

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2

Owner of the Declaration	M. Kaindl GmbH
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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Valid to	25.11.2030

Raw and Coated Medium-Density Wood Fibreboards (MDF) M. Kaindl GmbH

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1. General Information

M. Kaindl GmbH

Programme holder

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

Declaration number

EPD-KAI-20250364-IBC1-EN

This declaration is based on the product category rules:

Wood-based panels, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

23.09.2026

Valid to

25.11.2030



Dipl.-Ing. Hans Peters
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Dr. Martina Bender
(Managing Director Institut Bauen und Umwelt e.V.)

Raw and Coated Medium-Density Wood Fibreboards (MDF)

Owner of the declaration

M. Kaindl GmbH
Kaindlstrasse 2
5071 Wals
Austria

Declared product / declared unit

Declared unit raw Kaindl MDF board: 1 cubic metre. Declared unit coatings: melamine, wood veneer, CPL laminates (ANNEX): 1 square metre.

Scope:

This document covers medium-density fibreboards (MDF), both raw and coated, manufactured at the following factories:

M. Kaindl GmbH, Kaindlstraße 2, 5071 Wals/Salzburg, Austria

M. Kaindl GmbH, Gappen 38, 5523 Lungötz, Austria

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

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

Verification

The standard EN 15804 serves as the core PCR

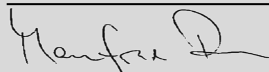
Independent verification of the declaration and data according to ISO 14025:2011

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internally

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externally



Manfred Russ,
(Independent verifier)

2. Product

2.1 Product description/Product definition

MDF boards raw and coated is a board-type wood material pursuant to EN 13986, EN 622-5, EN 622-1, EN 14323 und EN 14322.

The facing is applied using wood veneer, laminate or melamine-impregnated paper and serves to enhance the product's appearance. The desired texture is created during pressing using various textured sheets or texturing dies. The placing of products on the market in the EU/EFTA (except Switzerland) is governed by Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC (CPR). The required declarations of performance and the CE marking have been drawn up in accordance with the requirements of the harmonised standard EN 13986:2004+A1:2015.

2.2 Application

Kaindl coated wood-based materials are chiefly used in decorative interior design, furniture manufacturing, and exhibition stand and store construction.

2.3 Technical Data

Technical data according to Regulation (EU) No 305/2011 CPR. Declared performance of the product according to the declaration of performance DOP: MKMDF102 drawn up according to EN 13986:2004+A1:2015.

Declared performance MDF board: wood-based materials for interior used as non-structural components for dry environments.

Name	Value	Unit
Ageing resistance (bending tensile strength)	≥ 18	N/mm ²
Bonding quality	NPD	
Transverse tensile strength	≥ 0,55	N/mm ²
Formaldehyde release	E1	
Reaction to fire	D-s2, d0	
Water vapour permeability	NPD	
Airborne sound insulation	NPD	
Sound absorption	NPD	
Thermal conductivity	NPD	
Biological durability	Usage class 1	
Pentachlorophenol content	< 5ppm	

NPD: No performance declared

2.4 Delivery status

Kaindl raw and coated MDF boards are available in the following dimensions:

Length: 2800mm and 5600mm

Width: 2070mm

Thickness: 8mm to 25mm

Other formats are available on request.

2.5 Base materials/Ancillary materials

MDF wood fibreboard has the following composition:

- Wood: approx. 81%
- Water: approx. 4--7%

- Emulsion: <1%
- Resins (glue): approx. 11%

2.5.1 In addition as coatings:

Melamine coating with decorative paper weighing 60–140 g/m², wood veneer or continuous pressure laminates (CPL) with 0.2–1.2 mm thickness

1) The product contains substances according to the ECHA List of Candidate Substance of Very High Concern (SVHC) for authorisation above 0.1 mass %: no. 2) The product/at least one partial product contains additional, category 1A or 1B, CMR substances not included in the Candidate List at levels above 0.1 mass % in at least one partial product: no. 3) The construction product in question has biocides added or was treated with biocidal products (making it a treated good in the meaning of the Biocidal Products Regulation (EU) No 528/2012): no.

