EPD®

ENVIRONMENTAL PRODUCT DECLARATION

In accordance with EN 15804 and ISO 14025

VARIO® KM DUPLEX UV Membrane

Date of publication: 2018-06-11
Validity: 5 years
Valid until: 2023-06-11
Based on Products and construction services 2012:01
Version 2.2 Valid until: 2019-03-03
Scope of the EPD®: Europe

EPD VERIFIED

The environmental impacts of this product have been assessed over its whole life cycle. Its Environmental Product Declaration has been verified by an independent third party.

Registration number
The International EPD® System:
S-P-01140

ISOVER SAINT-GOBAIN

General information

Manufacturer: Saint- Gobain ISOVER
Programme used: The International EPD® System. More information at www.environdec.com
EPD® registration number: S-P-01140
PCR identification: EN 15804 Sustainability of construction works – Environmental product declaration - core rules for the product category of construction product and PCR: Products and construction services 2012:01 Version 2.2 Valid until: 2019-03-03
Product name and manufacturer represented: VARIO® KM DUPLEX UV; Saint- Gobain ISOVER, Les Miroirs, 18 Avenue d'Alsace, 92400, Courbevoie.
Owner of the declaration: Saint- Gobain ISOVER
EPD® prepared by: G&I LCA Central Team
Contact: Michael Medard Email: Michael.Medard@saint-gobain.com
Declaration issued: 2018-06-11, **valid until**: 2023-06-11

EPD program operator	The International EPD® System. Operated by EPD® International AB. www.environdec.com.
PCR review conducted by	The Technical Committee of the International EPD® System
LCA and EPD® performed by Patricia Jimenez Diaz	
Independent verification of the environmental declaration and data according to standard EN ISO 14025:2010 Internal ☐ External ☒	
Verifier Yannick Le Guern, ELYS Conseil	

Product description

Product description and description of use:

This Environmental Product Declaration (EPD®) describes the environmental impacts of 1 m² of airtight membrane.

.

The membrane Vario® KM Duplex UV consists of a reinforced polyamide-based film and a non-woven polypropylene fabric which assures a complete airtightness together with an active protection of the building.

Vario® KM Duplex UV is used in building, the S_d-value (from 0.3m to 4m) variability prevents the risk of condensation in the construction and enables roof structures, ceilings and walls to dry out. For instance, loft, sarking, attic floor, massive walls with internal insulation and timber frame wall.

The airtight membrane last for the average building's lifetime (which is often set at 50 years as a default), or as long as the insulated building component is part of the building.

Technical data/physical characteristics (for a thickness of 220 µmmm):

Dynamic diffusion equivalent air layer thickness (Sd value): 0.3 ≤ Sd ≤ 4m
Tear resistance (nail shank): ≥ 50N
Tensile strength: ≥ 110 N/50mm
Reaction to fire (Euroclass): E

Description of the main components and/or materials for 1 m² of product for the calculation of the EPD®:

PARAMETER	VALUE
Quantity of membrane for 1 m² of product	80 g
Thickness	220 µm
Packaging for the transportation and distribution	Cardboard: 6.93 g/m² Polyethylene (low-density): 0.37 g/m² Wood pallet : 5.95 g/m²
Product used for the Installation	5 g of metallic staples

The product does not contain any substance from the candidate list to authorization of the REACH legislation with a concentration above 0,1% (w/w).

The verifier and the programme operator do not make any claim nor have any responsibility of the legality of the product.

