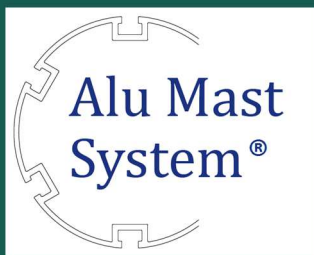


# Environmental Product Declaration

In accordance with ISO 14025 and EN 15804 +A2



The Norwegian  
EPD Foundation

**Owner of the declaration:**  
Lena Metall AS

**Program holder and publisher:**  
The Norwegian EPD foundation

**Declaration number:**  
NEPD-4955-4297-EN

**Registration Number:**  
NEPD-4955-4297-EN

**Issue date:** 11.09.2023  
**Valid to:** 11.09.2028

**Product name**

Alu Mast System®

Lena Metall AS  
Manufacturer

## General information

---

### Product:

Alu Mast System®

### 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-4955-4297-EN

### This declaration is based on Product

#### Category Rules:

NPCR 013:2019 Part B for Steel and aluminum construction products

### 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:

#### Declared unit with option:

1 kg of Alu Mast System  
Modules A1-A3, A4, C1- C4 and D

### Functional unit:

### Verification:

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

internal

external



Silvia Vilčeková

Independent verifier approved by EPD Norway

### Owner of the declaration:

Lena Metall AS  
Contact person: Edvard Dysthe  
Phone: +47 909 30 459  
e-mail: lm@lena-metall.no

### Manufacturer:

Lena Metall AS  
Framgutua 35  
Phone: +47 909 30 459  
e-mail: lm@lena-metall.no

### Place of production:

Bilitt, Østre Toten, Norway

### Management system:

-

### Organisation no:

982 783 550 MVA

### Issue date:

11.09.2023

### Valid to:

11.09.2028

### Year of study:


2021

### Comparability:

EPDs from other programmes than EPD-Norge may not be comparable.

### The EPD has been worked out by:

Johansen, B.H., Trebostad, M., Energiråd AS



---

Approved  
(Manager of EPD Norway)

# Product

## Product description:

Alu Mast System® is a Norwegian-developed product for Nordic conditions. The mast system is modular based where the posts are joined together to the desired length. The grooves in the posts are designed for attachment of line material and climbing equipment, which means that minimal processing on the rig space is needed. It comes with several advantages: low weight, less handling, quick installation, and high durability. The product is also recyclable at the end of life.

## Product specification:

The Alu Mast System consist of modules of extruded aluminum profiles ranging from Ø180 to Ø300mm in 4,5- and 6-meter sections. The modules are joined together before craning into position. The results in the current EPD is given for an average of the above mentioned diameter range with the following material composition per kg Alu Mast System®. In order to calculate the environmental footprint of a system in a given length the weight/length factor is given in the subsequent table.

Materials	KG	%
Aluminium EN AW 6082	0,925	92,51%
Steel S355J2	0,053	5,29%
Steel bolts AISi316L	0,022	2,20%

## Technical data:

Technical data	
Diameter:	180mm, 240mm, 300mm
Weight per meter Alu Mast system ®	180mm: 1m = 10,02 kg
	240mm: 1m = 14,46 kg
	300mm: 1m = 18,50 kg
	Intelligate: 1m = 6,18 kg
Safety:	AMS climbing shoes M10
	AMS fall safety M-03

## Market:

Nordics

## Reference service life, product:

80 - 100 years

## Reference service life, building:

N/A

## LCA: Calculation rules

---

### Declared unit:

1 kg of Alu Mast System  
Modules A1-A3, A4, C1- C4 and D

### Data quality:

#### **Upstream;**

Specific data was acquired by using measurable consumption and emission data from the Lena Metal facilities for 2021. The yearly averages for 2021 are referred to. Only specific data was used to analyze the core process of the LCA.

#### **Downstream:**

Scenarios were developed and generic data was used.

#### **Conversion to process flows and LCI:**

Conversion to primary flows and environmental effects were carried out via OpenLCA (version 1.11.0). Datasets from the ecoinvent v3.8 cutoff database, with EN15804 add-on developed by GreenDelta, were selected according to their technological, geographical and time related representativeness for the process assessed.

#### **Impact assessment:**

Open LCA software (version 1.11.0) was used to carry out the impact assessment of this LCA, the later refers to the LCIA characterization models, factors and methods as given by EN15804:2012+A2:2019, labeled "EN15804\_A1\_2020\_3" and "EN15804\_A2\_additional\_2020" in Open LCA.

