

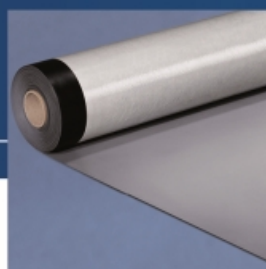
ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804



Owner of the Declaration	FDT FlachdachTechnologie GmbH & Co. KG
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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Rhepanol hfk-sk
FDT FlachdachTechnologie GmbH & Co. KG

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



1. General Information

<p>FDT FlachdachTechnologie GmbH & Co. KG</p> <hr/> <p>Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany</p> <hr/> <p>Declaration number EPD-FDT-20150015-IAA1-EN</p> <hr/> <p>This Declaration is based on the Product Category Rules: Plastic and elastomer roofing and sealing sheet systems, 07.2014 (PCR tested and approved by the SVR)</p> <hr/> <p>Issue date 07.04.2015</p> <hr/> <p>Valid to 06.04.2020</p> <hr/> <p style="text-align: center;"></p> <hr/> <p>Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)</p> <hr/> <p style="text-align: center;"></p> <hr/> <p>Dr. Burkhard Lehmann (Managing Director IBU)</p>	<p>Rhepanol hfk-sk</p> <hr/> <p>Owner of the Declaration FDT FlachdachTechnologie GmbH & Co. KG Eisenbahnstr. 6-8 68199 Mannheim</p> <hr/> <p>Declared product / Declared unit 1 m² produced roofing membrane Rhepanol hfk-sk</p> <hr/> <p>Scope: The Declaration applies for Rhepanol hfk-sk roofing membrane, 1.5 mm thick, manufactured in 68199 Mannheim-Neckarau. This document is translated from the German Environmental Product Declaration into English. It is based on the German original version EPD-FDT-20150015-IAA1-DE. The verifier has no influence on the quality of the translation. The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.</p> <hr/> <p>Verification</p> <p>The CEN Norm /EN 15804/ serves as the core PCR</p> <p>Independent verification of the declaration according to /ISO 14025/</p> <p><input type="checkbox"/> internally <input checked="" type="checkbox"/> externally</p> <hr/> <p style="text-align: center;"></p> <hr/> <p>Matthias Schulz (Independent verifier appointed by SVR)</p>
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2. Product

2.1 Product description

Rhepanol hfk-sk is a bitumen-compatible polyisobutylene (PIB) synthetic roofing membrane comprising PIB of high molecular weight, co-polymers and functional additives as well as a glass/synthetic non-woven fleece on the underside and a full-surface self-adhesive layer including protective foil. Rhepanol hfk-sk seams are hot air-welded.

2.2 Application

Rhepanol hfk-sk is used for single-layer sealing on both flat and inclined roofs in adhered layers.

The manufacturer's installation instructions must be maintained during processing.

2.3 Technical Data

Structural data

Name	Value	Unit
Water vapour diffusion resistance value μ /DIN EN 1931/ (method B)	≥ 160.000	
Tensile strength /DIN EN 12311-2/ (method B)	≥ 4	N/mm ²
Tensile strain /DIN EN 12311-2/ (B)	≥ 400	%
Seam peel resistance /DIN EN 12316-2/	≥ 150	N/50 mm

Seam shear resistance /DIN EN 12317-2/	≥ 200 (tearing outside the seam)	N/50 mm
Resistance to abrupt loads, rigid underlay / flexible underlay /DIN EN 12691/	$\geq 700 / \geq 700$	mm
Resistance to static loads /DIN EN 12730/ (method A/B)	≥ 15	kg
Hail, rigid underlay / flexible underlay /DIN EN 13583/	$\geq 20 / \geq 30$	m/s
Tear resistance /DIN EN 12310-2/	≥ 150	N
Dimensional stability after warm storage /DIN EN 1107-2/	$\leq 0,5$	%
Performance when exposed to bitume /DIN EN 1548/	passed	
Resistance to chemicals /DIN EN 1847/ (List in Annex C)	fulfilled	
UV radiation /DIN EN 1297/	Class 0 (5000 h)	h
Water tightness /DIN EN 1928/ (method B)	≥ 400	kPa
Resistance to root penetration (for green roofs) acc. to /EN 12948/ and FLL (roofing membranes)	Not of relevance	-
Ozone resistance (for EPDM/IIR)	Not of	-

acc. to /EN 1844/ (roof membranes)	relevance	
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2.4 Placing on the market / Application rules

Rhepanol hfk-sk is a bitumen-compatible PIB synthetic membrane with a glass/synthetic non-woven fleece on the underside and a full-surface self-adhesive layer based on /DIN EN 13956/ and /DIN V 20.000-201: DE/E1/ PIB-BV-E-GV-1.5.

