
ABB LOW VOLTAGE AC DRIVES AND WIND TURBINE CONVERTERS

Converter modules with electrolytic DC capacitors in the DC link

Capacitor reforming instructions

Table of contents

1. Introduction

Contents of this chapter	5
Target audience	5
Purpose of the manual	5
Applicability	5
Converter module types and reforming method selection	6

2. Reforming the capacitors

Contents of this chapter	7
Overview of the reforming	7
Reforming time	8
Checking the converter age	8
Safety instructions	9
Method 1 - Reforming with power on for 30 minutes	9
Method 2 - Reforming with external DC power supply	10
Method 3 - Reforming with external diode bridge	12
Method 4 - Reforming through external resistors	14

Further information







Introduction

Contents of this chapter

This chapter describes the applicability, target audience and purpose of this manual.

Target audience

You are expected to know the standard electrical wiring practices, electronic components, and electrical schematic symbols.

Purpose of the manual

The manual provides information needed for reforming the converter module capacitors.

Applicability

This manual is applicable with drive, inverter and converter modules which have electrolytic DC capacitors in the DC link. The module types are listed in the table below. The module types are commonly referred to as converter or converter module later in this manual.

The converter module types are in use in these product series:

- drive series: ACS800, ACS850, ACQ810, ACSM1, ACS180, ACS380, ACH480, ACS480, ACH580, ACQ580, ACS580 and ACS880
- wind turbine converter series: ACS800-67LC, ACS800-77LC, ACS800-87LC and ACS800N-87LC.

Note: A graphical symbol for a drive is used in all connection diagrams. The connection principle is the same for the other converter module types as well but the terminal markings can vary.

■ Converter module types and reforming method selection

The table below lists the converter module types that this guide is applicable to. It also shows the criteria for the reforming method selection. The reforming methods are described in chapter [Reforming the capacitors](#).

Converter module type	Frame size	Reforming method selection			
		Method 1	Method 2	Method 3	Method 4
ACS800-01, -11, -31, -02, -04, -104 and -104LC	all	$1 \leq t < 2$	$2 \leq t$	$2 \leq t$	$2 \leq t$
ACS850-04	all	$1 \leq t < 2$	$2 \leq t$	$2 \leq t$	$2 \leq t$
ACQ810-04	all	$1 \leq t < 2$	$2 \leq t$	$2 \leq t$	$2 \leq t$
ACSM1-04 and ACSM1-204	all	$1 \leq t < 2$	$2 \leq t$	$2 \leq t$	$2 \leq t$
ACS180-04	R0 and R1	$1 \leq t < 2$	NA*	NA*	$2 \leq t$
ACS180-04	R2 to R4	$1 \leq t < 2$	$2 \leq t$	$2 \leq t$	$2 \leq t$
ACS380-04	all	$1 \leq t < 2$	$2 \leq t$	$2 \leq t$	$2 \leq t$
ACH480-04	all	$1 \leq t < 2$	$2 \leq t$	$2 \leq t$	$2 \leq t$
ACS480-04	all	$1 \leq t < 2$	$2 \leq t$	$2 \leq t$	$2 \leq t$
ACH580-01 ACQ580-01 ACS580-01	R1 to R3	$1 \leq t < 3$	NA*	NA*	$3 \leq t$
ACH580-01 ACQ580-01 ACS580-01	R4 to R9	$1 \leq t < 3$	$3 \leq t$	$3 \leq t$	$3 \leq t$
ACH580-04, -31 and 34 ACQ580-04, -31 and 34 ACS580-04, -31 and 34	all	$1 \leq t < 3$	$3 \leq t$	$3 \leq t$	$3 \leq t$
ACS880-01, -04, -11, -31, -14, -34	all	$1 \leq t < 3$	$3 \leq t$	$3 \leq t$	$3 \leq t$
ACS880-104	all	$1 \leq t < 2$	$2 \leq t$	$2 \leq t$	$2 \leq t$

t non-operational (power off) time in years

NA not applicable

* No DC terminal(s) for connecting DC reforming circuit

4

Reforming the capacitors

Contents of this chapter

This chapter contains the instructions on how to reform the converter capacitors.

