

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A1

| | |
|--------------------------|--------------------------------------|
| Owner of the Declaration | SWISS KRONO TEX GmbH & Co. KG |
| Programme holder | Institut Bauen und Umwelt e.V. (IBU) |
| Publisher | Institut Bauen und Umwelt e.V. (IBU) |
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SWISS KRONO Particleboards - coated
SWISS KRONO Group

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1. General Information

| | | | | | | | |
|--|--|---|--|---|--|-------------------------------------|--|
| <p>SWISS KRONO Group</p> <hr/> <p>Programme holder IBU – Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany</p> <hr/> <p>Declaration number EPD-KRO-20210237-IBB1-EN</p> <hr/> <p>This declaration is based on the product category rules: Wood based panels, 12.2018 (PCR checked and approved by the SVR)</p> <hr/> <p>Issue date 20.12.2021</p> <hr/> <p>Valid to 19.12.2026</p> | <p>SWISS KRONO Particleboards – coated</p> <hr/> <p>Owner of the declaration SWISS KRONO TEX GmbH & Co. KG Wittstocker Chaussee 1 16909 Heiligengrabe Germany</p> <hr/> <p>Declared product / declared unit Coated particle board in m²</p> <hr/> <p>Scope: This document relates to all SWISS KRONO coated particleboards which are manufactured in the following SWISS KRONO Group factories:</p> <p>SWISS KRONO AG, Menznau, Switzerland</p> <p>SWISS KRONO S.A.S., Sully-sur-Loire, France</p> <p>SWISS KRONO Sp. z o.o, Zary, Poland</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.</p> <p>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>Verification</p> <table border="1"> <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><input type="checkbox"/> internally</td> <td><input checked="" type="checkbox"/> externally</td> </tr> </table> <hr/> <p> Dipl. Ing. Hans Peters (chairman of Institut Bauen und Umwelt e.V.)</p> <hr/> <p> Dr. Alexander Röder (Managing Director Institut Bauen und Umwelt e.V.)</p> <hr/> <p> Matthias Klingler (Independent verifier)</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 |
| 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 | | | | | | |

2. Product

2.1 Product description/Product definition

SWISS KRONO particleboards (P2-P5, normal or flame-resistant) as coated board-like wood-based products in accordance with EN 13986, EN 312 and EN 14322 are coated with melamine resin-impregnated paper. The decorative texture of coated SWISS KRONO particleboards is achieved with the aid of printed decorative papers. The corresponding surface feel is embossed during pressing by special pressure plates.

EU regulation no. 305/2011 of 9th March 2011 applies for putting the product on the market in the EU/EFTA (with the exception of Switzerland). The products require a declaration of performance in compliance with *EN 13986:2015 Wood-based materials for use in construction - Characteristics, evaluation of conformity*

and marking and CE labelling. *EN 312:2010-12, Particleboards - Specifications; German version EN 312:2010* also applies. The respective national regulations apply to use.

2.2 Application

Coated SWISS KRONO particleboards can be used in decorative furniture and interior construction as well as exhibition stand and commercial construction. Flame-resistant SWISS KRONO particleboards with melamine facing (SF-B = Stop Fire Board) are used where increased fire protection requirements apply.