2.5 Delivery status

The standard dimensions of Rhepanol hfk-sk (length x width x thickness) are 15 m x 1.50 m x 1.5 mm (thickness excl. sheathing).

2.6 Base materials / Ancillary materials

Rhepanol hfk-sk comprises a sealing layer with 50-65% polyisobutylene (PIB) and copolymers, 30-45% flame retardants (metal hydroxide) and functional mineralogical aggregates, 2-10% titanium dioxide and 0.5-2.0% carbon black and additives. Rhepanol hfk-sk is also reinforced using a glass and synthetic non-woven fleece inlay and has a self-adhesive layer. Details vary depending on the colour, sheathing and adhesive layer.

The formulation was examined in accordance with the current /REACH/ list of candidates. The formulation does not contain any substances of high concern /SVHC/.

2.7 Manufacture

Rhepanol hfk-sk compounds are produced by a continuous operating mixer in which the individual raw materials are combined to form a homogeneous mass before being granulated. The granulate is added to a calendar via another mixing extruder and mixing roll which shapes the membranes. A doubling calendar combines two synthetic membranes with glass non-woven fleece, synthetic non-woven fleece and self-adhesive layering. The roofing membranes are packed at the end of the doubling calendar.

Production is subject to the Quality Management system introduced in accordance with /ISO 9001/. The certification agency is TÜV Süd Management Service.

External quality monitoring and tests (are also performed by the State Material Testing Institute in Darmstadt.

2.8 Environment and health during manufacturing

Over and beyond national guidelines, environmentally-friendly processes are used in the production of Rhepanol hfk-sk, e.g.

> an electric separator is used for waste air which achieves a high degree of waste air purity,

> waste heat for heating and hot water is used in the energy-efficient production processes and Environment Management system (EMS) in accordance with /DIN 50001/) and

> the production waste incurred is redirected to the production circuit in the form of in-company recycling.

In order to ensure the health and safety of employees, workplace designs are continuously improved for the purpose of physical relief and optimised ergonomics and regular seminars are held on the topic of health and safety.

2.9 Product processing/Installation

Rhepanol hfk-sk is rolled out on the roof and joined overlapping at the seams using hot-air welding.

Rhepanol hfk-sk is glued to the surface. The Rhepanol hfk-sk adhesive layer does not contain any bitumen and is solvent-free. The self-adhesive membrane is rolled out onto a suitable surface (clean, even, poss. with primer) and aligned. Then the protective foil is removed, starting at one end of the membrane (0.7 – 1 metre). The end of the roofing membrane is glued. The protective foil is pulled out sideways from under the roofing membrane and the roofing membrane is then pressed into place across the entire surface using a brush, thereby gluing it. This is followed by welding the seam.

When using adhesive and ancillary materials, the processing guidelines and information on the containers and safety data sheets must be observed.

The following must be observed when cleaning the seam with cleaning agents containing solvents or when using primers containing solvents:

- Avoid contact with the skin and eyes
- Wear gloves
- No smoking, no naked flames, avoid sparking
- Do not inhale vapours, only use outdoors or in well-ventilated rooms

No particular measures concerning health and safety are required when hot air welding Rhepanol hfk-sk.

More information on professional installation is outlined in the technical manual.

2.10 Packaging

Nine rolls of Rhepanol hfk-sk are stored on a Euro pallet covered with a PE hood. A protective separating layer made of cardboard is between the Euro pallets and rolls and the top side of the rolls features a protective cardboard sheet. The rolls are secured by four wooden wedges. The pallet is shrink-wrapped in PE stretch foil and bound by four plastic straps. All packaging materials are recyclable and re-usable.

2.11 Condition of use

On the basis of long-term experience, there are no relevant changes concerning material composition for the period of use of Rhepanol hfk-sk.

2.12 Environment and health during use

There are no references to possible material emissions during the use phase for Rhepanol hfk-sk.

