2.17E-11	1.00E-14	0.00E+00	0.00E+00	1.59E-15	0.00E+00	8.92E-14	0.00E+00
AP	[kg SO_2-Eq.]	1.80E-03	3.56E-05	0.00E+00	0.00E+00	5.65E-06	0.00E+00	3.39E-05	0.00E+00
EP	[kg $(PO_4)^{3-}$-Eq.]	1.90E-04	9.70E-06	0.00E+00	0.00E+00	1.54E-06	0.00E+00	4.65E-06	0.00E+00
POCP	[kg ethene-Eq.]	9.14E-05	-1.22E-05	0.00E+00	0.00E+00	-1.94E-06	0.00E+00	3.18E-06	0.00E+00
ADPE	[kg Sb-Eq.]	4.55E-06	4.19E-10	0.00E+00	0.00E+00	6.65E-11	0.00E+00	2.07E-09	0.00E+00
ADPF	[MJ]	1.35E+01	1.10E-01	0.00E+00	0.00E+00	1.75E-02	0.00E+00	7.28E-02	0.00E+00

Caption	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

RESULTS OF THE LCA - RESOURCE USE: 1 m² mineral fleece

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	5.79E-01	8.44E-03	0.00E+00	0.00E+00	1.34E-03	0.00E+00	7.46E-03	0.00E+00
PERM	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERT	[MJ]	5.79E-01	8.44E-03	0.00E+00	0.00E+00	1.34E-03	0.00E+00	7.46E-03	0.00E+00
PENRE	[MJ]	1.41E+01	1.11E-01	0.00E+00	0.00E+00	1.76E-02	0.00E+00	7.59E-02	0.00E+00
PENRM	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PENRT	[MJ]	1.41E+01	1.11E-01	0.00E+00	0.00E+00	1.76E-02	0.00E+00	7.59E-02	0.00E+00
SM	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RSF	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	[m^3]	3.20E-03	4.88E-06	0.00E+00	0.00E+00	7.75E-07	0.00E+00	1.44E-05	0.00E+00

Caption	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 – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m² mineral fleece

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	3.39E-04	8.95E-08	0.00E+00	0.00E+00	1.42E-08	0.00E+00	2.35E-08	0.00E+00
NHWD	[kg]	6.33E-02	2.77E-05	0.00E+00	0.00E+00	4.40E-06	0.00E+00	3.47E-01	0.00E+00
RWD	[kg]	2.56E-04	1.47E-07	0.00E+00	0.00E+00	2.34E-08	0.00E+00	1.21E-06	0.00E+00
CRU	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFR	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MER	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EEE	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EET	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Caption	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; EEE = Exported thermal energy

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	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: 1 m² 1 m² mineral based primer

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	[kg CO_2-Eq.]	2.17E-01	5.87E-03	0.00E+00	0.00E+00	9.31E-04	0.00E+00	4.03E-03	0.00E+00
ODP	[kg CFC11-Eq.]	1.21E-11	7.25E-15	0.00E+00	0.00E+00	1.15E-15	0.00E+00	6.45E-14	0.00E+00
AP	[kg SO_2-Eq.]	8.86E-04	2.57E-05	0.00E+00	0.00E+00	4.08E-06	0.00E+00	2.45E-05	0.00E+00
EP	[kg $(PO_4)^{3-}$-Eq.]	7.85E-05	7.06E-06	0.00E+00	0.00E+00	1.12E-06	0.00E+00	3.36E-06	0.00E+00
POCP	[kg ethene-Eq.]	8.83E-05	-8.82E-06	0.00E+00	0.00E+00	-1.40E-06	0.00E+00	2.30E-06	0.00E+00
ADPE	[kg Sb-Eq.]	2.63E-07	3.02E-10	0.00E+00	0.00E+00	4.80E-11	0.00E+00	1.50E-09	0.00E+00
ADPF	[MJ]	4.29E+00	8.00E-02	0.00E+00	0.00E+00	1.27E-02	0.00E+00	5.26E-02	0.00E+00

Caption	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

RESULTS OF THE LCA - RESOURCE USE: 1 m² mineral based primer

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	2.76E-01	6.11E-03	0.00E+00	0.00E+00	9.70E-04	0.00E+00	5.39E-03	0.00E+00
PERM	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERT	[MJ]	2.76E-01	6.11E-03	0.00E+00	0.00E+00	9.70E-04	0.00E+00	5.39E-03	0.00E+00
PENRE	[MJ]	4.66E+00	8.00E-02	0.00E+00	0.00E+00	1.27E-02	0.00E+00	5.48E-02	0.00E+00
PENRM	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PENRT	[MJ]	4.66E+00	8.00E-02	0.00E+00	0.00E+00	1.27E-02	0.00E+00	5.48E-02	0.00E+00
SM	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RSF	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	[m^3]	1.11E-03	3.53E-06	0.00E+00	0.00E+00	5.60E-07	0.00E+00	1.04E-05	0.00E+00

