



ENVIRONMENTAL PRODUCT DECLARATION

SINAMICS S120 Booksize

Active Line Module 16kW

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.

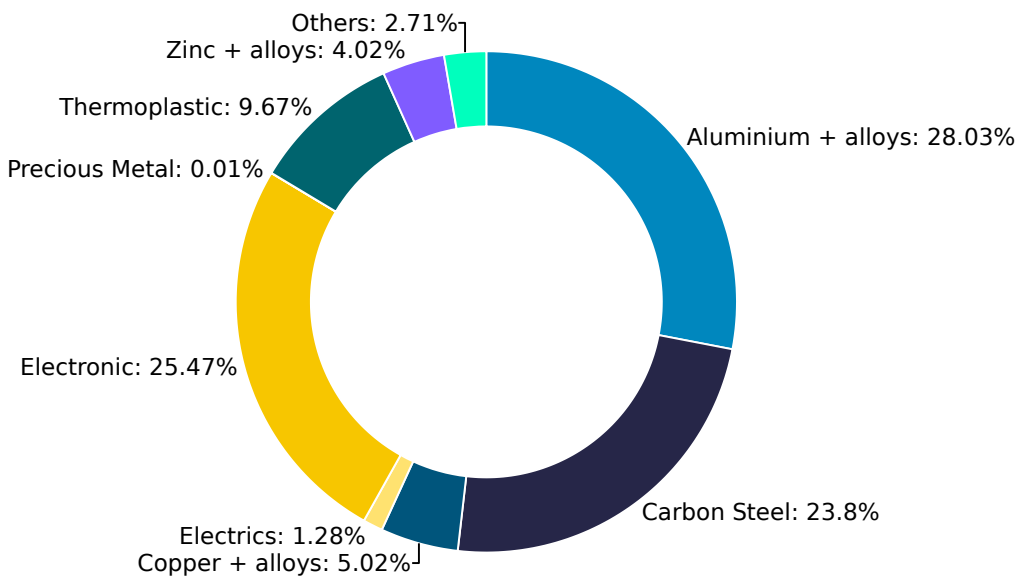
Products	SINAMICS S120 Active Line Modules, power range 16 to 120 kW at 380 ... 480 V 3AC
Represented by the reference product	6SL3130-7TE21-6AA4, 16 kW, 3AC 380 ... 480V
Product Description	The SINAMICS S120 Active Line Modules is one of the components of SINAMICS S120 Booksize drive system. ALM generate a constant, regulated DC voltage in the DC link from the 3-phase line supply voltage that supplies the connected Motor Modules with power. Input: 380-480V, 50/60HZ. Output: DC 600V. Power range 16 to 120kW. Internal air cooling, energy recovery capability, DRIVE-CLiQ.
Functional Unit	A device that converts 380-480V 3AC power into DC power and feeds to the MoMo module. Calculation of the environmental impacts is based on 15 years of product service lifetime. This value cannot be equated with the minimum, average or individual life time. 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 7.0 kg adds up with packaging weight of 0.38 kg to a total weight of 7.38 kg. Packaging consists of: PE, Corrugated box (average composition).

Product Weight 7.0 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: Germany (renewable mix), Germany (Thermal energy from biogas), China (standard mix), Europe (standard mix), Germany (standard mix) Transportation model: Road Truck (7.5 t-12 t) 1000.0 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: 61% of time at 100% Infeed Load OP2: 19% of time at 50% Infeed Load OP3: 8% of time at 25% Infeed Load OP4: 12% of time at 0% Infeed Load Lifetime 15 years and 5000h/year	Energy model used: EMEA End-of-Life methodology: Avoided burden (net-scrap calculation)

