Environmental Product Declaration

Center Breaker Disconnector type SGF range 123 - 245 kV.

CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION
S-P 00018
http://www.environdec.com

ABB Zwar S.A.

Organizational framework

Manufacturer:
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ABB Zwar S.A. belongs to Business HV Disconnectors as a part of the Business Area, BA High Voltage Technology "PTHV", and consists of five main manufacturing sites:

PLZWA - Poland Łódź Lead Centre
RUELE - Russia Ekaterinburg
AUTIL - Australia Sydney
INTAD - India Maneja Baroda
EGHVO - Egypt Cairo

The products consist of high voltage disconnectors for use in electrical AC and DC transmission systems for voltages above 44 kV.

Environmental management:
Process of environmental management system (EMS) implementation according to international standard ISO 14001 have been started four years ago. A Polish Disconnectors Division in the middle of 1997 received the certificate as first one in the BU.

Implementation status	PLZWA	Implemented
	RUELE	Will be completed 2002
	AUTIL	Implemented
	INTAD	Implemented
	EGHVO	Will be completed 2002

Product description:
Disconnectors are mechanical switch devices, which in the open position provide an insulating distance. They are able to open or close a circuit if either a negligible current is switched or if no significant change occurs in the voltage between the terminals of the poles.
The ABB range of disconnectors cover all common switching station arrangements for 44 to 800 kV; 800A to 4000A and 100 to 160 kA (Ip, peak short – circuit current).

Product range

Type	Centre-break disconnector
Voltage	66 kV ÷ 550 kV
Op. Mechanism	Motor or Manual
Current	1600 A ÷ 4000 A
Ip	100 kA / 160 kA
Earth Switch	one or two for pole

Type	SGF ... n	SGF ... p	SGF ... pc/q
	Ip	Ip	Ip
66 kV	100 kA	100 kA	---
72,5 kV	100 kA	100 kA	---
90 kV	100 kA	100 kA	---
123 kV	100 kA	100/125 kA	125 kA
145 kV	100 kA	100/125 kA	125 kA
170 kV	100 kA	100/125 kA	125 kA
245 kV	100 kA	100/125 kA	125 kA
300 kV	100 kA	100/125 kA	125 kA
420 kV	100 kA	100/125 kA	160 kA
550 kV	100 kA	100/125 kA	125 kA
Associated built-in Earthling Switch (66, 300) kV –TEC; 420-550 kV – TEB			

Environmental performance

The data and calculation are in accordance with Product Specific Requirements (PSR 2000:4) for Medium/High-Voltage Disconnectors, dated September 2000, which applying rules included in ISO 14040÷43, specifies the following baselines for the LCA calculation.

Functional unit has been set to:
a device that can serve as a disconnector in a three pole power transmission system, operational for 20 years, at current 2500 A and voltage 123÷245 kV when in the closed position, in all kind of climate without polar climate.

System boundaries
The life cycle assessment covers all environmental aspects for extraction and production of raw materials, manufacturing of main parts, assembly of the device, transportation and use of the product and dismantling 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 20 years and average load assumed as 50% of nominal current. Polish mix of energy has been used for calculating energy consumption during manufacturing and a European mix of energy for calculating energy losses during use and energy for disposal.
The SGF123 and SGF 245 have been chosen for the Life Cycle Assessment study, for device in-between these limits the environmental impact may be interpolated.
No energy consumed by drives during lifetime has been taken into account due to the fact that is less than 3% total disconnectors energy consumption.

The table below lists the materials used and their quantities:

Summary of materials	kg / device	
	SGF 245	SGF 123
Aluminium	138,84	91,62
Cooper	42,87	23,16
Plastic	9,05	8,41
Porcelain	540,00	420,00
Steel	527,82	438,02
Wood (packaging)	165,00	165,00
Lubricant	0,926	0,906

Allocation unit

The factor for allocation of common environmental aspects during manufacturing is calculated as the ratio of the functional unit to the sum of all functional units produced annually in the relevant part of the production unit.