2.6 Manufacture

Manufacture of the raw MDF board:

- Log barking
- Round timber and wood chips/wood waste are shredded into wood chips in the chipper
- The wood chips are screened and boiled
- Defibration of the wood chips
- Drying of the wood fibres
- Application of glue (specific glue data has been taken into account) to the wood fibres
- Spreading of the glued fibres onto the forming belt and pressing
- Trimming and splitting of the fibre strand
- Cooling of the boards in the cooling turner
- Storage in ripening facility
- Sanding of the boards, final cutting, and final inspection
- Delivery or further processing

2.6.1 Manufacture of directly faced MDF decorative boards:

- Manufacture of impregnated paper: mounting of the untreated paper rolls; impregnation of the paper with melamine-urea resin; drying of the impregnated film; sizing of the paper
- Impregnated films are placed under or above the unfinished MDF board
- High-speed press is loaded with the bundle of impregnated carrier boards
- Pressing under pressure and heat
- Visual inspection of the bonded board
- Stacking

2.6.2 Manufacture of composite panels:

- Bonding of several layers of impregnated paper (cf 2.6.1) into a laminate in a continuous process under pressure and heat
- Rolling up of the laminate
- Application of glue to both sides of the carrier board
- Feeding a continuous press with the carrier board and laminate on the top and bottom
- Pressing of the bundle under pressure and heat
- Sizing of the laminate panel thus produced
- Stacking

2.6.3 Manufacture of wood-veneered panels:

- Sorting of real wood veneer strips
- Application of glue and joining of the sorted strips to form wood veneer sheets
- Application of glue to both sides of the carrier board
- Placement of the wood veneer sheets on the top and bottom of the carrier board

- Bonding of the bundle in a multi-daylight press
- Final sanding of the top and bottom sides
- Stacking

2.7 Environment and health during manufacturing

In the manufacturing process of MDF boards, the officially mandated health and safety measures (high-visibility vests, safety footwear, dust protection, hearing protection, etc.) are observed. No further measures are required. The in-production exhaust air is treated in accordance with regulations. Emission values are below statutory requirements. Water and soil are not impacted by the production process.

2.8 Product processing/Installation

Kaindl MDF boards can be cut and processed using standard woodworking equipment. Before processing, Kaindl MDF boards must be checked for visible damage. To guarantee a sound cutting quality, various factors need to be taken into account, such as feed rate, tooth geometry and pitch, saw blade overhang, chip space of the saw blade, etc.

2.9 Packaging

MDF boards are delivered in the form of board stacks. The stacks are sandwiched between protective panels to safeguard against possible transport damage. The package is secured using plastic straps. Protective panels can be reused several times or put to material recycling. The plastic straps can be recycled.

2.10 Condition of use

The composition of the finished products is as specified in section 2.5 'Raw Materials'. When the panels are pressed, the binder cures under pressure and heat through a polycondensation process, forming a thermosetting, three-dimensionally cross-linked plastic.

2.11 Environment and health during use

Environment:

Based on current scientific understanding, there is no risk to water, air or soil when the products are used as intended (see Chapter 7: Evidence).

Health:

Based on current scientific understanding, there is no risk to health when the products are used as intended. Small quantities of wood-inherent natural substances may be released. Emissions of other substances are, without exception, below the legally regulated limit values (see Chapter 7: Evidence). Exposure of the skin or foodstuffs is safe.

2.12 Reference service life

The service life is defined based on the MDF use classes. The durability of the products is influenced by the intensity of use and environmental factors (UV radiation; moisture). Service life according to the BBSR service life table for building fixtures: 50 years.

