ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	Kuraray Europe GmbH
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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Valid to	03/02/2031

PVB film (Trosifol®) - Ulsan, South Korea

Kuraray Europe GmbH

Institut Bauen und Umwelt e.V.

ECO PLATFORM EPD VERIFIED

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General Information

Kuraray Europe GmbH

Programme holder

IBU – Institut Bauen und Umwelt e.V.
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Germany

Declaration number

EPD-KUR-20250327-CBC1-EN

This declaration is based on the product category rules:

Plate glass for construction and interlayers, 01/08/2021
(PCR checked and approved by the SVR)

Issue date

04/02/2026

Valid to

03/02/2031

Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)

Florian Pronold
(Managing Director Institut Bauen und Umwelt e.V.)

PVB film (Trosifol®) - Ulsan, South Korea

Owner of the declaration

Kuraray Europe GmbH
Philipp-Reis-Str. 4
65795 Hattersheim
Germany

Declared product / declared unit

Trosifol® PVB.
The declared unit is 1 m².

Scope:

Trosifol® PVB film, manufactured in Ulsan, South Korea based on Mowital® (PVB) resin produced in Frankfurt, Germany.

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
☐ internally ☒ externally

Ms Emma Wilde,
(Independent verifier)

Product

Product description/Product definition

Kuraray's polyvinyl butyral (PVB) thermoplastic films are durable, resilient interlayers designed for use in laminated safety glass. These Trosifol® PVB interlayers provide critical safety benefits by holding glass shards in place in the event of breakage, helping to prevent injury. Widely available across global markets, they serve as effective safety glass interlayers.

This Environmental Product Declaration (EPD) covers all Trosifol® PVB products manufactured at the Ulsan facility in South Korea, utilizing PVB resin produced in Frankfurt, Germany, with product codes Trosifol® X2XXX, in a thickness range of 0.38–2.28 mm.

The Kuraray Trosifol product portfolio is publicly available in our *Product Guide*, please go to:
https://www.trosifol.com/tools-resources/downloads

For the use and application of the product the respective national provisions at the place of use apply, in Germany, for example the building codes of the federal states and the corresponding national specifications.

Application

Trosifol® PVB film needs to be laminated between two pieces of glass. This sandwich arrangement is called laminated safety glass according to *EN ISO 14449*. Special Trosifol® PVB grades offer additional decorative, acoustic, UV managing and structural properties.

Technical Data

For calculating the light, solar and heat parameters of glazing specifically containing Trosifol® & SentryGlas® products, please go to:
https://www.trosifol.com/winslt-tool/

For evaluating glazing systems in terms of their acoustic perfomance containing Trosifol® & SentryGlas® products, please go to:
https://www.trosifol.com/soundlab-ai/

For evaluating glazing systems in terms of their structural properties by providing a quick analysis of the virtual glazing configuration, dimension, and load case containing Trosifol® & SentryGlas® products, please go to:
https://www.trosifol.com/strength-lab-ai

For calculating the carbon footprint of laminated safety glass containing Trosifol® & SentryGlas® products, please go to:
https://www.trosifol.com/tools-resources/tools/carbon-reduce-ai

If you are looking for more information about Trosifol® automotive products, please check our product brochure *Automotive Glazing*, please go to:
https://www.trosifol.com/de/tools-und-ressourcen/downloads

If you are looking for more information about Trosifol® R3 products, please check our product brochure *Trosifol® R3 – Sustainable Glazing*, please go to:
https://www.trosifol.com/de/tools-und-ressourcen/downloads

The following data are valid for Trosifol® Clear and Trosifol® UltraClear. Other product's data can be found in our brochures, please go to:
https://www.trosifol.com/de/tools-und-ressourcen/downloads

Constructional data

Name	Value	Unit
Refractive index acc. To DIN EN ISO 489	1.48	-
Thermal conductivity acc. DIN EN 993-15	0.21	W/(mK)
Thermal expansion coefficient acc. ISO 11359-2	0.00017	K^{-1}
Specific heat capacity	1.9	kJ/kgK
Surface resistivity acc. DIN 53482	1E+13	Ω
Tensile strength acc. ISO 527-3	20	N/mm^2
Elongation at break acc. ISO 527-3	250	%
Tg acc. DMA, 3K/min, 1Hz	32	°C

Performance data of the product with respect to its characteristics in accordance with the relevant technical provision (no CE-marking).

