

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A1

Owner of the Declaration	Rudolf Hensel GmbH
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-RHG-20190097-IAC1-EN
Issue date	08.10.2019
Valid to	07.10.2024

HENSOTHERM® 410 KS / 420 KS / 421 KS
HENSOTHERM® 461 KS / 471 KS
RENITHERM® PMA 600 HD / 1200 HD

Rudolf Hensel GmbH

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



1. General Information

Rudolf Hensel GmbH

Programme holder

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

Declaration number

EPD-RHG-20190097-IAC1-EN

This declaration is based on the product category rules:

Coatings with organic binders, 09.2017
(PCR checked and approved by the SVR)

Issue date

08.10.2019

Valid to

07.10.2024



Dipl. Ing. Hans Peters
(chairman of Institut Bauen und Umwelt e.V.)



Dr. Alexander Röder
(Managing Director Institut Bauen und Umwelt e.V.)

HENSOTHERM® 410 KS / 420 KS / 421 KS
HENSOTHERM® 461 KS / 471 KS
RENITHERM® PMA 600 HD / 1200 HD

Owner of the declaration

Rudolf Hensel GmbH
Lack- und Farbenfabrik
Lauenburger Landstraße 11
21039 Börsen

Declared product / declared unit

The declared products are HENSOTHERM® 410 KS / 420 KS / 421 KS / 461 KS / 471 KS and RENITHERM® PMA 600 HD / 1200 HD. The declared unit involves 1 kilogram of the product. The packaging is included in the calculation. The declared unit is indicated in [kg].

Scope:

This document refers to HENSOTHERM® 410 KS / 420 KS / 421 KS / 461 KS / 471 KS and RENITHERM® PMA 600 HD / 1200 HD. Specific data from the Rudolf Hensel GmbH manufacturing plant in Börsen was used for generating this LCA. This LCA is based on data from 2018 which corresponds with the annual average.

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.

Verification

The standard EN 15804 serves as the core PCR

Independent verification of the declaration and data according to ISO 14025:2010

☐ internally ☒ externally



Dr.-Ing. Wolfram Trinius
(Independent verifier appointed by SVR)

2. Product

2.1 Product description/Product definition

HENSOTHERM® 410 KS / 420 KS / 421 KS / 461 KS / 471 KS and RENITHERM® PMA 600 HD / 1200 HD are water-based intumescent fire protection coatings. They are factory-produced dispersion coatings with organic binding agents, water, mineral fillers, pigments and additives. The coatings are classified as low-emission, and contain no borates, plasticisers, halogens, formaldehydes or alkylphenol ethoxylates (APEO).

The fire protection coatings are part of the "Green Product Line" of Rudolf Hensel GmbH.

Products according to CPR with ETA:Directive (EU)

No. 305/2011 (CPR) applies for placing the HENSOTHERM® 410 KS / 420 KS / 421 KS products on the market in the EU/EFTA (with the exception of Switzerland). The products require a Declaration of Performance taking consideration of /ETA No. 11/0481/ for HENSOTHERM® 410 KS and /ETA No. 12/0050/ for HENSOTHERM® 420 KS and /ETA No. 16/0251/ for HENSOTHERM® 421 KS and the corresponding CE marking.

Use is governed by the respective national regulations.

Products which are not subject to any EU harmonisation legislation guidelines:

Application of the HENSOTHERM® 461 KS / 471 KS and RENITHERM® PMA 600 HD / 1200 HD products – approved in accordance with the British Standard /BS 476, Part 20/21/ – is subject to the respective national specifications at the place of use; in Germany, e.g. the state building codes and the technical specifications based on these guidelines.

2.2 Application

Fire protection of steel components with H and I profiles (columns and beams) and hollow sections for a fire resistance duration of up to 180 minutes in accordance with /EN13501-2/ and for design temperatures of 350 °C to 750 °C.

The products are suitable for galvanised surfaces.

In general, the complete coating system consists of a suitable anti-corrosion primer, the fire protection coating and, if required, a suitable topcoat. Primers and topcoats are not components of this EPD.

European Technical Assessment in accordance with /EAD 350402-00-1106/:

The main application of HENSOTHERM® 410 KS is for fire resistance durations of 30 – 60 minutes; HENSOTHERM® 420 KS and HENSOTHERM® 421 KS mainly cover the range from 90 – 120 minutes.