2.13 Extraordinary effects

Fire

The reaction to fire of raw and coated MDF boards according to EN 13501-1 is as follows:

Fire resistance

Name	Value
Construction material category	D (normal flammability)
Burning droplets	d0 (no droplets)
Smoke gas production	s2 (moderate smoke production)

Change in physical state: Burning droplets cannot form, as Kaindl's raw and coated wood-based materials do not liquefy when heated.

Water

The product does not contain any substances that pose a risk to water bodies if washed out. Prolonged exposure to moisture will cause the board structure to break down. The products must therefore be protected from prolonged exposure to water.

Mechanical destruction

The product exhibits brittle fracture properties when exposed to mechanical stress. This may result in spalling and formation of sharp fracture edges.

2.14 Re-use phase

Reuse/Subsequent use

When deconstructed and sorted by type, Kaindl wood-based materials can be reused for other applications within the wood-based materials sector.

Recycling: When sorted by type, the material can be shredded and reintroduced into the manufacturing process for wood-based materials.

Subsequent use: Due to their composition, Kaindl wood-based materials have a high calorific value and can be put to thermal utilisation. A prerequisite for this is that the heating system is approved for this type of application and is officially certified. However, this should only be considered if subsequent use or reuse is not possible.

2.15 Disposal

Waste generated during the processing and finishing of unfaced and faced wood-based materials should, as a matter of priority, be sent for further processing or recycling. These approaches are preferable to incineration.

Waste code according to the European Waste Catalogue (EWC): 030105.

2.16 Further information

Additional information can be found on the homepage <http://www.kaindl.com>

3. LCA: Calculation rules

3.1 Declared Unit

The unit of measurement is 1 m³ of MDF board with a moisture content of 5%. The coated boards have a declared unit of 1 m² with 5% moisture content (annex).

Other assessed products listed in the annex have the following properties.

Decorative MDF: grammage 8.3 kg/m² and 10 mm thickness

CPL faced MDF: grammage 14,5 kg/m² and 17,5 mm thickness.

Wood veneered MDF: grammage 11,6 kg/m² and 14 mm

thickness.

Declared unit and mass reference

Name	Value	Unit
Declared unit	1	m ³
Unit mass	830	kg/m ³
Mass per unit area	6,9	kg/m ²
Density	830	kg/m ³

Kaindl unfaced and faced MDFs are manufactured at the Salzburg (AT) factory.

3.2 System boundary

The life cycle assessment of Kaindl's average raw MDF covers the following system boundaries: cradle to gate with options, modules C1–C4 and module D (A1–A3 + C + D and additional modules A4, A5).

Module A1–A3 Production Stage

The production stage includes the extraction and processing of raw materials (e.g., round timber, wood or sawdust) as well as the associated transport to the production site in Salzburg (A2). The transport of wet wood is always taken into account in order to reflect reality in the model. The energy supply system is composed as follows:

- Electricity from the grid (Austria) (0.224 kg CO₂eq/kWh)
- Thermal energy from gas burners (natural gas)
- Thermal energy from our own biomass plant (only internal wood waste, which may also come from other Kaindl production lines in Salzburg).

The treatment of waste generated during production, right up to the end of its waste status during production, is covered in modules A1–A3.

The finished board is packaged.

Module A4 Transport

This module accounts for a 100 km truck haul to the site (diesel, EURO 6, 22-tonne total load, 61% load factor).

Module A5 Installation

This module includes the treatment and disposal of packaging materials in the form of films/straps.

Credits for potentially avoided impacts through the energy substitution of electricity and thermal energy are reflected in module D (EU scenario).

Module C1: Deconstruction/Demolition

Dismantling is performed manually so that no encumbrances are accounted for.

Module C2: Transport to waste treatment

50 km distance (diesel-powered, vehicle type: truck, Euro 6 A–C, 28 – 32 t gross vehicle weight / 22 t payload capacity, 61% load factor).

