

ABB INDUSTRIAL DRIVES

ACS880-607LC 3-phase dynamic brake units

Hardware manual



ACS880-607LC 3-phase dynamic brake units

Hardware manual

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4. Electrical installation



7. Start-up



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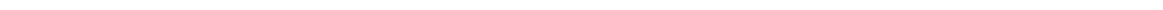


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Further information





1

Introduction to the manual

Contents of this chapter

This chapter contains information on the manual.

Applicability

The manual is applicable to the cabinet-installed ACS880-607LC 3-phase brake units that form a part of an ACS880 multidrive system.

Safety instructions

Obey all safety instructions delivered with the drive.

- Read the **complete safety instructions** before you install, commission, use or service the drive. The complete safety instructions are given in *ACS880 liquid-cooled multidrive cabinets and modules safety instructions* (3AXD50000048633 [English]).
- Read the **software-function-specific warnings and notes** before changing the default settings of a function. For each function, the warnings and notes are given in the section describing the related user-adjustable parameters.
- Read the **task-specific safety instructions** before starting the task. See the section describing the task.

Target audience

This manual is intended for people who plan the installation, install, start up and do maintenance work on the drive, or create instructions for the end user of the drive concerning the installation and maintenance of the drive.

Read the manual before working on the drive. You are expected to know the fundamentals of electricity, wiring, electrical components and electrical schematic symbols.

Categorization by frame size and option code

The frame size identifies information which concerns only a certain frame size of the drive. The frame size is shown on the type designation label. All frame sizes are listed in the technical data.

The option code (+A123) identifies information which concerns only a certain optional selection. The options included in the drive are listed on the type designation label.

Use of component designations

Some device names in the manual include the item designation in brackets, for example [Q20], to make it possible to identify the components in the circuit diagrams of the drive.

Quick installation flowchart

Task	See
Plan the electrical installation and acquire the accessories needed (cables, fuses, etc.). Check the ratings, required coolant flow, and other technical data. Select the brake resistor (if custom resistor is used).	Guidelines for planning the electrical installation (page 31) Technical data (page 89) Selecting the brake resistor (page 31)
Examine the installation site.	ACS880 liquid-cooled multidrive cabinets mechanical installation instructions (3AXD50000048635 [English])
Unpack and examine the drive (only intact units may be started up). Make sure that all necessary optional modules and equipment are present and correct.	ACS880 liquid-cooled multidrive cabinets mechanical installation instructions (3AXD50000048635 [English]) If the drive has been non-operational for more than one year, the DC link capacitors need to be reformed. See Capacitor reforming instructions (3BFE64059629 [English]) .
Fasten the cabinet and join cabinet sections together.	ACS880 liquid-cooled multidrive cabinets mechanical installation instructions (3AXD50000048635 [English])
Route the resistor cables (if customer resistor is used).	Selecting and routing the brake resistor cables (page 32)
Measure the insulation of the resistor circuit (if customer resistor is used).	Measuring the insulation of the brake resistor circuit (page 38)
Connect the resistor cables and thermal switch (if customer resistor is used). Connect the control cables (if customer resistor is used).	Electrical installation (page 35)
Check the installation.	Installation checklist (page 57)
Start the brake unit up.	Start-up (page 59) ACS880 brake control program firmware manual (3AXD50000020967 [English])

Task

See



Operate the brake unit.

Operating instructions (page 61)

ACS880 brake control program firmware manual
[\(3AXD50000020967 \[English\]\)](#)

Related documents

Manual	Code
General manuals	
<i>ACS880 liquid-cooled multidrive cabinets and modules safety instructions</i>	3AXD50000048633
<i>ACS880 liquid-cooled multidrive cabinets and modules electrical planning instructions</i>	3AXD50000048634
<i>ACS880 liquid-cooled multidrive cabinets mechanical installation instructions</i>	3AXD50000048635
<i>CIO-01 I/O module for distributed I/O bus control user's manual</i>	3AXD50000126880
Supply unit manuals	
<i>ACS880-207LC IGBT supply units hardware manual</i>	3AXD50000174782
<i>ACS880 IGBT supply control program firmware manual</i>	3AUA0000131562
<i>ACS880-307LC...+A018 diode supply units hardware manual</i>	3AXD50000579662
<i>ACS880 diode supply control program firmware manual</i>	3AUA0000103295
Inverter unit manuals	
<i>ACS880-107LC inverter units hardware manual</i>	3AXD50000196111
<i>ACS880 primary control program firmware manual</i>	3AUA0000085967
<i>ACS880 primary control program quick start-up guide</i>	3AUA0000098062
Manuals for application programs (Crane, Winder, etc.)	
Brake unit and DC/DC converter unit manuals	
<i>ACS880-607LC 1-phase brake units hardware manual</i>	3AXD50000481491
<i>ACS880-607LC 3-phase dynamic brake units hardware manual</i>	3AXD50000581627
<i>ACS880 (3-phase) brake control program firmware manual</i>	3AXD50000020967
<i>ACS880-1607LC DC/DC converter units hardware manual</i>	3AXD50000431342
<i>ACS880 DC/DC converter control program firmware manual</i>	3AXD50000024671
Option manuals	
<i>ACS880-1007LC liquid cooling unit user's manual</i>	3AXD50000129607
<i>ACS-AP-x assistant control panels user's manual</i>	3AUA0000085685
<i>Drive composer start-up and maintenance PC tool user's manual</i>	3AUA0000094606
<i>Converter module lifting device for drive cabinets hardware manual</i>	3AXD50000210268
Manuals for I/O extension modules, fieldbus adapters, safety options etc.	

You can find manuals on the Internet. See www.abb.com/drives/documents. For manuals not available in the document library, contact your local ABB representative.

Terms and abbreviations

Term	Description
BCON	Type of control board
BCU	Type of control unit
BDPS	Module internal power supply board
Brake chopper	Conducts the surplus energy from the intermediate circuit of the drive to the brake resistor when necessary. The chopper operates when the DC link voltage exceeds a certain maximum limit. The voltage rise is typically caused by deceleration (braking) of a high inertia motor.
Brake chopper module	Brake chopper enclosed in a metal frame or housing. Intended for cabinet installation.
Brake resistor	Dissipates the drive surplus braking energy conducted by the brake chopper to heat
Brake unit	Brake chopper modules and the necessary auxiliary equipment, such as control electronics, fusing and cabling
CIO	I/O module for controlling cooling fans
Control board	Circuit board in which the control program runs
Control unit	Control board built in a housing (often rail-mountable)
Cubicle	One section of a cabinet-installed drive. A cubicle is typically behind a door of its own.
DC link	DC circuit between rectifier and inverter
Drive	Frequency converter for controlling AC motors
EMC	Electromagnetic compatibility
Frame, frame size	Physical size of the drive or power module
Intermediate circuit	DC circuit between rectifier and inverter
Inverter unit	Inverter module(s) under control of one control unit, and related components. One inverter unit typically controls one motor.
Multidrive	Drive for controlling several motors which are typically coupled to the same machinery. Includes one supply unit, and one or several inverter units.
Parameter	In the drive control program, user-adjustable operation instruction to the drive, or signal measured or calculated by the drive. In some (for example fieldbus) contexts, a value that can be accessed as an object, eg, variable, constant, or signal.
Supply unit	Supply module(s) under control of one control unit, and related components.
ZMU	Type of memory unit, attached to the control unit

2

Operation principle and hardware description

Contents of this chapter

This chapter describes the operation principle and construction of the brake unit.

Product overview

ACS880-607LC is a liquid-cooled cabinet-installed brake unit, which forms a part of an ACS880 multidrive system. As standard, it includes brake chopper(s). Brake resistors are external, and customer must acquire and install them separately.

Operation principle

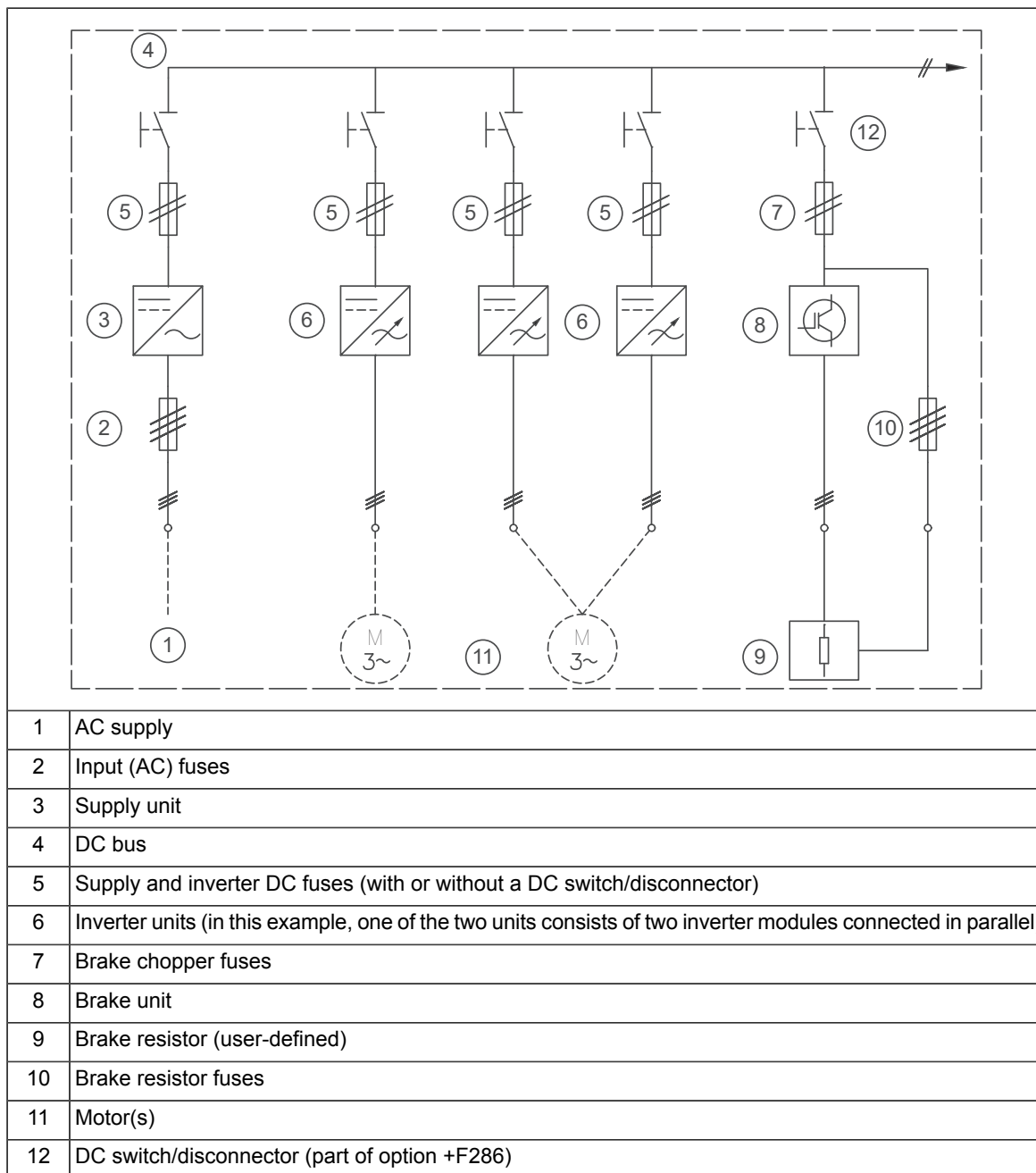
The brake chopper handles the energy generated by a decelerating motor. The extra energy increases the DC link voltage. The chopper connects the brake resistor to the intermediate DC circuit whenever the voltage in the circuit exceeds the limit defined by the control program. Energy consumption by the resistor losses lowers the voltage until the resistor can be disconnected.

When is resistor braking necessary?

Resistor braking is necessary for high capacity braking if a regenerative drive cannot be used.

Overview diagram of the drive system

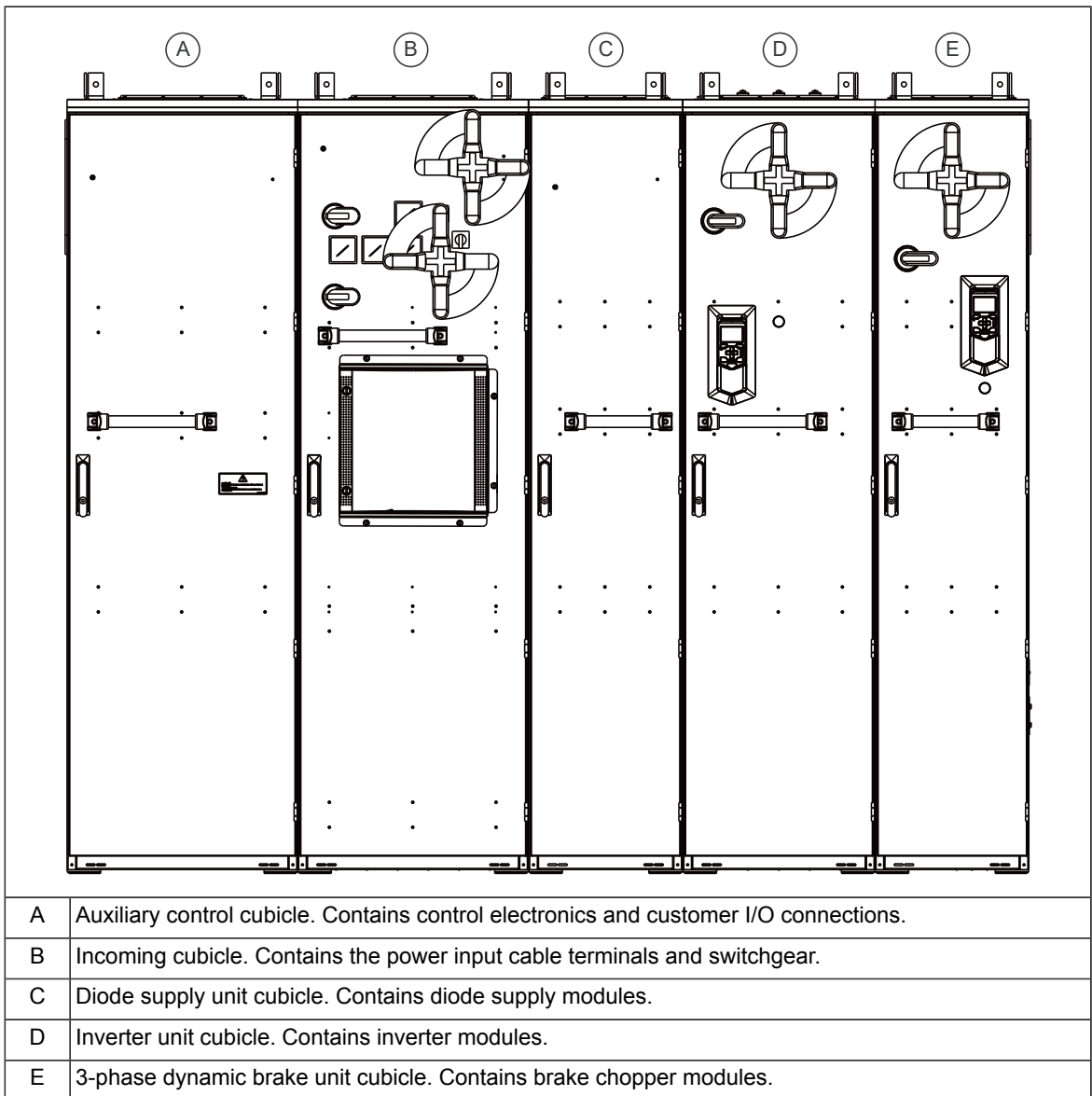
This diagram shows a multidrive system with a brake unit.



The supply unit connects to the AC supply network. The supply unit converts the AC voltage into DC. The DC voltage is distributed through the DC bus to all inverter and brake units. The inverter unit, consisting of one or more inverter modules, converts the DC back to AC that rotates the motor. The brake unit, consisting of one or more brake chopper modules, conveys energy to brake resistors whenever needed.

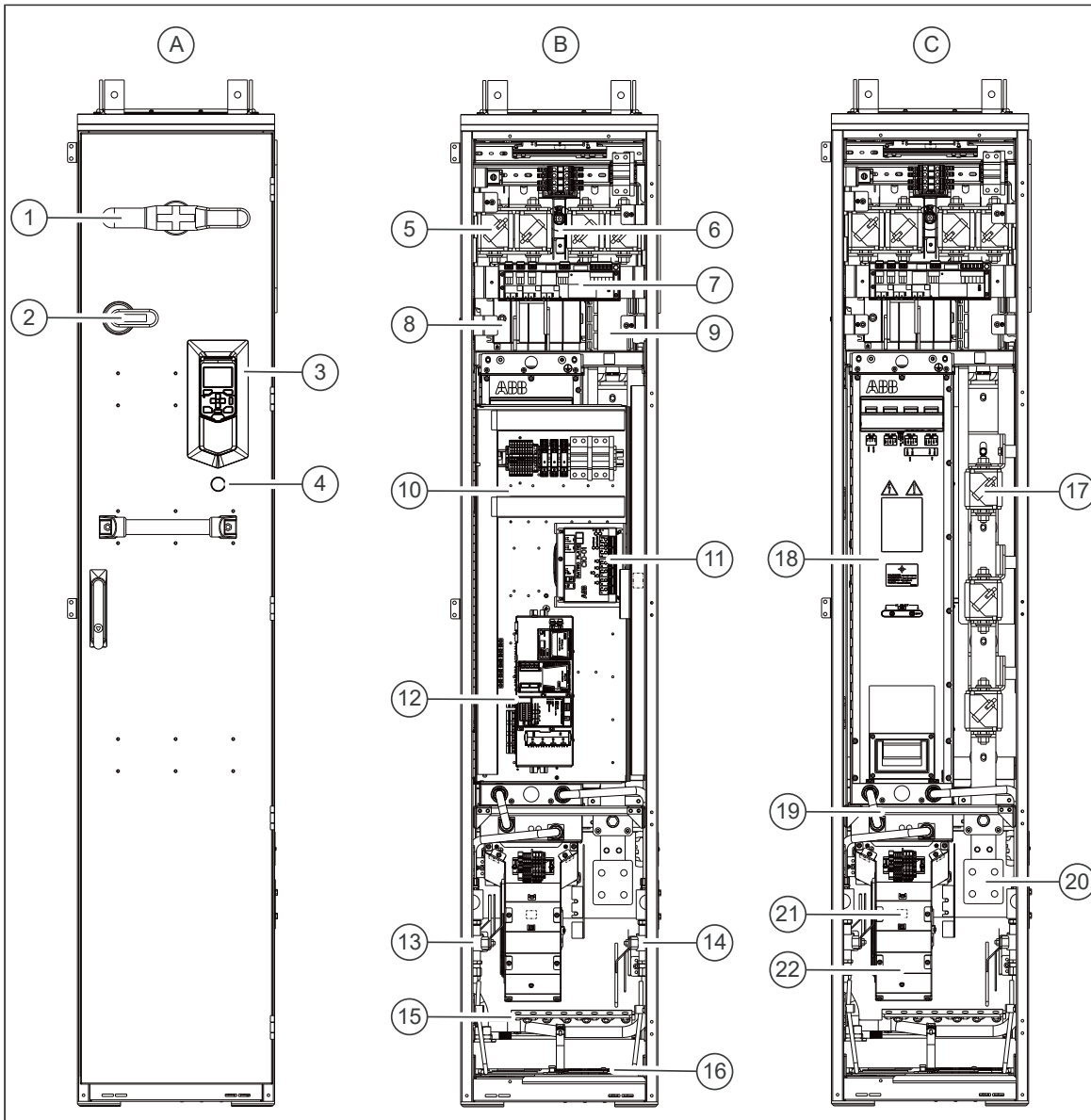
Overview drawing of the drive system

This drawing shows an example of a drive system.



Layout drawings – brake module cubicle

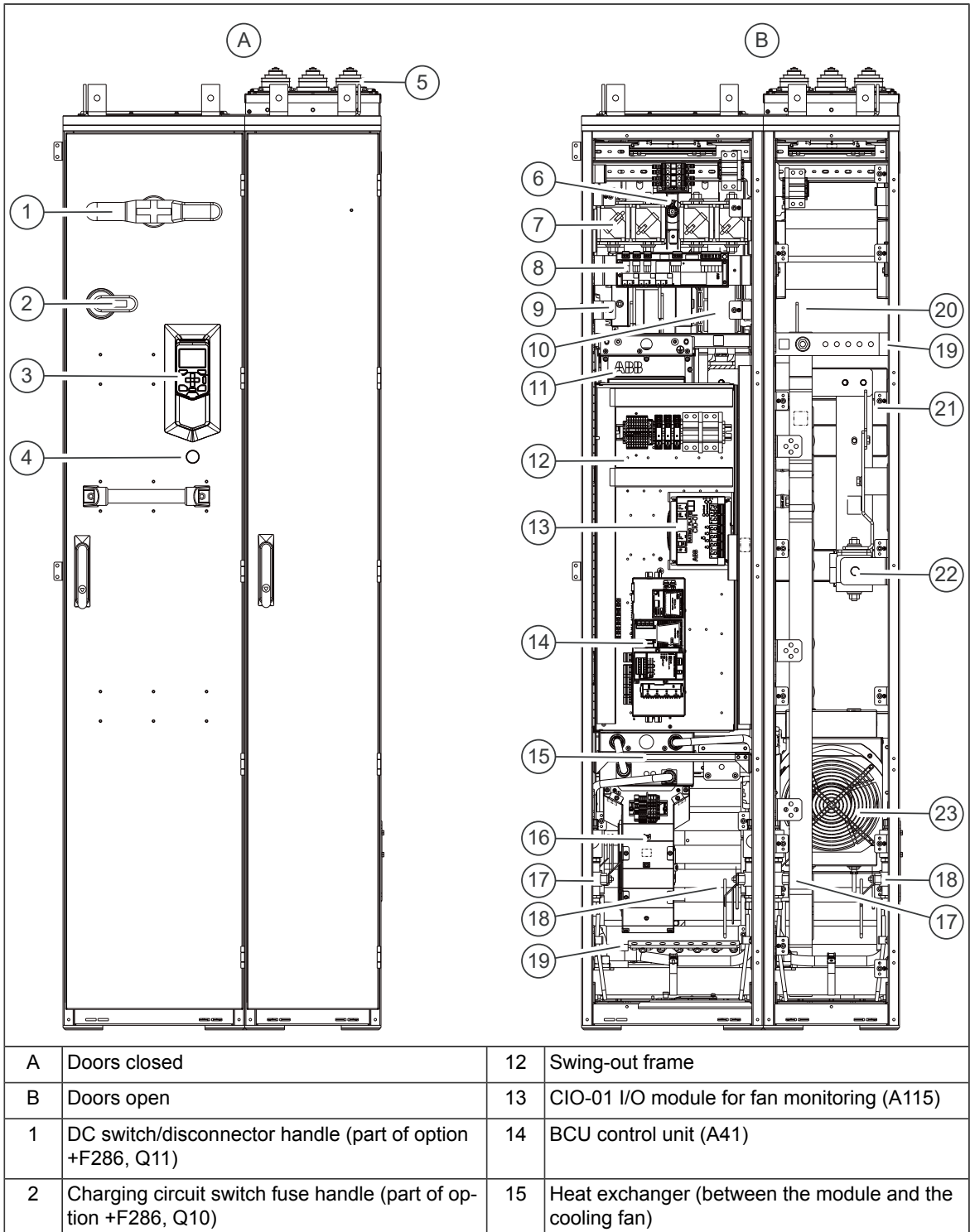
The drawing below shows the components of the brake chopper cubicle with bottom entry and exit of cables (shrouds removed).



A	Door closed	11	CIO-01 I/O module for fan monitoring (A115)
B	Door open	12	BCU control unit (A41)
C	Door open, swing-out frame removed	13	Coolant inlet manifold with stop and drain valves
1	DC switch/disconnector handle (part of option +F286, Q11)	14	Coolant outlet manifold with stop and drain valves
2	Charging circuit switch fuse handle (part of option +F286, Q10)	15	PE busbar
3	Control panel (A49)	16	Cable entries
4	Indicator light (P11)	17	Brake resistor fuses (F11.xx)
5	DC fuses (F11.xx)	18	Brake chopper module (T11)
6	DC switch/disconnector (behind the fuses, part of option +F286, Q11)	19	Heat exchanger (between the module and the cooling fan)

7	Charging controller (part of option +F286, A11)	20	Incoming resistor connection busbars (R1.2, R2.2 R3.2)
8	Charging mechanics (part of option +F286)	21	Outgoing resistor connection busbars (behind cooling fan, R1.1, R2.1 R3.1)
9	Charging resistors (obscure, R10.x)	22	Cooling fan (G115)
10	Swing-out frame		

The drawing below shows the components of the brake chopper cubicles with top entry and exit of cables (shrouds removed).

