

# Environmental Product Declaration

In accordance with ISO 14025 and EN 15804+A2



The Norwegian  
EPD Foundation

**Owner of the declaration:**

Oy Forcit Ab

**Program holder and publisher:**

The Norwegian EPD foundation

**Declaration number:**

NEPD-3671-2616-EN

**Registration Number:**

NEPD-3671-2616-EN

**Issue date:** 18.08.2022

**Valid to:** 18.08.2027

**Product name**

Kemix A pipecharge  
ø32 mm

**Manufacturer**

Oy Forcit Ab

# General information

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## Product:

Kemix A pipecharge

## Program Holder:

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

## Declaration Number:

NEPD-3671-2616-EN

## This declaration is based on Product Category Rules:

NPCR 024 Explosives and Initiation Systems, ver. 2.0

## Statements:

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 kg of Kemix A pipecharge with diameter of 32 mm.

## Declared unit with option:

Detonated installed and used packaged explosive.

## Functional unit:

Not applicable

## Verification:

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

internal  external

*Alexander Borg*

Alexander Borg, Asplan Viak AS  
(Independent verifier approved by EPD Norway)

## Owner of the declaration:

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## Manufacturer:

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Phone: +358 20 744 0400  
e-mail: forcit@forcit.fi

## Place of production:

Vihtavuori, Finland

## Management system:

ISO 9001, ISO 14004

## Organisation no:

0103189-6

## Issue date:

18.08.2022

## Valid to:

18.08.2027

## Year of study:

2022

## Comparability:

EPDs from other programmes than The Norwegian EPD Foundation may not be comparable.

## The EPD has been worked out by:

Emma Salminen

 **LCA CONSULTING**  
part of Etteplan

*Helen Helen*

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approved (Manager of EPD Norway)

## Product

### Product description:

Kemix A pipecharges are emulsion explosives wrapped in plastic cylinders. Kemix A pipecharges are suitable for all types of blasts in quarries and mine sites where a precise amount of explosive is required to ensure the success of the blasting process. The pipecharges are suitable for smooth wall blasting and pre-splitting applications in both open-cut excavations and drifting.

### Product specification:

Kemix A pipecharges are provided in sizes Ø22 mm–Ø39 mm. This EPD considers the Kemix A pipecharges with a diameter of 32 mm.

Raw materials	%
Ammonium nitrate	70-85 %
Sodium nitrate	0-5 %
Secondary aluminium	3-6 %
Oil blend	4-6 %
Product package	%
PVC	0-1 %
PP	0-1 %
Label sticker	0-1 %

In addition to primary package (i.e. product package), pipecharges are packaged to transportation package presented below.

Transportation package	g/kg
Corrugated boxboard box	49.4
Hot melt adhesive	0.4
Tape and label sticker	0.3
PP-band	0.3

### Technical data:

Detonation energy of Kemix A pipecharge is 3.8 MJ/kg. Density of the explosive 1.10-1.15 kg/dm<sup>3</sup> and velocity of detonation > 5000m/s.

### Market:

Finland, Norway, and Sweden.

### Reference service life:

Not relevant. Explosives cannot be used several times.

## LCA: Calculation rules

### Declared unit:

1 kg of Kemix A pipecharge with diameter of 32 mm.

### 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 GaBi professional and Ecoinvent 3.7 databases is used when primary data is not accessed. Used secondary data is no older than 10 years.

### Allocation:

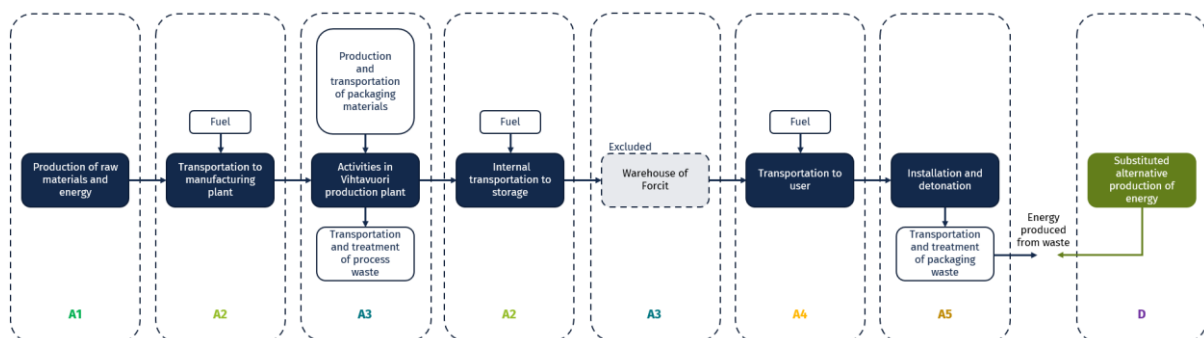
Allocation procedure described in ISO 14044:2006, section 4.3.4 is followed.

