Product Environmental Profile

FNQ-R Fuse

Representative product	FNQ-R-2 Fuse (Eaton Bussmann series FNQ-R fuse) PSR Product Category: Other Equipment (Passive product - continuous operation)
Description of the product	Eaton Bussmann Series offers a complete range of FNQ-R Fuse. FNQ-R Fuses provides 10X better current limitation to help prevent equipment damage caused by short-circuit events. These fuses are ideal for critical industrial or commercial applications that have specific current limitation requirements. The representative FNQ-R Fuse under the study is Eaton Bussmann series FNQ-R Fuse with the offerings ranges from 0.25A to 30A of current rating. Representative product selected for the study has current rating of 2 A.
Homogeneous Environmental Families Covered	The PEP covers FNQ-R fuse Fuses with current rating from 0.25 to 30A. FNQ-R-2 (Reference Product), FNQ-R-1/4, FNQ-R-3/10, FNQ-R-4/10, FNQ-R-1/2, FNQ-R-6/10, FNQ-R-3/4, FNQ-R-8/10, FNQ-R-1, FNQ-R-1-1/8, FNQ-R-1-1/4, FNQ-R-1-3/10, FNQ-R-1-4/10, FNQ-R-1-1/2, FNQ-R-1-6/10, FNQ-R-1-8/10, FNQ-R-2-1/4, FNQ-R-2-1/2, FNQ-R-2-8/10, FNQ-R-3, FNQ-R-3-2/10, FNQ-R-3-1/2, FNQ-R-4, FNQ-R-4-1/2, FNQ-R-5, FNQ-R-5-6/10, FNQ-R-6, FNQ-R-6-1/4, FNQ-R-7, FNQ-R-7-1/2, FNQ-R-8, FNQ-R-9, FNQ-R-10, FNQ-R-12, FNQ-R-15, FNQ-R-17-1/2, FNQ-R-20, FNQ-R-25, FNQ-R-30
Functional unit	To protect the circuit for 20 years of installation against the overload of more than 2A current and 600 Vac rated voltage.
Company information	Eaton Bussmann S. de R. L de C.V., Circuit Protection Division, Prolongacion Hermanos, Escobar, 7750 Partido Manuel Doblado, Cd. Juarez, Chih. Mexico 32310. Email: productstewardship-es@eaton.com

Constituent Materials			
Reference product mass	1.63E-02 kg (Including packaging)		
Category PEP Material	Materials	Mass (kg)	Percentage (%)
Others	Corrugated Cardboard	5.60E-03	34.4%
Others	Wood	2.78E-03	17.1%
Metals	Copper	2.50E-03	15.4%
Others	Quartz	1.70E-03	10.4%
Metals	Zinc	1.06E-03	6.5%
Others	Glass Fibre	9.36E-04	5.8%
Others	Melamine	6.24E-04	3.8%
Others	Silicon Rubber	6.00E-04	3.7%
Metals	Tin	2.64E-04	1.6%
Others	Paper	1.67E-04	1.0%
Others	Glue	2.05E-05	0.13%
Metals	Silicon	1.28E-05	<0.1%
Metals	Silver	1.04E-05	<0.1%
Metals	Nickel	2.00E-06	<0.1%
Total		**1.63E-02**	**100%**

Substance Assessment

The representative product is compliant with the EU-RoHS Directive (2011/65/EU) without any exemption and the product doesn't contain any substance listed as Substance-of-Very-High-Concern (SVHC) on the Candidate List of the EU-REACH Regulation (1907/2006/EC). The substance assessment does not apply to the following products FNQ-R-1/4, FNQ-R-3/10, FNQ-R-4/10 as they contain one or more of the restricted substances as per the RoHS Directive or the presence of such a substance is exempted as outlined in the Annexes III/IV.

Additional Environmental Information	
Manufacturing	The reference product is assembled at an Eaton plant holding management system certifications according to ISO 14001 standards.
Distribution	Eaton is committed to minimizing weight and volume of product and packaging with focus to optimize transport efficiency.
Installation	The installation of the product does not require any additional energy source and no waste other than the obsolete product packaging is generated during this step.
Use	The product does not have maintenance during operation.
End of life	The recyclability rate of the overall product is 40% if it is properly dismantled prior to shredding. The rate is calculated based on "ECO'DEEE recyclability and recoverability calculation method" (version V1, 20 Sep. 2008 presented to the French Agency for Environment and Energy Management: ADEME).

