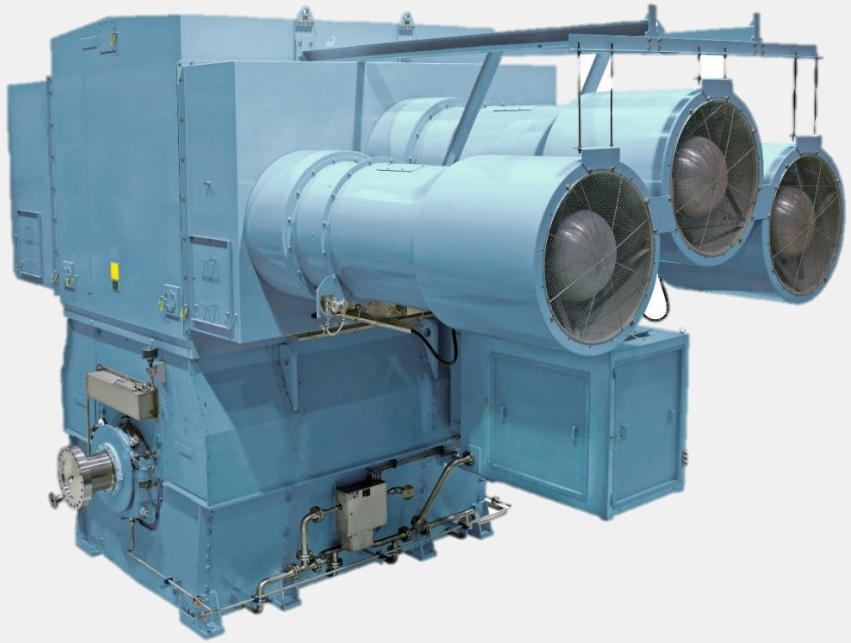


Environmental Product Declaration for Synchronous motor, AMS 1120 (31 MW)

In accordance with ISO 14025:2006

Program	The International EPD® System, www.environdec.com
Program operator	EPD International AB
EPD registration number	EPD-IES-0016258
Publication date	2024-08-27
Valid until	2029-08-27
Product Category Rules (PCR)	Electrical motors and generators and parts thereof (for industrial applications), 2022:06, version 1.0, UN CPC 46112 and 46131

Company information

ABB is a leading global technology company that energizes the transformation of society and industry to achieve a more productive, sustainable future. By connecting software to its electrification, robotics, automation and motion portfolio, ABB pushes the boundaries of technology to drive performance to new levels. With a history of excellence stretching back more than 140 years, ABB's success is driven by about 110,000 talented employees in over 100 countries.

We offer a wide range of reliable and high efficiency motors and generators to help every industry and application reach new levels of efficiency and energy savings. Combining the best available materials with superior technology, a global footprint and application expertise, our electric motor and generator have a well-earned reputation of improving reliability and productivity in the most demanding applications.

Owner of the EPD	Andreas Holmqvist, andreas.holmqvist@se.abb.com
The production facility is certified according to the following management systems	ISO 9001, ISO 14001 and ISO 45001
Name and location of production site	ABB Västerås, Sweden

Sustainability

Striving to achieve all targets by 2030

With our 2030 sustainability strategy, we are actively enabling a low-carbon society as well as working with our customers and suppliers to implement sustainable practices across our value chain and the lifecycle of our products and solutions. We are equally committed to driving social progress, along with our suppliers and in our communities.

A key part of our 2030 sustainability strategy is to support our customers and suppliers to reduce their emissions and achieve carbon neutrality in our own operations. Our greenhouse gas emissions reduction targets have been validated by the Science Based Targets initiative as being in line with the 1.5°C scenario of the Paris Agreement.

To ensure that we are focused on achieving our goals, our sustainability targets are integrated into our decision-making processes and we have accountabilities and incentive plans in place to drive action.