2.3 Technical Data

| Mechanical properties <i>Particle board average values</i> | | Unit | Board thicknesses | | | | | | | | | |
|---|--|----------------------|-------------------|------|------|-------|--------|--------|--------|--------|--------|-----|
| Bulk density | | [kg/m ³] | plant-specific | | | | | | | | | |
| Thickness ranges | | [mm] | <3 | 3-4 | 4-6 | >6-13 | >13-20 | >20-25 | >25-32 | >32-40 | >40 | |
| P2 | Transverse tensile strength EN319 | [N/mm ²] | 0.45 | 0.45 | 0.45 | 0.4 | 0.35 | 0.3 | 0.25 | 0.2 | 0.2 | |
| | Bending strength EN310 | [N/mm ²] | 13 | 13 | 12 | 11 | 11 | 10.5 | 9.5 | 8.5 | 7 | |
| | Modulus of elasticity in bending EN310 | [N/mm ²] | 1800 | 1800 | 1950 | 1800 | 1600 | 1500 | 1350 | 1200 | 1050 | |
| | Surface soundness EN311 | [N/mm ²] | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | |
| P3 | Transverse tensile strength EN319 | [N/mm ²] | 0.5 | 0.5 | 0.5 | 0.45 | 0.45 | 0.4 | 0.35 | 0.3 | 0.25 | |
| | Bending strength EN310 | [N/mm ²] | 13 | 13 | 14 | 15 | 14 | 12 | 11 | 9 | 7.5 | |
| | Modulus of elasticity in bending EN310 | [N/mm ²] | 1800 | 1800 | 1950 | 2050 | 1950 | 1850 | 1700 | 1550 | 1350 | |
| | Swelling 24h EN317 | [%] | 25 | 23 | 20 | 17 | 14 | 13 | 13 | 12 | 12 | |
| | Moisture resistance EN321 | | | | | | | | | | | |
| | Transverse tensile strength after cyclic test | [N/mm ²] | 0.18 | 0.18 | 0.18 | 0.15 | 0.13 | 0.12 | 0.1 | 0.09 | 0.08 | |
| | Moisture resistance EN321 Swelling after cyclic test | [%] | 15 | 15 | 14 | 14 | 13 | 12 | 12 | 11 | 11 | |
| | Moisture resistance EN 1087-1 Transverse tensile strength after boiling test | [N/mm ²] | 0.09 | 0.09 | 0.09 | 0.09 | 0.08 | 0.07 | 0.07 | 0.06 | 0.06 | |
| Thickness ranges | | [mm] | <3 | 3-4 | 4-6 | >6-10 | >10-13 | >13-20 | >20-25 | >25-32 | >32-40 | >40 |
| P4 | Transverse tensile strength EN319 | [N/mm ²] | 0.5 | 0.45 | 0.45 | 0.4 | 0.4 | 0.35 | 0.3 | 0.25 | 0.2 | |
| | Bending strength EN310 | [N/mm ²] | 14 | 15 | 16 | 16 | 16 | 15 | 13 | 11 | 9 | |
| | Modulus of elasticity in bending EN310 | [N/mm ²] | 1800 | 1950 | 2200 | 2300 | 2300 | 2300 | 2050 | 1850 | 1500 | |
| | Swelling 24h EN317 | [N/mm ²] | 25 | 25 | 21 | 19 | 16 | 15 | 15 | 15 | 14 | |
| P5 | Transverse tensile strength EN319 | [N/mm ²] | 0.5 | 0.5 | 0.45 | 0.45 | 0.45 | 0.45 | 0.4 | 0.35 | 0.3 | |
| | Bending strength EN310 | [N/mm ²] | 16 | 18 | 19 | 18 | 18 | 16 | 14 | 12 | 10 | |
| | Modulus of elasticity in bending EN310 | [N/mm ²] | 2000 | 2400 | 2450 | 2550 | 2550 | 2400 | 2150 | 1900 | 1700 | |
| | Swelling 24h EN317 | [%] | 16 | 16 | 14 | 13 | 11 | 10 | 10 | 10 | 9 | |
| | Moisture resistance EN321 | | | | | | | | | | | |
| | Transverse tensile strength after cyclic test | [N/mm ²] | 0.3 | 0.3 | 0.3 | 0.25 | 0.25 | 0.22 | 0.2 | 0.17 | 0.15 | |
| | Moisture resistance EN321 Swelling after cyclic test | [%] | 12 | 12 | 12 | 12 | 12 | 12 | 11 | 10 | 9 | |
| | Moisture resistance EN 1087-1 Transverse tensile strength after boiling test | [N/mm ²] | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.14 | 0.12 | 0.11 | 0.1 | |

| Surface properties | Unit | Value |
|---|----------------------------|---|
| Surface flaws EN 14323 | - points - Longitudinal | [mm ² /m ²] [mm/m] |
| | | ≤ 2 ≤ 20 |
| Behaviour when scratched EN 14323 | [N] | ≥ 1.5 |
| Resistance to staining EN 14323 | [Stage] | ≥ 3 |
| Susceptibility to cracking EN 14323 | [Stage] | ≥ 3 |
| Abrasion resistance EN 14323 | | Class IP |
| Different levels may be achieved depending on the configuration of the layer structure. | [rpm] | 1 < 50 2 ≥ 50 3A ≥ 150 3B ≥ 250 4 ≥ 350 |

Constructional data

| Name | Value | Unit |
|--|-------------|-------------------|
| Gross density EN 323 | 600 - 760 | kg/m ³ |
| Tensile Bending strength (longitudinal) EN 310 | 7,5 - 18 | N/mm ² |
| Transverse tensile strength density EN 319 | 0,20 - 0,45 | N/mm ² |
| E-module (longitudinal) EN 310 | 1350 - 2550 | N/mm ² |

