ENVIRONMENTAL PRODUCT DECLARATION

SINAMICS S120 Booksize

Single motor modules 300mm

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.
The applied use phase scenario including load profile is based on EN 50598-3:2015 Table 5.

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.

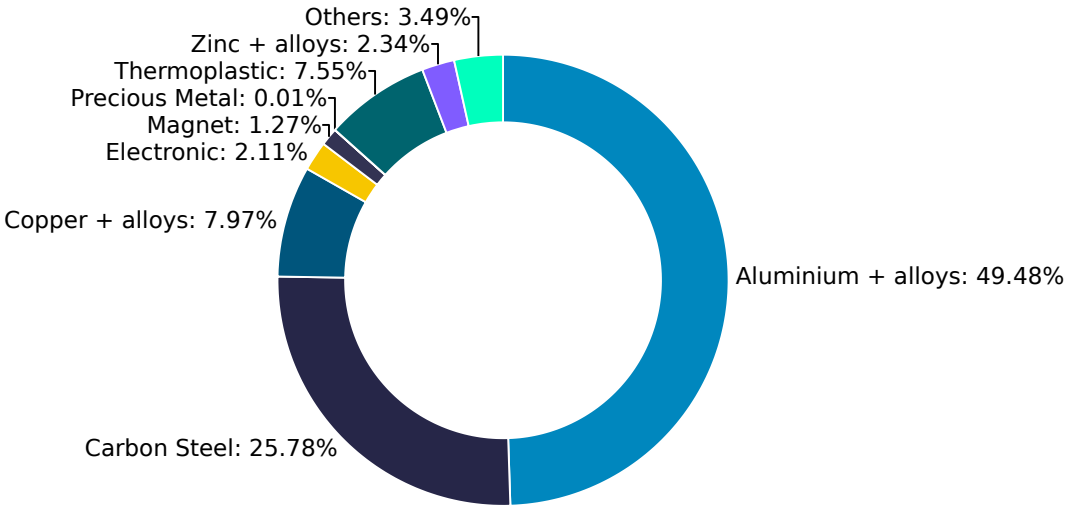
Products	**SINAMICS S120 Booksize Motor Modules (50-300mm)**
Represented by the reference product	6SL3120-1TE32-0AA4, S120 MOMO 400V/200A
Product Description	SINAMICS S120 Single Motor Module Input: DC 510-720V, 200A Output: 3AC 0-480V, 200A, Rated Power: 107kW, Design: Booksize IP20
Functional Unit	Modular multi-axis drive system for position, velocity and torque control of asynchronous, synchronous and reluctance three-phase rotary and linear motors.[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 21.0 kg adds up with packaging weight of 2.57 kg to a total weight of 23.57 kg. Packaging consists of: PE film, Corrugated box (average composition), Graphic paper, EPS-Foam (30 kg/m3).

Product Weight 21.0 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),
Europe (standard mix)

Transportation model:
Container ship (Suezmax 160000 DWT 18500 TEU) 19000 km,
Truck 7.5t-12t gross weight 1000 km

Energy model used:
Europe (standard mix)

Distribution scenario:
Truck (7.5 t-12 t) 3500 km

Use Scenario:
Operation profile is defined by 4 operational points (OP):
OP1: 10% of time at 50% speed and 200% torque.
OP2: 5% of time at 100% speed and 50% torque.
OP3: 60% of time at 50% speed and 50% torque.
OP4: 25% of time at 0% speed and 0% torque.
Lifetime 15 years and annual operation 5000h/year

Energy model used:
Europe (standard mix)

End-of-Life methodology:
Avoid Burden (plastic waste incineration with energy recovery)

Key environmental performance indicators

The following impact categories characterize the product's environmental footprint. They have been calculated with LCIA methodology 01 EN15804+A2 (EF 3.1); LCA tool: Green Digital Twin (GDT), Database: One Siemens LCA Database (based on MLC CUP 2024.1, formerly GaBi).