#### **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. The recycling process and transportation of the material is allocated to this analysis.

## System boundary:

The scope of the study is cradle to gate with options, described as A1-A3, A4, C1-C4 and D. The study takes into consideration the life cycle stages from the extraction of raw materials, production and disposal, including all transport stages. The flowchart (Figure 1) illustrates the different stages of the product's life cycle considered. Module D includes the loads of melting and casting used aluminum and steel together with the potential benefits for the use of secondary aluminum outside the system boundary for the next product life cycle.

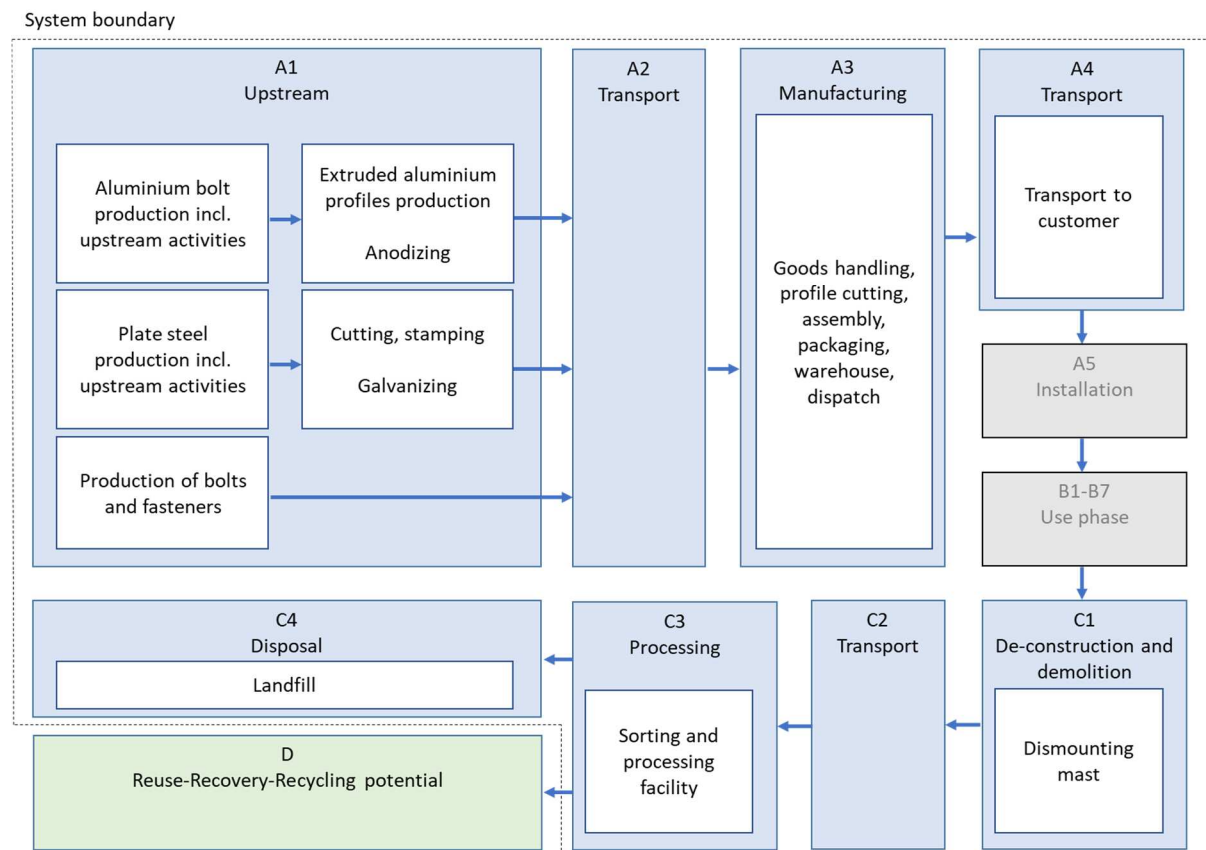


Figure 1: Life cycle stages of Alu Mast System<sup>®</sup>

## 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.

## LCA: Scenarios and additional technical information

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

The transport scenario considered for Alu Mast system<sup>®</sup> is based on the distribution of sales in 2021 and corresponding transport data. Datasets fromecoinvent were referred to.

