ABB Oy Drives
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ACS 600 product family

ENVIRONMENTAL INFORMATION
Recycling instructions

Table of contents

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1. Introduction

This document covers the environmental information of the following products:

- ACS 600 product family, module frame sizes R2…R9,
  with accessories and option modules,
  according to the sales brochure.

The document applies to products ACx 6xx (ACS, ACP, ACF, ACC, ABE, ADE, AKO, GME, AVO and API) excluding cabinet assembly.

The document comprises a summary of materials used in the products and instructions how to handle an end-of-life product.

This document is intended for ABB internal use as well as for commercial recyclers.

While environmental regulations vary from country and region to another, and are also evolving rapidly by time, it is recommended to contact local environmental authorities for up-to-date information when consulting with customers or other stakeholders about proper product material recovery or other treatment.

Information for local customers, like where an end-of-life product can be returned, is recommended to be provided with this information.

Further information is available from

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The newest revision of this document can be found in “ABB Library”.

2. Product package

The product package is made of corrugated board (frame sizes up to R5 and option modules) or plywood (frame sizes from R6 upwards). The package is covered with plastic covering made of polyethylene (PE-LD) and tied with polypropylene (PP) or steel bands. Option boards are in protective polyethylene (PE-LD) bags.

All materials used in the package can be recycled.

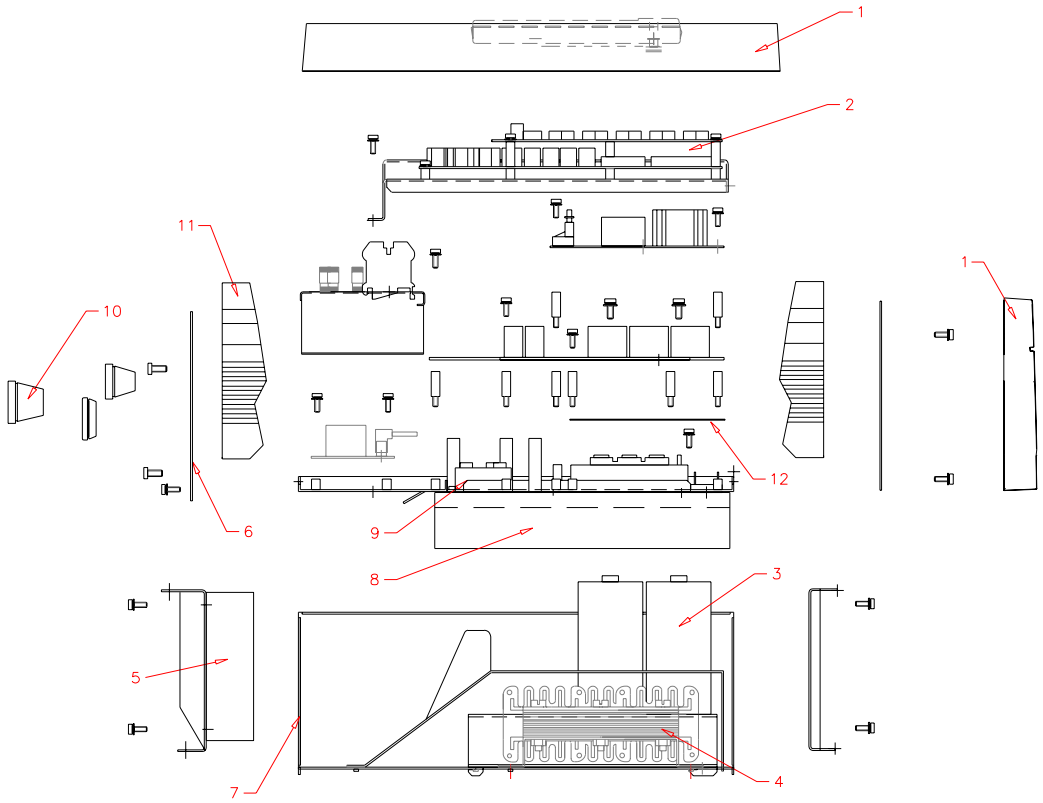
To avoid pollution caused by unnecessary transportation, the manufacturing factory is not taking back used packages. Package recycling is organised by the importing ABB sales company locally, according to local regulations.

