Self-Declared Environmental Claim

Variable speed drive ACH580-01 Frame R5 22 to 55 kW

Type II environmental labelling
In accordance with
ISO 14021

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START

Company information

ABB is a leading global technology company that energizes the transformation of society and industry to achieve a more productive, sustainable future. By connecting software to its electrification, robotics, automation and motion portfolio, ABB pushes the boundaries of technology to drive performance to new levels. With a history of excellence stretching back more than 130 years, ABB's success is driven by about 105,000 talented employees in over 100 countries.

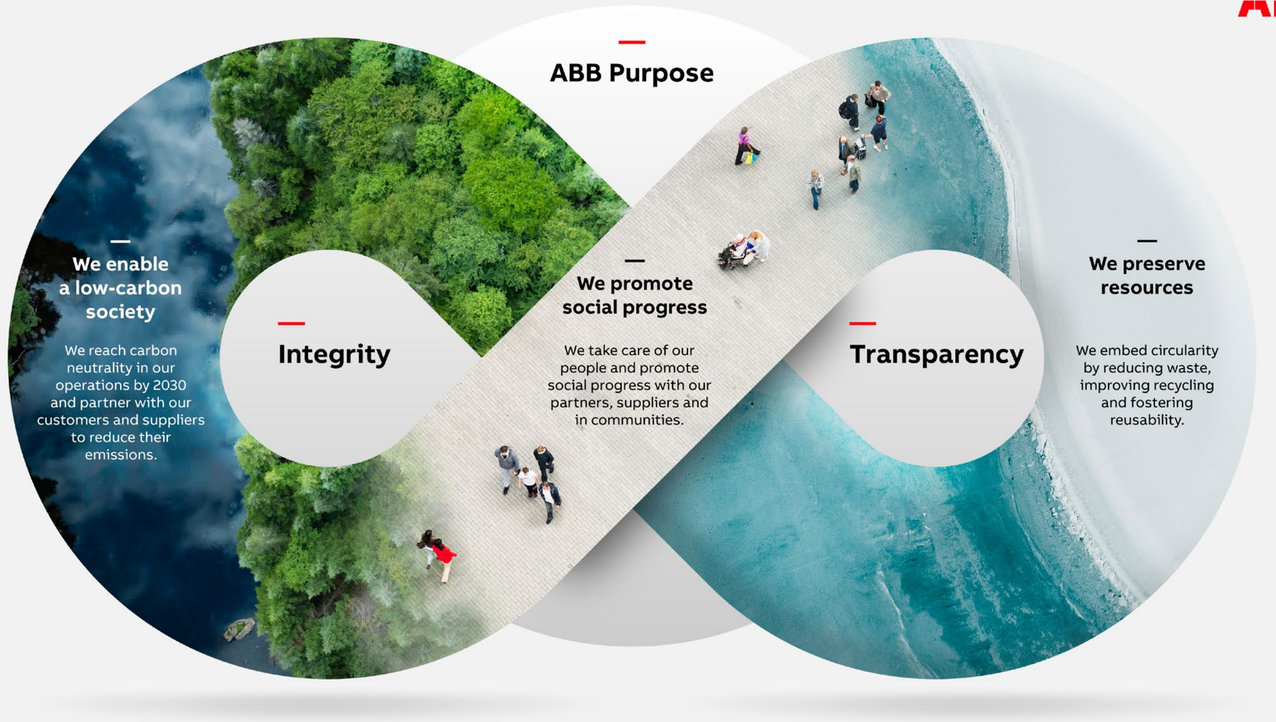
ABB Motion keeps the world turning, while saving energy every day. Our pioneering drives, motors, generators products and integrated digital powertrain solutions are driving the low-carbon future for industries, cities, infrastructure and transportation. Through our global presence we are always close to our customers. We help them optimize energy efficiency, and improve safety, reliability and performance.

Aiming to achieve these crucial sustainability targets by 2030

Our 2030 sustainability targets, as shown in this image, are intended to help ABB enable a low-carbon society, promote social progress and preserve natural resources. Working with our customers and suppliers, our aim is to firmly embed sustainable practices across our complete value chain in every step of the lifecycle of our products and solutions. We are equally committed to driving social progress, along with our suppliers and in our communities.

