

# Environmental Product Declaration



In accordance with ISO 14025:2006 for:

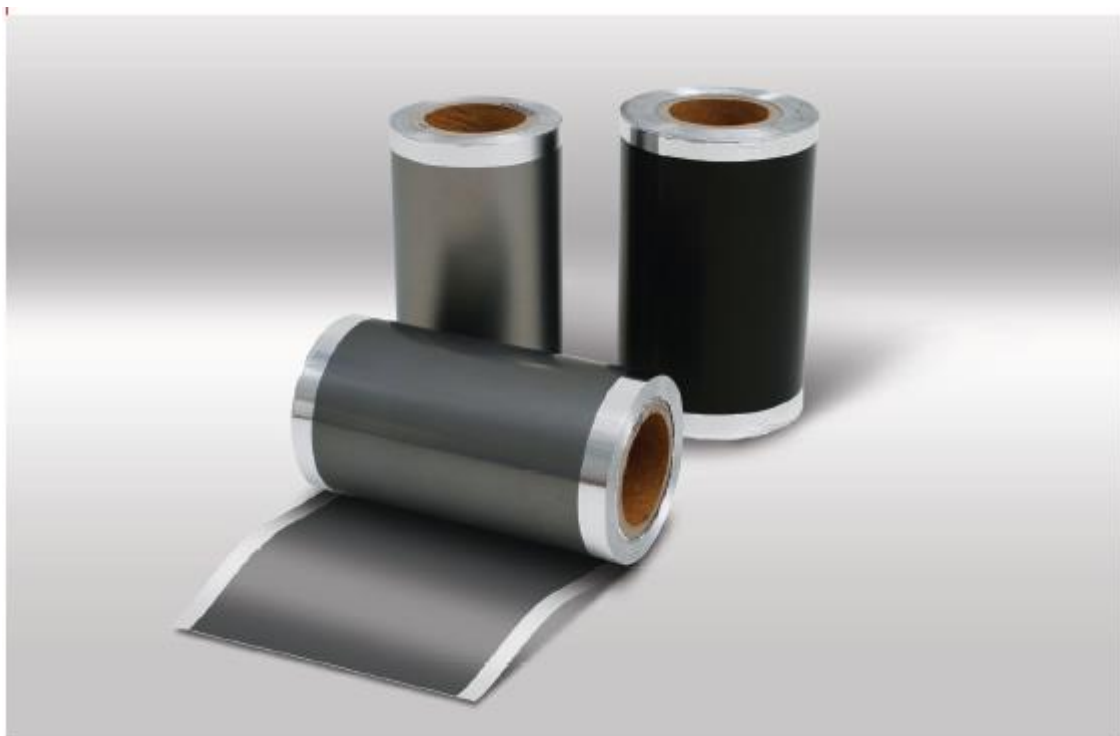
## Cathode Aluminium Foil

from

**LOTTE ALUMINIUM**

**LOTTE ALUMINIUM**

Programme:	The International EPD® System, <a href="http://www.environdec.com">www.environdec.com</a>
Programme operator:	EPD International AB
EPD registration number:	S-P-10281
Publication date:	2023-08-22
Valid until:	2028-08-22



## Programme information

<b>Programme:</b>	The International EPD <sup>®</sup> System EPD International AB Box 210 60 SE-100 31 Stockholm Sweden  <a href="http://www.environdec.com">www.environdec.com</a> <a href="mailto:info@environdec.com">info@environdec.com</a>
-------------------	--

<b>Accountabilities for PCR, LCA and independent, third-party verification</b>
<b>Product Category Rules (PCR)</b>
PCR: <i>BASIC ALUMINIUM PRODUCTS AND SPECIAL ALLOYS, 2022:08, VERSION 1.0, UN CPC 4153</i>
PCR review was conducted by: <i>Hüdai Kara, The Technical Committee of the International EPD<sup>®</sup> System. A full list of members is available at <a href="http://www.environdec.com">www.environdec.com</a>. The review panel may be contacted via <a href="mailto:info@environdec.com">info@environdec.com</a>.</i>
<b>Life Cycle Assessment (LCA)</b>
LCA accountability: Junwon Jung, LOTTE ALUMINIUM
<b>Third-party verification</b>
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:  <input checked="" type="checkbox"/> EPD verification by individual verifier  Third-party verifier: <i>Ik Kim, SMARTECO, <a href="mailto:kohung@samrt-eoc.co.kr">kohung@samrt-eoc.co.kr</a></i>  Approved by: The International EPD <sup>®</sup> System
Procedure for follow-up of data during EPD validity involves third-party verifier:  <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No  [Procedure for follow-up the validity of the EPD is at minimum required once a year with the aim of confirming whether the information in the EPD remains valid or if the EPD needs to be updated during its validity period. The follow-up can be organized entirely by the EPD owner or together with the original verifier via an agreement between the two parties. In both approaches, the EPD owner is responsible for the procedure being carried out. If a change that requires an update is identified, the EPD shall be re-verified by a verifier]