| | | |
|--|--|-------------------|
| Swelling 24h EN 317 | 10-17 | % |
| Transverse tensile strength after cycle test in accordance EN321 | 0,09 - 0,25 | N/mm ² |
| Swelling after cyclic test EN321 | 11-15 | % |
| Transverse tensile strength after boiling test EN 1087-1 | 0,06 – 0,08 | N/mm ² |
| Fire behaviour EN 13501-1; EN 13986 | Standard: D-s2, d0 (≥ 9 mm, ≥ 600 kg/m ³); SF-B: B-s1/s2, d0 | |
| Airborne sound insulation EN13986 | 24-33 | dB |
| Sound absorption 250 - 500 HZ EN 13986 | 0,1 | |
| Sound absorption 1000 - 2000 HZ EN 13986 | 0,25 | |
| Thermal conductivity EN 13986 | 0,11 - 0,14 | W/(mK) |
| Biological durability EN 13986 | - | |
| Formaldehyde emissions EN 717-1; EN ISO 12460-3 | E1, E1-D2020; CARB*, | |

| | | |
|--|--------|--|
| | TSCA** | |
|--|--------|--|

Product performance values in compliance with the declaration of performance in relation to their main characteristics in accordance with *EN 312:2010-12, particleboards – Specifications* and *EN 14322:2017-07, Wood-based panels - Melamine-faced boards for interior uses - Definition, requirements and classification*.

***CARB** are certified in accordance with California Air Resource Board CARB regulation CCR-17-93129.2(a) - Phase 2.

****TSCA** products comply with formaldehyde class to TSCA Title VI – Formaldehyde Standard for Composite Wood Products Section 770.7

2.4 Delivery status

SWISS KRONO coated particleboards are available in the following size ranges (plant-specific):

Length: min. 1730 mm – max. 5600 mm

Width: min. 610 mm – max. 2620 mm

Thickness: min. 8 mm – max. 40 mm

Special sizes on request.

2.5 Base materials/Ancillary materials

SWISS KRONO melamine-coated particleboards consist of SWISS KRONO raw particleboards (approx. 98%) and decorative papers impregnated with melamine formaldehyde resin (approx. 2%). SWISS KRONO raw particleboards contain no materials from the *ECHA list of materials which are especially problematic for approval*: Substances of Very High Concern – (SVHC) above a mass % of 0.1. They also do not contain Category 1A or 1B CMR materials which are on the candidate list above a mass of 0.1%. SWISS KRONO melamine-faced particleboards also contain no biocidal products in terms of *EU Biocidal Products Ordinance No. 528/2012* and are also not treated with biocidal products. Flame-resistant SWISS KRONO melamine-faced particleboards contain ammonium salt and alkali phosphate and sulphate-based flame retardants.

2.6 Manufacture

- 1) Laying of impregnated papers under or/and on top of a SWISS KRONO raw particle board.
- 2) Feeding a hot press with the impregnated papers and the Impregnate and the carrier board.
- 3) Pressing with structure providers under pressure and heat
- 4) Trimming of the boards
- 5) Quality control of the boards produced
- 6) Stacking, packaging and climatisation of the boards

2.7 Environment and health during manufacturing

SWISS KRONO Group particle board factories are fully integrated wood-based materials plants with their own biomass heating or power plants. Production-related waste materials can thus be expediently thermally recycled.

All noise-emitting parts of the plant such as the chipping and debarking drums are capsuled by constructional measures. Energy management is

oriented towards the constant reduction of CO₂ emissions at the factory site.

French factory (*ISO 9001; ISO 50001*)

Polish factory

(*ISO 9001; ISO 14001; ISO 50001*)

Swiss factory (*ISO 9001; ISO 14001*)

2.8 Product processing/Installation

SWISS KRONO coated particleboards can be processed and machined with normal woodworking machines.

SWISS KRONO coated particleboards should be checked for visual damage before processing. Various measures such as feed rate, tooth geometry and distribution, sawblade projection, sawblade chip space, etc. must be taken into account in order to achieve good cut quality. Dust masks should be worn when machining by hand without dust extraction.

2.9 Packaging

Wooden particleboards, fibreboards and corrugated cardboard are used as coverings and also PET or steel tape and packaging tape are used.

2.10 Condition of use

The composition of the finished products corresponds to the base materials listed in 2.5 Base materials.

2.11 Environment and health during use

No hazards or impairments to health are to be expected if SWISS KRONO coated particleboards are used normally and as intended. According to the current state of knowledge, no hazards for water, air/the atmosphere and soil can arise if used as intended.

2.12 Reference service life

The service life of SWISS KRONO coated particleboards depends on where they are deployed and is at least 50 years with correct use (according to the *BBSR table*).

2.13 Extraordinary effects

Fire

SWISS KRONO coated particleboards with/without flame retardant have the following fire behaviour (in accordance with *EN 13501-1; EN 13986*):

- Standard products (without flame retardant): D-s2, d0 ($\geq 9\text{mm}$ / Bulk density $\geq 600\text{ kg/m}^3$)
- SF-B products (Stop Fire Board, with flame retardant): B-s1/s2, d0

Fire Protection

| Name | Value |
|-------------------------|-------|
| Building material class | B-D |
| Burning droplets | d0 |
| Smoke gas development | s1-s2 |

Water

The product contains no substances which would contaminate water through being washed out. The products must be protected against continuous exposure to moisture since the long-term effects of water lead to the destruction of the composite panel.