Approval in accordance with Warrington Certifire Ltd. – /TS15/, Intumescent Coatings for Steelwork:

The main application of HENSOTHERM® 461 KS is for fire resistance durations of 30 – 60 minutes; HENSOTHERM® 471 mainly covers the range from 90 – 180 minutes. RENITHERM® PMA 600 HD is a multiple listing transfer from HENSOTHERM® 461 KS while RENITHERM® PMA 1200 HD is a multiple listing transfer from HENSOTHERM® 471 KS.

All fire protection coatings referred to above are mainly used indoors and in open buildings. They are not to be used on construction units that are constantly exposed to rain or moisture or aggressive gases for a longer period of time.

2.3 Technical Data

HENSOTHERM® 410 KS / 420 KS / 421 KS / 461 KS / 471 KS and RENITHERM® PMA 600 HD / 1200 HD do not contain any hazardous substances exceeding the limit values in accordance with the /REACH Directive, Annex XVII/ and the /ECHA candidate list/ of substances of very high concern.

Construction data

Name	Value	Unit
Density	1300 - 1400	kg/m³
Solids content	66 - 72	%
pH value	7.7 - 8.7	log ₁₀ (a _{H+})
Fire resistance /EN13381-8/, /EN13501-2/	R15 - R180	min
Reaction to fire /EN13501-1/	Building material class E	-
Durability /ETAG 018-2/	Typ Y, Z2, Z1	410 / 420 / 421 KS

Total VOC /ISO 11890-2/	< 1g/l	Detection limit
HENSOTHERM® 410 KS / 420 KS / 421 KS / 461 KS / 471 KS and RENITHERM® PMA 600 HD / 1200 HD are emission-rated coating materials. Sampling, testing and evaluation were effected in accordance with the latest versions of /AgBB/, /LEED/, /ISO 16000-3/, /ISO 16000-6/, /ISO 16000-9/ and /ISO 16000-11/.		

Germany:

HENSOTHERM® 410 KS, HENSOTHERM® 420 KS and HENSOTHERM® 421 KS meet the requirements of the /Approval guidelines for the health-related evaluation of indoor construction products/ in conjunction with the LCI values of the /AgBB/ in the version dated June 2012.

France:

CMR substances: The tested products meet the requirements of the French Directives /DEVP0908633A/ of 30 April 2009 and /DEVP0910046A/ of 28 May 2009.

VOC classification: HENSOTHERM® 410 KS, HENSOTHERM® 420 KS and HENSOTHERM® 421 KS were classified as VOC emission class A+. The recommended classification is based on the French regulation for labelling building products or wall panelling, flooring, paints, and lacquers with respect to their emissions of volatile contaminants, as published on 25 March 2011 (décret DEVL1101903D) and 13 April 2011 (arrêté DEVL1104875A).

Belgium:

HENSOTHERM® 410 KS, HENSOTHERM® 420 KS and HENSOTHERM® 421 KS meet the requirements of the /Royal Decree for determining the limit values for indoor emissions by construction products for certain intended types of use/ (draft of December 2012).

HENSOTHERM® 461 KS / 471 KS and RENITHERM® PMA 600 HD / 1200 HD meet the requirements for low-emitting paint and coating material in credit EQc2 of the /LEED/v4 rating system and comply with the requirements in accordance with (i) /Standard Method v1.1-2010/ and (ii) VOC content to /ASTM D 2369-10/ and (iii) /Rule 1113/.

Products according to /CPR/ with ETA:

The performance values of HENSOTHERM® 410 KS / 420 KS / 421 KS products correspond with the Declaration of Performance in terms of their essential properties in accordance with /ETA No. 11/0481/ for HENSOTHERM® 410 KS, /ETA No. 12/0050/ for HENSOTHERM® 420 KS and /ETA No. 16/0251/ for HENSOTHERM® 421 KS

Products which are not subject to any EU harmonisation legislation guidelines:

The performance values of HENSOTHERM® 461 KS / 471 KS and RENITHERM® PMA 600 HD / 1200 HD products in accordance with the applicable technical regulation Certifire Technical Schedule /TS15/ Intumescent Coatings for Steelwork (no CE marking)

2.4 Delivery status

HENSOTHERM® 410 KS / 420 KS / 421 KS / 461 KS / 471 KS and RENITHERM® PMA 600 HD / 1200 HD are liquid coating materials and are offered in plastic containers ranging in size from 6 to 25 kg.