LINK TO OUR WEBSITE

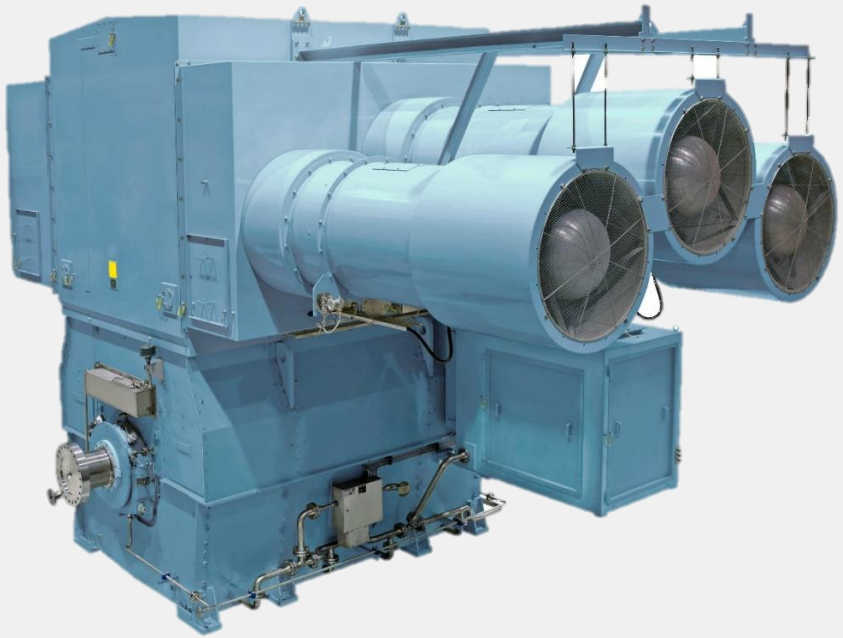
Product information

AMS High speed synchronous motor

The AMS 1120 is a high-performance synchronous motor, ideal for industrial processes, the marine and offshore industries, utilities, and specialized applications. With its exceptional reliability, availability and efficiency, these high-speed motors reduce operating costs, maintenance, and energy consumption.

Key features

- High Efficiency, typically above 98,4%
- 4 pole design for high-speed, optimized performance.
- Air-to-air closed circuit cooling
- High-quality sleeve bearings
- Suitable for centrifugal compressors, refiners, blowers, and extruders.



Product identification:	AMS 1120
UN CPC code	UN CPC 46112 and 46131
Geographical scope	United States is considered for the downstream phase
Shaft height	1120 mm
Nominal output power	31,105 MW
Efficiency*	98,61%

*Measured according to NEMA standard.

EPD®

LCA information

Data quality, allocation rules and cut-off criteria

Data quality, allocation rules and cut-off criteria

In this LCA, both primary and secondary data are used. Site specific foreground data have been provided by ABB using data from the Västerås factory from year 2022. Main data sources are the bill of materials available on the enterprise resource planning. For all processes for which primary data are not available, generic data originating from the ecoinvent v3.9.1 database, allocation cut-off by classification, are used. The ecoinvent database is available in the SimaPro 9.5.0.0 software. The potential environmental impact has been calculated using the calculation method European Environmental footprint 3.1 Method (adapted).

An allocation key is used for consumptions related to the manufacturing process at the production site, as well for company waste. Since the factory produces several products, only a part of the environmental impact has been allocated to the production line. In this study the allocation is divided into allocation of co-products and allocation of waste.

- Co-product allocation: the main products in this LCA are the electrical motors, the co-products are the other products being manufactured and assembled on the same production line. In this study a physical allocation based on mass has been adopted.
- Allocation of waste treatment processes: Allocation of waste shall follow the polluter pays principle and its interpretation in EN 15804: processes of waste processing shall be assigned to the product system that generates the waste until the end-of-waste state is reached.

A cut-off rule of 1% has been applied. In other words, the included inventory data shall together give rise to at least 99% of the results of any of the environmental impact categories. Also, 99% of the mass of the product content and 99% of the energy use of the product life cycle has been accounted for.

LCA information

Functional unit, Use stage and System boundaries

Functional unit

In accordance with the PCR: UN CPC 46112 AND 46131, the functional unit in this study is to provide 1 MW of mechanical power during the reference service life of 25 years. The functional unit is the reference unit used to quantify the performance of the service delivered by a product to the user. The main purpose of the functional unit is to provide a reference to which inputs and outputs are related in the LCA.

This EPD shows the environmental impact based on 1 MW (the functional unit) which enables comparisons between products with different output. The environmental impact needs to be multiplied by the output of the motor to get the total impact the motor contributes with.

Use stage

The motor is assumed to be operating 6 500 hours/year on 100% load in accordance with the PCR. Maintenance of the motor is assumed to be the spare parts change every six to twelve years.

The considered efficiency for the use stage is 98.61%, based on the efficiency measured at 100% load, according to IEEE and NEMA MG1.