Package recycling is recommended while recycling preserves raw materials and reduces waste being landfilled.

3. Product materials

3.1 Structure of ACS 600 module

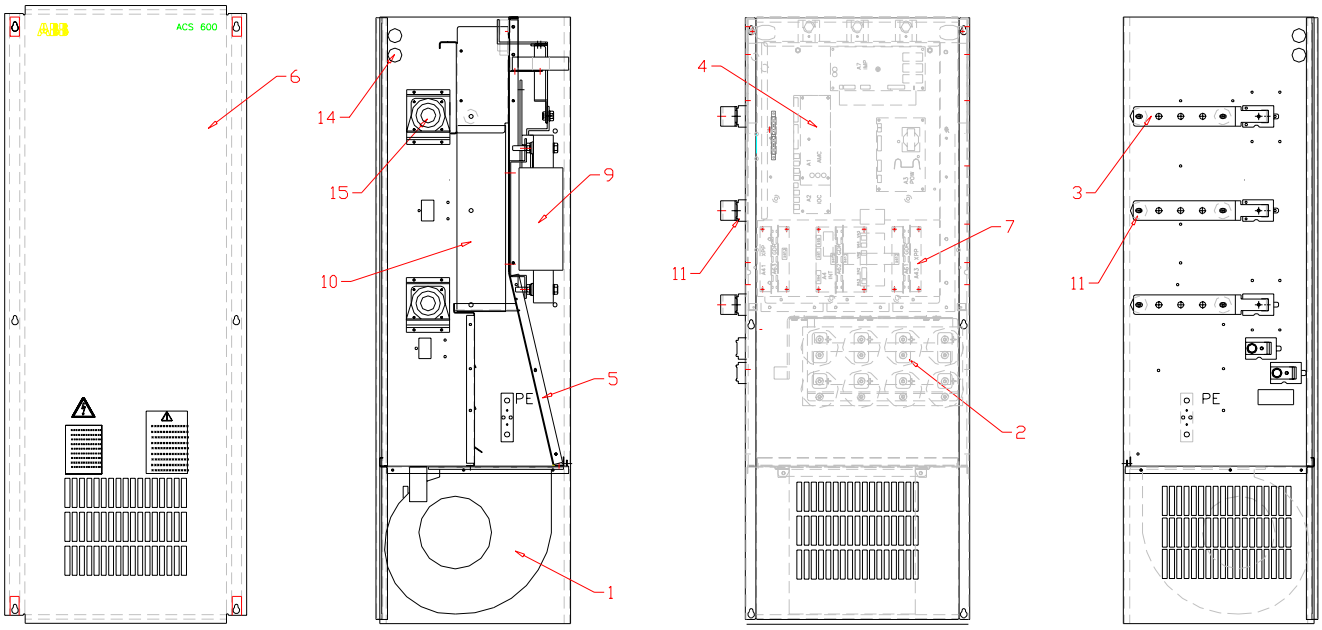
The main components of ACS 601 R2...R6 are shown in the figure below.



Part no.	Name	Materials	Weight / kg
1	Cover parts	PS (STYRON, Lacqrene®), front cover Cu coated	0,6...1,0
2	Printed circuit boards	Various (FR4)	
3	Electrolytic capacitors	Al, electrolytic solute	0,24...2,64
4	Chokes	Fe, Cu + various	2,5...9,0
5	Fan	PBT, PA, Cu, Al	0,3...0,76
6	Sheetmetal parts	Zn coated steel	6,4...16,5
7	Sheetmetal part paint	Polyester powder paint (Teknos CZ 8080®)	
8	Heatsink	Al alloy (Mg, Si)	1,5...12,6
9	Semiconductors	Epoxy, Cu, Al, Si, Si gel, PBT, Pb, PPS, SiN, AlN	
10	Membrane packing	EPDM / CR	
11	Side Profile	Anodised Al alloy	1,6...2,8
12	Insulating Plate	PC (Lexan 9030®)	
13	Screws	Zn coated steel	
14	Cables and wires	PVC, Cu, Sn + various	

