ENVIRONMENTAL PRODUCT DECLARATION
as per ISO 14025 and EN 15804

<table>
<thead>
<tr>
<th>Owner of the Declaration</th>
<th>Knauf Insulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programme holder</td>
<td>Institut Bauen und Umwelt e.V. (IBU)</td>
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<tr>
<td>Publisher</td>
<td>Institut Bauen und Umwelt e.V. (IBU)</td>
</tr>
<tr>
<td>Declaration number</td>
<td>EPD-KIN-20140161-CBB1-EN</td>
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<tr>
<td>ECO EPD Ref. No.</td>
<td>ECO-00000001</td>
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<tr>
<td>Issue date</td>
<td>22.09.2014</td>
</tr>
<tr>
<td>Valid to</td>
<td>21.09.2019</td>
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</table>

Glass Mineral Wool 032 unfaced rolls
TI 132U, KI Fit 032, Naturoll 032, KI Multifit 032, EASY LRR 032 U
with ECOSE® Technology

Knauf Insulation

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

Knauf Insulation
Programme holder
IBU - Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

GMW 032 unfaced rolls with ECOSE
Owner of the Declaration
Knauf Insulation
rue E. Franqui, 7
1435 Mont-Saint-Guibert
Belgium

Declaration number
EPD-KIN-20140161-CBB1-EN | ECO-00000001

This Declaration is based on the Product Category Rules:
Mineral insulating materials, 07.2014
(PCR tested and approved by the independent expert committee)

Issue date
22.09.2014

Valid to
21.09.2019

Scope:
GMW (Glass Mineral Wool) 032 rolls are unfaced insulation products. They comply with the requirements of /EN 13162/. The thickness is ranging from 30 mm to 260 mm. The manufacturing company is Knauf Insulation - plants Krupka (Czech Republic), Lannemezan (France) and Visé (Belgium). Indicators are calculated using 2013 data.

The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

Verification
The CEN Norm EN 15804 serves as the core PCR
Independent verification of the declaration according to ISO 14025

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

Dr. Burkart Lehmann
(Managing Director IBU)

Dr. Burkhart Lehmann
(Independent tester appointed by SVA)

Product

Product description
Knauf Insulation manufactures glass mineral wool insulation products such as TI 132U, KI Fit 032, Naturell 032, KI Multifit 032, EASY LRR 032 U with ECOSE® Technology. They are available in the form of slabs or rolls, and also boards. The density for glass mineral wool ranges from 10 to 85 kg/m³. In general, glass mineral wool consists of >= 92.5% inert material. The inert part is made of recycled glass (external cullet, up to 80% of the composition) and mainly sand and dolomite. The remaining <= 7.5% are made of bio-based binder components. At Knauf Insulation, the binder used for the GMW products is the ECOSE binder whose origin is plant starch.

GMW 032 rolls are products unfaced, and they are used for their thermal, acoustical and fire characteristics. A representative product out of a particular group of products was selected for the calculation.


Application
Main applications for GMW 032 unfaced rolls are in pitched roofs, partition walls and timber frames. For the applications and use national regulations apply, in Germany the /Allgemeine bauaufsichtliche Zulassung Z.23.15-1461/ (building inspection approval) issued by the Deutsches Institut für Bautechnik (DIBt), Berlin.

Technical Data
GMW 032 unfaced rolls and their technical characteristics meet a number of technical requirements. The most important ones are summarized in the table here below, which also includes references to testing methods.

Technical characteristics

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal conductivity /EN 12667/</td>
<td>0.032</td>
<td>W/(mK)</td>
</tr>
<tr>
<td>Water vapour diffusion resistance factor /EN 13162/</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Gross density /EN 1602/</td>
<td>29.5 - 32.5</td>
<td>kg/m²</td>
</tr>
<tr>
<td>Longit. air-diffusion resist. /EN 29053/</td>
<td>&gt;=5</td>
<td>kNs/m^4</td>
</tr>
<tr>
<td>Water absorption Wp /EN 1609/</td>
<td>&lt; 1</td>
<td>kg/m²</td>
</tr>
<tr>
<td>Water absorption Wlp /EN 12087/</td>
<td>&lt; 3</td>
<td>kg/m²</td>
</tr>
</tbody>
</table>
GMW is an insulation material of mostly inorganic origin intended for thermal and acoustic insulation, as well as for fire prevention in construction and industry. Raw materials used in the production of GMW are sand, limestone, soda ash and a high level of recycled glass (up to 80%). A bio-based binder, ECOSE, is spread on the fibers which polymerisation contributes to fix the product dimensions. The cured binder bonds the fibres together thus providing the necessary mat stability and mechanical strength.

Reference service life
The RSL or durability of GMW 032 is as long as the lifetime of the building in which it is used.

### LCA: Calculation rules

#### Declared Unit
The declared unit is 1 m³ of glass mineral wool. The density used for the calculation of the LCA is 31 kg/m³.