System boundaries

This is a “from cradle to grave” analysis and covers the life cycle of the motor under study. It includes one air-to –air cooling unit and excludes the motor control panel (MCP). The stages of the product life cycle that are considered according to the PCR are the following:

Upstream processes (from cradle-to-gate)

- The extraction of all raw material that is used in the different components, including epoxy paint and lubrication oil for the bearings.
- Impact of the different materials that are used in the components: steel, copper, aluminium, brass, cast iron, rubber, plastic, electrical material, wood, and polypropylene.
- Processes included for some of the materials, such as:
  - Cast iron removed by milling
  - Metal working for steel product manufacturing
  - Metal working for aluminium product manufacturing
  - Sheet rolling of electrical steel
  - Casting for brass
  - Enameling
- Processes for other materials are included in the generic data in SimaPro

Core processes (from gate-to-gate)

- Transportation of material and components from supplier to the production in Västerås
- Energy and resources used in the production
- Swedish renewable electricity 100% wind-powered
- The electricity includes all manufacturing, assembly, testing, painting, and packaging
- District heating from municipal waste
- Internal transport, diesel-based
- Water consumption
- The waste generation from the production including the transportation of it to the scrapyard

Downstream (from gate-to-grave)

- Transport of the motor from the production in Västerås to the end customer in Plaquemines, LA, USA.
- Installation:
  - No material or energy is assumed to be required during the installation
  - The disposal of the packaging that the motor arrived with
- Maintenance: change of spare parts every 6 to 12 years, yearly oil change, including transport to the customer and transport of the old materials to scrapyard
- The energy consumption of the motor over the reference service life
- Transport of the motor at end-of-life to scrapyard
- End-of-life scenario which is assumed to be 95% recycled and 5% landfill

Capital goods such as buildings, machinery, tools and infrastructure, as well as packaging for internal transport, which cannot be allocated directly to the production of the reference product is excluded from the system boundary.

LCA information

UPSTREAM

Raw materials production:
Metals, plastics, etc.

Transport

Processing of materials:
Production of intermediate components

Transport

CORE

Manufacturing and Assembly:
Welding, impregnation, machining etc.

Testing:
Electrical and mechanical verification test of motor

Painting and packaging:
Painting of complete machine and packaging before distribution to customer

Transport

DOWNSTREAM

Installation:
No material or energy was assumed to be used in this step, disposal of packaging included