Base materials/Ancillary materials

The main constituents of Trosifol® PVB film are (in mass percentages):
-PVB resin ~72 %
-Plasticizer ~27-28 %
-Additives <1 %

1) This product contains substances listed in the *candidate list* (date: 7.11.2024) exceeding 0.1 percentage by mass: **no**

2) This product contains other Carcinogenic, Mutagenic, Reprotoxic (CMR) substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass: **no**

3) Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) *Ordinance on Biocide Products No. 528/2012*): **no**

Reference service life

The reference service life is typically determined by the glass and not by the interlayer.

LCA: Calculation rules

Declared Unit

This declaration refers to the declared unit of 1 m^2 of PVB film (Trosifol®). The grammage of the PVB film is 0.8132 kg/m^2.

Declared unit - PVB film (Trosifol®)

Name	Value	Unit
Declared unit	1	m^2
Layer thickness	0.00076	m
Grammage	0.8132	kg/m^2
Density	1.07	g/cm^3

System boundary

The type of EPD is cradle-to-gate with options, modules C1–C4, and module D (A1–A3, C, D and additional module A5). In the following section, a detailed description of the specific system boundaries is given:

Module A1 to A3:
The product stage includes the provision of all materials, products and energy, as well as waste processing up to the end-of-waste state or disposal of final residues during the product stage.

These modules consider the manufacturing of system components/raw materials, the transport to the production site and the production processes of the products under study. The impact of packaging materials is included.

Additionally, the emission factor for the Korean electricity grid mix (production electricity) used in this EPD, according to *EN15804+A2 (EF3.1)*, is 0.60 kg CO_2 eq. / kWh.

Module A5:
Treatment and disposal of packaging material. Benefits for potential avoided burdens due to energy substitution of electricity and thermal energy generation are declared in module D and affect only the rate of primary material (no secondary materials).

Module C1 to C4:
The end-of-life scenarios are as follows:

- C1 - Deconstruction/demolition: Dismantling is manual (no environmental burden).
- C2 - Transport to treatment/disposal site: Average transport distance from the demolition site to waste treatment is assumed as 50 km to the landfill.
- C3 - Waste processing for reuse, recovery or recycling: No waste processing (no environmental burden).
- C4 - Disposal: PVB film is 100 % landfilled.

Module D:
For the thermal and electrical energy generated in Module A5 due to the thermal treatment of packaging waste, avoided burdens have been calculated by the inversion of the electricity grid mix and thermal energy from natural gas, using Korean datasets.

Geographic Representativeness
Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Korea, Republic Of

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 datasets: *LCA FE software (formerly GaBi software) version 10.9* and *Managed LCA Content (formerly GaBi Databases) version 2023.2.*

LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

Biogenic carbon is found exclusively in the packaging materials, which include wooden pallets, wood crates, and cartons.

- The assumed water content is 18 % for wooden pallets and 5 % for wood crates.
- The carbon content assumptions are as follows: dry wood mass contains 50 % biogenic carbon, while paper and cardboard contain 43 % biogenic carbon.

Biogenic carbon content calculation:

- **Wooden pallets:** (1.79E-02 kg pallet / declared unit) * (0.82) * (0.5 kg C / kg pallet (abs. dry)) = 7.32E-03 kg C / declared unit
- **Wood crates:** (1.85E-02 kg plywood board) * (0.95) * (0.5 kg C / kg plywood (abs. dry)) = 8.80E-03 kg C / declared unit
- **Cardboard/paper:** (1.51E-02 kg paper-cardboard / declared unit)*(0.43 kg C / kg paper-cardboard) = 6.51E-03 kg C / declared unit
- **Total biogenic carbon content:** 2.26E-02 kg C / declared unit

Information on describing the biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in accompanying packaging	0.0226	kg C

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO_2.