A key part of ABB's 2030 sustainability strategy is to work to support our customers' and suppliers' efforts to reduce their emissions, and aim to achieve carbon neutrality in our own operations. Our greenhouse gas emissions reduction targets have been validated by the Science Based Targets initiative as being in line with the 1.5 °C scenario of the Paris Agreement.

To ensure that we are focused on achieving our goals, the ABB sustainability targets are integrated into our decision-making processes, and we have accountabilities and incentive plans in place to drive the appropriate actions.



Link to our website

Abbreviations

ABS	Acrylonitrile butadiene styrene
APOS	Allocation at point of substitution
CTU	Comparative toxic unit
DOL	Direct on line
EoL	End of life
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
PSR	Product Specific Rules
PVC	Polyvinyl chloride
R factors	Proportions of recyclable materials
UN CPC	The United Nations Central Product Classification
VSD	Variable speed drive
WEEE	Waste from Electric and Electronic Equipment

Production plant location of ABB: Finland

Product information

This document describes the environmental performance of Variable speed drive ACH580-01-106A-4.

Product group: Electrical, Electronic and HVAC-R products

Representative product	Variable speed drive ACH580-01-106A-4, nominal power 55 kW
Product description	Variable speed drive (VSD) is used to control the speed and torque of (three phase) electrical 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. The benefits of VSD control are gained because of precise process control, which leads to significant energy savings due to the optimal speed being applied at all times.
UN CPC code	UN CPC 46122
Total mass of the product including product package	35.63 kg
Reference lifetime	10 years

Product range covered

Product	P_N (kW)	I_N (A)	U_N (V)	Enclosure class
ACH580-01-088A-4 (+B056)	45	88	400	IP21 and IP55
ACH580-01-106-4 (+B056) (representative product)	**55**	**106**	**400**	**IP21 and IP55**
ACH580-01-089A-2 (+B056)	22	89	230	IP21 and IP55
ACH580-01-115A-2 (+B056)	30	115	230	IP21 and IP55