15	Busbars (R4-R6)	Sn coated Cu	
		Total Weight	**14...50 kg**

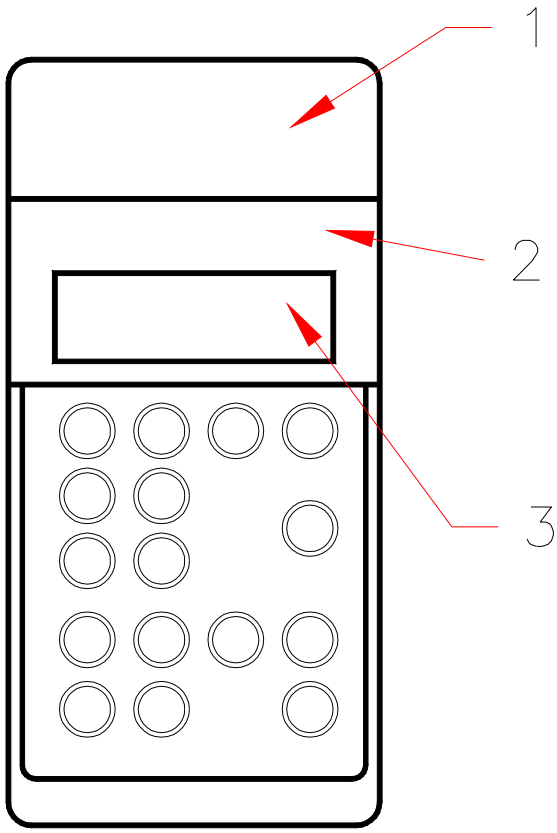
The main components of ACS 601 R7...R9 are shown in the figure below.



Part no.	Name	Materials	Weight / kg
1	Fan R8 / R9	Zn coated steel, Al, Cu	10,0 / 12,0
	Fan R7 (2 pcs)	PBT, PA, Cu, Al	2 x 0,76
2	Electrolytic capacitors	Al, electrolytic solute	3,5...13,2
3	Bushbars	Sn coated Cu	4,0...18,0
4	Printed circuit boards	Various (FR4)	
5	Sheetmetal parts	Zn coated steel	37,5...63,5
6	Sheetmetal part paint	Polyester powder paint (Teknos CZ 8080®)	
7	Semiconductors	Epoxy, Cu, Al, Si, Si gel, PBT, Pb, PPS, SiN, AlN	
8	Insulating Plates	PC (Lexan 9030®)	
9	Chokes	Fe, Cu + various	18,0...38,0
10	Heatsinks	Al alloy (Mg, Si)	9,0...24,0
11	Insulating Supports	PA, GF, epoxy	
13	Screws	Zn coated steel	
14	Membrane packing	EPDM / CR	

15	Transducers	PC (Lexan 2814®), PUR (Damival 13552®), Cu	
16	Cables and wires	PVC, Cu, Sn + various	
		Total Weight	**88...171 kg**

