



# Self-Declared Environmental Claim

Variable speed drive  
ACH580-01 Frame R4  
30 to 45 kW

Type II environmental labelling  
In accordance with  
ISO 14021

ABB Oy  
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00380 Helsinki, Finland  
[new.abb.com/fi](http://new.abb.com/fi)



# Company information

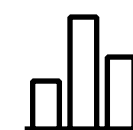
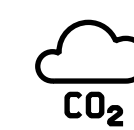
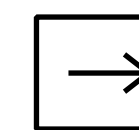
ABB is a leading global technology company that energizes the transformation of society and industry to achieve a more productive, sustainable future. By connecting software to its electrification, robotics, automation and motion portfolio, ABB pushes the boundaries of technology to drive performance 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.



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# 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.

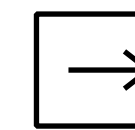
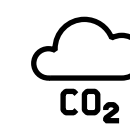
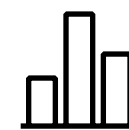
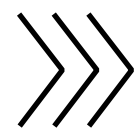
To ensure that we are focused on achieving our goals, the ABB sustainability targets are integrated into our decision-making processes, and we have accountabilities and incentive plans in place to drive the appropriate actions.


**ABB**



# Abbreviations

<b>ABS</b>	Acrylonitrile butadiene styrene
<b>APOS</b>	Allocation at point of substitution
<b>CTU</b>	Comparative toxic unit
<b>DOL</b>	Direct on line
<b>EoL</b>	End of life
<b>HVAC-R</b>	Heating, ventilation, air conditioning and refrigeration
<b>LCA</b>	Life cycle assessment
<b>LCIA</b>	Life cycle impact assessment
<b>PC</b>	Polycarbonate
<b>PCBA</b>	Printed circuit board assembly
<b>PCR</b>	Product Category Rules
<b>PE</b>	Polyethylene
<b>PEP</b>	Product Environmental Profile
<b>PSR</b>	Product Specific Rules
<b>PVC</b>	Polyvinyl chloride
<b>R factors</b>	Proportions of recyclable materials
<b>UN CPC</b>	The United Nations Central Product Classification
<b>VSD</b>	Variable speed drive
<b>WEEE</b>	Waste from Electric and Electronic Equipment







Production plant location of ABB: Finland

# Product information

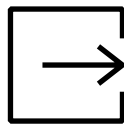
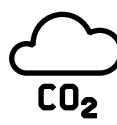
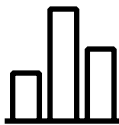
This document describes the environmental performance of Variable speed drive ACH580-01-089A-4.

**Product group:** Electrical, Electronic and HVAC-R products

Representative product	Variable speed drive ACH580-01-089A-4, nominal power 45 kW
Product description	<p>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.</p> <p>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.</p>
UN CPC code	UN CPC 46122
Total mass of the product including product package	22.35 kg
Reference lifetime	10 years

## Product range covered

Product	$P_N$ (kW)	$I_N$ (A)	$U_N$ (V)	Enclosure class
ACH580-01-062A-4 (+B056)	30	62	400	IP21 and IP55
ACH580-01-073A-4 (+B056)	37	73	400	IP21 and IP55
<b>ACH580-01-089A-4 (+B056)</b> (representative product)	<b>45</b>	<b>89</b>	<b>400</b>	<b>IP21 and IP55</b>