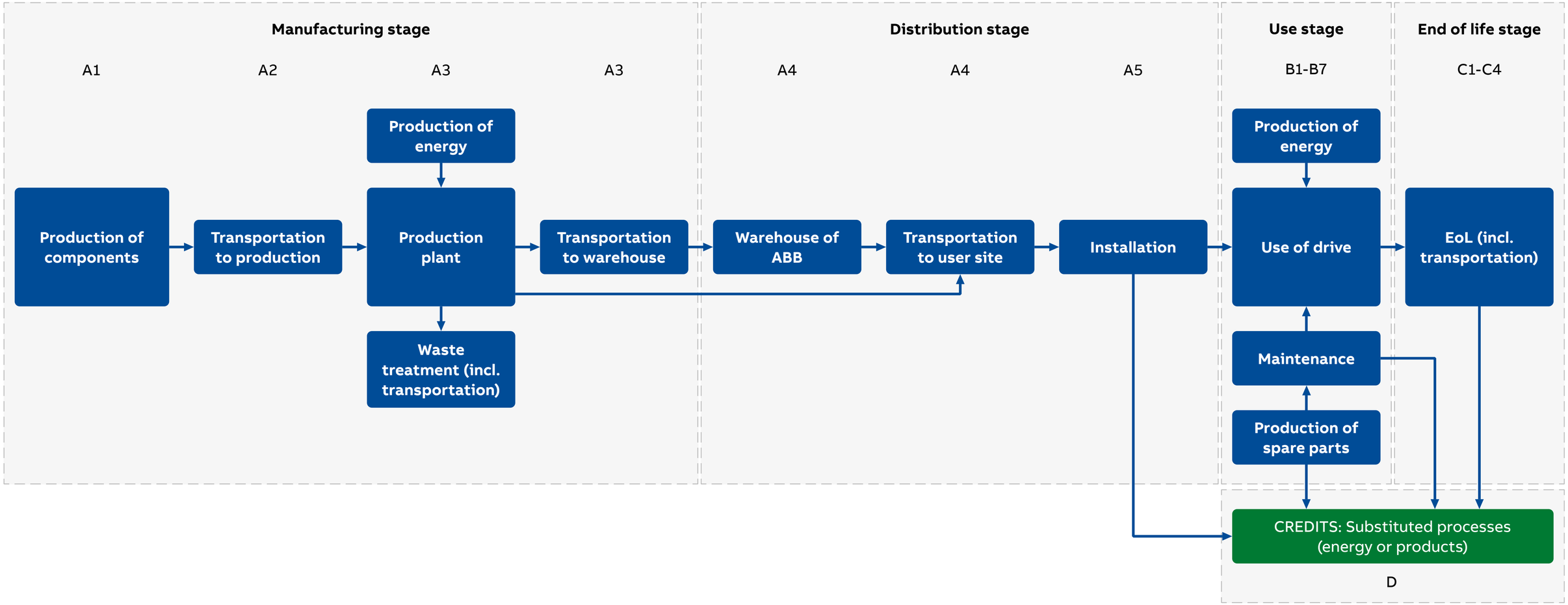
LCA information

Scope definition

Functional unit	To control the speed and torque of three phase motors (Asynchronous and Permanent Magnet motors) in energy management for machine applications. Calculation of the environmental impacts is based on 10 years of product service lifetime. The usage profile considered is 12.5% uptime in use phase at 100 % loading rate, 12.5% uptime in use phase at 49% loading rate, 12.5% uptime in use phase at 21.6% loading rate, 12.5% uptime in use phase at 8.4% loading rate, 10% uptime in standby phase and 40% in OFF phase.
System boundary	Throughout the whole life cycle of the product, including also net loads and benefits beyond system boundaries.
Description of data representativeness	Primary data used in the modelling represents the year 2022. Assembly site data is allocated based on annual data of 2021. Production of energy consumed in the manufacturing is modelled according to the country in question based on local market mix. Use stage modelling represents an average European user of the product. Technological and geographical representativeness otherwise is as good as possible based on data availability and more information is presented with main assumptions in this document.
Allocation methods applied	The “polluter pays” principle for EoL allocation. Allocation choices in secondary datasets may vary between datasets. No allocation to co-products.
Cut-off rule applied and main exclusions	Cut-off: The mass, energy flows or environmental impacts of intermediate flows not considered shall be less than or equal to 5% of the mass of the elements/total energy consumption or environmental impacts of the reference product corresponding to the functional unit.
Applied standards and rules	This document is made following the ISO 14021, ISO 14040 and ISO 14044 standards. Main requirements of the PEP ecopassport® Product Category Rules (PCR) edition 4 have been applied. This document or the LCA report have not been verified or critically reviewed.
Modelling software	SimaPro 9.5.0.1, LCIA methodology EN 15804+A2
Secondary dataset	Ecoinvent 3.9.1 (Cut-off system model)

LCA information

System boundary



LCA information

Main assumptions used in the modelling

Manufacturing
Manufacturing includes life cycle stages from cradle-to-gate, including material acquisition, component manufacturing, assembly of products and transportation between these facilities.

Component manufacturing
Components used were determined using internal systems and by taking apart and weighting the product in parts. Component manufacturing is fully modelled with secondary data since the supplier-specific data was not available. Some of the components are modelled with component specific average data (e.g. PCBAs) and the rest of the components with material specific (e.g. ABS plastic part) secondary data. Component specific data was used whenever it was available in Ecoinvent database. The datasets may not always represent a specific technology or inventory used by the suppliers, which increases uncertainty to the results. The authors speculate that these choices rather overestimate, than underestimate the results. 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.

Manufacturing at ABB site
Data about the energy consumption and waste generation was obtained for one year for a similar purpose plant. It was allocated between production lines. Energy model for manufacturing at ABB site is based on local electricity market mix and heat produced from natural gas.

Distribution
Distribution considers the whole transportation route from centralized warehouses and 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.

Installation
Installation stage considers waste management of packing materials of the product. Energy consumption in installation is negligible and is excluded.

Use stage
Use stage includes the power losses from the use of the product according to the functional unit and production of parts replaced during maintenance and waste treatment of discarded parts.

The use profile considered is 12.5% uptime in use phase at 100% loading rate, 12.5% uptime in use phase at 49% loading rate, 12.5% uptime in use phase at 21.6% loading rate, 12.5% uptime in use phase at 8.4% loading rate, 10% uptime in standby phase and 40% in OFF phase for a reference service life of 10 years. Supply voltage is 400 V and default switching frequency is used. Use stage energy model is based on Europe without Switzerland consumption mix data (of the year 2019). 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.

