ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	**SWISS KRONO Tec AG**
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
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SWISS KRONO OSB Panels

SWISS KRONO Tec AG

Institut Bauen und Umwelt e.V.

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

ECO PLATFORM EPD EN 15804 VERIFIED

1. General Information

SWISS KRONO Tec AG	**SWISS KRONO OSB panels**
Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	**Owner of the Declaration** SWISS KRONO Tec AG Haldenstrasse 12 6006 Lucerne Switzerland
Declaration number EPD-KRO-20150067-IBD2-EN	**Declared product / Declared unit** 1 cubic metre OSB panels
This Declaration is based on the Product Category Rules: Wood based panels, 07.2014 (PCR tested and approved by the SVR)	**Scope:** This document refers to all OSB panels produced in the following SWISS KRONO GROUP plants: SWISS KRONO GmbH, Heiligengrabe, Germany SWISS KRONO Sp. z o.o, Zary, Poland.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.
Issue date 15.06.2015	
Valid to 14.06.2020	**Verification** The CEN Norm /EN 15804/ serves as the core PCR Independent verification of the declaration according to /ISO 14025/ ☐ internally ☒ externally
Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)	
Dr. Burkhart Lehmann (Managing Director IBU)	Matthias Schulz (Independent verifier appointed by SVR)

2. Product

2.1 Product description

OSB panels (Oriented Strand Board – SWISS KRONO OSB) are adhesive-bound, three-ply wooden panels (pressed panels) made from oriented long, slender wood chips (pinewood veneer 120 - 160 mm in length), so-called strands in accordance with /EN13986/ and /EN 300 “OSB”/. “Strands” from a defined thickness and shape primarily comprising roundwoods are glued at several layers. The core layer is oriented at a 90° angle to the surface layers. The OSB panels are glued using PMDI resin and manufactured in thicknesses of 8 to 40 mm.
A flame retardant is used for flame resistant SWISS KRONO OSB/SF-B.
The declared product represents a mass-weighted average of the ranges manufactured. In calculating the average, consideration is taken of the fact that different volumes with different densities are produced in each of the plants.

2.2 Application

SWISS KRONO OSB correspond with utilisation classes 1 and 2 according to EC5 and may therefore be used in moist areas and/or non-weathered outdoor areas. OSB panels can be used for load-bearing and stiffening purposes.

2.3 Technical Data

Technical construction data

Name	Value	Unit
Gross density acc. to EN 323	600 - 620	kg/m^3
E-module (longitudinal)	4930 - 7500	N/mm^2
E-module (transverse)	1980 - 3500	N/mm^2
Bending strength (longitudinal)	14.8 - 28.5	N/mm^2
Bending strength (transverse)	7.4 - 20	N/mm^2
Thermal conductivity	0.13	W/(mK)
Water vapour diffusion resistance factor	200 - 300	-

2.4 Placing on the market / Application rules

Directive (EU) No. 305/2011 applies for placing the product on the market in the EU/EFTA (with the exception of Switzerland) dated 9 March 2011. The products require a Declaration of Performance taking consideration of the /EN 13986:2004 Wood flooring – Characteristics, evaluation of conformity and marking/, and CE marking.
Use is governed by the respective national guidelines; in Germany, this is the /General Technical Approval: Approval number: Z-9.1-503; subject of approval: OSB SWISS KRONO OSB/4; approval certificate dated 01.01.2016/ of the DIBt - Deutsches Institut für

Bautechnik and Approval number: Z-9.1-618; "SWISS KRONO OSB/F****"; dated 01.04.2015.

SWISS KRONO OSB – Wood-based materials for use in construction can be used in all load-bearing and stiffening purposes in which the general construction inspection approval or the performance features to /EN 13986/ are a prerequisite for application. SWISS KRONO OSB panels can also be used in areas such as in the packaging industry or for shelves, furniture, doors etc.

2.5 Delivery status

OSB panels are available in the following sizes:
Length: 2,050 mm to 15,000 mm
Width: 675 mm to 2,800 mm
Thickness: 8 to 40 mm
Special sizes available on request.

