

# ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A1

Owner of the Declaration	<b>Knauf AMF Deckensysteme Ges.m.b.H.</b>
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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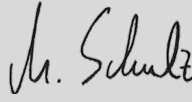
Heradesign acoustic panels (Euroclass B)  
Knauf AMF Deckensysteme Ges.m.b.H.

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## 1. General Information

<p><b>Knauf AMF Deckensysteme Ges.m.b.H.</b></p> <hr/> <p><b>Programme holder</b>          IBU – Institut Bauen und Umwelt e.V.          Panoramastr. 1          10178 Berlin          Germany</p> <hr/> <p><b>Declaration number</b>          EPD-KNA-20200028-IBA1-EN</p> <hr/> <p><b>This declaration is based on the product category rules:</b>          Wood cement - Mineral-bonded wooden composites, 07.2014          (PCR checked and approved by the SVR)</p> <hr/> <p><b>Issue date</b>          15/05/2020</p> <hr/> <p><b>Valid to</b>          14/05/2025</p> <hr/> <p style="text-align: center;"></p> <hr/> <p>Dipl. Ing. Hans Peters          (chairman of Institut Bauen und Umwelt e.V.)</p> <hr/> <p style="text-align: center;"></p> <hr/> <p>Dr. Alexander Röder          (Managing Director Institut Bauen und Umwelt e.V.)</p>	<p><b>Heradesign acoustic panels</b></p> <hr/> <p><b>Owner of the declaration</b>          Knauf AMF Deckensysteme Ges.m.b.H.          Ferndorf 29          9702 Ferndorf          Austria</p> <hr/> <p><b>Declared product / declared unit</b>          1 m<sup>2</sup> Heradesign acoustic panel (Euroclass B)</p> <hr/> <p><b>Scope:</b>          This document refers to 1 m<sup>2</sup> average Heradesign acoustic panel manufactured by Knauf AMF Deckensysteme Ges.m.b.H at the production facility in Ferndorf.</p> <p>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 <i>EN 15804+A1</i>. In the following, the standard will be simplified as <i>EN 15804</i>.</p> <hr/> <p><b>Verification</b></p> <table border="1" style="width: 100%;"> <tr> <td colspan="2">The standard <i>EN 15804</i> serves as the core PCR</td> </tr> <tr> <td colspan="2">Independent verification of the declaration and data according to <i>ISO 14025:2010</i></td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/> internally</td> <td style="text-align: center;"><input checked="" type="checkbox"/> externally</td> </tr> </table> <hr/> <p style="text-align: center;"></p> <hr/> <p>Matthias Schulz          (Independent verifier appointed by SVR)</p>	The standard <i>EN 15804</i> serves as the core PCR		Independent verification of the declaration and data according to <i>ISO 14025:2010</i>		<input type="checkbox"/> internally	<input checked="" type="checkbox"/> externally
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Independent verification of the declaration and data according to <i>ISO 14025:2010</i>							
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## 2. Product

### 2.1 Product description/Product definition

Heradesign panels are wood wool panels in accordance with *EN 13168* and/or *EN 13964*, manufactured from wood wool and mineral binding agents.

Product names:  
 Heradesign superfine  
 Heradesign fine  
 Heradesign macro  
 Heradesign micro  
 Heradesign plano

For the marketing of the products in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) Regulation (EU) No. 305/2011 (CPR) applies.  
 The products require a declaration of performance taking into account *EN 13168:2012+A1:2015, Thermal insulation products for buildings - Factory made wood wool (WW) products - Specification* or *EN 13964:2014, Suspended ceilings - Requirements and test methods* and the CE marking.  
 The respective national regulations apply to their use.

### 2.2 Application

Heradesign acoustic panels are primarily used as acoustic/decorative wall and ceiling panelling in offices, kindergartens etc.