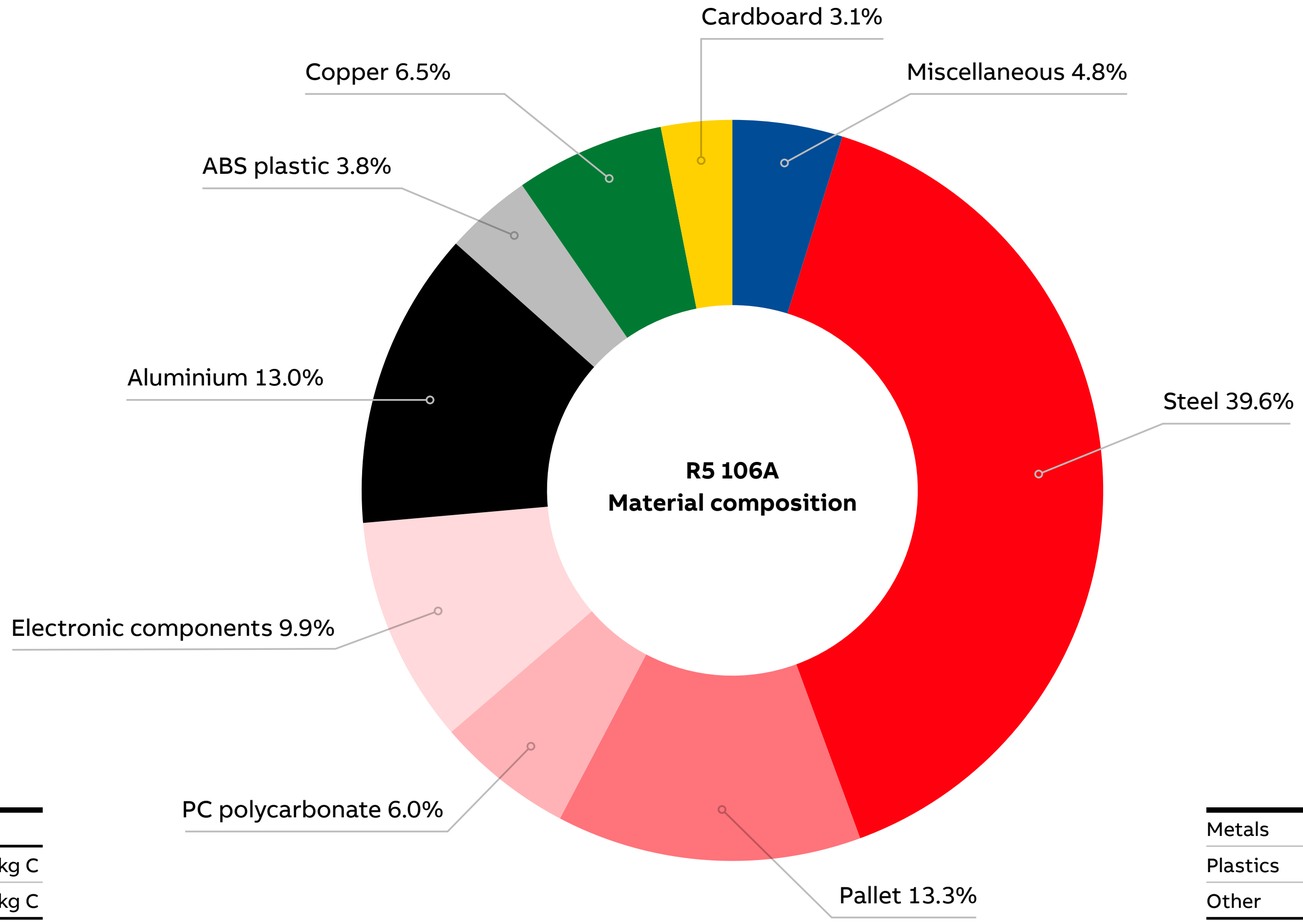
Production of replacement parts and waste treatment of removed parts are considered in the use stage.

End of life stage
End of life includes the waste treatment of the product.

EoL treatment of the product is modelled based on the ABB recycling instructions. R factors of PEF 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. Energy model is applied similarly to the component manufacturing stage.

