BUILDING TRUST

Declaration of conformity for products with Model EPDs

The Association of the European Adhesive & Sealant Industry (FEICA), of which Sika is a member, has developed so-called Model Environmental Product Declarations (Model EPDs) and had them independently verified by the Institute Construction and Environment (IBU). These IBU verified Model EPDs have been made publicly available by FEICA and IBU. The Model EPDs depict the current production technology in Europe. Based on the product formulations it was checked if our products were covered by the Model EPDs.

This Declaration confirms that the products

Sikaflex® AT Connection • Sikaflex® AT Façade
Sikaflex® AT Universal • Sikaflex® AT Metal
SikaHyflex® -220 Window • SikaBond® AT-44 R
SikaBond® Ultra Tack •SikaBond® AT-80
SikaBond® AT-82 • SikaBond® -200
SikaBond® -210 Parquet

are covered by the attached Model EPD *„Reactive resins based on PU or silane-modified polymers (SMP), filled or aqueous, solvent-free“ (Declaration number EPD-FEI-20150250-IBG1-EN)*. This means that the Life Cycle Assessment (LCA) data and the remaining content of the attached Model EPD apply to the above mentioned product and may thus be used for the evaluation of the sustainability of buildings where the product is applied.

Sika Services AG

Mark Schneider
Head Global Product Sustainability

Uwe Bankwitz
Head Market Field Sealing and Bonding

Zurich, May 2016

Sika Services AG · Tüffenwies 16
8048 Zurich Switzerland · Telefon +41 58 436 40 40 · Telefax +41 58 436 43 43
Internet: www.sika.com

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

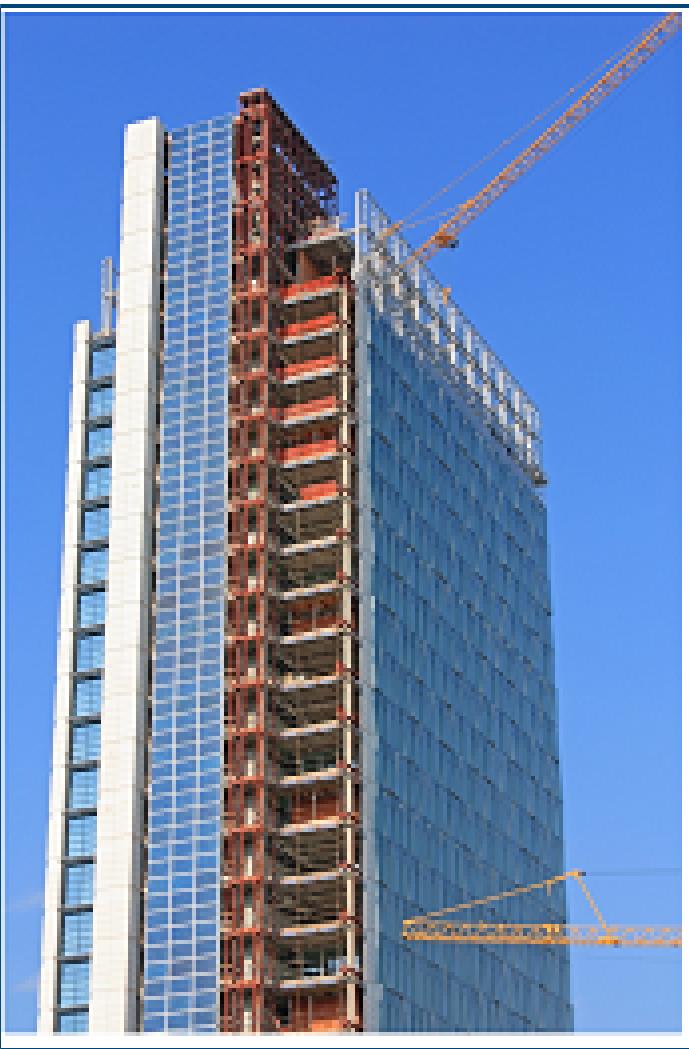
Owner of the Declaration	FEICA - Association of the European Adhesive and Sealant Industry
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-FEI-20150250-IBG1-EN
Issue date	24/09/2015
Valid to	23/09/2020

Reactive resins based on polyurethane or SMP, filled or aqueous, solvent-free

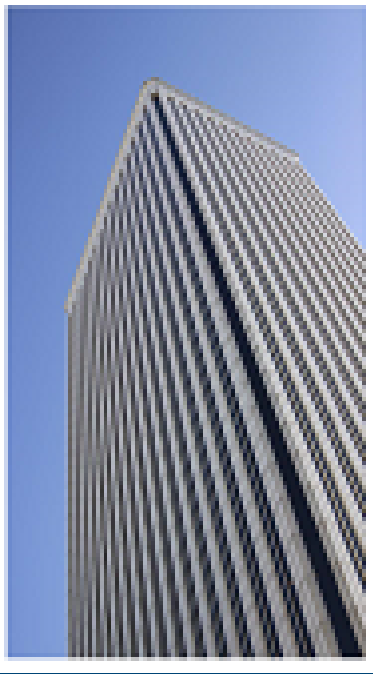
FEICA - Association of the European Adhesive and Sealant Industry