2.6 Base materials / Ancillary materials

- Wood (primarily pine, partially PEFC- or FSC-certified), approx. 90%
- PUR resin adhesive (MDI-based), 2-4%
- Water in the form of wood moisture, 4-6%
- Wax emulsion, < 1%
- Flame retardant (for SWISS KRONO OSB/SF-B)

2.7 Manufacture

1) Debarking the wood
2) Cutting the roundwood to strands (small veneer-like strips)
3) Drying the wet strands from 100% wood moisture to 3% wood moisture
4) Straining the strands into surface layer, middle layer and fine material.
5) Gluing the surface layer and middle layer strands with resin
6) Aligning the surface layer strands in the production direction; the middle layer strands are oriented at an angle of 90° to the surface layer
7) Pressing the strand cake in a continuous press
8) Trimming the OSB along the long edges and cutting to length
9) Stacking the OSB and packing with cardboard packaging and plastic or steel bands
All manufacturing plants implement a Quality Management System according to /ISO 9001/.

2.8 Environment and health during manufacturing

Owing to the manufacturing conditions, no particular statutory or regulatory measures are required. The MAK (max. concentrations at the workplace) values (Germany) are significantly fallen short of at each point of the system.
Air: Waste air generated during production is cleaned in accordance with statutory specifications. Emissions are significantly below the requisite limit values.
Water/Soil: No contamination of water or soil. No production-related waste water is incurred. Production is free of waste water.
Noise: Sound protection analyses have established that all values communicated inside and outside the production facilities are far below the requisite standards. Noise-emitting system components such as the debarking drum have been encapsulated accordingly.
The manufacturing plants implement an Environment Management System according to /ISO 14001/.

2.9 Product processing/Installation

SWISS KRONO OSB can be processed using standard woodworking machinery or tools. When processing, the standard safety measures as for processing solid wood must be taken (protective gloves, dust masks when grinding and sawing).

2.10 Packaging

Paper, cardboard and PE foil transport packaging and packing bands can be sorted and directed to the recycling circuit.

2.11 Condition of use

Material composition for the period of use complies with the base materials indicated in section 2.6.

2.12 Environment and health during use

No damage to health can be anticipated if SWISS KRONO OSB is used as designated.
No risks are known for water, air and soil if the products are used as designated.

2.13 Reference service life

The reference service life of SWISS KRONO OSB is dependent on the area of application and is at least 50 years when used as designated in accordance with usage classes 1 and 2.
Influences on ageing when the recognised rules of technology are applied.

2.14 Extraordinary effects

Fire
D-s2, d0 - according to /EN 13986/ Euro class D, smoke class s2, drip class d0 or B-s2, d0 for SWISS KRONO OSB/3 SF-B
Development of smoke gas / Smoke density: In accordance with the smoke development and smoke density associated with solid wood.
Fire gas toxicity: Owing to the conversion process during combustion, hydrogen cyanide is released from the PUR resins contained in the panels under certain fire conditions. Owing to the toxicity of gaseous hydrogen cyanide arising, leftovers of the products referred to may only be burned in accordingly permissible and sealed systems and under no circumstances in any type of naked flame.
Changing the system condition (burning dripping/falling material): Burning dripping material is not possible as SWISS KRONO OSB does not liquefy when heated.

Water
No heavy metals could be established in the quantitative analysis of inorganic trace substances in the material. The OSB panels do not represent a danger for humans or the environment in any way.

Mechanical destruction
Breakage: SWISS KRONO OSB breakage features display relatively brittle performance, whereby no smooth breaks are established along the panel edges, whereby no environmental damage is incurred.

2.15 Re-use phase

Provided they are untreated and not fully glued, SWISS KRONO OSB panels can be easily segregated

and re-used for the same application when converting or completing the usage phase of a building.
Energetic utilisation (in approved systems): Owing to the high heat value, energetic utilisation for generating process energy and electricity (CHP plants) from OSB leftovers and OSB panels arising from breakage measures on the building site is recommendable.

2.16 Disposal

*Disposal/Landfilling:*SWISS KRONO OSB leftovers on the building site as well as those incurred by breakage measures may not be landfilled where material recycling is not possible but rather require energetic recycling (see above) or combustion in an MVA owing to their purely organic components (wood, PUR) and their high heat values. Waste key: 170201/030103 in line with the European Waste Catalogue.
Packaging: Paper/Cardboard transport packaging, plastic packing bands and band irons can be sorted and directed to the recycling circuit. In individual cases, external disposal can be arranged with the manufacturer.

2.17 Further information

Further information is available at www.swisskrono.de and www.swisskrono.pl.

