Environmental Product Declaration
as per ISO 14025 and EN 15804

Owner of the declaration:	Sto SE & Co. KGaA
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Registration number:	EPD-Kiwa-EE-000417-EN
Issue date:	19.11.2024
Valid to:	19.11.2029

StoColor Lotusan®

façade paint with Lotus-Effect® Technology

1. General information

Sto SE & Co. KGaA

Programme operator:
Kiwa-Ecobility Experts
Kiwa GmbH, Ecobility Experts
Wattstraße 11-13
13355 Berlin
Germany

Registration number:

This declaration is based on the Product Category Rules:
Kiwa-Ecobility Experts (Kiwa-EE) – General Product Category Rules (2022-02-14)

Issue date:
19.11.2024

Valid to:
19.11.2029

Raoul Mancke
(Head of programme operations, Kiwa-Ecobility Experts)

Kripanshi Gupta
(Verification body, Kiwa-Ecobility Experts)

StoColor Lotusan®

Owner of the declaration:
Sto SE & Co. KGaA
Ehrenbachstraße 1
D-79780 Stühlingen, Germany

Declared product / declared unit:
1 kg StoColor Lotusan® with an RSL of 15 years.

Scope:
StoColor Lotusan® is a façade paint with Lotus-Effect® Technology for exterior application, produced in Stühlingen, Germany. The environmental impact of StoColor Lotusan® G, a variant of StoColor Lotusan®, is described in the Annex.

Kiwa-Ecobility Experts assumes no liability for manufacturer's information, LCA data and evidence.

Verification:
The European standard EN 15804+A2:2019 serves as the core PCR.

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

☐internal ☒external

Lucas Pedro Berman, Senda
(Third party verifier)

2. Product

2.1 Product description

StoColor Lotusan® is a façade paint consisting of a binder based on polymer dispersion in compliance with EN 1062-1. Inorganic and organic pigments are used for coloring and adjusting the opacity. StoColor Lotusan® uses mineral fillers such as chalk, water and small amounts of additives (thickeners, defoamers, wetting agents, preservatives, etc.). Drying takes place physically by evaporation of the contained water. The use of StoColor Lotusan® extends the service life of buildings. It is produced in a plant in Stühlingen, Germany.

The use of the product is subject to the respective national regulations at the place of use, for example the building regulations of the federal states of Germany and their respective technical regulations.

StoColor Lotusan® has the following properties:

- texture-retaining
- Lotus-Effect® Technology: reduced adhesion of dirt particles and self-cleaning when exposed to rain
- dirt runs off with the rain
- without biocide film protection
- very highly permeable to water vapour
- water based

Raw material	Weight (%)
Binder	10 - 15
Filler	30 - 40
Additive	1 - 2
Water	25 - 35
Colorant	15 - 25

2.2 Application (Intended Use of the product)

StoColor Lotusan® is a façade paint for exterior usage which can be applied by paint brush, roller or by airless sprayer.

Type of application	Approx. consumption	
per paint coat	0.17 - 0.20	l/m²
for 2 coats	0.34 - 0.40	l/m²

2.3 Reference Service Life (RSL)

The reference service life (RSL) is 15 years in exterior application (in accordance with BNB) and is declared in the Sustainability Data Sheet

2.4 Technical data

The technical data stated here is relevant for the use of the declared product. Further information regarding the technical properties can be found on the Technical Data Sheet.

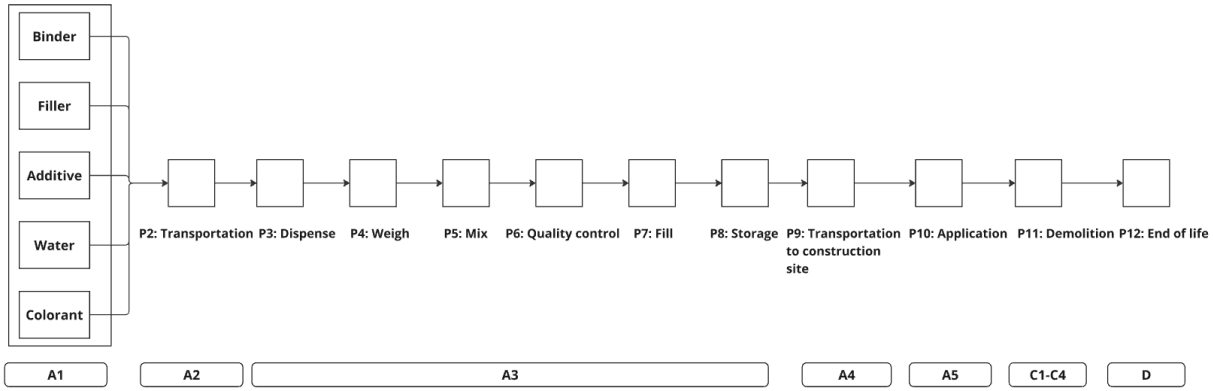
Criterion	Standard/ test specification	Class
Density	EN ISO 2811	1.40 - 1.60 g/cm³
Diffusion-equivalent air layer thickness	EN 1062-3	V1 high
Water permeability rate w	EN 1062-1	W3 low
Gloss	EN 1062-1	G3
Dry layer thickness	EN 1062-1	E3 > 100; ≤ 200
Grain size	EN 1062-1	S1 fine

2.5 Substances of very high concern

The product does not contain substances of very high concern (SVHC) on the REACH Candidate List published by the European Chemicals Agency in a concentration more than 0.1 % (by unit weight).