### 2.3 Technical Data

Product-specific values can be found at <http://www.knaufamf.com>

#### Construction data

Name	Value	Unit
Gross density acc. to EN 197-1	470 - 545	kg/m <sup>3</sup>
Grammage	7.2 - 19	kg/m <sup>2</sup>
Thickness	15 - 35	mm
Bending strength (longitudinal)	n.r.	N/mm <sup>2</sup>
Bending strength (transverse)	n.r.	N/mm <sup>2</sup>
E-module (longitudinal)	n.r.	N/mm <sup>2</sup>
E-module (transverse)	n.r.	N/mm <sup>2</sup>
Tensile strength rectangular	n.r.	N/mm <sup>2</sup>
Thermal conductivity acc. to DIN 52612	0.08 - 0.11	W/(mK)
Water vapour diffusion resistance factor acc. to DIN 4108-4	2 - 5	-
Moisture content at 23 °C, 80%	11	M.-%
Coefficient of thermal expansion	n.r.	10 <sup>-6</sup> K <sup>-1</sup>
Swelling (air-dry to water-	n.r.	%

saturated)		
Sound absorption coefficient	0.35 - 1	%
n.r. = not relevant		

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics to EN

13168:2012+A1:2015, *Thermal insulation products for buildings - Factory made wood wool (WW) products - Specification* or rather EN 13964:2014, *Suspended ceilings - Requirements and test methods*.

## 2.4 Delivery status

Wood wool products are exclusively available as panels.

Typical dimensions:

Lengths: 1250 mm, 1200 mm and on request

Widths: 625 mm, 600 mm

Thicknesses: 15 mm, 25 mm, 35 mm

The products are delivered packed in cardboard on pallets.

## 2.5 Base materials/Ancillary materials

### Composition of Heradesign products:

Name	Value	Unit
Spruce ( <i>Picea abies</i> )	34 +/- 3	%
Caustic calcined magnesite ( $MgO$ , CAS 1309-48-4)	50 +/- 3	%
<i>of which primary material</i>	35	%
<i>Of which secondary material</i>	15	%
Magnesium sulfate ( $MgSO_4$ , CAS 7487-88-9)	5 +/- 1	%
Water ( $H_2O$ , CAS 7732-16-5)	10 +/- 3	%
Calcium carbonate ( $CaCO_3$ , CAS 471-34-1)	1 +/- 0,3	%

The pine wood is procured from sustainable forest management and serves as a substrate. Caustic magnesia is extracted from regional magnesite raw material. Magnesium sulphate serves as a co-binding partner; water is partially bound in the form of crystal water and partially contained as residual moisture. No biocides or fire retardants are used in the product. For optical reasons, the finished products are dyed on the visible side using dispersion paint.

At least one sub-product contains substances of the candidate list (date 16.01.2020) above 0.1 % by mass: **no**.

The product contains other cancerogenic, mutagenic, reprotoxic (CMR) substances of category 1A or 1B that are not on the candidate list, above 0,1 % by mass in at least one part product: **no**.

Biocidal products have been added to this construction product or it has been treated with biocidal products (it is therefore a treated product within the meaning of the Biocidal Products Regulation (EU) No 528/2012): **no**.

No fire retardants were used in the product.

## 2.6 Manufacture

### 2.6.1 Raw material

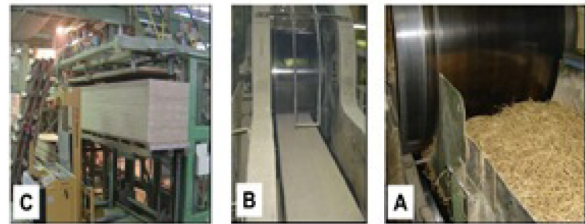
Pine wood is stored as trunks 2 metres in length. Depending on climate conditions, storage lasts around 6-12 months. The trunks are transported by conveyor belts to a multi-rip saw, cut into pieces and processed as wood wool using a planing machine. The binding agent components are stored in steel silos.

### 2.6.2 Mixer

Wood wool, as well as a binding agent and a magnesium sulphate solution, are required for generating a mixture for wood wool pellets. These components are transported to a mixer where they are processed to form the requisite formula.

### 2.6.3 Scattering and shaping

The mixture is scattered onto a steel band and passed through a binding channel, whereby it is separated from the room by a second horizontal steel strip as well as two side strips. An endless product is produced on leaving the twin belt. The raw goods are then cut to the desired length.