Resource utilisation

Inventory			Manufacturing phase		Use phase	
Use of non-renewable resources			**SGF 245**	**SGF 123**	**SGF 245**	**SGF 123**
* Ag	(material, resource)	kg	0,05	0,04	0,00	0,00
* Al	(material, resource)	kg	150,45	119,42	0,00	0,00
* Coal	(energy, resource)	kg	1104,46	873,84	15765,29	12728,94
* Cu	(material, resource)	kg	43,26	23,37	16,88	16,88
* Fe	(material, resource)	kg	566,12	468,74	0,01	0,01
* Gas	(energy, resource)	m^3	489,71	361,76	0.00	0,00
* Gas	(energy, resource)	kg	62,13	49,77	1093,27	883,23
* Oil	(energy, resource)	kg	218,30	176,22	1693,05	1370,42
* S	(material, resource)	kg	3,26	2,41	0,00	0,00
* U	(energy, resource)	kg	0,01	0,00	0,61	0,49
* Zn	(material, resource)	kg	4,02	3,31	0,13	0,13
Use of renewable resources			**SGF 245**	**SGF 123**	**SGF 245**	**SGF 123**
* Wood	(material, resource)	kg	165,00	165,00	0,00	0,00
* Hydro power		MJ	12,08	10,28	0,05	0,05
Water		m^3	3,00	2,47	0,10	0,10

Energy consumption and losses	kWh			
	Manufacturing phase		Use phase	
	SGF 245	SGF 123	SGF 245	SGF 123
Electrical energy	1585,89	1423,19	57499,08	46412,20
Heat energy	779,00	779,00	0,00	0,00

The average Polish electricity mix is defined as being 2,9% hydro, 36,3% lignite and 60,8% stone coal. The 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 / device	
Hazardous waste	**SGF 123**	**SGF 245**
After production	7,965	9,674
After usage	0,318	0,318
After end of life	0,000	0,000
Regular waste (to landfill)	**SGF 123**	**SGF 245**
After production	218,157	285,878
After usage	1,400	1,400
At final disposal total waste	949,056	1259,196
At final disposal waste to recycling	473,176	647,202

The classification data for emissions are as below

Category of impact	Equivalent unit per device	Manufacturing SGF 245	Usage phase SGF 245	Total life cycle SGF 245
Global warming GWP (100 years)	kg Co_2	4968,05	29113,61	34081,65
Acidification	mol H+	551,13	5735,64	6286,77
Ozone depletion ODP	kg CFC-11	0,00	0,00	0,00
Photochemical oxidants POCP	kg ethylene	0,95	6,77	7,71
Eutrophication	kg Co_2	54,02	375,71	429,73

Category of impact	Equivalent unit per device	Manufacturing SGF 123	Usage phase SGF 123	Total life cycle SGF 123
Global warming GWP (100 years)	kg Co_2	3895,26	23525,07	27420,34
Acidification	mol H+	432,29	4635,33	5067,62
Ozone depletion ODP	kg CFC-11	0,00	0,00	0,00
Photochemical oxidants POCP	kg ethylene	0,75	5,48	6,23
Eutrophication	kg Co_2	40,81	304,49	345,31

The values are based upon the indexes specified in Requirements for Environmental Product Declarations, EPD (MSR 1999:2) - an application of ISO TR 14025, published 1999-11-25 by the Swedish Environmental Management Council

Additional qualifying factors

Recycling and disposal

The disconnectors consist of large metals parts (aluminium, copper, steel) relatively easy to dismantling and recycling
The description of decommissioning can be found in the:

- Service instruction GPDT 069622
- Sales manual (on CD)
- LCA report
- 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.

Category of impact	SGF 245	SGF 123
Global warming GWP	85	86
Acidification	91	91
Photochemical oxidants	88	88
Eutrophication	87	88

Third party certification

This EPD has been reviewed and found to comply with the Product Specific Requirement, PSR 2000:4 for, Medium/High-Voltage Disconnectors, dated September 2000 with the Swedish Environmental Councils (requirements for environmental product declarations dated 25 November 1999.

References

- LCA report TR 01-007
- PSR for Disconnectors (PSR 2000:4)
- Service instructions (includes de-commissioning instruction)
- Sales manual (on CD)
- Requirements for Environmental Product Declarations, EPD (MSR 1999:2) - an application of ISO TR 14025, published 2000-03-27 by the Swedish Environmental Management Council

The above mentioned documents are available upon request

Time of Validity

This Environmental product Declaration which has been approved and certified by BVQI according to MSR 1999:2 and PSR 2000:4 is valid up to and including 27 October 2003

Accredited certification body

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