

Environmental Product Declaration

In accordance with ISO14025:2006 and EN15804:2012+A2:2019

Emulex C and Emulex AV



Owner of the declaration:
Austin Powder GmbH

Product name:
Emulex C and Emulex AV

Declared unit:
1 kg of manufactured, installed and used
(detonated product)

Product category /PCR:
Packaged explosives/ NPCR 024:2021 version
2.0 Explosives and Initiation Systems, NPCR
Part A: Construction products and services,
version 2.0

Program holder and publisher:
The Norwegian EPD foundation

Declaration number:
NEPD-6648-5830-EN

Registration number:
NEPD-6648-5830-EN

Issue date: 22.05.2024

Valid to: 22.05.2029



General information

Product:

Emulex C and Emulex AV

Program operator:

The Norwegian EPD Foundation
Post Box 5250 Majorstuen, 0303 Oslo, Norway
Tlf: +47 23 08 80 00
e-mail: post@epd-norge.no

Declaration number:

NEPD-6648-5830-EN

This declaration is based on Product

Category Rules:

NPCR 024:2021 version 2.0 Explosives and
Initiation Systems

NPCR Part A: Construction products and services.
Version 2.0.

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, life
cycle assessment data and evidence.

Declared unit:

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

Verification:

Independent verification of the declaration and
data, according to ISO14025:2010

internal

external

Sign

Mie Vold - LCA.no AS

Independent verifier approved by EPD Norway

Owner of the declaration:

Austin Powder GmbH
Contact person: Dr. Raphael Kubiak
Phone: +43 (0)3585 2251-216
e-mail: raphael.kubiak@austinpowder.at

Manufacturer:

Austin Powder GmbH
Weissenbach 16, St. Lambrecht, Austria
Phone: +43 (0)3585 2251-0
e-mail: office@austinpowder.at

Place of production:

St. Lambrecht, Styria, Austria

Management system:

ISO 9001

Organisation no:

ATU56875929

Issue date:

22.05.2024

Valid to:

22.05.2029

Year of study:

Primary data represents year 2023. Study
conducted in 2024.

Comparability:

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

The EPD has been worked out by:

Emma Salminen, Etteplan Finland Oy

Approved Manager of EPD Norway



Product

Product description:

Emulex C is a detonator sensitive emulsion especially designed for smooth blasting in mining, quarries and tunneling (contour holes).

Emulex AV is an emulsion explosive containing aluminium which is used to release avalanches artificially. It is commonly used as concentrated charge and can be used at temperatures down to -30 °C.

The results and data presented in this EPD are based on **average composition** of Emulex C and Emulex AV. The LCIA results of all of the studied impact categories differ less than $\pm 10\%$ between Emulex C and Emulex AV. The only difference between Emulex C and Emulex AV is the dimension of the cartridge that have minor impact on specific cartridge material consumption

Product specification:

General product type: Emulsion explosives, cartridge

Materials	Value [kg]	%
Ammonium nitrate	0.60-0.80	60-80
Distillates (petroleum)	0.04-0.08	4-8
Aluminium	0.02-0.05	2-5
Sodium nitrate	0.10-0.15	10-15
Primary packaging materials per declared unit (1kg of product)	Value [kg]	%
Cartridge film	0.013	1.3
Metal clip	0.001	0.10

In addition to primary package, Emulex C & Emulex AV cartridges are packaged into cardboard boxes wrapped with plastic to protect them in transportation and storing before use. Both primary and secondary packing materials are considered in the modelling

Technical data:

EC-type examination certificate: 0589.EXP.0286/14

Energy content (MJ/ea): 3.775

Market:

Europe

Reference service life, product:

Not relevant. Explosives cannot be used several times.



LCA: Calculation rules

This is an average EPD of two products manufactured by Austin Powder - Emulex C and Emulex AV.

Declared unit:

1 kg of manufactured, installed and used (detonated product) explosive product and its package

Cut-off criteria:

Cut-off criterion based on mass and energy is adhered to. The cut-off rule is reflected in the inputs and outputs of each separate module in the studied product system. Flows accounting less than 1% of the overall input mass or energy flows are excluded from the study if appropriate primary, secondary or even proxy data are not available.

- *Capital equipment, infrastructure and employee commute are excluded.*
- *Production of pallets and possible plastic wrapping materials used in transportation and auxiliary fuels used in reject explosive waste treatment at production site are excluded.*
- *Production of detonators used in A5-1 stage are excluded.*

Allocation:

Allocation procedure described in ISO 14044:2006, section 4.3.4 is followed.

