Environmental Product Declaration

AC machine type AMB

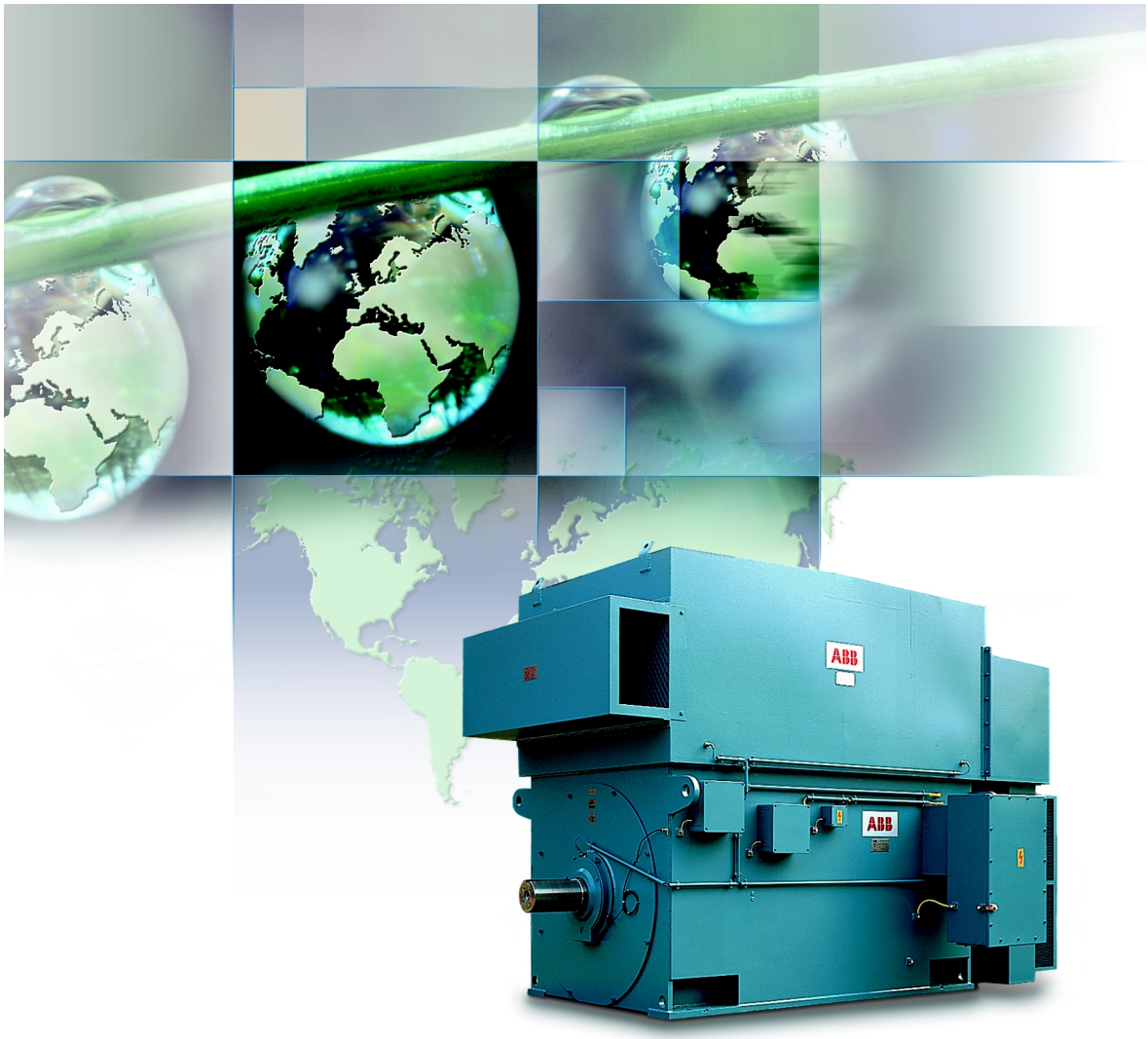


ABB Automation

Organizational framework

Manufacturer

ABB Industrie AG
P.O. Box
CH-5442 Birr
Switzerland

ABB Industry AG/Electrical Machines, Birr is part of the Motors & Machines ***Business Unit***, comprising 10 manufacturing locations around the world. The business unit belongs to the Automation Power Products ***Business Area***, part of ABB's Automation segment.