Use of motor:
Use of product during Reference service life

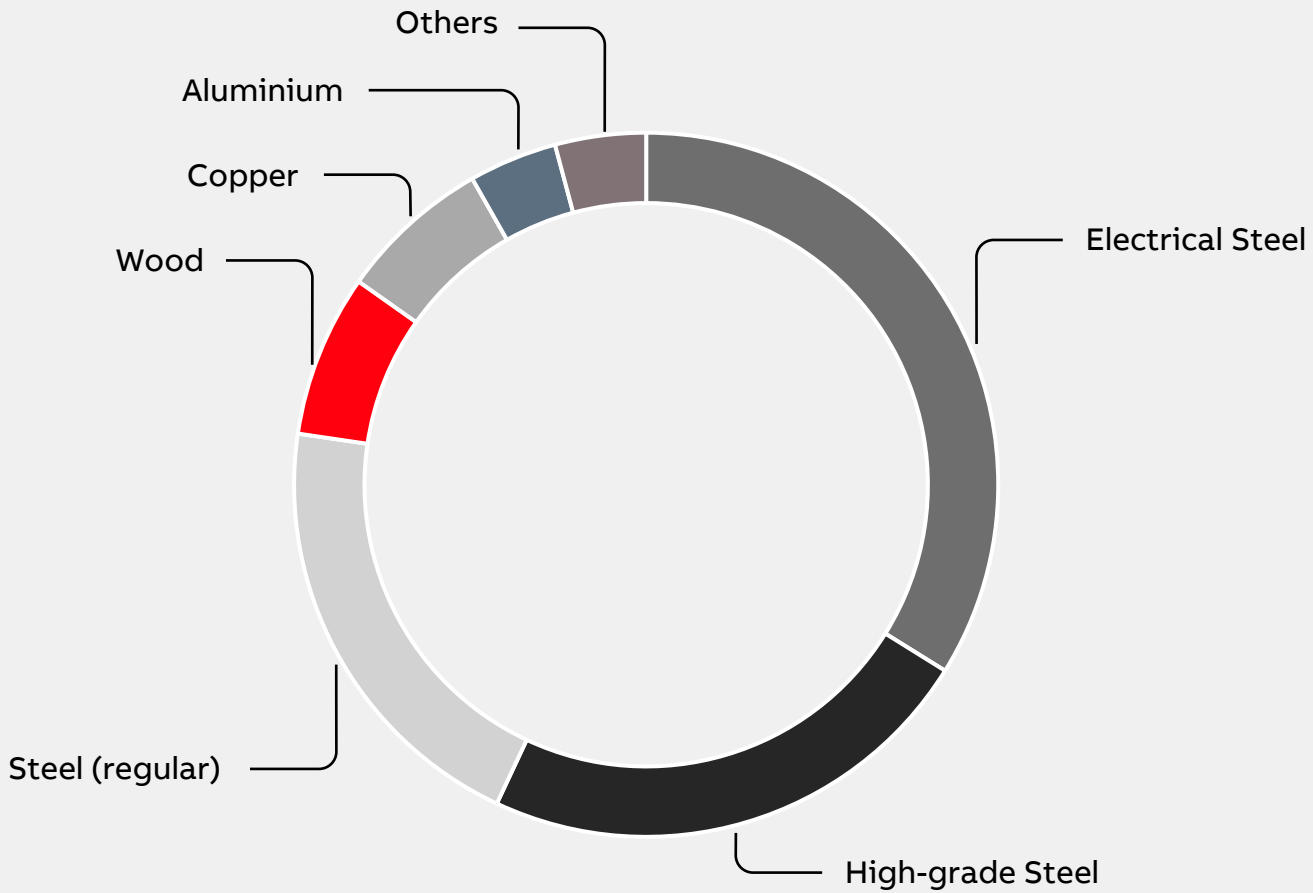
Transport

End-of-Life:
For example, recycling or incineration of materials

Content declaration
Product with packaging

Based on content of included products in this EPD

Materials	Percentage (%)
Electrical steel	34 %
High grade steel	23%
Steel (regular)	20%
Wood	7 %
Copper	7 %
Aluminum	4%
Others*	4%



*Other materials include insulation material, cast iron, epoxy, electrical material, stainless steel, lubricating oil, dessicant, brass, solvent, plastic, paint and rubber.

Environmental performance

Potential environmental impact

Parameter		Unit	Upstream (per MW)	Core (per MW)	Downstream distribution (per MW)	Downstream use (per MW)	Downstream end-of-life (per MW)	TOTAL[1] (per MW)
Global warming potential (GWP)	Fossil	kg CO2 eq	8,86E+03	7,74E+02	3,73E+02	7,79E+07	4,99E+01	7,78E+07
	Biogenic	kg CO2 eq	9,20E+01	2,82E-01	8,47E-02	6,33E+04	6,12E-02	6,34E+04
	Land use and land transformation	kg CO2 eq	1,15E+01	4,66E-01	2,53E-01	3,98E+04	3,20E-02	3,98E+04
	Total	kg CO2 eq	8,96E+03	7,75E+02	3,73E+02	7,79E+07	5,00E+01	7,79E+07
Acidification potential (AP)		kg mol H+ eq,	9,78E+01	3,79E+00	7,07E+00	2,19E+05	2,98E-01	2,19E+05
Eutrophication potential (EP)	Aquatic freshwater	kg P eq,	1,70E+01	1,98E-01	1,87E-02	4,81E+04	9,25E-03	4,81E+04
	Aquatic marine	kg N eq,	1,37E+01	6,23E-01	1,77E+00	4,48E+04	9,80E-02	4,48E+04
	Aquatic terrestrial	mol N eq,	1,65E+02	6,56E+00	1,95E+01	3,91E+05	1,05E+00	3.91E+05
Photochemical oxidant creation potential (POCP)		kg NMVOC eq.	5.00E+01	2.85E+00	5.55E+00	1.56E+05	3.40E-01	1.56E+05
Ozone layer depletion (ODP)		kg CFC 11 eq.	1.55E-04	1.38E-05	6.48E-06	3.01E-01	6.70E-07	3.01E-01
Abiotic depletion potential (ADP)	Metals and minerals	kg Sb eq.	9.43E-01	9.26E-03	6.87E-04	1.01E+02	1.75E-04	1.02E+02
	Fossil resources	MJ, net calorific value	1.41E+05	9.80E+03	4.90E+03	1.41E+09	7.03E+02	1.41E+09
Water deprivation potential (WDP)		m3 world eq.	1.55E+03	2.32E+02	1.58E+01	1.63E+07	7.27E+00	1,63E+07