Annual consumption of district heat, onsite produced heat, water and electricity and waste streams generated in production plant are allocated evenly to all products manufactured based on production volumes.

In allocation of the recycling and recovery processes, taking place in the modules A1, A3, and A5-1, the “polluter pays” principle is applied. Thus, the environmental burden related to waste stream treatment are allocated to the system producing them until end-of waste state has been met. Corresponding definition is used also for recycled materials entering the system.

Data quality:

Data quality assessment is performed extensively for used modelling data. Data quality level and criteria of the UN Environment Global Guidance on LCA database development was applied in data quality assessment. Best available data was used in the modelling. Primary data from year 2021 is applied. Of priority, primary data is used. Secondary data from Sphera professional 202 database is used when primary data is not accessed. Used secondary data is no older than 10 years.

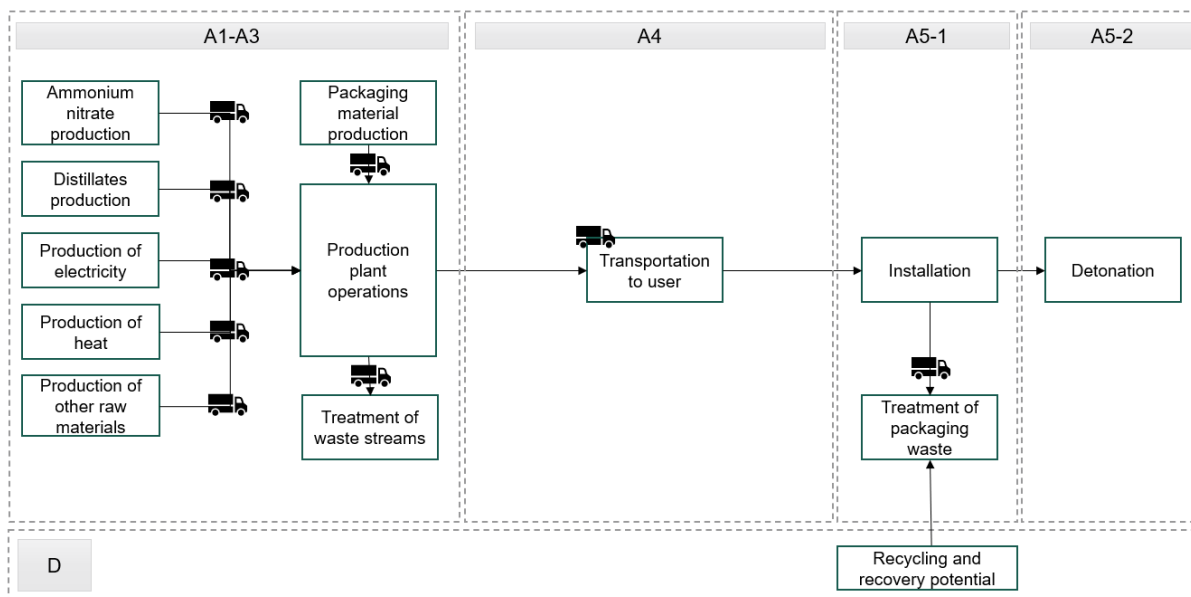


System boundaries (X=included, MND=module not declared, MNR=module not relevant)

Product stage			Assembly stage		Use stage							End of life stage				Benefits & loads beyond system boundary	
Raw materials	Transport	Manufacturing	Transport	Assembly	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	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	
X	X	X	X	X	MNR	MNR	MNR	MNR	MNR	MNR	MNR	MNR	MNR	MNR	MNR	MNR	X

System boundary:

System boundary includes all life cycle stages relevant for explosive products. Product studied is detonated in A5-2 stage and thus module B or C are not applicable.



LCA: Scenarios and additional technical information

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

Electricity used at manufacturing site (A3)

Location based approach is applied in the modelling, i.e. electricity is modelled national production + import – export -based electricity production in Austria (i.e. market mix). Additionally, it should be considered that Austria has a full disclosure system for electricity markets, meaning that all electricity sold must have a guarantee of origin (GoO) available. Thus, a residual mix is zero (no electricity with unknown origin exist) and market mix electricity represents an average electricity delivered to customers.

Transport from production place to assembly/user (A4)

Transportation of the product to its customer is modelled based on average European customer. Product is transported by trucks. The transportation distance takes into account the possible use of an intermediate warehouse.