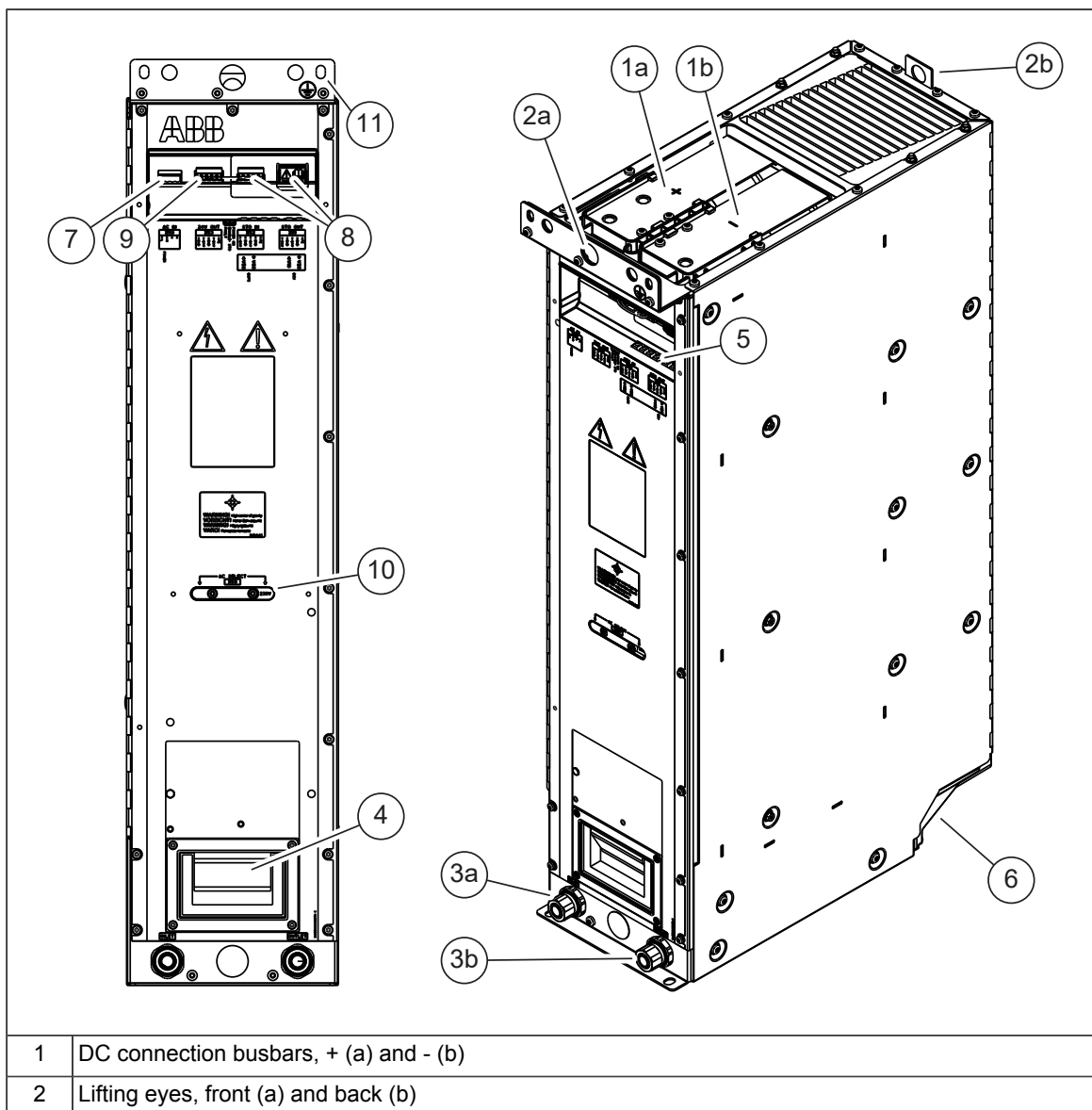


20 Operation principle and hardware description

3	Control panel (A49)	16	Cooling fan (G115)
4	Indicator light (P11)	17	Coolant inlet manifold with stop and drain valves
5	Cable entries	18	Coolant outlet manifold with stop and drain valves
6	DC fuses (F11.xx)	19	PE busbar
7	DC switch/disconnector (behind the fuses, part of option +F286, Q11)	20	Outgoing resistor connection busbars (R1.1, R2.1 R3.1)
8	Charging controller (part of option +F286, , A11)	21	Incoming resistor connection busbars (R1.2, R2.2 R3.2)
9	Charging mechanics (part of option +F286)	22	Brake resistor fuses (F11.xx)
10	Charging resistors (obscure, R10.x)	23	Cooling fan (G115)
11	Brake chopper module (behind the swing-out frame, T11)		

Layout drawing – brake module R8i

■ Module layout



3	Coolant in (a) and out (b) connectors
4	Handle
5	Fiber optic connectors
6	Quick connector (AC connection) (the counterpart fastened to the cabinet behind the module)
7	Terminal block X50 (auxiliary power input for internal boards)
8	Terminal block X51 and X52 (Safe torque off in inverter modules only)
9	Terminal block X53 (24 V DC power output)
10	Auxiliary voltage selector (115 or 230 V)
11	Unpainted fastening hole. The grounding point (PE) between module frame and cabinet frame.

■ Coolant connectors

The coolant pipe inlet and outlet connectors are located at the bottom front of the module. The connectors are for 16/13 millimeter PA (polyamide) pipe.

■ Connectors X50...X59

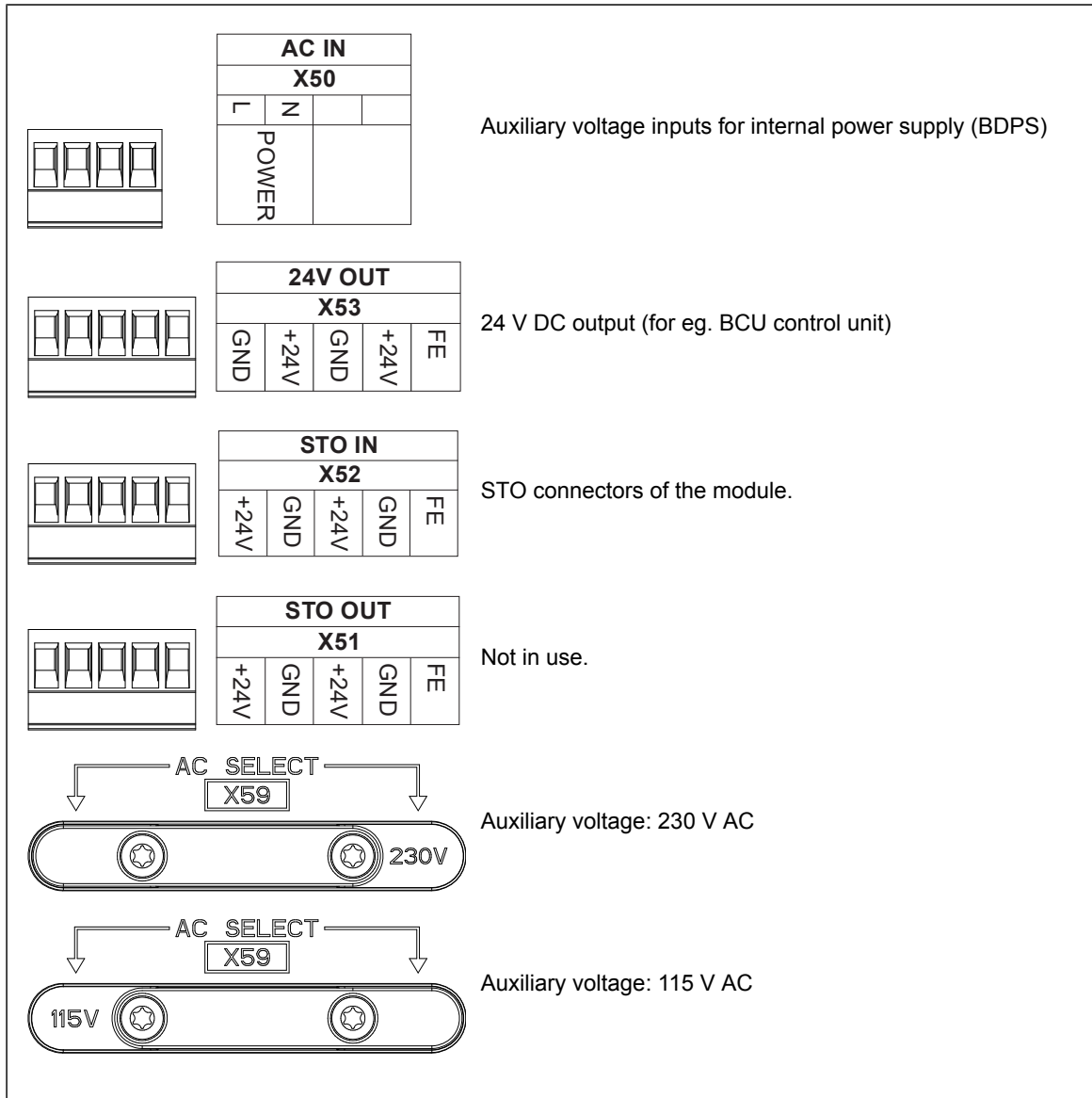
R8i modules contain a power supply (BDPS) that provides 24 V DC for the circuit boards of the module.

The BDPS is powered internally from the DC link.

Note: The Safe torque off (STO) safety function is only implemented in inverter units. Therefore, the STO function can not be used in supply, brake and converter units. In supply, brake and converter units, de-energizing any connection of STO IN (X52) connector stops the unit. Note that this stop in supply or brake module is not safety related and must not be used for safety function purposes.

The “24V” inputs on X52 must be connected to +24 V (on connector X53, for example) on each module. On a new module, a jumper wire set installed at the factory makes this connection.

22 Operation principle and hardware description

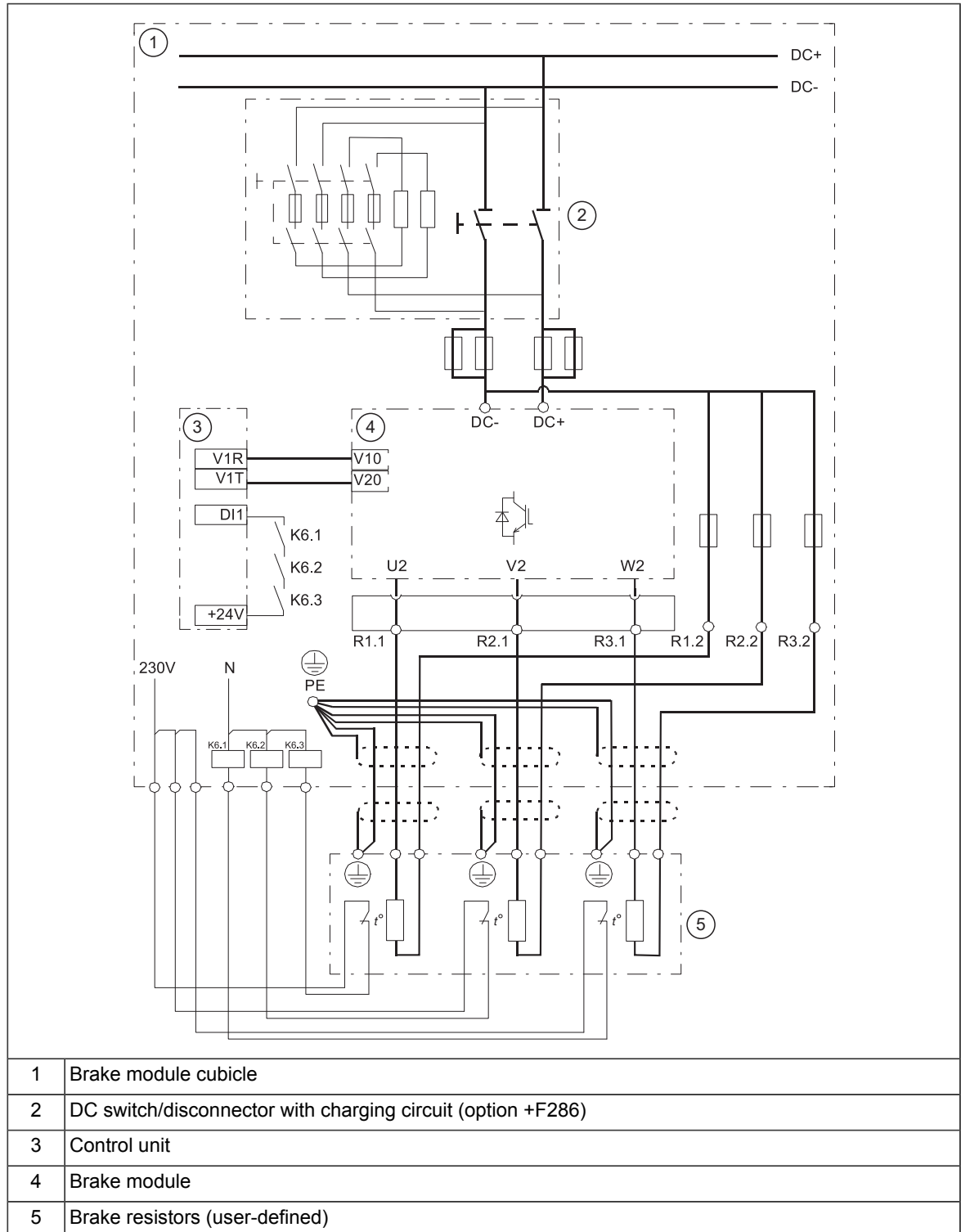


■ Fiber optic connectors

Name	Description
BSFC	Charging controller connection.
BCU	Control unit connection.

Overview of power and control connections

The diagram below shows the power and control connections of the brake unit consisting of one 3-phase brake module. For parallel-connected brake modules, the brake resistors are connected to each brake module also as shown below.

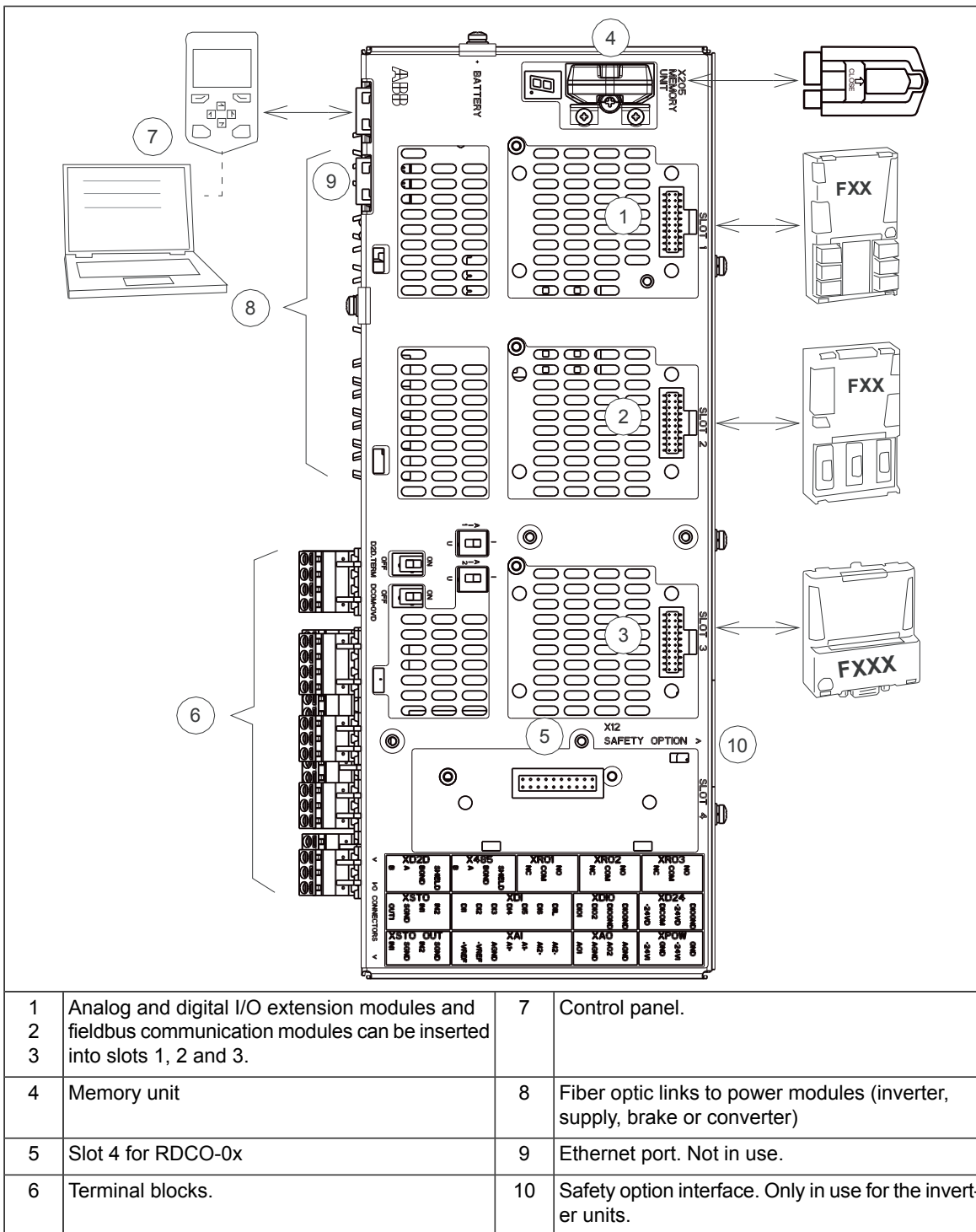


Brake unit control devices

Each brake chopper module employs a dedicated control unit (BCU) that contains the BCON board with basic I/Os and slots for optional modules. A fiber optic link connects the BCU to the brake chopper module.

■ Overview of the control connections of the BCU control unit

The diagram shows the control connections and interfaces of the BCU control unit.



1	Analog and digital I/O extension modules and fieldbus communication modules can be inserted into slots 1, 2 and 3.	7	Control panel.
4	Memory unit	8	Fiber optic links to power modules (inverter, supply, brake or converter)
5	Slot 4 for RDCO-0x	9	Ethernet port. Not in use.
6	Terminal blocks.	10	Safety option interface. Only in use for the inverter units.

■ The control panel

The control panel (optional) is the user interface of the brake unit, providing the essential controls such as reset, and the parameter settings for the control program.

The control panel is mounted on a platform on the brake chopper cubicle door.

For details on the control panel, see *ACS-AP-x Assistant control panels user's manual* (3AUA0000085685 [English]).

■ Control by PC tools

There is a USB connector on the front of the control panel that can be used to connect a PC to the drive.

■ Fieldbus control

The unit can be controlled through a fieldbus interface if it is equipped with an optional fieldbus adapter, and when the control program has been configured for fieldbus control by parameters. For information on the parameters, see the firmware manual.

■ DC switch and charging switch

DC switch/disconnector (option +F286)

The brake unit can optionally be equipped with DC switch/disconnectors which allow the isolation of the brake chopper modules from the DC bus.

The status of the DC switch/disconnector is connected to the brake control unit. By default, the run enable signal is removed when the DC switch/disconnector is open.



WARNING!

Do not open the DC switch/disconnector under load.

Charging switch






Brake units equipped with a DC switch/disconnector also have a DC link precharging circuit including a BSFC-12C charging control unit and a charging switch.

Type designation labels

A type designation label is attached onto each brake unit and brake chopper module. The type designation stated on the label contains information on the specifications and configuration of the unit. The first digits express the basic construction, for example “ACS880-607LC-0870-7”. Any optional selections are given thereafter, separated by plus signs.

■ Type designation label of the brake unit

An example of the brake unit label is shown below.

 ACS880-607LC-1300-7+A012+B054+D150+G307+G315+G320+G450+H352+H367+K451 1 																						
Origin Finland Made in Finland ABB Oy Hiomotie 13 00380 Helsinki Finland																						
<table border="1"> <tr><td>FRAME</td></tr> <tr><td>R8i 2</td></tr> </table>	FRAME	R8i 2	<table> <tr> <td>Input</td> <td>U1</td> <td>742/849/976 VDC 6</td> </tr> <tr> <td></td> <td>I1</td> <td>1171 A</td> </tr> <tr> <td>Output</td> <td>U2</td> <td>3x0...742/849/976 VDC 7</td> </tr> <tr> <td></td> <td>I2</td> <td>3x465 A</td> </tr> <tr> <td rowspan="3">Resistor</td> <td>Rmin</td> <td>2 Ohm</td> </tr> <tr> <td>Rmax</td> <td>2.4 Ohm</td> </tr> <tr> <td>Sn</td> <td>1300 kVA</td> </tr> </table>	Input	U1	742/849/976 VDC 6		I1	1171 A	Output	U2	3x0...742/849/976 VDC 7		I2	3x465 A	Resistor	Rmin	2 Ohm	Rmax	2.4 Ohm	Sn	1300 kVA
FRAME																						
R8i 2																						
Input	U1	742/849/976 VDC 6																				
	I1	1171 A																				
Output	U2	3x0...742/849/976 VDC 7																				
	I2	3x465 A																				
Resistor	Rmin	2 Ohm																				
	Rmax	2.4 Ohm																				
	Sn	1300 kVA																				
Liquid cooling 3	 																					
IP42 4	 8 S/N: 1200806724																					
UL/CSA: max. 849 VDC 5																						
1	Type designation																					
2	Frame size																					
3	Cooling method																					
4	Degree of protection																					
5	Maximum input voltage (UL/CSA)																					
6	Ratings																					
7	Valid markings																					
8	Serial number. The first digit refers to the manufacturing plant. The next four digits indicate manufacturing year and week respectively (yyww). The remaining digits complete the serial number so that there are no two units with the same number.																					

Type designation key

Type designation describes the composition of the unit in short. The complete designation code is divided in subcodes:

- The first digits form the basic code. It describes the basic construction of the unit. The fields in the basic code are separated by hyphens.
- The plus codes follow the basic code. Each plus code starts with an identifying letter (common for the whole product series), followed by descriptive digits. The plus codes are separated by plus signs.

■ Basic code

Example code: ACS880-607LC-0870-7

Code	Description
ACS880	Product series
607LC	Cabinet-installed liquid-cooled brake unit. IP42 (UL Type 1), IEC industrial cabinet construction, EN/IEC approved components, speed-controlled module cooling fans, DC busbar material copper, standard wiring material, ACS-AP-W assistant control panel, ACS880 brake unit control program, coated circuit boards, bottom cable entry, lead-through-type cable entries, multilingual door device label sticker, complete documentation in English in a USB memory stick.
0870	Size. See the rating table in the technical data.
7	709...976 V DC. This is indicated in the type designation label as typical input voltage levels 742 / 849 / 976 V DC (849 V DC UL, CSA).

■ Option codes

Code	Description
A012	50 Hz supply frequency
A013	60 Hz supply frequency
B054	IP42 (UL Type 1 Filtered)
B055	IP54 (UL Type 12)
C121	Marine construction
C164	Plinth height 100 mm
C176	Door hinges on left
C179	Plinth height 200 mm
C205	Marine product certification issued by DNV GL
C206	Marine product certification issued by the American Bureau of Shipping (ABS)
C207	Marine product certification issued by Lloyd's Register (LR)
C209	Marine product certification issued by Bureau Veritas
C228	Marine product certification issued by China Classification Society (CCS)
C229	Marine product certification issued by Russian Maritime Register of Shipping (RS)
D150	Brake choppers
F286	DC switch-disconnector
G300	Cabinet and module heating elements (external supply)
G301	Cabinet lighting
G304	Control (auxiliary) voltage 115 V AC
G314	Aluminum busbars

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Code	Description
G315	Tin-plated copper DC busbars
G320	Control (auxiliary) voltage 230 V AC
G330	Halogen-free wiring and materials
G338	Additional wire markings
G339	
G340	
G341	
G342	
H352	Motor cabling direction down
H353	Motor cabling direction up
H358	Cable gland plates (3 mm steel, undrilled)
H364	Cable gland plates (3 mm aluminum, undrilled)
H365	Cable gland plates (6 mm brass, undrilled)
H367	Control cable entry through floor of cabinet
H368	Control cabling through roof of cabinet
J400	ACS-AP-W control panel (with Bluetooth)
J410	Control panel mounting platform
J412	Common control panel
K450	Panel bus (control of several units from one control panel)
K451	FDNA-01 DeviceNet™ adapter module
K452	FLON-01 LonWorks® adapter module
K454	FPBA-01 PROFIBUS DP adapter module
K457	FCAN-01 CANopen adapter module
K458	FSCA-01 RS-485 (Modbus/RTU) adapter module
K462	FCNA-01 ControlNet™ adapter module
K469	FECA-01 EtherCat adapter module
K470	FEPL-02 EtherPOWERLINK adapter module
K475	FENA-21 Ethernet adapter module for EtherNet/IP™, Modbus TCP and PROFINET IO protocols, 2-port
K480	Ethernet switch for PC tool or control network (for max. 6 inverter units)
K483	Ethernet switch with optical link for PC tool or control network (for max. 6 inverter units)
K490	FEIP-21 Ethernet adapter module for EtherNet/IP™
K491	FMBT-21 Ethernet adapter module for Modbus TCP
K492	FPNO-21 Ethernet adapter module for PROFINET IO
L500	FIO-11 analog I/O extension module
L501	FIO-01 digital I/O extension module
L509	RDCO-04 optical DDCS communication for BCU-xx (4xTransmitter/Receiver)
L525	FAIO-01 analog I/O extension module
L526	FDIO-01 digital I/O extension module
N8010	IEC 61131-3 application programmability
P913	Special color (RAL Classic)
P966	Special color (other than RAL Classic)

Code	Description
Q986	FSPS-21 PROFIsafe safety functions module
R700	Documentation/manuals in English
R701	Documentation/manuals in German
R702	Documentation/manuals in Italian
R705	Documentation/manuals in Swedish
R706	Documentation/manuals in Finnish
R707	Documentation/manuals in French
R708	Documentation/manuals in Spanish
R711	Documentation/manuals in Russian
R712	Documentation/manuals in Chinese
R716	Hard copies of documentation
R717	Second set of hard copies of documentation

3

Guidelines for planning the electrical installation

Contents of this chapter

This chapter contains instructions on selecting, placing and protecting the brake circuit components and cables.

Limitation of liability

The installation must always be designed and made according to applicable local laws and regulations. ABB does not assume any liability whatsoever for any installation which breaches the local laws and/or other regulations. Furthermore, if the recommendations given by ABB are not followed, the drive may experience problems that the warranty does not cover.

Generic guidelines

See *ACS880 liquid-cooled multidrive cabinets and modules electrical planning instructions* (3AXD50000048634 [English]) for the generic guidelines for planning the electrical installation (selecting cables, routing cables, etc.).

Selecting the brake resistor



WARNING!

ABB is not responsible for user resistor selection or protection of the resistor.

Select the resistor according to the resistor specification given in the technical data. In addition, consider the following:

- Each output of the brake chopper module must feed a resistor of its own. There is one output in the 1-phase brake chopper module, and 3 outputs in the 3-phase brake chopper module.
- The resistance (R) of the brake resistor must be equal to or above the value specified. Never use resistance values below the specified value.
- The brake resistor must withstand the specified brake cycles.
- The ventilation of the space/room in which the brake resistor is located must meet the air flow amounts specified.
- The resistor must be equipped with a thermal switch.



