ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Declaration holder	**SWISS KRONO GmbH / SWISS KRONO Sp. z o.o.**
Publisher	Institut Bauen und Umwelt (IBU)
Programme holder	Institut Bauen und Umwelt (IBU)
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SWISS KRONO WP50 / DP50

SWISS KRONO GmbH / SWISS KRONO Sp. z o.o.

www.bau-umwelt.com

1 General information

SWISS KRONO GmbH / SWISS KRONO Sp. z o.o.	SWISS KRONO WP50 / DP50
Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 D-10178 Berlin	**Declaration holder** SWISS KRONO GmbH Wittstocker Chaussee 1 D-16909 Heilgengrabe SWISS KRONO Sp z o.o. ul.Serbska 56 PL-68200 Zary
Declaration number EPD-KRO-2012311-EN	**Declared product/unit** 1 cubic metre of SWISS KRONO WP50 / DP50
This Declaration is based on the Product Category Rules: Wood Materials, 06-2011 (PCR tested and approved by the independent Committee of Experts (SVA))	**Validity** This document refers to the SWISS KRONO WP50 / DP50 boards manufactured by SWISS KRONO in PL-68-200 Zary (Poland). The Life Cycle Assessment data was recorded in 2008 by the company in Zary. 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 28.07.2012	**Verification** The CEN EN 15804 standard serves as the core PCR.
Valid until 27.07.2017	Verification of the EPD by an independent third party in accordance with ISO 14025 ☐ internal ☒ external

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

Prof. Dr.-Ing. Hans-Wolf Reinhardt
(Chairman of the Committee of Experts (SVA))

Dr. Frank Werner
(Independent auditor appointed by the SVA)

2 Product

2.1 Product description

SWISS KRONO WP50 / DP50 boards are board-shaped wooden materials made of wood fibres in accordance with EN 622-5, MDF RWH. SWISS KRONO WP50 / DP50 boards are square-edged (SWISS KRONO WP50) or they feature a LiquiSafe® tongue-and-groove profile (SWISS KRONO DP50). The boards are manufactured in a so-called dry process, glued with an MDI resin (diphenylmethane diisocyanate) and compressed under heat and pressure in an infinite press with the addition of paraffin wax emulsion for hydrophobicity. Wood fibre boards for the construction sector are classified as various board types – a description of the classes is outlined in the EN 622 requirements. The board types are primarily distinguished and classified in use as non-bearing and bearing elements in dry and moist areas (utilisation classes 1 and 2).

2.2 Application

SWISS KRONO WP50 / DP50 boards are used as open to diffusion and supporting external panelling of walls and roofs in the application areas of utilisation classes 1 and 2 acc. to DIN 1052, DIN EN 1995-1-1 and DIN 68800-2, whereby the maximum permanent board moisture must not exceed 15%. SWISS KRONO DP50 boards have also been tested as under-roof panels in a wood research project in

Vienna and are classified as UDP-A by the Zentralverband des Deutschen Dachdeckerhandwerks (ZVDH – German Confederation of Roofers) as a result.

2.3 Technical Data

Gross density [kg/m³]: *510 - 550*

Thermal conductivity characteristic [W/mK]: *0.09*

Water vapour diffusion resistance factors [μ]: *11*

General construction inspection approval DIBt Z-9.1-442

2.4 Placing on the market / Application rules

DIN EN 622-5:2010-03, Fibreboard - Requirements - Part 5: requirements on boards after the dry process (MDF); German version EN 622-5:2009

DIBt approval Z-9.1-442: "SWISS KRONO WP50 and DP50 wood fibre boards"

When using SWISS KRONO WP50 / DP50 boards as bearing or reinforcing panelling, the regulations of the DIBt approval Z-9.1-442 and the DIN 68800-2 standard on "Wood protection – Preventive structural measures" shall apply. Furthermore, the specifications outlined in DIN 1052:2008-12 or DIN EN 1995-1-1 with National Application Document (NAD) also still apply for constructive applications.

