SENTINEL HOLDING
INSTITUT

SHI PRODUCT PASSPORT

Find products. Certify buildings.

SHI Product Passport No.:

15188-10-1000

RECAtherm microfine Kautschukisolierung

Product group: Sealants - Insulation

RECA NORM GmbH
Am Wasserturm 4
74635 Kupferzell

Product qualities:

- SHI Product Assessment 2024
- QNG Qualitätssiegel Nachhaltiges Gebäude
- DGNB NEW CONSTRUCTION 2023
- DGNB NEW CONSTRUCTION 2018
- EU taxonomy
- BREEAM DE NEUBAU 2018
- LEED v4.1 (outside US)

CERTIFIED SUSTAINABLE PRODUCT
SHI PRODUCT PASSPORT
SENTINEL HOLDING INSTITUT
www.sentinel-holding.eu

Köttner

Helmut Köttner
Scientific Director
Freiburg, 07 April 2026

SENTINEL HOLDING
INSTITUT

Product:
RECAtherm microfine Kautschukisolierung

SHI Product Passport no.:
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Contents

SHI Product Assessment 2024	1
QNG - Qualitätssiegel Nachhaltiges Gebäude	2
DGNB New Construction 2023	3
DGNB New Construction 2018	4
EU taxonomy	5
BREEAM DE Neubau 2018	6
LEED v4.1	7
Product labels	8
Legal notices	9
Technical data sheet/attachments	10

The SHI Database is the first and only database for construction products whose comprehensive processes and data accuracy are regularly verified by the independent auditing company SGS-TÜV Saar

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SHI Product Assessment 2024

Since 2008, Sentinel Holding Institut GmbH (SHI) has been establishing a unique standard for products that support healthy indoor air. Experts carry out independent product assessments based on clear and transparent criteria. In addition, the independent testing company SGS regularly audits the processes and data accuracy.

Criteria	Product category	Harmful substance limit	Assessment
SHI Product Assessment	Other products	TVOC ≤ 300 µg/m³ Formaldehyd ≤ 24 µg/m³	Indoor Air Quality Certified
Valid untill: 15 August 2026			

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SHI Product Passport no.:
15188-10-1000

QNG - Qualitätssiegel Nachhaltiges Gebäude

The Qualitätssiegel Nachhaltiges Gebäude (Quality Seal for Sustainable Buildings), developed by the German Federal Ministry for Housing, Urban Development and Building (BMWSB), defines requirements for the ecological, socio-cultural, and economic quality of buildings. The Sentinel Holding Institut evaluates construction products in accordance with QNG requirements for certification and awards the QNG ready label. Compliance with the QNG standard is a prerequisite for eligibility for the KfW funding programme. For certain product groups, the QNG currently has no specific requirements defined. Although classified as not assessment-relevant, these products remain suitable for QNG-certified projects.

Criteria	Pos. / product group	Considered substances	QNG assessment
3.1.3 Schadstoffvermeidung in Baumaterialien	12.2 Flexible plastic foam insulation materials for building services	Halogenated propellants / chlorinated paraffins / polybrominated biphenyls (PBB) / polybrominated diphenyl ethers (PBDE)	QNG ready
Verification: Herstellererklärung vom 18.09.2024			

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Product:
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SHI Product Passport no.:
15188-10-1000

DGNB New Construction 2023

The DGNB System (German Sustainable Building Council) assesses the sustainability of various types of buildings. It can be applied to both large-scale private and commercial projects as well as smaller residential buildings. The 2023 version sets high standards for ecological, economic, socio-cultural, and functional aspects throughout the entire life cycle of a building.

Criteria	No. / Relevant building components / construction materials / surfaces	Considered substances / aspects	Quality level
ENV 1.2 Local environmental impact, 03.05.2024 (3rd edition)	43 Flame-retardant construction products (substances)	a) Chlorinated paraffins (cf. definition), polybrominated biphenyls (PBBs), diphenyl ethers (PBDEs) and SVHCs; b) Antimony trioxide	Quality level 3
Verification: Herstellererklärung vom 18.09.2024			

Criteria	No. / Relevant building components / construction materials / surfaces	Considered substances / aspects	Quality level
ENV 1.2 Local environmental impact, 29.05.2025 (4th edition)	43b Flame-retardant construction products	Chlorinated paraffins (cf. definition), polybrominated biphenyls (PBBs), diphenyl ethers (PBDEs), SVHCs, Antimony trioxide	Quality level 3
Verification: Herstellererklärung vom 18.09.2024			

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SHI Product Passport no.:
15188-10-1000

DGNB New Construction 2018

The DGNB System (German Sustainable Building Council) assesses the sustainability of various types of buildings. It can be applied to both large-scale private and commercial projects as well as smaller residential buildings.

Criteria	No. / Relevant building components / construction materials / surfaces	Considered substances / aspects	Quality level
ENV 1.2 Local environmental impact	43 Construction products equipped with flame retardant (products)	Chlorinated paraffins (cf. definition), polybrominated biphenyls (PBBs), diphenyl ethers (PBDEs) and SVHCs	Quality level 3
Verification: Herstellererklärung vom 18.09.2024			

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SHI Product Passport no.:
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EU taxonomy

The EU Taxonomy classifies economic activities and products according to their environmental impact. At the product level, the EU regulation defines clear requirements for harmful substances, formaldehyde and volatile organic compounds (VOCs). The Sentinel Holding Institut GmbH labels qualified products that meet this standard.

Criteria	Product type	Considered substances	Assessment
DNSH - Pollution prevention and control		Substances according to Annex C	EU taxonomy compliant
Verification: Herstellererklärung vom 18.09.2024			

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BREEAM DE Neubau 2018

BREEAM (Building Research Establishment Environmental Assessment Methodology) is a UK-based building assessment system that evaluates the sustainability of new constructions, refurbishments, and conversions. Developed by the Building Research Establishment (BRE), the system aims to assess and improve the environmental, economic, and social performance of buildings.