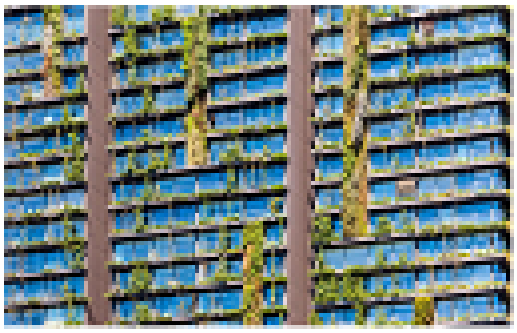
Institut Bauen und Umwelt e.V.

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



FEICA





1. General Information

FEICA - Association of the European Adhesive and Sealant Industry

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

Declaration number
EPD-FEI-20150250-IBG1-EN

This Declaration is based on the Product Category Rules:
Reaction resin products, 07.2014
(PCR tested and approved by the SVR)

Issue date
24/09/2015

Valid to
23/09/2020

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

Dr. Burkhart Lehmann
(Managing Director IBU)

Reactive resins based on polyurethane or SMP, filled or aqueous, solvent-free

Owner of the Declaration
FEICA - Association of the European Adhesive and Sealant Industry
Avenue E. van Nieuwenhuyse 4
1160 Brussels
Belgium

Declared product / Declared unit
1 kg reactive resin based on polyurethane or SMP, filled or aqueous, solvent-free; density 1.25 - 1.8 g/cm³

Scope:
This validated Declaration entitles the holder to bear the symbol of the Institut Bauen und Umwelt e.V. It exclusively applies for products produced in Europe and for a period of five years from the date of issue. This EPD may be used by FEICA members and their members provided it has been proven that the respective product can be represented by this EPD. For this purpose a guideline is available at the FEICA secretariat. The members of FEICA are listed on its website. 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.

Verification

The CEN Norm /EN 15804/ serves as the core PCR
Independent verification of the declaration according to /ISO 14025/
☐ internally ☒ externally

Mr Olivier Muller
(Independent verifier appointed by SVR)

2. Product

2.1 Product description

Reactive resins based on polyurethane or SMP, filled or aqueous, solvent-free
These single- or two-component reactive resins are manufactured using polyols (based on mineral oil or from sustainable raw materials) and isocyanates. Reactive resins based on silane-modified polymers (SMP) are usually manufactured as single components from polyols and alkoxysilane preliminary stages.
The aqueous systems can be formulated as aqueous dispersions on the resin or crosslinking agent side.
The products fulfil manifold, often specific, tasks in the construction, furnishing and repair of buildings. Using reactive resins based on polyurethane or SMP, filled or aqueous/solvent-free, decisively improves the fitness for use of structures and extends their service lives.
The product displaying the highest environmental impacts was used as a representative product for calculating the Life Cycle Assessment results (worst case-approach).

2.2 Application

Reactive resins based on polyurethane or SMP, filled or aqueous, solvent-free, are used for the following applications:
Module 1:
Adhesives for parquet and floor coverings
Parquet adhesives in accordance with /EN 14293:2006-10/ for wooden and parquet floors and flooring adhesives in accordance with /EN 14259:2004-07/ for floor coverings
Module 2:
Reactive resins for protecting and repairing concrete structures
Products for **surface protection of concrete**, for increasing the durability of concrete and reinforced concrete structures as well as for new concrete and for maintenance and repair work (requirements 2.1), products for **structural bonding** of strengthening materials to an existing concrete structure (requirements 2.2) and products for **concrete**

injection for filling cracks, voids and interstices in concrete (requirements 2.3)

Module 3:

Liquid-applied roof waterproofing kits

Reactive resins for waterproofing roof constructions which are applied on site

Module 4:

Reactive resins for liquid-applied bridge deck waterproofing kits

Products for liquid-applied waterproofing for use on concrete bridge decks

Module 5:

Screed material and floor screeds

Products for screed / synthetic resin screed for use in floor constructions

Module 6:

Reactive resins as adhesive for tiles

Tile adhesives for internal and external tile installations on walls, floors and ceilings

Module 7:

Adhesives and sealants

Reactive resins for use as:

· Structural and repair adhesives
· Surface and joint sealants

Applications in accordance with the manufacturer's technical documentation / declaration of performance

