

Environmental Product Declaration

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

EXEL NEO



Exel™
Neo



Owner of the declaration:
Orica Norway

Product name:
Exel™ Neo

Declared unit:
1 ea (detonator)

Product category /PCR:
NPCR 024 version 2.0 Explosives and Initiation
Systems (11/2021)

Program holder and publisher:
The Norwegian EPD foundation

Declaration number:
NEPD-7474-6859-EN

Registration number:
NEPD-7474-6859-EN

Issue date:
06.09.2024

Valid to:
06.09.2029

General information

Product:

Exel™ Neo - Non-electric initiation system

Program operator:

The Norwegian EPD Foundation
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Declaration number:

NEPD-7474-6859-EN

This declaration is based on Product

Category Rules:

CEN Standard EN 15804:2012+A2:2019 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, life cycle assessment data and evidences.

Declared unit:

1 ea (detonator) manufactured, installed and used product

Declared unit with option:

A1-A3, A4, A5, C1-C4, D

Functional unit:

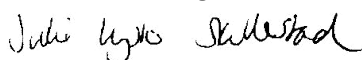
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Verification:

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

internal external

Sign



Julie Lyslo Skullestad, Aase Teknikk AS

Independent verifier approved by EPD Norway

Owner of the declaration:

Orica Norway AS

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Manufacturer:

Orica Norway AS

Place of production:

Gyttorp, Sweden

Management system:

ISO 9001

Organisation no:

981 413 156

Issue date:

06.09.2024

Valid to:

06.09.2029

Year of study:

2023

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:

Kristine Bjordal, Asplan Viak AS

Approved



Manager of EPD Norway

Product

Product description:

Exel Neo system is a non-electric initiation system based on a shock tube of low energy type. Detonators are manufactured at Orica's detonator factory at Gyttorp, Sweden. After production they are transported to customer in Sweden, Norway, Finland or other countries where they are stored at suitable storage facilities, before being transported to the mine, quarry or construction site where they are used in blasting activities by the end user.

Product specification:

Energy content of declared products:

Exel: 3000 J/ea (=3 kJ/ea = 3*10⁻³ MJ/ea)

In this EPD the declared product is based on average values for all different Exel detonators and contains the following substances:

Materials	%
Plastic	83
Aluminium	8
Steel	4
Delay element and explosives, consisting of:	5
Pentaeritryltetranitrat, (PETN)	20-40
1,3,5-trinitro-1,3,5-triazinan, (RDX)	0-30
Strontiummolybdat	0-5
Nikkelpulver, [particle diameter < 1 mm]	0-3
Vanadiumpentoxid	0-0.2

Technical data:

1 ea non electric detonator. Weight: ca. 54 g. Average shock tube length: 8,2 m

Market:

Nordic countries (Norway, Sweden, Finland)

Reference service life, product:

Not relevant. Explosives cannot be used more than once.

Reference service life, building:

Not relevant.

Additional technical information

Not relevant.

LCA: Calculation rules

Declared unit:

1 ea (detonator) manufactured, installed and used product.

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+A2:2019. 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.

Data quality:

The data quality complies with the guidelines for the use of generic and specific data according to EN 15804 and ISO 14044. The data used is representative with regard to temporal, geographical and technological conditions.

