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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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 of 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 multidrives cabinets and modules safety instructions (3AXD50000048633 [English]).
- Read the warnings of the software function before you take the function in use or change its default parameter settings. Read the warnings of the parameter before you change its default setting. Refer to the firmware manual.

Target audience

This manual is intended for people who plan the installation, install, commission, 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 you do work on the drive. You are expected to know the fundamentals of electricity, wiring, electrical components, and electrical schematic symbols.

Related documents

For more documentation, go to www.abb.com/drives/documents.

Manuals for ACS880 multidrives cabinets

Categorization by frame size and option code

The frame size identifies information for a specific 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 (for example, A123) identifies information that concerns only a specific optional component. 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 component designation in brackets (for example, [Q20]). This will help you to identify the components in the circuit diagrams.

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 39) Technical data (page 107) Selecting the brake resistor (page 40)
↓	
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. Refer to 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 40)

Task	See
Measure the insulation of the resistor circuit (if customer resistor is used).	Measuring the insulation resistance of the brake resistor circuit (page 46)
Connect the resistor cables and thermal switch (if customer resistor is used). Connect the control cables (if customer resistor is used).	Electrical installation (page 43)
Check the installation.	Installation checklist (page 69)
Start the brake unit up.	Start-up (page 71) ACS880 brake control program firmware manual (3AXD50000020967 [English])
Operate the brake unit.	Operating instructions (page 75) ACS880 brake control program firmware manual (3AXD50000020967 [English])

Terms and abbreviations

Term	Description
BCON	Type of control board
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 unit	Enclosure that contains the control board and related connector boards. The term is also used as a synonym for the control board.
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 or converter control program, parameter is a user-adjustable setting, or a read-only monitoring signal. In some (for example fieldbus) contexts, a value that can be accessed as an object. For example, variable, constant, or signal.
Supply unit	Supply module(s) under control of one control unit, and related components.
UCU	Type of control unit
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

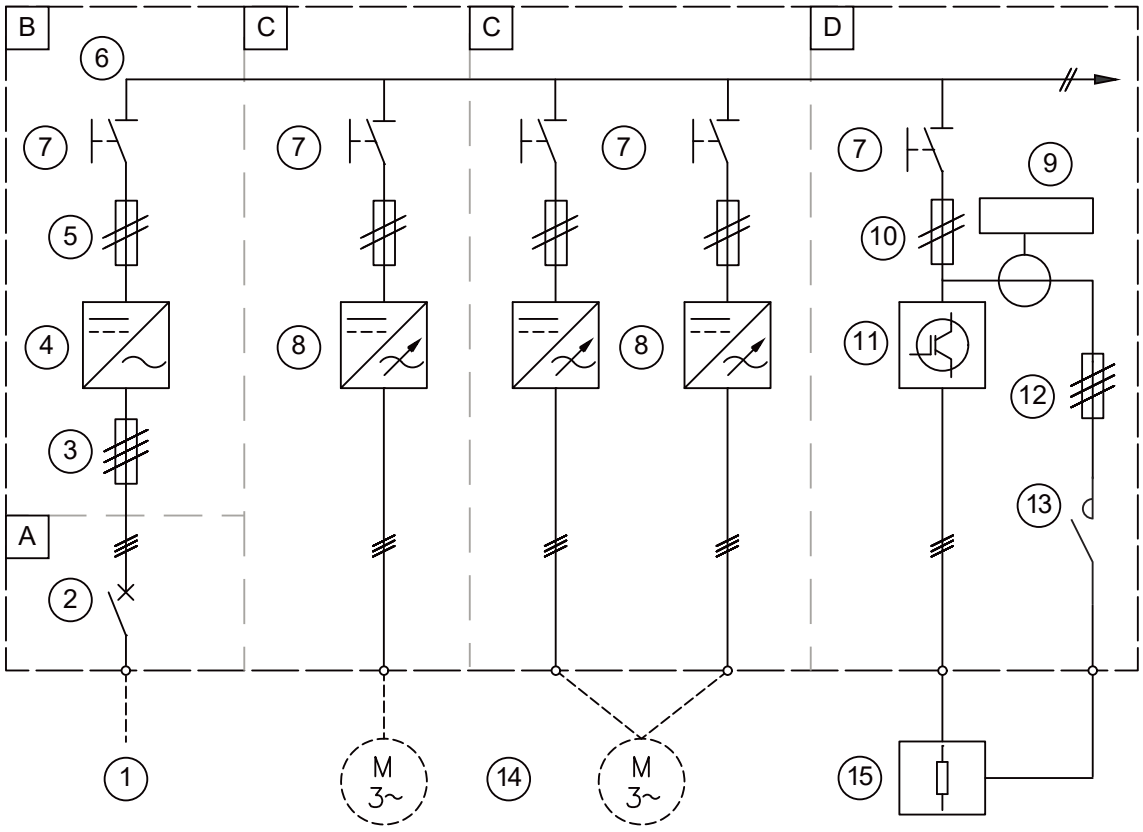
The brake chopper handles the extra energy generated by the motor during a quick deceleration. The extra energy increases the DC link voltage of the drive. The chopper connects the brake resistor to the DC link whenever the voltage is more than the operation limit of the chopper. The energy consumed by the resistor losses lowers the voltage until it is less than the limit at which the chopper stops.

When to use resistor braking

Resistor braking is necessary for high-capacity braking of the motor and machinery if a regenerative drive cannot be used.

Overview diagram of the drive system

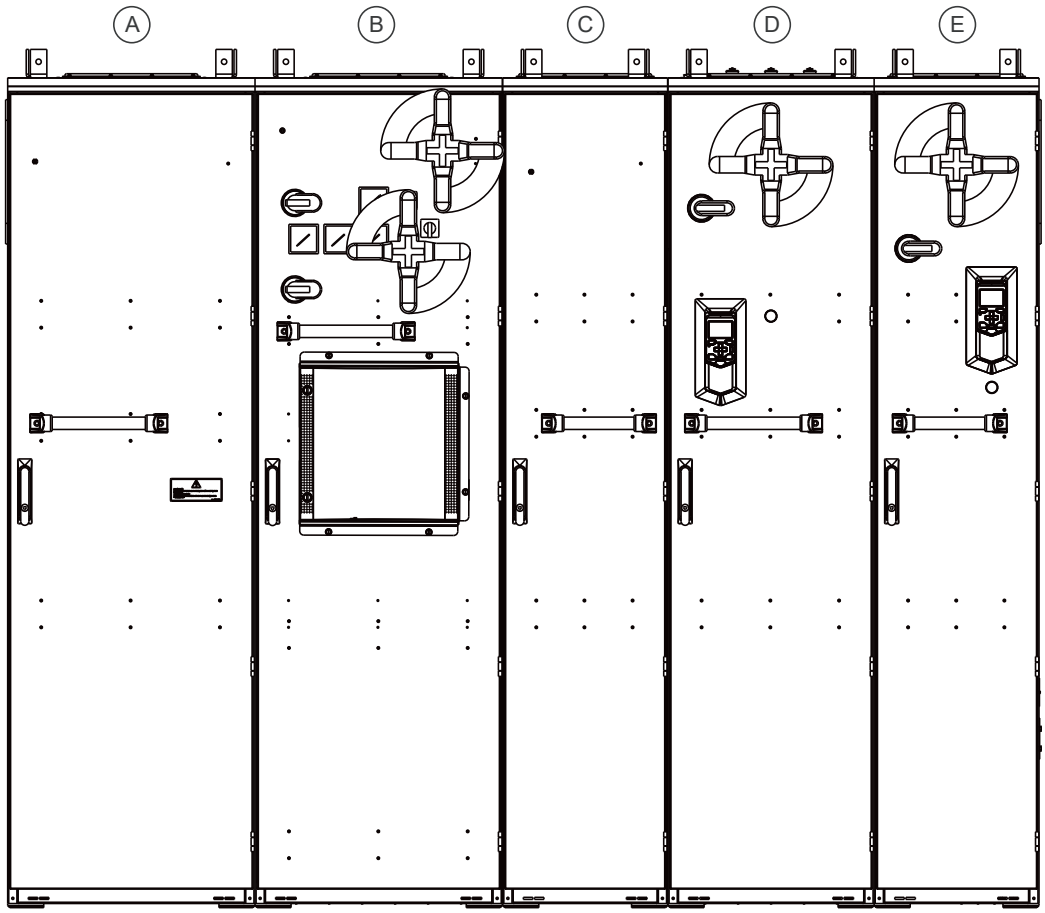
The diagram that follows shows an example of a multidrive. The supply unit connects the drive to the AC supply network. It converts the AC voltage into DC. The DC voltage is distributed through the DC link to all inverter units and brake units. The inverter unit converts the DC back to AC that rotates the motor. The brake unit conveys energy to brake resistors when needed.



A	Incoming unit
B	Supply unit
C	Inverter unit
D	Brake unit
1	AC supply
2	Main breaker, or main contactor and main switch-disconnector
3	Input (AC) fuses
4	Supply module
5	Supply and inverter module DC fuses
6	DC link
7	DC switch-disconnector (option +F286)
8	Inverter modules
9	Current transducer (option +G467)
10	Brake chopper fuses
11	3-phase brake chopper module
12	Fuses for the brake resistors
13	Output contactor (option +F269)
14	Motor(s) (acquired by the customer)
15	Brake resistors (acquired by the customer)

Layout drawings

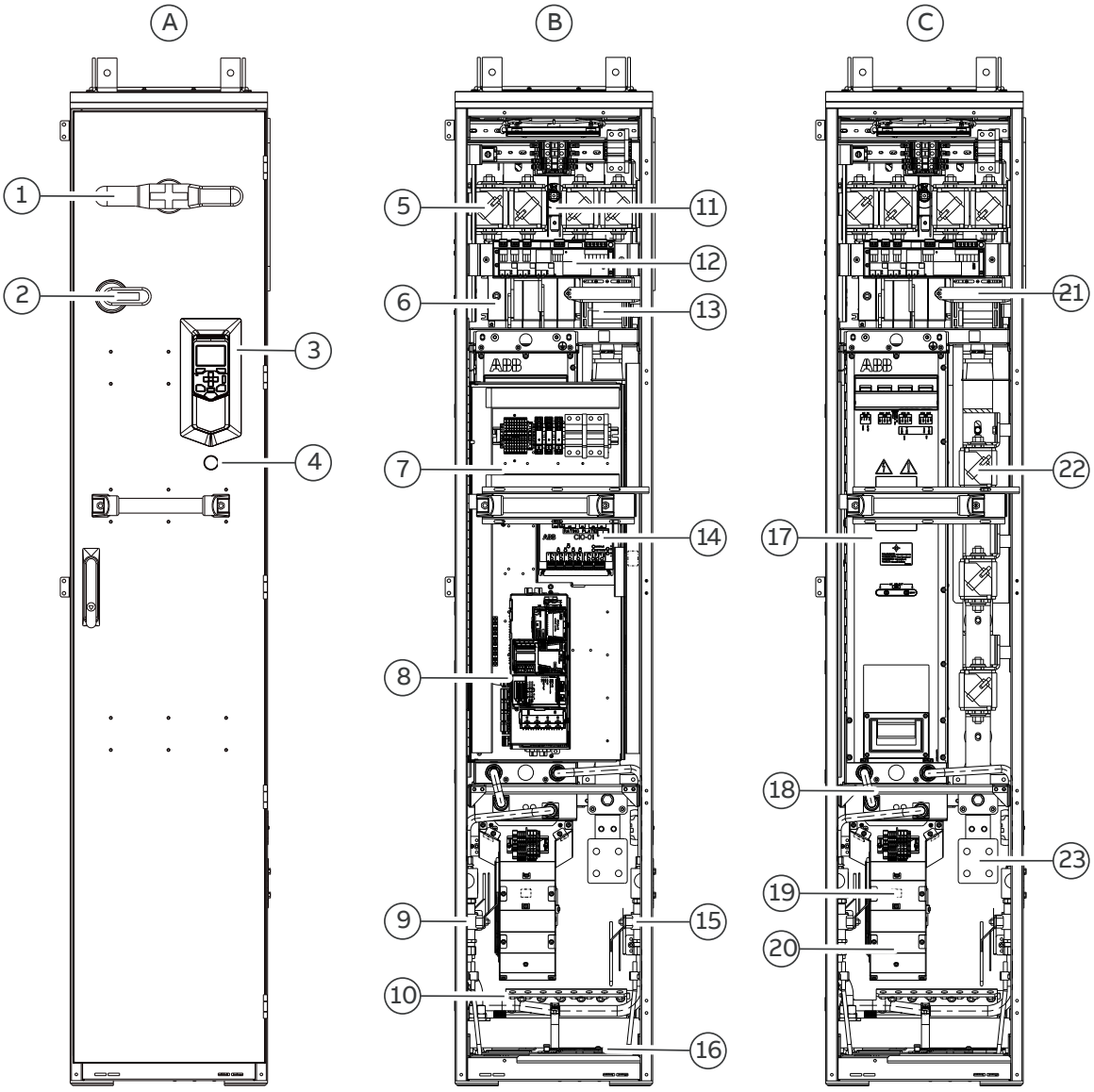
The figure below shows an example of a drive system.



A	Auxiliary control cubicle. Contains control electronics and customer I/O connections.
B	Incoming cubicle. Contains the power input cable terminals and switchgear.
C	Diode supply unit cubicle. Contains diode supply modules.
D	Inverter unit cubicle. Contains inverter modules.
E	3-phase dynamic brake unit cubicle. Contains brake chopper modules.

Bottom cable entry with current transducer (option +G467)

The figure below shows the components of the brake chopper cubicle with bottom entry and exit of cables and option +G467.

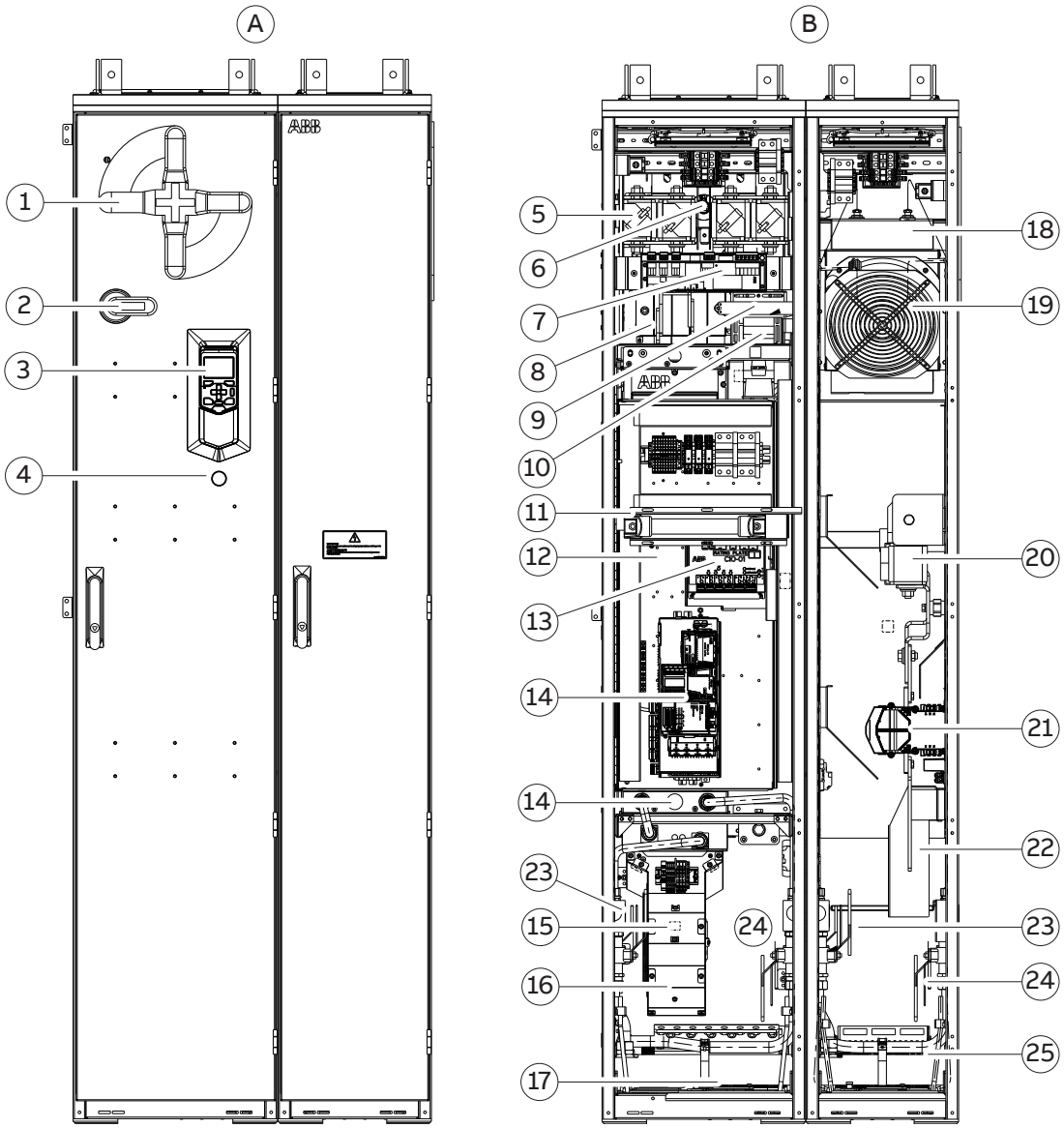


A	Door closed	11	DC switch/disconnector (behind the fuses, part of option +F286, Q11)
B	Door open	12	Charging controller (part of option +F286, A11)
C	Door open, swing-out frame removed	13	Charging resistors (R10.x)
1	DC switch/disconnector handle (part of option +F286, Q11)	14	CIO-01 I/O module for fan monitoring (A115)
2	Charging circuit switch fuse handle (part of option +F286, Q10)	15	Coolant outlet manifold with stop and drain valves
3	Control panel (A49)	16	Cable entries
4	Indicator light (P11)	17	Brake chopper module (T11)
5	DC fuses (F11.xx)	18	Heat exchanger (between the module and the cooling fan)

6	Charging mechanics (part of option +F286)	19	Outgoing resistor connection busbars (behind cooling fan, R1.1, R2.1 R3.1)
7	Swing-out frame	20	Cooling fan (G115)
8	Control unit (A41)	21	Current transducer (+G467)
9	Coolant inlet manifold with stop and drain valves	22	Brake resistor fuses (F11.xx)
10	PE busbar	23	Incoming resistor connection busbars (R1.2, R2.2, R3.2)

Bottom cable entry with output contactor (option +F269) and current transducer (option +G467)

The figure below shows the components of the brake chopper cubicle with bottom entry and exit of cables – options +F269 and +G467 included.

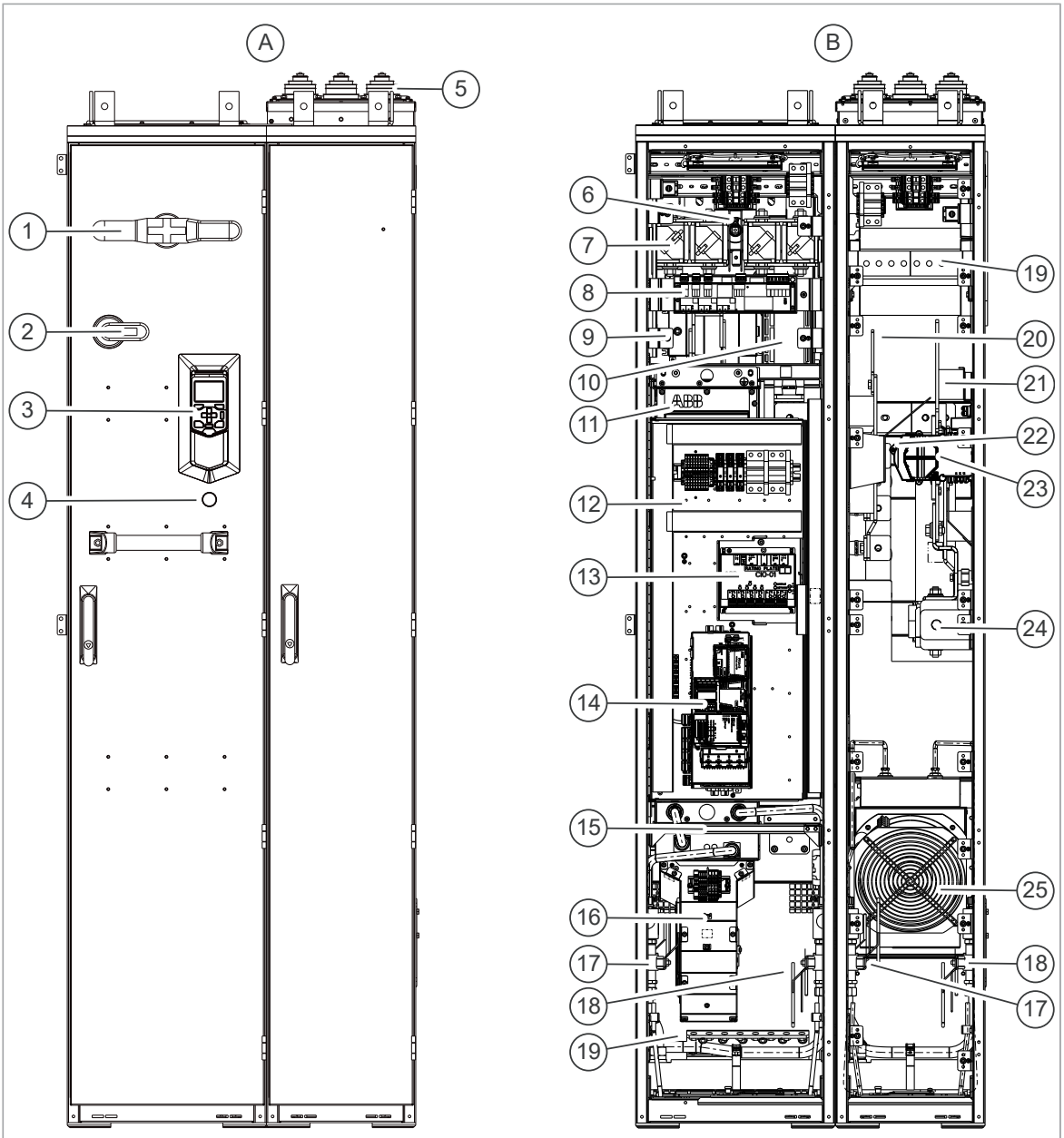


A	Door closed	13	CIO-01 I/O module for fan monitoring (A115)
B	Door open	14	Control unit (A41)
1	DC switch/disconnector handle (part of option +F286, Q11)	15	Outgoing resistor connection busbars (behind cooling fan, R1.1, R2.1 R3.1)
2	Charging circuit switch fuse handle (part of option +F286, Q10)	16	Cooling fan (G115)
3	Control panel (A49)	17	Cable entries
4	Indicator light (P11)	18	Heat exchanger
5	DC fuses (F11.xx)	19	Cooling fan (G115)

6	DC switch/disconnector (behind the fuses, part of option +F286, Q11)	20	Brake resistor fuses (F11.xx)
7	Charging controller (part of option +F286, A11)	21	Output contactor (+F269)
8	Charging mechanics (part of option +F286)	22	Incoming resistor connection busbars (R1.2, R2.2, R3.2)
9	Current transducer (+G467)	23	Coolant inlet manifold with stop and drain valves
10	Charging resistors (R10.x)	24	Coolant outlet manifold with stop and drain valves
11	Brake chopper module (T11, behind the swing-out frame)	25	PE busbar
12	Swing-out frame		

Top cable entry with output contactor (option +F269) and current transducer (option +G467)

The figure below shows the components of the brake chopper cubicles with top entry and exit of cables – options +F269 and +G467 included.