Module 8:

Reactive resins for watertight covering kits

Products for waterproofing floors and/or walls in wet rooms inside buildings

Module 9:

Reactive resins for liquid applied waterproofing for buildings

Liquid applied plastics for waterproofing of buildings

Module 10:

Reactive resins for waterproofing concrete components or masonry and for pre-treating mineral substrates such as screed or concrete floors prior to flooring, parquet and tile work

Applications in accordance with the manufacturer's technical documentation / declaration of performance

Module 11:

Reactive resins for visual design of concrete components

Products for usually coloured design of concrete with simultaneous, unspecific surface protection and improved permanence of concrete and reinforced concrete surfaces; the same applies for other mineral substrates such as plaster, stone and masonry, for example.

2.3 Technical Data

Module 1:

Reactive resins as adhesive for parquet and floor coverings

The minimum requirements of /EN 14293:2006-10/ and /EN 14259:2004-07/ must be adhered to.

Module 2:

Reactive resins for protecting and repairing concrete structures

The minimum requirements of /EN 1504/ must be maintained. These are:

2.1 **Surface protection** systems for concrete – Requirements on performance characteristics for all intended uses in accordance with /EN 1504-2:2005-01/, Tables 1 and 5:

- Permeability to CO2 (/EN 1062-6:2002-10/)
- Water vapour permeability (/EN ISO 7783-1/-2:2012-02/)
- Capillary absorption and permeability to water (/EN 1062-3:2008-04/)
- Adhesive strength by pull off test (/EN 1542:1999-07/)

2.2 Products for **structural bonding** – Performance characteristics for all intended uses in accordance with Tables 3.1 and 3.2 (manufacturer's declaration of performance)

2.3 Products for **concrete injection** for filling cracks, voids and interstices in concrete – Requirements on performance characteristics for all intended uses in accordance with /EN 1504-5:2005-03/, Table 3:

- Injectability (/EN 1771:2004-11/)
- Viscosity (/EN ISO 3219:1994-10/)

Other performance characteristics in accordance with the manufacturer's technical documentation / declaration of performance

Module 3:

Liquid-applied roof waterproofing kits

The minimum requirements of EAD (on the basis of /ETAG 005/) must be maintained.

The performance characteristics must be indicated in accordance with the European Technical Assessment.

Module 4:

Reactive resins for liquid-applied bridge deck waterproofing kits

The minimum requirements of EAD (on the basis of /ETAG 033/) must be maintained.

The performance characteristics must be indicated in accordance with the European Technical Assessment.

Module 5:

Screed material and floor screeds

The minimum requirements of /EN 13813:2003-01/ must be maintained. For synthetic resin screeds, these are:

- Bond strength (/EN 13892-8:2003-02/)
- Reaction to fire (/EN 13501-1:2010-01/)

Performance characteristics in accordance with the manufacturer's technical documentation / declaration of performance

Module 6:

Reactive resins as adhesive for tiles

The minimum requirements of /EN 12004:2012-09/ must be maintained. These are:

- Initial shear adhesion strength (/EN 12003:2009-01/)
- Shear adhesive strength after water immersion (/EN 12003:2009-01/)
- Open time: tensile adhesion strength (/EN 1346:2007-11)

Other performance characteristics in accordance with the manufacturer's technical documentation / declaration of performance

Module 7:

Adhesives and sealants

Performance characteristics in accordance with the manufacturer's technical documentation / declaration of performance

Module 8:

Reactive resins for watertight covering kits

The minimum requirements of EAD (on the basis of /ETAG 022/) must be maintained.

The performance characteristics must be indicated in accordance with the European Technical Assessment.

Module 9:

Reactive resins for liquid-applied waterproofing for buildings

Module 10:

Reactive resins for waterproofing concrete components or masonry and for pre-treating mineral substrates such as screed or concrete floors prior to flooring, parquet and tile work

At least the following requirements must be fulfilled:

Name	Value	Unit
Shore hardness A ISO 7619-1,2	15-100	
Shore hardness D ISO 7619-1,2	5-95	
Density EN ISO 2811: 2011-06	0,7-2,5	kg/dm³
Viscosity EN ISO 3219: 1994-10	< 100	Pa s

Other performance characteristics in accordance with the manufacturer's technical documentation / declaration of performance

Module 11:

Reactive resins for visual design of concrete components

Physical data on the coating material and/or coating must be indicated in accordance with the respective product standards; these can include, for example:
- Viscosity (/EN ISO 3219:1994-10/)
- Density (/EN ISO 2811:2011-06/)
- Pendulum damping (/ISO 1522:2007-04/)
- Reaction to fire (/EN 13501-1:2010-01/)
- Tensile strength (/EN 13892-8:2003-02/)

Other performance characteristics in accordance with the manufacturer's technical documentation / declaration of performance

2.4 Placing on the market / Application rules

For the placing on the market in the EU/EFTA (with the exception of Switzerland) products falling under the Regulation (EU) No 305/2011 (/CPR/) need a Declaration of Performance taking into consideration either the relevant harmonised European standard or the European Technical Assessment and the CE-marking.