2.13 Reference service life

Under normal conditions and correct installation, Rhepanol hfk-sk has a life cycle of 35 years and more.

2.14 Extraordinary effects

Fire

Name	Value
Reaction to fire tests /DIN EN 11925-2 / /DIN EN 13501-1/	Class E / passed
Performance in case of external fire exposure to roofs /DIN CEN TS 1187: 2012-03/ /DIN EN 13501-5/	B (t1) / passed

Comments

The B roof (t1) test results in accordance with /DIN CEN TS 1187: 2012-03/ apply for the roof structures tested by FDT.

Water

The materials used for Rhepanol hfk-sk are not water-soluble.

Mechanical destruction

There are no known negative consequences for the environment in the event of unforeseen mechanical destruction of Rhepanol hfk-sk.

2.15 Re-use phase

Rhepanol hfk-sk is not re-used in its original form once the use phase has expired. When separated by type, Rhepanol hfk-sk can be directed to the "ROOFCOLLECT" collection system (recycling system for synthetic roofing and water-proofing membrane systems). This collection system manufactures a recycle from the old roofing membranes which can be used or re-used for a variety of applications, e.g. for garden slabs or noise-insulating boards.

Thermal utilisation is also possible with the result that the energy contained in Rhepanol hfk-sk is released and used during incineration.

2.16 Disposal

After Rhepanol hfk-sk has fulfilled its function, it is directed towards thermal utilisation; please refer to 2.15. The roofing membranes can be allocated to number 170904 or 200139 in the /List of Wastes Ordinance/.

2.17 Further information

More information on Rhepanol hfk-sk in the form of brochures, data sheets, installation instructions and technical manuals can be found on the FDT website (www.fdt.de).

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit is 1 m² Rhepanol hfk-sk 1.5 mm of roofing membrane produced.

3.1 Declared unit

Name	Value	Unit
Declared unit	1	m ²
Grammage	2.139	kg/m ²
Type of sealing	Thermal welding	-
Conversion factor to 1 kg	0.468	-
Thickness	1,5	mm

3.2 System boundary

This Life Cycle Analysis addresses the life cycle stage of product manufacturing (cradle to gate). The product stage comprises Module A1 (Raw material supply), A2 (Transport), A3 (Production) in accordance with EN 15804 including the provision of all materials, products and energy. Waste indicated in A1-A3 only concerns that which is recycled internally.

3.3 Estimates and assumptions

Polybutylene was used as a conservative estimate for polyisobutylene as the exact data record for the polymer was not available. This is modelled as 100% for raw material mixtures in which one component accounts for at least 95%..

3.4 Cut-off criteria

All data from the operating data survey was taken into consideration in the analysis, i.e. all starting materials used according to the recipe, the thermal energy used as well as electricity. Transport costs were considered for all inputs and outputs.

3.5 Background data

The primary data was provided by FDT FlachdachTechnologie GmbH Co. KG. The background data was taken from the GaBi software data base offered by PE INTERNATIONAL AG /GaBi 6 2014/. The German power mix was applied.

3.6 Data quality

The data recorded by FDT FlachdachTechnologie GmbH Co. KG for production year 2013 was used for the various recipes for modelling the product stage associated with the synthetic roofing membranes. All other relevant background data sets were taken from the GaBi 6 software data base which was last revised in November 2014. The representativity can be classified as very good.

3.7 Period under review

The data for this Life Cycle Analysis is based on data records from 2013. The volumes of raw materials, energy, auxiliaries and consumables used are considered as average annual values in the Mannheim-Neckarau manufacturing plant.

3.8 Allocation

Production waste which is re-used internally (the edge trims in production) is modelled as closed-loop recycling in Modules A1-A3.

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.

4. LCA: Scenarios and additional technical information

Disposal

It can be assumed that in 80% of current roof refurbishments the roofing membranes remains on the roof and serves as an underlay for a new covering. Accordingly, in most cases disposal of the roofing membrane occurs later when the building is demolished and this subsequent use means that it is no longer within the system boundaries considered here. Under such conditions, disposal as municipal solid waste can therefore be assumed for 20% of waste (25% incineration, 75% landfilling).

No scenarios are considered in this Life Cycle Analysis of synthetic roofing membrane Systems.

