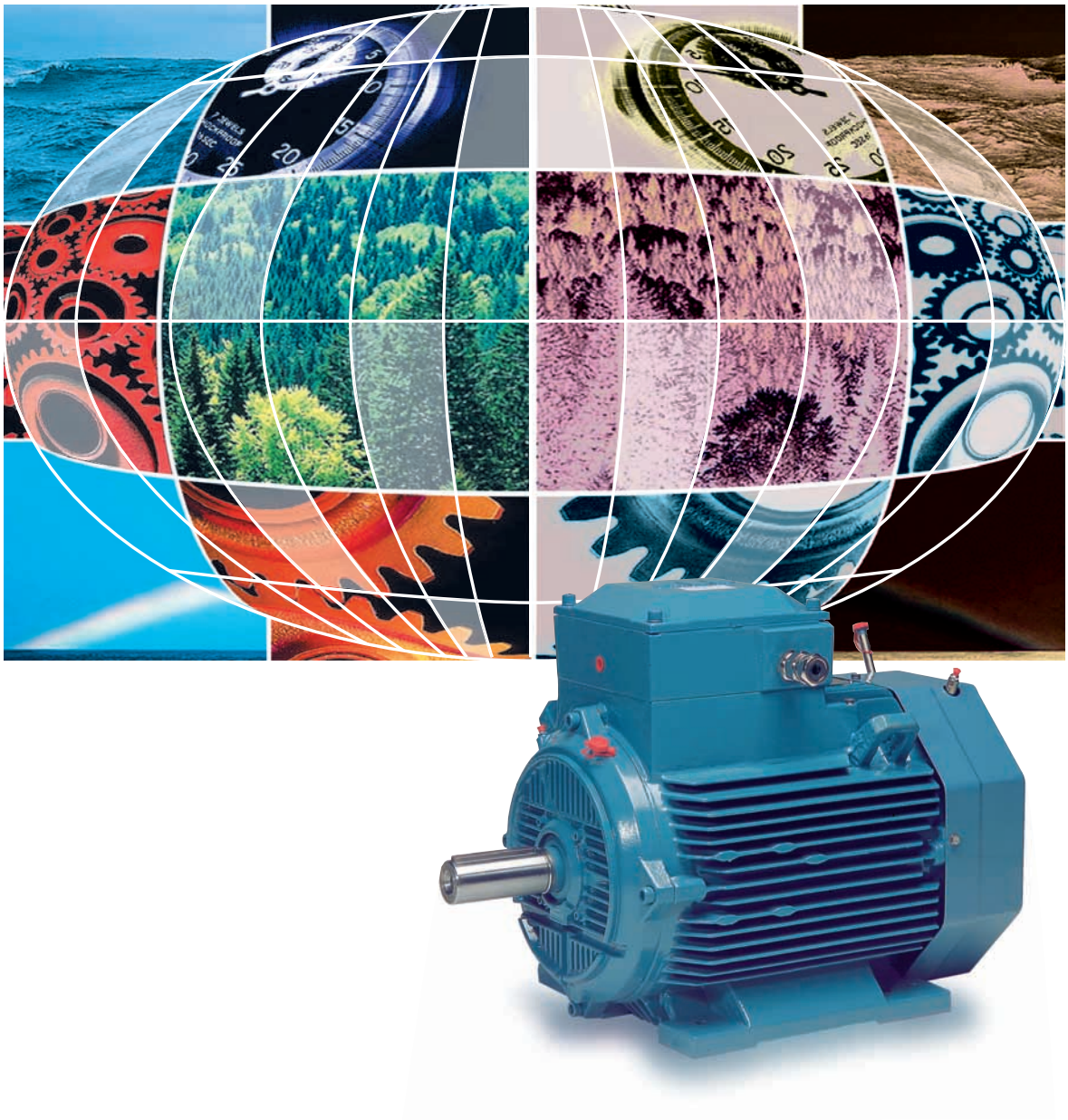
Environmental Product Declaration

AC Low voltage flameproof motor, type M3JP 180



Organizational framework

Manufacturer:

