Environmental Product Declaration

Registration number: S-P-00110
Rev. 0 – 22/12/05

Tmax T2

Low voltage circuit breaker

Information about the company and the product

This document aims to provide information on the environmental performance of the Tmax T2 product life cycle, in conformity with "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

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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 T2, (WxHxD=90x130x70), is characterised by decidedly high electrical performances (rated current of 160 A and breaking capacity Icu up to 85 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 Tmax T1 and Tmax T3 circuit breaker of the same series, are worthy of note.

Special attention was paid to limiting the energy dissipated by Tmax T2 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 T2 has the following electrical characteristics:

- rated uninterrupted current: I_u=160 A
- 3/4 poles
- rated service voltage: U_e=690 Vac; U_e=500 Vdc
- impulse withstand voltage; U_{imp}=8kV
- rated insulation voltage: U_i=800V
- short-circuit breaking capacity according to the service conditions as indicated below.

Rated Voltage [V]	Ultimate Short-circuit Breaking capacity (Icu) [up to kA]
220/230	120
380/415	85
440	75
500	50
690	10

Scope of the declaration

The LCA study was carried out on the three-pole Tmax T2 R160 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 4.380 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.

Materiale	g	
ABS	4,3	0,39%
Alluminium	48	4,38%
BMC	412,5	37,65%
Copper	148,7	13,57%
Copper alloys	63,8	5,83%
Kraft papere	3	0,27%
PA 20% Glass Fiber	3,5	0,32%
PA 30% Glass Fiber	13,9	1,26%
PET 30% Glass Fiber	50,2	4,58%
Polycarbonate	36,4	3,32%
Silver	6,9	0,63%
SMC 25% Glass Fiber	31	2,83%
Stainless steel	15,4	1,41%
Steel	253,1	23,10%
Verton	4,9	0,45%
Total weight	**1095,5**	**100%**

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 3.016 MJ (voltage drop measured equivalent to 106 mV).

Environmental performance sheet

The impact categories of this environmental performance sheet are in accordance to MSR 1999:2 specification and their figures refer to the functional unit.

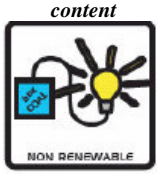
NON RENEWABLE RESOURCES

Without energy content

Production
0,75 [kg]

Use
2,32 [kg]

With energy content



Production
108,9 [MJ]

Use
10.425 [MJ]

NON RENEWABLE RESOURCES - Details

Without energy content	*Production [kg]*	*Use [kg]*	*With energy content*	*Production [kg]*	*Use [kg]*
Barite	0,001	0,148	Hard coal	0,049	0,893
Copper	0,187	0,009	Lignite	0,138	151
Iron	0,294	1,240	Methane	0,972	117,6
Sand	0,203	0,676	Oil	1,01	27
Silver	0,007	0	Uranium	0,000026	0,0103

RENEWABLE RESOURCES

Without energy content

Production
114 [l]

Use
21.460 [l]

With energy content

Production
4 [MJ]

Use
685 [MJ]

ELECTRICITY CONSUMPTION

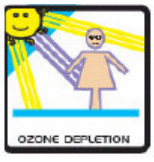
Production *
14,26 [MJ]

Use
3.016 [MJ]

Note:
** Electricity consumption is related only to the production site: ABB SACE SpA of Frosinone - Italy*

EMISSION RELATED IMPACTS

[kg CO2 eq.]
Production
9,10
Use
494



[g CFC_{11} eq.]
Production
0
Use
0

[kg C_2H_4 eq.]
Production
0,004
Use
0,097

[mol H^+ eq.]
Production
2,32
Use
109

[kg O_2 eq.]
Production
0,18
Use
5,51

WASTE

Production
2,07 [kg]

Use
66,3 [kg]

Production
0,123 [kg]

Use
0,093 [kg]

Additional information

Additional information

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.

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 T2 is higher than 40%.

Material*	Recicle [g]	Recovery* [g]	Landfill [g]
ABS	4,3		
Alluminium			48,0
Copper	131,4		17,3
Copper alloys	19,9		43,9
Kraft paper			3,0
PA 20% Glass fiber	2,8	0,7	
PA 30% Glass Fiber	13,1	5,6	
PET 30% Glass Fiber	50,2		
Policarbonate	36,4		
Silver			6,9
Stainless steel	15,4		
Steel	217,1		36,0
Thermosets		443,5	
Weights	**490,7**	**449,8**	**155,1**
Percentage	***44,8%***	***41,1%***	***14,2%***

* by the term recovery, the incineration process with energy recovery is intended.

Reference documentation

- MSR 1999:2: Guidelines for the Environmental Product Declaration (EPD);
- LCA study of Tmax T2 (EPD I - 3 rev.1)
- 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., accredited certification body (SWEDAC reg. num. 1812 – SINCERT reg. num. 001H)

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.

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