Criteria	Product category	Considered substances	Quality level
Hea 02 Indoor Air Quality			Not relevant for assessment

SENTINEL HOLDING
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Product:
RECAtherm microfine Kautschukisolierung

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LEED v4.1

LEED (Leadership in Energy and Environmental Design) is an internationally recognised building certification system developed by the U.S. Green Building Council. It is one of the most widely used sustainability standards for buildings worldwide and is particularly applied in internationally oriented projects. LEED assesses buildings holistically across categories such as energy efficiency, resource conservation, material selection, indoor environmental quality and site sustainability. Depending on the number of points achieved, projects are awarded one of the certification levels: LEED Certified, Silver, Gold or Platinum.

Criteria	Product category	Assessment
EQ Credit: Low-Emitting Materials		Not relevant for assessment

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Product:
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Product labels

In the construction industry, high-quality materials are crucial for a building's indoor air quality and sustainability. Product labels and certificates offer guidance to meet these requirements. However, the evaluation criteria of these labels vary, and it is important to carefully assess them to ensure products align with the specific needs of a construction project.

This product is SHI Indoor Air Quality certified and recommended by Sentinel Holding Institut. Indoor-air-focused construction, renovation, and operation of buildings is made possible by transparent and verifiable criteria thanks to the Sentinel Holding concept.

Products bearing the Sentinel Holding Institute QNG-ready seal are suitable for projects aiming to achieve the "Qualitätssiegel Nachhaltiges Gebäude" (Quality Seal for Sustainable Buildings). QNG-ready products meet the requirements of QNG Appendix Document 3.1.3, “Avoidance of Harmful Substances in Building Materials.” The KfW loan program Climate-Friendly New Construction with QNG may allow for additional funding.

Product:
RECAtherm microfine Kautschukisolierung

SHI Product Passport no.:
15188-10-1000

Legal notices

(*) These criteria apply to the construction project as a whole. While individual products can positively contribute to the overall building score through proper planning, the evaluation is always conducted at the building level. The information was provided entirely by the manufacturer.

Find our criteria here: https://www.sentinel-holding.eu/de/Themenwelten/Pr%C3%BCfkriterien%20f%C3%BCr%20Produkte

The SHI Database is the first and only database for construction products whose comprehensive processes and data accuracy are regularly verified by the independent auditing company SGS-TÜV Saar

Publisher

Sentinel Holding Institut GmbH
Bötzinger Str. 38
79111 Freiburg im Breisgau
Germany
Tel.: +49 761 590 481-70
info@sentinel-holding.eu
www.sentinel-holding.eu

DOKUMENTATION

Technische Daten für recatherm microfine

Artikelnummer 0878 3.., Graues Kautschukmaterial für die Heizungs- und Sanitärinstallation

Materialart			Schaumstoff auf Basis synthetischen Kautschuks, FEF (Flexible Elastomeric Foam)	
Zellstruktur			Geschlossenzellig	
Farbe			Grau	
Obere Temperaturgrenze	Rohr Ebene Fläche		+110 °C +85 °C	
Untere Temperaturgrenze			Wie bei Heizungs- & Sanitäranlagen üblich	
Wärmeleitfähigkeit	Dicke ≤ 15 mm	λ_ϑ bei +30 °C bei +40 °C bei +50 °C	$0{,}033 + 7{,}2 \cdot 10^{-5}\,\vartheta + 1{,}2 \cdot 10^{-6}\,\vartheta^2$ ≤0,036 W/(m·K) ≤0,037 W/(m·K) ≤0,038 W/(m·K)	Prüfung nach DIN EN ISO 8497 DIN EN 12667
	Dicke > 15 mm bis ≤ 24 mm	λ_ϑ bei +30 °C bei +40 °C bei +50 °C	$0{,}036 + 7{,}2 \cdot 10^{-5}\,\vartheta + 1{,}2 \cdot 10^{-6}\,\vartheta^2$ ≤0,039 W/(m·K) ≤0,040 W/(m·K) ≤0,041 W/(m·K)	
	Dicke > 24 mm	λ_ϑ bei +30 °C bei +40 °C bei +50 °C	$0{,}038 + 7{,}2 \cdot 10^{-5}\,\vartheta + 1{,}2 \cdot 10^{-6}\,\vartheta^2$ ≤0,041 W/(m·K) ≤0,042 W/(m·K) ≤0,043 W/(m·K)	
Baustoffklasse(n) ⁰	Schläuche Selbstklebendes Band		B_L-s3, d0 bis C_L-s3, d0 B-s3, d0	Prüfung nach DIN EN 13501-1
Feuerwiderstandsklasse gemäß DIN 4102-11			R 90	(ABP) Nr.: P-MPA-E-14-001
Korrosionsbeständigkeit			entspricht den Anforderungen – FMPA Stuttgart	Gemäß DIN 1988
Gesundheitliche Aspekte			Frei von Staub und Fasern Frei von Schwermetallen (z.B. Cadmium, Blei) und Formaldehyd	
Umweltaspekte			ODP Zero GWP Zero CFC & H-CFC-frei	
Andere Eigenschaften			CE-konform	
Lagerung	Selbstklebende Produkte		1 Jahr	Lagerung in trockenen, sauberen Räumen bei normaler Luftfeuchte (50 % bis 70 %) und Raumtemperatur (0 °C bis + 35 °C)
Toleranzen & Grenzabmaße			Gemäß DIN EN 14304:2013-04	
Anwendung im Außenbereich			Schutz gegen UV-Strahlung muss aufgebracht werden.	siehe Hinweis (1)

