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FASLOC – resin cartridges



Owner of the EPD:

DSI Underground Chemicals sp. z o.o.
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EPD Program Operator:

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ITB is the verified member of The European Platform for EPD program operators and LCA practitioner www.eco-platform.org

Basic information

This declaration is the Type III Environmental Product Declaration (EPD) based on EN 15804+A2 and verified according to ISO 14025 by an external auditor. It contains the information on the impacts of the declared construction materials on the environment. Their aspects were verified by the independent body according to ISO 14025. Basically, a comparison or evaluation of EPD data is possible only if all the compared data were created according to EN 15804+A2.

Life cycle analysis (LCA): A1-A3 in accordance with EN 15804+A2 (Cradle-to-Gate)

The year of preparing the EPD: 2023

Service Life: N/A

PCR: ITB-PCR A

Declared unit: 1 kg

Reasons for performing LCA: B2B

Representativeness: Polish, European

MANUFACTURER

DSI Underground, part of the Sweden based company Sandvik Group, is the world's leading supplier of ground support products, systems and solutions for the underground mining and tunneling industry. One of the company's Polish entities, DSI Underground Chemicals, located in Mikołów, produces mainly resin cartridges for mining and tunneling.



Fig. 1. A view of the DSI Underground Chemicals sp. z o.o. production plant located in Mikołów (Poland)

PRODUCTS DESCRIPTION AND APPLICATION

FASLOC resin cartridges are used in mining workings (roofs, sidewalls, floors) for the main bolting support, for fixing rods and bolts as well as auxiliary bolting. They are also used for bolting and anchoring steel elements in tunnel construction and all types of civil engineering structures.

Resin anchor bolting provides effective long term strata support in underground softrock, hardrock, mining and tunnelling. The resin anchored bolts can be fully encapsulated for corrosion resistance and point anchored and tensioned to plate and mesh for confinement of the coal or rock face.

DSI FASLOC resin anchors are manufactured from a sophisticated blend of reinforced polyester resins and inert fillers. In addition to the typical two-part mastic/catalyst arrangement, DSI manufacture two speed anchors containing two distinct resin gel times in the same package where separate point anchor and tension times are required for bolting. DSI also provides a two capsule arrangement where 2 resin capsules are joined and folded in half for packaging, and are available in either single-speed or two-speed configurations.

FASLOC resin capsules comprise an outer clear plastic heat sealed sheath clipped at both ends. Within this are two separate internal compartments consisting of:

1. Colour coded reinforced thixotropic polyester resin mastic of a specific setting speed and

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2. Catalyst/hardener to activate the resin.

In addition to the typical two-part mastic/catalyst arrangement, Duo Speed cartridges contain two distinct resin gel times – Fast and Slow – in the same convenient package.

On rotation of the bolt through the capsule in the bolt hole, the two capsule compartments are ruptured and the components are mixed together initiating a rapid polymerization process and cure to form a rock solid anchor.

Table 1. Types and technical data of Fasloc resin cartridges manufactured by DSI Underground Chemicals sp. z o.o.

FASLOC Type	Diameter	Length		Gel Time	
	[mm]	[mm]		[s]	
FASLOC (S, S+, HS, SW, X, SK*)	18 ÷ 42	200 ÷ 2500		10 ÷ 600	
FASLOC (S, S+, HS, SW, X, SK*) DUO SPEED	23 ÷ 30	Fast	Slow	Fast	Slow
		200 ÷ 1200	200 ÷ 1200	15 ÷ 60 **	60 ÷ 600 **

*SK symbol means a two capsule arrangement where 2 cartridges are joined and folded in half for packing.

**Unless otherwise stated, the standard gel time for Fast part is 30 seconds and for Slow part is 180 seconds.

More information about Fasloc resin cartridges can be found on the DSI Underground Chemicals sp. z o.o. website <https://www.dsiunderground.com/>

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Unit

The declared unit is 1 kg of product of Fasloc resin cartridge

System boundary

Modules A1-A3 are taken into consideration in the LCA: A1 Production of preliminary products, A2 Transport to plant, A3 Production (incl. provision of energy, production of auxiliaries and consumables or waste treatment). Fasloc resin cartridges were identified as physically integrated with other products during installation so they cannot be physically separated from them at the end of life and no longer identifiable at the end of life as a result of a physical or chemical transformation process. Therefore, they may omit the declaration of modules C1-C4 and D. This type of EPD declaration is called "cradle to gate".

