

ENVIRONMENTAL PRODUCT DECLARATION

20 A Single-Pole Dual Function (CAFCI/GFCI) Plug-On Neutral Circuit Breaker

Q115DF(N), Q120DF(N)

Type II according to ISO 14021 including life cycle impact assessment (LCIA)



SIEMENS

General information

This environmental product declaration (EPD) is based on the international standard ISO 14021 (“Environmental labels and declarations – Self declared environmental claims – Type II environmental labelling”). The data in this EPD has been evaluated on a full-scale life cycle assessment (LCA) study according to ISO 14040/44, taking into account the product category rules (PCR) for electronic and electrotechnical products and systems defined in EN 50693, as well as product specific rules (PSR) for low-voltage switchgear and control gear equipment in IEC TS 63058 ED1.0

Siemens is dedicated to an environmentally conscious design of its products in line with IEC 62430 and has implemented an integrated management system according to ISO 9001, ISO 14001 and ISO 45001.

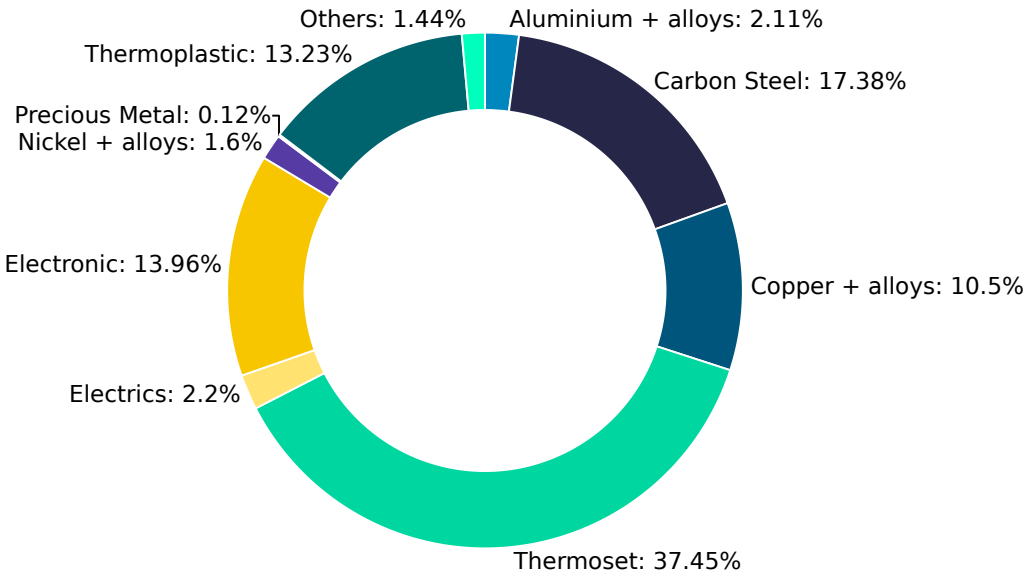
Products	**All variants in the range of Q115DF(N) to Q120DF(N)**
Represented by the reference product	Q120DFN: 120V 20A Dual Function CAFCI/GFCI
Product Description	The dual-function circuit breaker combines class A 5mA GFCI and combination type AFCI, protecting against both arc faults and ground faults. This, along with the new self-test feature, makes it the first in class in electrical safety for homeowners.
Functional Unit	- To carry its rated current, as defined in UL 489, 1699, and 943 without interruption for a period of 20 years. - To protect against overload and short-circuit events based on the product’s rated current and short-circuit rating[1]

[1] The lifetime value used for calculation is a reference value and does not equate with the minimum, average or real life time.

Material composition

The following chart outlines the overall material composition of the calculated reference product without packaging. Product weight of 0.11 kg adds up with packaging weight of 0.02 kg to a total weight of 0.13 kg. Packaging consists of: Corrugated box (average composition), Graphic paper.

Product Weight 0.11 kg



Substance assessment

At Siemens, we are committed to the development and production of environmentally sound and sustainably produced equipment. This includes avoiding hazardous substances in our products without compromising their benefits for our customers. Please visit the following website to learn more about how we comply with product-related environmental regulations like RoHS, REACH, WEEE and others: Product Related Environmental Protection

Life cycle stages and reference scenarios



Manufacturing

This stage covers the extraction of natural resources, production of raw materials, manufacturing, packaging, and transportation.



Distribution and Operation

This stage covers the product's distribution, installation, use, and maintenance. Different operating conditions can lead to deviations from the reference scenario.