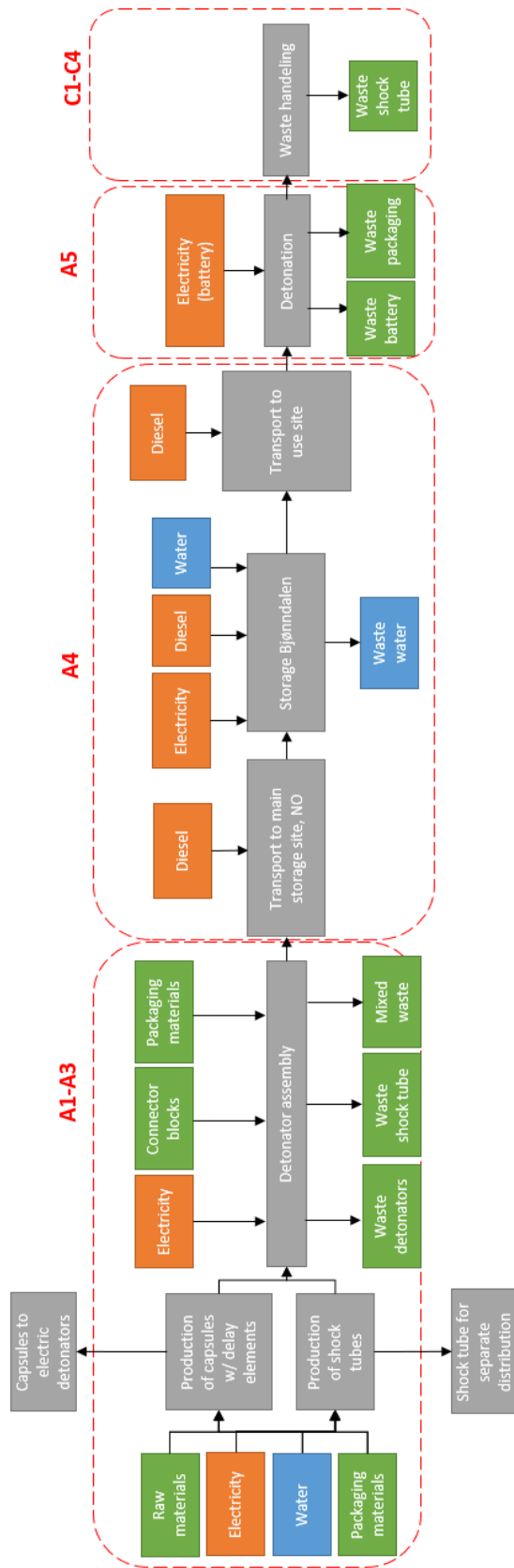
Data has been collected in 2023, and is representative for the period July 2022 to June 2023. Data for production, transport and storage of detonators (A1-A3) is based on specific consumption data for the factory at Gytorp and storage facility at Bjønndalen. Generic data is from Ecoinvent v.3.9 and SimaPro v 9.5.0.1. All generic data is < 10 years old. Characterization factors according to EN15804:2012 + A2 2019.

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	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X

System boundary:

The flow chart for production, transport and use of non electric detonator is shown in the figure below. A1-A3, A4, A5, C1-C4 and D.



LCA: Scenarios and additional technical information

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

This declaration is based on a "cradle to gate with options, modules C1-C4 and module D" assessment. The production stage (A1-A3) includes production at the factory in Sweden. Transport to the construction site (A4) also includes the storage process, as well as transport to storage, in accordance with system boundaries defined for product systems in EPDs for explosives. The storage facility is located at Bjønndalen, Norway, and the distance from factory to storage site is 340 km. Average transport to a construction site has been added, to show the importance of this transport. On average, detonators are transported 60 km from storage to use site.

Use of detonators in detonation of explosives at site is included, as it represents the part of the life cycle in which the detonator is fulfilling its intended function. The scenario for detonation at site (A5) includes energy use (battery power) required for ignition, as well as waste treatment of cardboard packaging. The packaging should be collected and sent to recycling.

The waste scenarios (C1-C4) includes treatment of waste shock tube. All remaining shock tube (plastic) from the blast and plastic strips should be handled as "general unsorted waste" and sent to a local waste handling facility. The waste is collected manually and therefore no activities are included in C1.

Unused Exel detonators are classified as explosives and must only be handled by personnel with approvals/licences to handle such products. Remaining plastic tubes from used (detonated) Exel detonators should be collected and treated as general residual waste.