Mechanical destruction

The product is brittle under mechanical stress. Splintering and sharp broken edges can form. Resistance to mechanical effects corresponds to the respective board type.

2.14 Re-use phase

Reuse/further use

If SWISS KRONO coated particleboards are correctly sorted on dismantling they can be recycled as a wood-based material in accordance with the cascade.

Reuse

If SWISS KRONO coated particleboards are correctly sorted they can be broken down and added to the manufacturing process. SWISS KRONO coated particleboards can be thermally recycled due to their high heating value because they consist mainly of natural wood. A heating system which is officially

approved for this application area is a requirement. Thermal use should, however, remain the use option of last resort in terms of the sustainability of cascading use.

2.15 Disposal

Residues which accrue after working and processing coated SWISS KRONO boards should be first and foremost mainly reused or recycled. These measures are preferable to incineration. Waste code: 17 02 01/ 03 01 05 according to the European Waste Catalogue (EWC).

Packaging: Paper or cardboard transport packaging, protective boards and plastic or steel bands can be recycled if sorted correctly. External disposal can be arranged with the manufacturer in individual cases.

2.16 Further information

Further information is available at www.swisskrono.com

3. LCA: Calculation rules

3.1 Declared Unit

The declaration refers to the manufacture of 1m² of coated particle board with a weight of 11.6 kg/m².

Angabe der deklarierten Einheit

| Name | Value | Unit |
|--|--------|-------------------|
| Declared unit | 1 | m ² |
| conversion factor [Mass/Declared Unit] zu 1 kg | 11.6 | - |
| Layer thickness | 0.0002 | m |
| Grammage | 11.6 | kg/m ² |
| Bulk density | 656 | kg/m ³ |

Declaration type in accordance with PCR Part A:

1. Manufacturer's declaration:
 - 1d) Declaration of an average product from several plants of one manufacturer.

3.2 System boundary

This is a cradle to factory gate declaration with options. The lifecycle analysis for the products under examination covers the production stage processes (building construction stage) and also credits and impacts beyond the boundary of the product system. The systems thus contain the following stages in accordance with EN 15804:

Product stage (Modules A1-A3):

- A1 Raw material provision and processing and working processes of secondary materials serving as input
- A2 Transport to manufacturer,
- A3 Manufacturing – building construction
- A5 Assembly (just the disposal of the packaging material for the product).

End of life stage:

C3 Waste treatment

Credits and impacts beyond the system boundary:

D Reuse, recovery or recycling potential

In accordance with EN 15804, the boundary between waste disposal in the first system examined and the downstream system (Module D) is defined at the point at which the secondary material reaches its end-

of-waste status. The end-of-waste status is defined as the point at which energy is produced.

3.3 Estimates and assumptions

It is assumed that the product can be energetically recycled after use. The assumption that thermal energy and electricity are substituted in accordance with the EU 28 mix corresponds to realistic circumstances as it can be assumed that the boards are recycled within the territory of the EU.

The credit for thermal energy is calculated from data record "EU-28: Thermal energy from natural gas PE" and the credit for electricity from data record "EU-28: Electricity mix PE".

3.4 Cut-off criteria

All data from the operating data collection is included. An anti-adhesive agent and a wetting agent used in the Polish plant have been disregarded. The share of these two in relation to total production is significantly below 1 %. It can therefore be assumed that the total of the processes not included does not exceed 5% of the impact categories and that the cutoff criteria are fulfilled in accordance with EN 15804. Chopping and sorting before incineration was also not included.

3.5 Background data

All other relevant background data was taken from the GaBi software database (GABI 2020.1) and is not more than 10 years old. The GaBi data used was collected under consistent temporal and methodological framework conditions.

3.6 Data quality

Data for the product under examination was collected directly at the three sites for the period from 2017 to 2018 based on a questionnaire compiled by the Sphera consulting company. The input and output data was provided by SWISS KRONO and checked for plausibility. It can therefore be assumed that the representativeness of the data is good

3.7 Period under review

All primary data from the SWISS KRONO operating data collection (three sites: CH, FR, PL) was included.

The manufacturing data of the companies represents an average for the years from 2017 to 2018. The actual transport distances were used for all inputs and outputs

3.8 Allocation

Energy credits for electricity and thermal energy produced in the biomass power station in the end-of-life stage are added according to the heat value of the input, whereby the efficiency of the plant is also included.

Input-dependent emissions (e.g. CO₂, HCl, SO₂ or heavy metals) in the end-of-life stage are calculated according to the material composition of the ranges brought in. Technology-dependent emissions (e.g. CO) are added according to the exhaust gas quantity. Waste is also added to production in full.

