ABB INDUSTRIAL DRIVES

ACS880-207LC IGBT supply units

Hardware manual

ACS880-207LC IGBT supply units

Hardware manual

3AXD50000174782 Rev D
EN
Original instructions
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1

Introduction to the manual

Contents of this chapter

This chapter describes the manual. It gives information on the markings and component designations, and also the terms and abbreviations that are used in the manual. This chapter also includes a list of related manuals.

Applicability

The manual is applicable to liquid-cooled, cabinet-installed ACS880-207LC IGBT supply 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 work on the drive. You are expected to know the fundamentals of electricity, wiring, electrical components and electrical schematic symbols.

Purpose of the manual

This manual helps in installing, commissioning, using and maintaining a multidrive with an IGBT supply unit.

Categorization by frame size and option code

Some instructions and technical data which concern only certain unit or frame sizes are marked with the size identifier. The frame size indicates the number of power modules that form the supply unit.

The unit size can be identified from the basic code visible on the type designation label, for example, ACS880-207LC-4360A-7 where 4360A is the unit size. The option codes of the unit are listed after the plus sign. Section Type designation key (page 39) explains the type designation code in detail.The frame size is marked on the type designation label, and can also be determined from the type code.

The instructions and technical data which only concern certain optional selections are marked with option codes (such as +E205). The options included in the drive can be identified from the option codes visible on the type designation label. The option selections are listed in section Type designation key (page 39).

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 of the drive.

Terms and abbreviations

Term/ Abbreviation	Description
ACS-AP-…	Assistant control panel
BCON	Type of control board
BCU	Type of control unit
Cabinet	An enclosure that consists of one or more cubicles
CIO	I/O module for controlling cooling fans
Control unit	The part in which the control program runs.
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
DDCS	Distributed drives communication system protocol
DI	Digital input
Drive	Frequency converter for controlling AC motors

Term/ Abbreviation	Description
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
FAIO-01	Analog I/O extension module
FCAN	Optional CANopen® adapter module
FCNA-01	Optional ControlNet™ adapter module
FDIO-01	Optional digital I/O extension module
FDNA-01	Optional DeviceNet™ adapter module
FDPI	Diagnostics and panel interface board
FEA-03	Optional I/O extension adapter
FECA-01	Optional EtherCAT® adapter module
FEN-01	Optional TTL incremental encoder interface module
FENA-11	Optional Ethernet adapter module for EtherNet/IP™, Modbus TCP® and PROFINET IO® protocols
FENA-21	Optional Ethernet adapter module for EtherNet/IP™, Modbus TCP and PROFINET IO protocols, 2-port
FEPL-02	Optional Ethernet POWERLINK adapter module
FIO-01	Optional digital I/O extension module
FIO-11	Optional analog I/O extension module
FPBA-01	Optional PROFIBUS DP® adapter module
Frame, frame size	Physical size of the drive or power module
FSCA-01	Optional RS-485 (Modbus/RTU) adapter
FSO-12, FSO-21	Optional functional safety modules
IGBT	Insulated gate bipolar transistor
IGBT supply unit	IGBT supply module(s) under control of one control unit, and related components.
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.
ISU	IGBT supply unit
LCL filter	Inductor-capacitor-inductor filter
Multidrive	Drive for controlling several motors which are typically coupled to the same machinery. Includes one supply unit, and one or several inverter units.
Parameter	In the drive control program, user-adjustable operation instruction to the drive, or signal measured or calculated by the drive. In some (for example fieldbus) contexts, a value that can be accessed as an object. For example, variable, constant, or signal.
PE	Protective earth (ground)
PLC	Programmable logic controller
Power module	Common term for drive module, inverter module, supply module, brake chopper module etc.
PTC	Positive temperature coefficient
RDCO	Optical DDCS communication module
STO	Safe torque off (IEC/EN 61800-5-2)
UCU	Type of control unit
USCA-02	Adapter for installing F-series option modules onto the UCU control unit.

Related documents

You can find manuals on the Internet. See below for the relevant code/link. For more documentation, go to www.abb.com/drives/documents.

	Manuals for ACS880 multidrives cabinets

2

Operation principle and hardware description

Contents of this chapter

This chapter describes the operation basics and the hardware of the IGBT supply unit (ACS880-207LC).

Operation principle

IGBT supply unit rectifies three-phase AC current to direct current for the intermediate DC link of the drive. The intermediate DC link supplies the inverters that run the motors. There can be one inverter unit only (single drives) or several inverter units (multidrives) connected to the intermediate circuit.

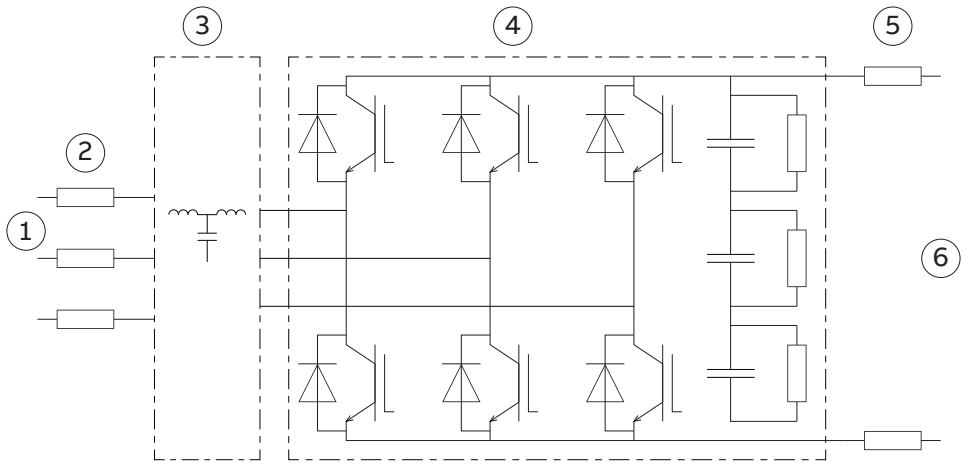
The LCL filter is an essential part of the IGBT supply unit. The supply module does not work without the filter. It suppresses the AC voltage distortion and current harmonics. The high AC inductance smooths the line voltage waveform distorted by the high-frequency switching of the converter. Capacitive component of the filter effectively filters the high-frequency (over 1 kHz) harmonics.

The IGBT supply unit can be equipped with optimal grid control functionality and work as a grid converter. The grid converter can be used to produce an island AC grid. It is also possible to use grid converters in parallel with generators to support the operation of a distributed power system. The grid converter produces sinusoidal three-phase AC voltages from the DC link voltage of the system. AC voltage magnitude and frequency can be defined by the user. A grid converter can be used in eg. marine applications where ordinary power grid connection is not available. For further details, refer to Optimal grid control of ACS880 IGBT supply control program supplement (3AXD50000164745 [English]) or Optimal grid control of ACS880 IGBT supply control program (YISLX) supplement (3AXD50001096762 [English]).

Optimal grid control functionality is in use only when the license key N8053 has been activated on the memory unit. This has been done at the factory for a unit with the option +N8053. You can see the license information with the Drive Composer PC tool or ACS-AP-x control panel in **System info** - **Licenses**. If the license key for the optimal grid control is missing, the converter indicates fault 6E1F Licensing fault. Auxiliary code in the event logger indicates the plus code of missing license, in this case N8053. For further assistance, contact your local ABB representative.

Simplified main circuit diagram

This figure shows the simplified main circuit diagram of the rectifier.



1.	AC voltage
2.	AC fuses
3.	LCL filter
4.	IGBT supply module
5.	DC fuses
6.	DC voltage

Charging

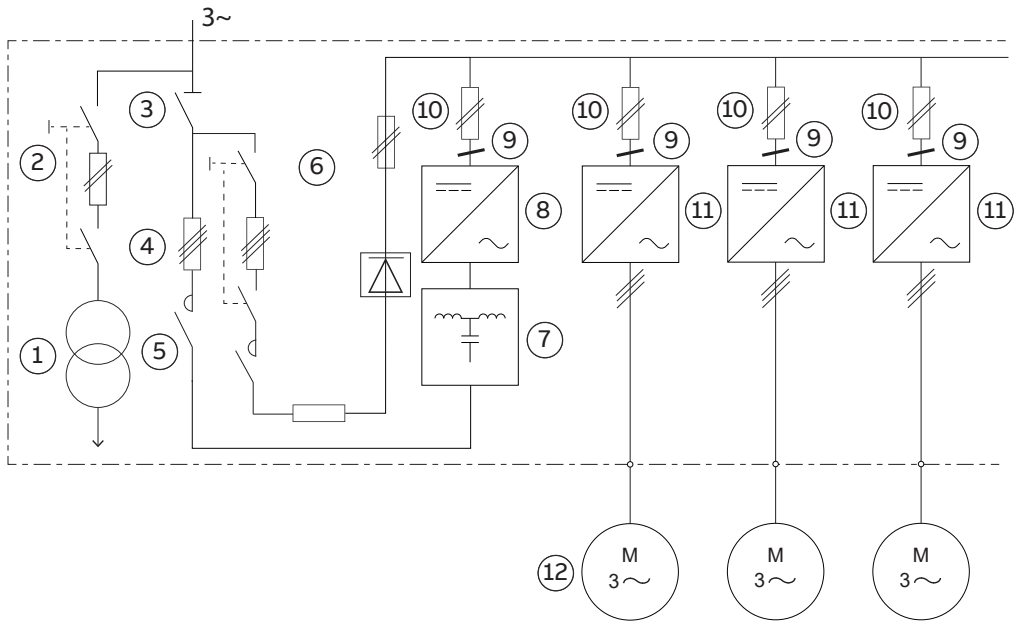
A charging circuit powers up the DC link capacitors of the drive system smoothly. Discharged capacitors cannot be directly connected to the full supply voltage. The charging current must be limited until the capacitors are charged and ready for normal use.

Cabinet-installed units have a resisting charging circuit. It consists of fuses, a contactor and charging resistors. The resistive charging circuit is in use after power-up for as long as DC voltage has risen to a predefined level.

The control program has a function for controlling the charging circuit. For further information, refer to the firmware manual.

Overview diagram of the drive

This diagram shows a simplified main circuit of a drive with IGBT supply unit (frame R7i) and inverter unit.



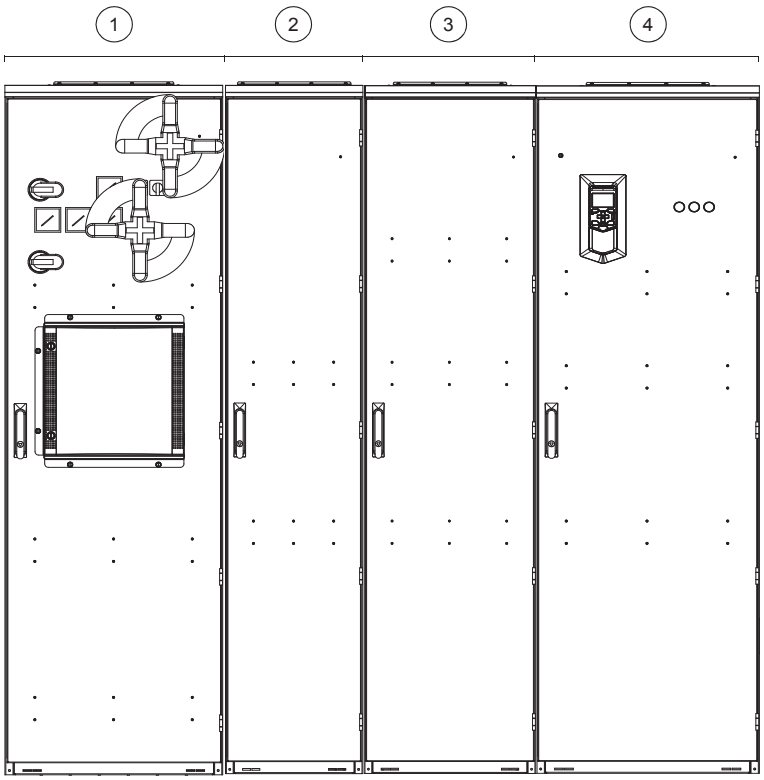
1.	Auxiliary voltage transformer ([T21] option +G344)
2.	Auxiliary voltage switch [Q21]
3.	Main switch-disconnector ([Q1] option +F253) (standard, always with +F250)
4.	AC fuses [F1]
5.	Main contactor ([Q2] option +F250) (standard, always with +F253)
6.	Charging circuit
7.	LCL filter [R03]
8.	IGBT supply module [T01]
9.	Common mode filter [R1]
10.	DC fuses [F2]
11.	Inverter modules [T11]
12.	Motor(s)

Layout drawings

This section contains layout drawings of cubicles that are included in a supply unit. The components, layout and size of the cubicles vary depending on the supply unit size and selected options.

Supply unit

This drawing shows an example of an IGBT supply unit. Cables go to the cabinet through the bottom.



1.	Incoming cubicle (ICU). Contains the power input cable terminals and switchgear.
2.	LCL filter cubicle. Contains LCL filter(s).
3.	Supply module cubicle. Contains IGBT supply module(s) of frame size R8i.
4.	Auxiliary control cubicle. Contains control electronics and customer I/O connections.

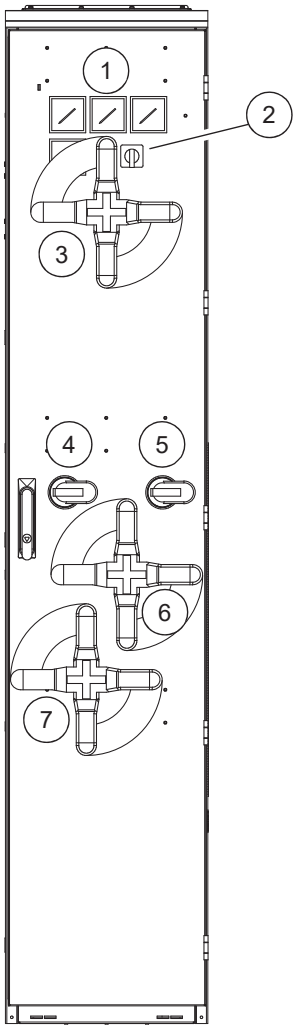
Incoming cubicle

This section shows examples of incoming cubicle layout. The cubicle contains the main switching and disconnecting devices. The input power cables are connected to the incoming cubicle through cabinet bottom. The components, layout and size vary depending on the supply unit size and selected options. The top cable entry (option +H351) increases the cubicle height.

Input cubicle (IPU) does not contain main disconnecting device (main switch-disconnector or main circuit breaker), but is otherwise similar.

Supply units with high power can contain two incoming cubicles. Then only one of them contains charging components, otherwise the cubicles are similar.

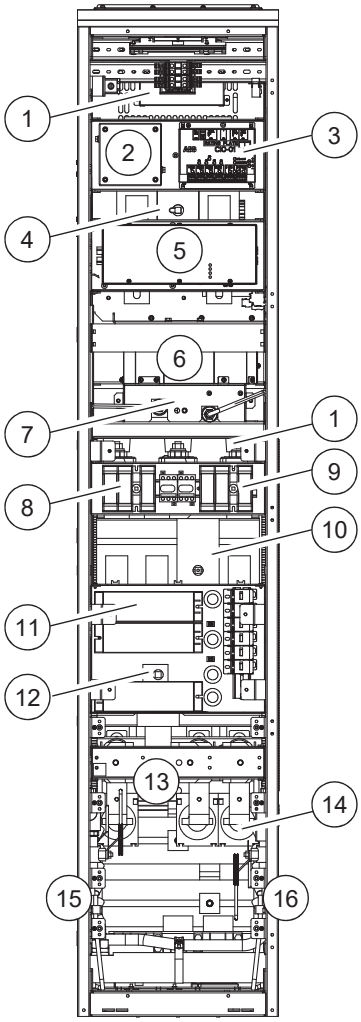
Incoming cubicle for frame R7i (door closed)



1.	Meters
2.	V-meter selector switch [S5]
3.	DC link charging switch [Q40]
4.	Auxiliary voltage switch
5.	Charging switch

6.	Grounding switch (option +F259)
7.	Main switch-disconnector

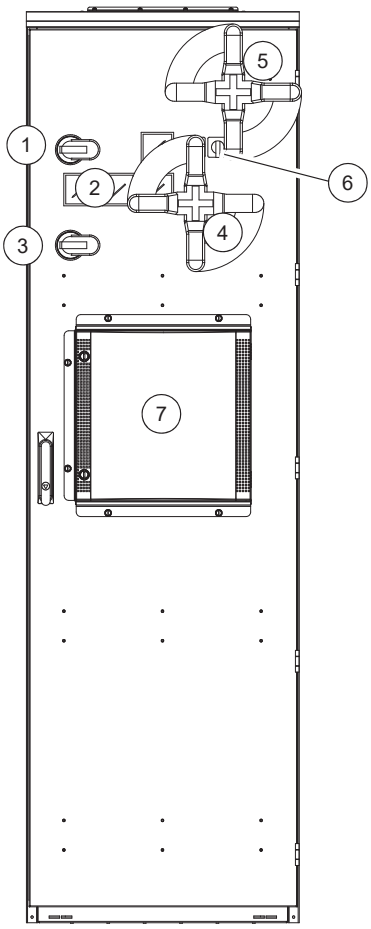
Incoming cubicle for frame R7i (door open)



1.	DC fuses
2.	Diode bridge
3.	CIO-01 I/O module
4.	DC switch
5.	BAMU auxiliary measurement unit
6.	Fan
7.	Heat exchanger
8.	Auxiliary voltage switch
9.	Charging switch
10.	Grounding switch (option +F259)
11.	Charging resistors
12.	Main switch-disconnector
13.	Input power cable terminals L1, L2, L3
14.	Current transformers

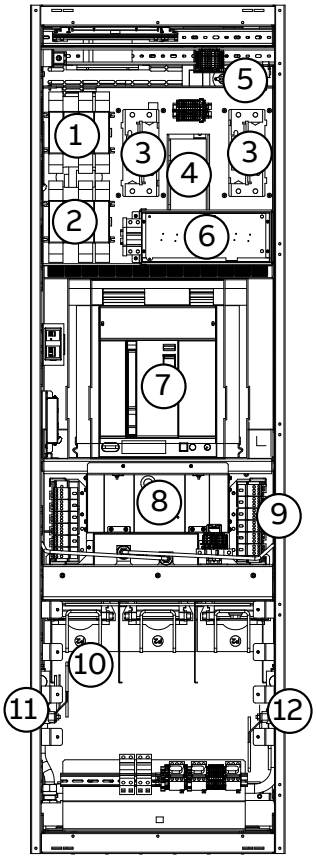
15.	Inlet manifold with stop and drain valves
16.	Outlet manifold with stop and drain valves

Incoming cubicle for frame R8i (door closed)



1.	Auxiliary voltage switch [Q21]
2.	Meters: Voltage meter [P5.x] (option +G334), phase selector switch for voltage meter [S5.x] (option +G334), AC phase current meters [P2.x] (option +G335)
3.	Charging switch [Q3]
4.	Grounding switch [Q9] (option +F259)
5.	DC switch-disconnector for line up charging circuit [Q40]. Included if supply unit has DC switch-disconnector [Q11] (option +F286).
6.	Operating switch [S21]
7.	Main breaker [Q1.x] (option +F255). Main AC input on/off control, isolation and overload protection.

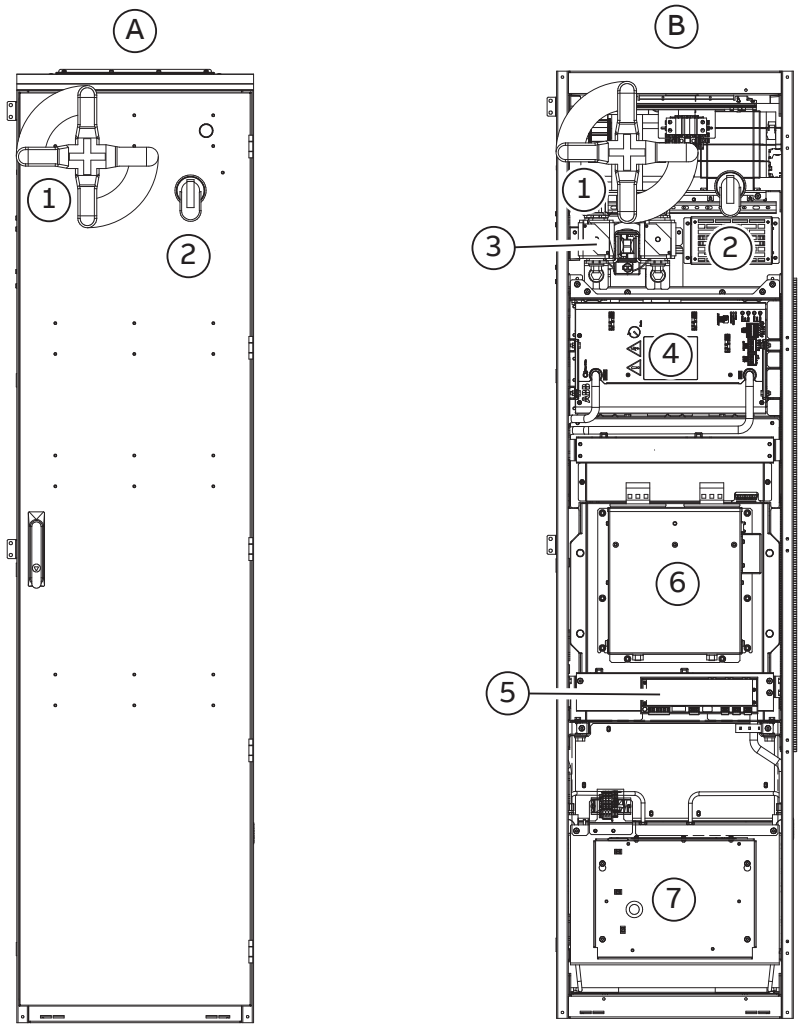
Incoming cubicle for frame R8i (door open)



1.	Auxiliary voltage disconnector [Q21]
2.	Charging circuit disconnector, AC side
3.	DC fuses
4.	Option +F259: Grounding switch [Q9]
5.	Charging circuit disconnector, DC side
6.	Option +G442: BAMU measurement unit
7.	Option +F255: Main circuit breaker [Q1]
8.	Cooling fan and heat exchanger [G115.x]
9.	Charging resistors [R4.x]
10.	Input power cable terminals L1, L2, L3
11.	Inlet manifold with stop and drain valves
12.	Outlet manifold with stop and drain valves

Supply module cubicle (frame R7i)

This section shows an example of supply module cubicle layout. The cubicle contains IGBT supply module and LCL filter.

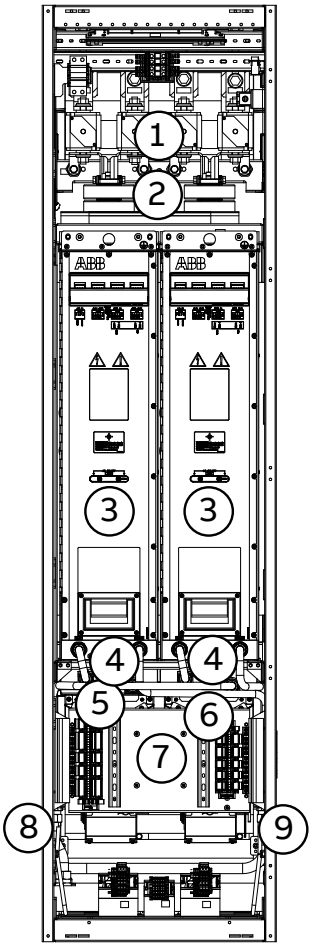


A	Door closed
B	Door open
1.	DC switch
2.	Charging circuit disconnector
3.	DC fuses
4.	IGBT supply module of frame size R7i (on its side)
5.	BSFC-12C charging controller
6.	LCL filter
7.	Fan

Supply module cubicle (frame R8i)

This section shows an example of supply module cubicle layout. The cubicle contains IGBT supply modules.

Door open



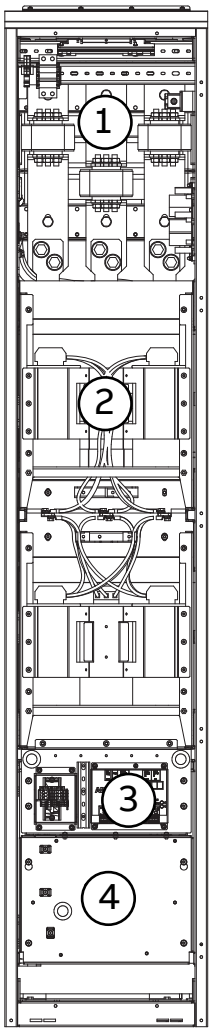
1.	DC fuses [F2.x]
2.	Common mode filters [R1.x]
3.	IGBT supply module of frame size R8i [T01]
4.	Coolant connections
5.	Air-to-liquid heat exchanger installed below each module
6.	(Behind the mounting plate) Fan. Forces air inside the cubicle through the heat exchanger.
7.	Mounting plate with terminal blocks for customer connections
8.	Inlet manifold with stop and drain valves
9.	Outlet manifold with stop and drain valves

Filter cubicle (frame R8i)

This section shows an example of LCL filter cubicle layout. The cubicle contains LCL filter(s).

There are no switches or devices on the cabinet door.

Door open



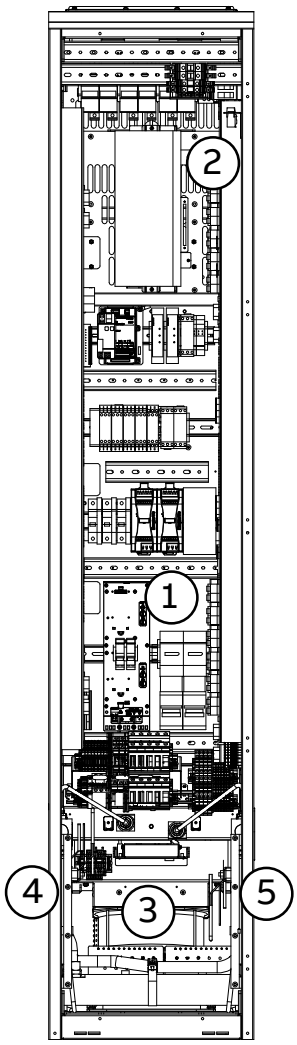
1.	AC fuses
2.	Capacitors. Inductors are behind the capacitors.
3.	CIO-01 I/O module
4.	Cooling fan and heat exchanger

Auxiliary control cubicle (width 400 mm, frame R7i)

This section shows an example of auxiliary control cubicle layout. The composition and size of the cubicle vary depending on the selected options.

There are no switches or devices on the cabinet door.

Door open



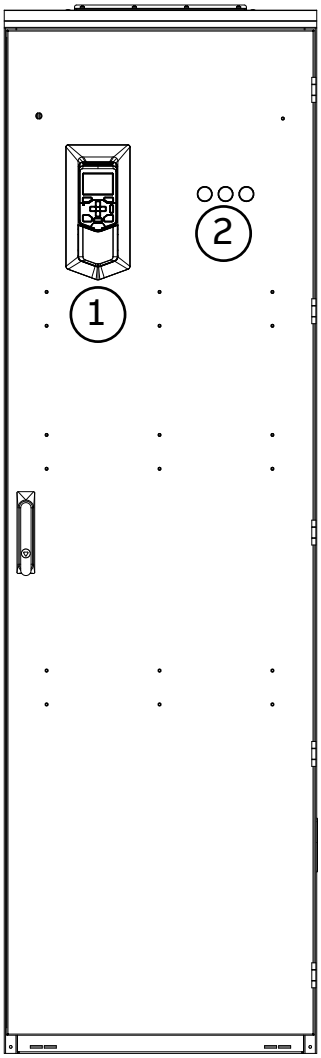
1.	Control unit
2.	CIO-01 I/O module [A115]
3.	Cooling fan and heat exchanger [G115.x]
4.	Inlet manifold with stop and drain valves
5.	Outlet manifold with stop and drain valves

Auxiliary control cubicle (width 600 mm)

This section shows an example of auxiliary control cubicle layout. The composition and size of the cubicle vary depending on the selected options.

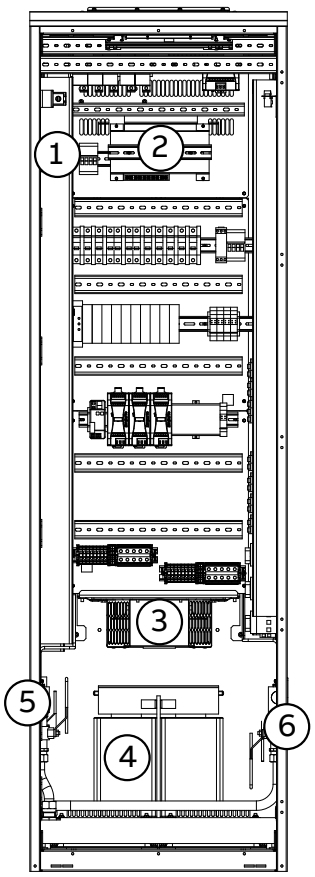
The cubicle has a bottom control cable entry. The top cable entry (option +H351) increases the cubicle height.

Door closed



1.	Control panel
2.	Operating switches

Door open

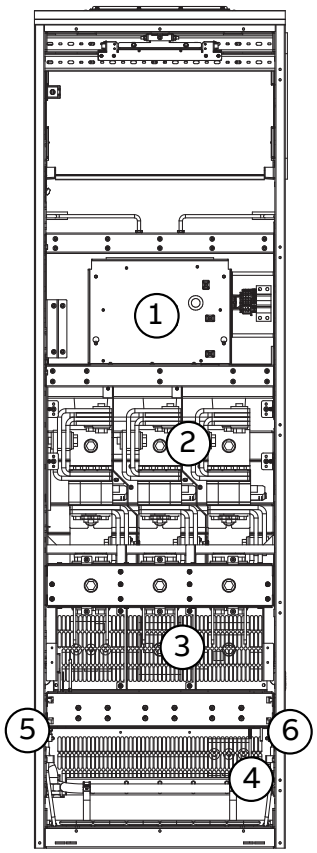


1.	CIO-01 I/O module [A115]
2.	Control unit [A51]
3.	Cooling fan and heat exchanger [G115.x]
4.	Transformer. Two transformers can also be behind the assembly plates.
5.	Inlet manifold with stop and drain valves
6.	Outlet manifold with stop and drain valves

100 kA input cubicle (option +F274)

The 100 kA input cubicle (option +F274) increases the short-circuit withstand rating of the drive. The cubicle contains extra fuses. The 100 kA cubicle is installed adjacent to the standard 65 kA incoming cubicle or input cubicle at the factory. The input power cables go into the 100 kA input cubicle. All other customer cables go into the auxiliary control cubicle or other supply unit cubicles. ABB does not install optional door devices (for example, meters) on the door of the 100 kA cubicle at the factory. No UL version (option +C129) is available.

This layout drawing shows the bottom power cable entry version.



1	Fan
2	AC fuses
3	Input power cable terminals L1, L2, L3
4	Protective earth (ground)
5	Inlet manifold with stop and drain valves
6	Outlet manifold with stop and drain valves

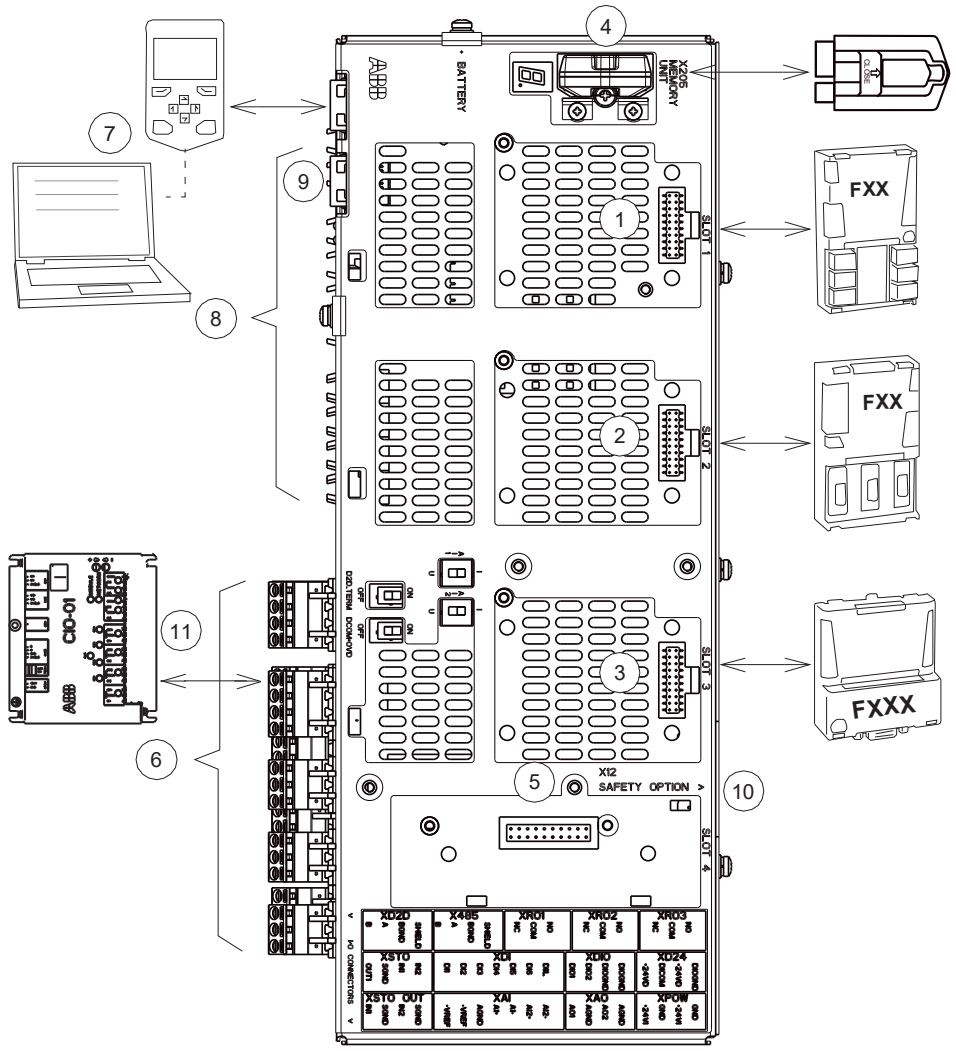
Overview of power and control connections

Input power connections of the IGBT supply unit are terminals L1, L2 and L3 in the lower part of the incoming cubicle. Power cables go into the cabinet via cable entries on the floor of the cubicle as standard. A cabinet-installed supply unit is typically controlled using the local control devices installed on the cabinet door. No additional control connections are needed. However, it is possible to:

- control the unit through the control panel and the fieldbus
- read the status information through the control panel, fieldbus and relay output
- halt the unit with an externally wired emergency stop button (if the unit has an emergency stop option).