Stand 5. August 2020 – Abt.P - rk

RECA NORM GmbH
Am Wasserturm 4
74635 Kupferzell
Telefon 07944 61-0
info@recanorm.de
www.recanorm.de
Sitz Kupferzell
Amtsgericht Stuttgart HRB 738108
USt-IdNr. DE146280166
Geschäftsführer
Thomas Häusele
Alexander Retzbach

Kaimann GmbH | Hansastr. 2-5 | D-33161 Hövelhof

03.07.2024

To our valued customers

Dr. Jürgen Georg Weidinger
Chief Technology Innovation Officer

Tel.: +49 5257 9850-0
Fax: +49 5257 9850-590
E-Mail: juergengeorg.weidinger@kaimann.de
Internet: www.kaimann.de

REACH Declaration of Conformity

European ordinance 1907/2006 (REACH) has been in place since 2007 and applies to all business located in the EU. Together with the GHS / CLP ordinance (1272/2008) it regulates the determination of data, the classification and identification and the forwarding of data relating to chemicals. As a user of chemicals and manufacturer of products, we have considered all the implications of REACH and its requirements:

1) As a so-called “downstream user”, we are not obliged to register according to title II of the ordinance. Our products are neither chemicals nor mixtures (acc. to art. 3) and comply with all the requirements of the REACH ordinance and are continuously tested and evaluated in relation to compliance with all legal premises. Proper (intended) use of our materials will not lead to release of respective chemicals (see 2). This again liberates us from any registration and edition of safety data sheet under title II of the ordinance for our insulation materials.

2) Under REACH our products are considered as commodities that are defined by their outer form. Being manufacturer of products, we are affected by the requirements of Article 33 to determine Substances of Very High Concern (SVHC) according to annex XIV and XVII of European ordinance 1907/2006 and to notify our customers of these. We are regularly checking the publications of the European health board (ECHA); according to the latest edition

   October 2016 / last amendment to SVHC candidate list July 2024

   no SVHC are contained in our products.

Additionally, our products do not contain other substances considered as hazardous to our present knowledge as defined in EC 850/2004, EU 519/2012, EU 253/2011, 67/548 ECC and EU 65/2011 (RoHS).

The company Kaimann GmbH therefore herewith declares that the products KAIFLEX KKplus(s1,s2,s3), KAIFLEX KK(s3), KAIFLEX EPDM(plus), KAIFLEX SOLAR EPDM, KAIFLEX HTplus(s2), KAIFLEX SHplus, KAIFLEX HF(plus,s2), KAIFLEX EF, KAIFLEX EF-E, KAIFLEX ST(plus,s2), KAIFLEX LS, KAIFLEX R-Force, KAIFOAM PE, KAIFLEX railPROTECT / railLSLT / railCLAD as well as the auxiliary materials KAIFLEX/KAIFIX supports, KAIFLEX tape, PROTECT, INCERAM and comCLAD claddings, KAIFINISH products and KAIFLEX Pyrostar together with adhesives Kaiflex 414, 415plus, 494 HHF, 505 and EPDM are complying to the requirements of EU ordinance 1907/2006 (REACH).

Kaimann GmbH

Dr. Jürgen Weidinger
CTIO

HERSTELLERERKLÄRUNG

Produktbezeichnung:	RECAtherm microfine Kautschukisolierung
Produktnummer:	0878 7xx
Anwendung/Beschreibung	Ein Schaumstoff auf der Basis synthetischen Kautschuks mit einer mikrofeinen Zellstruktur, der alle Anforderungen des GEG 2020 erfüllt. Eine hochflexible Isolierung mit geschlossener, microfeiner Zellstruktur für die Heizung-/Sanitärinstallation.

TVOC-Emission: Die TVOC-Emission des Produkts nach 28 Tagen in mg/m^3 beträgt: <0,005 mg/m^3

CMR Kategorie 1A und 1B: Die Kat. 1A und 1B krebserregende Emission des Produktes nach 28 Tagen in mg/m^3 beträgt: <0,001 mg/m^3

Chlorierte Paraffine: Es werden keine kurz- (SCCP) oder mittelkettigen Chlorparaffine verwendet. Langkettige Chlorparaffine (LCCP) werden in einer Konzentration von > 0,1% als Flammschutzmittel verwendet.

Anforderungen	**Erfüllt**
Frei von halogenierten Treibmitteln	Ja
Frei von Chlorparaffine (SCCP, MCCP)	Ja
Frei von Altreifengranulat	Ja
HBCD (≤ 0,1 Gew.-%)	Ja
SVHC (≤ 0,1 Gew.-%)	Ja
CMR-Stoffe der Kategorie 1A und 1B < 0,1%	Ja
Blei- und Zinnkonzentration (≤ 0,1 Gew.-%)	Ja
PBB & PBDE & TCEP (≤ 0,1 Gew.-%)	Ja
REACH-konform	Ja