For the application and use of the products the respective national provisions apply.

2.5 Delivery status

Liquid or pasty in containers made of tinplate or plastic appropriately prepared in separate or combi-containers for the practical mixing ratio. One kg of product in individual containers. Sealants in plastic cartridges and poly-tube bags made of foil compound materials. Typical container sizes contain 10 to 25 kg of material. For more extensive applications, vats containing approx. 200 kg or IBCs containing more than 1 tonne are also used.
For the LCA, tinplate (33%) and plastic packaging (66%) was considered.

2.6 Base materials / Ancillary materials

Dual-component reactive resin based on polyurethane, filled or aqueous/solvent-free, comprises resin and crosslinking agent components. The resin component contains polyether and/or polyester polyols (based on mineral oil or from sustainable raw materials). Crosslinking takes place after installation on site and using the crosslinking component. This involves the use of homologues, pre-polymers and polymers based on MDI, TDI, HDI or IPDI. The components can contain auxiliaries such as accelerators, catalysts, wetting agents, foam regulators and viscosity regulators for fine-tuning the product features (application or marketing restrictions must be adhered to).
The resin and crosslinking agent mixing ratio is adjusted according to the stoichiometric requirements. Product crosslinking commences directly after the components are mixed.

Single-component reactive resins based on polyurethane or SMP, filled/solvent-free, which crosslink in the presence of water without adding a resin component, comprise pre-polymers based on MDI, TDI, HDI, IPDI or those with alkoxy-silane end groups.

On average, the products covered by this EPD contain the following ranges of base materials and auxiliaries referred to:
Resin component: up to approx. 80%
Crosslinking components: up to approx. 40%
SMP components: up to approx. 45%
Plasticiser: ~ 0-25%
Filler materials: ~ 0-65%
Additives / Pigments: ~ 0-30%
Water: ~ 0-35%

These ranges are average values and the composition of products complying with the EPD can deviate from these concentration levels in individual cases. More detailed information is available in the respective manufacturer's documentation (e.g. product data sheets).
In individual cases, it is possible that substances on the list of materials of particularly high concern for inclusion in Annex XIV of the /REACH/ regulation are contained in concentrations exceeding 0.1%. If this is the case, this information can be found on the respective safety data sheet.

2.7 Manufacture

The product components formulated are usually mixed from the ingredients in batch mode and packaged for delivery, whereby quality and environmental standards in accordance with /ISO 9001:2008-12/ and the provisions outlined in the relevant regulations such as the Industrial Safety Regulation and Federal Pollution Control Act are adhered to.

2.8 Environment and health during manufacturing

As a general rule, no other environmental protection measures other than those specified by law are necessary.

2.9 Product processing/Installation

Reactive resins based on polyurethane or SMP, filled or aqueous/solvent-free, are processed by trowelling/knife-coating or rolling, pouring, spraying or injection, whereby health and safety measures (ventilation, respiratory equipment) are to be taken and consistently adhered to in accordance with the information on the safety data sheet and conditions on site.

2.10 Packaging

A detailed description of packaging is provided in section 2.5. Empty containers and clean foils can be recycled.

2.11 Condition of use

During the use phase, reactive resins based on polyurethane or SMP, filled or aqueous/solvent-free, are crosslinked and essentially comprise an inert three-dimensional network.
They are long-lasting products which protect our buildings in the form of adhesives, coatings or sealants as well as making an essential contribution towards their function and conservation of value.

2.12 Environment and health during use

Option 1

Products for applications outside indoor areas with permanent stays by people

During use, filled or aqueous/solvent-free polyurethane- or SMP-based reactive resins lose their reactive capacity and are inert.
No risks are known for water, air and soil if the products are used as designated

Option 2

Products for applications inside indoor areas with permanent stays by people

When used in indoor areas with permanent stays by people, evidence of the emission performance of construction products in contact with indoor air must be submitted according to national requirements. No further influences by emissions on the environment and health are known.

2.13 Reference service life

Reactive resins based on polyurethane or SMP, filled or aqueous/solvent-free, comply with a variety of, often specific, tasks in the construction or refurbishment of building structures. They decisively improve the usability of building structures and significantly extend their original service lives.
The anticipated reference service life depends on the specific installation situation and the exposure associated with the product. It can be influenced by weathering as well as mechanical or chemical loads.