The following technical scenario information is required for the declared modules.

Installation into the building (A5)
The packaging material treatment and disposal are considered in module A5.

Name	Value	Unit
Output substances following waste treatment on site [packaging materials per declared unit]	0.076	kg

End of life (C1-C4)
The end-of-life scenarios are as follows:

- **C1 -** The deconstruction of the PVB film is assumed to be done manually. Therefore, no environmental loads for the dismantling of this product are considered.
- **C2 - Transport to treatment/disposal site:** Average transport distance from the demolition site to waste treatment is assumed as 50 km to landfill.
- **C3 - Waste processing for reuse, recovery or recycling:** No waste processing (no environmental burden).
- **C4 - Disposal:** The PVB film is 100 % landfilled.

Name	Value	Unit
Collected as mixed construction waste [PVB film per declared unit]	0.8132	kg
Landfilling [PVB film per declared unit]	0.8132	kg

LCA: Results

The following tables outline the environmentally relevant results according to *EN 15804+A2* (EF3.1) for 1 m² of PVB film.
Please note that the results correspond to a product with a layer thickness of 0.00076 m, a grammage of 0.8132 kg/m², and a density of 1.07 g/cm³. However, it is important to emphasize that the LCA results can be converted to indicator values per square meter ([unit/m²]) for different thicknesses using the following equation: **Indicator value per square meter [unit / m²] × (layer thickness [mm] / 0.76 mm)**.

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	MND	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 m² PVB film

Parameter	Unit	A1-A3	A5	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	4.09E+00	1.6E-01	0	3.31E-03	0	5.58E-02	-8.03E-02
GWP-fossil	kg CO_2 eq	4.13E+00	7.74E-02	0	2.73E-03	0	5.57E-02	-8.03E-02
GWP-biogenic	kg CO_2 eq	-5.02E-02	8.28E-02	0	5.75E-04	0	0	-5.25E-05
GWP-luluc	kg CO_2 eq	5.13E-04	4.21E-07	0	7.15E-08	0	4.6E-05	-4.65E-06
ODP	kg CFC11 eq	1.79E-09	1.16E-14	0	1.15E-16	0	9.4E-14	-1.82E-13
AP	mol H^+ eq	8.49E-03	2.54E-05	0	1.42E-05	0	1.68E-04	-9.05E-05
EP-freshwater	kg P eq	5.55E-05	3.29E-09	0	5.2E-10	0	1.08E-05	-3.06E-08
EP-marine	kg N eq	3.18E-03	7.87E-06	0	5.97E-06	0	3.84E-05	-3.42E-05
EP-terrestrial	mol N eq	3.31E-02	1.16E-04	0	6.58E-05	0	4.22E-04	-3.74E-04
POCP	kg NMVOC eq	9.86E-03	2.11E-05	0	1.18E-05	0	1.22E-04	-9.67E-05
ADPE	kg Sb eq	1.65E-07	1.1E-10	0	2.13E-11	0	1.48E-09	-1.95E-09
ADPF	MJ	9.35E+01	3.4E-02	0	4.57E-02	0	8.35E-01	-1.31E+00
WDP	m^3 world eq deprived	-6.52E-01	1.54E-02	0	5.66E-06	0	-7.89E-04	-6.21E-04

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 m² PVB film

Parameter	Unit	A1-A3	A5	C1	C2	C3	C4	D
PERE	MJ	6.83E+00	8.6E-01	0	1.53E-04	0	7.53E-02	-6.87E-02
PERM	MJ	8.53E-01	-8.53E-01	0	0	0	0	0
PERT	MJ	7.69E+00	7.32E-03	0	1.53E-04	0	7.53E-02	-6.87E-02
PENRE	MJ	6.57E+01	1.14E+00	0	4.58E-02	0	8.35E-01	-1.31E+00
PENRM	MJ	2.79E+01	-1.11E+00	0	0	0	0	0
PENRT	MJ	9.36E+01	3.4E-02	0	4.58E-02	0	8.35E-01	-1.31E+00
SM	kg	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0
FW	m^3	1.92E-02	3.62E-04	0	1.89E-07	0	8.24E-06	-1.47E-04