3. LCA: Calculation rules

3.1 Declared Unit

The Declaration refers to the manufacture of 1 m³ OSB panel weighing 617 kg/m³.

Details on declared unit

Name	Value	Unit
Declared unit	1	m^3
Conversion factor to 1 kg	0.0016	-
Mass reference	-	kg/m^3
Holzfeuchte bei Auslieferung	4,5	%

3.2 System boundary

The Declaration is from the "cradle to plant gate, with options". The Life Cycle Assessment for the products under review comprises the “Product stage” and “Benefits and loads beyond the system boundary” life cycle phases. The systems include the following stages in accordance with /EN 15804/: Product stage (Modules A1-A3):

- A1 Raw material supply, processing and processing stages associated with secondary substances serving as input
- A2 Transport to the manufacturer
- A3 Manufacture

Module C3 indicates the net flow and emissions of biogenic CO_2.
Once the product has achieved end-of-waste status as chipped waste wood, it is assumed that the product is directed to biomass incineration which produces thermal energy and electricity. The ensuing effects and credits are declared in Module D.

3.3 Estimates and assumptions

The abrasive belts used in production are estimated. The composition (silicon carbide is adhered to a paper or plastic substrate using synthetic resin) is based on details provided by the manufacturer. The percentages of individual components of the abrasive paper are individual estimates.
The abrasive belts account for considerably less than 1% of the overall system with the result that the influence of this estimate on the calculated results is neglibly small.
Low-flammable OSB panels account for significantly less than 1% which is why the flame retardant is ignored.
It is assumed that the product can be recycled energetically after use. As it can be assumed that the panels are recycled within the EU, the assumption concerning substitution of thermal energy and electricity as per the EU-27 mix corresponds with real conditions. The credit for thermal energy is calculated on the basis of “EU-27: Thermal energy from natural gas PE“; the credit for electricity is calculated from the “EU-27: Power mix PE” data set.

3.4 Cut-off criteria

All operating data was taken into consideration. The wooden pallets in the German plant which can be reused frequently and the very small volumes of flame retardants used were not taken into consideration. Low-flammable OSB panels account for significantly less than 1% of overall production. It can be assumed that the total processes ignored do not therefore exceed 5% of the impact categories and the cut-off criteria according to /EN 15804/ are complied with. Chipping and sorting prior to incineration were not taken into consideration either.

3.5 Background data

All of the relevant background data sets were taken from the /GaBi 6/ (GABI 6 2013) software data base and is less than 10 years old. The data used was obtained under consistent marginal conditions in terms of time and method.

3.6 Data quality

The data was recorded for the products under review directly at the two production facilities for the period 01.10.2011 to 30.09.2012 on the basis of a questionnaire drawn up by PE International (now called "thinkstep AG"). The input and output data was made available and examined for plausibility by SWISS KRONO with the result that good data representativity can be assumed.

3.7 Period under review

All of the primary data from the operating data surveys conducted by SWISS KRONO GmbH and SWISS KRONO Sp. z o.o was taken into consideration, i.e. all starting materials used according to the recipe, energy requirements and all direct production waste were considered in the analysis. Only the flame retardants were not taken into consideration. The manufacturing data represents an average during the period 01.10.2011 to 30.09.2012. The actual transport distances and means of transport were applied for all inputs and outputs.

3.8 Allocation

Energy credits for electricity and thermal energy produced in the biomass power plant at the end of life are allocated according to the calorific value of the input, whereby the efficiency of the plant is also considered.
The emissions dependent on input (e.g. CO_2, HCl, SO2 or heavy metals) at the end of life were calculated

in line with the content composition of the ranges used. Emissions dependent on technology (e.g. CO) are added in terms of waste gas volume.
Waste was also allocated throughout production.
The upstream chain for the forest was analysed as per /Hasch 2002/ in the Rüter and Albrecht update (2007). In the case of sawmill by-products, the forest process and associated transports are allocated to the wood according to the volume share (or dry mass); no loads are allocated to sawmill by-products from sawmill processes. A calculation code is used by the manufacturer's Controlling Department in order to delineate the material flows from other products manufactured in the plant. Accordingly, the respective input and output flows are allocated to the products by volume.
In order to calculate the net flows for Module D, the waste wood volumes were applied for SWISS KRONO OSB panels introduced to the system in Modules A1-A3 and thermally recycled. The waste wood volume used for the production of thermal energy and electricity was applied for calculating the net flows. The total mass of secondary fuels (waste wood from external sources) was deducted from the total mass of the product. The product mass reduced by the waste wood incinerated in production is then incinerated at the end of life.