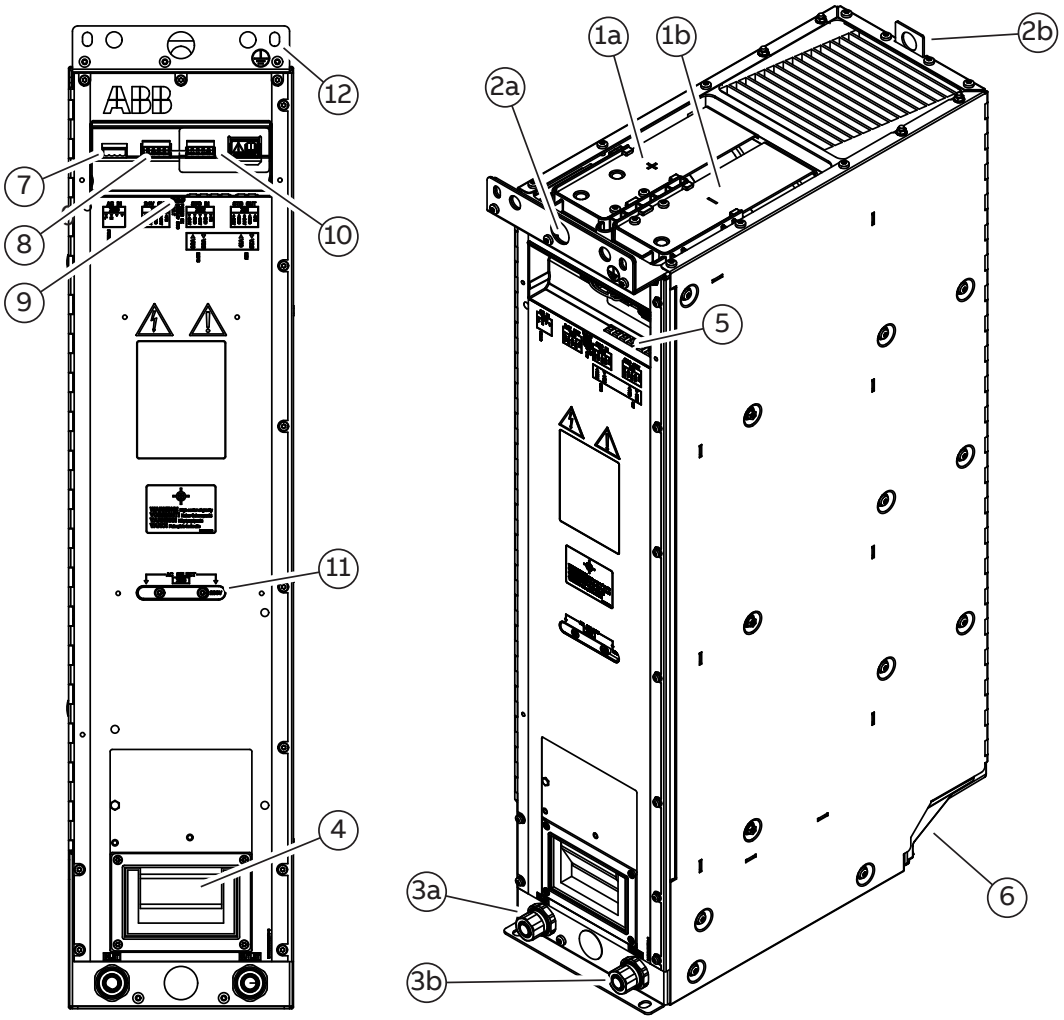


A	Doors closed	13	CIO-01 I/O module for fan monitoring (A115)
B	Doors open	14	Control unit (A41)
1	DC switch/disconnector handle (part of option +F286, Q11)	15	Heat exchanger (between the module and the cooling fan)
2	Charging circuit switch fuse handle (part of option +F286, Q10)	16	Cooling fan (G115)
3	Control panel (A49)	17	Coolant inlet manifold with stop and drain valves
4	Indicator light (P11)	18	Coolant outlet manifold with stop and drain valves
5	Cable entries	19	PE busbar

6	DC switch/disconnector (behind the fuses, part of option +F286, Q11)	20	Outgoing resistor connection busbars (R1.1, R2.1, R3.1)
7	DC fuses (F11.xx)	21	Incoming resistor connection busbars (R1.2, R2.2, R3.2)
8	Charging controller (part of option +F286, , A11)	22	Current transducer (+G467)
9	Charging mechanics (part of option +F286)	23	Output contactor (+F269)
10	Charging resistors (R10.x)	24	Brake resistor fuses (F11.xx)
11	Brake chopper module (behind the swing-out frame, T11)	25	Cooling fan (G115)
12	Swing-out frame		

Frame R8i layout

Module layout



1	DC connection busbars, + (a) and - (b)
2	Lifting eyes, front (a) and back (b)
3	Coolant in (a) and out (b) connectors
4	Handle
5	Fiber optic connectors
6	Terminals for the quick connector (3-phase power connection). The quick connector is attached to the cabinet.
7	Terminal block X50 (auxiliary power input for internal boards)
8	Terminal block X53 (24 V DC power output)
9	Module LEDs
10	Terminal blocks X51 and X52 (Safe torque off in inverter modules only)
11	Auxiliary voltage selector X59 (115 or 230 V)
12	Unpainted fastening hole. The grounding point between the module frame and the 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.

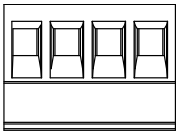
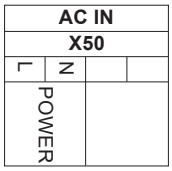
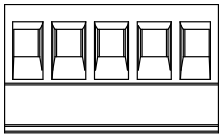
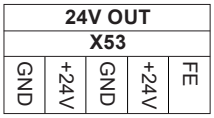
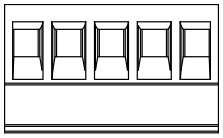
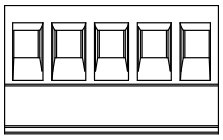
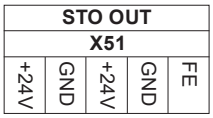
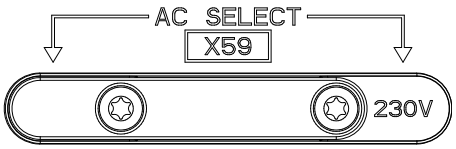
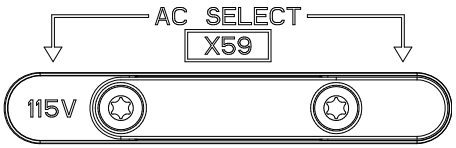
Connectors X50...X59

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

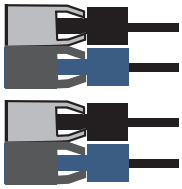
The BDPS is powered internally from the DC bus.

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.

 	Auxiliary voltage inputs for internal power supply (BDPS)
 	24 V DC output (for eg. control unit)
 	STO connectors of the module.
 	Not in use.
	Auxiliary voltage: 230 V AC
	Auxiliary voltage: 115 V AC

Fibre optic connectors

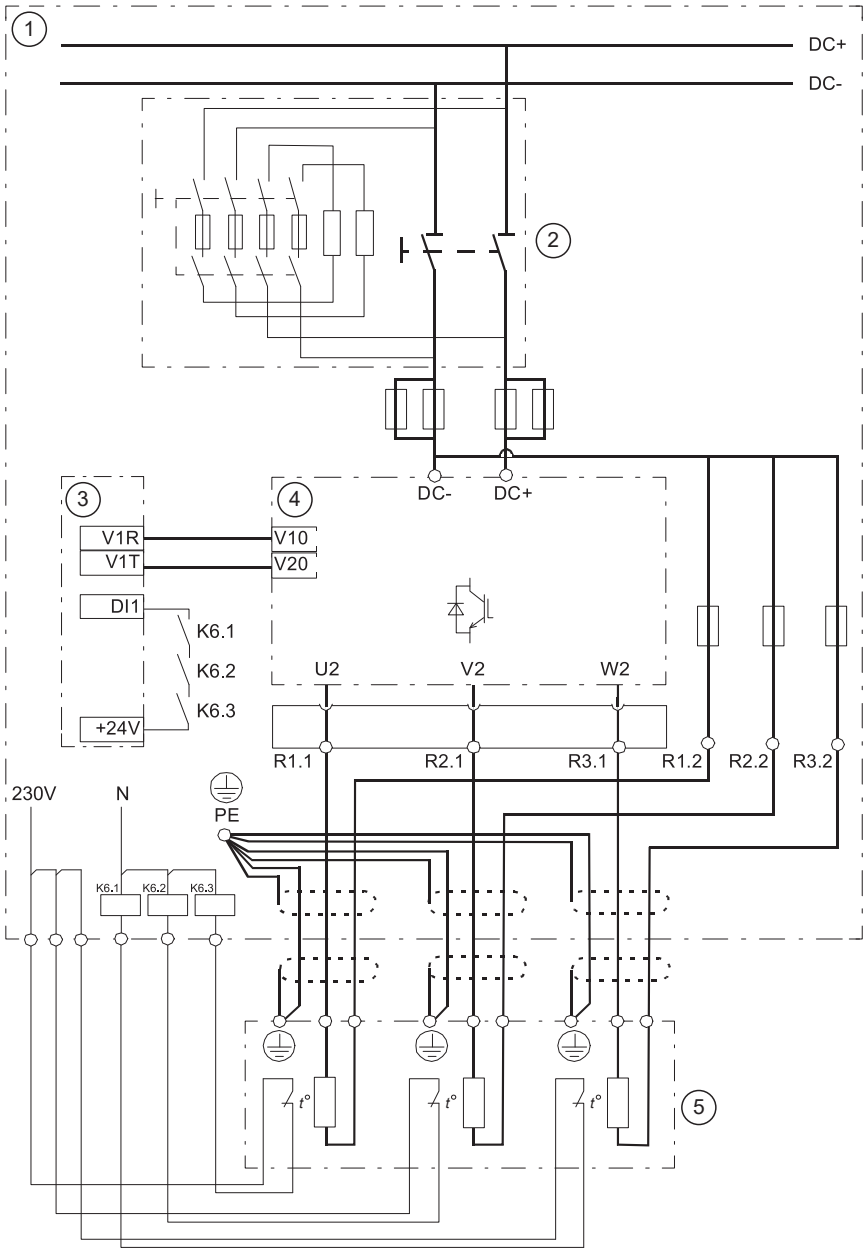
Control unit connection.	V20 V10	
Charging controller BSFC connection.	V60 V50	

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 sufficient (> 21 V).

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.



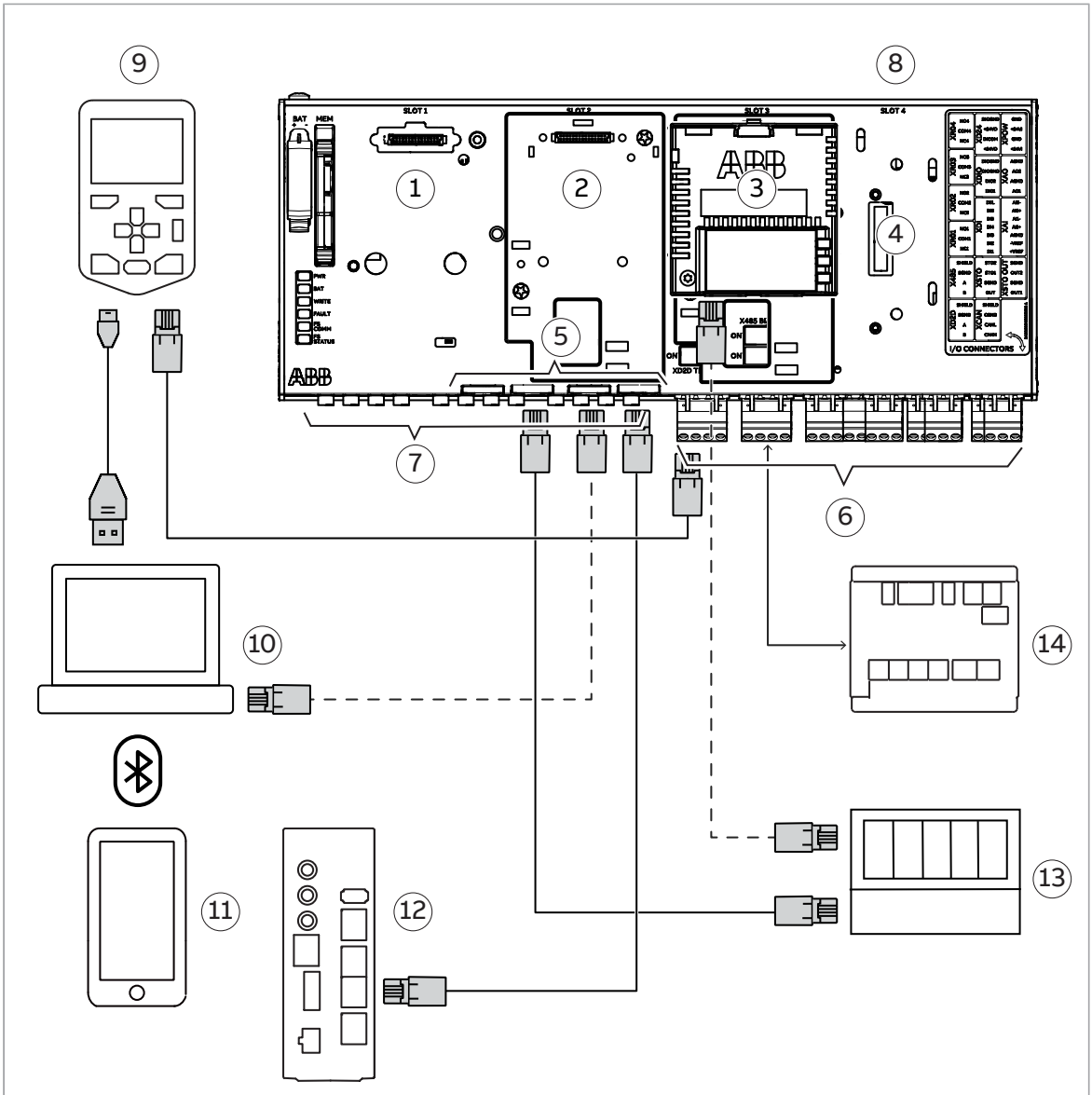
1	Brake module cubicle
2	DC switch/disconnector with charging circuit (option +F286)
3	Control unit
4	Brake module
5	Brake resistors (user-defined)

Brake unit control devices

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

Overview of the control connections of the UCU-22, UCU-23 and UCU-24 control unit

The diagram shows the possible control connections and interfaces of the UCU-22, UCU-23 and UCU-24 control units.



1 2 3	Analog and digital I/O extension modules and fieldbus communication modules can be inserted into slots 1, 2 and 3. For F-type modules with USCA-02 adapter.	9	Control panel
4	Slot 4 for RDCO module	10	PC with Drive Composer
5	Ethernet ports	11	Mobile device with Drivetune
6	Terminal blocks	12	EGW-02 Connectivity Edge Gateway
7	Fiber optic links to power modules (inverter, supply, brake or converter)	13	Programmable logic controller
8	Safety option interface. Only in use for the inverter units.	14	Distributed I/O bus with CIO-01 modules for cooling fan monitoring and control (in use only if the fan speed control is in use).

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, refer to ACS-AP-I, -S, -W and ACH-AP-H, -W 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, refer to the firmware manual.

DC switch-disconnector 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 link.

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.

NOTICE Do not open the DC switch-disconnector under load.

Charging switch

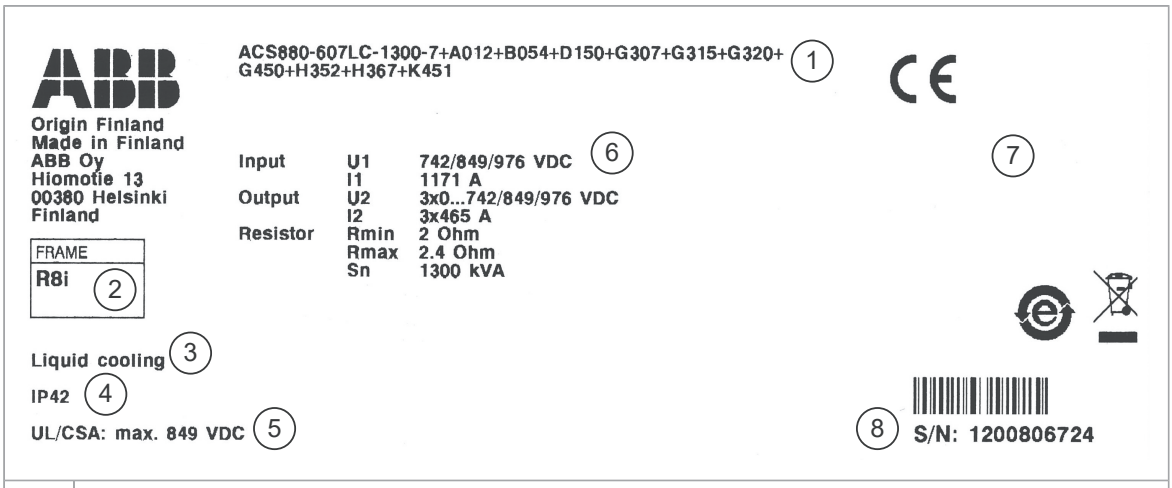
Brake units equipped with a DC switch/disconnector also have a DC link precharging circuit, including a BSFC-12C charging control unit and a charging switch.

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.



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 nickel-plated or tin-plated 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 the left
C179	Plinth height 200 mm
C205	Marine product certification issued by DNV
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
F269	Output contactors
F286	DC switch-disconnector
G300	Cabinet and module heating elements (external supply)
G301	Cabinet lighting

Code	Description
G304	Control (auxiliary) voltage 115 V AC
G314	Aluminum busbars
G315	Nickel-plated or tin-plated copper DC busbars
G320	Control (auxiliary) voltage 230 V AC
G330	Halogen-free wiring and materials
G338	Wire marking class A1
G339	Wire marking class A2
G340	Wire marking class A3
G341	Wire marking class B1
G342	Wire marking class C1
G450	External supply voltage for fans
G451	Voltage transformer for fans (internal supply)
G467	Output current measurement
H352	Power cabling exit from bottom
H353	Power cabling exit from top
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 cabling through the floor of the cabinet
H368	Control cabling through the roof of the cabinet
H394	Cable entry, Roxtec frame without sealing components
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 Ethernet POWERLINK 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
K493	Ethernet switch for PROFINET
K494	Ethernet switch with optical link for PROFINET

Code	Description
L500	FIO-11 analog I/O extension module
L501	FIO-01 digital I/O extension module
L509	RDCO-04 optical DDCS communication module (4×Transmitter/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)
Q986	FSPS-21 PROFIsafe safety functions module
R700	Printed documents in English
R701	Printed documents in German [1)]
R702	Printed documents in Italian[1)]
R705	Printed documents in Swedish[1)]
R706	Printed documents in Finnish[1)]
R707	Printed documents in French[1)]
R708	Printed documents in Spanish[1)]
R711	Printed documents in Russian[1)]
R712	Printed documents in Chinese[1)]
R716	Hard copies of documentation
R717	Second set of hard copies of documentation

1) The delivery can include documents in English if the requested language is not available.

3

Mechanical installation

Contents of this chapter

This chapter describes the mechanical installation of the brake units.

Brake unit

The ACS880 multidrive - the brake unit as one part of the complete drive - is transported in sections. Refer to ACS880 liquid-cooled multidrive cabinets mechanical installation instructions (3AXD50000048635 [English]).

User-defined brake resistors

Obey the brake resistor manufacturer’s instructions.

4

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 that 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.

- **North America**

Installations must be compliant with NFPA 70 (NEC)[1)] and/or Canadian Electrical Code (CE code), along with state and local codes for your location and application.

[1)] National Fire Protection Association 70 (National Electric Code).

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

Note: 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 are 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 (temperature sensor).

⚠WARNING IEC 60664 and IEC 61800-5-1 require double or reinforced insulation between resistor live parts and the temperature sensor. If the resistor assembly does not fulfill the requirement, the temperature sensor must be isolated from the I/O terminals, for example, with a suitable relay.

Selecting and routing the brake resistor cables

Minimizing electromagnetic interference

Make sure that the installation complies with the EMC requirements. Obey these rules to minimize electromagnetic interference caused by the rapid voltage and current changes in the resistor cables:

- Shield the brake resistor cable. Use shielded cable or a metallic enclosure. If you use unshielded single-core cables, route them 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° angles.
- Keep the cable as short as possible to minimize the radiated emissions and stress on the brake chopper. A longer cable produces more radiated emissions, inductive load, and voltage peaks over the IGBT semiconductors of the brake chopper.

Selecting the installation location for the brake resistors

Protect the open (IP00) brake resistors against contact. Install the brake resistor in a place where it cools effectively. Arrange the cooling of the resistor so that:

- no danger of overheating is caused to the resistor or nearby materials, and
- the temperature of the space that the resistor is in does not go above the allowed maximum value.

⚠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 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 kV
- jacket material for at least 90 °C (194 °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, refer to the appropriate firmware manual.

Protecting the brake unit and brake resistor circuit 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.

The brake unit also has a current fault monitoring function that detects current differences between output phase currents. By default, the current fault indication causes the main breaker to trip. This cuts off the power supply to the drive DC link and further to the brake resistor. If the application does not allow the main breaker to open suddenly, it is possible to install an output contactor in the brake unit (option +F269). The output contactor disconnects the resistors from the drive DC link when necessary.

Refer to the firmware manual for information on the current fault monitoring function, related parameters and fault indications.

Protecting the brake unit in an output earth fault

A current transducer is necessary for earth fault supervision in an earthed (TN) system. ABB implements it as standard, which is indicated with the output current measurement option code +G467 in the type code of the brake unit.

The brake unit has an output earth fault supervision function that monitors the current value. If the value goes above the parameter-defined limit, the supervision function detects an earth fault. If the current exceeds the fault limit, the brake unit trips on a fault. By default, the current fault indication causes the main breaker to trip. This cuts off the power supply to the drive DC link and further to the brake resistor. If the application does not allow the main breaker to open suddenly, it is possible to install an output contactor in the brake unit (option +F269). The output contactor disconnects the resistors from the drive DC link when necessary.

Refer to the firmware manual for information on the current fault monitoring function, related parameters and fault indications.

5

Electrical installation

Contents of this chapter

This chapter contains instructions on wiring the brake units.

Electrical safety precautions

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

This procedure gives information on how to de-energize the drive and make it safe to do work on it. The procedure does not include all possible drive configurations. Each drive is made to order. Always refer to the circuit diagrams of the drive delivery.

⚠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 electrical installation or maintenance work. Do these steps before you do installation or maintenance work.

1. Prepare for the work.
   - Make sure that you have a work order.
   - Do an on-site risk assessment or job hazard analysis.
   - Make sure that you have the correct tools available.
   - Make sure that the workers are qualified.
   - Select the correct personal protective equipment (PPE).
   - Stop the drive and motor(s).
2. Clearly identify the work location and equipment.
3. Disconnect all possible voltage sources. Make sure that connection is not possible. Lock out and tag out.
   - If the drive is equipped with a DC/DC converter unit or a DC feeder unit: Open the disconnecting device of the energy storage connected to the unit. The

disconnecting device is outside the drive cabinet. Then open the DC switch-disconnector ([Q11], option +F286 or +F290) of the unit.
- Open the main disconnecting device of the drive [Q1].
- Open the DC switch-disconnectors [Q11] in the multidrives units if they are present.
- Open the line-up charging switch [Q3] if it is present. Open also the unit charging switches [Q10] in the multidrives units if they are present.
- Open the disconnector 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.)
- Open the auxiliary voltage switch-disconnector (if it is 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 there is a permanent magnet motor connected to the drive, disconnect the motor from the drive with a safety switch or by other means.
- Open the main isolating device of the drive.
- Disconnect all dangerous external voltages from the control circuits.
- After you disconnect power from the drive, wait 5 minutes to let the intermediate circuit capacitors discharge before you continue.

4. Protect other energized parts in the work location against contact and take special precautions when close to bare conductors.

5. Measure that the installation is de-energized. Use a high-quality voltage tester. If the measurement requires that you remove shrouding or other cabinet structures, obey the local laws and regulations applicable to live electrical work. This includes, but is not limited to, electric shock and arc protection.
   - Before and after you measure the installation, verify the operation of the voltage tester on a known voltage source.
   - Make sure that the voltage between the input power terminals of the drive (L1, L2, L3) and the grounding (PE) busbar is zero.
   - Make sure that the voltage between the output power terminals of the drive (U, V, W) and the grounding (PE) busbar is zero.
     Important! Repeat the measurement with the DC voltage setting of the voltage tester. Measure between each phase and ground. There is a risk of dangerous DC voltage charging due to leakage capacitances of the motor circuit. This voltage can remain charged for a long time after the drive power-off. The measurement discharges the voltage.
   - Make sure that the voltage between the drive DC busbars and the grounding (PE) busbar is zero.
   - If the drive is equipped with a DC/DC converter unit or a DC feeder unit: Make sure that the voltage between the energy storage terminals of the unit (ES+ and ES-) and the grounding (PE) busbar is zero.

⚠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 for a permit to work from the person that is responsible for the electrical installation work.

General notes

Printed circuit boards

NOTICE Use an antistatic wrist strap when you handle printed circuit boards. Do not touch the boards unnecessarily. The boards are sensitive to electrostatic discharge.

Handling fiber optic cables

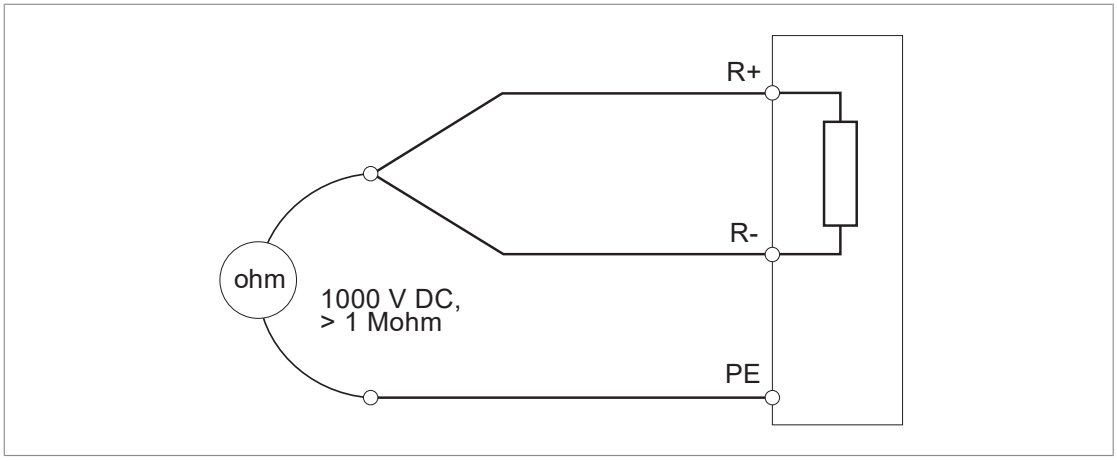
NOTICE Obey these instructions. If you ignore them, equipment malfunction and damage to the fiber-optic cables can occur.