Caption	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 – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m² mineral based primer

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	3.43E-04	6.49E-08	0.00E+00	0.00E+00	1.03E-08	0.00E+00	1.70E-08	0.00E+00
NHWD	[kg]	5.28E-02	2.00E-05	0.00E+00	0.00E+00	3.18E-06	0.00E+00	2.50E-01	0.00E+00
RWD	[kg]	1.44E-04	1.06E-07	0.00E+00	0.00E+00	1.69E-08	0.00E+00	8.72E-07	0.00E+00
CRU	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFR	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MER	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EEE	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EET	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Caption	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; EEE = Exported thermal energy

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	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: 1 m² aluminium sandwich foil

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	[kg CO_2-Eq.]	6.41E-01	2.22E-03	0.00E+00	0.00E+00	3.53E-04	0.00E+00	1.53E-03	0.00E+00
ODP	[kg CFC11-Eq.]	2.23E-10	2.74E-15	0.00E+00	0.00E+00	4.35E-16	0.00E+00	2.44E-14	0.00E+00
AP	[kg SO_2-Eq.]	2.34E-03	9.77E-06	0.00E+00	0.00E+00	1.55E-06	0.00E+00	9.28E-06	0.00E+00
EP	[kg $(PO_4)^{3-}$-Eq.]	1.70E-04	2.66E-06	0.00E+00	0.00E+00	4.23E-07	0.00E+00	1.27E-06	0.00E+00
POCP	[kg ethene-Eq.]	1.70E-04	-3.35E-06	0.00E+00	0.00E+00	-5.32E-07	0.00E+00	8.70E-07	0.00E+00
ADPE	[kg Sb-Eq.]	1.46E-06	1.15E-10	0.00E+00	0.00E+00	1.82E-11	0.00E+00	5.68E-10	0.00E+00
ADPF	[MJ]	8.98E+00	3.03E-02	0.00E+00	0.00E+00	4.81E-03	0.00E+00	2.00E-02	0.00E+00

Caption	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

RESULTS OF THE LCA - RESOURCE USE: 1 m² aluminium sandwich foil

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	2.37E+00	2.32E-03	0.00E+00	0.00E+00	3.68E-04	0.00E+00	2.05E-03	0.00E+00
PERM	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERT	[MJ]	2.37E+00	2.32E-03	0.00E+00	0.00E+00	3.68E-04	0.00E+00	2.05E-03	0.00E+00
PENRE	[MJ]	8.03E+00	3.04E-02	0.00E+00	0.00E+00	4.82E-03	0.00E+00	2.08E-02	0.00E+00
PENRM	[MJ]	2.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PENRT	[MJ]	1.07E+01	3.04E-02	0.00E+00	0.00E+00	4.82E-03	0.00E+00	2.08E-02	0.00E+00
SM	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RSF	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	[m^3]	5.11E-03	1.34E-06	0.00E+00	0.00E+00	2.12E-07	0.00E+00	3.93E-06	0.00E+00

Caption	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 – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m² aluminium sandwich foil

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	2.79E-06	2.45E-08	0.00E+00	0.00E+00	3.89E-09	0.00E+00	6.45E-09	0.00E+00
NHWD	[kg]	1.12E-01	7.56E-06	0.00E+00	0.00E+00	1.20E-06	0.00E+00	9.50E-02	0.00E+00
RWD	[kg]	6.93E-04	4.04E-08	0.00E+00	0.00E+00	6.41E-09	0.00E+00	3.31E-07	0.00E+00
CRU	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFR	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MER	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EEE	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EET	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Caption	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; EEE = Exported thermal energy

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	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:
1 m² anorganic fiber-reinforced coating based on magnesium oxide

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	[kg CO_2-Eq.]	6.66E+00	1.28E-01	0.00E+00	0.00E+00	2.03E-02	0.00E+00	8.79E-02	0.00E+00
ODP	[kg CFC11-Eq.]	2.18E-10	1.58E-13	0.00E+00	0.00E+00	2.50E-14	0.00E+00	1.41E-12	0.00E+00
AP	[kg SO_2-Eq.]	1.10E-02	5.61E-04	0.00E+00	0.00E+00	8.90E-05	0.00E+00	5.33E-04	0.00E+00
EP	[kg $(PO_4)^{3-}$-Eq.]	1.68E-03	1.53E-04	0.00E+00	0.00E+00	2.43E-05	0.00E+00	7.32E-05	0.00E+00
POCP	[kg ethene-Eq.]	6.69E-04	-1.93E-04	0.00E+00	0.00E+00	-3.06E-05	0.00E+00	5.00E-05	0.00E+00
ADPE	[kg Sb-Eq.]	5.39E-05	6.62E-09	0.00E+00	0.00E+00	1.05E-09	0.00E+00	3.27E-08	0.00E+00
ADPF	[MJ]	5.35E+01	1.74E+00	0.00E+00	0.00E+00	2.76E-01	0.00E+00	1.15E+00	0.00E+00