## Company information

### Owner of the EPD

LOTTE ALUMINIUM

### Description of the organisation

LOTTE ALUMINIUM is the nation’s biggest comprehensive packaging material company founded in 1966. Having developed with the nation’s history in packaging materials, LOTTE ALUMINIUM is producing diverse products including Aluminium foil, printed packaging materials, corrugated cardboard boxes, CAN, Vending Machine, Showcase and House-hold Goods. LOTTE ALUMINIUM is providing the best quality and technology to live up to the name of Lotte Brand.

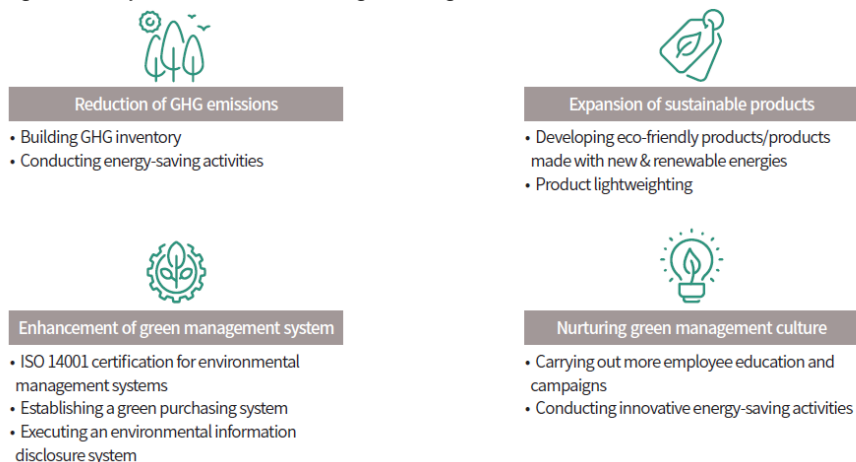
LOTTE ALUMINIUM is dedicated to become Asia’s leading global company in new materials by guaranteeing the world’s best quality and productivity through enhancing global competitiveness, improving our brand value, and technical innovation.

In addition, we will create future values and realize customer satisfaction with green technology and strive to become a leader in global packaging materials market.

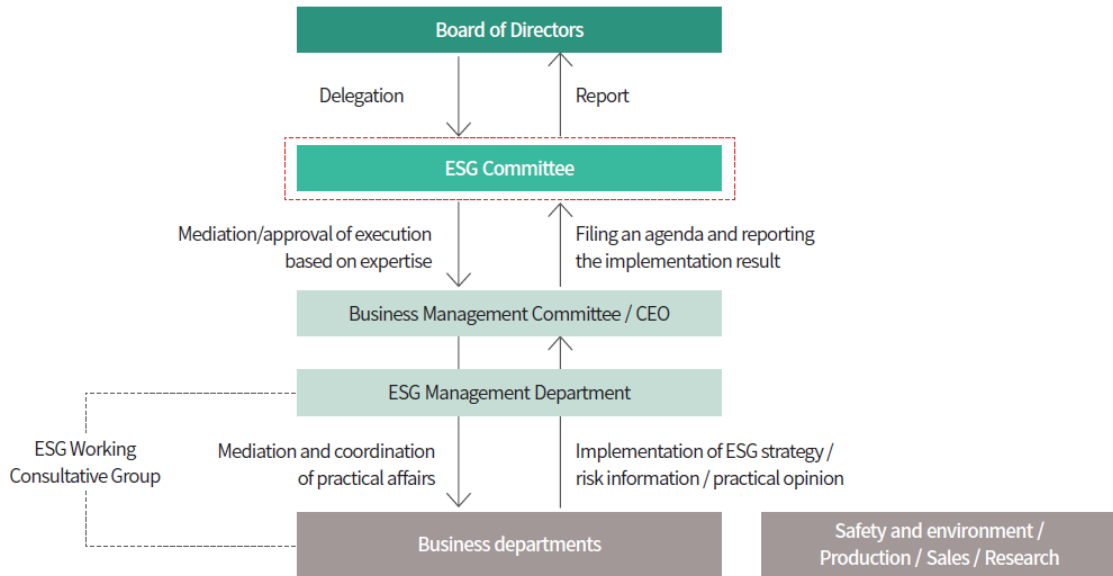
Today's businesses are expected to actively participate in a range of eco-friendly policies in response to the rapid climate change, such as global environmental regulations becoming more stringent, and to develop a response system for global eco-friendly trends and risks.