# LCA information

## Scope definition

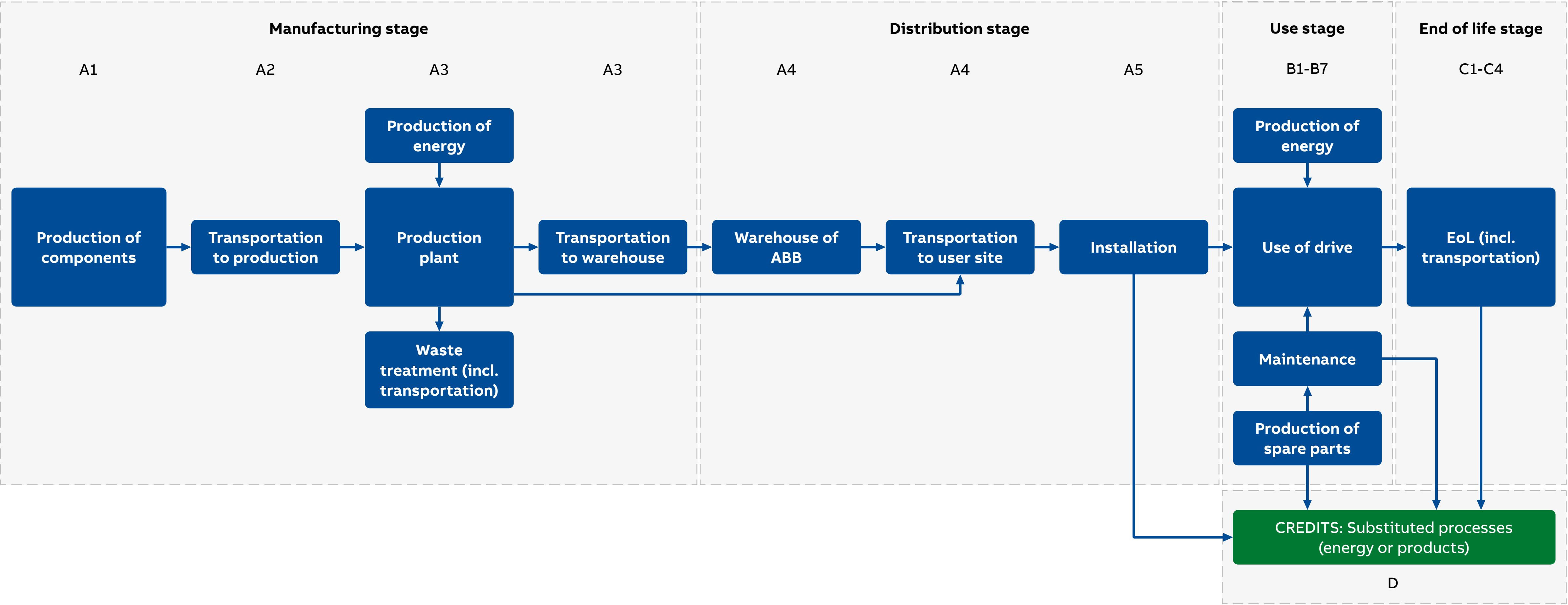
Functional unit	<p>To control the speed and torque of three phase motors (Asynchronous and Permanent Magnet motors) in energy management for machine applications. Calculation of the environmental impacts is based on 10 years of product service lifetime.</p> <p>The usage profile considered is 12.5% uptime 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.</p>
System boundary	<p>Throughout the whole life cycle of the product, including also net loads and benefits beyond system boundaries.</p>
Description of data representativeness	<p>Primary data used in the modelling represents the year 2022. Helsinki plant 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.</p> <p>Use stage modelling represents an average European user of the product.</p> <p>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.</p>
Allocation methods applied	<p>The “polluter pays” principle for EoL allocation. Allocation choices in secondary datasets may vary between datasets. No allocation to co-products.</p>
Cut-off rule applied and main exclusions	<p>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.</p>
Applied standards and rules	<p>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.</p>
Modelling software	<p>SimaPro 9.5.0.1, LCIA methodology EN 15804+A2</p>
Secondary dataset	<p>Ecoinvent 3.9.1 (Cut-off system model)</p>





# 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 from local supplier.



### 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.



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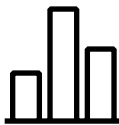