2.5 Base materials/Ancillary materials

Name	Value	Unit
Polymer dispersion -50%	15 - 25	% [m/m]
Pigment TiO ₂	5 - 15	% [m/m]
Ammonium polyphosphate	20 - 30	% [m/m]
Melamine	5 - 15	% [m/m]
Pentaerythritol	5 - 15	% [m/m]
Dispersing agents	< 1	% [m/m]
Thixotropic agents	< 1	% [m/m]
In-can preservatives	< 0,25	% [m/m]
Water	15 - 25	% [m/m]

The in-can preservative contained in the product comes from the group of isothiazolinones.

2.6 Manufacture

HENSOTHERM® 410 KS / 420 KS / 421 KS / 461 KS / 471 KS and RENITHERM® PMA 600 HD / 1200 HD are manufactured in a fully-automatic dispersing unit. The dosage of the liquid raw materials is effected largely automatically; powders are dosed manually. The preliminary products required for manufacture are made available after an inspection of the incoming materials.

After the batches have been produced, an internal quality control is carried out. This comprises technical quality characteristics relating to paint and fire protection requirements. Besides the internal factory control, official external monitoring takes place at regular intervals.

2.7 Environment and health during manufacturing

The preliminary products are stored in such a way that, as far as humanly possible, they can not enter the environment.

With raw materials that are dosed automatically, direct contact between the workers and the preliminary products is avoided. When raw materials in powder form are dosed manually, direct contact with the raw material is reduced to a minimum. As well as adequately dimensioned extraction units, the workers have protective clothing and dust masks at their disposal. Suitable body protection equipment is also provided.

The production process is optimised in such a way that the parts of the unit can be cleaned in situ. Any cleaning water is fed back into the production process as production water. If this is not possible on account of a product change, the cleaning water is collected and thermally recycled.

All types of waste are sorted, stored and returned to the recycling process.

HENSOTHERM® 410 KS / 420 KS / 421 KS / 461 KS / 471 KS and RENITHERM® PMA 600 HD / 1200 HD do not contain any substances subject to declaration in accordance with the /REACH Directive, Annex XVII/ and the /ECHA candidate list/.

2.8 Product processing/Installation

The product can be applied using brushes, rollers or sprays.

Details concerning surface pre-treatment, application requirements and drying behaviour can be seen in the current technical information sheet (see www.rudolf-hensel.de).

2.9 Packaging

The coatings are filled in plastic containers made of polypropylene (PP), which are recycled by the customers returning the packaging. The plastic containers are packed on pallets for shipping and are protected with a shrink foil made of *low-density polyethylene* (LDPE).

2.10 Condition of use

The two coatings are intumescent fire protection coatings on an aqueous polymer dispersion basis for the protection of steel components. After the coatings have been applied, the film is formed by physical drying (evaporation) of the receptively contained water. The dried polymer film, including the non-aqueous substances, remains on the coated component.

2.11 Environment and health during use

HENSOTHERM® 410 KS / 420 KS / 421 KS / 461 KS / 471 KS and RENITHERM® PMA 600 HD / 1200 HD are coatings with extremely low emissions and are regarded as being harmless to health. Emission tests – performed in independent laboratories – have confirmed that the fire protection coatings meet the requirements of various national and international emissions standards, with classification in the lowest emission class (see Section 7).

The coatings contain no borates, plasticisers, halogens, formaldehydes or alkylphenol ethoxylates (APEO).

2.12 Reference service life

For HENSOTHERM® 410 KS / 420 KS / 421 KS, when used for the intended purpose, the service life is at least 10 years, in accordance with /EAD 350402-00-1106/. The respective "Technical Approval Body" has recommended a service life of 25 years for dry interior applications – category Z2 in accordance with /EAD 350402-00-1106/. However, the practical service life can be far longer. A precondition for a long service life is that the requirements of correct handling and regular inspection of the coated surfaces are satisfied.

