

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A1

Owner of the Declaration	Verband der Deutschen Holzwerkstoffindustrie e.V. (VHI)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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WPC decking profiles

**Verband der Deutschen
Holzwerkstoffindustrie e.V. (VHI)**

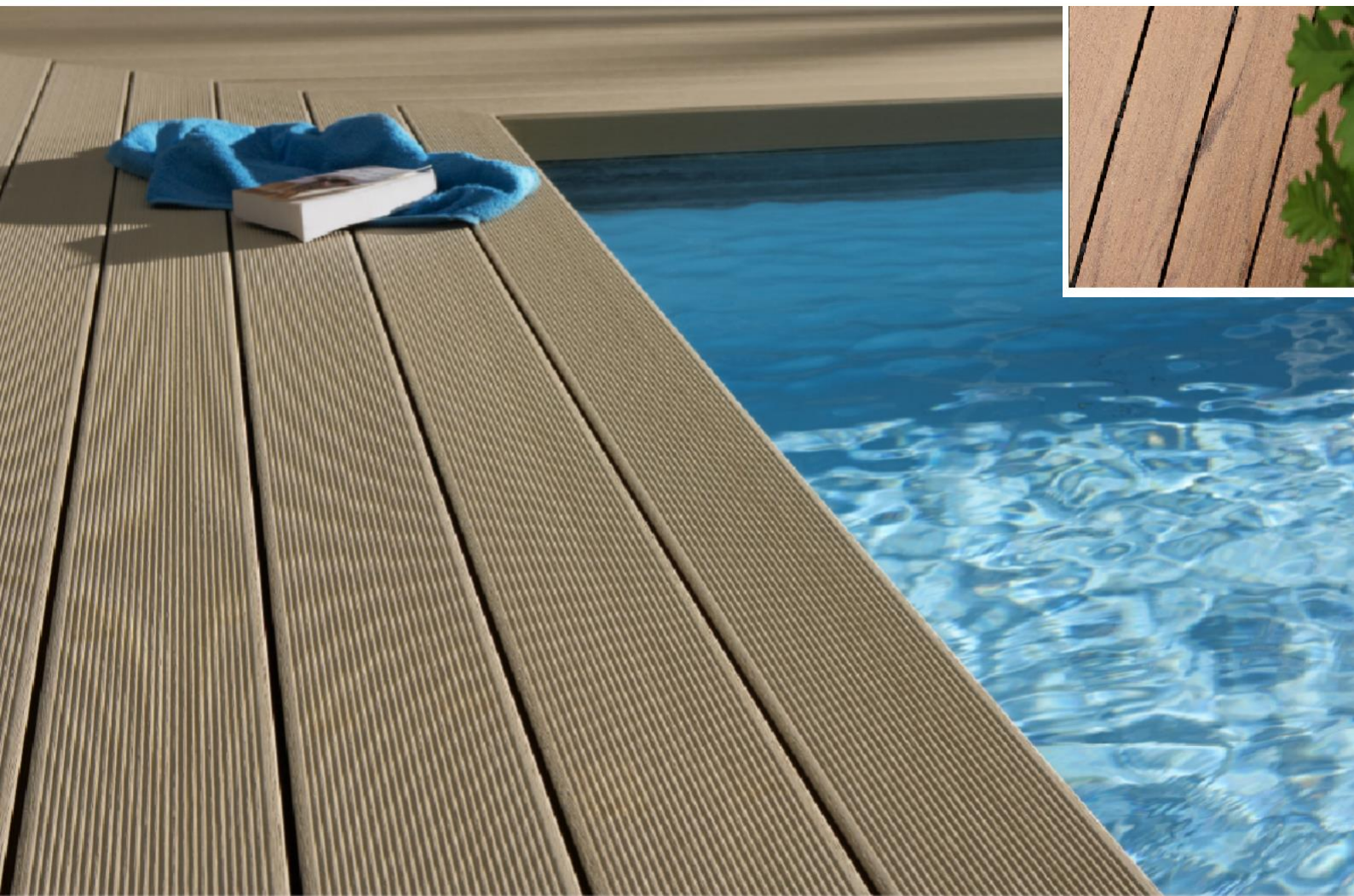
Association of the German Wood-based Panel
Industry



Überreicht durch das VHI-Mitgliedsunternehmen
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www.ibu-epd.com | <https://epd-online.com>



General Information

Verband der Deutschen Holzwerkstoffindustrie e.V.