Overview of the reforming

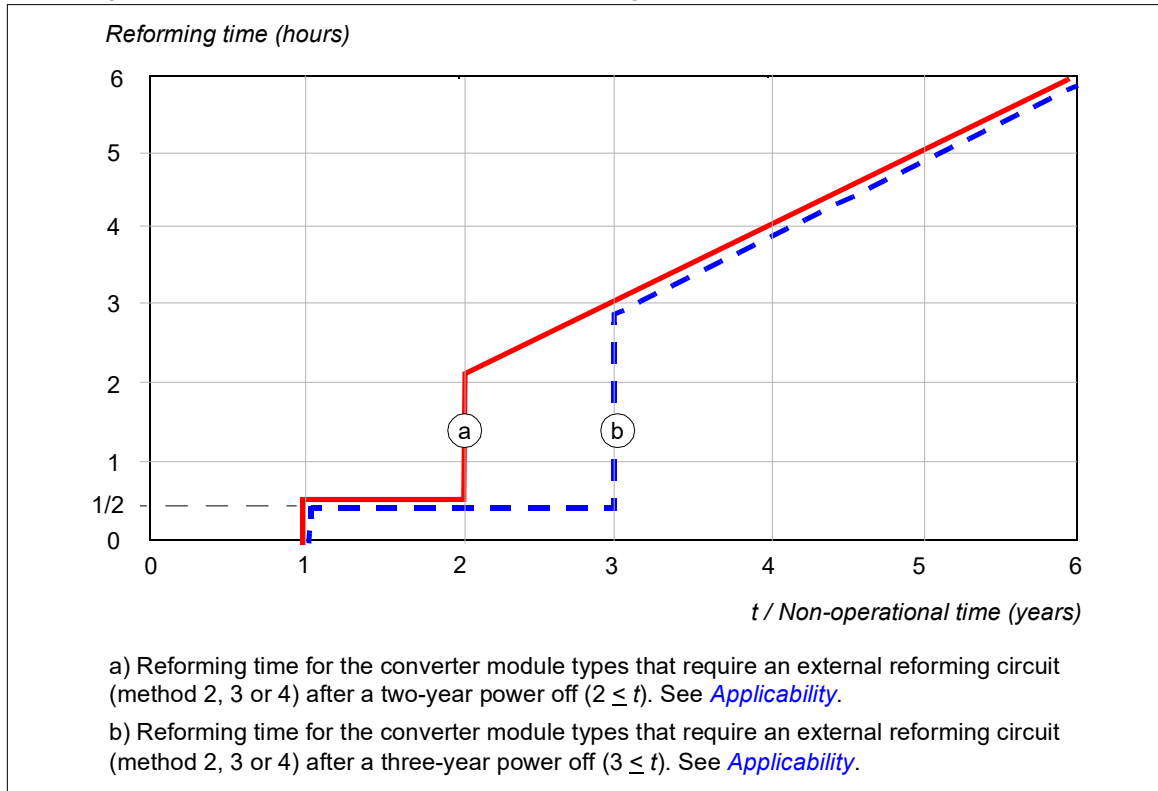
Electrolytic DC capacitors in the converter module DC link need to be reformed (re-aged) if the module has been non-operational for a year or more. The reforming time depends on how long the converter has been non-operational and on the converter module type. Without reforming, the capacitors can get damaged when the converter starts to operate.

If the converter has been non-operational for less than one year, the capacitors do not need reforming.

Besides the reforming methods presented in this manual, ABB can supply you with ready-made reforming devices, such as FINERO FST-DCP 1500-05 and FUG HCK 800-2000. For more information, contact your local ABB representative.

Reforming time

The diagram below shows the required reforming time.