2.6 Description production process

StoColor Lotusan® is produced in a mixing plant in Stühlingen, Germany. The raw materials are produced by and transported from suppliers located in Europe. The raw materials are filled in weighting containers and thereafter mixed together. Quality control checks the consistency of the product and adjusts if necessary. The finished product is filled into pails and stored. The product is transported on pallets and delivered to customers in Europe with focus on Germany



2.7 Construction description

A detailed description for the use of StoColor Lotusan® can be found on the Technical Data sheet on www.sto.de .

3. LCA: Calculation rules

3.1 Declared unit

The declared unit is 1 kg StoColor Lotusan® with an RSL of 15 years. The scope of this LCA is cradle to gate with options, modules C1-C4 and module D. Technical life span of the products raw materials is the same as for the whole product.
Reference unit: kilogram (kg)

3.2 Conversion factors

Product	Value	Unit
Declared Unit	1	kg
Conversion factor to 1 kg	1	-

3.3 Scope of declaration and system boundaries

This is a Cradle to gate with options EPD. The life cycle stages included are as shown below:

Description of the system boundary																
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 manufacturer to place of use	Installation process	Use	Maintenance	Repair	Replacement	Refurbishmen	Operational energy use	Operational water use	Deconstruction	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	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
X=Module declared | ND= Module not declared																

The modules of the EN15804 contain the following:

Module A1 = Raw material supply Module

A2 = Transport Module

A3 = Manufacturing Module

A4 = Transport Module

A5 = Construction - Installation process Module

B1 = Use Module

B2 = Maintenance Module

B3 = Repair Module

B4 = Replacement

B5 = Refurbishment Module

B6 = Operational energy use Module

B7 = Operational water use Module

C1 = De-construction / Demolition Module

C2 = Transport Module

C3 = Waste Processing Module

C4 = Disposal Module

D = Benefits and loads beyond the product system boundaries

3.4 Representativeness

This EPD is representative for StoColor Lotusan®, a product of Sto SE & Co. KGaA. The data is representative for the European Union. The scenarios included in this life cycle analysis are currently in use and are representative for one of the most likely scenario alternatives.

3.5 Cut-off Criteria

Product Stage (A1-A3)

The production stage consists of the extraction of raw materials, transportation of the raw materials, processing the raw materials into materials and the production of the product. The required energy for production, ancillary materials, packaging materials and production emissions are included. All substantial raw materials and types of energy during production are included. Raw materials added to the product in very small amounts (less than 1%) are not included. These cut-off limits do not apply to hazardous materials or substances.

Construction process stage (A4-A5)

All input flows (e.g. transportation to the construction site, additional raw material use for construction, installation energy (use)of energy use for assembly , etc.) and output flows (e.g. construction waste, packaging waste, etc.) are considered in this LCA. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass.

End of life stage (C1-C4)

All input flows (e.g. energy use for demolition or disassembly, transport to waste processing, etc.) and output flows (e.g. end-of-life waste processing of the product, etc.) are considered in this LCA. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass. The degree of landfill is assumed to be 100%.

Benefits and Loads beyond the system boundary (Module D)

All benefits and loads beyond the system boundary resulting from reusable products, recyclable materials and/or useful energy carriers leaving the product system are considered in this LCA.

Excluded processes

Following processes has not been taken into account in this life cycle analysis:

- The manufacture of equipment used in production, buildings or any other capital goods;
- The transportation of personnel to the production plant;
- The transportation of personnel within the production plant;
- Research and development activities;

3.6 Allocation

The amount of electricity and natural gas at the production site for StoColor Lotusan® derives from figures concerning the total amount of electricity being used at the site (for all products produced) and is then recalculated into the amount only used for the production of StoColor Lotusan®. The amount of electricity and natural gas is then shown per declared unit.

Modularity principle has been taken into account. Since StoColor Lotusan® is a façade paint, there are no co-products that have to be taken into account.

The producer of StoColor Lotusan® is under regulation from national authorities and follows the polluter pays principle.

3.7 Data collection and reference time period

This EPD project has been performed during the year 2024. Production data is from the year 2023.

3.8 Estimates and assumptions

1% cut off criteria has been applied for formulation and production data when applicable according to ISO 15804+A2.

Façade paint is categorized under the European Waste Catalogue (EWC), category 17.09 "Other Construction and Demolition Waste" and is categorized as non-hazardous waste.

A payload factor of 50 percent was used for all truck transports, which in fact corresponds to a full delivery and empty return trip. A data set for a non-specific truck was used.
An amount of 0.013 kWh/kg has been assumed for deconstruction.

3.9 Data Quality

For LCA calculation datasets of Ecoinvent 3.6 from 2019 have been applied and calculated with R<think. Data concerning production has been collected from the Production Management System used at the production site and the figures shown in this report is for the year 2023.

3.10 Power mix

Data has been collected at production site in Stühlingen. The energy used consists of 100% hydropower (market based approach) and covers the foreground processes in Stühlingen. The electricity supplier is bound by state regulations in Germany for electricity labelling. The electricity labelling indicates 100 % renewable energy from hydropower. Hydropower is calculated with an environmental impact of 0.042 kg CO_2-eq/kWh.

3.11 Comparability

In principle, a comparison or assessment of the environmental impacts of different products is only possible if they have been prepared in accordance with EN 15804. For the evaluation of the comparability, the following aspects have to be considered in particular: PCR used , functional or declared unit, geographical reference, definition of the system boundary, declared modules, data selection (primary or secondary data, background database, data quality), scenarios used for use and disposal phases, and the life cycle inventory (data collection, calculation methods, allocations, validity period). PCRs and general program instructions of different EPDs programs may differ. A comparability needs to be evaluated. For further guidance see EN 15804+A2 (5.3 Comparability of EPD for construction products) and ISO 14025 (6.7.2 Requirements for comparability).

4. LCA: Scenarios and additional technical information

4.1 Transport to construction site (A4)

For the transport from production place to assembly/user, the following scenario is assumed for module A4 of this EPD. The results of modul A4 can be scaled to accommodate to individual projects.

	Value and unit
Vehicle type used for transport	Lorry (Truck) 16-32t, EURO4 | market for (EU)
Fuel type and consumption of vehicle	not available
Distance	350 km
Capacity utilisation (including empty returns)	50 % (loaded up and return empty)
Bulk density of transported products	inapplicable
Volume capacity utilisation factor	1

4.2 Assembly (A5)

The following information describes the scenarios for flows entering the system and flows leaving the system at module A5.

Flows entering the system

For flows entering the system at A5 the following scenario is assumed for module A5.

	Value	Unit
Materials used for installation/assembly		
Tap water - part of the product	0.0025	kg

Flows leaving the system

The following output flows leaving the system at module A5 are assumed.

	Value	Unit
Output materials as result of loss during construction	3	%
Output materials as result of waste processing of materials used for installation/assembly at the building site	0.003	kg
Output materials as result of waste processing of used packaging	0.050	kg

4.3 De-construction/Demolition (C1)

The following information describes the scenario for demolition at end of life.

Description	Amount	Unit
Electricity (DE) – low voltage (max 1kV)	0.013	kWh

4.4 Transport end-of-life (C2)

The following distances and transport conveyance are assumed for transportation during end of life for the different types of waste processing.

Waste scenario	Transport conveyance	Not removed (stays in work) [km]	Landfill [km]	Incineration [km]	Recycling [km]	Reuse [km]
Debris - STO mixed with 100% landfill	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0

The transport conveyance(s) used in the scenario(s) for transport during end of life has the following characteristics.

	Value and unit
Vehicle type used for transport	Lorry (Truck), unspecified (default) | market group for (GLO)
Fuel type and consumption of vehicle	not available
Capacity utilisation (including empty returns)	50 % (loaded up and return empty)
Bulk density of transported products	inapplicable
Volume capacity utilisation factor	1

4.5 End of life (C3, C4)

The scenario(s) assumed for end of life of the product are given in the following tables. First the assumed percentages per type of waste processing are displayed, followed by the assumed amounts.

Waste Scenario	Region	Not removed (stays in work)[%]	Landfill [%]	Incineration [%]	Recycling [%]	Reuse [%]
Debris - STO mixed with 100% landfill	NL	0	100	0	0	0

Waste Scenario	Not removed (stays in work)[kg]	Landfill [kg]	Incineration [kg]	Recycling [kg]	Reuse [kg]
Debris - STO mixed with 100% landfill	0	1	0	0	0
Total	**0**	**1**	**0**	**0**	**0**

4.6 Benefits and loads beyond the system boundary (D)

The presented Benefits and loads beyond the system boundary in this EPD are based on the following calculated Net output flows in kilograms and Energy recovery displayed in MJ Lower Heating Value.

Waste scenario	Net output flow [kg]	Energy recovery [MJ]
Debris - STO mixed with 100% landfill	0	0
Total	**0**	**0**

5. LCA: Results

For the impact assessment, the characterization factors of the LCIA method EN 15804 +A2 Method v1.0 are used. Long-term emissions (>100 years) are not considered in the impact assessment. The results of the impact assessment are only relative statements that do not make any statements about end-points of the impact categories, exceedance of threshold values, safety margins or risks. The following tables show the results of the indicators of the impact assessment, of the use of resources as well as of waste and other output flows.

The following tables show the results of the impact assessment indicators, resource use, waste and other output streams. The results presented here refer to the declared average product.

Disclaimer on ADP-e, ADP-f, WDP, ETP-fw, HTP-c, HTP-nc, SQP: The results of these environmental impact indicators must be used with caution, as the uncertainties in these results are high or as there is limited experience with the indicator.

Disclaimer on IR: This impact category mainly addresses the potential effect of low dose ionizing radiation on human health in the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents and occupational exposures, nor does it consider radioactive waste disposal in underground facilities. Potential ionizing radiation from soil, radon, and some building materials is also not measured by this indicator.

5.1 Environmental impact indicators per kilogram

LCA results – Indicators describing environmental impacts based on the impact assessment (LCIA): [declared unit + product name] (EN 15804+A2)											
Parameter	**Unit**	**A1**	**A2**	**A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
Core environmental impact indicators (EN 15804+A2)											
AP	mol H+ eqv	3,07E-02	2,74E-04	4,14E-04	3,09E-04	9,90E-04	2,17E-05	7,83E-05	0,00E+00	5,00E-05	-7,65E-05
GWP-total	kg CO_2 eqv.	1,28E+00	5,38E-02	1,75E-02	6,08E-02	1,41E-01	8,09E-03	1,35E-02	0,00E+00	5,28E-03	-2,33E-02
GWP-b	kg CO_2 eqv.	8,56E-03	2,99E-05	-5,47E-02	3,27E-05	5,56E-02	6,03E-04	6,23E-06	0,00E+00	1,04E-05	-6,12E-06
GWP-f	kg CO_2 eqv.	1,27E+00	5,37E-02	7,22E-02	6,07E-02	8,58E-02	7,48E-03	1,35E-02	0,00E+00	5,27E-03	-2,33E-02
GWP-luluc	kg CO_2 eqv.	7,77E-04	1,86E-05	5,98E-05	2,14E-05	3,02E-05	9,07E-06	4,95E-06	0,00E+00	1,47E-06	-2,09E-05
EP-m	kg P eqv.	1,55E-03	9,31E-05	6,02E-05	1,05E-04	6,73E-05	3,36E-06	2,76E-05	0,00E+00	1,72E-05	-2,20E-05
EP-fw	kg N eqv.	6,49E-05	4,24E-07	1,86E-06	4,81E-07	2,17E-06	1,13E-06	1,36E-07	0,00E+00	5,90E-08	-2,22E-07
EP-T	mol N eqv.	1,47E-02	1,03E-03	6,61E-04	1,16E-03	6,70E-04	5,32E-05	3,04E-04	0,00E+00	1,90E-04	-3,30E-04
ODP	kg CFC 11 eqv.	1,48E-07	1,23E-08	3,73E-09	1,39E-08	7,02E-09	2,93E-10	2,98E-09	0,00E+00	2,17E-09	-3,18E-09
POCP	kg NMVOC eqv.	5,70E-03	2,94E-04	2,62E-04	3,31E-04	2,37E-04	1,01E-05	8,68E-05	0,00E+00	5,51E-05	-6,90E-05
ADP-f	MJ	1,72E+01	8,19E-01	1,67E+00	9,23E-01	6,79E-01	1,02E-01	2,04E-01	0,00E+00	1,47E-01	-4,03E-01
ADP-mm	kg Sb-eqv.	2,14E-05	1,41E-06	7,75E-07	1,66E-06	8,50E-07	6,22E-08	3,42E-07	0,00E+00	4,82E-08	-4,26E-08
WDP	m^3 world eqv.	1,95E+00	2,32E-03	3,01E-02	2,57E-03	6,20E-02	3,88E-04	7,28E-04	0,00E+00	6,60E-03	-2,62E-03
Additional environmental impact indicators (EN 15804+A2)											
ETP-fw	CTUe	4,32E+01	6,56E-01	1,01E+00	7,39E-01	1,90E+00	8,46E-02	1,81E-01	0,00E+00	9,55E-02	-5,63E-01
PM	disease incidence	1,07E-07	4,00E-09	3,67E-09	4,39E-09	3,96E-09	8,45E-11	1,21E-09	0,00E+00	9,72E-10	-8,48E-10
HTP-c	CTUh	4,47E-09	1,82E-11	8,04E-11	2,08E-11	1,55E-10	1,95E-12	5,89E-12	0,00E+00	2,21E-12	-7,78E-12
HTP-nc	CTUh	2,33E-08	7,18E-10	7,61E-10	8,06E-10	9,77E-10	7,68E-11	1,99E-10	0,00E+00	6,79E-11	-2,50E-10
IR	kBq U235 eqv.	5,23E-02	3,58E-03	1,44E-03	4,04E-03	2,09E-03	3,20E-04	8,53E-04	0,00E+00	6,04E-04	-2,31E-04
SQP	Pt	1,01E+01	6,02E-01	6,85E+00	6,37E-01	5,90E-01	2,45E-02	1,77E-01	0,00E+00	3,09E-01	-2,20E+00