Transport from production place to storage and assembly/user (A4)

Transport from production place to assembly/user (A4)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy consumption	Unit	Value
Truck (from production to storage site)	100	340	0,38	l/km	7,26
Van (from storage site to use site)	100	60	0,15	l/km	0,01
Storage at Bjønndalen, Norway					

Assembly (A5)

	Unit	Value
Alkaline battery	kg	9,00E-08
Waste detonator	kg	0,04

End of Life (C1, C3, C4)

	Unit	Value
Incineration with energy recovery	kg	0,039

Transport to waste processing (C2)

Transport from production place to assembly/user (C2)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy consumption	Unit	Value (l/t)
Van	100	10	0,1	l/km	0,002

Benefits and loads beyond the system boundaries (D)

The benefits of exported energy from energy recovery in a treatment facility is calculated with substitution of Norwegian electricity market mix and Norwegian district heating mix (SSB 2020). Conversion factors for efficiencies and losses from waste to delivered energy are included.

Benefits and loads beyond the system boundaries (D)	Unit	Value
Substitution of electricity, in Norway	MJ	0,12
Substitution of thermal energy, district heating, in Norway	MJ	0,94

LCA: Results

The LCA results show environmental impacts, resource use and outflows calculated according to EN 15804:2012+A2:2019. The results are per detonator, manufactured, installed and used at site. Results are given for A1-A3, A4, A5, C1, C2, C3, C4 and D. These main results are shown with a location-based approach, and the additional section includes the results with electricity based on guarantees of origin.

Core environmental impact indicators

Indicator	Unit	A1-A3	A4	A5
GWP - total	kg CO2 eq	3,40E-01	7,35E-03	5,77E-03
GWP - fossil	kg CO2 eq	3,17E-01	7,37E-03	2,28E-04
GWP - biogenic	kg CO2 eq	1,96E-02	-2,33E-05	5,54E-03
GWP - luluc	kg CO2 eq	2,65E-03	4,46E-06	5,61E-08
ODP	kg CFC11 eq	2,17E-08	1,49E-10	1,16E-11
AP	molc H+ eq	1,63E-03	3,37E-05	1,72E-06
EP- freshwater	kg P eq	1,05E-05	1,02E-07	5,45E-09
EP -marine	kg N eq	2,79E-04	1,32E-05	6,13E-07
EP - terrestrial	molc N eq	3,13E-03	1,27E-04	5,70E-06
POCP	kg NMVOC eq	1,19E-03	4,73E-05	1,64E-06
ADP-M&M ²	kg Sb-Eq	3,90E-06	5,05E-08	5,02E-10
ADP-fossil ²	MJ	9,27E+00	9,82E-02	2,24E-03
WDP ²	m ³	1,18E-01	5,49E-04	9,84E-03

Indicator	Unit	C1	C2	C3	C4	D
GWP - total	kg CO2 eq	0,00E+00	6,34E-04	4,93E-02	4,21E-04	-9,43E-03
GWP - fossil	kg CO2 eq	0,00E+00	6,32E-04	2,00E-02	4,15E-04	-6,25E-03
GWP - biogenic	kg CO2 eq	0,00E+00	1,60E-06	2,93E-02	5,33E-06	-3,15E-03
GWP - luluc	kg CO2 eq	0,00E+00	3,35E-07	2,85E-07	1,44E-07	-2,78E-05
ODP	kg CFC11 eq	0,00E+00	1,04E-11	5,37E-11	4,67E-12	-1,65E-10
AP	molc H+ eq	0,00E+00	2,58E-06	1,02E-05	1,46E-06	-5,60E-05
EP- freshwater	kg P eq	0,00E+00	6,51E-09	1,10E-08	1,05E-08	-3,25E-07
EP -marine	kg N eq	0,00E+00	8,73E-07	4,34E-06	8,45E-07	-1,79E-05
EP - terrestrial	molc N eq	0,00E+00	9,65E-06	4,80E-05	5,37E-06	-2,06E-04
POCP	kg NMVOC eq	0,00E+00	3,95E-06	1,23E-05	1,76E-06	-5,66E-05
ADP-M&M ²	kg Sb-Eq	0,00E+00	4,46E-09	1,88E-09	6,31E-10	-1,77E-07
ADP-fossil ²	MJ	0,00E+00	7,17E-03	8,67E-03	4,12E-03	-9,58E-02
WDP ²	m ³	0,00E+00	3,30E-05	2,43E-03	3,83E-05	-2,27E-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