Checking the converter age

The converter serial number defines the week when the converter was manufactured:

- 7 digits: For example, in 3260034, 3 denotes manufacturing year (2003), 26 manufacturing week and 0034 running manufacturing number.
- 8 digits: For example, in 14250125, 1 denotes manufacturing country (1 = Finland), 4 manufacturing year (2004), 25 manufacturing week and 0125 running manufacturing number.
- 10 digits: For example, in 1173200725, 1 denotes manufacturing country, 17 manufacturing year (2017), 32 manufacturing week and 00725 running manufacturing number.

Safety instructions



WARNING! Obey the converter safety instructions, and the safety instructions given in this manual. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do electrical installation or maintenance work.

1. **Drives:** Never work on the converter, motor cable or motor when input power is applied. After you have disconnected the input power, always wait for 5 minutes to let the intermediate circuit capacitors to discharge before you start to work on the converter, the motor or motor cable.
Wind turbine converters: Never work on the converter or generator when input power is applied. After you have disconnected the input power, always wait for 10 minutes to let the intermediate circuit capacitors discharge before you start to work on the converter, generator or generator cable.
 2. Measure that the installation is de-energized. Use a quality voltage tester.
 - Before and after measuring the installation, verify the operation of the voltage tester on a known voltage source.
 - Make sure that the voltage between the converter input power terminals (U1, V1 and W1) and the grounding terminal (PE) is zero.
 - Make sure that the voltage between the drive DC terminals (UDC+ and UDC-) and the grounding terminal (PE) is zero.
 3. Never switch on the converter power supply while the reforming circuit is connected. Lock the disconnecter to an open position.
 4. Make sure that the converter is clean and dry (no condensation) before you start the reforming.
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Method 1 - Reforming with power on for 30 minutes

See [Applicability](#) on page 5 for information on when you can use this reforming method.

Reforming instructions:

1. Switch the power on to the converter for 30 minutes.
2. Do not load the converter while the reforming is ongoing.

The converter “wakes up” its capacitors on its own, after which it is ready for use.

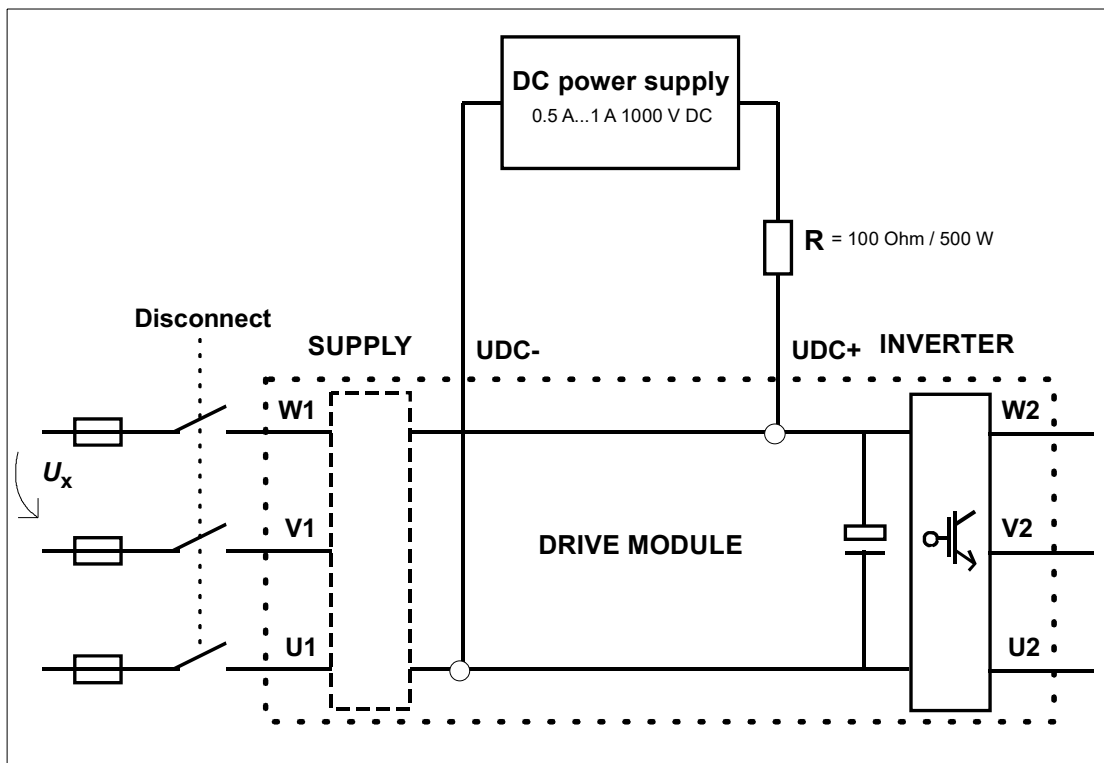
Method 2 - Reforming with external DC power supply

