Environmental Product Declaration (EPD)

W22 Cast Iron Electric Motor (37kW)







In accordance with ISO 14025:2006

Owner of EPD	WEG Equipamentos Elétricos S.A.
Programme	The International EPD System www.environdec.com
Programme operator	EPD International AB
EPD registration number	EPD-IES-0017771
Publication date	08/11/2024
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An EPD may be updated or depublished if conditions change. To find the latest version of the EPD and to confirm its validity, see <u>www.environdec.com</u>.

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General information

Programme Information:

EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden E-mail: support@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.

Life Cycle Assessment (LCA)

LCA accountability: Henrique Rogerio Antunes de Souza Junior, EnCiclo Soluções Sustentáveis.

Third-party verification

- Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:
 - EPD verification through a pre-verified and integrated EPD tool.
- Third-party verifier, accountable for the EPD verification: Diogo Aparecido Lopes Silva.
- Approved by: The International EPD System.
- Pre-verified and integrated EPD Tool: WEG EcoHub Version 1.0.
- Third-party verifier, accountable for the tool verification: Diogo Aparecido Lopes Silva.
- Approved by: The International EPD System.

The EPD owner has the sole ownership, liability, and responsibility for the EPD







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Company information

Description of the organisation:

Founded in 1961, WEG is a global electro-electronic equipment company, operating mainly in the capital goods sector with solutions in electrical machines, automation and paints, for various sectors, including infrastructure, steel, pulp and paper, oil and gas, mining, among many others.

WEG stands out in innovation by constantly developing solutions to meet the major trends in energy efficiency, renewable energy, and electric mobility. With industrial operations in 15 countries and a commercial presence in more than 135 countries, the company has more than 40,000 employees distributed around the world.

We are a global company that moves at the pace of the needs of society and the economy of our time. We contribute to a more efficient and sustainable world by investing in technologies for the energy transition and in smart solutions for industry, the countryside, cities and homes.

Contact	Quality System and Certifications Manager Vitor Marcon vitorm@weg.net
The production unit is certified according to the following management systems	ISO 9001, ISO 14001 and ISO 45001
Name and location of production site	WEG Equipamentos Elétricos S.A.





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Product information

Product description:

Electric motors play a crucial role in modern industry, being responsible for converting electrical energy into mechanical energy efficiently and reliably. WEG, one of the world's leading manufacturers of electric motors, stands out for offering products that meet the most diverse industrial needs, including:

- High efficiency
- Excellent cost-benefit ratio
- High productivity
- Reliability
- Energy savings
- Design for industrial application

Product identification	W22 200
Nominal output power	37 kW
Shaft height	200
Efficiency class	IE3
Efficiency ¹⁾	94.5%
UN CPC code	UN CPC 46112 and 46131
Geographical scope	Europe is being evaluated for the downstream phase

Note: 1) In line with IEC 60034-30-1:2014, for Direct-On-Line motors in the use phase the efficiency used is at 100% load





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Content declaration

Product:

Materials	Percentage (%)
Aluminium	1-5
Cast Iron	33-37
Copper	5-9
Electrical Steel	44-48
Other Steel	6-10
Plastics	1-3
Others	<1

Packaging:

Materials	Percentage (%)
Wood	100

Total weight:

Description	Weight (kg)
Gross weight	265





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LCA information

In this Life Cycle Assessment (LCA), primary and secondary data are used. Preference was given to the use of primary data that were obtained from the WEG motors headquarters factory located in Jaragua do Sul in the year 2023. For all processes for which primary data are not available, secondary data were used. For secondary data, preference was given to relevant and reliable data sources available in the SimaPro-[®] (9.6.0.1) and ecoinvent[®] (3.10). The environmental indicators and characterization models described in EN 15804+A2 (as specified by PCR 2022:06) were used, and they have been compiled into a method known as EN 15804+A2 Method V1.00 in the SimaPro[®] software. The characterization factors applied are associated with the EF 3.1 method. Enviromental impacts related to overhead operations during processing such as: machines, infrastructure, raw materials used in the process (e.g. as glues, adhesives, etc.) packaging for internal transport and tools are excluded from the system boundary. For the inbound logistics, a mass-based cut-off criterion was applied to smaller components (e.g. screws, washers, rivets, etc.). The coverage of the inbound logistics represented 99.9% of the mass composition of the electric motor.

Functional unit:

This EPD shows the environmental impact based on the provision of 1 kW of mechanical power over the motor's 25-year lifespan.