2.14 Extraordinary effects

Fire

Even without any special fire safety features, reactive resins based on polyurethane or SMP, filled or aqueous/solvent-free, comply with at least the requirements of /EN 13501-1/ standard for fire classes E and Efl. In terms of the volumes applied, they only have a subordinate influence on the fire performance characteristics (e.g. smoke gas development) of the building structure in which they are installed. As networked polyurethane resins do not melt or drip, the resins do not contribute towards spreading fire.

Water

Reactive resins based on polyurethane or SMP, filled or aqueous/solvent-free, are chemically inert and insoluble in water. They are often used to protect building structures from harmful water ingress / the effects of flooding.

Mechanical destruction

The mechanical destruction of reactive resins based on polyurethane or SMP does not lead to any decomposition products which are harmful for the environment or health.

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 crosslinked polyurethane or SMP products adhere.
If polyurethane or SMP 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

Individual components which can no longer be recycled must be combined at a specified ratio and hardened.

Hardened product residue is not special waste.
Non-hardened product residue is special waste.

Empty, dried containers (free of drops and scraped clean) are directed to the recycling process. Residue must be directed to proper waste disposal taking consideration of local guidelines.
The following waste codes according to the European List of Waste (/2000/532/EC/) can apply:
Hardened product residue:
080112 Paint and varnish waste 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

More information is available in the manufacturer's product or safety data sheets and is available on the manufacturer's Web sites or on request. Valuable technical information is also available on the associations' Web sites.

3. LCA: Calculation rules

3.1 Declared Unit

This EPD refers to the declared unit of 1 kg reactive resin based on polyurethane or SMP, filled or aqueous, solvent-free of density 1.25 - 1.8 g/cm³ in the mixing ratio required for processing both components in accordance with the /PCR Part B/ for Reactive resin products.
Consumption per unit area of the products to be applied extensively can range between only a few hundred grams and more than 1 kg per square metre. In the case of products, which are injected, the application volume depends on the component to be injected.
The results of the Life Cycle Assessment provided in this declaration have been calculated from the product with the highest environmental impact (worst-case scenario).

Declared unit

Name	Value	Unit
Declared unit	1	kg
Conversion factor to 1 kg	1	-

3.2 System boundary

Modules A1-A3, A4, A5 and D are taken into consideration in the LCA:

- A1 Production of preliminary products
- A2 Transport to plant
- A3 Production incl. provision of energy, production of packaging as well as auxiliaries and consumables, waste treatment)
- A4 Transport to site
- A5 Installation (disposal of packaging &

installation losses and emissions during installation)
- D Credits from incineration of packaging materials & installation losses and recycling the metal container

The Declaration is therefore from "cradle to gate - with options".

3.3 Estimates and assumptions
Where no specific GaBi processes were available, the individual recipe ingredients of formulation were estimated on the basis of information provided by the manufacturer or literary sources.

3.4 Cut-off criteria
All raw materials submitted for the formulations and production data were taken into consideration.
The manufacture of machinery, plants and other infrastructure required for production of the products under review was not taken into consideration in the LCA.
Transport of packaging materials is also excluded.

3.5 Background data
Data from the GaBi 6 database was used as background data. Where no background data was available, it was complemented by manufacturer information and literary research.

3.6 Data quality
Representative products were applied for this EPD and the product in a group displaying the highest environmental impact was selected for calculating the LCA results. The datasets are no more than 5 years old.
Production data and packaging are based on details provided by the manufacturer. The formulation used for evaluation refers to a specific product.

3.7 Period under review
Representative formulations were accepted by FEICA Ltd and collected in 2011.

3.8 Allocation
No allocations were applied for production. A multi-input allocation with a credit for electricity and thermal energy was used for incineration of production residues and packaging materials. The credits achieved through packaging disposal are declared in Module D.

3.9 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. In this case, 1 kg reactive resin was selected as the declared unit. Depending on the application, a corresponding conversion factor such as the specific unit area must be taken into consideration.

4. 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 in the context of a building evaluation if modules are not declared (MND).

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel	0.0016	l/100km
Transport distance	1000	km
Capacity utilisation (including empty runs)	85	%
Gross density of products transported	1250 - 1800	kg/m^3
Capacity utilisation volume factor	1	-

Installation into the building (A5)

Name	Value	Unit
Material loss	0.01	kg

5. 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	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 kg reactive resin based on polyurethane or SMP, filled or aqueous/solvent-free

