Type III Environmental Product Declaration No. 412/2023

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LOKSET – resin capsules for anchoring steel elements

Owner of the EPD:

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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, C1-C4 and D modules in accordance with EN 15804+A2 (Cradle-to-Gate with options)

The year of preparing the EPD: 2023

Service Life: 100 years

PCR: ITB-PCR A

Declared unit: 1 kg

Reasons for performing LCA: B2B

Representativeness: Polish, European

MANUFACTURER

Minova is a global producer of ground support materials used in the underground mining and infrastructure sectors, specializing in steel bolts, nails, anchors and micropiles and injection and capsule resins and powders for anchoring, grouting, ground engineering and water and void/crack control.

Production site MINOVA EKOCHEM Sp. z o.o. is located in Siemianowice Śląskie (Fig. 1).

The main application of Minova's portfolio comprises:

- **Sealing and water control** – prevention or reduction of inflow into underground structures, to stop structural instability.
- **Strengthening** - increases the original rock and soil parameters: compressive strength, shear resistance, tensile strength, cohesion.
- **Securing –** stabilizes rock and/or soil by increasing the safety factor of the rock/soil mass
- **Filling** - filling of empty spaces including cavities or over-breaks to control rock movement, annulus grouting, and air movement.
- **Consolidation** - consolidation by grouting rock mass discontinuities, reducing the compressibility of the soil matrix in construction applications.

Fig. 1. A view of the MINOVA EKOCHEM Sp. z o.o. production plant located in Siemianowice Śląskie (Poland)

PRODUCTS DESCRIPTION AND APPLICATION

Lokset resin capsules are two-component resin mortars – firstly a mastic based on polyester resin, and secondly, a hardener containing organic peroxide. The two components are separated from each other with a plastic sheath.

The primary use of the product is as an anchoring medium to secure various types of bolts, which are used for ground support in the underground mining and infrastructure sector. The secondary application of the product is as an anchoring medium of short pins or bolts for machinery, foundation, pipes and cables in structures (such as concrete or various masonry).

Lokset resin capsules can be applied using different types of bolting machines, under different geological conditions and fulfilling specific customer requirements. Therefore, there is a large variation of Lokset capsules in the portfolio. Main differentiations are: geometrical dimensions (diameter x length), reactivity (gel time), viscosity (M-medium viscosity, L, AV – thixotropic and low viscosity), mechanical parameters (S - standard, H - high strength) and special versions (tailor-made solutions for customers).

Table 1. Specification of Lokset resin capsules manufactured by MINOVA EKOCHEM Sp. z o.o.

Parameter	Unit	Value
Viscosity at 20°C	Pa·s	200-2000
Gel time at 20°C	s	20 - 600
Capsule diameter	mm	10 - 50
Capsule length	mm	100 - 2000
Compressive strength after 2h	MPa	≥ 10
Compressive strength after 24h	MPa	≥ 30
Pull-out force of the glued-in anchor	kN	≥ 120

Figure 2. Illustrative (upper) and production (lower) picture of the Lokset resin capsules

More information about Lokset resin capsules can be found on the MINOVA EKOCHEM Sp. z o.o. website www.minovaglobal.com

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Allocation

The allocation rules used for this EPD are based on general ITB PCR A. Production of Lokset resin capsules is a line process conducted in the factory of MINOVA EKOCHEM Sp. z o.o., located in Siemianowice Śląskie (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 MINOVA EKOCHEM Sp. z o.o. were inventoried and 21.3 % were allocated to the production of Lokset resin capsules 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 takien into consideration.

System limits

The life cycle analysis (LCA) of the declared products covers: product stage – modules A1-A3, end of life – modules C1-C4 and benefits and loads beyond the system boundary – module D (cradle-to-gate with options) in accordance with EN 15804+A2 and ITB PCR A. 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.

Modules A1 and A2: ***Raw materials supply and transport***
Limestones, unsaturated polyester resins, calcium carbonates or benzyl peroxides used to produce Lokset resin capsules, additives, auxiliary materials and packaging materials come from external suppliers. Means of transport include average (10-16 t) and big trucks (>16 t) are applied. Based on data provided by the manufacturer, all input of transport resources was inventoried in details.

Module A3: ***Production***
A scheme of Lokset resin capsules production process is presented in Figure 3.