The service life is not limited for HENSOTHERM® 461 KS / 471 KS and for RENITHERM® PMA 600 HD /1200 HD in accordance with /TS15/ Intumescent Coatings for Steelwork.

The information concerning service life can not be interpreted as a guarantee given by the manufacturer, but serves as an aid towards the selection of the right

product, taking account of the expected and economically reasonable service life of the building.

When the products are used according to the standard codes of practice, adverse influences through ageing are not known.

2.13 Extraordinary effects

Fire

Intumescent fire protection coatings are reactive systems which, under the influence of temperature – through a sharp increase in volume (propellant melamine – decomposition into NH₃, N₂, H₂O und CO₂) – form a high-carbon insulation layer. On account of its very low thermal conductivity, the insulation layer protects the substrate from a material-destroying increase in temperature. Through the further influence of temperature, a stable, inorganic insulation layer is finally formed, consisting mainly of titanium pyrophosphate. The mode of functioning of the fire protection coating is thus irreversible.

Fire protection

Name	Value
Building material class acc. to /EN 13501-1/	E

Water

HENSOTHERM® 410 KS / 420 KS / 421 KS / 461 KS / 471 KS and RENITHERM® PMA 600 HD / 1200 HD are fire protection coatings for dry interiors / open halls and must not be exposed to permanent rain or water.

In the presence of water (e.g. flooding), the coating film becomes soft and shows a slight ammoniacal reaction (pH 7.7 – 8.7).

No substances hazardous to water are washed out.

Mechanical destruction

High-viscous variants of the respective fire protection coatings are available for repairing surface damage and surface impairments. These products are used as repair putties.

No consequences for the environment caused by unforeseen mechanical destruction are known.

2.14 Re-use phase

On account of their shares of organic products, HENSOTHERM® 410 KS / 420 KS / 421 KS / 461 KS / 471 KS and RENITHERM® PMA 600 HD / 1200 HD have a substance-inherent energy content which can be recovered in incineration plants.

Taking account of the carbon content of the coating, the steel coated with the fire protection coatings referred to above can be returned to the steel recycling process.

If the fire protection coating is to be deposited separately, it meets the required standards for disposal. On account of the thermoplastic properties of the fire protection coating, the latter can be softened with a hairdryer and then mechanically removed with a scraper.

2.15 Disposal

The following waste code numbers must be taken into account:

a) Coated steel

/AVV/ No. (recommended): 170405 Construction and demolition waste – Iron and steel

b) Solid product residue:

/AVV/ No. (recommended): 080118 Waste from paint and varnish removal with the exception of that covered by 080117

c) Liquid product residue:

/AVV/ No. (recommended): 080120 Aqueous suspensions containing paint and varnish with the exception of that covered by 080119

Packaging that can not be cleaned is to be disposed of like the substance. Uncontaminated packaging can be recycled.

/AVV/ No. (recommended): 1501025 Packaging made of plastic

2.16 Further information

Further product information is available at: www.rudolf-hensel.de

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit is a fire retardant by Rudolf Hensel GmbH with the designations HENSOTHERM® 410 KS / 420 KS / 421 KS / 461 KS / 471 KS or RENITHERM® PMA 600 HD / 1200 HD, with packaging. The calculated weight is one kilogram of the fire retardant. The packaging is also included in the calculation. The following table depicts the data on the declared unit.

Declared unit

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

3.2 System boundary

Type of EPD: cradle to plant gate. The following information modules are defined in this study as system boundaries:

A1-A3 Product stage:

- A1, Raw material supply
- A2, Transport to manufacturer
- A3, Production

A total of three information modules are reviewed in order to obtain an accurate record of the indicators and environmental impact of the declared unit. Information modules A1 to A3 outline the provision of raw materials, transport to the production facility and the actual product production process. All preliminary

products are procured mainly in Germany. Transport is exclusively by truck. The following process diagram depicts the production process on which this is based.

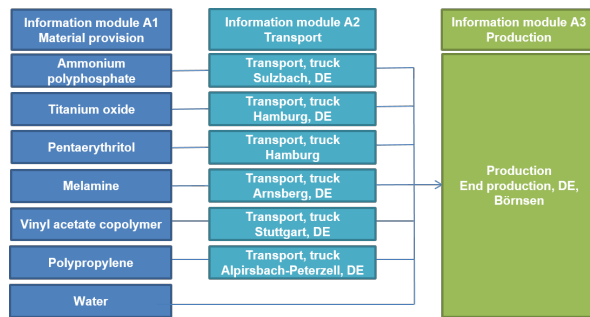


Fig.: Flow chart of the production process

3.3 Estimates and assumptions

Country-specific power mixes and additional background information are calculated for the production processes.