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

Measuring the insulation resistance of the brake resistor circuit

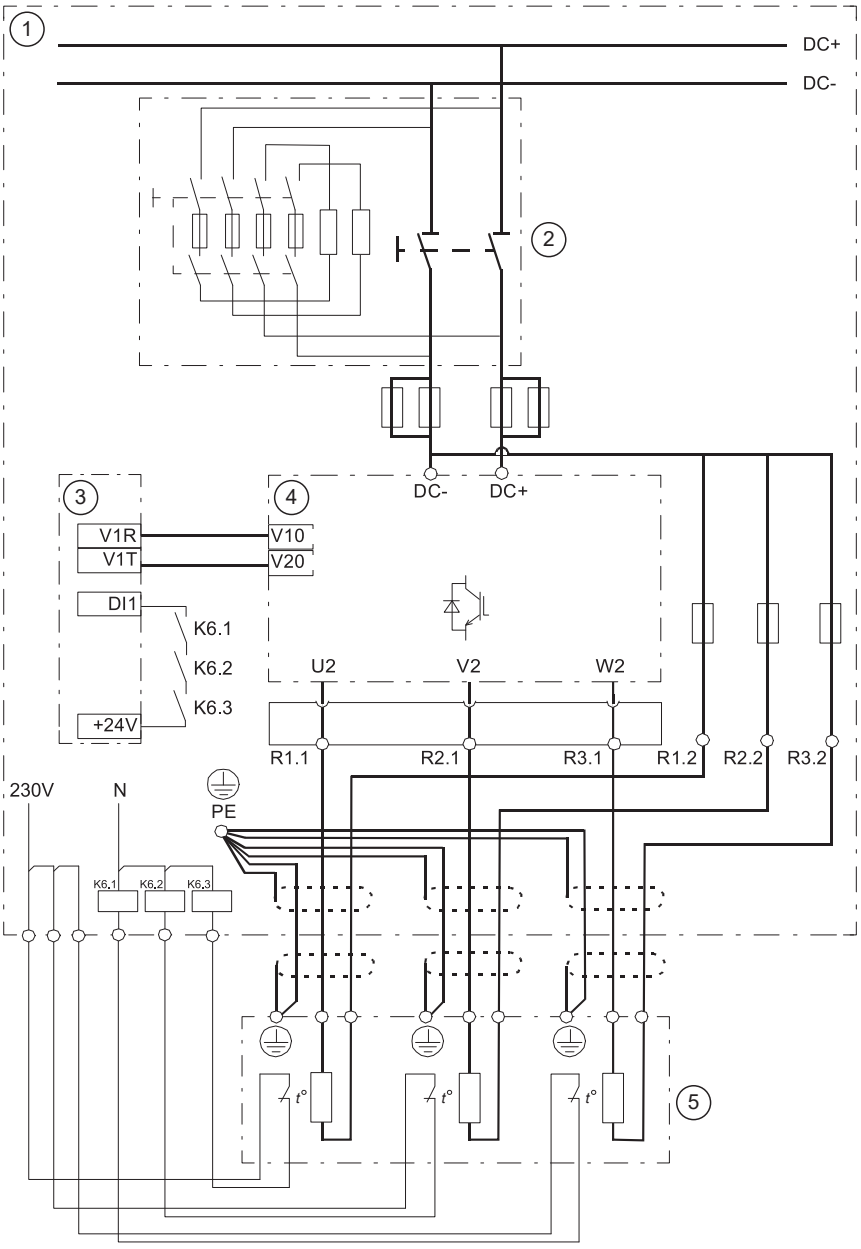
⚠WARNING Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do electrical installation, commissioning or maintenance work.

1. Stop the drive and do the steps in Electrical safety precautions (page 43) 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



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

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.

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, commissioning, or maintenance work.

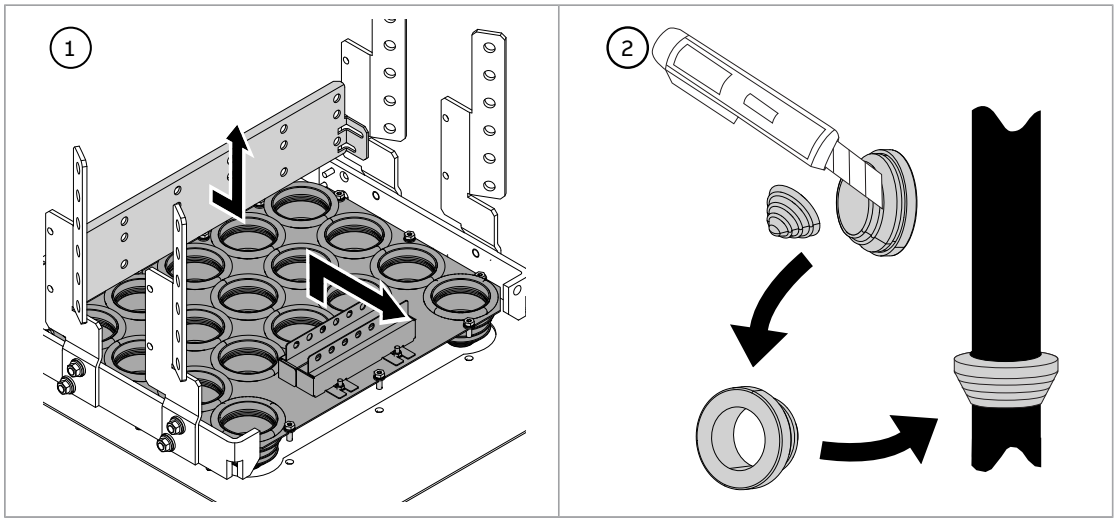
Removing shrouds

1. Stop the drive and do the steps in section Electrical safety precautions before you start the work.
2. Open the door of the incoming cubicle.
3. Remove the shrouding and assembly plates covering the input terminals.

Connecting the cables

This section describes the power cable connecting procedure for a bottom cable entry with the standard cable entry plate. The standard cable entry plate has conductive sleeves for the 360° grounding of the cable shields. For Roxtec cable entry plate (option +H394) and cable gland plate (option +H358), refer to the manufacturer's instructions.

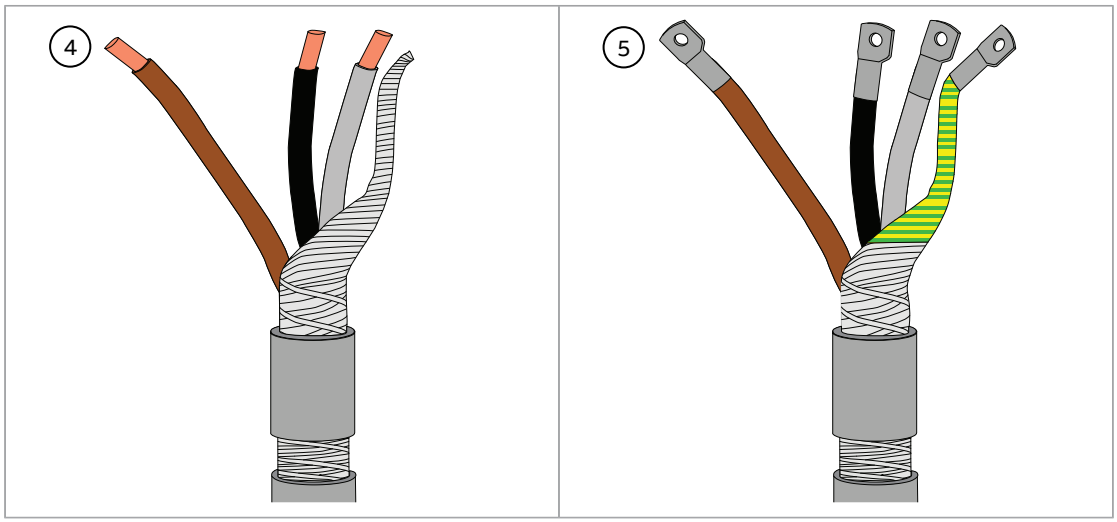
1. IP54 cabinet: Remove the rear horizontal cable support bracket and the cable entry plate.
2. IP54 cabinet: Remove a sealing grommet from the cable entry plate for each cable. Cut hole into the rubber grommet and move it onto the cable.



3. Put the cables inside the cabinet through the cable entry plate. If there are several cables, use the rear 3 holes first.
   IP54 cabinet: Attach the sealing grommets to the cable entry plate. Attach also the cable entry plate, and the cable support bracket.
4. For each cable, strip off 3…5 cm (1.2 … 2 inches) of the outer insulation above the cable entry plate. Strip also the end of the cable, and the end of the phase

conductors. Twist the shield to form a PE conductor, and mark it with yellow-green tape or heat-shrink tubing.

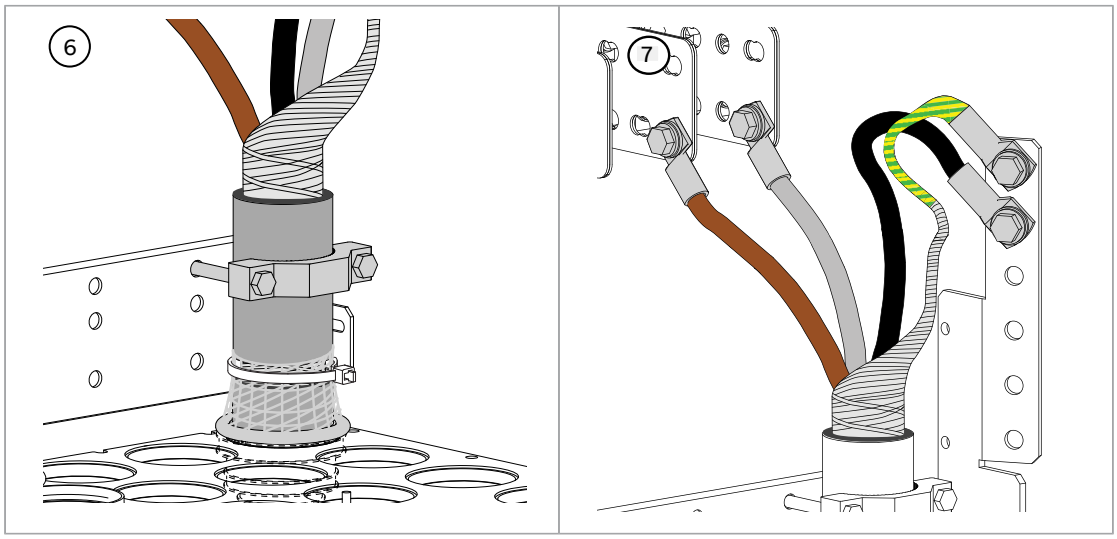
5. For each cable, attach cable lugs at the end of the PE conductor (twisted shield) and phase conductors.



6. For each cable, attach the conductive sleeve to the bare cable shield with a cable tie. Attach the cable to the support bracket with a clamp.

NOTICE Do not overtighten the clamp, or tighten it onto the bare shield (stripped part of the cable). It can cause damage to the cable.

7. For each cable, connect the PE conductor to the PE busbar, and phase conductors to the phase terminals. Connect the third phase conductor to the PE busbar. Tighten the screws to the torque given in the technical data. Use the bolts and washers in the delivery. Refer to Use of fasteners in cable lug connections (page 51).



8. If there are more than 3 cables, attach additional cable support brackets for them.

Installing shrouds

1. Install the thermal switch cable. Refer to section Connection procedure of the thermal switch cable (page 50).
2. Install the shrouding removed earlier.
3. Close the cubicle door.

Connection procedure of the thermal switch cable

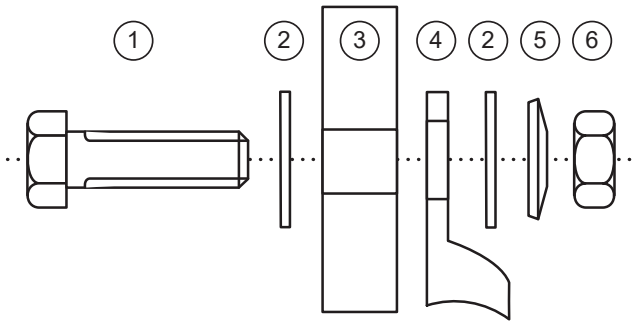
⚠WARNING Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do installation, commissioning, or maintenance work.

1. Stop the drive and do the steps in Electrical safety precautions (page 43) before you start the work.
2. Open the door of the brake chopper module cubicle and remove any shrouding. Refer to section Removing shrouds (page 48).
3. Run the thermal switch cable inside the brake unit cubicle.
4. ABB recommends that you ground the cable shield 360° at the cable entry. Refer to section Connecting the control cables (page 52).
5. Run the cable to its connection point using existing trunking wherever possible. Protect the cables against any sharp edges or hot surfaces.
6. Connect the conductors to the appropriate terminals.
7. 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).

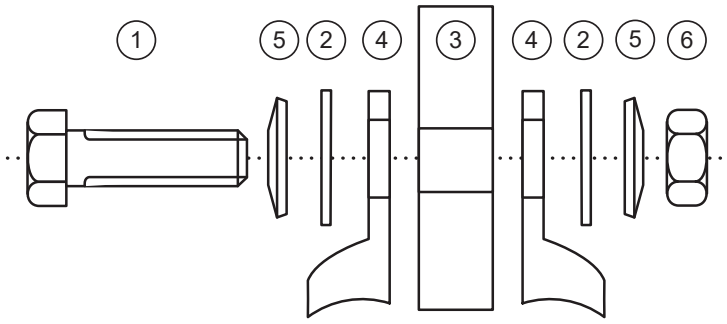
Use of fasteners in cable lug connections

Use the bolts, nuts and washers include in the delivery. Install all the fasteners in the correct order. See the figure below. Tighten the cable lug to the torque specified for the connection.

Cable lug on one side of the busbar



Cable lugs on both sides of the busbar



1	Bolt	4	Cable lug
2	Plain washer	5	Spring washer
3	Busbar	6	Nut

Connecting the control cables

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

Control cable connection procedure

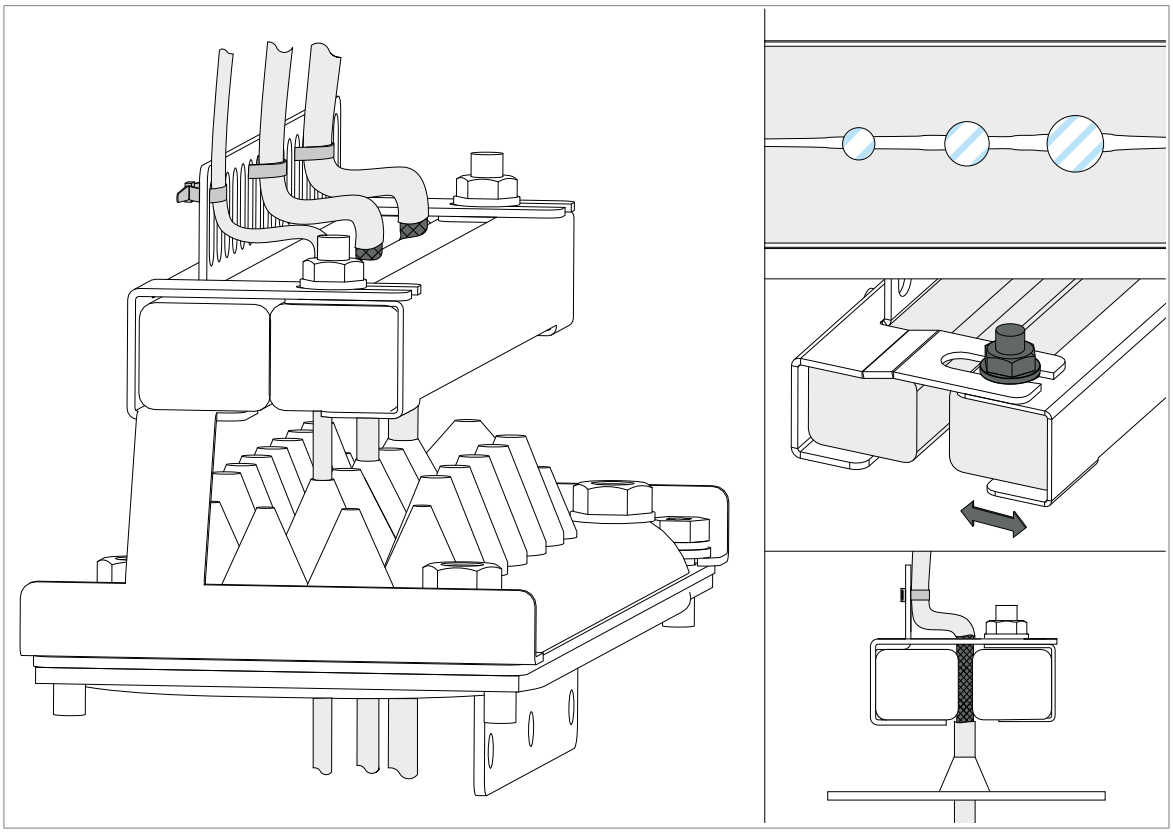
WARNING Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do electrical installation, commissioning or maintenance work.

1. Stop the drive and do the steps in Electrical safety precautions (page 43) before you start the work.
2. Put the control cables into the cabinet as described in section Grounding the outer shields of the control cables 360° at the cabinet entry (page 52).
3. Route the control cables as described in section Routing the control cables inside the cabinet (page 53).
4. Connect the control cables as described in section Connecting control cabling (page 54).

Grounding the outer shields of the control cables 360° at the cabinet entry

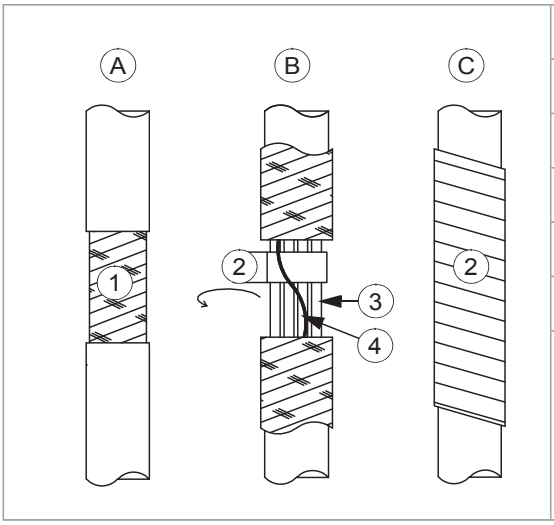
Ground the outer shields of all control cables 360° with the EMI conductive cushions at the cabinet entry. The grounding principle is the same for top and bottom entry cables. The figures show the bottom entry. The actual design details can vary.

1. If necessary, temporarily remove the shrouding in front of the cable entry.
2. Put the cables in sequence from the smallest to the largest. This will help to achieve a good contact with the cushions.
3. Loosen the tightening bolts of the EMI conductive cushions and pull them apart.
4. Cut holes in the grommets and put the cables through the grommets.
5. Peel the insulation from the part of the cable that will be in contact with the EMI conductive cushion.
6. Put the cables between the cushions and attach them with cable ties for strain relief.
7. Move the cushions back together.
8. Tighten the bolts to make sure that the EMI conductive cushions press tightly around the peeled part of the cables.



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

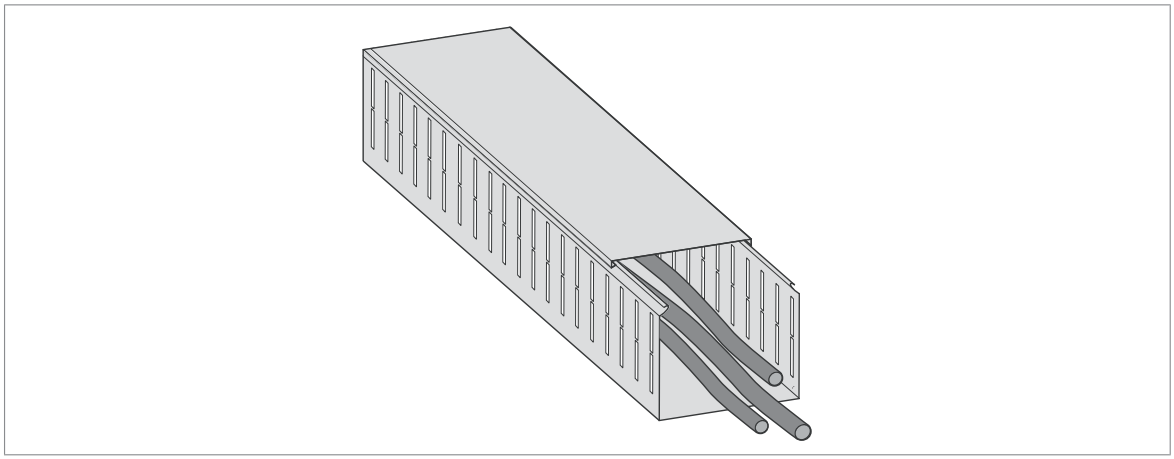
- Cut the shield at the midpoint of the peeled part. Be careful not to cut the conductors or the grounding wire.
- Turn the conductive side of the shield inside out over the insulation.
- Cover the exposed shield and the peeled cable with copper foil to keep the shielding continuous.



A	Stripped cable
B	Conductive surface of the shield exposed
C	Stripped part covered with copper foil
1	Cable shield
2	Copper foil
3	Shielded twisted pair
4	Grounding wire

Routing the control cables inside the cabinet

Use the existing trunking in the cabinet where 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.



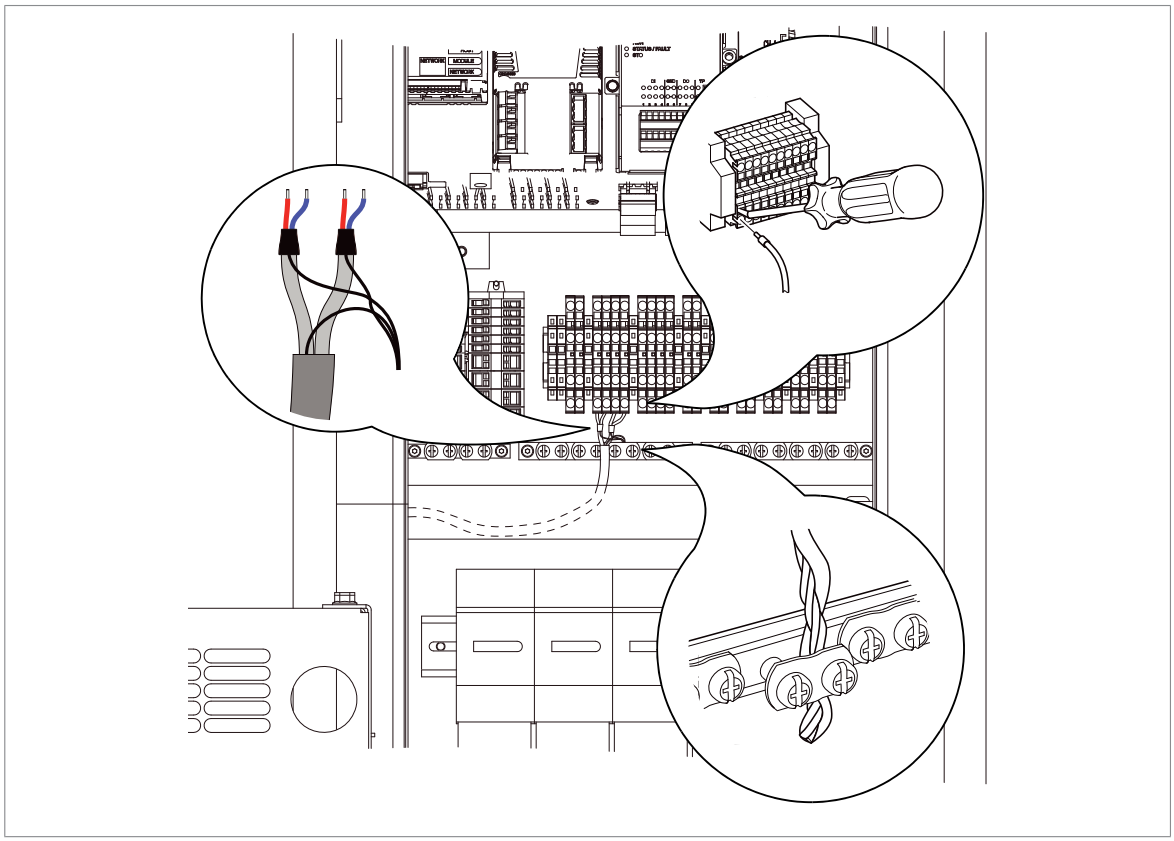
Connecting control cabling

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

Obey these instructions:

- Connect the inner twisted pair shields and all separate grounding wires to the grounding clamps near the terminals.
- Ground the outer shield of the cable with a 360° grounding at the cable entry. Do not make the 360° grounding at the grounding clamps near the terminals.
- 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.