Programme holder

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Panoramastr. 1
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Germany

Declaration number

EPD-VHI-20210249-IBE1-EN

This declaration is based on the product category rules:

Patio coverings made from wood polymer composites (WPC), 07.2014
(PCR checked and approved by the SVR)

Issue date

25.03.2022

Valid to

24.03.2027



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WPC decking profiles

Owner of the declaration

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Declared product / declared unit

1 m² decking profile made of WPC

Scope:

This declaration is an association EPD that represents an average product of the WPC manufacturing VHI member companies. The average is the weighted average of the manufacturer's data. The proportion of the production volume covered by the LCA is 84 % of the total production volume manufactured by all association members in the reference year 2021.

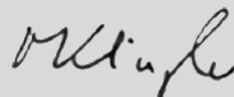
The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

The EPD was created according to the specifications of *EN 15804+A1*. 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 14025:2010*

internally externally



Matthias Klingler
(Independent verifier)

Product

Product description/Product definition

The declared products are wood-polymer decking profiles specially suitable for outdoor use. The plastics matrix can consist either of polyethylene (PE), polypropylene (PP) or polyvinylchloride (PVC).

This EPD does not refer to a specific product of one manufacturer, but declares the average environmental quality for all WPC decking profiles produced by member companies of the VHI. The information represents 80 % of the German market. Detailed data can be obtained from the product description of the manufacturer in question.

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.

General regulations on WPC products can be found in the product standard /DIN EN 15234 Parts: 1, 4, 5/ as well as the quality and testing guidelines of the

Qualitätsgemeinschaft Holzwerkstoffe e.V.. (www.qg-holzwerkstoffe.de/).

The legally binding version of these terms is the German EPD-document available on:
www.ibu-epd.com | <https://epd-online.com>

Application

WPC decking profiles in accordance with DIN EN 15534:2014, Parts 1 - 4 are used as flooring and can only be used as non-load-bearing structural elements (no general building inspection approval required). The products pose no risk to health and are technically safe.

Technical Data

The technical construction data listed in the following apply to all WPC decking profiles made by the manufacturers involved.

Technical construction data

Name	Value	Unit
Density in accordance with EN ISO 1183-3	1100 - 1420	kg/m ³
Density according to EN ISO 1183-3	-	kg/m ³
Grammage	13 - 26	kg/m ²
Grammage	-	kg/m ²
Moisture content in accordance with ISO 16979	1 - 5	M.-%
Moisture content according to ISO 16979	-	-
length density of the profiles in accordance with DIN EN 15534-1:2014	2000 - 5000	g/m
length density the profiles according to DIN EN 15534-1:2014	-	g/m
Dimensions (thickness, length and width of the profiles in accordance with DIN EN 15534-1:2014)	21-38/ 3000-6000/ 138-196	mm
Dimensions (thickness, length and width of profiles according to DIN EN 15534-1:2014)	-	mm
Deviation from straightness in accordance with DIN EN 15534-1	0 - 1	mm
Deviation from straightness acc. to DIN EN 15534-1	-	mm
Curvature in accordance with DIN EN 15534-1	0 - 0.8	mm
Curvature acc DIN EN 15534-1	-	mm
Flexural properties Bending properties in accordance with EN 310:1993 - Elasticity modulus	<6200	MPa
Flexural properties acc EN 310:1993 - tensile modulus	-	MPa
Flexural properties Bending properties in accordance with EN 310:1993 - Bending strength	<55	MPa
Flexural properties acc EN 310:1993 - flexural strength	-	MPa
Impact resistance acc EN 477 - crack length	-	mm
Impact resistance in accordance with EN 477 - Crack length	0 - 10	mm
Impact resistance nach EN 477 - depth of impression	-	mm
Impact resistance in accordance with EN 477 - Impression depth	0 - 0.5	mm
Linear thermal expansion coefficient acc ISO 11359-2	-	K ⁻¹
Linear thermal expansion coefficient in accordance with ISO 11359-2	<4E-05	K ⁻¹
Swelling acc EN 317 - length-/ width- / thickness	-	%
Swelling in accordance with EN 317 (length, width, thickness)	0,1-1,42/ 0,2-1,2/ 1,26-4,5	%
Behavior in weathering tests acc EN ISO 4892-2:2013	-	-
Behavior in weathering tests in accordance with EN ISO 4892-2:2013	<10	-
Dimensional stability at high temperatures Dimensional stability acc EN ISO 75-1 and EN ISO 75-2	-	°C
Dimensional stability at high temperatures in accordance with EN ISO 75-1 and EN ISO 75-2	78 - 100	°C
Impact bending toughness acc EN ISO 179-1/1fU	-	kJ/m ²

