

ACS6080

PRODUCT ENVIRONMENTAL PROFILE

Environmental Product Declaration

VARIABLE SPEED DRIVE ACS6080 5 TO 36 MW



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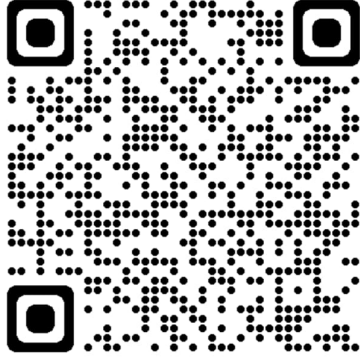
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ABB Purpose & Embedding Sustainability

ABB is demonstrating their commitment to sustainability by making themselves sustainable. Across their own operations and value chain, aspiring to become a role model for others to follow. With **ABB Purpose** ABB is focusing on reducing harmful emissions, preserving natural resources and championing ethical and humane behavior to achieve this.

ABB has also taken part of the **The Ellen MacArthur Foundation's**.



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Abbreviations

CTU	Comparative Toxic Unit
DOL	Direct on Line
EoL	End of Life
GWP	Global warming potential
HVAC-R	Heating, Ventilation, Air conditioning and refrigeration
LCA	Life Cycle Assessment
LCIA	Life Cycle Impact Assessment
PC	Polycarbonate
PCBA	Printed circuit board assembly
PCR	Product Category Rules
PE	Polyethylene
PEP	Product Environmental Profile
PET	Polyethylene terephthalate
PSR	Product-Specific Rules
PVC	Polyvinyl chloride
R factors	Proportions of recyclable materials
VSD	Variable Speed Drive
WEEE	Waste from Electric and Electronic Equipment

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General Information

Reference product	ACS6080 Converter type 2LSU14-3a9-C37_C36-DIU-W3
Description of the product	<p>Variable speed drive (VSD) is used to control the speed and torque of (three phase) electrical induction motors (e.g asynchronous, permanent magnet and synchronous reluctance motors), which are used in compressors, conveyors, mixers, pumps, centrifuges, fans and many other variable and constant torque applications in different industries.</p> <p>The benefits of VSD control are gained because of precise process control, which leads to significant energy savings through optimal speed control.</p> <p>The reference product has a nominal power of 18 000 kW with a 3 100 V voltage.</p>
Functional unit	<p>To control the speed and torque of a three phase motors (Asynchronous and Permanent Magnet motors) in energy management for machines application. Calculation of the environmental impacts is based on 15 years of product service lifetime. The usage profile considered is according to EN50598-3:2015.</p> <p>The usage profile considered is 11.4% uptime in use phase at 100% loading rate, 40.0% uptime in use phase at 50% loading rate, 5.7% uptime in standby phase and 42.9% in OFF phase.</p>
Product family	This PEP covers the complete ACS6080 product family.

