

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

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

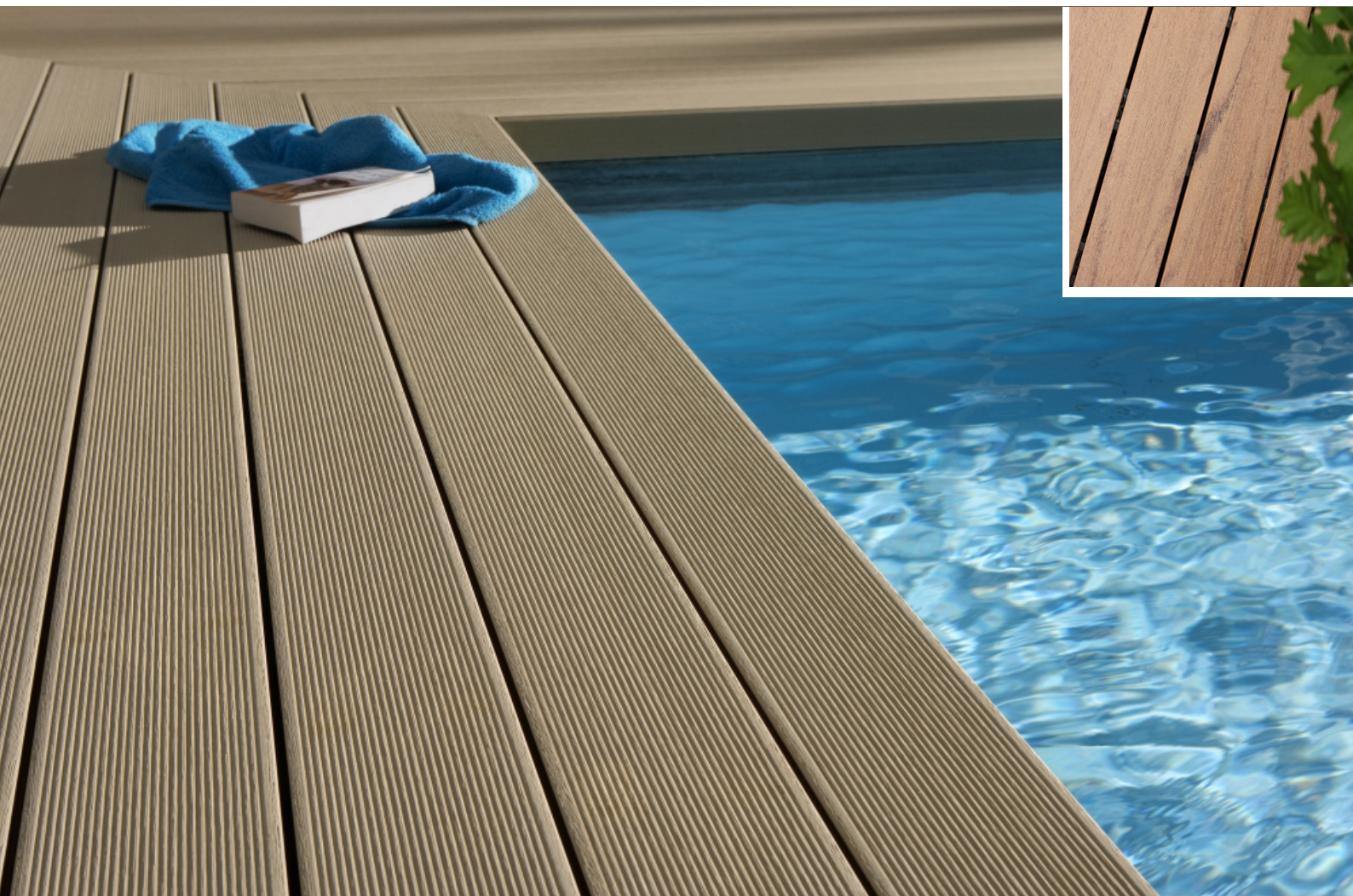
Verband der Deutschen

Holzwerkstoffindustrie e.V. (VHI)

