

ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025, ISO 21930 and EN 15804

Owner of the declaration:	SSE Sverige AB
Program operator:	The Norwegian EPD Foundation
Publisher:	The Norwegian EPD Foundation
Declaration number:	NEPD-4267-3500-EN
Registration number:	NEPD-4267-3500-EN
ECO Platform reference number:	-
Issue date:	30.12.2022
Valid to:	30.12.2027

Bulk explosives
Emulga

SSE Sverige AB



www.epd-norge.no



General information

Product:

Bulk explosives
Emulga

Program operator:

The Norwegian EPD Foundation
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Declaration number:

NEPD-4267-3500-EN

ECO Platform reference number:

This declaration is based on Product Category Rules:

CEN Standard EN 15804 serves as core PCR
NPCR 024 version 2.0 Explosives and Initiation Systems (11/2021)

Statement of liability:

The owner of the declaration shall be liable for the underlying information and evidence. EPD Norway shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

Declared unit:

1 kg of manufactured, installed and used (detonated) bulk explosives product

Declared unit with option:

Functional unit:

Verification:

The CEN Norm EN 15804 serves as the core PCR. Independent verification of the declaration and data, according to ISO14025:2010

internal

external

Third party verifier:



Ole M. K. Iversen
(independent verifier approved by EPD Norway)

Owner of the declaration:

SSE Sverige AB
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Manufacturer:

SSE Sverige AB

Place of production:

Sweden

Management system:

Organisation no:

SE556294459401

Issue date:

30.12.2022

Valid to:

30.12.2027

Year of study:

LCA conducted in 2022. Production data is from 2021.

Comparability:

EPD of construction products may not be comparable if they do not comply with EN 15804 and are seen in a building context.

The EPD has been worked out by:

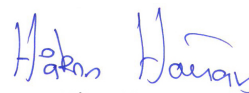
EPD has been developed using FEEM EPD Generator Version 1.5. Data collection has been carried out by

Joanna Wijas
SSE Sverige AB



Federation of European
Explosives Manufacturers

Approved



Håkon Hauan
Managing Director of EPD-Norway

General information

Product description:

The production plant for the semifinished product is in Gyttop, Sweden. It is from there filled and transported by MEMU's (Mobile Explosives Manufacturing Units) to quarry where the finished bulk emulsion explosive is manufactured and charged into the borehole. After charging, the bulk emulsion explosive is detonated.

Energy content of declared products (MJ/kg):
Emulga 3 MJ/kg

Technical data:

1 kg explosives product

EC-type examination certificate:
Emulga 1453.EXP.15.0214

Product specification:

Materials	Amount (%)
Ammonium nitrate	65-75%
Distillates (petroleum)	4-7%
Sodium nitrate	9-11%
Calcium nitrate	

Market:

Nordic countries

Reference service life, product:

Not relevant. Explosives products cannot be used more than once.

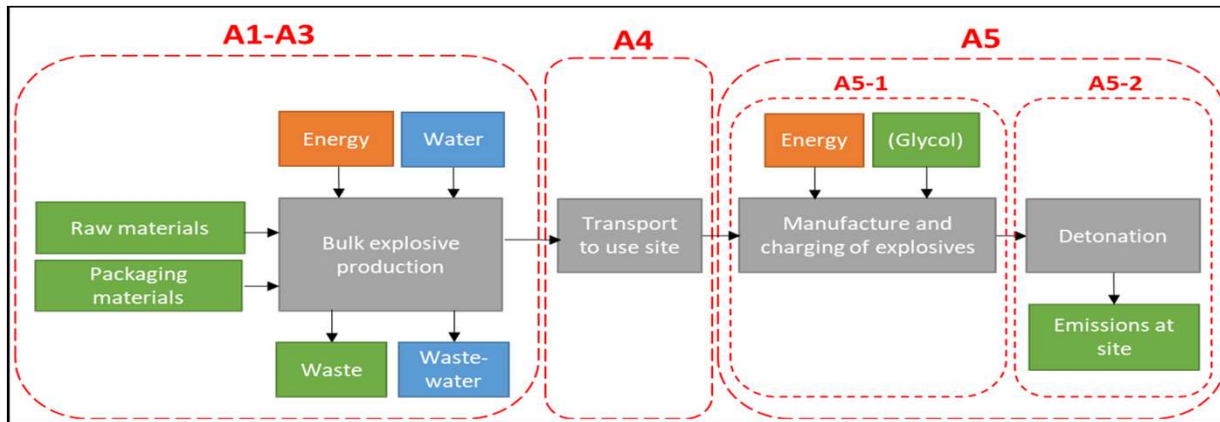
LCA: Calculation rules

Declared unit:

1 kg of manufactured, installed and used (detonated) bulk explosives product

System boundary:

The flow chart for production, transport and use of bulk explosive is shown in the figure below.