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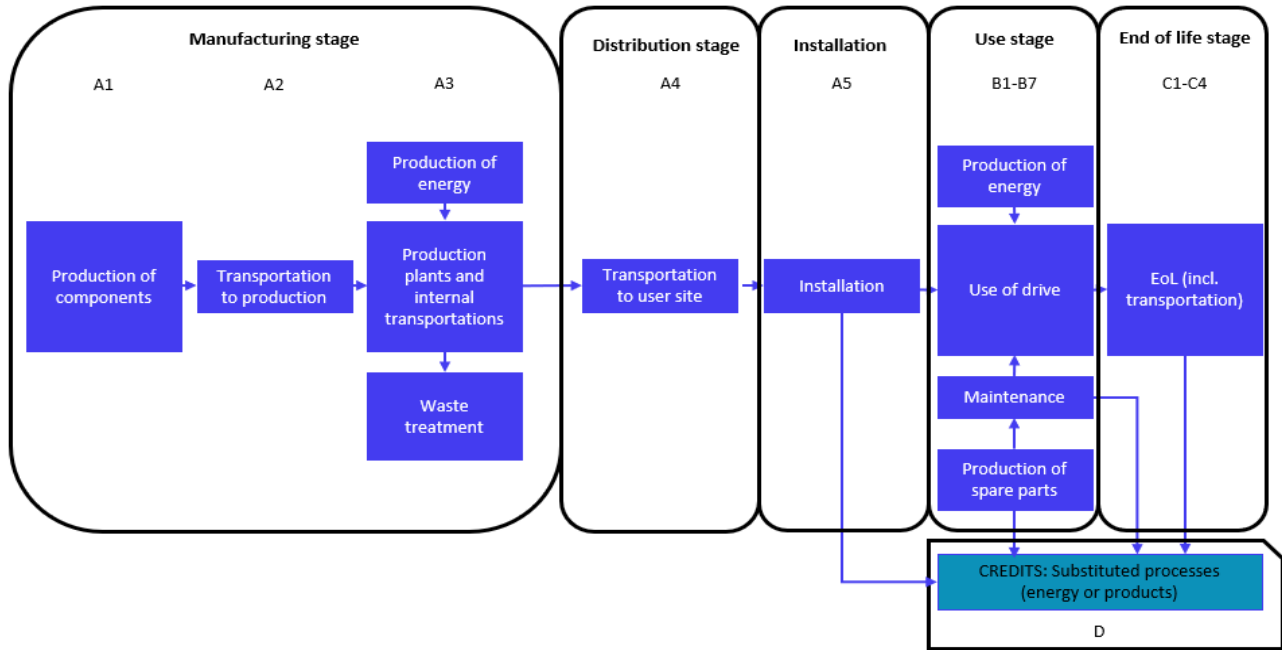
Catalog list of ACS6080 products. This list is not an exhaustive list of product variations.

Motor data		Converter data		kVa	kg
kW	A	Type code			
3300 V - Induction motors, single drive with diode front end					
4 300	915	ACS6080-033-W-11A-E2-011-111A		5 000	4 100
6 000	1 300	ACS6080-033-W-12A-E2-011-112A		7 000	4 300
7 700	1 650	ACS6080-033-W-13A-E2-011-113A		9 000	4 400
10 000	2 150	ACS6080-033-W-14A-E2-011-115A		12 000	5 300
12 000	2 600	ACS6080-033-W-14A-E2-011-122A		14 000	7 300
15 400	3 300	ACS6080-033-W-23A-E4-011-123A		18 000	8 100
20 200	4 300	ACS6080-033-W-24A-E4-011-125A		24 000	9 500
23 200	4 950	ACS6080-033-W-24A-E4-011-123A		27 000	12 600
3300 V - Induction motors, single drive with active front end					
4 300	915	ACS6080-033-W-11A-R1-011-111A		5 000	4 900
6 000	1 300	ACS6080-033-W-12A-R1-011-112A		7 000	5 100
7 700	1 650	ACS6080-033-W-13A-R1-011-113A		9 000	5 200
10 000	2 150	ACS6080-033-W-16A-R1-011-115A		12 000	5 400
12 000	2 600	ACS6080-033-W-22A-R2-011-122A		14 000	9 500
15 400	3 300	ACS6080-033-W-23A-R2-011-123A		18 000	10 300
20 200	4 300	ACS6080-033-W-26A-R2-011-125A		24 000	10 700
23 200	4 950	ACS6080-033-W-33A-R3-011-123A		27 000	14 500
3300 V - synchronous motors, single drive with diode front end					
4 800	915	ACS6080-033-W-11A-E2-011-111A		5 000	4 500
6 800	1 300	ACS6080-033-W-12A-E2-011-112A		7 000	4 700
8 700	1 650	ACS6080-033-W-13A-E2-011-113A		9 000	4 800
11 200	2 150	ACS6080-033-W-14A-E2-011-115A		12 000	5 700
13 600	2 600	ACS6080-033-W-14A-E2-011-122A		14 000	7 700
17 400	3 300	ACS6080-033-W-23A-E4-011-123A		18 000	8 600
22 400	4 300	ACS6080-033-W-24A-E4-011-125A		24 000	9 900
26 100	4 950	ACS6080-033-W-24A-E4-011-123A		27 000	13 000
3300 V - synchronous motors, single drive with active front end					
4 800	915	ACS6080-033-W-11A-R1-011-111A		5 000	5 300
6 800	1 300	ACS6080-033-W-12A-R1-011-112A		7 000	5 500
8 700	1 650	ACS6080-033-W-13A-R1-011-113A		9 000	5 600
11 200	2 150	ACS6080-033-W-16A-R1-011-115A		12 000	6 000
13 600	2 600	ACS6080-033-W-22A-R2-011-122A		14 000	9 900
17 400	3 300	ACS6080-033-W-23A-R2-011-123A		18 000	10 700
22 400	4 300	ACS6080-033-W-26A-R2-011-125A		24 000	11 100
26 100	4 950	ACS6080-033-W-33A-R3-011-123A		27 000	14 900
3300 V - multidrive examples with diode front end					
2 x 6 000	2 x 1 300	ACS6080-033W-22A-E4-021-112A-212A		14 000	7 450
5 x 6 000	5 x 1 300	ACS6080-033W-22A-E4-021-112A-212A-312A-412A-512A		28 000	16 050
3300 V - multidrive examples with active front end					
2 x 22 400	2 x 4 750	ACS6080-033W-22A-E4-021-112A-212A		36 000	15 850
5 x 6 000	2 x 1300	ACS6080-033W-22A-E4-021-112A-212A-312A-412A-512A		13 000	7 950