1. Total per functional unit. To calculate the total impact for a specific motor: Nominal output power of motor x TOTAL (per MW), Example: 31 MW x 7.78E+07 kg of CO_2 per MW= 2.41E+09 kg of CO_2;

Environmental performance

Use of resources

Parameter		Unit	**Upstream** (per MW)	**Core** (per MW)	**Downstream distribution** (per MW)	**Downstream use** (per MW)	**Downstream end-of-life** (per MW)	**T O T A L** (per MW)
Primary Energy resources – Renewable	**Use as energy carrier**	MJ, net calorific value	2.32E+02	8.57E+03	2.43E+01	9.39E+07	4.38E+01	9.39E+07
	Used as raw materials	MJ, net calorific value	4.64E+02	1.11E+02	2.83E+01	5.32E+07	0.00E+00	5.32E+07
	Total	MJ, net calorific value	6.96E+02	8.68E+03	5.27E+01	1.47E+08	4.38E+01	1.47E+08
Primary energy resources – Non-renewable	**Use as energy carrier**	MJ, net calorific value	1.39E+03	1.04E+04	5.21E+03	1.50E+09	7.48E+02	1.50E+09
	Used as raw materials	MJ, net calorific value	2.78E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.78E+03
	Total	MJ, net calorific value	5.56E+03	1.04E+04	5.21E+03	1.50E+09	7.48E+02	1.50E+09

Environmental performance

Waste production and output flows

Waste production

Parameter	Unit	Upstream (per kW)	Core (per kW)	Downstream distribution (per kW)	Downstream use (per kW)	Downstream end-of-life (per kW)	T O T A L (per kW)
Hazardous waste disposed	kg	1.68E+01	0.00E+00	0.00E+00	0.00E+00	1.68E+01	1.68E+01
Non-hazardous waste disposed	kg	5.90E+02	1.75E+02	3.69E+01	0.00E+00	8.02E+02	5.90E+02
Radioactive waste disposed	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Output flows

Parameter	Unit	Upstream (per kW)	Core (per kW)	Downstream distribution (per kW)	Downstream use (per kW)	Downstream end-of-life (per kW)	T O T A L (per kW)
Components for reuse	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material for recycling	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, thermal	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Program information and references

The International EPD® System

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SE-100 31 Stockholm
Sweden

www.environdec.com
info@environdec.com

Accountabilities for PCR, LCA and independent, third-party verification

Product Category Rules (PCR)

- PCR: Electrical motors and generators and parts thereof (for industrial applications), 2022:06, version 1.0, UN CPC 46112 and 46131
- PCR review was conducted by: The technical committee of the International EPD® System. A full list of members available on www.environdec.com. The review panel may be contacted via info@environdec.com. Chair of the PCR review: Lars-Gunnar Lindfors

Life Cycle Assessment (LCA)

- LCA accountability: Nathalie Garavito, Andreas Holmqvist.

Third-party verification

- Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:

☑ EPD verification by individual verifier

- Third-party verifier: Pär Lindman, Miljögiraff
- Approved by: The International EPD® System

Procedure for follow-up of data during EPD validity involves third-party verifier:

☑ No

References

- General Programme Instructions of the International EPD® System. Version 4.0.
- PCR 2022:06. Version 1.0 - Electrical motors and generators and parts thereof (for industrial applications), UN CPC 46112 and 46131
- ISO 14040:2006 Environmental management – Life cycle assessment
  - Principles and Framework
- ISO 14044:2006 Environmental management – Life cycle assessment
  - Requirements and Guidelines
- NEMA G21 – Motors and Generators
- e. v. d. (2022), ecoinvent version 3.8, Centre for Life Cycle Inventories, 2022
- SimaPro, SimaPro desktop software, Available: https://support.simapro.com/
- Life Cycle Assessment report: Synchronous motor, AMS 1120 31 MW, with air-to-air cooling. ABB, 2024.

ABB Synchronous Motors

We empower people with technology to drive the transformation of industries needed to enable a low-carbon society and address the world’s energy challenges.

LINK TO OUR WEBSITE


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