The supply unit I/O control interface is mostly in internal use.

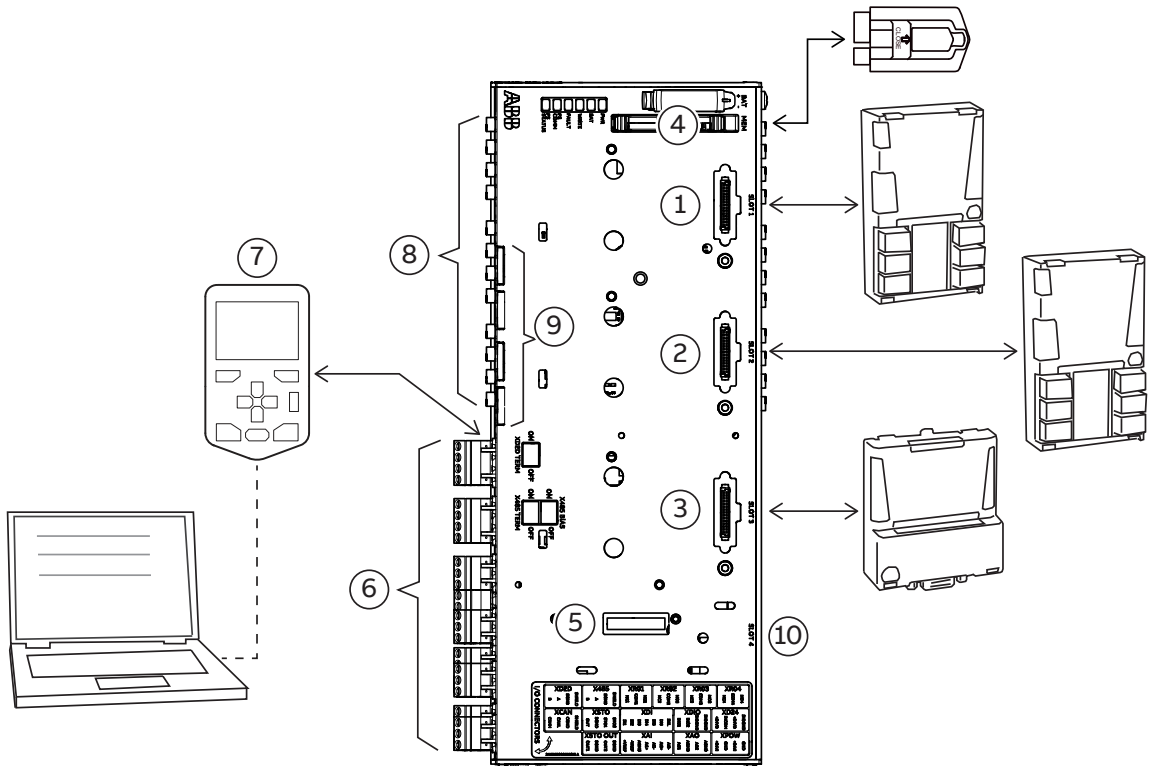
Overview of the control connections of the BCU control unit



1 2 3	Analog and digital I/O extension modules and fieldbus communication modules can be inserted into slots 1, 2 and 3.	7	Control panel.
4	Memory unit	8	Fiber optic links to power modules (inverter, supply, brake or converter)
5	Slot 4 for RDCO-0x	9	Ethernet port. Not in use.
6	Terminal blocks.	10	Safety option interface. Only in use for the inverter units.
11	Distributed I/O bus with CIO-02 modules for cooling fan monitoring and control.		

Overview of the control connections of the UCU control unit

This diagram shows the control connections and interfaces of the UCU control unit.



1 2 3	Analog and digital I/O extension modules and fieldbus communication modules can be inserted into slots 1, 2 and 3.	7	Control panel
4	Memory unit	8	Fiber optic links to power modules (inverter, supply, brake or converter)
5	Slot 4 for RDCO module	9	Ethernet ports
6	Terminal blocks	10	Safety option interface. Reserved for future use.

Supply unit control devices

Run enable is the main control signal of the supply unit. The control program reads it from digital input DI2. User controls the signal with an operating switch installed on the cabinet door, typically. When the digital input DI2 is on, it is also possible to control the Run enable signal from a control panel, through fieldbus interface, or from the inverter unit.

Main disconnecting device [Q1]

Depending on the configuration of the drive, the main disconnecting device [Q1] is either a switch-disconnector or a main circuit breaker. Units with a switch-disconnector also have a main contactor.

The main disconnecting device isolates the drive main circuit from the main AC power supply. To isolate, user turns the switch-disconnector to the 0 (OFF) position, or racks out the main breaker.

WARNING!
The main disconnecting device does not isolate the input power terminals or AC voltage meters [P5.x] (option +G334) from the main AC power supply. Depending on the drive configuration, also the auxiliary circuit and charging circuit (if any) can remain non-isolated. To isolate the drive completely from the main AC power supply, open the main breaker of the supply transformer.

WARNING!
The grounding switch [Q9] (option +F259) and the main switch-disconnecting device [Q1] are electrically interlocked: Only one of them can be closed at a time. The drive auxiliary control voltage must be on to close the switches.

Auxiliary voltage switch [Q21]

The auxiliary voltage switch [Q21] controls the supply to the internal auxiliary circuits. User operates the switch with a handle on the cabinet door.

Grounding switch [Q9]

The grounding switch [Q9] (option +F259) connects the main AC power busbars to the PE busbar.

To close the grounding switch, auxiliary voltage must be switched on, and the main disconnecting device [Q1] must be open. User operates the switch with a handle on the cabinet door.

WARNING!
The grounding switch does not ground the input power terminals of the drive or the auxiliary (control) voltage circuits.

Charging switch [Q3] and DC switch/disconnector [Q40]

The charging switch [Q3] feeds power to the charging circuit. The supply unit control program controls the charging circuit on and off with the charging contactor [Q4]. At the drive power up, the control program closes the contactor. After the DC link capacitors are charged, the control program opens the contactor and starts the supply unit.

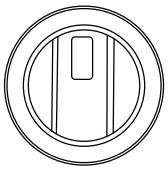
User operates the charging switch with a handle on the cabinet door. The switch must be closed during the drive power up to enable charging. ABB recommends to keep the switch open otherwise.

If the supply unit is equipped with the DC switch/disconnector [Q11] (option +F286), ABB adds an additional DC switch/disconnector [Q40] to the supply unit charging circuit automatically. With the DC switch/disconnector [Q40], user must isolate also the charging circuit from the drive DC link when he/she isolates the supply modules with the DC switch/disconnector [Q11].

Operating switch [S21]

As standard, the operating switch [S21] controls the drive as follows:

- ENABLE/RUN (1) position: Run enable and Start signals of the supply unit are active. If the drive is de-energized, the control program runs the power up sequence: supply unit charges the drive DC link, closes the main contactor [Q2] or the main breaker [Q1] and starts the normal operation.
- 0 position: Supply unit stops and opens the main contactor [Q2] or the main breaker [Q1].

Position ENABLE/RUN (1)	Position OFF (0)
	

DC switch/disconnector [Q11], charging switch [Q10] and indicator lamp [P1]

You can isolate the supply modules from the drive DC link with the DC switch/disconnector [Q11] (option +F286). The DC switch/disconnector assembly also also includes a charging switch [Q10]. Before you can close DC switch-disconnector [Q11] and reconnect the modules back to the DC link, you must charge the supply module capacitors through the charging switch [Q10]. Indicator lamp [P1] goes on when you can close the DC switch/disconnector [Q11]. User operates the DC switch/disconnector and the charging switch with handles on the cabinet door.

Note: If the unit consists of multiple supply module cubicles, each cubicle has a DC switch/disconnector and charging switch. The DC switch/disconnector isolates only the supply modules within that particular cubicle.

Operating instructions

WARNING! Open the DC switch/disconnector [Q11] only when the supply unit is stopped and there is no load.

Supply unit DC link disconnecting procedure:

1. Stop the inverter units and the supply unit.
2. Open the DC switch/disconnector [Q11].

3. Make sure that the charging switch [Q10] is open. It isolates the supply module charging circuit from the drive DC link.
4. Open the DC switch/disconnector [Q40] of the charging circuit. It isolates the drive charging circuit from the drive DC link. Handle is on the incoming unit door.
5. Lock out and tag out the switches.

Supply unit DC link re-connecting procedure:

1. Close the charging switch [Q10].
2. Wait that the capacitors in the supply modules charge.
3. When the indicator [P1] on the cabinet door goes on (capacitors charged), close the DC switch/disconnector [Q11].
4. Open the charging switch [Q10].
5. Close the DC switch/disconnector [Q40] of the drive charging circuit. Handle is on the incoming unit door.
6. Start the supply unit. Note that the charging switch [Q10] must be open to start the supply unit.

Local charging control switch [S4]

The cabinet can have a local charging control switch [S4]. Position "1" lets you close the DC switch-disconnector [Q11].

If the DC link is not energized and the DC switch isolator [Q11] of the supply unit is in the OFF position, [Q11] is locked by solenoid [K11]. In this case, the DC switch of the supply unit cabinet cannot be closed again to start the unit. The DC main charging circuit must be activated manually. For this purpose, there is a local charging control switch [S4] on the cabinet door, next to the start switch [S21]. First, the AC charging switch [Q3] and DC switch isolator [Q40] must be closed. The DC main charging circuit is activated by turning the local charging control switch [S4] to position (1). After a few seconds, when the DC link is charged to the rated voltage level, the DC charging switch [Q10] of the supply unit is closed. When charging is complete (DC voltage above 80 % of the nominal), [Q11] lock is released. The DC main switch isolator [Q11] can now be closed and the charging switch [Q10] opened. Before the supply unit can be started, [S4] must be turned to position (0).

Emergency stop button [S61] and reset button [S62]

The emergency stop button [S61] (option +G331) activates an emergency stop function. When the user presses the button, the function stops the drive and motor according to the stop category (optional selection). The button has a self-hold mechanism. Before the drive restart is possible, the user must release the button and press the reset button [S62]. The reset button light goes on after the emergency stop function is ready for reset.

Control panel [A59]

The control panel is the user interface of the unit. An example control panel is shown below.

With the control panel, the user can:

- start and stop the unit
- view and reset the fault and warning messages, and view the fault history
- view actual signals
- change parameter settings
- change between local (control panel) and remote (external device) control.

To be able to start and stop the unit with the control panel, the Run enable signal and Start enable signal must be on (1) on the supply control unit. Normally, this is the case when the operating switch [S21] on the cabinet door is in ENABLE/RUN (1) position. The control mode selection on the control panel must also be Local. The Loc/Rem key of the panel selects between the local and remote control modes.

PC connection

User can connect a PC to the drive through the USB connector on the front of the control panel. When PC is connected to the control panel, the control panel keypad is disabled. To communicate with the drive, the PC must have a suitable drive PC tool installed (for example, Drive Composer).

Fieldbus control

If the drive, or a unit of a drive (supply, inverter, etc.) has an optional fieldbus adapter, it is possible to control the drive or unit through a fieldbus. There are many fieldbus adapter types available.

Cooling system

See chapter Internal cooling circuit.

Coolant connectors

Frame R7i: The coolant pipe inlet and outlet connectors are at the bottom front and top front of the module respectively. The connectors are for 16/13 millimeter PA (polyamide) pipe.

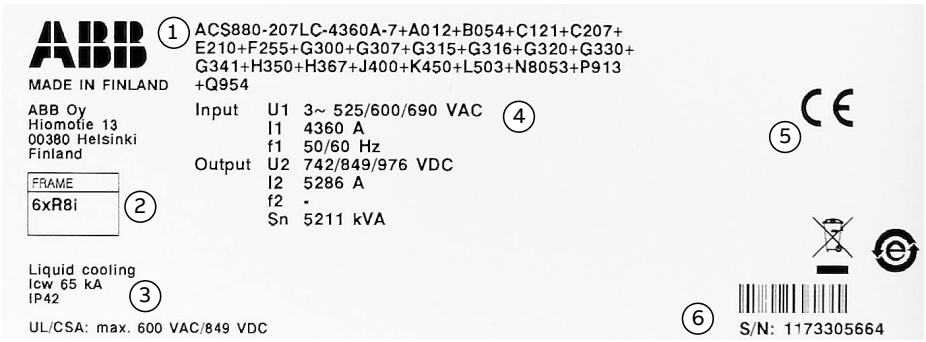
Frame R8i: The coolant pipe inlet and outlet connectors are at the bottom front of the module. The connectors are for 16/13 millimeter PA (polyamide) pipe.

WARNING!
For a reliable connection, the end of the pipe going to the connector must be completely intact for a length of at least 5 cm (2 in). Make sure the pipe is perfectly round where it goes to the connector, and not deformed eg. by any bends nearby. The piping must not exert any tension or torque on the connector.

Type designation label(s)

Each IGBT supply unit has a type designation label attached onto the inside of the cubicle door. The type designation label includes the ratings, appropriate markings, a type designation and a serial number of the unit. An example label is shown below.

Quote the complete type designation and serial number when you contact technical support.



1	Type designation (see section Type designation key (page 39)).
2	Frame size
3	Short-time withstand current rating (see chapter Technical data); degree of protection; UL/CSA specifications
4	Ratings. See also chapter Technical data.
5	Valid markings. See ACS880 liquid-cooled multidrives cabinets and modules electrical planning (3AXD50000048634 [English]).
6	Serial number. The first digit of the serial number refers to the manufacturing plant. The next four digits refer to the unit's manufacturing year and week, respectively. The remaining digits complete the serial number so that there are no two units with the same number.

Type designation key

The type designation contains information on the specifications and configuration of the supply unit. The first digits from left express the basic supply unit type. The optional selections are given thereafter, separated by plus signs, eg. +F255. The main selections are described below. Note that all selections are not available for all types.

Code	Description
Basic code	
ACS880	Product series
ACS880-207LC	Default configuration: liquid-cooled cabinet-installed IGBT supply unit, IP42 (UL Type 1), 50 Hz supply frequency, no main switch or breaker, connection for 230 V AC auxiliary voltage, ACS-AP-W assistant control panel, EMC filter (category 3, 2nd Environment), du/dt limitation by choke, ACS880 IGBT supply control program, BAMU auxiliary measurement unit (+G442) when the option +C186 is not selected, coated circuit boards, bottom entry and exit of cables with lead-through-type entries, multilingual door device label sticker, USB memory stick containing circuit diagrams, dimension drawings and manuals.
Size	
xxxxx	Refer to the rating table.
Voltage range	
3	380…415 V AC. This is indicated in the type designation label as typical input voltage level (3~ 400 V AC).
5	380…500 V AC. This is indicated in the type designation label as typical input voltage levels (3~ 400/480/500 V AC).
7	525…690 V AC. This is indicated in the type designation label as typical input voltage levels (3~ 525/600/690 V AC).
Option codes (plus codes)	
Supply connection	
A013	60 Hz supply frequency
Degree of protection	
B055	IP54 (UL Type 12)
Construction	
C121	Marine construction
C129	UL Listed
C132	Marine type approved
C164	Plinth height 100 mm
C176	Door hinges on left
C179	Plinth height 200 mm
C205	Marine product certification issued by DNV GL
C206	Marine product certification issued by the American Bureau of Shipping (ABS)
C207	Marine product certification issued by Lloyd's Register (LR)
C209	Marine product certification issued by Bureau Veritas
C228	Marine product certification issued by China Classification Society (CCS)
C229	Marine product certification issued by Russian Maritime Register of Shipping (RS)
C238	300 mm wide input cubicle
C239	400 mm wide input cubicle
C240	600 mm wide input cubicle

Code	Description
C241	800 mm wide input cubicle
C245	1000 mm wide input cubicle
C243	Additional voltage measurement for optimal grid control
Filters	
E205	du/dt filtering by choke
E210	2nd environment, C3, grounded (TN) and ungrounded (IT) networks
Line options	
F250	Main (line) contactor
F253	Main switch-disconnector
F255	Main (air) circuit breaker
F259	Grounding (earthing) switch
F274	100 kA input cubicle (100 kA short-circuit rating)
F276	Ride-through function (ride-through capability without tripping in a voltage break of max. 3 s)
F286	DC switch
F321	External LCL filter
Cabinet equipment	
C186	Current and voltage measurements with BAMU measurement unit
G300	Cabinet and module heating elements (external supply)
G301	Cabinet lighting
G304	115 V AC control voltage
G307	Terminals for connecting external control voltage (230 V AC or 115 V AC, eg. UPS)
G314	DC bus material: aluminum
G315	DC bus material: tin-plated copper
G316	Supply connection by cables
G317	Supply connection by busbars
G320	230 V AC control voltage
G330	Halogen-free wiring and materials
G331	Emergency stop push button on the door (red)
G332	Electrical disconnect push button on the door (black, opens main contactor / main circuit breaker)
G333	Meters for A, V, kW and kWh
G334	V-meter with selector switch
G335	A-meter in one phase
G336	Arc monitoring, 1 loop, Rea 101, including cable
G337	Arc monitoring current sensing unit
G338	Additional wire markings
G339	
G340	
G341	
G342	
G343	Corrosion coupon in auxiliary control cubicle

Code	Description
G344	Auxiliary voltage transformer
G426	Arc monitoring unit, extension for 2 loops, Rea 105
G432	Frequency monitoring device
G442	BAMU auxiliary measurement unit
G453	Common mode filter temperature monitoring
J400	Bluetooth control panel
J410	Control panel connection kit
J425	Non-Bluetooth control panel
K450	Panel bus
Cabling	
H350	Supply cabling direction down
H351	Supply cabling direction up
H358	Cable gland plates (Steel 3 mm, undrilled)
H364	Cable gland plates (Aluminum 3 mm, undrilled)
H367	Control cable entry through the floor of cabinet
H368	Control cable entry through the roof of cabinet
H394	Cable entry, Roxtec frame without sealing components
Fieldbus adapters and other communication options	
K451	FDNA-01 DeviceNet™ 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
K473	FENA-11 Ethernet adapter module for EtherNet/IP™, Modbus TCP and PROFINET IO protocols
K475	FENA-21 Ethernet adapter module for EtherNet/IP™, Modbus TCP and PROFINET IO protocols, 2-port
K480	Ethernet switch for PC tool and control network
K483	Ethernet switch with optical link for PC tool and control network
K490	FEIP-21 EtherNet/IP adapter module
K491	FMBT-21 Modbus TCP adapter module
K492	FPNO-21 PROFINET IO fieldbus adapter module
K493	Ethernet switch for PROFINET
K494	Ethernet switch with optical link for PROFINET
I/O extensions	
L500	FIO-11 analog I/O extension module
L501	FIO-01 digital I/O extension module
L503	FDCO-01 optical DDCS communication adapter module
L508	FDCO-02 optical DDCS communication adapter module
L509	RDCO-04, DDCS communication adapter module
L525	FAIO-01 analog I/O extension module

Code	Description
L526	FDIO-01 digital I/O extension module
Control program	
N8010	IEC 61131-3 application programmability
N8053	Optimal grid control mode in ACS880 IGBT supply control program
Specialties	
P913	Special color
Safety functions	
Q951	Emergency stop (category 0) by opening the main contactor / main circuit breaker
Q952	Emergency stop (category 1) by opening the main contactor / main circuit breaker
Q954	Ground fault monitoring for IT (ungrounded) systems
Q959	Supply transformer breaker disconnect push button (black, wired to terminals) on the door
Q963	Stop category 0 without opening main contactor / main circuit breaker
Q964	Stop category 1 without opening main contactor / main circuit breaker
Q979	Emergency stop (configurable for category 0 or 1) by activating the Safe torque off function
Q984	E-stop button monitoring
Full set of printed manuals in the selected language **Note:** The delivery may include manuals in English if the requested language is not available.	
R700	English
R701	German
R702	Italian
R703	Dutch
R704	Danish
R705	Swedish
R706	Finnish
R707	French
R708	Spanish
R709	Portuguese
R711	Russian

Weak supply networks

In weak supply networks with a short-circuit ratio less than 8, ABB recommends that the supply unit has BAMU auxiliary measurement unit (option +G442). If it is not included, there is a risk of nuisance DC overvoltage trippings due to disturbances caused by high-voltage THD in the supply voltage. Short-circuit ratio is defined as the supply network's apparent short-circuit power $S_{k,net}$ divided by the drive's nominal apparent power S_n:

$SCR_{net} = S_{k,net} / S_n$, where

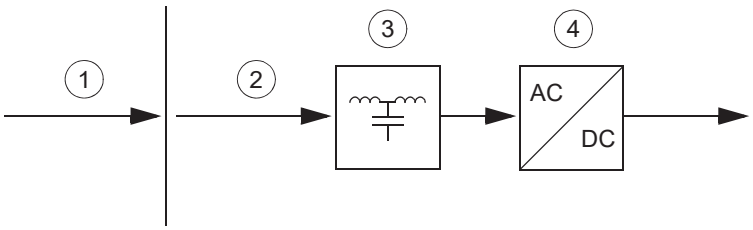
SCR_{net} = short-circuit ratio of the supply network,

$S_{k,net}$ = supply network's apparent short-circuit power,

S_n = nominal apparent power of the drive.

If a generator is used as a supply: The recommendation for ACS880 IGBT supply unit with generator supply is:

- always use BAMU auxiliary measurement unit
- short-circuit ratio of the supply network $SCR_{net} > 3$
- short-circuit ratio of the generator $SCR_{gen} = 1/xk > 2$, where xk = relative short-circuit reactance
- generator nominal power $P_{gen} > 0.3 \times P_{N,ISU}$, where
  P_{gen} = generator nominal power (output),
  $P_{N,ISU}$ = typical power of the IGBT supply unit in no-overload use.



1	Generator. $SCR_{gen} > 2$
2	Supply network. $SCR_{net} > 3$
3	LCL filter
4	IGBT supply module

3

Electrical installation

Contents of this chapter

This chapter gives instructions on how to install the input power cables and control cables, and it contains electrical safety precautions. The information is valid for cabinet-installed ACS880-207LC supply units.

Necessary tools

The tools for tightening the connections are listed below:

- Pozidriv and Torx screwdrivers
- torque wrench
- set of wrenches or sockets.

Electrical safety precautions

These electrical safety precautions are for all personnel 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 installation or maintenance work.

Do these steps before you begin any 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 motor(s).
2. Clearly identify the work location and equipment.
3. Disconnect all possible voltage sources. Make sure that re-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.
   - Open the charging switch if 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.)
   - Close the grounding switch or switches ([Q9], option +F259) if present. Do not use excessive force as the switch has electromagnetic interlocking.
   - Open the auxiliary voltage switch-disconnector (if present), and all other possible disconnecting devices that isolate the drive from dangerous voltage sources.
   - In the liquid cooling unit (if present), open the switch-disconnector of the cooling pumps.
   - If you have a permanent magnet motor connected to the drive, disconnect the motor from the drive with a safety switch or by other means.
   - Open the main isolating device of the drive.
   - Disconnect all dangerous external voltages from the control circuits.
   - After you disconnect power from the drive, always wait 5 minutes to let the intermediate circuit capacitors discharge before you continue.
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 quality voltage tester. If the measurement requires removal or disassembly of shrouding or other cabinet structures, obey the local laws and regulations applicable to live working (including – but not limited to – electric shock and arc protection).
   - Before and after you measure the installation, verify the operation of the voltage tester on a known voltage source.
   - Make sure that the voltage between the drive input power terminals (L1, L2, L3) and the grounding (PE) busbar is zero.

- Make sure that the voltage between the drive output terminals (T1/U, T2/V, T3/W) and the grounding (PE) busbar is zero.
  Important! Repeat the measurement also with the DC voltage setting of the 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 in control of the electrical installation work.

WARNING! In case of DC bus remaining alive, Personal Protective Equipment (PPE) of Level 2 is required for doing maintenance. Note that this is valid for work on every cabinet of the device.

Isolation from AC supply networks

1. Clearly identify the work location.
2. Disconnect all possible voltage sources.
   - Open the main switch-disconnector [Q1], or rack out the main breaker [Q1] of the drive (whichever is present). Note that some drives have two switch-disconnectors or main breakers [Q1.1 and Q1.2].
   - Open the disconnector of the supply transformer as the main disconnecting device of the drive does not remove the voltage from the input busbars of the drive or from the voltmeter (option +G334), or BAMU auxiliary measurement unit, auxiliary control voltage switch [Q21], charging circuit disconnector [Q4] or others.
   - Make sure that reconnection is not possible. Lock the disconnectors to open position and attach a warning notice to them.
   - Disconnect any external power sources from the control circuits before you do work on the control cables.
   - After you disconnect the drive, always wait for 5 minutes to let the intermediate circuit capacitors discharge before you continue.
3. Protect any other energized parts in the work location against contact.
4. Take special precautions when close to bare conductors.
5. Measure that the installation is de-energized.
   - Use a voltage tester with an impedance of at least 1 Mohm.
   - Make sure that the voltage between the drive input power terminals and the grounding (PE) busbar is close to 0 V.
6. Install temporary grounding as required by the local regulations. Close the grounding switch ([Q9] option +F259) if present, or connect the AC and DC busbars to PE with a temporary grounding tool.
7. Ask for a permit to work from the person in control of the electrical installation work.

Isolation from common DC bus

In case of units with DC voltage remaining: if there are several power sources for the DC bus, the supply unit which shall be isolated must have a DC switch-disconnector (option +F286). In order to isolate the supply unit from the live DC bus, open the DC switch-disconnector [Q11] and also the charging switch [Q10] in EVERY cubicle containing supply modules. In addition, open the DC switch-disconnector of the AC circuit [Q40].

1. Clearly identify the work location.
2. Disconnect all possible voltage sources. Note that energy to the DC bus can also be fed back by motors, energy storages, etc.
   - Make sure that reconnection is not possible. Lock the disconnectors to open position and attach a warning notice to them.
   - Disconnect any external power sources from the control circuits before you do work on the control cables.
   - After you disconnect the drive, always wait for 5 minutes to let the intermediate circuit capacitors discharge before you continue.
3. Protect any other energized parts in the work location against contact.
4. Take special precautions when close to bare conductors.
5. Measure that the installation is de-energized.
   - Use a voltage tester with an impedance of at least 1 Mohm.
   - Make sure that the voltage between the drive input power terminals and the grounding (PE) busbar is close to 0 V.
6. Install temporary grounding as required by the local regulations. Connect the DC busbars to PE with a temporary grounding tool.
7. Ask for a permit to work from the person in control of the electrical installation work.

Measuring the insulation of the assembly

Measuring the insulation resistance of the drive

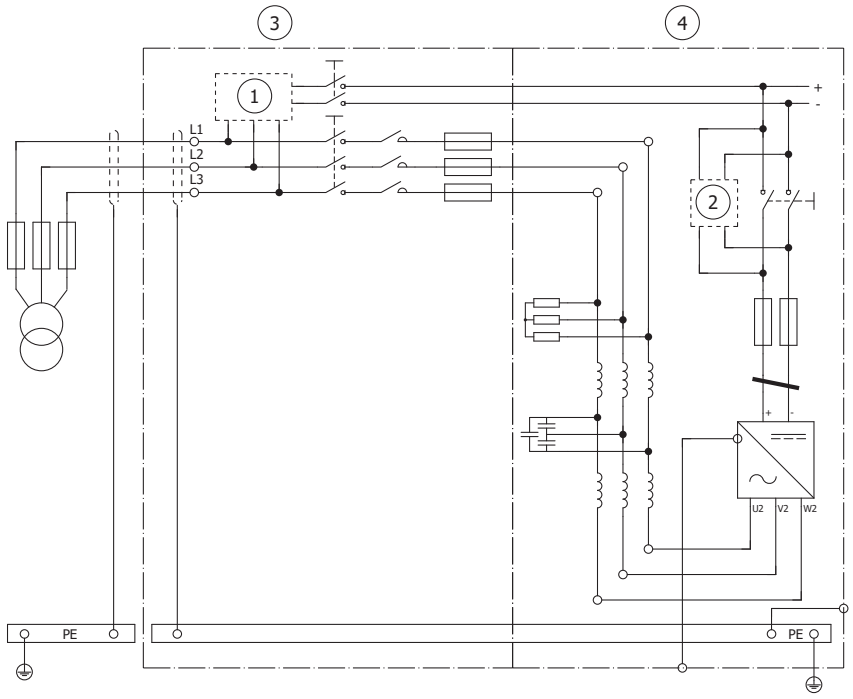
WARNING!
Do not do voltage withstand or insulation resistance tests on the drive. The tests can cause damage to the drive. Every drive is tested for insulation between the main circuit and the chassis at the factory. Also, there are voltage-limiting circuits inside the drive which cut down the testing voltage automatically.

Measuring the insulation resistance of the input power cable

Before you connect the input power cable to the drive, measure its insulation resistance according to local regulations.

Connecting the input power cables

Connection diagram (frame R7i)



1	Components for the drive main charging circuit. For details, see the delivery-specific circuit diagrams.
2	Components for the supply module (DC) charging circuit. For details, see the delivery-specific circuit diagrams.
3	Incoming cubicle
4	IGBT supply module cubicle

Note: For the conductivity requirements for the shield and the PE conductor, and the cable selection instructions, see ACS880 liquid-cooled multidrives cabinets and modules electrical planning (3AXD50000048634 [English]).

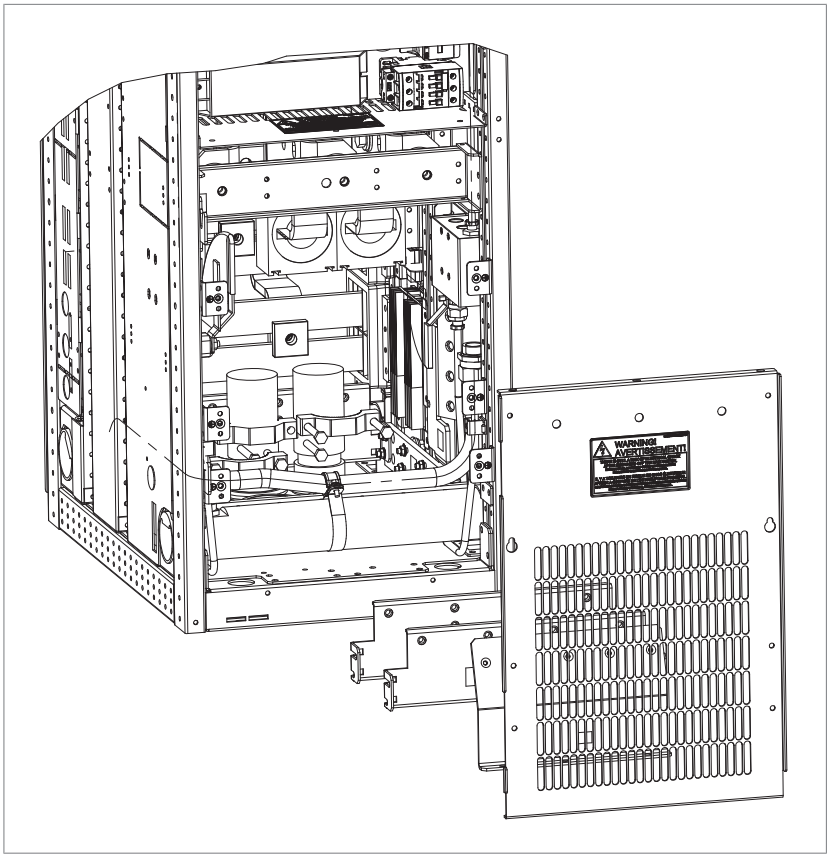
Connection procedure (frame R7i)

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

WARNING!
Do the steps in section Electrical safety precautions (page 45) before you start the work.

Removing shrouds

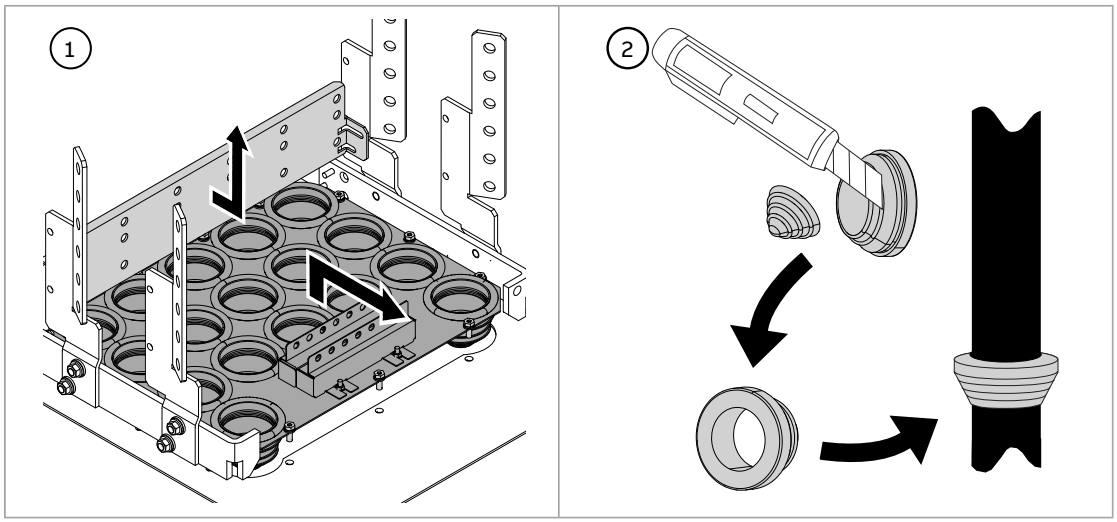
1. Open the door of the incoming cubicle.
2. Remove the shrouding and assembly plates that cover the input terminals.