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System boundary

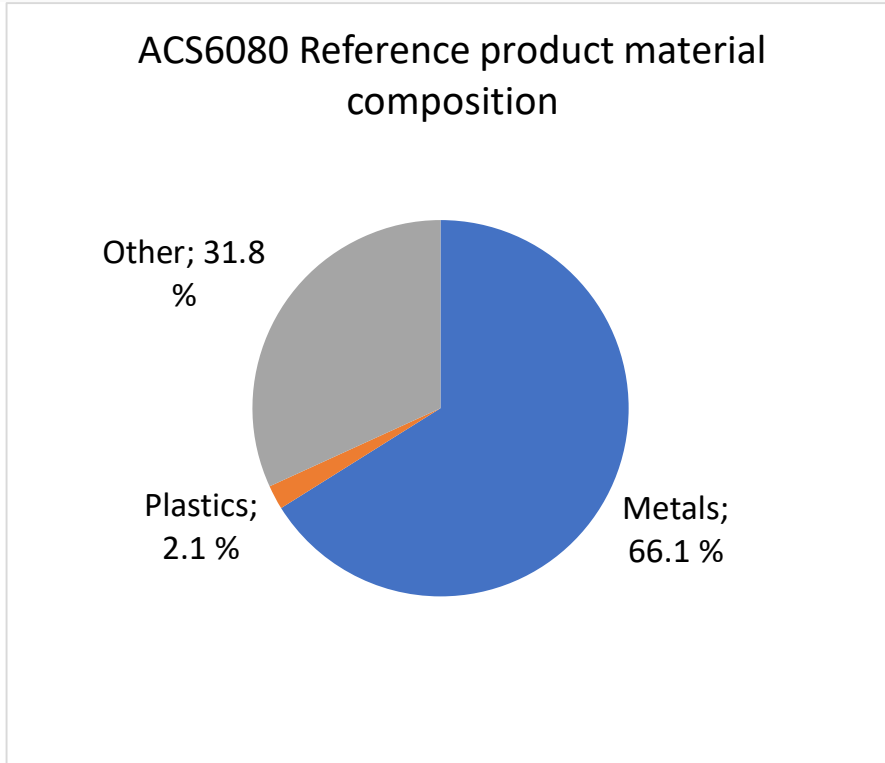


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Constituent materials

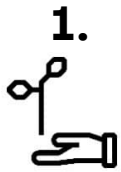
Total weight of Reference product 14 583 kg including the product and its packaging.



Plastics as % of weight		Metals as % of weight		Other as % of weight	
Name	Weight-%	Name	Weight-%	Name	Weight-%
Glass fibre reinforced polyester	1.7	Steel	43.4 %	Electronic components	12.9 %
Other plastics	0.4	Copper	20.4 %	Wood	13.7 %
		Aluminium	2.25 %	Others	5.25 %

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1. Environmental Information