Data quality:

Data has been collected in 2021 and is representative of that year. Data for production and transport of explosives (A1-A3) is based on specific consumption data. Detonation of explosives has been calculated from a balanced chemical reaction, at final state and 1 bar (IDeX code, ideal detonation). Generic data is from ecoinvent v3.2, Allocation, Recycled Content and SimaPro v 8.2.3.0. Characterization factors from EN15804: 2012 + A1: 2013.

Cut-off criteria:

All major raw materials and all the essential energy is included. The production process for raw materials and energy flows that are included with very small amounts (<1%) are not included. This cut-off rule does not apply for hazardous materials and substances

Allocation:

The allocation is made in accordance with the provisions of EN 15804. Incoming energy and water and waste production in-house is allocated equally among all products through mass allocation. Effects of primary production of recycled materials allocated to the main product in which the material was used.

LCA: Scenarios and additional technical information

The following information describes the scenarios in the different modules of the EPD.

This declaration is based on a cradle to gate with options assessment, including production at Gyttop in Sweden. Manufacture, charging and detonation of explosives at site is included, as it represents the part of the life cycle in which the explosives are fulfilling its intended function (detonation). A bulk carriage (A4) to a construction site has been added, to show the importance of this transport. On average, bulk explosives are transported 500 km from production to use site. Scenarios for manufacture and charging of explosives, as well as detonation at site in Nordic countries have also been added. The charging of explosives scenario (A5-1) includes use of energy and material inputs required for standard charging of the declared explosives products. The detonation of explosives scenario (A5-2) represents detonation below ground. Detonation of explosives has been calculated from a balanced chemical reaction, at final state and 1 bar for the decomposition of the explosive.

Transport from production site to use site (A4)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance (km)	Fuel consumption (l/tkm)
Truck	50%	SSE Truck (MEMU)	500	0.4
Train	20%	Freight train	0	n/a
Boat	20%	Barge tanker	0	n/a

Manufacture and charging of explosives (A5-1)

	Unit	Amount
Electricity, from grid	kWh	
Diesel, as fuel	l	0.008
Water	kg	0.010

Detonation of explosives (A5-2)

Emissions to air	Unit	Amount
Carbon, C	kg	0.00E+00
Methane, CH ₄	kg	0.00E+00
Carbon dioxide, CO ₂	kg	1.34E-02
Carbon monoxide, CO	kg	0.00E+00
Water, H ₂ O	kg	5.07E-01
Nitrogen, N ₂	kg	2.57E-01
Nitrogen oxides, NO _x	kg	0.00E+00
Sodium carbonate, Na ₂ CO ₃	kg	5.93E-03
Calcium carbonate, CaCO ₃	kg	0.00E+00

LCA: Results

The LCA results show environmental impacts, resource use and outflows calculated according to EN 15804: 2012 + A1: 2013. The results are per kg bulk explosive, manufactured, charged and detonated at use site. Transport in A4 is 500 km to a construction site.

System boundaries (X=included, MND= module not declared, MNR=module not relevant)

Product stage			Assembly stage			Use stage							End of life stage				Beyond the system boundaries	
Raw materials	Transport	Manufacturing	Transport	Manufacture and charging	Detonation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential	
A1	A2	A3	A4	A5-1	A5-2	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	
X	X	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Environmental impact

Parameter	Unit	A1-A3	A4	A5-1	A5-2
GWP	kg CO2 -eqv	1.49E+00	4.48E-02	2.71E-02	1.34E-02
ODP	kg CFC11-eqv	1.17E-07	8.42E-09	4.64E-09	0.00E+00
POCP	kg C2H4 -eqv	2.20E-04	5.59E-06	4.34E-06	0.00E+00
AP	kg SO2 -eqv	5.47E-03	1.45E-04	2.03E-04	0.00E+00
EP	kg PO43--eqv	3.56E-03	2.42E-05	4.47E-05	1.08E-01
ADPM	kg Sb-eqv	2.49E-05	1.06E-07	7.23E-09	0.00E+00
ADPE	MJ	2.21E+01	6.96E-01	3.67E-01	0.00E+00