Parameter	Unit	A1-A3	A4	A5	D
Global warming potential	[kg CO_2-Eq.]	4.10E+0	5.04E-2	1.29E-1	-1.16E-1
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	8.59E-9	2.07E-13	4.67E-13	-1.77E-11
Acidification potential of land and water	[kg SO_2-Eq.]	1.24E-2	1.29E-4	1.66E-5	-3.88E-4
Eutrophication potential	[kg $(PO_4)^{3-}$-Eq.]	1.12E-3	3.19E-5	3.09E-6	-3.02E-5
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	1.64E-3	-3.50E-5	1.43E-6	-4.80E-5
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	1.70E-5	1.98E-9	1.28E-9	-6.05E-9
Abiotic depletion potential for fossil resources	[MJ]	7.84E+1	6.94E-1	2.40E-2	-1.33E+0

RESULTS OF THE LCA - RESOURCE USE: 1 kg reactive resin based on polyurethane or SMP, filled or aqueous/solvent-free

Parameter	Unit	A1-A3	A4	A5	D
Renewable primary energy as energy carrier	[MJ]	4.11E+0	-	-	-
Renewable primary energy resources as material utilization	[MJ]	0.00E+0	-	-	-
Total use of renewable primary energy resources	[MJ]	4.11E+0	3.89E-2	2.70E-3	-7.42E-2
Non-renewable primary energy as energy carrier	[MJ]	6.43E+1	-	-	-
Non-renewable primary energy as material utilization	[MJ]	1.98E+1	-	-	-
Total use of non-renewable primary energy resources	[MJ]	8.41E+1	6.97E-1	2.85E-2	-1.47E+0
Use of secondary material	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of non-renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of net fresh water	[m^3]	3.15E-2	6.82E-5	3.16E-4	-2.28E-4

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 kg reactive resin based on polyurethane or SMP, filled or aqueous/solvent-free

Parameter	Unit	A1-A3	A4	A5	D
Hazardous waste disposed	[kg]	1.02E-5	3.31E-7	8.35E-9	-1.79E-7
Non-hazardous waste disposed	[kg]	1.87E-1	9.92E-5	1.42E-3	7.65E-4
Radioactive waste disposed	[kg]	2.26E-3	9.52E-7	1.78E-6	-5.38E-5
Components for re-use	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Materials for recycling	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Materials for energy recovery	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Exported electrical energy	[MJ]	0.00E+0	0.00E+0	1.83E-1	0.00E+0
Exported thermal energy	[MJ]	0.00E+0	0.00E+0	4.25E-1	0.00E+0

6. LCA: Interpretation

All impacts are associated with the production phase (A1-A3). The most significant contribution to the production phase impacts is the upstream production of raw materials as main driver. Another substantial contributor in the production phase, in the category of Abiotic Depletion Potential Elements (**ADPE**), is the steel sheet used as packaging material. Emissions associated with the manufacturing of products also have some influence on Photochemical Ozone Creation Potential (**POCP**) in the production phase. In all EPDs, CO_2 is the most important contributor to Global Warming Potential (GWP). For the Acidification Potential (AP), NO_x and SO_2 contribute to the largest share. In some cases HCl in water also impacts AP due to the use of TiO_2.

The majority of life cycle energy consumption takes place during the production phase (A1-A3). Significant contributions to Primary Energy Demand – Non-renewable (**PENRT**) come from the energy resources used in the production of raw materials. The largest contributor to Primary Energy Demand – Renewable (**PERT**) impacts comes from the consumption of renewable energy resources required for the generation and supply of electricity. It should be noted that Primary Energy Demand – Renewable (**PERT**) generally represents a small percentage of the production phase primary energy demand with the bulk of the demand coming from non-renewable energy resources.

Transportation to the construction site (A4) and the installation process (A5) contribute to a negligible extent to all impacts. Scrap burdens and energy credit reported in module D are not important (contribution <2.5% for most results).

7. Requisite evidence

VOC

Special tests and evidence have not been carried out or provided within the framework of drawing up this Model EPD. Some member states require special documentation on VOC emissions into indoor air for specific areas of application. This documentation, as well as documentation for voluntary VOC labelling, has to be provided separately and is specific for product in question.

Evidence pertaining to VOC emissions shall show
- either an attestation of compliance with,
- or a documentation of test data that are required in,

any of the existing regulations or in any of the existing voluntary labeling programs for low-emitting products, as far as these
(1) include limits for the parameters TVOC, TSVOC, carcinogens, formaldehyde, acetaldehyde, LCI limits for individual substances (including but not limited to the European list of harmonized LCIs), and the R value;
(2) base their test methods on CEN/TS 16516 (or EN 16516, after the on-going revision of CEN/TS 16516);
(3) perform testing and apply the limits after 28 days storage in a ventilated test chamber, under the conditions specified in CEN/TS 16516; some regulations and programs also have limits after 3 days, on top of the 28 days limits;
(4) express the test results as air concentrations in the European Reference Room, as specified in CEN/TS 16516.