Transport from production place to user (A4)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy consumption	Unit	Value
Truck	64%	800	Fuel consumption	dm ³ /tkm	0.02

Installation (A5-1)

The cartridges are unpacked from corrugated board boxes and installed. Drilling of blast holes and usage of detonators and other auxiliary materials are excluded. Cardboard and plastic used to protect cartridges in transportation are assumed to be directed to nearest material recovery site.

Waste treatment	Unit	Value
Output materials from waste treatment	kg	0.041

Detonation (A5-2)

Detonation emissions to air are calculated from the ideal theoretical composition of Emulex C & Emulex AV, based on balanced chemical reaction at final state and 1 bar, for the decomposition of the explosive, using stoichiometry and thermochemistry.

Substance	Unit	Value
Carbon, C	kg	0
Methane, CH ₄	kg	0.008
Carbon dioxide, CO ₂	kg	0.088
Carbon monoxide, CO	kg	0.0028
Water (vapour), H ₂ O	kg	0.465
Nitrogen, N ₂	kg	0.249
Nitrogen oxides, NO _x	kg	0
Sodium carbonate, Na ₂ CO ₃	kg	0.008



Use stage (B1-B7)

Use stage is not relevant for explosives since product is fully detonated in A5 stage.

End of Life (C1-C4)

Product is fully detonated during use phase. Therefore C module is not relevant.

Benefits and loads beyond the system boundaries (D)

Packaging materials used to cover cartridges of Emulex C & Emulex AV are assumed to be directed material recovery site in the A5-1 stage.

Benefits and loads beyond the system boundaries (D)	Unit	Value
Packaging materials directed to material recovery (A5-1)	kg	0.041

LCA: Results

Core environmental impact indicators

Indicator	Unit	A1-A3	A4	A5-1	A5-2	D
GWP - total	kg CO2 eq	1.40E+00	7.26E-02	4.06E-02	3.26E-01	-1.56E-02
GWP - fossil	kg CO2 eq	1.42E+00	7.19E-02	2.28E-02	3.26E-01	-1.55E-02
GWP - biogenic	kg CO2 eq	-1.76E-02	0.00E+00	1.76E-02	0.00E+00	0.00E+00
GWP - luluc	kg CO2 eq	7.32E-04	6.72E-04	7.94E-05	0.00E+00	-5.62E-05
ODP	kg CFC11 eq	6.73E-09	1.14E-14	4.25E-14	0.00E+00	-1.63E-13
AP	mol H+ eq	4.21E-03	7.38E-05	4.63E-05	0.00E+00	-9.03E-05
EP- freshwater	kg P eq	1.05E-04	2.66E-07	6.44E-07	0.00E+00	-7.02E-07
EP -marine	kg N eq	2.77E-03	2.21E-05	2.16E-05	0.00E+00	-3.89E-05
EP - terrestrial	mol N eq	1.49E-02	2.68E-04	2.05E-04	0.00E+00	-3.72E-04
POCP	kg NMVOC eq	2.73E-03	6.20E-05	4.27E-05	2.08E-04	-1.05E-04
ADP-M&M ²	kg Sb eq	4.65E-06	4.88E-09	9.89E-09	0.00E+00	-5.20E-09
ADP-fossil ²	MJ	2.26E+01	9.98E-01	3.21E-01	0.00E+00	-2.41E-01
WDP ²	m ³	3.08E-01	9.12E-04	6.12E-04	0.00E+00	-3.67E-03

GWP-total: Global Warming Potential; **GWP-fossil:** Global Warming Potential fossil fuels; **GWP-biogenic:** Global Warming Potential biogenic; **GWP-LULUC:** Global Warming Potential land use and land use change; **ODP:** Depletion potential of the stratospheric ozone layer; **AP:** Acidification potential, Accumulated Exceedance; **EP-freshwater:** Eutrophication potential, fraction of nutrients reaching freshwater end compartment; See "additional Norwegian requirements" for indicator given as PO4 eq. **EP-marine:** Eutrophication potential, fraction of nutrients reaching freshwater end compartment; **EP-terrestrial:** Eutrophication potential, Accumulated Exceedance; **POCP:** Formation potential of tropospheric ozone; **ADP-M&M:** Abiotic depletion potential for non-fossil resources (minerals and metals); **ADP-fossil:** Abiotic depletion potential for fossil resources; **WDP:** Water deprivation potential, deprivation weighted water consumption