Module C3 Waste treatment for reuse, recovery or recycling

End of life of the board after utilisation in a biomass plant. The end-of-life scenario is based on the 'secondary fuel' option. The unfinished MDF board has a calorific value of approx. 20.9 MJ/kg. After dismantling, the product is shredded and then utilised in a biomass plant to generate thermal energy and electricity. According to IBU PART A, the product ceases to classify as waste prior to incineration and the plant has an R1 value > 0.6: waste treatment is declared in C3 and the incineration process and environmental impacts are declared in module D. The useful energy generated in the energy recovery process is declared in D as RSF and NRSF, and the environmental impacts avoided through the use of the generated useful energy are declared in module D (EU scenario).

Module C4 Disposal

In the EoL scenario, there is no disposal in landfills so the values in this module are zero.

Module D Credits and encumbrances outside the system

boundaries

Credits for electricity and thermal energy (EU scenario) generated through energy substitution from thermal utilisation.

3.3 Estimates and assumptions

For some chemicals, estimates are made that are as realistic and verifiable as possible, as representative datasets are lacking.

The background datasets for round wood consist of generic datasets taken from the MLC database (formerly GaBi). Two datasets were drawn up for a hardwood mix and a softwood mix. Kaindl uses approx. 30% hardwood and 70% softwood.

The end-of-life system boundary between module C3 and module D is set at where outputs, such as secondary materials or fuel, reach their end-of-waste status. The end-of-waste status for chipboard is reached following removal from the building, single-fraction sorting, and processing. Transport from the waste wood processing plant to the biomass power plant is disregarded. Energy produced in the form of electricity and thermal energy from biomass combustion substitutes thermal energy produced from natural gas as well as electrical energy (EU-28).

3.4 Cut-off criteria

The assessment covers all relevant data (with significant expected impacts) available from production processes, i.e. raw materials used, thermal energy and electricity consumption, and has been modelled using the best available LCI datasets. Data gaps are assessed using conservative assumptions based on average or generic data, and are documented accordingly. Only data with a contribution of less than 1% is excluded. Thus, no processes, materials or emissions with a significant contribution to the environmental impact were neglected. The 5% threshold for negligible processes in relation to mass and energy input, as required by PCR Part A, is therefore met.

Expenses for machinery and infrastructure were not considered.

The wooden slats are needed as packaging material for MDF boards with decorative paper, MDF boards with laminate finish (CPL) and MDF boards with a wood veneer facing. These were not included in the model, as they are generated as waste materials in other production lines (without encumbrances) and are also not part of the end-product packaging. Moreover, the intention is to avoid the handling of bound CO₂.

The study does not cover the manufacture of packaging materials, which are classified as raw materials/intermediate products, and therefore does not include the treatment of packaging materials in A1–A3. This contribution is insignificant so it is not taken into account in the study.

3.5 Background data

The background system is represented in the life cycle assessment model using secondary data taken from the MLC database (Sphera 2024), content version 2024.1

3.6 Data quality

Data quality complies with EN 15941:2024. The data for the life cycle assessments of the wood-based boards was compiled by Kaindl.

A questionnaire specifically designed by Sphera was used for data collection. Upon receipt, each questionnaire was checked for completeness and plausibility using mass balance, stoichiometry, and internal and external benchmarking. Where gaps, outliers or other inconsistencies were noted, Sphera

contacted the data provider to resolve any outstanding issues (via email, telephone or online calls via Teams). The data quality is considered to be very good.

When using background data from the MLC database (Sphera 2024), the focus was on technological, geographical and temporal representativeness. The MLC background datasets used are no more than ten years old.

3.7 Period under review

The collection of primary data relates to the 2022/2023 period. The data is based on the annual quantities used and produced.

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: Europe

3.9 Allocation

The allocation within the forestry chain is based on the publication by Hasch (2002) and the update by Rüter & Albrecht (2007), and is reflected accordingly in the MLC data. The products' carbon and primary energy content was

calculated based on their material-specific properties in accordance with the underlying physical relationships.