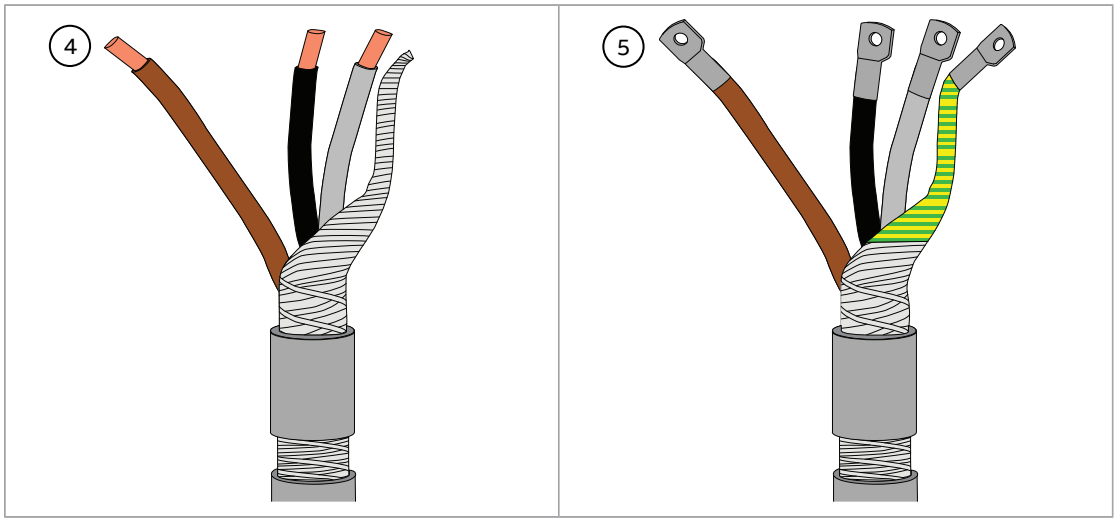
Connecting the cables

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 Rotex cable entry plate (option +H394) and cable gland plate (option +H358), refer to the manufacturer's instructions.

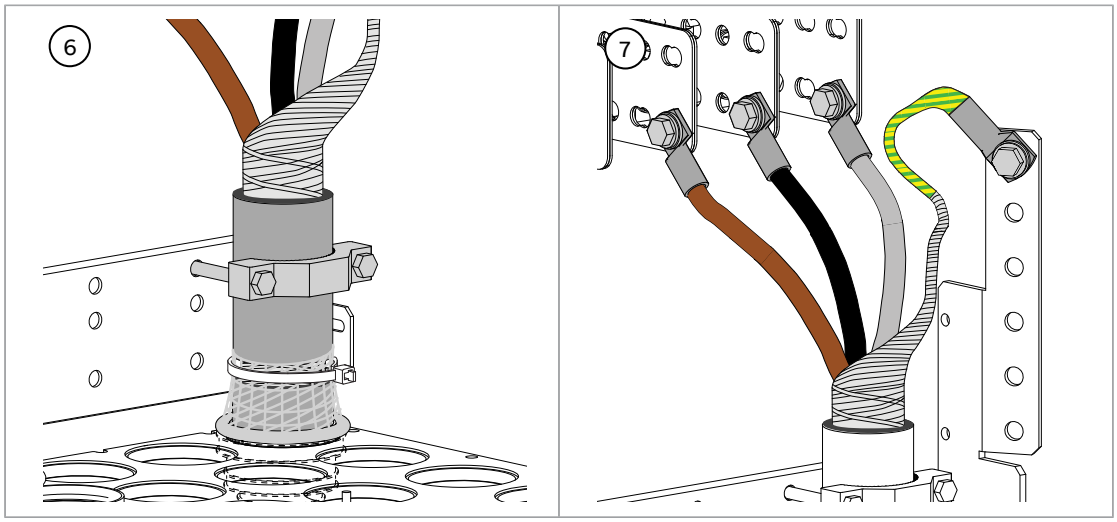
1. IP54 cabinet: Remove the rear horizontal cable support bracket and the cable entry plate.
2. IP54 cabinet: Remove a sealing grommet from the cable entry plate for each cable. Cut hole into the rubber grommet and move it onto the cable.



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.
7. For each cable, connect the PE conductor to the PE busbar, and two 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 57).

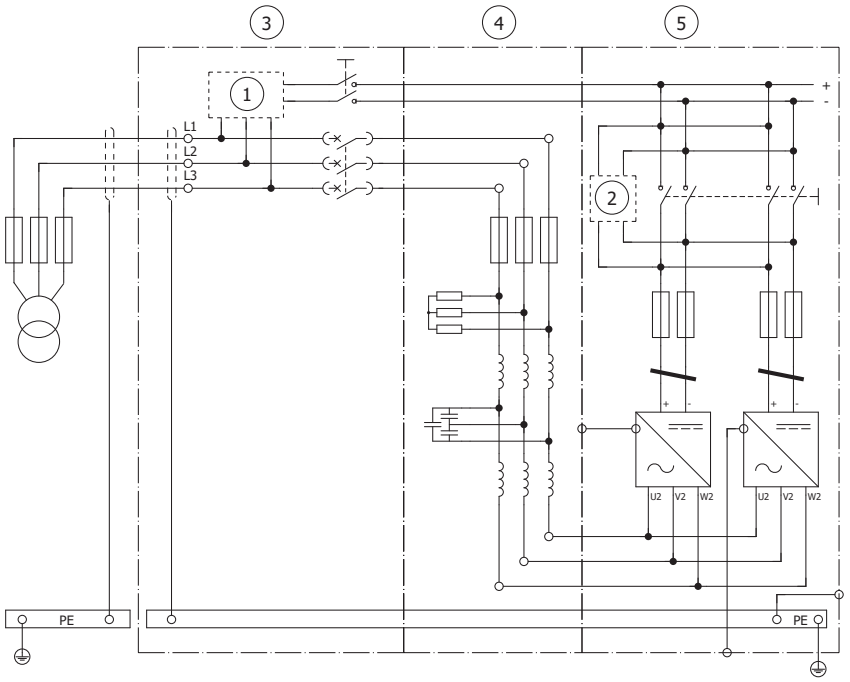


8. If there are more than 3 cables, attach additional cable support brackets for them.

Installing shrouds

1. Install the shrouding removed earlier.
2. Close the cubicle door.

Connection diagram (frame R8i and multiples)



1	Components for the drive main charging circuit. For details, see the delivery-specific circuit diagrams.
2	Components for the supply module (DC) charging circuit. For details, see the delivery-specific circuit diagrams.
3	Incoming cubicle
4	LCL filter cubicle
5	IGBT supply module cubicle

Note: For the conductivity requirements for the shield and the PE conductor, and the cable selection instructions, see ACS880 liquid-cooled multidrives cabinets and modules electrical planning (3AXD50000048634 [English]).

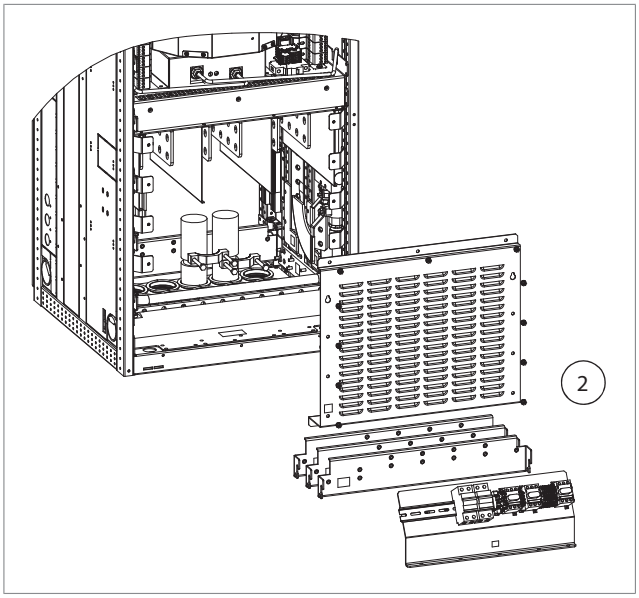
Connection procedure (frame R8i and multiples)

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

WARNING!
Do the steps in section Electrical safety precautions (page 45) before you start the work.

Removing shrouds

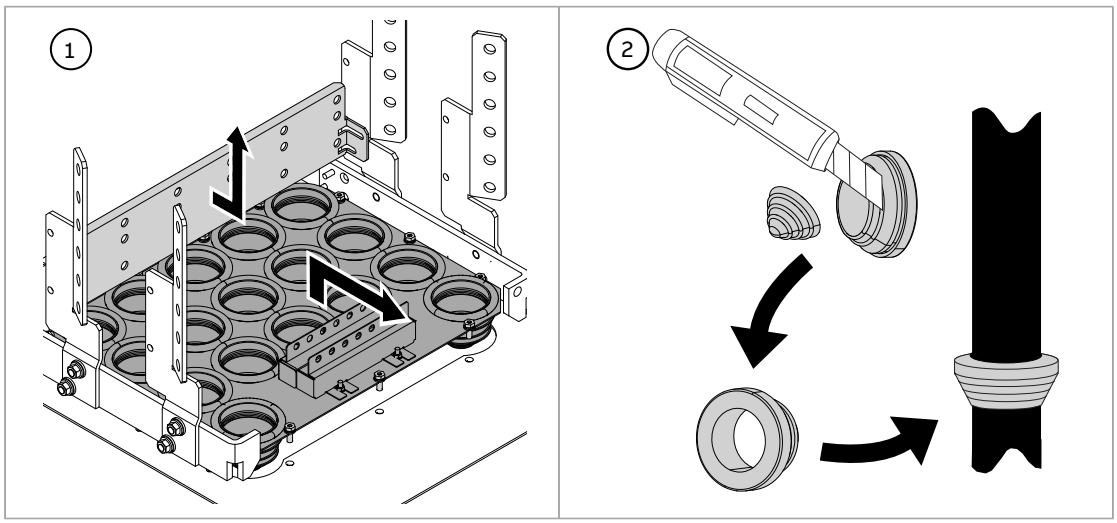
1. Open the door of the incoming cubicle.
2. Remove the shrouding and assembly plates covering the input terminals.



Connecting the cables

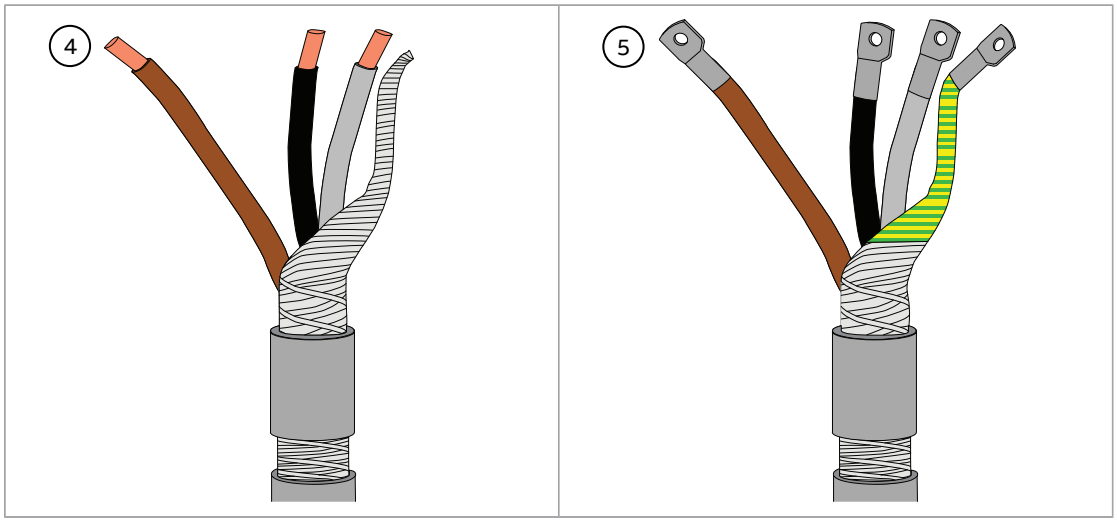
This section describes the power cable connecting procedure for a bottom cable entry with the standard cable entry plate. The standard cable entry plate has conductive sleeves for the 360° grounding of the cable shields. For Rotex cable entry plate (option +H394) and cable gland plate (option +H358),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

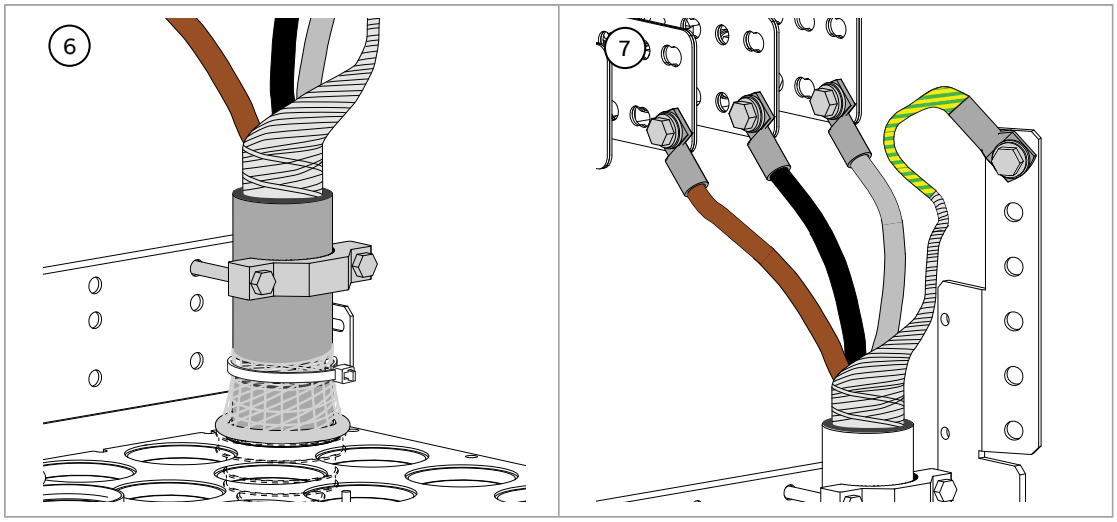


3. Put the cables inside the cabinet through the cable entry plate. If there are several cables, use the rear 3 holes first.
   IP54 cabinet: Attach the sealing grommets to the cable entry plate. Attach also the cable entry plate, and the cable support bracket.

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.
7. For each cable, connect the PE conductor to the PE busbar, and two 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 57).



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

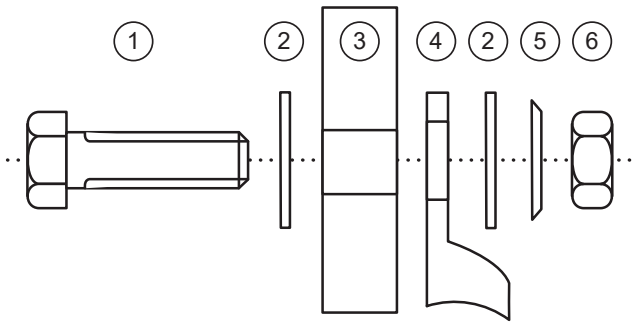
Installing shrouds

1. Reinstall the shrouding removed earlier.
2. Close the cubicle door.

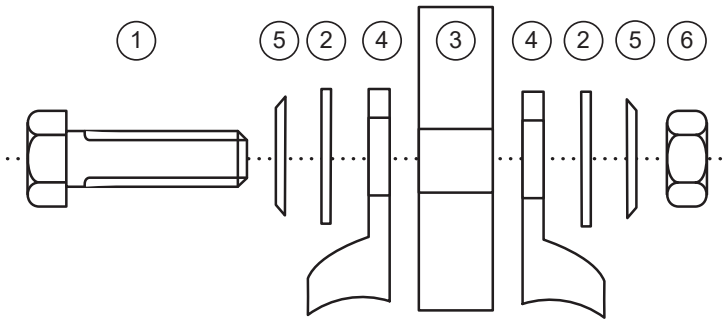
Use of fasteners in cable lug connections

Use the bolts, nuts and washers delivered with the drive. 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



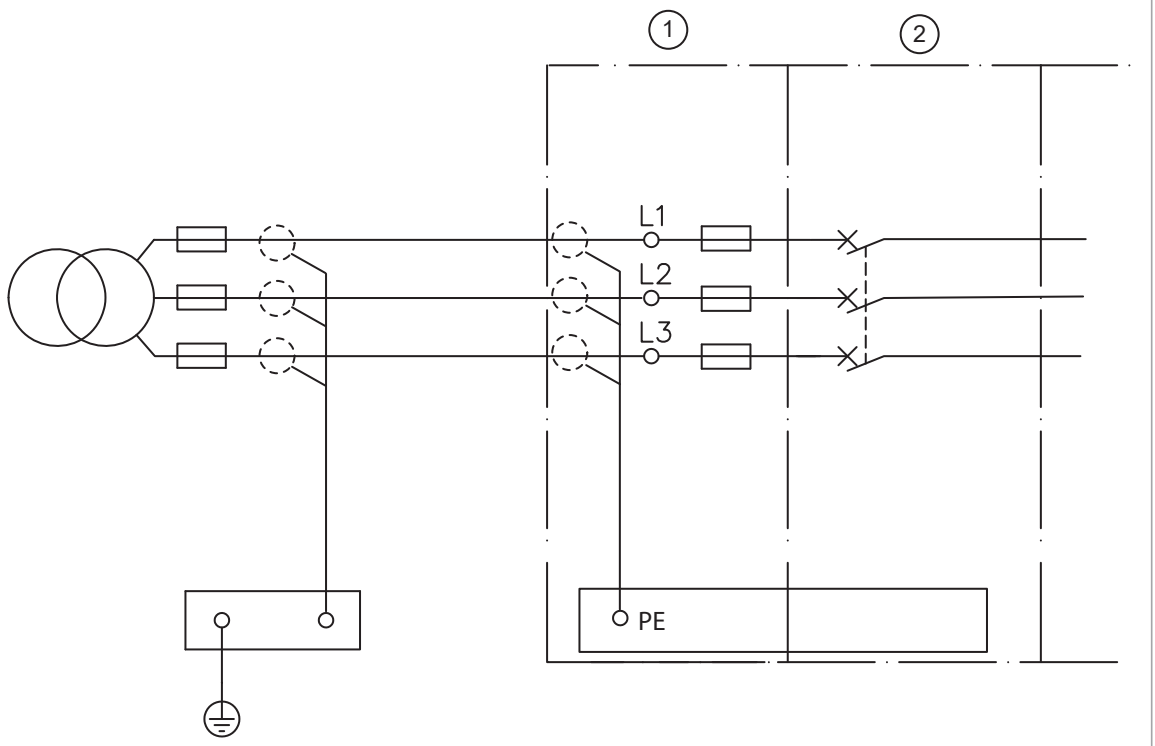
Cable lugs on both sides of the busbar



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

Connecting input power cables - cable entry in 100 kA input cubicle (option +F274)

Connection diagram



1	100 kA input cubicle
2	Incoming cubicle

Note: This diagram shows the installation with shielded single core cables. The shields are grounded at both ends and they operate as the PE conductors of the drive. Make sure that the shields meet the conductivity requirement for the drive protective earth conductor. If that is not the case, install separate PE cabling. For the conductivity requirements, refer to ACS880 liquid-cooled multidrives cabinets and modules electrical planning (3AXD50000048634 [English]).

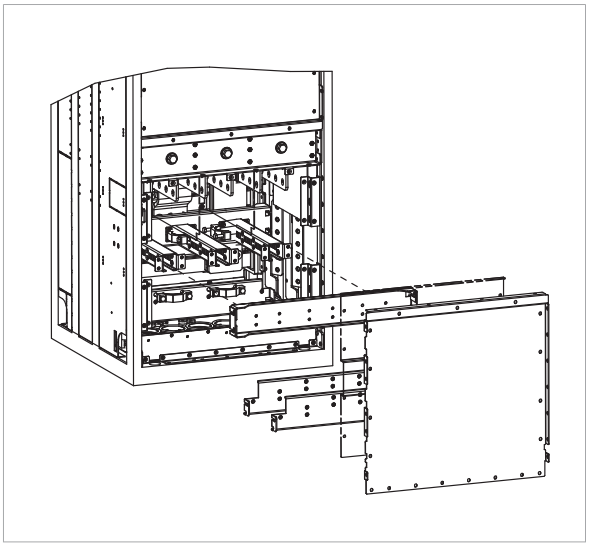
Connection procedure

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 installation, commissioning or maintenance work.

Do the steps in section Electrical safety precautions (page 45) before you start the work.

Removing shrouds and beams in front of the input cable terminals

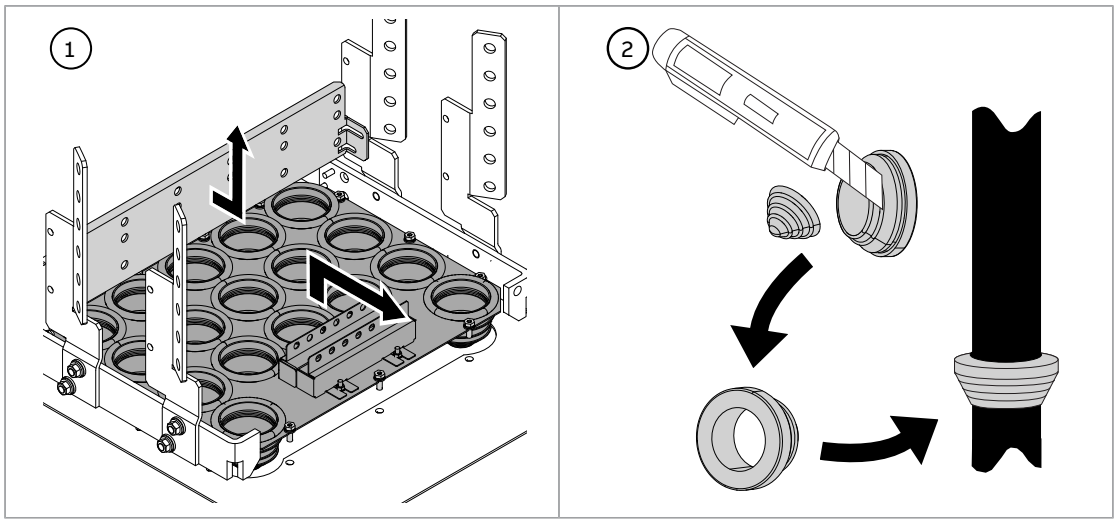
1. Open the door of the 100 kA input cubicle.
2. Remove the shrouding and assembly plates covering the input terminals.
3. Remove the beams in front of the input power cable terminals.



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 Rotex cable entry plate (option +H394) and cable gland plate (option +H358), refer to the manufacturer's instructions.

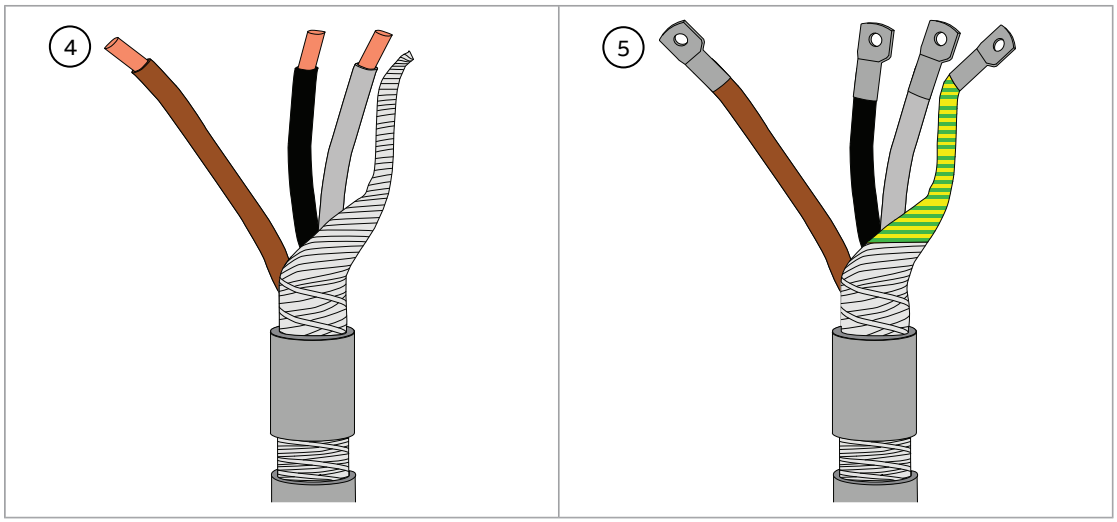
1. IP54 cabinet: Remove the rear horizontal cable support bracket and the cable entry plate.
2. IP54 cabinet: Remove a sealing grommet from the cable entry plate for each cable. Cut hole into the rubber grommet and move it onto the cable.



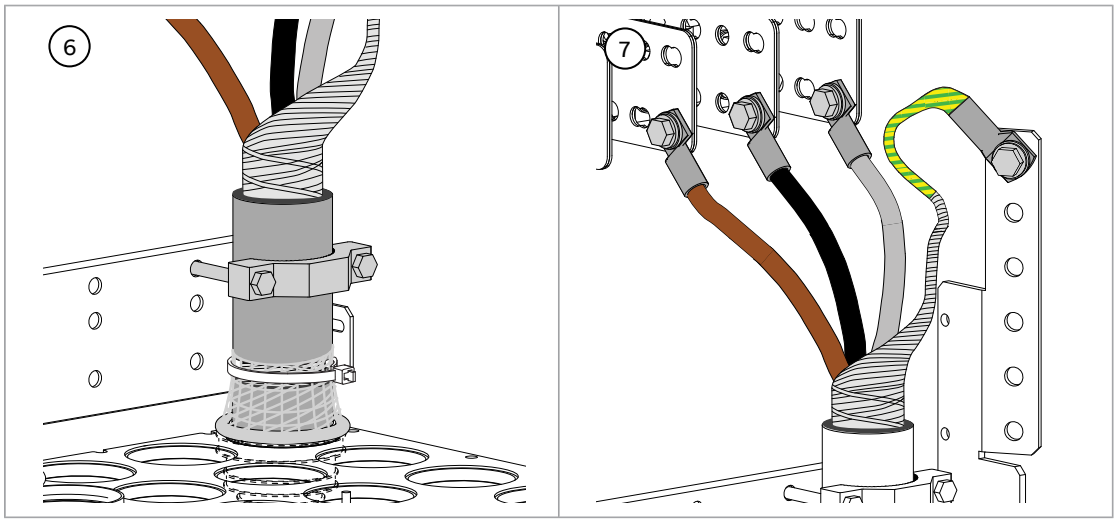
3. Put the cables inside the cabinet through the cable entry plate. If there are several cables, use the rear 3 holes first.
   IP54 cabinet: Attach the sealing grommets to the cable entry plate. Attach also the cable entry plate, and the cable support bracket.
4. For each cable, strip off 3…5 cm (1.2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



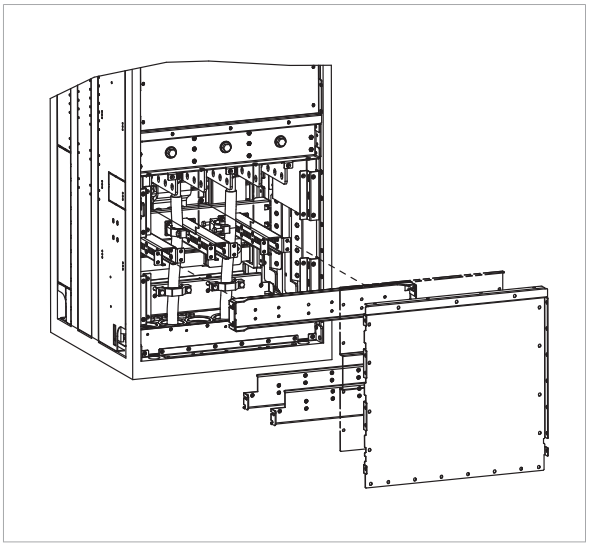
6. For each cable, attach the conductive sleeve to the bare cable shield with a cable tie. Attach the cable to the support bracket with a clamp.
7. For each cable, connect the PE conductor to the PE busbar, and two phase conductors to the phase terminals. Connect the third phase conductor to the PE busbar. 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 57).



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

Replacing shrouds and beams in front of input power cable terminals

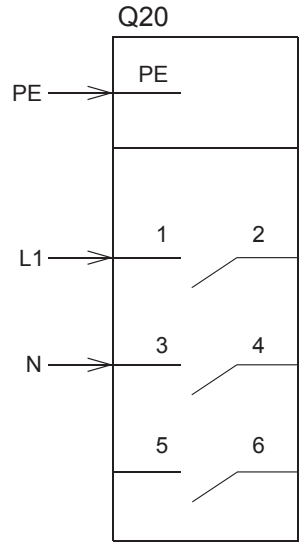
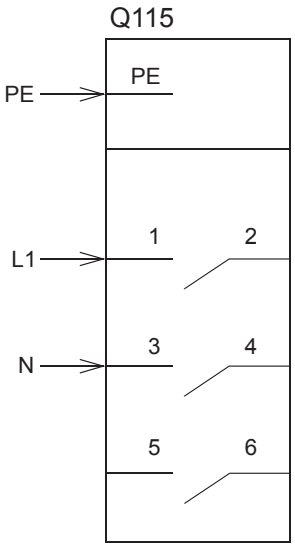
1. Install the beams.
2. Reinstall the shrouding and assembly plates.
3. Close the cubicle door.



Connecting the external power supply cable for the auxiliary circuit

User must provide the auxiliary voltage from an external supply to the drive. For details, see the delivery-specific circuit diagrams.

Connection diagram

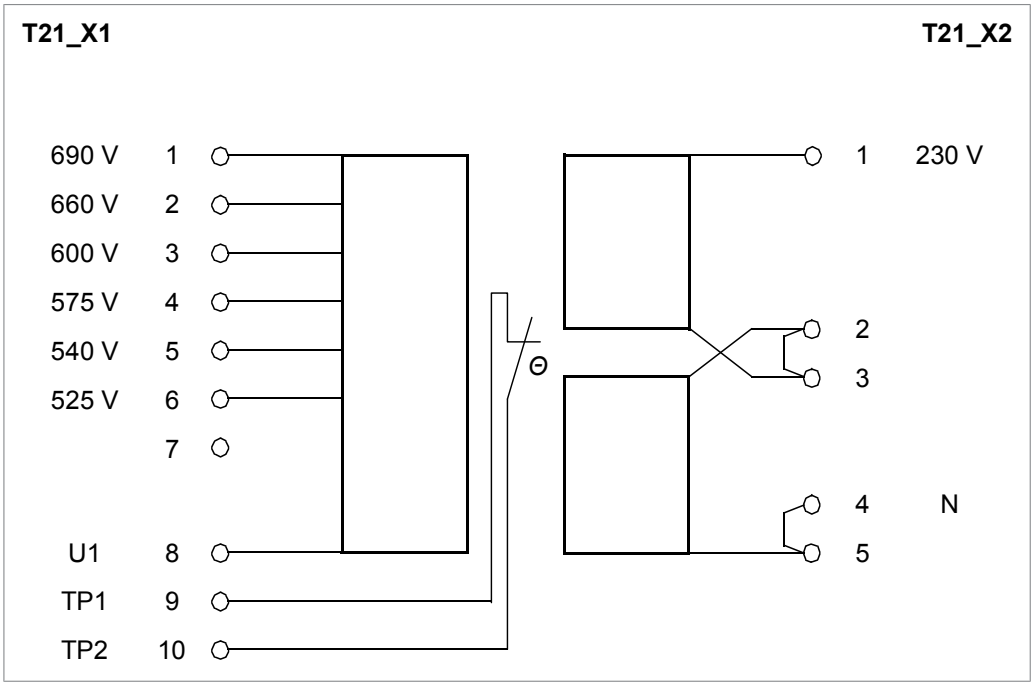
External control voltage supply	External fan voltage supply
	

Examining the settings of the auxiliary voltage transformer ([T21] option +G344)

Examine the tap settings of all auxiliary voltage transformers. Transformer T21 is optional equipment.

The voltage settings of transformer T21 are made at terminal blocks T21_X1/X2 and T115_X1/X2 respectively.