LCA calculation information

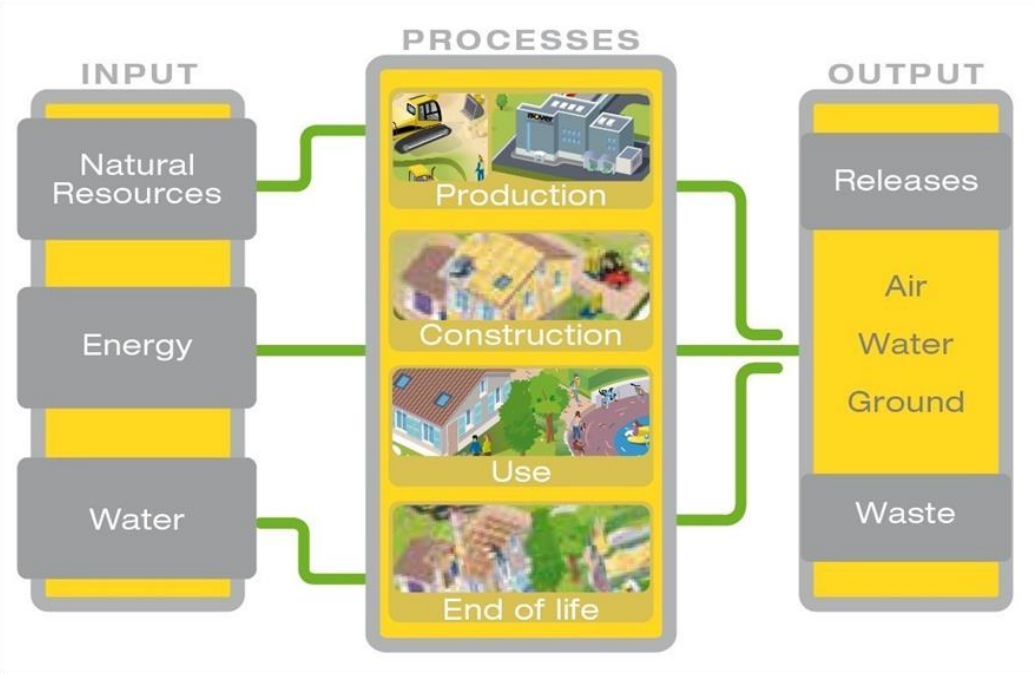
FUNCTIONAL UNIT	1 m² of airtight membrane with a Sd-value from 0.3m to 4m
SYSTEM BOUNDARIES	Cradle to Grave. Mandatory stages = A1-3, A4-5, B1-7, C1-4.
REFERENCE SERVICE LIFE (RSL)	50 years The RSL chosen corresponds to the period at the end of which it is assumed a renovation of the building caused by needs independent of the life of the product, (may exceed 50 years). The product maintains its technical performance during the entire life cycle
CUT-OFF RULES	In the case that there is not enough information, the process energy and materials representing less than 1% of the whole energy and mass used can be excluded (if they do not cause significant impacts). The addition of all the inputs and outputs excluded cannot be bigger than the 5% of the whole mass and energy used, as well of the emissions to environment occurred. Flows related to human activities such as employee transport are excluded. The construction of plants, production of machines and transportation systems are excluded since the related flows are supposed to be negligible compared to the production of the building product when compared at these systems lifetime level.
ALLOCATIONS	Allocation criteria are based on mass.
GEOGRAPHICAL COVERAGE AND TIME PERIOD	Scope: Europe Production in Austria, 2013 (period of primary data collection) Secondary data is based on DEAM (TEAM 5.2/PWC) database updating with an energetic process from 2011 and ecoinvent v2.2 (2010) and v3.3 (2016) database

- “EPDs of construction products may be not comparable if they do not comply with EN 15804"
- “Environmental Product Declarations within the same product category from different programs may not be comparable”

.

Life cycle stages

Flow diagram of the Life Cycle



Product stage, A1-A3

Description of the stage: the product stage of the membrane products is subdivided into 3 modules A1, A2 and A3 respectively “Raw material supply”, “transport” and “manufacturing”.

The aggregation of the modules A1, A2 and A3 is a possibility considered by the EN 15 804 standard. This rule is applied in this EPD.

Description of the scenarios and other additional technical information:

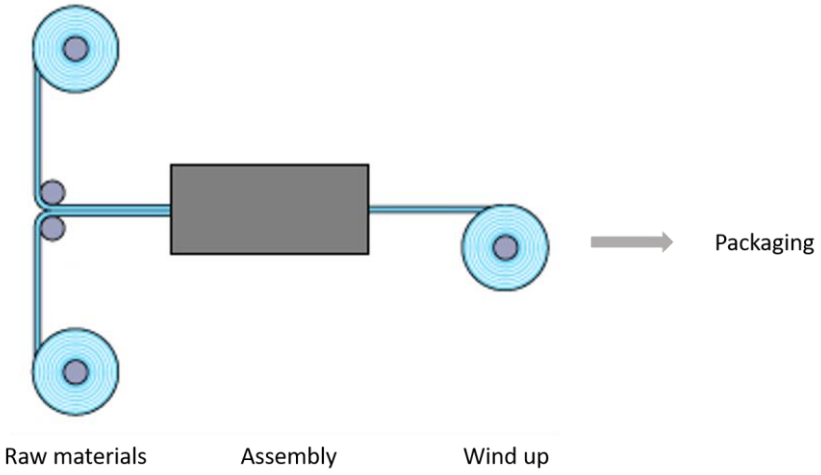
A1, Raw materials supply
This module takes into account the extraction and processing of all raw materials and energy which occur upstream to the studied manufacturing process

Specifically, the raw material supply covers production of granulate polymers for the film extrusion as well as the glue material.