Examples of such regulations are the Belgian Royal Decree C-2014/24239, or the German /AgBB/. Examples of such voluntary labeling programs are /EMICODE/, Blue Angel or Indoor Air Comfort.

Relevant test results shall be produced either by an ISO 17025 accredited commercial test lab, or by a qualified internal test lab of the manufacturer.
Examples for the applied limits after 28 days storage in a ventilated test chamber are:
- TVOC: 1000 µg/m³
- TSVOC: 100 µg/m³
- Each carcinogen: 1 µg/m³
- Formaldehyde: 100 µg/m³
- LCI: different per substance involved
- R value: 1 (meaning that, in total, 100% of the combined LCI values must not be exceeded).

Informative Annexes (2 tables):
The table shown below is an overview of the most relevant regulations and specifications as of April 2015, as regards requirements after 3 days storage in a ventilated test chamber.

	TVOC [µg/m³]	Sum of carcinogens. C1A,CA2 [µg/m³]	Formal-dehyde [µg/m³]	Acet-aldehyde [µg/m³]	Sum of Form- and Acet-aldehyde
German DIBt/AgBB regulation	10 000	10	-/-	-/-	-/-
draft Lithuanian regulation	10 000	10	-/-	-/-	-/-
EMICODE EC1	1 000	10	50	50	50 ppb
EMICODE EC1 *PLUS*	750	10	50	50	50 ppb

	TVOC [µg/m³]	TSVOC [µg/m³]	Each carcinogen C1A,CA2 [µg/m³]	Formaldehyde [µg/m³]	Acetaldehyde [µg/m³]	LCI	R value	Specials	Sum non-LCI & non-identified [µg/m³]
Belgian regulation	1000	100	1	100	200	Belgian list	1	Toluene 300 µg/m³	-/-
French regulations class A+	1000	-/-	-/-	10	200	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
French regulations class A	1500	-/-	-/-	60	300	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
French regulations class B	2000	-/-	-/-	120	400	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
French regulations class C	>2000	-/-	-/-	>120	>400	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
German DIBt/AgBB regulation	1000	100	1	100	1200	German AgBB list	1	-/-	100
draft Lithuanian regulation	1000	100	1	product type specific	-/-	Lithua-nian list	1	-/-	-/-
EMICODE EC1	100	50	1	(after 3 days)	(after 3 days)	-/-	-/-	-/-	-/-
EMICODE EC1 *PLUS*	60	40	1	(after 3 days)	(after 3 days)	German AgBB list	1	-/-	40
Finnish M1, sealants	20	-/-	1	10	-/-	-/-	-/-	Ammonia, odour	-/-
Finnish M1, adhesives	200 µg/m²h	-/-	5 µg/m²h	50 µg/m²h	-/-	-/-	-/-	Ammonia, odour	-/-

The table above provides an overview of the most relevant regulations and specifications as of April 2015, as regards requirements after 28 days storage in a ventilated test chamber. Some details may be missing in the table due to lack of space. Values given represent maximum values/limits.

8. References

PCR 2013, Part A
Institut Bauen und Umwelt e.V., Berlin (pub.): Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU), Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report; 2013-04
www.bau-umwelt.de

PCR 2012, Part B
Product Category Rules for Building Products, Part B: Requirements on the EPD for reactive resin products, 2012-07
www.bau-umwelt.de

2000/532/EC
Commission decision dated 3 May 2000 replacing decision 94/3/EC on a waste directory in accordance with Article 1 a) of Council Directive 75/442/EEC on waste and Council decision 94/904/EC on a directory of hazardous waste in terms of Article 1, paragraph 4 of Directive 91/689/EEC on hazardous waste

CPR
Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC

ISO 7619-1:2012-02
Rubber, vulcanized or thermoplastic - Determination of

indentation hardness - Part 1: Durometer method (Shore hardness)

ISO 7619-2:2012-02
Rubber, vulcanized or thermoplastic - Determination of indentation hardness - Part 2: IRHD pocket meter method

EN 923
Adhesives -Terms and definitions

EN 14293:2006-10
Adhesives – Adhesives for bonding parquet to a sub-floor – Test methods and minimum requirements

EN 14259:2004-07
Adhesives for floor coverings – Requirements on mechanical and electric performance

EN 1504-2:2005-01
Products and systems for the protection and repair of concrete structures – Definitions, requirements, quality control and evaluation of conformity – Part 2: Surface protection systems for concrete

EN 1504-5:2005-03
Products and systems for the protection and repair of concrete structures – Definitions, requirements, quality control and evaluation of conformity – Part 5: Injecting concrete components

EN 1062-6:2002-10
Paints and varnishes – Coating materials and coating systems for exterior masonry and concrete – Part 6: Determination of carbon dioxide permeability