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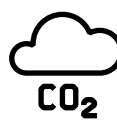
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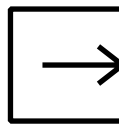
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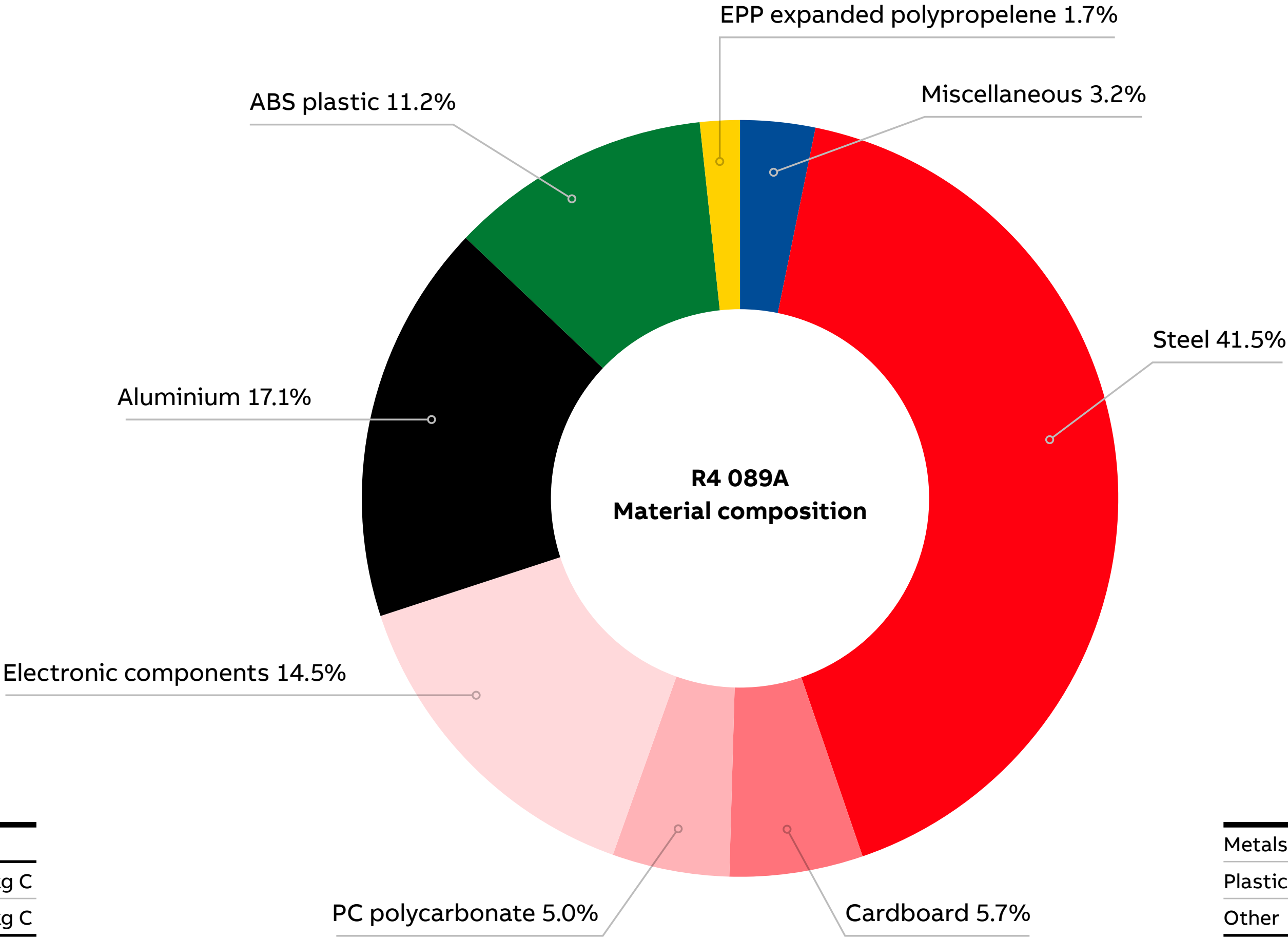






# Content declaration

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	0.66	kg C

Metals	59.6%
Plastics	19.7%
Other	20.7%



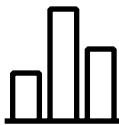
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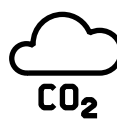


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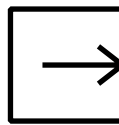
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# Environmental performance