WARNING!

IEC 60664 and IEC 61800-5-1 require double or reinforced insulation between resistor live parts and the sensor. If the resistor assembly does not fulfill the requirement, the I/O terminals on the control unit must be protected against contact and must not be connected to other equipment, or the temperature sensor must be isolated from the I/O terminals, for example, with a suitable relay.

Selecting and routing the brake resistor cables

■ Typical resistor cable sizes

See the technical data.

■ Minimizing electromagnetic interference

Obey these rules in order to minimize electromagnetic interference caused by the rapid current changes in the resistor cables:

- Shield the braking power line completely, either by using shielded cable or a metallic enclosure. Unshielded single-core cable can only be used if it is routed inside a cabinet that efficiently suppresses the radiated emissions.
- Install the cables away from other cable routes.
- Avoid long parallel runs with other cables. The minimum parallel cabling separation distance is 0.3 meters (1 ft).
- Cross the other cables at 90 degree angles.
- Keep the cable as short as possible in order to minimize the radiated emissions and stress on chopper IGBTs. The longer the cable the greater the radiated emissions, inductive load and voltage peaks over the IGBT semiconductors of the brake chopper.

Note: ABB has not verified that the EMC requirements are fulfilled with custom brake resistors and cabling. The customer must consider the EMC compliance of the complete installation.

■ Maximum cable length

See the technical data.

Placing the brake resistor

Install the resistor assembly outside the drive in a place where it is able to cool effectively.

Arrange the cooling of the resistor in a way that:

- no danger of overheating is caused to the resistor or nearby materials, and
- the temperature of the room the resistor is located in does not exceed the allowed maximum.

Supply the resistor with cooling air or coolant according to the resistor manufacturer's instructions.



WARNING!

The materials near the brake resistor must be non-flammable. The surface temperature of the resistor is high. Air flowing from the resistor is of hundreds of degrees Celsius. If the exhaust vents are connected to a ventilation system, make sure that the material withstands high temperatures. Protect the resistor against contact.

Selecting the resistor thermal switch circuit cable

Make sure that the cable in the resistor thermal switch circuit meets the following requirements:

- shielded cable
- rated operating voltage between a core and ground $> 750 (U_0)$
- insulation test voltage $> 2.5 \text{ kV}$
- jacket material for at least $90 \text{ }^\circ\text{C}$ ($194 \text{ }^\circ\text{F}$). Take into account further requirements due to resistor construction and temperature.

Protecting the system against thermal overload

The brake control program includes a resistor and resistor cable thermal protection function, which can be tuned by the user. The brake chopper protects itself and the resistor cables against thermal overload. Make sure that the resistor assembly is equipped with a thermal switch, which is wired to disable the chopper (and/or switch off the supply to the drive) in case of overtemperature.

For more information on the thermal protection function, see the appropriate firmware manual.

Protecting the system against short-circuits

The brake unit is equipped with fuses as standard.

The fuses protect the brake chopper, the brake resistor and the brake circuit cables in a short-circuit situation.



4

Electrical installation

Contents of this chapter

This chapter contains instructions on wiring the brake units.



WARNING!

Obey the safety instructions of the drive. 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 installation or maintenance work.

Electrical safety precautions

These electrical safety precautions are for all personnel who do work on the drive, motor cable or motor.





WARNING!

Obey these instructions. 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 installation or maintenance work.

Go through these steps before you begin any installation or maintenance work.

1. Clearly identify the work location and equipment.
2. Disconnect all possible voltage sources. Make sure that re-connection is not possible. Lock out and tag out.
 - Open the main disconnecting device of the drive.
 - Open the charging switch if present.
 - Open the disconnecter of the supply transformer. (The main disconnecting device in the drive cabinet does not disconnect the voltage from the AC input power busbars of the drive cabinet.)
 - If the drive is equipped with a DC/DC converter unit (optional): Open the DC switch-disconnector ([Q11], option +F286) of the DC/DC converter. Open the disconnecting device of the energy storage connected to the DC/DC converter unit (outside the drive cabinet).
 - Open the auxiliary voltage switch-disconnector (if present), and all other possible disconnecting devices that isolate the drive from dangerous voltage sources.
 - In the liquid cooling unit (if present), open the switch-disconnector of the cooling pumps.
 - If you have a permanent magnet motor connected to the drive, disconnect the motor from the drive with a safety switch or by other means.
 - Disconnect all dangerous external voltages from the control circuits.
 - After you disconnect power from the drive, always wait 5 minutes to let the intermediate circuit capacitors discharge before you continue.
3. Protect any other energized parts in the work location against contact.
4. Take special precautions when close to bare conductors.



5. Measure that the installation is de-energized. If the measurement requires removal or disassembly of shrouding or other cabinet structures, obey the local laws and regulations applicable to live working (including – but not limited to – electric shock and arc protection).
 - 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 drive input power terminals (L1, L2, L3) and the grounding (PE) busbar is zero.
 - Make sure that the voltage between the drive output terminals (T1/U, T2/V, T3/W) and the grounding (PE) busbar is zero.
 - Make sure that the voltage between the drive DC terminals (UDC+ and UDC-) and the grounding (PE) terminal is zero. In cabinet-built drives, measure between the drive DC busbars (+ and -) and the grounding (PE) busbar.

**WARNING!**

The busbars inside the cabinet of liquid-cooled drives are partially coated. Measurements made through the coating are potentially unreliable, so only measure at uncoated portions. Note that the coating does not constitute a safe or touch-proof insulation.

6. Install temporary grounding as required by the local regulations.
7. Ask the person in control of the electrical installation work for a permit to work.

General notes

■ Printed circuit boards

**WARNING!**

Use a grounding wrist band when you handle printed circuit boards. Do not touch the boards unnecessarily. The boards contain components sensitive to electrostatic discharge.

■ Optical components

**WARNING!**

Obey these instructions. If you ignore them, damage to the equipment can occur.

- Handle the fiber optic cables with care.
- When you unplug the fiber optic cables, always hold the connector, not the cable itself.
- Do not touch the ends of the fibers with bare hands as the ends are extremely sensitive to dirt.
- Do not bend the fiber optic cables too tightly. The minimum allowed bend radius is 35 mm (1.4 in).

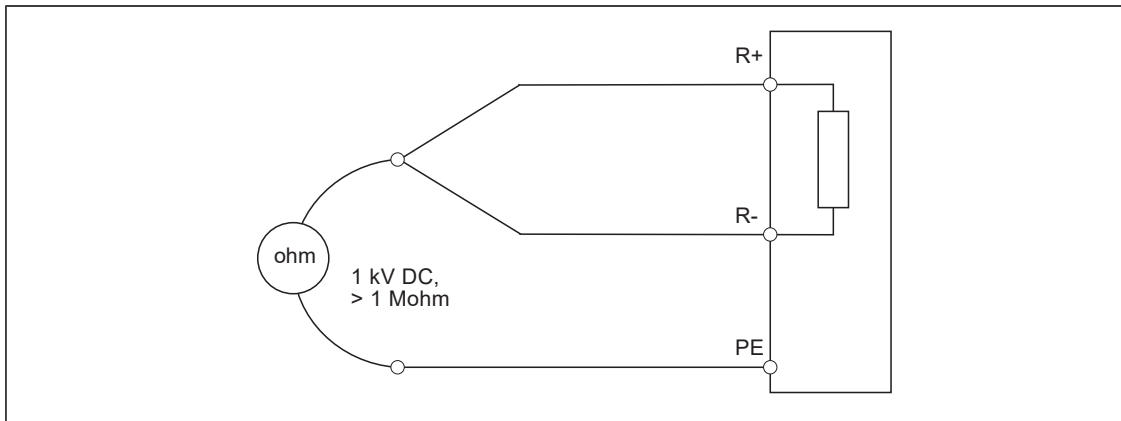
Measuring the insulation of the brake resistor circuit



WARNING!

Obey the safety instructions of the drive. 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 installation or maintenance work.

1. Stop the drive and do the steps in section *Electrical safety precautions (page 35)* before you start the work.
2. Make sure that the resistor cable is connected to the resistor and disconnected from the drive output terminals.
3. At the drive end, connect the R+ and R- conductors of the resistor cable together. Measure the insulation resistance between the conductors and the PE conductor with a measuring voltage of 1000 V DC. The insulation resistance must be more than 1 Mohm.

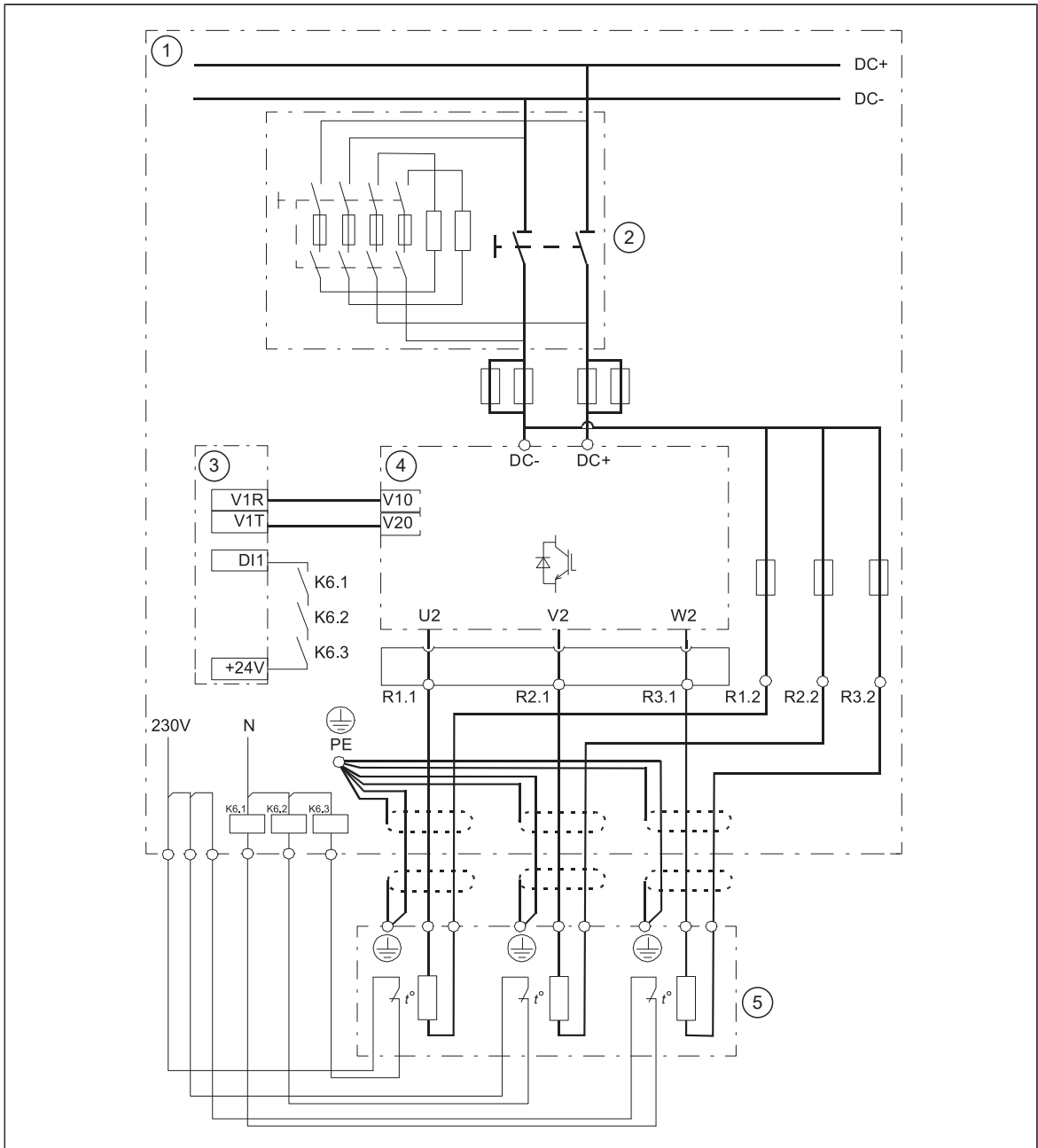


Connecting the brake resistor cables and thermal switch

■ Connection diagram

This diagram shows the brake resistor cable connections and an example connection of the thermal switches.

The diagram also shows the internal connections of the brake chopper module cubicle done by ABB.



1	Brake chopper cubicle
2	DC switch/disconnector including charging circuit (+F286)
3	Control unit
4	Brake chopper module
5	Brake resistor assembly

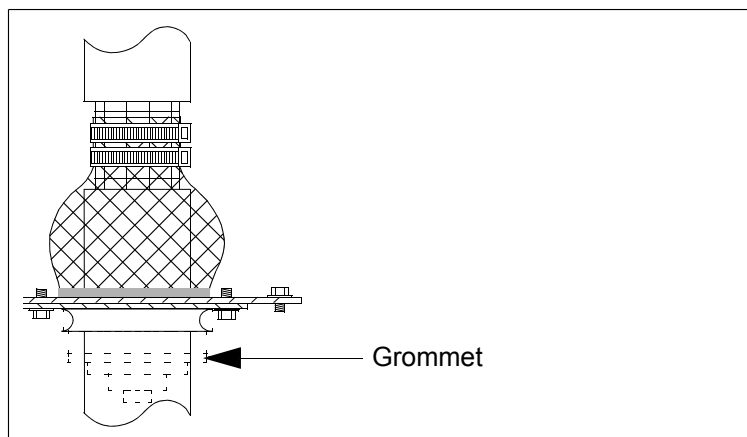
■ **Connection procedure of the resistor cables**




WARNING!

Obey the safety instructions of the drive. 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 installation or maintenance work.

1. Stop the drive and do the steps in section *Electrical safety precautions (page 35)* before you start the work.
2. Open the door of the brake unit cubicle and remove the shrouding.
3. Lead the cables into the cubicle. Make the 360° earthing arrangement at the cable entry as shown. Install the rubber grommet (if present) below the cable entry for proper sealing.



- 
4. Cut the cables to suitable length. Strip the cables and conductors.
 5. Twist the cable shields into bundles and connect the bundles to the PE busbar in the cubicle.
 6. Connect the resistor cables. Note the connection of the third conductor and the cable shield. See also the circuit diagrams delivered with the unit. See the technical data for tightening torques.

■ Connection procedure of the thermal switch cable



WARNING!

Obey the safety instructions of the drive. 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 installation or maintenance work.

1. Stop the drive and do the steps in section *Electrical safety precautions (page 35)* before you start the work.
2. Run the sensor cable inside the brake unit cubicle.
3. ABB recommends that you ground the cable shield 360° at the cable entry.
4. Run the cable to its connection point using existing trunking wherever possible. Protect the cables against any sharp edges or hot surfaces.
5. Connect the conductors to the appropriate terminals.
6. Twist the cable shield into a bundle, crimp a ring terminal onto it and connect it to the nearest chassis grounding point. At the other end of the cable, leave the shields unconnected or ground them via a capacitor (eg. 3.3 nF / 630 V).

Connecting the control cables

See the chapter on control units for the default I/O connections. Note that the default I/O connections can be affected by some options. See the circuit diagrams delivered with the drive for the actual wiring.

■ Control cable connection procedure



WARNING!

Obey the safety instructions given in *ACS880 liquid-cooled multidrive cabinets and modules safety instructions* (3AXD50000048633 [English]). If you ignore the safety instructions, injury or death, or damage to the equipment can occur.

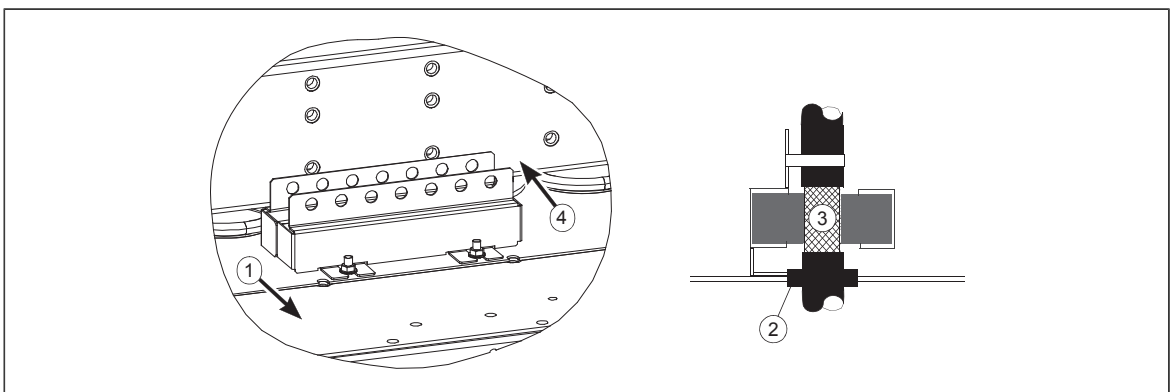
If you are not a qualified electrical professional, do not do installation or maintenance work.

1. Stop the drive (if running) and do the steps in section *Electrical safety precautions* (page 35) before you start the work.
2. Run the control cables into the cabinet as described in section *Grounding the outer shields of the control cables at the cabinet entry* below.
3. Route the control cables as described in section *Routing the control cables inside the cabinet*.
4. Connect the control cables as described in section *Connecting control cabling*.

Grounding the outer shields of the control cables at the cabinet entry

Ground the outer shields of all control cables 360 degrees at the EMI conductive cushions as follows (example constructions are shown below, the actual hardware may vary):

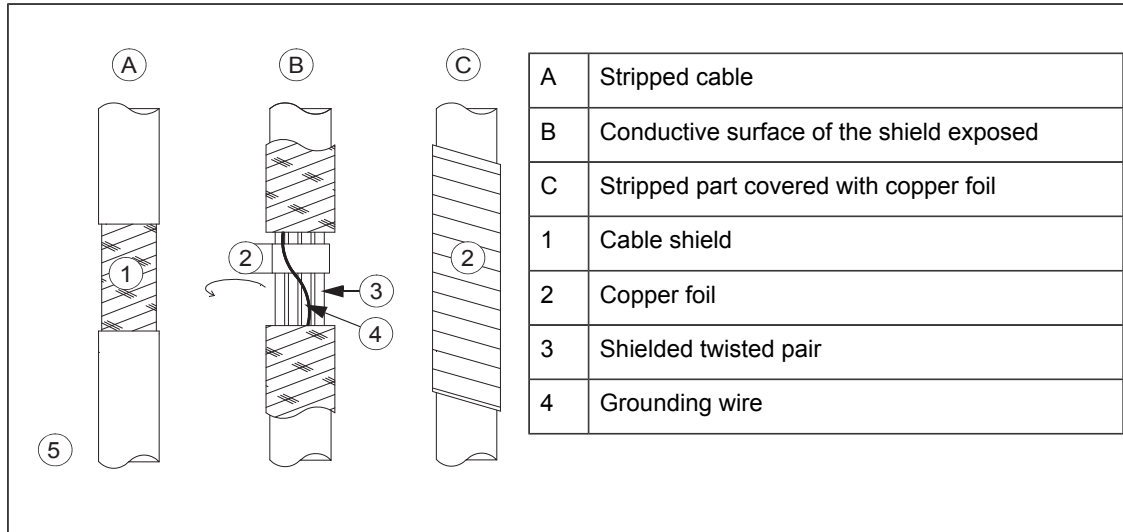
1. Loosen the tightening screws of the EMI conductive cushions and pull the cushions apart.
2. Cut adequate holes to the rubber grommets in the entry plate and put the cables through the grommets and the cushions.
3. Strip off the cable plastic sheath above the entry plate just enough to ensure proper connection of the bare shield and the EMI conductive cushions.
4. Tighten the two tightening screws so that the EMI conductive cushions press tightly round the bare shield.



Note 1: Keep the shields continuous as close to the connection terminals as possible. Secure the cables mechanically at the entry strain relief.

Note 2: If the outer surface of the shield is non-conductive:

- Cut the shield at the midpoint of the bare part. Be careful not to cut the conductors or the grounding wire (if present).
- Turn the shield inside out to expose its conductive surface.
- Cover the turned shield and the stripped cable with copper foil to keep the shielding continuous.

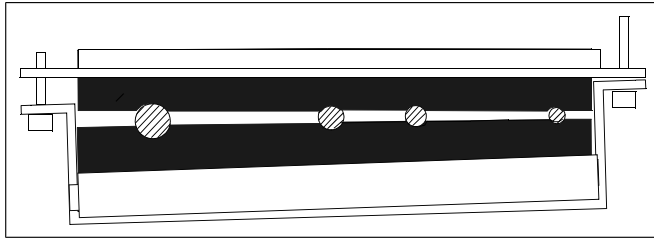


Note for top entry of cables: When each cable has its own rubber grommet, sufficient IP and EMC protection can be achieved. However, if there is more than one cable per grommet, plan the installation beforehand as follows:

1. Make a list of the cables coming to the cabinet.
2. Sort the cables going to the left into one group and the cables going to the right into another group to avoid unnecessary crossing of cables inside the cabinet.
3. Sort the cables in each group according to size.
4. Group the cables for each grommet as follows ensuring that each cable has a proper contact to the cushions on both sides.

Cable diameter in mm	Max. number of cables per grommet
≤ 13	4
≤ 17	3
< 25	2
≥ 25	1

5. Arrange the bunches according to size from thickest to the thinnest between the EMI conductive cushions.



6. If more than one cable go through a grommet, seal the grommet by applying Loctite 5221 inside the grommet.

Routing the control cables inside the cabinet

Use the existing trunking in the cabinet wherever possible. Use sleeving if cables are laid against sharp edges. When running cables to or from a swing-out frame, leave enough slack at the hinge to allow the frame to open fully.

Connecting control cabling

Connect the conductors to the appropriate terminals. Refer to the wiring diagrams delivered with the drive.

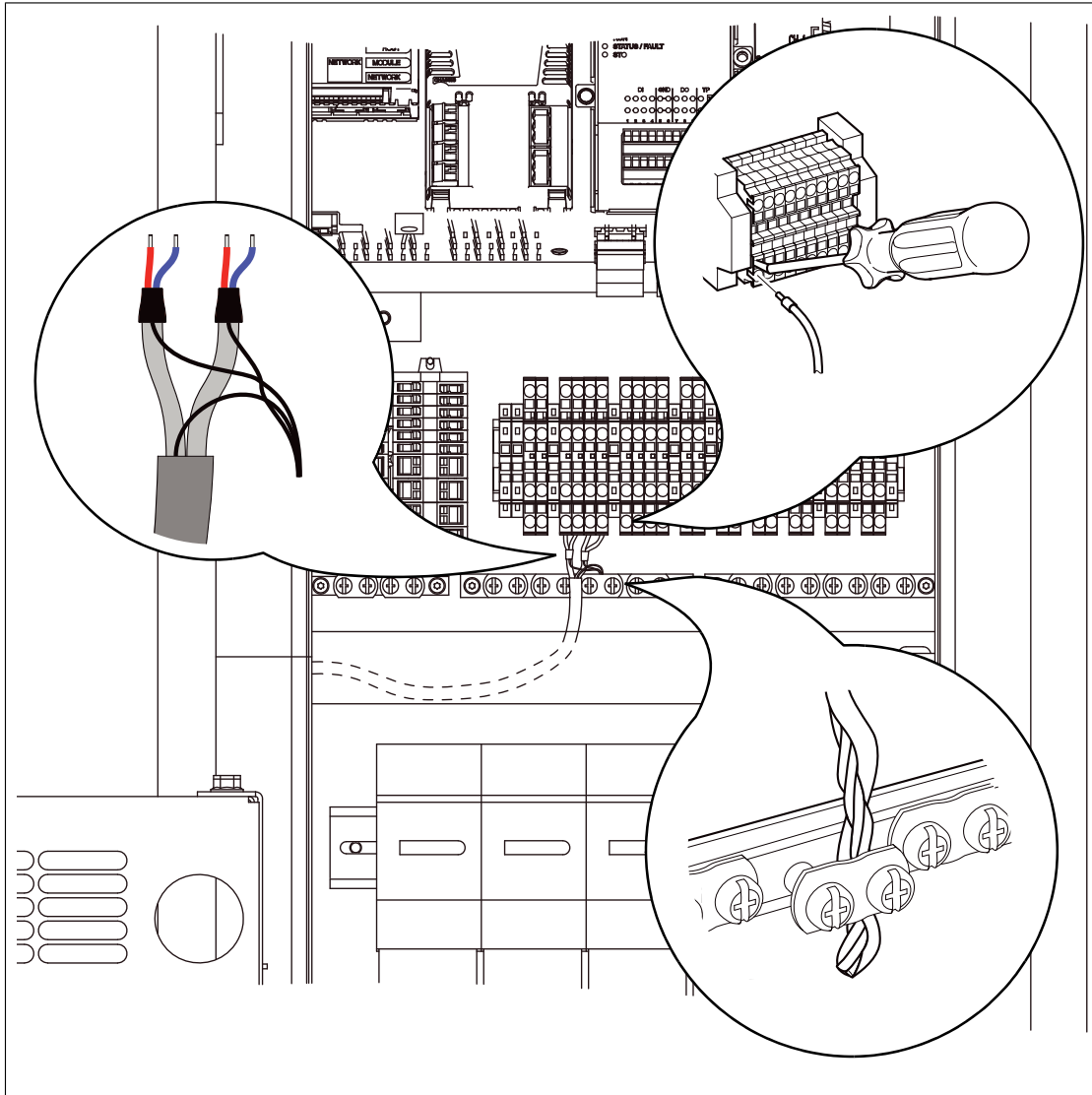
Connect the inner twisted pair shields and all separate grounding wires to the grounding clamps closest to the terminals.

The drawing below represents the grounding of the control cabling when connecting to a terminal block inside the cabinet. The grounding is done in the same way when connecting directly to a component such as the control unit.

Notes:



- Do not ground the outer shield of the cable here since it is grounded at the cable entry.
- Keep any signal wire pairs twisted as close to the terminals as possible. Twisting the wire with its return wire reduces disturbances caused by inductive coupling.