A2, Transport to the manufacturer
The raw materials are transported to the manufacturing site. The modelling includes: road, boat and train (average values).

A3, Manufacturing
This module includes the manufacturing of the product and packaging. Specifically, it covers the manufacturing of polymeric membranes, the assembly, winding and packing steps. A loss rate is considered at this step as well as the amount of packaging waste (cardboard mandrel and polyethylene). In addition, the production of packaging is taken into account at this stage.

Manufacturing process flow diagram



Construction process stage, A4-A5

Description of the stage: the construction process is divided into 2 modules: A4, transport to the building site and A5, installation in the building.

A4, Transport to the building site: this module includes transport from the production gate to the building site.
Transport is calculated on the basis of a scenario with the parameters described in the following table.

PARAMETER	VALUE/DESCRIPTION
Fuel type and consumption of vehicle or vehicle type used for transport e.g. long distance truck, boat, etc.	Average truck trailer with a 24t payload, diesel consumption 38 liters for 100 km
Distance	1560 km
Capacity utilisation (including empty returns)	100 % of the capacity in volume 30 % of empty returns
Bulk density of transported products	2520 m² per pallet and 10 pallet per truck
Volume capacity utilisation factor	1

A5, Installation in the building: this module includes:

PARAMETER	VALUE/DESCRIPTION
Materials for installation (specified by materials)	5 g metallic staples *Note: other materials could be necessary for installation of the product.*
Water use	None
Other resource use	None
Quantitative description of energy type regional mix) and consumption during the installation process	None
Wastage of materials on the building site before waste processing, generated by the product's installation (specified by type)	10 % membranes and staples Cardboard: 6.93 g/m² Polyethylene (low-density): 0.37 g/m² Wood pallet : 5.95 g/m²
Distance	25 km to landfill by truck
Output materials (specified by type) as results of waste processing at the building site e.g. of collection for recycling, for energy recovering, disposal (specified by route)	Packaging wastes are 100 % collected and modelled as recovered matter Membranes losses and metallic staples are landfilled
Direct emission to air, soil or water	None

Use stage (excluding potential savings), B1-B7

Description of the stage: the use stage is divided into the following modules:

- B1: Use
- B2: Maintenance
- B3: Repair
- B4: Replacement
- B5: Refurbishment
- B6: Operational energy use
- B7: Operational water use

Description of the scenarios and additional technical information:
Once installation is complete, no actions or technical operations are required during the use stages until the end of life stage. Therefore, membranes have no impact (excluding potential energy savings) on this stage.

End of Life Stage, C1-C4

Description of the stage: this stage includes the next modules:

C1, Deconstruction, demolition
The de-construction and/or dismantling of membranes take part of the demolition of the entire building. In our case, the environmental impact is assumed to be very small and can be neglected

C2, Transport to waste processing
The model use for the transportation (see A4, transportation to the building site) is applied.

C3, Waste processing for reuse, recovery and/or recycling
The product is considered to be landfilled without reuse, recovery or recycling.

C4, Disposal
The membrane is assumed to be 100% landfilled.

Description of the scenarios and additional technical information:

End of life:

PARAMETER	VALUE/DESCRIPTION
Collection process specified by type	The entire product is collected alongside any mixed construction waste 80 g of membrane (collected with mixed construction waste)
Recovery system specified by type	There is no recovery, recycling or reuse of the product once it has reached its end of life phase.
Disposal specified by type	100% of the membrane waste is landfilled
Assumptions for scenario development (e.g. transportation)	We assume that the waste going to landfill will be transported by truck with 24 tons payload, using diesel as a fuel consuming 38 litres per 100km. Distance covered is 25 km

Reuse/recovery/recycling potential, D

Description of the stage: module D has not been taken into account.