Caption	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

RESULTS OF THE LCA - RESOURCE USE:
1 m² anorganic fiber-reinforced coating based on magnesium oxide

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	7.67E+00	1.34E-01	0.00E+00	0.00E+00	2.12E-02	0.00E+00	1.18E-01	0.00E+00
PERM	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERT	[MJ]	7.67E+00	1.34E-01	0.00E+00	0.00E+00	2.12E-02	0.00E+00	1.18E-01	0.00E+00
PENRE	[MJ]	6.05E+01	1.75E+00	0.00E+00	0.00E+00	2.77E-01	0.00E+00	1.20E+00	0.00E+00
PENRM	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PENRT	[MJ]	6.05E+01	1.75E+00	0.00E+00	0.00E+00	2.77E-01	0.00E+00	1.20E+00	0.00E+00
SM	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RSF	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	[m^3]	1.57E-02	7.69E-05	0.00E+00	0.00E+00	1.22E-05	0.00E+00	2.26E-04	0.00E+00

Caption	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 – OUTPUT FLOWS AND WASTE CATEGORIES:
1 m² anorganic fiber-reinforced coating based on magnesium oxide

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	2,95E-05	1,40E-06	0,00E+00	0,00E+00	2,23E-07	0,00E+00	3,71E-07	0,00E+00
NHWD	[kg]	6,92E-01	4,36E-04	0,00E+00	0,00E+00	6,92E-05	0,00E+00	5,46E+00	0,00E+00
RWD	[kg]	2,77E-03	2,32E-06	0,00E+00	0,00E+00	3,69E-07	0,00E+00	1,90E-05	0,00E+00
CRU	[kg]	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
MFR	[kg]	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
MER	[kg]	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
EEE	[MJ]	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
EET	[MJ]	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Caption	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; EEE = Exported thermal energy

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	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: 1 m² RockTect facing

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	[kg CO_2-Eq.]	4.06E-01	3.40E-03	0.00E+00	0.00E+00	5.40E-04	0.00E+00	2.34E-03	0.00E+00
ODP	[kg CFC11-Eq.]	1.02E-11	4.19E-15	0.00E+00	0.00E+00	6.65E-16	0.00E+00	3.74E-14	0.00E+00
AP	[kg SO_2-Eq.]	6.77E-04	1.49E-05	0.00E+00	0.00E+00	2.37E-06	0.00E+00	1.42E-05	0.00E+00
EP	[kg $(PO_4)^{3-}$-Eq.]	6.96E-05	4.08E-06	0.00E+00	0.00E+00	6.47E-07	0.00E+00	1.95E-06	0.00E+00
POCP	[kg ethene-Eq.]	1.48E-04	-5.12E-06	0.00E+00	0.00E+00	-8.13E-07	0.00E+00	1.33E-06	0.00E+00
ADPE	[kg Sb-Eq.]	1.39E-07	1.76E-10	0.00E+00	0.00E+00	2.79E-11	0.00E+00	8.69E-10	0.00E+00
ADPF	[MJ]	1.18E+01	4.63E-02	0.00E+00	0.00E+00	7.35E-03	0.00E+00	3.05E-02	0.00E+00

Caption	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

RESULTS OF THE LCA - RESOURCE USE: 1 m² RockTect facing

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	3.77E-01	3.55E-03	0.00E+00	0.00E+00	5.63E-04	0.00E+00	3.13E-03	0.00E+00
PERM	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERT	[MJ]	3.77E-01	3.55E-03	0.00E+00	0.00E+00	5.63E-04	0.00E+00	3.13E-03	0.00E+00
PENRE	[MJ]	7.04E+00	4.65E-02	0.00E+00	0.00E+00	7.38E-03	0.00E+00	3.18E-02	0.00E+00
PENRM	[MJ]	5.13E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	[MJ]	1.22E+01	4.65E-02	0.00E+00	0.00E+00	7.38E-03	0.00E+00	3.18E-02	0.00E+00
SM	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RSF	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	[m^3]	1.61E-03	2.05E-06	0.00E+00	0.00E+00	3.25E-07	0.00E+00	6.02E-06	0.00E+00