Annual consumption of district heat and electricity in production plant is allocated equally to all products manufactured based on production volumes. Both heat and electricity consumption is deemed minor and thus the applied allocation method is seen applicable.

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.

### System boundary:

The system boundary is from cradle to gate (A1-A3) including mandatory modules A4, A5, and module D. C1-C4 and B1-B7 modules are not relevant for studied product since product is detonated in the use phase (A5). Construction stage emissions of A5 are divided into A5-1 installation and A5-2 detonation stages.



### Cut-off criteria:

Flows accounting less than 1% of the overall input mass or energy flows are excluded from the study if appropriate LCI data or even proxy data is not available. Additionally, the sum of excluded flows should not exceed 5% of the total inflows (by mass or by energy). No major flows or processes were excluded due to cut-off criteria applied.

## LCA: Scenarios and additional technical information

### Transport from production place to assembly/user (A4)

Transportation distances and vehicles from production plant to customer are defined based on typical transportation distance in each of the studied markets. These figures represent the most likely scenario for distribution of Kemix A pipecharges. Two alternatives in transportation (A4) exist. Products are either transported to users directly from the production plant or via warehouses of Oy Forcit Ab. Average transportation distance presented here is based on weighted average over the market area. Total transported mass including transportation package is 1,05 kg per 1 kg transported pipecharges.

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance (km)	Fuel/Energy consumption	value (l/t)
Van	50	Euro 5 van with payload of 1 t	62	220 g/tkm (diesel)	16
Truck	100	Euro 5 truck with payload of 16 t	154	16,9 g/tkm (diesel)	3

### Installation (A5-1)

The pipecharges are unpacked from corrugated board boxes and installed on the installation phase. Drilling of blast holes and use of detonators are excluded from the use phase. Secondary product package (composition presented below) is assumed to be directed to energy recovery to waste-to-energy plant.

Incinerated waste generation on use phase	Unit	Value
Corrugated board box	g	49.4
Hot melt adhesive	g	0.4
Tape (PP)	g	0.1
Label sticker	g	0.2
PP-band	g	0.3

### Detonation (A5-2)

Detonation emissions are calculated with Explo5 software. Emissions consider both emulsion and product package (i.e. PVC pipe).

Detonation emissions	Unit	Value
H <sub>2</sub> O	kg	0.439
N <sub>2</sub>	kg	0.219
CO <sub>2</sub>	kg	0.089
C	kg	0
CH <sub>4</sub>	kg	0.004
Na <sub>2</sub> CO <sub>2</sub>	kg	0
CO*	kg	0.064

\* Formed in secondary reactions.

### Use (B1-B7)

B1-B7 are not relevant for explosives.

### End of Life (C1, C3, C4)

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

### Benefits and loads beyond system boundaries (D)

Secondary packaging materials of Kemix A pipecharges are assumed to be directed to municipal waste incineration in the A5-1 stage. Municipal waste incineration in market area of Kemix A pipecharge is typically conducted in waste to energy plants. It is assumed that electricity generated in waste incineration plants substitutes grid mix electricity (of country in question) and produced steam substitutes thermal energy produced from natural gas.

Waste incineration	Unit	Value
Packaging directed to energy recovery	kg	0.05
Energy recovered	MJ	0.29

### Additional technical information

Additional technical information of Kemix A pipecharges can be found:

<https://forcitexplosives.fi/en/product/kemix-a-kemix-pipecharges/>

## LCA: Results

Impact assessment results are presented with core and additional impact indicators presented in EN15804+A2. Reading example: 9,0 E-03 = 9,0\*10<sup>-3</sup> = 0,009

**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

### Core environmental impact indicators

Parameter	Unit	A1-A3	A4	A5-1	A5-2	D
GWP-total	kg CO <sub>2</sub> eq.	1,16E+00	5,18E-02	8,06E-02	3,36E-01	-1,84E-02
GWP-fossil	kg CO <sub>2</sub> eq.	1,23E+00	5,14E-02	3,25E-03	3,36E-01	-1,84E-02
GWP-biogenic	kg CO <sub>2</sub> eq.	-7,73E-02	0,00E+00	7,73E-02	1,05E-05	0,00E+00
GWP-LUC	kg CO <sub>2</sub> eq.	7,85E-04	4,20E-04	4,23E-06	0,00E+00	-4,74E-06
ODP	kg CFC11-eq.	1,86E-09	1,01E-17	1,29E-17	0,00E+00	-2,49E-17
AP	mole H <sup>+</sup> eq.	1,26E-02	1,51E-04	1,98E-05	0,00E+00	-2,53E-05
EP-freshwater	kg P eq.	1,07E-05	1,53E-07	3,45E-09	0,00E+00	-1,51E-08
EP-marine	kg N eq.	6,41E-03	6,75E-05	7,28E-06	0,00E+00	-8,09E-06
EP-terrestrial	mole of N eq.	6,84E-02	7,58E-04	9,03E-05	0,00E+00	-8,75E-05
POCP	kg NMVOC eq.	1,57E-02	1,35E-04	1,89E-05	2,96E-03	-2,27E-05
ADP-M&M	kg Sb eq.	6,40E-07	4,55E-09	2,30E-10	0,00E+00	-1,75E-09
ADP-fossil	MJ	2,04E+01	6,84E-01	2,64E-02	0,00E+00	-3,76E-01
WDP	m <sup>3</sup> world eq.	5,26E-02	4,77E-04	8,32E-03	0,00E+00	-6,51E-04