Environmental management

The ISO 14001 international environmental management standard has been implemented and the Birr factory has been certified since 1999. Lifecycle assessment is applied continuously to all product development.

The Birr factory was awarded the ISO 9001 quality certificate in 1993 in recognition of its commitment to maintaining the high quality of its AC Machines.

Product description

AMB and AMC machines have shaft heights ranging from 560 mm to 1120 mm. The range of rated output is 1000–20 000 kW, and voltage ranges from 3300 V to 15 000 V. Typical applications of the AMB and AMC machines include pumps, fans, blowers, compressors, conveyors, grinders, ship thrusters and AC generators. This document applies to the AMB 560 model, a 3600 kW, 3300 V product.

Material for the product is used according to the following table:

Type of material	kg/product	kg/kW
Electrical steel	3962	1.10
Other steel	3864	1.07
Cast iron	173	0.05
Brass	65	0.02
Copper	1778	0.49
Insulation material	58	0.02
Wooden packing material	1036	0.30
Impregnation resin	77	0.02
Paint	29	0.01
Other chemicals	37	0.01

Environmental performance

The data and calculations are in accordance with the Product-Specific Requirements (PSR) for Rotating Electrical Machines dated April 2000, which specify the following baselines for the LCA calculation.

Functional unit

The functional unit for the LCA is 1 kW of rated output power.

System boundaries

The lifecycle assessment covers all environmental aspects for extraction and production of raw materials, manufacturing of main parts, assembly of the machine, transportation and use of the product, dismantling, fragmentation, disposal and recycling of scrap at the end of the product's life. It includes consumption of material and energy resources as well as emissions and waste generation.

Calculations are based upon an estimated lifetime of 25 years when operating 6500 hours per year. A European mix of energy has been used to calculate energy consumption during manufacturing and a European mix of energy to calculate energy consumption during, use and disposal.

The operational point chosen for the usage phase is 3600 kW, 1500 rpm and efficiency 97.8 %. The operational point in reality will vary considerably depending on the specific application.

Allocation unit

The factor for allocation of common environmental aspects during manufacturing (such as manufacturing waste) is calculated as the rated output power of the product in relation to the total annual production volume of the factory.

Resource utilisation	Manufacturing phase unit/kW	Usage phase unit/kW	Disposal phase unit/kW
Use of non-renewable resources			
Coal kg	11.34	635.27	-0.03
Copper (Cu) kg	0.24	0.00	-0.00
Iron (Fe) kg	2.58	0.00	-0.04
Manganese (Mn) kg	0.00	0.00	-0.00
Natural Gas kg	0.82	43.92	-0.00
Uranium (U) kg	0.00	0.02	-0.00
Oil kg	0.70	66.58	-0.00
Use of renewable resources			
Hydro Power MJ	0.02	0.00	0.00

Energy losses

	kWh/product			kWh/kW		
Energy form	**Manufacturing phase**	**Usage phase**	**Disposal phase**	**Manufacturing phase**	**Usage phase**	**Disposal phase**
Electrical energy	24 000	8 350 520	–	6.67	2319	_
Heat energy	17 660	–	–	4.91	–	–

Average European electrical energy is defined as being 10 % gas, 15 % hydro, 36 % nuclear, 10 % oil, 19 % stone coal and 10 % lignite coal. The resultant resource utilisation is shown in the table above.

Waste	**kg/kW**
Hazardous waste after usage phase	
Various	0.03
Regular waste (to landfill)	
During manufacturing phase	0.065
At disposal phase	0.337

The classification data for emissions are as below:

Environmental effect	Equivalent unit	Manufacturing phase	Usage phase	Disposal phase
Global warming potential GWP	kg CO_2/kW	45.27	1175.81	-0.24
Acidification potential AP	kg SO_2/kW	0.03	7.36	0.00
Eutrophication	kg O_2/kW	0.03	0.32	0.00
Ozone depletion potential ODP	kg CFC-11/kW	0.00	0.00	0.00
Photochemical oxidants POCP	kg ethylene/kW	0.00	0.26	0.00

Additional qualifying factors

Recycling and disposal

The main parts of the product can be recycled. Some parts need to be fragmented to separate different types of material. A list of parts and components that can be fragmented and recycled can be obtained from the manufacturer. See references.