Allocation

The allocation rules used for this EPD are based on general ITB PCR A. Production of Fasloc resin cartridges is a line process conducted in the factory of DSI Underground Chemicals sp. z o.o., located in Mikołów (Poland). Allocation was done on product mass basis. All impacts from raw materials extraction and processing are allocated in module A1 of the LCA. Impacts from the global line production DSI Underground Chemicals sp. z o.o. were inventoried and 100 % were allocated to the production of Fasloc resin cartridges based on the annual production volume expressed in kg. Water and energy consumption, associated emissions and generated wastes are allocated to module A3. Packaging materials were taken into consideration.

System limits

According to the standard EN 15804+A2, products used for the production of other products should be declared at the production stage. Energy and water consumption, emissions as well as information on generated wastes were inventoried and were included in the calculations. It can be assumed that the total sum of omitted processes does not exceed 5% of all impact categories. In accordance with EN 15804+A2, machines and facilities (capital goods) required for the production as well as transportation of employees were not included in LCA. The production of etiquettes/printing was not considered.

Modules A1 and A2: Raw materials supply and transport

The products covered by this EPD contain the base materials: polyester resin, calcium carbonate, other chemical substances and additives materials. Raw materials come mainly from Polish suppliers. Data on transport of the different products to the manufacturing plant is collected and modelled for factory by assessor. Means of transport include trucks and Polish and European fuel averages are applied. Means of transport include small trucks < 10 t. and lorries > 16 t. Based on data provided by the manufacturer, all input of transport resources was inventoried in details.

Module A3: Production

The production is done by DSI Underground Chemicals sp. z o.o. plant in Mikołów, Poland. A scheme of Fasloc resin cartridges production process is presented in Figure 2. The facility is ISO 9001 and ISO 14001 certified.

Data quality

The data selected for LCA analysis comes from ITB-LCI questionnaires completed by DSI Underground Chemicals sp. z o.o. using the inventory data, ITB and Ecoinvent v. 3.9.1 databases and KOBiZE. KOBiZE data is supplemented with Ecoinvent v. 3.9.1 data on the national electricity mix impact where no specific indicator data is provided. No specific data collected is older than five years and no generic datasets used are older than ten years. The representativeness, completeness, reliability, and consistency are judged as good.

Data collection period

Primary data provided by DSI Underground Chemicals sp. z o.o. covers a period of 01.2022 – 12.2022 (1 year). The life cycle assessments were prepared for Poland and Europe as reference area.

Assumptions and estimates

The impacts of the representative of Fasloc resin cartridges were aggregated using weighted average. Impacts were inventoried and calculated for all products of Fasloc resin cartridge types (S, S+, HS, SW, X, SK, Duo Speed).

Calculation rules

LCA was performed using ITB-LCA tool developed in accordance with EN 15804 + A2.

Databases

The data for the processes comes from Ecoinvent v. 3.9.1 and ITB-Database. Specific data quality analysis was a part of external audit. Polish electricity mix used (production) is 0.761 kg CO₂/kWh (KOBiZE 2022).

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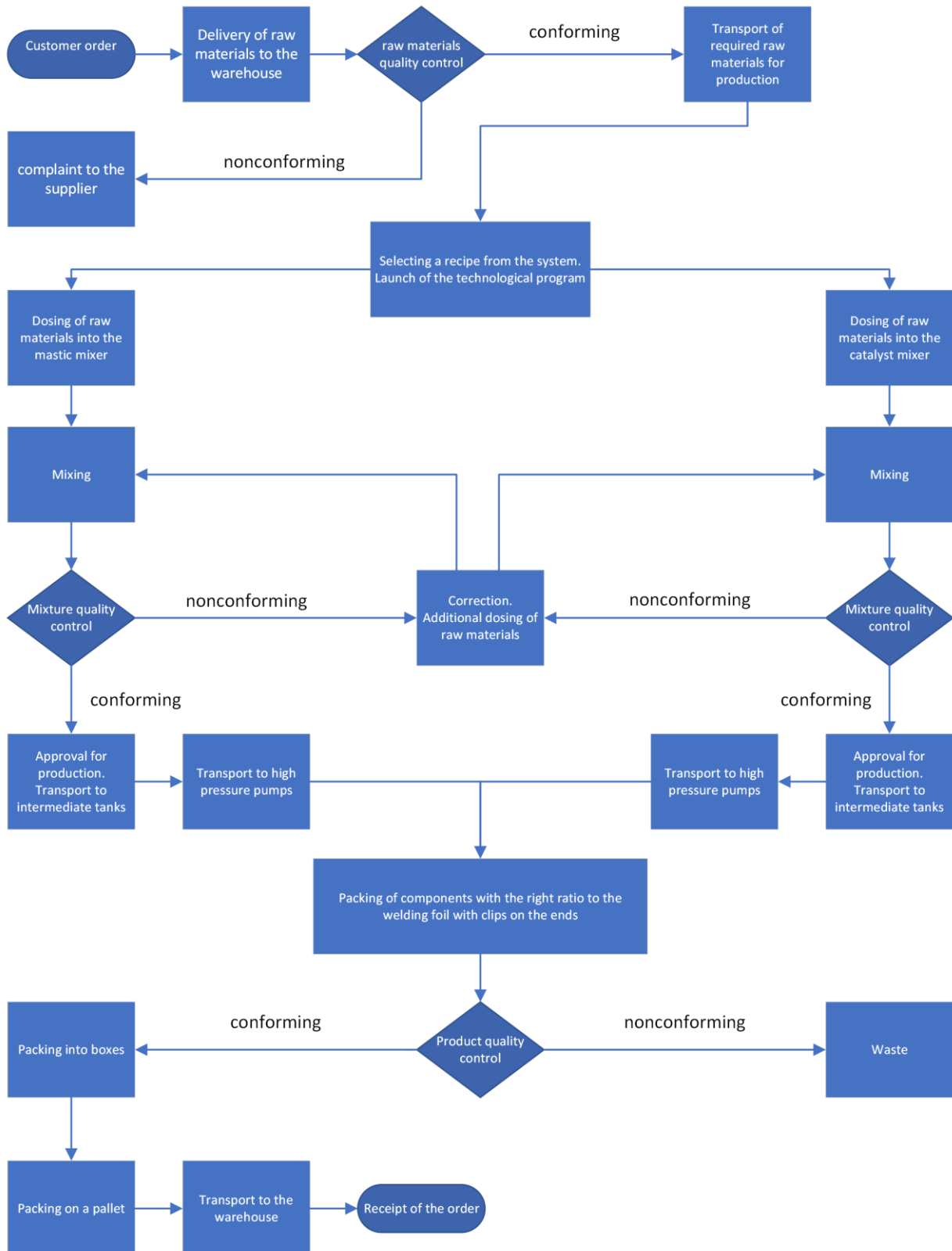