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ABB is a global leader in power and automation technologies that enable utility and industry customers to improve performance while lowering environmental impact. ABB has 152,000 employees in more than 100 countries. As a key element of its business strategy, ABB has committed to a broad program of product development and positioning under the Industrial IT umbrella. This initiative is geared towards increasing integration of ABB products as the 'building blocks' of larger solutions, while incorporating functionality that will allow multiple products to interact seamlessly as components of real-time automation and information systems. Motors and generators represent one of the fundamental building blocks in the Industrial IT architecture.

ABB Oy, LV Motors forms a part of ABB's Automation Technology Products segment. LV Motors is designing, manufacturing and marketing low voltage induction motors and generators for the industry and power production.

Environmental management

The ISO 14001 international environmental management standard has been implemented and the Vaasa factory has been certified since 1996. Life cycle assessment (LCA) is applied continually to all product development.

Product description

ABB Oy, LV Motors manufacturers motors for hazardous areas in shaft heights from 80 to 400. Typical applications include pumps, fans, blowers, compressors, conveyors.

This document applies to the M3JP 180MLB 4 B3 4 B3 model which is a 22 kW, 400 V product.

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

Type of material	kg / product	kg / kW
Electrical steel	117	5.35
Other steel	17	0.79
Cast iron	116	5.28
Aluminium	4.1	0.19
Copper	12	0.54
Insulation material	0.3	0.01
Wooden packing material	10	0.45
Impregnation resin	1.2	0.06
Paint	1.6	0.07

Environmental performance

The data and calculations are in accordance with Product Specific Requirements (PSR) for Rotating Electrical Machines, which specifies 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 life cycle assessment covers all environmental aspects for extraction and production of raw materials, manufacturing of main parts, assembly, transportation and use of the product, dismantling, fragmentation and disposal and recycling of scrap after end of life. It includes consumption of material and energy resources as well as emissions and waste generation.

Calculations are based on an estimated lifetime of 15 years when operating 5,000 hours per year. A Finnish mix of energy has been used for calculating energy consumption during manufacturing and an European mix of energy for calculating energy consumption during use and disposal.

The operational point chosen for the usage phase 22 kW, 1500 rpm and efficiency 93.1%. 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 in factory.

Resource utilisation	Manufacturing phase unit / kW	Usage phase unit / kW	Disposal phase unit / kW
Use of non-renewable resources			
Coal kg	7.37	765.89	-6.35
Aluminium (Al) kg	0.19	0.00	-0.18
Copper (Cu) kg	0.42	0.00	-0.38
Iron (Fe) kg	7.94	0.00	-7.90
Manganese (Mn) kg	0.02	0.01	-0.03
Natural Gas kg	0.88	134.88	-0.35
Uranium (U) kg	0.00	0.05	0.00
Oil kg	1.42	118.19	0.38
Use of renewable resources			
Wood kg	1.53	57.97	0.00
Hydro Power MJ	1.46	5,244.18	0.00

Energy consumption and losses	kWh / product			kWh / kW		
Energy form	Manufacturing phase	Usage phase	Disposal phase	Manufacturing phase	Usage phase	Disposal phase
Electrical energy	83.2	122,287.9	9.1	3.78	5,558.54	0.41
Heat energy	70.1	-	-	3.19	-	-

The Finnish electricity mix is defined as being 13 percent gas, 21 percent hydro, 31 percent nuclear, 2 percent oil, 12 percent stone coal, 7 percent lignite coal and 14 percent biomass & waste.The average European electrical energy mix is defined as being 13 percent gas, 17 percent hydro, 30 percent nuclear, 7 percent oil, 20 percent stone coal, 11 percent lignite coal, 1.5 percent biomass & waste and 0.5 percent wind.The resultant resource utilisation is shown in the table above.