Reference service life:

The general lifespan of the motors can vary between 5 to 50 years or more, with the right maintenance and operation. For this EPD, in accordance with the recommendation of PCR 2022:06, the reference service life was established at 25 years.



System boundaries

This is a "cradle to grave" analysis that covers the life cycle of the motor under study. This assessment does not include other components in a motor system. According to the PCR 2022:06, the following stages of the product life cycle were determined:

Upstream processes (from cradle-to-gate):

- All extraction of raw materials and componentes acquired by WEG used in the products and packagings has been considered, such as: aluminum, cast iron, steel, wood, bearing, copper, polymers, cardboard and others.
- Transportation of the material and components from supplier to WEG in Jaragua do Sul.

Core processes (from gate-to-gate):

- All relevant production processes conducted for motor manufacturing: stamping, wire drawing, casting, castings machining, shaft machining, assembly, painting, testing and packaging.
- Water and energy consumption, 19% wind energy and 81% Brazilian national electricity grid.
- Internal transport and generation of production waste.

Downstream (from gate-to-grave):

- Transportation of the WEG motor in Jaraguá do Sul to the customer located within the geographic scope of this EPD.
- Installation: A transportation distance of 100 km was considered, representing the distance from the customer's storage unit to the site of operations. Assuming that no energy or material sources are used during installation. In addition, during installation, the packaging is discarded for final treatment in a landfill.
- Use Stage: The usage profile was determined based on the motor's energy consumption throughout its life cycle. It is assumed that the motor operates for 6,500 hours per year over a lifespan of 25 years. Additionally, it is assumed that the motor will operate exclusively using electricity sourced from the grid of the market in which it will be deployed, in this case, the European grid mix.
- Maintenance: For maintenance, it is considered the change of bearings once every 25 years of operation.
- Uninstallation: Assumed that no energy source or material is used during installation.
- Disposal: The end-of-life scenario which is assumed to be 95% recycled and 5% landfill. Transport for final disposal was considered the following distances: 100 km from the customer's storage to the technical assistance, 200 km from the technical assistance to the recycling facility, and 50 km from the to technical assistance the landfill.

The apportionment processes follow the polluter pays principle, as in PCR, the cut allocation approach was applied to deal with waste leaving the factory as well as metals recovered at the end of product life, which are recycled externally by other companies.



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LCA boundary







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Environmental indicators

Mandatory impact

Parameter			Upstream module	Core module		Downstrea	am module		
		Unit	Manufa	Manufacturing		Installation	Use & Maintenance	Deinstallation & End-of-life	Total
Global warming potential (GWP)	Fossil	kg CO2 eq	1.60E1	9.44E-1	8.63E-1	1.63E-1	5.19E4	2.87E-1	5.19E4
	Biogenic	kg CO2 eq	8.09E-2	3.03E-2	3.23E-5	3.25E-1	1.17E2	2.50E-1	1.18E2
	Land use and land transformation	kg CO2 eq	9.69E-2	3.42E-2	6.38E-4	3.78E-4	1.65E2	9.16E-4	1.65E2
	TOTAL	kg CO2 eq	1.62E1	1.01E0	8.64E-1	4.89E-1	5.22E4	5.38E-1	5.22E4
Eutrophication potential (EP)	Aquatic freshwater	kg P eq	1.45E-3	6.17E-6	9.97E-7	7.61E-6	5.06E0	6.29E-6	5.06E0
	Aquatic marine	kg N eq	2.26E-2	3.75E-3	5.75E-3	4.57E-4	3.36E1	6.44E-4	3.36E1
	Aquatic terrestrial	mol N eq	2.94E-1	4.03E-2	6.38E-2	3.25E-3	3.78E2	5.65E-3	3.79E2
Abjetic depletion petential (ADP)*	Metals and minerals	kg Sb eq	4.99E-3	8.14E-8	1.84E-8	6.93E-9	3.25E-3	1.61E-8	8.24E-3
Abiolic depiction potential (ADF)	Fossil resources	MJ	1.13E2	1.06E0	1.45E-1	3.60E-2	9.14E5	8.51E-2	9.14E5
Water deprivation potential (WDP)*		m3 depriv.	7.86E0	7.18E-2	5.44E-3	2.28E-3	1.37E4	3.91E-3	1.37E4
Ozone layer depletion (ODP)		kg CFC11 eq	1.44E-7	4.06E-8	1.31E-8	1.64E-9	8.19E-4	3.95E-9	8.19E-4
Acidification potential (AP)		mol H+ eq	4.00E-1	1.46E-2	2.26E-2	6.89E-4	2.60E2	1.21E-3	2.60E2
Photochemical oxidant creat	tion potential (POCP)	kg NMVOC eq	9.67E-2	1.17E-2	1.72E-2	1.22E-3	1.26E2	1.94E-3	1.26E2