Content declaration

Product and its package under study consists of:



Biogenic carbon content		
Biogenic carbon content of product	0.00	kg C
Biogenic carbon content of product package	2.74	kg C

Metals	59.1%
Plastics	12.1%
Other	28.8%

Environmental performance

Life cycle impact assessment results – core impact indicators

Impact category		Unit	Manufacturing	Distribution	Installation	Use	End of life	Benefits and loads	TOTAL (without benefits and loads)
Global warming	TOTAL	kg CO_2 eq.	3.83E+02	5.76E+00	1.20E+01	1.14E+04	4.43E+01	-7.54E+01	**1.19E+04**
	Fossil	kg CO_2 eq.	3.93E+02	5.76E+00	1.57E+00	1.14E+04	4.43E+01	-7.52E+01	**1.18E+04**
	Biogenic	kg CO_2 eq.	-1.04E+01	0.00E+00	1.04E+01	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
	Land use and land use change	kg CO_2 eq.	6.44E-01	3.69E-03	5.47E-03	2.84E+01	2.20E-02	-1.58E-01	**2.91E+01**
Ozone depletion		kg CFC-11 eq.	2.06E-05	8.86E-08	2.45E-08	2.17E-04	2.97E-07	-9.66E-07	**2.38E-04**
Acidification of soils and water		mole H^+ eq.	4.09E+00	1.01E-01	5.46E-03	6.53E+01	3.61E-01	-2.76E+00	**6.98E+01**
Eutrophication	Freshwater	kg P eq.	5.19E-01	3.21E-04	3.37E-04	1.08E+01	2.03E-02	-1.44E-01	**1.13E+01**
	Marine	kg N eq.	5.92E-01	2.60E-02	8.08E-03	1.06E+01	3.06E-02	-1.45E-01	**1.12E+01**
	Terrestrial	mole N eq.	7.33E+00	2.87E-01	1.80E-02	9.56E+01	3.50E-01	-1.84E+00	**1.04E+02**
Photochemical ozone formation		kg NMVOC eq.	2.28E+00	8.20E-02	6.41E-03	3.10E+01	1.12E-01	-6.00E-01	**3.34E+01**
Depletion of abiotic resources	Minerals, metals	kg Sb eq.	3.87E-02	1.02E-05	4.36E-06	1.38E-01	3.89E-03	-3.65E-02	**1.81E-01**
	Fossil fuels	MJ	5.12E+03	7.68E+01	1.48E+01	2.57E+05	2.50E+02	-7.76E+02	**2.62E+05**
Water deprivation		m^3 world eq.	9.73E+01	2.85E-01	1.70E-01	2.90E+03	9.91E+00	-3.90E+01	**3.01E+03**

Environmental performance

Life cycle impact assessment results – additional impact indicators

Impact category		Unit	Manufacturing	Distribution	Installation	Use	End of life	Benefits and loads	TOTAL (without benefits and loads)
Particulate matter		Disease incidences	2.74E-05	3.61E-07	9.97E-08	2.41E-04	1.87E-06	-9.03E-06	**2.71E-04**
Ionizing radiation		kBq U235 eq.	4.60E+01	5.41E-02	6.90E-02	7.16E+03	2.99E+00	-3.00E+00	**7.21E+03**
Ecotoxicity		CTUe	7.55E+03	3.97E+01	2.19E+01	4.35E+04	5.38E+02	-2.28E+03	**5.17E+04**
Human toxicity	**Cancer**	CTUh	6.75E-07	2.49E-09	7.28E-10	5.34E-06	3.59E-07	-6.35E-07	**6.38E-06**
	Non cancer	CTUh	1.64E-05	3.94E-08	2.82E-08	2.12E-04	5.24E-06	-4.39E-05	**2.34E-04**
Land use/soil quality index		–	2.28E+03	4.25E+01	1.11E+01	5.03E+04	2.20E+02	-1.02E+03	**5.29E+04**

Environmental performance

Life cycle inventory results – resource use indicators

Parameter	Unit	Manufacturing	Distribution	Installation	Use	End of life	Benefits and loads	TOTAL (without benefits and loads)
Use of renewable primary energy resources as energy	MJ	1.49E+02	2.07E-01	2.68E-01	7.49E+03	9.44E+00	-4.23E+01	7.65E+03
Use of renewable primary energy resources as raw materials	MJ	8.08E+01	0.00E+00	0.00E+00	3.44E+01	0.00E+00	0.00E+00	1.15E+02
Total use of renewable primary energy	MJ	2.30E+02	2.07E-01	2.68E-01	7.53E+03	9.44E+00	-4.23E+01	7.77E+03
Use of non-renewable primary energy as energy	MJ	4.91E+03	6.99E+01	1.48E+01	2.57E+05	2.50E+02	-7.75E+02	2.62E+05
Use of non-renewable primary energy as raw materials	MJ	2.08E+02	6.89E+00	0.00E+00	1.54E+01	0.00E+00	0.00E+00	2.30E+02
Total use of non-renewable primary energy	MJ	5.12E+03	7.68E+01	1.48E+01	2.57E+05	2.50E+02	-7.75E+02	2.62E+05