Impact bending toughness in accordance with EN ISO 179-1/1fU	5 - 8	kJ/m ²
Swelling After cooking water storage acc DIN EN 15534-1:2014 - water absorption	-	%
Swelling after boiling water storage in accordance with DIN EN 15534-1:2014 - Water absorption	1.3 - 8	%
creep behavior acc DIN EN 15534-1:2014 - deflection	-	mm
creep behavior in accordance with DIN EN 15534-1:2014 - Deformation	0.9 - 5	mm
creep behavior acc DIN EN 15534-1:2014 - creep	-	mm
creep behavior in accordance with DIN EN 15534-1:2014 - Creep factor	<1,3	mm
Behavior on value Fluctuating acc EN 321:2001 - breaking load waste	-	%
Behavior on value Fluctuating in accordance with EN 321:2001 - Breaking load drop	<20	%
Water absorption acc EN 317	-	1 kg
Water absorption in accordance with EN 317	2 - 9	%
skid resistance acc DIN EN 15534-1:2014 a) Dynamic coefficient of sliding friction μ acc EN 13893	-	-
skid resistance in accordance with EN 15534-1:2014 a) Dynamic coefficient of friction ... in accordance with EN 13893	>0,43	-
skid resistance acc DIN EN 15534-1:2014 b) Slip inhibition class acc DIN 51097	-	-
skid resistance in accordance with EN 15534-1:2014 b) Slip resistance class in accordance with DIN 51097	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 average WPC decking profile consists mainly of the following base materials:

Material	Description	Share in M-%
Wood fibres	Industrial waste wood of spruce and pine	63
Plastics matrix	Polyethylene (PE) Polypropylene (PP) Polyvinylchloride (PVC)	29
Additives	adhesives, internal lubricants, pigments, filling materials, dispersing agent	8

The plastic or plastic compound integrated in the product must consist of 100 % new material, or of pure plastic which has accumulated as waste material once in the course of industrial production. Recycled material that is pure and free of harmful substances may also be used.

In addition, various additives are used in production. These are organic pigments and UV stabilisers, lubricants, adhesion promoters and dispersants. The additives used belong to the functional groups carboxylic acid anhydride, alkene, calcium stearate, zinc stearate, carbon and carboxylic acid ester.

The share of wood in the product must be at least 50 per cent by weight (dry), and must come from verifiably sustainable forestry (FSC or PEFC certificate). Natural waste wood (waste wood category AI in accordance with the Waste Wood Ordinance) may be used, but waste wood of the categories AII to AIV may not be used. Other natural fibres may be components of the product.

In order to save raw materials and to prevent emissions, ground material which comes from profiles of the company's own system and which was taken back from the market may be added again.

