ENVIRONMENTAL PRODUCT DECLARATION
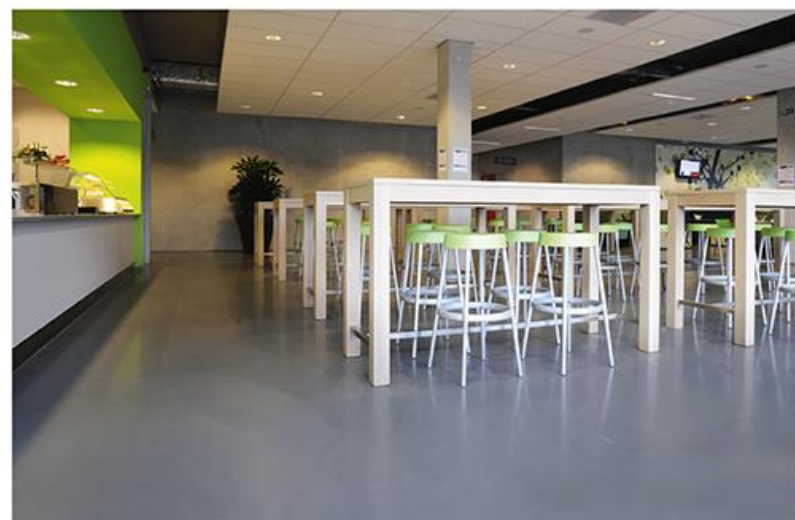
in accordance with ISO 14025 and EN 15804
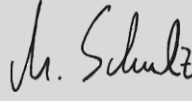
Owner of the Declaration	Unipro bv
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-UTZ-20160087-IBA1-EN
Issue date	05.10.2016
Valid until	04.10.2021

Arturo PU2030 Self-smoothing Floor
Unipro bv

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

Unipro

Unipro bv

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

Declaration number
EPD-UTZ-20160087-IBA1-EN

This declaration is based on the Product Category Rules:
Reactive resin products, 07.2014
(PCR tested and approved by the Expert Committee (SVA))

Issue date
05.10.2016

Valid until
04.10.2021

Wrennmayer

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

Lehmann

Dr. Burkhart Lehmann
(Managing Director IBU)

Arturo PU2030

Owner of the Declaration
Unipro bv
Bouwstraat 18
NL-7483 PA Haaksbergen

Declared product / Declared unit
1 kg Arturo PU2030 self-smoothing floor

Scope
This Environmental Product Declaration refers to "Arturo PU2030" self-smoothing floor. Data and calculation values refer to the Unipro bv manufacturing plant in Haaksbergen, the Netherlands. The owner of the Declaration shall be liable for the underlying information and evidence; IBU shall not be liable with respect to manufacturer information, LCA data and evidence.

Verification

The DIN EN 15804 CEN standard serves as the core PCR.
Independent verification of the Declaration according to /ISO 14025/
☐ internally   ☒ externally

M. Schulz

Matthias Schulz,
(Independent verifier appointed by the SVA)

2.1   Product description
Arturo PU2030 self-smoothing floor is a solvent-free, UV-stable, 2-component floor sealing based on polyurethane resin.

2.2   Application
Arturo PU2030 is suitable as an aesthetic, decorative, seamless and coloured coating on cement-, anhydrite- and magnesite-bonded surfaces, tiles and asphalt. Arturo PU2030 self-smoothing floor is suitable as a coating for floors subject to light wear, e.g. in apartments, kindergartens, therapy rooms and offices.

2.3   Technical data

Structural data
Arturo PU2030 fulfils the requirements of the /DIN EN 13813/ standard (see 2.4).

Description	Value	Unit
Density	1650	kg/m^3
Adhesive tensile strength acc. to /DIN EN 14293/	< 1.5	N/mm^2
Wear resistance acc. to /EN 13892-4/	≤ AR0.5	
Impact strength according to /EN ISO 6272/	≥ IR4	

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). The product requires a Declaration of Performance taking consideration of the /DIN EN 13813/ standard (Screed material and floor screeds), and CE marking.
Use is governed by the respective national specifications; in Germany, this is the General Technical Approval of the Deutsches Institut für Bautechnik /DIBt/ (TGA no. Z-156.605-116).