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

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance KM	Fuel/Energy consumption	value (l/t)
Truck	53%	lorry >32 metric ton, EURO6	300	0,02285 l/t.km Diesel	7,02

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

	Unit	Value
Hazardous waste disposed	Kg	-
Collected as mixed construction waste	Kg	-
Reuse	Kg	-
Recycling	Kg	0,95
Energy recovery	Kg	-
To landfill	Kg	0,05

Recycling rates of aluminum from European Aluminium<sup>1</sup>

### Transport to waste processing (C2)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance KM	Fuel/Energy consumption	value (l/t)
Truck	37%	lorry 16-32 metric ton, EURO5	300	0,045 l/t.km Diesel	12,03

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

	Unit	Value
Substituted wrought aluminum	Kg	0,88

The Alu Mast System<sup>®</sup> is assumed to be recycled after being cut to shorter units and added as aluminum scarp in ingot production which could for different purposes have a varied degree of recycled aluminum content and therefore the recycled material minus recycled content in the materials are credited with a dataset for recycled aluminum.

<sup>1</sup>European Aluminum - ENVIRONMENTAL PROFILE REPORT

## LCA: Results

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

The Alu Mast system<sup>®</sup> is produced in Lena Metal facilities in Bilitt, Norway. This includes goods reception, cutting of alu-profiles, assembly and shipment. The system is sold under different size-profiles. The scenarios for modules beyond the factory gate (A4, C and D), are based on recommended practices for installation and maintenance as well as expected service life and guidelines for waste treatment from NCPR 013 supplemented by European Aluminum GPI<sup>2</sup>.

### Core environmental impact indicators

Indicator	Unit	A1	A2	A3	A1-A3	A4
GWP-total	kg CO2 eq.	4,55E+00	6,02E-01	2,65E-01	5,42E+00	4,89E-02
GWP-fossil	kg CO2 eq.	4,56E+00	6,00E-01	2,14E-01	5,37E+00	4,88E-02
GWP-biogenic	kg CO2 eq.	-1,90E-02	1,02E-03	4,98E-02	3,18E-02	8,69E-05
GWP-LULUC	kg CO2 eq.	1,52E-03	2,50E-04	4,70E-04	2,24E-03	1,96E-05
ODP	kg CFC11 eq.	5,13E-07	1,38E-07	3,70E-08	6,88E-07	1,13E-08
AP	mol H <sup>+</sup> eq.	2,47E-02	2,59E-03	1,52E-03	2,88E-02	1,40E-04
EP-freshwater	kg P eq.	9,20E-04	3,86E-05	6,67E-05	1,03E-03	3,22E-06
EP-marine	kg N eq.	7,80E-04	5,70E-04	4,40E-04	1,79E-03	2,82E-05
EP-terrestrial	mol N eq.	7,56E-03	6,29E-03	4,51E-03	1,84E-02	3,10E-04
POCP	kg NMVOC eq.	5,09E-03	2,04E-03	1,24E-03	8,37E-03	1,10E-04
ADP-M&M	kg Sb eq.	8,52E-06	1,98E-06	9,07E-06	1,96E-05	1,66E-07
ADP-fossil	MJ	9,80E+00	6,79E-01	7,46E-01	1,12E+01	5,65E-02
WDP	m <sup>3</sup>	6,81E-01	4,29E-02	3,40E+00	4,12E+00	3,60E-03

<sup>2</sup> [22-02-16-epd-programme-rules-3rd-rev-european-aluminium.pdf](https://www.epd.org/2022-02-16-epd-programme-rules-3rd-rev-european-aluminium.pdf)