### 2.6.4 Interim storage and picking

The products are put into interim storage for 3-5 days (drying and maturing process). The requisite edge design is then produced on so-called double-end profiling machines.

Edge processing:

18 standard edges are possible.



### 2.6.5 Dyeing, packaging and shipping

The requisite colour is applied in a dyeing plant, followed by packaging and storage.

Dyeing: Possible in many RAL colours (left)

Products ready for storage (right)



## 2.7 Environment and health during manufacturing

Knauf AMF Deckensysteme GmbH has introduced a safety management system in accordance with *BS OHSAS 18001*, whereby Bureau Veritas confirms compliance with the specified requirements in the form of a corresponding certificate.

In order to safeguard all environmental protection measures during the manufacturing process, Knauf



AMF Deckensysteme GmbH has opted for ISO 14001 certification. The Bureau Veritas certificate confirms compliance with the specified requirements. The manufacturing plant has a "zero waste policy", all production-related waste (cutting waste, production residues) is returned to the production process in the course of raw material preparation. This also applies to washing water, which is also 100 % recycled in the production process.

## 2.8 Product processing/Installation

The type of mounting is described in detail in the brochure "System solutions". In it, the possible systems, concealed systems, screw systems etc. are dealt with in detail.

For further information, in addition to the "System Solutions" brochure, individual processing videos can also be downloaded from the website [www.knaufamf.com](http://www.knaufamf.com).

## 2.9 Packaging

Heraesign acoustic panels are supplied in protective cardboard packaging on untreated wooden pallets. It must be ensured that the packaging materials are separated and disposed of where such waste incurs.

## 2.10 Condition of use

No emissions are to be expected during the use phase of the Heraesign acoustic panels because the ingredients are firmly bound in the state of use. Heraesign acoustic panels do not require any maintenance from which significant effects on the environment can be expected.

Cleaning is done by sweeping off occasionally. No effects are assumed in Module B3 -Repair- because the repair of Heraesign acoustic panels is rarely necessary. In the case of a repair, the entire board is replaced, which would correspond to the environmental impact declared in modules A1-A3. No effects are assumed for modules B4 and B5 either, because with Heraesign acoustic panels, when used as intended, no replacement or renewal is required during the service life of 50 years. Modules B6 (energy use for operating the building) and B7 (water use for operating the building) are not relevant for Heraesign acoustic panels.

## 2.11 Environment and health during use

According to current knowledge, hazards to water, air and soil cannot arise if the described products are used as intended.

Heraesign products meet the requirements of the Blue Angel (RAL UZ 132, low-emission thermal insulation materials and suspended ceilings for use in buildings, October 2010) and the Danish Indoor Climate label. Test reports from eurofins confirm the fulfilment of the requirements for building structures with regard to health protection (ABG), draft 31.08.2017, as well as the achievement of class A+ of the French Volatile Organic Compound (VOC) regulation (regulation March and April 2011 ( DEVL1101903D and DECL1104875A).

## 2.12 Reference service life

The reference service life (RSL) of Heraesign products is 50 years, but it depends mainly on the life of the building. Due to the mineral binder, no ageing processes are known.

## 2.13 Extraordinary effects

### Fire

Reaction to fire : Class B-s1, d0 according to EN 13501-1

### Reaction to fire:

Name	Value
Building material class acc. to EN 13501-1	B
Burning droplets acc. to EN 13501-1	d0
Smoke gas development acc. to EN 13501-1	s1

### Water

Heraesign acoustic panels are intended for indoor use. Should an unforeseen water effect, e.g. a flood, occur, the panels are fully functional again after drying. There is no impairment of the environment to be expected.

### Mechanical destruction

This point is not relevant for a wood-wool building board, as there is no environmental impact in case of unforeseen destruction. It would be more an optical defect.

## 2.14 Re-use phase

Uncontaminated Heraesign panels can be reused.