2.5   Delivery status
Arturo PU2030 is a 2-component product which is available in tins of 1 kg, 5 kg, 10 kg and 25 kg. The sets hold the correct blending ratio of components A and B.

2.6   Base materials / Ancillary materials
Polyurethanes are formed by a reaction between a resin component and a hardener component. The resin component (A) contains polyols and mineral fillers as well as additives and pigments. The hardener component (B) comprises di-isocyanates which involve the use of homologues, pre-polymers and polymers based on MDI, HDI or IPDI. Additives include wetting agents, accelerators and catalysts.

The blended Arturo PU2030 product contains the following ingredients:

Resin: 30-40%
Hardener: 20-30%
Filler materials: 40-50%
Additives/Pigments: 5-10%

The product does not contain any substances of very high concern (SVHC) from the ECHA Candidate List. The VOC content of Arturo PU2030 ready for use is < 500 g/l VOC.

2.7 Production

The product components formulated are usually blended from the ingredients in batch mode and packaged for delivery, whereby quality and environmental standards in accordance with /DIN EN ISO 9001/ and /DIN EN ISO 14001/ as well as the provisions outlined in the relevant regulations such as the Industrial Safety Regulation or Federal Pollution Control Act are maintained.

2.8 Environment and health during manufacturing

Apart from the customary measures concerning hygiene and safety in the workplace, no particular protective measures need to be observed during production.

2.9 Product processing / Installation

The components are blended well. The blended material is applied to the prepared surface and distributed in the requisite layer strength using a notched trowel or a notched spreader. The fresh layer is then ventilated cross-wise using a spiked roller. During processing, work protection measures must be observed in accordance with the safety data sheet, the product label and the professional liability associations.

2.10 Packaging

The packaging comprises a 2-component combination tine set. Empty sets and clean foils can be recycled. Reusable wooden pallets are taken back by the building material trade (reusable pallets remunerated in the German deposit system) which returns them to the building product manufacturer who in turn redirects them into the production process.

2.11 Condition of use

During the use phase, solvent-free reactive resins based on polyurethane are hardened and essentially comprise an inert three-dimensional network. After hardening, the product has a neutral odour and is ecologically and physiologically safe. No environmental impacts are incurred by the product during use.

2.12 Environment and health during use

Arturo PU2030 self-smoothing floor was tested in accordance with the /AgBB/ principles of the Deutsches Institut für Bautechnik and classified as low-

emission. The product is therefore suitable for use indoors.

2.13 Reference Service Life

Floor coatings are durable products and contribute to maintaining the function and value of buildings.

2.14 Extraordinary effects

Fire

Classification and testing of fire performance according to /DIN EN 13501-1/ in the system:

Fire protection

Description	Value
Building material class	Bfl
Smoke gas development	s1

Water

Reactive resins based on polyurethane are chemically inert and insoluble in water. When exposed to water, no substances are washed out which could be hazardous to water.

Mechanical destruction

Not of relevance

2.15 Re-use phase

According to present knowledge, no environmentally-hazardous effects in terms of landfilling are to be generally anticipated through dismantling and recycling components to which hardened polyurethanes adhere. If reactive resin systems can be removed from the components at no great effort, thermal recovery is a practical recycling variant on account of its energy content.

2.16 Disposal

Do not let Arturo PU2030 enter the sewage system, bodies of water or soil. Sets whose contents have not hardened as well as hardened product residue are regarded as special waste. Sets with hardened contents are construction waste. Product residue should therefore be collected, both components blended, allowed to harden and disposed of as construction waste.

The following /AVV/ waste codes can be applied for hardened product residue:

080112 Waste paint and varnish with the exception of those covered by 08 01 11.

080410 Adhesive and sealant compound waste with the exception of those covered by 08 04 09

2.17 Further information

Further information such as product or safety data sheets as well as the Declaration of Performance can be downloaded from www.arturoflooring.com.

3. LCA: Calculation Rules

3.1 Declared unit

The declared unit refers to 1 kg ready-to-use Arturo PU2030 self-smoothing floor, manufactured by Unipro bv in its plant in Haaksbergen, NL.

The consumption values can be used to convert to other units such as 1 m².