*GWP-total: Global Warming Potential; GWP-fossil: Global Warming Potential fossil fuels; GWP-biogenic: Global Warming Potential biogenic; GWP-LUC: 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 (given as PO<sub>4</sub> eq. an as P 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.*

### Additional environmental impact indicators

Parameter	Unit	A1-A3	A4	A5-1	A5-2	D
PM	Disease incidences	5,56E-08	8,83E-10	1,09E-10	0,00E+00	-1,92E-10
IRP	kBq U235 eq.	7,61E-02	1,82E-04	1,69E-04	0,00E+00	-4,05E-03
ETP-fw	CTUe	5,64E+00	5,08E-01	1,37E-02	2,74E-03	-6,02E-02
HTP-c	CTUh	1,89E-10	1,03E-11	6,17E-13	0,00E+00	-3,73E-12
HCTP-nc	CTUh	8,75E-09	5,98E-10	2,84E-11	6,91E-08	-1,78E-10
SQP	Pt	4,63E+00	2,35E-01	7,28E-03	0,00E+00	-9,33E-02

*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.*

### Classification of disclaimers to the declaration of core and additional environmental impact indicators

ILCD classification	Indicator	Disclaimer
ILCD type / level 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None
	Acidification potential, Accumulated Exceedance (AP)	None
ILCD type / level 2	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	None
	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
ILCD type / level 3	Potential Human exposure efficiency relative to U235 (IRP)	1
	Abiotic depletion potential for non-fossil resources (ADP-minerals & metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
Potential Soil quality index (SQP)	2	



**Disclaimer 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.

**Disclaimer 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	2,75E+00	3,94E-02	4,33E-03	0,00E+00	-9,00E-02
RPEM	MJ	6,39E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TPE	MJ	3,39E+00	3,94E-02	4,33E-03	0,00E+00	-9,00E-02
NRPE	MJ	2,04E+01	6,87E-01	2,64E-02	0,00E+00	-3,76E-01
NRPM	MJ	2,47E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TRPE	MJ	2,29E+01	6,87E-01	2,64E-02	0,00E+00	-3,76E-01
SM	kg	8,85E-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 <sup>3</sup>	3,46E-03	4,51E-05	1,96E-04	0,00E+00	-1,36E-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 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	D
HW	kg	2,63E-02	1,85E-08	3,62E-11	4,21E-12	0,00E+00
NHW	kg	9,59E-03	1,08E-04	5,24E-02	0,00E+00	-2,24E-04
RW	kg	6,12E-04	1,25E-06	1,09E-06	0,00E+00	-3,83E-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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00	5,03E-02	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	1,03E-01	0,00E+00	0,00E+00
ETE	MJ	0,00E+00	0,00E+00	1,87E-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	0.000003
Biogenic carbon content in product package (i.e. in primary and secondary package)	kg C	0.0211

## Additional Norwegian 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 for the manufacturing process (A3).

Energy mix	Unit	A1-A3
National electricity grid mix (GWP-Fossil)	g CO <sub>2</sub> eq./kWh	194

## Additional environmental impact indicators required in NPCR Part A for construction products

Parameter	Unit	A1-A3	A4	A5-1	A5-2	D
GWP-IOBC	kg CO <sub>2</sub> eq.	1,23E+00	5,14E-02	3,25E-03	3,36E-01	-1,84E-02
GWP	kg CO <sub>2</sub> eq.	1,16E+00	5,18E-02	8,06E-02	3,36E-01	-1,84E-02

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

## Dangerous substances

- x The product contains no substances given by the REACH Candidate list or the Norwegian priority list. The product is classified as hazardous waste (Avfallsforskriften, Annex III), see table.

Name	CAS no.	Amount
Ammonium nitrate	CAS 6484-52-2	70-85 %
Sodium nitrate	CAS 7631-99-4	0-5 %
Secondary aluminum	CAS 7429-90-5	3-6 %
Oil blend	No CAS number available	4-6 %

## Indoor environment




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

## Carbon footprint

Carbon footprint of the Kemix A pipecharge with diameter of 32mm is 1,61 kg CO<sub>2</sub> eq./kg.

## 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
PCR	NPCR Part A: Construction products and services. Version: 2.0
PCR	NPCR 024 Explosives and Initiation Systems, ver. 2.0
LCA Consulting Oy	LCA/background report for EPD of 32mm ø Kemix A pipecharge. Version 1.0 LCA Consulting Oy.

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# EPD for the best environmental decision

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