Environmental impacts produced by the incineration of the product's packaging (installation) are allocated to module A5; the resulting benefits for thermal and electrical energy are declared in module D.

The thermal and electrical energy benefits are calculated by inverting the life cycle inventory of the EU average data.

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. On the whole, EPD data can be compared or evaluated only if all datasets to be compared were generated according to *EN 15804* and the building context and product-specific performance characteristics are taken into consideration. The LCA FE Software version 10.9.0.31 was used, with content version 2024.1 (Sphera 2024).

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

The biogenic carbon content quantifies the amount of biogenic carbon in the declared construction product

Data used to describe the biogenic carbon content at the factory gate

Name	Value	Unit
Biogenic carbon content in product	351.5	kg C
Biogenic carbon content in accompanying packaging	-	kg C

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg CO₂.

The following technical information is the basis for the declared modules or can be used for the development of specific scenarios in the context of a building assessment if no modules are declared (MND).

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel	2.4	l/100km
Transport distance	100	km
Capacity utilisation (including empty runs)	61	%
Gross density of products transported	830	kg/m ³

Installation into the building (A5)

The end of the product packaging's life cycle (plastic straps) is declared in module A5

Name	Value	Unit
Output materials resulting from on-site waste processing	0.091	kg

End of life (C1-C4)

Name	Value	Unit
Waste type collected separately		kg
Collected as mixed construction waste	830	kg
To energy recovery	830	kg

The end-of-life system boundary between module C3 and module D is set at where outputs, such as secondary materials or fuel, reach their end-of-waste status.

The end-of-waste status for MDF is reached following removal from the building, single-fraction sorting, and processing. Transport from the waste wood processing plant to the biomass power plant is disregarded.

Energy produced in the form of electricity and thermal energy from biomass combustion substitutes thermal energy produced from natural gas as well as electrical energy (EU-28).

Plant-specific parameters correspond to a European average scenario (EU28). The scenario assumes a 100% recycling rate for MDF following its removal from the building. This assumption must be adjusted accordingly when applying the results in a building context.

5. LCA: Results

The following table shows the life cycle assessment results for the declared unit of 1 m³ of standard unfaced MDF with a density of 830 kg/m³ and a mass per unit area of 6.9 kg/m² (approx. 5% moisture content).

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

Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m³ unfaced wood fibreboard (MDF)

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO ₂ eq	-9.93E+02	7.39E+00	2.09E-01	0	3.77E+00	1.29E+03	0	5.23E+02
GWP-fossil	kg CO ₂ eq	2.96E+02	7.25E+00	2.09E-01	0	3.7E+00	2.76E+00	0	5.23E+02
GWP-biogenic	kg CO ₂ eq	-1.29E+03	1.73E-02	1.31E-05	0	8.85E-03	1.29E+03	0	0
GWP-luluc	kg CO ₂ eq	5.83E-01	1.22E-01	6.61E-07	0	6.23E-02	4.18E-04	0	-6.33E-02
ODP	kg CFC11 eq	2.21E-09	1.07E-12	2.59E-14	0	5.46E-13	6.25E-11	0	-7.04E-09
AP	mol H ⁺ eq	1.49E+00	1.13E-02	2.79E-05	0	5.82E-03	5.33E-03	0	1.9E+00
EP-freshwater	kg P eq	8.08E-04	3.1E-05	5.67E-09	0	1.58E-05	1.14E-05	0	-1.3E-03
EP-marine	kg N eq	4.36E-01	4.3E-03	6.26E-06	0	2.23E-03	1.33E-03	0	7.54E-01
EP-terrestrial	mol N eq	6.67E+00	5.06E-02	1.33E-04	0	2.62E-02	1.39E-02	0	8.31E+00
POCP	kg NMVOC eq	1.43E+00	1.12E-02	1.67E-05	0	5.78E-03	3.52E-03	0	2.1E+00
ADPE	kg Sb eq	2.97E-05	6.32E-07	2.17E-10	0	3.23E-07	5.16E-07	0	-6.56E-05
ADPF	MJ	6.17E+03	9.56E+01	3.67E-02	0	4.88E+01	5.78E+01	0	-1.19E+04
WDP	m ³ world eq deprived	8.46E+00	1.12E-01	1.85E-02	0	5.74E-02	7.62E-01	0	-2.4E+01