With sawmill waste wood, the forest process and associated transport are added to the wood according to the volume share (or dry mass). A calculation key is applied in the manufacturer's controlling to delimit the material flows of other products manufactured in the factory. The respective input and output flows are accordingly allocated to products according to volume.

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.

Background data was taken from the *GaBi 2020.1 software database (SP 40.0/ GUP 14.0)*.

4. LCA: Scenarios and additional technical information

In accordance with *EN 15804*, the boundary between waste disposal in the first system examined and the downstream system (Module D) is defined at the point at which the secondary material reaches its end-of-waste status. The end-of-waste status is defined at the point at which energy is produced. The resulting effects are declared in Module C and the credits are declared in Module D.

After the product has reached end-of-life status it is assumed that the wood and paper part (85%) of the product is incinerated as biomass (EU 28 average) which produces thermal energy and electricity. The remains are burnt in an incineration plant for urea-formaldehyde (worst case scenario). The old wood content of the product produces no credits as this material enters production without impacts.

It is assumed that the product was not treated or serviced with chemicals during the use period; for this reason, biomass incineration is assumed to be suitable. It is assumed that the product can be energetically recycled after use with a heat value of < 18.4 MJ/kg (at average wood moisture of 16.5%). Through increasing the moisture of the product during use the heat value is lower than the heat value of the product directly after manufacture.

Since incineration in a biomass power station is assumed by this study, it can be assumed that $R1 > 0.6$ as the efficiency of biomass plants is generally greater than 0.6.

The biogenic carbon content of the product is 17.10 kg CO₂ eq.

Installation into the building (A5)

| Name | Value | Unit |
|---|----------|------|
| Output substances following waste treatment on site | 0.124 | kg |
| Carton | 1.21E-01 | kg |
| Plastik | 1.56E-03 | kg |
| Stahl Band | 1.04E-03 | kg |

Waste processing (C3)

| Name | Value | Unit |
|-----------------|-------|------|
| Energy recovery | 11.6 | kg |

5. LCA: Results

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 | X | MND | MND | MNR | MNR | MNR | MND | MND | MND | MND | X | MND | X | |

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A1: 1 m² coated particle board

| Parameter | Unit | A1-A3 | A5 | C3 | D |
|--|---|----------|----------|----------|-----------|
| Global warming potential | [kg CO ₂ -Eq.] | -1.44E+1 | 1.35E-1 | 1.99E+1 | -8.66E+0 |
| Depletion potential of the stratospheric ozone layer | [kg CFC11-Eq.] | 5.29E-12 | 2.31E-17 | 2.08E-15 | -1.37E-13 |
| Acidification potential of land and water | [kg SO ₂ -Eq.] | 1.56E-2 | 2.64E-5 | 3.22E-2 | -1.05E-2 |
| Eutrophication potential | [kg (PO ₄) ³ -Eq.] | 4.06E-3 | 5.92E-6 | 6.02E-3 | -1.38E-3 |
| Formation potential of tropospheric ozone photochemical oxidants | [kg ethene-Eq.] | 5.27E-3 | 1.69E-6 | 3.88E-3 | -1.03E-3 |
| Abiotic depletion potential for non-fossil resources | [kg Sb-Eq.] | 8.26E-7 | 2.40E-10 | 3.64E-8 | -1.65E-6 |
| Abiotic depletion potential for fossil resources | [MJ] | 8.05E+1 | 1.04E-2 | 5.28E+0 | -1.19E+2 |

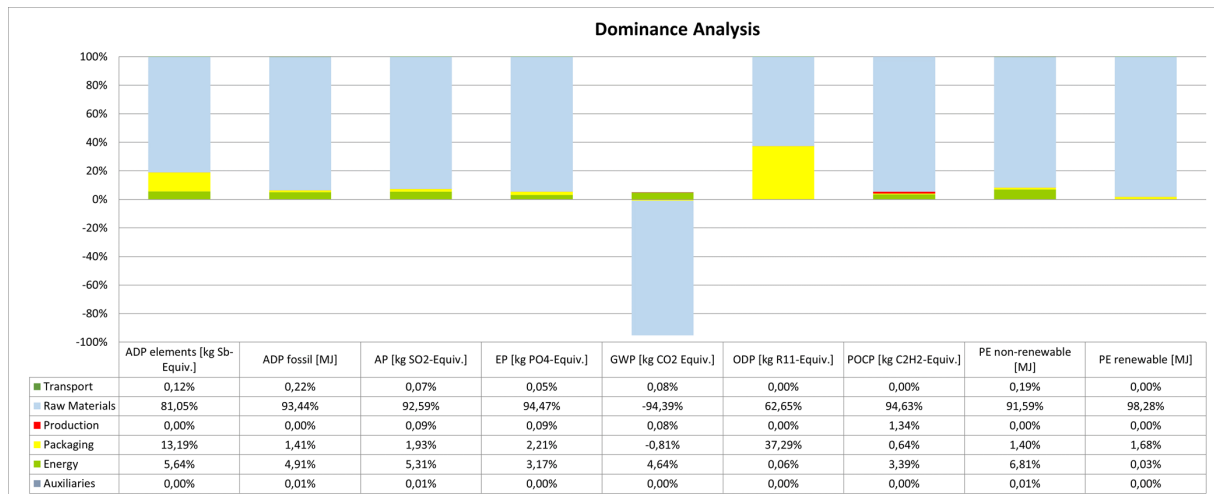
RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A1: 1 m² coated particle board

