



ENVIRONMENTAL PRODUCT DECLARATION

SINAMICS G120X

Converters FSA - FSG

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.

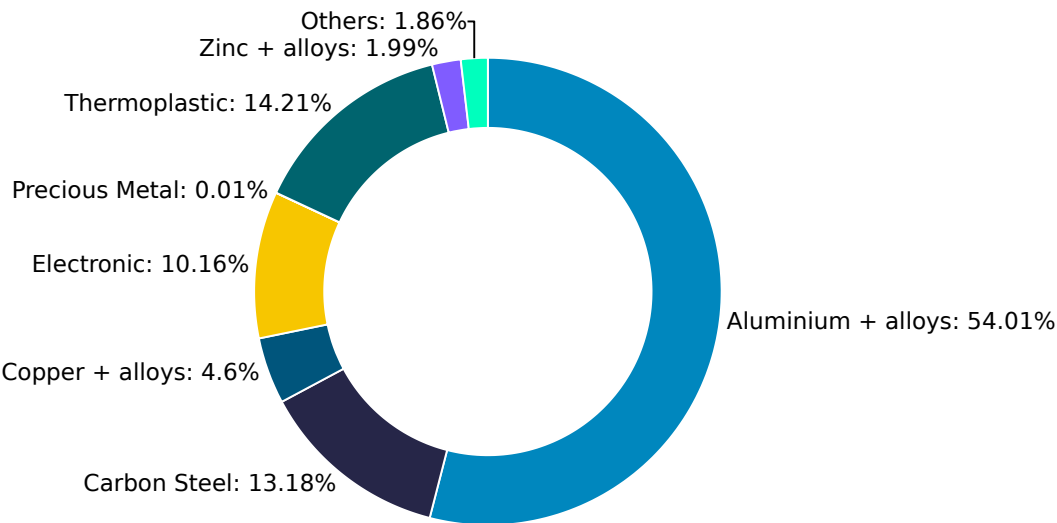
Products	SINAMICS G120X converters in frame sizes FSA - FSG, voltage class 200..240 V (0.75 kW - 55 kW), 380...480 V (0.75 - 250 kW), 500...690 V (3 kW - 250 kW) in IP20 degree of protection
Represented by the reference product	6SL3220-1YH26-0AB0, 11kW, 500...690V, IP20
Product Description	SINAMICS G120X converters, IP 20, air cooled.
Functional Unit	Converters with integrated control unit for speed and torque control of asynchronous induction motor. Calculation of the environmental impacts is based on 15 years of product service lifetime. 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 16.6 kg adds up with packaging weight of 4.47 kg to a total weight of 21.07 kg. Packaging consists of: Graphic paper, PE film, Corrugated box (average composition), EPS-Foam (30 kg/m3), EPS-Foam (25 kg/m3), Polyethylene foam.

Product Weight 16.6 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: Container ship (Suezmax 160000 DWT 18500 TEU) 19000 km, Truck 7.5t-12t gross weight 1000 km Use Scenario: Operation profile is defined by 3 operational points (OP): OP1 : 20% of time at 100% speed and 100% torque OP2: 70% of time at 50% speed and 25% torque OP3: 10% of time at 0% speed and 25% 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