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

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m³ unfaced wood fibreboard (MDF)

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	2.84E+03	8.23E+00	1.25E-02	0	4.21E+00	4.18E+01	0	-4.72E+03
PERM	MJ	1.29E+04	0	0	0	0	-1.29E+04	0	0
PERT	MJ	1.57E+04	8.23E+00	1.25E-02	0	4.21E+00	-1.28E+04	0	-4.72E+03
PENRE	MJ	1.74E+03	9.56E+01	4.04E+00	0	4.88E+01	5.78E+01	0	-1.19E+04
PENRM	MJ	4.43E+03	0	-4E+00	0	0	-4.42E+03	0	0
PENRT	MJ	6.17E+03	9.56E+01	3.67E-02	0	4.88E+01	-4.37E+03	0	-1.19E+04
SM	kg	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	8.19E+03
NRSF	MJ	0	0	0	0	0	0	0	6.98E+02
FW	m ³	1.51E+00	9.17E-03	4.35E-04	0	4.69E-03	3.2E-02	0	-2.17E+00

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA - WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m³ unfaced wood fibreboard (MDF)

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	2.65E-06	3.66E-09	2.9E-11	0	1.87E-09	8.36E-08	0	-9.53E-06
NHWD	kg	3.75E+00	1.56E-02	1E-03	0	7.97E-03	4.77E-02	0	7.03E-01
RWD	kg	1.03E-01	1.74E-04	1.12E-06	0	8.9E-05	9.24E-03	0	-1.05E+00
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	8.3E+02	0	0
EEE	MJ	0	0	2.5E-01	0	0	0	0	0
EET	MJ	0	0	5.9E-01	0	0	0	0	0

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

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 m³ unfaced wood fibreboard (MDF)

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	Disease incidence	1.64E-05	1.23E-07	1.61E-10	0	6.14E-08	4.45E-08	0	2.72E-06
IR	kBq U235 eq	9.87E+00	2.53E-02	1.19E-04	0	1.29E-02	1.52E+00	0	-1.73E+02
ETP-fw	CTUe	1.73E+03	7.1E+01	1.46E-02	0	3.63E+01	1.68E+01	0	-1.9E+03
HTP-c	CTUh	5.66E-06	1.43E-09	1.2E-12	0	7.32E-10	9.41E-10	0	-3.75E-08
HTP-nc	CTUh	2.97E-06	6.43E-08	1.48E-11	0	3.29E-08	1.44E-08	0	6.65E-07
SQP	SQP	1.19E+05	4.7E+01	1.29E-02	0	2.4E+01	2.44E+01	0	-2.75E+03

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

Qualifier 1 – applies to indicator 'potential effect through human exposure to U235'.

This effect category mainly covers the potential impact of low-dosage ionising radiation on human health in the nuclear fuel cycle. It does not account for effects caused by possible nuclear accidents and occupational exposure nor for the disposal of radioactive waste in subterranean installations. This indicator also does not cover the potential ionising radiation emitted by the ground, radon, and certain construction materials.

Qualifier 2 – applies to the indicators: 'abiotic resource scarcity potential – non-fossil resources', 'abiotic resource scarcity potential – fossil fuels', 'water deprivation potential (user)', 'potential toxicity reference unit for ecosystems', 'potential toxicity reference unit for humans – carcinogenic effect', 'potential toxicity reference unit for humans – non-carcinogenic effect', and 'potential soil quality index'.

Diligence must be applied when using the results for the environmental impact indicator because they are fraught with uncertainties or because experience with the indicator is limited.

This EPD was prepared using a software tool.