T21 tap settings (690 V units)

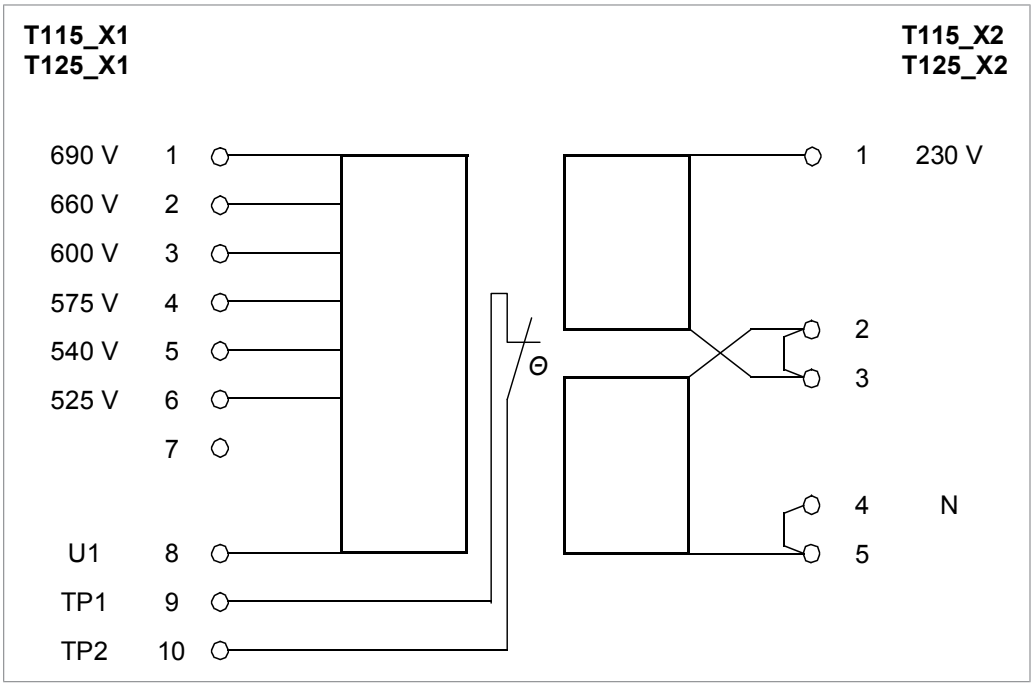


Examining the settings of the cooling fan transformer

Examine the tap settings of all cooling fan transformers. Cooling fan transformers T115 and T125 are present depending on drive configuration. If the delivery contains an incoming unit, the cooling fan transformer connections are made at the factory. The connection of the primary winding of the fan transformer depends on the actual system voltage.

The voltage settings of cooling fan transformers T115 and T125 are made at terminal blocks T115_X1/X2 and T125_X1/X2 respectively.

T115 and T125 tap settings (690 V units)



Connecting the power supply cable for the charging circuit

If the delivery contains an incoming cubicle (ie, the drive has a main circuit breaker ([Q1] option +F255), or main contactor ([Q2] option +F250), the charging circuit connections are made at the factory. The charging circuit components are in the incoming cubicle. If the delivery does not contain incoming cubicle, see the delivery-specific circuit diagrams for wiring.

Activate and tune the charging function in the control program. For information on tuning the parameters, refer to the firmware manual of the supply unit.

Connecting the control cables

The control interface of the supply unit is mainly reserved for internal use. It is possible that there is no, or only a few user-specific control connections. See the delivery-specific circuit diagrams. See the control unit chapter for the default I/O connections of the supply unit.

General instructions on connecting the control cables to the drive

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

Control cable connection procedure

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

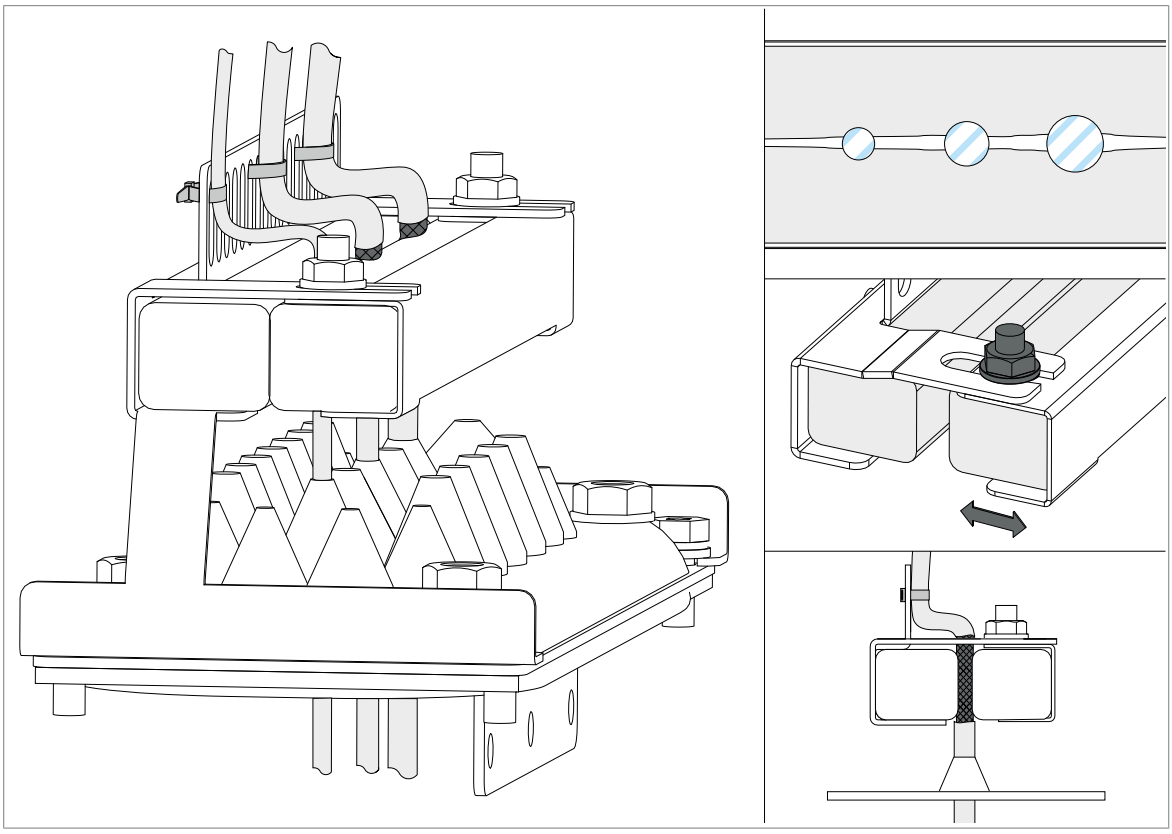
If you are not a qualified electrical professional, do not do installation or maintenance work.

1. Stop the drive (if running) and do the steps in section Electrical safety precautions (page 45) 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 65).
3. Route the control cables as described in section Routing the control cables inside the cabinet (page 67).
4. Connect the control cables as described in section Connecting control cabling (page 68).

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

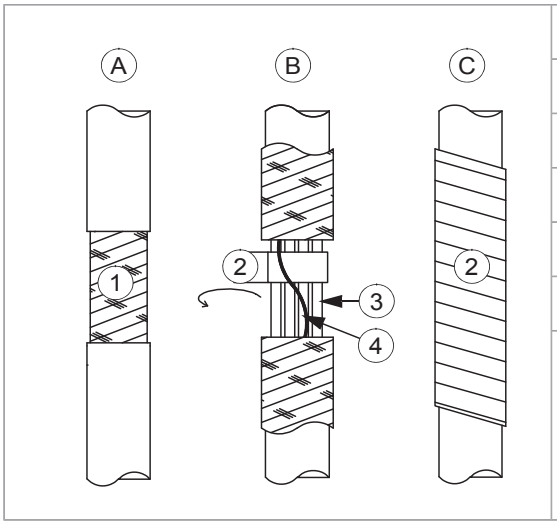
Ground the outer shields of all control cables 360° with the EMI conductive cushions at the cabinet entry. The grounding principle is the same for top and bottom entry cables. The figures show the bottom entry. The actual design details can vary.

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:

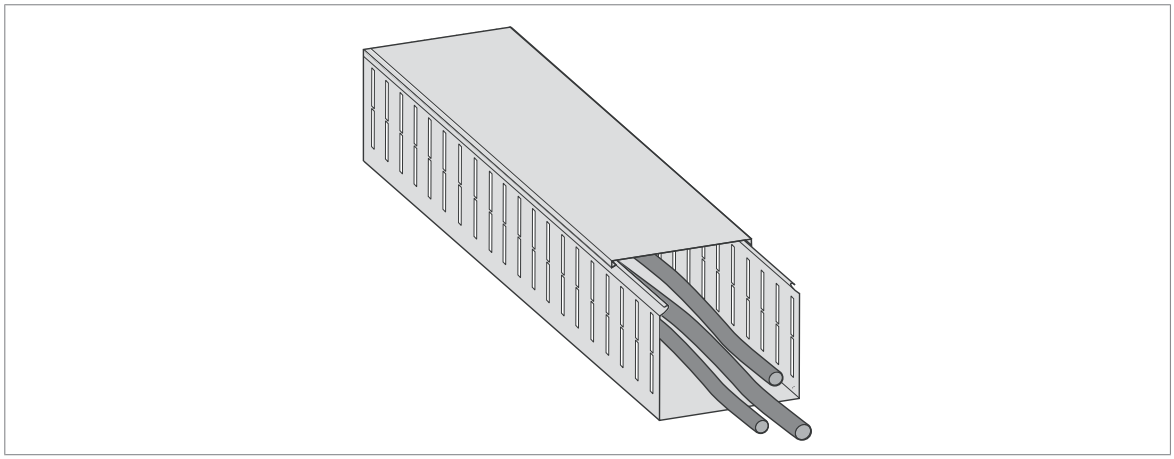
- Cut the shield at the midpoint of the peeled part. Be careful not to cut the conductors or the grounding wire.
- Turn the conductive side of the shield inside out over the insulation.
- Cover the exposed shield and the peeled cable with copper foil to keep the shielding continuous.



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.



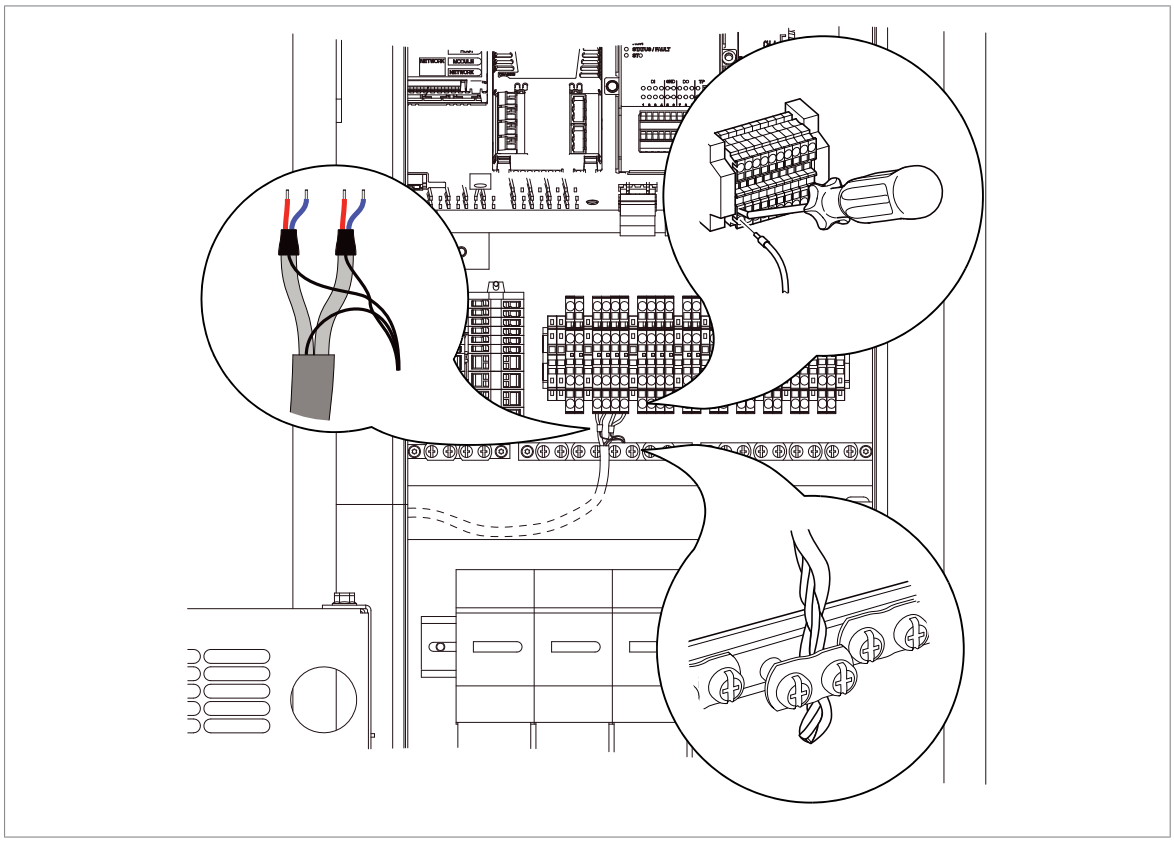
Connecting control cabling

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 at the cable entry, not 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.

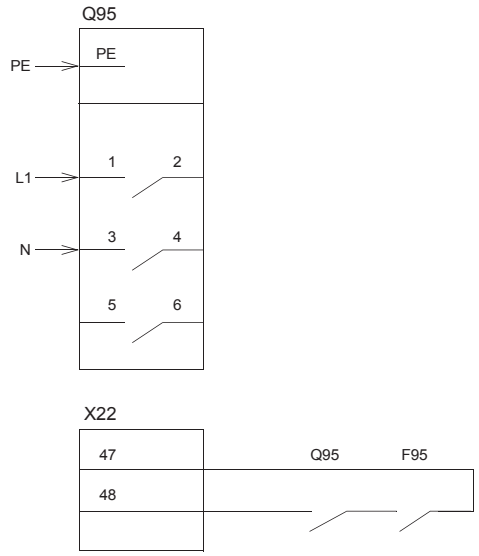
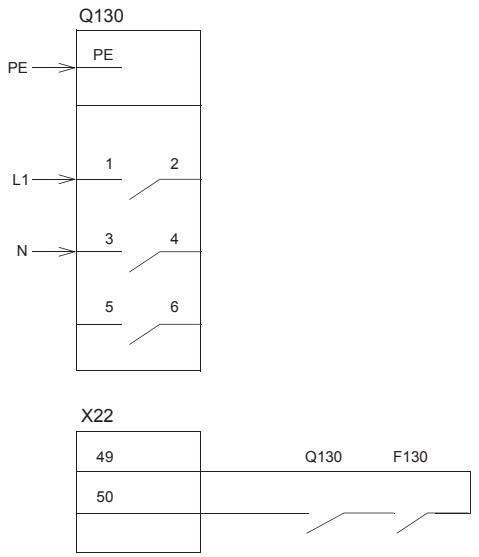
The drawing below represents the grounding of the control cabling when connecting to a terminal block inside the cabinet. The grounding is done in the same way when connecting directly to a component such as the control unit.



Powering the heating and lighting equipment (options +G300 and +G301)

See the circuit diagrams delivered with the supply unit. Cabinet heaters and/or lighting (230 or 115 V AC, options +G300/+G301) are to be supplied from external power sources.

Connection diagram

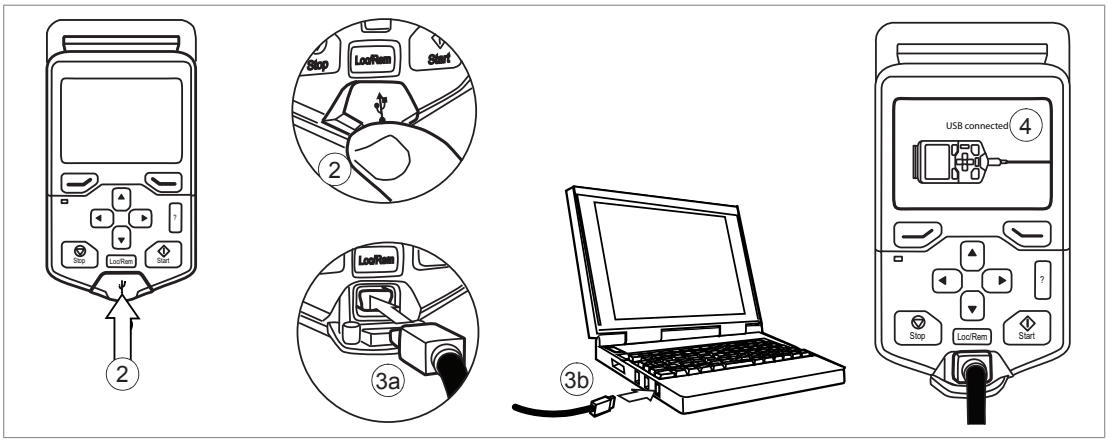
External heating voltage supply		External lighting voltage supply	
			
X22:47 X22:48	Internal wiring of the cabinet heating: heating supply off/fault = contact open	X22:49 X22:50	Internal wiring of the cabinet lighting: lighting supply off/fault = contact open

Connecting a PC

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

A PC (with, for example, the Drive Composer PC tool) can be connected as follows:

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



Installing optional modules

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

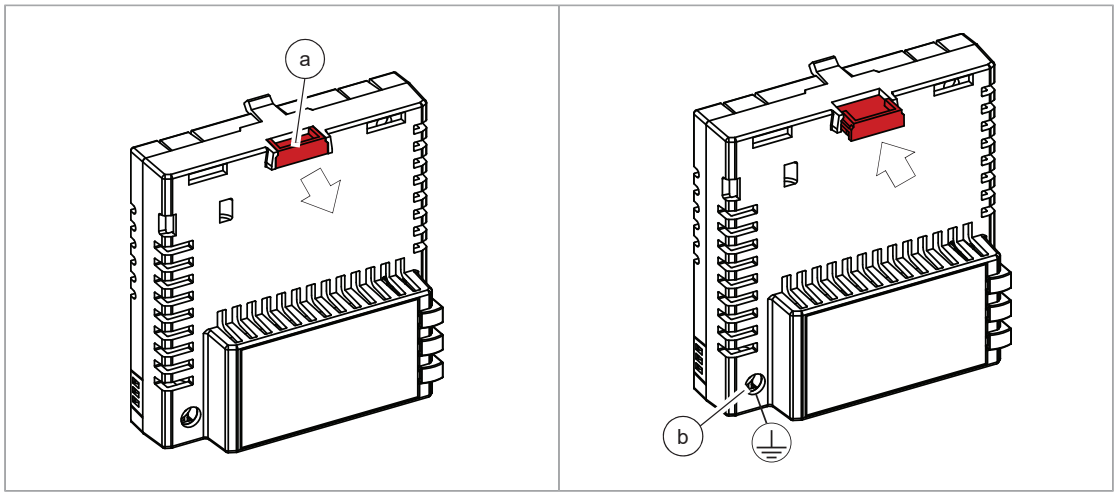
Pay attention to the free space required by the cabling or terminals coming to the option modules.

1. Do the steps in section Electrical safety precautions (page 45) before you start the work.
2. Pull out the lock (a) with a screw driver.

   Note: The location of the lock depends on the module type.
3. Install the module to a free option module slot on the control unit.
4. Push in the lock (a).
5. Tighten the grounding screw (b) to a torque of 0.8 N·m (7 lbf·in).

   Note: The screw tightens the connections and grounds the module. It is essential for fulfilling the EMC requirements and for proper operation of the module.

   WARNING!
   Do not use excessive force, or leave the screw too loose. Over-tightening can cause damage to the screw or module. A loose screw can cause an operation failure.



6. Connect the wiring to the module. Obey the instructions given in the documentation of the module.

If you need to remove the option module after it has been installed into the drive, use a suitable tool (e.g. small pliers) to carefully pull out the lock.

4

The control unit

Contents of this chapter

This chapter

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

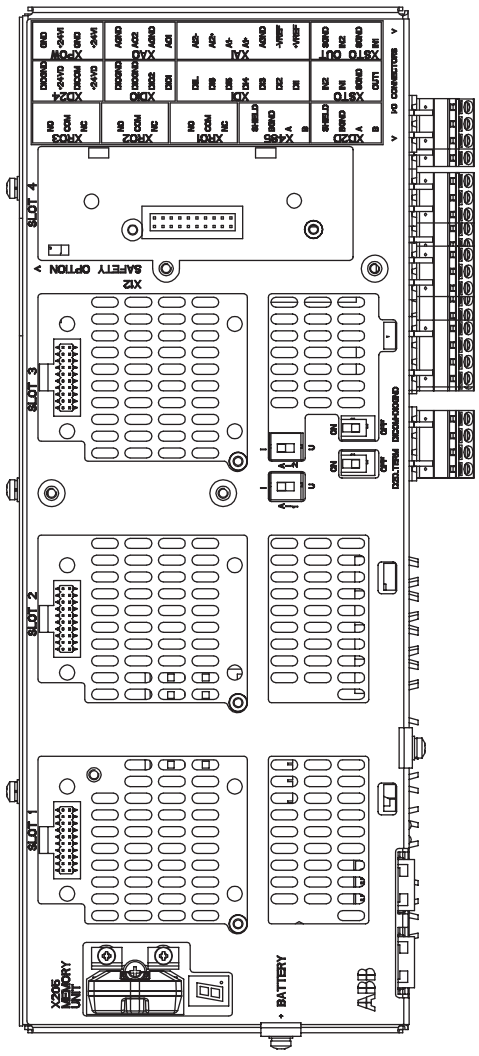
General

The BCU-x2 or UCU-22…24 control unit is used with frame sizes R7i and R8i and multiples. The BCU-x2 consists of a BCON-12 control board (and a BIOC-01 I/O connector board and power supply board) built in a metal housing. The control unit is connected to the IGBT supply module(s) by fiber optic cables.

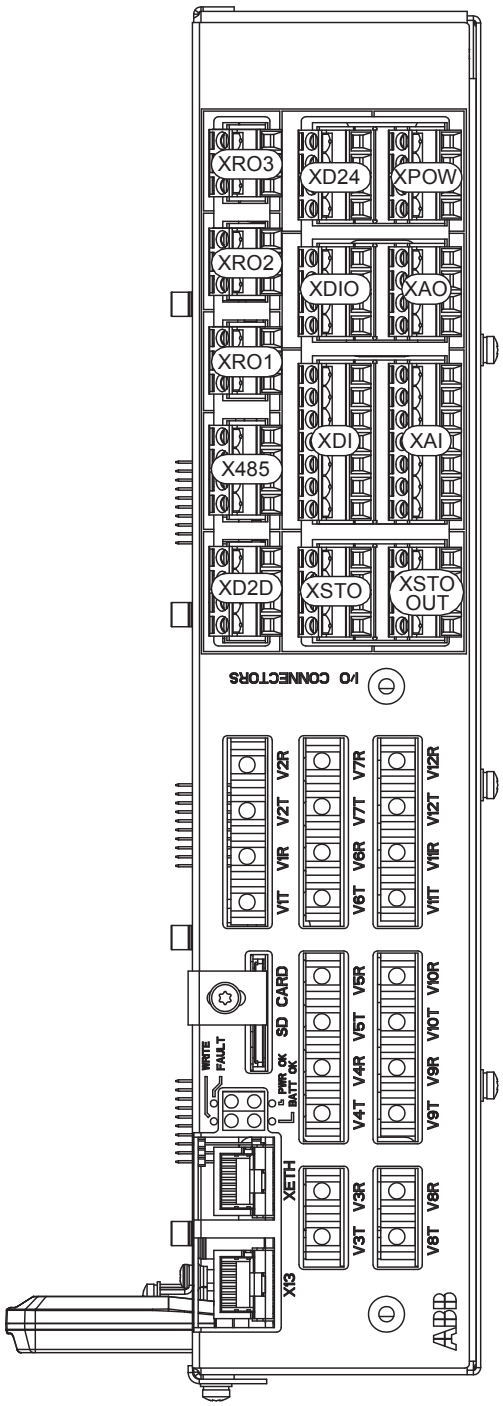
In this manual,

- the name “BCU-x2” represents the control unit types BCU-02, BCU-12 and BCU-22. These have a different number of power module connections (2, 7 and 12 respectively) but are otherwise similar.
- the name "UCU-22…24” represents the control unit types UCU-22 and UCU-23. These have a different number of power module connections (2 and 8 respectively) but are otherwise similar.

BCU layout

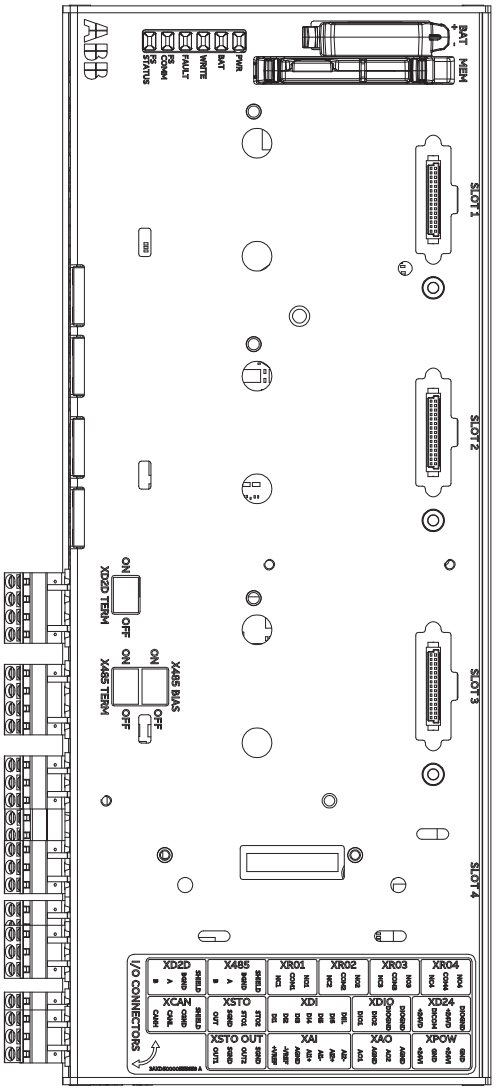


	Description
I/O	I/O terminals (see following diagram)
SLOT 1	I/O extension, encoder interface or fieldbus adapter module connection. (This is the sole location for an FDPI-02 diagnostics and panel interface.)
SLOT 2	I/O extension, encoder interface or fieldbus adapter module connection
SLOT 3	I/O extension, encoder interface, field-bus adapter or FSO safety functions module connection
SLOT 4	RDCO-0x DDCS communication option module connection
X205	Memory unit connection
BATTERY	Holder for real-time clock battery (BR2032)
AI1	Mode selector for analog input AI1 (I = current, U = voltage)
AI2	Mode selector for analog input AI2 (I = current, U = voltage)
D2D TERM	Termination switch for drive-to-drive link (D2D)
DICOM= DIOGND	Ground selection. Determines whether DICOM is separated from DIOGND (ie. the common reference for the digital inputs floats). See the ground isolation diagram.
7-segment display Multicharacter indications are displayed as repeated sequences of characters	
	(“U” is indicated briefly before “o”.) Control program running
	Control program startup in progress
	(Flashing) Firmware cannot be started. Memory unit missing or corrupted
	Firmware download from PC to control unit in progress
	At power-up, the display may show short indications of eg. “1”, “2”, “b” or “U”. These are normal indications immediately after power-up. If the display ends up showing any other value than those described, it indicates a hardware failure.



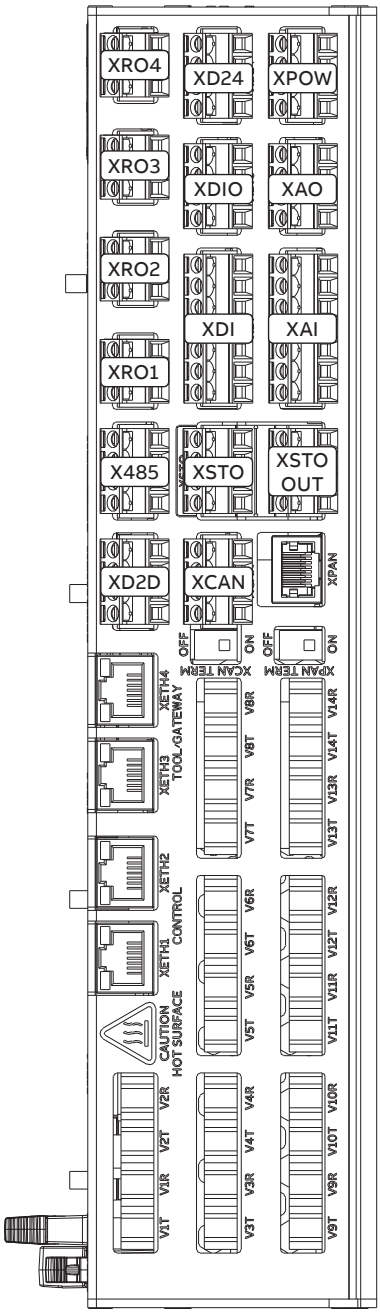
	Description
XAI	Analog inputs
XAO	Analog outputs
XDI	Digital inputs, Digital input interlock (DIIL)
XDIO	Digital input/outputs
XD2D	Drive-to-drive link
XD24	+24 V output (for digital inputs)
XETH	Ethernet port – Not in use
XPOW	External power input
XRO1	Relay output RO1
XRO2	Relay output RO2
XRO3	Relay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

UCU-22...24 layout

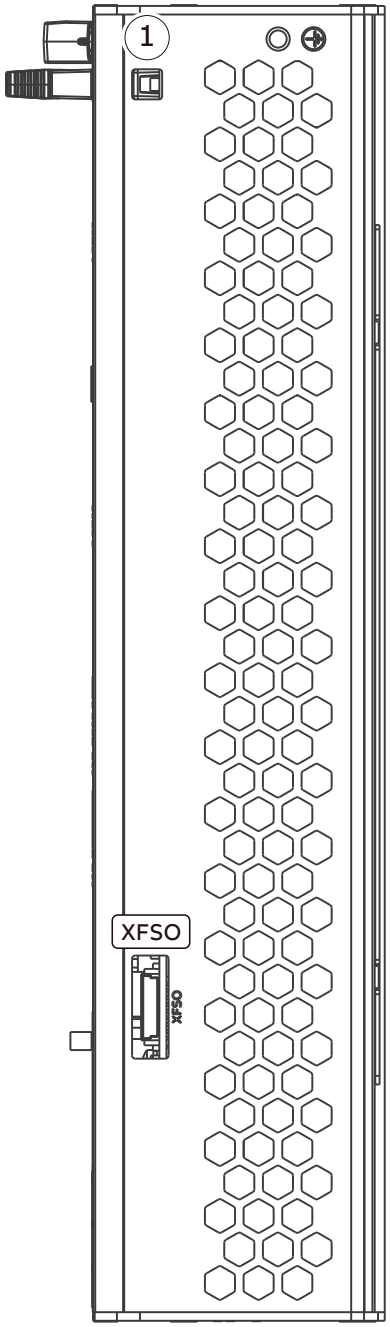


	Description
I/O	I/O terminals
SLOT 1	I/O extension, encoder interface or fieldbus adapter module connection. For F-type modules with USCA-02 adapter.
SLOT 2	I/O extension, encoder interface or fieldbus adapter module connection. For F-type modules with USCA-02 adapter.
SLOT 3	I/O extension, encoder interface or fieldbus adapter module connection. For F-type modules with USCA-02 adapter.
SLOT 4	RDCO-0x DDCS communication option module connection
MEM	UMU-01 memory unit connection. Data logger microSDHC memory card for inverter module communication 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.

LED	Description
PWR	When the PWR LED is on, the voltage supply is sufficient.
BAT	When the BAT LED is on, the real-time clock battery voltage is higher than 2.5 V. If the LED is off, replace the battery.
WRITE	When the WRITE LED is on, writing to microSDHC memory card is in progress. Do not remove the microSDHC memory card.
FAULT	The control program has generated a fault. Refer to the firmware manual.
FS COMM	Reserved.
FS STATUS	Reserved.



	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
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 to converter modules (VxT = transmitter, VxR = receiver)



	Description
XFSO	Not in use
Environmental sensors (1)	Humidity and temperature measurements

Default I/O diagram of the supply control unit (BCU)

The diagram below shows the default I/O connections on the supply control unit (A51), and describes the use of the connections in the supply unit. Under normal circumstances, the factory-made wiring should not be changed.

The wire size accepted by all screw terminals (for both stranded and solid wire) is 0.5 … 2.5 mm² (22 … 12 AWG). The tightening torque is 0.45 N·m (4 lbf·in).

Terminal			Description	
XD2D			Drive-to-drive link	
1 2 3 4	1	B	Not in use by default	
	2	A		
	3	BGND		
	4	Shield		
ON OFF	D2D.TERM		Drive-to-drive link termination switch [1]	
X485			RS485 connection	
5 6 7 8	5	B	Cooling fan monitoring (CIO module)	
	6	A		
	7	BGND		
	8	Shield		
XRO1, XRO2, XRO3			Relay outputs	
11 12 13 21 22 23 31 32 33	11	NC	Norm. closed	XRO1: **Charging** [2] (Energized = Closes charging contactor.) 250 V AC / 30 V DC, 2 A
	12	COM	Common	
	13	NO	Norm. open	
	21	NC	Norm. closed	XRO2: **Fault (-1)** [3] (Energized = Indicates no fault.) 250 V AC / 30 V DC, 2 A
	22	COM	Common	
	23	NO	Norm. open	
	31	NC	Norm. closed	XRO3: **MCB ctrl** [2] (Energized = Closes main contactor/breaker.) 250 V AC / 30 V DC, 2 A
	32	COM	Common	
	33	NO	Norm. open	
XSTO, XSTO OUT			Safe torque off [4]	
1 2 3 4 5 6 7 8	1	OUT	XSTO: Factory connection. Both circuits (power module, control unit) must be closed for the supply unit to start (IN1 and IN2 must be connected to OUT).	
	2	SGND		
	3	IN1		
	4	IN2		
	5	IN1	XSTO OUT: Not in use.	
	6	SGND		
	7	IN2		
	8	SGND		
XDI			Digital inputs	

Terminal			Description
1 2 3 4 5 6 7	1	DI1	**Temp fault**[3] (0 = overtemperature)
	2	DI2	**Run / enable**[3] (1 = run / enable)
	3	DI3	**MCB feedback**[2] (0 = main contactor/breaker open)
	4	DI4	Not in use by default. Can be used for eg, auxiliary circuit breaker fault.
	5	DI5	Not in use by default. Can be used for eg, earth fault monitoring.
	6	DI6	**Reset**[3] (0 -> 1 = fault reset)
	7	DIIL	Not in use by default. Can be used for eg, emergency stop.
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	1	+24VD	+24 V DC 200 mA[5]
	2	DICOM	Digital input ground
	3	+24VD	+24 V DC 200 mA[5]
	4	DIOGND	Digital input/output ground
ON OFF	DICOM=DIOGND		Ground selection switch[6]
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[7]
	5	AI1-	
	6	AI2+	Not in use by default. 0(4)…20 mA, R_{in} = 100 ohm[8]
	7	AI2-	
– ⊃	AI1		AI1 current/voltage selection switch
– ⊃	AI2		AI2 current/voltage selection switch
XAO			Analog outputs
1 2 3 4	1	AO1	**Zero** (no signal indicated)[3] 0…20 mA, R_L < 500 ohm
	2	AGND	
	3	AO2	**Zero** (not signal indicated)[3] 0…20 mA, R_L < 500 ohm
	4	AGND	
XPOW			External power input
1 2 3 4	1	+24VI	24 V DC, 2.05 A
	2	GND	
	3	+24VI	
	4	GND	
X12			Safety functions module connection (not in use in supply units)
X13			Control panel connection

Terminal	Description
X205	Memory unit connection

1) Must be set to ON when the supply unit is the first or last unit on the drive-to-drive (D2D) link. On intermediate units, set termination to OFF.