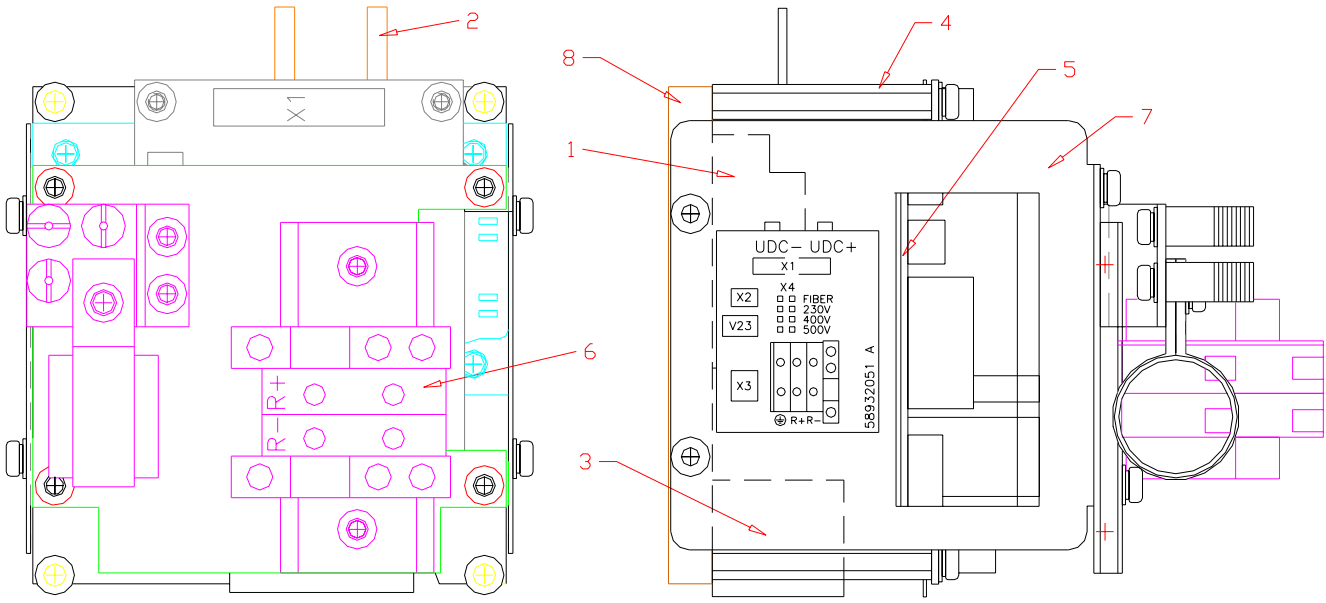
The main components of **Control Panel**



Part no.	Name	Materials	Weight / g
1	Frame	PC + ABS =Cycoloy®	90
2	Lens	PC (Lexan®)	20
3	LCD-display+printed circuit board	Various	70
		Total Weight	**180 g**