In order to calculate the material provision of the titanium oxide, a titanium oxide data set is used, since there is no data set for titanium oxide in the data bases used. This is also applicable for the formula contents vinyl acetate copolymer (50% aqueous) which is shown by the ethylene vinyl acetate copolymer data set.

Since the transportation routes are mainly within Germany, a German mixture was used as a basis for the provision of fuel.

3.4 Cut-off criteria

All of the information modules under review were included in detail in the calculation so as to comply with the requirements of /EN 15804/.

The following formula contents come under the cut-off criterion because they are far below 5% weight of the product mass: dispersing agents (<1%), thixotropic agents (<1%) and in-can preservatives (<0.25%). Material consumption for the Euro-pallets used for transport is less than 5% by mass on account of the

fact that they are reused and therefore fall short of the cut-off criterion in the overall calculation.

3.5 Background data

The basis for the background data from the /GaBi 8.7/ data bases (SP 37), to which this study also refers, is documented in the link (see section 8).

3.6 Data quality

Specific data for 2018 from the Rudolf Hensel GmbH manufacturing plant in Börnsen, Germany was used for generating this Life Cycle Assessment. The background data used from the /GaBi 8.7/ data base refers to 2018 and is therefore very recent.

The mass of individual product components comes from the information on the formula. According to the manufacturer, it can be assumed that the accuracy of this information is high.

3.7 Period under review

This LCA is based on data from 2018 which corresponds with the annual average.

3.8 Allocation

Co-products are allocated in the information modules A1-A3. The production waste incurred by injection-moulded parts and production completion in Börnsen is thermally recovered. The ensuing electric and thermal energy credits are completely charged in Module 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.

. The basis for the background data from the /GaBi 8.7/ data bases (SP 37), to which this study also refers, is documented in the link (see section 8).

4. LCA: Scenarios and additional technical information

No additional scenarios were declared for the underlying EPD.

5. LCA: Results

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	MND	MND	MND	MND	MNR	MNR	MNR	MND	MND	MND	MND	MND	MND	MND

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A1: HENSOTHERM® 410 KS / 420 KS / 421 KS / 461 KS / 471 KS und RENITHERM® PMA 600 HD / 1200 HD [1 kg]

Parameter	Unit	A1-A3
Global warming potential	[kg CO ₂ -Eq.]	1.81
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	1.07E-7
Acidification potential of land and water	[kg SO ₂ -Eq.]	2.01E-2
Eutrophication potential	[kg (PO ₄) ³ -Eq.]	3.28E-3
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	9.69E-4
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	8.13E-6
Abiotic depletion potential for fossil resources	[MJ]	33.56

RESULTS OF THE LCA - RESOURCE USE according to EN 15804+A1: HENSOTHERM® 410 KS / 420 KS / 421 KS / 461 KS / 471 KS und RENITHERM® PMA 600 HD / 1200 HD [1 kg]

Parameter	Unit	A1-A3
Renewable primary energy as energy carrier	[MJ]	2.34
Renewable primary energy resources as material utilization	[MJ]	0.00
Total use of renewable primary energy resources	[MJ]	2.34
Non-renewable primary energy as energy carrier	[MJ]	23.65
Non-renewable primary energy as material utilization	[MJ]	12.12
Total use of non-renewable primary energy resources	[MJ]	35.77
Use of secondary material	[kg]	0.00
Use of renewable secondary fuels	[MJ]	0.00E+0
Use of non-renewable secondary fuels	[MJ]	0.00E+0
Use of net fresh water	[m³]	31.98

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES according to EN 15804+A1: HENSOTHERM® 410 KS / 420 KS / 421 KS / 461 KS / 471 KS und RENITHERM® PMA 600 HD / 1200 HD [1 kg]

Parameter	Unit	A1-A3
Hazardous waste disposed	[kg]	0.00
Non-hazardous waste disposed	[kg]	0.01
Radioactive waste disposed	[kg]	2.76E-4
Components for re-use	[kg]	0.00
Materials for recycling	[kg]	0.00
Materials for energy recovery	[kg]	0.00
Exported electrical energy	[MJ]	0.00
Exported thermal energy	[MJ]	0.00

All indicators are collected in accordance with /EN 15804/. The estimated impact of environmental impacts is in accordance with /CML 2001 Apr. 2015/.