<p>Manufacturing</p>	<p>Manufacturing includes life cycle stages from cradle-to-gate, including material acquisition, component manufacturing, assembly of products and transportation between these facilities.</p> <p>Component manufacturing is mainly modelled with secondary data since supplier-specific data was not available. Some of the components are modelled with component specific average data (e.g. Capacitors) and the rest of the components with material specific (e.g. PC plastic part) secondary data. Component specific data was used whenever it was available in Ecoinvent database or as EPDs. For components manufactured within Europe, European average datasets were used whenever available. Otherwise, global average datasets for component manufacturing were used. Thus, the energy model is either average Europe or Global for components.</p> <p>Manufacturing at ABB site</p> <p>Data about the energy consumption was obtained at annual stage for assembly line level at production plants. Data was allocated to a single drive product by dividing the annual energy consumption of the production line by a number of units produced. Energy model for manufacturing at ABB site is based on local electricity market mix.</p>
<p>Distribution</p>	<p>Distribution considers the whole transportation route from ABB manufacturing sites to customers. Distribution of product is modelled based on primary data of the year 2022. Weighted average distribution route was applied in the modelling. Weight of packaging is 2 045 kg.</p>
<p>Installation</p>	<p>Installation stage considers waste management of packing materials of the product, use of forklift for moving the unit in place and deionized water for water cooling circuit. Energy consumption in other installation operations are negligible and are excluded.</p>
<p>Use</p>	<p>The usage profile considered is according to EN50598-3:2015: 11.4% uptime in use phase at 100% loading rate, 40.0% uptime in use phase at 50% loading rate, 5.7% uptime in standby phase and 42.9% in OFF phase for a reference service life of 15 years. Supply voltage is according to unit nominal voltage and default switching frequency is used. Use stage energy model is based on a global market mix from (of year 2020) from Ecoinvent. Thus, the use stage related environmental impacts are likely to be different at the user site depending on the origin of energy consumed. More information about ABB products load points at https://ecodesign.drivesmotors.abb.com/drive.</p> <p>Use stage also considers included spare parts, but their impacts compared to electricity losses are minimal.</p>
<p>End of life</p>	<p>EoL treatment of the product is modelled based on the ABB recycling instructions. R factors of the PCR requirements are applied for EoL modelling to estimate the share of materials directed for material and energy recovery and landfilling after manual dismantling and mechanical treatment of WEEE waste. Mainly global energy models are used in the datasets used for EoL.</p>
<p>Software and data-base used</p>	<p>Simapro 9.6.0.1 and Ecoinvent 3.10 (Cut-off system model)</p>
<p>Standards</p>	<p>ISO14040:2006, ISO14044:2006, PEP Ecopassport PCR-ed4-EN-2021 09 06</p>

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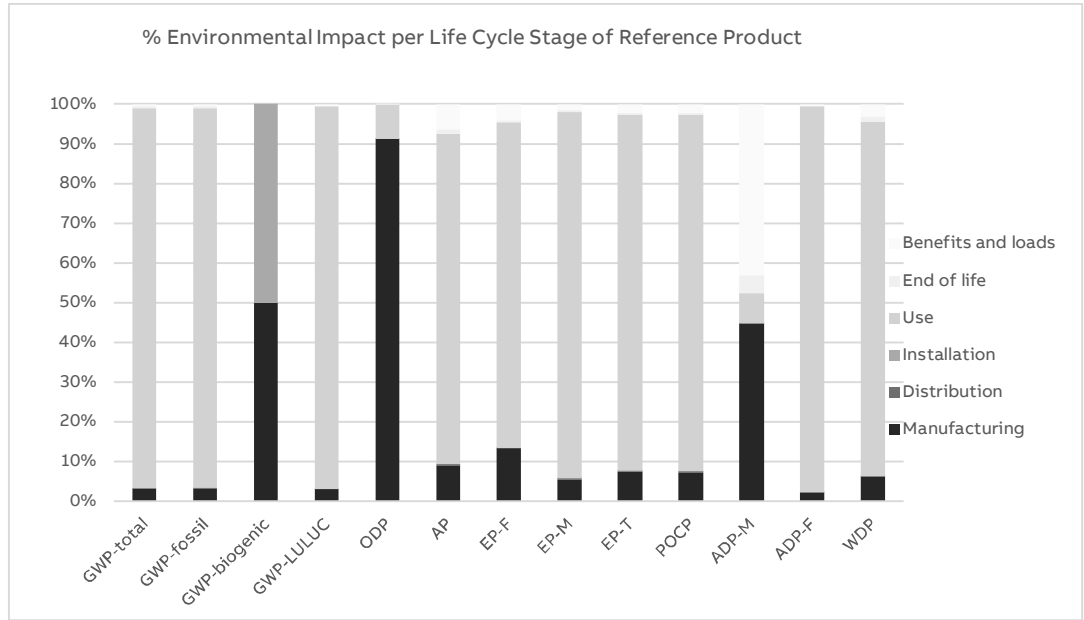