The following reuse options are available:

### Re-use

Clean Heraesign panels can be re-used. By screw mounting or an inserted T-rail, re- and new mounting is easily possible without damaging the product

### Composting

Wood wool panels, mechanically shredded, can be converted into compost material by enrichment with appropriate bacteria. This material can then be used for soil improvement in agriculture.

## 2.15 Disposal

If the above-mentioned recycling options are not practicable, the slab residues arising on the construction site as well as slabs from demolition activities can easily be disposed of in landfills without pretreatment due to their predominantly mineral content.

Waste code *EAK-Code*: 17 01 07

### Thermal recycling

In the manufacturing plant, waste plates can be recycled to binder in a rotary kiln process. This would be the preferred way in terms of a functioning recycling economy.

## 2.16 Further information

Further information, for example, product data sheets, safety data sheets or declarations of performances are available on the website: [www.knaufamf.com](http://www.knaufamf.com)

### 3. LCA: Calculation rules

#### 3.1 Declared Unit

This EPD refers to a declared unit of 1 m<sup>2</sup> of Heradesign acoustic panel. The declared unit refers to an average surface weight of 13,1 kg/m<sup>2</sup>. The LCA results for other thicknesses of Heradesign products Euroclass B can be calculated by means of linear conversion of the surface weight.

#### Declared unit

Name	Value	Unit
Declared unit	1	m <sup>2</sup>
Mass per unit area	13,1	kg/m <sup>2</sup>
Mass per unit area	0,0131	t/m <sup>2</sup>
Conversion factor to 1 kg	0,0763	-

Various Heradesign products are manufactured at the site. The allocation of product specific material and energy flows for the different Euroclasses produced is based on the composition of the referring products. This EPD refers to products of Euroclass B. Main differences between the products refer to product thickness, surface weight and dimensions of the wood fibers. This large spectrum of specifications provides maximum flexibility for the client, while the recipe of the panels itself only changes marginally. The presented results are thus considered representative for the declared product.

#### 3.2 System boundary

The life cycle assessment of average Heradesign acoustic panels refers to a cradle-to-gate analysis with options. The following life-cycle phases are taken into consideration in the analysis:

##### Module A1-A3 | Production stage

The production stage includes upstream burdens of raw materials (wood, binding agents, recalcination, auxiliaries, etc.) and the corresponding transports to the production site in Ferndorf (Austria). Material and energy flows needed for the mixing of the components, scattering and shaping, interim storage and picking as well as dyeing and packaging were specifically recorded. In addition, the recalcination process for the provision auf Knauf Sekundärkauster is considered. The representation of all specific input and output flows is thus based on company-specific foreground data. Electricity is provided from the Austrian grid. Thermal energy results from energy recovery from the recalcination process supplemented by natural gas.

##### Module C4 | Disposal

Modul C4 declares the environmental impacts from landfilling after use of the product.

#### 3.3 Estimates and assumptions

All assumptions are verified through detailed documentation and correspond to the best possible representation of reality based on the available data. Regional applicability of the used background data refers to average data under European or German conditions taken from the *GaBi 9* database. German data were used for the Austrian market whenever European or regionalised average data were not available.

#### 3.4 Cut-off criteria

All inputs and outputs for which data are available are included in the LCA model. Data gaps are filled with conservative assumptions from average data (when available) or with generic data and are documented accordingly. Only data with a contribution of less than 1 % were cut off. Ignoring such data is justified based on the insignificance of the expected effect. Processes, materials or emissions known to have a significant contribution to the environmental effects of the products under examination have not been neglected. It is assumed that the data have been completely recorded and that the overall total of ignored input flows does not amount to more than 5 % of the total energy and mass flows. Environmental impacts of machines, plant and infrastructure were not included.

#### 3.5 Background data

Secondary data are used to depict the background system in the LCA model. These data originate from the *GaBi 9*, (SP39) database developed by thinkstep AG. Where necessary, additional data were specifically modelled.

Due to a lack of representative data, the upstream supply chain for caustic calcined magnesium oxide was specifically modelled accounting for state of the art production based in Austria.

#### 3.6 Data quality

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

#### 3.7 Period under review

Foreground data were collected in the 2018 production year, and the data are based on the volumes produced on an annual basis.