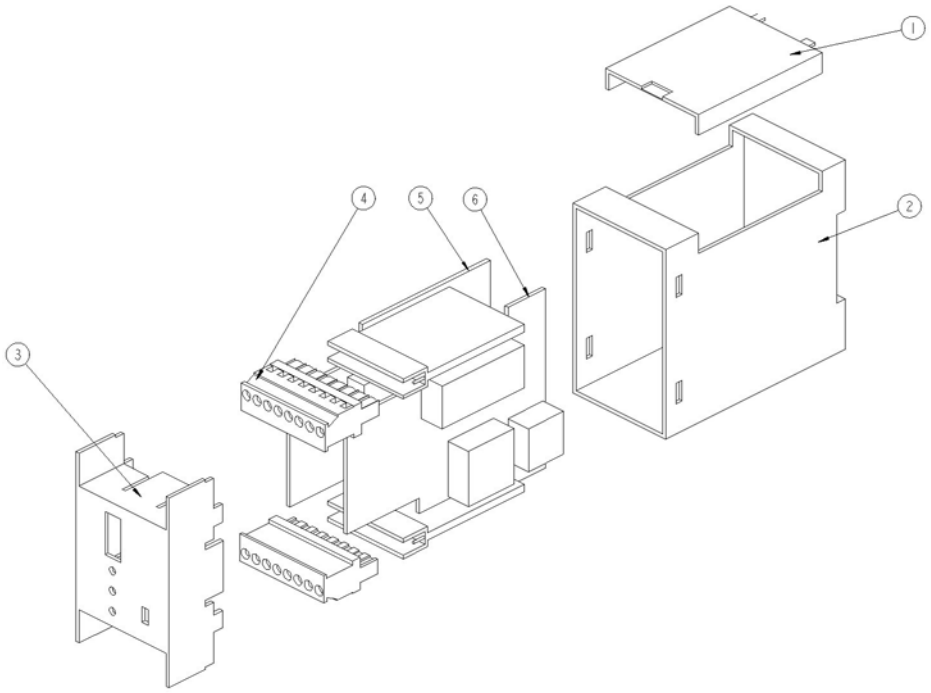
3.2 Option modules

Brake chopper unit



Part no.	Name	Material	Weight/kg
1	IGBT-module	Cu, Al, Si, Si gel, PBT, Pb, PPS, SiN, AlN	0,17...0,91
2	Busbars	Sn coated Cu	0,08...3,34
3	Clamp-capacitor	PP, Al, Sn, Brass, Epoxy	
4	Insulating supports	PA, GF	
5	Printed circuit board	Various (FR4)	
6	Connector	Various	
7	Sheet metal parts	Zn coated steel	0,41...10,8
8	Heat sink	Al alloy (Mg, Si)	0,3...10,0
9	Screws	Zn coated steel	
10	Cables	PVC, Cu, Sn + various	
11	Insulating plate	PC (Lexan 9030®)	
		Total weight	**1,6...26 kg**

Control option module



Part No.	Name	Qty.	Materials	Weight / g
1-3	Frame parts	3	ABS	55
4	Connector	1-2	ABS, PA, Ni or Sn plated brass	17...33
5,6	Printed circuit boards	2	various	105...120
			Total weight:	**178...209 g**

All screws in ACS600: Carbon steel, Pozidrives or Torx recess, Zinc plating

Plastics and rubber:

ABS	acrylonitrile-butadiene-styrene
CR	chloroprenerubber (neoprene)
EPDM	ethylenepropylenerubber
GF	glassfibre
PBT	polybutylene terephthalate
PA	polyamide
PC	polycarbonate
PP	polypropylene
PPS	polyphenylenesulfide
PS	polystyrene
PUR	polyurethane
PVC	polyvinyl chloride

All plastic parts (weight > 25 g) are marked according to ISO 1043 and DIN 54840.

3.3 Product manuals and sales brochures

All brochures and manuals are printed according to the guidelines of the Nordic Environmental Label criteria and they are equipped with the “Swan” Ecolabel.

To save natural resources and reduce paper waste, all product manuals are available also in electronic media. The documents are available from “ABB Library”, the technical files are accessible for all ABB Drives sales and service people.

4. Product use

The use of a frequency converter has several positive environmental impacts, like

- Substantial energy savings can be reached using a frequency converter. According to investigations, these savings are in pump and fan drives typically 50 %. This means reduced CO_2 and NO_x emissions in power plants, due to reduced energy demand.

- Process controllability is improved when a state-of-the art drive is used as a part of a process control system, meaning reduced waste

- When a process can be driven in an optimal way, process equipment's (like conveyors' and pumps') wearing is reduced and life time increased, decreasing environmental loading caused by manufacturing new equipment

- Noise is in most cases reduced

- Natural resources like wood in pulp & paper industry are saved while process efficiency is improved

The frequency converter itself does not cause any emissions while in use. Due to reduced energy consumption, overall harmful emissions are reduced as described above.

The product does not need any periodic maintenance.

For more information on product use, see *ACS 600 User's Guide*.

5. Product disposal

Product disposal can be made in two alternative ways. The product can be disassembled manually or crushed in a shredding machine.

5.1 Manual disassembly

The product is disassembled manually and parts are sorted according to their material contents as follows:

- iron metals (plates, screws)
- aluminium (heatsink)
- plastics
- printed circuit boards*
- electrolytic capacitors* (mounted on the main circuit board)
- other*

* For more information, see 5.3 List of potentially harmful materials

Metal parts (iron and aluminium) can easily be recycled, other materials according to local arrangements.