Details on declared unit

Description	Value	Unit
Declared unit	1	kg
Yield per mm layer strength	1.56	kg/m^2

3.2 System boundary

Module **A1** takes consideration of the production of raw materials and auxiliaries. Module **A2** comprises transport of the raw materials and auxiliaries to the plant. Module **A3** considers production in the plant and

manufacture of the packaging. Module **A4** comprises transport of the product to the site; environmental impacts are indicated for a distance of 500 km. The real environmental impacts are calculated via multiplication/division in terms of the actual distance. Apart from installation of the product in the building, the emissions and loads associated with recycling the packaging are allocated to Module **A5**. Credits based on packaging recycling and/or recycling of the tin sets are allocated to Module **D**.

3.3   Estimates and assumptions

Generic data from the data bases in /GaBi6/ and /Ecoinvent/ was relied on for manufacturing the raw materials. Chemically-related substances were applied for ancillaries for which no data sets for equivalent substances were available.

3.4   Cut-off criteria

The standard rules according to ISO 14044 were applied as cut-off criteria. They apply for the entire product system as well as for individual process modules and take consideration of mass, energy and environmental relevance. All inputs were incorporated in the LCA which account for more than 1% of the total effects of an impact category. No more than 5% of the flows were ignored with regard to the cut-off criteria.

3.5   Background data

Plant-specific data from the operating data records was used for product manufacturing. Data sets from GaBi6 and Ecoinvent were used for all other life cycle phases. The LCA model was generated in the GaBi6 software.

3.6   Data quality

The data can be regarded as being of good quality. Plant-specific data is from 2015. The remaining data originates from the data bases referred to above, the content of which is examined for topicality on a regular basis. Accordingly, the data used for the LCA is representative. The data sets are complete and correspond with the system boundaries and their cut-off criteria for inputs and outputs. The data quality therefore complies with the requirements of the PCR, Part A.

3.7   Period under review

Reference year 2015

3.8   Allocation

Product manufacture: As various liquid products such as other reactive or dispersion products are manufactured in the Unipro bv plant in Haaksbergen, the input and output volumes recorded (e.g. electricity, water, waste) were calculated on a pro rata basis from the annual production of liquid products for the declared unit of 1 kg Arturo PU2030.

3.9   Comparability

As a general rule, 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 and/or the product-specific characteristics of performance are taken into account.

4.   LCA: Scenarios and additional technical information

The following technical information forms the basis for the declared modules:

Transport to construction site (A4)

Description	Value	Unit
Litres of fuel	0.0015	l/100 km
Transport distance	500	km
Capacity utilisation (including empty runs)	85	%
Volume capacity factor	n.a.	-

Construction installation process (A5)

Description	Value	Unit
Auxiliary	0	kg
Water consumption	0	m^3
Other resources	0	kg
Power consumption	0	kWh
Other energy carriers	0	MJ
Material loss	0.01	kg
Output materials as a result of waste treatment on site	0	kg
Dust emissions	0	kg
VOC into air	0	kg

Reference service life

Description	Value	Unit
Reference Service Life	40	a

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5. LCA: Results

SYSTEM BOUNDARIES (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	Manufacture	Transport from manufacturer to site	Assembly	Use / Application	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / Demolition	Transport	Waste processing	Disposal	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	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	X

LCA RESULTS – ENVIRONMENTAL IMPACT: 1 kg Arturo PU2030

| Parameter	Unit	A1	A2	A3	A4	A5	D
Global warming potential	[kg CO_2 equiv.]	2.24E+0	2.07E-2	1.97E-1	2.54E-2	4.61E-3	-1.26E-1
Depletion potential of the stratospheric ozone layer	[kg CFC11 equiv.]	2.38E-8	4.27E-14	3.22E-12	5.24E-14	4.69E-15	3.98E-9
Acidification potential of soil and water	[kg SO_2 equiv.]	4.36E-3	1.29E-4	8.21E-4	1.58E-4	1.23E-5	-2.99E-4
Eutrification potential	[kg $(PO_4)^3$ equiv.]	1.29E-3	3.32E-5	1.08E-4	4.07E-5	3.16E-6	-8.43E-6
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene equiv.]	9.00E-4	-5.60E-5	9.34E-5	-6.89E-5	-5.27E-6	-6.67E-5
Abiotic depletion potential for non-fossil resources	[kg Sb equiv.]	6.90E-6	1.56E-9	1.14E-5	1.91E-9	1.91E-9	-1.27E-6
Abiotic depletion potential for fossil resources	[MJ]	4.81E+1	2.80E-1	2.25E+0	3.44E-1	2.68E-2	-1.34E+0