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	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m² roofing membrane

Parameter	Unit	A1-A3
Global warming potential	[kg CO ₂ -Eq.]	8.49E+0
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	4.98E-10
Acidification potential of land and water	[kg SO ₂ -Eq.]	3.19E-2
Eutrophication potential	[kg (PO ₄) ³ -Eq.]	1.90E-3
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	3.41E-3
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	6.64E-6
Abiotic depletion potential for fossil resources	[MJ]	1.64E+2

RESULTS OF THE LCA - RESOURCE USE: 1 m² roofing membrane

Parameter	Unit	A1-A3
Renewable primary energy as energy carrier	[MJ]	1.61E+1
Renewable primary energy resources as material utilization	[MJ]	0.00E+0
Total use of renewable primary energy resources	[MJ]	1.61E+1
Non-renewable primary energy as energy carrier	[MJ]	1.09E+2
Non-renewable primary energy as material utilization	[MJ]	6.75E+1
Total use of non-renewable primary energy resources	[MJ]	1.76E+2
Use of secondary material	[kg]	0.00E+0
Use of renewable secondary fuels	[MJ]	0.00E+0
Use of non-renewable secondary fuels	[MJ]	0.00E+0
Use of net fresh water	[m ³]	4.39E-2

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES:

1 m² roofing membrane

Parameter	Unit	A1-A3
Hazardous waste disposed	[kg]	4.22E-3
Non-hazardous waste disposed	[kg]	3.38E-1
Radioactive waste disposed	[kg]	4.70E-3
Components for re-use	[kg]	0.00E+0
Materials for recycling	[kg]	0.00E+0
Materials for energy recovery	[kg]	0.00E+0
Exported electrical energy	[MJ]	0.00E+0
Exported thermal energy	[MJ]	0.00E+0

6. LCA: Interpretation

A dominance analysis can be used to discuss the main influential factors in terms of the product's environmental performance.

Indicators of the Life Cycle Inventory Analysis and estimated impact

The absolute value of the use of non-renewable energy carriers as primary energy (**PENRT**) is approx. 11 times higher than the use of renewable primary energy carriers (**PERT**).

In the dominance analysis, it is apparent that the flame retardant has a certain to significant influence on the various environmental categories.

The flame retardant and polymers make relevant contributions to the global warming potential (**GWP**). A

moderately important influence is exerted by electricity, thermal energy and PES non-woven fleece.

The flame retardant has a relevant influence on the eutrophication potential (**EP**) and acidification potential (**AP**). This is seconded by polymers for the EP and titanium dioxide for the AP, both of which have a relevant influence. The flame retardant makes a significant contribution to the ozone depletion potential (**ODP**) and total use of renewable primary energy (**PERT**). The flame retardant only has a moderately important influence on abiotic depletion of resources – elementary (**ADPE**), abiotic depletion of resources – fossil fuels (**ADPF**) and total use of non-renewable primary energy (**PENRT**), whereby the polymers have a relevant influence.

The glass non-woven fleece inlay accounts of the greatest contribution to ADPE. The polymers make a

very important contribution to the photochemical ozone creation potential (**POCP**).

7. Requisite evidence

Es sind keine Nachweise erforderlich.

8. References

Institut Bauen und Umwelt

Institut Bauen und Umwelt e.V., Berlin(pub.):
Generation of Environmental Product Declarations
(EPDs);

General principles

for the EPD range of Institut Bauen und Umwelt e.V.
(IBU), 2013/04
www.bau-umwelt.de

ISO 14025

DIN EN ISO 14025:2011-10: Environmental labels and
declarations — Type III environmental declarations —
Principles and procedures

EN 15804

EN 15804:2012-04+A1 2013: Sustainability of
construction works — Environmental Product
Declarations — Core rules for the product category of
construction products

Product Category Rules for Construction Products,

Part A: Calculation rules for the Life Cycle
Assessment and requirements on the Background
Report, 2013-04

PCR 2014, Part B: PCR instructions for construction -
related products and services in the construction
products group pertaining to synthetic and elastomer
roofing membrane systems (2014)

GaBi 6:

PE INTERNATIONAL AG, GaBi 6: Software system
and data base for comprehensive analysis; copyright,
TM Stuttgart, Echterdingen, 1992-2014

GaBi 6D:

GaBi 6 documentation: data sets from the data base
for comprehensive analysis; copyright, TM Stuttgart,
Echterdingen, 1992-2014. [http://documentation.gabi-
software.com/](http://documentation.gabi-software.com/)