The product contains substances on the ECHA list of substances of very high concern (SVHCs) which may be Substances of Very High Concern (en: Substances of Very High Concern (SVHC) (date 21.02.22) above 0.1 mass%: no.

The product contains other CMR substances of category 1A or 1B that are not on the candidate list,

LCA: Calculation rules

Declared Unit

The declared unit is defined as follows:

1 m² of installed WPC decking profiles, with the dimensions 3,000 - 6,000 mm/138 - 196 mm/21 - 38 mm and a surface weight of 18.36 kg/m², over a service life of 30 years.

The composition of the WPC decking profiles results from the weighted average, depending on the production volume of the manufacturers involved.

Details on declared unit

Name	Value	Unit
Density	-	kg/m ³
Density	1238	kg/m ³
Profile type	-	-
Profile type	44 % solid profile and 56 % hollow-chamber profile	-
Conversion factor to 1 kg	-	-
Conversion factor to 1 kg unit m ²	0.05448	-
Declared unit	-	m ²
Declared unit	1	m ²

The WPC products of the individual manufacturers have different proportions of wood and plastic. In order to determine the influence of the wood content, it was reduced to 50 % on the one hand and increased to 80 % on the other hand. The proportion of wood has a strong influence on the individual environmental impact categories.

In general, a higher proportion of wood fibre in the WPC product can reduce the environmental impact of a WPC decking board.

In contrast, if the proportion of additives is changed by +/- 20 %, the results of the impact assessment for the individual environmental impact categories vary only very slightly.

above above 0.1% by mass in at least one of the a sub-product: no.

The present construction product contains added biocidal products have been added or it has been treated with treated with biocidal products (it is therefore a treated product within the meaning of the Biocidal Products Regulation (EU) No 528/2012): no."

Reference service life

No reference service life is declared; according to manufacturers' specifications, a service life (SL) of 30 years can be expected for average use.

The technical service life of individual components is not exceeded here either, and so replacement does not need to be taken into account during the service life.

System boundary

Type of EPD: cradle-to-gate, with options

In accordance with EN 15804 the following modules are used:

Module A1-3

The aggregated representation in the form of A1-3 is used for production. This includes the supply of raw materials, the production of the WPC decking profiles, all transportation to the manufacturer, the required energy consumption and resources, as well as all production waste that may accrue.

Module A4

Transportation of the product from the manufacturer to the construction site

Module B2

Maintenance of the WPC decking profiles during the utilisation phase: cleaning of the WPC decking profiles

Module C2

Transportation of the scrapped product to the recycling yard or to the manufacturer

Module C3

Waste treatment, such as thermal or material utilisation:

On account of the selected system boundaries (definition of the *end-of-waste* status), no disposal (Module C4) of the WPC decking profiles takes place. This means that only the export of the properties inherent in the material is included in the balance.

Module D

Credits and debits outside the system under review, through thermal and material utilisation

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.

LCA: Scenarios and additional technical information

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

Transport to construction site (A4)

Name	Value	Unit
Litres of fuel per kg of goods transported	0.00142	l/100km
Transport distance	500	km
Capacity utilisation (including empty runs)	85	%
Gross density of products transported	1238	kg/m ³

Construction installation process (A5)

Composition of the packaging waste to be disposed of:

Name	Value	Unit
Squared timber	15	%
Polyethylene foil	55	%
Polyester strapping	2	%
Grey board	20	%
Hardboard	8	%

Maintenance (B2)

Name	Value	Unit
Information on maintenance cleaning frequency in m ² /a	0.149	-
Water consumption	0.089	m ³
Auxiliary material cleaning agent	0.01	kg
Material loss	-	kg
Material loss	-	kg
Maintenance cycle in m ² /SL	4.47	number/S L

End of life (C1-C4)

According to information from manufacturers, it can be assumed that 70 % of WPC products are subject to material recycling and 30 % thermal recycling. Material and thermal recycling is declared in 100 % scenarios. The average transportation distance between the consumer and the waste disposal facility is 250 km.