Indicator	Unit	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	8,16E-03	4,89E-02	3,40E-02	2,70E-04	-4,39E-01
GWP-fossil	kg CO2 eq.	8,14E-03	4,88E-02	1,76E-02	2,70E-04	-4,54E-01
GWP-biogenic	kg CO2 eq.	1,45E-05	8,69E-05	1,64E-02	6,39E-07	1,56E-02
GWP-LULUC	kg CO2 eq.	3,26E-06	1,96E-05	8,77E-06	1,20E-07	-5,20E-04
ODP	kg CFC11 eq.	1,89E-09	1,13E-08	7,52E-10	4,77E-11	-4,53E-08
AP	mol H <sup>+</sup> eq.	2,31E-05	1,40E-04	7,77E-05	2,52E-06	-8,26E-03
EP-freshwater	kg P eq.	5,37E-07	3,22E-06	4,22E-06	3,26E-08	-6,40E-04
EP-marine	kg N eq.	4,71E-06	2,82E-05	1,78E-05	1,04E-06	-6,30E-04
EP-terrestrial	mol N eq.	5,12E-05	3,10E-04	2,10E-04	1,13E-05	-7,72E-03
POCP	kg NMVOC eq.	1,91E-05	1,10E-04	5,17E-05	3,08E-06	-2,24E-03
ADP-M&M	kg Sb eq.	2,77E-08	1,66E-07	6,69E-07	1,64E-10	-1,60E-04
ADP-fossil	MJ	9,41E-03	5,65E-02	3,50E-02	7,40E-04	-7,01E+00
WDP	m <sup>3</sup>	6,00E-04	3,60E-03	7,91E-03	2,25E-05	-5,98E-01

**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

ILCD class	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, Share of nutrients to freshwater end compartment (EP-fw)	None
	Eutrophication potential, Share of nutrients to 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	A2	A3	A1-A3	A4
RPEE	MJ	1,07E+01	9,47E-02	1,07E+01	2,15E+01	7,96E-03
RPEM	MJ	2,14E-01	3,13E-02	2,14E-01	4,59E-01	2,61E-03
TPE	MJ	1,09E+01	1,26E-01	1,09E+01	2,19E+01	1,06E-02
NRPE	MJ	1,43E+00	8,64E-01	1,43E+00	3,72E+00	7,21E-02
NRPM	MJ	2,30E+00	8,22E+00	2,30E+00	1,28E+01	6,73E-01
TRPE	MJ	3,73E+00	9,08E+00	3,73E+00	1,65E+01	7,45E-01
SM	Kg	2,73E-02	9,11E-03	2,73E-02	6,37E-02	7,60E-04
RSF	MJ	6,05E-03	2,67E-03	6,05E-03	1,48E-02	2,30E-04
NRSF	MJ	4,04E-02	1,08E-02	4,04E-02	9,16E-02	9,20E-04
W	m <sup>3</sup>	7,95E-02	1,02E-03	7,95E-02	1,60E-01	8,57E-05

Parameter	Unit	C1	C2	C3	C4	D
RPEE	MJ	1,33E-03	7,96E-03	3,33E-02	7,51E-05	-1,00E+00
RPEM	MJ	4,40E-04	2,61E-03	9,88E-03	1,78E-05	0,00E+00
TPE	MJ	1,76E-03	1,06E-02	4,32E-02	9,29E-05	-1,00E+00
NRPE	MJ	1,20E-02	7,21E-02	6,86E-02	8,70E-04	-7,85E+00
NRPM	MJ	1,12E-01	6,73E-01	5,15E-02	2,99E-03	0,00E+00
TRPE	MJ	1,24E-01	7,45E-01	1,20E-01	3,86E-03	-7,85E+00
SM	kg	1,30E-04	7,60E-04	1,02E+00	4,25E-06	0,00E+00
RSF	MJ	3,77E-05	2,30E-04	9,00E-04	1,12E-06	0,00E+00
NRSF	MJ	1,50E-04	9,20E-04	1,20E-04	1,51E-06	0,00E+00
W	m <sup>3</sup>	1,43E-05	8,57E-05	1,90E-04	5,34E-07	-1,40E-02

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 nonrenewable 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	A2	A3	A1-A3	A4
HW	KG	6,04E+02	1,99E-01	4,05E-01	6,05E+02	1,66E-02
NHW	KG	4,98E+02	4,49E-01	1,54E-01	4,99E+02	3,84E-02
RW	KG	3,30E-01	1,80E-04	4,50E-04	3,31E-01	1,49E-05

Parameter	Unit	C1	C2	C3	C4	D
HW	KG	2,77E-03	1,66E-02	2,50E-02	1,60E-04	0,00E+00
NHW	KG	6,41E-03	3,84E-02	2,42E-02	3,79E-06	0,00E+00
RW	KG	2,48E-06	1,49E-05	2,11E-05	1,03E-07	0,00E+00

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

## End of life – output flow

Parameter	Unit	A1	A2	A3	A1-A3	A4
CR	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MR	kg	3,63E+02	7,59E-03	1,59E-02	3,63E+02	6,30E-04
MER	kg	2,89E+00	2,17E-03	1,70E-03	2,89E+00	1,70E-04
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

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	9,50E-01	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	-

## 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).

National electricity grid	Unit	Value
Norwegian mix (market for electricity, ecoinvent 3.8)	kg CO2 -eq/kWh	0,01713

### Additional environmental impact indicators required in NPCR Part

To increase the transparency of biogenic carbon contribution to climate impact, the indicator for GWP is also given as GWP-IOBC, being climate impacts calculated according to the principle of instantaneous oxidation of bio-carbon. This is however not relevant to calculate in this EPD and could be considered equal to GWP-fossil.