AVV (List of Wastes Ordinance) Issue date:
10/12/2001

No. 17 09 04: Mixed building and demolition rubble
with the exception of those covered by 17 09 01, 17 09
02 and 17 09 03

No. 200139: Plastics

DIN EN 495-5:201210

Flexible sheets for waterproofing – Determination of
foldability at low temperature – Part 5: Plastic and
rubber sheets for roof waterproofing

DIN EN 1107-2:2001-04 Flexible sheets for
waterproofing – Determination of dimensional stability
– Part 2: Plastic and rubber sheets for roof
waterproofing

DIN CEN TS 1187:2012-03 Test methods for external
fire exposure to roofs

DIN EN 1297:2004-12 Flexible sheets for
waterproofing – Bitumen, plastic and rubber sheets for
roof waterproofing – Method of artificial ageing by long-
term exposure to the combination of UV radiation,
elevated temperature and water

DIN EN 1548:2007-11 Flexible sheets for
waterproofing – Plastic and rubber sheets for roof
waterproofing – Method for exposure to bitumen

DIN EN 1847:2010-4 Flexible sheets for waterproofing
– Plastics and rubber sheets for roof waterproofing –
Methods for exposure to liquid chemicals, including
water

DIN EN 1928:2000-07 Flexible sheets for
waterproofing – Bitumen, plastic and rubber sheets for
roof waterproofing – Determination of watertightness

DIN EN 1931:2001-03 Flexible sheets for
waterproofing – Bitumen, plastic and rubber sheets for
roof waterproofing – Determination of water vapour
transmission properties

ISO 9001:2008-12 Quality management systems –
Requirements

DIN EN ISO 11925-2:2011-02 Reaction to fire tests –
Ignitability of products subjected to direct impingement
of flame

DIN EN 12310-2:2000-12 Flexible sheets for
waterproofing – Determination of resistance to tearing
– Part 2: Plastic and rubber sheets for roof
waterproofing

DIN EN 12311-2:2010-12 Flexible sheets for
waterproofing – Determination of tensile properties –
Part 2: Plastic and rubber sheets for roof waterproofing

DIN EN 12316-2:2012-10 Flexible sheets for
waterproofing – Determination of peel resistance of
joints – Part 2: Plastic and rubber sheets for roof
waterproofing

DIN EN 12317-2:2010-12 Flexible sheets for
waterproofing – Determination of shear resistance of
joints – Part 2: Plastic and rubber sheets for roof
waterproofing

DIN EN 12691:2006-06 Flexible sheets for
waterproofing – Bitumen, plastic and rubber sheets for
roof waterproofing – Determination of resistance to
impact

DIN EN 12703:012-06 Adhesives for paper and board,
packaging and disposable sanitary products –

Determination of low temperature flexibility or cold crack temperature

DIN EN 13501-1:2010-01 Classification of construction products and methods by reaction to fire – Part 1: Classification with the results of tests on reaction to fire of construction products

DIN EN 13501-5:2010-02 Classification of construction products and methods by reaction to fire – Part 5: Classification using data from external fire exposure to roofs tests

DIN EN 13583:2012-10 Flexible sheets for waterproofing – Bitumen, plastic and rubber sheets for roof waterproofing – Determination of hail resistance

DIN EN 13948:2008-01 Flexible sheets for waterproofing – Bitumen, plastic and rubber sheets for roof waterproofing – Determination of resistance to root penetration

DIN EN 13956:2012-05 Flexible sheets for waterproofing – Plastic and rubber sheets for roof waterproofing – Definitions and characteristics

DIN EN ISO 14025:2009-11 Environmental labels and declarations – Type III environmental declarations – Principles and procedures.

DIN V 20000-201:2006-11 Use of construction products in construction works – Part 201: Adaptation standard for flexible sheets for waterproofing according to European standards for use as waterproofing of roofs

DIN V 20000-202:2007-12 Use of construction products in construction works – Part 202: Adaptation standard for flexible sheets for waterproofing according to European standards for use as waterproofing

DIN EN ISO 50001:2011-12 Energy management systems – Requirements with guidance for use

REACH

Directive (EC) No. 1907/2006 of the European Parliament and Council of 18 December 2006 on the Registration, Evaluation, Authorisation of Chemicals (REACH) for establishing a European Chemicals Agency

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