Waste	kg / kW
Hazardous waste	
During manufacturing	0.02
At disposal phase	0.15
Regular waste (to landfill)	
During manufacturing phase	0.05
At disposal phase	0.01

The classification data for emissions are as follows:

Environmental effect	Equivalent unit	Manufacturing phase	Usage phase
Global warming potential GWP	kg CO2 / kW	26.748	3,031.608
Acidification potential AP	kmol H+ / kW	0.005	0.617
Eutrophication	kg O2 / kW	0.369	33.882
Ozone depletion potential ODP	kg CFC-11 / kW	0.000	0.001
Photochemical oxidants POCP	kg ethylene / kW	0.004	0.524

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 should be observed that the environmental impact during the usage phase is the most important.As an example, GWP for the usage phase is approximately 113 times larger than GWP for the manufacturing phase.

Category of impact	Usage in % of total
Global warming GWP	99.6 %
Acidification AP	99.4 %
Eutrophication	99.1 %
Ozone depletion ODP	100 %
Photochemical oxidants POCP	99.6 %

References

- LCA report, 3GZF500930-7
- PSR 2000:2 for Rotating Electrical Machines, The Swedish Environmental Management Council
- Machine instructions for Induction Motors for hazardous atmospheres, LV Motors/Ex-motor Instructions 00-10
- Recycling instructions, cast iron, steel motors 280-400, Ex-motors 80-400, 3GZF 500930-5.
- MSR 1999:2 Requirements for Environmental Product Declarations, EPD,The Swedish Environmental Management Council

The above mentioned documents are available upon request.





GLOSSARY

Acidification, AP
Acidification originates from the emissions of sulphur dioxide and oxides of nitrogen. In the atmosphere, these oxides react with water vapour and form acids which subsequently fall down to the earth in the form of rain or snow, or as dry depositions. Acidification potential translates the quantity of emission of substances into a common measure to compare their contributions to the capacity to release hydrogen ions.

Eutrophication
Nutrients (mainly nitrogen and phosphorus) from sewage outfalls and fertilised farmland accelerate the growth of algae and other vegetation in water. The degradation of organic material consumes oxygen resulting in oxygen deficiency and fish kill. Eutrophication translates the quantity of emission of substances into a common measure expressed as the oxygen required for the degradation of dead biomass.

Global warming potential, GWP
Some of the gases in the earth's atmosphere (in particular water vapour and carbon dioxide) have an ability to absorb infrared radiation. They do not prevent sunlight reaching the earth's surface, but they do trap some of the infrared radiation emitted back into space causing an increase in the surface temperature. Global Warming Potential, GWP100, translates the quantity of emission of gases into a common measure to compare their contributions - relative to carbon dioxide - to the absorption of infrared radiation in 100 years perspective.

Life cycle assessment, LCA
A management tool for appraising and quantifying the total environmental impact of products or activities over their entire life cycle of particular materials, processes, products, technologies, services or activities. Life cycle assessment comprises three complementary components-inventory analysis, impact analysis and improvement analysis.

Ozone depletion potential, ODP
Ozone forms a layer in the stratosphere protecting plants and animals from much of the sun's harmful UV-radiation. The ozone levels have declined as a consequence of CFCs and halons released into the atmosphere. A depletion of the ozone layer will increase the UV-radiation at ground level. Ozone depletion potential translates the quantity of emission of gases into a common measure to compare their contributions - relative to CFC-11 (a freon) - to the breakdown of the ozone layer.

Photochemical ozone creation, POCP
Photochemical ozone or ground level ozone is formed by the reaction of volatile organic compounds and nitrogen oxides in the presence of heat and sunlight. Ground-level ozone forms readily in the atmosphere, usually during hot summer weather. Photochemical ozone creation potential translates the quantity of emission of gases into a common measure to compare their contributions - relative to ethylene - to the formation of photochemical oxidants.

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