Additional environmental impact indicators

Indicator	Unit	A1-A3	A4	A5
PM	Disease incidence	1,38E-08	3,89E-10	1,35E-11
IRP ¹	kBq U235 eq.	9,95E-02	9,07E-05	8,52E-06
ETP-fw ²	CTUe	3,23E+00	5,30E-02	7,42E-03
HTP-c ²	CTUh	3,49E-10	6,29E-12	3,85E-13
HTP-nc ²	CTUh	6,95E-09	1,73E-10	1,82E-11
SQP ²	Dimensionless	1,64E+00	7,07E-02	7,43E-04

Indicator	Unit	C1	C2	C3	C4	D
PM	Disease incidence	0,00E+00	1,91E-11	7,79E-11	1,97E-11	-3,26E-09
IRP ¹	kBq U235 eq.	0,00E+00	6,02E-06	6,93E-06	4,20E-06	-1,00E-03
ETP-fw ²	CTUe	0,00E+00	3,32E-03	3,01E-03	7,66E-02	-4,84E-02
HTP-c ²	CTUh	0,00E+00	5,94E-13	1,62E-12	3,94E-12	-8,82E-12
HTP-nc ²	CTUh	0,00E+00	1,44E-11	1,05E-10	1,07E-10	-4,05E-10
SQP ²	Dimensionless	0,00E+00	3,54E-03	1,58E-03	5,54E-03	-1,36E+00

PM: Particulate matter emissions; **IRP:** Ionising radiation, human health; **ETP-fw:** Ecotoxicity (freshwater); **ETP-c:** Human toxicity, cancer effects; **HTP-nc:** Human toxicity, non-cancer effects; **SQP:** Land use related impacts / soil quality

¹ This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

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
RPEE	MJ	1,53E+00	1,08E-02	8,34E-05
RPEM	MJ	1,01E-01	0,00E+00	0,00E+00
TPE	MJ	1,63E+00	1,08E-02	8,34E-05
NRPE	MJ	6,85E+00	9,82E-02	2,24E-03
NRPM	MJ	2,42E+00	0,00E+00	0,00E+00
TRPE	MJ	9,27E+00	9,82E-02	2,24E-03
SM	kg	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00
W	m ³	4,87E-03	5,98E-05	2,30E-04

Parameter	Unit	C1	C2	C3	C4	D
RPEE	MJ	0,00E+00	2,13E-04	3,22E-04	1,15E-04	-5,75E-01
RPEM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TPE	MJ	0,00E+00	2,13E-04	3,22E-04	1,15E-04	-5,75E-01
NRPE	MJ	0,00E+00	7,17E-03	8,67E-03	4,12E-03	-9,58E-02
NRPM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TRPE	MJ	0,00E+00	7,17E-03	8,67E-03	4,12E-03	-9,58E-02
SM	kg	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
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
W	m ³	0,00E+00	1,44E-06	5,76E-05	-1,51E-05	-2,06E-03

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
HW	kg	1,23E-03	6,16E-06	3,13E-05
NHW	kg	6,19E-02	4,76E-03	1,72E-04
RW	kg	4,59E-05	5,60E-08	3,81E-09

Parameter	Unit	C1	C2	C3	C4	D
HW	kg	0,00E+00	5,99E-07	2,92E-06	8,59E-03	-3,85E-05
NHW	kg	0,00E+00	2,80E-04	3,34E-04	1,81E-03	-2,44E-03
RW	kg	0,00E+00	3,90E-09	4,70E-09	3,11E-09	-4,68E-07

HW Hazardous waste disposed; **NHW** Non-hazardous waste disposed; **RW** Radioactive waste disposed.

End of life – output flow

Parameter	Unit	A1-A3	A4	A5
CR	kg	0,00E+00	0,00E+00	0,00E+00
MR	kg	0,00E+00	0,00E+00	2,15E-02
MER	kg	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	0,00E+00
ETE	MJ	0,00E+00	0,00E+00	0,00E+00

Parameter	Unit	C1	C2	C3	C4	D
CR	kg	0,00E+00	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	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	1,16E-01	0,00E+00	0,00E+00
ETE	MJ	0,00E+00	0,00E+00	9,45E-01	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	0,002

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 (foreground/core) per functional unit.