LOTTE Aluminium, in response, is working to reduce emissions of diverse pollutants by enhancing company-wide environmental management while taking into account international eco-friendly trends and environmental regulations by placing a premium on environmental protection. There are 4 Environmental policies. Reduction of GHG emissions, Expansion of sustainable products, Enhancement of green management system and Nurturing management culture.

#### Environmental Policy



With LOTTE Aluminium sharing the same ESG activities and vision of LOTTE Group, we intend to pursue sustainability in our businesses by making environmental and social values and corporate governance the pillars of our operations. We carry out internal and external work through the company-wide ESG Management Department, supervised by the Strategic Planning Division, and the Safety and Environment Division. The ESG Management Department oversees the achievement and performance of environmental goals, and the major issues are reported during the BoD and executive meetings.



LOTTE Aluminium has established an integrated operating system that incorporates environmental, safety and health, and quality management as part of our efforts to create synergies across various domains. We re-establish the systems operating system and adopt and settle on the same standard for organic work efficiency across all business sites through the enactment and revision of standards. This provides a system that meets the demand of international society. Our entire domestic business sites (6 sites, 100%) acquired ISO 14001, as well as green technology certification for eco-friendly food packaging material manufacturing technology, and green technology product certification.



LOTTE Aluminium includes environment/safety investment plans in its annual investment plan to minimize the emissions of various pollutants and protect the environment. In 2021, we invested 3.4 billion KRW to contribute to environmental/energy enhancements. We will continue to actively promote green investments by expanding sustainable businesses until 2030 and implementing sustainable business strategies to encourage carbon-reduction growth. Accordance with the Chemical Substances Control Act, LOTTE Aluminium provides training for hazardous chemical managers, handlers, and workers in order to enhance its employees' environmental expertise.

**Name and location of production site**  
Ansan Factory 1, Haean-ro 201, Danwon-gu, Ansan, Gyeonggi-do

## Product information

### Product name

Cathode Aluminium Foil

### Product identification

Cathode Aluminium Foil is thin aluminium foil that is used in cathode of lithium ion battery.

### Product description

Cathode Aluminium Foil works as route of electrons in secondary battery, emits heat inside battery and supports slurry of cathode active materials on cathode.

### Manufacturing Process

The cathode aluminum foil production process consists of a total of five stages.

In the manufacturing process, both raw materials and subsidiary materials are employed to produce aluminum products. Aluminum coils serve as the primary raw materials in the production of aluminum products. Additionally, lubricating oil, rolling oil, machine oil, and filters (used in rolling oil) are also utilized as auxiliary materials. These materials play a supporting role in the production process by facilitating various functions such as lubrication, cooling, and equipment maintenance, particularly during the Milling process.

Following this, the process flow of the production of cathode aluminum foil is presented in Table 1 and illustrated in Figure 1.

**Table 1 production process of aluminium foil**

No.	Process name	Description
1	<b>Milling 1 Pass</b>	After the input of Aluminium Strip (raw material), the 1st milling is carried out according to the operational plan to produce a 1-pass semi-finished product.
2	<b>Milling 2 Pass</b>	After the input of a 1-pass semi-finished product, the 2nd milling is carried out according to the operational plan to produce a 2-pass semi-finished product.
3	<b>Milling 3 Pass</b>	After the input of a 2-pass semi-finished product, the 3rd milling is carried out according to the operational plan to produce a 3-pass semi-finished product.
4	<b>Milling Final</b>	After the input of a 3-pass semi-finished product, the final milling is carried out according to the operational plan to produce a final-pass semi-finished product.
5	<b>slitting</b>	The process of slitting the coil, which has been rolled to the thickness requested by the customer, into the width specified by the customer.



