PRODUCT ENVIRONMENTAL PROFILE

DACF25S-31-275

LV surge protector Type 2 Three-phase + Neutral plug-in - integrated fuses

Technology VG

Company Information	**References covered**
CITEL 29 boulevard Edgar Quinet 75014 Paris – France www.citel.fr contact@citel.fr	DACF25-11-X, DACF25-31-X, DACF25S-11-X, DACF25S-31-X, DACF15-11-X, DACF15-31-X, DACF15S-11-X, DACF15S-31-X with X the Uc voltage range of 150 to 440 Vac.

Methodology

PEP has been performed according to the PCR version PEP-PCR-ed4-2021 09 06 and PSR version PSR-005-ed3.1-2023 12 08 issued by the PEP ecopassport program.
For further information, please see the website of the program www.pep-ecopassport.org

GENERAL INFORMATION

Reference product	The reference product is one unit of Type 2 or 3 plug-in LV surge protector with integrated fuse produced by CITEL and with the technology VG. VG technology is CITEL's exclusive and patented technology based on the use of specific types of Gas-filled spark gaps (GSG) in conjunction with Metal oxide varistors (MOV). These components, the result of over 75 years of experience in the gas discharge tube field, have a behaviour adapted to the power network and provide robustness and working stability: their association with varistors combines the advantages of both technologies. The representative product is DACF25S-31-275, LV surge protector Type 2 Three-phase + Neutral plug-in - integrated fuses because it is the best-selling product of the references covered. This PEP is validated for 5 years.
Functional unit	Protect, against direct and indirect effects of lightning or against transient overvoltages, electronic equipment connected to networks with a rated operational voltage of up to 1000 V AC or 1500 V DC, via a surge arrester of type T, with Np poles, according to the appropriate use scenario, and for the reference service life of the product of 20 years.
Description of the range	This Product Environnement Profile includes DACF25 and DACF15 range for a total of 32 references. Functional Units for the products family covered by this LCA and PEP includes: Through limiting transient voltages to safe operation levels and diverting surge currents into earth, the product covers for 20 years installations from the risk of permanent failures or damage. This protection is ensured in accordance with the following parameters for the products family covered by this PEP: - Surge protective device type according to the standard IEC 61643-11: T2, T2-T3 - Number of protected conductors: N = 1, 1+1, 3, 3+1 - Maximum continuous operating voltage (Uc) (V): 150, 275, 320,440 - Nominal discharge current (In) (kA): 5, 15 - Impulse discharge current for class 1 test (current waveshape 10/350s) (kA): limp = NA - Open circuit voltage of the combination wave generator for surge protective devices type 3 (UoC) (kV): 10 - Voltage protection level (Up) (kV): 0.6, 0.9, 1,1.2, 1.25, 1.5, 2 - Current drawn by the surge protective device and his related functions: Ic (µA): 10 Each reference can be with or without remote signalling.
Specifications of the representative product (product code 821410244)	This protection is ensured in accordance with the following parameters for the product in this PEP: - Surge protective device type according to the standard IEC 61643-11 = T2 - Number of protected conductors: Np = 3+1 - Maximum continuous operating voltage: Uc = 275 V - Rated discharge current for class 2 test (current waveshape 8/20µs): In = 15 kA - Impulse discharge current for class 1 test (current waveshape 10/350s) (kA): limp = NA - Open circuit voltage of the combination wave generator for surge protective devices type 3 (kV): UoC = NA - Voltage protection level Up =1.5 kV - Current drawn by the surge protective device and his related functions: Ic = 10µA

CONSTITUENT MATERIALS

All useful measures have been adopted to ensure that the materials used in the composition of the product do not contain any substances banned by the legislation in force at the time of marketing (for example: REACH and ROHS).