2.5 Delivery status

Table 1: SWISS KRONO DP50 range, with LiquiSafe® tongue-and-groove on four sides

Thickness [mm]	Format [mm]	Boards per pallet	Area per pallet [m²]
15	2500 x 675	60	101.25

Table 2: SWISS KRONO WP50, square-edge

Thickness [mm]	Format [mm]	Boards per pallet	Area per pallet [m²]
15	2650 x 1247 (special format)	60	198.27
15	2800 x 1247	60	209.50

2.6 Base materials / Auxiliaries

Wood percentage, min. 85% of which is largely pine with FSC min. 50%, as well as sawmill by-products and wood chips

Adhesive in the form of PUR resin: 4 - 6%

Water in the form of wood moisture: 4 - 8%

Wax emulsion (paraffin wax): < 1%

2.7 Manufacture

1. Debarking the trunks
2. Crushing the roundwood to wood chips
3. Boiling the wood chips
4. Defibering in a refiner
5. Glueing the fibres with resin and adding the paraffin wax
6. Drying the fibres to approx. 10% residual moisture
7. Scattering the glued fibres on a forming belt
8. Pressing the fibre mat in a continuous press
9. Trimming the long edges and cutting to length
10. For SWISS KRONO DP50: Profiling the edges with tongue and groove
11. Stacking the boards and packaging with cardboard packaging and steel or polyester bands

EN ISO 9001:2008 (Certificate No. QS-1408 HH)

- FSC, Chain of Custody (GFA-COC-001008)

2.8 Environment and health during manufacture

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 ground. Production-related waste water is treated internally and returned to the production process.

Noise

Sound protection analyses have established that all values communicated inside and outside the production facility are far below the requisite (German) standards. Noise-emitting system components are encapsulated accordingly.

2.9 Production processing / Installation

SWISS KRONO WP50 / DP50 boards can be sawn, milled, planed and drilled using standard woodworking machinery or tools. Correct structural installation must be ensured. When selecting additional products, please ensure that they do not have negative influence on the designated environmental compatibility properties of the building product referred to. Detailed processing information is available directly from SWISS KRONO Zary (Poland), SWISS KRONO Heiligengrabe (Germany) or at www.swisskrono.de.

2.10 Packaging

Paper/Cardboard transport packaging and foil/straps can be sorted and directed to the recycling circuit.

2.11 Condition of use

The contents comply with those of SWISS KRONO WP50 / DP50 base material composition (see 2.6. “Base materials“). MDI binding agent fully and irreversibly reacts with the wood moisture to become a 3D-cured polyurethane (PUR) and polyurea during the binding process. The binding agent is chemically and stably bound to the wood. Glueing with PUR leads to SWISS KRONO WP50 / DP50 displaying great stability as regards deviations in humidity.

2.12 Environment and health during use

No damage to health can be anticipated if SWISS KRONO WP50/DP50 boards are used as designated.

No risks for water, air or soil if SWISS KRONO WP50 / DP50 boards are used as designated.

2.13 Reference service life

The reference service life depends on the area of application in the specific project which is why no RSL is declared.

2.14 Extraordinary effects

Fire

Fire performance:

Fire class E in accordance with EN 13501-1

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 WP50 / DP50 does not liquefy when heated.

Water

Effects of water:

No heavy metals could be established in the quantitative analysis of inorganic trace substances in the material.

Mechanical destruction:

Breakage: SWISS KRONO WP50 / DP50 boards display relatively brittle performance, whereby no smooth breaks are established along the panel edges.

2.15 Re-use phase

Provided they are untreated and not fully glued, SWISS KRONO WP50 / DP50 boards can be easily segregated and re-used for the same application when converting or completing the usage phase of a building. Provided the panels have not been damaged or contaminated with foreign products, SWISS KRONO WP50 / DP50 can be used again in line with their original designated purpose.

Energetic utilisation (in approved systems):

Owing to the high heat value of approx. 17 MJ/kg, energetic utilisation for generating process energy and electricity (CHP plants) from board leftovers and SWISS KRONO WP50 / DP50 boards arising from breakage measures on the building site is recommendable.

2.16 Disposal

SWISS KRONO WP50 / DP50 board 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: 170201/030105 in line with the European Waste Catalogue.

3 LCA: Calculation rules

3.1 Declared unit

The declared unit involves the manufacture and disposal of one cubic metre each of SWISS KRONO WP50 / DP50. 1 cubic metre of SWISS KRONO WP50 / DP 50 weighs 540 kg.

3.2 System limit

EPD type: from weighing to factory gate – with options.

The EPD system limit corresponds with the modular design in accordance with EN 15804.

The production stage comprises:

A1 Provision and processing of raw materials by secondary substances serving as input (e.g. recycling processes)

A2 Transport to the manufacturer

A3 Manufacture

The module commences with consideration of forest production and wood growth in the forest (CO_2 absorption). Additional processes involve the production of SWISS KRONO WP50 / DP50 in the plant as well as all necessary transport associated with the product. The assessment also includes packaging as far as the product is ready for delivery at the plant gate. Transport associated with the wood and binding agents used is always taken into consideration.