Datum: 18.09.2024

RECA NORM GmbH

Am Wasserturm 4
74635 Kupferzell

Telefon 07944 61-0
info@recanorm.de
www.recanorm.de

Sitz Kupferzell
Amtsgericht Stuttgart HRB 738108
USt-IdNr. DE146280166

Geschäftsführer
Thomas Häusele
Stefan John
Alexander Retzbach

ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A1*

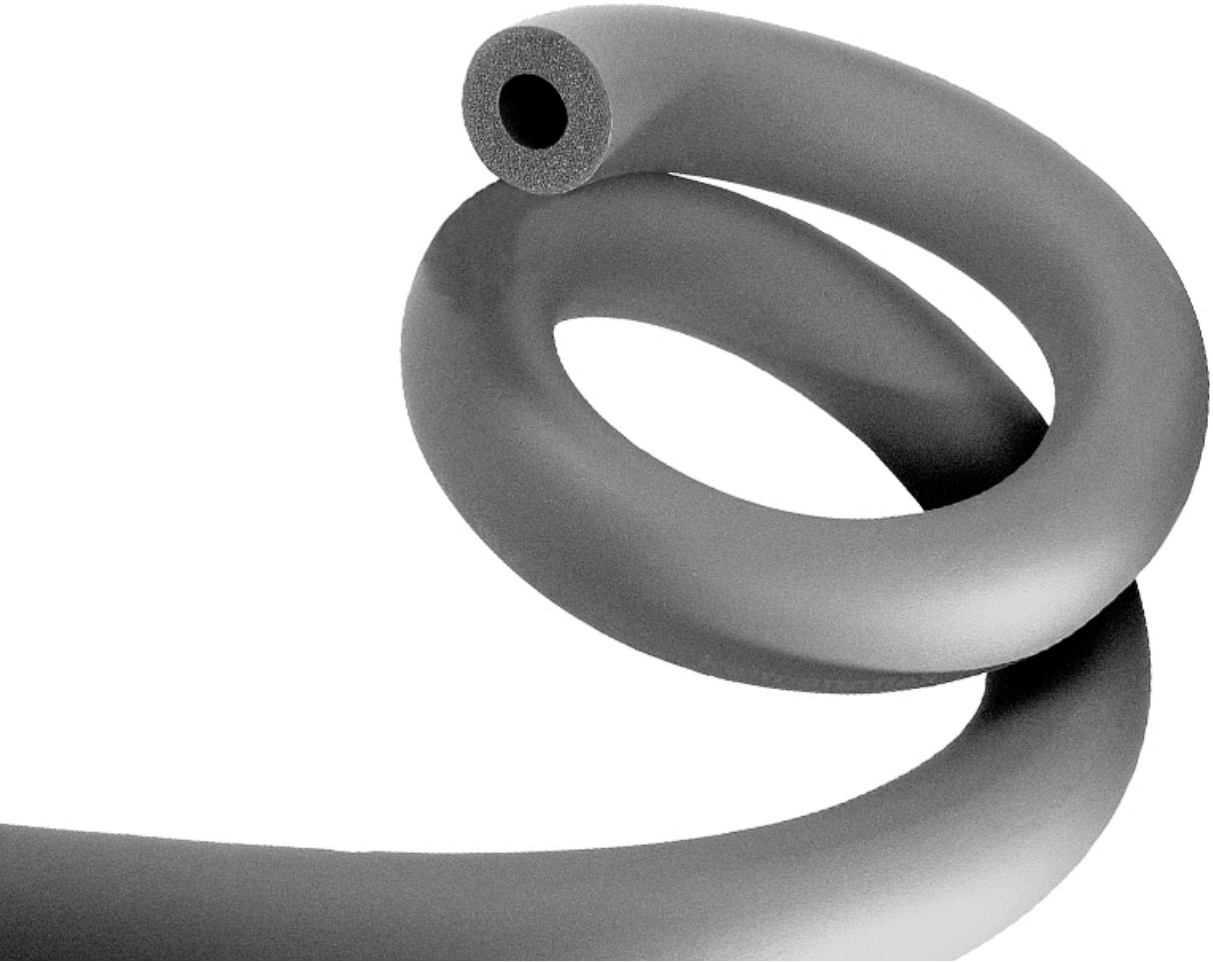
Owner of the Declaration	Kaimann GmbH
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-KAI-20200235-IBC1-EN
Issue date	17.12.2020
Valid to	16.12.2025

Kaiflex HTplus, Kaiflex HT s2

Kaimann GmbH

Institut Bauen und Umwelt e.V.

www.ibu-epd.com | https://epd-online.com





1. General Information

Kaimann GmbH	Kaiflex HTplus, Kaiflex HT s2
Programme holder IBU – Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	**Owner of the declaration** Kaimann GmbH Hansastraße 2-5 33161 Hövelhof
Declaration number EPD-KAI-20200235-IBC1-EN	**Declared product / declared unit** 1 m3 insulation material Kaiflex HTplus, Kaiflex HT s2
This declaration is based on the product category rules: Insulating materials made of foam plastics, 06.2017 (PCR checked and approved by the SVR)	**Scope:** Product line Kaiflex HTplus, Kaiflex HT s2 Thermal insulation material made of flexible elastomeric foam for technical building equipment and industrial installations. The EPD is performed in agreement with the demands of PCR Part A with reference to *EN 15804+A1:2013* and *PCR Part B*: Requirements on the EPD for insulating materials made of foam plastics. The EPD is based on the average Kaiflex HTplus, Kaiflex HT s2 production from one plant in Germany.
Issue date 17.12.2020	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*.
Valid to 16.12.2025	**Verification** The standard *EN 15804* serves as the core PCR Independent verification of the declaration and data according to *ISO 14025:2010* ☐ internally ☒ externally
 Dipl. Ing. Hans Peters (chairman of Institut Bauen und Umwelt e.V.)	 Matthias Klingler (Independent verifier)
 Dr. Alexander Röder (Managing Director Institut Bauen und Umwelt e.V.))	

2. Product

2.1 Information about the enterprise

Kaimann is a manufacturer of elastomeric insulation materials for technical pipe insulation in building technology and industry.

2.2 Product description/Product definition

Kaiflex HTPLUS, Kaiflex HT s2 is a flexible closed cell rubber insulation that prevents condensation and reduces energy loss. By incorporating a water vapour barrier into the insulation cell structure Kaiflex HTPLUS, Kaiflex HT s2 can effectively eliminate water vapour migration and retain its performance over the entire system life. It is available in tubes with thicknesses from 10 to 57.5 mm.

For the placing on the market of the product in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) *Regulation (EU) No. 305/2011 (CPR)* applies. The product needs a declaration of performance taking into consideration *EN 14304* Thermal insulation products for building equipment and industrial installations - Factory made flexible elastomeric foam (FEF) products - Specification, and the CE-marking. For the application and use the respective national provisions apply.

2.3 Application

In addition to preventing condensation and saving energy, Kaiflex HTplus, Kaiflex HT s2 also performs an acoustic function, absorbing sound and dampening duct wall vibration. It has inherent anti-microbial resistance as standard and a BL-s3, d0 fire rating.

2.4 Technical Data

Constructional data

Name	Value	Unit
Gross density	45	kg/m³

Water vapour diffusion resistance factor acc. to EN 12088	μ ≥ 2000	-
Thermal conductivity	λϑ = 0.032 + 7.2 · 10E-5 ϑ + 1.2*10E-6*ϑ²	W/(mK)
Thermal conductivity at 30 °C	0.035	W/(mK)
Thermal conductivity at 40 °C	0.036	W/(mK)
Thermal conductivity at 50 °C	0.037	W/(mK)

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to *EN 14304* Thermal insulation products for building equipment and industrial installations - Factory made flexible elastomeric foam (FEF) products - Specification.

2.5 Delivery status

The EPD is declared as a specific product of one plant of one manufacturer. This is in accordance with the classification rules for group 1a) from *PCR Part A* paragraph 5.2. The tubes are available in thicknesses between 13 to 19 mm and outer diameters of 48 to 80 mm.

2.6 Base materials/Ancillary materials

Kaiflex HTplus, Kaiflex HT s2 is based on synthetic rubber and consists of several components. The following table shows the components of her insulating foam clustered into substance groups:

- Rubber and polymers: 31%
- Fillers and pigments: 15%
- Blowing agent: 15%
- Vulcanisation system, additives, plasticizer: 3%
- Flame retardant: 35.5%
- Stabilizer: 0.5%

Rubber and polymer are the base material. Fillers and pigments are for firmness and colour. The blowing agent causes the volume increase and expansion process during the manufacture of the product. The vulcanisation system, additives, and plasticizer sure flexibility and workability. The flame retardants ensure the fire resistance of the end-product, and the adhesives and stabilizers are for processing and process control.

1) This product/article/at least one partial article contains substances listed in *SVHC 2019* candidate list (16.01.2020) exceeding 0.1 percentage by mass: **yes**. It contains 15% Azodicarbonamide (CAS number: 123-77-3).
2) This product/article/at least one partial article contains other carcinogenic, mutagenic, reprotoxic (CMR) substances in categories 1A or 1B which are not on *SVHC 2019* candidate list, exceeding 0.1 percentage by mass: **no**.
3) Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) *Ordinance on Biocide Products*: **no**.

2.7 Manufacture

Manufacturing happens in a single plant in Germany. Upon delivery, the raw materials are either stored in a warehouse or used in the production shortly after. The first step in the production of Kaiflex HTplus, Kaiflex HT s2 is to mix the raw materials in a kneader and to roll-out the resulting mixture which is then cut into sheets. The flat sheets are passed through an industrial cooler and cooled-off. The cooled-off sheets are granulated and the granulates are temporarily stored at room temperature before entering the compounding plant.
In the next step, the different types of granulates enter the compounding plant for mixing. The resulting elastomer compound is pushed through one of five extruders and carried on a conveyer belt through an industrial furnace for foaming. After foaming, the endless sheets are passed through an industrial cooler upon which a continuous longitudinal cut is applied to cut sheets into the right width. If applicable, the adhesive coating is applied on one side of the sheets. Finally, a traverse cut trims the continuous sheet into sheets of various sizes.

2.8 Environment and health during manufacturing

The manufacturer of the product complies with national manufacturing guidelines and regulations. KAIMANN's environmental management system is certified in accordance with *ISO 9001/14001/50001.*

2.9 Product processing/Installation

The installation of Kaiflex HTplus, Kaiflex HT s2 requires basic tools such as cutters and scissors. No additional specific protection, beyond normal protective clothes, is required. Liquid oxygen can react explosively in conjunction with organic material such as Kaiflex HTplus, Kaiflex HT s2 insulation material. To avoid the diffusion of oxygen, a complete seal must be affected. Butt joints and overlapping areas must also be made airtight using Kaiflex adhesive.

2.10 Packaging

Kaiflex HTplus, Kaiflex HT s2 is packaged in cardboard boxes, polyethene film, and polypropylene bags, both in varying sizes. Cardboard boxes and polypropylene bags are placed on wooden EURO pallets.

2.11 Condition of use

Changes in materials composition of the product during the use-phase only occur in case of extraordinary effects.

2.12 Environment and health during use

An odour should be considered normal. The odour will dissipate during use (about 4 weeks) because the cells are exchanged with the air.

2.13 Reference service life

Since the use stage (B1-B7) is not fully declared, the declaration of the reference service life is only voluntary.

2.14 Extraordinary effects

Fire

Fire protection

Name	Value
Building material class	EL
Burning droplets	d0

Smoke gas development	-

These properties were tested according to *EN 13501*.

Water
Formed from thousands of independently water-resistant cells, Kaiflex insulation is naturally resistant to moisture ingress and requires no additional water vapour barrier.

Mechanical destruction
Kaiflex insulation materials are flexible foams and display limited mechanical rigidity. If the material should be subjected to mechanical loads, it should be protected accordingly.

2.15 Re-use phase
At the end-of-life, the product can be used for energy recovery in a waste incineration plant, as well as the plastic from packaging. The cardboard and wooden pallets from packaging can be recycled.

2.16 Disposal
The product is disposed of in accordance with local regulations governed by the *European Waste Catalogue* (waste code: 07 wastes from organic chemical processes - 07 02 13 waste plastic).