End-of-Life

This stage covers the disassembly or shredding and material recycling of all recyclable materials, as well as energy recovery, thermal treatment and the disposal of all other materials.

Scenarios

Energy model used:
China (standard mix), Philippines (standard mix)

Transportation model:
Road Truck-trailer (34-40 t) 100.0 km

Energy model used:
United States (standard mix)

Distribution scenario:
Container ship (large ship 200000 DWT 23000 TEU) 19000 km, Truck-trailer (34-40 t) 1000 km

Use Scenario:
0.9 W full load, 50% load rate, 30% use time rate, reference lifetime: 20 years

Energy model used:
Americas

End-of-Life methodology:
Avoided burden (net-scrap calculation)

Key environmental performance indicators

The following impact categories characterize the product's environmental footprint. They have been calculated with LCIA methodology EF3.1; LCA tool: Green Digital Twin (GDT), Database: One Siemens LCA Database (based on MLC CUP 2023.2, formerly GaBi).

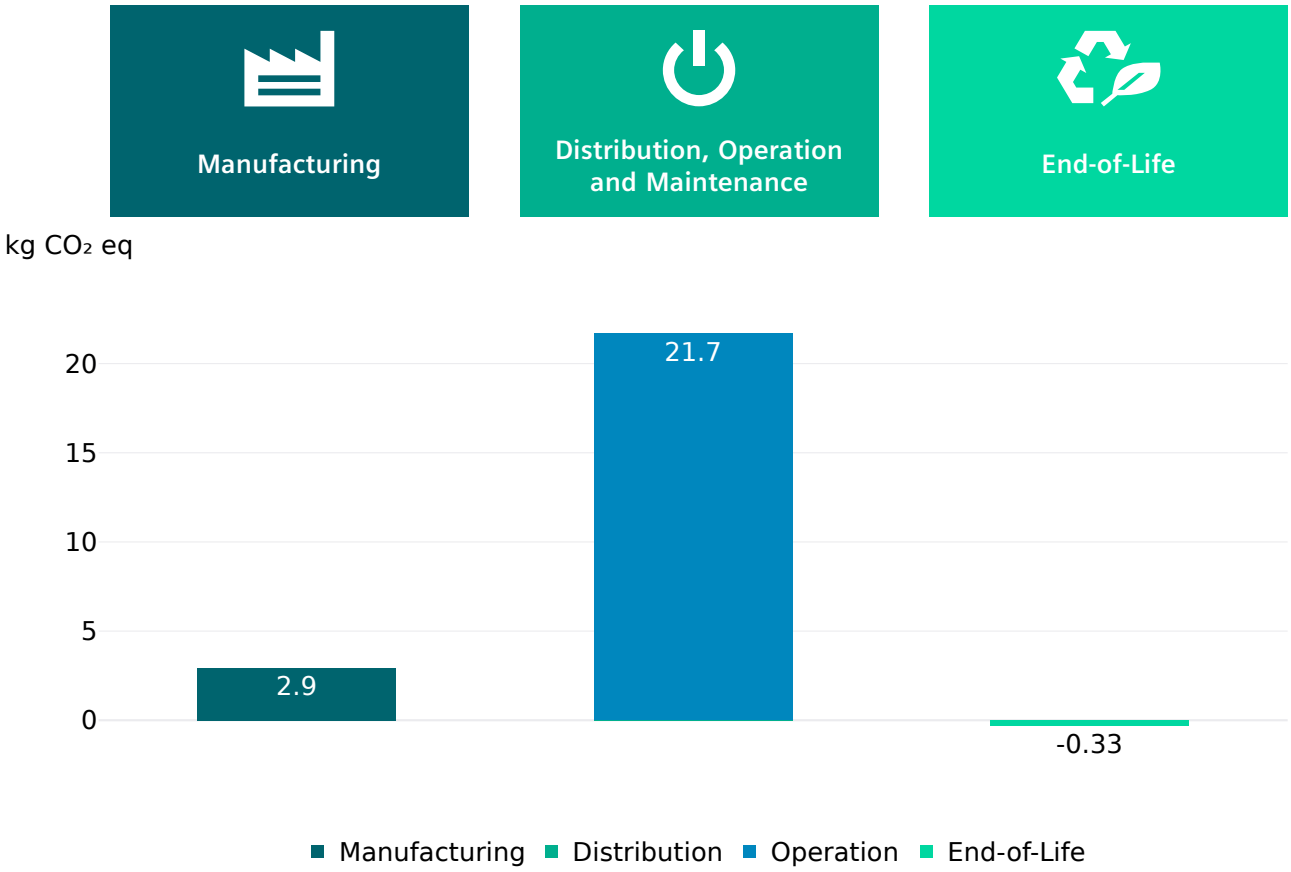
To ensure the high quality and completeness of the LCA results, Primary Data have been used whenever possible. Datasets for resources, such as electrical energy or natural gas, are chosen from the region where the device is produced and assembled. If primary data are not available, datasets reflecting state-of-the-art manufacturing technology are considered.