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.

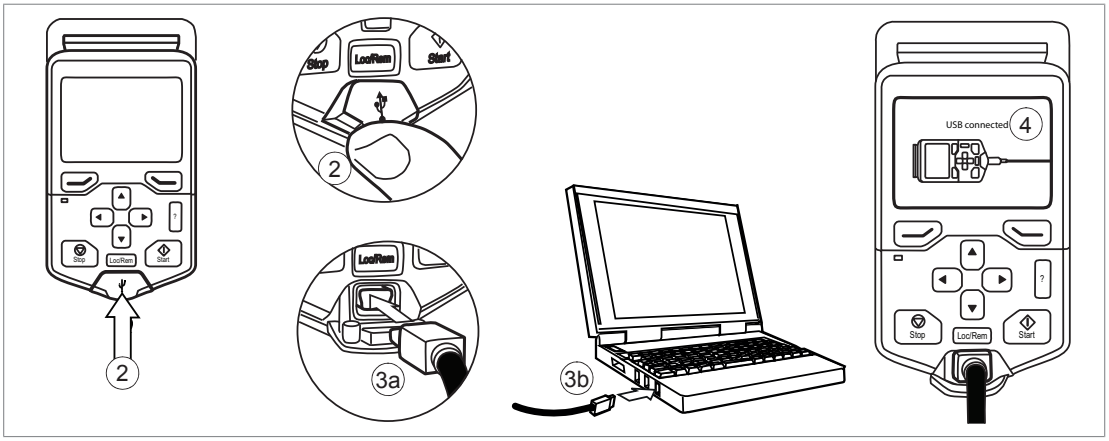


Connecting a PC

NOTICE Do not connect a PC directly to the control panel connector of the control unit. It can cause damage.

To connect a control panel to a PC (with, for example, Drive Composer PC tool):

1. Put the control panel into the panel holder or platform.
2. Remove the USB connector cover on the front of the control panel.
3. Connect a 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 shows when the connection is active.
5. Refer to the documentation of the PC tool for setup instructions.



Alternatively, you can connect an Ethernet cable (for example, Cat 5e) to the Ethernet port behind the control panel. Make sure that the control panel is on a platform or a DIN rail.

6

Control unit (UCU)

Contents of this chapter

This chapter

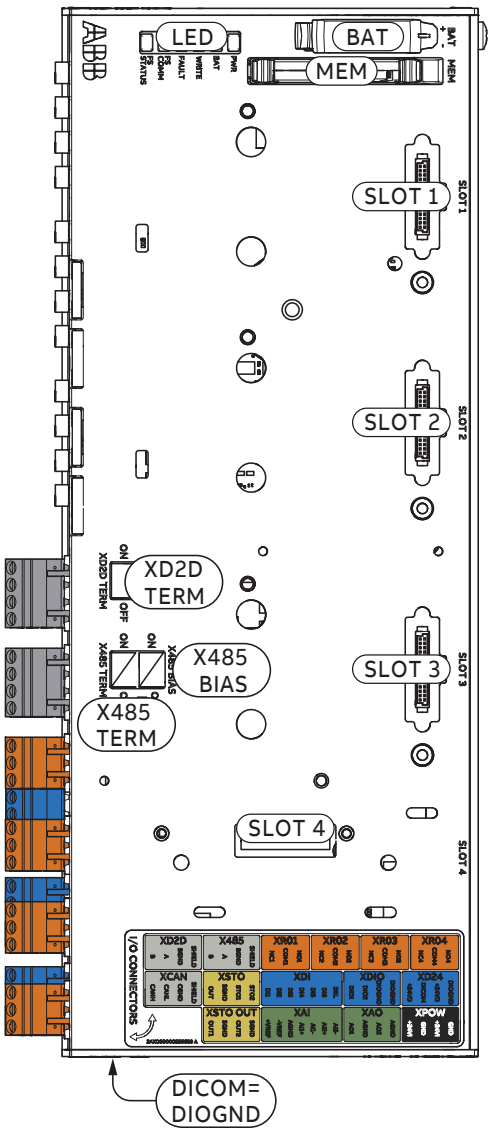
- describes the connections of the control unit
- contains the specifications of the inputs and outputs of the control unit.

General

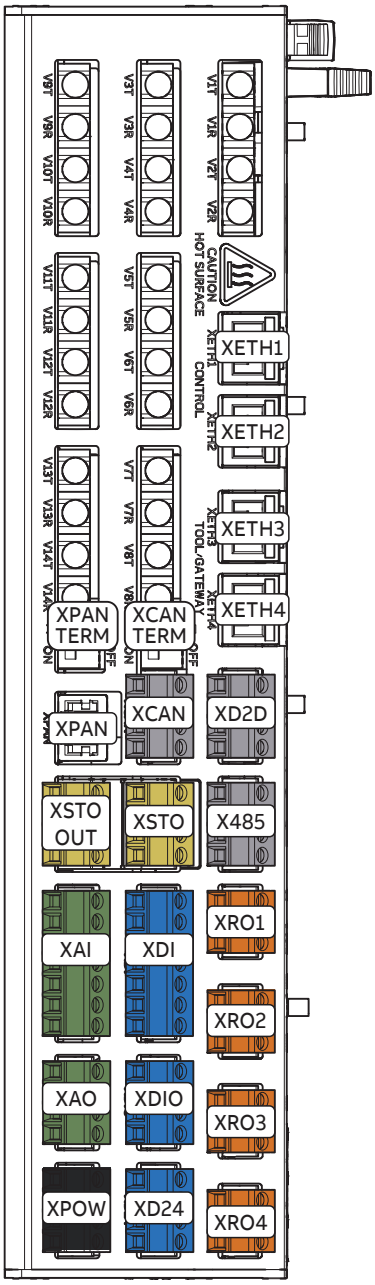
The UCU-22...24 control units are used for controlling power modules (drive, inverter, supply, converter, etc) via fiber optic links. UCU-22 has two, UCU-23 has eight and UCU-24 has 14 power module connections. The UCU-22...24 control units have integrated branching unit functionality for collecting and storing real-time data from the power modules to help fault tracing and analysis. The data is stored on a memory card which can be analyzed by ABB service personnel.

Layout

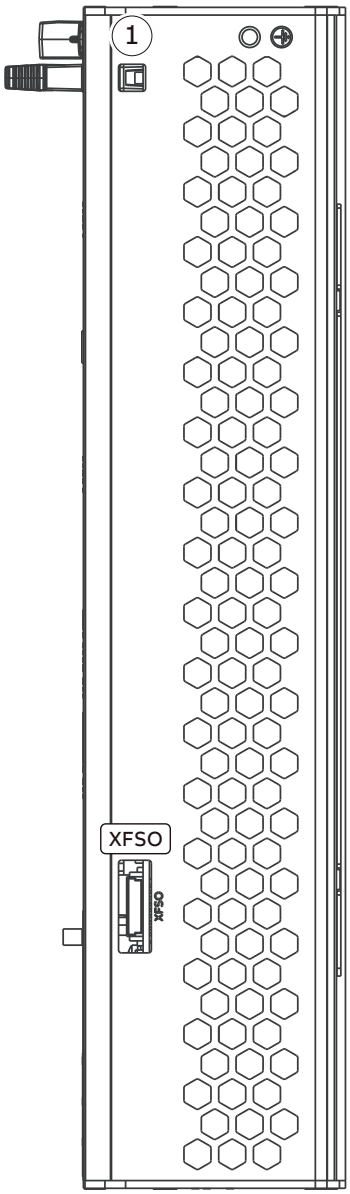
The figures below show the layout of the UCU-24 control unit.



Item	Description
SLOT 1	I/O extension, encoder interface or fieldbus adapter module connection. For F-type modules with USCA-02 adapter.
SLOT 2	
SLOT 3	
SLOT 4	RDCO DDCS communication option module connection
MEM	UMU-01 memory unit connection. A data logger microSDHC memory card is inside the memory unit.
BAT	Holder for real-time clock battery (BR2032)
XD2D TERM	Termination switches for drive-to-drive link (XD2D)
X485 TERM	RS-485 link termination switch
X485 BIAS	RS-485 link bias switch.
DICOM= DIOGND	Ground selection. Determines whether DICOM is separated from DIOGND (ie. the common reference for the digital inputs floats). Refer to the ground isolation diagram.
PWR LED	When the PWR LED is on, the voltage supply is sufficient.
BAT LED	When the BAT LED is on, the real-time clock battery voltage is higher than 2.5 V. If the LED is off when the control unit is energized, the battery must be replaced.
WRITE LED	When the WRITE LED is on, writing to the microSDHC memory card is in progress. Do not remove the microSDHC memory card.
FAULT LED	If the FAULT LED is on, the control program has generated a fault. Refer to the firmware manual.
FS COMM LED	Reserved
FS STATUS LED	Reserved



Item	Description
XAI	Analog input
XAO	Analog output
XCAN	Not in use
XCAN TERM	CAN bus termination switch
XDI	Digital input
XDIO	Digital input/output
XD2D	Drive-to-drive link or Modbus/RTU
XD24	+24 V output (for digital input)
XETH1	Ethernet ports for fieldbus, internal switch
XETH2	
XETH3	Ethernet ports for tool communication, internal switch
XETH4	
XPAN	Control panel connection
XPAN TERM	Panel bus termination switch
XPOW	External power input
XRO1	Relay output RO1
XRO2	Relay output RO2
XRO3	Relay output RO3
XRO4	Relay output RO4, reserved
XSTO	Safe torque off connection (input signals)
XSTO OUT	Safe torque off connection (to inverter modules)
X485	RS-485 link
V1T/V1R … V14T/V14R	Fiber optic connections (VxT = transmitter, VxR = receiver) UCU-22: V1T/V1R … V2T/V2R UCU-23: V1T/V1R … V8T/V8R UCU-24: V1T/V1R … V14T/V14R



Item	Description
XFSO	Optional connection for FSO safety functions module (supported only in inverter units)
1	Humidity and temperature measurements

Default I/O diagram of the brake control unit

The table below describes the use of the connections in the brake unit. Under normal circumstances, the factory-made wiring should not be changed.

Terminal			Description	
XD2D			Drive-to-drive link	
1	1	B	Not supported	
2	2	A		
3	3	BGND		
4	4	SHIELD		
	XD2D TERM		Drive-to-drive link termination switch. [1]	
X485			RS485 connection	
5	5	B	CIO-01 module connection	
6	6	A		
7	7	BGND		
8	8	SHIELD		
	X485 BIAS		X485 bias selection switch	
	X485 TERM		X485 termination switch	
XCAN			CAN bus	
9	9	CANH	Not supported	
10	10	CANL		
11	11	CGND		
12	12	SHIELD	Control cable shield	
	XCAN TERM		CANopen termination switch	
XRO1			Relay output 1	
11	11	NC1	Norm. closed	XRO1: Running [2] (Energized = running) 250 V AC / 30 V DC, 2 A
12	12	COM1	Common	
13	13	NO1	Norm. open	
XRO2			Relay output 2	
21	21	NC2	Norm. closed	XRO2: **Fault (-1)** [3] (Energized = no fault) 250 V AC / 30 V DC, 2 A
22	22	COM2	Common	
23	23	NO2	Norm. open	
XRO3			Relay output 3	
31	31	NC3	Norm. closed	XRO3: Current fault monitoring (Energized = current fault FE0B or 2E08 is active) 250 V AC / 30 V DC, 2 A
32	32	COM3	Common	
33	33	NO3	Norm. open	
XRO4			Relay output 4	

Terminal			Description	
41 42 43	41	NC4	Norm. closed	XRO4: Not supported 250 V AC / 30 V DC, 2 A
	42	COM4	Common	
	43	NO4	Norm. open	
XSTO			Safe torque off input connection	
1 2 3 4	1	OUT	XSTO: STO1 and STO2 are connected to OUT at the factory. To enable start and operation, STO1 and STO2 must be connected to OUT.	
	2	SGND		
	3	STO1		
	4	STO2		
XSTO OUT			Safe torque off output connection (to inverter modules)	
5 6 7 8	5	OUT1	XSTO OUT: Not in use.	
	6	SGND		
	7	OUT2		
	8	SGND		
XDI			Digital inputs	
1 2 3 4 5 6 7	1	DI1	Temp fault[3] (0 = overtemperature)	
	2	DI2	Not in use by default	
	3	DI3	Not in use by default	
	4	DI4	Not in use by default	
	5	DI5	Not in use by default	
	6	DI6	Reset[2] (0 -> 1 = fault reset)	
	7	DIIL	Not in use by default. DIIL is connected to XD24:5 at the factory.	
XDIO			Digital input/outputs	
1 2 3 4	1	DIO1	Not in use by default	
	2	DIO2	Not in use by default	
	3	DIOGND	Digital input/output ground	
	4	DIOGND	Digital input/output ground	
XD24			Auxiliary voltage output	
5 6 7 8	5	+24VD	+24 V DC 200 mA[4]	
	6	DICOM	Digital input ground	
	7	+24VD	+24 V DC 200 mA[4]	
	8	DIOGND	Digital input/output ground	
ON	DICOM=DIOGND		Ground selection switch. Determines whether DICOM is separated from DIOGND (ie, common reference for digital inputs floats). ON: DICOM connected to DIOGND. OFF: DICOM and DIOGND separate.	
XAI			Analog inputs, reference voltage output	
1 2 3 4 5 6 7	1	+VREF	10 V DC, R_L 1…10 kohm	
	2	-VREF	-10 V DC, R_L 1…10 kohm	
	3	AGND	Ground	
	4	AI1+	Not in use by default. 0(2)…10 V, R_{in} > 200 kohm[5]	
	5	AI1-		
	6	AI2+	Not in use by default. 0(4)…20 mA, R_{in} = 100 ohm[6]	
	7	AI2-		

Terminal			Description
XAO			Analog outputs
1 2 3 4	1	AO1	Zero (no signal indicated)[3] 0…20 mA, R_L < 500 ohm (not in use by default)
	2	AGND	
	3	AO2	Zero (not signal indicated)[3] 0…20 mA, R_L < 500 ohm (not in use by default)
	4	AGND	
XPOW			External power input
1 2 3 4	1	+24VI	19…32 V DC, 1.5 … 2.9 A (depends on the load and supply voltage) External power input. Two supplies can be connected to the control unit for redundancy.
	2	GND	
	3	+24VI	
	4	GND	
XFSO			Safety functions module connection. Not supported in brake units.
XETH1			Ethernet ports for tool communication. Support depends on the firmware. Refer to the firmware manual.
XETH2			
XETH3			Ethernet ports for tool communication. Support depends on the firmware. Refer to the firmware manual.
XETH4			
XPAN			Control panel connection
	XPAN TERM		Control panel connection termination switch
MEM			Memory unit connection

1) Must be set to ON when the unit is the first or last unit on a drive-to-drive (D2D) link. On intermediate units, set termination to OFF (1).
2) Default use of the signal in the control program. The use can be changed by a parameter. See also the delivery-specific circuit diagrams.
3) Default use of the signal in the control program. The use can be changed by a parameter. See also the delivery-specific circuit diagrams.
4) Total load capacity of these outputs is 4.8 W (200 mA at 24 V) minus the power taken by DIO1 and DIO2.
5) Current [0(4)…20 mA, R_{in} = 100 ohm] or voltage [0(2)…10 V, R_{in} > 200 kohm]. Change of setting requires reboot of control unit.
6) Current [0(4)…20 mA, R_{in} = 100 ohm] or voltage [0(2)…10 V, R_{in} > 200 kohm]. Change of setting requires reboot of control unit.

Additional information on the connections

Power supply for the control unit (XPOW)

Power to the control unit is supplied through terminal block XPOW.

Refer to the control unit connector data for the current and voltage ratings of the power supply.

Connect an additional external power supply to the free +24 V and GND terminals of the XPOW terminal block if:

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

Digital interlock (DIIL)

Digital interlock input (DIIL) terminal is originally intended for interlock signals that stop the drive/unit when necessary.

In the ACS880 primary control program, DIIL terminal is the source for the run enable signal by default. The inverter unit or drive cannot start, or it stops when there is no DIIL signal. In other control programs (and units), the default use of the DIIL terminal varies. Refer to the firmware manual for more information.

Note: This input is **not** SIL or PL classified.

Safe torque off (XSTO, XSTO OUT)

The XSTO input only acts as a true Safe torque off input on the inverter control unit. De-energizing the STO input terminals of other control units (supply, DC/DC converter, or brake unit) stops the unit but does not constitute a SIL/PL classified safety function.

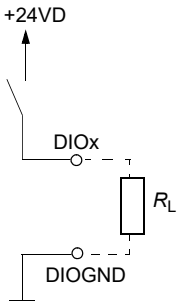
MicroSDHC memory card slot

The control unit 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 microSDHC memory card inserted into the UMU-01 memory unit and can be analyzed by ABB service personnel.

Connector data

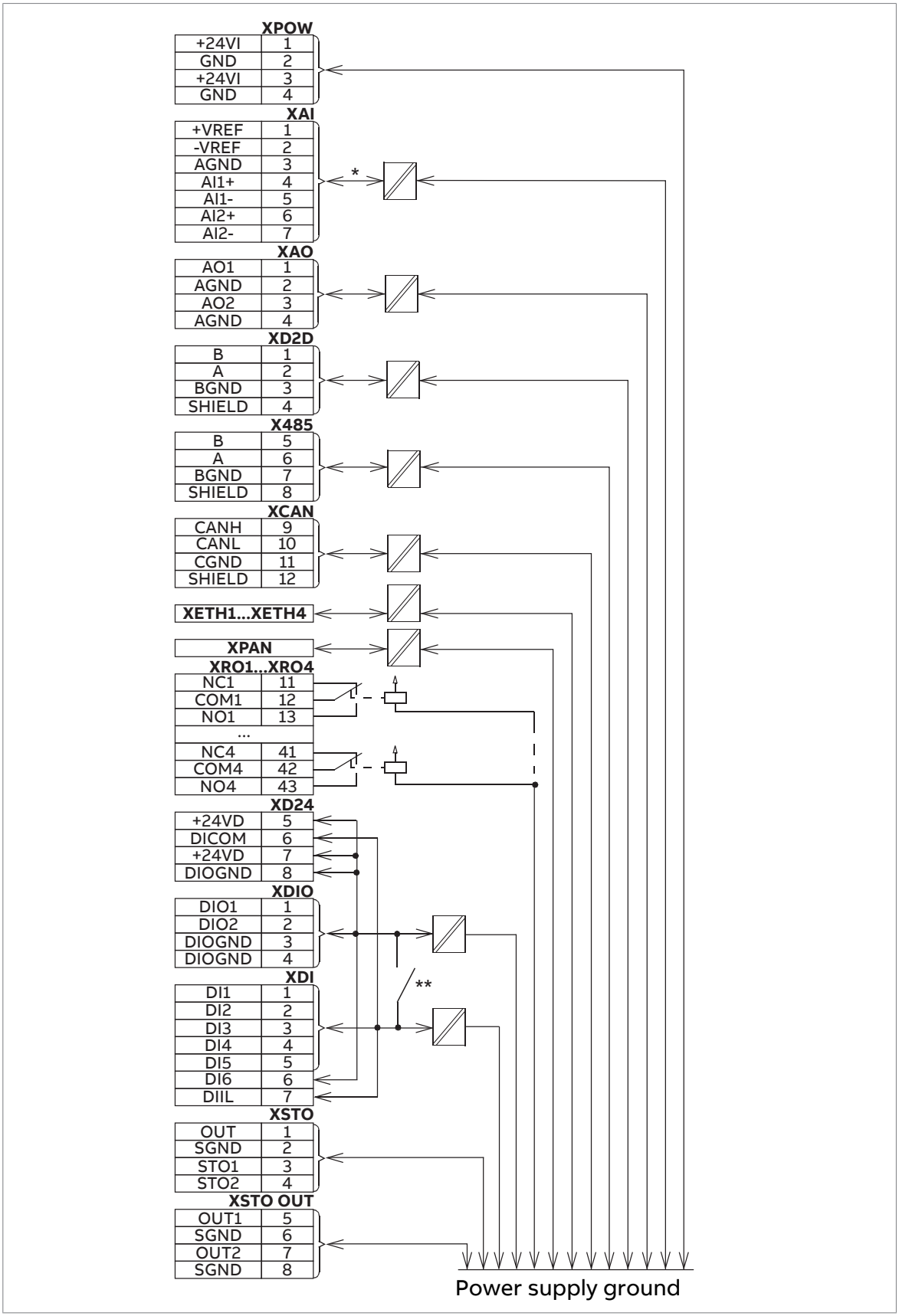
The wire size accepted by all screw terminals (for both stranded and solid wire) is 0.5 … 2.5 mm^2 (22…12 AWG). Connector pitch is 5 mm.

Maximum tightening torque of the screw terminals is 0.45 N·m (4 lbf·in).

Power supply (XPOW)	19…32 V DC, 1.5 … 2.9 A (depends on the load and supply voltage) External power input. Two supplies can be connected to the control unit for redundancy.
Relay outputs XRO1…XRO4	250 V AC / 30 V DC, 2 A Protected by varistors
+24 V output (XD24:5 and XD24:7)	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)	24 V logic levels: “0” < 5 V, “1” > 15 V R_{in}: 2.0 kohm Input type: NPN/PNP (DI1…DI5), PNP (DI6) Hardware filtering: 0.04 ms, digital filtering up to 8 ms I_{max}: 15 mA (DI1…DI5), 5 mA (DI6)
Start interlock input DIIL (XDI:7)	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…100 kHz with hardware filtering of 4 microseconds) for 24 V level square wave signal (sinusoidal or other wave form cannot be used). In some control programs, DIO2 can be configured as a 24 V level square wave frequency output. Refer to the firmware manual, parameter group 11.	As inputs: 24 V logic levels: "0" < 5 V, "1" > 15 V. R_{in}: 2.0 kohm. Filtering: 1 ms. As outputs: Total output current from +24VD is limited to 200 mA 
Reference voltage for analog inputs +VREF and -VREF (XAI:1 and XAI:2)	10 V ±1% and -10 V ±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 parameters 12.15 AI1 unit selection and 12.25 AI2 unit selection	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 Resolution: 11 bit + sign bit Inaccuracy: 1% of full scale range
Analog outputs AO1 and AO2 (XAO)	0…20 mA, R_{load} < 500 ohm Frequency range: 0…500 Hz Resolution: 11 bit + sign bit Inaccuracy: 2% of full scale range

XD2D connector	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
RS-485 connection (X485)	Physical layer: RS-485 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 and bias by switch (X485 TERM and X485 BIAS)
CAN connection (XCAN)	Termination by switch (XCAN TERM) This connection is not supported by the ACS880 control programs.
Safe torque off connection (XSTO)	Input voltage range: -3…30 V DC Logic levels: "0" < 5 V, "1" > 17 V. **Note:** Both circuits must be closed to enable start and operation (STO1 and STO2 must be connected to OUT). This applies to all control units (including drive, inverter, supply, brake, DC/DC converter etc. control units), but SIL/PL classified Safe torque off functionality is only achieved through the XSTO connector of the drive/inverter control unit. Current consumption (continuous) per STO channel: 15 mA. The number of parallel inverter modules does not have an effect on the current consumption. EMC (immunity) according to IEC 61326-3-1 and IEC 61800-5-2
Safe torque off output (XSTO OUT)	To STO connector of inverter module.
Control panel connection (XPAN)	Connector: RJ-45 Cable length < 50 m (164 ft) Termination by switch (XPAN TERM)
Control Ethernet connection with internal switch (XETH1 and XETH2)	Connector: RJ-45 Cable type: minimum requirement CAT5e
Tool Ethernet connection with internal switch (XETH3 and XETH4)	Connector: RJ-45 Cable type: minimum requirement CAT5e
microSDHC memory card slot (microSDHC CARD)	Memory card type: microSDHC (minimum of class 4 speed grade) Supported memory size: 4 GB…32 GB
Battery	Real-time clock battery type: BR2032
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.	

Ground isolation diagram



*The maximum common mode voltage between each AI input and AGND is ±30 V.

**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.

7

Installation checklist

Contents of this chapter

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

Checklist

⚠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 electrical installation, commissioning or maintenance work.

⚠WARNING Do the steps in Electrical safety precautions (page 43) before you start the work.

Examine the mechanical and electrical installation of the drive before start-up. Do the tasks in the checklist together with a second person.

