Environmental Product Declaration

Registration number: S-P-00048

Rev. 0 – 11/06/03

Tmax T3

Low voltage circuit breaker

ABB SACE SpA

Information about the company and the product

This document aims to provide information on the environmental performance of the Tmax T3 product life cycle, in conformity with the standard "MSR 1999:2 Guidelines for the Environmental Product Declaration (EPD)"; and with product specific requirements dictated by the PSR for low voltage circuit breakers.
The environmental performance is determined by means of an LCA study carried out in accordance with the ISO 14040 Standards.

Company

ABB SACE SpA - LV Circuit-breakers sector
Via Baioni, 35
24123 Bergamo - Italy
Tel.: +39 035 395111; Fax: +39 035 395306-433
Web: www.abb.com/it

Contact persons:
Local Sustainability Officer - S. Ferrari
e-mail: simone.ferrari@it.abb.com

ABB SACE, is a company of the ABB Group working in the area of low voltage products and technologies of the Automation Technology Products Division. The company offers a complete and integrated range of products for industrial and residential sectors within the context of a constant technological development process.

The circuit breaker is produced in Frosinone plant. This site has been ISO 14001 certified since 1997. From 2000 the Integrated Management System (Quality, Environment and Safety) has also been implemented and certified. The processing activities carried out at the facility are assembly and testing.

Product description

Tmax is the new series of ABB SACE low voltage moulded-case circuit breakers. These are solutions suitable for installation in both industrial and civil spheres.

Notwithstanding its limited dimensions, the Tmax T3 circuit breaker (WxHxD = 105x150x70), is characterised by decidedly high electrical performances (rated current of 250 A, and breaking capacity Icu equal to 50 kA at 415 V AC) which allow a wide range of use.
The environmental performances obtained thanks to application of the DfE (Design for Environment) methodology during the project design development stage, already used in the case of the smaller Tmax T1 size circuit breaker of the same series, are worthy of note.

Special attention was paid to limiting the energy dissipated by Tmax T3 during its use phase.
Further improvements introduced in the product with application of the DfE were:

- use of recyclable thermoplastic resins to partly replace the thermosetting resins;
- marking of the plastic components aimed at helping their identification and end of life recycling/recovery;
- use of design solutions aimed at simplifying dismantling of the circuit breaker at the end of its life, which, by allowing separation of the individual components, encourages its recycling and/or its correct waste disposal management;

The Tmax T3 has the following electrical characteristics:

- rated uninterrupted current : Iu = 250 A
- 3/4 poles
- rated service voltage: Ue = 690 Vac; Ue = 500 Vdc
- impulse withstand voltage; Uimp = 8kV
- rated insulation voltage: Ui = 800V
- short-circuit breaking capacity (version N) according to the service conditions as indicated below.

Rated voltage (V)	Breaking capacity (kA)
220/230	50
380/415	36
440	25
500	20
690	5

Scope of the declaration

The LCA study was carried out on the three-pole Tmax T3 R 250 circuit breaker in accordance with the ISO 14040 Standards.

Functional unit

The functional unit, as specified under the Product Specific Requirements, is represented by a circuit breaker in service for a 15 years estimated lifetime, with annual use of 4380 hours and a rated current of 160 A, intended as the one defined in the IEC 947-2 Standards.

System boundaries

Production

The system includes the production stages of the materials and components constituting the circuit breaker, observing the quantities indicated in the table.

Material	[g]	
ABS	4.4	0.3%
Copper	306	17.8%
Copper alloys	36.6	2.1%
Paper	0.8	0.0%
PET with 30% glass fibre	87	5.0%
Polyamide with 20% glass fibre	3.3	0.2%
Polyamide with 30% glass fibre	16.9	1.0%
Polycarbonate	46.2	2.7%
Polycarbonate with 20% glass fibre	8.2	0.5%
Polyester resin	41.6	2.4%
Polyester resin with 30% glass fibre	496	28.9%
Steel	328	19.1%
Stainless steel	308	17.9%
Silver	23.2	1.4%
Total	**1706.2**	**99.2%**
Circuit-breaker weighed	**1719.6**	**100.0%**
Cut-off	**13.4**	**0.8%**

Finished product assembly and testing are carried out in the ABB SACE facility in Frosinone.
The reference energy mix used during the production stage is the Italian one (ANPA I-LCA version 2 data base).
Packing of the finished product and components is not included in the system.

Transport

The system includes the transport stages regarding raw materials and semi-finished products as far as the production site. Transport of the finished product onto the market was not taken into consideration since this has extremely variable characteristics, which depend on the end customer.

Usage

The service stage of the product leads to potential impacts, consumption of resources and production of waste caused by production and supply of dissipated energy due to the Joule effect.
The reference energy mix used during the service stage is the European one (ANPA I-LCA version 2 data base).
Under the service conditions, defined by the reference PSR, the energy dissipated by the main circuit resistance is 5,322 MJ (voltage drop measured equivalent to 60 mV).