6. LCA: Interpretation

The following interpretation provides a summary of the life cycle assessment results based on a declared unit of 1 m³ of average MDF board.

For the global warming potential (GWP) during the production phase (modules A1–A3) of the MDF board, the total result is a negative value (for biogenic and total GWP). The reason for this is the use of wood as a raw material in production. As trees grow, the wood stores carbon dioxide in the form of biogenic carbon (negative global warming potential) and thus has no greenhouse effect as long as the carbon dioxide remains bound

in the product. It is only during energetic utilisation at the end of the product's life (module C3) that the stored carbon leaves the product system.

The negative values in module D can be explained by the fact that the energy generated by the thermal utilisation of the product can substitute the combustion of fossil fuels. This means that more emissions (mainly from fossil fuels) are avoided than are caused by the use of the energy stored in the wood.



7. Requisite evidence

7.1 Formaldehyde

Measuring body:

Entwicklungs- und Prüflabor Holztechnologie GmbH (EPH), Zellescher Weg 24, 01217 Dresden, Germany Test report: Testing for formaldehyde emissions according to DIN EN 16516, DIN EN ISO 12460-5, DIN EN ISO 12460-3 und ASTM E1333-14: PT--23--12--20--01 dated 20/12/2023.

Test result:

Formaldehyde emissions are below the maximum permissible levels specified in the Chemicals Prohibition Ordinance, as measured in accordance with EN 16516. The products meet the requirements for Class E1 as specified in EN 13986. The formaldehyde concentration, measured in accordance with ASTM E1333-14, is below the maximum permissible limit set by the EPA/CARB/TSCA Title VI requirements.

7.4 VOC emissions

AgBB results (28 days [$\mu\text{g}/\text{m}^3$])

Measuring body:

Entwicklungs- und Prüflabor Holztechnologie GmbH (EPH), Zellescher Weg 24, D-01217 Dresden; Germany

Test report:

Emission test according to AgBB Schema 2021, order number 2523573/3 (Kaindl MDF CPL coated, 8--25mm), order number 2523573/2 (Kaindl MDF melamine faced, 8--25mm), order number 2523573/1 (Kaindl MDF veneered, 8--25mm) dated

06/03/2024. Test result:

The tested products meet the requirements under the AgBB Schema.

Test results "Kaindl MDF CPL coated, 8-25mm" after 28 days:

Name	Value	Unit
TVOC (C6 - C16)	213	$\mu\text{g}/\text{m}^3$
Sum SVOC (C16 - C22)	-	$\mu\text{g}/\text{m}^3$
R (dimensionless)	0.361	-
VOC without NIK	-	$\mu\text{g}/\text{m}^3$
Carcinogenic Substances	-	$\mu\text{g}/\text{m}^3$

Test results "Kaindl MDF melamine-faced, 8-25mm" after 28 days:

Name	Value	Unit
TVOC (C6 - C16)	243	$\mu\text{g}/\text{m}^3$
Sum SVOC (C16 - C22)	-	$\mu\text{g}/\text{m}^3$
R (dimensionless)	0.475	-
VOC without NIK	-	$\mu\text{g}/\text{m}^3$
Carcinogenic Substances	-	$\mu\text{g}/\text{m}^3$

Test results "Kaindl MDF veneered 8-25mm" after 28 days:

Name	Value	Unit
TVOC (C6 - C16)	723	$\mu\text{g}/\text{m}^3$
Sum SVOC (C16 - C22)	-	$\mu\text{g}/\text{m}^3$
R (dimensionless)	0.904	-
VOC without NIK	-	$\mu\text{g}/\text{m}^3$
Carcinogenic Substances	-	$\mu\text{g}/\text{m}^3$

8. References

ASTM E1333-14

ASTM E1333-14, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.

EN 13501-1

ÖNORM EN 13501-1:2020-15, Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests of construction products.