Make sure that ...	☑
The ambient operating conditions meet the drive ambient conditions specification and enclosure rating (IP code).	☐
The supply voltage matches the nominal input voltage of the drive. Refer to the type designation label.	☐
The insulation resistance of the input power cable, motor cable, and motor is measured according to local regulations and the manuals of the drive.	☐
The drive cabinet is attached to the floor, and if it is necessary due to vibration etc., also by its top to the wall or roof.	☐

Make sure that ...	☑
If the drive is connected to a network other than a symmetrically grounded TN-S system: You have done all the required modifications (for example, you may need to disconnect the EMC filter or ground-to-phase varistor). Refer to the electrical installation instructions in the supply unit manual.	☐
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. Grounding is measured according to the regulations.	☐
If the drive is equipped with a DC/DC-converter unit: There is an adequately sized protective earth (ground) conductor between the energy storage and the DC/DC-converter, the conductor is connected to the correct terminal, and the terminal is tightened to the correct torque. Proper grounding is measured according to the regulations.	☐
If the drive is equipped with a DC/DC-converter unit: The energy storage cable is connected to the correct terminals of the DC/DC-converter and energy storage, and the terminals are tightened to the correct torque.	☐
If the drive is equipped with a DC/DC-converter unit: The energy storage is equipped with fuses for protecting the energy storage cable in a cable short-circuit situation.	☐
If the drive is equipped with a DC/DC-converter unit: The energy storage is equipped with a disconnecting device.	☐
The input power cable is connected to the correct terminals, the phase order is correct, and the terminals are tightened to the correct torque.	☐
There is an adequately sized protective earth (ground) conductor between the motor and the drive. The conductor is connected to the correct terminal, and the terminal is tightened to the correct torque. Grounding has also been measured according to the regulations.	☐
The motor cable is connected to the correct terminals, the phase order is correct, and the terminals are tightened to the correct torque.	☐
The motor cable is routed away from other cables.	☐
No power factor compensation capacitors are connected to the motor cable.	☐
If an external brake resistor is connected to the drive: 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. Grounding has also been measured according to the regulations.	☐
If an external brake resistor is connected to the drive: The brake resistor cable is connected to the correct terminals, and the terminals are tightened to the correct torque.	☐
If an external brake resistor is connected to the drive: The brake resistor cable is routed away from other cables.	☐
The control cables are connected to the correct terminals, and the terminals are tightened to the correct torque.	☐
The voltage setting of the auxiliary voltage transformers (if any) is correct. Refer to the electrical installation instructions.	☐
If a drive bypass connection will be used: 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.	☐
There are no tools, foreign objects, or dust from drilling inside the drive.	☐
The terminal box cover of the motor is in place. Cabinet shrouds are in place and doors are closed.	☐
The motor and the driven equipment are ready for power-up.	☐
The coolant connections between cubicles (if any) and to the cooling circuit are tight.	☐
If the drive is equipped with a cooling unit: Make sure that the mechanical and electrical installation of the cooling unit is completed. Refer to the cooling unit documentation.	☐

8

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	☑
Safety	
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, commissioning, or maintenance work. **⚠WARNING** Make sure that the disconnector 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. 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.	
Starting and checking the cooling system	
Fill up and bleed the internal cooling circuit. Start the cooling unit up. Refer to the Filling up and bleeding the internal cooling circuit (page 102). If the drive is equipped with a cooling unit (ACS880-1007LC): Start up and power up the cooling unit. Refer to the ACS880-1007LC liquid cooling unit user's manual (3AXD50000129607 [English]) and the delivery-specific circuit diagrams.	☐
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.	☐
Make sure that the coolant can flow freely in all cubicles. Make sure that drive system cools down. Refer to the ACS880-1007LC liquid cooling unit user's manual (3AXD50000129607 [English]).	☐
Install all shrouds (if removed) and close the cabinet doors.	☐
Powering up the DC link and starting up the inverters	
Make sure that all cabinet doors are closed.	☐
Close the disconnector of the supply transformer.	☐
Close the drive auxiliary voltage switch [Q21] to power up the control units.	☐
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 link.	☐
Start up the inverter units. Refer to the procedure in the inverter unit hardware manual.	☐
Brake units with DC switch-disconnector (option +F286): Connecting the brake unit to the DC link	
Switch on the auxiliary voltage to the brake unit.	☐
To charge the brake unit capacitors, close the charging switch [Q10].	☐
When the green light on the cabinet door illuminates, close the DC switch-disconnector [Q11] of the brake unit.	☐
Open the charging switch [Q10]. **Note:** The brake unit can only start after the charging is complete and the charging switch is open.	☐
Setting up the parameters at start-up	
Check the brake control program parameter settings. Refer to ACS880 brake control program firmware manual (3AXD50001150723 [English]).	☐

Tasks	☑
If output contactor (+F289) has been selected, make sure that parameter 195.20 b9 has been activated.	☐
If output current measurement (+G)has been selected, check that parameter 195.20 b5 has been activated	☐
Operational tests	
Test the operation of the braking. Refer to ACS880 brake control program firmware manual (3AXD50001150723 [English]).	☐

9

Operating instructions

Contents of this chapter

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

Starting and stopping the brake unit

The brake unit is ready to start when:

- The brake module DC capacitor charging is complete
- The brake modules are connected to an energized drive DC link
- The charging switch is open.

The brake unit starts automatically when the drive DC link voltage exceeds a pre-defined brake unit operating limit. By default, the brake unit does not have any start/stop or enable signals in use. Refer to the firmware manual for more information on the external control signals.

Disconnecting the brake unit from the drive DC bus

This procedure applies to a brake unit that has the DC switch-disconnector (option +F286).

1. Stop all motors and inverter units that can regenerate energy back to the DC link. Keep them stopped when the brake unit is disconnected.
2. Open the DC switch/disconnector [Q11] of the brake unit.
3. Make sure that also the charging switch [Q10] is open.

Connecting the brake unit to the drive DC bus

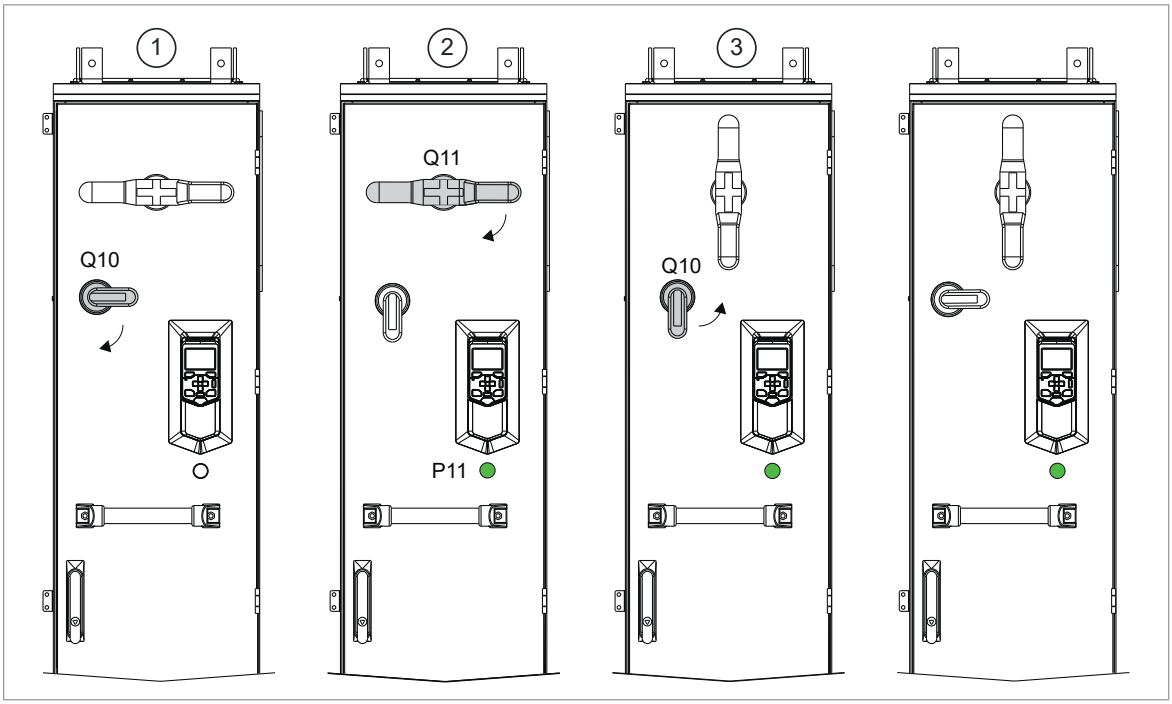
This procedure applies to a brake unit that has the DC switch-disconnector (option +F286).

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 brake unit after the first start-up, obey these instructions:

1. Make sure that the auxiliary power supply of the brake unit is connected and the drive DC link is powered up.
2. Close the charging switch [Q10]. The brake unit capacitor charging starts.
3. When the green light on the cabinet door illuminates, close the DC switch/disconnector [Q11] of the brake unit.
4. Open the charging switch [Q10].

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



10

Fault tracing

Contents of this chapter

This chapter describes the fault tracing of the brake unit.

Fault indications

A fault in the resistor brake circuit prevents fast motor deceleration and can cause the drive to trip on a fault.

If a fault is detected by the chopper control unit, the brake chopper disconnects the brake resistor from the intermediate circuit, and a chopper fault indication relay output is de-energized.

Depending on the application, the relay output RO3 opens the drive main contactor/breaker, or the relay output RO2 opens the output contactor of the brake unit (+F269). The relay output RO2 can give a fault indication to the overriding control system. Refer to the circuit diagrams of the delivery.

Fault indication/Fault	Cause	What to do
Fault indication relay output (RO2) switches off the main power or gives a fault indication to an overriding control system.	Chopper or resistor overheated.	Let the equipment cool.
	Digital input for the temperature fault is at value 0 = overtemperature, although there is no overtemperature.	Check temperature sensor connections at the brake control unit end and at the temperature sensor end. Check the sensor. Replace the faulty sensor.
	Short circuit in resistor or power cables.	Check the power cables and the resistor.
	Chopper control board failure. Chopper damaged; it is not able to disconnect the resistor from the intermediate circuit.	Contact the local ABB representative.
Current fault monitoring (RO3) opens the drive main contactor/breaker or the brake unit output contactor	Earth fault in a resistor or power cable in an earthed network (2E08 Ext earth leakage) or short-circuit in the chopper module.	Check the power cables and the resistor. Contact the local ABB representative.
	An IGBT short-circuit fault (FE0B Current difference).	Refer to the firmware manual.
Chopper does not function.	Chopper voltage setting is too high. Inverter overvoltage control is on.	Check the voltage setting. Make sure that the DC overvoltage control (30.03) is disabled in all inverter units.
	Chopper control program has been configured to use external start or enable signals, and the signal is not on.	Refer to the firmware manual.
Chopper starts to function at too low a DC voltage.	Chopper voltage setting too low.	Check the voltage setting.
Inverter trips on fault 3210 DC link overvoltage.	Chopper voltage setting too high.	Check the voltage setting. Refer to the inverter unit firmware manual for more information.
Brake resistor or chopper overheats.	The maximum brake cycle exceeded or resistor cooling insufficient.	Check duty cycle and resistor cooling.

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 status LED indications, refer to the following table.

Location	LED	Indication
Control panel	Continuous green	The unit operates normally.
	Flickering green	Data is transferred between the PC and the unit through the USB connection of the control panel.
	Flashing green	There is an active warning in the unit.
	Continuous red	There is an active fault in the unit.
	Flashing red	There is a fault that requires the stopping and restarting of the drive/converter/inverter.
	Flashing 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 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		Indication
BAT	Green	Battery voltage of the real-time clock is sufficient (higher than 2.5 V).
	Off	Battery voltage is below 2.5 V, the battery is missing or the control unit is not powered.
PWR	Green	Internal voltage is sufficient.
FAULT	Red	Control program indicates that the equipment is faulty. Refer to the appropriate firmware manual.
WRITE	Yellow	Writing to microSDHC card in progress.
FS COMM	Green	Reserved
FS STATUS	Green	Reserved

R8i power 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 sufficient (> 21 V).

Warning and fault messages

Refer to (3AXD50001150723 [English]).

11

Maintenance

Contents of this chapter

This chapter instructs how to maintain the brake unit.

Maintenance intervals

The tables show the maintenance tasks that can be done by the end user. For the ABB Service offering, contact your local ABB Service representative (new.abb.com/contact-centers).

Description of symbols

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

Recommended maintenance intervals after start-up

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	
CIO-module for fan control (115 VAC) [1)]							I/R						R	
Batteries														
Control panel battery										R				
Control unit battery							R						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
Functional safety														
Safety function test	I See the maintenance information of the safety function.													
Safety component expiry (Mission time, T_M)	20 years													

Maintenance task/object	Years from start-up													
	0	1	2	3	4	5	6	7	8	9	10	11	12	...
														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]).

Note:

- The maintenance and component replacement intervals are valid when the equipment operates within the specified ratings and ambient conditions. ABB recommends annual drive inspections.
- Long-term operation near the specified maximum ratings or ambient conditions may require shorter maintenance intervals for certain components. Contact 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, refer to the firmware manual.

Cabinet

Cleaning the interior 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 electrical installation, commissioning or maintenance work.

NOTICE Use an antistatic wrist strap and a vacuum cleaner with an antistatic hose and nozzle. A normal vacuum cleaner creates static discharges which can cause damage to circuit boards.

1. Stop the drive and do the steps in Electrical safety precautions (page 43) 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

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 electrical installation, commissioning or maintenance work.

1. Stop the drive and do the steps in Electrical safety precautions (page 43) before you start the work.
2. Clean the exterior. Use:
   - vacuum cleaner with an antistatic hose and nozzle
   - soft brush
   - dry or damp (not wet) cleaning cloth. Moisten with clean water, or mild detergent (pH 5…9 for metal, pH 5…7 for plastic).

   NOTICE Do not use too much water, a hose, or steam to clean the drive. Moisture can go into the drive and cause damage.

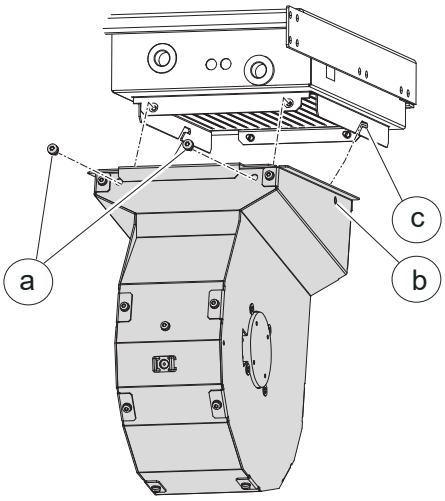
Fan replacement

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 electrical installation, commissioning or maintenance work.

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

1. Stop the drive and do the steps in Electrical safety precautions (page 43) before you start the work.
2. Open the door.
3. Remove any shrouding in front of the cooling fan (option +C121).
4. Disconnect the fan wiring. Remove the CIO module.
5. Remove the two retaining screws (a).
6. Pull the fan outwards to separate it from the heat exchanger housing.
7. 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 install the retaining screws (a).



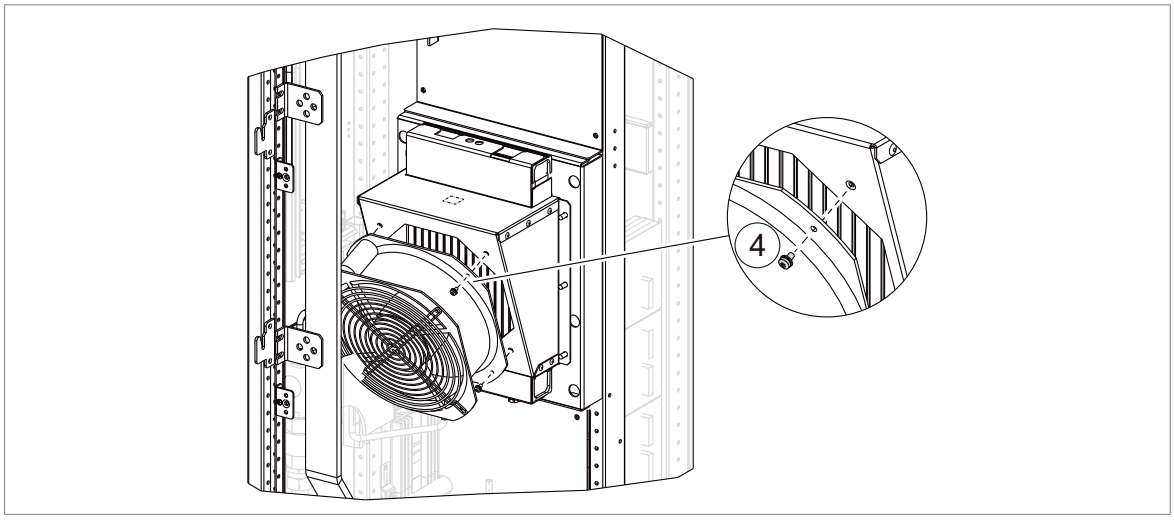
Fan in the output cubicle, top cable entry (option +H351)

⚠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, commissioning, 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 43).
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.

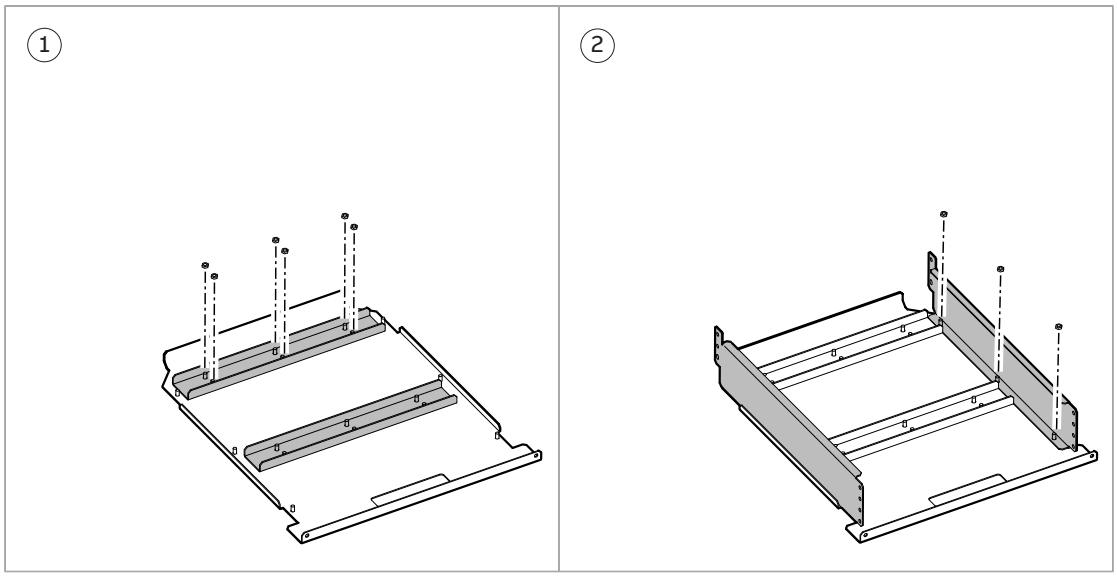


Brake module

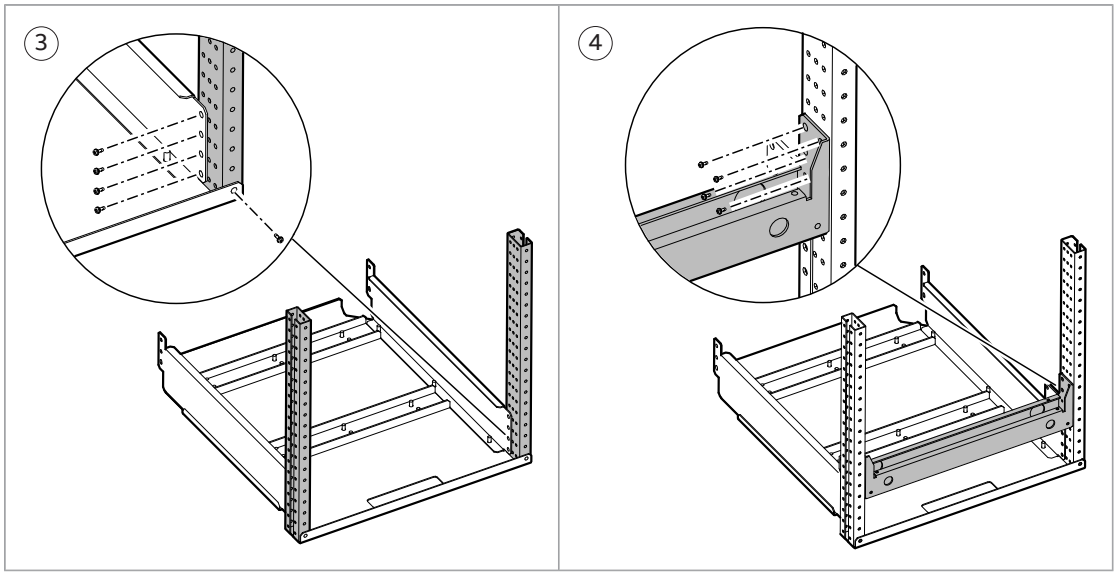
Assembling the service platform

The service platform is included in the cabinet delivery. Use the platform when you remove or install power modules of a liquid-cooled drive. Use the platform with module sizes R7i, R8i, and D8T. Measure the required height of the platform ahead to assemble the platform correctly.

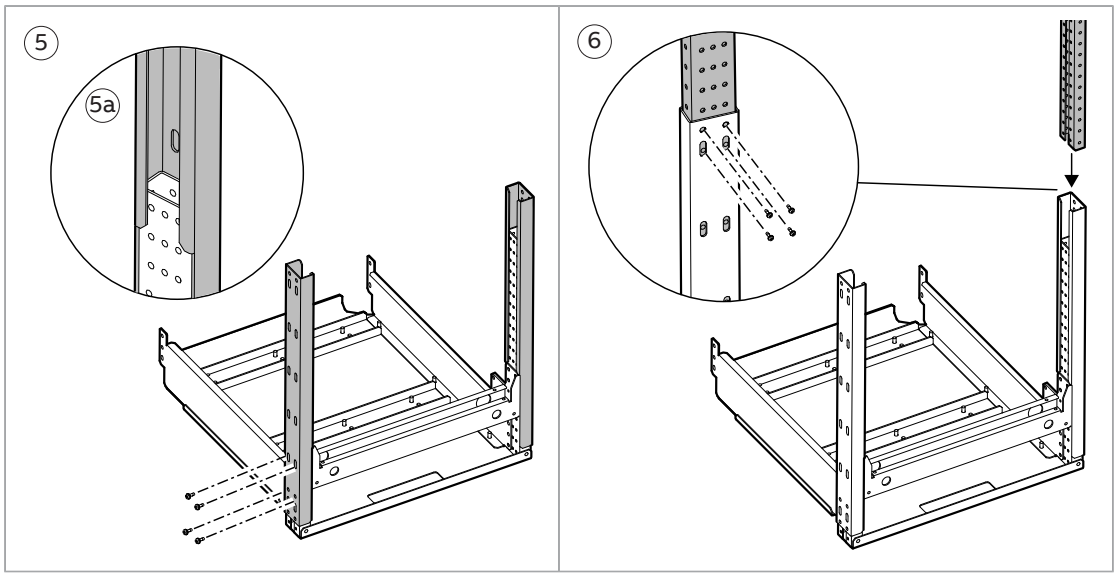
1. Choose a slide plate according to the width of the frame. Attach the two horizontal supports to the slide plate (6 × counter nuts for each horizontal support for 500 mm wide and 10 × counter nuts for 700 mm wide slide plate). Tighten to 5 N·m / 44.3 lbf·in.
2. Attach the two side supports to the slide plate (3 × counter nuts for each side support, torque: 5 N·m / 44.3 lbf·in).



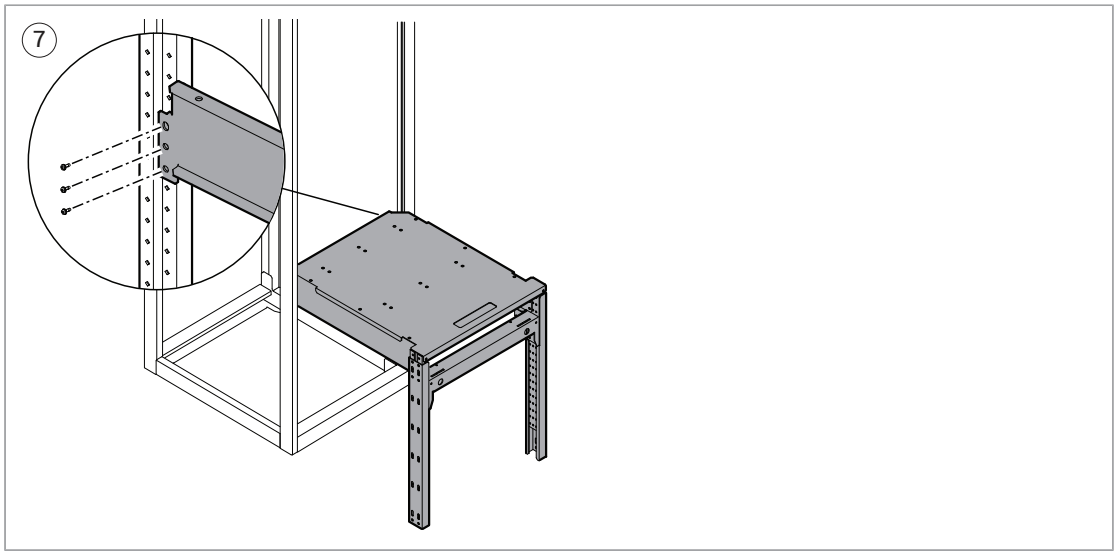
3. Attach the support legs to the side supports (5 × M6 self-tapping screws for each leg, torque: 5 N·m / 44.3 lbf·in).
4. Attach a horizontal support beam between the support legs (8 × M6 self-tapping screws). Make sure that the guide pins are correctly inserted in the holes of the support leg. Tighten the screws to torque (5 N·m / 44.3 lbf·in).