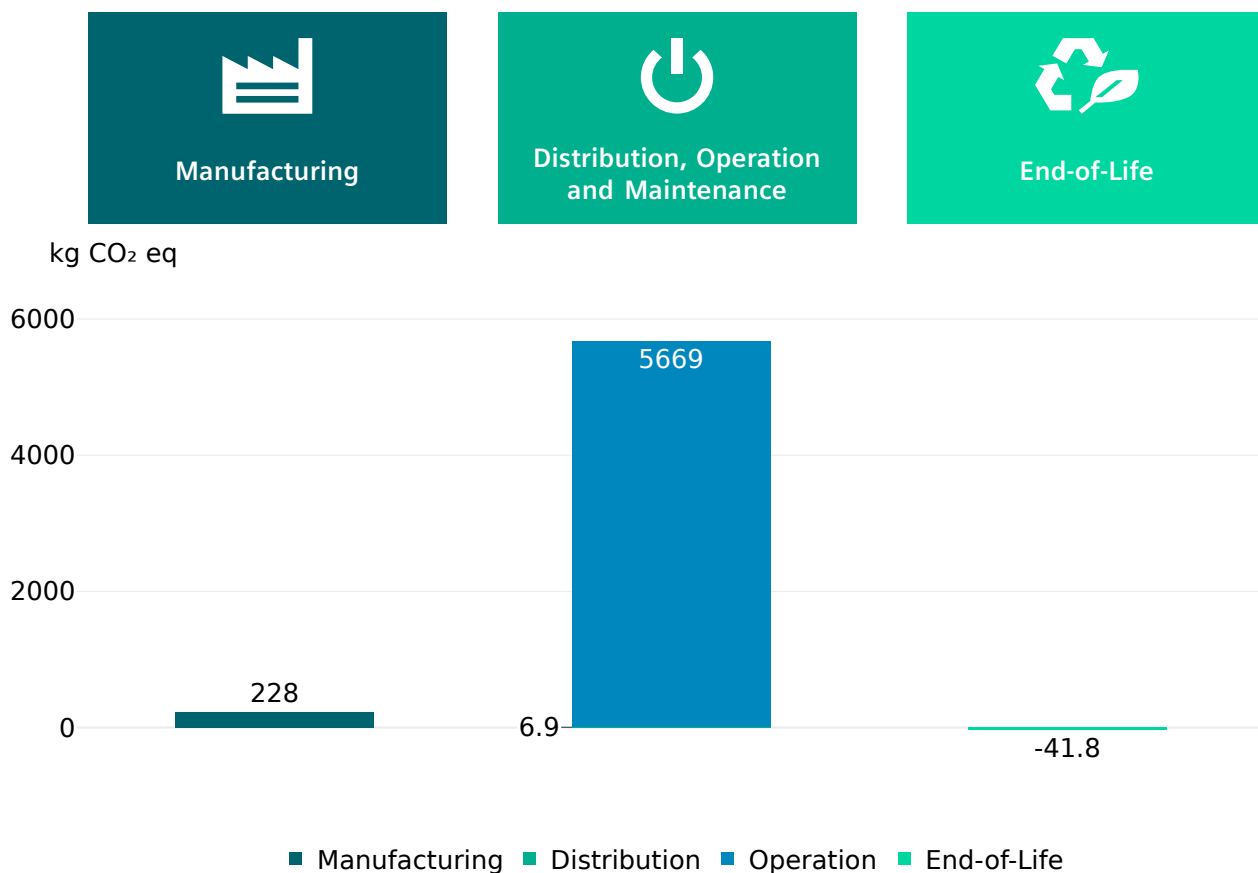
The following impact categories characterize the product's environmental footprint. They have been calculated with LCIA methodology EF3.1; LCA tool: Green Digital Twin (GDT), Database: One Siemens LCA Database (based on MLC CUP 2023.2, formerly GaBi).

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	1.33E+1	1.53E+0	8.04E-2	1.20E+1	-3.34E-1
Climate change – total	kg CO ₂ eq	5.86E+3	2.28E+2	6.90E+0	5.67E+3	-4.18E+1
Climate change – fossil	kg CO ₂ eq	5.81E+3	2.26E+2	6.84E+0	5.62E+3	-4.18E+1
Climate change – biogenic	kg CO ₂ eq	5.10E+1	1.28E+0	1.44E-2	4.97E+1	-6.51E-3
Climate Change, land use and land use change	kg CO ₂ eq	7.13E-1	1.25E-1	4.38E-2	6.13E-1	-2.45E-2
Ecotoxicity, freshwater – total	CTUe	3.41E+4	1.34E+3	6.46E+1	3.28E+4	-1.57E+2
Eutrophication, freshwater	kg P eq	2.18E-2	7.62E-4	1.78E-5	2.11E-2	-2.11E-5
Eutrophication, marine	kg N eq	3.07E+0	2.14E-1	2.05E-2	2.87E+0	-3.87E-2
Eutrophication, terrestrial	Mole of N eq	3.21E+1	2.32E+0	2.26E-1	3.00E+1	-4.17E-1
Human toxicity, cancer – total	CTUh	1.84E-6	1.09E-7	1.27E-9	1.74E-6	-8.42E-9
Human toxicity, non-cancer – total	CTUh	3.06E-5	2.96E-6	5.24E-8	2.77E-5	-6.30E-8
Ionising radiation, human health	kBq U235 eq	3.12E+3	1.00E+1	2.25E-2	3.11E+3	-5.09E+0
Land Use	dimensionless (pt)	4.75E+4	1.06E+3	2.70E+1	4.65E+4	-7.18E+1
Ozone depletion	kg CFC-11 eq	1.61E-7	5.78E-8	7.63E-13	1.04E-7	-2.95E-10
Particulate matter	Disease incidences	1.31E-4	3.31E-5	1.37E-6	1.01E-4	-3.99E-6
Photochemical ozone formation, human health	kg NMVOC eq	8.29E+0	7.03E-1	5.71E-2	7.65E+0	-1.22E-1
Resource use, fossils	MJ	1.20E+5	2.86E+3	9.06E+1	1.18E+5	-5.52E+2
Resource use, mineral and metals	kg Sb eq	1.71E-1	1.75E-1	3.33E-7	8.69E-4	-4.72E-3
Water use	m ³ water eq deprived water	1.27E+3	4.27E+1	6.07E-2	1.24E+3	-8.81E+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.