Association of the German Wood-based Panel
Industry



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



General Information

<p>Verband der Deutschen Holzwerkstoffindustrie e.V.</p> <hr/> <p>Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany</p> <hr/> <p>Declaration number EPD-VHI-20150033-CBE1-EN</p> <hr/> <p>This Declaration is based on the Product Category Rules: Patio coverings made from wood polymer composites (WPC), 07.2014 (PCR tested and approved by the SVR)</p> <hr/> <p>Issue date 30.07.2015</p> <hr/> <p>Valid to 29.07.2020</p> <hr/> <div style="text-align: center; margin-top: 20px;"> </div> <hr/> <p style="font-size: small;">Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)</p> <hr/> <div style="text-align: center; margin-top: 20px;"> </div> <hr/> <p style="font-size: small;">Dr. Burkhard Lehmann (Managing Director IBU)</p>	<p>WPC decking profiles</p> <hr/> <p>Owner of the Declaration Verband der Deutschen Holzwerkstoffindustrie e.V. Ursulum 18 35396 Gießen</p> <hr/> <p>Declared product / Declared unit 1 m² decking profile made of WPC</p> <hr/> <p>Scope: This EPD is an Association EPD. The weighted average from the manufacturer's specifications of six member companies was taken as the data basis for the decking profile made of wood-polymer composite (WPC). For the list of members, please refer to the Association's websites. The companies supplying the data represent a share of 80 % of German production. The scope of the EPD covers all decking profiles made of wood-polymer materials, since the various types of plastic were taken into account in accordance with their shares. This document is translated from the German Environmental Product Declaration into English. It is based on the German original version EPD-VHI20150033-CBE1-DE. The verifier has no influence on the quality of the translation. The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.</p> <hr/> <p>Verification</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td colspan="2" style="text-align: center;">The CEN Norm /EN 15804/ serves as the core PCR</td> </tr> <tr> <td colspan="2" style="text-align: center;">Independent verification of the declaration according to /ISO 14025/</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/> internally</td> <td style="text-align: center;"><input checked="" type="checkbox"/> externally</td> </tr> </table> <hr/> <div style="text-align: center; margin-top: 20px;"> </div> <hr/> <p style="font-size: small;">Dr. Frank Werner (Independent verifier appointed by SVR)</p>	The CEN Norm /EN 15804/ serves as the core PCR		Independent verification of the declaration according to /ISO 14025/		<input type="checkbox"/> internally	<input checked="" type="checkbox"/> externally
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Independent verification of the declaration according to /ISO 14025/							
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Product

Product description
 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.

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
Grammage	13 - 26	kg/m ²
Moisture content in accordance with ISO 16979	1 - 5	M.-%
length density of the profiles in accordance with DIN EN 15534-1:2014	2000 - 5000	g/m
Dimensions (thickness, length	21-38/	mm

and width of the profiles in accordance with DIN EN 15534-1:2014)	3000-6000/ 138-196	
Deviation from straightness in accordance with DIN EN 15534-1	0 - 1	mm
Curvature in accordance with DIN EN 15534-1	0 - 0.8	mm
Flexural properties Bending properties in accordance with EN 310:1993 - Elasticity modulus	<6200	MPa
Flexural properties Bending properties in accordance with EN 310:1993 - Bending strength	<55	MPa
Impact resistance in accordance with EN 477 - Crack length	0 - 10	mm
Impact resistance in accordance with EN 477 - Impression depth	0 - 0.5	mm
Linear thermal expansion coefficient in accordance with ISO 11359-2	<4E-05	K ⁻¹
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 in accordance with EN ISO 4892-2:2013	<10	-
Dimensional stability at high temperatures in accordance with EN ISO 75-1 and EN ISO 75-2	78 - 100	°C
Impact bending toughness in accordance with EN ISO 179-1/1fU	5 - 8	kJ/m ²
Swelling after boiling water storage in accordance with DIN EN 15534-1:2014 - Water absorption	1.3 - 8	%
creep behavior in accordance with DIN EN 15534-1:2014 - Deformation	0.9 - 5	mm
creep behavior in accordance with DIN EN 15534-1:2014 - Creep factor	<1,3	mm
Behavior on value Fluctuating in accordance with EN 321:2001 - Breaking load drop	<20	%
Water absorption in accordance with EN 317	2 - 9	%
skid resistance in accordance with EN 15534-1:2014 a) Dynamic coefficient of friction ... in accordance with EN 13893	>0,43	-
skid resistance in accordance with EN 15534-1:2014 b) Slip resistance class in accordance	C	-

with DIN 51097		
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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 order to obtain the appearance of natural wood, organic pigments and UV stabilisers are also added during production.

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.

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.

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

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
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)

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	MND	MND	MND	MND	MND	MND	X	X	MND	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 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 - RESOURCE USE: 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 – OUTPUT FLOWS AND WASTE CATEGORIES: 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

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

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 pyknometer 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

Ökobau.dat 2014, Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

FSC

Forest Stewardship Council, Germany

PEFC

Programme for the Endorsement of Forest Certification Schemes, Germany

**Publisher**

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

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

**Author of the Life Cycle Assessment**

SKZ - Das Kunststoff-Zentrum
Friedrich-Bergius-Ring 22
97076 Würzburg
Germany

Tel +49 931 4104-433
Fax +49 931 4104-707
Mail kfe@skz.de
Web www.skz.de

**Owner of the Declaration**

Verband der Deutschen
Holzwerkstoffindustrie e.V. (VHI)
Ursulum 18
35396 Gießen
Germany

Tel +49 641 97547-0
Fax +49 641 97547-99
Mail vhimail@vhi.de
Web www.vhi.de