At the other end of the cable, leave the shields unconnected or ground them indirectly via a high-frequency capacitor with a few nanofarads, eg. 3.3 nF / 630 V. The shield can also be grounded directly at both ends if they are in the same ground line with no significant voltage drop between the end points.

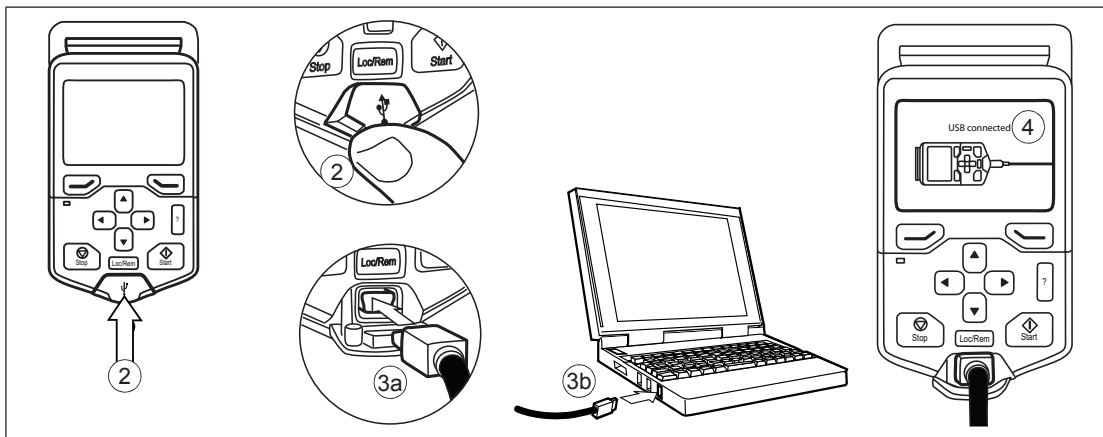
Connecting a PC

**WARNING!**

Do not connect the PC directly to the control panel connector of the control unit as this can cause damage.

A PC (with eg, the Drive composer PC tool) can be connected as follows:

1. Connect an ACx-AP-x control panel to the unit either
 - by inserting the control panel into the panel holder or platform, or
 - by using an Ethernet (eg, Cat 5e) networking cable.
2. Remove the USB connector cover on the front of the control panel.
3. Connect an USB cable (Type A to Type Mini-B) between the USB connector on the control panel (3a) and a free USB port on the PC (3b).
4. The panel will display an indication whenever the connection is active.
5. See the documentation of the PC tool for setup instructions.





The control unit

Contents of this chapter

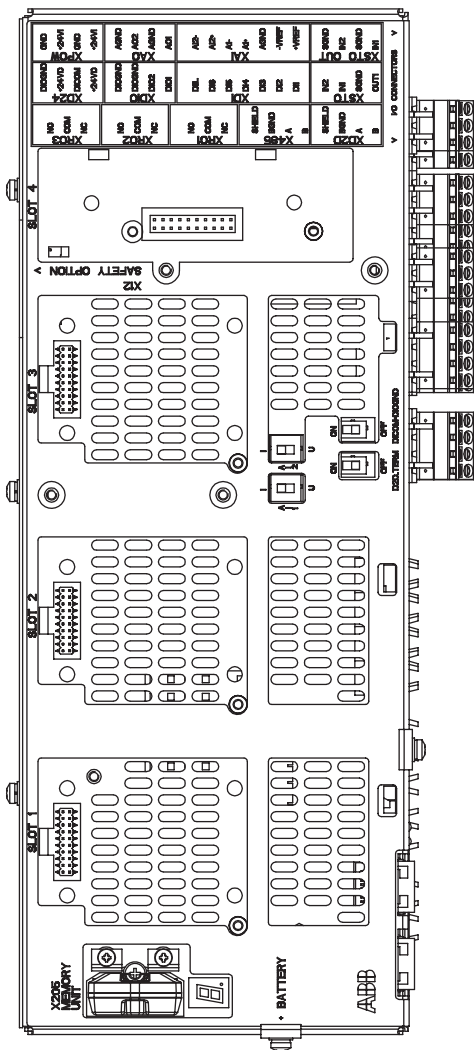
This chapter

- describes the connections of the control unit
- contains the specifications of the inputs and outputs of the control unit.

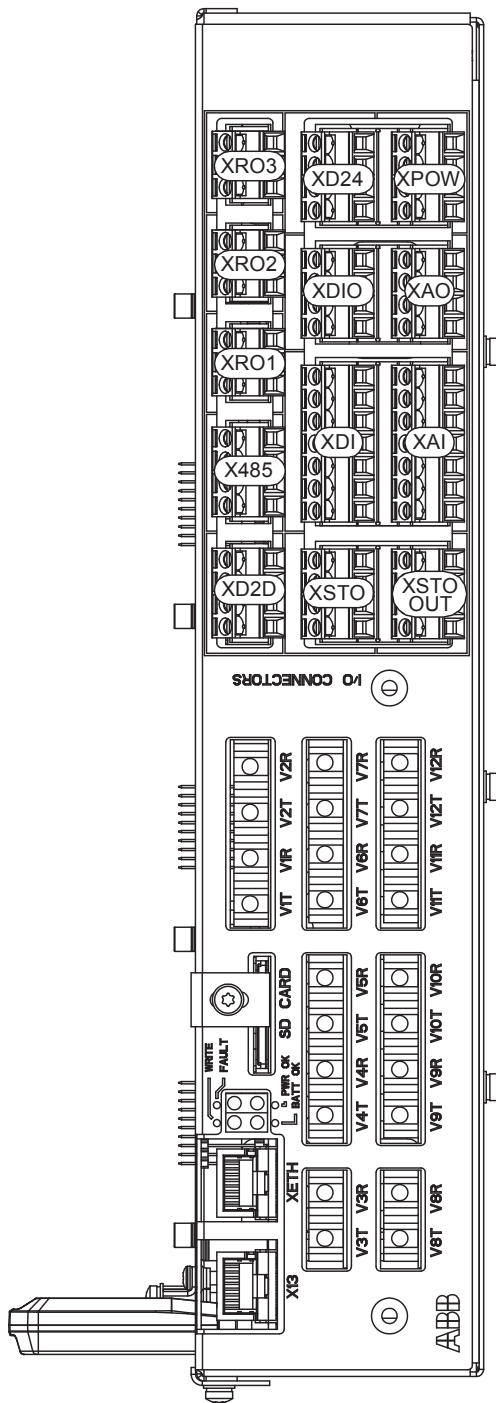
General

Each brake module is controlled by a dedicated BCU control unit. The control unit consists of a BCON-12 control board (and a BIOC-01 I/O connector board and power supply board) built in a metal housing. The control unit is connected to the brake module by fiber optic cables.

BCU-x2 layout



	Description
I/O	I/O terminals (see following diagram)
SLOT 1	I/O extension, encoder interface or fieldbus adapter module connection. (This is the sole location for an FDPI-02 diagnostics and panel interface.)
SLOT 2	I/O extension, encoder interface or fieldbus adapter module connection
SLOT 3	I/O extension, encoder interface, fieldbus adapter or FSO-xx safety functions module connection
SLOT 4	RDCO-0x DDCS communication option module connection
X205	Memory unit connection
BATTERY	Holder for real-time clock battery (BR2032)
A11	Mode selector for analog input A11 (I = current, U = voltage)
A12	Mode selector for analog input A12 (I = current, U = voltage)
D2D TERM	Termination switch for drive-to-drive link (D2D)
DICOM= DIOGND	Ground selection. Determines whether DICOM is separated from DIOGND (ie. the common reference for the digital inputs floats). See the ground isolation diagram.
7-segment display	
Multicharacter indications are displayed as repeated sequences of characters	
	("U" is indicated briefly before "o".) Control program running
	Control program startup in progress
	(Flashing) Firmware cannot be started. Memory unit missing or corrupted
	Firmware download from PC to control unit in progress
	At power-up, the display may show short indications of eg. "1", "2", "b" or "U". These are normal indications immediately after power-up. If the display ends up showing any other value than those described, it indicates a hardware failure.




	Description
XAI	Analog inputs
XAO	Analog outputs
XDI	Digital inputs, Digital input interlock (DIIL)
XDIO	Digital input/outputs
XD2D	Drive-to-drive link
XD24	+24 V output (for digital inputs)
XETH	Ethernet port – Not in use
XPOW	External power input
XRO1	Relay output RO1
XRO2	Relay output RO2
XRO3	Relay output RO3
XSTO	Safe torque off connection (input signals)
XSTO OUT	Safe torque off connection (to inverter modules)
X12	(On the opposite side) Not in use
X13	Control panel / PC connection
X485	Connection to CIO-01 (optional)
V1T/V1R, V2T/V2R	Fiber optic connection to modules 1 and 2 (VxT = transmitter, VxR = receiver)
V3T/V3R, V7T/V7R	Fiber optic connection to modules 3...7 (BCU-12/22 only) (VxT = transmitter, VxR = receiver)
V8T/V8R, V12T/V12R	Fiber optic connection to modules 8...12 (BCU-22 only) (VxT = transmitter, VxR = receiver)
SD CARD	Data logger memory card for inverter module communication
BATT OK	Real-time clock battery voltage is higher than 2.8 V. If the LED is off when the control unit is powered, replace the battery.
FAULT	The control program has generated a fault. See the firmware manual of the supply/inverter unit.
PWR OK	Internal voltage supply is OK
WRITE	Writing to memory card in progress. Do not remove the memory card.

Default I/O diagram of the brake control unit

The diagram below shows the default I/O connections on the brake control unit, and describes the use of the signals/connections. Under normal circumstances, the factory-made wiring should not be changed. See the delivery-specific circuit diagrams.

The wire size accepted by all screw terminals (for both stranded and solid wire) is 0.5 ... 2.5 mm² (24...12 AWG). The torque is 0.5 N·m (5 lbf-in).

Terminal			Description	
XD2D			Drive-to-drive link	
1	1	B	Not in use by default	
2	2	A		
3	3	BGND		
4	4	Shield		
X485			RS485 connection	
5	5	B	Cooling fan monitoring (CIO module)	
6	6	A		
7	7	BGND		
8	8	Shield		
XRO1, XRO2, XRO3			Relay outputs	
11	11	NC	Norm. closed	XRO1: Running ¹⁾ (Energized = running) 250 V AC / 30 V DC, 2 A
	12	COM	Common	
	13	NO	Norm. open	
21	21	NC	Norm. closed	XRO2: Fault (-1) ¹⁾ (Energized = no fault) 250 V AC / 30 V DC, 2 A
	22	COM	Common	
	23	NO	Norm. open	
31	31	NC	Norm. closed	XRO3: Running ¹⁾ (Energized = running) 250 V AC / 30 V DC, 2 A
	32	COM	Common	
	33	NO	Norm. open	
XSTO, XSTO OUT			XSTO connector	
1	1	OUT	XSTO: Factory connection. Both circuits (power module, control unit) must be closed for the brake unit to start (IN1 and IN2 must be connected to OUT). ²⁾	
	2	SGND		
	3	IN1		
	4	IN2		
5	5	IN1	XSTO OUT: Not in use.	
	6	SGND		
	7	IN2		
	8	SGND		
XDI			Digital inputs	

Terminal		Description	
1	1	DI1	Temp fault ¹⁾ (0 = overtemperature)
2	2	DI2	Not in use by default
3	3	DI3	Not in use by default
4	4	DI4	Not in use by default
5	5	DI5	Not in use by default
6	6	DI6	Reset ¹⁾ (0 -> 1 = fault reset)
7	7	DIIL	Not in use by default
XDIO		Digital input/outputs	
1	1	DIO1	Not in use by default
2	2	DIO2	Not in use by default
3	3	DIOGND	Digital input/output ground
4	4	DIOGND	Digital input/output ground
XD24		Auxiliary voltage output	
5	1	+24VD	+24 V DC 200 mA ³⁾
6	2	DICOM	Digital input ground
7	3	+24VD	+24 V DC 200 mA ³⁾
8	4	DIOGND	Digital input/output ground
		DICOM=DIOGND	Ground selection switch ⁴⁾
XAI		Analog inputs, reference voltage output	
1	1	+VREF	10 V DC, R_L 1...10 kohm
2	2	-VREF	-10 V DC, R_L 1...10 kohm
3	3	AGND	Ground
4	4	AI1+	Not in use by default. 0(4)...20 mA, R_{in} = 100 ohm ⁵⁾
5	5	AI1-	
6	6	AI2+	Not in use by default. 0(2)...10 V, R_{in} > 200 kohm ⁶⁾
7	7	AI2-	
XAO		Analog outputs	
1	1	AO1	Zero (no signal indicated) ¹⁾ 0...20 mA, R_L < 500 ohm
2	2	AGND	
3	3	AO2	Zero (no signal indicated) ¹⁾ 0...20 mA, R_L < 500 ohm
4	4	AGND	
XPOW		External power input	
1	1	+24VI	24 V DC, 2.05 A
2	2	GND	
3	3	+24VI	
4	4	GND	
X12		Not in use in brake units	
X13		Control panel connection	
X205		Memory unit connection	

¹⁾ Default use of the signal in the control program. The use can be changed by a parameter. See also the delivery-specific circuit diagrams.

- 2) This input only acts as a true Safe torque off input in inverter control units. In other applications (such as a supply or brake unit), de-energizing the IN1 and/or IN2 terminal will stop the unit but not constitute a true safety function.
- 3) Total load capacity of these outputs is 4.8 W (200 mA at 24 V) minus the power taken by DIO1 and DIO2.
- 4) Determines whether DICOM is separated from DIOGND (ie, common reference for digital inputs floats). ON: DICOM connected to DIOGND. OFF: DICOM and DIOGND separate.
- 5) Current [0(4)...20 mA, $R_{in} = 100 \text{ ohm}$] or voltage [0(2)...10 V, $R_{in} > 200 \text{ kohm}$] input selected by switch AI2. Change of setting requires reboot of control unit.
- 6) Current [0(4)...20 mA, $R_{in} = 100 \text{ ohm}$] or voltage [0(2)...10 V, $R_{in} > 200 \text{ kohm}$] input selected by switch AI1. Change of setting requires reboot of control unit.

External power supply for the control unit (XPOW)

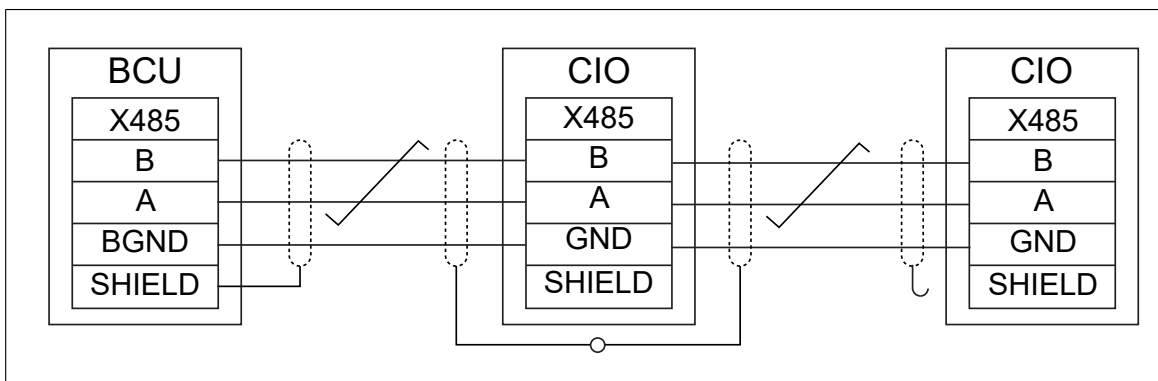
The control unit is powered from a 24 V DC, 2 A supply through terminal block XPOW. With a type BCU control unit, a second supply can be connected to the same terminal block for redundancy.

Using an external supply is recommended if

- the control unit needs to be kept operational during input power breaks, for example, because of continuous fieldbus communication
- immediate restart is needed after a power break (that is, no control unit power-up delay is allowed).

The X485 connector

The X485 provides a connection for optional CIO-01 I/O module. The following diagram shows the wiring for the CIO module.



Safe torque off (XSTO, XSTO OUT)

Note: The XSTO input only acts as a true Safe torque off input on the inverter control unit. De-energizing the IN1 and/or IN2 terminals of other units (supply, DC/DC converter, or brake unit) will stop the unit but not constitute a true safety function.

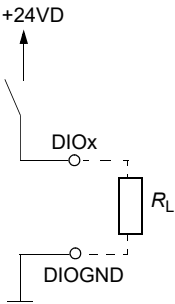
FSO-xx safety functions module connection (X12)

See the user manual of the FSO-xx module. Note that the FSO-xx safety functions module is not in use in supply, DC/DC converter or brake units.

SDHC memory card slot

The BCU-x2 has an on-board data logger that collects real-time data from the power modules to help fault tracing and analysis. The data is stored onto the SDHC memory card inserted into the SD CARD slot and can be analyzed by ABB service personnel.

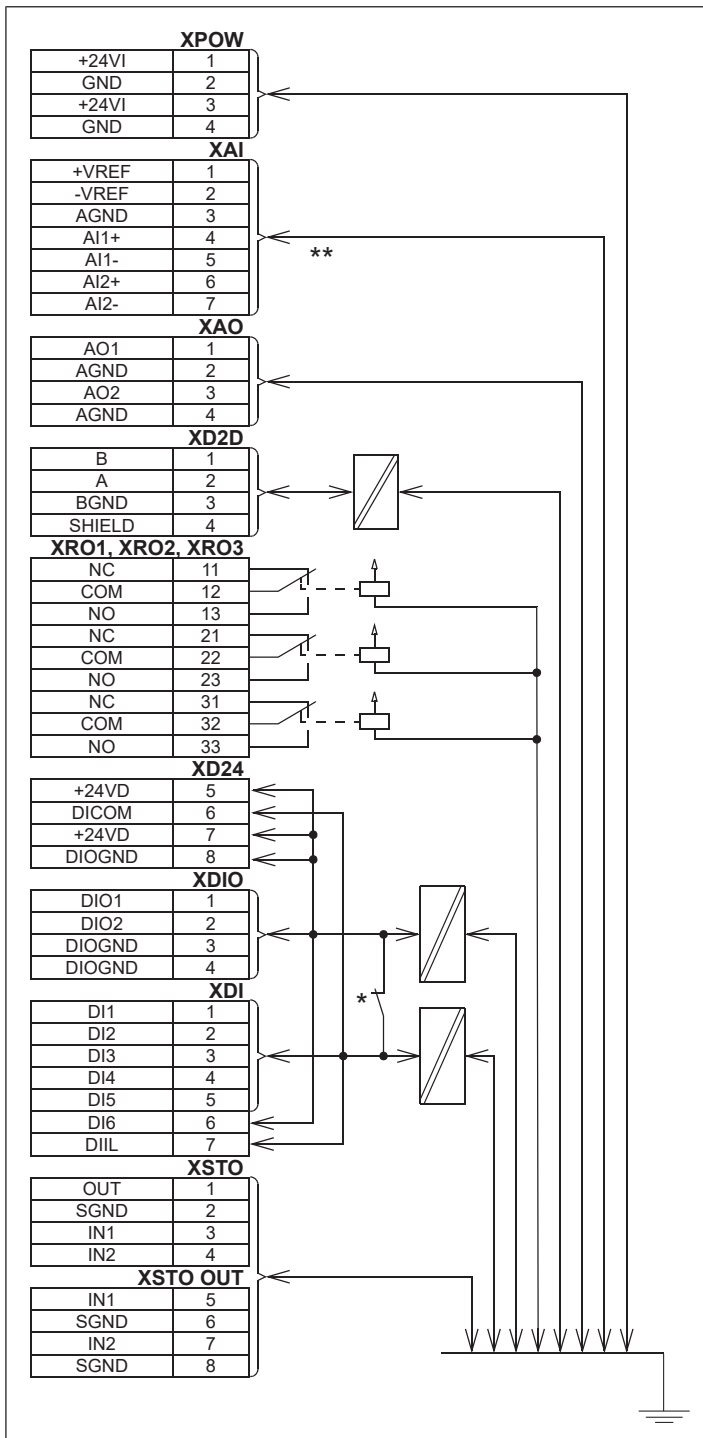
Connector data

Power supply (XPOW)	Connector pitch 5 mm, wire size 2.5 mm ² 24 V ($\pm 10\%$) DC, 2 A External power input. Two supplies can be connected for redundancy.
Relay outputs RO1...RO3 (XRO1...XRO3)	Connector pitch 5 mm, wire size 2.5 mm ² 250 V AC / 30 V DC, 2 A Protected by varistors
+24 V output (XD24:2 and XD24:4)	Connector pitch 5 mm, wire size 2.5 mm ² Total load capacity of these outputs is 4.8 W (200 mA / 24 V) minus the power taken by DIO1 and DIO2.
Digital inputs DI1...DI6 (XDI:1...XDI:6)	Connector pitch 5 mm, wire size 2.5 mm ² 24 V logic levels: "0" < 5 V, "1" > 15 V R_{in} : 2.0 kohm Input type: NPN/PNP (DI1...DI5), NPN (DI6) Hardware filtering: 0.04 ms, digital filtering up to 8 ms DI6 (XDI:6) can alternatively be used as an input for a PTC sensor. "0" > 4 kohm, "1" < 1.5 kohm. I_{max} : 15 mA (DI1...DI5), 5 mA (DI6)
Start interlock input DIIL (XDI:7)	Connector pitch 5 mm, wire size 2.5 mm ² 24 V logic levels: "0" < 5 V, "1" > 15 V R_{in} : 2.0 kohm Input type: NPN/PNP Hardware filtering: 0.04 ms, digital filtering up to 8 ms
Digital inputs/outputs DIO1 and DIO2 (XDIO:1 and XDIO:2) Input/output mode selection by parameters. DIO1 can be configured as a frequency input (0...16 kHz with hardware filtering of 4 microseconds) for 24 V level square wave signal (sinusoidal or other wave form cannot be used). DIO2 can be configured as a 24 V level square wave frequency output. See the firmware manual, parameter group 111/11.	Connector pitch 5 mm, wire size 2.5 mm ² <u>As inputs</u> : 24 V logic levels: "0" < 5 V, "1" > 15 V. R_{in} : 2.0 kohm. Filtering: 1 ms. <u>As outputs</u> : Total output current from +24VD is limited to 200 mA 
Reference voltage for analog inputs +VREF and -VREF (XAI:1 and XAI:2)	Connector pitch 5 mm, wire size 2.5 mm ² 10 V $\pm 1\%$ and -10 V $\pm 1\%$, R_{load} 1...10 kohm Maximum output current: 10 mA
Analog inputs AI1 and AI2 (XAI:4 ... XAI:7). Current/voltage input mode selection by switches	Connector pitch 5 mm, wire size 2.5 mm ² Current input: -20...20 mA, R_{in} = 100 ohm Voltage input: -10...10 V, R_{in} > 200 kohm Differential inputs, common mode range ± 30 V Sampling interval per channel: 0.25 ms Hardware filtering: 0.25 ms, adjustable digital filtering up to 8 ms Resolution: 11 bit + sign bit Inaccuracy: 1% of full scale range

54 The control unit

Analog outputs AO1 and AO2 (XAO)	<p>Connector pitch 5 mm, wire size 2.5 mm² 0...20 mA, $R_{load} < 500 \text{ ohm}$ Frequency range: 0...500 Hz Resolution: 11 bit + sign bit Inaccuracy: 2% of full scale range</p>
XD2D connector	<p>Connector pitch 5 mm, wire size 2.5 mm² Physical layer: RS-485 Transmission rate: 8 Mbit/s Cable type: Shielded twisted-pair cable with a twisted pair for data and a wire or another pair for signal ground (nominal impedance 100 ... 165 ohm, for example Belden 9842) Maximum length of link: 50 m (164 ft) Termination by switch</p>
RS-485 connection (X485)	<p>Connector pitch 5 mm, wire size 2.5 mm² Physical layer: RS-485</p>
Safe torque off connection (XSTO)	<p>Connector pitch 5 mm, wire size 2.5 mm² Input voltage range: -3...30 V DC Logic levels: "0" < 5 V, "1" > 17 V. Note: For the unit to start, both connections must be "1". This applies to all control units (including drive, inverter, supply, brake, DC/DC converter etc. control units), but true Safe torque off functionality is only achieved through the XSTO connector of the drive/inverter control unit. EMC (immunity) according to IEC 61326-3-1</p>
Safe torque off output (XSTO OUT)	<p>Connector pitch 5 mm, wire size 2.5 mm² To STO connector of inverter module.</p>
Control panel connection (X13)	<p>Connector: RJ-45 Cable length < 3 m</p>
Ethernet connection (XETH)	<p>Connector: RJ-45 This connection is not supported by the firmware.</p>
SDHC memory card slot (SD CARD)	<p>Memory card type: SDHC Maximum memory size: 4 GB</p>
<p>The terminals of the control unit fulfill the Protective Extra Low Voltage (PELV) requirements. The PELV requirements of a relay output are not fulfilled if a voltage higher than 48 V is connected to the relay output.</p>	

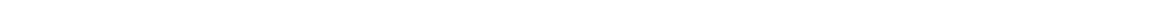
■ BCU-x2 ground isolation diagram



***Ground selector (DICOM=DIOGND) settings**

DICOM=DIOGND: ON
All digital inputs share a common ground (DICOM connected to DIOGND). This is the default setting.
DICOM=DIOGND: OFF
Ground of digital inputs DI1...DI5 and DIIL (DICOM) is isolated from DIO signal ground (DIOGND). Isolation voltage 50 V.

**Common mode voltage between each AI input and AGND is +30 V



6

Installation checklist

Contents of this chapter

This chapter contains a checklist of the mechanical and electrical installation of the drive.

Checklist

Examine the mechanical and electrical installation of the drive before start-up. Go through the checklist together with another person.



WARNING!

Obey the safety instructions of the drive. 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 installation or maintenance work.



WARNING!

Stop the drive and do the steps in section [Electrical safety precautions \(page 35\)](#) before you start the work.