LCA results

LCA model, aggregation of data and environmental impact are calculated from the TEAM software. CML 4.1 impact method has been used, together with TEAM and ecoinvent databases to obtain the inventory of generic data.

Raw materials and energy consumption, as well as transport distances have been taken directly from the manufacturing plant (Production data according 2013).

All figures refer to a functional unit of 1 m² of airtight membrane with a Sd-value from 0.3m to 4m.

ENVIRONMENTAL IMPACTS

Parameters	Product stage	Construction stage		Use stage							End of life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Global Warming Potential (GWP) - *kg CO2 equiv/FU*	5,3E-01	6,0E-02	7,4E-02	0	0	0	0	0	0	0	0	1,1E-04	0	3,3E-02	MNA
The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas, carbon dioxide, which is assigned a value of 1.															
Ozone Depletion (ODP) *kg CFC 11 equiv/FU*	1,7E-08	4,3E-08	6,8E-09	0	0	0	0	0	0	0	0	8,3E-11	0	9,7E-10	MNA
Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbons or halons), which break down when they reach the stratosphere and then catalytically destroy ozone molecules.															
Acidification potential (AP) *kg SO2 equiv/FU*	1,5E-03	2,7E-04	2,3E-04	0	0	0	0	0	0	0	0	5,2E-07	0	1,1E-05	MNA
Acid depositions have negative impacts on natural ecosystems and the man-made environment incl, buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production, heating and transport.															
Eutrophication potential (EP) *kg (PO4)3- equiv/FU*	6,7E-04	6,4E-05	1,1E-04	0	0	0	0	0	0	0	0	1,2E-07	0	2,4E-06	MNA
Excessive enrichment of waters and continental surfaces with nutrients, and the associated adverse biological effects.															
Photochemical ozone creation (POPC) *kg Ethene equiv/FU*	2,3E-04	4,3E-05	4,6E-05	0	0	0	0	0	0	0	0	8,2E-08	0	6,6E-06	MNA
Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.															
Abiotic depletion potential for non-fossil resources (ADP-elements) - *kg Sb equiv/FU*	1,1E-08	1,1E-11	1,3E-08	0	0	0	0	0	0	0	0	2,1E-14	0	1,8E-12	MNA
Abiotic depletion potential for fossil resources (ADP-fossil fuels) - *MJ/FU*	11	7,7E-01	1,3	0	0	0	0	0	0	0	0	1,5E-03	0	1,5E-02	MNA
Consumption of non-renewable resources, thereby lowering their availability for future generations.															

RESOURCE USE

Parameters	Product stage	Construction process stage		Use stage							End of life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Use of renewable primary energy excluding renewable primary energy resources used as raw materials - *MJ/FU*	6,3E-01	3,7E-04	7,2E-02	0	0	0	0	0	0	0	0	7,1E-07	0	1,5E-04	MNA
Use of renewable primary energy used as raw materials *MJ/FU*	2,5E-01	0	2,6E-02	0	0	0	0	0	0	0	0	0	0	0	MNA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	8,8E-01	3,7E-04	9,8E-02	0	0	0	0	0	0	0	0	7,1E-07	0	1,5E-04	MNA
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - *MJ/FU*	7,0	7,7E-01	9,1E-01	0	0	0	0	0	0	0	0	1,5E-03	0	1,4E-02	MNA
Use of non-renewable primary energy used as raw materials *MJ/FU*	3,3	0	3,3E-01	0	0	0	0	0	0	0	0	0	0	0	MNA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	10	7,7E-01	1,2	0	0	0	0	0	0	0	0	1,5E-03	0	1,4E-02	MNA
Use of secondary material *kg/FU*	2,2E-03	0	2,2E-04	0	0	0	0	0	0	0	0	0	0	0	MNA
Use of renewable secondary fuels- *MJ/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MNA
Use of non-renewable secondary fuels - *MJ/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MNA
Use of net fresh water - *m3/FU*	1,8E-03	7,3E-05	2,6E-04	0	0	0	0	0	0	0	0	1,4E-07	0	7,2E-08	MNA

WASTE CATEGORIES

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Hazardous waste disposed *kg/FU*	2,9E-03	2,3E-05	3,2E-03	0	0	0	0	0	0	0	0	4,5E-08	0	0	MNA
Non-hazardous waste disposed *kg/FU*	2,4E-02	6,3E-05	2,1E-02	0	0	0	0	0	0	0	0	1,2E-07	0	8,0E-02	MNA
Radioactive waste disposed *kg/FU*	1,3E-05	1,2E-05	2,9E-06	0	0	0	0	0	0	0	0	2,4E-08	0	0	MNA

OTHER OUTPUT FLOWS

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Components for re-use *kg/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MNA
Materials for recycling *kg/FU*	8,1E-06	3,2E-07	1,3E-02	0	0	0	0	0	0	0	0	6,1E-10	0	0	MNA
Materials for energy recovery *kg/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MNA
Exported energy *MJ/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MNA

LCA interpretation

The following figure refers to a functional unit of 1 m² of airtight membrane with a Sd-value from 0.3m to 4m.

Environmental Impact / Stages	Production stage (A1-A3)	Construction stage (A4-A5)	Use stage (B1-B7)	End-of-life stage (C1-C4)	Total *Environmental impacts of the product*	Recycling *Positive benefits of recycling* (D)
Global warming *kg CO2 equiv /FU*	0,53	0,13	0,00	0,03	**7,0E-01** kg CO_2 equiv /FU	0,00
Non-renewable resources consumption *MJ/FU*	10,92	2,08	0,00	0,02	**13** MJ/FU	0,00
Energy consumption *[1] MJ/FU*	11,17	2,12	0,00	0,02	**13** MJ/FU	0,00
Water consumption *m^3/FU*	0,00	0,00	0,00	0,00	**2,1E-03** m^3/FU	0,00
Waste production *[2] kg/FU*	0,03	0,02	0,00	0,08	**1,3E-01** kg/FU	0,00

[1] Addition of : "Total use of renewable primary energy resources " + "Total use of non-renewable primary energy resources ".
[2] Addition of : "Hazardous waste disposed" + "Non-hazardous waste disposed " + "Radioactive waste disposed".

Global Warming Potential (Climate Change) (GWP)
When analysing the above figure for GWP, it can clearly be seen that the majority of contribution to this environmental impact is from the production modules (A1 – A3). This is primarily because the sources of greenhouse gas emissions are predominant in this part of the life cycle. CO2 is generated by the raw material consumption. The second most important contribution comes from the construction stage (A4-A5). This impact is mainly generated by the fuel consumption in transport vehicles and the waste during the installation stage.

Non-renewable resources consumptions
A similar trend is visible for “non-renewable resources consumption”. In the same way, raw material and fuel consumption has a strong contribution on this indicator.

Energy Consumptions
As we can see, modules A1 – A3 have the highest contribution to total energy consumption. Energy consumed during the production of the raw materials used to create the membrane.

Water Consumption
As we don't use water in any of the other modules (A4 – A5, B1 – B7, C1 – C4), the consumption of water related to the A1-A3 stage is related to the energy consumption (electricity) during the industrial process.

Waste Production
Waste production does not follow the same trend as the above environmental impacts. The largest contributor is the end of life module. This is because the entire product is here sent to landfill once it reaches the end of life state. The second visible contribution comes from the production stage and it is related to the energy consumption.

Other environmental indicators

Regarding the indoor environment, the VARIO® KM DUPLEX UV Membrane is ranked A+ according to the decree of 19 April 2011 on the French labelling of construction products installed indoor or wall or floor coating and paints and varnishes on their volatile pollutant emissions.

Bibliography

- ISO 14040:2006: Environmental Management-Life Cycle Assessment-Principles and framework.
- ISO 14044:2006: Environmental Management-Life Cycle Assessment-Requirements and guidelines.
- ISO 14025:2006: Environmental labels and declarations-Type III Environmental Declarations-Principles and procedures.
- PCR: Products and construction services 2012:01 version 2.2 valid until: 2019-03-03
- UNE-EN 15804:2012+A1:2013: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
- EPD International (2017) General Programme Instructions for the International EPD® System. Version 3.0, dated 2017-12-11. www.environdec.com
- Saint-Gobain Environmental Product Declaration Methodological Guide for Construction Products, Version 3.0.1 (2013)
- European Chemical Agency, Candidate List of substances of very high concern for Authorisation.

  http://echa.europa.eu/chem_data/authorisation_process/candidate_list_table_en.asp