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 <sub>2</sub> eq.	3.10E+02	3.81E+00	5.64E+00	9.55E+03	3.38E+01	-5.01E+01	9.90E+03
	Fossil	kg CO <sub>2</sub> eq.	3.15E+02	3.80E+00	6.56E-01	9.52E+03	3.35E+01	-5.00E+01	9.88E+03
	Biogenic	kg CO <sub>2</sub> eq.	-5.29E+00	0.00E+00	4.97E+00	0.00E+00	3.20E-01	0.00E+00	0.00E+00
	Land use and land use change	kg CO <sub>2</sub> eq.	5.19E-01	2.35E-03	5.42E-03	2.38E+01	1.37E-02	-1.10E-01	2.43E+01
Ozone depletion		kg CFC-11 eq.	1.33E-05	5.87E-08	1.34E-08	1.81E-04	1.97E-07	-6.29E-07	1.95E-04
Acidification of soils and water		mole H <sup>+</sup> eq.	3.67E+00	5.85E-02	3.34E-03	5.46E+01	1.66E-01	-1.16E+00	5.85E+01
Eutrophication	Freshwater	kg P eq.	2.49E-01	2.27E-04	2.78E-04	9.02E+00	9.99E-03	-6.13E-02	9.28E+00
	Marine	kg N eq.	4.33E-01	1.52E-02	7.90E-03	8.83E+00	1.85E-02	-7.79E-02	9.30E+00
	Terrestrial	mole N eq.	5.06E+00	1.67E-01	9.40E-03	7.98E+01	1.96E-01	-9.29E-01	8.53E+01
Photochemical ozone formation		kg NMVOC eq.	1.64E+00	4.88E-02	3.35E-03	2.57E+01	6.30E-02	-3.08E-01	2.74E+01
Depletion of abiotic resources	Minerals, metals	kg Sb eq.	4.03E-02	7.31E-06	3.09E-06	1.15E-01	1.62E-03	-1.36E-02	1.57E-01
	Fossil fuels	MJ	4.15E+03	5.14E+01	7.55E+00	2.15E+05	1.54E+02	-5.02E+02	2.20E+05
Water deprivation		m <sup>3</sup> world eq.	6.90E+01	2.03E-01	1.31E-01	2.43E+03	5.75E+00	-1.74E+01	2.51E+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	1.99E-05	2.61E-07	4.95E-08	2.00E-04	1.12E-06	-5.22E-06	2.21E-04
Ionizing radiation		kBq U235 eq.	3.76E+01	3.81E-02	4.63E-02	6.02E+03	1.75E+00	-1.53E+00	6.06E+03
Ecotoxicity		CTUe	4.30E+03	2.68E+01	1.62E+01	3.63E+04	3.12E+02	-9.21E+02	4.10E+04
Human toxicity	Cancer	CTUh	5.02E-07	1.65E-09	3.89E-10	4.45E-06	2.23E-07	-2.91E-07	5.18E-06
	Non cancer	CTUh	1.33E-05	2.83E-08	1.25E-08	1.77E-04	2.26E-06	-1.67E-05	1.93E-04
Land use /soil quality index		–	1.45E+03	3.24E+01	4.42E+00	4.22E+04	1.24E+02	-4.86E+02	4.38E+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	9.24E+01	1.43E-01	2.36E-01	6.30E+03	5.39E+00	-3.27E+01	6.40E+03
Use of renewable primary energy resources as raw materials	MJ	4.16E+01	0.00E+00	0.00E+00	7.12E+00	0.00E+00	0.00E+00	4.87E+01
Total use of renewable primary energy	MJ	1.34E+02	1.43E-01	2.36E-01	6.31E+03	5.39E+00	-3.27E+01	6.45E+03
Use of non-renewable primary energy as energy	MJ	3.94E+03	4.80E+01	7.55E+00	2.15E+05	1.54E+02	-5.01E+02	2.19E+05
Use of non-renewable primary energy as raw materials	MJ	2.04E+02	3.44E+00	0.00E+00	7.91E+00	0.00E+00	0.00E+00	2.16E+02
Total use of non-renewable primary energy	MJ	4.15E+03	5.14E+01	7.55E+00	2.15E+05	1.54E+02	-5.01E+02	2.20E+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	2.69E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.69E+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	2.27E+00	5.86E-03	4.91E-03	1.70E+02	1.53E-01	-4.65E-01	1.72E+02



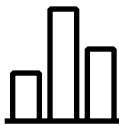
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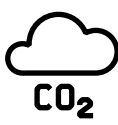
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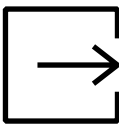
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# Environmental performance

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	3.19E-02	2.96E-04	4.63E-05	3.79E-01	2.05E+01	-1.71E-03	2.09E+01
Non-hazardous waste disposed	kg	4.77E+01	2.70E+00	1.14E+00	8.64E+02	4.36E+00	-1.48E+01	9.20E+02
Radioactive waste disposed	kg	8.90E-03	8.96E-06	1.14E-05	1.54E+00	4.48E-04	-3.91E-04	1.55E+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	2.30E+00	0.00E+00	6.89E-01	4.26E-01	1.12E+01	0.00E+00	1.46E+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
ACH580-01-062A-4 (+B056)	1.000	1.000	1.000	0.834	1.000	1.000
ACH580-01-073A-4 (+B056)	1.000	1.000	1.000	1.042	1.000	1.000
<b>ACH580-01-089A-4 (+B056)</b> (representative product)	<b>1.000</b>	<b>1.000</b>	<b>1.000</b>	<b>1.000</b>	<b>1.000</b>	<b>1.000</b>