Modules *C1-C4 and D: End-of-life (EoL)*
It is assumed that at the end-of-life, 100% of Lokset resin capsules demounted using electric demolition hammer (module C1) and is transported to waste processing plant distant by 50 km, on 16-32 t lorry (Euro 5) (module C2).
It is assumed that 95% of the wastes residues are forwarded to a landfill in the form of mixed construction and demolition wastes (without packaging materials).
All adhesive mortars end up in construction and demolition waste landfills as their final stage and modelled as such in the LCA (C4). No potential benefits of recycling and re-use were taken into account in the current LCA report (D).

Data quality
The data selected for LCA analysis originate from ITB-LCI questionnaires completed by MINOVA EKOCHEM Sp. z o.o. using the inventory data, ITB and Ecoinvent database v. 3.9. 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 MINOVA EKOCHEM Sp. z o.o. covers a period of 01.2021 – 12.2021 (1 year). The life cycle assessments were prepared for Poland and Europe as reference area.

Assumptions and estimates
The impacts of the representative of Lokset resin capsules were aggregated using weighted average. Impacts were inventoried and calculated for all products of Lokset resin capsules.

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

Databases
The data for the processes come from Ecoinvent v. 3.9 database. The data for the processes comes from Ecoinvent v. 3.9 and ITB-Database. Specific data quality analysis was a part of external audit. Polish electricity mix used (production) is 0.698 kg CO_2/kWh (KOBiZE 2021). European electricity mix used is 0.430 kg CO_2/kWh for the end of life (Ecoinvent v. 3.8, RER).