Module D comprises:

D Re-use-, recovery and/or recycling potentials

As the End-of-Life scenario, a bio-mass power plant with energy production (credits as per the substitution approach) was assumed. The analysis period starts at the recycling facility's plant gate. In terms of output, it is assumed that the ash incurred is directed to a landfill. Recycling is analysed taking consideration of the credits in the Austrian power mix and heat from gas firing.

Credits from the disposal stage were allocated to Module D. The "EU 25: Power Mix" and "EU 25 Thermal energy from natural gas" data records were used for the credit.

Further assumptions:

It is assumed that chopped waste wood reaches end-of-waste status as a secondary fuel.

As incineration in a bio-mass plant was assumed in this study, it can also be assumed that R1 > 0.6.

3.3 Estimates and assumptions

No other estimates or assumptions were made regarding the specifications outlined in this section 3.

3.4 Cut-off criteria

All data from the operating data survey were taken into consideration. Accordingly, material flows with a share of less than 1 per cent were also considered. Therefore, it can be assumed that the total of all neglected processes does not exceed 5% in the impact categories. It would appear to be plausible that the cut-off criteria in accordance with the PCR are complied..

3.5 Background data

Data on the products tested was recorded directly at the production site on the basis of a questionnaire drawn up by PE INTERNATIONAL. The input and output data was made available and tested for plausibility by SWISS KRONO Sp. z o.o. with the result that good data representativity can be assumed.

The majority of data for upstream chains originates from industrial sources and was collected under consistent time- and method-based constraints. The process data and background data used are consistent.

GaBi 4 2010 - the software system for comprehensive analysis developed by PE INTERNATIONAL AG - was used for modelling the life cycle for the manufacture and disposal of the declared products manufactured by SWISS KRONO. The consistent data records contained in the GaBi data base are documented and can be viewed in the online GaBi documentation (GABI 4 2010B). In order to guarantee comparability of the results, exclusively the consistent background data from the GaBi data base was used in the LCA (e.g. data records on energy, transport, auxiliaries and consumables).

3.6 Data quality

The general rule was observed that specific data from specific production processes or average data derived from specific processes takes priority when calculating an EPD.

The requirements on data quality and background data comply with the specifications of the PCR, Part A.

The technological background of data recorded reflects the physical reality for the declared product.

The data records are complete and comply with the system limits and criteria for excluding inputs and outputs.

The data used was last revised less than 8 years ago.

3.7 Period under review

The data records are based on an annual average (fiscal year 2008).

The period across which the inputs and outputs are considered amounts to 100 years from the year for which the data is declared as being representative.

3.8 Allocation

Allocation relates to the assignment of input and output flows for an ecological analysis module to the tested product system (ISO 14040).

When product systems involve multiple products and recycling processes, allocations should be avoided as far as possible. If they are inevitable, allocations should be considered with care and justified (EN 15804).

The upstream chain for the forest was analysed as per Schweinle 2001 and Hasch 2002 in the Rüter and Albrecht update (2007). In the case of leftover sawmill wood, the forestry process and associated transport are allocated by volume fraction (or dry mass) to the wood while leftover sawmill wood is not attributed any pollutants from sawmill processes. Pollutants from the forestry process and transport are allocated for residual wood but not for the sawing process.

The attribution of energy credits for electricity and thermal energy produced in the end-of-life process in the bio-mass power plant is based on the heat value of the input, whereby plant efficiency is also taken into consideration. The credit for thermal energy is calculated on the basis of "EU-25: Thermal energy from natural gas PE" data record; the credit for electricity is calculated from the "EU-25: Power Mix PE" data record.

The emissions dependent on input (e.g. CO_2, HCl, SO_2 or heavy metals) at the end-of-life (EoL) stage 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 in full to production.

3.9 Comparability

As a general rule, a comparison or assessment of EPD data is only possible when all of the data records to be compared have been generated in accordance with EN 15804 and the building context or product-specific characteristics are taken into consideration.

4 LCA: Scenarios and additional technical information

Re-use, recovery and recycling potential (D)

The incineration plant for recycling used boards (17 MJ/kg and 8% moisture) comprises an incineration line featuring a grate and a steam generator. The fuel energy utilisation of the bio-mass power plant is 93%.

5 LCA: Results

The following technical information forms the basis for the declared modules or can be used for developing specific scenarios within the context of building assessment if modules are not declared (MND).