Key environmental performance indicators

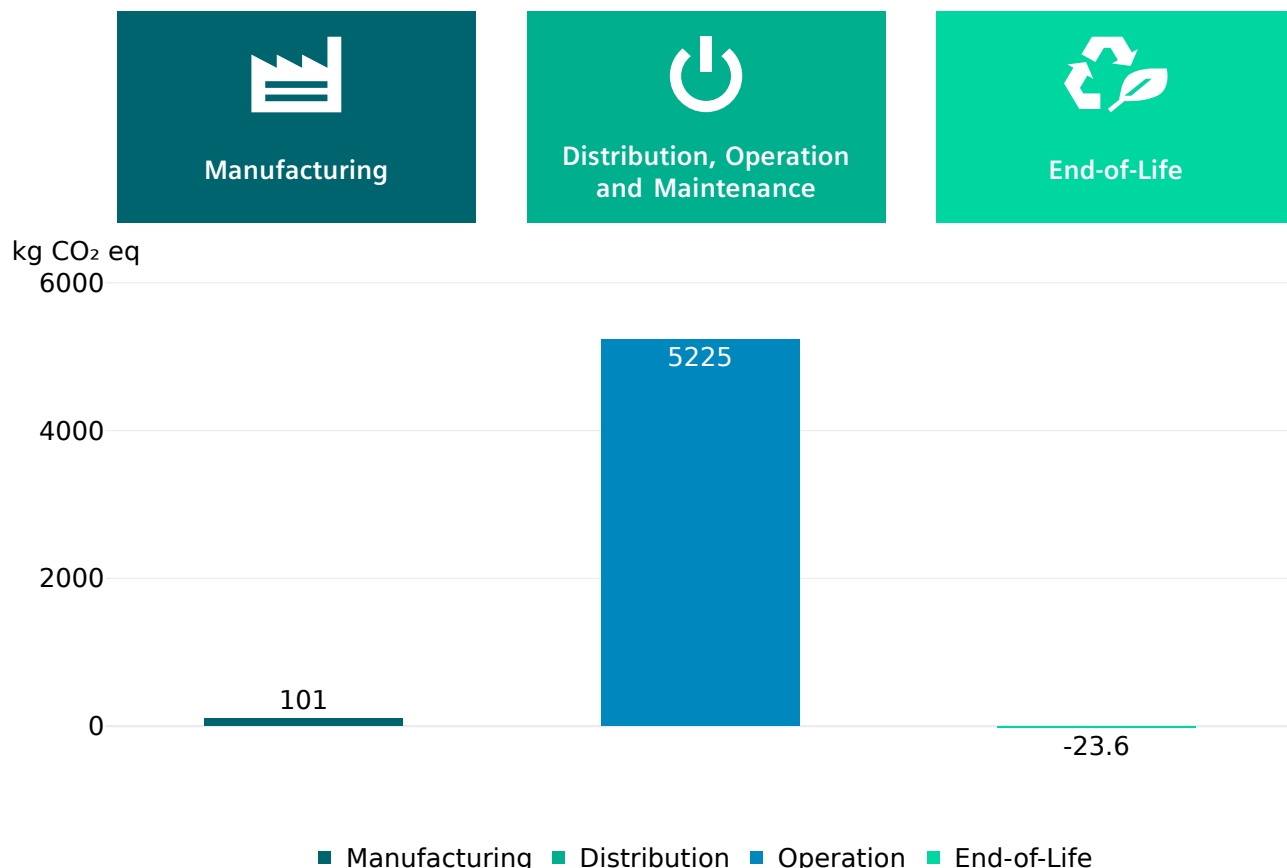
The following impact categories characterize the product's environmental footprint. They have been calculated with LCIA methodology EF3.1; LCA tool: Green Digital Twin (GDT), Database: One Siemens LCA Database (based on MLC CUP 2023.2, formerly GaBi).

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.