Note: * The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator. ¹ Category indicators according to EN 15804

Use of resources

Parameter			Upstream module	Core module		Downstream module				
		Unit	Manufa	Manufacturing		Installation	Use & Maintenance	Deinstallation & End-of-life	Total	
Use as energy carrier		MJ	3.65E1	6.41E0	2.21E-2	3.34E-3	3.50E5	7.84E-3	3.50E5	
Primary energy resources - Renewable	Used as raw materials	MJ	7.17E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	7.17E0	
	TOTAL	MJ	4.37E1	6.41E0	2.21E-2	3.34E-3	3.50E5	7.84E-3	3.50E5	
Primary energy resources - Non-Renewable TOTAL	Use as energy carrier	MJ	1.12E2	1.16E0	1.50E-1	3.87E-2	9.14E5	9.17E-2	9.14E5	
	Used as raw materials	MJ	1.10E0	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	1.10E0	
	TOTAL	MJ	1.13E2	1.16E0	1.50E-1	3.87E-2	9.14E5	9.17E-2	9.14E5	
Net fresh water	(LCI-level)	m3	2.50E-1	1.87E-2	2.67E-4	8.76E-5	1.05E3	1.67E-4	1.05E3	



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Additional mandatory and voluntary impact category indicators

Parameter	Unit	Upstream module	Core module					
		Manufacturing		Distribution	Installation	Use & Maintenance	Deinstallation & End-of-life	lotal
Particulate matter	disease inc.	2.40E-6	6.18E-8	3.03E-8	6.42E-8	5.96E-4	6.32E-8	5.99E-4
Ionising radiation*	kBq U-235 eq	2.37E-1	7.61E-3	8.62E-4	1.00E-4	1.14E4	2.38E-4	1.14E4
Human toxicity, cancer**	CTUh	1.23E-6	7.06E-10	1.38E-10	1.26E-9	1.73E-5	9.96E-10	1.85E-5
Human toxicity, non-cancer**	CTUh	5.20E-6	5.60E-9	2.80E-9	8.54E-9	3.08E-4	7.94E-9	3.13E-4
Land use**	Pt	2.24E2	1.94E0	3.51E-2	2.55E-1	1.79E5	2.17E-1	1.80E5
IPCC 2013 GWP 100a (GHG-GWP)	kg CO2 eq	1.62E1	1.01E0	8.65E-1	4.99E-1	5.22E4	5.45E-1	5.22E4
Ecotoxicity, freshwater**	CTUe	6.88E2	1.34E1	1.07E0	6.70E0	9.95E4	5.91E0	1.00E5

Note: * 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. ** The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator

Waste indicators

		Upstream module	Core module						
Parameter Unit		Manufacturing		Distribution	Installation	Use & Maintenance	Deinstallation & End-of-life	Total	
Hazardous waste disposed (HWD)	kg	0.00	0.14	0.00	0.00	0.00	0.00	0.14	
Non-hazardous waste disposed (NHWD)	kg	0.00	0.00	0.00	0.44	0.00	0.34	0.77	
Radioactive waste disposed (RWD)	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Output Flow Indicators

Parameter	Unit	Upstream module	Core module					
		Manufacturing		Distribution	Installation	Use & Maintenance	Deinstallation & End-of-life	Total
Materials for energy recovery (MER)	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Material for recycling (MFR)*	kg	0.00	0.18	0.00	0.00	0.07	6.39	6.64
Components for reuse (CRU)	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exported electricity energy (EEE)	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exported thermal energy (ETE)	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00



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- EPD International (2021) General Programme Instructions for the International EPD[®] System. Version 40
- International EPD System (2023) General Programme Instructions for the International EPD[®] System. Version 5.0.
- IEC 60034-30-1:2014 Rotating electrical machines Efficiency classes of line operated AC motors.
- BSI (2019) EN 15804+A2:2019 Sustainability of construction works Environmental product declarations - Core rules for the product category of construction products. British Standard.
- IPCC (2013). Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.- K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp.
- ISO (2006a) 14025: Environmental labels and declarations Type III environmental declarations -Principles and procedures.
- ISO (2006b) 14040: Environmental Management Life Cycle Assessment Principles and Framework.
- ISO (2006c) 14044: Environmental Management Life Cycle Assessment Requirements and guidelines.





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