#### 3.8 Allocation

The life cycle assessment considers the material inherent properties of wood (carbon content and primary energy content) and relies on its physical relations.

The annually used raw material and referring energy flows at Ferndorf were allocated to the specific products based on the square meters produced yearly.

Wooden residues result from the production process. As they account for less than 1 % of the yearly turnover of the organisation, they were not considered as co-products. Referring quantities were cut-off.



### 3.9 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building

context, respectively the product-specific characteristics of performance, are taken into account.

The *GaBi* background database was used to calculate the LCA.

## 4. LCA: Scenarios and additional technical information

### Production stage (A1-A3)

In module A1-A3 the absorption of 6,82 kg biogenic CO<sub>2</sub> in the Heradesign acoustic panels has been considered, due to the carbon stored in the wood. In the recalcination process, the emissions of 0,8 kg of biogenic CO<sub>2</sub> were balanced in module A1-A3.

### Installation (A5)

The End-of-Life of product packaging is not declared in module A5. The biogenic carbon content of the carton and the wooden pallets has been treated CO<sub>2</sub>-neutral and not accounted for as carbon storage.

Name	Value	Unit
Product packaging to waste treatment at the construction site	0,289	kg

### End-of-Life (C1-C4)

The end-of-life scenario used in this LCA study is based on the following assumptions:

### End of Life (C1-C4)

Name	Value	Unit
Landfilling	13.1	kg

During landfilling 6,82 kg of biogenic CO<sub>2</sub> remain in the product. Due to the binding properties of magnesite, Heradesign acoustic panels can be deposited. This corresponds to a representative scenario. Long-term landfill gas measurements as well as periodic material withdrawals from the deposited products confirm the retention of the biogenic bound carbon during landfilling.

## 5. LCA: Results

The following table contains the LCA results for a declared unit of 1 m<sup>2</sup> Heradesign acoustic panel with a surface weight of 13.1 kg/m<sup>2</sup>. This corresponds to 0,0131 t/m<sup>2</sup> (conversion factor to 1 tonne: 0,0763).

### 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	MND	MND	MND	MND	MNR	MNR	MNR	MND	MND	MND	MND	MND	X	MND

### RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A1: 1 m<sup>2</sup> Heradesign acoustic panel

Parameter	Unit	A1-A3	C4
Global warming potential	[kg CO <sub>2</sub> -Eq.]	2.81E+0	1.95E-1
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	1.21E-12	1.13E-15
Acidification potential of land and water	[kg SO <sub>2</sub> -Eq.]	1.37E-2	1.16E-3
Eutrophication potential	[kg (PO <sub>4</sub> ) <sup>3</sup> -Eq.]	2.05E-3	1.31E-4
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	1.14E-3	8.97E-5
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	8.91E-7	1.94E-8
Abiotic depletion potential for fossil resources	[MJ]	8.33E+1	2.73E+0

### RESULTS OF THE LCA - RESOURCE USE according to EN 15804+A1: 1 m<sup>2</sup> Heradesign acoustic panel

Parameter	Unit	A1-A3	C4
Renewable primary energy as energy carrier	[MJ]	1.86E+1	3.58E-1
Renewable primary energy resources as material utilization	[MJ]	7.23E+1	0.00E+0
Total use of renewable primary energy resources	[MJ]	9.09E+1	3.58E-1
Non-renewable primary energy as energy carrier	[MJ]	8.90E+1	2.82E+0
Non-renewable primary energy as material utilization	[MJ]	0.00E+0	0.00E+0
Total use of non-renewable primary energy resources	[MJ]	8.90E+1	2.82E+0
Use of secondary material	[kg]	1.99E+0	0.00E+0
Use of renewable secondary fuels	[MJ]	0.00E+0	0.00E+0
Use of non-renewable secondary fuels	[MJ]	0.00E+0	0.00E+0
Use of net fresh water	[m <sup>3</sup> ]	2.13E-2	7.11E-4

### RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES according to EN 15804+A1: 1 m<sup>2</sup> Heradesign acoustic panel

