Environmental Product Declaration

DMI type DC machine—180–471 kW power range

CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION
S-P 00009
http://www.environdec.com

ABB Automation

Organizational framework

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ABB Motors AB belongs to the Business Unit, Motors & Machines, with 19 sites. The sub-unit Machines has seven sites: in Brazil, Finland, France, Italy, South Africa, Sweden and Switzerland. The business unit belongs to the Business Area Automation Power Products, part of ABB's Automation segment.

Environmental management: The ISO 14001 international environmental management standard has been implemented at six of the seven sites of sub-unit Machines. DMI type DC machines are manufactured at the Swedish site, which has been certified to ISO 14001 since 1997. Life cycle assessment is applied continuously to all product development.

Product description: DMI type DC machines are used for variable-speed and variable-load applications, such as cranes and lifts and in the process industry for paper machines, winders, dryers, extruders and mixers for any application where high efficiency is required over a speed range exceeding 2:1.

The DMI type machine can be supplied for five main axle heights: 180, 200, 225, 250 and 280 mm.

The table below lists the materials used and their quantities:

The plant that manufactures these motors has been certified to the ISO 9001 quality management standard since 1993.

Environmental performance

The data and calculations are in accordance with Product Specific Requirements (PSR) for Rotating Electrical Machines dated April 2000 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 of the machine, 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 upon an estimated lifetime of 25 years when operating 6,500 hours per year. A Swedish mix of energy has been used for calculating energy consumption during manufacturing and a European mix of energy for calculating energy consumption during use and disposal.

The 180 kW DMI 180 and the 471 kW DMI 280, have been chosen as they represent the extremes of the range when calculating the Life Cycle Assessment. For machines in-between these limits the environmental impact may be interpolated.

Summary of materials

	kg/product		kg/kW	
Type of material	**DMI 180**	**DMI 280**	**DMI 180**	**DMI 280**
Electro steel	581	1812	3.230	3.850
Normal rolled steel	61	193	0.340	0.410
Steel tubes and special steel	64	97	0.360	0.210
Cast iron	104	311	0.580	0.660
Aluminium	2	9	0.010	0.020
Copper	121	318	0.670	0.670
Insulation material	8	16	0.040	0.034
Wooden boxes and planks	35	78	0.190	0.170
Impregnation resin	3.9	11	0.020	0.020
Paint	0.7	1.9	0.001	0.004

The operational point chosen for the usage phase is 180 kW, 1600 rpm and 89.9 % efficiency for the DMI 180 and 471 kW, 780 rpm and 91,26 % efficiency for the DMI 280. The operational point in reality will vary considerablely depending on the application.

Allocation unit

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

Resource utilization

Inventory	Manufacturing phase		Usage phase		Disposal phase	
	DMI 180	DMI 280	DMI 180	DMI 280	DMI 180	DMI 280
Use of non-renewable resources						
Iron (Fe) kg/kW	3.90	4.44	0.01	0.01	-2.27	-2.62
Aluminium (Al) kg/kW	0.01	0.02	0.00	0.00	-0.01	0.00
Manganese (Mn) kg/kW	0.02	0.03	0.01	0.01	0.00	0.00
Copper (Cu) kg/kW	0.61	0.62	0.34	0.34	-0.53	-0.58
Uranium (U) kg/kW	0.0002	0.0002	0.19	0.16		
Coal kg/kW	4.79	5.37	5000.00	4263.36	-2.47	-2.80
Oil kg/kW	0.32	0.32	524.64	447.57	-0.07	-0.05
Gas kg/kW	0.31	0.33	345.79	294.87	-0.10	-0.11
Use of renewable resources						
Wood kg/kW	0.19	0.16				
Hydropower MJ/kW	0.09	0.09	0.05	0.25		

Energy consumption and losses

	Absolute requirements kWh/product				Requirement per unit of output power kWh/kW			
Energy form	Manufacturing phase		Usage phase		Manufacturing phase		Usage phase	
	DMI 180	DMI 280	DMI 180	DMI 280	DMI 180	DMI 280	DMI 180	DMI 280
Electrical energy	572	1,465	3,286,000	7,330,000	3	3	18,300	15,563
Heat energy	390	1,021			2	2		

The average Swedish electricity mix is defined as 0.5% gas, 52% hydro, 44% nuclear, 1.7% oil and 1.8% coal. The average European electrical energy mix is defined as 10% gas, 15% hydro, 36% nuclear, 10% oil, 19% coal and 10% lignite. The resultant resource utilization is shown in the table above.

Waste

Weight per unit of rated output power	kg/kW DMI 180	DMI 280
Hazardous waste after manufacturing		
Barrier water	0.008	0.008
Water from oil separator	0.008	0.008
Oil emulsions	0.029	0.029
Hazardous waste after end of life		
Various	0.032	0.037
Regular waste (to landfill)		
During manufacturing	0.053	0.053
At final disposal	0.328	0.270

Recycling is stated as net result after disposal.

The classification data for emissions are as below:

Category of impact	Equivalent unit per kW	Manufacturing DMI 180	Usage phase DMI 180	Total life cycle DMI 180
Global warming GWP	kg CO_2/kW	8.73	9,430	9,448
Acidification	kmol H+/kW	0.00	1.81	1.81
Ozone depletion ODP	kg CFC–11/kW	0.0000	0.0006	0.0006
Photochemical oxidants POCP	kg ethylene/kW	0.01	2.10	2.11
Eutrophication	kg O_2/kW	0.16	114.70	114.86

Category of impact	Equivalent unit per kW	Manufacturing DMI 280	Usage phase DMI 280	Total life cycle DMI 280
Global warming GWP	kg CO_2/kW	9.52	8,050	8,060
Acidification	kmol H+/kW	0.00	1.54	1.54
Ozone depletion ODP	kg CFC-11/kW	0.0000	0.0005	0.0005
Photochemical oxidants POCP	kg ethylene/kW	0.01	1.79	1.80
Eutrophication	kg O_2/kW	0.16	97.85	98.01

The values are based on the indexes specified in the document from The Swedish Environmental Management Council (AB Svenska Miljöstyrningsrådet) entitled MSR 1999:1.

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 is to be observed that the environmental impact during the usage phase is the most important. As an example, GWP for the usage phase is approximately 1000 times larger than GWP for the manufacturing phase.

Category of impact	Usage in % of total	
	DMI 180	DMI 280
Global warming GWP	99.92	99.92
Acidification	99.96	99.95
Ozone depletion ODP	99.90	99.87
Photochemical oxidants POCP	99.70	99.66
Eutrophication	99.93	99.92

Third party certification

This EPD has been reviewed and found to comply with the Product Specific Requirements for rotating electrical machines, dated April 2000, and with the Swedish Environmental Council's (Miljöstyrnings-rådet) requirements for environmental product declarations dated 25 November 1999.

References

- LCA report (LCA) m000124, revision G.
- PSR 2000:2 for Rotating Electrical Machines
- Periodical maintenance 3 BSM 003045-1
- Recycling and disposal 3BSE 021 224
- LCA instruction 3BSG000021
- MSR 1999:1 Bestämmelser Certifierade Miljövarudeklarationer, EPD from the Swedish Environmental Management Council

The above mentioned documents are available upon request.

Time of Validity

This Environmental Product Declaration which has been reviewed and approved by BVQI according to MSR 1999:1 and PSR 2000:2 is valid up to and including 10 May, 2003.

Ackredited certification body

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