

Environmental Product Declaration

EPD I – ANPA - 1



TMAX T1



ABB Sace SpA



Presentation

Aim of this document is to supply information on the environmental performances of the **TMAX T1** product life cycle, conforming to the "General rules for the drafting of Environmental Product Declaration" (ANPA, July 2001 draft) and to the category "Product Specific Requirements".

The environmental performance is measured by means of an LCA study carried out in accordance to ISO 14040 standards.

Manufacturer information

ABB SACE SpA – LV Circuit Breakers

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ABB SACE is a company of the ABB Group working in the field of low-voltage products and technologies of the Automation Technology Products Division. It offers a complete and integrated range of products for industry, services and residential in the context of a constant technological development process.

Frosinone's production site is certified ISO14001 since 1997. In addition, since April 2000 also the Integrated Management System (Quality, Environment and Safety – SGI) was implemented and certified.

Product description

The model surveyed by the study is the smallest in size of the new series of Tmax low-voltage molded case circuit breakers. Suited for installing in industrial and civil environments, Tmax was developed in 3 sizes – T1, T2 and T3 – capable to cover a field of range of currents from 1 to 250 A. The Tmax T1 circuit breaker stands out in the present production thanks to its high performance/size ratio. Its size is extremely contained (70 mm deep, 130 mm high, 76 mm long), with very high performances: rated current from 160 A, Icu breaking capacity equal to 36 kA at 415 V AC. Such performances make the Tmax circuit breaker suited to be used for switchboards with no need to check short circuit withstand of the according to paragraph 8.2.3.1 of IEC 60439-1 (Low-voltage assembled protection and manoeuvre equipment). In fact Tmax is characterized by a strong limitation of the peak short circuit current. Such limitation is lower than 17 kA peak (415 V AC) requested by the standard, up to the maximum breaking power of the circuit breaker (36 kA at 415 V AC) and up to the maximum available calibration. This greatly enhances its applications because by avoiding the verification of the short circuit withstand, we obtain an appreciable advantage in terms of cost and time.

The Tmax T1 electrical characteristics are:

- Rated uninterrupted current: $I_u = 160$ A
- 3-4 poles (a unipolar version is also manufactured)
- rated voltage: $U_e = 690$ Vac; $U_e = 500$ Vdc
- impulse withstand voltage: $U_{imp} = 8$ kV
- rated insulation voltage: $U_i = 800$ V
- short circuit withstand (N version) according to usage conditions as indicated

Rated voltage (V)	Breaking capacity (kA)
220/230	50
380/415	36
440	22
500	15
690	6

Scope of declaration

The LCA study is carried out, in accordance to ISO 14040, on the Tmax T1 with three poles.

Functional unit

The functional unit, as specified in the Product Specific Requirements PSR I-2001:01, is represented by the rated current, as defined by IEC 947-2 standard. The reference flow for the LCA study and the environmental performance evaluation is represented by the single circuit breaker.

System boundaries

The boundaries of the system surveyed by the LCA study conform to PSR-I 01:2001.

For what not specified in the Product Specific Requirements the following holds true:

Production

The system includes the production phases of all material concurring to make the circuit breaker, respecting the amounts shown in the chart.

Materials	[g]	%
Polyester with 20% glass fiber	193	20.1
Polyester with 25% glass fiber	253	26.4
Polyamide with 25% glass fiber	9	0.9
Polyamide with 30% glass fiber	6.7	0.7
Polyamide	2	0.2
ABS	5.7	0.6
Polycarbonate with 20% glass fiber	8.1	0.8
Polycarbonate	33.5	3.5
Copper	134	14.0
Silver	2.8	0.3
Rolled steel	238	24.8
Steel	68	7.1
Total	953	99.3
Weighted	960	100.0
Cut-off		0.7

Data relating to processes being controlled by the company regard ABB Sace's production site located in Frosinone.

One hundred percent of data relating to associated production processes are of a specific type.

The reference energy mix is the Italian one (ANPA I – LCA version 2 databank).

Packaging of the product is not included in the system.

Transportation

The system includes the transportation phases of finished and semifinished products concurring to make up the finished product. The transportation of finished product to clients was not considered since the product is sold on the international market.

Usage

The product usage phase brings along potential impacts, energy consumption and waste due to the production and supply of dissipated energy due to the Joule effect.

The reference energy mix used in the usage phase is the European one (ANPA I – LCA version 2 databank).