National electricity grid	Data source	Foreground / core [kWh]	GWP _{total} [kg CO ₂ -eq/kWh]	SUM [kg CO ₂ -eq]
<i>Electricity, low voltage {SE} market for electricity, low voltage Cut-off, U</i>	Ecoinvent	0,450	0,067	0,030

Guarantees of origin from the use of electricity in the manufacturing phase

Where guarantees of origin is applied in stead of national production mix – the electricity for the manufacturing process (A3) shall be stated clearly in the EPD per functional unit. The guarantee of origin utilized in this EPD is provided by Entelios and 100% of Nuclear power is used. The declaration is valid for 2023 and 2024. Contact the EPD-owner to get more information on the guarantee of origin.

Electricity source	Foreground / core [kWh]	GWP _{total} [kg CO ₂ -eq/kWh]	SUM [kgCO ₂ -eq]
<i>Guarantee of origin electricity used in the foreground. 100% electricity from Nuclear power</i>	0,450	0,020	0,009
Residual mix electricity used in the foreground <i>Electricity, low voltage {SE} electricity, low voltage, residual mix Cut-off, U</i>	0	0,080	0

The environmental impact when using the marked based approach is presented in the following table.

Indicator	Unit	A1-A3
GWP - total	kg CO ₂ eq	3,20E-01
GWP - fossil	kg CO ₂ eq	3,09E-01
GWP - biogenic	kg CO ₂ eq	1,01E-02
GWP - luluc	kg CO ₂ eq	1,23E-03

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
GWP-IOBC	kg	3,20E-01	7,05E-03	2,84E-04

Parameter	Unit	C1	C2	C3	C4	D
GWP-IOBC	kg	0,00E+00	6,04E-04	1,99E-02	4,07E-04	-6,12E-03

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

LCA results for different tube lengths

The declared product contains an average shock tube length: of 8,2 m. The Exel™ product group have several variations for this shock tube length, hence additional results are presented per 1 meter shock tube to provide results which are scalable to the actual product.

Indicator	Unit	A1-A3 per 1 meter shock tube Location based reporting	A1-A3 per 1 meter shock tube Guarantees of origin
GWP - total	kg CO2 eq	2,31E-02	2,28E-02
GWP - fossil	kg CO2 eq	2,28E-02	2,27E-02
GWP - biogenic	kg CO2 eq	3,98E-05	1,54E-05
GWP - luluc	kg CO2 eq	3,98E-05	1,54E-05
ODP	kg CFC11 eq	2,30E-09	2,30E-09
AP	molc H+ eq	5,59E-07	5,50E-07
EP- freshwater	kg P eq	3,11E-01	3,11E-01
EP -marine	kg N eq	1,96E-05	1,95E-05
EP - terrestrial	molc N eq	2,15E-04	2,12E-04
POCP	kg NMVOC eq	8,57E-05	8,52E-05
ADP-M&M ²	kg Sb-Eq	1,45E-07	1,45E-07
ADP-fossil ²	MJ	6,16E-01	6,83E-01
WDP ²	m ³	6,45E-03	7,02E-03

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 is classified as hazardous waste, see table.

Name	CAS no.	Amount*
Pentaeritryltetranitrat, (PETN)	78-11-5	20-40%
1,3,5-trinitro-1,3,5-triazinan, (RDX)	121-82-4	0-30%
Strontiummolybdat	13470-04-7	0-5%
Nikkelpulver [particle diameter < 1 mm]	7440-02-0	0-3%
Vanadiumpentoxid	1314-62-1	0-0.2%

* Share of delay element and explosives in detonator, as given in safety data sheets

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	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
Ecoinvent v3.9	Swiss Centre of Life Cycle Inventories. https://www.ecoinvent.org/
SimaPro	LCA software, developed by PRé Sustainability https://simapro.com/
NPCR 024 2021 ver. 2.0	Explosives and Initiation Systems
Bjordal, Kristine, 2023	LCA Report Exel Non electric detonators Orica Norway AS

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