5.2 Mechanical shredding

In this method, a whole product is mechanically shredded into small pieces and materials are sorted using dedicated sorting processes. Components containing harmful materials must, however, be removed before shredding (for more information, see 5.3 List of potentially harmful materials).

5.3 List of potentially harmful materials

Definitions and regulations of hazardous materials differ from country to country and are also changing when knowledge of materials increases. The materials used in the product are materials typically used in electric and electronic devices.

The list given below is based on the following references:

1. CEFIC-EECA-EICTA. Excerpts of restrictions on substances from legal provisions for special application in electric and electronic products. May 02, 2002.
2. Substances contained in products of the electrical/electronics industry. Zentralverband Elektrotechnik- und Elektronikindustrie (ZVEI) e.V., Frankfurt am Main. 1995.
3. Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE).
4. Commission Decision of 3 May 2000 replacing Decision 94/3/EC establishing a list of wastes pursuant to Article 1(a) of Council directive 75/442/EEC on waste and Council Decision 94/904/EC establishing a list of hazardous waste pursuant to Article 1(4) of Council Directive 91/689/EEC on hazardous waste. (2000/532/EC). “European Waste Catalogue”.

Table: List of possibly harmful substances in different materials and components according to the references

Component	Harmful substance(s)	Reference
Printed circuit boards	lead (in solder)	3
	tetrabromobisphenol A (TBBA, flame retardant)	3
Electrolytic capacitors	N/A	3
	may contain harmful chemicals (DMAC/DMF) *	
Plastics	None	
Semiconductors	None	
Cables	PVC	1

* composition varies with the manufacture and technical development of the electrolytic capacitors
N/A = not available

Note. According to the “European Waste Catalogue”, an end-of-life product is classified by code 16 02 14.
Printed circuit boards and electrolytic capacitors, removed from the product, are however classified as “hazardous components removed from discarded equipment”, code 16 02 15, requiring special treatment.

5.4 One recycling method

The procedure described below complies with regulations valid in Finland in January, 2003.

- steel — recycled as material
- aluminium — recycled as material
- plastics — energy recovery (incineration) or landfilled
- printed circuit boards — sent for hazardous material treatment
- electrolytic capacitors — sent for hazardous material treatment
- cables — landfilled
- other materials — energy recovery (incineration) or landfilled

6. Manufacturing

The product is manufactured by ABB Oy Drives, Helsinki. The environmental system of the manufacturing unit is certified to ISO 14001.

The accessories and option modules are manufactured by other manufacturers, mainly in Finland.

7. Environmental management system of ABB Oy Drives

Environmental management system (EMS)

ABB Oy Drives has an environmental system covering all divisions and functions of the company. The EMS is certified to ISO 14001 since November, 1996.

The company's environmental objectives include among others items as follows,
- reduce use of material in products, difficult to recycle or reuse
- improve recyclability of products
- reduce environmental burden caused by packaging materials.

ABB Oy Drives's environmental policy

ABB Oy Drives is committed to an environmental policy, which is based on the following:

1. We develop and manufacture products such as alternating current electrical drives and automation systems that save our customers energy and raw materials and give them better control over their processes. We strive continuously to make our products environmentally more sound by applying results obtained in recyclability and life-cycle assessments.

2. We are committed to reducing the harmful environmental impacts of our operations by continuously improving the operation of our production processes.

3. Our minimum requirement is to abide by all acts, decrees and official regulations on environmental protection in all our operations; we aim to ensure that all our subcontractors do likewise. We work closely with our suppliers in seeking environmentally sound solutions.

4. We regularly review the substance and practice of our environmental policy in the light of our environmental management system, setting new environmental goals and targets annually. We regularly inform our

staff and other affiliated groups about our environmental concerns, and make sure that our environmental policy is available to the public.

Our environmental management system, certified to ISO 14001, is the tool for carrying out our environmental policy. The line organisation, assisted by the environmental organisation, is responsible for ensuring that we fulfil our obligations with respect to environmental protection. In raising and maintaining the environmental awareness of our staff, we assign high priority to training.