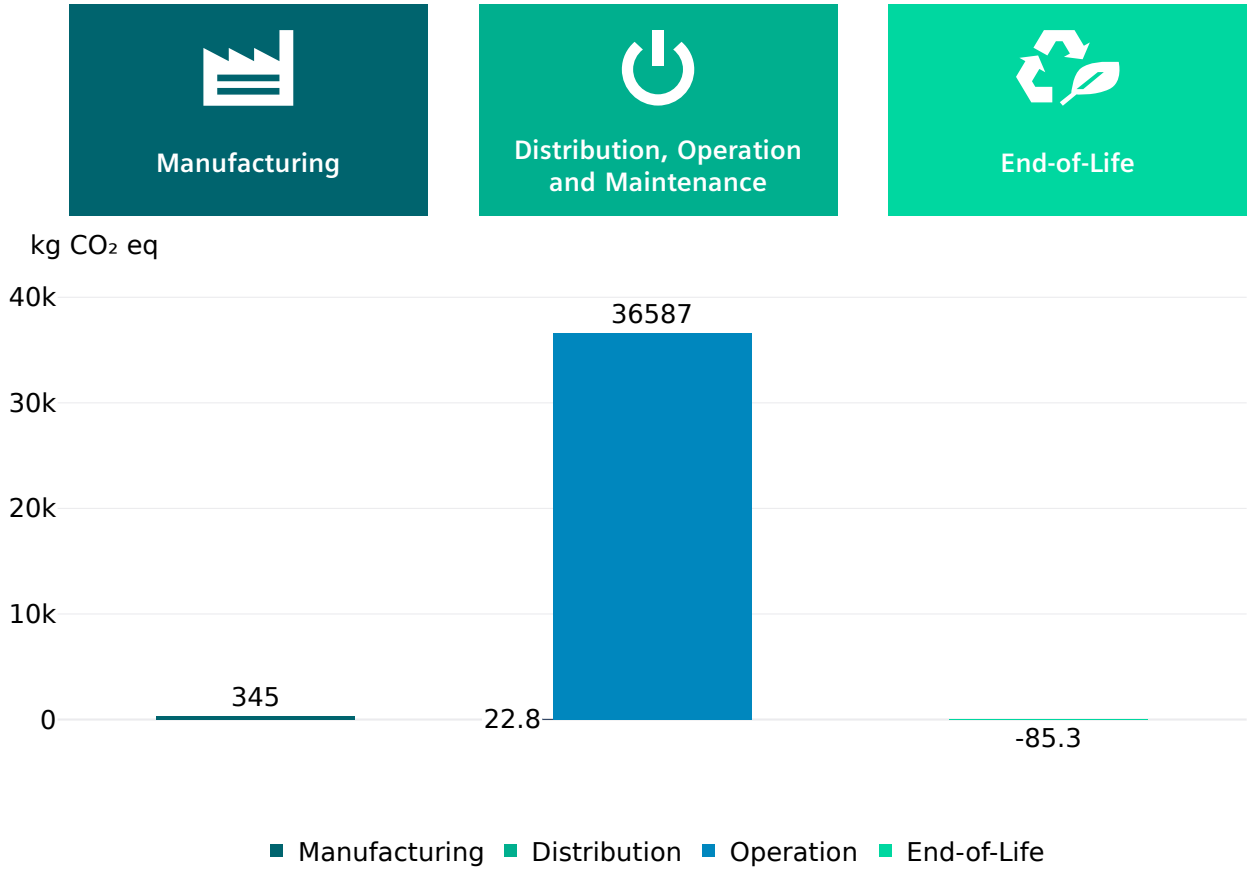
To ensure the high quality and completeness of the LCA results, Primary Data have been used whenever possible. Datasets for resources, such as electrical energy or natural gas, are chosen from the region where the device is produced and assembled. If primary data are not available, datasets reflecting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

For products belonging to the same homogeneous product family range the following extrapolation criteria (Appendix) can be used to derive their climate change impact in kg CO2 eq. The rest of the listed impacts will be determined in the following version of the EPD.