Total weight of reference product	390.34 g including the product, its packaging and additional elements and accessories

Table 1: Materials distribution of the reference product

Plastics			**Metals**			**Others**		
	g	%		g	%		g	%
Polyamide 66	167	42.6	Copper	71.4	18.2	Cardboard	22.9	5.8
Polyester resin	1.19	0.3	Stainless steel	50.9	13.0	Ceramic	18.6	4.7
Others	1.9	0.5	Zinc	27.9	7.1	Sand	8.89	2.3
			Brass	4.68	1.2	Paper	4.10	1.0
			Steel	2.68	0.7	Glass fibre	0.94	0.2
			Others	4.8	1.2	Others	3.95	1.0
Total		43.4%	Total		41.4%	Total		15%

ADDITIONAL ENVIRONMENTAL INFORMATION

Software and database used	EIME 6.3 software from LCIE Bureau Veritas. Databases CODDE 2024-04, ELCD and ESR (WEEE)
Manufacturing	Manufacturing takes place in CITEL plant in Shanghai. The plan has the ISO 14001 and ISO 9001 certification.
Distribution	The product is distributed exclusively in Europe from our logistics site in France.
Installation	Installation is done in Europe. For the installation of the product, only standard tools (electric screw) are needed.
Use	This product requires no servicing, no maintenance or additional products. Only B6 module is applicable.
End of life	We are considering an end-of-life for the product in Europe. The product is covered by ESR data under the EoL Small Household Elec Equip category.
Standards	NF EN 61643-11, IEC 61643-11 and UL1449 ed.5

ENVIRONMENTAL IMPACTS

Modules	Life Cycle Stage
A1-A3 Manufacturing Stage	The A1-A3 module covers the extraction and processing of raw materials [A1], transport to the manufacturer [A2] and manufacturing [A3]. The reference product DACF25S-31-275 is divided into three sub-assemblies: - The MDACF25-275 module: present in 3x - The MDAC50G-255 module: present in 1x - The BDACS31 base The modelling also includes the product instructions and its primary packaging, namely a single cardboard box. The energy module use is Electricity Mix; production mix; low voltage; 2020; China, CN. The transportation of raw materials or product until the logistic platform is included.
A4 Distribution Stage	Transportation of the product in its packaging from the manufacturer's last logistic platform to the distributor and from the distributor to the installation place. We consider that the product is mainly sold in Europe. We are therefore basing our calculations on the scenario described in section 5.5.3 p22 of PCR ed4, namely intra-continental transport: 3,500 km by lorry >27t.
A5 Installation Stage	Installation at the place of use and disposal of packaging waste. The product packaging is disposed of in Europe, as we consider the product to be sold entirely in Europe. The module Energy use is Electricity Mix; production mix; Low Voltage; 2020; Europe.
B1-B7 Use Stage	Energy consumption of the product during the use stage. The module Energy use is Electricity Mix; production mix; Low Voltage; 2020; Europe. We calculate the energy consumption of our product based on a reference lifespan of 20 years and express it in watts per hour. The formula is as follows: E = U0 x Ic x A x 20 x 365 x 24 in W.h For a three-phase product, A = 3 and for a single-phase product, A = 1. The actual mains voltage Uo between L and N/PE is equal to 230V for a 230/400V application and Ic = 10 µA for 100% MOV and 0% VG.
C1-C4 End of life Stage	The C1-C4 module covers the desinstallation [C1], transport to waste treatment plant [C2], treatment of waste with a view to its reuse, recovery or recycling [C3] and disposal [C4]. The product is covered by ESR data under the category EoL Small Household Electrical Equipment. We consider the product to have reached the end of its life in Europe.
Module D	Module D covers the net benefits and costs arising from the reuse of products or the recycling or recovery of energy from end-of-life materials. We are using the [0;100] method: we are counting as profit what will generate recycled material.