Life cycle inventory results – indicators describing the use of secondary materials, water and energy resources

Parameter	Unit	Manufacturing	Distribution	Installation	Use	End of life	Benefits and loads	TOTAL (without benefits and loads)
Use of secondary materials	kg	3.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.75E+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	m^3	3.56E+00	8.29E-03	6.88E-03	2.02E+02	2.57E-01	-9.68E-01	2.06E+02

Environmental performance

Life cycle inventory results – waste flow and output flow indicators

Parameter	Unit	Manufacturing	Distribution	Installation	Use	End of life	Benefits and loads	TOTAL (without benefits and loads)
Hazardous waste disposed	kg	7.75E-02	4.33E-04	9.41E-05	4.54E-01	2.95E+01	-2.78E-03	3.01E+01
Non-hazardous waste disposed	kg	6.60E+01	3.51E+00	1.62E+00	1.04E+03	9.16E+00	-2.53E+01	1.12E+03
Radioactive waste disposed	kg	1.09E-02	1.27E-05	1.71E-05	1.84E+00	7.67E-04	-7.73E-04	1.85E+00
Components for re-use	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	3.60E+00	0.00E+00	6.59E-01	1.19E+00	1.73E+01	0.00E+00	2.27E+01
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

Environmental performance

Determination of the environmental impacts of the other products with the same frame size

According to the conducted LCA study, proportionality rules to evaluate the environmental impacts of other products from this product family have been defined. To estimate the environmental impact of a specific product, the LCIA results presented in this document for each life cycle stage should be multiplied with the factor presented in table below to estimate the environmental impacts from them.

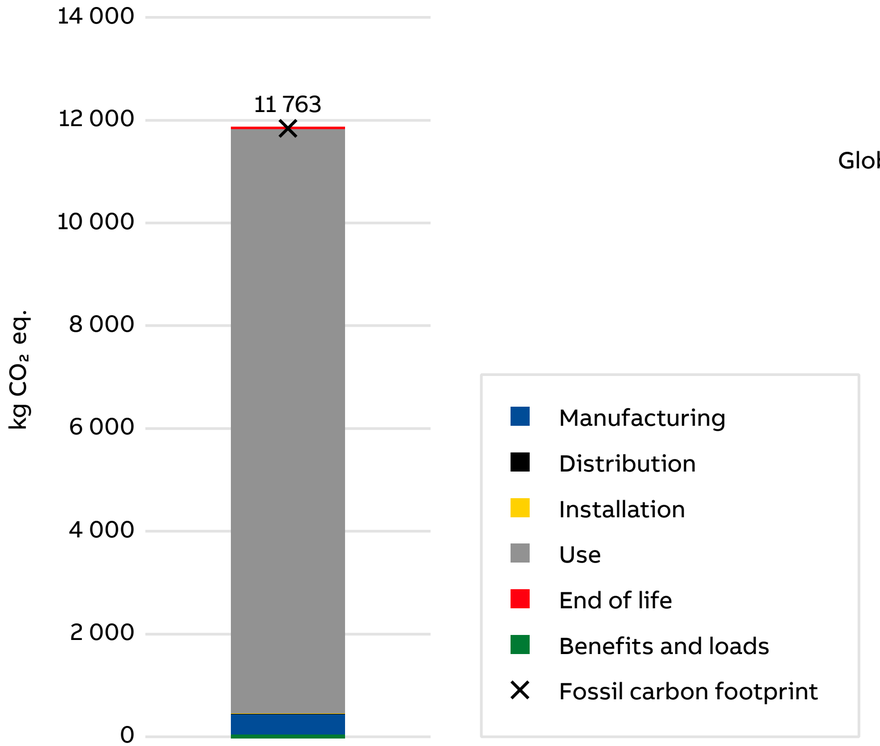
Extrapolation factors

Products	Manufacturing	Distribution	Installation	Use	End of life	Benefits and loads
ACH580-01-088A-4 (+B056)	1.000	1.000	1.000	0.891	1.000	1.000
ACH580-01-106-4 (+B056) (representative product)	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
ACH580-01-089A-2 (+B056)	0.991	1.090	1.000	0.704	1.000	1.000
ACH580-01-115A-2 (+B056)	0.991	1.090	1.000	0.988	1.000	1.000

