



ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025, ISO 21930 and EN 15804

Owner of the declaration:	Orica Norway AS
Program operator:	The Norwegian EPD Foundation
Publisher:	The Norwegian EPD Foundation
Declaration number:	NEPD-2954-1649-EN
Registration number:	NEPD-2954-1649-EN
ECO Platform reference number:	-
Issue date:	02.07.2021
Valid to:	02.07.2026

Bulk emulsion explosives.
Centra Gold M 75 and Centra Gold M 80

Orica Norway AS



www.epd-norge.no



General information

Product:

Bulk emulsion explosives: Centra Gold M 75 and Centra Gold M 80

Program operator:

The Norwegian EPD Foundation
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Declaration number:

NEPD-2954-1649-EN

ECO Platform reference number:
This declaration is based on Product Category Rules:

CEN Standard EN 15804 serves as core PCR
NPCR 024 version 1.0 Explosives and Initiation Systems
(03/2016)

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:

A1-A3, A4, A5

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:

Julie Lyslo Skullestad

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(Independent verifier approved by EPD Norway)

Owner of the declaration:

Orica Norway AS
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Manufacturer:

Orica Norway AS

Place of production:

Ågotnes, Norway

Management system:

ISO 9001

Organisation no:

981 413 156

Issue date:

02.07.2021

Valid to:

02.07.2026

Year of study:

LCA conducted i 2018/19 and updated in 2021 with new data for ammonium nitrate production. Production inventory data has been collected in 2017.

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:

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Brita Kristine Velken



Approved

Håkon Hauan

Håkon Hauan
Managing Director of EPD-Norway

Product

Product description:

Semifinished products for the bulk emulsion explosives are produced at Orica's factory at Ågotnes, Norway. The bulk emulsion explosives are further transported to the use site where the finished bulk emulsion explosives are manufactured and charged into the bore holes by use of Mobile Explosives Manufacturing Units (MEMUs). The finished bulk emulsion explosive is finally detonated.

Technical data:

1 kg explosives product

EU-type examination certificate:

Centra Gold M 75: EXP 1395-006/2019
Centra Gold M 80: EXP 1395-006/2019

Product specification:

Energy content of declared products:

Centra Gold M 75: 2,5 MJ/kg
Centra Gold M 80: 2,5 MJ/kg

Market:

Norway

Reference service life, product:

Not relevant. Explosives cannot be used more than once.

Materials	Centra Gold M 75	Centra Gold M 80
Ammonium nitrate (ANSOL)	60-80 %	60-80 %
Fuel phase	4-6 %	4-6 %
AN Prill	15-35 %	15-35 %

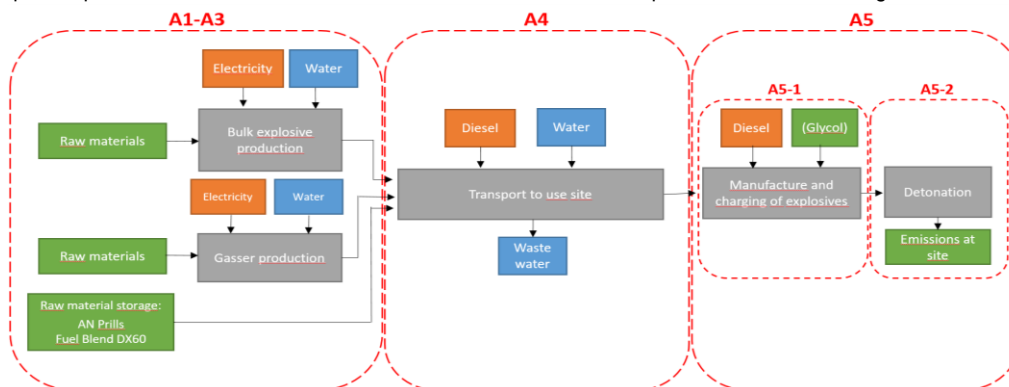
LCA: Calculation rules

Declared unit:

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

System boundary:

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



Data quality:

Inventory data has been collected in 2017 and is representative of that year. Data for production, transport and storage of explosives (A1-A3) is based on specific consumption data for the factory at Kavaheden and storage facilities at Kevitsa and Ballangen. Detonation of explosives has been calculated from a balanced chemical reaction, at final state and 1 bar (IDeX code, ideal detonation). Specific producer data on ammonium nitrate production has been used. Generic data is from ecoinvent v3.4, Allocation, Cut-Off (March 2018) and v3.7, Cut-off by classification (May 2021) SimaPro v 9.1.1.1. 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 describe the scenarios in the different modules of the EPD.

This declaration is based on a "cradle to gate with options" assessment, including A1-A3: Production at factory, and storage at the production factory; A4: transport from factory to use site; as well as A5: Manufacture, charging and detonation of explosives at site. The A5 phase is included, as it represents the part of the life cycle in which the explosive is fulfilling its intended function (detonation). The charging of explosives scenario (A5-1) includes use of energy and material inputs required for standard charging of the declared explosives products. Detonation of explosives has been calculated from a balanced chemical reaction, at final state and 1 bar (IDeX code, ideal detonation).

The declaration represents bulk emulsion explosives made from semifinished product produced and other raw materials stored at Ågotnes, Norway. For the transport of SME from the factory in Ågotnes to use site (A4), a distance of 80 km has been used, representative of average distance to construction site in Norway.

Transport from storage site to user (A4)

					CG M 75	CG M 80
Type	Capacity utilisation %	Type of vehicle	Fuel/Energy	Value	Distance km	Distance km
Truck	50 %	SSE Truck (MEMU)	l/tkm	0,45	80	80

Manufacture and charging of explosives (A5-1)

	Unit	CG M 75	CG M 80
Diesel consumption*	l	0,002	0,002
Bulk explosive consumption	kg	0,97	0,97
Gassing agent consumption	kg	0,006	0,006
Glycol consumption**	kg	0,0003	0,0003
Water consumption	kg	0,02	0,02

**Glycol is used in winter for frost protection

Detonation of explosives (A5-2)

Emissions to air	Unit	CG M 75	CG M 80
Carbon	kg	0,0048	0,0026
Methane	kg	0,001	0,001
Carbon dioxide	kg	0,147	0,148
Water	kg	0,564	0,567
Nitrogen	kg	0,282	0,278
Sodium carbonate	kg	0,0015	0,0025

Theoretical calculations per kg explosive product detonated, from a balanced chemical reaction, at final state and 1 bar (IDeX code, Ideal detonation)