Table 2 : Environmental Impacts information

Reference lifetime	20 years
Product category	Surge arresters, PSR 005-ed3.1-2023 12 08
Installation elements	Only a screwdriver is used for installation, not other material is needed This step is not considered because it is a recommendation in our technical notice
Use scenario	The representative product is only used in Europe. The calculation is based on the use scenario in Europe, operation for 20 years, load factor: 100% of Ic
Geographical representativeness	[A1-A3] : China [A4], [A5], [B1-B7], [C1-C4]: Europe

Table 3 Environmental impact indicators of life cycle impact assessment
DACF25S-31-275

			A1+A2+A3	A4	A5	B stage	C stage	D
Indicators	**unit**	**Total**	**Manufacturing stage**	**Distribution stage**	**Installation stage**	**Use stage B6**	**End of Life stage**	**Ben./loads byd system bound.**
Climat change - total	kg CO2 eq.	5,98E+00	4,96E+00	8,76E-02	7,53E-02	4,26E-01	4,33E-01	-8,95E-01
Climate change - fossil fuels	kg CO2 eq.	5,93E+00	4,97E+00	8,76E-02	3,28E-02	4,25E-01	4,19E-01	-9,07E-01
Climate change - biogenics	kg CO2 eq.	4,51E-02	-1,21E-02	0,00E+00	4,25E-02	7,84E-04	1,39E-02	1,20E-02
Climate change - land use and land use transformation	kg CO2 eq.	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Ozone depletion	kg.equivalent.CFC-11	2,33E-06	2,28E-06	1,34E-10	4,14E-10	2,06E-09	4,58E-08	-3,88E-08
Acidification (AP)	mole of H+ equiv	4,98E-02	4,13E-02	5,56E-04	9,03E-05	2,18E-03	5,63E-03	-4,12E-02
Freshwater eutrophication	kg P eq.	6,05E-05	5,06E-05	3,29E-08	3,90E-07	1,12E-06	8,30E-06	-4,12E-03
Marine aquatic eutrophication	kg of N equiv	9,89E-03	6,17E-03	2,60E-04	4,17E-05	2,66E-04	3,15E-03	-2,39E-03
Terrestrial eutrophication	mole of N equiv	7,83E-02	6,52E-02	2,86E-03	2,78E-04	4,27E-03	5,66E-03	-3,09E-02
Photochemical ozone formation	kg of NMVOC equiv	2,69E-02	2,34E-02	7,21E-04	6,51E-05	8,37E-04	1,80E-03	-8,45E-03
Depletion of abiotic resources - elements	kg.equivalent.Sb	8,81E-04	8,78E-04	3,45E-09	1,36E-09	1,51E-07	2,01E-06	-3,40E-04
Depletion of abiotic resources - fossil fuels	MJ	1,05E+02	8,59E+01	1,22E+00	2,91E-01	1,08E+01	6,57E+00	-7,21E+00
Water scarcity	m3 of equiv. deprivation worldwide	1,05E+02	1,76E+00	3,33E-04	2,41E-03	3,26E-02	1,03E+02	-3,84E+02
Emission of fine particles	incidence of diseases	3,46E-07	2,97E-07	4,52E-09	5,34E-10	1,76E-08	2,70E-08	-1,06E-07
Ionizing radiation, human health	kBq of U235 equiv.	1,21E+02	1,21E+02	2,14E-04	3,96E-03	6,13E-01	2,29E-02	-3,66E-02
Ecotoxicity, fresh water	CTUe	3,03E+03	3,02E+03	5,75E-02	4,30E-01	8,05E-01	3,39E+00	-1,16E+01
Human toxicity, cancer effects	CTUh	5,20E-07	5,16E-07	1,54E-12	3,13E-09	5,36E-11	4,76E-10	-9,39E-09
Human toxicity, non-cancer effects	CTUh	4,22E-07	3,87E-07	2,98E-11	9,28E-11	1,28E-09	3,33E-08	-4,55E-07
Impacts related to land use/soil quality	-	1,04E+00	3,31E-03	0,00E+00	8,56E-05	1,18E-02	1,03E+00	-2,66E+01