Reading example: 9,0 E-03 = 9,0*10⁻³ = 0,009

² The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator



Resource use

Parameter	Unit	A1-A3	A4	A5-1	A5-2	D
RPEE	MJ	2.77E+00	7.28E-02	1.31E+00	0.00E+00	-1.20E+00
RPEM	MJ	6.15E-01	0.00E+00	-6.15E-01	0.00E+00	0.00E+00
TPE	MJ	3.38E+00	7.28E-02	6.99E-01	0.00E+00	-1.20E+00
NRPE	MJ	1.98E+01	1.00E+00	3.36E-01	0.00E+00	-2.41E-01
NRPM	MJ	2.85E+00	0.00E+00	-1.42E-02	0.00E+00	0.00E+00
TRPE	MJ	2.26E+01	1.00E+00	3.21E-01	0.00E+00	-2.41E-01
SM	kg	3.20E-02	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
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
W	m ³	7.86E-03	8.08E-05	3.33E-04	0.00E+00	-1.63E-04

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* Nonrenewable primary energy resources used as energy carrier; *NRPM* Nonrenewable 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	D
HW	kg	3.30E-04	5.13E-12	1.12E-08	0.00E+00	-8.52E-09
NHW	kg	6.96E-03	1.53E-04	1.03E-03	0.00E+00	-1.31E-03
RW	kg	2.04E-04	1.93E-06	7.30E-06	0.00E+00	-1.15E-05

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	D
CR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR	kg	8.44E-05	0.00E+00	4.13E-02	0.00E+00	0.00E+00
MER	kg	0.00E+00	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	0.00E+00
ETE	MJ	0.00E+00	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.

Information describing the biogenic carbon content at the factory gate

Biogenic carbon content	Unit	Value
Biogenic carbon content in product	kg C	0
Biogenic carbon content in the accompanying packaging	kg C	0.018

Additional requirements

Location based electricity mix from the use of electricity in manufacturing

National production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process (core) per functional unit.

National electricity grid	Data source	Core [kWh]	GWP _{total} [kg CO ₂ -eq/kWh]	SUM [kg CO ₂ -eq]
<i>Austria, national electricity grid mix</i>	Sphera MLC 2023.1	0.05	0.248	0.01

Additional environmental impact indicators required for construction products

In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator GWP-IOBC is required as it declares climate impacts calculated according to the principle of instantaneous oxidation. GWP-IOBC is also referred to as GWP-GHG in context to Swedish public procurement legislation.

Parameter	Unit	A1-A3	A4	A5-1	A5-2	D
GWP-IOBC	kg	1.42E+00	7.23E-02	2.30E-02	3.26E-01	-1.56E-02

GWP-IOBC Global warming potential calculated according to the principle of instantaneous oxidation.

Hazardous substances

The declaration is based upon reference to threshold values and/or test results and/or material safety data sheets provided to EPD verifiers. Documentation available upon request to EPD owner.

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

Indoor environment

Product shall not be used indoor.






Carbon footprint

While a carbon footprint analysis has not been conducted for the product separately, the results section does include an evaluation of Global Warming Potential (GWP) with such an analysis. The GWP total results presented in this EPD document represents the carbon footprint of the product studied



Bibliography

ISO 14025:2010	Environmental labels and declarations - Type III environmental declarations - Principles and procedures
ISO 14044:2006	Environmental management - Life cycle assessment - Requirements and guidelines
EN 15804:2012+A2:2019	Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products
ISO 21930:2007	Sustainability in building construction - Environmental declaration of building products
NPCR 024:2021 version 2.0	Explosives and Initiation Systems
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Etteplan Finland. 2024.	LCA background report for EPD of Emulex C & Emulex AV – cartridge explosive

	Program Operator	tlf	+47 23 08 80 00
	The Norwegian EPD Foundation Post Box 5250 Majorstuen, 0303 Oslo Norway	e-post: web	post@epd-norge.no www.epd-norge.no
	Publisher	tlf	+47 23 08 80 00
	The Norwegian EPD Foundation Post Box 5250 Majorstuen, 0303 Oslo Norway	e-post: web	post@epd-norge.no www.epd-norge.no
	Owner of the declaration	tlf	+43 (0)3585 2251-0
	Austin Powder GmbH Weissenbach 16 Austria	Fax	
		e-post: web	office@austinpowder.at www.austinpowder.com/austria/home/
	Author of the life cycle assesment	tlf	010 307 1010
	Etteplan Finland Oy Askonkatu 9 E, 15100 Lahti Finland	Fax	010 307 1012
		e-post:	firstname.lastname@etteplan.com
		web	https://www.etteplan.com/solutions/sustainability
	ECO Platform ECO Portal	web web	www.eco-platform.org ECO Portal