2) Use of the signal in the control program. When parameter 120.30 External charge enable has value Yes (default setting), the control program reserves this I/O terminal for external charging circuit control and monitoring, and parameters 110.24 RO1 source and 110.30 RO3 source are write-protected. If the value is No, you can use the I/O terminal for other purposes.

3) Use of the signal in the control program (fixed). See also the delivery-specific circuit diagrams.

4) This input only acts as a true Safe torque off input in inverter units. In other applications (such as a supply or brake unit), de-energizing the IN1 and/or IN2 terminal will stop the unit but not constitute a SIL/PL classified safety function.

5) Total load capacity of these outputs is 4.8 W (200 mA at 24 V) minus the power taken by DIO1 and DIO2.

6) Determines whether DICOM is separated from DIOGND (ie, common reference for digital inputs floats). ON: DICOM connected to DIOGND. OFF: DICOM and DIOGND separate.

7) Current [0(4)…20 mA, R_{in} = 100 ohm] or voltage [0(2)…10 V, R_{in} > 200 kohm] input selected by switch AI1. Change of setting requires reboot of control unit.

8) Current [0(4)…20 mA, R_{in} = 100 ohm] or voltage [0(2)…10 V, R_{in} > 200 kohm] input selected by switch AI2. Change of setting requires reboot of control unit.

Default I/O diagram of the supply control unit (UCU-22…24)

The diagram below shows the default I/O connections on the supply control unit (A51), and describes the use of the connections in the supply unit. Under normal circumstances, the factory-made wiring should not be changed.

The wire size accepted by all screw terminals (for both stranded and solid wire) is 0.5 … 2.5 mm² (22…12 AWG). The tightening torque is 0.45 N·m (4 lbf·in).

Terminal			Description	
XD2D			Drive-to-drive link	
1 2 3 4	1 2 3 4	B A BGND SHIELD	Not in use by default	
	XD2D TERM		Drive-to-drive link termination switch.	
X485			RS485 connection	
5 6 7 8	5 6 7 8	B A BGND SHIELD	Not in use by default	
	X485 BIAS		X485 bias selection switch	
	X485 TERM		X485 termination switch	
XCAN			CAN bus	
9 10 11 12	9 10 11 12	CANH CANL CGND SHIELD	Not supported Not supported Not supported Control cable shield	
	XCAN TERM		CANopen termination switch	
XRO1			Relay output 1	
11 12 13	11 12 13	NC1 COM1 NO1	Norm. closed Common Norm. open	XRO1: **Charging** [1] (Energized = Closes charging contactor.) 250 V AC / 30 V DC, 2 A
XRO2			Relay output 2	
21 22 23	21 22 23	NC2 COM2 NO2	Norm. closed Common Norm. open	XRO2: **Fault (-1)** [2] 250 V AC / 30 V DC, 2 A
XRO3			Relay output 3	

Terminal			Description	
31 32 33	31	NC3	Norm. closed	XRO3: **MCB ctrl**[1] (Energized = Closes main contactor/breaker.) 250 V AC / 30 V DC, 2 A
	32	COM3	Common	
	33	NO3	Norm. open	
XRO4			Relay output 4	
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[3]	
1 2 3 4	1	OUT	XSTO: Factory connection. Both circuits must be closed for the supply to start (STO1 and STO2 must be connected to OUT).	
	2	SGND		
	3	STO1		
	4	STO2		
XSTO OUT			Safe torque off 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**[4] (0 = overtemperature)	
	2	DI2	**Run / enable**[4] (1 = run / enable)	
	3	DI3	**MCB feedback**[1] (0 = main contactor/breaker open)	
	4	DI4	Not in use by default. Can be used for eg, auxiliary circuit breaker fault.	
	5	DI5	Not in use by default. Can be used for eg, earth fault monitoring.	
	6	DI6	**Reset**[4] (0 -> = fault reset)	
	7	DIIL	Not in use by default. Can be used for eg, emergency stop.	
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[5]	
	6	DICOM	Digital input ground	
	7	+24VD	+24 V DC 200 mA[5]	
	8	DIGND	Digital input/output ground	
	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.	

Terminal			Description
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 [6]
	5	AI1-	
	6	AI2+	Not in use by default. 0(4)…20 mA, R_{in} = 100 ohm [7]
	7	AI2-	
XAO			Analog outputs
1 2 3 4	1	AO1	**Zero** (no signal indicated)[4] 0…20 mA, R_L < 500 ohm
	2	AGND	
	3	AO2	**Zero** (not signal indicated)[4] 0…20 mA, R_L < 500 ohm
	4	AGND	
XPOW			External power input
1 2 3 4	1	+24V	24 V DC, 2.05 A
	2	GND	
	3	+24V	
	4	GND	
XFSO			Safety functions module connection. Not in use by default.
XETH1			Ethernet ports for fieldbus. Not in use by default.
XETH2			
XETH3			Ethernet ports for tool communication. Not in use by default.
XETH4			
XPAN			Control panel connection
ON 1	XPAN TERM		Control panel connection termination switch
MEM			Memory unit connection

1) Use of the signal in the control program. When parameter 120.30 External charge enable has value Yes (default setting), the control program reserves this I/O terminal for external charging circuit control and monitoring, and parameters 110.24 RO1 source and 110.30 RO3 source are write-protected. If the value is No, you can use the I/O terminal for other purposes.

2) Use of the signal in the control program (fixed). See also the delivery-specific circuit diagrams.

3) This input only acts as a true Safe torque off input in inverter units. In other applications (such as a supply or brake unit), de-energizing the STO1 and/or STO2 terminal will stop the unit but not constitute a SIL/PL classified safety function.

4) Use of the signal in the control program (fixed). See also the delivery-specific circuit diagrams.

5) Total load capacity of these outputs is 4.8 W (200 mA at 24 V) minus the power taken by DIO1 and DIO2.

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.

7) 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)

The control unit is powered from a 24 V DC, 2 A supply (ZCU, BCU) or a 24 V DC, 2.9 A supply (UCU) through terminal block XPOW. With a type BCU/UCU control unit, a second supply can be connected to the same terminal block for redundancy.

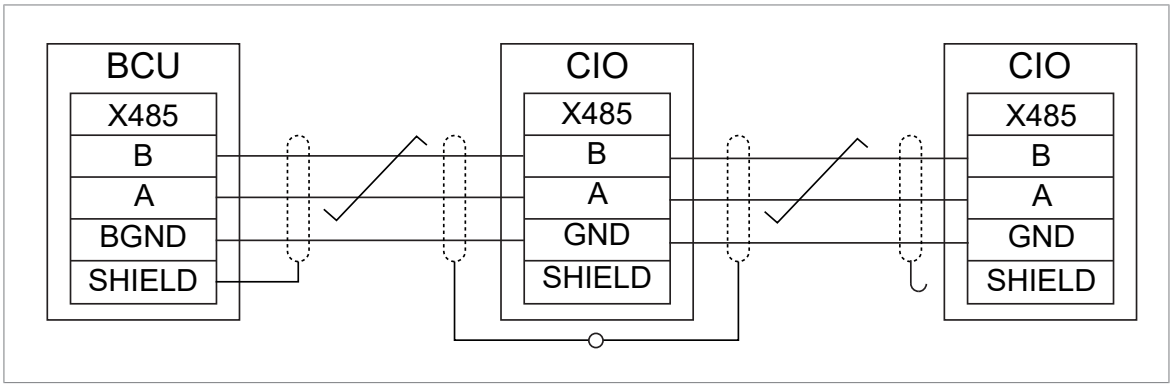
Using a second supply is recommended, if:

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

The X485 connector (BCU)

The X485 connector provides a connection for the optional CIO-01 I/O module. Refer to CIO-01 I/O module for distributed I/O bus control user's manual (3AXD50000126880 [English]) for more information.

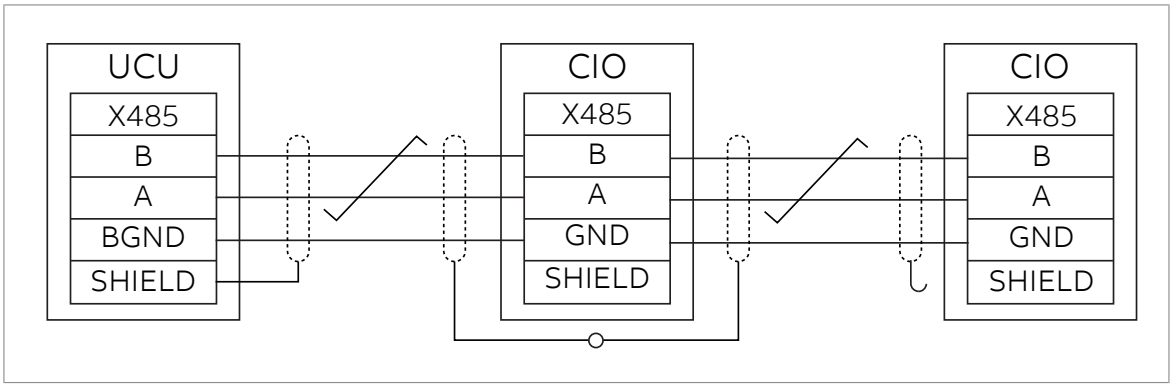
This diagram shows the wiring for the module.



The X485 connector (UCU)

The X485 connector provides a connection for the optional CIO-01 I/O module. Refer to CIO-01 I/O module for distributed I/O bus control user's manual (3AXD50000126880 [English]) for more information.

This diagram shows the wiring for the module.



Terminate the I/O bus at its physical ends:

1. Set the termination resistor switch of the CIO-01 module on the end of the I/O bus to ON position.
2. Set the X485 termination switch (X485 TERM) of the UCU control unit to ON position to terminate the other end of the I/O bus.
3. Set the termination resistors of all other CIO-01 modules to OFF position.

Make sure that two devices in the I/O bus have the biasing on:

1. Set the X485 bias switch (X485 BIAS) of the UCU control unit to ON position.
2. Make sure that the termination resistor switch in one of the CIO-01 modules is set to ON position. This automatically starts the biasing.

Safe torque off (XSTO, XSTO OUT)

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

FSO safety functions module connection (X12, with BCU only)

Refer to the applicable FSO module user's manual. Note that the FSO safety functions module is not used in supply, DC/DC converter or brake units.

Note: Control units that have a sticker with the text “No FSO support” are not compatible with the FSO safety functions module.

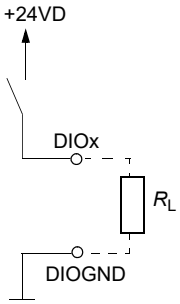
SDHC memory card slot

The BCU 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 SDHC memory card inserted into the SD CARD slot and can be analyzed by ABB service personnel.

MicroSDHC memory card slot

The UCU-22…24 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 memory unit and can be analyzed by ABB service personnel.

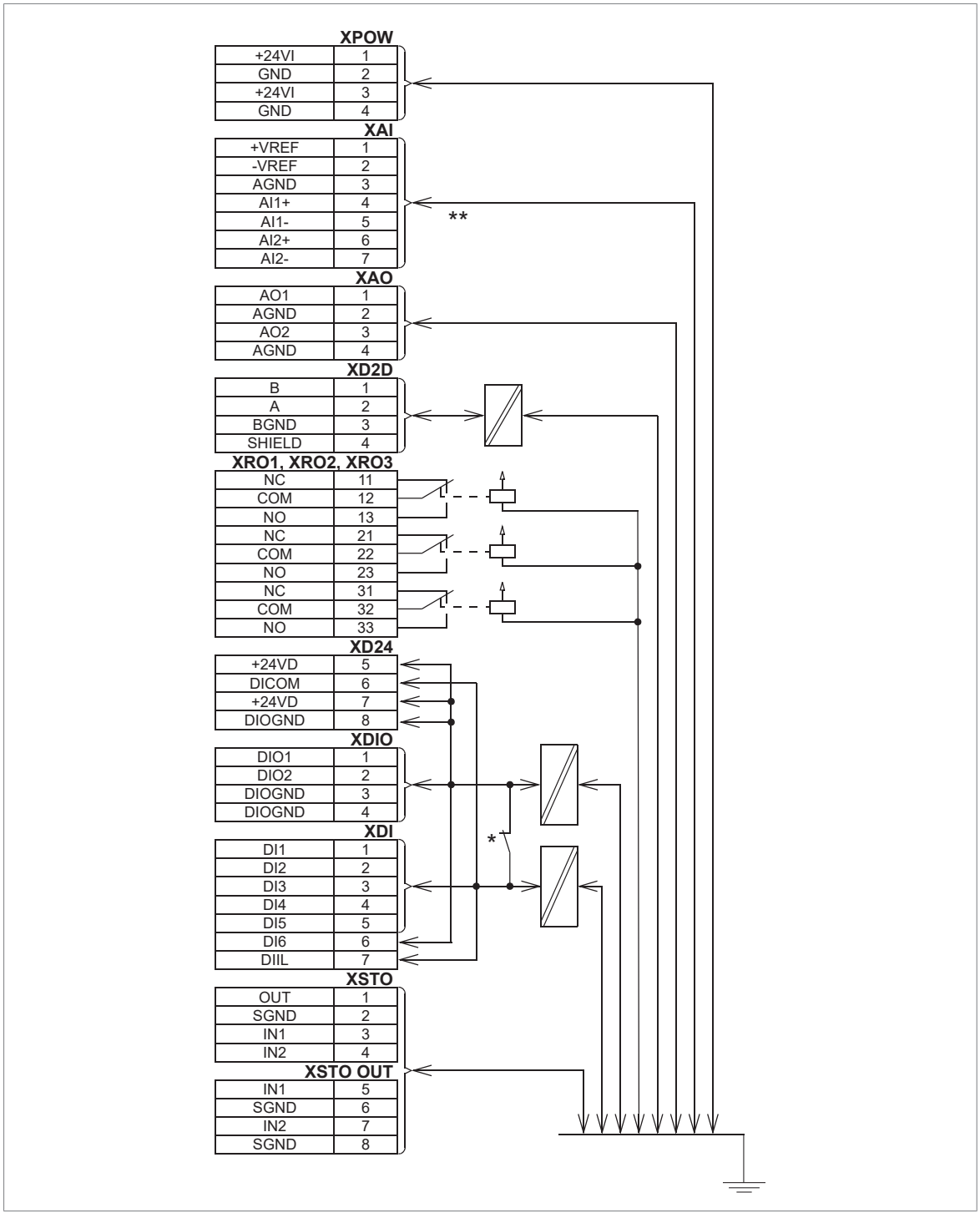
Connector data

Power supply (XPOW)	Connector pitch 5 mm, wire size 0.5 … 2.5 mm² (22…12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) 24 V (±10%) DC, 2 A (BCU) 19…32 V DC, 2.9 A (UCU-22…24) External power input. Two supplies can be connected to the BCU and UCU-22…24 control units for redundancy.
Relay outputs RO1…RO3 (XRO1…XRO3 [BCU]) Relay outputs RO1…RO4 (XRO1…XRO4 [UCU-22…24])	Connector pitch 5 mm, wire size 0.5 … 2.5 mm² (22…12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) 250 V AC / 30 V DC, 2 A Protected by varistors
+24 V output (XD24:2 and XD24:4)	Connector pitch 5 mm, wire size 0.5 … 2.5 mm² (22…12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) Total load capacity of these outputs is 4.8 W (200 mA / 24 V) minus the power taken by DIO1 and DIO2.
Digital inputs DI1…DI6 (XDI:1…XDI:6)	Connector pitch 5 mm, wire size 0.5 … 2.5 mm² (22…12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) 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 (BCU) I_{max}: 15 mA (DI1…DI5), 5 mA (DI6)
Start interlock input DIIL (XDI:7)	Connector pitch 5 mm, wire size 0.5 … 2.5 mm² (22…12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) 24 V logic levels: "0" < 5 V, "1" > 15 V R_{in}: 2.0 kohm Input type: NPN/PNP Hardware filtering: 0.04 ms, digital filtering up to 8 ms
Digital inputs/outputs DIO1 and DIO2 (XDIO:1 and XDIO:2) Input/output mode selection by parameters. DIO1 can be configured as a frequency input (0…16 kHz with hardware filtering of 4 microseconds) for 24 V level square wave signal (sinusoidal or other wave form cannot be used). (BCU) 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). (UCU-22…24) 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.	Connector pitch 5 mm, wire size 0.5 … 2.5 mm² (22…12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) 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)	Connector pitch 5 mm, wire size 0.5 … 2.5 mm^2 (22…12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) 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 switches (BCU) Current/voltage input mode selection by parameters 12.15 AI1 unit selection and 12.25 AI2 unit selection (UCU)	Connector pitch 5 mm, wire size 0.5 … 2.5 mm^2 (22…12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) 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)	Connector pitch 5 mm, wire size 0.5 … 2.5 mm^2 (22…12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) 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	Connector pitch 5 mm, wire size 0.5 … 2.5 mm^2 (22…12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) 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)	Connector pitch 5 mm, wire size 0.5 … 2.5 mm^2 (22…12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) 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) (UCU-22…24)
CAN connection (XCAN [UCU-22…24])	Connector pitch 5 mm, wire size 0.5 … 2.5 mm^2 (22…12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) Termination by switch (XCAN TERM) This connection is not supported by the firmware.

Safe torque off connection (XSTO)	Connector pitch 5 mm, wire size 0.5 … 2.5 mm^2 (22…12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) Input voltage range: -3…30 V DC Logic levels: "0" < 5 V, "1" > 17 V. **Note:** For the unit to start, both connections must be “1”. This applies to all control units (including drive, inverter, supply, brake, DC/DC converter etc. control units), but SIL/PL classified Safe torque off functionality is only achieved through the XSTO connector of the drive/inverter control unit. Current consumption: 10 mA (continuous) per STO channel (UCU-22…24). The number of parallel drive/inverter modules does not have an effect on the current consumption. Current consumption: 66 mA (continuous) per STO channel per drive/inverter module (BCU) EMC (immunity) according to IEC 61326-3-1 and IEC 61800-5-2
Safe torque off output (XSTO OUT)	Connector pitch 5 mm, wire size 0.5 … 2.5 mm^2 (22…12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) To STO connector of inverter module.
Control panel connection (X13 [BCU]) Control panel connection (XPAN [UCU-22…24])	Connector: RJ-45 Cable length < 100 m (328 ft) (BCU) Cable length < 50 m (164 ft) (UCU-22…24) Termination by switch (XPAN TERM) (UCU-22…24)
Ethernet connection (XETH [BCU]) Fieldbus Ethernet connection with internal switch (XETH1 and XETH2 [UCU-22…24]) Tool Ethernet connection with internal switch (XETH3 and XETH4 [UCU-22…24])	Connector: RJ-45 This connection is not supported by the firmware (BCU) Cable type: minimum requirement CAT5e (UCU-22…24)
SDHC memory card slot (SD CARD [BCU])	Memory card type: SDHC Maximum memory size: 4 GB
microSDHC memory card slot (microSDHC CARD [UCU-22…24])	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.	

BCU ground isolation diagram

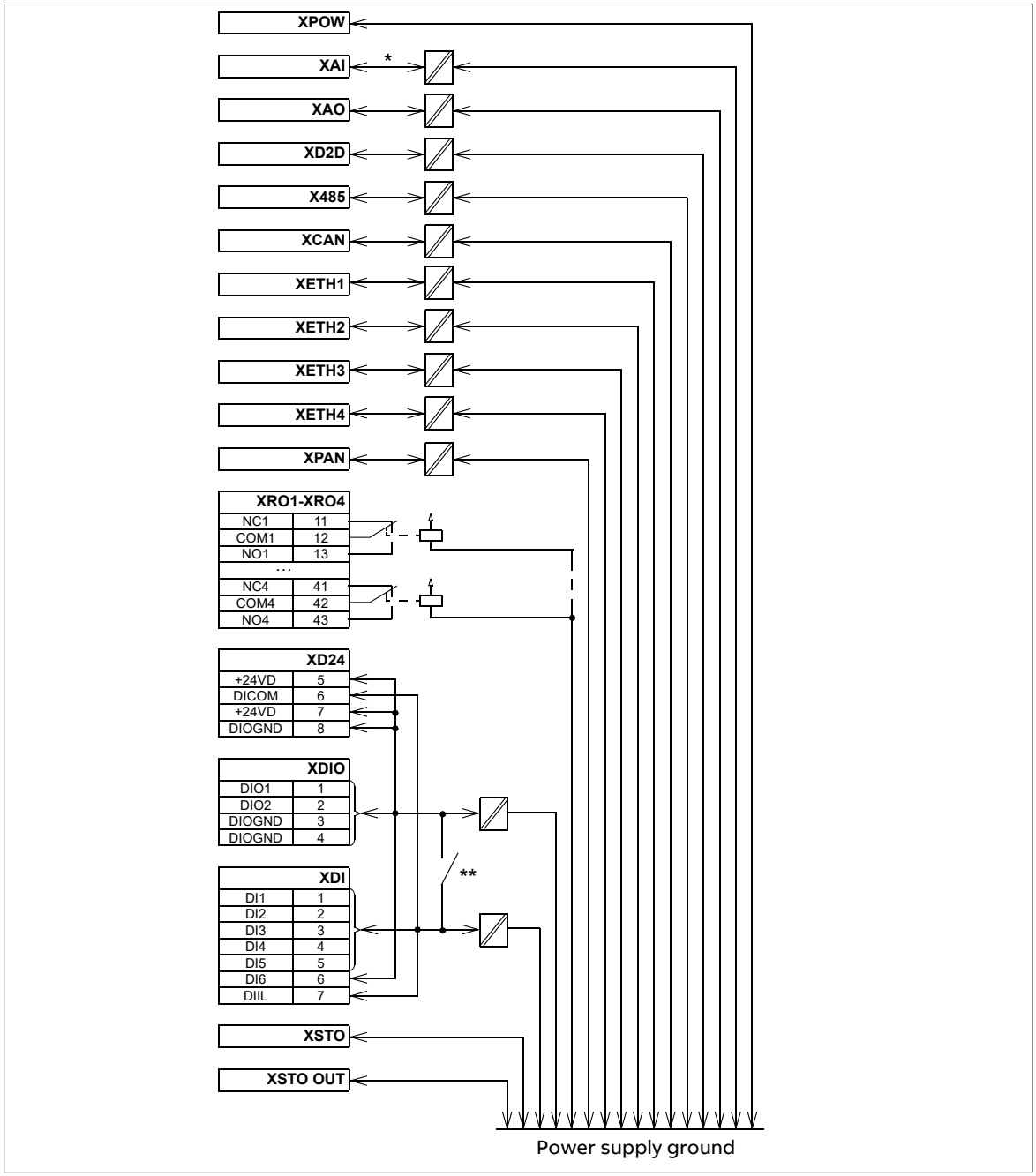


*Ground selector (DICOM=DIOGND) settings

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

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

UCU-22…24 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.

5

Installation checklist

Contents of this chapter

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

Checklist

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

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

WARNING!
Stop the drive and do the steps in section Electrical safety precautions (page 45) before you start the work.

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. See 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 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) See 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 has also been 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 has also been 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. See 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.	☐

6

Start-up and operation

Contents of this chapter

This chapter describes the start-up procedure of the IGBT supply unit. The information is valid for cabinet-installed ACS880-207LC IGBT supply units.

Note: These instructions do not cover all possible start-up tasks of a customized drive. Always refer to the delivery-specific circuit diagrams when proceeding with the start-up.

The underlined tasks are needed for certain cases only. The option codes (if any) are given in brackets. The default device designations (if any) are given in square brackets. For example: Supply unit with the grounding switch ([Q9] option +F259). The same device designations are also used in the circuit diagrams, typically.

Start-up procedure

Action	☑
Safety	
WARNING! Only qualified electricians are allowed to do the work described in this chapter. Obey all safety instructions in ACS880 liquid-cooled multidrives cabinets and modules safety instructions (3AXD50000048633 [English]) and section Electrical safety precautions (page 45). If you ignore the safety instructions, injury or death, or damage to the equipment can occur	
Checks/Settings with no voltage connected	
Ensure that the disconnector of the supply transformer is locked to the off (0) position, ie. no voltage is, and cannot be connected to the drive inadvertently.	☐
Make sure that the main disconnecting device of the supply unit is open and locked: • Drives with a main switch-disconnector ([Q1,] option +F253): Open the main switch-disconnector of the drive. • Drives with a main breaker ([Q1] option +F255): Crank the main breaker to DISCONNECTED position.	☐
Drive with the grounding switch ([Q9] option +F259): Close the grounding switch. **WARNING!** Do not use excessive force. Check the inter-lockings if you cannot turn the switch. See the delivery-specific circuit diagrams.	☐
Make sure that the charging disconnector [Q4] and the DC switch-disconnector for line-up charging [Q40] (if present) are open.	☐
Open the auxiliary voltage switch [Q21].	☐
Check the mechanical and electrical installation. See chapter Installation checklist.	☐
Check the settings of breakers/switches in the auxiliary circuits. See the delivery-specific circuit diagrams.	☐
Disconnect any unfinished or uninspected auxiliary voltage (115/230 V AC) cables that lead from the terminal blocks to the outside of the equipment.	☐
Drives with ground fault monitoring device for IT ungrounded systems (option +Q954): If necessary, adjust the settings of the device. See the circuit diagrams of the delivery and the manual of the device.	☐
Starting and checking the cooling system	
Fill up and bleed the internal cooling circuit. Start the cooling unit up. See Filling up and bleeding the internal cooling circuit (page 170). If the drive is equipped with a cooling unit (ACS880-1007LC): Start up and power up the cooling unit. See 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. See ACS880-1007LC liquid cooling unit user's manual (3AXD50000129607 [English]).	☐
Install all shrouds (if removed).	☐
Powering up the auxiliary circuit of the drive	
Make sure that it is safe to connect voltage. Ensure that • nobody is working on the unit or circuits that have been wired from outside into the cabinet • the cover of the motor terminal box is in place.	☐
Drives with a voltmeter ([P5] option +G334): Make sure that the circuit breaker of the measuring circuit (F5.1) is closed.	☐
Close the circuit breakers and/or fuse disconnectors supplying the auxiliary voltage circuits.	☐

Action	☑
Close the cabinet doors.	☐
Close the main breaker of the supply transformer.	☐
Close the auxiliary voltage switch [Q21]. Also switch on the voltage to any other externally-supplied options (such as the cooling fan supply, lighting, heating).	☐
Setting up the supply unit parameters	
Check the voltage range setting in parameter 195.01 Supply voltage. For more information on setting up the supply control program, see the firmware manual of the supply unit. For more information on setting up the Optimal grid control mode, see Optimal grid control of ACS880 IGBT supply control program supplement (3AXD50000164745 [English]) or Optimal grid control of ACS880 IGBT supply control program (YISLX) supplement (3AXD50001096762 [English]). For more information on setting up the distributed I/O bus, see CIO-01 I/O module and distributed I/O bus user's manual (3AXD50000126880 [English]). If you need more information on the use of the control panel, see the ACS-AP-I, -S, -W and ACH-AP-H, -W Assistant control panels user's manual (3AUA0000085685 [English]).	☐
Drives with a fieldbus adapter module (optional): Set the fieldbus parameters. Activate the fieldbus adapter module in the control program. See the user's manual of the fieldbus adapter module, and the firmware manual of the supply unit. Check that the communication works between the drive and the PLC.	☐
Make sure that the control panel [A51] is in the remote mode (Loc/Rem key of the panel). Otherwise no external control (operating switch on the cabinet door, or fieldbus adapter) is possible.	☐
Powering up the main circuit of the drive	
Drive with the grounding switch ([Q9] option +F259): Open the grounding switch.	☐
Drives with a DC switch-disconnector ([Q11] option +F286): Make sure that all DC switch-disconnectors [Q11] are closed and charging switches [Q10] are open in all IGBT supply module cubicles. See also Additional instructions for closing the DC switch-disconnector of the supply module cubicle ([Q11] option +F286) (page 98).	☐
• Drives with a main switch-disconnector ([Q1] option +F253): Close the main switch-disconnector. • Drives with a main breaker ([Q1] option +F255): Crank the main breaker in. **WARNING!** Do not use excessive force. Check the inter-lockings if you cannot close the disconnecting device. See the delivery-specific circuit diagrams.	☐
Close the charging disconnector [Q4] and the supply unit DC switch-disconnector for line-up charging [Q40].	☐
Turn the operating switch [S21] to the ON (1) position to activate the run enable signal. The main contactor or breaker closes. If this is not the case, use possible additional main contactor/breaker control signal(s) to close it. See the delivery-specific circuit diagrams and the supply unit firmware manual.	☐
Validating the safety functions	
Validate the operation of safety functions (for example, emergency stop). **WARNING!** The safety functions are not safe before they are validated according to the instructions. See the function-specific manual for the validation tasks. Safety functions are optional. See the function-specific manual for the validation tasks.	☐
On-load checks	
Validate the operation of safety functions if any (for example, emergency stop). See the delivery-specific circuit diagrams and function-specific manuals.	☐

Action	☑
Drives with an emergency stop circuit (options +Q951, +Q952, +Q963, +Q964, +Q978, +Q979): Test and validate the operation of the emergency-stop circuit. See the delivery specific circuit diagrams and wiring, start-up and operating instructions of the option.	☐

Additional instructions for closing the DC switch-disconnector of the supply module cubicle ([Q11] option +F286)

If the DC bus is not energized and the DC switch-disconnector [Q11] of the supply unit is in OFF position, [Q11] is interlocked by interlock [K11]. In order to get the supply unit started there are two possibilities: the DC bus is powered up by another supply unit, or the DC bus must be powered by means of the local charging control switch [S4], which forces the charging circuit on.

Before local operation of the charging circuit via local charging control switch [S4], make sure that the main breaker(s) of the supply unit is racked in and the DC switch-disconnector for line-up charging [Q40] is closed.

IGBT supply modules can then be charged as follows:

- Force the charging circuit of the unit on via setting the local charging control switch [S4] to position “1”.
- Wait for a few seconds for the DC bus charging up to nominal voltage level.
- Charge the IGBT supply modules: close the charging switch [Q10] of the units that are to be powered up.
- After the IGBT supply modules are charged and the charging light [P11] on the cabinet door illuminates, the lock of DC switch-disconnector [Q11] is released. The main DC switch-disconnector [Q11] can now be closed, and the charging switch [Q10] opened.
- Repeat this for all IGBT supply module cubicles in this supply unit.
- Set the local charging control switch [S4] back into OPEN position and the DC bus will be discharged again.

When the DC switch-disconnector [Q11] is in the ON position, follow the normal start-up procedure to charge the line-up and to start the operation of the supply unit.

7

Maintenance

Contents of this chapter

This chapter instructs how to maintain the IGBT supply unit and how to interpret its fault indications. The information is valid for cabinet-installed ACS880-207LC IGBT supply units.

Maintenance intervals

The tables below show the maintenance tasks which can be done by the end user. For ABB Service offering, refer to www.abb.com/drivesservices or consult your local ABB Service representative (www.abb.com/searchchannels).

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	
Checking coolant quality			P		P		P		P		P		P	
Coolant draining and replacement							R						R	

Maintenance task/object	Years from start-up													
	0	1	2	3	4	5	6	7	8	9	10	11	12	...
ABB cooling unit (if present)														
Pump and motor										R				
Expansion tank										R				
Inspection of expansion tank air pressure			P		P		P		P		P		P	
External circuit of main heat exchanger (temperature/flow/pressure)			I		I		I		I		I		I	
Cooling fan and fan control														
Cooling fans 230 V AC 50/60 Hz and 24 V DC										R				
Cooling fans 115 V AC 50/60 Hz							R						R	
Frame R7i: Internal cooling fan for circuit boards										R				
CIO module for fan control (230 V AC) [1]										R				
CIO module for fan control (115 V AC) [1]							I/R						R	
Aging														
Control unit battery							R						R	
Control panel battery										R				
Cabinet auxiliary power supplies													R	
Buffer module 24 V DC (+F276 Ride-through function)							R						R	
Connections and environment														
Quality of supply voltage		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	
Inspections by user														
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
Other														
ABB SACE main circuit breaker maintenance		I	I	I	I	I	I	I	I	I	I	I	I	I
ABB contactors maintenance		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													
														3AXD10000578918 rev T

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

Note:

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

Maintenance timers and counters

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

Cabinet

Cleaning the interior of the cabinet

WARNING!
Obey the safety instructions 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 a vacuum cleaner with antistatic hose and nozzle, and wear a grounding wristband. Using a normal vacuum cleaner creates static discharges which can damage circuit boards.

1. Stop the drive and do the steps in section Electrical safety precautions (page 45) before you start the work.
2. Open the cabinet door.
3. Clean the interior of the cabinet. Use a vacuum cleaner and a soft brush.
4. Clean the air inlets of the fans and air outlets of the modules (top).
5. Clean the air inlet gratings (if any) on the door.
6. Close the door.