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. Results are given for both declared product types for A1-A3, A5-1 and A5-2. A4 is similar for both product types. Transport in A4 is 80 km to an average Norwegian 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	CG M 75	CG M 80	CG M 75 & CG M 80		CG M 75	CG M 80
		A1- A3	A1- A3	A4	A5-1	A5-2	A5-2
GWP	kg CO ₂ -eqv	1,49E+00	1,49E+00	3,22E-02	8,08E-03	1,72E-01	1,73E-01
ODP	kg CFC11-eqv	1,47E-07	1,47E-07	3,27E-09	1,99E-09	0,00E+00	0,00E+00
POCP	kg C ₂ H ₄ -eqv	2,11E-04	2,12E-04	2,98E-06	2,02E-06	6,00E-06	6,00E-06
AP	kg SO ₂ -eqv	5,87E-03	5,88E-03	5,66E-05	6,22E-05	0,00E+00	0,00E+00
EP	kg PO ₄ ³⁻ -eqv	3,55E-03	3,56E-03	1,31E-05	1,38E-05	1,18E-01	1,17E-01
ADPM	kg Sb-eqv	2,21E-05	2,22E-05	6,69E-08	4,23E-09	0,00E+00	0,00E+00
ADPE	MJ	2,67E+01	2,67E+01	2,75E-01	1,94E-01	0,00E+00	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	CG M 75	CG M 80	CG M 75 & CG M 80		CG M 75	CG M 80
		A1- A3	A1- A3	A4	A5-1	A5-2	A5-2
RPEE	MJ	1,85E+00	1,90E+00	3,01E-03	1,13E-03	0,00E+00	0,00E+00
RPEM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TPE	MJ	1,85E+00	1,90E+00	3,01E-03	1,13E-03	0,00E+00	0,00E+00
NRPE	MJ	2,80E+01	2,80E+01	2,80E-01	1,98E-01	0,00E+00	0,00E+00
NRPM	MJ	1,81E+00	1,78E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TRPE	MJ	2,99E+01	2,98E+01	2,80E-01	1,98E-01	0,00E+00	0,00E+00
SM	kg	0,00E+00	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	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
W	m ³	1,34E-01	1,47E-01	3,55E-06	1,02E-05	0,00E+00	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	CG M 75	CG M 80	CG M 75 & CG M 80		CG M 75	CG M 80
		A1- A3	A1- A3	A4	A5-1	A5-2	A5-2
HW	kg	1,01E-04	9,97E-05	1,84E-07	7,97E-08	0,00E+00	0,00E+00
NHW	kg	2,39E-01	2,41E-01	9,88E-03	2,15E-04	0,00E+00	0,00E+00
RW	kg	4,17E-05	4,18E-05	1,84E-06	6,96E-07	0,00E+00	0,00E+00

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

End of life - Output flow (INA = Information not available)

Parameter	Unit	CG M 75	CG M 80	CG M 75 & CG M 80		CG M 75	CG M 80
		A1- A3	A1- A3	A4	A5-1	A5-2	A5-2
CR	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MR	kg	INA	INA	INA	INA	INA	INA
MER	kg	INA	INA	INA	INA	INA	INA
EEE	MJ	0,00E+00	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	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: $9,0 \text{ E-}03 = 9,0 \cdot 10^{-3} = 0,009$

Additional Norwegian requirements

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

Norwegian national production mix with import, on low voltage (included production of transmission lines, in addition to direct emissions and losses in grid) is applied for electricity in the manufacturing process (A3). The annual production volumes of this market are taken from IEA/OECD statistics and are valid for the year 2017 (ecoinvent 3.4).

Data source	Amount	Unit
Norwegian production mix, with import, low voltage, Econinvent v3.4 (May 2019)	0,031	kg CO ₂ -eqv/kWh

Dangerous substances

- The product contains no substances given by the REACH Candidate list or the Norwegian priority list
- The product contains substances given by the REACH Candidate list or the Norwegian priority list that are less than 0,1 % by weight.
- The product contains dangerous substances, more than 0,1% by weight, given by the REACH Candidate List or the Norwegian Priority list, see table.
- The product contains no substances given by the REACH Candidate list or the Norwegian priority list. The product is classified as hazardous waste (Avfallsforsikten, §11-2), see table.

Name	CAS no.	Amount	
		CG M 75	CG M 80
Ammonium nitrate	6484-52-2	80-95%	80-95%
Distillates (petroleum), solvent-dewaxed heavy paraffinic	64742-65-0	2.5-5%	2.5-5%
Distillates (petroleum), hydrotreated light	64742-47-8	1- <2.5%	1- <2.5%
Sodium nitrite	7632-00-0	0.1- <0.25%	0.1- <0.25%

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 v3.4, March 2018 Ecoinvent v3.7, June 2021	Swiss Centre of Life Cycle Inventories. https://www.ecoinvent.org/
SimaPro	LCA software, developed by PRé Sustainability https://simapro.com/
NPCR 024 2016 ver. 1.0	<i>Explosives and Initiation Systems</i>
Velken, Brita Kristine, 2021	<i>LCA Report Bulk Emulsion Explosives SME (Ågotnes), Orica Norway AS 30.06.2021</i>
Yara International ASA 2020	<i>Carbon Footprint of Yara UltrAN® products manufactured in Köping, Sweden, 14.09.2020</i>

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