Re-Use, recovery and recycling potential (D), relevant scenario information

The energy (electrical and thermal) or the created recycling material resulting from the thermal and material recycling of the waste is credited here. The efficiency of the waste recycling facilities is 66 % for German facilities and 69 % for European facilities. The data records used are based on German and European recycling facilities. The data records for electricity and heat are "DE:power mix" (production mix) and "DE: process steam" from natural gas 85 %, from GaBi 6.4.

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	X	MND	MND	X	MNR	MNR	MNR	MND	MND	MND	X	X	MND	X	

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A1: 1 m² WPC decking profile

Parameter	Unit	A1-A3	A4	B2	C2	C3/1	C3/2	D/1	D/2
GWP	[kg CO ₂ -Eq.]	2.53E-1	5.55E-1	2.25E-1	2.71E-1	2.11E+1	2.11E+1	-4.87E+0	-6.89E+0
ODP	[kg CFC11-Eq.]	9.56E-9	6.69E-13	4.46E-12	3.26E-13	0.00E+0	0.00E+0	6.23E-8	2.18E-9
AP	[kg SO ₂ -Eq.]	4.39E-2	2.37E-3	5.43E-4	1.15E-3	0.00E+0	0.00E+0	-1.97E-2	-2.03E-2
EP	[kg (PO ₄) ³⁻ -Eq.]	5.49E-3	6.48E-4	8.83E-5	3.15E-4	0.00E+0	0.00E+0	-2.64E-3	-2.29E-3
POCP	[kg ethene-Eq.]	7.82E-3	-8.14E-4	5.35E-5	-3.96E-4	0.00E+0	0.00E+0	-2.63E-3	-5.58E-3
ADPE	[kg Sb-Eq.]	1.40E-4	2.80E-8	1.05E-6	1.36E-8	0.00E+0	0.00E+0	-4.03E-6	-1.23E-4
ADPF	[MJ]	4.90E+2	7.40E+0	6.28E+0	3.60E+0	0.00E+0	0.00E+0	-3.42E+2	-3.31E+2

Caption: 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

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A1: 1 m² WPC decking profile

Parameter	Unit	A1-A3	A4	B2	C2	C3/1	C3/2	D/1	D/2
PERE	[MJ]	2.90E+0	5.66E-1	2.54E-1	2.76E-1	0.00E+0	0.00E+0	-6.58E+1	-3.77E+0
PERM	[MJ]	1.99E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-2.20E+2
PERT	[MJ]	2.02E+2	5.66E-1	2.54E-1	2.76E-1	0.00E+0	0.00E+0	-6.58E+1	-2.23E+2
PENRE	[MJ]	2.48E+2	7.42E+0	3.61E+0	3.61E+0	0.00E+0	0.00E+0	-3.16E+2	-1.94E+1
PENRM	[MJ]	2.87E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-2.78E+2
PENRT	[MJ]	5.35E+2	7.42E+0	3.61E+0	3.61E+0	0.00E+0	0.00E+0	-3.16E+2	-2.97E+2
SM	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.74E+1
RSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.96E+2	9.80E+0
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.72E+2	1.36E+2
FW	[m ³]	8.96E+1	3.27E-1	1.59E-1	1.59E-1	0.00E+0	0.00E+0	2.90E+1	-3.41E+1

Caption: 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+A1: 1 m² WPC decking profile

Parameter	Unit	A1-A3	A4	B2	C2	C3/1	C3/2	D/1	D/2
HWD	[kg]	2.13E-4	5.98E-6	1.46E-6	2.91E-6	0.00E+0	0.00E+0	-1.35E-4	-5.55E-5
NHWD	[kg]	3.56E-1	1.85E-3	1.58E-3	9.02E-4	0.00E+0	0.00E+0	-5.50E-2	-2.37E-1
RWD	[kg]	1.77E-2	9.87E-6	8.67E-5	4.80E-6	0.00E+0	0.00E+0	-1.22E-2	-1.16E-3
CRU	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.74E+1	0.00E+0	0.00E+0
MER	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.84E+1	9.20E-1	0.00E+0	0.00E+0
EEE	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

Caption: 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; EEE = Exported thermal energy

GWP: Share of biogenic CO₂ A1-3: -21,08 kg CO₂-equiv., C3: 21,08 kg CO₂-equiv.