See [Applicability](#) on page 5 for information on when you can use this reforming method.



WARNING! Obey the safety instructions in section [Safety instructions](#) on page 9. If you ignore them, injury or death, or damage to the equipment can occur. Never switch on the converter power supply while the reforming circuit is connected. Lock the disconnect (if any) to an open position.

1. Make sure that the converter module is disconnected from all possible power sources (all AC and DC inputs/outputs are disconnected).
2. Measure that the installation is de-energized. Use a quality voltage tester.
 - Before and after measuring the installation, verify the operation of the voltage tester on a known voltage source.
 - Make sure that the voltage between the converter input power terminals (U1, V1 and W1) and the grounding terminal (PE) is zero.
 - Make sure that the voltage between the drive DC terminals (UDC+ and UDC-) and the grounding terminal (PE) is zero.
3. Make this reforming circuit and connect it to the DC terminals of the converter module. An external resistor is not needed if the DC power supply has an adjustable current limiter.



4. Switch on the reforming circuit for the time defined in section [Reforming time](#) on page 8.

Note: Limit the reforming current to max. 500 mA. If the DC power supply does not have an adjustable current limiter, increase the voltage gradually from 0 to the full scale value. Regulated DC power with active current limiting:

- Output current: 0.5...1 A DC, max. 500 mA during reforming
- Output voltage: adjustable 0...1000 V DC. An appropriate voltage during reforming is $1.35 \dots 1.45 \cdot U_x$. U_x denotes the nominal AC voltage of the converter.



WARNING! The capacitors can get damaged if you use excessive DC voltage during the reforming.