Impact Category	Unit	Total	Manufacturing	Distribution	Operation	End of life
Acidification	Mole of H+ eq	1.13E+1	5.40E-1	8.38E-3	1.10E+1	-2.48E-1
Climate change – total	kg CO ₂ eq	5.31E+3	1.01E+2	5.78E+0	5.22E+3	-2.36E+1
Climate change – fossil	kg CO ₂ eq	5.26E+3	1.00E+2	5.71E+0	5.18E+3	-2.36E+1
Climate change – biogenic	kg CO ₂ eq	4.66E+1	7.67E-1	1.56E-2	4.58E+1	-1.25E-2
Climate Change, land use and land use change	kg CO ₂ eq	6.11E-1	5.90E-2	5.37E-2	5.65E-1	-1.27E-2
Ecotoxicity, freshwater – total	CTUe	3.09E+4	6.76E+2	5.65E+1	3.02E+4	-8.99E+1
Eutrophication, freshwater	kg P eq	2.00E-2	5.83E-4	2.12E-5	1.94E-2	-1.39E-5
Eutrophication, marine	kg N eq	2.71E+0	8.66E-2	3.00E-3	2.65E+0	-2.43E-2
Eutrophication, terrestrial	Mole of N eq	2.83E+1	9.32E-1	3.57E-2	2.76E+1	-2.63E-1
Human toxicity, cancer – total	CTUh	1.67E-6	7.05E-8	1.15E-9	1.60E-6	-3.32E-9
Human toxicity, non-cancer – total	CTUh	2.71E-5	1.35E-6	5.10E-8	2.55E-5	1.37E-7
Ionising radiation, human health	kBq U235 eq	2.87E+3	7.16E+0	2.21E-2	2.87E+3	-2.43E+0
Land Use	dimensionless (pt)	4.34E+4	5.01E+2	3.30E+1	4.29E+4	-3.64E+1
Ozone depletion	kg CFC-11 eq	1.04E-7	8.16E-9	7.54E-13	9.57E-8	-1.44E-10
Particulate matter	Disease incidences	9.86E-5	8.36E-6	7.28E-8	9.29E-5	-2.68E-6
Photochemical ozone formation, human health	kg NMVOC eq	7.24E+0	2.55E-1	7.30E-3	7.05E+0	-7.83E-2
Resource use, fossils	MJ	1.10E+5	1.36E+3	7.89E+1	1.09E+5	-3.00E+2
Resource use, mineral and metals	kg Sb eq	3.18E-2	3.61E-2	3.84E-7	8.01E-4	-5.13E-3
Water use	m ³ water eq deprived water	1.16E+3	2.37E+1	7.00E-2	1.14E+3	-5.56E+0

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. The distribution stage of the reference product is not shown in the chart due to its relatively small contribution to climate change and its impact is included in the operation bar.



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-of-life information provided by manufacturers and recyclers and for recyclability rate calculation of electrical and electronic equipment.



It leads to:

- an overall **product recyclability of up to 69%** mainly due to metal content
- an **energy recoverability of up to 13%** from plastic materials
- a **minimum disposal rate of 18%**

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 Active Line Modules 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 based on the Mass in kg(x) of the assessed product.

The following equation based on linear regression is defined as:

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

where,

y climate change in kg CO₂eq.

m.... scaling factor in kg CO₂eq./kg of product

x mass of the product in kg without packaging

b intercept (offset) in kg CO₂eq.

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

m = 11.47 kgCO₂eq./kg of product, b= 15.37 kg CO₂eq

For **End of Life**:

m = -3.86 kgCO₂eq./kg of product, b= 5.14 kg CO₂eq

For the operation phase, the climate change in kgCO₂eq was derived for 400 V and rated power P_R (LO) in kW for European standard energy mix, lifetime of 15 years, annual operation 5000h/year and 4 operational points. The climate change values for operation phase are described in Table 1. The mass of S120 Active Line Modules are listed in Table 2.

Operation profile is defined by 4 operational points (OP):

OP1: 61% of time at 100% Infeed Load

OP2: 19% of time at 50% Infeed Load

OP3: 8% of time at 25% Infeed Load

OP4: 12% of time at 0% Infeed Load

Table. 1 Climate change results for the operation phase

Voltage	V	400	400	400	400	400
P _R (LO)	kW	16	36	55	80	120
Climate change	kg CO ₂ eq	5225	12295	17465	25551	41064

Table. 2 Mass of modules

Voltage(V)	MLFB	Power Rating(kW)	Mass(kg)
400	6SL3130-7TE21-6AA4	16	7
	6SL3130-7TE23-6AA3	36	10
	6SL3130-7TE25-5AA3	55	16
	6SL3130-7TE28-0AA3	80	25.8
	6SL3130-7TE31-2AA3	120	25.8

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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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