Environmental performance
Summary

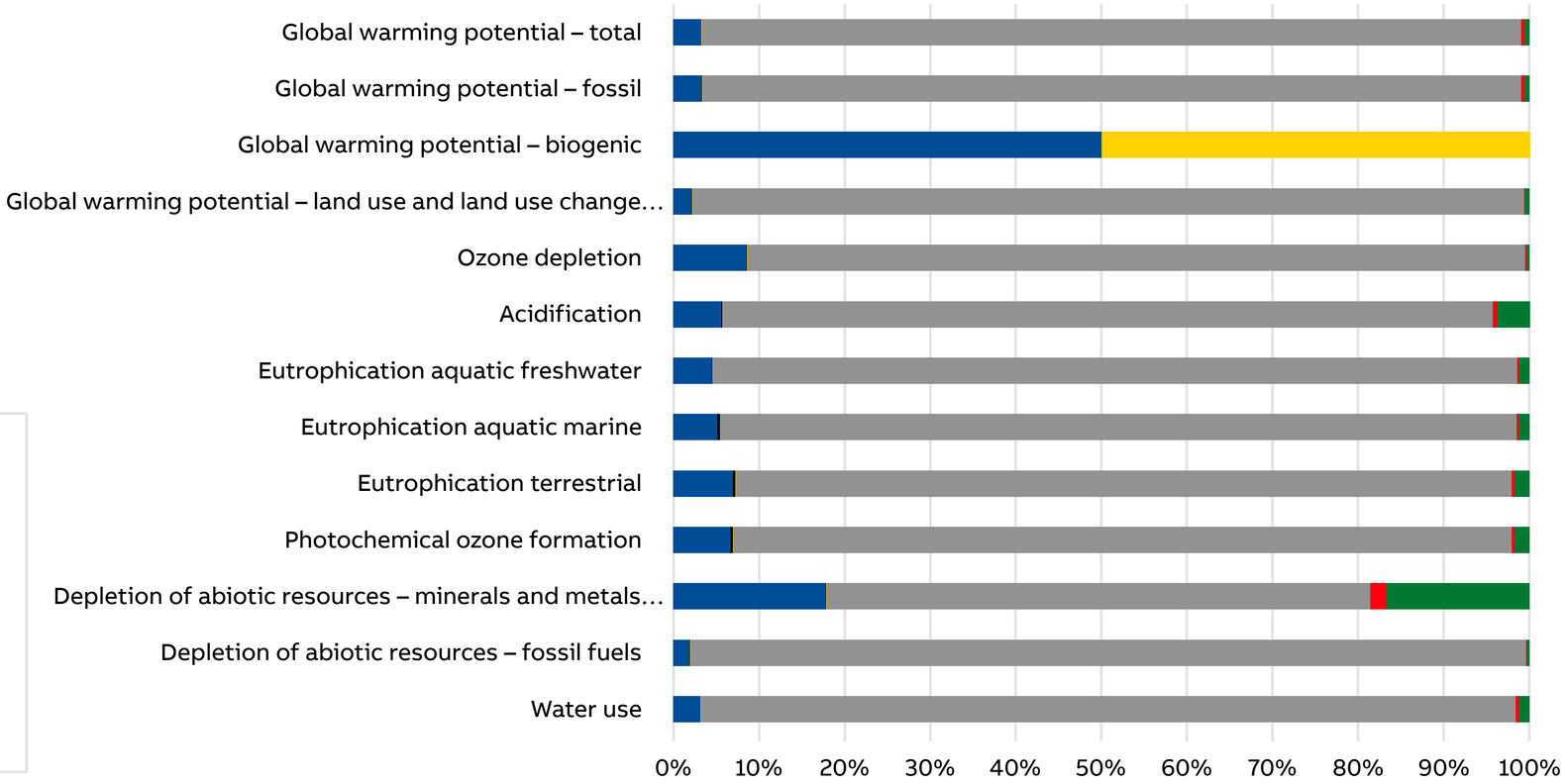
Global warming potential / ACH580-01-106A-4

Global warming potential fossil results – i.e. the carbon footprint results of studied variable speed drive including also the benefits and loads beyond life cycle.