| Parameter | Unit | A1-A3 | A5 | C3 | D |
|--|-------------------|---------|----------|----------|----------|
| Renewable primary energy as energy carrier | [MJ] | 2.22E+2 | 2.01E+0 | 1.61E+1 | -3.66E+1 |
| Renewable primary energy resources as material utilization | [MJ] | 1.77E+1 | -2.01E+0 | -1.57E+1 | IND |
| Total use of renewable primary energy resources | [MJ] | 2.40E+2 | 2.91E-3 | 4.06E-1 | -3.66E+1 |
| Non-renewable primary energy as energy carrier | [MJ] | 9.01E+1 | 9.24E-2 | 8.20E+0 | -1.51E+2 |
| Non-renewable primary energy as material utilization | [MJ] | 2.83E+0 | -6.90E-2 | -2.72E+0 | IND |
| Total use of non-renewable primary energy resources | [MJ] | 9.29E+1 | 2.34E-2 | 5.48E+0 | -1.51E+2 |
| Use of secondary material | [kg] | 2.60E+0 | IND | IND | IND |
| Use of renewable secondary fuels | [MJ] | IND | IND | IND | IND |
| Use of non-renewable secondary fuels | [MJ] | IND | IND | IND | IND |
| Use of net fresh water | [m ³] | 2.86E-2 | 4.56E-4 | 2.12E-2 | -4.23E-2 |

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A1: 1 m² coated particle board

| Parameter | Unit | A1-A3 | A5 | C3 | D |
|-------------------------------|------|---------|----------|---------|----------|
| Hazardous waste disposed | [kg] | 1.29E-6 | 1.29E-10 | 3.35E-9 | -6.04E-8 |
| Non-hazardous waste disposed | [kg] | 6.89E-2 | 4.70E-3 | 1.08E-1 | -7.37E-2 |
| Radioactive waste disposed | [kg] | 4.60E-3 | 5.15E-6 | 7.87E-5 | -1.25E-2 |
| Components for re-use | [kg] | IND | IND | IND | IND |
| Materials for recycling | [kg] | IND | IND | IND | IND |
| Materials for energy recovery | [kg] | IND | IND | IND | IND |
| Exported electrical energy | [MJ] | 0.00E+0 | 1.02E-2 | 0.00E+0 | 5.09E+1 |
| Exported thermal energy | [MJ] | 0.00E+0 | 1.32E-2 | 0.00E+0 | 7.34E+1 |

6. LCA: Interpretation



The following interpretation contains a summary of the LCA results in relation to a declared unit of 1 m² coated particle board. The dominance analysis regards Modules A1-A3 only.

Abiotic depletion potential for non-fossil resources (ADPE) is mainly dominated by the raw materials (81.05%).

For abiotic depletion potential for fossil resources (ADPF) the greatest influence is the urea-formaldehyde adhesive (input in raw and coated particle board (impregnation)).

Acidification and eutrophication potential (AP, EP) are dominated by energy provision in raw particleboards (SO₂ and NO_x emissions).

Global warming potential (GWP) has a particular status as negative values accrue in the analysis in Modules A1–A3 through the sequestration of carbon dioxide in wood.

The storage of carbon dioxide during the growth of trees is reflected in the raw material provision.

This stored carbon dioxide is released again during incineration in the end-of-life phase. The largest driver of global warming is the production of thermal energy because the burning of waste wood and natural gas releases large quantities of CO₂. The ozone depletion potential (ODP) is caused almost exclusively by packaging (corrugated board) in Switzerland, France and Poland. Methyl chloride emissions play a significant role here.

Consumption of non-renewable primary energy as energy carrier (PENRE) is mainly caused by the raw materials (approx. 92%).

The primary energy requirement from renewable energy carriers (PERE) is more than 85% attributable to the provision of wood. The need for renewable energy carriers in the provision of raw materials is caused to a large extent by the provision of roundwood.