5. Slide braces over the support legs. Adjust the height of the support leg + brace according to the total height required for the service platform. Attach the braces to the legs (4 × M6 self-tapping screws for each brace, torque: 5 N·m / 44.3 lbf·in). Important: The brace must go long enough over the support leg. Refer to detail 5a.
6. If the total height of the support legs + braces is less than the total height required, attach additional support legs to the braces. Attach the additional legs on the braces (4 × M6 self-tapping screws for each additional leg, torque: 5 N·m / 44.3 lbf·in). When using additional support legs, attach an additional support beam between the support legs at a suitable height.



7. Attach the assembled service platform to the frame from the side supports (6 × M6 self-tapping screws, torque: 5 N·m / 44.3 lbf·in).



⚠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 electrical installation, commissioning or maintenance work.

⚠WARNING If screws or other items fall inside the drive or module, find and remove them. Unwanted items inside the drive can cause a short-circuit or arc blast when the drive is energized.

⚠WARNING The module is heavy. Reserve two persons, hoist and a suitable platform for the replacement procedure. Keep the module fastened to the hoist to prevent the module from falling. For information on a lifting device available from ABB, refer to Converter module lifting device for drive cabinets hardware manual (3AXD50000210268 [English]).

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

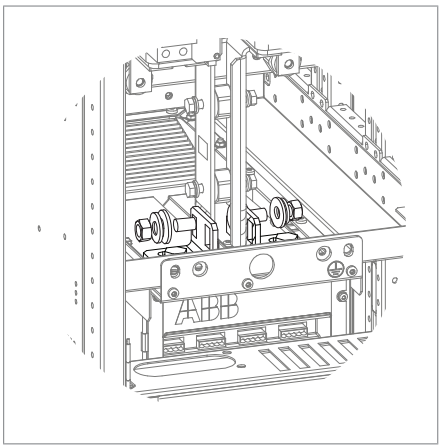
⚠CAUTION Stop the pumps and drain the coolant before you do work on the liquid cooling system. There is high-pressure hot coolant (6 bar, max. 50 °C) in the cooling circuit when it is in operation.

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

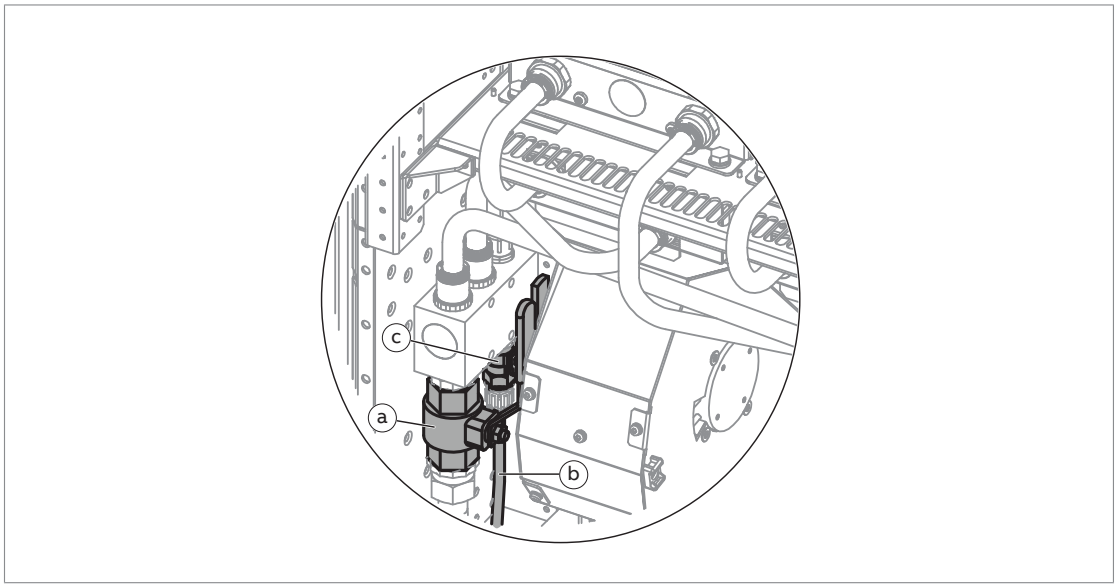
Removing the module

1. Stop the drive and do the steps in Electrical safety precautions (page 43) before you start the work.
2. Assemble the service platform delivered with the drive. Refer to section Assembling the service platform. Attach the service platform to the cabinet only before you are ready to pull out the module out of the cabinet.
3. Install the converter module lifting device by ABB, or make sure that you have another winch in use. For information on a lifting device available from ABB, refer to Converter module lifting device for drive cabinets hardware manual (3AXD50000210268 [English]).
4. Remove the shrouding in front of the module.
5. Remove the fastening screws (a) of the swing-out frame and open it (b).
6. Disconnect the wires from the module and move them aside. Use cable ties to keep the wires out of the way.

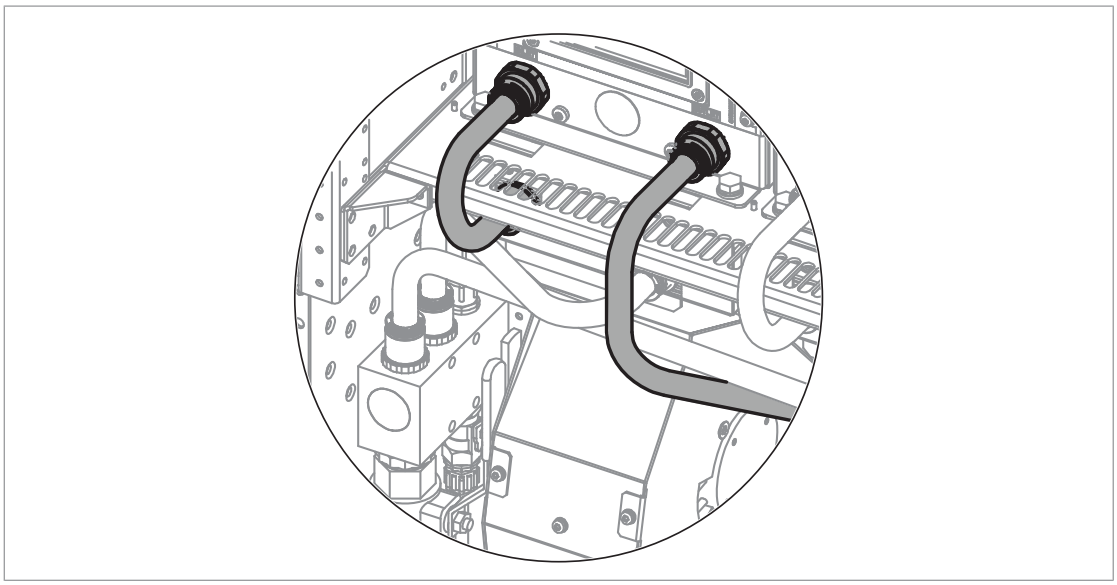
7. Remove the L-shaped DC busbars at the top of the module. Make note of the orientation of the screws as well as the order of the washers.



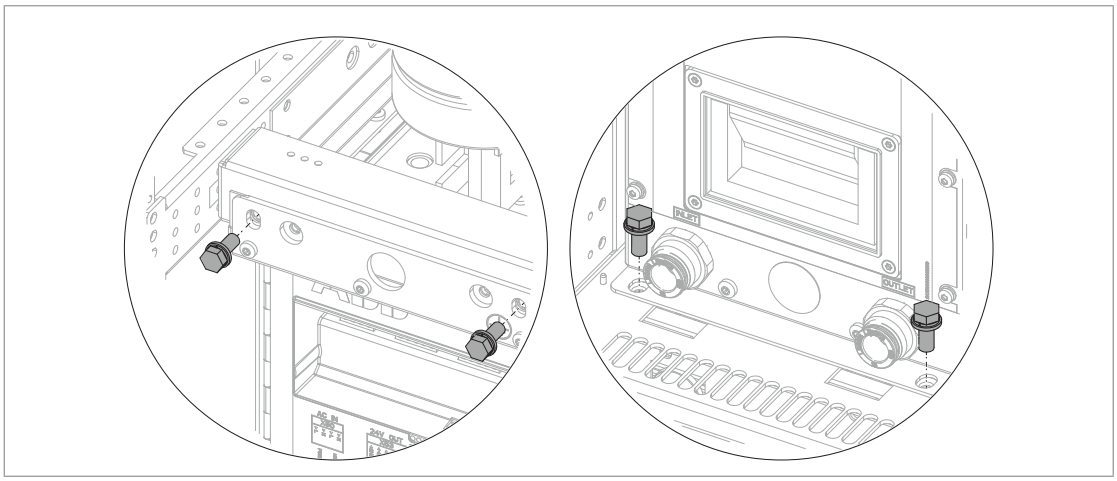
8. Close the inlet valve (a) (located on the left-hand side of the cubicle) and outlet valve (located on the right-hand side of the cubicle). Lead the drain hoses (b, on both sides of the cubicle) into a suitable container. Open the drain valves (c, on both sides of the cubicle). This will drain all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



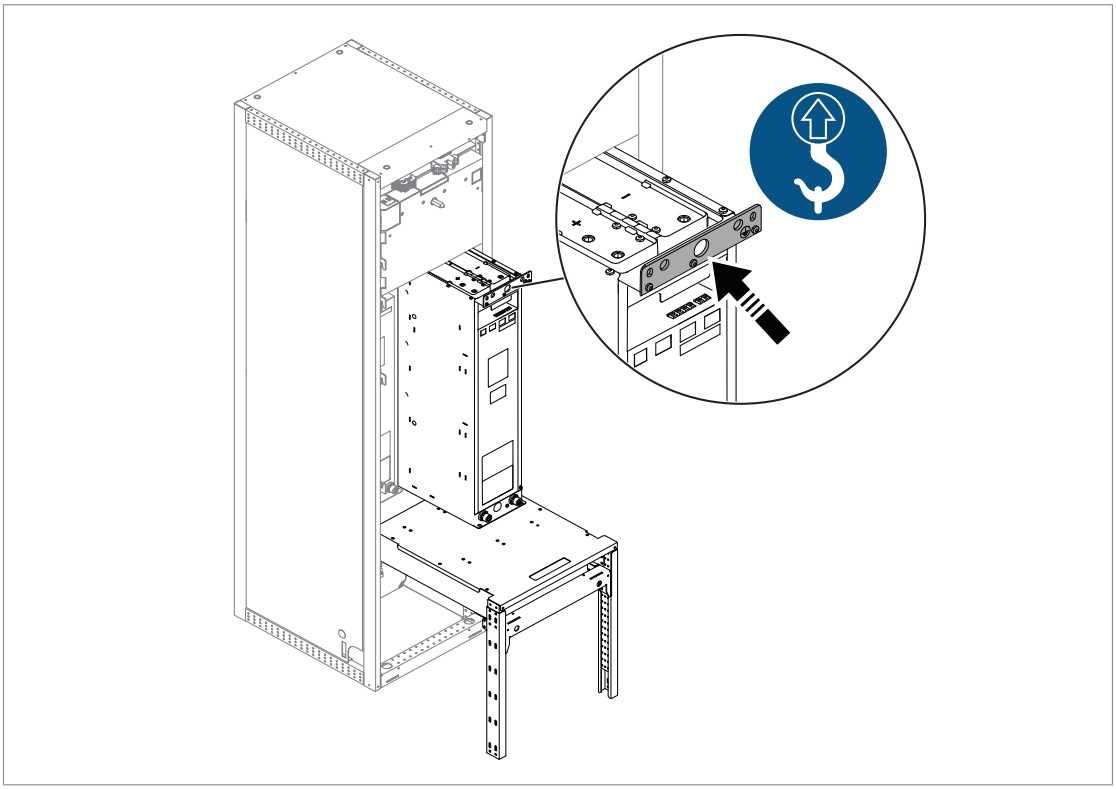
9. After the module has drained, disconnect the piping from the module.



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



11. Pull the module carefully out onto the service platform. Attach the module secured to a hoist or equivalent to prevent the module from falling. For information on using the lifting device, refer to Converter module lifting device for drive cabinets hardware manual (3AXD50000210268 [English]).



Installing the module

1. Assemble the service platform delivered with the drive, if it is not yet assembled. Refer to section Assembling the service platform (page 87).
2. Install the converter module lifting device by ABB, or make sure that you have another winch in use. For information on a lifting device available from ABB, refer to Converter module lifting device for drive cabinets hardware manual (3AXD50000210268 [English]).
3. Attach the lifting device to the spare module to be installed, and lift it onto the service platform.
4. Push the module carefully into its bay.
5. Fasten the retaining screws at the top and the bottom of the module.
6. Install the DC busbars at the top of the module. Tighten the fastening bolts to 70 N·m (51.6 lbf·ft).
7. Connect the coolant pipes to the module. Tighten to the specified torque. R8i module coolant connections: 15 N·m (11.1 lbf·ft). Other connections: 20 N·m (14.75 lbf·ft).
8. Connect the control wiring to the module.
9. Fill up the cooling system. For instructions, see section Filling up and bleeding the internal cooling circuit.
10. Remove the service platform and lifting device, if they were assembled earlier.
11. Close the swing-out frame (if present). Install all shrouds removed earlier.

Capacitors

The intermediate DC circuit of the drive contains several electrolytic capacitors. The operating time, load, and surrounding air temperature have an effect on the operating life of these capacitors. A lower ambient temperature can increase the operating life of capacitors.

Capacitor failure can cause damage to the unit, 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

Reform the capacitors if the drive was not powered for a year or more (is in storage or is unused). Read the manufacturing date from the type designation label. For the instructions, refer to Capacitor reforming instructions (3BFE64059629 [English]).

Fuses

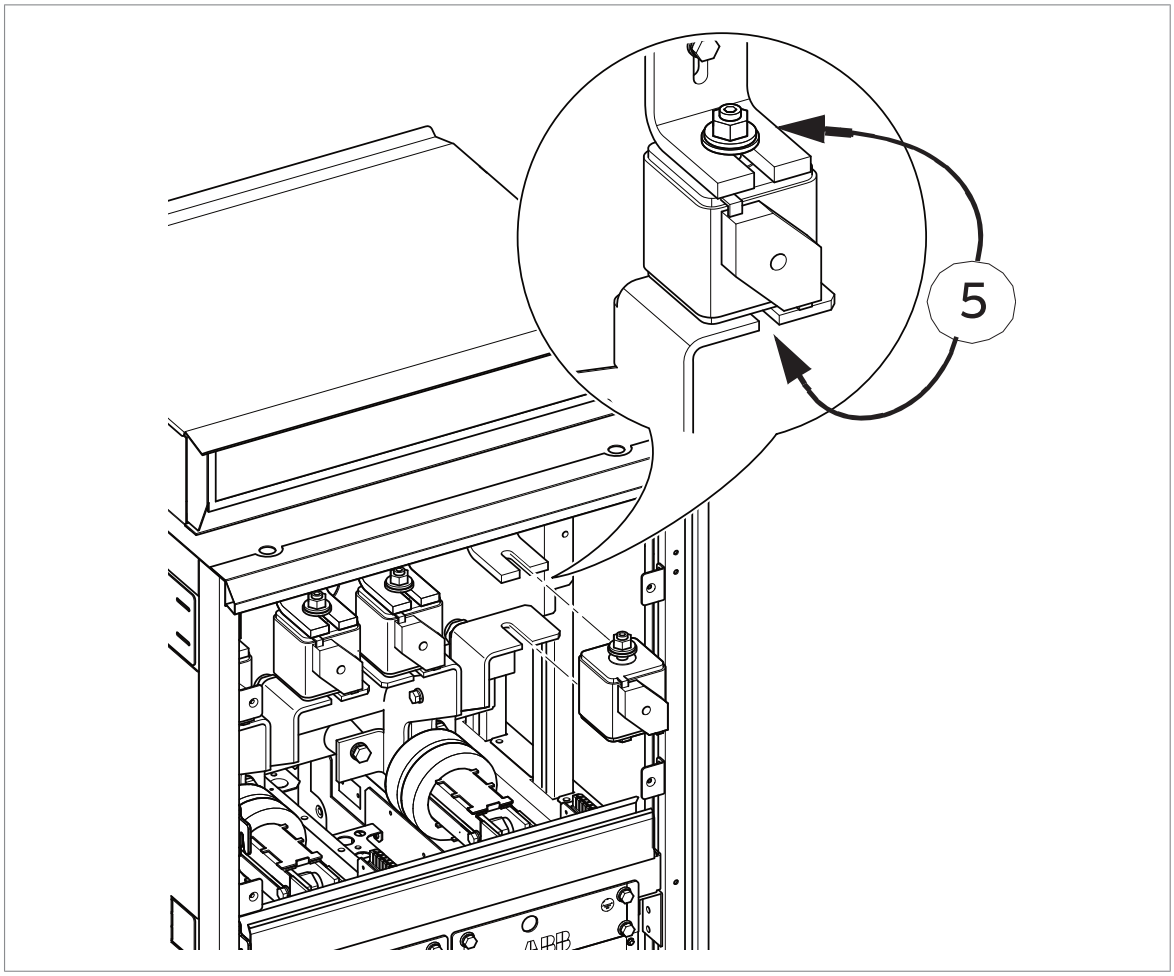
Replacing the brake chopper fuses

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

⚠WARNING If screws or other items fall inside the drive or module, find and remove them. Unwanted items inside the drive can cause a short-circuit or arc blast when the drive is energized.

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

1. Stop the drive and do the steps in Electrical safety precautions (page 43) before you start the work.
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.

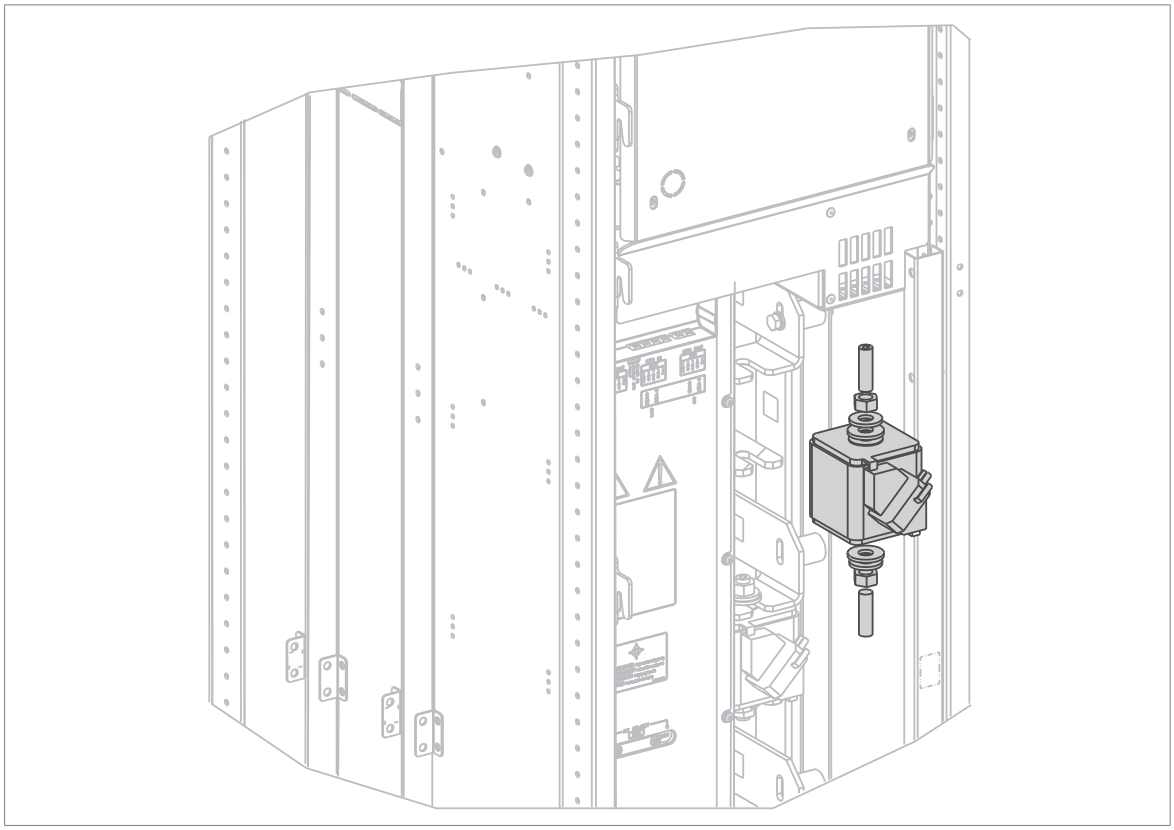

5

Replacing the resistor fuses

⚠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, commissioning, 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 43) 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

Refer to:

- ACS-AP-I, -S, -W Assistant control panels user's manual (3AUA0000085685 [English])
- ACS-BP-S basic control panels user's manual (3AXD50000032527 [English]).

Control unit

Refer to UCU-22, UCU-23 and UCU-24 control units hardware manual (3AXD50000817726 [English]) for the replacement instructions of:

- real-time clock battery
- memory unit
- microSDHC memory card
- control unit.

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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 multidrives modules.

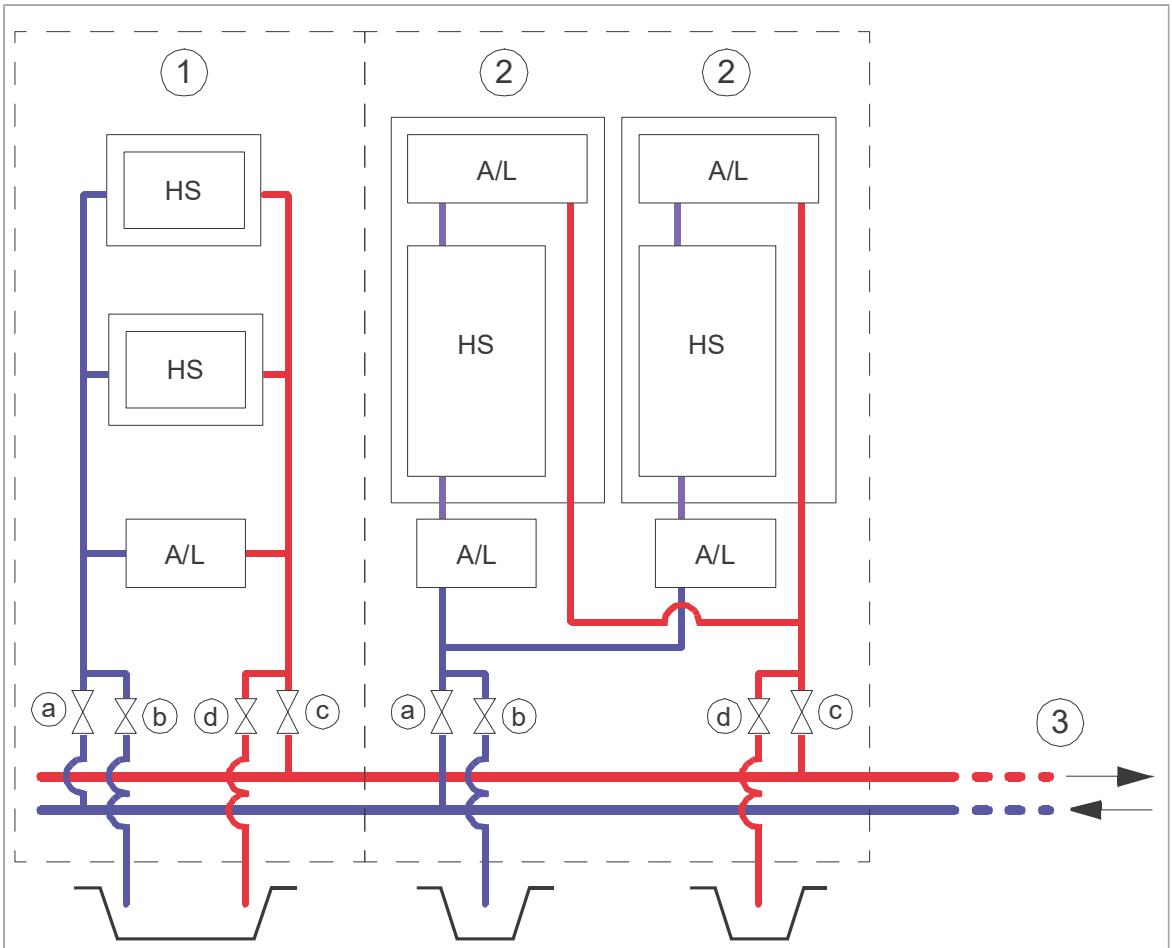
Internal cooling system

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. Other units, such as brake units, DC/DC converter units have similar cooling arrangements. Other cubicles containing components that require cooling may also contain heat exchangers.



1	Supply modules. The drawing shows the configuration of a diode supply unit with two modules, 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 103).

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 tank 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 for the internal cooling circuit (page 103). 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 106).

Coolant temperature control

The temperature of the coolant in the internal cooling circuit must be kept within the limits specified in Technical data for the internal cooling circuit (page 103). 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.

NOTICE 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.