GWP Global warming potential; ODP Depletion potential of the stratospheric ozone layer; POCP Formation potential of tropospheric photochemical oxidants; AP Acidification potential of land and water; EP Eutrophication potential; ADPM Abiotic depletion potential for non fossil resources; ADPE Abiotic depletion potential for fossil resources

Resource use

Parameter	Unit	A1-A3	A4	A5-1	A5-2
RPEE	MJ	1.14E+00	7.82E-03	1.43E-03	0.00E+00
RPEM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TPE	MJ	1.14E+00	7.82E-03	1.43E-03	0.00E+00
NRPE	MJ	2.19E+01	7.10E-01	3.71E-01	0.00E+00
NRPM	MJ	1.50E+00	0.00E+00	0.00E+00	0.00E+00
TRPE	MJ	2.34E+01	7.10E-01	0.00E+00	0.00E+00
SM	kg	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
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
W	m3	1.68E-02	7.53E-05	4.13E-03	0.00E+00

RPEE Renewable primary energy resources used as energy carrier; RPEM Renewable primary energy resources used as raw materials; TPE Total use of renewable primary energy resources; NRPE Non renewable primary energy resources used as energy carrier; NRPM Non renewable primary energy resources used as materials; TRPE Total use of non renewable primary energy resources; SM Use of secondary materials; RSF Use of renewable secondary fuels; NRSF Use of non renewable secondary fuels; W Use of net fresh water

End of life - Waste

Parameter	Unit	A1-A3	A4	A5-1	A5-2
HW	kg	2.74E-05	1.70E-06	1.01E-06	0.00E+00
NHW	kg	1.28E-01	6.16E-02	3.24E-04	0.00E+00
RW	kg	3.70E-05	4.83E-06	2.60E-06	0.00E+00

HW Hazardous waste disposed; NHW Non hazardous waste disposed; RW Radioactive waste disposed

End of life - Output flow

Parameter	Unit	A1-A3	A4	A5-1	A5-2
CR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR	kg	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
EEE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ETE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00

CR Components for reuse; MR Materials for recycling; MER Materials for energy recovery; EEE Exported electric energy; ETE Exported thermal energy

Reading example: 9,0 E-03 = $9,0 \cdot 10^{-3}$ = 0,009

Additional requirements

Greenhouse gas emission from the use of electricity in the manufacturing phase

National production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity in production.

Data source	Amount	Unit
Electricity, medium voltage {SE}	1.44E-09	g CO2-equiv/kWh
Electricity, medium voltage {Europe}	0.00E+00	g CO2-equiv/kWh

Dangerous substances

- The product contains no substances given by the REACH Candidate list
- The product contains substances given by the REACH Candidate list that are less than 0,1 % by weight.
- The product contain dangerous substances, more then 0,1% by weight, given by the REACH Candidate List, see table.
- The product is classified as hazardous waste.*

*Explosive products are not disposed of as waste, but are subject to local regulations and handled accordingly. Definition of hazardous waste is given by the European list of Waste (LoW)

Name	CAS no.	Amount
Ammonium nitrate	6484-52-2	65-75%
Distillates	68334-30-5	4-7%
Sodium nitrate	7631-99-4	9-11%

Indoor environment


Not relevant. No tests have been carried out on the product concerning indoor climate.

Carbon footprint

Carbon footprint has not been worked out for the product.

Bibliography

ISO 14025:2010	<i>Environmental labels and declarations - Type III environmental declarations - Principles and procedures</i>
ISO 14044:2006	<i>Environmental management - Life cycle assessment - Requirements and guidelines</i>
EN 15804:2012+A1:2013	<i>Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products</i>
ISO 21930:2007	<i>Sustainability in building construction - Environmental declaration of building products</i>
Ecoinvent v3.2, November 2015	Swiss Centre of Life Cycle Inventories. https://www.ecoinvent.org/
SimaPro	LCA software, developed by PRé Sustainability https://simapro.com/
NPCR PART A Ver 2	<i>Construction Products and Services</i>
NPCR 024 2021 ver. 2.0	<i>Explosives and Initiation Systems</i>
Michael M. Jenssen	<i>LCA Report 03.05.2022</i>

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