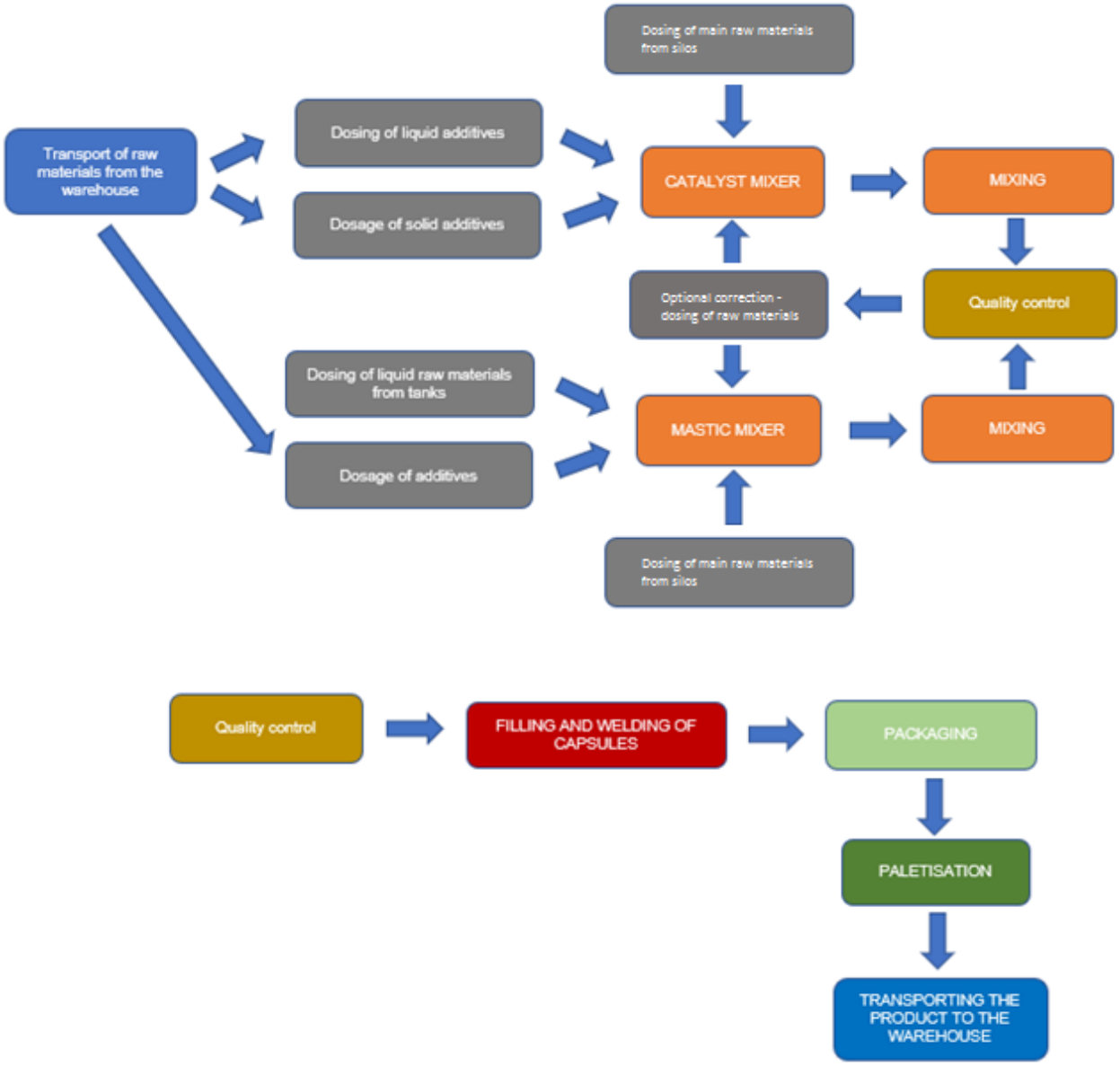

Figure 3. The scheme of the Lokset resin capsules production process by MINOVA EKOCHEM Sp. z o.o.

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The declaration refers to declared unit (DU) – 1 kg of Lokset resin capsules manufactured by MINOVA EKOCHEM Sp. z o.o.

Table 2. System boundaries for the environmental characteristic of Lokset resin capsules production process by MINOVA EKOCHEM 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**	**MD**	**MD**	**MD**	**MD**	**MD**

Table 3. Life cycle assessment (LCA) results of Lokset resin capsules manufactured by MINOVA EKOCHEM Sp. z o.o. – environmental impacts (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO2	5.15E-01	2.24E-01	3.06E-01	1.05E+00	8.38E-02	3.34E-03	0.00E+00	1.36E-02	0.00E+00
Greenhouse gas potential - fossil	eq. kg CO2	5.81E-01	2.23E-01	3.02E-01	1.11E+00	8.23E-02	3.32E-03	0.00E+00	1.36E-02	0.00E+00
Greenhouse gas potential - biogenic	eq. kg CO2	-6.66E-02	1.09E-03	4.33E-03	-6.12E-02	1.48E-03	1.14E-05	0.00E+00	1.01E-05	0.00E+00
Global warming potential - land use and land use change	eq. kg CO2	6.23E-04	1.27E-04	5.74E-05	8.07E-04	1.93E-05	1.30E-06	0.00E+00	1.54E-05	0.00E+00
Stratospheric ozone depletion potential	eq. kg CFC 11	1.92E-07	4.89E-08	7.65E-09	2.48E-07	1.58E-09	7.69E-10	0.00E+00	2.87E-10	0.00E+00
Soil and water acidification potential	eq. mol H+	2.65E-03	8.72E-04	2.82E-03	6.35E-03	8.71E-04	1.35E-05	0.00E+00	9.97E-05	0.00E+00
Eutrophication potential - freshwater	eq. kg P	1.33E-04	2.09E-05	4.03E-04	5.56E-04	1.49E-04	2.23E-07	0.00E+00	9.48E-07	0.00E+00
Eutrophication potential - seawater	eq. kg N	4.79E-04	2.43E-04	4.51E-04	1.17E-03	1.24E-04	4.07E-06	0.00E+00	4.13E-05	0.00E+00
Eutrophication potential - terrestrial	eq. mol N	5.04E-03	2.64E-03	3.75E-03	1.14E-02	1.06E-03	4.44E-05	0.00E+00	4.45E-04	0.00E+00
Potential for photochemical ozone synthesis	eq. kg NMVOC	2.18E-03	8.23E-04	1.23E-03	4.23E-03	2.98E-04	1.36E-05	0.00E+00	1.43E-04	0.00E+00
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	8.40E-06	1.33E-06	3.45E-07	1.01E-05	1.19E-07	1.18E-08	0.00E+00	1.97E-08	0.00E+00
Abiotic depletion potential - fossil fuels	MJ	1.41E+01	3.26E+00	4.67E+00	2.20E+01	1.34E+00	4.93E-02	0.00E+00	2.45E-01	0.00E+00
Water deprivation potential	eq. m^3	2.29E-01	1.96E-02	8.12E-02	3.30E-01	2.73E-02	2.28E-04	0.00E+00	1.01E-03	0.00E+00