#### Declared unit

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declared unit</td>
<td>1</td>
<td>m³</td>
</tr>
<tr>
<td>Gross density</td>
<td>31</td>
<td>kg/m³</td>
</tr>
<tr>
<td>Conversion factor to 1 kg</td>
<td>0.032</td>
<td></td>
</tr>
</tbody>
</table>

#### System boundary
The system boundary of the EPD follows the modular approach defined by /EN 15804/.

#### The type of EPD is cradle-to-gate-with options.

List and explanation of the modules declared in the EPD.

The **product stage** (A1-A3) includes:
- A1 - raw material extraction and processing, processing of secondary material input (e.g. recycling processes),
- A2 - transport to the manufacturer and
- A3 - manufacturing.

This includes provision of all materials, products and energy, packaging processing and their transport, as well as waste processing up to the end-of-waste state or disposal of final residues during the product stage. The LCA results are given in an aggregated form for the product stage, meaning that the modules A1, A2 and A3 are considered as a unique module A1-A3.

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

The transport to the building site (A4) is included in the LCA calculation. For GMW 032 rolls, the average transport distance is assumed to be 600 km with a truck capacity utilization of 70%.

Module A5 has neither been included nor declared in this EPD, since it depends on the application, and method or tools used which can be very diverse, as GMW 032 rolls are used in different external wall applications. Therefore, the treatment of the packaging waste after the installation of the product has not been considered.

The **use phase**, because they are specific for the building, its use and location, none of the modules related to the

### Example Table

<table>
<thead>
<tr>
<th>Reaction to fire /EN 13501-1/</th>
<th>A1</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific heat capacity /EN ISO 10456/</td>
<td>850</td>
<td>J/kgK</td>
</tr>
<tr>
<td>Acoustic absorption</td>
<td>not relevant</td>
<td></td>
</tr>
<tr>
<td>Compression strength/resistance</td>
<td>not relevant</td>
<td></td>
</tr>
</tbody>
</table>
**LCA: Scenarios and additional technical information**

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

**Transport to the building site (A4)**

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Litres of fuel</td>
<td>0.0025</td>
<td>l/100km</td>
</tr>
<tr>
<td>Transport distance</td>
<td>600</td>
<td>km</td>
</tr>
<tr>
<td>Capacity utilisation (including empty runs)</td>
<td>70</td>
<td>%</td>
</tr>
<tr>
<td>Gross density of products transported</td>
<td>31</td>
<td>kg/m³</td>
</tr>
</tbody>
</table>

**Reference service life**

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference service life</td>
<td>50</td>
<td>a</td>
</tr>
</tbody>
</table>

**End-of-life (C1 - C4)**

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landfilling</td>
<td>31</td>
<td>kg</td>
</tr>
<tr>
<td>Transport distance</td>
<td>50</td>
<td>km</td>
</tr>
<tr>
<td>Capacity utilization</td>
<td>50</td>
<td>%</td>
</tr>
</tbody>
</table>
The primary energy demand from non-renewable resources is dominated by the production of glass mineral wool products (especially due to the energy consumption) and with little influence of raw materials, binder and packaging. The renewable energy demand is dominated by the binder (bio-based), the production (electricity mix) and the packaging (wood pallets).
References

Institut Bauen und Umwelt
Institut Bauen und Umwelt e.V., Berlin (pub.): Generation of Environmental Product Declarations (EPDs)

ISO 14025
DIN EN ISO 14025:2011-10: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

EN 15804
EN 15804:2012-04+A1 2013: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

PCR Part A
Institut Bauen und Umwelt e.V., Berlin (pub.): Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU). Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report. April 2013
www.bau-umwelt.de

IBU 2014 Part B
PCR -Part B: Requirements on the EPD for Mineral insulating materials (in german „Anforderungen an die EPD für Mineralische Dämmstoffe“), Version 1.3
Institut Bauen und Umwelt e.V., www.bau-umwelt.com, 074/2014

GaBi 6 2012

GaBi 6 2012B
GaBi 6: Documentation of GaBi6-Datasets for life cycle engineering. LBP University of Stuttgart and PE INTERNATIONAL AG, 2012.
http://documentation.gabi-software.com/

SoFi 5.8, 2014

DIN 4108-10

EN 13162
EN 13162:2012 Thermal insulation products for buildings - Factory made mineral wool (MW) products — Specification

EN 12667
EN 12667: 2001 Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Products of high and medium thermal resistance

EN 1602
EN 1602: 2013 Thermal insulating products for building applications - Determination of the apparent density

EN 29053
EN 29053: 1993 Acoustics; materials for acoustical applications; determination of airflow resistance

EN 1609
EN 1609: 2013 Thermal insulating products for building applications - Determination of short term water absorption by partial immersion

EN 12087
EN 12087: 2013 Thermal insulating products for building applications - Determination of long term water absorption by immersion

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

ISO 10456
ISO 10456: 2007 Building materials and products - Hygrothermal properties - Tabulated design values and procedures for determining declared and design thermal values

Regulation (EU) No 305/2011/

Regulation (EC) No 765/2008
Regulation (EC) No 765/2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products and repealing Regulation (EEC) No 339/93

Zulassung Z-23. 15-1461
Zulassung Z-23. 15-1461 Building inspection approval issued by the Deutsches Institut für Bautechnik (DIBt), Berlin. Wärmedämmsstoffe aus Mineralwolle (MW) nach DIN EN 13162:2009-02.