References

PCR patio coverings

Product Category Rules for Construction Products, Part B: Requirements to be met by the EPD for patio coverings made of wood-based materials (WPC), 2014

Waste Wood Ordinance

Ordinance governing the requirements on utilisation and disposal of waste wood (AltholzV), 2012

DIN EN 13501-1

Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests, German version EN 13501-1:2007+A1:2009

DIN EN 13501-5

Fire classification of construction products and building elements - Part 5: Classification using data from external fire exposure to roofs tests; German version EN 13501-5:2005+A1:2009

DIN EN 15534-1

Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC)) - Part 1: Test methods for characterisation of compounds and products; German version EN 15534-1:2014

DIN EN 15534-4

Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC)) - Part 4: Specifications for decking profiles and tiles; German version EN 15534-4:2014

DIN EN 15534-5

Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC)) - Part 5: Specifications for cladding profiles and tiles; German version EN 15534-5:2014

DIN EN ISO 9001

Quality management systems - Success through quality; German version EN 9001:2008

EN ISO 11925-2

Reaction to fire tests - Ignitability of products subjected to direct impingement of flame - Part 2: Single-flame source test (ISO 11925-2:2010); German version EN ISO 11925-2:2010

EN ISO 1183-3

Plastics - Methods for determining the density of non-cellular plastics - Part 3: Gas pycnometer method (ISO 1183-3:1999); German version EN ISO 1183-3:1999

ISO 16979

Wood-based panels - Determination of moisture content, ISO 16979:2003-05

EN 310:1993

Wood-based panels; determination of modulus of elasticity in bending and of bending strength; German version EN 310:1993

EN 477

Unplasticised polyvinylchloride (PVC-U) profiles for the fabrication of windows and doors - Determination of the resistance to impact of main profiles by falling mass; German version EN 477:1995

ISO 11359-2

Plastics - Thermomechanical analysis (TMA) - Part 2: Determination of coefficient of linear thermal expansion and glass transition temperature, ISO 11359-2:1999-10

EN 317

Particleboards and fibreboards; determination of swelling in thickness after immersion in water; German version EN 317:1993

EN ISO 4892-2:2013

Plastics - Methods of exposure to laboratory light sources - Part 2: Xenon-arc lamps

EN ISO 75-1

Plastics - Determination of temperature of deflection under load - Part 1: General test method (ISO 75-1:2013); German version EN ISO 75-1:2013

EN ISO 75-2

Plastics - Determination of temperature of deflection under load - Part 2: Plastics and ebonite (ISO 75-2:2013); German version EN ISO 75-2:2013

EN ISO 179-1/1fU

Plastics - Determination of Charpy impact properties - Part 1: Non-instrumented impact test (ISO 179-1:2010); German version EN ISO 179-1:2010

EN 321:2001

Wood-based panels - Determination of moisture resistance under cyclic test conditions; German version EN 321:2001

DIN 51097

Testing of floor coverings; determination of the anti-slip properties; wet-loaded barefoot areas; walking method; ramp test, DIN 51097:1992-11

European Waste Classification

Ordinance governing the European Waste Classification (Waste Classification Ordinance, AVV), 2001

GaBi 6.4

Software-System and Databases for Life Cycle Engineering, PE International AG, Leinfelden-Echterdingen, 1992-2015, with special acknowledgement to LBP, University of Stuttgart

ÖKOBau.DAT

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FSC

Forest Stewardship Council, Germany

PEFC

Programme for the Endorsement of Forest Certification Schemes, Germany



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