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.

4. LCA: Scenarios and additional technical information

The scenario includes a 100% recycling rate for OSB panels, i.e. without rejections.
Once the product has achieved end-of-waste status, it is assumed that the product is directed to biomass incineration (EU-27 average) which produces thermal energy and electricity. The ensuing effects and credits are declared in Module D. The emissions of biogenic CO_2 are declared in C3. It is assumed that the product has not been treated with chemicals during use; for this reason, biomass incineration was assumed to be suitable. It is assumed that the product can be recycled energetically with a calorific value of 18.8 MJ/kg (and average wood moisture of 12%) after use.
As product moisture increases during use, this is lower than the calorific value of the product directly after production. As this study assumes incineration in a biomass power plant, it can be assumed that R1>0.6 as the efficiency of biomass plants is generally greater than 0.6. Recycling the panels in a biomass power plant and the ensuing energy is allocated to Module D. To this end, an end-of-life scenario was modelled in /GaBi/ for the corresponding volume of waste wood.

End of Life (C3)

Name	Value	Unit
Energy recovery	605.12	kg

5. LCA: Results

The following tables depict the results of the environmental impact analysis differentiated by CML environmental categories, use of resources, output flows and waste categories scaled to the functional unit of 1 m³ OSB panel. The emissions of biogenic CO_2 and material primary energy contained in the panels are declared in Module C3. Loads from incineration (with the exception of biogenic CO_2) and benefits are declared in Module D.

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

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	MND	MND	MND	MND	MNR	MNR	MNR	MND	MND	MND	MND	X	MND	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m³ OSB panel (617 kg)

Parameter	Unit	A1-A3	C3	D
Global warming potential	[kg CO_2-Eq.]	-7.60E+2	1.04E+3	-6.49E+2
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	1.36E-4	0.00E+0	-2.97E-7
Acidification potential of land and water	[kg SO_2-Eq.]	1.04E+0	0.00E+0	-3.86E-1
Eutrophication potential	[kg $(PO_4)^{3-}$-Eq.]	1.39E-1	0.00E+0	2.88E-4
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	1.50E-1	0.00E+0	5.21E-2
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	1.28E-4	0.00E+0	-7.82E-5
Abiotic depletion potential for fossil resources	[MJ]	4.61E+3	0.00E+0	-8.41E+3

RESULTS OF THE LCA - RESOURCE USE: 1 m³ OSB panel (617 kg)

Parameter	Unit	A1-A3	C3	D
Renewable primary energy as energy carrier	[MJ]	8.99E+2	0.00E+0	1.04E+4
Renewable primary energy resources as material utilization	[MJ]	1.19E+4	-1.19E+4	0.00E+0
Total use of renewable primary energy resources	[MJ]	1.28E+4	-1.19E+4	1.04E+4
Non-renewable primary energy as energy carrier	[MJ]	4.27E+3	0.00E+0	-1.05E+4
Non-renewable primary energy as material utilization	[MJ]	5.37E+2	-5.37E+2	0.00E+0
Total use of non-renewable primary energy resources	[MJ]	4.81E+3	-5.37E+2	-1.05E+4
Use of secondary material	[kg]	0.00E+0	0.00E+0	0.00E+0
Use of renewable secondary fuels	[MJ]	2.12E+2	0.00E+0	1.14E+4
Use of non-renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0
Use of net fresh water	[m³]	7.21E-1	0.00E+0	-2.16E+0

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m³ OSB panel (617 kg)

Parameter	Unit	A1-A3	C3	D
Hazardous waste disposed	[kg]	1.70E-3	0.00E+0	-3.89E-3
Non-hazardous waste disposed	[kg]	3.06E+0	0.00E+0	1.27E+0
Radioactive waste disposed	[kg]	8.13E-2	0.00E+0	-1.07E+0
Components for re-use	[kg]	0.00E+0	0.00E+0	IND
Materials for recycling	[kg]	0.00E+0	0.00E+0	IND
Materials for energy recovery	[kg]	IND	6.05E+2	IND
Exported electrical energy	[MJ]	IND	0.00E+0	IND
Exported thermal energy	[MJ]	IND	0.00E+0	IND

6. LCA: Interpretation

The following interpretation contains a summary of the LCA results relating to a functional unit of 1 m³ OSB panel.
The abiotic depletion of elementary resources **(ADPE)** is primarily dominated by the raw material supply. The adhesive system plays a decisive role here.
In terms of abiotic depletion of fossil resources **(ADPF)**, around half of the effect is attributable to the provision of thermal energy. The use of natural gas has a significant impact here.