7. Requisite evidence

7.1 Formaldehyde

Measuring body: WKI Fraunhofer Wilhelm-Klauditz-Institut Prüf-, Überwachungs- und Zertifizierungsstelle, Braunschweig, D.

Test reports and date: QA-2021-0124, SWISS KRONO E1 coated particle board, 22/01/2021

Results: The formaldehyde content was checked in accordance with *EN 717-1*. The result is: 0.012 mg/m³ / 0.01 ppm. Board thickness examined: 18 mm. (Representative for the entire thickness range).

7.2 MDI

Measuring body: Entwicklungs- und Prüflabor Holztechnologie GmbH, Dresden
Test report and date: 2520239/2, SWISS KRONO raw particle board, 03/09/2020

Results: The examination was carried out based on *RAL DE-UZ-76, DIN EN 16516*. MDI emissions were below the detection threshold (< 0.1 µg/m³) of the analytic process.

7.3 Test for pre-treatment of raw materials

In accordance with *EU Directive 2021/277*:

Measuring body: Entwicklungs- und Prüflabor Holztechnologie GmbH, Dresden

Test report and date: 2520239/2, SWISS KRONO raw particle board, 03/09/2020

Results: Pentachlorophenol (PCP) is below the detection threshold; heavy metals are below the threshold levels of the Waste Wood Ordinance - *Waste Wood V* Appendix II Polychlorinated biphenyls: Individual values smaller than the detection threshold, therefore not calculated (total chlorine compounds 122 mg/kg (threshold value 600 mg/kg), total fluorine compounds 32.6 mg/kg (threshold value 100 mg/kg))

7.4 Toxicity of flue gases

Measuring body: Energie- und Prozesstechnik Aachen GmbH, Solingen

Test reports and date: 0018/2021, 0019/2021, 0020/2021 of 18/10/2021

Results: SWISS KRONO P2 coated particleboards with and without flame retardants were tested. The results to *DIN 53436* show that no chlorine and sulphur compounds could be detected. The gaseous emissions released under the selected test conditions are mainly equivalent to the emissions which are released from wood under the same conditions.

7.5 VOC emissions

Measuring body: Fraunhofer Institut für Holzforschung Wilhelm-Klauditz-Institut.

Test report and date: MAIC-2016-3412, 10/08/2016, SWISS KRONO coated particle board; Test basis - determination of volatile organic compound emissions in accordance with the AgBB schema, *ISO 16000*, Parts 3, 6, 9 and 11.

Results: The product examined fulfils the requirements of the AgBB schema. The material examined fulfil the requirements of the principles for the health-related

assessment of building products after three days and the demolition criteria after seven days (*AgBB schema* 2015).

AgBB Overview of results (7 days [$\mu\text{g}/\text{m}^3$])

| Name | Value | Unit |
|-------------------------|-------|--------------------------|
| TVOC (C6 - C16) | 19 | $\mu\text{g}/\text{m}^3$ |
| Sum SVOC (C16 - C22) | 0 | $\mu\text{g}/\text{m}^3$ |
| R (dimensionless) | 0.115 | - |
| VOC without NIK | 0 | $\mu\text{g}/\text{m}^3$ |
| Carcinogenic Substances | 0 | $\mu\text{g}/\text{m}^3$ |

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

| Name | Value | Unit |
|-------------------------|-------|--------------------------|
| TVOC (C6 - C16) | 19 | $\mu\text{g}/\text{m}^3$ |
| Sum SVOC (C16 - C22) | 0 | $\mu\text{g}/\text{m}^3$ |
| R (dimensionless) | 0.115 | - |
| VOC without NIK | 0 | $\mu\text{g}/\text{m}^3$ |
| Carcinogenic Substances | 0 | $\mu\text{g}/\text{m}^3$ |

8. References

Standards

EN 310

DIN EN 310:1993-08, Wood-based panels; Determination of modulus of elasticity in bending and of bending strength.

EN 312

DIN EN 312:2010-12, Particleboards - Specifications.

EN 317

DIN EN 317:1993-08, Particleboards and fibreboards; Determination of swelling in thickness after immersion in water.

EN 319

DIN EN 319:1993-08, Particleboards and fibreboards, Determination of tensile strength perpendicular to the plane of the board.

EN 321

DIN EN 321: 2002-03, Wood-based panels - Determination of moisture resistance under cyclic test conditions.

EN 323

DIN EN 323:1993, Wood-based panels; determination of density.

EN 717-1

DIN EN 717-1:2005-01, Wood-based panels - Determination of formaldehyde release - Part 1: Formaldehyde emission by the test chamber method.

EN 1087-1

DIN EN 1087-1:1995, Particleboards - Determination of moisture resistance - Part 1: Boil test.

ISO 9001

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

ISO 12460-3

DIN EN 12460-3:2016-03, Wood-based panels - Determination of formaldehyde release - Part 3: Gas analysis method.