6. LCA: Interpretation

The dominance analysis indicates that the main causes of environmental impacts and indicators can be found in information module A1. This shows a global warming potential (GWP) for material provision of approx. 96% with reference to all information modules.

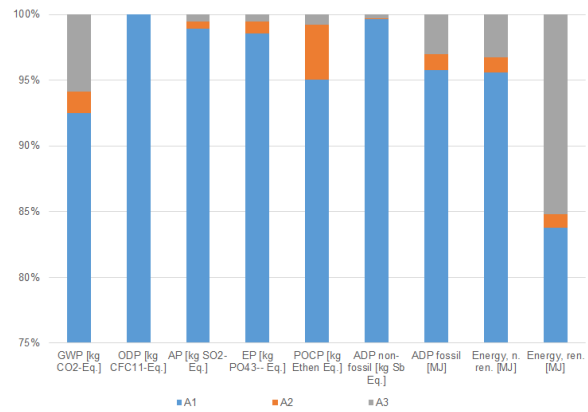


Fig.: Dominance analysis Modules A1 to A3

If we look at the material provision for the fire retardants HENSOTHERM® 410 KS / 420 KS / 421 KS / 461 KS / 471 KS and RENITHERM® PMA 600 HS / 1200 HD in detail, it becomes clear that three raw materials make a decisive contribution to the environmental impacts and indicators in question. The material provision of the titanium oxide accounts for approx. 34% of the greenhouse gas emissions. With melamine, this figure is approx. 28% and with vinyl acetate copolymer, it accounts for 14% of the greenhouse gas emissions.

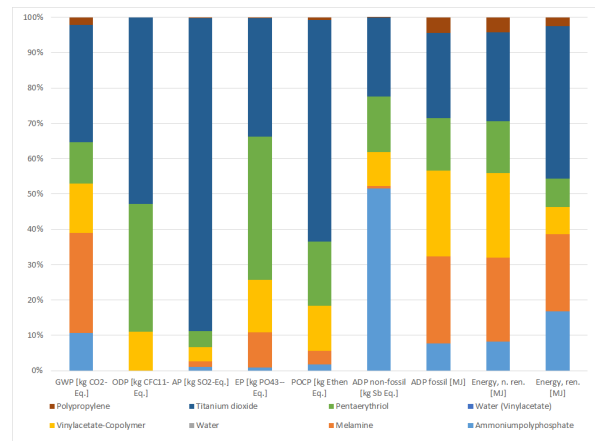


Fig.: Dominance analysis Module A1

The masses of individual product components come from the information on the formula. According to the manufacturer, it can be assumed that the accuracy of this information is high.

The relevant data sets that were used to calculate the material provision of the product are absolutely up to date (RER: Titanium dioxide: Ecoinvent 3.5, year: 2018; DE: Melamine: Thinkstep, year: 2018; RER: Ethylene vinyl acetate copolymer: Ecoinvent 3.5, year: 2018).

All these data sets have a strong influence on the results - as indicated by the dominance analysis - the same also applies for the overall calculation.

7. Requisite evidence

VOC emissions

Name	Value	Unit
TVOC (C6 - C16) - 410 KS	32	µg/m³
Sum SVOC (C16 - C22) - 410 KS	< 5	µg/m³
R (dimensionless) - 410 KS	0,01	-
VOC without NIK - 410 KS	< 5	µg/m³
Carcinogenic Substances - 410 KS	< 1	µg/m³
AgBB Ergebnissübersicht - 420 / 421 KS (28 Tage)	< 5	µg/m³
TVOC (C6 - C16) - 420 / 421 KS	< 5	µg/m³
Summe SVOC (C16 - C22) - 420 / 421 KS	< 5	µg/m³
R (dimensionslos) - 420 / 421 KS	< 1	-
VOC ohne NIK - 420 / 421 KS	< 5	µg/m³
Kanzerogene - 420 / 421 KS	< 1	µg/m³

Test reports by /Eurofins Product Testing A/S/

- a) HENSOTHERM® 410 KS: Report No.: 392-2013-00007601 dated 27.03.2013
- b) HENSOTHERM® 420 KS: Report No.: 392-2013-00015701 dated 27.03.2013
- c) HENSOTHERM® 421 KS: Report No.: 392-2013-00093301Arev1_02 dated 14.06.2016

The emission values were determined immediately after application of the coating materials.