LCA RESULTS – RESOURCE USE: 1 kg Arturo PU2030

Parameter	Unit	A1	A2	A3	A4	A5	D
Renewable primary energy as energy carrier	[MJ]	2.17E+0	1.91E-2	1.84E+0	2.35E-2	1.86E-3	6.57E-2
Renewable primary energy resources as material utilisation	[MJ]	4.07E-1	IND	IND	IND	IND	IND
Total use of renewable primary energy resources	[MJ]	2.58E+0	1.91E-2	1.84E+0	2.35E-2	1.86E-3	6.57E-2
Non-renewable primary energy as energy carrier	[MJ]	3.52E+1	2.81E-1	2.33E+0	3.45E-1	2.69E-2	-1.19E+0
Non-renewable primary energy as material utilisation	[MJ]	1.53E+1	IND	IND	IND	IND	IND
Total use of non-renewable primary energy resources	[MJ]	5.05E+1	2.81E-1	2.33E+0	3.45E-1	2.69E-2	-1.19E+0
Use of secondary materials	[kg]	IND	IND	IND	IND	IND	IND
Renewable secondary fuels	[MJ]	IND	IND	IND	IND	IND	IND
Non-renewable secondary fuels	[MJ]	IND	IND	IND	IND	IND	IND
Net use of fresh water	[m³]	1.83E+0	1.23E-3	8.75E-2	1.51E-3	1.52E-4	-2.12E-3

LCA RESULTS – OUTPUT FLOWS AND WASTE CATEGORIES: 1 kg Arturo PU2030

Parameter	Unit	A1	A2	A3	A4	A5	D
Hazardous waste for disposal	[kg]	4.45E-8	0.00E+0	7.03E-7	0.00E+0	0.00E+0	-1.27E-6
Non-hazardous waste for disposal	[kg]	2.80E+0	1.87E-3	1.00E+0	2.30E-3	2.45E-4	-3.35E-1
Radioactive waste for disposal	[kg]	7.61E-4	3.81E-7	2.79E-5	4.68E-7	4.92E-8	4.13E-5
Components for reuse	[kg]	IND	IND	IND	IND	IND	IND
Materials for recycling	[kg]	IND	IND	IND	IND	8.25E-2	IND
Materials for energy recovery	[kg]	IND	IND	IND	IND	IND	IND
Exported electrical energy	[MJ]	IND	IND	IND	IND	4.91E-3	IND
Exported thermal energy	[MJ]	IND	IND	IND	IND	1.19E-2	IND

![Unipro logo]