2.17 Further information
Additional information about the product is available on https://kaimann.com/.

3. LCA: Calculation rules

3.1 Declared Unit
The declared unit is 1 m³ of the thermal insulation material for technical building equipment and industrial installations Kaiflex HTplus, Kaiflex HT s2 including packaging materials. The declared unit refers to the product as it leaves the factory gate. The gross density is the average density of al declared products, weighted by production volume.

Declared unit

Name	Value	Unit
Gross density	45	kg/m³
Conversion factor to 1 kg (in kg/m³)	45	-
Declared unit	1	m³

3.2 System boundary
The type of EPD is cradle to gate with options. The system boundaries of the EPD follow the modular structure of *EN 15804* (according to *EN 15804*, section 6.2.1). Only the declaration of the product stage modules A1 to A3 is mandatory for compliance with *EN 15804*. The declaration of the modules of other life cycle stages is optional. Resources from the ecosphere and technosphere enter the system on stage A1 and leave the system on stage C4. The following life cycle stages are considered:

Module A1: The system boundaries comprise raw material extraction and supply from cradle to factory gate and is represented through generic background data sets.

Module A2: The transport of the raw materials from the factory gate to the point of manufacturing is represented through generic background data sets. The transportation distances have been provided by the manufacturer.

Module A3: The manufacturing includes manufacturer-specific material and energy data which are represented through generic data sets. Machinery as well as buildings to manufacture the declared unit are neglected. On average, 0.49 kWh electricity and 2.65 kWh natural gas are required for the manufacturing of 1m³ Kaiflex HTplus, Kaiflex HT s2. This data was provided by Kaimann GmbH. This module also includes packaging with plastics and cardboard and wooden pallets. The biogenic carbon stored is declared in the result section.

Module A4: The transport of Kaiflex HTplus, Kaiflex HT s2 from the factory gate to the site of assembly is represented through generic background data. The transportation distances are based on average transportation data provided by the manufacturer.

Module A5: The assembly can be done manually without the use of any electrical equipment. Packaging material from module A3 is disposed of here: Plastic packaging is incinerated, and cardboard and the wooden pallet are re-used.

Modules B1-B7: No resource use and impacts occur during the use phase of the products.

Modules C1&C3: Dismantling of Kaiflex HTplus, Kaiflex HT s2 is done manually without using any electrical equipment. No processing is required before disposal. Therefore, module C1 and C3 are disregarded.

Module C2: The products to be disposed of are transported to the waste treatment facility.

Module C4: The waste is treated according to the waste framework directive of the European Union.

Module D: Potential impacts and benefits from energy recovery and recycling are described.

3.3 Estimates and assumptions
Module A2: Raw materials are transported to the manufacturer by road transport and shipping. Information on the transportation distances was provided by the manufacturer. For the calculation, the distances were weighted by the mass of the respective raw materials.

Module A3: No production waste is assumed during the production of Kaiflex.

Module A4: Kaiflex HTplus, Kaiflex HT s2 is distributed in Europe. The average transportation distance per declared unit was calculated based on the sales volume and average transportation distance per country where Kaiflex HTplus, Kaiflex HT s2 is distributed. Based on the sum product of sales volume multiplied with road transportation, the total transportation distances were calculated and divided by the total sales volume to calculate the average transportation distance per declared unit. As a result,

the average road transportation distance per declared unit is 429 km. No loss during transportation is assumed.

Module A5: Kaiflex HTplus, Kaiflex HT s2 is assembled by manual labour using adhesives. It is assumed that no further energy or materials are required in this module and that consumers of Kaiflex HTplus, Kaiflex HT s2 order correct product sizes and thus avoid waste production during the assembly. The packaging materials are disposed of by re-using (cardboard and wooden pallet) and by incineration (polyethene and polypropylene).

Module C2: The average distance of the disassembled product to the point of disposal is assumed to be 75 kilometres covered by road.

Module C4: The product is incinerated.

3.4 Cut-off criteria

All material flows in module A1 are covered and almost all material and energy flows in module A3 are covered. Neglected material or energy flows have a mass or energy contribution of less than one per cent per process and contribute to less than five per cent of mass and energy flows of a module. Infrastructure such as office buildings and the manufacturing hall as well as the machinery required to produce the product have not been considered.

3.5 Background data

The LCA model underlying this EPD was created in *openLCA 1.10* developed by GreenDelta GmbH. The underlying reference database was ecoinvent 3.4 (2017), edited by EuGeos into the EuGeos 15804-IA 3.0 database.

3.6 Data quality

The life cycle inventory for the assessed product is based on an internal assessment of manufacturing and environmental data, assessment of LCA-relevant data for the supply chain and energy measurement within the factors. The required product flows for creation of the product system were handed over to GreenDelta GmbH.
All data was scrutinised and found to be plausible and consistent and were therefore found to be representative.
Some of the background data sets are more than 10 years old but were used when no recent dataset was available. Datasets from the ecoinvent database are assumed to have a high quality.
There are no materials or processes that are left out because they are under the cut-off threshold.

3.7 Period under review

The production data refers to the average of the year 2018.

3.8 Allocation

No allocation is carried out.

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.

The LCA model underlying this EPD was created in openLCA 1.10 developed by GreenDelta GmbH. The underlying reference database was ecoinvent 3.4 (2017), edited by EuGeos into the *EuGeos 15804-IA 3.0* database.

4. LCA: Scenarios and additional technical information

The following technical scenario information serves as a basis for the declared modules. All values refer to the declared unit of 1 m³.

Transport to the building site (A4)

Name	Value	Unit
Transport distance (road)	429	km

Installation into the building (A5)

Name	Value	Unit
Auxiliary	1.6	kg
Water consumption	0	m^3
Other resources	0	kg
Electricity consumption	0	kWh
Other energy carriers	0	MJ
Material loss	0	kg
Output substances following waste treatment on site	16.5	kg
Dust in the air	0	kg
VOC in the air	0	kg

The 16.5 kg is the sum of all packaging materials per declared unit.