Cleaning the exterior of the drive

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 section Electrical safety precautions (page 45) before you start the work.
2. Clean the exterior of the drive. 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).

WARNING!
Prevent water from entering the drive. Never use excessive amount of water, a hose, steam, etc.

Fuses

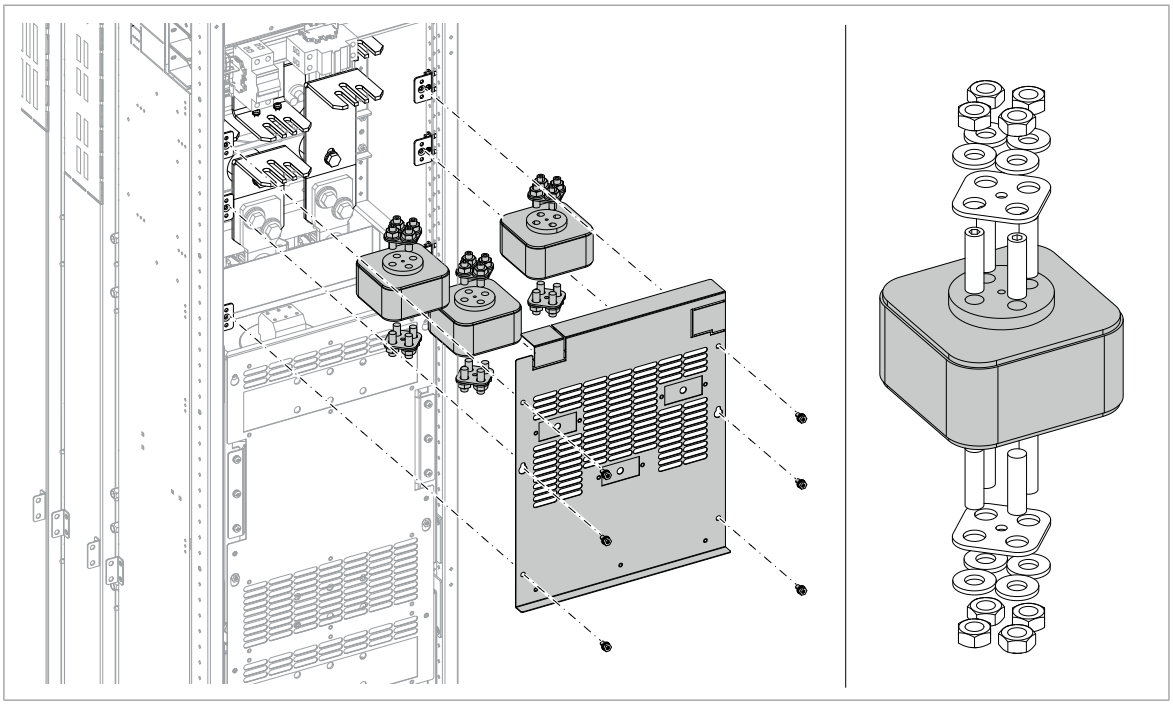
Replacing the supply unit AC fuses (frame R8i)

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

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

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

1. Stop the drive and do the steps in section Electrical safety precautions (page 45) before you start the work.
2. Open the door of the LCL filter cubicle.
3. Remove the shrouding in front of the fuses (if any).
4. Examine the condition of the fuses. In case of a blown fuse, replace all fuses with similar fuses: slacken the nuts of the fuses and pull the fuses out. Do not loosen the nuts completely, not to drop them inside the cubicle. Tighten the nuts first by hand or applying maximum 5 N·m force. Tightening torques for M12 nuts are 50 N·m (37 lbf·ft) for Cooper Bussmann fuses, and 46 N·m (34 lbf·ft) for Mersen (Ferraz-Shawmut) fuses.
5. Attach the shrouding (if any) and close the door.



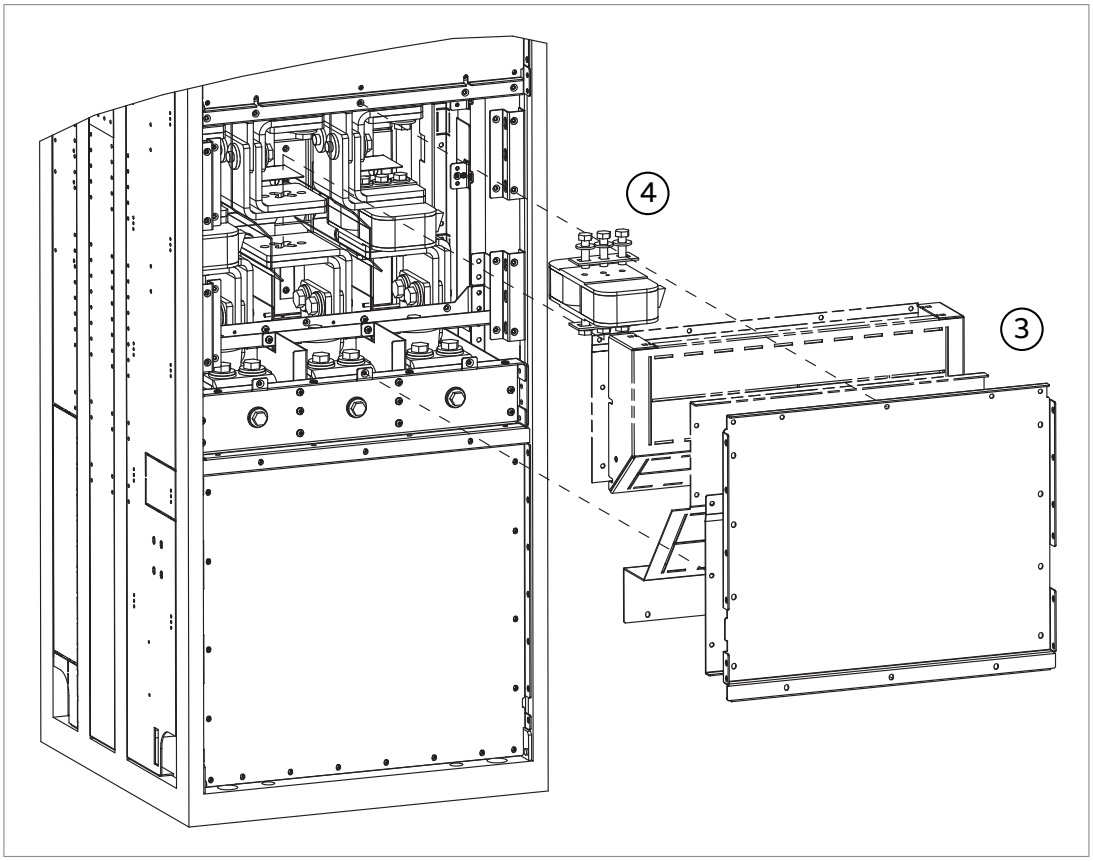
Replacing AC fuses - 100 kA input cubicle (option +F274)

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

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

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

1. Stop the drive and do the steps in section Electrical safety precautions (page 45) before you start the work.
2. Open the door of the 100 kA input cubicle.
3. Remove the shrouding in front of the fuses.
4. Examine the condition of the fuses. If a fuse is blown, replace all fuses with similar fuses as follows:
   - Loosen the nuts of the fuses and pull the fuses out. Do not remove the nuts completely. If you remove the nuts completely, there is a risk that they fall inside the cubicle.
   - Install the new fuses. Tighten the nuts first by hand or applying maximum 5 N·m force. Tightening torques for M12 nuts are 50 N·m (37 lbf·ft) for Bussmann fuses, and 46 N·m (34 lbf·ft) for Mersen (Ferraz-Shawmut) fuses.
5. Attach the shrouding and close the door.


4
3

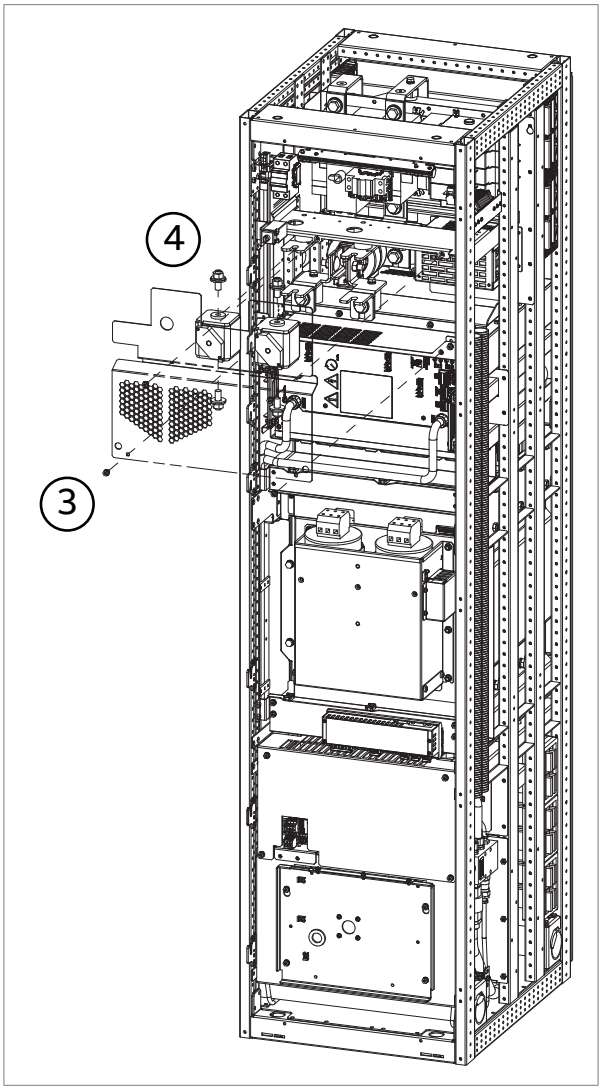
Replacing the supply unit DC fuses (frame R7i)

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

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

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

1. Stop the drive and do the steps in section Electrical safety precautions (page 45) 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: slacken the nuts of the screws of the fuses, and slide out the fuse blocks. Do not unscrew the nuts completely, not to drop them inside the cubicle.
5. Make note of the order of the washers on the screws.
6. 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.
7. 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).
8. Tighten the nuts to torque as follows:
   - Cooper-Bussmann fuses: 50 N·m (37 lbf·ft)
   - Mersen (Ferraz-Shawmut) fuses: 46 N·m (34 lbf·ft)
   - Other: Refer to the fuse manufacturer’s instructions.
9. Attach the shrouding and close the door.


4
3

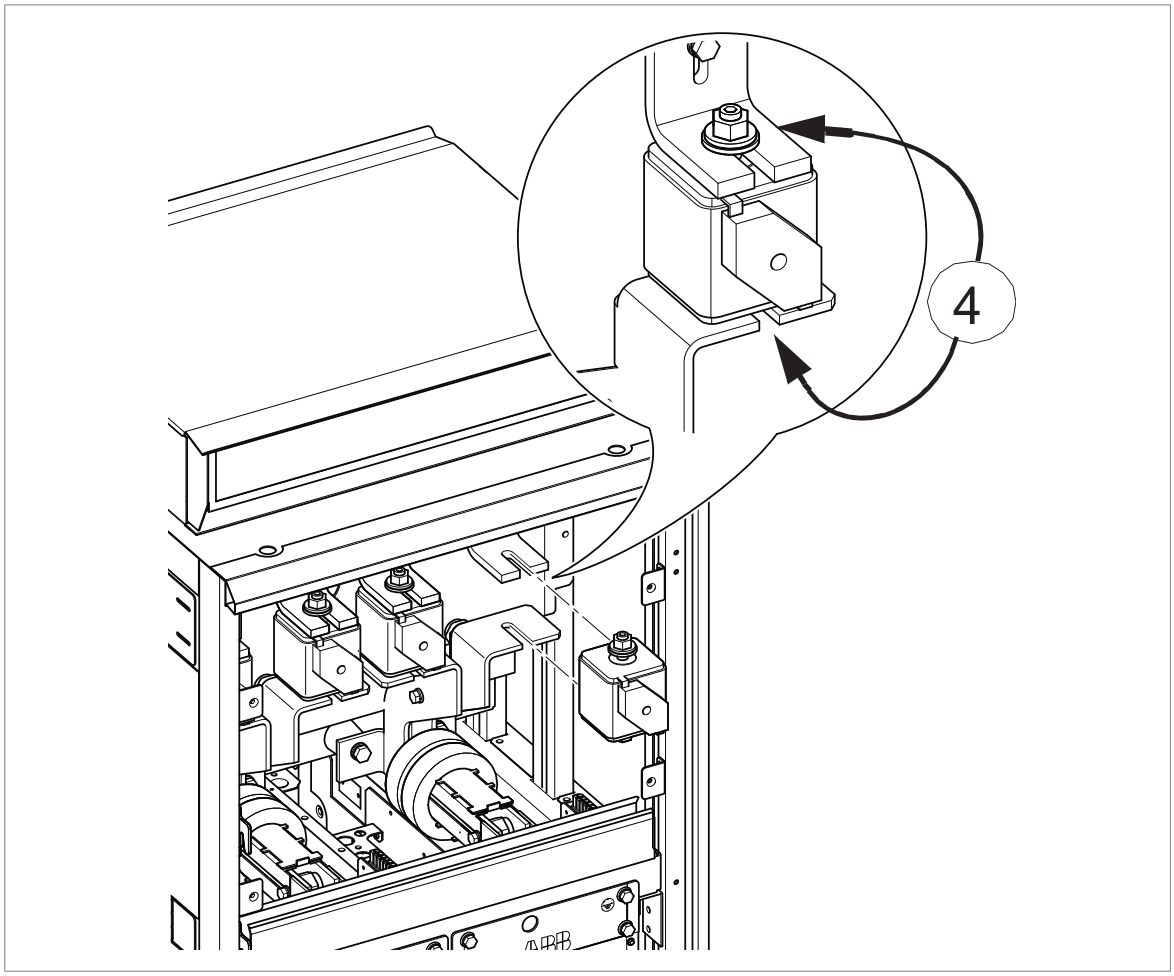
Replacing the supply unit DC fuses (frame R8i)

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

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

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

1. Stop the drive and do the steps in section Electrical safety precautions (page 45) 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.



Fans

The lifespan of the cooling fans of the drive depends on running time, ambient temperature and dust concentration. See the firmware manual for the actual signal which indicates the running time of the cooling fan. Reset the running time signal after fan replacement. See also CIO-01 I/O module and distributed I/O bus user's manual (3AXD50000126880 [English]).

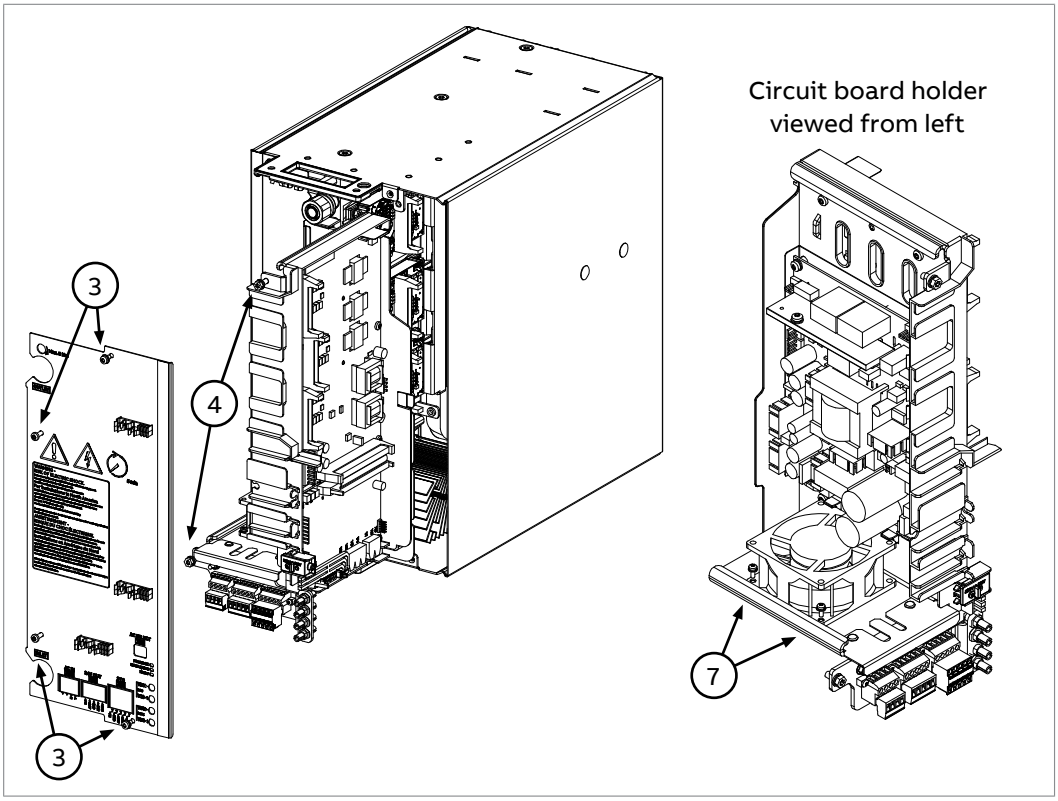
Replacement fans are available from ABB. Do not use other than ABB-specified spare parts.

Frame R7i – internal module fan replacement

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. Stop the drive and do the steps in section Electrical safety precautions (page 45) before you start the work.
2. Detach and move aside the wiring in front of the module.
3. Remove the four screws that hold the faceplate of the module. Remove the faceplate.
4. Remove the two screws that attach the circuit board holder to the module frame.
5. Carefully pull the circuit board holder outward until you have access to the cooling fan at the bottom of the holder. Detach the wiring coming to the circuit boards if necessary.
6. Disconnect the wiring of the fan.
7. Remove the two screws that hold the fan. Remove the fan.
8. Install a new fan in reverse order to the above. Note that the direction of airflow is up.

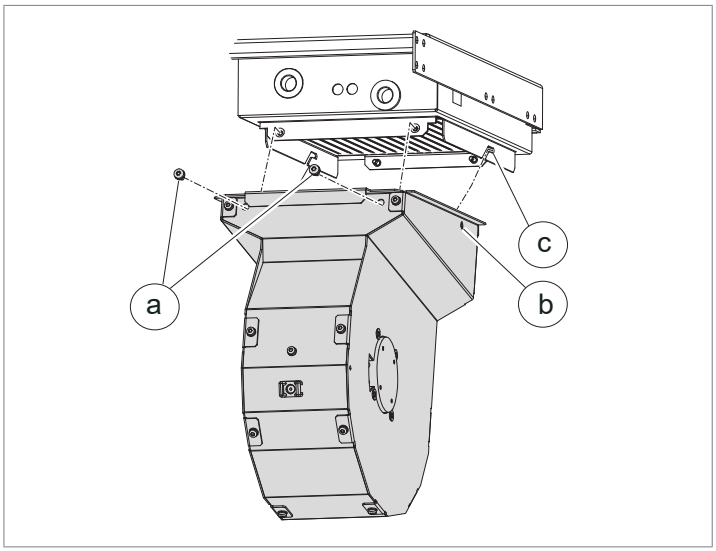


Frame R8i fan replacement

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. Stop the drive and do the steps in section Electrical safety precautions (page 45) before you start the work.
2. Remove any shrouding in front of the cooling fan in case of marine construction (option +C121).
3. Disconnect the fan wiring. Remove the CIO module.
4. Remove the two retaining screws (a).
5. Pull the fan outwards to separate it from the heat exchanger housing.
6. Install new fan in reverse order. Align the guide pins (b) at the rear of the fan cowling with the slots (c) in the module bottom guide, then install the retaining screws (a).



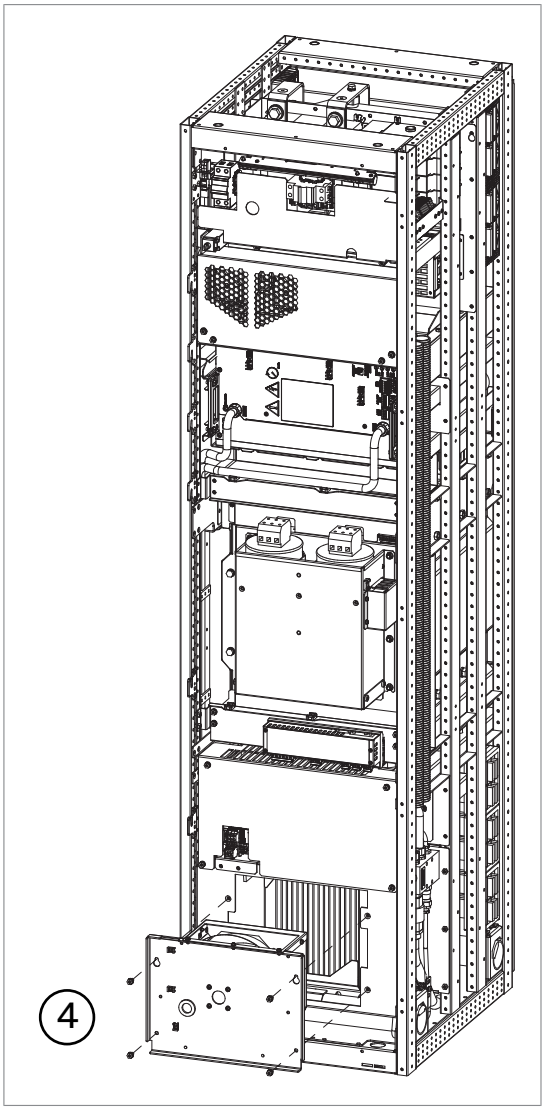
Replacing the cabinet fan in the module cubicle (frame R7i)

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

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

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

1. Stop the drive and do the steps in section Electrical safety precautions (page 45) before you start the work.
2. Remove the shrouding in front of the fan (if any).
3. Disconnect the fan wiring.
4. Remove the four screws and pull the fan unit out.
5. Install new fan in reverse order.


4

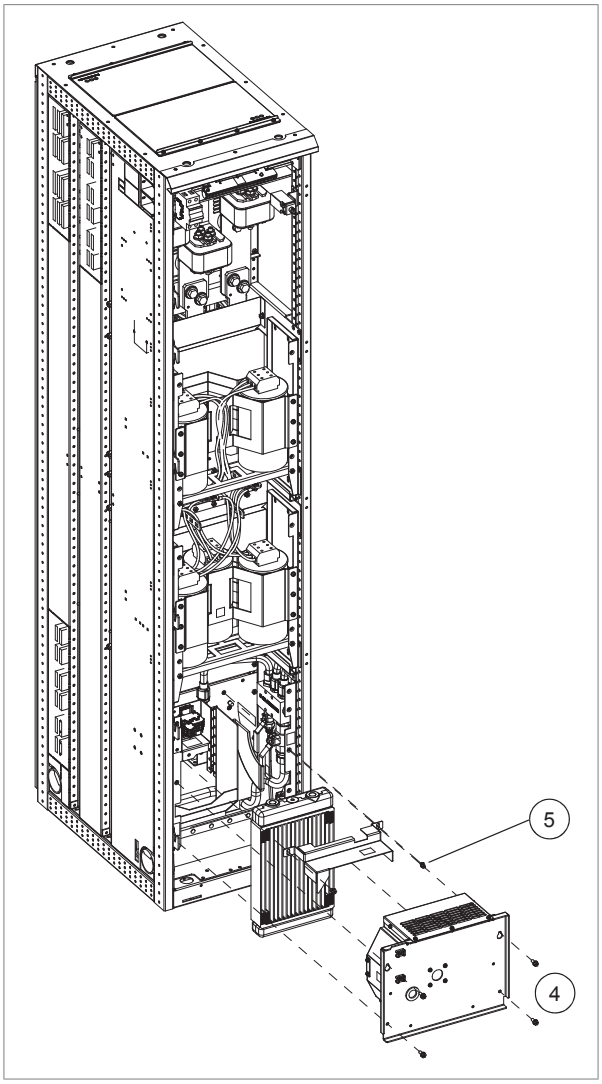
Replacing the heat exchanger fan in the filter cubicle (frame R8i)

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

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

WARNING!
Wear protective gloves and long sleeves. Some parts have sharp edges.

1. Stop the drive and do the steps in section Electrical safety precautions (page 45) before you start the work.
2. Remove the shrouding in front of the fan (if any).
3. Disconnect the fan wiring. Remove the CIO module.
4. Remove the four screws and pull the fan unit out.
5. Remove the two screws in front of the heat exchanger.
6. Install a new fan in reverse order.


5
4

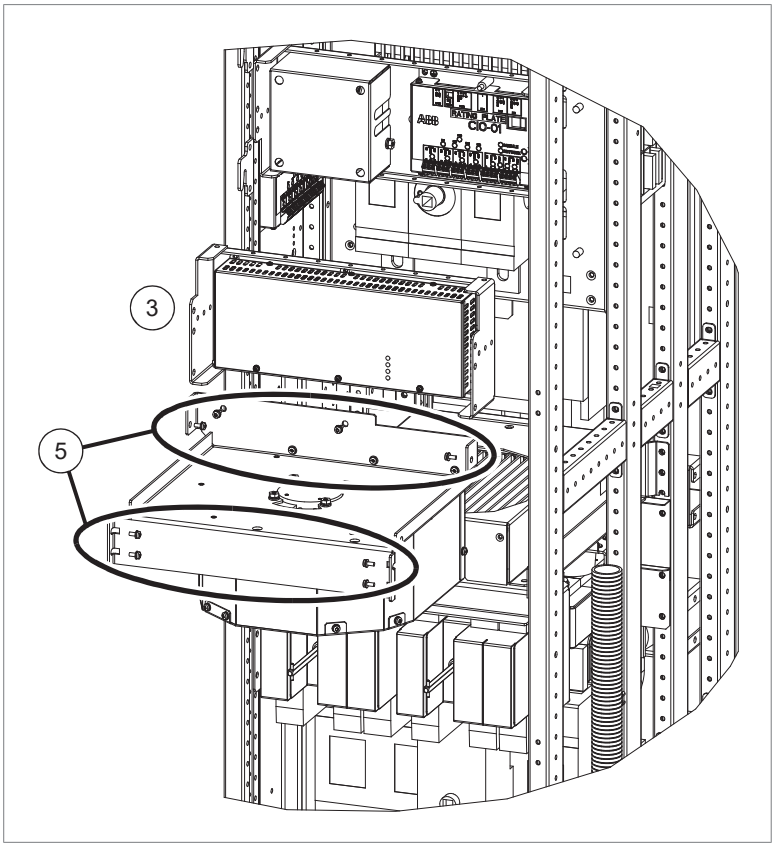
Replacing the fan in the incoming cubicle (frame R7i)

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

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

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

1. Stop the drive and do the steps in section Electrical safety precautions (page 45) before you start the work.
2. Open the door of the incoming cubicle.
3. Remove the assembly plate of the BAMU unit.
4. Disconnect the wiring of the fan.
5. Remove the eight screws of the fan unit and slide the fan unit out.
6. Install a new fan in reverse order.
7. Close the door.



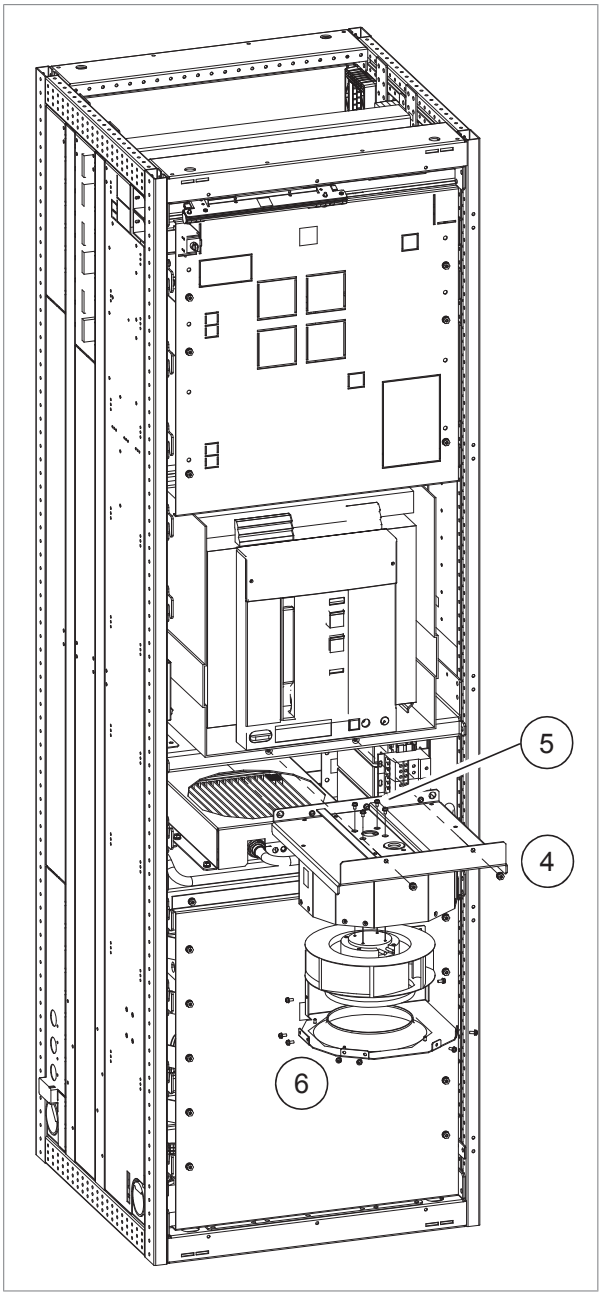
Replacing the fan in the incoming cubicle (frame R8i)

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

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

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

1. Stop the drive and do the steps in section Electrical safety precautions (page 45) before you start the work.
2. Remove the shrouding in front of the fan (if any).
3. Disconnect the fan wiring. Remove the CIO module.
4. Remove the two screws and slide the fan unit out.
5. Remove the four screws to detach the fan from the fan unit.
6. Remove the eight screws surrounding the fan unit.
7. Install a new fan in reverse order.


5
4
6

Replacing the fan in the 400 mm wide auxiliary control cubicle (frame R7i)

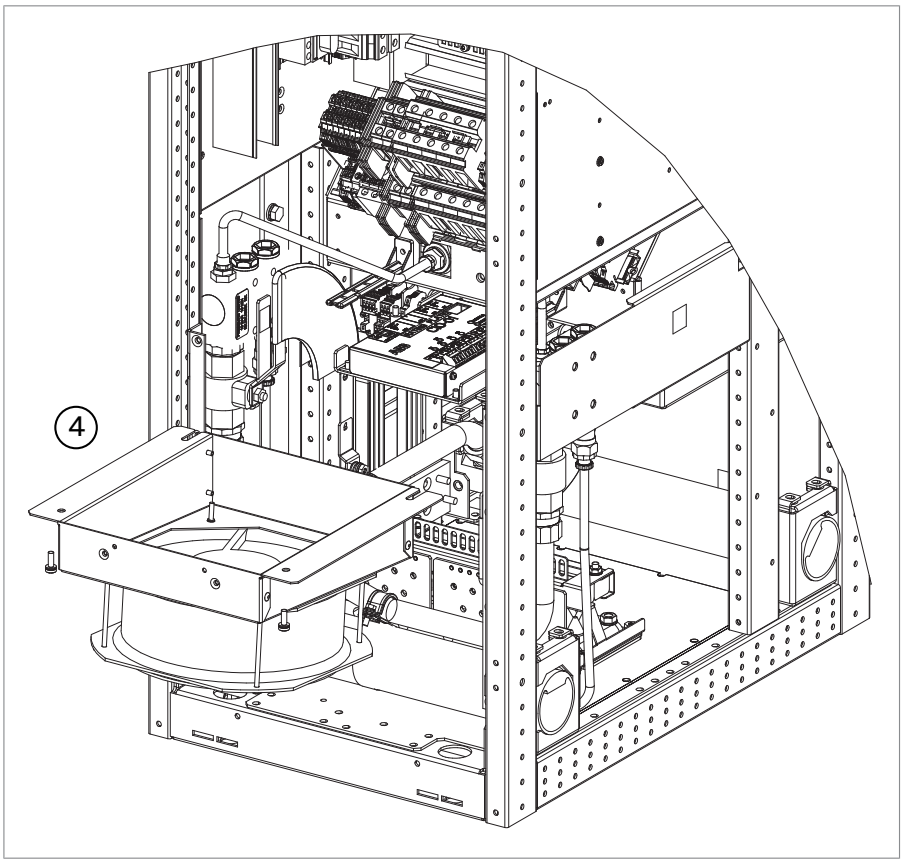
Auxiliary control cubicle has a fan in the lower part of the cubicle.

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

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

WARNING!
Wear protective gloves and long sleeves. Some parts have sharp edges.

1. Stop the drive and do the steps in section Electrical safety precautions (page 45) before you start the work.
2. Open the door of the auxiliary control cubicle.
3. Disconnect the fan wiring.
4. Remove the fastening screws of the fan collar and slide the fan with the collar out.
5. Detach the fan from the collar and replace the fan.
6. Install the new fan in reverse order.



Replacing the fan in the 600 mm wide auxiliary control cubicle

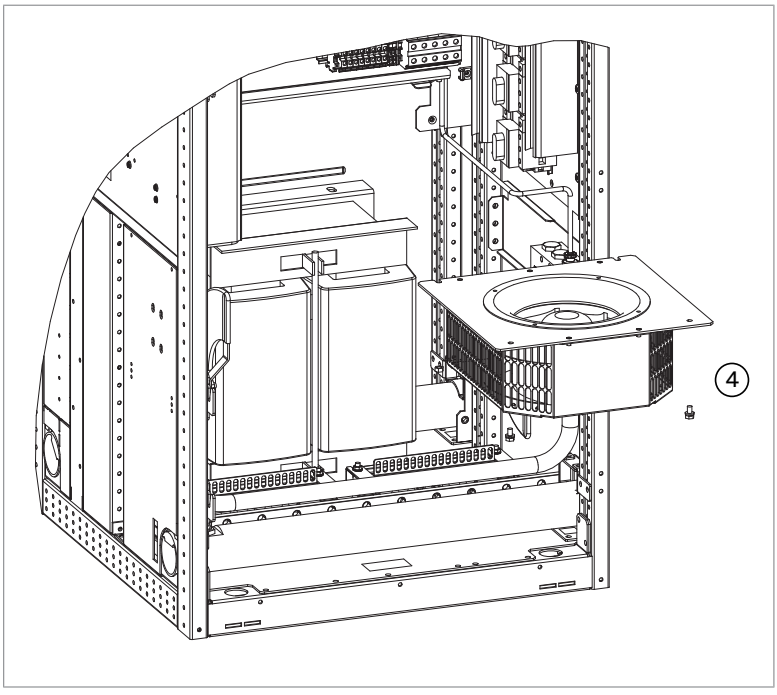
Auxiliary control cubicle has a fan in the lower part of the cubicle.

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

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

WARNING!
Wear protective gloves and long sleeves. Some parts have sharp edges.

1. Stop the drive and do the steps in section Electrical safety precautions (page 45) before you start the work.
2. Open the door of the auxiliary control cubicle.
3. Disconnect the fan wiring.
4. Remove the fastening screws of the fan collar and slide the fan with the collar out.
5. Detach the fan from the collar and replace the fan.
6. Install the new fan in reverse order.

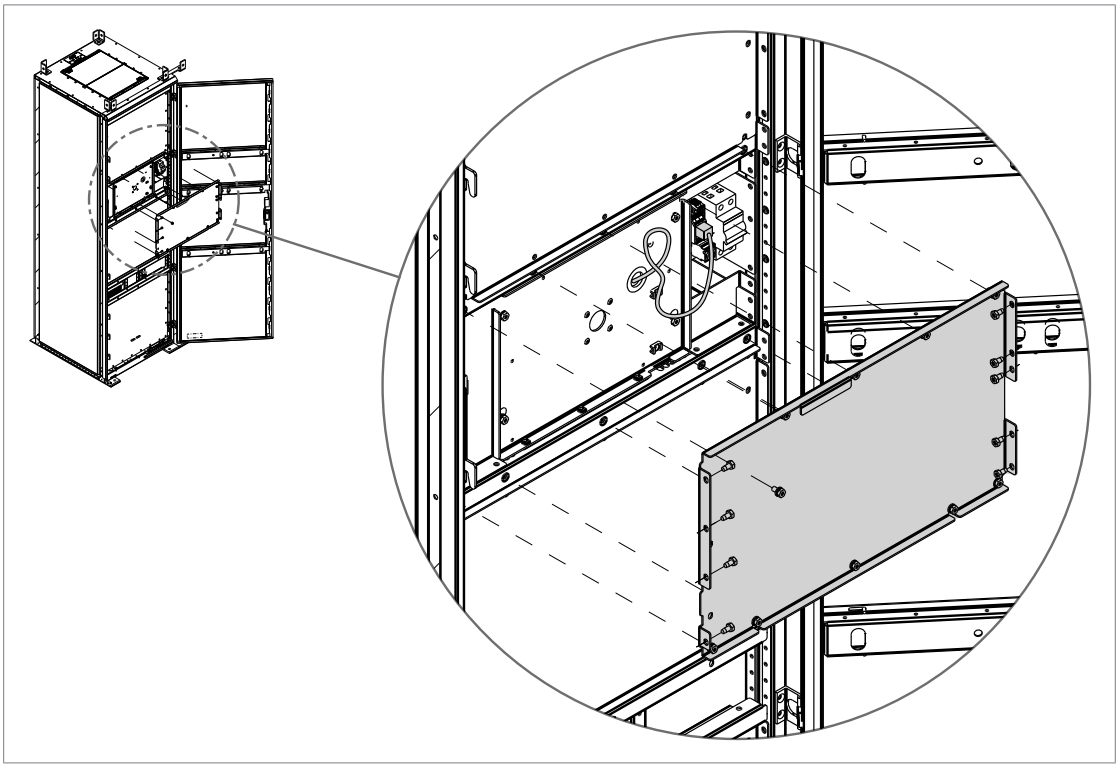


Replacing the cooling fan in the 100 kA input cubicle

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

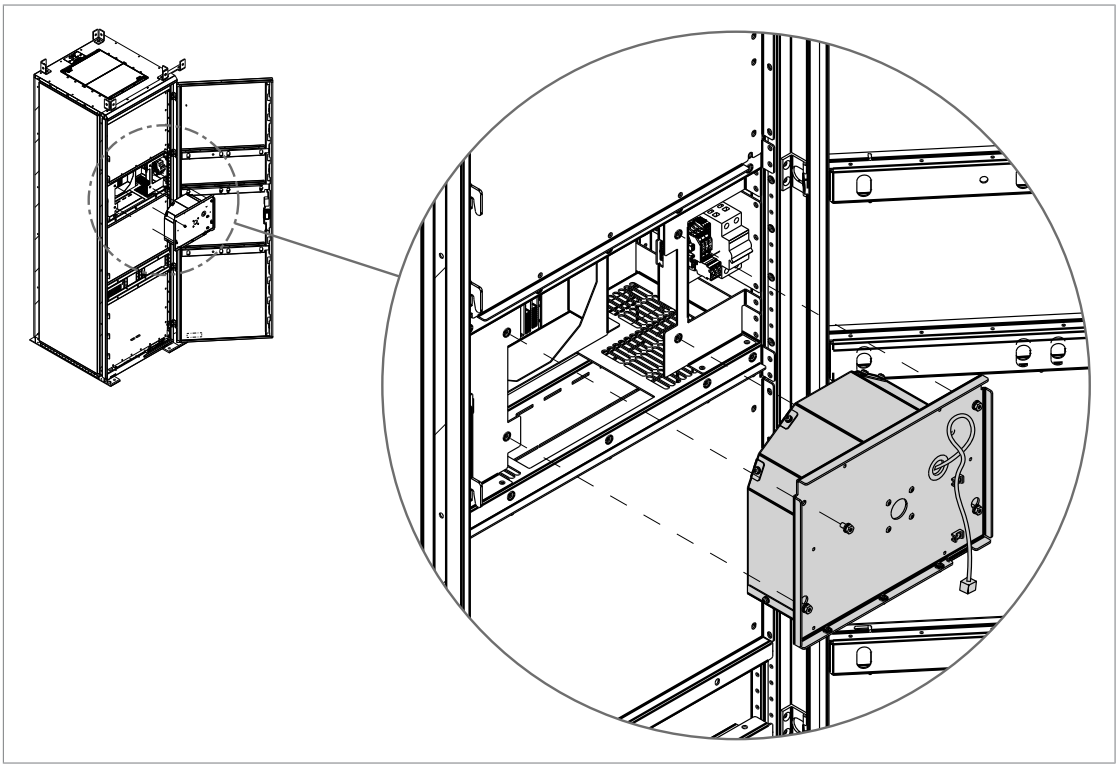
WARNING!
Use the required personal protective equipment. Wear protective gloves and long sleeves. Some parts have sharp edges.

1. Stop the drive and do the steps in section Electrical safety precautions (page 45) before you start the work.
2. Open the cubicle door.
3. Drives with marine construction (option +C121): Remove the support brace that is in front of the fan cover.
4. Remove all screws on the cover plate. Pull the cover plate out.

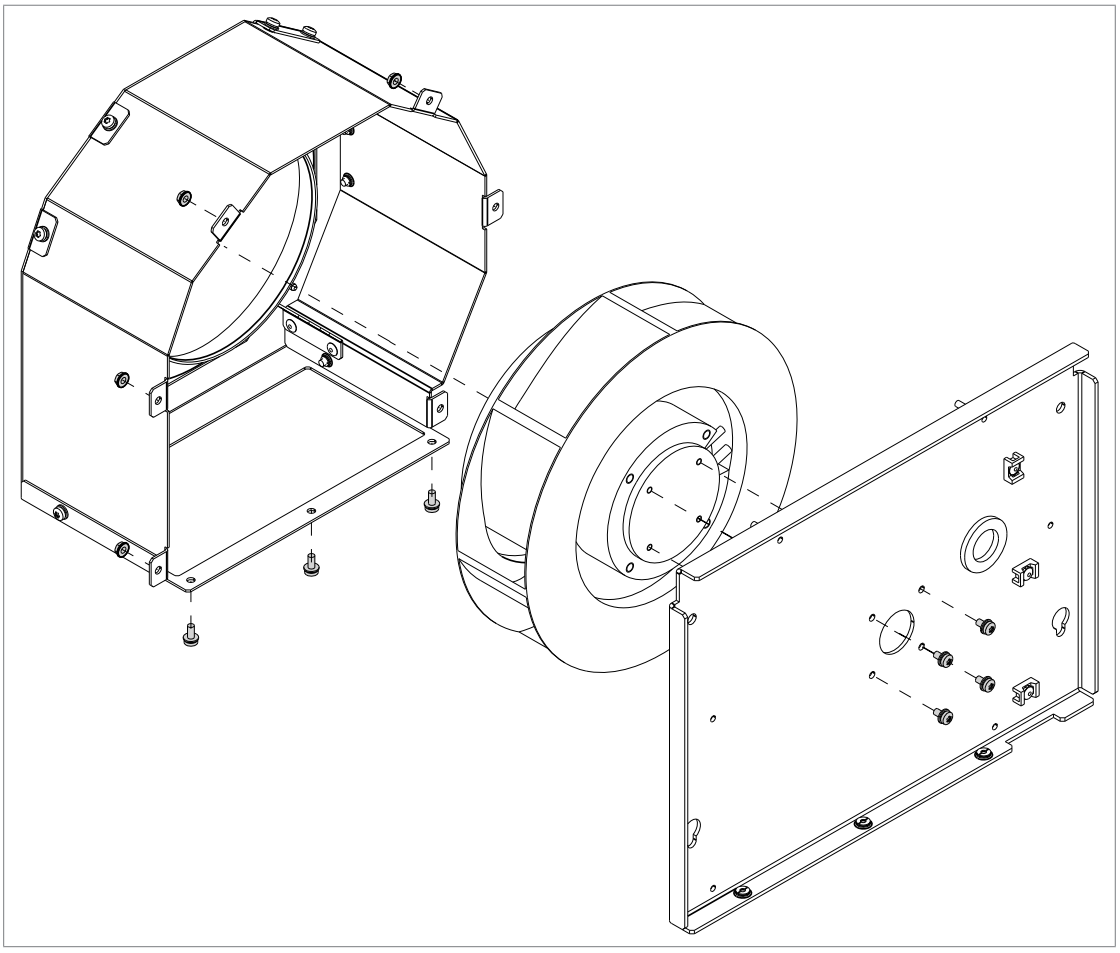


5. Disconnect the fan wiring.

6. Remove the 4 screws that attach the fan assembly to the frame. Pull the fan assembly out.



7. Disassemble the fan assembly as follows:
   - Remove the 3 screws and 6 nuts that attach the front casing to the rear casing.
   - Remove the 4 screws that attach the fan to the front casing.



8. Replace the fan.
9. Assemble and install the fan assembly in reverse order.

Supply modules

Replacing the supply module (frame R7i)

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

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

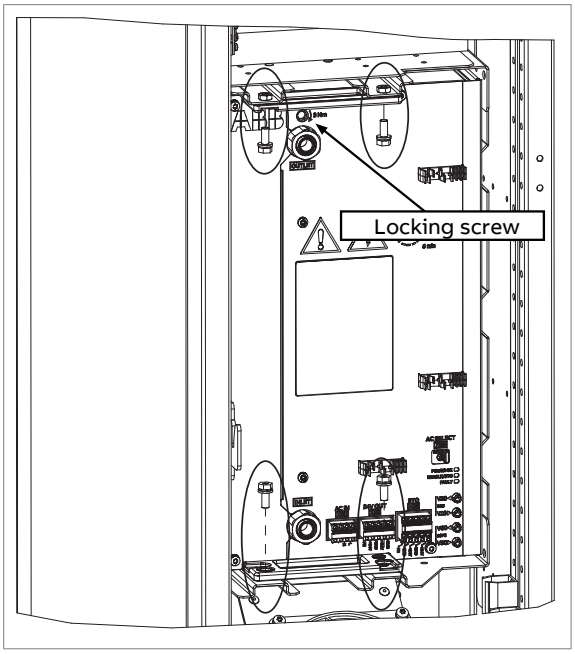
WARNING!
Make sure that the replacement module has exactly the same type code as the old module.

WARNING!
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.

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

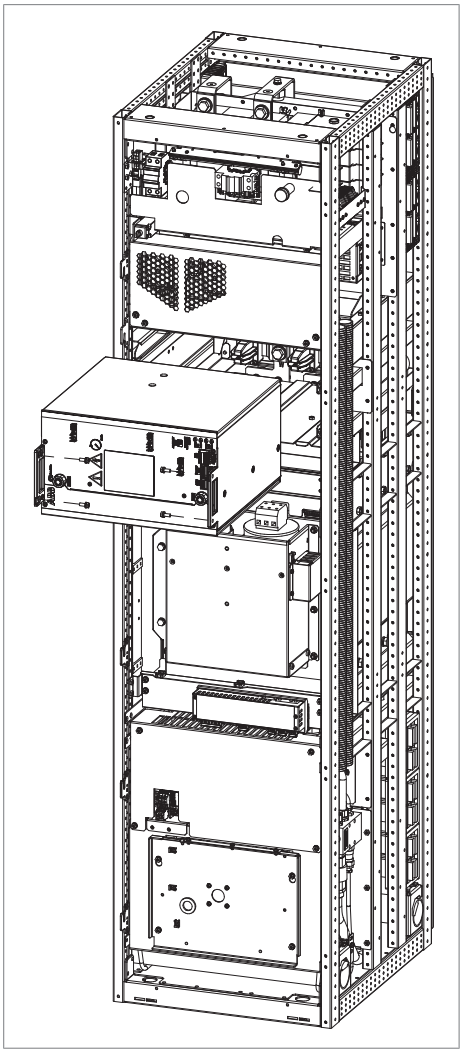
Removing the module

1. Do the steps in section Electrical safety precautions (page 45).
2. Disconnect the wiring from the R7i module. Move the wiring aside. Use cable ties to keep the wiring out of the way.
3. Close the inlet and outlet valves of the cubicle.
4. Lead the drain hoses (on the left-hand and right-hand sides of the cubicle) into a suitable container. Open the drain valves. This will drain all the equipment in the cubicle.
5. After the module has drained, disconnect the coolant piping from the module.
6. Remove the module retaining screws at the top and the bottom of the module (two screws each). Undo the locking screw (6 mm hex key) at the top of the module.



7. Install the module lifting device.
8. Pull the module out enough to attach a lifting chain to chain holes of the module.
9. Lift the module carefully out.

WARNING! Move the module with another person as it is heavy. Keep the module secured to a hoist or equivalent to prevent the module from falling.



Reinstalling the module

1. Push the module carefully into its bay.
2. Tighten the locking screw (6 mm hex key) at the top of the module to 5 N·m [3.6 lbf·ft] maximum.
3. Attach the module retaining screws at the top and the bottom of the module (two screws each).
4. Connect the coolant pipes to the module. Tighten to 20 N·m (14.75 lbf·ft).
5. Connect the control wiring to the module.
6. Fill up the cooling system. For instructions, refer to the section Filling up and bleeding the internal cooling circuit.

Replacing the supply module (frame R8i)

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

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

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

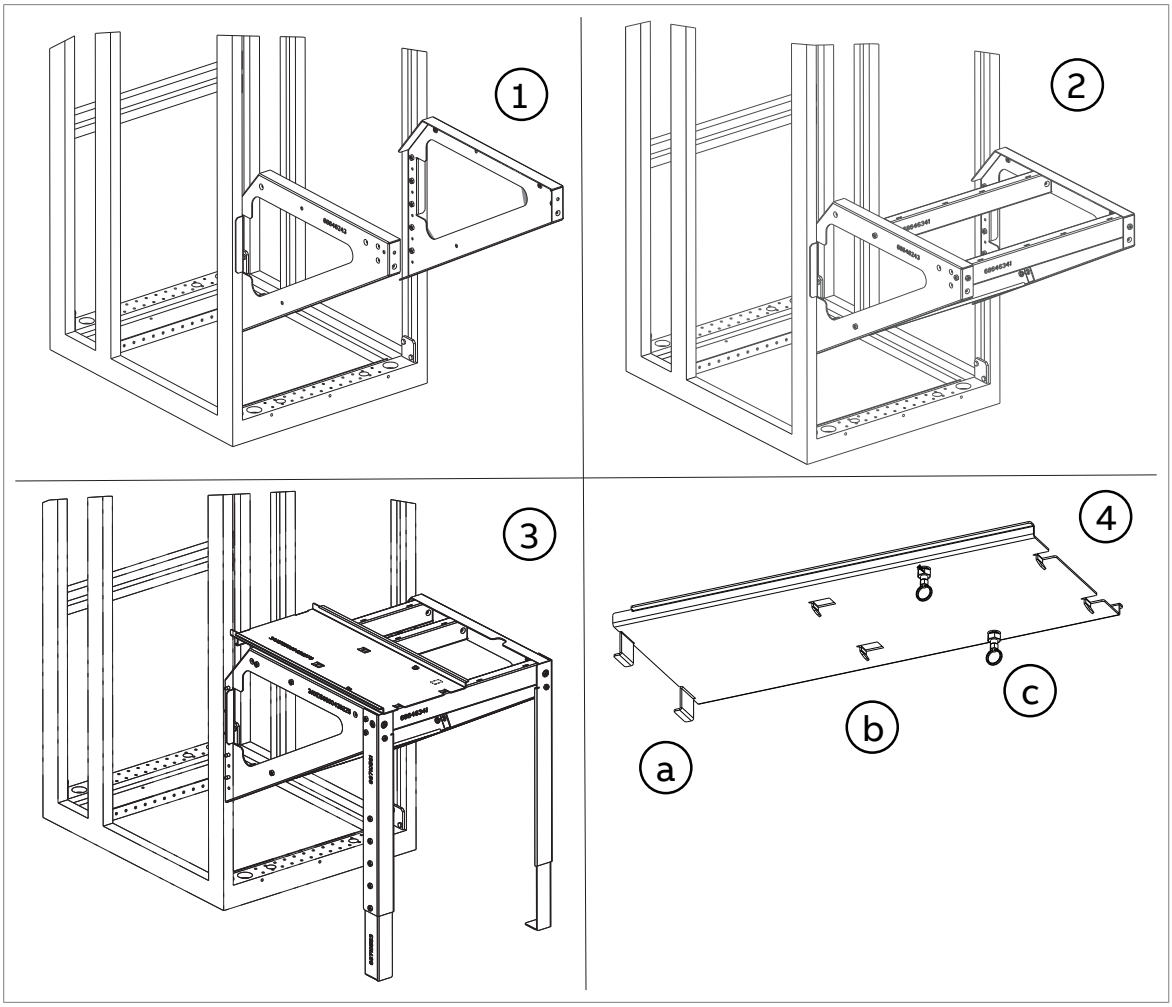
WARNING!
Stop the pumps and drain the coolant before you do work on the liquid cooling system. There is high-pressure hot coolant (6 bar, max. 50 °C) in the cooling circuit when it is in operation.

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

Assembling the service platform

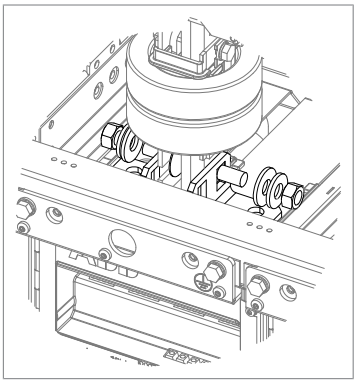
The service platform is included in the cabinet delivery. It can be used when installing or servicing liquid-cooled R8i modules.

1. Fasten the triangular supports to the cabinet frame (5 × M6 screws for each support). Make sure that the guide pins are properly inserted in the holes of the frame. Tighten the screws to torque (max 5.5 N·m / 4 lb·ft).
2. Select the braces (4 pcs) according to the width of the cubicle and attach them to the supports.
3. Attach the support feet to the platform and adjust them to the correct height.
4. Attach the slide plate. Put the hooks (a) at the back of the slide plate through the holes in the cabinet frame. Align the slots (b) in the slide plate with the braces.
5. Fix the slide plate into place with the index screws (c) at the bottom of the slide plate.

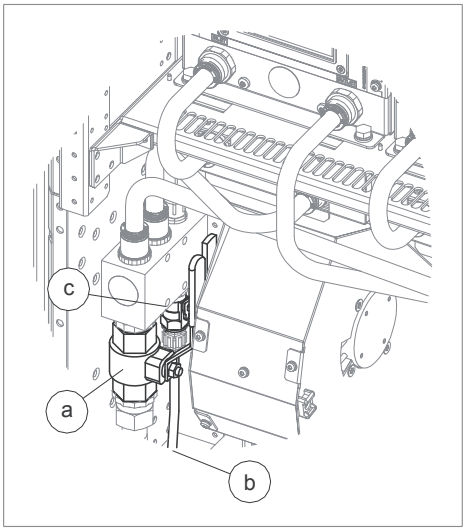


Removing the module

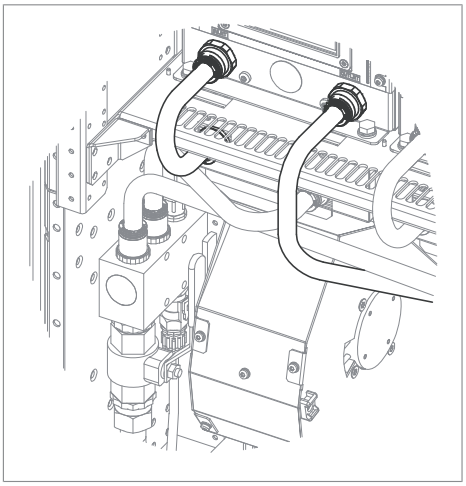
1. Do the steps in section Electrical safety precautions (page 45).
2. Assemble the service platform delivered with the drive. Refer to section Assembling the service platform (page 127).
3. Remove the shrouding in front of the module.
4. Remove the locking screws of the swing-out frame (if present) and open it.
5. Disconnect the wiring from the module and move it aside. Use cable ties to keep the wiring out of the way.
6. 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.



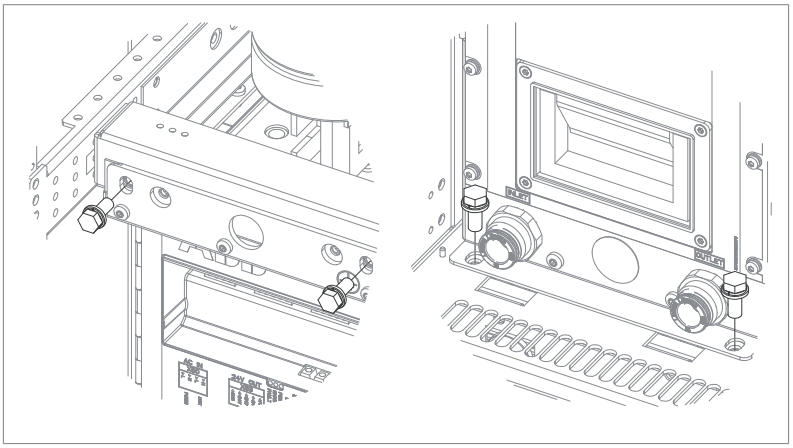
7. Close the inlet valve (a) and outlet valve (located on the right-hand side of the cubicle). Lead the drain hoses (b, on both sides of the cubicle) into a suitable container. Open the drain valves (c, on both sides of the cubicle). This will drain all modules in the cubicle.



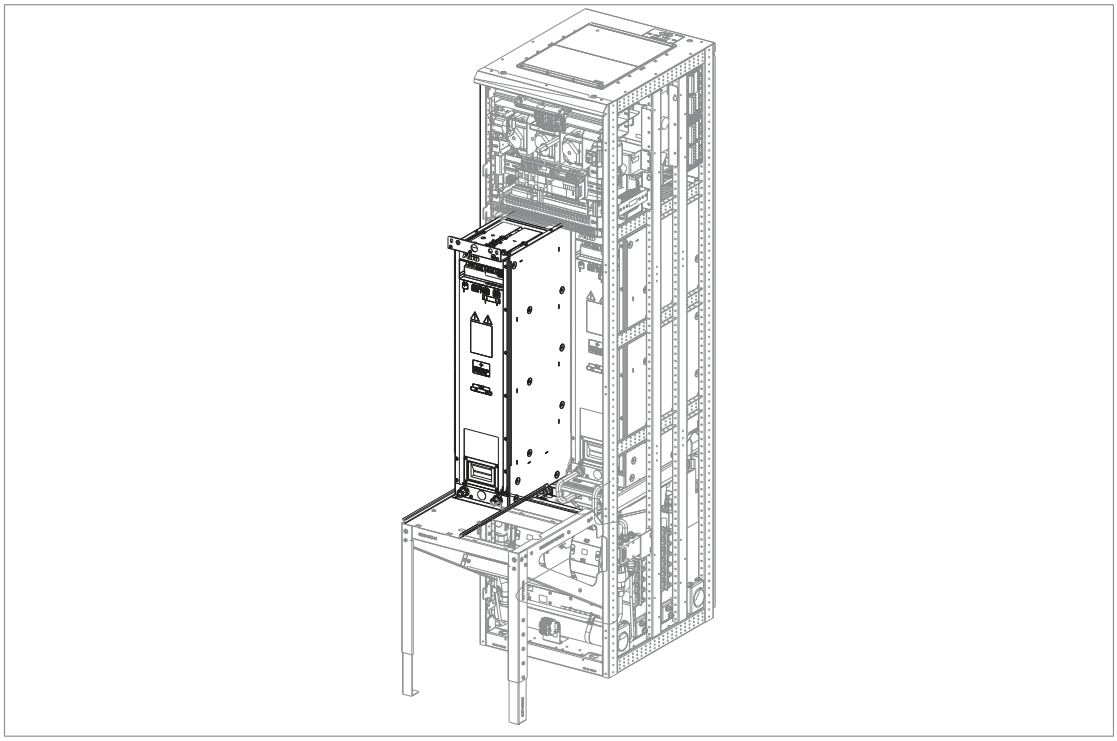
8. After the module has drained, disconnect the piping from the module.



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



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



Reinstalling the module

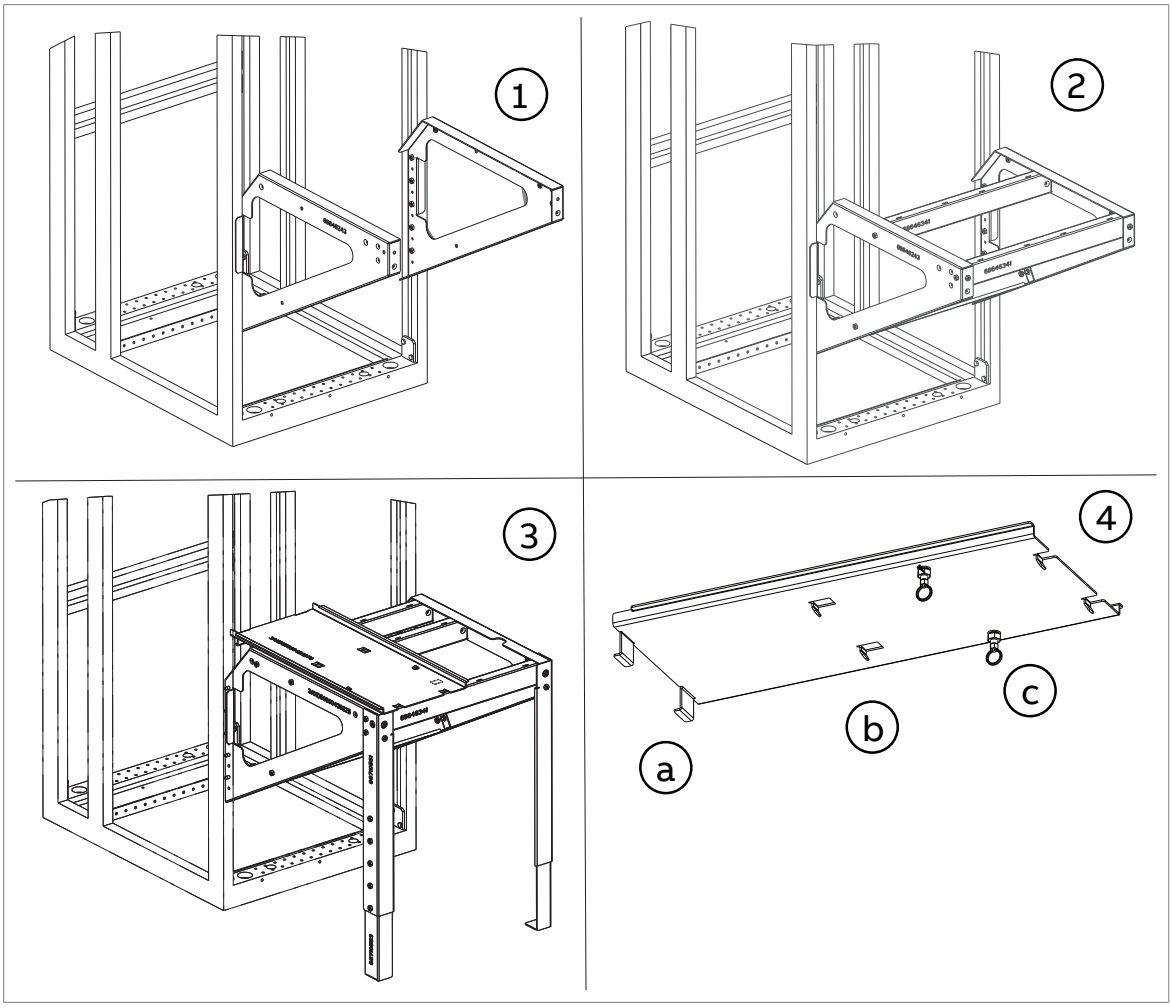
1. Push the module carefully into its bay.
2. Fasten the retaining screws at the top and the bottom of the module.
3. Reinstall the DC busbars at the top of the module.
4. Reconnect the coolant pipes to the module. Tighten to specified torque. R8i module coolant connections: 15 N·m (11.1 lbf·ft). Other connections: 20 N·m (14.75 lbf·ft).
5. Reconnect the control wiring to the module.
6. Fill up the cooling system. For instructions, see section Filling up and bleeding the internal cooling circuit.
7. Close the swing-out frame (if present). Reinstall all shrouds removed earlier.

Assembling the service platform

The service platform is included in the cabinet delivery. It can be used when installing or servicing liquid-cooled R8i modules.

1. Fasten the triangular supports to the cabinet frame (5 × M6 screws for each support). Make sure that the guide pins are properly inserted in the holes of the frame. Tighten the screws to torque (max 5.5 N·m / 4 lb·ft).
2. Select the braces (4 pcs) according to the width of the cubicle and attach them to the supports.
3. Attach the support feet to the platform and adjust them to the correct height.

4. Attach the slide plate. Put the hooks (a) at the back of the slide plate through the holes in the cabinet frame. Align the slots (b) in the slide plate with the braces.
5. Fix the slide plate into place with the index screws (c) at the bottom of the slide plate.

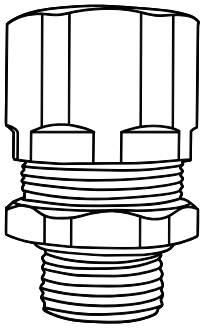


Liquid pipe connector installation instructions

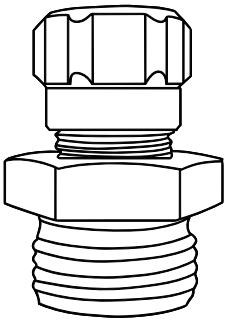
These instructions are applicable to the liquid pipe connectors that are used in ABB drives. There are two types of connectors: type A and type B. Refer to the illustrations below. When you install a connector, identify the connector type first. Obey the type-specific instructions carefully.

Reserve these materials and tools at hand:

- LOCTITE 2700 threadlocker
- Torque wrench (size depends on the connector size)
- For the type B connector: adjustable pliers



Type A



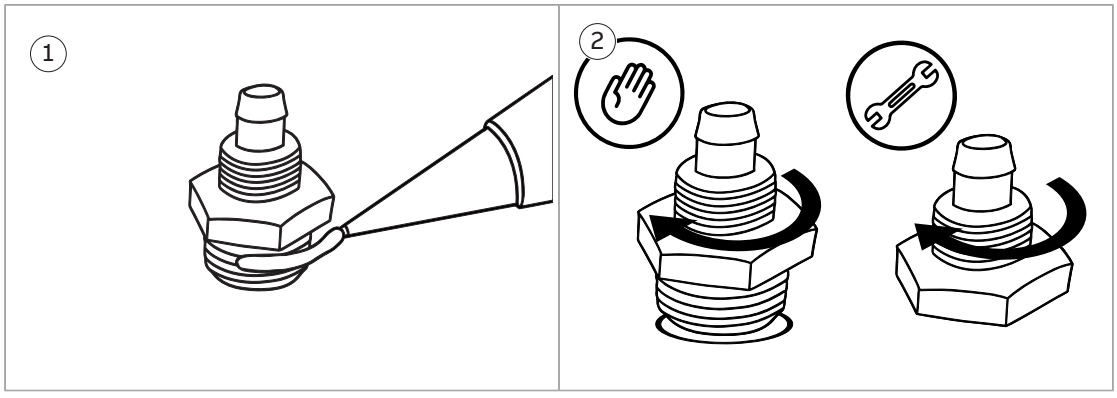
Type B

WARNING!
Do the electrical safety precautions steps before you do work on the drive. Refer to the drive safety instructions. If you are not a qualified electrical professional, do not do work on the drive. If you ignore safety instructions, injury or death, or damage to the equipment can occur.