NOTICE Bleeding of the cooling circuit is very important and must be done carefully. Air bubbles in the cooling circuit can decrease or completely stop coolant flow and cause overheating. Let the air out of the cooling system while filling in coolant, and after maintenance work (for example, after a power module replacement).

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

Obey 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 the coolant specification, refer to section Coolant specification (page 103).
   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…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 approximately 250 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…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.

⚠CAUTION Stop the pumps and drain the coolant before you do work on the liquid cooling system. There is high-pressure hot coolant (6 bar, max. 50 °C) in the cooling circuit when it is in operation.

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 103).
   - drain the cooling circuit again.

Maintenance intervals of the internal cooling circuit

The coolant replacement interval is specified in the maintenance table. If it is necessary to examine the quality of Antifrogen® L coolant between the replacement intervals, you can send a sample to Clariant through the sample submission process. See 'Antifrogen analysis service' at www.clariant.com. To start the sample submission process, you must buy a voucher. You can buy vouchers from Antifrogen® L distributors or through your local ABB representative.

Technical data for the internal cooling circuit

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.

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 permitted regardless of the freezing point of the coolant.

NOTICE The warranty does not cover damage that occurs from the use of incorrect coolant.

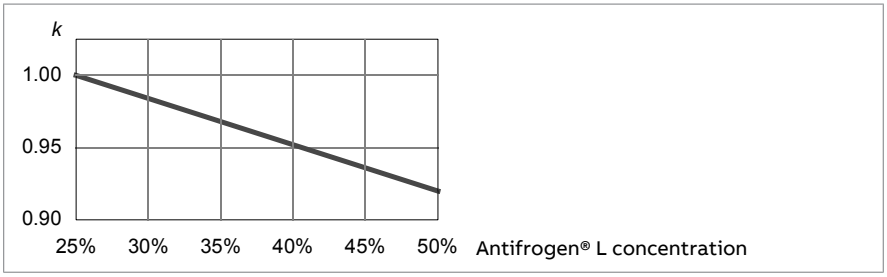
Temperature limits

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 105).

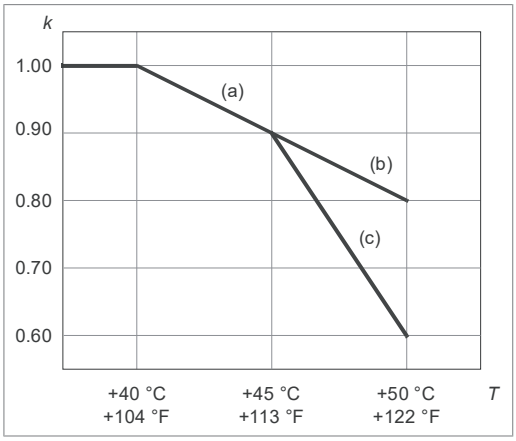
The nominal current ratings of drive system modules apply to an Antifrogen® L / water solution of 25/75% (volume). With the Antifrogen® L concentration between 25% and 50%, the drive output current must be derated by 1/3 percentage point per 1 p.p. increase in Antifrogen® L concentration. The drawing 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 permitted. 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 permitted as standard but the coolant temperature must be 0 °C (32 °F) or more.
Example:	At an air temperature of 45 °C and relative humidity of 65% the coolant temperature must not be less than +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

Note: The pressure limits for ACS880-1007 cooling units manufactured before week 24 of 2020 are given in ACS880-1007LC user's manual, revision C.

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 tank (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.

- 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).

NOTICE If you connect external piping to the internal cooling circuit, use only materials that are specified above. Other materials can cause galvanic corrosion. If the external piping contains other materials, use a cooling unit with a heat exchanger (for example, ACS880-1007LC) to keep the external piping separate from the internal cooling circuit.

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Technical data

Contents of this chapter

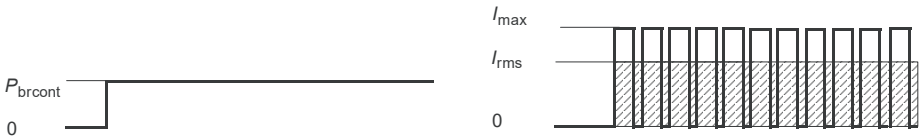
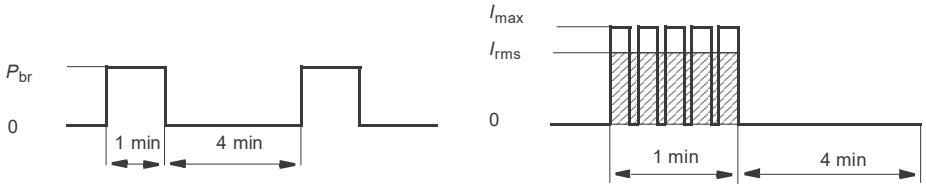
This chapter contains the technical data.

Ratings

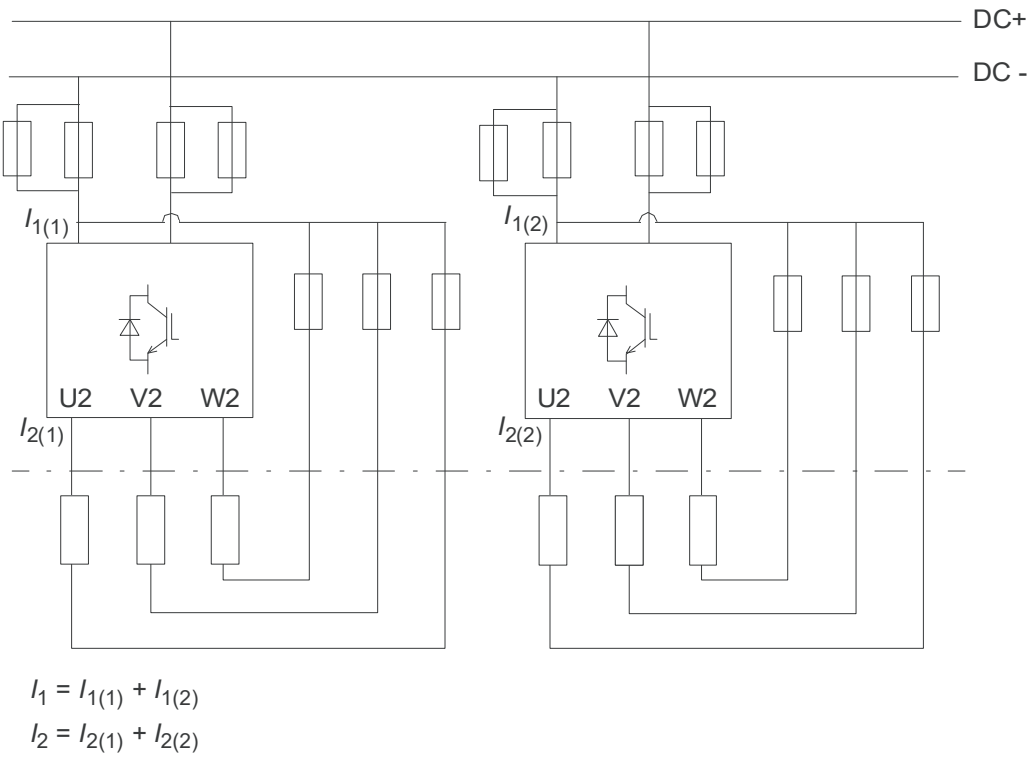
ACS880-607LC-...	Frame size	Brake resistor values		Ratings with R_{min}						
				No overload use			Cyclic load (1 min / 5 min)			
		R_{min}	R_{max}	I_1	I_2	$P_{cont-max}$ (S_n)	I_{max}	I_{dc}	I_{rms}	P_{br}
		Ohm	Ohm	A DC	A DC	kW (kVA)	A DC	A DC	A DC	kW
U_n = 690 V										
0870-7	R8i	3.0	3.6	781	310	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	$P_{cont-max}$ (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. 
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. 

Example: Brake unit with two parallel connected modules



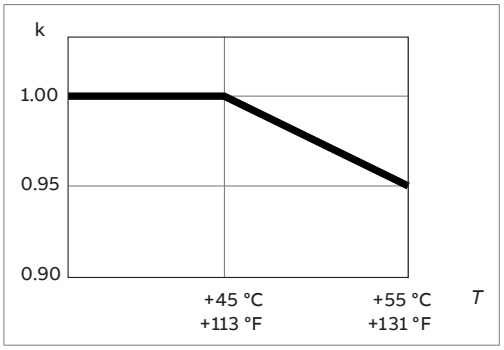
$I_1 = I_{1(1)} + I_{1(2)}$

$I_2 = I_{2(1)} + I_{2(2)}$

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 104).

Antifreeze content derating

See section Temperature limits (page 104).

Altitude derating

At altitudes more than 1000 m (3281 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. The maximum permitted installation altitude is given in the technical data.

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

Frame sizes and modules used

Brake unit type ACS880-607LC-...	Basic power module(s) used		
	Frame size	Qty	Type
U_n = 690 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 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 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 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 [2)]	Width [3)]	Depth	Weight [1)]	Weight [3)]
	mm	mm	mm	mm	mm	mm	kg	kg
U_n = 690 V								
0870-7	2002	2066	250	400	700	644	370	610
1300-7	2002	2066	250	400	700	644	370	610
1730-7	2002	2066	250	800	1400	644	740	1220
2600-7	2002	2066	250	800	1400	644	740	1220
3900-7	2002	2066	250	1200	2100	644	1110	1830
5200-7	2002	2066	250	1600	2800	644	1480	2440
6500-7	2002	2066	250	2000	3500	644	1850	3050

1) Bottom exit of cables.
2) Top exit of cables.
3) Top exit of cables or bottom exit of cables with option +F269.

Losses, cooling data and noise

ACS880-607LC-...	Coolant volume				Coolant flow		Heat dissipation	Pressure loss	Noise
	Module		Cabinet		l/min	US gal/min	kW	kPa	dB(A)
	l	US gal	l	US gal					
U_n = 690 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

These losses are not calculated according to the ecodesign standard IEC 61800-9-2.

Terminal and cable entry data for the resistor cables

Refer to Dimension drawings (page 121).

Tightening torques

Unless a tightening torque is specified in the text, these 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 (A2-70 or A4-70)
M10	32 N·m (23.5 lbf·ft)	8.8
M12	50 N·m (37 lbf·ft)	8.8

Typical power cable sizes

The tables below give the current carrying capacity (I_{Lmax}) and typical size for copper and aluminum cables with PVC or XLPE insulation. A correction factor K = 0.70 is used. Time const. is the temperature time constant of the cable.

The cable sizing is based on a maximum of 9 cables installed side by side on a ladder-type cable tray, with three trays on top of each other (with 30 cm of space between the trays), and an ambient temperature of 30 °C (IEC 60364-5-52).

Conductor cross-section (copper)		PVC insulation Conductor temperature 70°		XLPE insulation Conductor temperature 90°		Typical dimensions of copper cable	
mm²	AWG / kcmil	I_{Lmax} (A)	Time const. (s)	I_{Lmax} (A)	Time const. (s)	Size	ø [mm]
1.5	16	13	85	16	67	3 × 1.5 + 1.5	13
2.5	12	18	121	23	88	3 × 2.5 + 2.5	14
4	12	24	175	30	133	3 × 4 + 4	16
6	10	30	251	38	186	3 × 6 + 6	18
10	8	42	359	53	268	3 × 10 + 10	21
16	6	56	514	70	391	3 × 16 + 16	23
25	4	71	791	89	598	3 × 25 + 16	24
35	1	88	1000	110	760	3 × 35 + 16	26
50	1/0	107	1308	134	990	3 × 50 + 25	29
70	2/0	137	1613	171	1230	3 × 70 + 35	32
95	4/0	167	2046	209	1551	3 × 95 + 50	38
120	250	193	2441	241	1859	3 × 120 + 70	41
150	300	223	2820	279	2139	3 × 150 + 70	44
185	400	255	3329	319	2525	3 × 185 + 95	50
240	500	301	4073	376	3099	3 × 240 + 120	55
300	600	348	4779	435	3636	3 × 300 + 150	58

Conductor cross-section (aluminum)		PVC insulation Conductor temperature 70°		XLPE insulation Conductor temperature 90°		Typical dimensions of aluminum cable	
mm²	AWG / kcmil	I_{Lmax} (A)	Time const. (s)	I_{Lmax} (A)	Time const. (s)	Size	ø [mm]
35	1	67	736	84	669	3 × 35 + 10 Cu	26
50	1/0	82	959	102	874	3 × 50 + 15 Cu	29
70	2/0	105	1182	131	1079	3 × 70 + 21 Cu	32
95	4/0	128	1492	159	1376	3 × 95 + 29 Cu	38
120	250	148	1776	184	1637	3 × 120 + 41 Cu	41
150	300	171	2042	213	1881	3 × 150 + 41 Cu	44
185	400	196	2422	243	2237	3 × 185 + 57 Cu	49
240	500	231	2967	286	2740	3 × 240 + 72 Cu	54
300	600	267	3478	330	3229	3 × 300 + 88 Cu	58

Resistor connection

Voltage (U_2)	0…U_1 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	Nickel-plated or tin-plated copper

Control unit connection

Refer to Connector data (page 65).

Energy efficiency data (ecodesign)

Energy efficiency data is not provided for the drive/unit. Multidrives and multidrive modules are not in the scope of the EU ecodesign requirements (Regulation EU/2019/1781) or the UK ecodesign requirements (Regulation SI 2021 No. 745).

Efficiency

Approximately 98% at nominal power level.

The efficiency is not calculated according to the ecodesign standard IEC 61800-9-2.

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.
Arcing class (IEC TR 61641)	B – ASSEMBLY providing personnel and ASSEMBLY protection under arcing conditions. Tested at the following voltage with an arcing current of 65 kA for 300 milli-seconds: • 400 V units (indicated by "-4" in drive type): 420 V • 500 V units (indicated by "-5" in drive type): 550 V • 690 V units (indicated by "-7" in drive type): 760 V
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 … +70 °C (-40 … +158 °F)	-40 … +70 °C (-40 … +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 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 IEC/EN 60664-1	2		
Vibration IEC/EN 61800-5-1 IEC 60068-2-6:2007, EN 60068-2-6:2008	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	10…57 Hz: max. 0.075 mm amplitude 57…150 Hz: 1 *g*	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	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

Transportation

The table below specifies the transportation methods and conditions for the drive. The transportation conditions must also comply with the environmental limits specified in Ambient conditions (page 116). Seaworthy package (option +P912) is required for non-weather protected transportation conditions.

Package type	Method	Weather-protected conditions (IEC 60721-3-2)	Non-weather protected conditions (IEC 60721-3-2)
Standard package Wooden crate Vertical	Road, air, sea (in container). Special vehicle requirements: High-cube container. ABB recommends the use of container desiccant bags in sea transportation.	**2K12**: Transportation without temperature and humidity control allowed.	Not allowed.
Seaworthy package (option +P912) Wooden crate covered with plywood sheets Vertical	Road, air, sea (in container). Special vehicle requirements: High-cube container. ABB recommends the use of container desiccant bags in sea transportation.	**2K12**: Transportation without temperature and humidity control allowed.	**2K14:** Non-weather-protected transportation worldwide.

Storage conditions

The table below specifies the storage conditions for the drive. Store the drive in its package. ABB recommends seaworthy package (option +P912) if the drive is in long-term storage. The storage conditions must also comply with the environmental limits specified in Ambient conditions (page 116).

Package type	Storage conditions (IEC 60721-3-1)
Standard package Wooden crate Vertical	**1K20:** Up to 24 months in enclosed conditions (full temperature and humidity control). **1K22:** Up to 6 months in enclosed conditions (no temperature or humidity control). **1K23, 1K24**: Up to 3 months in sheltered conditions (roof providing protection from direct rain and sun). **1K25…1K27:** Up to 48 hours between loading operations in open-air conditions (no protection).
Seaworthy package (option +P912) Wooden crate covered with plywood sheets Vertical	**1K20:** Up to 24 months in enclosed conditions (full temperature and humidity control). **1K22:** Up to 12 months in enclosed conditions (no temperature or humidity control). **1K23, 1K24:** Up to 12 months in sheltered conditions (roof providing protection from direct rain and sun). **1K25…1K27:** Up to 1 month in open-air conditions (no protection). Not recommended, but can be temporarily allowed.

Color

RAL classic 7035 and RAL classic 9017.

Materials

Drive

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

Package materials for cabinet-installed high-power single drives and multidrives

- Plywood[1)]
- Wood
- PET (strapping)
- PE (VCI film)
- Metal (fixing clamps, screws)
- VCI emitter capsules
- Clay desiccant.

1) Seaworthy package only

Package materials for options, accessories and spare parts

- Cardboard
- Kraft paper
- PP (straps)
- PE (film, bubble wrap)
- Plywood, wood (only for heavy components)

The materials vary by item type, size, and shape. The typical package is a cardboard box with paper filling or bubble wrap. ESD-safe packaging is used for printed circuit boards and similar items.

Materials of manuals

Printed product manuals are made of recyclable paper.

Disposal

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

In general, all metals, such as steel, aluminum, copper, and its alloys, and precious metals can be recycled. Plastics, rubber, cardboard, and other packaging materials can be used in energy recovery.

Printed circuit boards and DC capacitors require selective treatment according to IEC 62635 guidelines.

To aid recycling, most plastic parts are marked with an appropriate identification code. Components that contain Substances of Very High Concern (SVHCs) are listed in the European Chemicals Agency SCIP database. SCIP is the database for information on Substances of Concern in articles as such or in complex objects (products) established under the Waste Framework Directive (2008/98/EC). For more information, contact your local ABB distributor or consult the European Chemicals Agency SCIP database to determine which SVHCs are used in the product and where the components are located.

Contact your local ABB distributor for more information on environmental aspects. End-of-life treatment must obey international and national regulations.

For more information on ABB end-of-life services, refer to new.abb.com/service/end-of-life-services.

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.

Cyber security disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. It is the Customer's sole responsibility to provide and continuously ensure a secure connection between the product and the Customer network or any other network (as the case may be). The 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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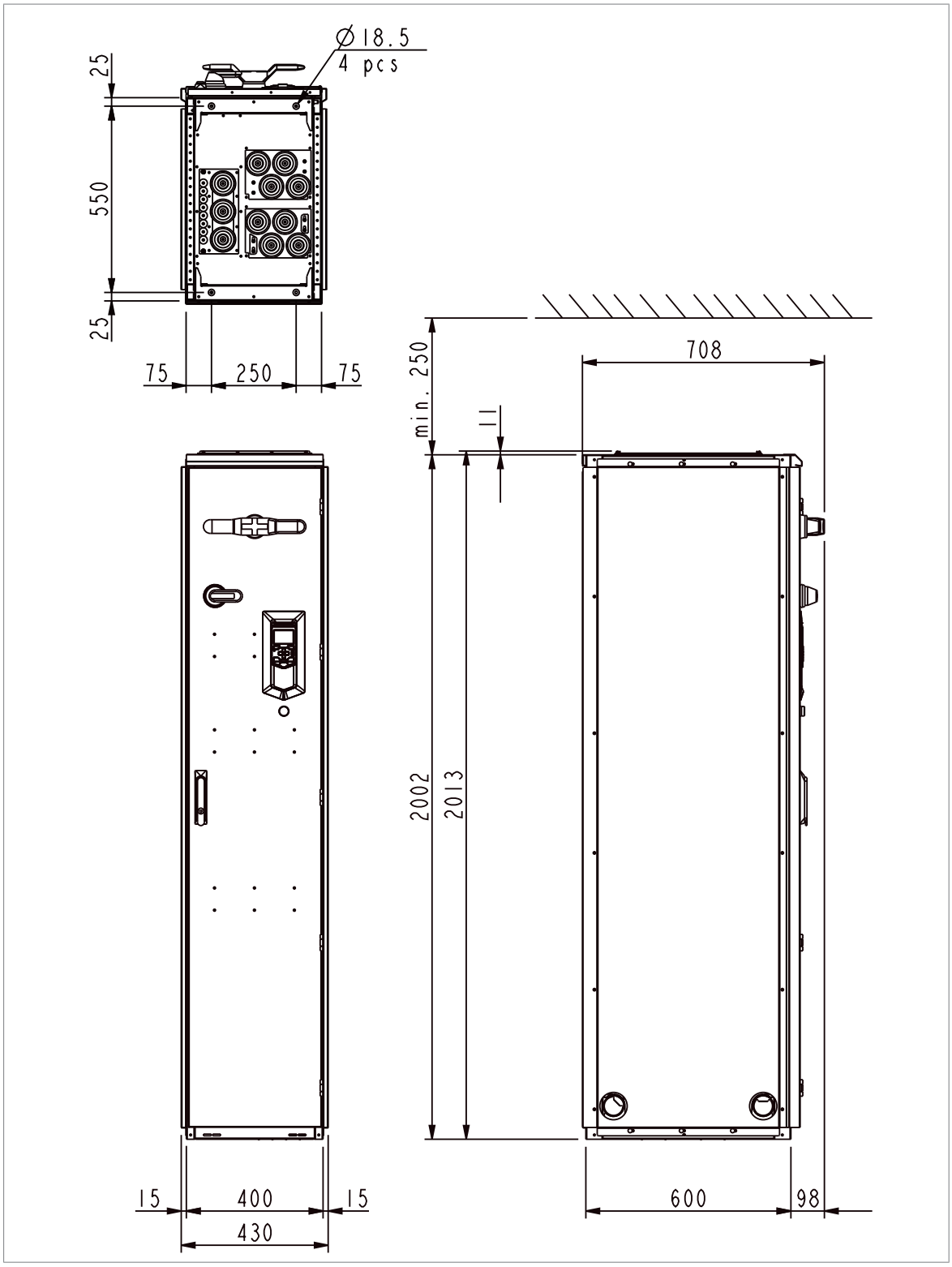
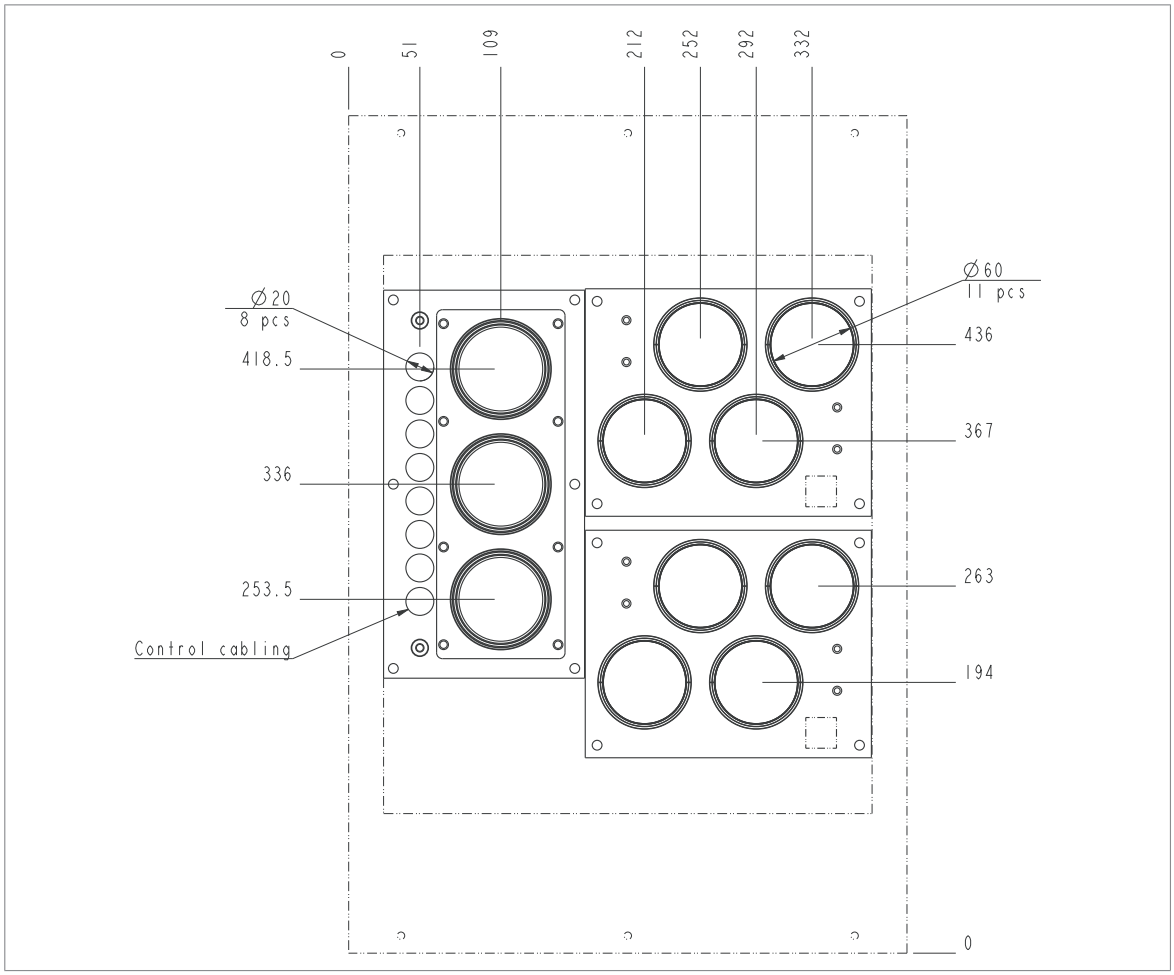
Dimension drawings

Contents of this chapter

This chapter contains dimension drawings for the brake unit. Dimensions are in millimetres (1 mm = 0.0394 in).