End of life (C1-C4)

Name	Value	Unit
Collected separately	45	kg
Collected as mixed construction waste	0	kg
Reuse	0	kg
Recycling	0	kg
Energy recovery	45	kg
Landfilling	0	kg
	-	

45 kg Kaiflex is incinerated for energy recovery.

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Module D includes the credits of the incineration processes from modules C4 and A5 (packaging waste) at a waste incineration plant with an assumed efficiency of R1<0.6.

5. LCA: Results

The life cycle impact assessment method is based on *EN15804*. Energy indicators for resource use utilise the lower calorific value.

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

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A1: 1 m³ Kaiflex HTplus, Kaiflex HT s2

Parameter	Unit	A1	A2	A3	A4	A5	C2	C4	D
GWP	[kg CO_2-Eq.]	1.91E+2	5.61E+0	1.49E+1	3.12E+0	7.48E+0	5.46E-1	1.42E+2	-3.20E+1
ODP	[kg CFC11-Eq.]	4.55E-5	9.89E-7	1.06E-6	5.83E-7	1.31E-8	1.02E-7	2.85E-7	-4.89E-6
AP	[kg SO_2-Eq.]	1.05E+0	5.91E-2	5.21E-2	1.21E-2	8.14E-4	2.12E-3	1.58E-2	-5.04E-2
EP	[kg $(PO_4)^{3-}$-Eq.]	4.19E-1	7.57E-3	1.01E-2	2.18E-3	2.48E-4	3.82E-4	3.87E-3	-1.05E-2
POCP	[kg ethene-Eq.]	4.80E-2	2.05E-3	3.65E-3	5.12E-4	1.73E-5	8.95E-5	4.45E-4	-4.11E-3
ADPE	[kg Sb-Eq.]	4.20E-1	6.69E-5	4.74E-5	3.07E-5	5.28E-7	5.37E-6	9.98E-6	-4.69E-5
ADPF	[MJ]	3.43E+3	8.14E+1	3.47E+2	4.76E+1	1.38E+0	8.32E+0	2.35E+1	-5.94E+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 m³ Kaiflex HTplus, Kaiflex HT s2

Parameter	Unit	A1	A2	A3	A4	A5	C2	C4	D
PERE	[MJ]	1.48E+2	1.37E+0	1.06E+1	7.04E-1	2.33E-2	1.23E-1	9.32E-1	-5.18E+0
PERM	[MJ]	0.00E+0	0.00E+0	2.35E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-2.35E+2
PERT	[MJ]	1.48E+2	1.37E+0	2.45E+2	7.04E-1	2.33E-2	1.23E-1	9.32E-1	-2.40E+2
PENRE	[MJ]	1.97E+3	8.36E+1	2.65E+2	4.87E+1	1.17E+2	8.51E+0	1.81E+3	-6.08E+2
PENRM	[MJ]	1.78E+3	0.00E+0	1.16E+2	0.00E+0	-1.16E+2	0.00E+0	-1.78E+3	0.00E+0
PENRT	[MJ]	3.75E+3	8.36E+1	3.80E+2	4.87E+1	1.40E+0	8.51E+0	2.46E+1	-6.08E+2
SM	[kg]	2.15E+0	3.19E-2	5.35E+0	1.70E-2	1.61E-3	2.98E-3	4.71E-2	-5.27E+0
RSF	[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
NRSF	[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
FW	[m³]	5.74E+0	1.60E-2	1.57E-1	9.38E-3	6.90E-4	1.64E-3	1.79E-1	-1.16E-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 m³ Kaiflex HTplus, Kaiflex HT s2

Parameter	Unit	A1	A2	A3	A4	A5	C2	C4	D
HWD	[kg]	1.56E+0	4.30E-3	1.49E-2	1.27E-3	2.82E-5	2.21E-4	3.92E-4	-6.26E-3
NHWD	[kg]	9.97E+0	1.88E+0	1.72E+0	2.28E+0	2.75E+0	3.99E-1	4.65E+1	-1.69E+0
RWD	[kg]	7.27E-3	5.56E-4	4.15E-4	3.36E-4	5.11E-6	5.87E-5	6.95E-5	-3.69E-4
CRU	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.37E+1	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	0.00E+0	0.00E+0	0.00E+0
MER	[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
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	6.94E+1	0.00E+0	1.07E+3	0.00E+0