The acidification and eutrification potentials **(AP, EP)** are partly attributable to raw material supply, energy production and process emissions.

The global warming potential **(GWP)** enjoys a particular significance as negative values arise in the analysis in Modules A1-A3 on account of sequestration of carbon dioxide in the wood.
The storage of carbon during tree growth has an impact in the raw material supply. This carbon is released again during incineration at the end of life.

The greatest impact on global warming is represented by the generation of thermal energy as the incineration of waste wood and natural gas releases large volumes of CO_2.
The ozone depletion potential **(ODP)** is almost exclusively attributable to the raw material supply. Primary energy requirements of non-renewable energy resources **(PENRE)** can largely be allocated to the provision of energy, i.e. thermal energy and electricity.

More than 90% of primary energy requirements of renewable energy resources **(PERE)** is attributable to raw material supply. The requirements of renewable energy resources in raw material supply are largely generated by the supply of roundwood.

The Polish power mix integrated in the production of OSB panels leads to the plant in Poland displaying somewhat higher values in terms of the acidification potential **(AP)** than the plant in Heiligengrabe.

7. Requisite evidence

7.1 Formaldehyde
The adhesive system for SWISS KRONO OSB does not contain any formaldehyde. It is not therefore of relevance.

7.2 MDI
Measuring agency:
Eco-INSTITUT GmbH, Cologne, Germany
Test report, date: 35926-001 dated 25.06.2012
Result: SWISS KRONO OSB was tested according to the DFG No. 1 analysis method.
Emissions of MDI and other isocyanates were below the detection limit (< 2 µg/m³) in the analysis process.

7.3 Testing pretreatment of substances used
No waste wood is used in manufacturing SWISS KRONO OSB. It is not therefore of relevance.

7.4 *Fire gas toxicity*
Measuring agency: Elektro-Physik Aachen GmbH
Test report: 14/2009 dated 14.5.2009
Result: Glued OSB FO were tested. The results in accordance with /DIN 53 436/ indicate that no chlorine or sulphur compounds could be verified. The gaseous emissions released under the selected test conditions largely comply with the emissions released by wood under the same conditions.

7.5 VOC emissions
Evidence of VOC is optional when the EPD is valid for a shorter period of time (1 year).

7.6 Lindane/PCP
Measuring agency: MPA Eberswalde, Materialprüfungsanstalt Brandenburg GmbH, Germany
Test report: 31/07/7847/13, 25.9.-11.10.2007 and 31/08/1011/09, 19.6.-1.7.2008 (as per CEN/TR 14823 and Annex IV Waste Wood Act, wood moisture: based on /EN 322/)
*Result:*After extraction of the substances contained, the solutions were derivatised, reprocessed and subjected to a gas chromatography analysis. The PCP and Lindan values are below the limit of detection of 0.1 mg/kg.

8. References

General construction inspection approval:
Approval number: Z-9.1-503; subject of approval: OSB Kronoply 4; approval certificate dated 20.01.2010; DIBt – Deutsches Institut für Bautechnik

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CEN/TR 14823:
Permanence of wood and wood products – Quantitative determination of pentachlorophenol in wood

DIN EN 323: Wood-based panels – Determination of density; German version EN 323:1993

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

EWC 170201, EWC 150103, EWC 150102:
Directive on the European Waste Catalogue; reference: BGBl I 2001, 3379

EN 300: Oriented Strand Boards (OSB) - Definitions, classification and specification

EN 322: Wood-based panels - Determination of moisture content

EN 13986: Wood-based panels for use in construction – Characteristics, evaluation of conformity and marking

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Product Category Rules for Building Products, Part B:
Requirements on the EPD for wood-based materials, version 1.6, 2014-07. Instut Bauen und Umwelt e.V.

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

DIN EN 15804
EN 15804 (ISO 14025:2006); German and English version EN ISO 14025:202014-07 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products; German version EN 15804:2012+A1:2013

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

General principles
for the EPD range of Institut Bauen und Umwelt e.V. (IBU), 2013/04
www.bau-umwelt.de

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

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

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