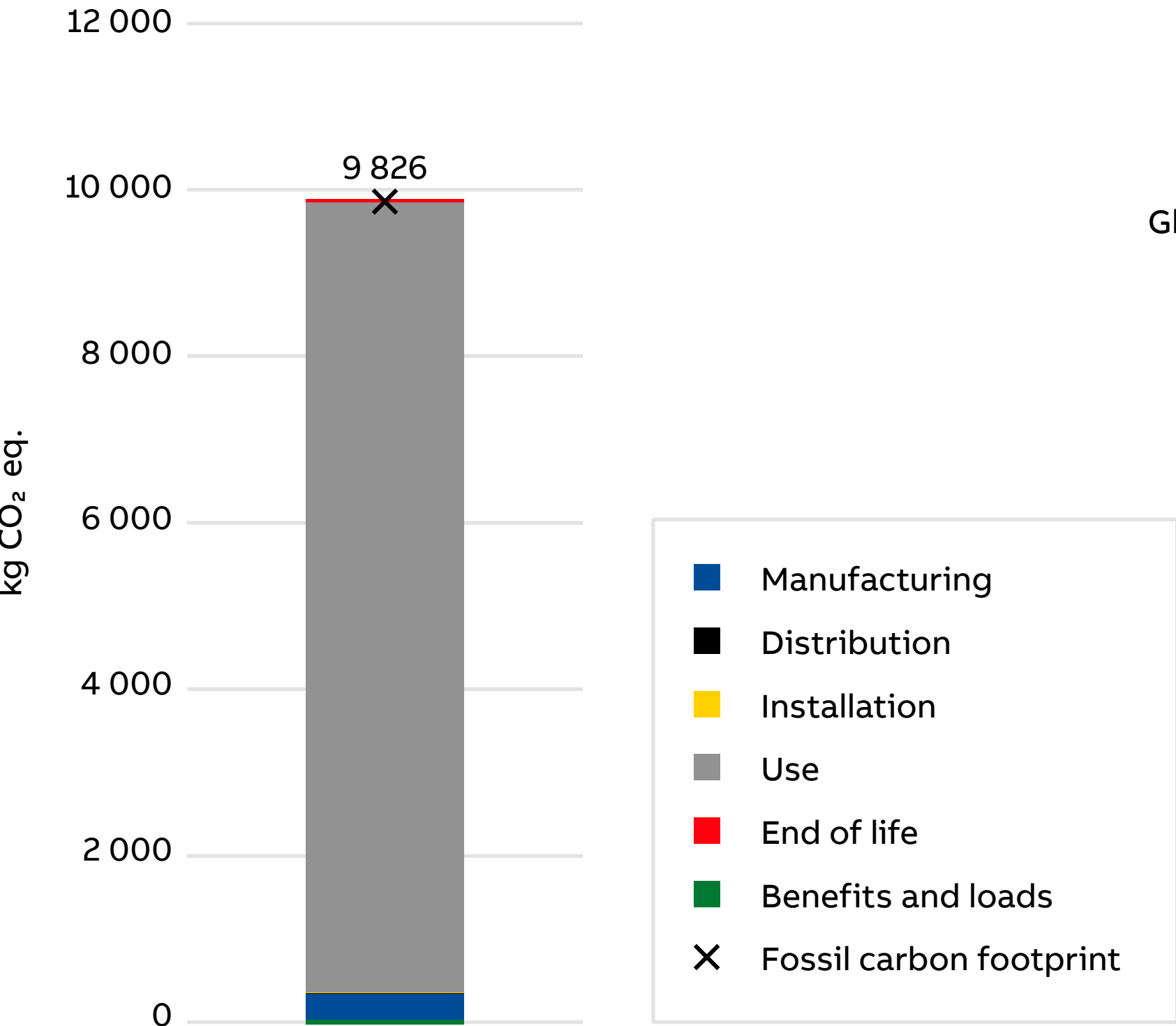


# Environmental performance

## Summary

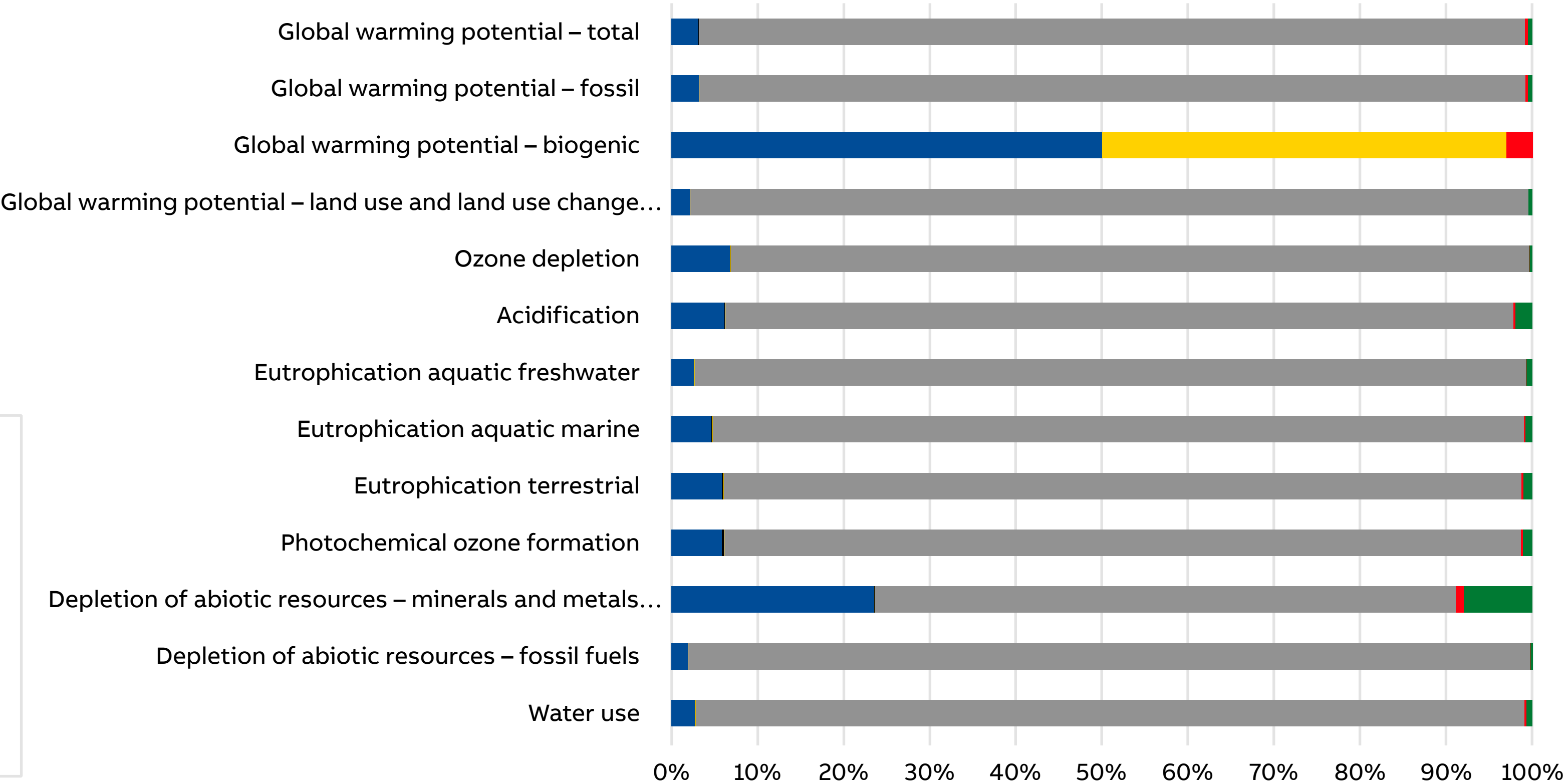
### Global warming potential / ACH580-01-089A-4

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 / ACH580-01-089A-4

Contribution of life cycle stages to the core environmental impacts.