HENSOTHERM® 410 KS / 420 KS / 421 KS meet the requirements relating to a low VOC content in accordance with /LEED/ credit EQ c4.2/ (paints and coatings).

HENSOTHERM® 420 KS / 421 KS / 461 KS / 471 KS and RENITHERM® PMA 600 HD / 1200 HD meet the requirements relating to low-emission paints and coatings in accordance with /LEED/v4 credit EQ c2.

HENSOTHERM® 410 KS and HENSOTHERM® 421 KS are registered with the Deutsche Gesellschaft für Nachhaltiges Bauen (DGNB – German Association for Sustainable Building).

Registration code HENSOTHERM® 410 KS: ZK5AGG
Registration code HENSOTHERM® 421 KS: 3E4MHK

8. References

/IBU 2016/

IBO (2016): General EPD programme instructions of Institut Bauen und Umwelt e.V. (IBU), version 1.1, Institut Bauen und Umwelt e.V., Berlin

/ISO 14025/

DIN EN /ISO 14025:2011-10/, Environmental labels and declarations - Type III environmental declarations - Principles and processes

/EN 15804/

/EN 15804:2012-04+A1 2013/, Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

/PCR: Coatings with organic binding agents/

Product category guidelines for building-related products and services, Part B: Requirements on the Environmental Product Declaration for coatings with organic binding agents, version 1.0; Berlin: Institut Bauen und Umwelt e.V. (pub.), July 2014

/ISO 14044/

DIN EN ISO 14044:2006-10, Environmental management – Life Cycle Assessment – Requirements and guidelines

/GaBi 8.7/

Software and data base for comprehensive life cycle analysis, version 8.7 (service pack 37); Stuttgart, Echterdingen: thinkstep AG. <http://www.gabi-software.com/deutsch/index/> (20.05.2019)

/CML 2001, Apr. 2015/

Impact categories of the University of Leiden, <https://www.universiteitleiden.nl/> (20.05.2019)

/ecoinvent v. 3.5/

Background data base, version 3.5; Zurich, Swiss Centre for Life Cycle Inventories, <http://www.ecoinvent.org> (20.05.2019)

/REACH Directive, Annex XVII/

(EC) Directive 1907/2006 of the European Parliament and Council dated 18.12.2006 (REACH Directive) – Restrictions Official Gazette no. L396/396-851 dated 30.12.2006

/ECHA candidate list/

European Chemical Agency (ECHA), Candidate List of Substances of Very High **Concern** for Authorisation (published in accordance with Article 59(10) of the REACH Regulation)

/ETAG 018-2/

ETAG No. 018 progress file, version November 2011, GUIDELINE FOR EUROPEAN TECHNICAL APPROVAL OF FIRE PROTECTIVE PRODUCTS, Part 2

/EAD 350402-00-1106/

EAD 350402-00-1106, September 2017: FIRE PROTECTIVE PRODUCTS – REACTIVE COATINGS FOR FIRE PROTECTION OF STEEL ELEMENTS

/EN 13381-8/

EN 13381-8:2010, Test methods for determining the contribution to the fire resistance of structural members – Part 8: Applied reactive protection to steel members

/EN13501/

EN13501-1:2010, Classification of construction products and methods by fire performance – Part 1: Classification with the results of tests on reaction to fire of construction products

EN13501-2:2010, Classification of construction products and methods by fire performance – Part 2: Classification using data from fire resistance tests, excluding ventilation services

/TS15/

Technical Schedule for Intumescent Coatings for Steelwork – Warrington Certifire Ltd.

/BS 476, Part 20/21/

BS 476, Part 20:1987, Fire tests on building materials and structures. Method for determination of the fire resistance of elements of construction (general principles)

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