SYSTEM LIMITS (X = INCLUDED IN THE LCA; MND = MODULE NOT DECLARED)																
Production stage			Construction stage		Use stage							Disposal stage				Credits and pollutants outside the system limit
Provision of raw materials	Transport	Manufacture	Transport to the site	Installation in the building	Use / Application	Maintenance	Repairs	Replacement	Renewal	Energy used for operating the building	Water used for operating the building	Renaturation / Demolition	Transport	Waste treatment	Landfilling	Re-use, recovery or 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	MND	MND	MND	MND	MND	MND	MND	MND	MND	X

RESULTS OF THE LIFE CYCLE ASSESSMENT - ENVIRONMENTAL IMPACTS: 1m³ SWISS KRONO WP50 / DP50			
		Production	Credits
Parameter	**Unit**	**A1-A3**	**D**
Global Warming Potential (GWP)	[kg CO_2 equiv.]	-444	181
Ozone Depletion Potential (ODP)	[kg CFC11 equiv.]	8.93E-06	-3.94E-07
Soil and water Acidification Potential (AP)	[kg SO_2 equiv.]	5.48	-3.38
Eutrification Potential (EP)	[kg PO_4^{3-} equiv.]	0.255	-0.071
Photochemical Ozone Creation Potential (POCP)	[kg ethene equiv.]	0.321	-0.186
Abiotic Depletion Potential of elementary resources (ADPE)	[kg Sb equiv.]	7.26E-04	-3.09E-05
Abiotic Depletion Potential of fossil resources (ADPF)	[MJ]	7197	-10482

RESULTS OF THE LIFE CYCLE ASSESSMENT - USE OF RESOURCES: 1m³ SWISS KRONO WP50 / DP50			
		Production stage	Credits
Parameter	**Unit**	**A1-A3**	**D**
Regenerative primary energy as an energy carrier (PERE)	[MJ]	3355	-43
Regenerative primary energy for material use (PERM)	[MJ]	9429	0
Total regenerative primary energy (PERT)	[MJ]	12784	-43
Non-regenerative primary energy as an energy carrier (PENRE)	[MJ]	3248	-10519
Non-regenerative primary energy for material use (PENRM)	[MJ]	4264	0
Total non-regenerative primary energy (PENRT)	[MJ]	7512	-10519
Use of secondary materials (SM)	[kg]	0	0
Regenerative secondary fuels (RSF)	[MJ]	0	0
Non-regenerative secondary fuels (NRSF)	[MJ]	0	0
Use of fresh water resources (FW)	[m³]	7.7	-0.17

RESULTS OF THE LIFE CYCLE ASSESSMENT - OUTPUT FLOWS AND WASTE CATEGORIES: 1m³ SWISS KRONO WP50 / DP50			
		Production stage	Credits
Parameter	**Unit**	**A1-A3**	**D**
Hazardous waste for dumping (HWD)	[kg]	0.543	0
Disposed of, non-hazardous waste (NHWD)	[kg]	1596	-1079
Disposed of radioactive waste (RWD)	[kg]	0.100	-0.009
Components for re-use (CRU)	[kg]	0	0
Materials for recycling (MFR)	[kg]	0	0
Substances for energy recovery (MER)	[kg]	0	0
Exported energy by type (electricity)	[MJ]	0	798
Exported energy by type (thermal energy)	[MJ]	0	7769

6 LCA: Interpretation

The estimated impact results are only relative which do not represent any unambiguous claims as regards "end points" of the impact categories, exceeding threshold values, safety margins or risks.

The Life Cycle Assessment and impact estimate are based on the specifications outlined in the European standard and there are no other restrictions limiting interpretation in terms of data or methods.

Water consumption

Water consumption for 1 m3 SWISS KRONO WP50 / DP50 raw particleboard comprises 7.7 m3 of water during the production stage. 0.17 m3 are credited during Stage D.

Water consumption for the boards is the result of water consumed during production and during incineration at the end of life.

Regenerative and non-regenerative primary energy

The percentage of regenerative energies in the products examined is attributable to the extensive use of wood.

The high percentage of non-regenerative energy in the products examined is attributable to the adhesive and the use of electricity, whereby the use of brown coal and pit coal are of particular relevance.

Waste

The greatest share of waste produced is accounted for by disposed of, non-hazardous waste. Disposed of, radioactive waste is incurred by energy utilisation in the preliminary product upstream chains (generation of electricity).

Global Warming Potential (GWP)

The Global Warming Potential is dominated by carbon dioxide in manufacturing. CO_2 is integrated in the sustainable raw materials required for production.

Outside the system under review, all GWP-relevant emissions are incurred by incineration. A percentage of the greenhouse gas emissions arising is substituted by the credit.