Table 4: Inventory Flow indicators of life cycle impact assessment
DACF25S-31-275

			A1+A2+A3	A4	A5	B stage	C stage	D
Indicators	**unit**	**Total**	**Manufacturing stage**	**Distribution stage**	**Installation stage**	**Use stage B6**	**End of Life stage**	**Ben./loads byd system bound.**
Use of renewable primary energy, excluding renewable primary energy resources used as raw materials	MJ	4,76E+00	1,40E+00	1,63E-03	3,98E-02	2,85E+00	4,75E-01	-4,70E+00
Use of renewable primary energy resources used as raw materials	MJ	5,28E-01	5,28E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	5,29E+00	1,92E+00	1,63E-03	3,98E-02	2,85E+00	4,75E-01	-4,70E+00
Use of non-renewable primary energy, excluding non-renewable primary energy resources used as raw materials	MJ	9,91E+01	8,03E+01	1,22E+00	2,91E-01	1,08E+01	6,57E+00	-7,21E+00
Use of non-renewable primary energy resources used as raw materials	MJ	5,65E+00	5,65E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	1,05E+02	8,59E+01	1,22E+00	2,91E-01	1,08E+01	6,57E+00	-7,21E+00
Use of secondary materials	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of renewable secondary fuels	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non-renewable secondary fuels	MJ	9,17E-02	9,17E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water	m3	2,85E+00	4,11E-02	7,76E-06	1,90E-04	7,67E-04	2,81E+00	-9,23E+00
Total use of primary energy during the life cycle	MJ	1,10E+02	8,79E+01	1,23E+00	3,31E-01	1,36E+01	7,05E+00	-1,19E+01
Hazardous waste disposed of	kg	1,43E+01	1,43E+01	0,00E+00	1,61E-03	1,87E-02	3,47E-04	-8,03E-04
Non-hazardous waste disposed of	kg	8,23E-01	7,21E-01	3,08E-03	1,06E-02	7,19E-02	1,61E-02	-1,60E-02

Radioactive waste disposed of	kg	7,21E-04	6,98E-04	2,19E-06	1,87E-06	1,65E-05	1,55E-06	-7,31E-06
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	1,40E-01	1,95E-03	0,00E+00	2,14E-02	0,00E+00	1,16E-01	0,00E+00
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy	MJ by energy vector	6,45E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,45E-03	0,00E+00

Biogenic carbon content of the product: 0,00E+00 kg of C

Biogenic carbon content of the associated packaging: 1,15E-02 kg of C

FAMILY OF PRODUCTS INFORMATION LIFE

To determine the environmental impact of a product covered by the PEP other than the representative product, the following rules apply:

Manufacturing, Distribution, End of Life and Module D phases are globally proportional to the mass of the product. So, the total environmental impact of a product covered by the PEP other than the representative product should be calculated by multiple the coefficients in Table 5 by the total environmental impact of the representative product.

As we were able to prove in the accompanying report, we can consider that only the weight parameter has an influence on the results of the environmental indicators.

As a result, the extrapolation coefficient is:

$$Extrapolation\ coefficient = \frac{\text{Mass of product required}}{\text{Mass of reference product}}$$

Note: the weights considered do not consider the weight of the packaging.
The reference product is DACF25S-31-275.
Only three exceptions for Human Toxicity Cancer (HTP-C), Ionisation Radiation Human Health indicators (IRP) and Resource use, minerals and metals (ADP-e), because the impact is mainly related to one of the components.

Installation phase is similar for all the range, so Extrapolation Coefficient = 1.