Dimension drawing – bottom exit

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Control cabling
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11 pcs
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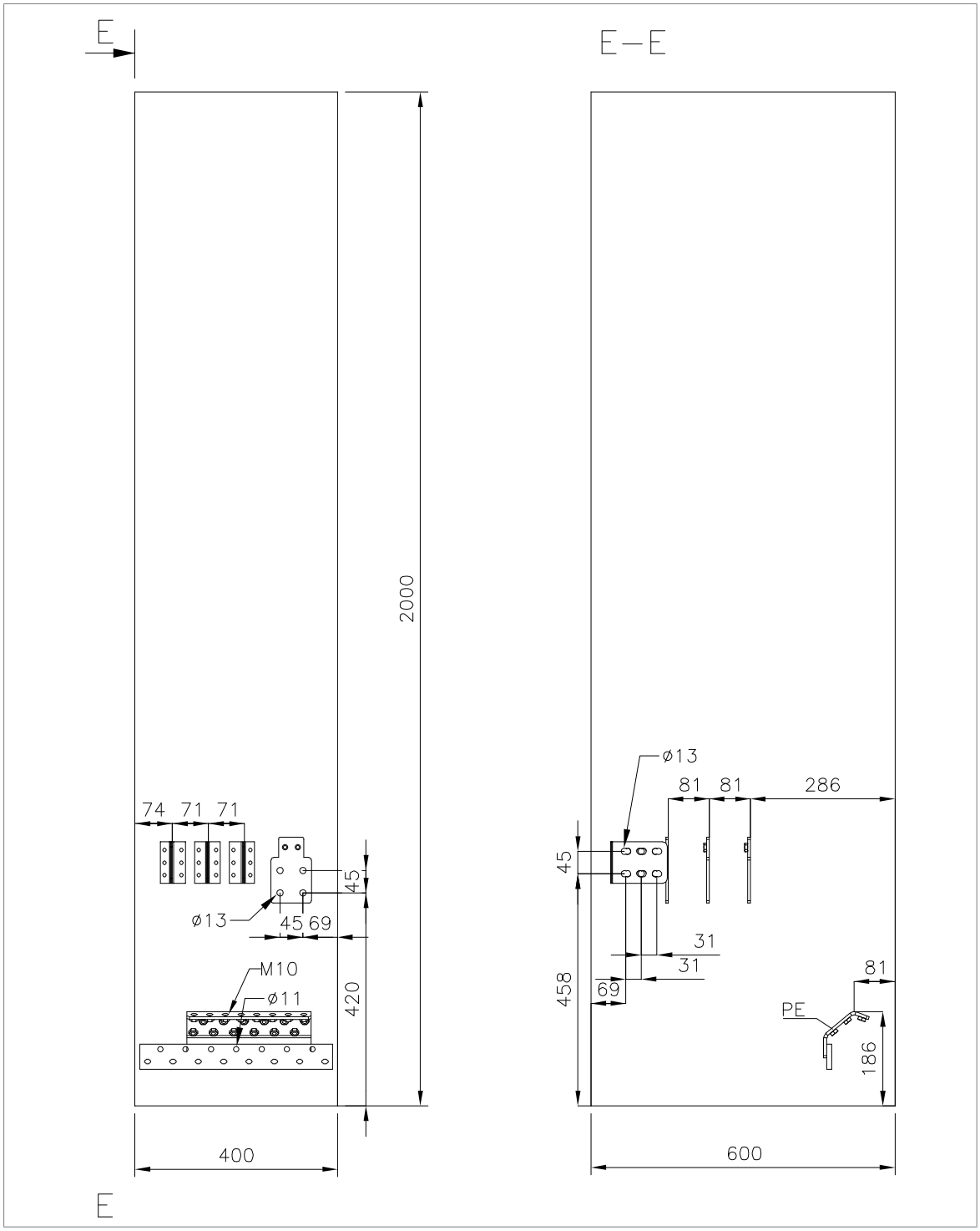
Terminals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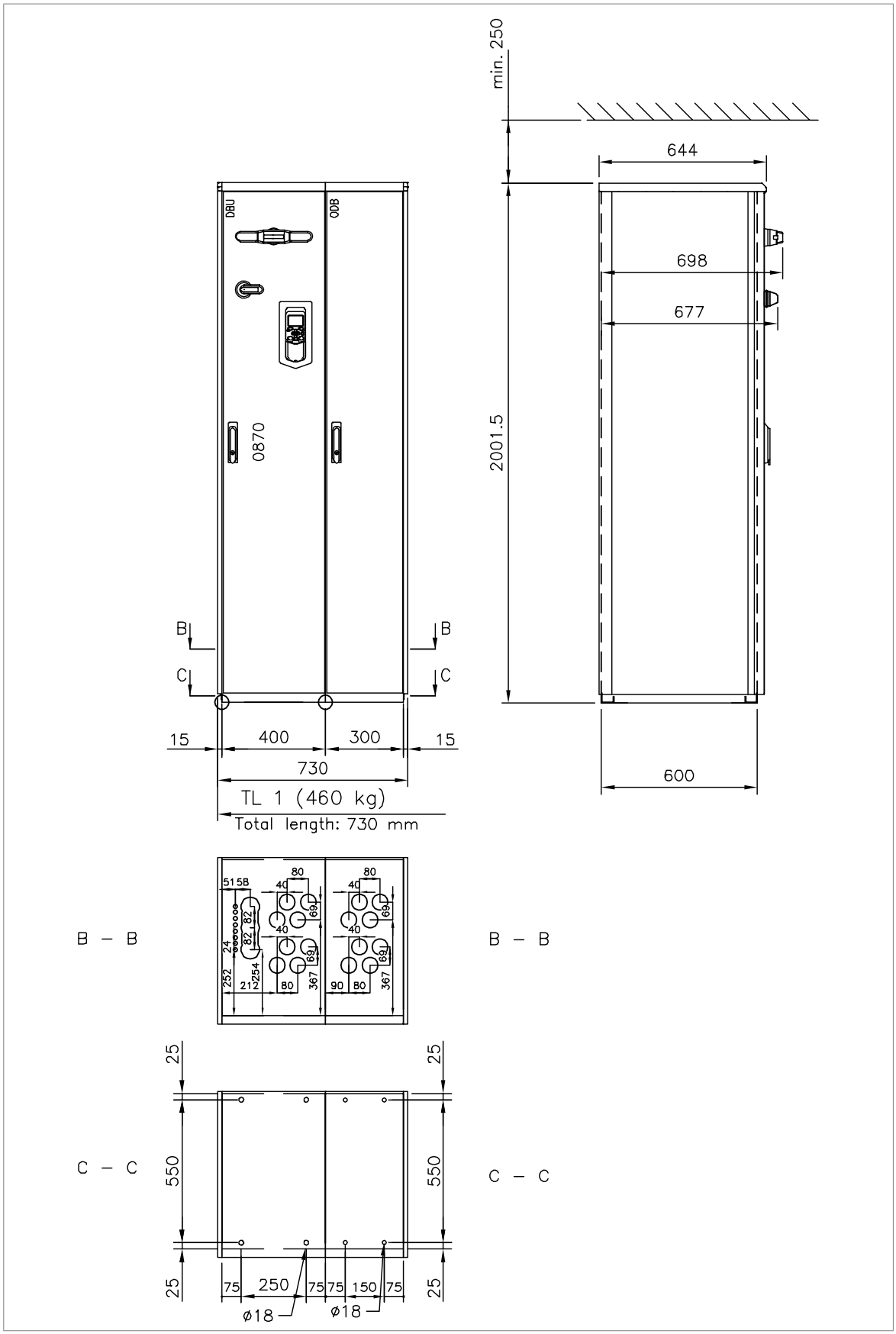
Dimension drawing – bottom exit with option +F269



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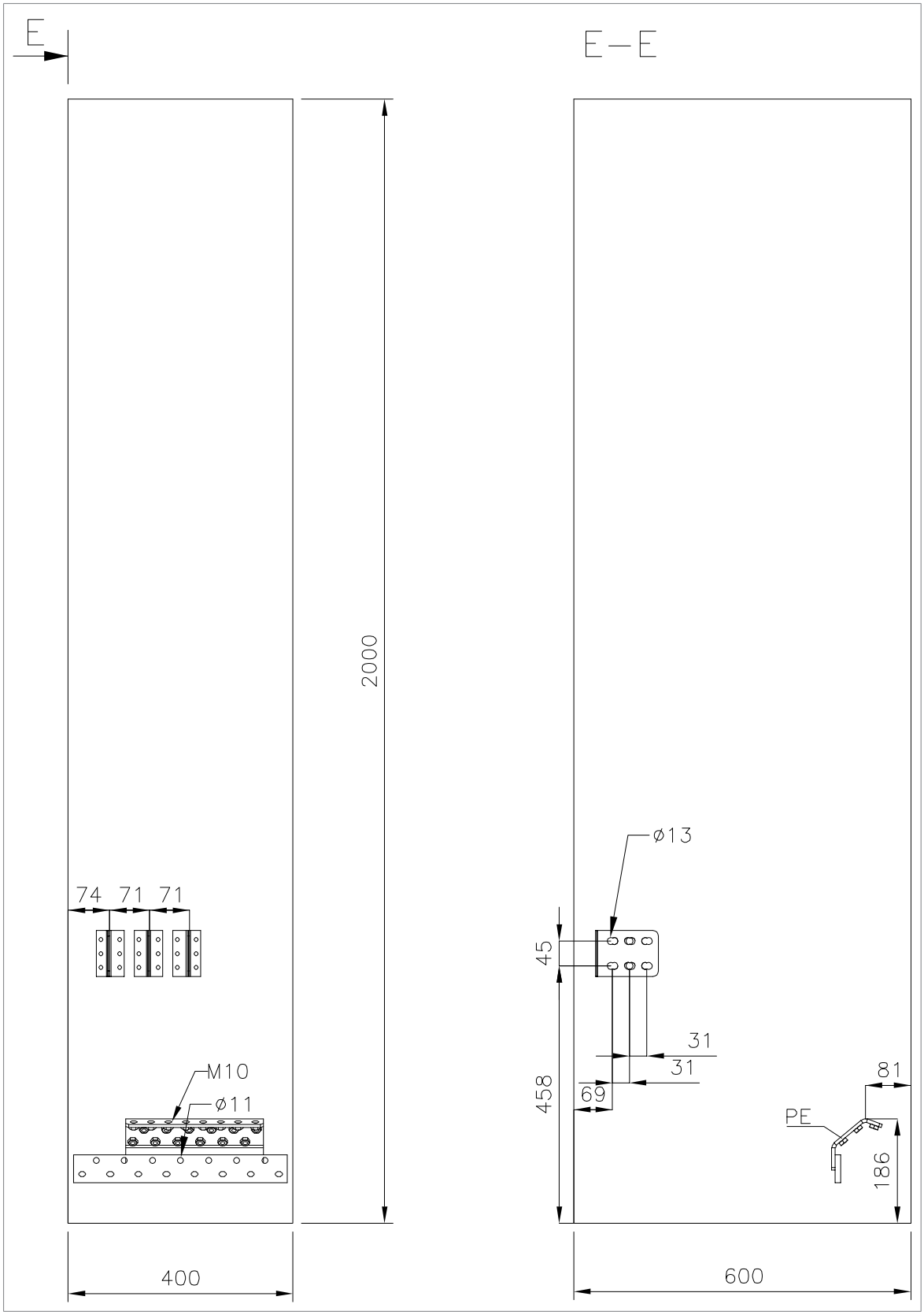

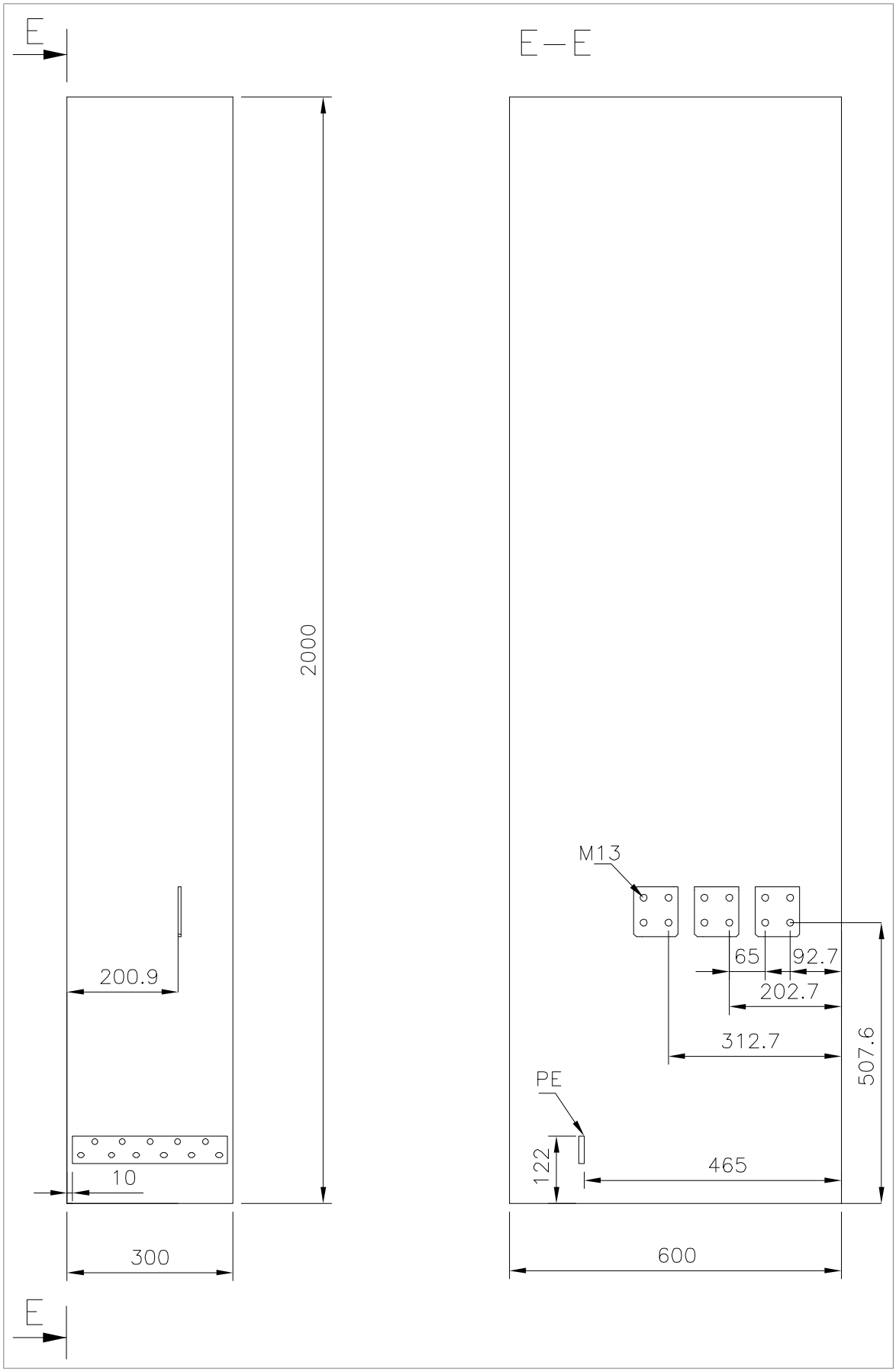
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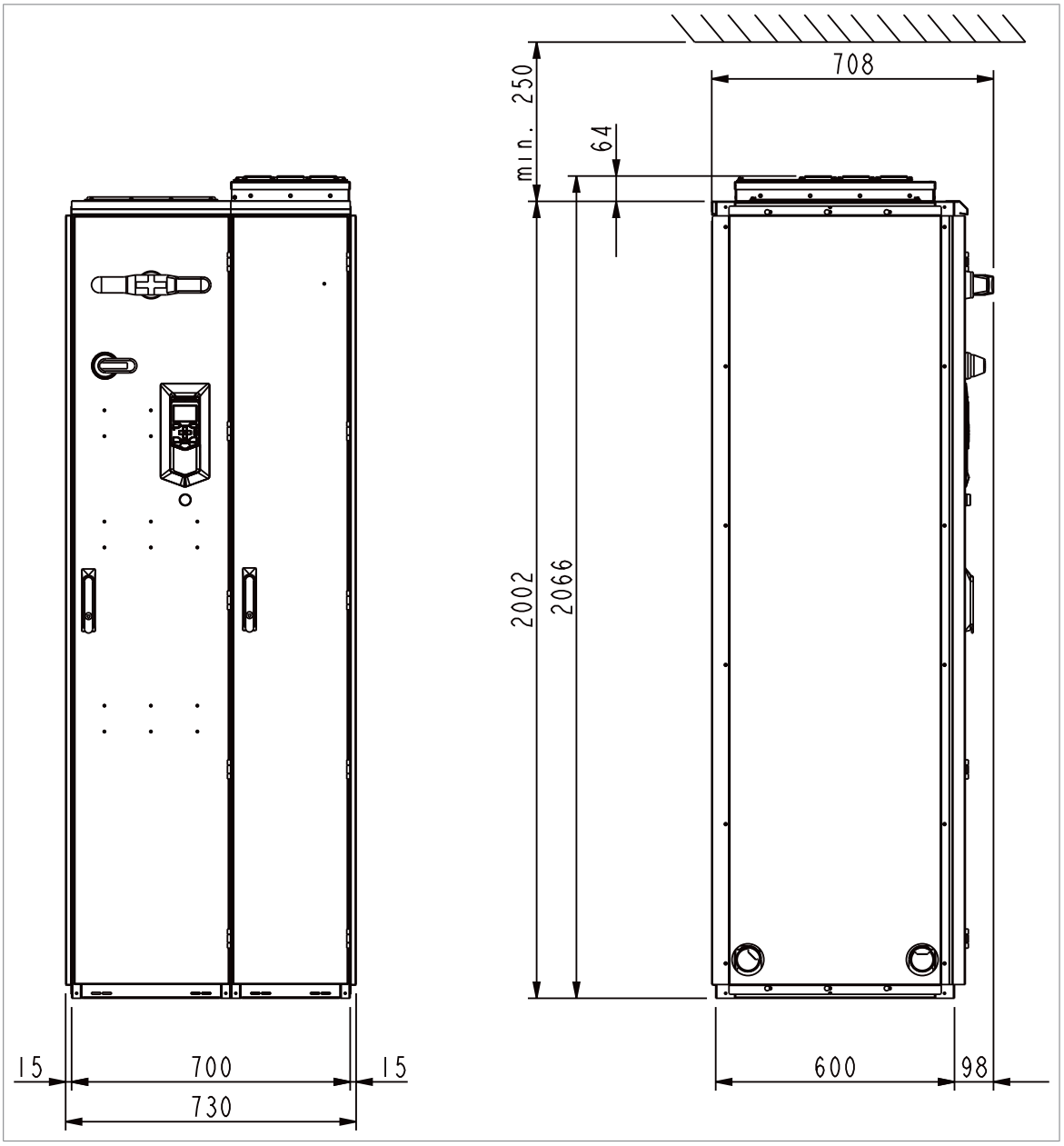
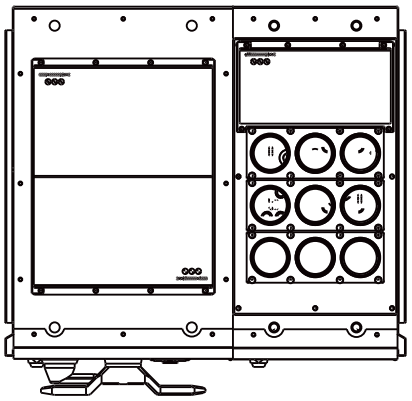
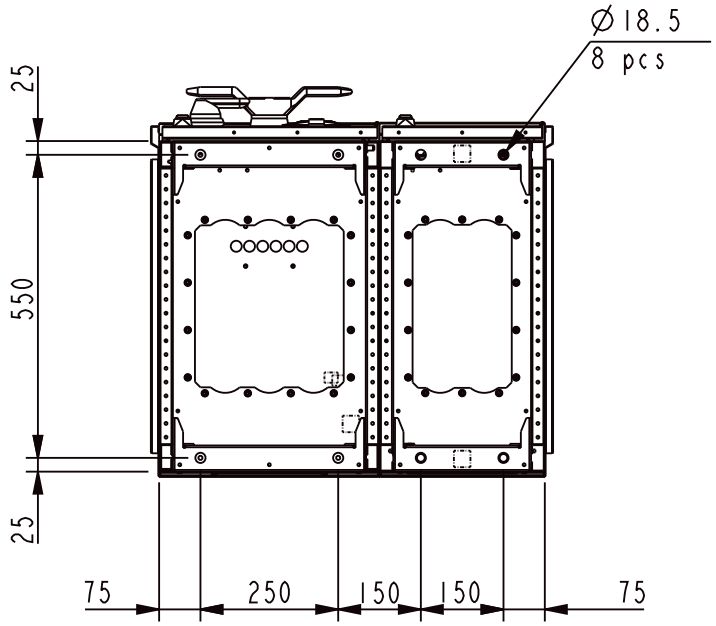
Dimension drawing – top exit



Top	Bottom
	

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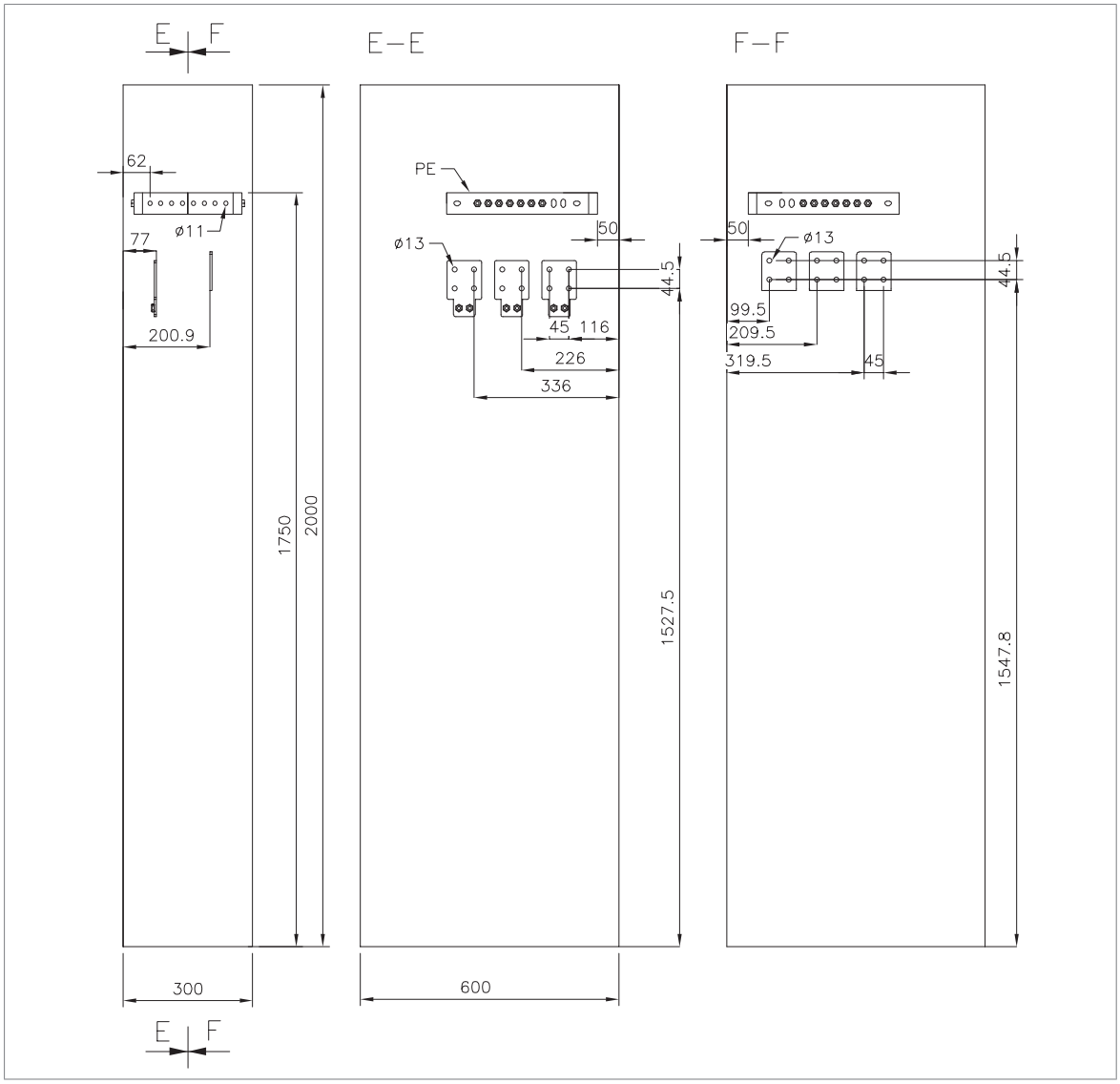
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44.5
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Further information

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 new.abb.com/contact-centers.

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 forms.abb.com/form-26567.

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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www.abb.com/drives

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