Make sure that ...	<input checked="" type="checkbox"/>
The ambient operating conditions meet the drive ambient conditions specification, and enclosure rating (IP code or UL enclosure type).	<input type="checkbox"/>
The supply voltage matches the nominal input voltage of the drive. See the type designation label.	<input type="checkbox"/>
The insulation resistance of the input power cable, motor cable and motor is measured according to local regulations and the manuals of the drive.	<input type="checkbox"/>
The drive cabinet is attached to the floor, and if necessary due to vibration etc, also by its top to the wall or roof.	<input type="checkbox"/>
The drive module is fastened properly to the enclosure.	<input type="checkbox"/>

58 Installation checklist

Make sure that ...	<input checked="" type="checkbox"/>
<u>If the drive is connected to a network other than a symmetrically grounded TN-S system:</u> You have done all the required modifications (for example, you may need to disconnect the EMC filter or ground-to-phase varistor). See the electrical installation instructions in the supply unit manual.	<input type="checkbox"/>
There is an adequately sized protective earth (ground) conductor(s) between the drive and the switchboard, the conductor is connected to correct terminal, and the terminal is tightened to the correct torque. Proper grounding has also been measured according to the regulations.	<input type="checkbox"/>
<u>If the drive is equipped with a DC/DC converter unit:</u> There is an adequately sized protective earth (ground) conductor between the energy storage and the DC/DC converter, the conductor has been connected to appropriate terminal, and the terminal has been tightened to the proper torque. Proper grounding has also been measured according to the regulations.	<input type="checkbox"/>
<u>If the drive is equipped with a DC/DC converter unit:</u> The energy storage cable has been connected to the correct terminals of the DC/DC converter and energy storage, and the terminals have been tightened to the proper torque.	<input type="checkbox"/>
<u>If the drive is equipped with a DC/DC converter unit:</u> The energy storage has been equipped with fuses for protecting energy storage cable in a cable short-circuit situation.	<input type="checkbox"/>
<u>If the drive is equipped with a DC/DC converter unit:</u> The energy storage has been equipped with a disconnecting device.	<input type="checkbox"/>
The input power cable is connected to the correct terminals, the phase order is correct, and the terminals are tightened to the correct torque.	<input type="checkbox"/>
There is an adequately sized protective earth (ground) conductor between the motor and the drive, and the conductor is connected to the correct terminal, and the terminal is tightened to the correct torque. Proper grounding has also been measured according to the regulations.	<input type="checkbox"/>
The motor cable is connected to the correct terminals, the phase order is correct, and the terminals are tightened to the correct torque.	<input type="checkbox"/>
The motor cable is routed away from other cables.	<input type="checkbox"/>
No power factor compensation capacitors are connected to the motor cable.	<input type="checkbox"/>
<u>If an external brake resistor is connected to the drive:</u> There is an adequately sized protective earth (ground) conductor between the brake resistor and the drive, and the conductor is connected to the correct terminal, and the terminals are tightened to the correct torque. Proper grounding has also been measured according to the regulations.	<input type="checkbox"/>
<u>If an external brake resistor is connected to the drive:</u> The brake resistor is connected to the correct terminals, and the terminals are tightened to the correct torque.	<input type="checkbox"/>
<u>If an external brake resistor is connected to the drive:</u> The brake resistor cable is routed away from other cables.	<input type="checkbox"/>
The control cables are connected to the correct terminals, and the terminals are tightened to the correct torque.	<input type="checkbox"/>
The voltage setting of the auxiliary voltage transformers (if any) is correct. See the electrical installation instructions.	<input type="checkbox"/>
<u>If a drive bypass connection will be used:</u> The direct-on-line contactor of the motor and the drive output contactor are either mechanically and/or electrically interlocked, that is, they cannot be closed at the same time. A thermal overload device must be used for protection when bypassing the drive. Refer to local codes and regulations.	<input type="checkbox"/>
There are no tools, foreign objects or dust from drilling inside the drive.	<input type="checkbox"/>
Cover(s) of the motor connection box are in place. Cabinet shrouds are in place and doors are closed.	<input type="checkbox"/>
The motor and the driven equipment are ready for power-up.	<input type="checkbox"/>
The coolant connections between cubicles (if any) and to the cooling circuit are tight.	<input type="checkbox"/>
<u>If the drive is equipped with a cooling unit:</u> Refer to the cooling unit documentation for specific tasks.	<input type="checkbox"/>

7

Start-up

Contents of this chapter



This chapter contains the start-up procedure of the brake unit.

The symbols in brackets, for example [Q1], refer to the item designations used in the circuit diagrams. If a task is valid only for a certain option device or feature, the option code is given in brackets, for example, (option +F286).

ABB recommends that you connect a commissioning PC tool (DriveComposer) to the brake unit for the start up. By using the tool, you can set up parameters and monitor the drive during the test.

These instructions do not cover all start-up tasks of all possible variants of the brake unit. Always refer to the unit-specific circuit diagrams when proceeding with the start-up.

Start-up procedure

Tasks	<input checked="" type="checkbox"/>
Safety	
	<p>WARNING! Obey the safety instructions during the start-up procedure. See <i>ACS880 liquid-cooled multidrive cabinets and modules safety instructions (3AXD5000048633 [English])</i>. If you ignore the safety instructions, injury or death, or damage to the equipment can occur.</p> <p>If you are not a qualified electrical professional, do not do installation or maintenance work.</p>
	<p>WARNING! Make sure that the disconnecter of the supply transformer is locked to open position, ie, no voltage is, or can be, connected to drive inadvertently. Check also by measuring that there is no voltage connected.</p>
<p>Note: Some brake resistors are coated with oil film for protection. The protective oil will burn off when the brake resistor is used for the first time. Make sure that there is proper ventilation.</p>	

Tasks	<input checked="" type="checkbox"/>
Starting and checking the cooling system	
Fill up and bleed the internal cooling circuit. Start the cooling unit up. See <i>Filling up and bleeding the internal cooling circuit (page 82)</i> . If the drive is equipped with a cooling unit (ACS880-1007LC): Start up and power up the cooling unit. See <i>ACS880-1007LC liquid cooling unit user's manual (3AXD50000129607 [English])</i> and the delivery-specific circuit diagrams.	<input type="checkbox"/>
Check the cooling system for leaks. Make sure that cooling circuit joints at the shipping split joining cubicles are tight and that all drain valves have been closed.	<input type="checkbox"/>
Make sure that the coolant can flow freely in all cubicles. Make sure that drive system cools down. See <i>ACS880-1007LC liquid cooling unit user's manual (3AXD50000129607 [English])</i> .	<input type="checkbox"/>
Install all shrouds (if removed) and close the cabinet doors.	<input type="checkbox"/>
Powering up the DC bus and starting up the inverters	
Make sure that all cabinet doors are closed.	<input type="checkbox"/>
Close the disconnecter of the supply transformer.	<input type="checkbox"/>
Close the drive auxiliary voltage switch [Q21] to power up the control units.	<input type="checkbox"/>
Start the supply unit. See the procedure in the supply unit hardware manual. When started, the supply unit charges the capacitors of all inverters and brake units connected to the DC bus.	<input type="checkbox"/>
Start up the inverter units. See the procedure in the inverter unit hardware manual.	<input type="checkbox"/>
Brake units with DC switch/disconnector (option +F286): Connecting the brake unit to the DC bus	
To charge the brake unit capacitors, close the charging switch [Q10].	<input type="checkbox"/>
When the green light on the cabinet door illuminates, close the DC switch/disconnector [Q11] of the brake unit.	<input type="checkbox"/>
Open the charging switch [Q10]. Note: The brake unit can start only after the charging switch is open.	<input type="checkbox"/>
Setting up the brake and inverter unit parameters	
Check the brake control program parameter settings. See <i>ACS880 brake control program firmware manual (3AXD50000020967 [English])</i> .	<input type="checkbox"/>
Operational tests	
Test the operation of the braking. See <i>ACS880 brake control program firmware manual (3AXD50000020967 [English])</i> .	<input type="checkbox"/>





Operating instructions

Contents of this chapter

This chapter instructs in the basic operations of the brake unit with the DC switch/disconnector (option +F286).

Disconnecting the brake unit from the drive DC bus

1. Stop all motors and inverter units that can regenerate energy back to the DC link. Keep them stopped when the brake unit disconnected.
2. Open the DC switch/disconnector [Q11] of the brake unit.

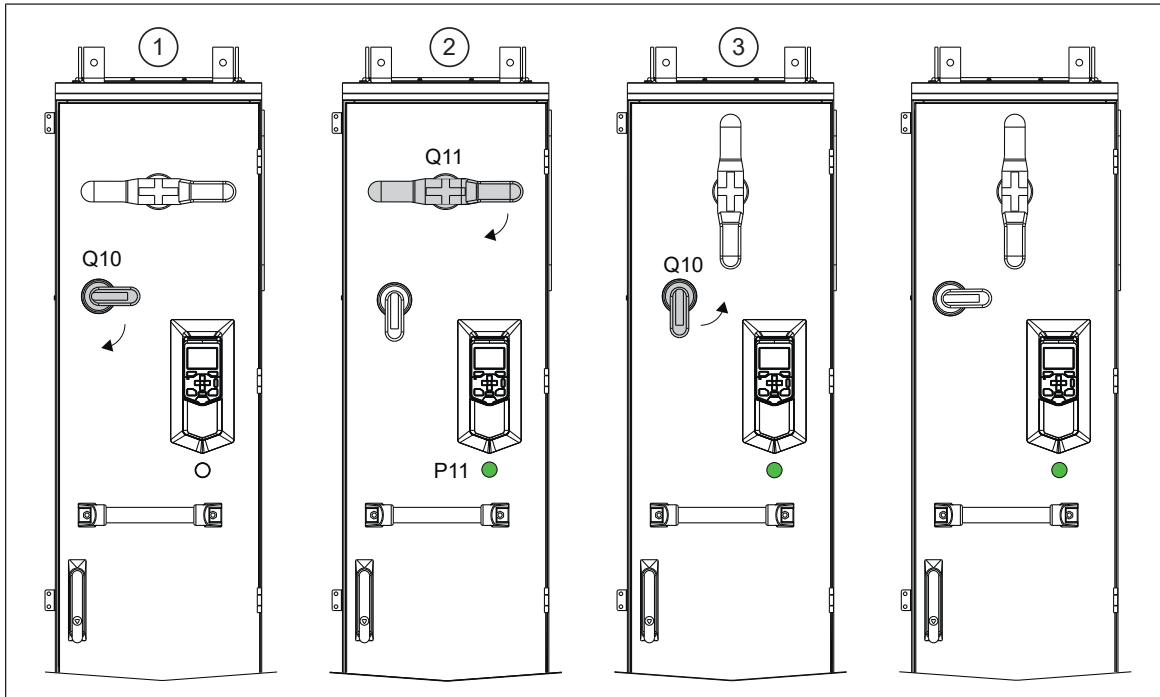
Connecting the brake unit to the drive DC bus

If you connect voltage to the brake unit for the first time, obey the brake unit start-up instructions.

If you connect voltage to the supply unit after the first start-up, obey these instructions:

1. To charge the brake unit capacitors, close the charging switch [Q10].
 2. When the green light on the cabinet door illuminates, close the DC switch/disconnector [Q11] of the brake unit.
 3. Open the charging switch [Q10].
-

Note: The brake unit only starts after the charging switch is open.





Fault tracing

Contents of this chapter

This chapter describes the fault tracing of the brake unit.

LEDs

- **Control panel and panel platform/holder LEDs**

The ACS-AP-... control panel has a status LED. The control panel mounting platform or holder has two status LEDs. For their indications, see the following table.

Location	LED	Indication
Control panel	Continuous green	The unit is functioning normally.
	Flickering green	Data is transferred between the PC and the unit through the USB connection of the control panel.
	Blinking green	There is an active warning in the unit.
	Continuous red	There is an active fault in the unit.
	Blinking red	There is a fault that requires the stopping and restarting of the drive/converter/inverter.
	Blinking blue (ACS-AP-W only)	The Bluetooth interface is enabled, in discoverable mode, and ready for pairing.
	Flickering blue (ACS-AP-W only)	Data is being transferred through the Bluetooth interface of the control panel.
Control panel mounting platform or holder (with the control panel removed)	Red	There is an active fault in the unit.
	Green	Power supply for the control unit is OK.

■ Control unit LEDs

LED	Color	Indication
BATT OK	Green	Battery voltage of the real-time clock is OK (higher than 2.8 V). When the LED is not lit, <ul style="list-style-type: none"> • battery voltage is below 2.8 V, • the battery is missing, or • the control unit is not powered.
PWR OK	Green	Internal voltage OK
FAULT	Red	The control program indicates that the equipment is faulty. See the appropriate firmware manual.
WRITE	Yellow	Writing to SD card in progress.

■ R8i module LEDs

LED	Color	Indication
FAULT	Continuous red	There is an active fault in the module.
ENABLE / STO	Continuous green	The module is ready for use.
ENABLE / STO	Continuous yellow	XSTO connectors are de-energized.
POWER OK	Continuous green	Supply voltage of the internal circuit boards is OK (> 21 V).

7-segment display of the brake control unit

See the control unit description.

Warning and fault messages

See *ACS880 brake unit control program firmware manual* [3AXD50000020967 (English)].

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Maintenance

Contents of this chapter

This chapter instructs how to maintain the brake unit.

Maintenance intervals

The table below shows the maintenance tasks which can be done by the end user. The complete maintenance schedule is available on the Internet (www.abb.com/drivesservices). For more information, consult your local ABB Service representative (www.abb.com/searchchannels).

Maintenance task/object	Years from start-up													
	0	1	2	3	4	5	6	7	8	9	10	11	12	...
Coolant														
Checking coolant antifreeze concentration		P	P	P	P	P	P	P	P	P	P	P	P	P
Checking coolant quality			P		P		P		P		P		P	
Coolant draining and replacement							R						R	
External circuit of the main heat exchanger (temperature, flow, pressure)		I		I		I		I		I		I		I
ABB cooling unit (if present)	See ACS880-1007LC liquid cooling unit user's manual (3AXD50000129607 [English])													
Cooling fans and fan control board														
Cooling fans 230 VAC 50/60Hz											R			
CIO-module for fan control (230 VAC) ¹⁾										R				
Cooling fans 115 VAC 50/60Hz							R						R	

Maintenance task/object	Years from start-up													
	0	1	2	3	4	5	6	7	8	9	10	11	12	...
CIO-module for fan control (115 VAC) ¹⁾							I/R						R	
Batteries														
Control panel battery										R				
Control unit battery							R						R	
Control unit														
BCU control unit													R	
Connections and environment														
Quality of supply voltage		P	P	P	P	P	P	P	P	P	P	P	P	P
Spare parts														
Spare parts		I	I	I	I	I	I	I	I	I	I	I	I	I
DC circuit capacitor reforming (spare modules and spare capacitors)		P	P	P	P	P	P	P	P	P	P	P	P	P
Inspections														
Checking tightness of cable and busbar terminals. Tightening if needed.		I	I	I	I	I	I	I	I	I	I	I	I	I
Checking ambient conditions (dustiness, corrosion, temperature)		I	I	I	I	I	I	I	I	I	I	I	I	I
Checking coolant pipe connections		I	I	I	I	I	I	I	I	I	I	I	I	I
3AXD10000578918 K														

¹⁾ To replace the CIO-module or reset the fan counters, see *CIO-01 I/O module for distributed I/O bus control user's manual* (3AXD50000126880 [English]).

Symbols

I	Inspection (visual inspection and maintenance action if needed)
P	Performance of on/off-site work (commissioning, tests, measurements or other work)
R	Replacement

Note:

- Maintenance and component replacement intervals are based on the assumption that the equipment is operated within the specified ratings and ambient conditions. ABB recommends annual drive inspections to ensure the highest reliability and optimum performance.
- Long term operation near the specified maximum ratings or ambient conditions may require shorter maintenance intervals for certain components. Consult your local ABB Service representative for additional maintenance recommendations.

Maintenance timers and counters

The control program has maintenance timers and counters that can be configured to generate a warning when a pre-defined limit is reached. Each timer/counter can be set to monitor any parameter. This feature is especially useful as a service reminder. For more information, see the firmware manual.

Cabinet

■ Cleaning the interior of the cabinet



WARNING!

Obey the safety instructions given in *ACS880 liquid-cooled multidrive cabinets and modules safety instructions* (3AXD50000048633 [English]). If you ignore the safety instructions, injury or death, or damage to the equipment can occur.

If you are not a qualified electrical professional, do not do installation or maintenance work.



WARNING!

Use a vacuum cleaner with antistatic hose and nozzle, and wear a grounding wristband. Using a normal vacuum cleaner creates static discharges which can damage circuit boards.

1. Stop the drive and do the steps in section [Electrical safety precautions \(page 35\)](#) before you start the work.
2. Open the cabinet door.
3. Clean the interior of the cabinet. Use a vacuum cleaner and a soft brush.
4. Clean the air inlets of the fans and air outlets of the modules (top).
5. Clean the air inlet gratings (if any) on the door.
6. Close the door.

■ Cleaning the exterior of the cabinet



WARNING!

Obey the safety instructions of the drive. 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 installation or maintenance work.

Clean the exterior of the cabinet with a cleaning cloth. Use a mild detergent.



WARNING!

Prevent water from entering the cabinet. Never use a hose or excessive amount of water.

Power connections

■ Retightening the power connections



WARNING!

Obey the safety instructions given in *ACS880 liquid-cooled multidrive cabinets and modules safety instructions* (3AXD50000048633 [English]). If you ignore the safety instructions, injury or death, or damage to the equipment can occur.

If you are not a qualified electrical professional, do not do installation or maintenance work.

1. Stop the drive and do the steps in section *Electrical safety precautions (page 35)* before you start the work.
2. Examine the tightness of the cable connections. Use the tightening torques given in the technical data.

Fan replacement

■ Brake chopper module cubicle



WARNING!

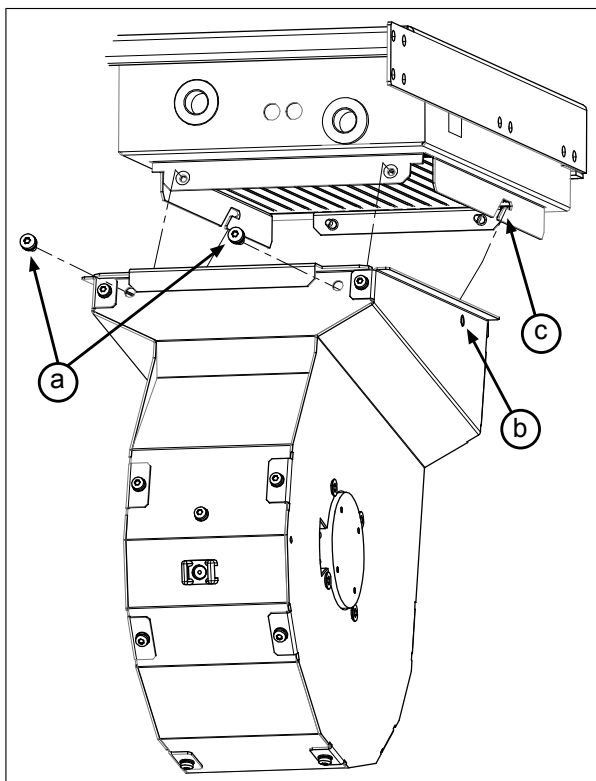
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do installation or maintenance work.



WARNING!

Use the required personal protective equipment. Wear protective gloves and long sleeves. Some parts have sharp edges.

1. Repeat the steps described in section *Electrical safety precautions (page 35)*.
 2. Remove any shrouding in front of the cooling fan.
 3. Disconnect the fan wiring.
 4. Undo the two retaining screws (a).
 5. Pull the fan outwards to separate it from the heat exchanger housing.
 6. Install new fan in reverse order. Align the guide pins (b) at the rear of the fan cowling with the slots (c) in the module bottom guide, then reinstall the retaining screws (a).
-



■ Fan in the output cubicle, top cable entry (option +H351)



WARNING!

Obey the safety instructions of the drive. 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 installation or maintenance work.

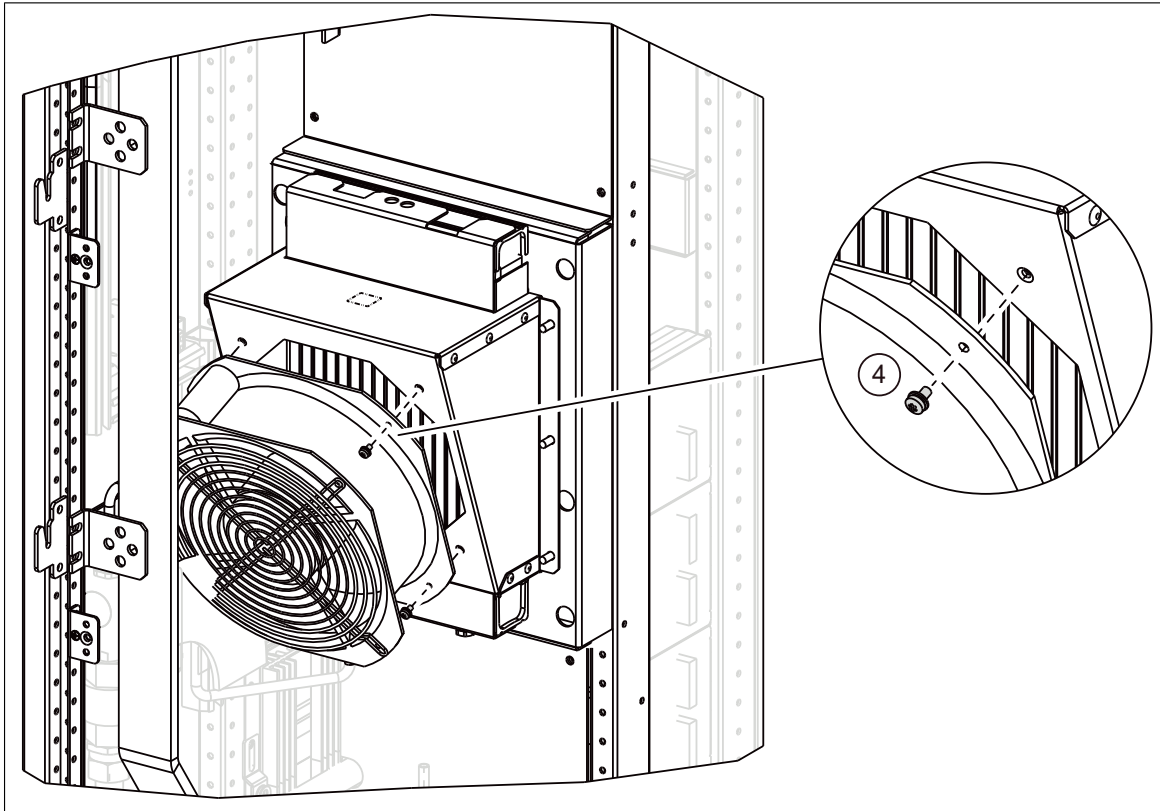


WARNING!

Use the required personal protective equipment. Wear protective gloves and long sleeves. Some parts have sharp edges.

Note: During the fan replacement, do not remove the PE busbar on the left side of the cabinet opening.

1. Repeat the steps described in section *Electrical safety precautions (page 35)*.
2. Remove any shrouding in front of the cooling fan.
3. Disconnect the fan wiring.
4. Undo the four fastening screws.
5. Pull the fan housing out.
6. Install the new fan in reverse order.



Brake module



WARNING!

Obey the safety instructions given in *ACS880 liquid-cooled multidrive cabinets and modules safety instructions* (3AXD5000048633 [English]). If you ignore the safety instructions, injury or death, or damage to the equipment can occur.

If you are not a qualified electrical professional, do not do installation or maintenance work.



WARNING!

Make sure that the replacement module has exactly the same type code as the old module.



WARNING!

Beware of hot coolant. Do not work on the liquid cooling system until the pressure is lowered down by stopping the pumps and draining the coolant. High-pressure warm coolant (6 bar, max. 50 °C) is present in the internal cooling circuit when it is in operation.

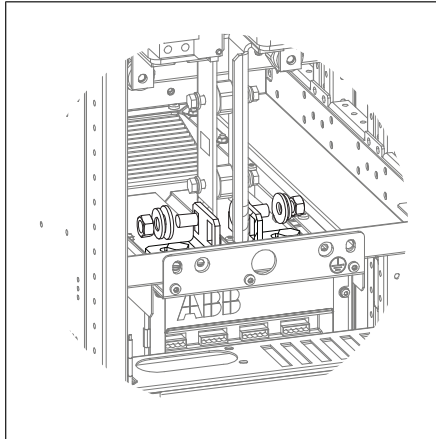


WARNING!

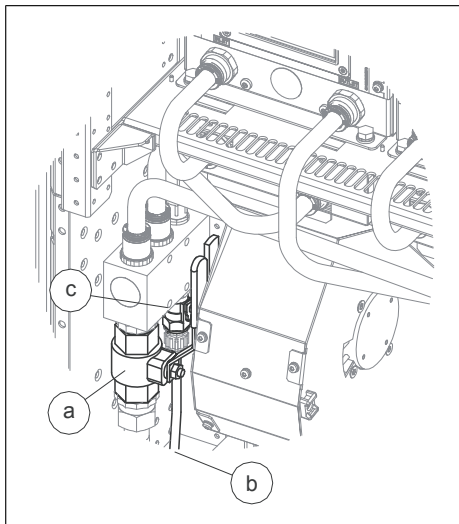
Use the required personal protective equipment. Wear protective gloves and long sleeves. Some parts have sharp edges.