Environmental impacts

Reference lifetime	15 years			
Product category	Variable speed drives			
Installation elements	Installation elements vary depending on the use application and installation site and thus were excluded from this study. Reference the hardware manual for more details.			
Use scenario	See functional unit.			
Geographical representativeness	Components are sourced globally. Manufacturing is localized to Poland and Switzerland. Use stage is modelled with global electricity mix.			
Technological representativeness	<p>Primary data used in the modelling represents year 2023 and 2022. Data for the assembly sites were received as primary data. Most components are modelled with secondary data, which is not specific to the actual components used by ABB.</p> <p>Technological representativeness otherwise is as good as possible based on data availability.</p>			
Energy model used	Manufacturing	Installation	Use	End of life
	Europe	Global	Global	Global

Compulsory Indicators								
Impact indicators	Unit	Total, without benefits and loads	Manufacturing	Distribution	Installation	Use	End of life	Benefits and loads
Climate change - total (GWP-total)	kg CO2 eq.	5.54E+06	1.72E+05	4.76E+03	3.98E+03	5.33E+06	2.32E+04	-3.51E+04
Climate change - fossil (GWP-fossil)	kg CO2 eq.	5.53E+06	1.75E+05	4.76E+03	5.34E+02	5.33E+06	2.32E+04	-3.51E+04
Climate change - biogenic (GWP-biogenic)	kg CO2 eq.	0.00E+00	-3.45E+03	0.00E+00	3.45E+03	0.00E+00	0.00E+00	0.00E+00
Climate change - land use and land use change (GWP-LULUC)	kg CO2 eq.	7.38E+03	2.20E+02	2.14E+00	1.86E-01	7.14E+03	1.26E+01	-3.26E+01
Ozone depletion (ODP)	kg CFC-11 eq.	3.85E-01	3.51E-01	6.94E-05	8.38E-06	3.36E-02	1.15E-04	-2.25E-04
Acidification (AP)	mol H+ eq.	2.91E+04	2.83E+03	6.65E+01	2.04E+00	2.59E+04	3.15E+02	-2.00E+03
Eutrophication aquatic freshwater (EP-F)	kg P eq.	2.69E+03	3.72E+02	2.83E-01	7.16E-02	2.30E+03	1.63E+01	-1.15E+02
Eutrophication aquatic marine (EP-M)	kg N eq.	5.53E+03	3.03E+02	1.73E+01	7.55E-01	5.18E+03	2.56E+01	-9.13E+01
Eutrophication terrestrial (EP-T)	mol N eq.	5.70E+04	4.26E+03	1.91E+02	7.85E+00	5.23E+04	2.84E+02	-1.25E+03
Photochemical ozone formation (POCP)	kg NMVOC eq.	1.69E+04	1.24E+03	5.67E+01	2.86E+00	1.55E+04	9.14E+01	-3.75E+02
Depletion of abiotic resources – minerals and metals (ADP-M)	kg Sb eq.	4.18E+01	3.28E+01	9.56E-03	1.04E-03	5.58E+00	3.35E+00	-3.16E+01
Depletion of abiotic resources – fossil fuels (ADP-F)	MJ	4.82E+07	1.10E+06	4.98E+03	1.08E+03	4.70E+07	1.03E+05	-2.44E+05
Water use (WDP)	m3 world eq.	8.97E+05	5.87E+04	2.64E+02	7.53E+01	8.28E+05	1.00E+04	-3.07E+04