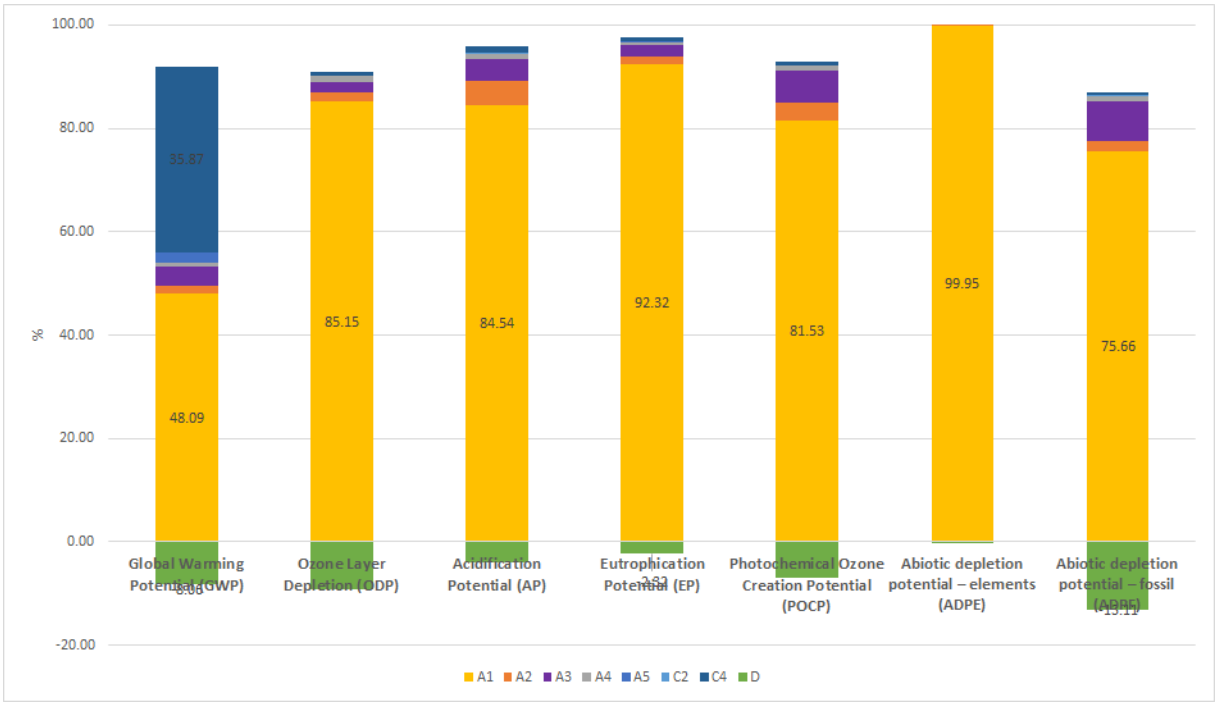
Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EEE = Exported thermal energy

Additional Technical scenario:

Biogenic carbon is not included in the results. It enters the product system with wood and cardboard in modules A3 and is 'released' by being an avoided burden in module A5 (declared in module D) and has thus no net-effect on the overall results. The wooden pallet has approximately 23 kg biogenic CO_2, and the cardboard has 16 kg.

6. LCA: Interpretation

Environmental Impacts



Most environmental impact categories are dominated by module A1 raw material supply. For the global warming potential, the incineration of the product in module C4 is another major source of greenhouse gas emissions.

7. Requisite evidence

7.1 VOC emissions

The Volatile Organic Compound (VOC) emissions have been tested by Eurofins Product Testing A/S by using the Committee for health-related evaluation of building products/Deutsches Institut für Bautechnik (*AgBB/DIBt*) test method in 09.2013.

AgBB overview of results (28 days [µg/m³])

Name	Value	Unit
TVOC (C6 - C16)	<5	µg/m³
Sum SVOC (C16 - C22)	<5	µg/m³
R (dimensionless)	<1	-
VOC without NIK	<5	µg/m³
Carcinogenic Substances	<1	µg/m³

AgBB overview of results (3 days [µg/m³])

Name	Value	Unit
TVOC (C6 - C16)	<5	µg/m³
Sum SVOC (C16 - C22)	<5	µg/m³
R (dimensionless)	<1	-
VOC without NIK	<5	µg/m³
Carcinogenic Substances	<1	µg/m³

7.2 Leaching performance

The concentration of water-soluble chloride ions is 300 mg/kg according to *EN 13468*.

8. References

Standards

EN 12088
EN 12088:2013, Thermal insulating products for building applications. Determination of long term water absorption by diffusion

EN 13468
EN 13468:2001, Thermal insulating products for building equipment and industrial installations - Determination of trace quantities of water soluble chloride, fluoride, silicate, and sodium ions and pH

EN 13501
Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests

EN 14304
EN 14304:2009+A1:2013, Thermal insulation products for building equipment and industrial installations - Factory made flexible elastomeric foam (FEF) products - Specification

EN 15804
EN 15804:2012+A1:2013, Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

ISO 9001
ISO 9001:2015, Quality management systems - Requirements

ISO 14001
ISO 14001:2015-0, Environmental management systems - Requirements with guidance for use

ISO 14025
ISO 14025:2010, Environmental labels and declarations - Type III environmental declarations - Principles and procedures

ISO 50001
ISO 50001:2018-08, Energy management systems - Requirements with guidance for use

Further References

AGBB/DIBt
Deusches Institut für Bautechnik 2018: Anforderungen an die Innenraumluftqualität in Gebäuden: Gesundheitliche Bewertung der Emissionen von flüchtigen organischen Verbindungen (VVOC, VOC und SVOC) aus Bauprodukten

EEG
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Energieeinsparverordnung 2014: Zweite Verordnung zur Änderung der Energieeinsparverordnung

EuGeos 15804-IA 3.0
LCA database by EuGeos Limited

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COMMISSION DECISION amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament and of the Council

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PCR Part A
PCR Part A Version 1.8, Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report

PCR Part B
PCR Part B Version 1.6, Requirements on the EPD for insulating materials made of foam plastics

REACH 2006
REGULATION (EC) No 1907/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

Regulation (EU) No. 305/2011 (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 Text with EEA relevance

SVHC 2019
Candidate List of substances of very high concern for Authorisation (SVHC), European Chemicals Agency, Helsinki, Finland



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@ibu-epd.com
Web **www.ibu-epd.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@ibu-epd.com
Web **www.ibu-epd.com**

GreenDelta

Author of the Life Cycle Assessment
GreenDelta GmbH
Kaiserdamm 13
14057 Berlin
Germany

Tel +49 30 6292 4320
Fax -
Mail gd@greendelta.com
Web **https://www.greendelta.com**



Owner of the Declaration
Kaimann GmbH
Hansastraße 2-5
33161 Hövelhof
Germany

Tel +49 5257 98 50 - 0
Fax +49 5257 98 50 590
Mail info@kaimann.de
Web **https://www.kaimann.com**