■ Removing the module

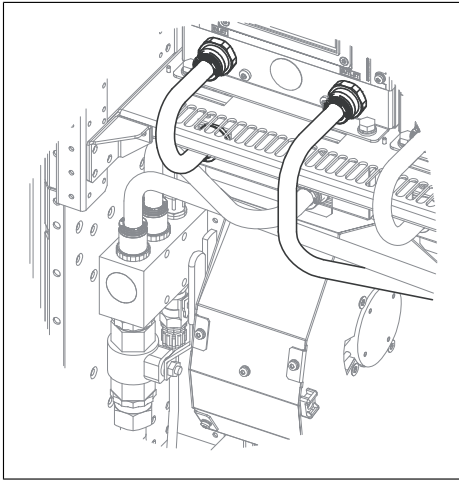
1. Repeat the steps described in section *Electrical safety precautions (page 35)*.
2. Remove the shrouding in front of the module.
3. Undo the locking screws of the swing-out frame (if present) and open it.
4. Unplug the wiring from the module and move it aside. Use cable ties to keep the wiring out of the way.
5. Remove the L-shaped DC busbars at the top of the module. Make note of the orientation of the screws as well as the order of the washers.



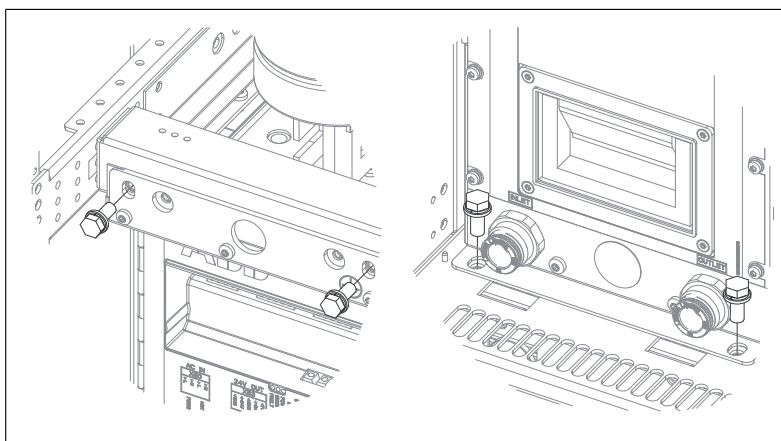
6. Close the inlet valve (a) and outlet valve (located on the right-hand side of the cubicle). Lead the drain hoses (b, on both sides of the cubicle) into a suitable container. Open the drain valves (c, on both sides of the cubicle). This will drain all modules in the cubicle.



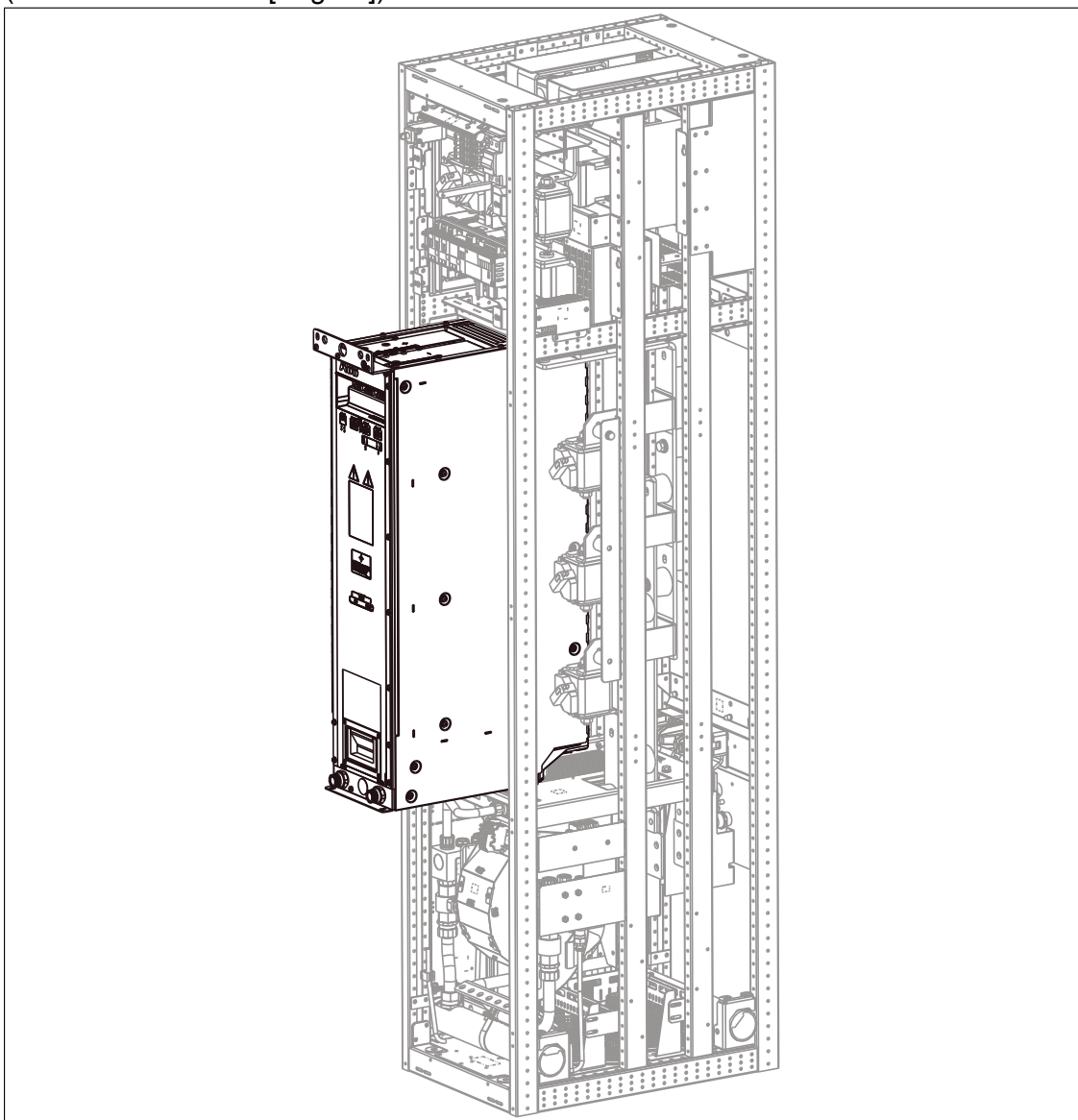
7. After the module has drained, disconnect the piping from the module.



8. Remove the module retaining screws at the top and the bottom of the module.



9. Pull the module carefully out onto a table or other platform. Keep the module secured to a hoist or equivalent to prevent the module from falling. For information on using the lifting device, see *Converter module lifting device for drive cabinets hardware manual* (3AXD50000210268 [English]).



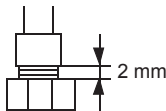
■ Reinstalling the module

1. Push the module carefully into its bay.
2. Fasten the retaining screws at the top and the bottom of the module.
3. Reinstall the DC busbars at the top of the module.
4. Reconnect the coolant pipes to the module.



WARNING!

To avoid breaking the coolant pipes, do not overtighten the nuts of the unions. Leave 2 to 3 millimeters (0.08 to 0.12 inches) of thread visible.



-
5. Reconnect the control wiring to the module.
 6. Fill up the cooling system. For instructions, see section [Filling up and bleeding the internal cooling circuit](#).
 7. Close the swing-out frame (if present). Reinstall all shrouds removed earlier.

Capacitors

The DC link of the drive contains several electrolytic capacitors. Operating time, load, and surrounding air temperature have an effect on the life of the capacitors. Capacitor life can be extended by decreasing the surrounding air temperature.

Capacitor failure is usually followed by damage to the unit and an input cable fuse failure, or a fault trip. If you think that any capacitors in the drive have failed, contact ABB.

■ Reforming the capacitors

The capacitors must be reformed if the drive has not been powered (either in storage or unused) for a year or more. The manufacturing date is on the type designation label. For information on reforming the capacitors, see [Capacitor reforming instructions \(3BFE64059629 \[English\]\)](#) in the ABB Library (<https://library.abb.com/en>).

Fuses

■ Replacing the brake chopper fuses



WARNING!

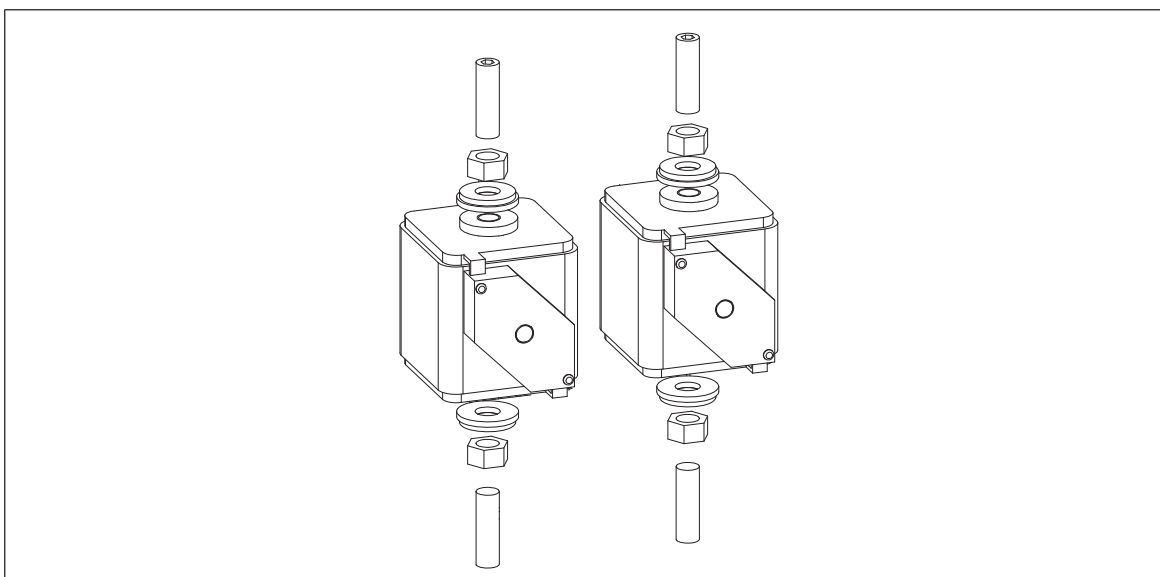
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur.



WARNING!

Use the required personal protective equipment. Wear protective gloves and long sleeves. Some parts have sharp edges.

1. Repeat the steps described in section *Electrical safety precautions (page 35)*.
2. Open the door of the module cubicle.
3. Remove the shrouding in front of the fuses (upper part of the cabinet).
4. Check the condition of the fuses. In case of a blown fuse, replace all fuses with similar fuses.
5. Slacken the nuts of the headless screws of the fuses, and slide out the fuse blocks.
6. Make note of the order of the washers on the screws.
7. Remove the screws, nuts and washers from the old fuses and attach them to the new fuses. Make sure to keep the washers in the original order.
8. Insert the new fuses into their slots in the cubicle. Pre-tighten the nuts first by hand or by applying a torque of no more than 5 N·m (3.7 lbf·ft).
9. Tighten the nuts to torque as follows:
 - Cooper-Bussmann fuses: 50 N·m (37 lbf·ft)
 - Mersen (Ferraz-Shawmut): 46 N·m (34 lbf·ft)
 - Other: Refer to the fuse manufacturer's instructions
10. Attach the shrouding (if any) and close the door.



■ Replacing the resistor fuses



WARNING!

Obey the safety instructions given in *ACS880 liquid-cooled multidrive cabinets and modules safety instructions (3AXD50000048633 [English])*. If you ignore the safety instructions, injury or death, or damage to the equipment can occur.

If you are not a qualified electrical professional, do not do installation or maintenance work.

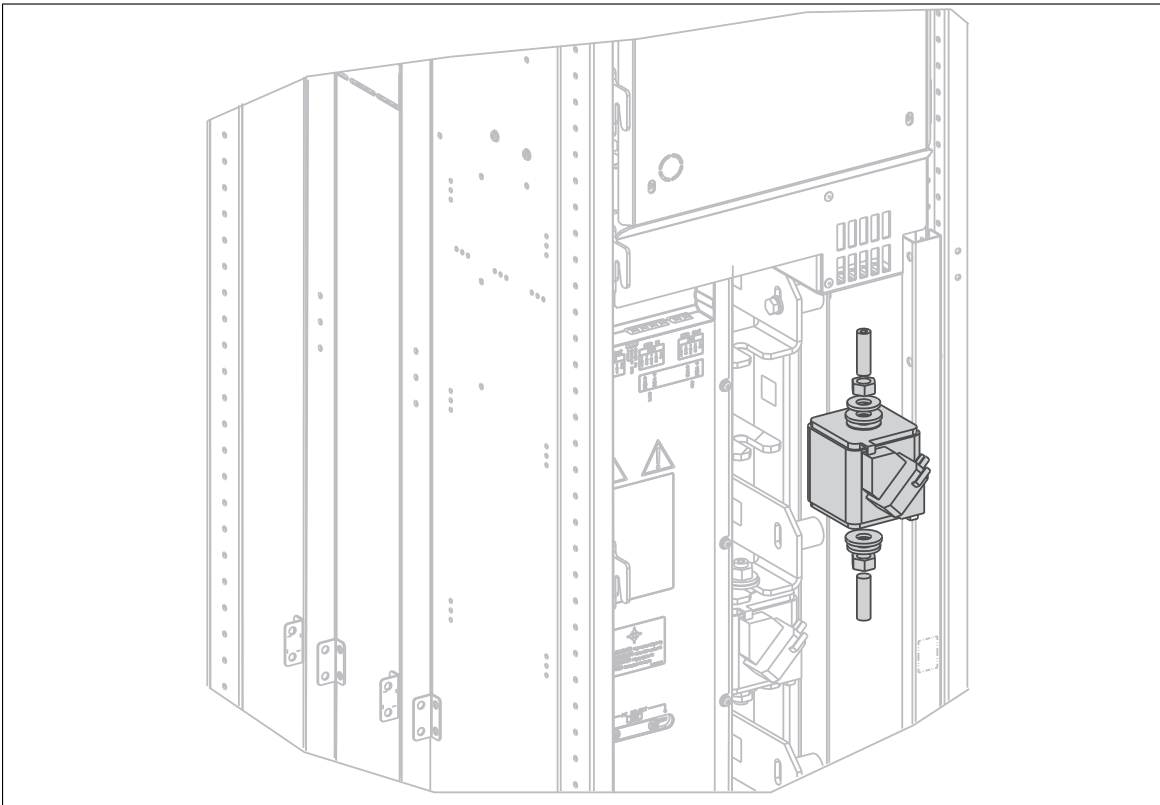


WARNING!

Use the required personal protective equipment. Wear protective gloves and long sleeves. Some parts have sharp edges.

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1. Repeat the steps described in section *Electrical safety precautions (page 35)* before you start the work.
2. Open the cubicle door.
3. Undo the locking screws and open the swing-out frame or remove the shrouding.
4. Check the condition of the fuses. In case of a blown fuse, replace all fuses with similar fuses.
5. Slacken the nuts of the headless screws of the fuses, and slide out the fuse blocks.
6. Make note of the order of the washers on the screws.
7. Remove the screws, nuts and washers from the old fuses and attach them to the new fuses. Make sure to keep the washers in the original order.
8. Insert the new fuses into their slots in the cubicle. Pre-tighten the nuts of the new fuses first by hand or by applying a torque of no more than 5 N·m (3.7 lbf·ft).
9. Tighten the nuts to torque as follows:
 - Cooper-Bussmann fuses: 50 N·m (37 lbf·ft)
 - Mersen (Ferraz-Shawmut): 46 N·m (34 lbf·ft)
 - Other: Refer to the fuse manufacturer's instructions
10. Close the swing-out frame, attach the shrouding (if any) and close the door.



Control panel

For detailed information on the control panel, see *ACx-AP-x assistant control panels user's manual* ([3AJA0000085685](#) [English]).

■ Cleaning the control panel

Use a soft damp cloth to clean the control panel. Avoid harsh cleaners which could scratch the display window.

■ Replacing the battery

The instructions below describe how to replace the battery that powers the real-time clock of the control panel.

1. Turn the lid on the back of the control panel counter-clockwise until the lid opens.
2. Remove the battery gently.
3. Replace the battery with a new CR2032 battery. The battery holder has grip nails. First slide the battery and then press on the other side. The battery will snap in.
4. Make sure that the battery polarity shows positive on the upside.
5. Put the lid back and tighten it by turning it clockwise.
6. Dispose of the old battery according to local disposal rules or applicable laws.



Memory unit

■ Replacing the memory unit

After replacing a control unit, you can keep the existing parameter settings by transferring the memory unit from the defective control unit to the new control unit.



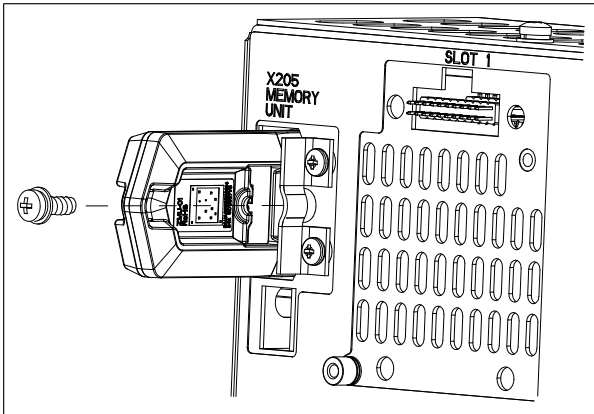
WARNING!

Do not remove or insert the memory unit when the control unit is powered.

1. Stop the drive and do the steps in section *Electrical safety precautions (page 35)* before you start the work.
 2. Make sure that the control unit is not powered.
-

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3. Remove the fastening screw and pull the memory unit out.
4. Install a memory unit in reverse order.



11

Internal cooling circuit

Contents of this chapter

The cooling system of a liquid-cooled drive consists of two circuits: the internal cooling circuit and the external cooling circuit. The internal cooling circuit covers the heat-generating electrical components of the drive and transfers the heat to the cooling unit. In the cooling unit, the heat is transferred to the external cooling circuit which is usually part of a larger external cooling system. This chapter deals with the internal cooling circuit.

Applicability

The information in this chapter is applicable to cabinet-built ACS880 liquid-cooled drives. Except where otherwise indicated, the information is also applicable to drives built out of ACS880 liquid-cooled multidrive modules.

Internal cooling system

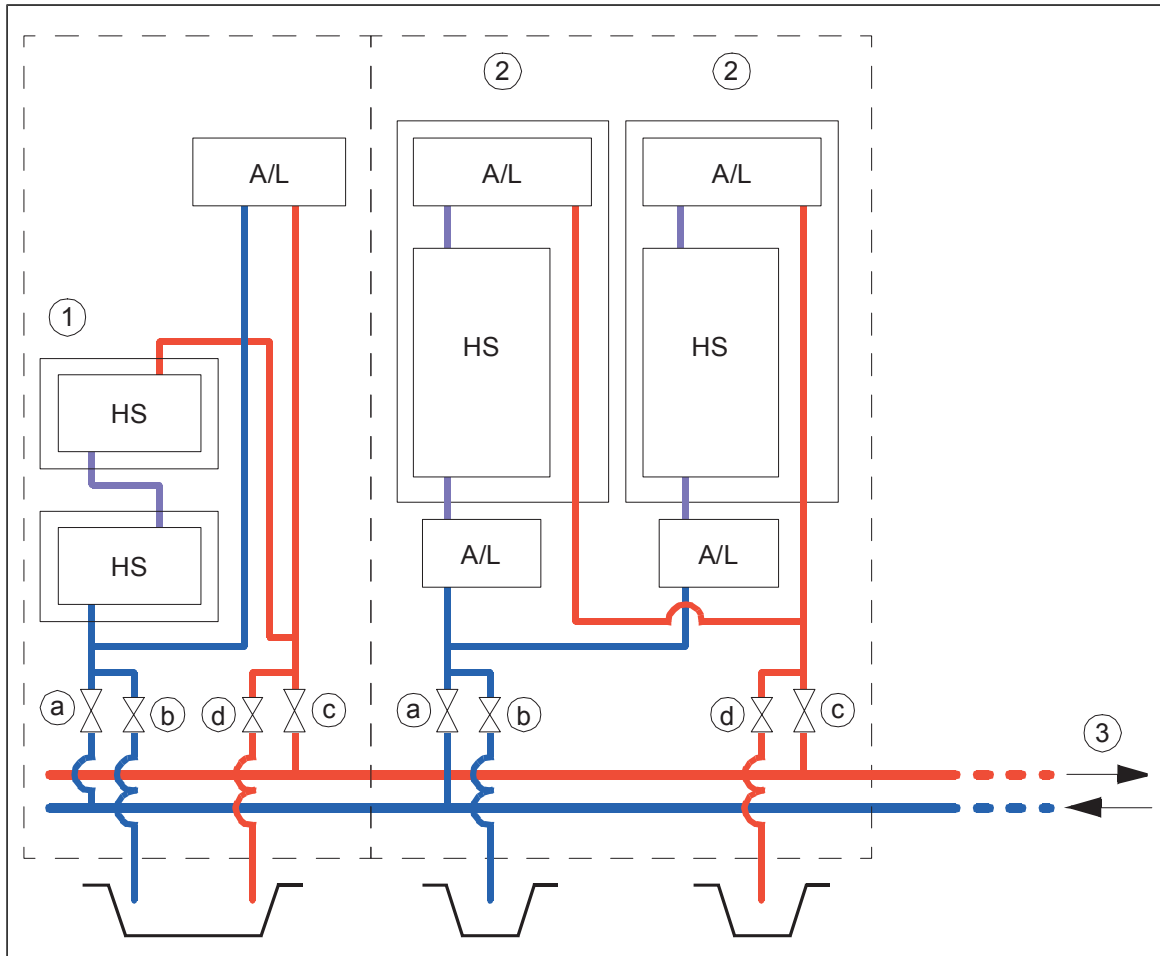
Each cubicle has an inlet and an outlet manifold, fitted with a stop valve and a drain valve. The stop valves can be closed to isolate all modules in the cubicle from the main cooling circuit.

In cabinet line-ups built by ABB, valves are color-coded:

- Blue – Open during operation
- Red – Closed during operation

The following diagram shows the coolant pipe connections in a drive system consisting of a supply unit and an inverter unit.

80 Internal cooling circuit



1	Supply modules. The drawing shows the configuration of a diode supply unit, ie. there is a common air-to-liquid exchanger in the cubicle. With an IGBT supply unit, each module has a dedicated air-to-liquid exchanger as shown for item 2.
2	Inverter modules
3	To/From cooling unit
A/L	Air-to-liquid heat exchanger
HS	Heat sink
a	Inlet valve
b	Inlet-side drain valve
c	Outlet valve
d	Outlet-side drain valve

The coolant used with ACS880 liquid-cooled drive systems is Antifrogen® L 25% or 50% mixture. See [Coolant specification \(page 84\)](#).

Connection to a cooling unit

■ Connection to an ACS880-1007LC cooling unit

Refer to *ACS880-1007LC cooling unit user's manual* (3AXD50000129607 [English]).

■ Connection to a custom cooling unit

General requirements

Equip the system with an expansion vessel to damp pressure rise due to volume changes when the temperature varies. Equip the system with a pump that provides a nominal flow and pressure. Keep the pressure within the limits specified in [Technical data \(page 84\)](#). Install a pressure regulator to make sure that the maximum permissible operating pressure is not exceeded.

Install a bleed valve at the highest point of the cooling circuit, and a drain valve at the lowest point.

The materials that can be used are listed in [Cooling circuit materials \(page 86\)](#).

Coolant temperature control

The temperature of the coolant in the internal cooling circuit must be kept within the limits specified in [Technical data \(page 84\)](#). Note that the minimum temperature is dependent on ambient temperature and relative humidity.

Filling up and bleeding the internal cooling circuit

Both the drive and coolant must be at room temperature before filling up the cooling circuit.



WARNING!

Make sure that the maximum permissible operating pressure is not exceeded. When necessary regulate the pressure to appropriate level by draining excess coolant out of the system.



WARNING!

Bleeding of the cooling circuit is very important and has to be done with great care. Air bubbles in the cooling circuit may reduce or completely block coolant flow and lead to overheating. Let the air out of the cooling system while filling in coolant and, eg. after any power module replacements.

■ Drive line-ups with an ACS880-1007LC cooling unit

Follow the filling up and bleeding instructions in *ACS880-1007LC cooling unit user's manual* (3AXD50000129607 [English]).

■ Drive line-ups with a custom cooling unit

Note:

- In filling up the system, the drain valves in the line-up are used only to vent the air from the circuit so that it can be displaced by the coolant. The actual bleeding of the circuit must be done via an external bleed valve installed at the highest point of the cooling circuit. The most practical location for the valve is usually near or at the cooling unit.
 - Observe the instructions given by the manufacturer of the cooling unit. Pay special attention to filling up and bleeding the pumps properly as they may be damaged if operated when dry.
 - Draining coolant into the sewer system is not allowed.
1. Open the bleed valve at the cooling unit.
 2. Open the inlet valve and the outlet-side drain valve of one cubicle. Keep the outlet valve and the inlet-side drain valve closed.
 3. Attach a hose to the outlet-side drain valve and lead it into a suitable container.
 4. Fill the circuit with coolant. For coolant specification, see [Coolant specification \(page 84\)](#).
Note: To minimize foaming, do not exceed the filling flow rate of 5 l/min (1.3 US gallon/min).
 5. As the piping and modules in the cubicle fills up, coolant starts to flow from the hose. Let some coolant flow out, then close the drain valve.
 6. Close the inlet valve.
 7. Repeat steps 2 to 6 for all cubicles in the line-up.
 8. Open the inlet and outlet valves in all cubicles. Let any air remaining in the system out through the bleed valve at the cooling unit.
 9. Close the bleed valve at the cooling unit.
 10. Continue to fill in coolant until a base pressure of 100...150 kPa is achieved.
-

11. Open the bleed valve of the pump to let out any air.
 - 12 Re-check the pressure and add coolant if necessary.
 - 13 Start the coolant pump. Let any air remaining in the system out through the bleed valve at the cooling unit.
 - 14 After one to two minutes, stop the pump or block the coolant flow with a valve.
 - 15 Re-check the pressure and add coolant if necessary.
 - 16 Repeat steps 13 to 15 a few times until all air is let out of the cooling circuit. Listen for a humming sound and/or feel the piping for vibration to find out if there is still air left in the circuit.
-

Draining the internal cooling circuit

The modules in each cubicle can be drained through the drain valves without draining the whole internal cooling circuit.