Impact Category	Unit	Total	Manufacturing	Distribution	Operation	End of life
Acidification	Mole of H+ eq	7.24E+1	3.11E+0	3.18E-2	6.99E+1	-6.13E-1
Climate change – total	kg CO_2 eq	3.69E+4	3.45E+2	2.28E+1	3.66E+4	-8.53E+1
Climate change – fossil	kg CO_2 eq	3.65E+4	3.19E+2	2.24E+1	3.62E+4	-8.52E+1
Climate change – biogenic	kg CO_2 eq	3.62E+2	2.52E+1	-1.93E-1	3.37E+2	-8.76E-2
Climate Change, land use and land use change	kg CO_2 eq	5.92E+0	4.00E-1	3.48E-1	5.52E+0	3.88E-4
Ecotoxicity, freshwater – total	CTUe	2.22E+5	1.86E+3	2.03E+2	2.20E+5	-2.87E+2
Eutrophication, freshwater	kg P eq	1.53E-1	1.66E-3	8.85E-5	1.51E-1	-6.63E-5
Eutrophication, marine	kg N eq	1.78E+1	4.52E-1	1.20E-2	1.75E+1	-8.04E-2
Eutrophication, terrestrial	Mole of N eq	1.87E+2	4.89E+0	1.42E-1	1.83E+2	-8.72E-1
Human toxicity, cancer – total	CTUh	1.26E-5	3.10E-7	4.10E-9	1.24E-5	-2.35E-8
Human toxicity, non-cancer – total	CTUh	1.91E-4	2.51E-6	1.84E-7	1.89E-4	-7.71E-7
Ionising radiation, human health	kBq U235 eq	1.99E+4	1.98E+1	7.36E-2	1.99E+4	-1.05E+1
Land Use	dimensionless (pt)	3.23E+5	1.85E+3	1.34E+2	3.21E+5	-5.59E+1
Ozone depletion	kg CFC-11 eq	8.54E-7	3.22E-8	7.86E-14	8.22E-7	-5.86E-10
Particulate matter	Disease incidences	6.09E-4	3.25E-5	3.48E-7	5.84E-4	-7.47E-6
Photochemical ozone formation, human health	kg NMVOC eq	4.73E+1	1.35E+0	3.14E-2	4.62E+1	-2.48E-1
Resource use, fossils	MJ	7.63E+5	4.48E+3	1.86E-1	7.59E+5	-1.08E+3
Resource use, mineral and metals	kg Sb eq	7.81E-2	7.89E-2	1.81E-6	6.78E-3	-7.60E-3
Water use	m^3 water eq deprived water	9.92E+3	6.20E+1	4.43E-1	9.87E+3	-1.66E+1

Climate change

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 considers the recyclability rates of metal, plastics contents and
minimum disposal rates according to the guidelines IEC TR 62635:2012 for end-oflife information provided by manufacturers and recyclers and for recyclability rate calculation of electrical and electronic equipment.

It leads to:

- product recyclability of up to 79%
- energy recoverability of up to 10%
- minimum disposal rate of 11%

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

For other MLFBs covered by this EPD under SINAMICS S120 MoMo homogenous product family, the climate change impact (CC) in kg CO2 eq. can be calculated for the manufacturing and end of life phases using linear regression equations according to the weight in kg (x) of the assessed product.

The following equations based on linear regression is defined as:

$$y = m \times x + b$$

where,

y.... climate change in kgCO2eq.

m.... scaling factor in kgCO2eq./kg of product

x .... mass of the product in kg without packaging

b .... intercept (offset) in kgCO2eq.

Thus, the factors for the **manufacturing phase** are:

m = 12.117 kgCO2eq./kg of converter, b = 45.04 kgCO2eq.

For **END of Life**:

m = -4.4641 kgCO2eq./kg of converter, b = 9.909 kgCO2eq.

For the **operation phase**, the climate change in kgCO2eq was derived for 400 V and rated power PR (LO) in kW for European standard energy mix, lifetime of 15 years, annual operation 5000h/year and three operation points.
The climate change values for operation phase are described in Tab. 1

Definition of the operational points are:

OP1: 10% of time at 50% speed and 200% torque.
OP2: 5% of time at 100% speed and 50% torque.
OP3: 60% of time at 50% speed and 50% torque.
OP4: 25% of time at 0% speed and 0% torque.

Tab.1 Climate change results for the operation phase

Width	mm	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**
Rated current	A	3 D-Type	5 D-Type	9 D-Type	18 C-Type	18 D-Type	24 C-Type	24 D-Type	2x3 D-Type	2x5 D-Type	2x9 D-Type
Climate change	kg CO2eq	539	702	1218	2927	2927	3911	3911	1030	1499	2904
Width	mm	**100**	**100**	**100**	**100**	**100**	**100**	**200**	**300**	**300**	
Rated current	A	30 C-Type	30 D-Type	45 C-Type	60 C-Type	2x18 C-Type	2x18 D-Type	85	132	200	
Climate change	kg CO2eq	5245	5245	6674	9296	5128	5128	14424	23814	39503	

Legal Disclaimer

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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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