5. Switch off the reforming circuit.
 6. Wait for 5 minutes (10 minutes for wind turbine converters) to let the converter DC capacitors discharge.
 7. Measure that the voltage of the DC terminals of the converter is close to 0 V.
 8. Disconnect the reforming circuit from the converter.
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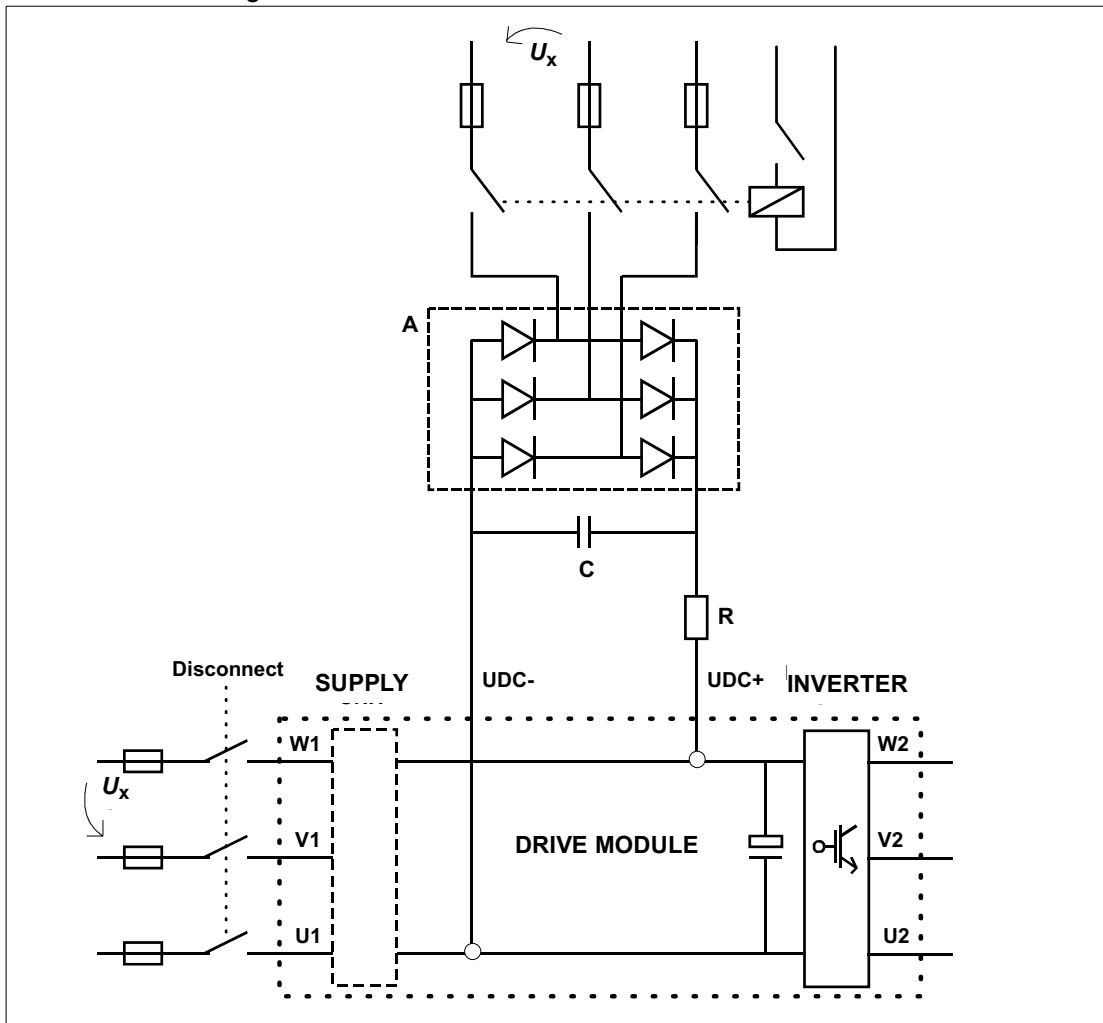
Method 3 - Reforming with external diode bridge

See [Applicability](#) on page 5 for information on when you can use this reforming method.



WARNING! Obey the safety instructions in section [Safety instructions](#) on page 9. If you ignore them, injury or death, or damage to the equipment can occur. Never switch on the converter power supply while the reforming circuit is connected. Lock the disconnecter (if any) to an open position.

1. Make sure that the converter module is disconnected from all possible power sources (all AC and DC inputs/outputs are disconnected).
2. Measure that the installation is de-energized. Use a quality voltage tester.
 - Before and after measuring the installation, verify the operation of the voltage tester on a known voltage source.
 - Make sure that the voltage between the converter input power terminals (U1, V1 and W1) and the grounding terminal (PE) is zero.
 - Make sure that the voltage between the drive DC terminals (UDC+ and UDC-) and the grounding terminal (PE) is zero.
3. Make this reforming circuit and connect it to the DC terminals of the converter module.



Voltage	Recommended components		
	A	R	C
$200\text{ V} < U_x < 240\text{ V}$	SKD 82/16	220 Ohm / 700 W	22 nF / 2000 V
$380\text{ V} < U_x < 415\text{ V}$	SKD 82/16	220 Ohm / 700 W	22 nF / 2000 V
$380\text{ V} < U_x < 500\text{ V}$	SKD 82/16	470 Ohm / 1200 W	22 nF / 2000 V
$525\text{ V} < U_x < 690\text{ V}$	SKD 82/16	680 Ohm / 1700 W	22 nF / 2000 V