WARNING!

Hot, pressurized coolant can be present in the cooling circuit. Do not work on the cooling circuit before the pressure is released by stopping the pumps and draining coolant.

1. Attach hoses to each drain valve in the cubicle to be drained. Lead the hoses into a suitable container. Make sure the ends of the hoses are not immersed in coolant at any point so that air can displace the coolant in the system.
2. Open the drain valves. Wait until all coolant has drained.
Note: Draining coolant into the sewer system is not allowed.
3. If required, dry the piping with compressed oil-free air of less than 6 bar.
4. If the drive is to be stored in temperatures below 0 °C (32 °F),
 - dry the cooling circuit with air,
 - fill the cooling circuit with coolant specified under *Coolant specification (page 84)*.
 - drain the cooling circuit again.

Maintenance intervals

As a general rule, the quality of the coolant should be checked at intervals of two years. This can be done by distributors of Antifrogen® L (see www.clariant.com) if a 250 milliliter sample is provided.

Technical data

■ Coolant specification

Coolant type

Antifrogen® L (by Clariant International Ltd, www.clariant.com) 25% or 50% mixture, available from Clariant distributors and ABB Service representatives.

Note: Do not dilute the coolant. It is ready to use.

Antifrogen® L 25% mixture is usable in storage temperatures down to -16 °C (3.2 °F).

Antifrogen® L 50% mixture is usable in storage temperatures down to -40 °C (-40 °F).

Note that operation below 0 °C (32 °F) is not allowed regardless of the freezing point of the coolant.



WARNING!

The warranty does not cover damage occurring from use of improper coolant.

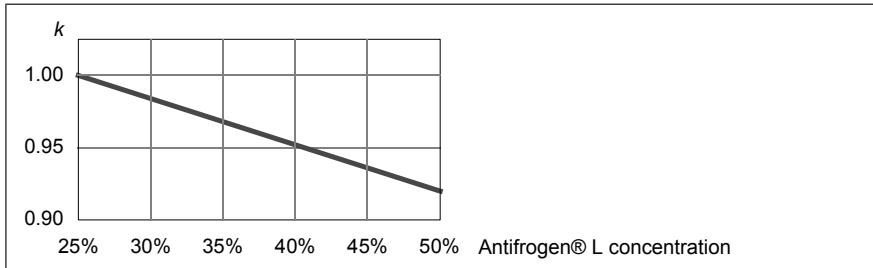
■ Temperature limits

Ambient temperature: See the technical data of the drive/unit.

Freeze protection: The freezing point of the coolant is determined by the concentration of heat transfer fluid in the mixture.

The higher the concentration of heat transfer fluid, the higher the viscosity of the coolant. This results in a higher pressure loss in the system. See [Pressure limits \(page 86\)](#).

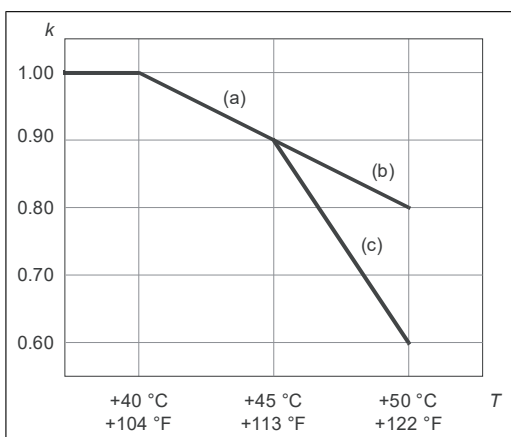
The nominal current ratings of drive system modules apply to an Antifrogen® L / water solution of 25/75% (volume). With the Antifrogen® L concentration between 25% and 50%, the drive output current must be derated by 1/3 percentage point per 1 p.p. increase in Antifrogen® L concentration. The drawing below shows the derating factor (k) in relation to Antifrogen® L concentration.



Incoming coolant temperature:

- 0...40 °C (32...104 °F): no drive output current derating required
- 40...45 °C (104...113 °F): drive output current must be derated by 2 percentage points per 1 °C (1.8 °F) temperature increase, as shown by curve (a).
- 45...50 °C (113...122 °F):
 - If components with a maximum operating temperature of 55 °C (131 °F) are installed in the same space as the drive modules, drive output current must be derated by 6 percentage points per 1 °C (1.8 °F) temperature increase, as shown by curve (c).
 - If there are no components with a maximum operating temperature of 55 °C (131 °F) installed in the same space as the drive modules, drive output current must be derated by 2 percentage points per 1 °C (1.8 °F) temperature increase, as shown by curve (b).

The drawing below shows the derating factor (k) in relation to coolant temperature.



1-phase (NBRW-669) brake modules (option +D150): 0...50 °C (32...122 °F): no current derating required

Condensation is not allowed. The minimum coolant temperature to avoid condensation (at an atmospheric pressure of 1 bar) is shown below as a function of relative humidity (RH) and ambient temperature (T_{air}).

T_{air} (°C)	Min. T_{coolant} (°C)				
	RH = 95%	RH = 80%	RH = 65%	RH = 50%	RH = 40%
5	4.3	1.9	-0.9	-4.5	-7.4
10	9.2	6.7	3.7	-0.1	-3.0
15	14.2	11.5	8.4	4.6	1.5
20	19.2	16.5	13.2	9.4	6.0
25	24.1	21.4	17.9	13.8	10.5
30	29.1	26.2	22.7	18.4	15.0
35	34.1	31.1	27.4	23.0	19.4
40	39.0	35.9	32.2	27.6	23.8
45	44.0	40.8	36.8	32.1	28.2
50	49.0	45.6	41.6	36.7	32.8
55	53.9	50.4	46.3	42.2	37.1
	= Not allowed as standard but the coolant temperature must be 0 °C (32 °F) or above.				
Example:	At an air temperature of 45 °C and relative humidity of 65% the coolant temperature may not be below +36.8 °C				

Maximum temperature rise: Depends on heat losses and mass flow. Typically 10 °C (18 °F) with nominal losses and flow.

■ Pressure limits

Base pressure: 250 kPa (recommended); 300 kPa (maximum). “Base pressure” denotes the pressure of the system compared with the atmospheric pressure when the cooling circuit is filled with coolant.

Air counterpressure in expansion vessel (with ACS880-1007LC cooling unit): 80 kPa

Design pressure (PS): 600 kPa

Nominal pressure difference: 120 kPa with Antifrogen® L 25% coolant solution, 140 kPa with Antifrogen® L 50% coolant solution. This has to be taken into account when dimensioning the liquid cooling circuit.

Maximum pressure difference: 160 kPa

■ Coolant flow rate limits

The maximum coolant flow rate for all drive equipment is 1.3 × nominal. See the technical data chapter for nominal values.

■ Cooling circuit materials

Materials used in the internal cooling circuit are listed below. These are also the only materials that can be used in the external cooling circuit.

- stainless steel AISI 316L (UNS 31603)
 - heavy gauge aluminum
 - plastic materials such as PA, PEX and PTFE
- Note:** PVC hoses are not suitable for use with antifreeze.
- rubber gasketing NBR (nitrile rubber).
-



WARNING!

If connecting external piping to the internal cooling circuit, use only materials that are specified above. Copper, brass or bronze must not be used under any circumstances. Even minor dissolution of copper can cause copper precipitation on aluminum and subsequent galvanic corrosion. The liquid cooling system must not contain any zinc (eg. galvanized pipes).

If the plant incorporates normal iron pipes or cast iron accessories (eg. motor housings), a cooling unit with a heat exchanger (such as the ACS880-1007LC) must be used to separate the systems.

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Technical data

Contents of this chapter


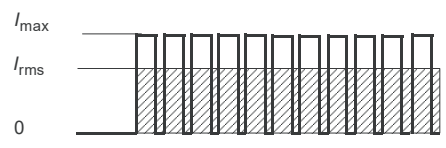
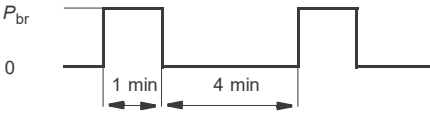
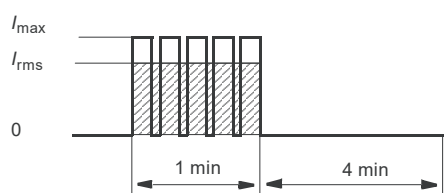
This chapter contains the technical data.

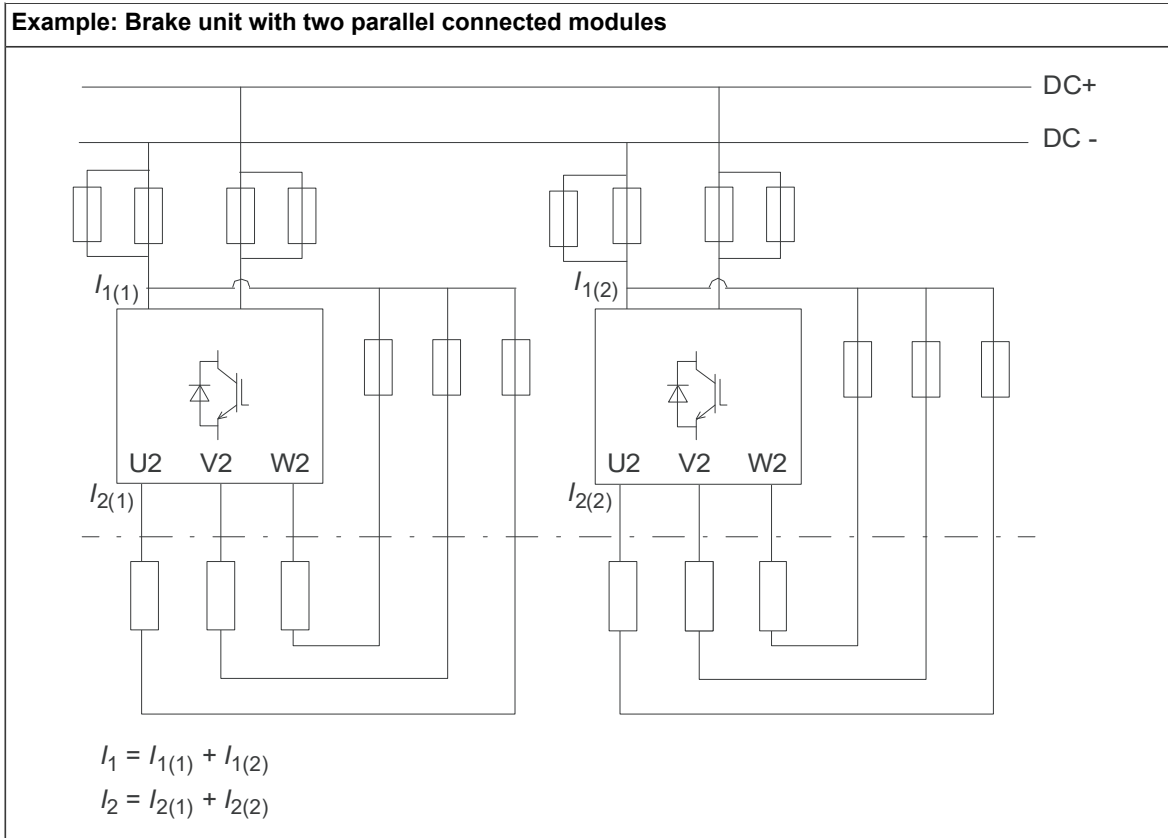
Ratings

ACS880-607LC-...	Frame size	Resistor values		Ratings with R_{\min}						
				No overload use			Cyclic load (1 min / 5 min)			
		R_{\min}	R_{\max}	I_1	I_2	$P_{\text{contmax}} (S_n)$	I_{\max}	I_{dc}	I_{rms}	P_{br}
		Ohm	Ohm	A DC	A DC	kW (kVA)	A DC	A DC	A DC	kW
$U_N = 690 \text{ V}$										
0870-7	R8i	3.0	3.6	781	310	870	370	999	351	1110
1300-7	R8i	2.0	2.4	1171	465	1300	555	1499	527	1660
1730-7	2×R8i	3.0	3.6	1562	621	1730	740	1998	702	2220
2600-7	2×R8i	2.0	2.4	2342	931	2600	1110	2997	1053	3330
3900-7	3×R8i	2.0	2.4	3514	1396	3900	1665	4496	1580	4990
5200-7	4×R8i	2.0	2.4	4685	1862	5200	2220	5994	2106	6650
6500-7	5×R8i	2.0	2.4	5856	2327	6500	2775	7493	2633	8320

ACS880-607LC-...	Frame size	Resistor values		Ratings with R_{max}						
				No overload use			Cyclic load (1 min / 5 min)			
		R_{min}	R_{max}	I_1	I_2	$P_{contmax}$ (S_n)	I_{max}	I_{dc}	I_{rms}	P_{br}
Ohm	Ohm	A DC	A DC	kW (kVA)	A DC	A DC	A DC	kW		
$U_N = 690$ V										
0870-7	R8i	3.0	3.6	781	283	870	312	833	293	920
1300-7	R8i	2.0	2.4	1171	425	1300	468	1249	439	1390
1730-7	2×R8i	3.0	3.6	1562	567	1730	625	1665	585	1850
2600-7	2×R8i	2.0	2.4	2342	850	2600	937	2498	878	2770
3900-7	3×R8i	2.0	2.4	3514	1275	3900	1405	3746	1316	4160
5200-7	4×R8i	2.0	2.4	4685	1700	5200	1874	4995	1755	5540
6500-7	5×R8i	2.0	2.4	5856	2125	6500	2342	6244	2194	6930

■ Definitions

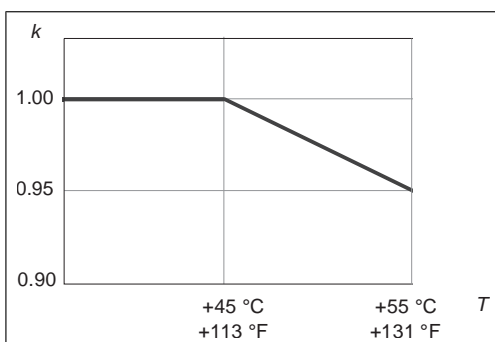
U_N	Nominal voltage
R_{min}	Minimum allowed resistance value of the brake resistor per one phase of the brake module.
R_{max}	Maximum resistance value of the brake resistor per one phase of the brake module.
Note:	Connect one resistor per brake chopper module phase. For example, a brake unit of frame size 2×R8i includes two brake chopper modules -> 2 × 3 resistors are needed.
No-overload use	
I_1	Input current. Input current with R_{min} is given in the type designation label.
I_2	Output current. This is indicated in the type designation label as 3x the value with R_{min} given in this table.
$P_{cont.max}$	Maximum continuous braking power per brake unit. <div style="display: flex; justify-content: space-around; align-items: center;">   </div>
S_n	Apparent power
Cyclic load (1 min / 5 min)	
I_{max}	Peak brake current (DC) per brake chopper module phase.
I_{dc}	Input current
I_{rms}	Total rms DC current per brake unit phase during a period of 1 minute with braking power P_{br} .
P_{br}	Short term braking power per brake unit allowed for one minute every 5 minutes. <div style="display: flex; justify-content: space-around; align-items: center;">   </div>



Derating

■ Surrounding air temperature derating

In the temperature range +45...55 °C (+113...131 °F), the rated output current is derated by 0.5 percentage points for every added 1 °C (1.8 °F). The output current can be calculated by multiplying the current given in the rating table by the derating factor (k):



■ Coolant temperature derating

See section [Temperature limits \(page 84\)](#).

■ Antifreeze content derating

See section [Temperature limits \(page 84\)](#).

■ Altitude derating

At altitudes 1000 ... 2000 m (3281 ... 6562 ft) above sea level, the output current derating is 1 percentage point for every added 100 m (328 ft). For example, the derating factor for 1500 m (4921 ft) is 0.95. For altitudes above 2000 m (6562 ft), contact ABB.

For a more accurate derating, use the DriveSize PC tool.

Frame sizes and modules used

Brake unit type ACS880-607LC-...	Inverter module(s) used		
	Frame size	Qty	Type
$U_N = 690 \text{ V}$			
0870-7	R8i	1	ACS880-104LC-0530A-7
1300-7	R8i	1	ACS880-104LC-0850A-7
1730-7	2×R8i	2	ACS880-104LC-0530A-7
2600-7	2×R8i	2	ACS880-104LC-0850A-7
3900-7	3×R8i	3	ACS880-104LC-0850A-7
5200-7	4×R8i	4	ACS880-104LC-0850A-7
6500-7	5×R8i	5	ACS880-104LC-0850A-7

Fuses

■ DC fuses (IEC)

ACS880-607LC-...	IEC			
	Type	Data	Qty (per module)	Qty (total)
$U_N = 690 \text{ V}$				
0870-7	170M6500	1250 A, 1250 V	2	2
1300-7	2 x 170M6548	2 × 1000 A, 1100 V	2 × 2	2 × 2
1730-7	170M6500	1250 A, 1250 V	2	4
2600-7	2 x 170M6548	2 × 1000 A, 1100 V	2 × 2	2 × 2 × 2
3900-7	2 x 170M6548	2 × 1000 A, 1100 V	2 × 2	3 × 2 × 2
5200-7	2 x 170M6548	2 × 1000 A, 1100 V	2 × 2	4 × 2 × 2
6500-7	2 x 170M6548	2 × 1000 A, 1100 V	2 × 2	5 × 2 × 2

■ DC fuses (UL)

ACS880-607LC-...	UL			
	Type	Data	Qty (per module)	Qty (total)
$U_N = 690 \text{ V}$				
0870-7	170M6500	1250 A, 1250 V	2	2
1300-7	170M6794	2000 A, 1250 V	2	2
1730-7	170M6500	1250 A, 1250 V	2	4
2600-7	170M6794	2000 A, 1250 V	2	4
3900-7	170M6794	2000 A, 1250 V	2	6
5200-7	170M6794	2000 A, 1250 V	2	8
6500-7	170M6794	2000 A, 1250 V	2	10

■ Resistor fuses (IEC and UL)

ACS880-607LC-...	Type	Data	Qty (per module)	Qty (total)
$U_N = 690 \text{ V}$				
0870-7	170M6542	500 A, 1250 V	1	3
1300-7	170M6546	800 A, 1250 V	1	3
1730-7	170M6542	500 A, 1250 V	1	6
2600-7	170M6546	800 A, 1250 V	1	6
3900-7	170M6546	800 A, 1250 V	1	9
5200-7	170M6546	800 A, 1250 V	1	12
6500-7	170M6546	800 A, 1250 V	1	15

Dimensions, weights and free space requirements

ACS880-607LC-...	Height ¹⁾	Height ²⁾	Space above	Width ¹⁾	Width ²⁾	Depth	Weight ³⁾	Weight ⁴⁾
	mm	mm	mm	mm	mm	mm	kg	kg
$U_N = 690 \text{ V}$								
0870-7	2002	2056	250	400	700	644	370	610
1300-7	2002	2056	250	400	700	644	370	610
1730-7	2002	2056	250	800	1400	644	740	1220
2600-7	2002	2056	250	800	1400	644	740	1220
3900-7	2002	2056	250	1200	2100	644	1110	1830
5200-7	2002	2056	250	1600	2800	644	1480	2440
6500-7	2002	2056	250	2000	3500	644	1850	3050

1) Bottom entry and exit of cables.

2) Top entry and exit of cables.

3) Bottom entry and exit of cables. With all options included.

4) Top entry and exit of cables. With all options included.

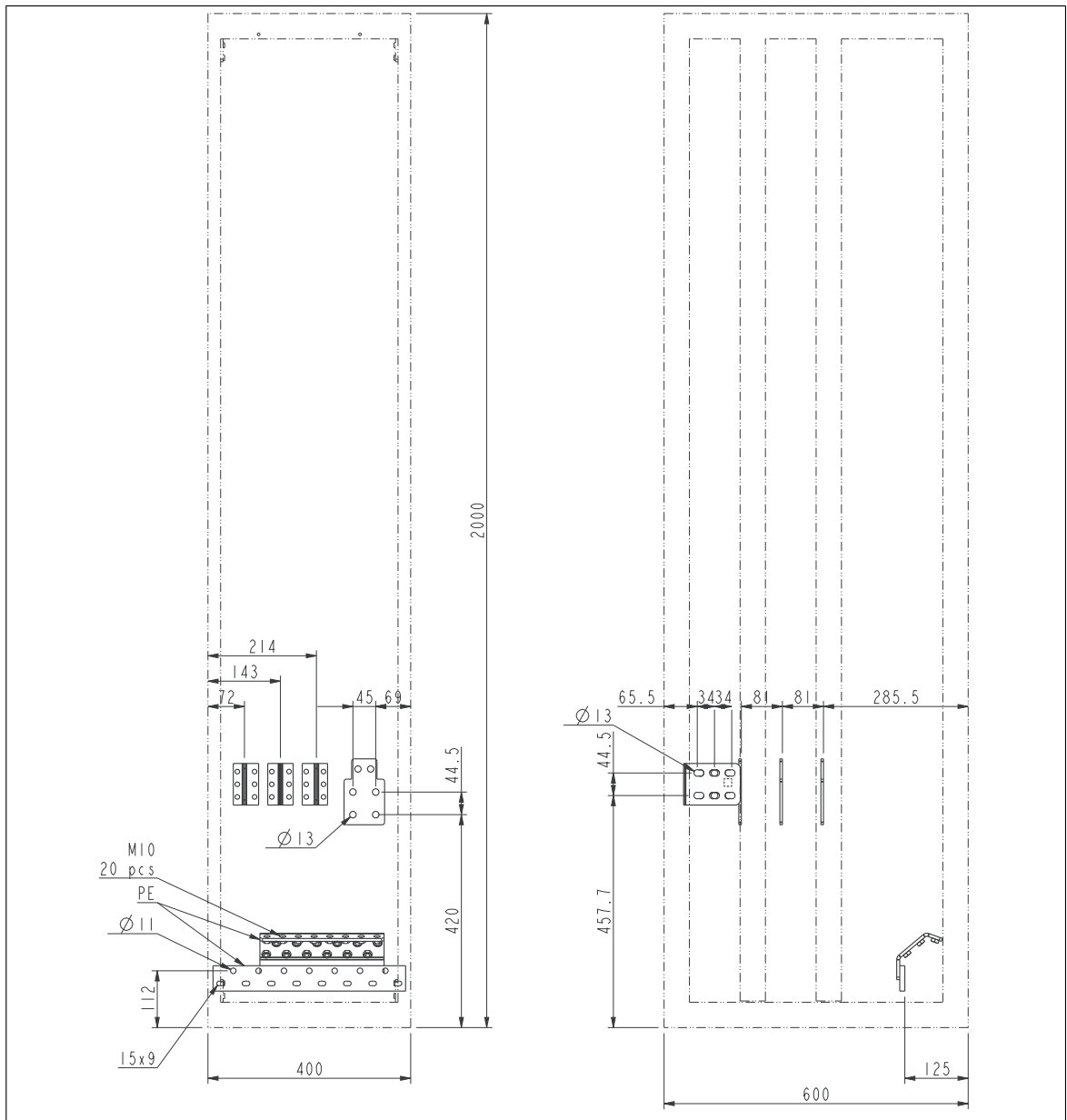
Losses, cooling data and noise

ACS880-607LC-...	Coolant volume				Coolant flow		Heat dissipation	Pressure loss	Noise
	Module		Cabinet		l/min	US gal/min			
	l	US gal	l	US gal			kW	kPa	dB(A)
$U_N = 690 \text{ V}$									
0870-7	1.6	0.4	2.8	0.7	16	4.2	3.3	120	63
1300-7	1.6	0.4	2.8	0.7	16	4.2	5.1	120	63
1730-7	3.2	0.8	5.6	1.5	32	8.5	6.5	120	66
2600-7	3.2	0.8	5.6	1.5	32	8.5	10.1	120	66
3900-7	4.8	1.3	8.4	2.2	48	12.7	15.1	120	68
5200-7	6.4	1.7	11.2	3.0	64	16.9	20.1	120	69
6500-7	8.0	2.1	14.0	3.7	80	21.1	25.2	120	70

Terminal and cable entry data for the resistor cables

These drawings show the terminal and cable entry dimensions for the resistor cables. The dimensions are given in millimeters. Tightening torques depend on the bolt size and type. See section [Tightening torques \(page 98\)](#).