Cathode Aluminium Foil Flow chart

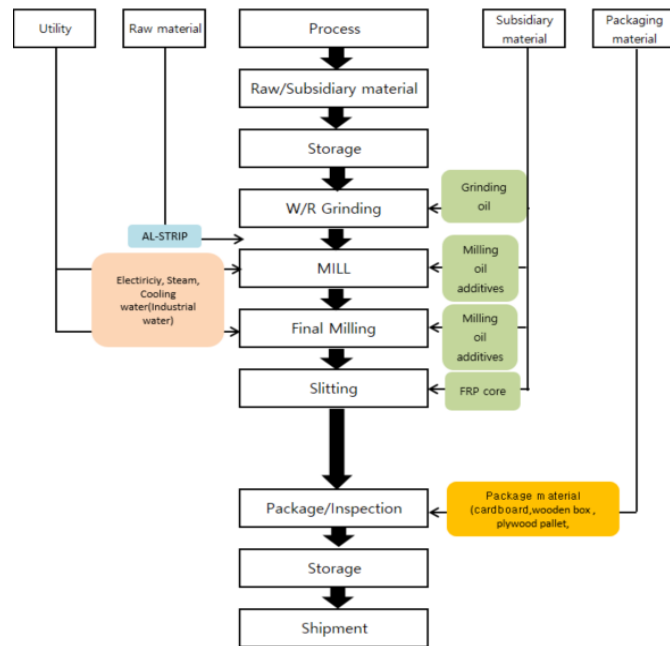


Figure 1 production process

UN CPC code

41535(CPC2.1)

Geographical scope

Republic of Korea

## LCA information

The project’s general scope and the approach taken to accomplish the stated goals are described in the next section. The study’s declared unit and system boundary, data collection, software & database, cut-off criteria, data quality requirements, geographical and time coverage, allocation principles, and LCIA category selection are all included.

### Declared unit

The Declared Unit is 1 kg of Cathode Aluminium Foil

### Time representativeness

Data refer to the year 2022

### LCA software used

LCA for Experts (Gabi) 10.7.0.183

### Database used

Ecoinvent Database 3.8, Professional database 2023 Extension database XVII and full US 2023