For products belonging to the same homogeneous product family range the scaling factors in the appendix can be used to derive their corresponding environmental impacts according to the standard EN50693.

Impact Category	Unit	Total	Manufacturing	Distribution	Operation	End-of-life
Acidification	Mole of H+ eq	6.49E-2	4.07E-2	3.73E-4	3.07E-2	-6.87E-3
Climate change – total	kg CO_2 eq	2.43E+1	2.93E+0	2.06E-2	2.17E+1	-3.26E-1
Climate change – fossil	kg CO_2 eq	2.43E+1	2.92E+0	2.05E-2	2.16E+1	-3.24E-1
Climate change – biogenic	kg CO_2 eq	1.64E-2	5.11E-3	3.48E-5	1.26E-2	-1.31E-3
Climate Change, land use and land use change	kg CO_2 eq	2.52E-3	1.56E-3	9.14E-5	1.37E-3	-4.09E-4
Ecotoxicity, freshwater – total	CTUe	1.25E+2	2.65E+1	1.87E-1	1.01E+2	-2.83E+0
Eutrophication, freshwater	kg P eq	2.36E-5	1.06E-5	3.85E-8	1.30E-5	-4.35E-8
Eutrophication, marine	kg N eq	1.11E-2	4.84E-3	9.25E-5	6.84E-3	-6.41E-4
Eutrophication, terrestrial	Mole of N eq	1.21E-1	5.28E-2	1.02E-3	7.42E-2	-7.04E-3
Human toxicity, cancer – total	CTUh	4.06E-9	1.31E-9	3.61E-12	2.89E-9	-1.37E-10
Human toxicity, non-cancer – total	CTUh	1.03E-7	5.75E-8	1.40E-10	5.09E-8	-5.87E-9
Ionising radiation, human health	kBq U235 eq	3.15E+0	1.50E-1	5.95E-5	3.01E+0	-6.12E-3
Land Use	dimensionless (pt)	4.44E+1	9.42E+0	5.65E-2	3.61E+1	-1.15E+0
Ozone depletion	kg CFC-11 eq	2.27E-10	1.21E-10	2.01E-15	1.07E-10	-9.71E-13
Particulate matter	Disease incidences	6.01E-7	3.69E-7	6.53E-9	2.85E-7	-5.98E-8
Photochemical ozone formation, human health	kg NMVOC eq	3.25E-2	1.48E-2	2.61E-4	1.95E-2	-2.07E-3
Resource use, fossils	MJ	4.07E+2	4.11E+1	2.63E-1	3.70E+2	-4.43E+0
Resource use, mineral and metals	kg Sb eq	2.62E-4	7.37E-4	7.50E-10	1.39E-6	-4.77E-4
Water use	m^3 water eq deprived water	5.43E+0	7.24E-1	1.37E-4	4.92E+0	-2.09E-1

Climate change

This chart shows the overall impact of the product on climate change – total. This chart shows the overall impact of the product on climate change – total. The operations phase is the lifecycle phase with the biggest overall impact. Different operating conditions can lead to deviations from the reference scenario.



End-of-Life results

The end-of-life stage was modelled by shredding of the device, followed by sorting and material separation process.

It leads to:

- **an overall** product recyclability of up to 37% mainly due to metal content
- **an** energy recoverability of up to 49% from plastic materials
- **a** minimum disposal rate of 14%

The exact final values depend on the used recycling process and add up to 100%.

Note: The device should not be disposed of as unsorted municipal waste. Special treatment for specific components may be mandated by law or recommended for environmental reasons. Observe all local and applicable laws.

Appendix

To extrapolate the impact from the reference product to another product from the range, multiply the following scaling factors by the impact category per life cycle stage from page 4:

Product	Manufacturing	Distribution	Use Phase	End-of-Life
Q120DFN	1.0	1.0	1.0	1.0
Q115DFN	1.0	1.0	**0.9**	1.0
Q120DF	1.0	**1.1**	1.0	1.0

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Please be aware that the data of this EPD cannot be compared with data calculated based upon product category rules (PCRs) other than the standards mentioned above. The values given are only valid within the context specified and cannot be used directly to draw up the environmental assessment of an installation.

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