Usage phase in relation to the total

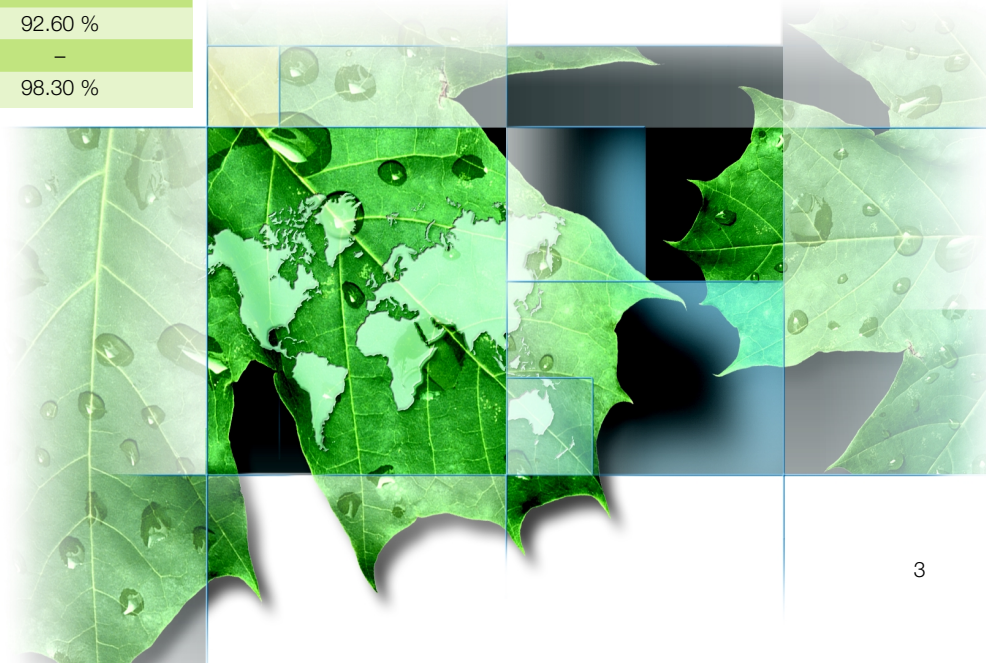
It must be noted that the environmental impact during the usage phase is the most important. As an example, the GWP of the usage phase is approximately 26 times greater than the GWP of the manufacturing phase.

Category of impact	Usage in % of total
Global warming GWP	96.30 %
Acidification AP	96.00 %
Eutrophication	92.60 %
Ozone depletion ODP	–
Photochemical oxidants POCP	98.30 %

References

- PSR 2000:2 for Rotating Electrical Machines
- 3BHS 119907 ZAB D01, Installation and Maintenance Manual
- 3BHS 119598 ZAB D21, Recycling and Disposal
- MSR 1999:1 Requirements for Environmental Product Declarations, EPD from the Swedish Environmental Management Council

The above-mentioned documents are available upon request.



GLOSSARY

Acidification, AP: Chemical alternation of the environment, resulting in hydrogen ions being produced more rapidly than they are dispersed or neutralised. Occurs mainly through fallout of sulphur and nitrogen compounds from combustion processes. Acidification can be harmful to terrestrial and aquatic life.

Eutrophication: Enrichment of bodies of water by nitrates and phosphates from organic material or surface runoff. This increases the growth of aquatic plants and can produce algal blooms that deoxygenate water and smother other aquatic life.

Global warming potential, GWP: The index used to translate the level of emissions of various gases into a common measure to compare their contributions to the absorption by the atmosphere of infrared radiation. GWPs are calculated as the absorption that would result from the emission of 1 kg of a gas to that of the emission of 1 kg of carbon dioxide over 100 years.

Lifecycle assessment, LCA: A management tool for appraising and quantifying the total environment impact of products or activities over their entire lifecycle of particular materials, processes, products, technologies, services or activities. Lifecycle assessment comprises three complementary components: inventory analysis, impact analysis and improvement analysis.

Ozone depletion potential, ODP: The index used to translate the level of emissions of various substances into a common measure to compare their contributions to the breakdown of the ozone layer. ODPs are calculated as the change that would result from the emission of 1 kg of a substance to that of the emission of 1 kg of CFC-11 (a freon).

Photochemical ozone creation, POCP: The index to translate the level of emissions of various gases into a common measure to compare their contributions to the change of ground-level ozone concentration. POCPs are calculated as the change that would result from the emission of 1 kg of a gas to that of the emission of 1 kg of ethylene.

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