Caption	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 – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m² RockTect facing

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	1.74E-06	3.75E-08	0.00E+00	0.00E+00	5.95E-09	0.00E+00	9.87E-09	0.00E+00
NHWD	[kg]	2.27E-03	1.16E-05	0.00E+00	0.00E+00	1.84E-06	0.00E+00	1.45E-01	0.00E+00
RWD	[kg]	1.41E-04	6.18E-08	0.00E+00	0.00E+00	9.81E-09	0.00E+00	5.06E-07	0.00E+00
CRU	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFR	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MER	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EEE	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EET	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Caption	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; EEE = Exported thermal energy

ANNEX 2 – product list medium bulk density range

The following products are covered by the IBU-EPD "ROCKWOOL rock wool insulation materials in the medium bulk density range".

A-Underlagsplade
Betorock
Betorock 035
Brickrock SL 240
Ceilrock
Ceilrock Top
Ceilrock Top
Conlit Firesafe
Conrock 10
Conrock 10 P
Conrock 6
Conrock 7
Conrock 7 P
Conrock 8
Conrock 8 P
Conrock 9
Conrock 9 P
Conrock Plus 10
Conrock Q3
Conrock Q5
Coverrock
Coverrock 034 Austria
Coverrock 036
Coverrock BR
Coverrock BR 035
Coverrock Deko
Coverrock I
Coverrock I 034 Austria
Coverrock II
Coverrock II 034 Austria
Coverrock Laibungsplatte
Coverrock Plus
Coverrock X
Coverrock X-2
Decrock
Ecorock Duo
Ecorock Duo PR
Facett Pure
Facett Pure schwarz
Fillrock KD
Fillrock KD Plus
Fillrock RG
Fillrock RG Plus
Fixrock 032 Austria
Fixrock 032 VS Austria
Fixrock 033
Fixrock 033 LB
Fixrock 033 VS

Fixrock BWM Brandriegel L
Fixrock BWM Brandriegel M
Fixrock BWM Brandriegel S
Fixrock BWM Brandriegel XL
Fixrock HB
Floorrock Acoustic CP5
Floorrock SE
Frontrock 120
Frontrock Max E 036
Frontrock Max Plus
Interrock 035
Interrock 9
Interrock 10
Kernrock 033
Kernrock 033 VS
Masterrock 033 kaschiert
Masterrock 035
Masterrock 035 kaschiert
Masterrock 035 GF
Masterrock 035 Kleinformat
Paneelrock
Planarock Paint
Planarock Top
ProRox WM 210
ProRox WM 220
ProRox WM 950
ProRox WM 960
PT A 036
PT A 036 II
Quadrorock N
Randdämmstreifen RST
RFP 035
RFP 035 VS
RFS 5350
RFS LK 6464
RMZ 4040
RMZ LK 5454
RMZ LK 6464
RMZ-LKG
Rockacier B NU Energy
RockFloor Base
RockSATE Duo Plus
ROCKWOOL 800
Rondorock G
Rondorock N
Rondorock N Schiedel
RPB-K
RPB-K 1

RPB-K 3
RPB-K 3 SE
RPI-6
RPI-6 035
RPI-7
RPI-7 032 Austria
RPI-7 033
RPI-7 035
RPI-8 035
RPI-8 H
RPI-9 035
RPI-10
RPI-10 035
RP-LB
RP-PL
RP-VII
RP-X
RSG 10
RSG 12
Silkrock 6 SE
Silkrock 6 SE hygienic
Silkrock 6 SE Trox
Silkrock 7 SE
Silkrock 8 SE
Silkrock 9 SE
Silkrock 10 SE
Silkrock 10 SE hygienic
Silkrock 10 SZ
Silkrock Green 8
Silkrock Green 12
Soundrock 6 NZ
Soundrock 6 SE
Soundrock 6 SZ
Soundrock 7 NZ 035
Soundrock 7 SE
Soundrock 8 NE
Soundrock 8 NZ
Soundrock 8 SE
Soundrock 9 NE
Soundrock 9 SE
Soundrock 9 SZ
Soundrock 10 NE
Soundrock 10 SE
Soundrock 10 SZ
Spanrock L
Spanrock L LAM
Spanrock M
Spanrock M LAM
Spanrock M Plus
Spanrock M Plus LAM
Spanrock S
Spanrock S LAM

Spanrock TT
Spanrock TT LAM
Spanrock XL
Spanrock XL LAM
Speedrock
Speedrock II
Splitrock MW Trennfugendämmplatte
Steelrock 70-035
Streetrock 95 SE
Streetrock 105 SE
Streetrock 120 SE
Teclit PS Cold
Tegarock
Tegarock L
Termarock 100