### System boundary

This EPD’s system boundary is cradle to gate

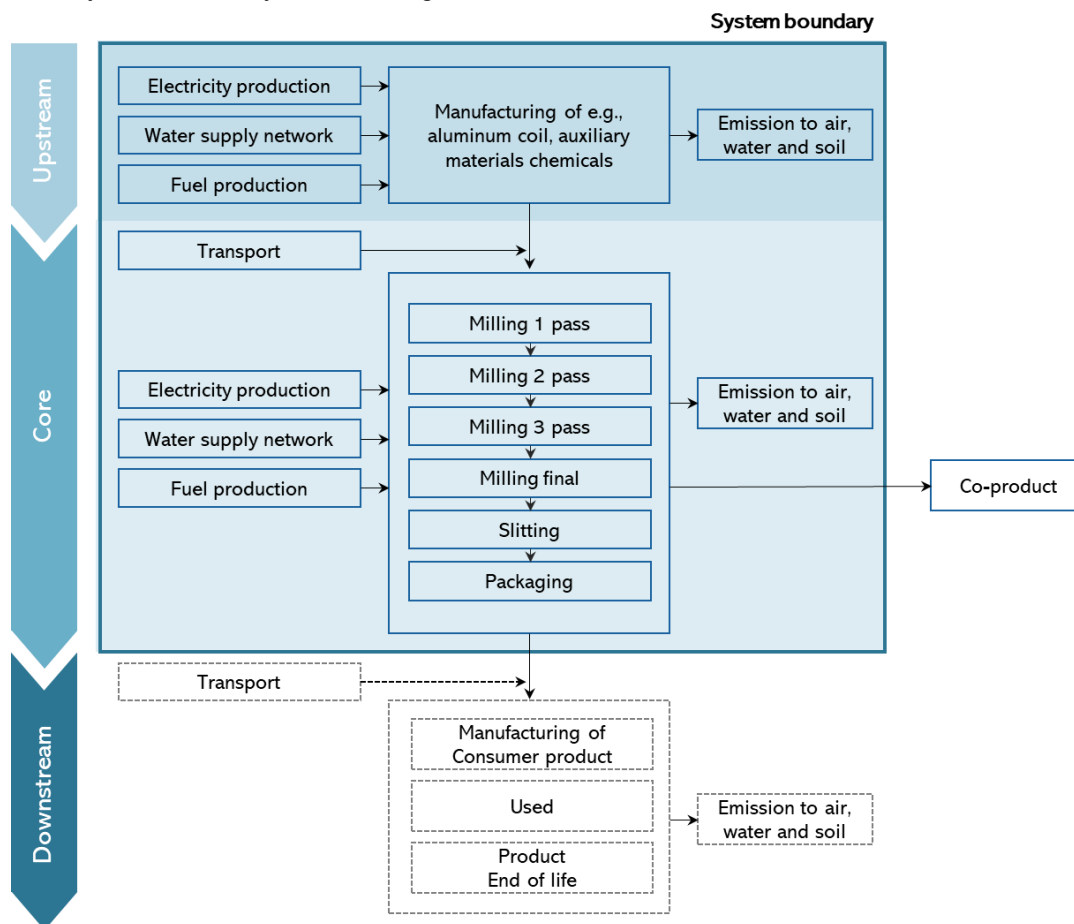


Figure 2 System boundary

### Excluded lifecycle stages

End-of-life of the product and use phase are excluded.

**Primary data**

The Primary data for the LCA study is based on the 2022 production figures for Cathode Aluminium Foil by Lotte aluminium production plant in Korea.

**CUT-OFF criteria**

According to the PCR, 99% of the product content and 99% of the energy consumption over the product's life cycle were considered.

**Allocations**

In this study, co-product, which is aluminium scrap, were generated during the production of aluminium products. As a result, the allocation of inputs and outputs within the studied system was conducted between the main product and co-products, considering their production mass. This means that the resources used, and the outputs generated were appropriately distributed between the main product and the aluminium scrap based on their respective mass in the production process.

The electricity consumption and consumable materials were allocated based on the following criteria, as specific usage data for each process was not managed separately.

Electricity is used throughout the entire manufacturing process, and its allocation is based on the production quantities (mass) for each individual process as well as the overall production quantities (mass) for all processes.

Consumable materials such as rolling oil, lubricating oil, and grinding stones are used only in the milling process. Therefore, their allocation is based on the total production quantity of the milling process and the production quantity of each specific milling process. Additionally, the waste generated from the use of rolling oil and lubricating oil is also allocated in the same manner as the consumable materials.

**Assumptions and Limitations**

**Co-product:**

The aluminium product of Lotte aluminium is product and Scrap. The Aluminium Foil is considered as the target product of LCA. All scraps from Lotte aluminium are sold at a negligible price and amount. Therefore, the scrap cannot be treated as waste but co-product which need allocation.

**Utility:**

During the production of cathode aluminium foil, we use electricity as the utility. Electricity is utilized in all stages of production. Therefore, to determine the electricity consumption for each process, we have allocated the total electricity usage of the entire factory based on the production output for each specific stage of production.

**Process water:**

No water is used in the production of cathode aluminium foils.

**Waste:**

During the manufacturing phase, waste oil (liquid, solid) is generated mainly from the use of rolling oil, lubricating oil, etc. as waste. The secondary database for waste disposal has been classified as waste oil recycling.

**Raw material and waste transportation distance:**

The transportation distance for raw materials was optimized by applying the shortest distance between the manufacturing plant and Lotte Aluminium factory. Additionally, for the transportation of waste generated during the process, we also utilized the shortest distance between Lotte Aluminium factory and the waste disposal company.





### Electricity consumption

Generation of electricity consumed within LOTTE ALUMINIUM production was based on the Korea national electricity grid mix.

### LCA modelling, calculation and data quality

The LCA was conducted using the Gabi software (10.7.0.183) and the EN15804+A2 method according to PCR. Selected generic data from the Ecoinvent database v.3.8 and professional database were used as secondary data.