CLASSIFICATION OF DISCLAIMERS TO THE DECLARATION OF CORE AND ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

ILCD classification	Indicator	Disclaimer
ILCD type / level 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None
ILCD type / level 2	Acidification potential, Accumulated Exceedance (AP)	None
	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	None
	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD type / level 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2

5.2 Indicators describing resource use and environmental information based on life cycle inventory (LCI)

LCA results - Indicators describing resource use and environmental information derived from life cycle inventory (LCI): 1 kg StoColor Lotusan® (EN 15804+A2)											
Parameter	**Unit**	**A1**	**A2**	**A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	1,80E+00	1,14E-02	6,23E-01	1,30E-02	7,72E-02	1,85E-02	2,55E-03	0,00E+00	1,19E-03	-4,54E-01
PERM	MJ	1,41E-01	0,00E+00	4,62E-01	0,00E+00	1,81E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	1,94E+00	1,14E-02	1,09E+00	1,30E-02	9,53E-02	1,85E-02	2,55E-03	0,00E+00	1,19E-03	-4,54E-01
PENRE	MJ	1,84E+01	8,70E-01	1,23E+00	9,80E-01	7,10E-01	1,09E-01	2,16E-01	0,00E+00	1,56E-01	-4,20E-01
PENRM	MJ	0,00E+00	0,00E+00	5,57E-01	0,00E+00	1,67E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-2,49E-02
PENRT	MJ	1,84E+01	8,70E-01	1,79E+00	9,80E-01	7,27E-01	1,09E-01	2,16E-01	0,00E+00	1,56E-01	-4,45E-01
SM	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	M^3	4,81E-02	8,70E-05	7,27E-04	9,73E-05	1,55E-03	4,63E-05	2,48E-05	0,00E+00	1,57E-04	-4,01E-05
HWD	Kg	4,63E-05	2,13E-06	1,06E-06	2,42E-06	1,69E-06	1,28E-07	5,16E-07	0,00E+00	2,20E-07	-5,12E-07
NHWD	Kg	1,11E+00	4,24E-02	1,32E-02	4,41E-02	7,37E-02	4,28E-04	1,29E-02	0,00E+00	1,00E+00	-9,89E-04
RWD	Kg	5,37E-05	5,59E-06	1,58E-06	6,29E-06	2,32E-06	4,11E-07	1,34E-06	0,00E+00	9,67E-07	-3,27E-07
CRU	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	Kg	0,00E+00	0,00E+00	5,40E-04	0,00E+00	2,59E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EET	MJ	0,00E+00	0,00E+00	-2,25E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-2,77E-01
EEE	MJ	0,00E+00	0,00E+00	-1,30E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-1,61E-01

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 fresh water | **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 | **EET**=Exported energy, thermical | **EE**=Exported energy, electrical

5.3 Information on biogenic carbon content per kilogram

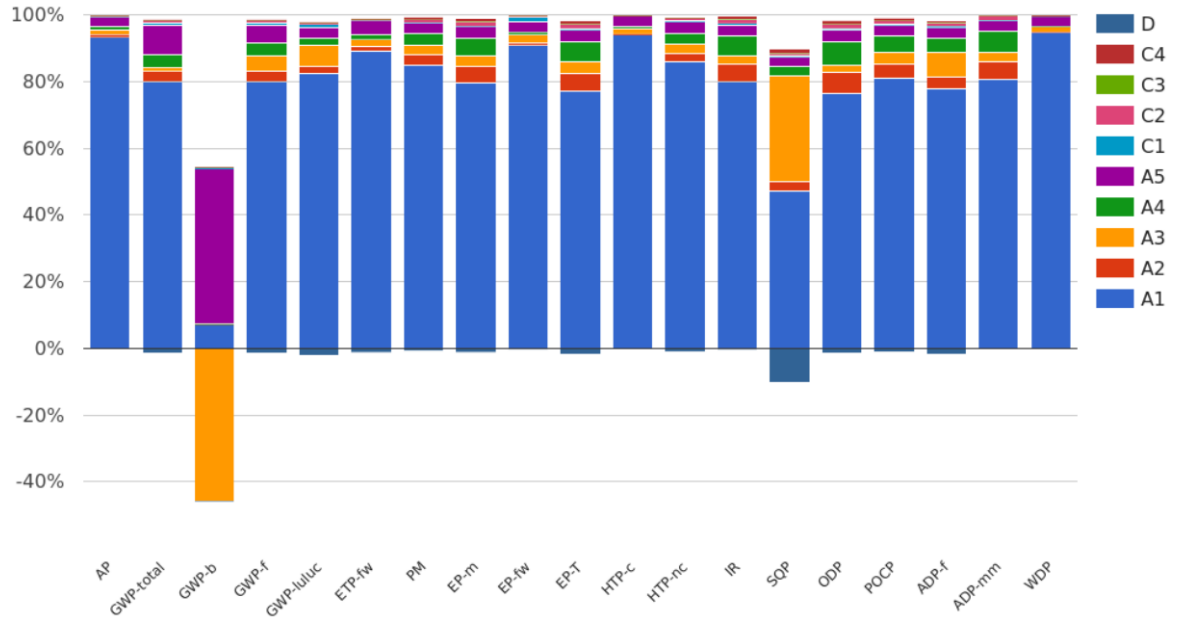
LCA results - information on biogenic carbon content at the factory gate: 1 kg StoColor Lotusan (EN 15804+A2)		
Parameter	**Unit**	**Amount**
biogenic carbon content in product	kg C	0
biogenic carbon content in accompanying packaging	kg C	0.015
NOTE 1 kg biogenic carbon is equivalent to 44/12 kg CO_2		