6. LCA: Interpretation
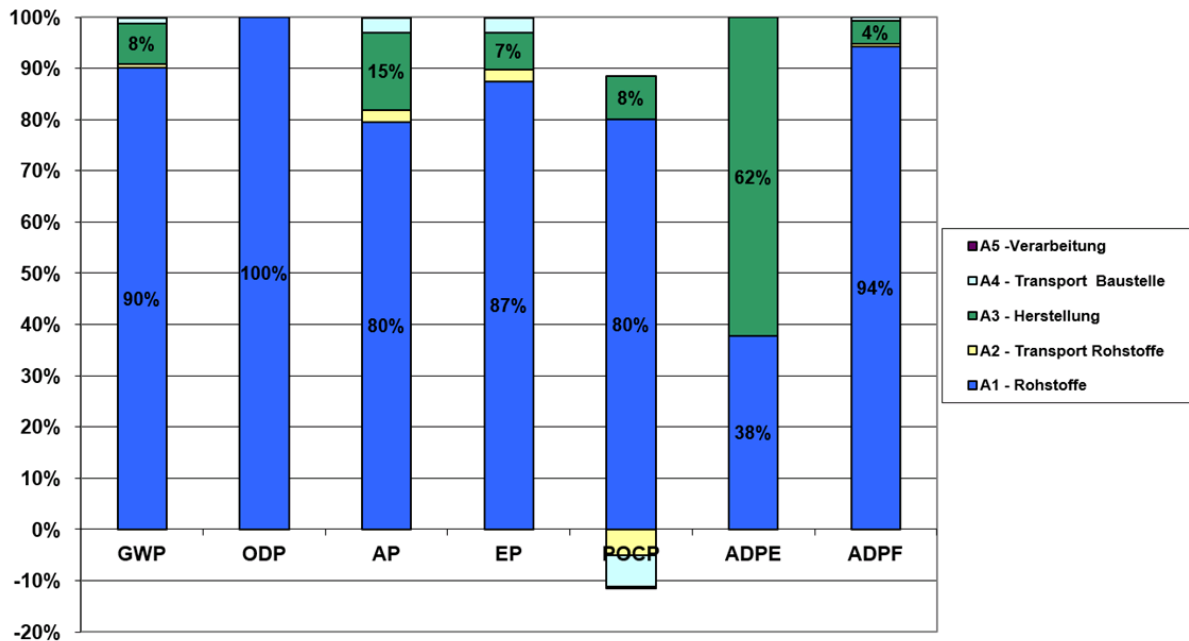
[Bildlegende Deutsch]	[Legend English:]
GWP	GWP
ODP	ODP
AP	AP
EP	EP
POCP	POCP
ADPE	ADPE
ADPF	ADPF
A5 – Verarbeitung	A5 – Processing
A4 – Transport Baustelle	A4 – Transport to site
A3 – Herstellung	A3 – Manufacture
A2 – Transport Rohstoffe	A2 – Transport of raw materials
A1 – Rohstoffe	A1 – Raw materials

Fig. 1: Relative contributions by the life cycle phases to environmental impacts of Arturo PU2030 (excl. D)

Fig. 1 depicts the relative dominance analysis of LCA results. All of the declared life cycle phases (except Module D) were incorporated: the provision of raw materials has the greatest influence on all impact categories. This relatively high influence by A1 is attributable to the use of raw materials based on crude oil which are manufactured in a range of synthesis cycles. The other life cycle phases play a rather subordinate role in the life cycle of the self-smoothing floor.

The negative values of the Photochemical Ozone Creation Potential **(POCP)** during transport are based on the development of nitrogen monoxide (NO) during fuel combustion. NO counteracts the formation of ground-level ozone.
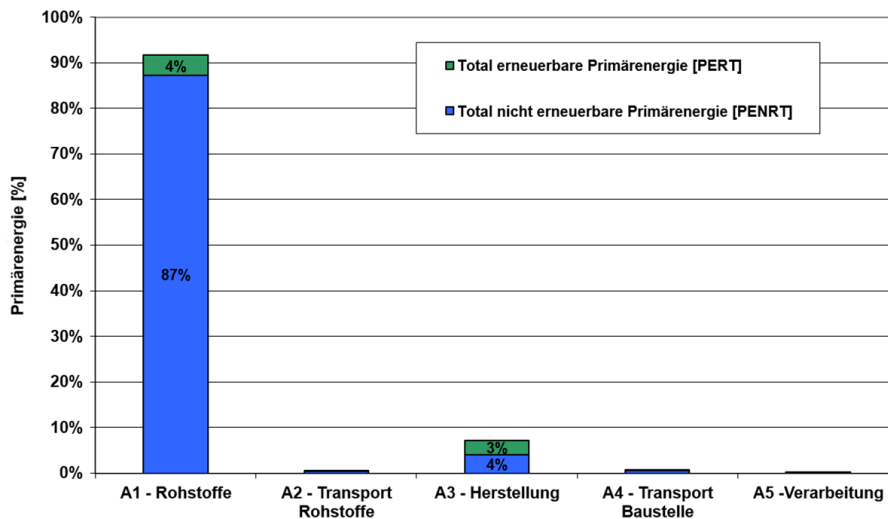
[Bildlegende Deutsch]	[Captions English:]
Total erneuerbare Primärenergie [PERT]	Total renewable primary energy [PERT]
Total nicht erneuerbare Primärenergie [PENRT]	Total non-renewable primary energy [PENRT]
A1 – Rohstoffe	A1 – Raw materials
A2 – Transport Rohstoffe	A2 – Transport of raw materials
A3 – Herstellung	A3 – Manufacture
A4 – Transport Baustelle	A4 – Transport to site
A5 – Verarbeitung	A5 – Processing

Fig. 2: Percentage share of primary energy requirements during the LCA phases of Arturo PU2030 (excl. D)

Fig. 2 depicts the primary energy requirements **(PER)** across the LCA phases under review. The PER indicates a similar result to the impact categories. The provision of raw materials has the greatest influence on the life cycle. Total primary energy consumption of renewable resources is relatively low.