Figure 2. The scheme of the Fasloc resin cartridges production process by DSI Underground Chemicals sp. z o.o.

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LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The declaration refers to declared unit (DU) – 1 kg of Fasloc resin cartridges manufactured by DSI Underground Chemicals sp. z o.o.

Table 2. System boundaries for the environmental characteristic of Fasloc resin cartridges production process by DSI Underground Chemicals sp. z o.o.

Environmental assessment information (MD – Module Declared, MND – Module Not Declared, INA – Indicator Not Assessed)																
Product stage			Construction process		Use stage							End of life			Benefits and loads beyond the system boundary	
Raw material supply	Transport	Manufacturing	Transport to construction site	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction 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
MD	MD	MD	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

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Table 3. Life cycle assessment (LCA) results of Fasloc resin cartridges manufactured by DSI Underground Chemicals sp. z o.o. – environmental impacts (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3
Global Warming Potential	eq. kg CO ₂	7.18E-01	3.37E-02	1.08E-01	8.60E-01
Greenhouse gas potential - fossil	eq. kg CO ₂	7.31E-01	3.37E-02	1.07E-01	8.71E-01
Greenhouse gas potential - biogenic	eq. kg CO ₂	-1.37E-02	2.89E-05	1.43E-03	-1.23E-02
Global warming potential - land use and land use change	eq. kg CO ₂	5.19E-04	1.75E-05	2.45E-05	5.61E-04
Stratospheric ozone depletion potential	eq. kg CFC 11	1.52E-07	7.33E-10	3.27E-09	1.56E-07
Soil and water acidification potential	eq. mol H ⁺	3.30E-03	7.30E-05	9.03E-04	4.28E-03
Eutrophication potential - freshwater	eq. kg P	1.64E-04	2.52E-06	1.31E-04	2.97E-04
Eutrophication potential - seawater	eq. kg N	5.96E-04	1.80E-05	1.39E-04	7.53E-04
Eutrophication potential - terrestrial	eq. mol N	6.35E-03	1.83E-04	1.24E-03	7.77E-03
Potential for photochemical ozone synthesis	eq. kg NMVOC	2.77E-03	1.12E-04	4.46E-04	3.33E-03
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1.17E-05	1.23E-07	1.18E-07	1.19E-05
Abiotic depletion potential - fossil fuels	MJ	1.56E+01	4.81E-01	2.25E+00	1.83E+01
Water deprivation potential	eq. m ³	2.84E-01	2.48E-03	2.61E-02	3.12E-01

Table 4. Life cycle assessment (LCA) results of Fasloc resin cartridges manufactured by DSI Underground Chemicals sp. z o.o. – additional impacts indicators (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3
Particulate matter	disease incidence	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA

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Table 5. Life cycle assessment (LCA) results of Fasloc resin cartridges manufactured by DSI Underground Chemicals sp. z o.o. - environmental aspects related to resource use (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	5.87E-01	8.26E-03	8.73E-02	6.83E-01
Consumption of renewable primary energy resources used as raw materials	MJ	2.44E-01	0.00E+00	0.00E+00	2.44E-01
Total consumption of renewable primary energy resources	MJ	8.31E-01	8.26E-03	8.73E-02	9.27E-01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	1.20E+01	4.81E-01	1.63E+00	1.41E+01
Consumption of non-renewable primary energy resources used as raw materials	MJ	3.56E+00	0.00E+00	6.87E-01	4.25E+00
Total consumption of non-renewable primary energy resources	MJ	1.56E+01	4.81E-01	2.31E+00	1.84E+01
Consumption of secondary materials	kg	3.95E-03	2.30E-04	2.02E-04	4.39E-03
Consumption of renewable secondary fuels	MJ	2.56E-03	2.80E-06	7.00E-07	2.56E-03
Consumption of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net consumption of freshwater resources	m ³	7.13E-03	6.06E-05	5.18E-04	7.71E-03

Table 6. Life cycle assessment (LCA) results of Fasloc resin cartridges manufactured by DSI Underground Chemicals sp. z o.o. - environmental information describing waste categories (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3
Hazardous waste neutralized	kg	1.71E-02	3.36E-04	2.17E-04	1.76E-02
Non-hazardous waste neutralised	kg	7.09E-01	1.07E-02	7.34E-02	7.93E-01
Radioactive waste	kg	1.19E-05	1.78E-07	1.06E-06	1.32E-05
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	1.75E-04	3.77E-06	1.09E-05	1.90E-04
Materials for energy recovery	kg	8.66E-07	2.50E-08	1.81E-08	9.09E-07
Energy exported	MJ	2.31E-02	3.82E-04	3.43E-03	2.69E-02

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Verification

The process of verification of this EPD is in accordance with ISO 14025 and ISO 21930. After verification, this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years, if the underlying data have not changed significantly.

The basis for LCA analysis was EN 15804+A2 and ITB PCR A
Independent verification corresponding to ISO 14025 (subclause 8.1.3.) <input checked="" type="checkbox"/> external <input type="checkbox"/> internal
External verification of EPD: Halina Prejzner, PhD Eng LCA, LCI audit and input data verification: Mateusz Kozicki, PhD Verification of LCA: Michał Piasecki, PhD, DSc, Eng

Note 1: The declaration owner has the sole ownership, liability and responsibility for the information provided and contained in EPD. Declarations within the same product category but from different programmes may not be comparable. Declarations of construction products may not be comparable if they do not comply with EN 15804 + A2. For further information about comparability, see EN 15804 + A2 and ISO 14025. Depending on the application, a corresponding conversion factor such as the specific weight per surface area must be taken into consideration.

Note 2: ITB is a public Research Organization and Notified Body (EC Reg. no 1488) to the European Commission and to other Member States of the European Union designated for the tasks concerning the assessment of building products' performance. ITB acts as the independent, third-party verification organization (17065/17025 certified). ITB-EPD program is recognized and registered member of The European Platform – Association of EPD program operators and ITB-EPD declarations are registered and stored in the international ECO-PORTAL.

Normative references

- ITB PCR A, v.1.6 General Product Category Rules for Construction Products
- ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services
- ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines
- ISO 15686-1:2011 Buildings and constructed assets – Service life planning – Part 1: General principles and framework
- ISO 15686-8:2008 Buildings and constructed assets – Service life planning – Part 8: Reference service life and service-life estimation
- EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- ISO 14067:2018 Greenhouse gases - Carbon footprint of products — Requirements and guidelines for quantification
- PN-EN 15942:2012 Sustainability of construction works – Environmental product declarations – Communication format business-to-business
- KOBIZE Emissions (CO₂, SO₂, NO_x, CO and total dust) from electricity, 2022



Instytut Techniki Budowlanej

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Thermal Physics, Acoustics and Environment Department

02-656 Warsaw, Ksawerów 21

CERTIFICATE № 563/2023 of TYPE III ENVIRONMENTAL DECLARATION

Products:

FASLOC - resin cartridges

Manufacturer:

DSI UNDERGROUND CHEMICALS Sp. z o.o.

ul. Podleska 76, 43-190 Mikołów, Poland

confirms the correctness of the data included in the development of
Type III Environmental Declaration and accordance with the requirements of the standard

EN 15804+A2

Sustainability of construction works.

Environmental product declarations.

Core rules for the product category of construction products.

This certificate, issued on 29th November 2023 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Head of the Thermal Physic, Acoustics
and Environment Department


Agnieszka Winkler-Skalna, PhD



Deputy Director
for Research and Innovation


Krzysztof Kuczyński, PhD

Warsaw, November 2023