Uptake of biogenic carbon dioxide

The following amount of carbon dioxide uptake is taken into account. Related uptake and release of carbon dioxide in downstream processes are not taken into account in this number although they do appear in the presented results. One kilogram of biogenic Carbon content is equivalent to 44/12 kg of biogenic carbon dioxide uptake.

Uptake of biogenic carbon dioxide	**Unit**	**Amount**
Packaging	kg CO_2 (biogenic)	0.055

6.1 Dominance analysis



The figure above shows the influence of the different life stages on the LCA results of each environmental indicator. The raw materials for StoColor Lotusan® (A1) contribute the most to the total GWP-total, as well as the other environmental indicators but GWP-b, which is dominated by the construction modul(A5) and the manufacturing stage (A3). The negative value for A3 derives from the carbon dioxide intake of the accompanying packaging (wooden pallet), the positive is due to the release of said carbon dioxide due to the disposal of the pallet during construction (A5). There are no additional environmental costs, since facade paint is assumed to be applied manually. The second biggest contributor is the End-of-life scenario (C), followed by the relatively small impact of the manufacturing process (A3). The relatively small impact of the manufacturing process (A3) can be attributed to the use of hydropower during production. The impact of the transport modules A4 and C2 is negligible for all environmental indicators, due to the short distance to the construction side and waste processing side. The same applies to deconstruction (C1) since the removal of facade paint does only need a small amount of energy.

7. Annex for StoColor Lotusan® G

This annex contains the life cycle assessment results for 1 kg StoColor Lotusan® G, which is a variant of StoColor Lotusan®. Additionally to the properties of StoColor Lotusan®, StoColor Lotusan® G has encapsulated and none persistent film protection. The LCA data is based on production data from the year 2023.

7.1 Technical Data

The technical data stated here is relevant for the use of the declared product. Farther information regarding the technical properties can be found on the Technical Data Sheet.

Criterion	Standard/ test specification	Class
Density	EN ISO 2811	1.40 - 1.60 g/cm³
Diffusion-equivalent air layer thickness	EN 1062-3	V1 high
Water permeability rate w	EN 1062-1	W3 low
Gloss	EN 1062-1	G3
Dry layer thickness	EN 1062-1	E3 > 100; ≤ 200
Grain size	EN 1062-1	S1 fine

7.2 Ancillary materials

Raw material	**Weight (%)**
Binder	10 - 15
Filler	30 - 40
Additive	2 - 3
Water	25 - 35
Colorant	15 - 25

7.3 Declared unit

The declared unit is 1 kg StoColor Lotusan® G with a RSL of 15 years The scope of this LCA is cradle to gate with options, modules C1-C4 and module D. Technical life span of the products raw materials is the same as for the whole product.

Reference unit: kilogram (kg)

8. LCA: Results

The following tables show the results of the impact assessment indicators, resource use, waste and other output streams. The results presented here refer to the declared average product.

Disclaimer on ADP-e, ADP-f, WDP, ETP-fw, HTP-c, HTP-nc, SQP: The results of these environmental impact indicators must be used with caution, as the uncertainties in these results are high or as there is limited experience with the indicator.

Disclaimer on IR: This impact category mainly addresses the potential effect of low dose ionizing radiation on human health in the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents and occupational exposures, nor does it consider radioactive waste disposal in underground facilities. Potential ionizing radiation from soil, radon, and some building materials is also not measured by this indicator.