## Content information

### Product components

Cathode aluminium foils are composed of aluminium strips. Depending on the customer's requirements, A1100 alloy strips and A1235 alloy strips are used.

Table 2 Product components

Product components	%
Aluminium strips	100

### Packaging

#### Distribution packaging

Cathode Aluminium Foil is packaged with PE film, Styrofoam disk, FRP core.

#### Consumer packaging

Cathode Aluminium Foil is packaged in wooden box and shipped to customers.

### Recycled material

No recycled materials used in the product

## Results of the environmental performance indicators

### Impact category indicators

PARAMETER		UNIT	Upstream	Core	TOTAL
Global warming potential (GWP)	Fossil	kg CO <sub>2</sub> eq.	8.82E+00	5.56E-01	9.37E+00
	Biogenic	kg CO <sub>2</sub> eq.	-1.39E-03	1.31E-03	-8.22E-05
	Land use and land transformation	kg CO <sub>2</sub> eq.	2.35E-03	3.08E-04	2.66E-03
	TOTAL	kg CO <sub>2</sub> eq.	8.82E+00	5.57E-01	9.38E+00
Ozone layer depletion (ODP)		kg CFC 11 eq.	5.70E-09	2.61E-08	3.18E-08
Acidification potential (AP)		mol H <sup>+</sup> eq.	4.11E-02	1.89E-03	4.30E-02
Eutrophication potential (EP)	Aquatic freshwater	kg P eq.	2.53E-05	3.65E-04	3.91E-04
	Aquatic marine	kg N eq.	6.08E-03	5.70E-04	6.65E-03
	Aquatic terrestrial	mol N eq.	6.64E-02	5.62E-03	7.20E-02
Photochemical oxidant creation potential (POCP)		kg NMVOC eq.	1.86E-02	1.87E-02	3.73E-02
Abiotic depletion potential (ADP)	Metals and minerals	kg Sb eq.	1.12E-06	2.54E-06	3.67E-06
	Fossil resources	MJ, net calorific value	1.17E+02	1.01E+01	1.28E+02
Water deprivation potential (WDP)		m <sup>3</sup> world eq. deprived	1.33E+00	1.09E-01	1.44E+00

### Resource use indicators

PARAMETER		UNIT	Upstream	Core	TOTAL
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	5.11E+01	2.63E-01	5.13E+01
	Used as raw materials	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00
	TOTAL	MJ, net calorific value	5.11E+01	2.63E-01	5.13E+01
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	1.18E+02	1.01E+01	1.28E+02
	Used as raw materials	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00
	TOTAL	MJ, net calorific value	1.18E+02	1.01E+01	1.28E+02
Secondary material (optional)		kg	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels (optional)		MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels (optional)		MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water (optional)		m <sup>3</sup>	1.24E-01	2.53E-03	1.27E-01

**Waste indicators**

PARAMETER	UNIT	Upstream	Core	TOTAL
Hazardous waste disposed	kg	5.90E-09	3.27E-14	5.90E-09
Non-hazardous waste disposed	kg	2.48E+00	9.77E-07	2.48E+00
Radioactive waste disposed	kg	6.73E-03	8.40E-09	6.73E-03

**Output flow indicators**

PARAMETER	UNIT	Upstream	Core	TOTAL
Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ per energy carrier	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal	MJ per energy carrier	0.00E+00	0.00E+00	0.00E+00



## References

- The International EPD<sup>®</sup> System, The International EPD<sup>®</sup> System is a programme for type III environmental declarations, maintaining a system to verify and register EPD@s as well as keeping a library of EPD@s and PCRs in accordance with ISO 14025, [www.environdec.com](http://www.environdec.com)
- General Programme Instructions of the International EPD<sup>®</sup> System. Version 3.01.
- Product Category Rules (PCR): BASIC ALUMINIUM PRODUCTS AND SPECIAL ALLOYS, 2022:08, VERSION 1.0
- ISO 14020:2000 Environmental labels and declarations - General principles
- ISO 14025:2006 Environmental labels and declarations - Type III environmental declarations - Principles and procedures
- ISO 14040:2006 Environmental management- Life cycle assessment - Principles and framework
- ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines