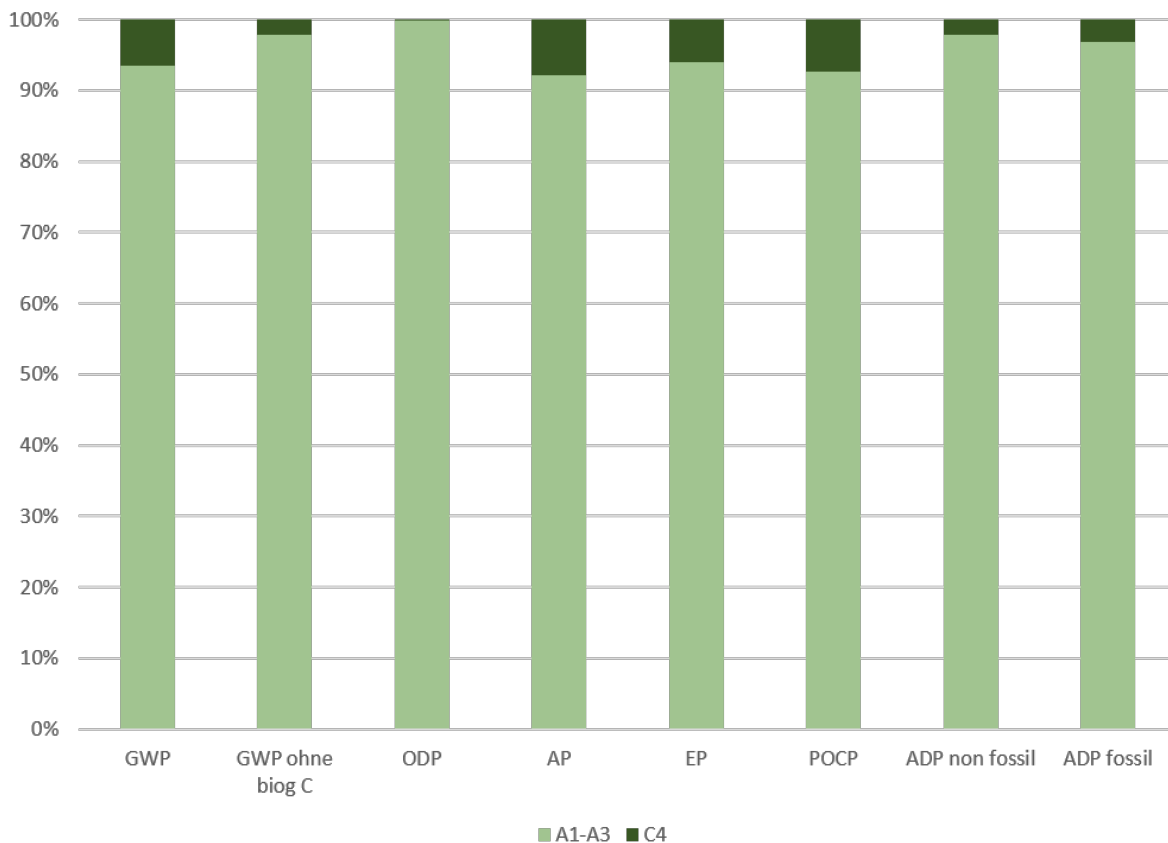
Parameter	Unit	A1-A3	C4
Hazardous waste disposed	[kg]	2.81E-7	4.81E-8
Non-hazardous waste disposed	[kg]	8.27E-1	1.31E+1
Radioactive waste disposed	[kg]	2.25E-3	3.79E-5
Components for re-use	[kg]	0.00E+0	0.00E+0
Materials for recycling	[kg]	0.00E+0	0.00E+0
Materials for energy recovery	[kg]	0.00E+0	0.00E+0
Exported electrical energy	[MJ]	0.00E+0	0.00E+0
Exported thermal energy	[MJ]	0.00E+0	0.00E+0

## 6. LCA: Interpretation

The following interpretation contains a summary of the LCA results referenced to a functional unit of 1 m<sup>2</sup> Heradesign acoustic panel.