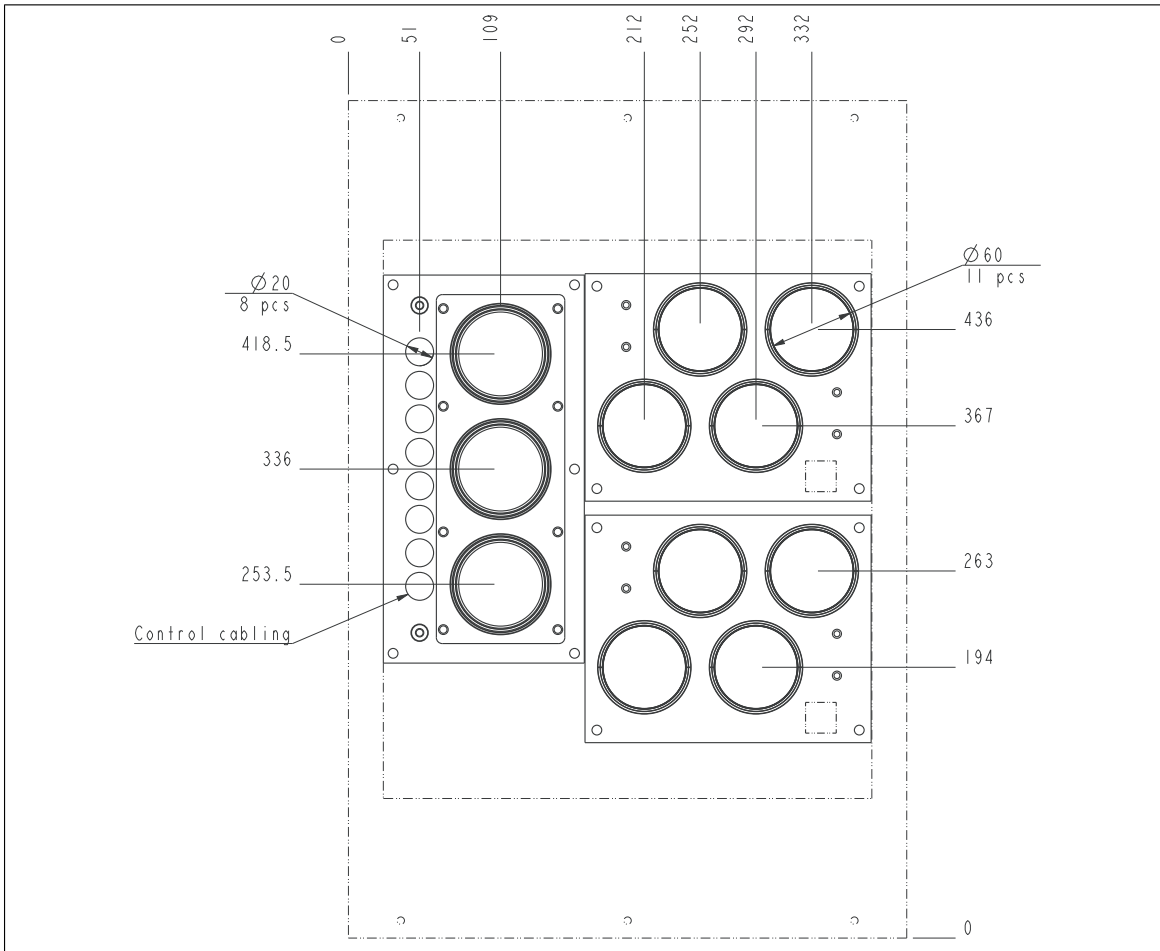
■ Bottom entry and exit of cables



Dimensions in mm

1 mm = 0.0394 in

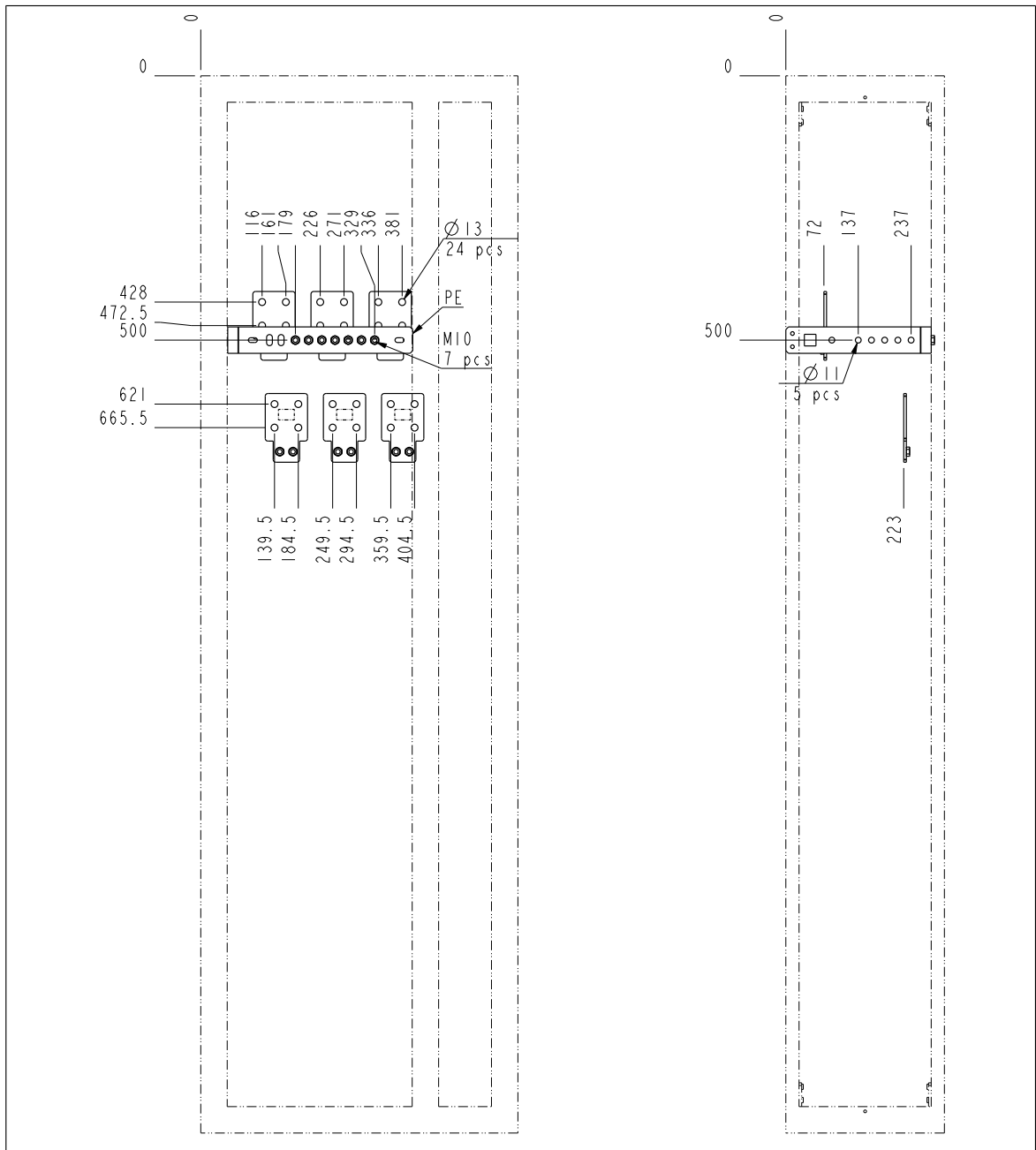
96 Technical data



Dimensions in mm

1 mm = 0.0394 in

■ Top entry and exit of cables



Dimensions in mm

1 mm = 0.0394 in

Tightening torques

Unless a tightening torque is specified in the text, the following torques can be used.

■ Electrical connections

Size	Torque	Strength class
M3	0.5 N·m (4.4 lbf-in)	4.6...8.8
M4	1 N·m (9 lbf-in)	4.6...8.8
M5	4 N·m (35 lbf-in)	8.8
M6	9 N·m (6.6 lbf-ft)	8.8
M8	22 N·m (16 lbf-ft)	8.8
M10	42 N·m (31 lbf-ft)	8.8
M12	70 N·m (52 lbf-ft)	8.8
M16	120 N·m (90 lbf-ft)	8.8

■ Mechanical connections

Size	Max. torque	Strength class
M5	6 N·m (53 lbf-in)	8.8
M6	10 N·m (7.4 lbf-ft)	8.8
M8	24 N·m (17.7 lbf-ft)	8.8

■ Insulation supports

Size	Max. torque	Strength class
M6	5 N·m (44 lbf-in)	8.8
M8	9 N·m (6.6 lbf-ft)	8.8
M10	18 N·m (13.3 lbf-ft)	8.8
M12	31 N·m (23 lbf-ft)	8.8

■ Cable lugs

Size	Max. torque	Strength class
M8	15 N·m (11 lbf-ft)	8.8
M10	32 N·m (23.5 lbf-ft)	8.8
M12	50 N·m (37 lbf-ft)	8.8

Typical resistor cable sizes

This table gives copper cable types. Cable sizing is based on max. 9 cables laid on a cable ladder side by side, three ladder type trays one on top of the other, ambient temperature 30 °C, PVC insulation, surface temperature 70 °C and 90 °C (EN 60204-1 and IEC 60364-5-2/2001). For other conditions, size the cables according to local safety regulations, appropriate input voltage and the load current of the drive. $I_{rms\ dim}$ is the dimensioning current.

ACS880-607LC-...	Frame size	I_{rms} dim	Cable data	
			Cable, T=70 °C	Cable, T=90 °C
		A	mm ²	mm ²
$U_N = 690$ V				
0870-7	R8i	372	$3 \times (2 \times (3 \times 120 + 70))$	$3 \times (3 \times 240 + 120)$
1300-7	R8i	559	$3 \times (2 \times (3 \times 240 + 120))$	$3 \times (2 \times (3 \times 150 + 70))$
1730-7	2×R8i	745	$2 \times (3 \times (2 \times (3 \times 120 + 70)))$	$2 \times (3 \times (3 \times 240 + 120))$
2600-7	2×R8i	1117	$2 \times (3 \times (2 \times (3 \times 240 + 120)))$	$2 \times (3 \times (2 \times (3 \times 150 + 70)))$
3900-7	3×R8i	1676	$3 \times (3 \times (2 \times (3 \times 240 + 120)))$	$3 \times (3 \times (2 \times (3 \times 150 + 70)))$
5200-7	4×R8i	2234	$4 \times (3 \times (2 \times (3 \times 240 + 120)))$	$4 \times (3 \times (2 \times (3 \times 150 + 70)))$
6500-7	5×R8i	2793	$5 \times (3 \times (2 \times (3 \times 240 + 120)))$	$5 \times (3 \times (2 \times (3 \times 150 + 70)))$

■ Maximum cable length

The maximum cable length of the resistor cable(s) is 300 m (984 ft). Keep the cable as short as possible in order to minimize the EMC emissions and stress on chopper IGBTs. The longer the cable the higher the EMC emissions. The longer the cable the higher the inductive load and voltage peaks over the IGBT semiconductors of the brake chopper.

Resistor connection

Voltage (U2)	0...U1 3-phase symmetrical. For ACS880-104LC-xxxx-7 modules: This is indicated in the type designation label as typical output voltage levels 3×0...742 / 849 / 976 V DC.
Maximum resistor cable length	300 m (984 ft)
Busbar material	Tin-plated copper

Control unit (board) connection data

See [Connector data \(page 53\)](#).

Auxiliary circuit current consumption

Auxiliary circuit current consumption varies depending on the actual drive configuration and options. Contact ABB for the delivery-specific value.

Efficiency

Approximately 99% at nominal power level.

Protection classes

Degrees of protection (IEC/EN 60529)	IP42 (standard), IP54 (option +B055)
Enclosure types (UL50)	UL Type 1 (standard), UL Type 12 (option +B055). For indoor use only.
Overvoltage category (IEC/EN 60664-1)	III, except for auxiliary power connections (fan, control, heating, lighting, cooling unit pump etc) which are category II.
Protective class (IEC/EN 61800-5-1)	I

Ambient conditions

Environmental limits for the drive are given below. The drive is to be used in a heated, indoor, controlled environment.

	Operation installed for stationary use	Storage in the protective package	Transportation in the protective package
Installation site altitude	0...2000 m (0...6562 ft) above sea level. For altitudes over 2000 m, contact ABB. Output derated above 1000 m (3281 ft).	-	-
Air temperature	0 ... +45 °C (+32 ... +113 °F), no condensation allowed. Output derated in the range +45 ... +55 °C (+113 ... +131 °F).	-40 to +70 °C (-40 to +158 °F)	-40 to +70 °C (-40 to +158 °F)
Relative humidity	Max. 95%	Max. 95%	Max. 95%
	No condensation allowed. Maximum allowed relative humidity is 60% in the presence of corrosive gases.		
Contamination	IEC/EN 60721-3-3:2002: Classification of environmental conditions - Part 3-3: Classification of groups of environmental parameters and their severities - Stationary use of weather protected locations Chemical gases: Class 3C2 Solid particles: Class 3S2. No conductive dust allowed.	IEC 60721-3-1:1997 Chemical gases: Class 1C2 Solid particles: Class 1S3 (packing must support this, otherwise 1S2)	IEC 60721-3-2:1997 Chemical gases: Class 2C2 Solid particles: Class 2S2
Pollution degree	2		

	Operation installed for stationary use	Storage in the protective package	Transportation in the protective package
Vibration IEC/EN 61800-5-1 IEC 60068-2-6:2007, EN 60068-2-6:2008 Environmental testing Part 2: Tests –Test Fc: Vibration (sinusoidal)	IEC/EN 60721-3-3:2002 10...57 Hz: max. 0.075 mm amplitude 57...150 Hz: 1 g Units with marine construction (option +C121): Max. 1 mm (0.04 in) (5 ... 13.2 Hz), max. 0.7 g (13.2 ... 100 Hz) sinusoidal	IEC/EN 60721-3-1:1997 10...57 Hz: max. 0.075 mm amplitude 57...150 Hz: 1 g	IEC/EN 60721-3-2:1997 2...9 Hz: max. 3.5 mm amplitude 9...200 Hz: 10 m/s ² (32.8 ft/s ²)
Shock IEC 60068-2-27:2008, EN 60068-2-27:2009 Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock	Not allowed	With packing max. 100 m/s ² (328 ft/s ²) 11 ms	With packing max. 100 m/s ² (328 ft/s ²) 11 ms

Materials

See *ACS880 cabinet-installed drives recycling instructions and environmental information* (3AXD50000153909 [English]).

Color

RAL 7035 and RAL 9017.

Package

■ Vertical package

Cabinets are attached to the pallet with screws and braced at the top to the package walls against swaying inside the package. Package elements are attached to each other with screws.

Standard package	Timber, polyethylene sheet (thickness 0.15 mm), stretch film (thickness 0.023 mm), PP tape, PET strap, sheet metal (steel). For land and air transport when planned storage time is less than 2 months, or, when storage can be arranged in clean and dry conditions, less than 6 months. Can be used when product will not be exposed to corrosive atmosphere during transport or storage.
Seaworthy package (option +P912)	Timber, plywood, VCI sheet film (PE, thickness 0.10 mm), VCI stretch film (PE, thickness 0.04 mm), VCI emitter bags, PP tape, PET strap, sheet metal (steel). For sea transport with or without containerization. For long storage periods in environments where roofed and humidity-controlled storage cannot be arranged.
Container package (option +P929)	Timber, VCI sheet film (PE, thickness 0.10 mm), VCI stretch film (PE, thickness 0.04 mm), VCI emitter bags, PP tape, PET strap, sheet metal (steel). For sea transport in containers. Recommended for land and air transport when storage time prior to installation exceeds 6 months or storage is arranged in partially weather-protected conditions.

Disposal

The main parts of the drive can be recycled to preserve natural resources and energy. Product parts and materials should be dismantled and separated.

Generally all metals, such as steel, aluminum, copper and its alloys, and precious metals can be recycled as material. Plastics, rubber, cardboard and other packaging material can be used in energy recovery. Printed circuit boards and large electrolytic capacitors need selective treatment according to IEC 62635 guidelines. To aid recycling, plastic parts are marked with an appropriate identification code.

Contact your local ABB distributor for further information on environmental aspects and recycling instructions for professional recyclers. End of life treatment must follow international and local regulations. See *ACS880 cabinet-installed drives recycling instructions and environmental information* (3AXD50000153909 [English]).

Applicable standards

See *ACS880 liquid-cooled multidrive cabinets and modules electrical planning* (3AXD50000048634 [English]).

Markings

See *ACS880 liquid-cooled multidrive cabinets and modules electrical planning* (3AXD50000048634 [English]).

Disclaimers

■ Generic disclaimer

The manufacturer shall have no obligation with respect to any product which (i) has been improperly repaired or altered; (ii) has been subjected to misuse, negligence or accident; (iii) has been used in a manner contrary to the manufacturer's instructions; or (iv) has failed as a result of ordinary wear and tear.

■ Cybersecurity disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. It is Customer's sole responsibility to provide and continuously ensure a secure connection between the product and Customer network or any other network (as the case may be). Customer shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

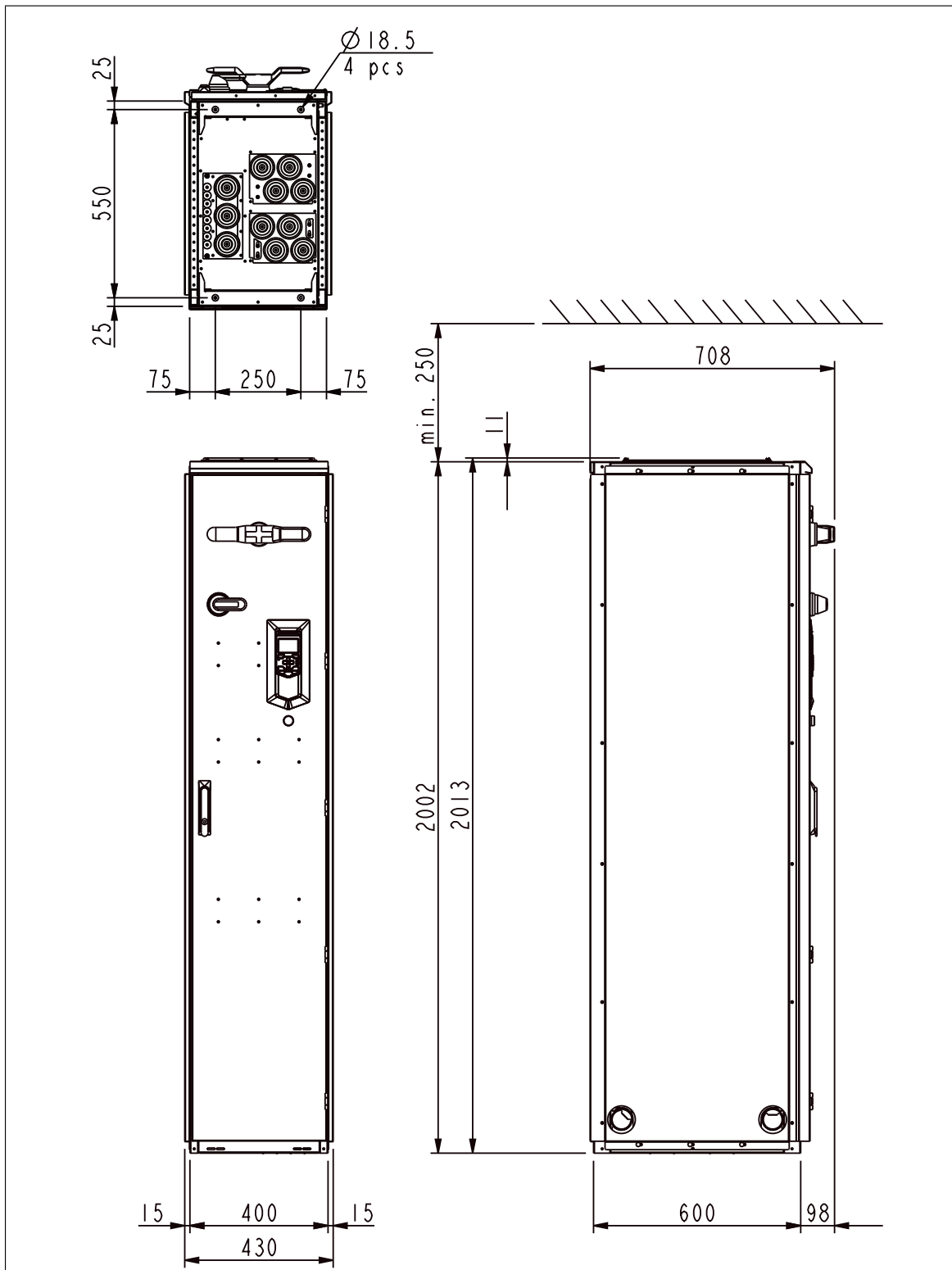
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Dimension drawings

Contents of this chapter

This chapter contains dimension drawings for the brake unit.

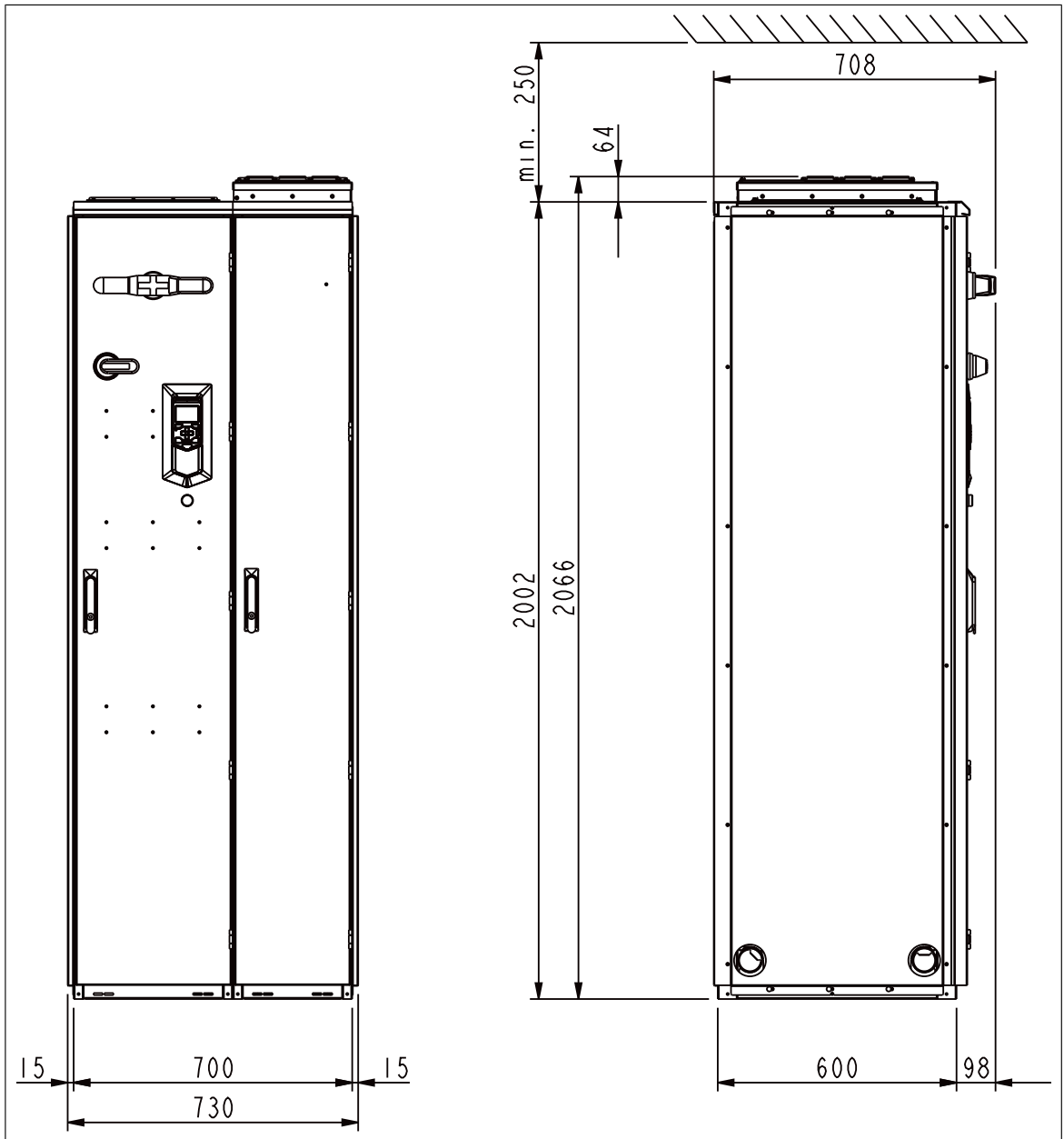
Brake unit with bottom exit



Dimensions in mm

1 mm = 0.0394 in

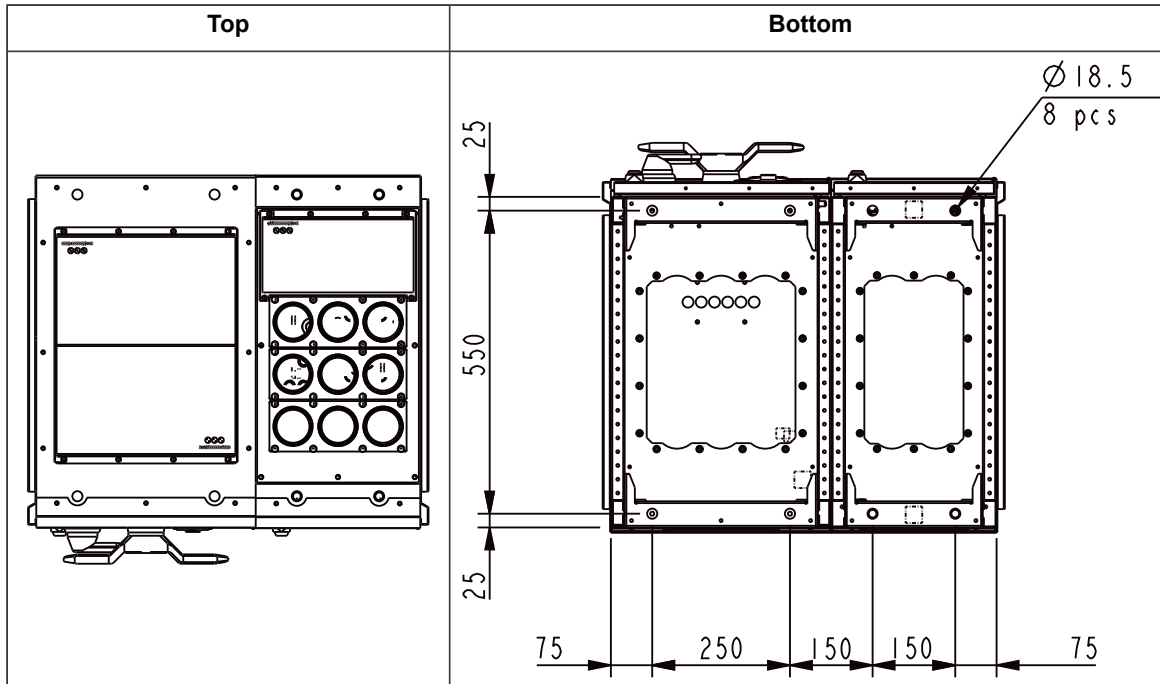
Brake unit with top exit



Dimensions in mm

1 mm = 0.0394 in

106 Dimension drawings



Dimensions in mm

1 mm = 0.0394 in

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 www.abb.com/searchchannels.

Product training

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

Providing feedback on ABB manuals

Your comments on our manuals are welcome. Navigate to new.abb.com/drives/manuals-feedback-form.

Document library on the Internet

You can find manuals and other product documents in PDF format on the Internet at www.abb.com/drives/documents.



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