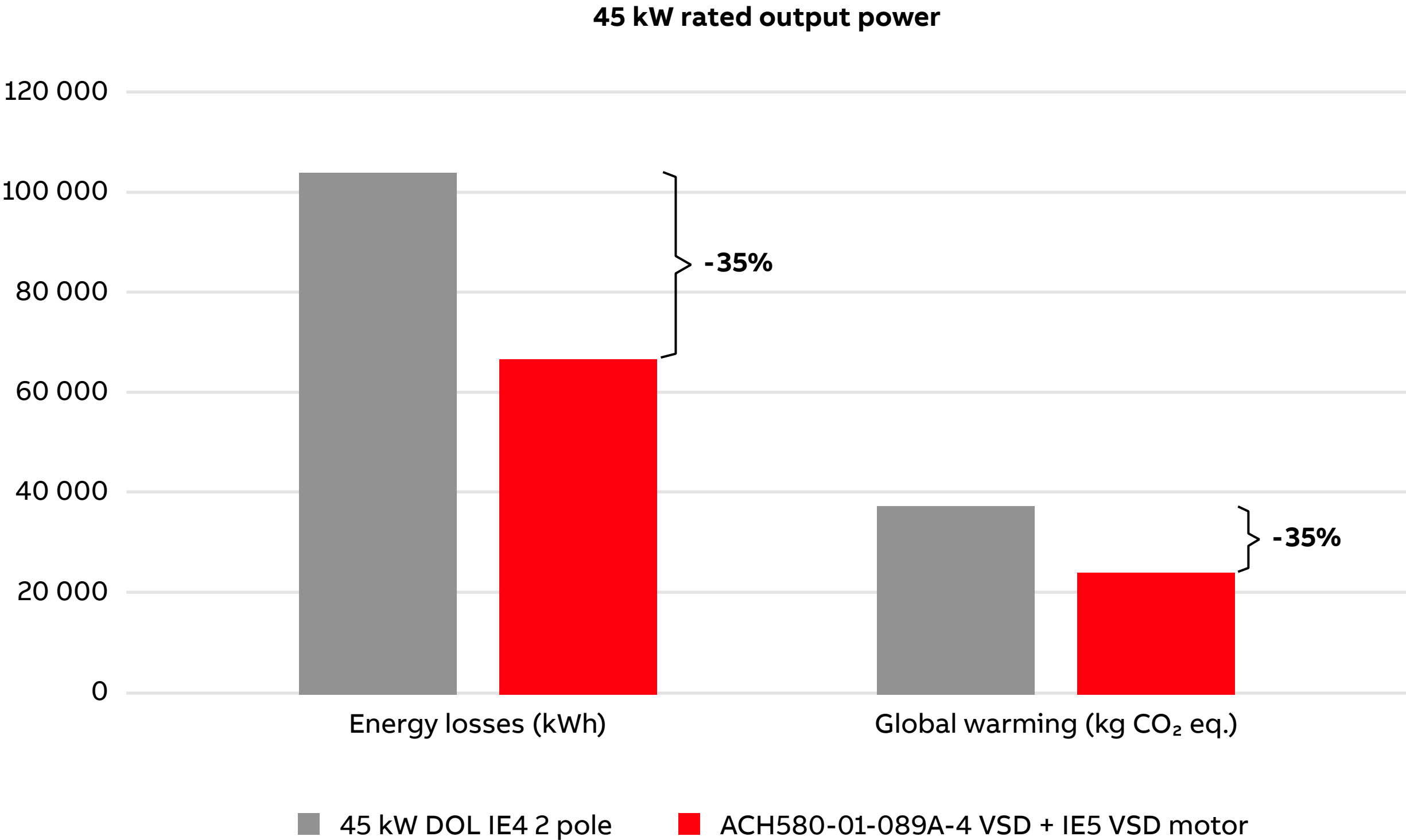
# Additional environmental information

**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 ACH580-01-089A-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 ACH580-01-089A-4 VSD + IE5 VSD motor system and an equivalent DOL motor.





# General information

**Commissioner of the study**

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new.abb.com/fi  
Contact: new.abb.com/locations/map

**LCA study was conducted by**

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53850 Lappeenranta, Finland  
www.etteplan.com  
lca.info@etteplan.com

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You base your business on efficiency and performance. You know that everything counts to make you more competitive. Our drives are made with all this in mind, empowering productivity and efficiency. They provide flexibility to help you optimize your processes and control, and reliable for less downtime. You also get premium service and expertise, anywhere on the globe.

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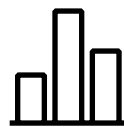
INTRO



PRODUCT  
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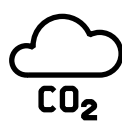
LCA  
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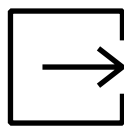
CONTENT  
DECLARATION



ENVIRONMENTAL  
PERFORMANCE



ADDITIONAL  
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INFORMATION



END