The energy losses in the usage phase due to the resistance of the main circuit (measured phase resistance equal to $0.49 \cdot 10^{-3}$ W) are equal to 2.221 MJ.

End of life

The environmental performance declaration regarding the phase of the product's end of life is made under the hypothesis that the best available technology is used and is based on the following scenario.

Material	Recycle [g]	Recovery [g]	Landfill [g]
Polyester with 20% glass fiber		182	11
Polyester with 25% glass fiber		226	27
Polyamide with 25% glass fiber			9
Polyamide with 30% glass fiber			6.7
Polyamide			2
ABS			5.7
Polycarbonate with 20% glass fiber			8.1
Polycarbonate	33.5		
Copper	107		27
Silver	2.2		0.6
Rolled steel	190		48
Steel	54		14

* by recovery we mean the incineration process with energy recovery

Environmental performance declaration

Consumption of resources

Consumption of main resources associated to the various phases of the life cycle is the following:

Resource	Production [kg]	Use [kg]	End of life [kg]
Water	197	15,800	-4
Silver	0.0029	0	0
Baryte	0.003	0.109	0
Coal	0.785	86.6	-0.407
Iron	0.318	0.915	-0.231
Natural gas	0.618	11.2	-0.063
Wood	0.038	0.657	0
Lignite	0.098	111	0.008
Oil	10127	20.02	-0.256
Copper	0.149	0.007	-0.084
Sand	0.158	0.498	0
Uranium	0.000011	0.007552	-0.000013

Consumption of gross energy

The consumption of gross energy tied to the various phases of the life cycle and distinguished between the non-renewable and the renewable energy is the following:

Non renewable	Production [MJ]	Use [MJ]	End of life [MJ]
Coal	14.9	1,650	-7.7
Gas	32.1	580	-3.3
Lignite	0.98	1,110	-0.08
Oil	50.7	900	-11.5
Uranium	5.1	3,400	-5.8
Total	103.78	7,064	-28.38
Renewable			
Hydro energy	5.21	491	-1.0
Wood	0.77	13.1	0
Total	104	504.1	-1.0
Total primary energy	109.8	8,144.1	-29.4

Potential Environmental Impacts

Potential environmental impacts tied to the various phases of the life cycle are the following:

Impact category	Production	Use	End of life
Acidification (kgSO ₂ eq)	0.063	2.57	-0.01
Climate changes (kgCO ₂ eq)	7.68	364	-0.2
Eutrophication (kgPO ₄ eq)	0.0036	0.0880	0.0005
Depletion of stratospheric ozone layer (kgCFC11eq)	0	0	0
Photochemical ozone creation (kgC ₂ H ₄ eq)	0.010	0.196	-0.001

Waste

Waste produced in the various phases of the life cycle are the following

Waste	Production [kg]	Use [kg]	End of life [kg]
Industrial	2.56	48.87	-0.04
Hazardous	0.012	0.069	0

Additional information

Traceability of potential impacts

Potential environmental impacts regarding the supply of electric power are those associated to the usage of the analysis data of the inventory contained in the I-LCA database, version 2 (ANPA-October 2000).

1 MJ produced with energy mix	Italian	European
Acidification (kgSO ₂ eq)	0.00151	0.00116
Climate changes (kgCO ₂ eq)	0.197	0.164
Eutrophication (kgPO ₄ eq)	0.0000582	0.0000396
Depletion of stratospheric ozone layer (kgCFC11eq)	0	0
Photochemical ozone creation (kgC ₂ H ₄ eq)	0.000170	0.0000884

Identification symbol for plastics

The plastic elements of the circuit breaker, where possible, are marked in accordance with the ISO 11469 and ISO 10431/2/3/4 standards in order to facilitate their identification and recovery at end of life.

See example shown below related to Polyamide with 30% of glass fiber.



> PA 66 – GF 30 <

Reference documents

- ANPA (July 2001 draft) "General rules for the drafting of Environmental Product Declarations"
- LCA study of the TMAX T1 (ref. EPD I – 1 rev. 0).
- Product Specific Requirements (PSR - I 01:2001)
- 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 environmental product declaration has been certified by ANPA (Agenzia Nazionale per la Protezione dell'Ambiente) according to "Regole per la Redazione della Dichiarazione Ambientale di Prodotto" – ANPA ed. July 2001 and the Product Specific Requirements PSR I-2001-1.

This translation into english is done from the certified declaration in Italian with the following registration number: **EPD I – ANPA – 1.**