Environmental Impacts	
The calculation of the environmental impacts is the result of the Product's Life Cycle Analysis in accordance with ISO 14040/44, covering the entire lifecycle, i.e. "Cradle-to-Grave" including the following life cycle phases: production, distribution, installation, use and end of life. System modelling was carried out using the commercial LCA software EIME v5.9.4 with database version CODDE-2022-01.	
Manufacturing Phase	The product is assembled as well as packed at Eaton Bussmann plant in Mexico. Energy model used: Mexico
Distribution Phase	Distribution of the product in its packaging from the Eaton's last logistics platform to the installation place in USA is considered as per PCR rules.
Installation Phase	Product is installed in USA. Only treatment of packaging waste is considered in this phase. Energy model used for treatment of packaging: Europe
Use Phase	PSR Product Category: Other Equipment (Scenario: Passive product - continuous operation) Reference lifetime: 20 Years Energy model used: USA Usage profile: The product has an average power loss of 0.139 W in an 100% active mode with 30% of the loading rate. For 100 % of the use time rate, total losses are 24.30 kWh over 20 years. Product do not require any maintenance/replacement during useful life.
End of life Phase	Product disposed with WEEE guidelines. Energy model used: Europe

Environmental Impact Indicators: Mandatory

Environmental impact indicators	Units	Total	Manufacturing (A1-A3)	Distribution (A4)	Installation (A5)	Use (B1-B7)	End of Life (C1-C4)
Resource use, minerals and metals (ADPe)	kg Sb eq.	1.80E-05	1.69E-05	1.53E-10	2.53E-10	5.36E-07	6.43E-07
Resource use, fossils (ADPf)	MJ	2.83E+02	9.87E-01	5.42E-02	7.92E-02	2.82E+02	2.59E-02
Acidification Potential (AP)	mole of H^+ eq.	7.16E-02	1.10E-03	2.46E-05	3.29E-05	7.03E-02	1.02E-04
Eutrophication, freshwater (Epf)	kg P eq.	4.21E-05	2.85E-07	1.46E-09	5.63E-08	2.05E-05	2.13E-05
Eutrophication marine (Epm)	kg N eq.	8.49E-03	8.51E-05	1.15E-05	1.49E-05	8.36E-03	1.51E-05
Eutrophication, terrestrial (Ept)	mol N eq.	9.94E-02	8.98E-04	1.26E-04	8.89E-05	9.81E-02	1.84E-04
Climate change-Total (GWP)	kg CO_2 eq.	1.34E+01	7.83E-02	3.89E-03	1.38E-02	1.33E+01	1.19E-02
Climate change-Biogenic (GWPb)	kg CO_2 eq.	1.60E-02	1.27E-03	0.00E+00	2.77E-04	1.40E-02	3.77E-04
Climate change-Fossil (GWPf)	kg CO_2 eq.	1.34E+01	7.70E-02	3.89E-03	1.35E-02	1.33E+01	1.15E-02
Climate change-Land use and land use change (GWPlu)	kg CO_2 eq.	1.89E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.89E-08
Ozone depletion (ODP)	kg CFC-11 eq.	6.98E-08	1.26E-08	5.95E-12	4.28E-10	5.64E-08	4.23E-10
Photochemical ozone formation - human health (POCP)	kg NMVOC eq.	2.81E-02	2.96E-04	3.19E-05	2.50E-05	2.77E-02	4.50E-05
Water use (WU)	m^3 eq.	5.32E-01	4.21E-02	1.47E-05	2.85E-03	4.77E-01	9.96E-03

Inventory Flow Indicators: Mandatory

Inventory flow indicators	Units	Total	Manufacturing (A1-A3)	Distribution (A4)	Installation (A5)	Use (B1-B7)	End of Life (C1-C4)
Use of renewable primary energy excluding renewable primary energy used as raw material	MJ	3.53E+01	-1.90E-02	7.23E-05	4.71E-03	3.54E+01	9.07E-03
Use of renewable primary energy resources used as raw material	MJ	1.54E-01	1.54E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources	MJ	3.55E+01	1.35E-01	7.23E-05	4.71E-03	3.54E+01	9.07E-03
Use of non-renewable primary energy excluding non-renewable primary energy used as raw material	MJ	2.83E+02	9.54E-01	5.42E-02	7.92E-02	2.82E+02	2.59E-02
Use of non-renewable primary energy resources used as raw material	MJ	3.23E-02	3.23E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources	MJ	2.83E+02	9.87E-01	5.42E-02	7.92E-02	2.82E+02	2.59E-02
Use of secondary material	kg	5.40E-06	5.40E-06	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
Use of nonrenewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of freshwater	m^3	1.24E-02	9.79E-04	3.43E-07	6.64E-05	1.11E-02	2.32E-04
Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	6.52E-03	0.00E+00	0.00E+00	3.42E-03	0.00E+00	3.10E-03
Materials for energy recovery	kg	2.88E-03	0.00E+00	0.00E+00	1.80E-03	0.00E+00	1.08E-03