EN 13501-1

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

EN 13986

DIN EN 13986:2015-06, Wood-based panels for use in construction - Characteristics, evaluation of conformity and marking.

ISO 14001

DIN EN ISO 14001:2015-09, 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.

EN 14322

DIN EN 14322:2017-07, Wood-based panels - Melamine-faced boards for interior uses - Definition, requirements and classification

EN 15804

DIN EN 15804:2020-03, Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.

ISO 16000-3

ISO 16000-3:2011-10, Indoor Air - Part 3: Measurement of formaldehyde and other carbonyl compounds in indoor air and test chamber air - Active sampling method.

ISO 16000-6

ISO 16000-6:2011-12, Indoor air - Part 6: Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA® sorbent, thermal desorption and gas chromatography using MS or MS-FID.

ISO 16000-9

ISO 16000- 9:2006-02, Indoor Air Pollution - Part 9: Determination of the emission of volatile organic compounds from building products and furnishings – Emission test chamber method.

ISO 16000-11

ISO 16000- 11:2006-02, Indoor Air - Part 11: Determination of the emission of volatile organic compounds from building products and furnishings – Sampling, storage of samples and preparation of test specimens.

EN 16516

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

ISO 50001

DIN EN ISO 50001:2018-12, Energy management systems– Requirements with guidance for use.

DIN 53436

DIN 53436:2015-12, Generation of thermal decomposition products from materials for their analytic-toxicological testing.

Further literature**AgBB schema**

Procedure for assessing the impact of emissions of volatile organic compounds (VOC, SVOC) from building products on health; committee for assessing the effects of building products on health.

Waste Wood Ordinance

Ordinance on requirements for the recycling and disposal of waste wood - Waste Wood Ordinance (AltholzV), Appendix IV - requirements for analytics for woodchips and shavings for manufacturing wood-based materials.

BBSR table

BBSR table on the useful life of components for lifecycle analyses according to the sustainable building assessment system, Federal Ministry of the Interior, Building and Community, last updated: 24/02/2017.

Ordinance on Biocidal Products

EU Ordinance 528/2012 of the European Parliament and Council of 22nd May 2012 on the Provision on the Market and Use of Biocidal Products.

CARB

CARB - Final regulation order Section 93120-931120.12, title 17, California Code of Regulations: "Airborne toxic control measurement to reduce formaldehyde emissions from composite wood products".

CPR

CPR - EU Ordinance No. 305/2011 of the European Parliament and Council of 9th March 2011 to define harmonised conditions for marketing building products (EU-BauPVO).

EAK

European Waste Catalogue (EWC) in the version of the Commission's decision of 2001/118/EC dated 16th January 2001 to modify decision 2000/532/EC on a waste catalogue.

ECHA List

ECHA List: List of materials which are especially problematic for approval (ECHA candidate list), 19/01/2021, published in accordance with Article 59 Paragraph 10 of the REACH regulations. Helsinki: European Chemicals Agency.

GABI 2020.1

GaBi 2020.1 (SP 40.0 / GUP 14.0). Software and database for integrated lifecycle assessment. LBP, University of Stuttgart and Sphera, (<http://documentation.gabi-software.com/>)

Hasch, J. (2002)

Ecological observations on chipboard and wooden fibreboards (Ökologische Betrachtungen von Holzspan- und Holzfaserplatten), Diss., Uni Hamburg-revised edition 2007: Rueter, S. (BFH HAMBURG; Wood Technology), Albrecht, S. (Uni Stuttgart, GaBi).

IBU programme instructions

General instructions for Institut Bauen und Umwelt e.V.'s EPD programme (general instructions for the IBU EPD programme), version 2.0.2021.

PCR:

Product category rules for building-related products and services. Part B: Requirements of environmental product declarations for wood-based materials, Version 1.7. Berlin: Institut Bauen und Umwelt e.V.(Ed.), 07/01/2019.

PCR Part A

Product category rules for building-related products and services. Part A: Calculation rules for the LCA and requirements of the background report. Version 1.8. Berlin: Institut Bauen und Umwelt e.V.(Ed.), 04/07/2019.

RAL DE-UZ-76

RAL DE-UZ-76:2010-02, Low-emission panel-shaped materials (building and furniture panels) for interior construction.

TSCA

TSCA Title VI - US EPA 40 CFR Part 770 "Formaldehyde Emission Standards for Composite Wood Products", Title VI to the Toxic Substances Control Act (TSCA) - 'TSCA Title VI', para 40 CFR § 770.10 (b).

EU Ordinance 2021/277

Delegated EU ordinance 2021/277 of the European Commission of 16th December 2020 to modify Appendix I of EU ordinance 2019/1021.

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