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 76%** mainly due to metal content
- an **energy recoverability of up to 14%** from plastic materials
- a **minimum disposal rate of 10%**

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 G120 X 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 = 7.8676 kgCO₂eq./kg of converter, b = 69.243 kgCO₂eq.

For **END of Life**:

m = -3.469 kgCO₂eq./kg of converter, b = 11.664 kgCO₂eq.

For the **operation phase**, the climate change in kgCO₂eq was derived for 400 V and 690 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. 1-3

Definition of the operational points are:

OP1: 20% of time at 100% speed and 100% torque.

OP2: 70% of time at 50% speed and 25% torque.

OP3: 10% of time at 0% speed and 25% torque.

Tab.1 Climate change results for the operation phase (200 V unfiltered)

Voltage	V	200	200	200	200	200	200	200	200
PR (LO) – unfiltered	kW	0,75	1,1	1,5	2,2	3	4	5,5	7,5
Climate change	kg CO ₂ eq	876	1167	1419	1763	2212	2825	3060	3885
Voltage	V	200	200	200	200	200	200	200	200
PR (LO) – unfiltered	kW	11	15	18,5	22	30	37	45	55
Climate change	kg CO ₂ eq	5292	6758	8627	10130	13471	15469	18038	23142

Tab.2 Climate change results for the operation phase (400 V filtered)

Voltage	V	400	400	400	400	400	400	400	400
PR (LO) – filtered	kW	0,75	1,1	1,5	2,2	3	4	5,5	7,5
Climate change	kg CO2eq	754	876	1036	1305	1672	2070	2315	2939
Voltage	V	400	400	400	400	400	400	400	400
PR (LO) – filtered	kW	11	15	18,5	22	30	37	45	55
Climate change	kg CO2eq	3974	4784	6842	8008	9352	11781	14218	17623
Voltage	V	400	400	400	400	400	400	400	
PR (LO) – filtered	kW	75	90	110	132	160	200	250	
Climate change	kg CO2eq	19276	26147	23625	29821	34406	41620	55052	

Tab.3 Climate change results for the operation phase (400 V unfiltered)

Voltage	V	400	400	400	400	400	400	400	400
PR (LO) – unfiltered	kW	0,75	1,1	1,5	2,2	3	4	5,5	7,5
Climate change	kg CO2eq	754	875	1034	1299	1663	2059	2294	2908
Voltage	V	400	400	400	400	400	400	400	400
PR (LO) – unfiltered	kW	11	15	18,5	22	30	37	45	55
Climate change	kg CO2eq	3955	4756	6809	7966	9320	11734	14172	17529
Voltage	V	400	400	400	400				
PR (LO) – unfiltered	kW	75	90	110	132				
Climate change	kg CO2eq	20759	25943	23421	29507				

Tab.4 Climate change results for the operation phase (690 V filtered)

Voltage	V	690	690	690	690	690	690	690	690
PR (LO) – filtered	kW	3	4	5,5	7,5	11	15	18,5	22
Climate change	kg CO ₂ eq	3004	3571	4482	5081	5669	6683	7549	8399
Voltage	V	690	690	690	690	690	690	690	690
PR (LO) – filtered	kW	30	37	45	55	75	90	110	132
Climate change	kg CO ₂ eq	10233	11940	13284	15544	16860	20714	24798	28671
Voltage	V	690	690	690					
PR (LO) – filtered	kW	160	200	250					
Climate change	kg CO ₂ eq	32357	38192	46622					

Tab.5 Climate change results for the operation phase (690 V unfiltered)

Voltage	V	690	690	690	690	690	690	690	690
PR (LO) – filtered	kW	3	4	5,5	7,5	11	15	18,5	22
Climate change	kg CO ₂ eq	3004	3571	4482	5081	5664	6678	7540	8385
Voltage	V	690	690	690	690	690	690	690	690
PR (LO) – filtered	kW	30	37	45	55	75	90	110	132
Climate change	kg CO ₂ eq	10209	11898	13237	16860	20620	24704	24704	28514

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