LCA results - Indicators describing environmental impacts based on the impact assessment (LCIA): 1 kg StoColor Lotusan® G(EN 15804+A2)											
Parameter	**Unit**	**A1**	**A2**	**A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
Core environmental impact indicators (EN 15804+A2)											
GWP-total	Kg CO_2 eqv.	1,33E+00	5,40E-02	1,09E-02	6,08E-02	1,43E-01	8,09E-03	1,35E-02	0,00E+00	5,28E-03	-2,33E-02
GWP-f	kg CO_2 eqv.	1,32E+00	5,40E-02	6,55E-02	6,07E-02	8,71E-02	7,48E-03	1,35E-02	0,00E+00	5,27E-03	-2,33E-02
GWP-b	kg CO_2 eqv.	8,65E-03	3,01E-05	-5,47E-02	3,27E-05	5,56E-02	6,03E-04	6,23E-06	0,00E+00	1,04E-05	-6,12E-06
GWP-luluc	kg CO_2 eqv.	8,25E-04	1,87E-05	5,65E-05	2,14E-05	3,16E-05	9,07E-06	4,95E-06	0,00E+00	1,47E-06	-2,09E-05
ODP	kg CFC 11 eqv.	3,04E-07	1,24E-08	4,28E-09	1,39E-08	1,17E-08	2,93E-10	2,98E-09	0,00E+00	2,17E-09	-3,18E-09
AP	mol H+ eqv.	3,16E-02	2,75E-04	3,73E-04	3,09E-04	1,01E-03	2,17E-05	7,83E-05	0,00E+00	5,00E-05	-7,65E-05
EP-fw	kg P eqv.	8,64E-05	4,26E-07	1,65E-06	4,81E-07	2,81E-06	1,13E-06	1,36E-07	0,00E+00	5,90E-08	-2,22E-07
EP-m	kg N eqv.	1,71E-03	9,35E-05	5,12E-05	1,05E-04	7,14E-05	3,36E-06	2,76E-05	0,00E+00	1,72E-05	-2,20E-05
EP-T	mol N eqv.	1,55E-02	1,03E-03	5,55E-04	1,16E-03	6,88E-04	5,32E-05	3,04E-04	0,00E+00	1,90E-04	-3,30E-04
POCP	kg NMVOC eqv.	5,94E-03	2,96E-04	2,34E-04	3,31E-04	2,42E-04	1,01E-05	8,68E-05	0,00E+00	5,51E-05	-6,90E-05
ADP-mm	kg Sb-eqv.	2,38E-05	1,42E-06	7,01E-07	1,66E-06	9,15E-07	6,22E-08	3,42E-07	0,00E+00	4,82E-08	-4,26E-08
ADP-f	MJ	1,79E+01	8,23E-01	1,61E+00	9,23E-01	6,98E-01	1,02E-01	2,04E-01	0,00E+00	1,47E-01	-4,03E-01
WDP	m^3 world eqv.	1,92E+00	2,33E-03	3,78E-02	2,57E-03	6,14E-02	3,88E-04	7,28E-04	0,00E+00	6,60E-03	-2,62E-03
Additional environmental impact indicators (EN 15804+A2)											
PM	disease in-cidence	1,12E-07	4,01E-09	3,36E-09	4,39E-09	4,09E-09	8,45E-11	1,21E-09	0,00E+00	9,72E-10	-8,48E-10
IR	kBq U235 eqv.	5,49E-02	3,60E-03	1,59E-03	4,04E-03	2,17E-03	3,20E-04	8,53E-04	0,00E+00	6,04E-04	-2,31E-04
ETP-fw	CTUe	4,76E+01	6,59E-01	7,69E-01	7,39E-01	2,02E+00	8,46E-02	1,81E-01	0,00E+00	9,55E-02	-5,63E-01
HTP-c	CTUh	4,58E-09	1,83E-11	7,79E-11	2,08E-11	1,58E-10	1,95E-12	5,89E-12	0,00E+00	2,21E-12	-7,78E-12
HTP-nc	CTUh	2,98E-08	7,21E-10	7,05E-10	8,06E-10	1,17E-09	7,68E-11	1,99E-10	0,00E+00	6,79E-11	-2,50E-10
SQP	Pt	1,03E+01	6,05E-01	6,82E+00	6,37E-01	5,95E-01	2,45E-02	1,77E-01	0,00E+00	3,09E-01	-2,20E+00

ADP-mm= Abiotic depletion potential for non-fossil resources | **ADP-f**=Abiotic depletion for fossil resources potential | **AP**= Acidification potential, Accumulated Exceedance | **EP-fw** = Eutrophication potential, fraction of nutrients reaching freshwater end compartment | **EP-m**= Eutrophication potential, fraction of nutrients reaching marine end compartment| **EP-T**= Eutrophication potential, Accumulated Exceedance | **GWP-b**=Global Warming Potential biogenic | **GWP-f**=Global Warming Potential fossil fuels | **GWP-luluc**=Global Warming Potential land use and land use change |**GWP-total**=Global Warming Potential total| **ODP**=Depletion potential of the stratospheric ozone layer |**POCP**=Formation potential of tropospheric ozone | **WDP**=Water (user) deprivation potential, deprivation- weighted water consumption | **ETP-fw**=Potential Comparative Toxic Unit for ecosystems | **HTP-c**=Potential Toxic Unit for Humans toxicity, cancer | **HTP-nc**= Potential Toxic Unit for humans, non-cancer | **IRP**=Potential Human exposure efficiency relative to U235, human health | **PM**=Potential incidence of disease due to Particulate Matter emissions | **SQP**=Potential soil quality index