A comparison of the individual life-cycle phases results in a clear dominance of the production phase (modules A1-A3).

Life cycle assessment of Heradesign acoustic panels



The environmental effects in the production phase are mainly dominated by the **upstream production of caustic calcined magnesium oxide** in the supply chain of Knauf AMF. Direct emissions from the calcination process as well as energy provision for the process account for the major environmental impacts in this context. The chosen background data refers to a realistic representation of the upstream processes as far as possible.

Whats'more, **energy provision for the production** at Ferndorf represents another important factor in the environmental profile of Heradesign acoustic panels.

The amount of wood stored in the product refers to a negative contribution to global warming potential. This is due to the sequestration of biogenic carbon of wood during tree growth. The sequestered carbon does not contribute to global warming as long as it is stored in the biomass. In the case of landfilling, this carbon content is stored in the product. If the material

is used as secondary material after deconstruction, the stored carbon is emitted during recalcination.

A comparison of the updated results in this EPD with its outdated version shows a **significant reduction of environmental impacts** associated to the declared product. This reduction results out of the innovative recalcination process implemented at the production site in Ferndorf in the last years. The recalcination enables the recycling of the binder material combined with energy recovery at the site. As a result, Knauf AMF can close the loop to omit former landfilling of production waste and thus substitute magnesium oxide at a high quality.

Notably, reduction potentials amount to -60 % contribution to global warming potential (**GWP**) and elementary resource depletion (**ADPe**) as well as -40 % contribution to acidification (**AP**), eutrophication (**EP**) and fossil resource depletion (**ADP<sub>f</sub>**).

## 7. Requisite evidence

### 7.1 Testing pretreatment of substances used

No secondary wood is used for the production of Heradesign acoustic panels.

### 7.2 Leaching

Not applicable. Heradesign products are designed for indoor use, a Leaching Measurement is not useful.

### 7.3 VOC emissions

Testing authority: Eurofins Product Testing A/S  
 Test report: VOC Emissionsprüfbericht Indoor Air Comfort GOLD (09.04.2018)  
 Number: 392-2018-00071201\_A-DE  
 Test period: 28.02-28.03.2018  
 Result: According to the test report, the product fulfils the requirements of the French VOC-Ordinance, the AgBB (Committee for health-related evaluation of building products) schema, the Belgian regulations, the





Indoor Air Comfort Gold Standard, the BLUE ANGEL, BREEAM NOR and LEED v4.

#### AgBB result overview (28 days)

Name	Value	Unit
TVOC (C6-C16) [concentration]	5,6	µg/m <sup>3</sup>
Sum SVOC (C16-C22)	Not detected	µg/m <sup>3</sup>
R (dimensionless)	0.08	-
VOC without NIK	Not detected	µg/m <sup>3</sup>
Cancerogens	< 1	µg/m <sup>3</sup>

## 8. References

### Standards

#### DIN 4108-4

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

#### DIN 52612

DIN 52612-2:1984-06, Testing of thermal insulating materials - Determination of thermal conductivity by the guarded hot plate apparatus - Use of values for use in building applications.

#### EN 197-1

DIN EN 197-1:2011-11, Cement - Part 1: Composition, specifications and conformity criteria for common cements; German version EN 197-1:2011.

#### EN 13168

EN 13168:2012+A1 2015. Thermal insulation products for buildings - Factory made wood wool (WW) products - Specification.

#### EN 13501

EN 13501-1:2007+A1:2009, Fire classification of construction products and building elements.

#### EN 13964

EN 13964:2014-04-15, Suspended ceilings - Requirements and test methods.

#### EN 15804

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

#### ISO 9001

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

#### ISO 14001

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

#### ISO 14025

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

#### ISO 14044

ISO 14044:2006-07, Environmental management - Life cycle assessment - Requirements and guidelines.

#### ISO 50001

EN ISO 50001:20101, Energy management systems - Requirements with guidance for use.

#### BS OHSAS 18001

BS OHSAS 18001:2007, Occupational Health and Safety Assessment Series.

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