Table 4. Life cycle assessment (LCA) results of Lokset resin capsules manufactured by MINOVA EKOCHEM Sp. z o.o.– additional impacts indicators (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 5. Life cycle assessment (LCA) results of Lokset resin capsules manufactured by MINOVA EKOCHEM Sp. z o.o. - environmental aspects related to resource use (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	9.75E-01	6.74E-02	2.65E-01	1.31E+00	9.74E-02	7.08E-04	0.00E+00	2.37E-03	0.00E+00
Consumption of renewable primary energy resources used as raw materials	MJ	6.07E-01	0.00E+00	0.00E+00	6.07E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	1.58E+00	6.74E-02	2.66E-01	1.91E+00	9.74E-02	7.08E-04	0.00E+00	2.37E-03	0.00E+00
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	9.96E+00	3.26E+00	4.77E+00	1.80E+01	1.42E+00	4.93E-02	0.00E+00	2.45E-01	0.00E+00
Consumption of non-renewable primary energy resources used as raw materials	MJ	4.13E+00	0.00E+00	8.78E-03	4.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of non-renewable primary energy resources	MJ	1.41E+01	3.26E+00	4.89E+00	2.23E+01	1.42E+00	4.93E-02	0.00E+00	2.45E-01	0.00E+00
Consumption of secondary materials	kg	6.54E-03	1.64E-03	4.15E-04	8.59E-03	1.08E-04	1.65E-05	0.00E+00	8.39E-05	0.00E+00
Consumption of renewable secondary fuels	MJ	2.88E-02	1.95E-05	2.01E-06	2.88E-02	5.92E-07	1.82E-07	0.00E+00	1.06E-06	0.00E+00
Consumption of non-renewable secondary fuels	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
Net consumption of freshwater resources	m^3	5.52E-03	5.22E-04	5.46E-03	1.15E-02	4.36E-04	6.21E-06	0.00E+00	1.63E-04	0.00E+00

Table 6. Life cycle assessment (LCA) results of Lokset resin capsules manufactured by MINOVA EKOCHEM Sp. z o.o.- environmental information describing waste categories (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Hazardous waste neutralized	kg	1.74E-02	4.98E-03	1.59E-02	3.83E-02	2.78E-07	5.54E-05	0.00E+00	1.42E-04	0.00E+00
Non-hazardous waste neutralised	kg	5.85E-01	9.15E-02	6.65E-02	7.43E-01	7.93E-03	9.83E-04	0.00E+00	4.05E-03	0.00E+00
Radioactive waste	kg	7.90E-06	2.20E-05	3.98E-06	3.38E-05	1.15E-06	3.40E-07	0.00E+00	4.07E-08	0.00E+00
Components for re-use	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
Materials for recycling	kg	4.70E-03	1.28E-05	1.15E-02	1.62E-02	8.15E-06	1.53E-07	0.00E+00	1.23E-06	0.00E+00
Materials for energy recovery	kg	6.83E-03	9.88E-08	1.35E-03	8.18E-03	1.14E-08	1.24E-09	0.00E+00	6.56E-09	0.00E+00
Energy exported	MJ	1.70E-02	4.45E-03	1.09E-02	3,23E-02	3.89E-03	5.48E-05	0.00E+00	3.50E-05	0.00E+00

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.) ☒ external ☐ internal
External verification of EPD: Halina Prejzner, PhD Eng LCA, LCI audit and input data verification: Mateusz Kozicki, PhD, m.kozicki@itb.pl Verification of LCA: Michał Piasecki, PhD. DSc. Eng

Note: The declaration owner has the sole ownership, liability, and responsibility for the declaration. 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. For further information about comparability, see EN 15804 and ISO 14025.

Normative references

- ITB PCR A 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

Signature Not Verified
Dokument podpisany przez
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CERTIFICATE № 412/2023
of TYPE III ENVIRONMENTAL DECLARATION

Product:

LOKSET - resin capsules for anchoring steel elements

Manufacturer:

MINOVA EKOCHEM Sp. z o.o.

Ul.. Budowlana 10, 41-100 Siemianowice Śląskie, 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

Sustainability of construction works.
Environmental product declarations.
Core rules for the product category of construction products.

This certificate, issued for the first time on 20th February 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

INSTYTUT TECHNIKI BUDOWLANEJ

Deputy Director for Research and Innovation
Krzysztof Kuczyński, PhD

Warsaw, February 2023