4. Switch on the AC power supply of the reforming circuit for the time defined in section [Reforming time](#) on page 8.
 5. Switch off and disconnect the AC power supply of the reforming circuit.
 6. Wait for 5 minutes (10 minutes for wind turbine converters) to let the converter DC capacitors discharge.
 7. Measure that the voltage of the DC terminals of the converter is close to 0 V.
 8. Disconnect the reforming circuit from the converter.
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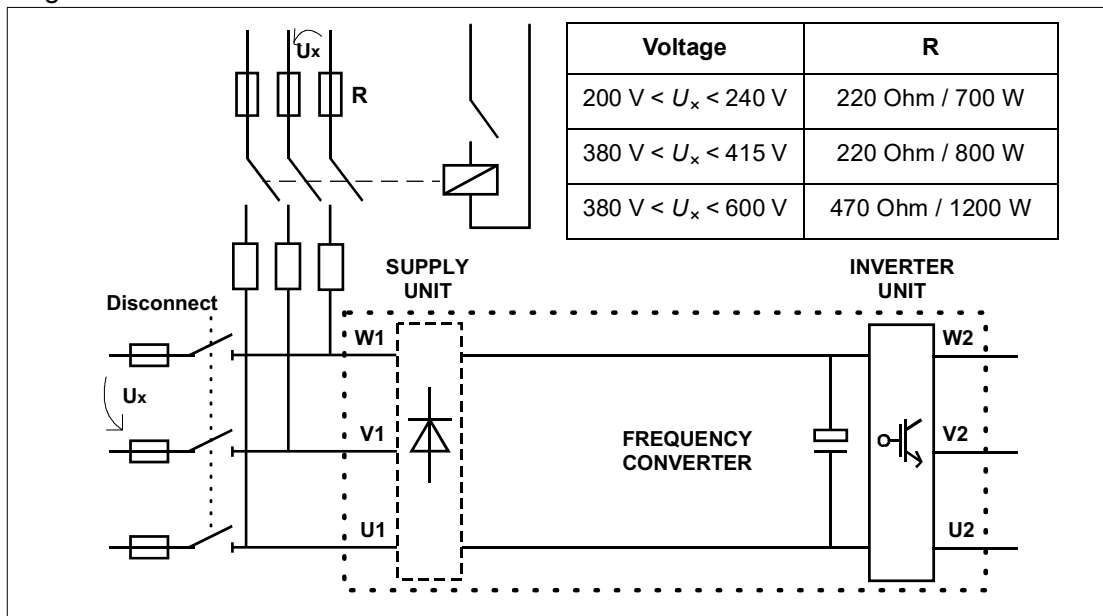
Method 4 - Reforming through external resistors

See [Applicability](#) on page 5 for information on when you can use this reforming method.



WARNING! Obey the safety instructions in section [Safety instructions](#) on page 9. If you ignore them, injury or death, or damage to the equipment can occur. Never switch on the converter power supply while the reforming circuit is connected. Lock the disconnecter (if any) to an open position.

1. Make sure that the converter module is disconnected from all possible power sources (all AC and DC terminals are disconnected).
2. Measure that the installation is de-energized. Use a quality voltage tester.
 - Before and after measuring the installation, verify the operation of the voltage tester on a known voltage source.
 - Make sure that the voltage between the converter input power terminals (U1, V1 and W1) and the grounding terminal (PE) is zero.
 - If the drive has UDC+ terminal, make sure that the voltage between the terminal and the grounding terminal (PE) is zero.
3. Connect a reforming circuit to the AC terminals of the converter module. See the diagram below.



4. Switch on the AC power supply of the reforming circuit for the time defined in section [Reforming time](#) on page 8.
5. Switch off the reforming circuit power supply and disconnect the power supply of the reforming circuit.
6. Wait for 5 minutes (10 minutes for wind turbine converters) to let the converter DC capacitors discharge.
7. Measure that the voltage of the DC terminals of the converter is close to 0 V.
8. Disconnect the reforming circuit from the converter.

Further information

Product and service inquiries

Address any inquiries about the product to your local ABB representative, quoting the type designation and serial number of the unit in question. A listing of ABB sales, support and service contacts can be found by navigating to abb.com/searchchannels.

Product training

For information on ABB product training, navigate to new.abb.com/service/training.

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