Module D: Module D is outside the life cycle according to the PCR for reactive resin products. The credits and loads for recycling the packaging are indicated in Module D.

7. Requisite evidence

VOC emissions

AgBB overview of results (after 28 days)

The results for Arturo PU2030 were communicated in a product system. All limit values according to AgBB / DIBt were clearly maintained. The table depicts the limit values after 28 days.

Description	Value	Unit
TVOC (C6 - C16)	< 1000	µg/m^3
Total SVOC (C16 - C22)	< 100	µg/m^3
R (dimensionless)	< 1	-
VOC without LCI	< 100	µg/m^3
Carcinogens	< 1	µg/m^3

Test institute: Eurofins Product Testing A/S, DK-8464 Galten
Measurement method: GEV test method for determining the emissions of volatile organic compounds from building products according to DIN EN ISO 16000-11 in a test chamber. Testing for CMR substances and TVOC/TSVOC after 3 and 28 days.
Date of test report: December 2014
Result: The product fulfils the requirements in accordance with the DIBt (October 2010) and the AgBB scheme (June 2012).

8. References

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

Product Category Rules for Construction Products, Part A: Calculation rules for the Life Cycle Assessment and requirements on the Background Report, 2013-04

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

AgBB: German Committee for Health-Related Evaluation of Construction Products: Health-related evaluation of emissions by volatile organic compounds (VOC and SVOC) from construction products last revised: January 2016; www.umweltbundesamt.de/produkte/bauprodukte/agbb.htm

AVV: Ordinance on the List of Wastes dated 10 December 2001 (BGBI. I, p. 3379), last amended by Article 5, section 22 of the law dated 24 February 2012 (BGBI. I, p. 212)

DIBt: Deutsches Institut für Bautechnik; www.dibt.de (last revised: January 2016)

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

DIN EN 13813: 2003-01 Screed material and floor screeds ─ Screed materials ─ Properties and requirements; EN 13813:2002
DIN EN 13892-8:2003-02: Test methods for screed material and floor screeds – Part 8: Determining the bond strength; German version EN 138928:2002

DIN EN 14293:2006-10: Adhesives – Adhesives for bonding parquet to subfloor – Test methods and minimum requirements; EN 14293:2006

DIN EN ISO 14001: 2009-11, Environmental management systems ─ Requirements with guidance for use (ISO 14001:2004 + Cor. 1:2009); EN ISO 14001:2004 + AC: 2009

DIN EN ISO 16000-11: Indoor air – Part 11: Determination of the emission of volatile organic compounds from building products and furnishings – Sampling, storage of samples and preparation of test specimens (ISO 16000-11:2006); EN ISO 16000-11:2006

DIN EN ISO 9001: Quality management systems – Requirements (ISO 9001:2008); EN ISO 9001:2008

EN ISO 6272: Paints and varnishes – Rapid-deformation (impact resistance) tests – Part 1: Falling-weight test, large-area indenter (ISO 6272-1:2011)

Ecoinvent: Swiss Centre of Life Cycle Inventories; LCA data base www.ecoinvent.org

GaBi software: GaBi 6 – Software and data base for comprehensive analysis; LBP, University of Stuttgart and PE International, 2015

GISCODE: GISBAU – Gefahrstoff-Informationssystem der Berufsgenossenschaft der Bauwirtschaft; www.gisbau.de (last revised: January 2016)

ISO 14044: Environmental Management – Life cycle assessment – Requirements and instructions; ISO 14044:2006-07

Product Category Rules, Part B: Requirements on the EPD by reactive resin products, version 1.6 (last revised: 04.07.2014)