EN ISO 7783:2012-02
Paints and varnishes – Determination of water-vapour transmission properties – Cup method

EN 1062-3:2008-04
Paints and varnishes – Coating materials and coating systems for exterior substrates and concrete – Part 3: Determining water permeability

EN 1542-2:1999-07
Products and systems for the protection and repair of concrete structures – Test methods – Determining the adhesive strength in a pull-off test

EN 1771-2:2004-11
Products and systems for the protection and repair of concrete structures – Test methods – Determining the injectability and splitting tensile strength

EN ISO 3219:1994-10
Plastics – Polymers/Resins in liquid state or as emulsions or dispersions – Determination of viscosity using a rotational viscometer with defined shear rate

EN ISO 9514:2005-07
Paints and varnishes – Determination of the pot life of multi-component coating systems – Preparation and conditioning of samples and guidelines for testing

EN 13813:2003-01
Screed material and floor screeds – Screed materials – Properties and requirements

EN 13892-8:2003-02
Test procedures for masonry – Part 8: Determining tensile strength

EN 13501-1:2010-01
Classification of building products and methods by fire performance – Part 1: Classification with the results of tests on fire performance by building products

EN 12004:2012-09
Adhesives for tiles – Requirements, evaluation of conformity, classification and designation

EN 12003:2009-01
Adhesives for tiles – Determining the shear strengths of reactive resin adhesives

EN 1346:2007-11
Adhesives for tiles – Determining the open time; EN 1346:2007

ETAG 022:2007-07
Guidance for European Technical Approval of watertight Covering Kits for Wet Room floors and or walls, Part 1: Liquid-applied coverings with or without wearing surface

ETAG 005:2004-03
Guideline for European Technical Approval of liquid-applied roof waterproofing kits, Part 1: General

ETAG 033:2010-09
Guideline for European Technical Approval of liquid-applied coverings for concrete bridges

EN ISO 2811-1:2011-06
Paints and varnishes – Determination of density - Part 1: Pycnometer method

EN ISO 1522:2007-04
Paints and varnishes – Pendulum damping test

CEN/TS 14472 -1 to 4:2003-10
Resilient, textile and laminate floor coverings – Design, preparation and installation – Part 1: General; Part 2: Textile floor coverings; Part 3: Laminate floor coverings; Part 4: Resilient floor coverings

CEN/TS 15717:2008-07
Parquet flooring – General guideline for installation

EN ISO 9001:2008-12
Quality management systems – Requirements

REACH
Directive (EG) No. 1907/2006 of the European Parliament and of the Council dated 18 December 2006 on the registration, evaluation, approval and restriction of chemical substances (REACH), for establishing a European Agency for chemical substances, for amending Directive 1999/45/EC and for annulment of Directive (EEC) No. 793/93 of the Council, Directive (EC) No. 1488/94 of the Commission, Guideline 76/769/EEC of the Council and Guidelines 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC of the Commission.

ISO 16000-3:2002-08
Indoor air – Part 3: Determination of formaldehyde and other carbonyl compounds by sampling using a pump

ISO 16000-6:2004-12
Indoor air – Part 6: Determination of volatile organic compounds indoors and in test chambers by sampling on TENAX TA®, thermal desorption and gas chromatography using MS or FID

EN ISO 16000-9:2008-04
Indoor air – Part 9: Determination of the emission of volatile organic compounds from building products and furnishings – Emission test chamber method

EN ISO 16000-11:2006-06
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

AgBB
Committee for Health-related Evaluation of Building Products: health-related evaluation of emissions of volatile organic compounds (VOC and SVOC) from building products; status: June 2012 www.umweltbundesamt.de/produkte/bauprodukte/agbb.htm

EMICODE
GEV – Gemeinschaft Emissionskontrollierte Verlegewerkstoffe, Klebstoffe und Bauprodukte e. V. (pub.).www.emicode.de

GaBi 6 2014
GaBi 6: Software and database for comprehensive analysis. LBP, University of Stuttgart and thinkstep AG, 2014

GaBi 6 2014b
GaBi 6: Documentation of GaBi 6 data sets from the data base for comprehensive analysis LBP, University of Stuttgart and thinkstep AG, 2014 http://documentation.gabi-software

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

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
thinkstep AG
Hauptstrasse 111 - 113
70771 Leinfelden-Echterdingen
Germany

Tel +49 (0)711 341817 0
Fax +49 (0)711 341817 25
Mail info@thinkstep.com
Web **www.thinkstep.com**

Owner of the Declaration
FEICA - Association of the European
Adhesive and Sealant Industry
Avenue E. van Nieuwenhuyse 4
B-1160 Brussels
Belgium

Tel +32 (0)267 673 20
Fax +32 (0)267 673 99
Mail info@feica.eu
Web **www.feica.eu**