EN 13986:2004+A1:2015

DIN EN 13986:2004+A1:2015, Wood-based panels for use in construction – Characteristics, evaluation of conformity and marking Harmonised standard as per EU Gazette 2018/C092/06.

EN 14322

DIN EN 14322:2022-02, Wood-based panels – Melamine faced boards for interior uses – Definition, requirements and classification.

EN 14323

DIN EN 14323:2022-02, Wood-based panels – Melamine faced boards for interior uses – Test procedures.

EN 16516

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

EN 622-1

ÖNORM EN 622-1, Fibreboards – Specifications – Part 1: General requirements.

IBU PCR Part A: Calculation rules for the life cycle assessment and requirements for the project report in accordance with EN 15804+A2:2019, version 1.4, Institut Bauen und Umwelt e.V., www.bau-umwelt.com, 15/04/2024

IBU PCR Part B: Requirements on the EPD for wood-based panels version 10, Institut Bauen und Umwelt e.V., www.bau-umwelt.com, 09/07/2025

EN 622-5

ÖNORM EN 622-5, Fibreboards – Specifications – Part 5: Requirements for dry process boards.

ISO 12460-3

DIN EN ISO 12460-3:2021-02, Wood-based panels – Determination of formaldehyde release – Part 3: Gas analysis method.

ISO 12460-5

DIN EN ISO 12460-5:2016-05, Wood-based panels – Determination of formaldehyde release – Part 5: Gas analysis method (referred to as perforator method). **Additional references**

AgBB Schema

Procedure for the health assessment of emissions of volatile organic compounds (VOCs, VOCs, and SVOCs) from construction products; Committee for the Health Assessment of Building Products (AgBB); as of 2018/2021.

BBSR Service Life Table

Service lives of building components for life cycle assessments under the Sustainable Building Assessment System, 2025. As of 25/09/2025

CARB

California Air Resources Board. ww2.arb.ca.gov.

Chemicals Prohibition Ordinance

Chemicals Prohibition Ordinance (ChemVerbotsV) Annex 1 to Section 3 of 20 January 2017 in conjunction with the declaration of analytical procedures, published on 26 November 2018, BAnz AT 26 November 2018 B2.

CPR

Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products (EU Construction Products Regulation – CPR).

EWG

European Waste Catalogue (EWG) as amended by Commission Decision 2001/118/EC of 16 January 2001 amending Decision 2000/532/EC establishing a list of waste.

EPA

United States Environmental Protection Agency. www.epa.gov.

Hasch 2002, Rüter & Albrecht 2007

Ökologische Betrachtung von Holzspan- und Holzfaserplatten (Ecological Evaluation of Particleboard and Wood Fibreboard, Dissertation, Hamburg University – revised 2007: Rüter, S. (BFH HAMBURG; Holztechnologie), Albrecht, S. (Uni Stuttgart, GaBi). Rüter S, Diederichs S (2012) Ökobilanz Basisdaten für Bauprodukte aus Holz, Hamburg, Johann Heinrich von Thünen Institut, Institut für Holztechnologie und Holzbiologie, Abschlussbericht

MKMDF102

MKMDF102, number of the declaration of performance of the company Kaindl Boards GmbH for the product MDF. Effective from 14/06/2022 (www.kaindl.com/DOP).

RAL-UZ 76

'Blue Angel' environmental label for low-emission, panel-type materials (construction and furniture panels) for interior construction.

TSCA

Title VI Toxic Substances Control Act (TSCA) Title VI – Formaldehyde Standards for Composite Wood Products. www.regulations.gov/document/EPA-HQyOPPT-2016-0461-0001.

Sphera LCA FE (fka GaBi ts)

Sphera LCA for Experts, LCA FE, software-system and databases, Managed LCA content MLC (fka GaBi database), University of Stuttgart and Sphera Solutions GmbH, 2024, CUP Version: 2024.1, MLC data set documentation under <https://sphera.com/product-sustainability-gabi-data-search/> (Nov 2024).



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