Contribution analysis / ACH580-01-106A-4

Contribution of life cycle stages to the core environmental impacts.



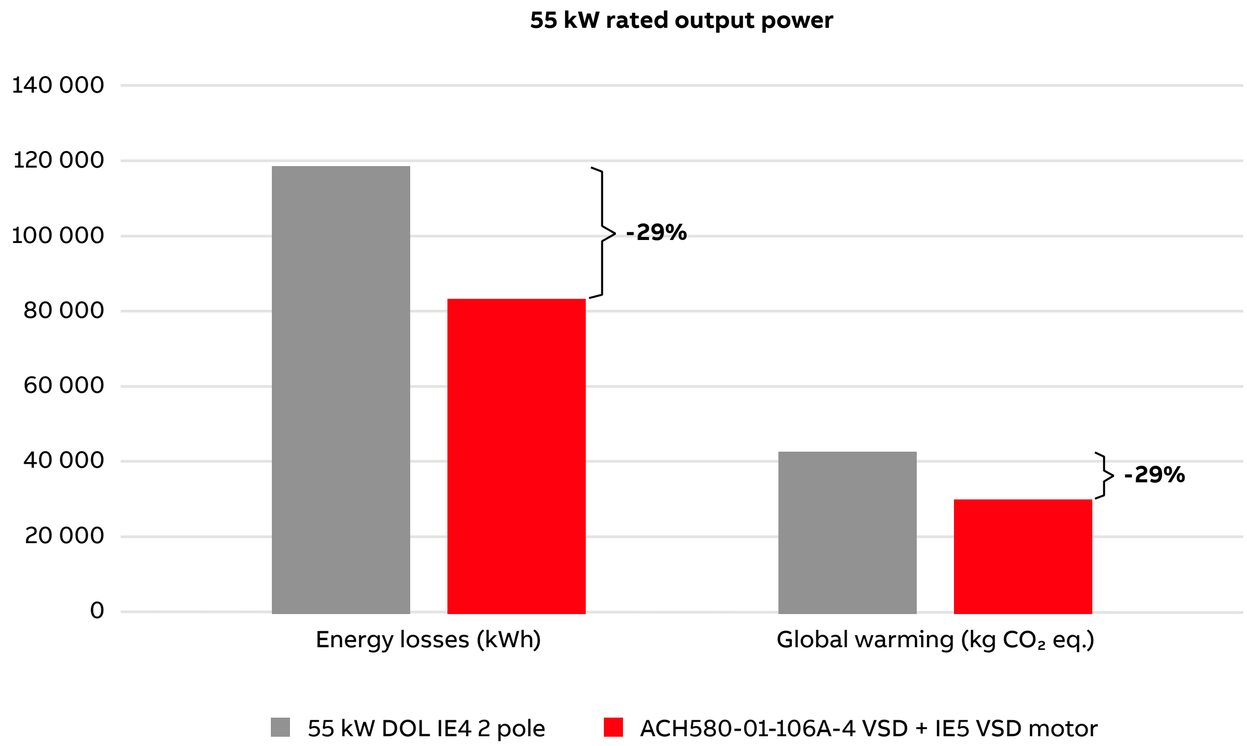
Additional environmental information

Energy savings, and potential for reduced emissions, when using a variable speed drive (VSD) to control an electrical motor

Using a variable speed drive (VSD) with an electrical motor enables significant energy savings and emission reduction compared to a Direct-on-Line (DOL) motor. The benefits of VSD control are gained via precise process control, which leads to significant energy savings due to the optimal speed being applied at all times.

The figures below present the use stage energy losses and contribution to global warming of of ACH580-01-106A-4 VSD + IE5 VSD motor system and an equivalent DOL motor. The losses and emissions have been calculated for the reference service life of the drive, which is 10 years.

Drive losses for each operating point have been calculated by applying the linear interpolation method taken from IEC 61800-9-2. DOL motor losses for each operating point are taken from IEC 60034-30-1. VSD motor losses for each operating point have been calculated using interpolation method from IEC 60034-31.



Use stage energy losses and contribution to global warming of ACH580-01-106A-4 VSD + IE5 VSD motor system and an equivalent DOL motor.

General information

Commissioner of the study

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LCA study was conducted by

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References

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Ecoinvent 3.9.1

ABB Oy. 2023. Inventory data.

ABB Drives

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