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 m² PVB film

Parameter	Unit	A1-A3	A5	C1	C2	C3	C4	D
HWD	kg	5.48E-08	8.05E-13	0	2.93E-14	0	7.03E-11	-5.99E-11
NHWD	kg	4.24E-02	2.09E-03	0	2.7E-06	0	8.1E-01	-3.65E-04
RWD	kg	1.84E-03	1.67E-06	0	1.19E-08	0	9.89E-06	-7.61E-05
CRU	kg	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	0	0

MER	kg	0	0	0	0	0	0	0
EEE	MJ	0	2.66E-01	0	0	0	0	0
EET	MJ	0	4.76E-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 m² PVB film

Parameter	Unit	A1-A3	A5	C1	C2	C3	C4	D
PM	Disease incidence	1.26E-07	1.47E-10	0	7.71E-11	0	1.63E-09	-8.89E-10
IR	kBq U235 eq	1.64E-01	2.65E-04	0	1.03E-06	0	1.46E-03	-5.96E-03
ETP-fw	CTUe	5.52E+01	1.62E-02	0	4.55E-02	0	7.13E-01	-1.21E-01
HTP-c	CTUh	8.96E-09	1.3E-12	0	7.47E-13	0	3.66E-11	-6.2E-12
HTP-nc	CTUh	5.2E-08	4.08E-11	0	1.75E-11	0	2.92E-09	-1.17E-10
SQP	SQP	2.16E+01	8.91E-03	0	6.95E-05	0	7.23E-02	-7.18E-02

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 (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”. This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

References

Standards

DIN 53482
DIN 53482:1967-01, Testing of Insulating Materials; Determination of Electrical Resistance Values.

DIN EN ISO 489
DIN EN ISO 489:1999-08, Plastics - Determination of the refractive index (ISO 489:1999).

DIN EN 993-15
DIN EN 993-15:2005-07, Methods of test for dense shaped refractory products - Part 15: Determination of thermal conductivity by the hot-wire (parallel) method.

DIN EN ISO 527-3
DIN EN ISO 527-3:2019-02, Plastics - Determination of tensile properties - Part 3: Test conditions for films and sheets (ISO 527-3:2018).

EN 15804+A2
EN 15804:2012+A2:2019+AC:2021, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

EN ISO 14449
EN 14449:2005/AC:2005, Glass in building - Laminated glass and laminated safety glass - Evaluation of conformity/Product standard.

ISO 11359-2
ISO 11359-2:2021-11, Plastics - Thermomechanical analysis (TMA) - Part 2: Determination of coefficient of linear thermal expansion and glass transition temperature.

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

Further References

Candidate list
Candidate List of substances of very high concern for Authorisation, published on ECHA website, latest version 7.11.2024 (https://echa.europa.eu/candidate-list-table)

LCA FE Software (formerly GaBi software) and Managed LCA Content (formerly GaBi Databases)
LCA FE Software and Managed LCA Content, 1992-2023, Sphera Solutions GmbH, Leinfelden- Echterdingen, with acknowledgement of LBP University of Stuttgart, program version 10.9; database version 2023.2.

Managed LCA Content documentation
Managed LCA Content dataset documentation for the software system and databases, LBP, University of Stuttgart and Sphera Solutions GmbH, Leinfelden-Echterdingen, 2023. (https://lcadatabase.sphera.com/)

IBU 2024
Institut Bauen und Umwelt e.V.: General Instructions for the EPD programme of Institut Bauen und Umwelt e.V., Version 2.0, Berlin: Institut Bauen und Umwelt e.V., 2021 www.ibu-epd.com

Ordinance on Biocide Products No. 528/2012
Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products

PCR Part A
PCR Part A: Calculation rules for the Life Cycle Assessment and Requirements on the Background Report according to EN 15804+A2:2019, Version 1.4, Institut Bauen und Umwelt e.V., 2024.

PCR Part B
Product Category Rules for Building Products, Part B:

Requirements on the EPD for plate glass for construction and interlayers, version from 08/2021, 2024 www.bau-umwelt.de

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