Declaration of the environmental performance

Consumption of natural resources

Consumption of the main resources associated with the different life cycle stages is as follows

Resources	Production [kg]	Use [kg]
Renewable resources		
Without energy content		
Water	253	37,860
With energy content		
Wood	0.093	1,575
Non-renewable resources		
Without energy content		
Baryte	0.003	0.261
Copper	0.365	0.016
Iron	0.690	2.192
Sand	0.330	1.192
Silver	0.0233	0
With energy content		
Coal	1.570	207.5
Lignite	0.128	266
Natural gas	2.296	38.2
Oil	1.740	47.9
Uranium	0.000035	0.018093

Consumption of primary energy

The consumption of primary energy associated with the different stages of the life cycle, divided between non-renewable and renewable energy is as follows

Non-renewable resources	Production [MJ]	Use [MJ]
Coal	28.8	3,943
Natural gas	89.5	1,490
Lignite	1.28	2,665
Oil	78.3	2,155
Uranium	15.6	8,142
Total	**213.48**	**18,395**

Renewable resources	Production [MJ]	Use [MJ]
Hydraulic energy	7.22	1,176
Wood	1.85	31.5
Total	**9.07**	**1,208**
Total primary energy	**222.55**	**19,603**

Consumption of electric energy

Electric energy	Production [MJ]	Use [MJ]
Consumption and dissipation	50.72	5,322

Potential environmental impacts

The potential environmental impacts associated with the different life cycle stages are the following:

Categories of impact	Production	Use
Acidification [mol H^+eq]	3.16	192.36
Global warming [kg CO_2eq]	14.61	872
Eutrophication [kgO_2eq]	0.235	9,725
Stratospheric ozone depletion [kg CFC_{11}eq]	0	0
Photochemical ozone creation [kg C_2H_4eq]	0.006	0.172

Waste

The waste produced in the different life cycle stages is as follows

Waste	Production [kg]	Use [kg]
Non-hazardous waste	2.07	117
Hazardous waste	0.017	0.165

Additional information

Marking plastic parts

Where technologically possible, the plastic parts of the circuit breaker are marked in accordance with the ISO 11469 and ISO 10431/2/3/4 standards to facilitate their identification and recovery at the end of their life.
See the example illustrated in the figure relative to Polyamide in 30% glass fibre.

> PA 66 – GF 30 <

Recycling

Based on the analysis of the materials that constitute the product and coherently with the best technologies available to date, the potential recycling rate of the T3 is higher than 60%.

Material**	Recycling [g]	Recovery* [g]	Disposal [g]
ABS	4.4		
Copper	306		
Copper alloys	15.8		20.9
Paper			0.8
PET with 30% glass fibre		87	
Polyamide with 20% glass fibre		3.3	
Polyamide with 30% glass fibre		16.9	
Polycarbonate	46.2		
Polycarbonate with 20% glass fibre		8.2	
Polyester resin		41.6	
Polyester resin with 30% glass fibre		496	
Silver	23.3		
Stainless steel	308		
Steel	328		
Total	1031.7	653	21.7
Total	**60.5%**	**38.3%**	**1.3%**

* by the term recovery, the incineration process with energy recovery is intended.
** the end of life scenario does not take the materials constituting the cut-off into consideration.

Reference documentation

- MSR 1999:2: Guidelines for the Environmental Product Declaration (EPD);"
- LCA study of TMAX T3 (EPD I – 3 rev. 2)
- PSR 02:2003 “Low voltage circuit-breakers”
- ISO 14020 (2000) "Environmental labels and declarations - Principles and guidelines"
- ISO/TR 14025 (2000) "Environmental labels and declarations - Type III environmental declarations"
- ISO 11469 “Plastics – Generic identification and marking of plastics products”
- ISO 1043-1 “Plastics – Symbols and abbreviated terms - Part 1: Basic polymers and their special characteristics”
- ISO 1043-2 “Plastics – Symbols - Part 2: Fillers and reinforcing materials”
- ISO 1043-3 “Plastics – Symbols and abbreviated terms - Part 3: Plasticizers”
- ISO 1043-4 “Plastics – Symbols and abbreviated terms - Part 4: Flame retardants”

Validation

This EPD and the relative Life Cycle Assessment study have been approved by RINA S.p.A. Certification Body (www.rina.it) for the certification, in accordance with MSR 1999:2 standard provided by Swedish Environmental Management Council.

Further information regarding the aims of the Environmental Product Declaration, the validation course, the standard references and documents mentioned above, as well as the list of the EPDs validated in the various countries, are available on the following site: www.environdec.com.

Registration number: S-P-00048

Validity time: 07/07/2006