Ozone Depletion Potential (ODP)

The Ozone Depletion Potential primarily arises through the use of adhesive in the production of SWISS KRONO WP50 / DP50 boards. By substituting the energy utilisation incurred by the boards at the end of life, the overall ozone depletion potential is reduced. The ozone depletion potential is incurred by organic emissions containing halogen into the air.

Acidification Potential (AP)

The Acidification Potential is primarily incurred by the use of adhesive during board production and by emissions during incineration outside the system reviewed where sulphur dioxide and nitrogen oxides make the greatest contribution towards the acidification potential.

Eutrification Potential (EP)

The Eutrification Potential is primarily incurred by the use of adhesive during board production and by emissions during incineration outside the system reviewed where nitrogen oxides make the greatest contribution towards the eutrification potential.

Photochemical Ozone Creation Potential (POCP)

The Photochemical Ozone Creation Potential is primarily incurred by the use of energy (electricity and power plant) as well as the use of adhesive and wood and by the emissions during incineration outside the system reviewed, whereby NMVOCs and nitrogen oxide emissions make the greatest contribution towards the photochemical ozone creation potential.

Abiotic consumption of resources (fossil)

The ADP is primarily incurred by the use of non-regenerative fossil energy carriers such as natural gas and crude oil, whereby the adhesive used and the power mix make the greatest contribution.

Abiotic consumption of resources (elementary)

The ADP elementary is primarily incurred by non-regenerative material resources such as metals or rock salt, whereby the glue used as well as the machine parts subject to wear make the greatest contribution.

7 Requisite evidence

7.1 Formaldehyde

Measuring agency:

HFB Engineering GmbH, Prüfstelle für Baustoffe und Bauelemente, Leipzig, Germany

Test reports, date:

31100 0751/1/2012 dated 26.04.2012

Result:

The formaldehyde content was examined using the Perforator Method in accordance with DIN EN 120.

The results are clearly below the limit value of 8.0 mg HCHO/100g atro panel (at 6.5% material moisture) in accordance with DIBt Guideline 100 in line with the Chemical Restriction Regulation, Annexe to § 1, section 3 in combination with the publication by the BGA in the Public Health Gazette in October 1991 on “Test procedures for wood materials”.

The average result for SWISS KRONO WP50 / DP 50 boards (12-18 mm) is 0.18 HCHO/100g in accordance with DIN EN 120 (average value of double determination).

7.2 MDI

Measuring agency:

Eco-INSTITUT GmbH, Cologne, Germany

Test reports, date:

35926-001 dated 25.06.2012

Result:

SWISS KRONO WP50 / DP 50 boards were examined in accordance with the DFG No.1 method of analysis.

MDI emissions and other isocyanate emissions were below the detection limit (< 2 µg/m3) of the analysis process.

7.3 Fire gas toxicity

Measuring agency:

EPA Energie- und Prozesstechnik Aachen GmbH, Germany

Test report, date:

22/2012 dated 19.06.2012

Result:

The toxic fire gases were determined in accordance with DIN 4102 Part 1 – Class A at 400 ^{o}C. The results indicate that no ammonia or chlorine water and sulphurous water compounds could be detected although CO, CO_2, hydrogen cyanide, acetic acid and COHb were detected.

The gaseous emissions released under the selected test conditions do not comply with the emissions released by wood under the same conditions.

7.4 VOC emissions

The VOC verification is outstanding as no recognised test method (or evaluation method) is in place.

8 References

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EN 622-5

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EN 120

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Publisher
Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Tel. +49 (0)30 3087748-0
Fax +49 (0)30 3087748-29
E-mail info@bau-umwelt.com
Web **www.bau-umwelt.com**

Programme holder
Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Tel. +49 (0)30 3087748-0
Fax +49 (0)30 3087748-29
E-mail info@bau-umwelt.com
Web **www.bau-umwelt.com**

SWISS KRONO

Declaration holder
SWISS KRONO GmbH
Wittstocker Chausee 1
16909 Heilgengrabe
Germany

Tel. +49 (0) 33962 69 - 740
Fax +49 (0) 33962 69 - 376
E-Mail sales@kronoply.de
Web **www.swisskrono.de**

SWISS KRONO Sp. z o.o.
Ul.Serbska 56
68200 Zary
Poland

Tel. +48 (0)68 36 31 100
Fax: +48 (0)68 36 31 320
E-mail: info@kronopol.pl
Web **www.swisskrono.pl**

PE INTERNATIONAL

Life Cycle Assessment author
PE CEE GmbH
Hütteldorferstr. 63-65/8
1150 Vienna
Austria

Tel. +43 (0)1 4799724-0
Fax: +43 (0)1 4799724-10
E-mail: info@pe-international.com
Web **www.pe-cee.com**