Inventory flow indicators	Units	Total	Manufacturing (A1-A3)	Distribution (A4)	Installation (A5)	Use (B1-B7)	End of Life (C1-C4)
Exported Energy	MJ	1.23E-03	0.00E+00	0.00E+00	1.23E-03	0.00E+00	0.00E+00
Hazardous waste disposed	kg	7.35E-01	4.67E-01	0.00E+00	7.68E-05	2.60E-01	7.72E-03
Non-hazardous waste disposed	kg	2.17E+00	1.71E-01	1.36E-04	2.56E-02	1.96E+00	7.34E-03
Radioactive waste disposed	kg	3.96E-04	2.15E-05	9.70E-08	2.80E-06	3.70E-04	1.90E-06
Biogenic carbon content of the product	kg C	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon content of the associated packaging	kg C	2.72E-03	2.72E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Environmental Impact Indicators: Optional

Environmental impact indicators	Units	Total	Manufacturing (A1-A3)	Distribution (A4)	Installation (A5)	Use (B1-B7)	End of Life (C1-C4)
Ecotoxicity, freshwater	CTUe	1.63E+02	2.09E+00	2.61E-03	7.74E-02	1.58E+02	2.26E+00
Human toxicity, cancer	CTUh-c	7.60E-08	7.22E-08	6.82E-14	2.24E-09	1.56E-09	3.86E-11
Human toxicity, non-cancer	CTUh-nc	8.62E-08	1.91E-08	7.38E-12	4.94E-11	6.55E-08	1.49E-09
Ionizing radiation, human health	kBq U235 eq.	1.25E+01	1.33E+00	9.45E-06	3.02E-04	1.12E+01	6.75E-04
Land use	--	2.23E-01	3.89E-04	0.00E+00	0.00E+00	1.78E-01	4.45E-02
EF-particulate Matter	Disease occurrence	4.83E-07	6.54E-09	2.00E-10	2.26E-10	4.75E-07	7.69E-10
Total Primary Energy	MJ	3.19E+02	1.12E+00	5.42E-02	8.39E-02	3.17E+02	3.50E-02

To evaluate the environmental impact of other product covered by this PEP, multiply the impact figures by-

Extrapolation Factors for Manufacturing, Distribution, Installation and End-of-Life Phase:

Series	Current rating (A)	Multiplying factor
FNQ-R Fuse Series	0.25,0.3,0.4,0.5,0.6,0.75,0.8,1.0,1.13,1.25,1.3,1.4, 1.5,1.6,1.8,2,2.25,2.5,2.8,3,3.2,3.5,4,4.5,5,5.6,6, 6.25,7,7.5,8,9,10,12,15,17.5,20,25,30	1

Extrapolation Factors for Use Phase:

Product	Multiplying factor
FNQ-R-2 (Reference Product)	1
FNQ-R-1/4	0.17
FNQ-R-3/10	0.21
FNQ-R-4/10	0.15
FNQ-R-1/2	1.02
FNQ-R-6/10	1.04
FNQ-R-3/4	1.03
FNQ-R-8/10	0.91
FNQ-R-1	1.01
FNQ-R-1-1/8	1
FNQ-R-1-1/4	0.9
FNQ-R-1-3/10	0.89
FNQ-R-1-4/10	0.93
FNQ-R-1-1/2	0.96
FNQ-R-1-6/10	0.92
FNQ-R-1-8/10	0.95
FNQ-R-2-1/4	0.94
FNQ-R-2-1/2	0.96
FNQ-R-2-8/10	0.99
FNQ-R-3	0.98

Product	Multiplying factor
FNQ-R-3-2/10	1.04
FNQ-R-3-1/2	0.96
FNQ-R-4	1
FNQ-R-4-1/2	1.08
FNQ-R-5	0.99
FNQ-R-5-6/10	0.82
FNQ-R-6	1.31
FNQ-R-6-1/4	1.03
FNQ-R-7	1.07
FNQ-R-7-1/2	0.94
FNQ-R-8	1.23
FNQ-R-9	1.13
FNQ-R-10	1.05
FNQ-R-12	1.19
FNQ-R-15	0.94
FNQ-R-17-1/2	1.04
FNQ-R-20	1.23
FNQ-R-25	1.29
FNQ-R-30	1.58

Disclaimer
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Internal	X	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 or EN 50693:2019 *The components of the present PEP may not be compared with components from any other program.*			
Document in compliance with ISO 14025: 2010 « Environmental labels and declarations. Type III environmental declarations »			