Use stage is globally proportional to the energy consummation of the product:

$$Extrapolation\ coefficient = \frac{\text{Energy Consummation of product required}}{\text{Energy Consummation of reference product}}$$

Table 5: Extrapolation Factors for all environmental indicators* of the range concerning the phases of Manufacturing, Distribution, End of life and Module D

Items	DACF15-	DACF15S-	DACF25-	DACF25S-
11-150	0.517	0.517	0.517	0.517
11-275	0.525	0.525	0.525	0.525
11-320	0.529	0.529	0.529	0.529
11-440	0.540	0.540	0.540	0.540
31-150	0.976	0.976	0.976	0.976
31-275	1	1	1	1
31-320	1.03	1.03	1.03	1.03
31-440	1.04	1.04	1.04	1.04

***Exception for three indicators ADP-e, HTP-C and IRP only manufacturing and module phases, the results are indicated below.**

Concerning the installation stage A5, the extrapolation factor is 1 for all references of the range. Indeed, the value of each environmental impact is the same that our reference product, no difference during this stage of life.

Concerning the use stage B6, the value depends on energy consummation in Watt/h. The results are affected by the network performance of the product.

Table 6: Extrapolation Factors for all environmental indicators of the range concerning the phase of Utilisation

Items	DACF15-	DACF15S-	DACF25-	DACF25S-
11-150	0.17	0.17	0.17	0.17
11-275	0.33	0.33	0.33	0.33
11-320	0.33	0.33	0.33	0.33
11-440	0.33	0.33	0.33	0.33
31-150	0.52	0.52	0.52	0.52
31-275	1	1	1	1
31-320	1	1	1	1
31-440	1.74	1.74	1.74	1.74

For our reference product, the impact in HTP-C comes from 51.45% for the Cage item and 33.47% for the Screw item. We can deduce that the more cages and screws a component has, the greater its impact will be on HTP-C.

Table 7: Extrapolation Factors for HTP-C indicator of the range concerning the phases of Manufacturing and Module D

Items	DACF15-	DACF15S-	DACF25-	DACF25S-
11-150	0.67	0.67	0.67	0.67
11-275	0.67	0.67	0.67	0.67
11-320	0.67	0.67	0.67	0.67
11-440	0.67	0.67	0.67	0.67
31-150	1	1	1	1
31-275	1	1	1	1
31-320	1	1	1	1
31-440	1	1	1	1

On our reference product, 80% of the IRP impact comes from the varistor item. It follows that the more varistors a component has and the heavier they are (weight related to voltage), the greater the impact.

Table 8: Extrapolation Factors for IRP indicator of the range concerning the phases of Manufacturing and Module D

Items	DACF15-	DACF15S-	DACF25-	DACF25S-
11-150	0.22	0.22	0.22	0.22
11-275	0.33	0.33	0.33	0.33
11-320	0.39	0.39	0.39	0.39
11-440	0.53	0.53	0.53	0.53
31-150	0.66	0.66	0.66	0.66
31-275	1	1	1	1
31-320	1.17	1.17	1.17	1.17
31-440	1.60	1.60	1.60	1.60

Concerning the indicator Resource use, minerals and metals (ADP-e), the impact comes from 72% of the component tube gaz decharge that is present in the same quantity in all the product range. So we can consider for the **phases of Manufacturing and Module D that the extrapolation factor for ADP-e is 1**.

VERIFICATION

Registration number: ***CITE-00002-V01.01-EN***	Drafting rules:**: *« PCR-ed4-FR-2021 09 06 »*** ***Supplemented by « PSR-005-ed3.1-FR-2023 12 08»***
Verifier accreditation number: ***VH55***	Information and reference documents: **www.pep-ecopassport.org**
Date of issue: 11-2025	Validity period**: 5 ans**
ndependent verification of the declaration and data in compliance with ISO 14025: 2006	
Internal : ☐	**External : ☒**
The PCR review was conducted by a panel of experts chaired by Julie Orgelet (DDemain)	
PEPs are compliant with XP C08-100-1:2016 and EN 50693:2019 or NF E38-500 :2022 The components of the present PEP may not be compared with components from any other program.	
Document complies with ISO 14025:2006 “Environmental labels and declarations. Type III environmental declarations”	