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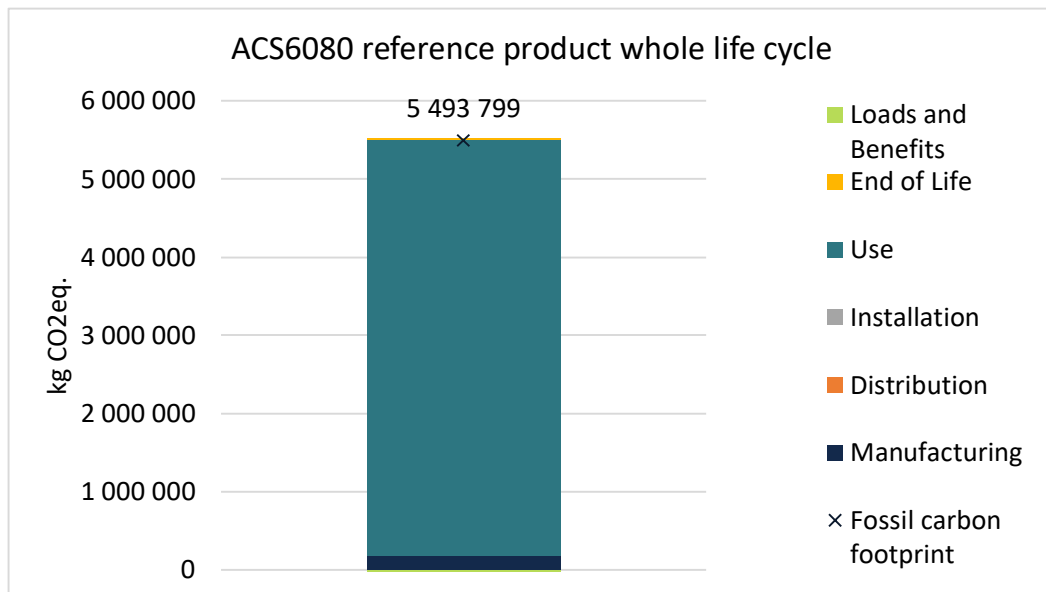
Other Indicators								
Optional Impact indicators	Unit	Total, without benefits and loads	Manufacturing	Distribution	Installation	Use	End of life	Benefits and loads
Particulate matter emissions	Disease incidence	2.50E-01	1.58E-02	3.40E-04	4.36E-05	2.32E-01	1.86E-03	-5.03E-03
Ionizing radiation, human health	kBq U235 eq.	7.38E+05	1.32E+04	4.70E+01	1.66E+01	7.24E+05	8.37E+02	-2.15E+03
Eco-toxicity (fresh water)	CTUe	1.96E+07	5.57E+06	1.39E+04	2.81E+03	1.36E+07	4.19E+05	-2.18E+06
Human toxicity, cancer effects	CTUh	8.65E-03	2.37E-03	2.22E-05	4.70E-06	5.94E-03	3.08E-04	-1.46E-03
Human toxicity, non-cancer effects	CTUh	5.77E-02	2.41E-02	3.21E-05	1.06E-05	2.96E-02	3.97E-03	-2.76E-02
Land use	-	1.21E+07	1.66E+06	4.31E+04	4.20E+03	1.02E+07	1.49E+05	-7.41E+05
Resource use indicators	Unit	Total, without benefits and loads	Manufacturing	Distribution	Installation	Use	End of life	Benefits and loads
Use of renewable primary energy, excluding renewable primary energy resources used as raw materials	MJ	8.60E+06	2.95E+05	7.17E+02	1.94E+02	8.28E+06	2.02E+04	-6.18E+04
Use of renewable primary energy resources as raw materials	MJ	2.65E+04	2.63E+04	0.00E+00	0.00E+00	1.47E+02	0.00E+00	0.00E+00
Total use of renewable primary energy resources	MJ	8.62E+06	3.22E+05	7.17E+02	1.94E+02	8.28E+06	2.02E+04	-6.18E+04
Use of non-renewable primary energy, excluding renewable primary energy resources used as raw materials	MJ	4.82E+07	1.06E+06	4.98E+03	1.08E+03	4.70E+07	1.03E+05	-2.44E+05
Use of non-renewable primary	MJ	5.22E+04	4.87E+04	0.00E+00	0.00E+00	3.50E+03	0.00E+00	0.00E+00

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energy resources as raw materials