### 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 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 (Avfallsforskriften, Annex III), see table.

## Indoor environment

Not relevant for outdoor products.

## Carbon footprint

Carbon footprint has not been worked out for the product.

# Additional – Results for Module with considerations for the Nordics Market reach

---

Based on the

## Core environmental impact indicators

Indicator	Unit	D
GWP - total	kg CO2 eq	-5.59E+00
GWP - fossil	kg CO2 eq	-5.41E+00
GWP - biogenic	kg CO2 eq	-3.65E-02
GWP - luluc	kg CO2 eq	-1.46E-01
ODP	kg CFC11 eq	-5.89E-07
AP	molc H+ eq	-3.09E-02
EP- freshwater	kg P eq	-2.86E-03
EP -marine	kg N eq	-4.61E-03
EP - terrestrial	molc N eq	-3.98E-02
POCP	kg NMVOC eq	-1.19E-02
ADP - M&M	kg Sb-Eq	1.51E-04
ADP - fossil	MJ	-7.15E+01
WDP	m3	-1.09E+01

## Additional environmental impacts indicators

Indicator	Unit	D
PM	Disease incidence	-3.75E-07
IRP	kBq U235 eq.	-1.69131
ETP-fw	CTUe	0.89857
HTP-c	CTUh	-1.46E-08
HTP-nc	CTUh	-9.76E-07
SQP	Dimensionless	-1.29599

### Resource use

Parameter	Unit	D
RPEE	MJ	-3.71E+01
RPEM	MJ	-7.50E-02
TPE	MJ	-3.72E+01
NRPE	MJ	-5.62E+01
NRPM	MJ	-4.40E+01
TRPE	MJ	-1.00E+02
SM	Kg	9.20E-01
RSF	MJ	-1.57E-02
NRSF	MJ	-1.87E-02
W	m <sup>3</sup>	-2.53E-01

### End of life – Waste





Parameter	Unit	D
HW	kg	0,00E+00
NHW	kg	0,00E+00
RW	kg	0,00E+00

### End of life – output flow

Parameter	Unit	D
CR	kg	0.00E+00
MR	kg	0,00E+00
MER	kg	0.00E+00
EEE	MJ	0.00E+00
ETE	MJ	0.00E+00

## 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

 Global Program Operator	<b>Program Operator</b>	phone	+47 23 08 80 00
	The Norwegian EPD Foundation Post Box 5250 Majorstuen, 0303 Oslo Norway	e-mail:	<a href="mailto:post@epd-norge.no">post@epd-norge.no</a>
		Web	<a href="http://www.epd-norge.no">www.epd-norge.no</a>
 Global Program Operator	<b>Publisher</b>	phone	+47 23 08 80 00
	The Norwegian EPD Foundation Post Box 5250 Majorstuen, 0303 Oslo Norway	e-mail:	<a href="mailto:post@epd-norge.no">post@epd-norge.no</a>
		web	<a href="http://www.epd-norge.no">www.epd-norge.no</a>
 Lena Metall as	<b>Owner of the declaration</b>	phone	+47 909 30 459
	Lena Metall AS Bilitt Næringspark, 2848 Skreia Norway	e-mail:	<a href="mailto:lm@lena-metall.no">lm@lena-metall.no</a>
		Web	<a href="http://www.lena-metall.no">www.lena-metall.no</a>
 energiråd	<b>Author of the life cycle assesment</b>	phone	+47 98 25 90 10
	Energiråd AS Trippevegen 1, 6009 Ålesund Norway	e-mail:	<a href="mailto:harald@energirad.no">harald@energirad.no</a>
		web	<a href="http://www.energirad.no">www.energirad.no</a>

# EPD for the best environmental decision

---



Global  
Program  
Operator