LCA results - Indicators describing resource use and environmental information derived from life cycle inventory (LCI): 1 kg StoColor Lotusan® G (EN 15804+A2)											
Parameter	**Unit**	**A1**	**A2**	**A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	1,87E+00	1,15E-02	6,25E-01	1,30E-02	7,92E-02	1,85E-02	2,55E-03	0,00E+00	1,19E-03	-4,54E-01
PERM	MJ	1,41E-01	0,00E+00	4,62E-01	0,00E+00	1,81E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	2,01E+00	1,15E-02	1,09E+00	1,30E-02	9,73E-02	1,85E-02	2,55E-03	0,00E+00	1,19E-03	-4,54E-01
PENRE	MJ	1,92E+01	8,74E-01	1,17E+00	9,80E-01	7,31E-01	1,09E-01	2,16E-01	0,00E+00	1,56E-01	-4,20E-01
PENRM	MJ	0,00E+00	0,00E+00	5,57E-01	0,00E+00	1,67E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-2,49E-02
PENRT	MJ	1,92E+01	8,74E-01	1,73E+00	9,80E-01	7,47E-01	1,09E-01	2,16E-01	0,00E+00	1,56E-01	-4,45E-01
SM	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	M^3	4,77E-02	8,74E-05	7,26E-04	9,73E-05	1,54E-03	4,63E-05	2,48E-05	0,00E+00	1,57E-04	-4,01E-05
HWD	Kg	4,76E-05	2,14E-06	1,00E-06	2,42E-06	1,72E-06	1,28E-07	5,16E-07	0,00E+00	2,20E-07	-5,12E-07
NHWD	Kg	1,11E+00	4,26E-02	1,15E-02	4,41E-02	7,37E-02	4,28E-04	1,29E-02	0,00E+00	1,00E+00	-9,89E-04
RWD	Kg	5,62E-05	5,61E-06	1,66E-06	6,29E-06	2,39E-06	4,11E-07	1,34E-06	0,00E+00	9,67E-07	-3,27E-07
CRU	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	Kg	0,00E+00	0,00E+00	5,40E-04	0,00E+00	2,59E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EET	MJ	0,00E+00	0,00E+00	-2,25E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-2,77E-01
EEE	MJ	0,00E+00	0,00E+00	-1,30E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-1,61E-01

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 fresh water | **HWD**=Hazardous waste disposed | **NHWD**=Non-hazardous waste disposed | **RWD**=Radio-active waste disposed | **CRU**=Components for re-use | **MFR**=Materials for recycling | **MER**=Materials for energy recovery | **EET**=Exported energy, thermical | **EE**=Exported energy, electrical

Uptake of biogenic carbon dioxide

LCA results - information on biogenic carbon content at the factory gate: 1 kg StoColor Lotusan® G (EN 15804+A2)		
Parameter	**Unit**	**Value**
biogenic carbon content in product	kg C	0
biogenic carbon content in accompanying packaging	kg C	0.015
NOTE 1 kg biogenic carbon is equivalent to 44/12 kg CO_2		

The following amount of carbon dioxide uptake is taken into account. Related uptake and release of carbon dioxide in downstream processes are not taken into account in this number although they do appear in the presented results. One kilogram of biogenic Carbon content is equivalent to 44/12 kg of biogenic carbon dioxide uptake

Uptake of biogenic carbon dioxide	**Unit**	**Amount**
Packaging	kg CO_2 (biogenic)	0.055

9. References

Ecoinvent 2019	Ecoinvent Datenbank Version 3.6 (2019)
EN 15804	EN 15804:2012+A2:2019: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products
ISO 14025	ISO 14025:2010 Environmental labels and declarations — Type III environmental declarations — Principles and procedures
ISO 14040	ISO 14040:2006 Environmental management - Life cycle assessment - Principles and framework
ISO 14044	ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines
NMD 2019	NMD STICHTING NATIONAL ENVIRONMENTAL DATABASE: Environmental Performance Assessment Method for Construction; 1.1 (March 2022); Rijswijk
PCR A	Kiwa-Ecobility Experts, Berlin, 2022: PCR A – General Program Category Rules for Construction Products from the EPD programme of Kiwa-Ecobility Experts; Version 2.1
R<THiNK 2023	R<THiNK; Online-EPD-Tool by NIBE B.V.
SimaPro Software	Industry data LCA library; website: https://simapro.com/databases/industry-data-lca-library/
EN 1062-1	Paints and varnishes - Coating materials and coating systems for exterior masonry and concrete (2004-08)
EN ISO 2811	Paints and varnishes - Determination of density - Part 1: Pycnometer method (2023-04)
EN ISO 1062-3	Paints and varnishes - Coating materials and coating systems for exterior masonry and concrete - Part 3: Determination of liquid water permeability (2008-04)

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