Total use of non-renewable primary energy resources	MJ	4.82E+07	1.10E+06	4.98E+03	1.08E+03	4.70E+07	1.03E+05	-2.44E+05
Use of secondary materials	kg	0.00E+00	0.00E+00	0.00E+00	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	0.00E+00
Use of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water	m³	3.09E+04	1.61E+03	7.28E+00	2.38E+00	2.89E+04	2.99E+02	-7.07E+02
Waste category indicators	Unit	Total, without benefits and loads	Manufacturing	Distribution	Installation	Use	End of life	Benefits and loads
Hazardous waste disposed	kg	1.29E+04	2.26E+02	3.97E-01	4.40E-02	1.15E+02	1.25E+04	-1.83E+00
Non-hazardous waste disposed	kg	1.31E+05	1.65E+04	3.52E+03	3.91E+02	1.08E+05	2.92E+03	-2.88E+03
Radioactive waste disposed	kg	1.80E+02	3.13E+00	1.15E-02	4.19E-03	1.77E+02	2.10E-01	-5.44E-01
Output flow indicators	Unit	Total, without benefits and loads	Manufacturing	Distribution	Installation	Use	End of life	Benefits and loads
Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	1.02E+04	1.62E+03	0.00E+00	3.96E+01	5.90E+02	7.99E+03	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

GWP fossil impacts of the studied product during the Reference service life.





Extrapolation rules for the product family

The ACS6080 product family includes a variety of variable speed drives with similar functions. According to the conducted LCA study, proportionality rules to evaluate the environmental impacts of other products from this product family have been defined. The products in this product family are made from similar modules. These modules and their environmental impacts are presented in additional environmental information.

For drive products covered by the PEP other than the Reference product, the environmental impacts for each phase of the lifecycle are obtained by multiplying the values of the Reference product by the extrapolation factors calculated from the following formulas:

Life Cycle Stage	Extrapolation rules
Manufacturing	$(0.00000697 \cdot m - 0.0227) \cdot EI$
Installation	$(0.00000697 \cdot m - 0.0227) \cdot EI$
Distribution	$(0.00000697 \cdot m - 0.0227) \cdot EI$
Use	$\frac{\text{Energy losses in use of target product [kWh]}}{\text{Energy losses in use of reference product [kWh]}} \cdot EI$
End-of-Life	$(0.00000697 \cdot m - 0.0227) \cdot EI$
Benefits and loads	$(0.00000697 \cdot m - 0.0227) \cdot EI$

Where m=mass of target product with packaging [kg], and EI=Environmental impact of reference product for this life cycle stage. The extrapolation factors need to be applied to each environmental impact indicator in each life cycle stage of ACS6080-2LSU14-3a9-C37_C36-DIU-W3 results. The accurate masses and energy losses can be requested from ABB. Power losses of the reference product are provided in the table below.

Unit	Power losses [kWh/15a]
ACS6080-2LSU14-3a9-C37_C36-DIU-W3	7 346 269.7

References

ISO. (2006a). ISO 14025:2006 Environmental labels and declarations — Type III environmental declarations — Principles and procedures. Geneva: International Organization for Standardization.


ISO. (2006b). ISO 14040:2006 Environmental management – Life cycle assessment – Principles and framework. Geneva: International Organization for Standardization.

ISO. (2006c). ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines. Geneva: International Organization for Standardization.

PEP ecopassport® PROGRAM. (2021). Product Category Rules for Electrical, Electronic and HVAC-R Products, PCR-ed4-EN-2021 09 06. <https://www.pep-ecopassport.org/>.

Ecoinvent. 2024. Ecoinvent version 3.10, cut-off database

ABB Oy. 2023. Inventory data.

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Verifier accreditation number: VH44		Information and reference documents: www.pep-ecopassport.org	
Date of issue: 11-2024		Validity period: 5 years	
Independent verification of the declaration and data, in compliance with ISO 14025: 2006			
Internal: <input type="checkbox"/>		External: <input checked="" type="checkbox"/>	
The PCR review was conducted by a panel of experts chaired by Julie ORGELET (DDemain)			
PEPs are compliant with XP C08-100-1:2016 and EN 50693:2019 or NF E38-500 :2022 The components of the present PEP may not be compared with components from any other program.			
Document in compliance with ISO 14025 : 2006 « Environmental labels and declarations. Type III environmental declarations »			

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