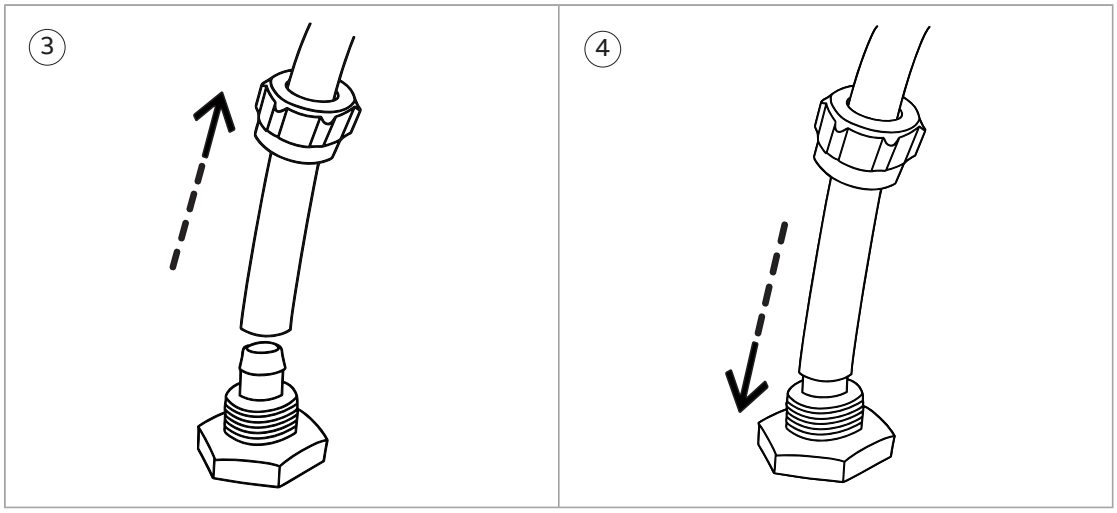
Installation procedure:

1. If the union nut has no sealing ring (o-ring), apply the threadlocker to the threads of the union nut. Always add the threadlocker onto the outer thread. This prevents the threadlocker from entering the circuit.
2. Put the union nut carefully onto the threads and start to screw it in by hand. Tighten it to the torque specified in the table below with a torque wrench. Wipe out extra threadlocker.

Torque for type A connector	Torque for type B connector
30 N·m	20 N·m

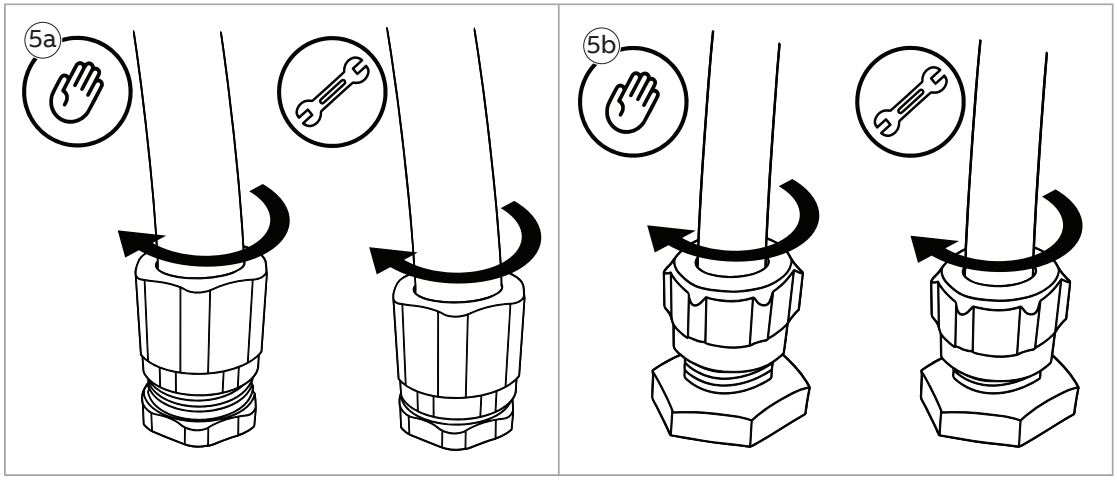


3. Push the screwing plug over the pipe, and place the pipe on the union nut.
4. Pull down the screwing plug.



5. a) Type A connector: Start to screw the plug in by hand. Tighten the plug with a torque wrench to 20 N·m.
   b) Type B connector: Start to screw the plug in by hand. Tighten the plug with adjustable pliers. Leave 2…3 mm thread visible.

WARNING!
Do not tighten the plug of the type B connector too much. It can break the connector or pipe.



LCL filters

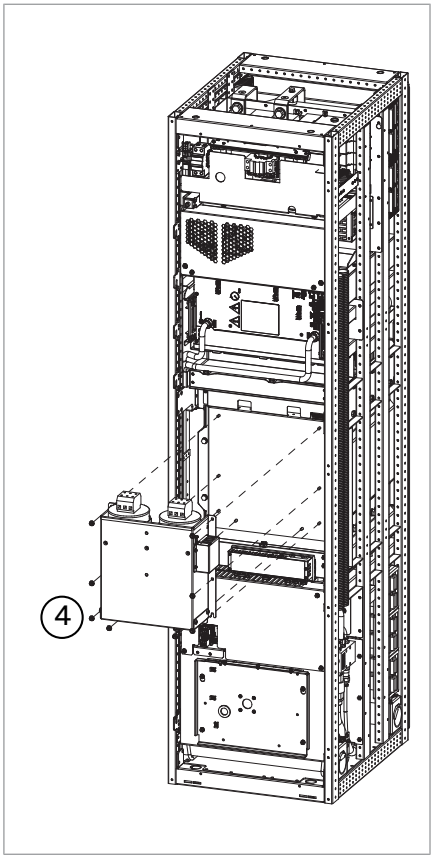
Replacing the capacitors of the LCL filter (frame R7i)

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

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

WARNING!
Wear protective gloves and long sleeves. Some parts have sharp edges.

1. Stop the drive and do the steps in section Electrical safety precautions (page 45) before you start the work.
2. Open the door of the module cubicle.
3. Disconnect the wiring of the capacitors.
4. Remove the eight screws of the capacitor unit and slide the capacitor unit out.
5. Install the new capacitor unit in reverse order.
6. Close the door.



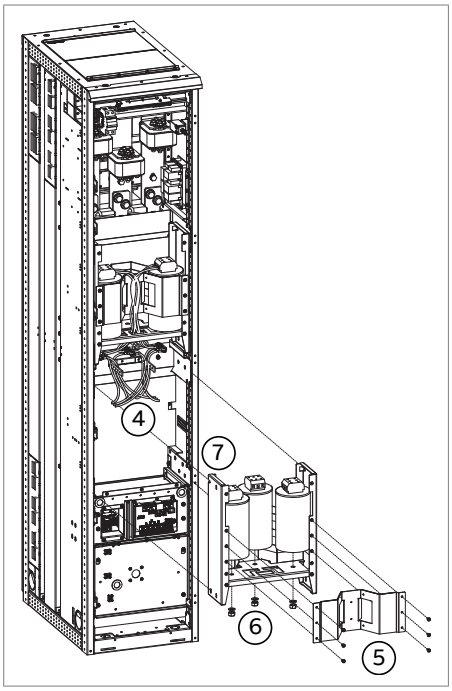
Replacing the capacitors of the LCL filter (frame R8i)

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

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

WARNING!
Wear protective gloves and long sleeves. Some parts have sharp edges.

1. Stop the drive and do the steps in section Electrical safety precautions (page 45) before you start the work.
2. Open the door of the LCL filter cubicle.
3. Remove the shrouding in front of the capacitors (if any).
4. Disconnect the wiring of the capacitors.
5. Remove the six fastening screws in front of the capacitor unit.
6. Remove the three bolts below each capacitor.
7. Remove the four screws of the capacitor unit and slide the capacitor unit out.
8. Install the new capacitor unit in reverse order.
9. Attach the shrouding (if any) and close the door.

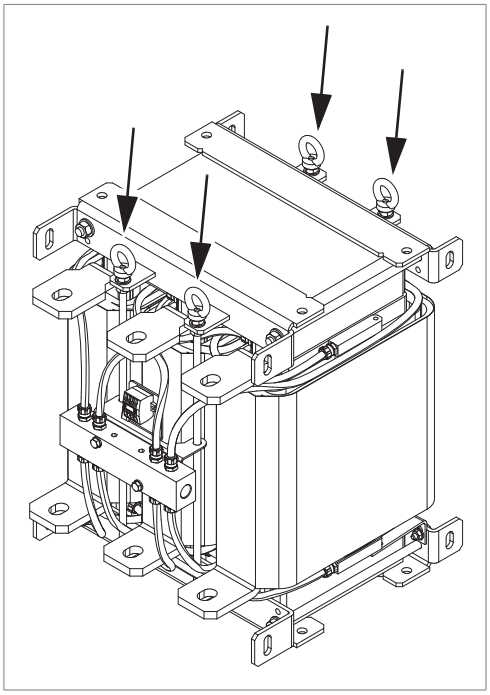


Lifting the inductor of the LCL filter

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

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

Lift the inductor steadily by its all four lifting eyes. Make sure that lifting device is suitable for lifting by four lifting points.



Charging resistors

Replacing the charging resistors (frame R8i)

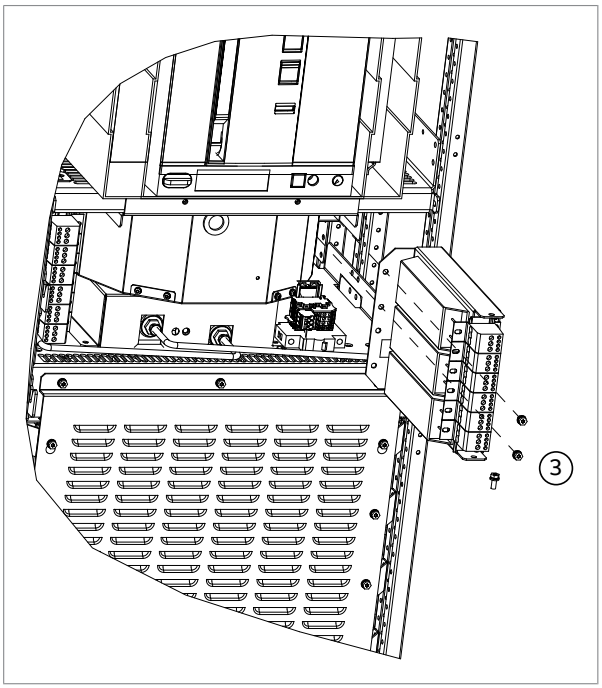
Charging resistors are next to the cooling fan of the incoming cubicle.

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

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

WARNING!
Wear protective gloves and long sleeves. Some parts have sharp edges.

1. Stop the drive and do the steps in section Electrical safety precautions (page 45) before you start the work.
2. Open the door of the incoming cubicle.
3. Remove the fastening screws of the charging resistor unit: two screws on the back and one screw on the front part of the charging resistor unit. Slide the resistor unit out.
4. Detach the charging resistors from the unit and replace the charging resistors.
5. Install the new charging resistors in reverse order.



Capacitors of the DC circuit

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

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

Reforming the capacitors

The capacitors must be reformed if the drive has not been powered (either in storage or unused) for a year or more. The manufacturing date is on the type designation label. For information on reforming the capacitors, refer to Capacitor reforming instructions (3BFE64059629 [English]).

Replacing the capacitors

See separate service manual by ABB Service.

Control panel

Refer to ACS-AP-I, -S, -W and ACH-AP-H, -W Assistant control panels user's manual (3AUA0000085685 [English]).

Memory unit

Replacing the memory unit of BCU control unit

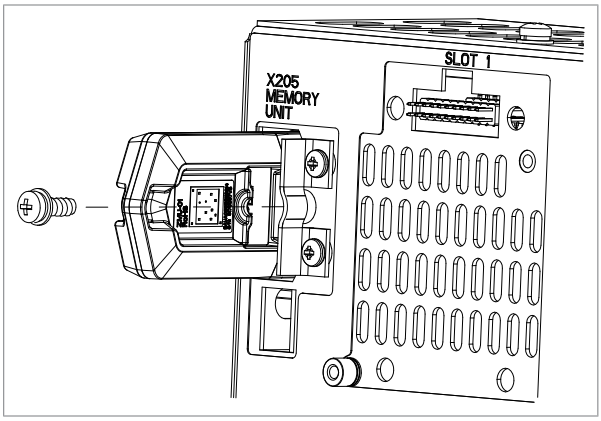
After replacing a control unit, you can keep the existing parameter settings by transferring the memory unit from the defective control unit to the new control unit.

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

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

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

1. Stop the drive and do the steps in section Electrical safety precautions (page 45) before you start the work.
2. Make sure that the control unit is not powered.
3. Remove the fastening screw and pull the memory unit out.
4. Install a memory unit in reverse order.



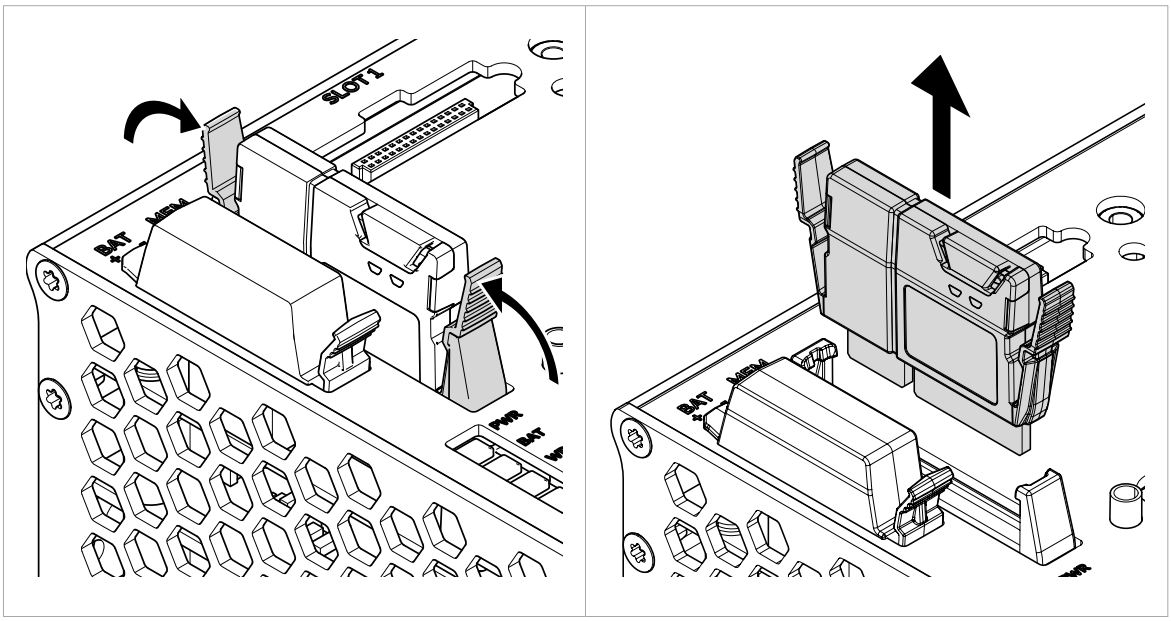
Replacing the memory unit of UCU control unit

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.

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

WARNING!
Do not remove or install the memory unit when the control unit is powered.

1. Stop the drive and do the steps in section Electrical safety precautions (page 45) before you start the work.
2. Make sure that the control unit is not powered.
3. Push and hold in the clips on the memory unit. Pull the memory unit out.
4. Push the new memory unit in.



LEDs

Control panel and panel platform/holder LEDs

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

Location	LED	Indication
Control panel	Continuous green	The unit is functioning normally.
	Flickering green	Data is transferred between the PC and the unit through the USB connection of the control panel.
	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 being transferred through the Bluetooth interface of the control panel.
Control panel mounting platform or holder (with the control panel removed)	Red	There is an active fault in the unit.
	Green	Power supply for the control unit is OK.

R7i and R8i module LEDs

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

Reduced run

A “reduced run” function is available for supply/rectifier units consisting of parallel-connected modules. The function makes it possible to continue operation with limited current even if one (or more) module is out of service, for example, because of maintenance work.

In principle, reduced run is possible with only one module, but the physical requirements of operating the motor still apply; for example, the modules remaining in use must be able to provide enough current. For allowed configurations when using reduced run function, refer to the firmware manual of the supply unit.

Starting reduced run operation

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

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

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

1. Stop the drive and do the steps in section Electrical safety precautions (page 45) before you start the work.
2. If the control unit is powered from the faulty module, connect the control unit to another 24 V DC power supply. ABB strongly recommends using an external power supply with supply/rectifier units consisting of parallel-connected modules.
3. Remove the module to be serviced from its bay.
4. Install an air baffle (for example, plexiglass) to the top module guide to block the airflow through the empty module bay.
5. Switch on the power to the supply/rectifier unit.
6. Enter the number of supply/rectifier modules present into parameter 195.13 Reduced run mode.
7. Reset all faults and start the supply/rectifier unit. The maximum current limit is now automatically set according to the new configuration. A mismatch between the number of detected modules (parameter 195.14) and the value set in 195.13 will generate a fault.

Resuming normal operation

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

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

1. Stop the drive and do the steps in section Electrical safety precautions (page 45) before you start the work.
2. Remove the air baffle from the module bay.
3. Reinstall the module into its bay.
4. Switch on the power to the supply/rectifier unit.
5. Enter "0" into parameter 195.13 Reduced run mode.

Functional safety components

The mission time of functional safety components is 20 years which equals the time during which failure rates of electronic components remain constant. This applies to the components of the standard Safe torque off circuit as well as any modules, relays and, typically, any other components that are part of functional safety circuits.

The expiry of mission time terminates the certification and SIL/PL classification of the safety function. The following options exist:

- Renewal of the whole drive and all optional functional safety module(s) and components.
- Renewal of the components in the safety function circuit. In practice, this is economical only with larger drives that have replaceable circuit boards and other components such as relays.

Note that some of the components may already have been renewed earlier, restarting their mission time. The remaining mission time of the whole circuit is however determined by its oldest component.

Contact your local ABB service representative for more information.

8

Technical data

Contents of this chapter

This chapter contains the technical data valid for the cabinet-installed ACS880-207LC IGBT supply units.

Ratings

ACS880-207LC-	Basic module type ACS880-104LC-	Frame size	No-overload use						Light-overload use		Heavy-duty use	
			I_1	I_N	I_{max}	I_{max}	P_N	S_N	I_{Ld}	P_{Ld}	I_{Hd}	P_{Hd}
			A (AC)	A (DC)	A (AC)	A (DC)	kW (DC)	kVA	A (DC)	kW (DC)	A (DC)	kW (DC)
U_N = 500 V												
0270A-5	0300A-5	1×R7i	272	330	410	494	233	235	316	224	247	174
0340A-5	0380A-5	1×R7i	342	415	520	622	293	296	398	281	310	219
0410A-5	0460A-5	1×R7i	415	503	630	755	356	359	483	341	376	266
U_N = 690 V												
0260A-7	0290A-7	1×R7i	260	315	400	473	308	311	303	295	236	230
0310A-7	0340A-7	1×R7i	306	371	460	557	362	366	356	348	278	271
0350A-7	0389A-7	1×R7i	351	426	530	638	415	419	409	399	318	311
0360A-7	0390A-7	1×R8i	360	436	540	655	426	430	419	409	327	319
0400A-7	0430A-7	1×R8i	400	485	600	727	473	478	466	454	363	354
0450A-7	0480A-7	1×R8i	450	546	680	818	532	538	524	511	408	398
0480A-7	0530A-7	1×R8i	480	582	720	873	568	574	559	545	435	425
0560A-7	0600A-7	1×R8i	560	679	840	1018	663	669	652	636	508	496
0620A-7	0670A-7	1×R8i	620	752	930	1128	734	741	722	704	562	549
0700A-7	0750A-7	1×R8i	700	849	1050	1273	828	837	815	795	635	620
0770A-7	0850A-7	1×R8i	770	934	1160	1400	911	920	896	875	698	681
0930A-7	0530A-7	2×R8i	930	1128	1400	1691	1100	1111	1083	1056	843	823
1090A-7	0600A-7	2×R8i	1090	1322	1640	1982	1290	1303	1269	1238	989	965
1180A-7	0670A-7	2×R8i	1180	1431	1770	2146	1396	1410	1374	1340	1070	1044
1360A-7	0750A-7	2×R8i	1360	1649	2040	2473	1609	1625	1583	1545	1233	1204
1500A-7	0850A-7	2×R8i	1500	1819	2250	2728	1775	1793	1746	1704	1360	1328
1800A-7	0670A-7	3×R8i	1800	2182	2700	3274	2130	2151	2095	2045	1633	1593
2020A-7	0750A-7	3×R8i	2020	2449	3030	3674	2390	2414	2351	2294	1832	1788
2220A-7	0850A-7	3×R8i	2220	2692	3330	4038	2627	2653	2584	2522	2013	1965
2670A-7	0750A-7	4×R8i	2670	3237	4010	4856	3159	3191	3108	3033	2422	2363
2930A-7	0850A-7	4×R8i	2930	3553	4400	5329	3467	3502	3411	3328	2657	2593
3320A-7	0750A-7	5×R8i	3320	4025	4980	6038	3928	3968	3864	3771	3011	2938
3840A-7	0750A-7	6×R8i	3840	4656	5760	6984	4543	4589	4470	4362	3483	3398
4360A-7	0850A-7	6×R8i	4360	5286	6540	7930	5159	5211	5075	4952	3954	3859
5240A-7	0750A-7	8×R8i	5240	6353	7860	9530	6200	6262	6099	5952	4752	4637
5810A-7	0850A-7	8×R8i	5810	7045	8720	10567	6874	6944	6763	6599	5269	5142

Definitions

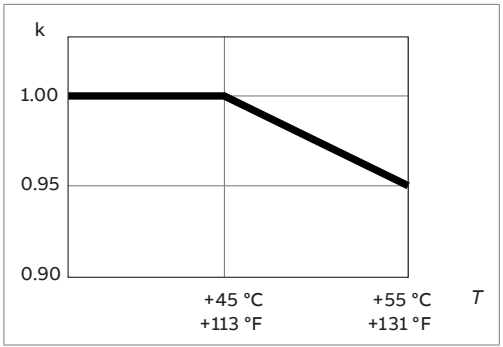
U_N	Supply voltage range
I_1	Nominal rms current
I_N	Nominal current (available continuously with no over-loading)

I_{max}	Maximum current. Available for 10 seconds at start, then as long as allowed by drive temperature.
P_N	Typical power in no-overload use
S_N	Nominal apparent power
I_{Ld}	Continuous rms current allowing 10% overload for 1 minute every 5 minutes
P_{Ld}	Typical power in light-overload use
I_{Hd}	Continuous rms current allowing 50% overload for 1 minute every 5 minutes
P_{Hd}	Typical power in heavy-duty use
Note 1: The ratings apply at an ambient air temperature of 45 °C (113 °F) and a coolant temperature of 40 °C (104 °F). **Note 2:** To achieve the rated power given in the table, the rated current must be higher than or equal to the rated current. For dimensioning, use DriveSize dimensioning tool available from ABB.	

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)*:



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.

Coolant temperature derating

See section Temperature limits (page 172).

Antifreeze content derating

See section Temperature limits (page 172).

Switching frequency derating

Switching frequencies other than default can require output current derating. Contact ABB for more information.

Type equivalence table

ACS880-207LC-...	Modules used			LCL filter	
	ACS880-104LC-...	DC capacitance (mF)	Qty	LCL filter type	Qty
U_N = 500 V					
0270A-5	0300A-5	9.6	1	BLCL-14LC-5	1
0340A-5	0380A-5	9.6	1	BLCL-14LC-5	1
0410A-5	0460A-5	9.6	1	BLCL-14LC-5	1
U_N = 690 V					
0260A-7	0290A-7	5.3	1	BLCL-13LC-7	1
0310A-7	0340A-7	5.3	1	BLCL-13LC-7	1
0350A-7	0389A-7	5.3	1	BLCL-13LC-7	1
0360A-7	0390A-7	6.0	1	BLCL-15LC-7	1
0400A-7	0430A-7	6.0	1	BLCL-15LC-7	1
0450A-7	0480A-7	6.0	1	BLCL-15LC-7	1
0480A-7	0530A-7	6.0	1	BLCL-15LC-7	1
0560A-7	0600A-7	9.0	1	BLCL-15LC-7	1
0620A-7	0670A-7	9.0	1	BLCL-15LC-7	1
0700A-7	0750A-7	9.0	1	BLCL-15LC-7	1
0770A-7	0850A-7	9.0	1	BLCL-15LC-7	1
0930A-7	0530A-7	12.0	2	BLCL-24LC-7	1
1090A-7	0600A-7	18.0	2	BLCL-24LC-7	1
1180A-7	0670A-7	18.0	2	BLCL-24LC-7	1
1360A-7	0750A-7	18.0	2	BLCL-25LC-7	1
1500A-7	0850A-7	18.0	2	BLCL-25LC-7	1
1800A-7	0670A-7	27.0	3	BLCL-24LC-7	2
2020A-7	0750A-7	27.0	3	BLCL-24LC-7	2
2220A-7	0850A-7	27.0	3	BLCL-24LC-7	2
2670A-7	0750A-7	36.0	4	BLCL-25LC-7	2
2930A-7	0850A-7	36.0	4	BLCL-25LC-7	2
3320A-7	0750A-7	45.0	5	BLCL-24LC-7	3
3840A-7	0750A-7	54.0	6	BLCL-24LC-7	4
4360A-7	0850A-7	54.0	6	BLCL-24LC-7	4
5240A-7	0750A-7	72.0	8	BLCL-25LC-7	4
5810A-7	0850A-7	72.0	8	BLCL-25LC-7	4

Fuses

Main circuit AC fuses

ACS880-207LC-...	AC fuses				
	Qty	A	V	Manufacturer	Type [1]
U_N = 500 V					
0270A-5	3	450	690	Bussmann	170M4413
0340A-5	3	550	690	Bussmann	170M4415
0410A-5	3	700	690	Bussmann	170M4417
U_N = 690 V					
0260A-7	3	450	690	Bussmann	170M4413
0310A-7	3	500	690	Bussmann	170M4414
0350A-7	3	630	690	Bussmann	170M4416
0360A-7	3	630	690	Bussmann	170M6410
0400A-7	3	700	690	Bussmann	170M6411
0450A-7	3	800	690	Bussmann	170M6412
0480A-7	3	800	690	Bussmann	170M6412
0560A-7	3	900	690	Bussmann	170M6413
0620A-7	3	1000	690	Bussmann	170M6414
0700A-7	3	1250	690	Bussmann	170M6416
0770A-7	3	1400	690	Bussmann	170M6417
0930A-7	3	1600	690	Bussmann	170M7061
1090A-7	3	2000	690	Bussmann	170M7062
1180A-7	3	2000	690	Bussmann	170M7062
1360A-7	3	2500	690	Bussmann	170M7063
1500A-7	3	2500	690	Bussmann	170M7063
1800A-7	6	1600	690	Bussmann	170M7061
2020A-7	6	2000	690	Bussmann	170M7062
2220A-7	6	2000	690	Bussmann	170M7062
2670A-7	6	2500	690	Bussmann	170M7063
2930A-7	6	2500	690	Bussmann	170M7063
3320A-7	9	2000	690	Bussmann	170M7062
3840A-7	12	1600	690	Bussmann	170M7061
4360A-7	12	2000	690	Bussmann	170M7062
5240A-7	12	2500	690	Bussmann	170M7063
5810A-7	12	2500	690	Bussmann	170M7063

[1] Fuses are also UL Recognized.

Main circuit AC fuses - 100 kA input cubicle (option +F274)

ACS880-207LC-...	AC fuses - 100 kA input cubicle (option +F274)				
	Qty	A	V	Manufacturer	Type [1]
U_N = 690 V					
0360A-7	3	1250	690	Bussmann	170M7059
0400A-7	3	1250	690	Bussmann	170M7059
0450A-7	3	1250	690	Bussmann	170M7059
0480A-7	3	1250	690	Bussmann	170M7059
0560A-7	3	1250	690	Bussmann	170M7059
0620A-7	3	1250	690	Bussmann	170M7059
0700A-7	3	1250	690	Bussmann	170M7059
0770A-7	3	1250	690	Bussmann	170M7059
0930A-7	3	1600	690	Bussmann	170M7061
1090A-7	3	2000	690	Bussmann	170M7062
1180A-7	3	2000	690	Bussmann	170M7062
1360A-7	3	2500	690	Bussmann	170M7063
1500A-7	3	2500	690	Bussmann	170M7063
1800A-7	3	3000	690	Bussmann	170M7064
2020A-7	3	3500	690	Bussmann	170M7085
2220A-7	3	4000	690	Bussmann	170M7162
2670A-7	3	4500	690	Bussmann	170M7163
2930A-7	3	5000	690	Bussmann	170M7164
3320A-7	3	5500	690	Bussmann	170M7165
3840A-7	6	3500	690	Bussmann	170M7085
4360A-7	6	3500	690	Bussmann	170M7085
5240A-7	6	4500	690	Bussmann	170M7163
5810A-7	6	5000	690	Bussmann	170M7164
					3AXD10000576900

[1] Fuses are also UL Recognized.

Main circuit DC fuses

The IGBT supply unit has DC fuses at the output of each IGBT supply module.

Notes:

- Fuses with higher current rating than the recommended ones must not be used.
- Fuses from other manufacturers can be used if they meet the ratings and the melting curve of the fuse does not exceed the melting curve of the fuse mentioned in the table.

ACS880-207LC-...	DC fuses				
	Qty	A	V	Manufacturer	Type [1]
U_N = 500 V					
0270A-5	2	550	1250	Bussmann	170M6543
0340A-5	2	700	1250	Bussmann	170M6545
0410A-5	2	900	1100	Bussmann	170M6547
U_N = 690 V					
0260A-7	2	550	1250	Bussmann	170M6543
0310A-7	2	630	1250	Bussmann	170M6544
0350A-7	2	700	1250	Bussmann	170M6545
0360A-7	2	800	1250	Bussmann	170M6546
0400A-7	2	800	1250	Bussmann	170M6546
0450A-7	2	900	1100	Bussmann	170M6547
0480A-7	2	1000	1100	Bussmann	170M6548
0560A-7	2	1100	1000	Bussmann	170M6549
0620A-7	2	1250	1100	Bussmann	170M6500
0700A-7	2	1400	1100	Bussmann	170M6501
0770A-7	2	1400	1100	Bussmann	170M6501
0930A-7	4	1000	1100	Bussmann	170M6548
1090A-7	4	1100	1000	Bussmann	170M6549
1180A-7	4	1250	1100	Bussmann	170M6500
1360A-7	4	1400	1100	Bussmann	170M6501
1500A-7	4	1400	1100	Bussmann	170M6501
1800A-7	6	1250	1100	Bussmann	170M6500
2020A-7	6	1400	1100	Bussmann	170M6501
2220A-7	6	1400	1100	Bussmann	170M6501
2670A-7	8	1400	1100	Bussmann	170M6501
2930A-7	8	1400	1100	Bussmann	170M6501
3320A-7	10	1400	1100	Bussmann	170M6501
3840A-7	12	1400	1100	Bussmann	170M6501
4360A-7	12	1400	1100	Bussmann	170M6501
5240A-7	16	1400	1100	Bussmann	170M6501
5810A-7	16	1400	1100	Bussmann	170M6501

[1] Fuses are also UL Recognized.

Dimensions and weights

Dimensions include auxiliary control cubicle, incoming cubicle, supply module cubicle and LCL filter cubicle. See also the dimension drawing.

ACS880-207LC-	Frame size	Height	Width	Depth	Weight
		mm	mm	mm	kg
U_N = 500 V					
0270A-5	1×R7i	2002	500	644	550
0340A-5	1×R7i	2002	500	644	550
0410A-5	1×R7i	2002	500	644	550
U_N = 690 V					
0260A-7	1×R7i	2002	500	644	550
0310A-7	1×R7i	2002	500	644	550
0350A-7	1×R7i	2002	500	644	550
0360A-7	1×R8i	2002	1900	644	900
0400A-7	1×R8i	2002	1900	644	900
0450A-7	1×R8i	2002	1900	644	900
0480A-7	1×R8i	2002	1900	644	900
0560A-7	1×R8i	2002	1900	644	900
0620A-7	1×R8i	2002	1900	644	900
0700A-7	1×R8i	2002	1900	644	900
0770A-7	1×R8i	2002	1900	644	900
0930A-7	2×R8i	2002	2100	644	1030
1090A-7	2×R8i	2002	2100	644	1030
1180A-7	2×R8i	2002	2100	644	1030
1360A-7	2×R8i	2002	2200	644	1180
1500A-7	2×R8i	2002	2200	644	1180
1800A-7	3×R8i	2002	2700	644	1800
2020A-7	3×R8i	2002	2700	644	1800
2220A-7	3×R8i	2002	2700	644	1800
2670A-7	4×R8i	2002	3200	644	2360
2930A-7	4×R8i	2002	3200	644	2360
3320A-7	5×R8i	2002	3600	644	2830
3840A-7	6×R8i	2002	4800	644	3600
4360A-7	6×R8i	2002	4800	644	3600
5240A-7	8×R8i	2002	5800	644	4720
5810A-7	8×R8i	2002	5800	644	4720

Note: The widths of the large UL Listed supply unit variants (option +C129) are bigger due to different main circuit breaker selections and incoming cubicle widths. For dimensions, contact your local ABB representative.

Note: The top power cable entry (option +H351) increases height (+50 mm) and width (+200 mm).

Note: 100 kA input cubicle (option +F274) adds width with 600 mm.

Free space requirements

The values are as required by cooling, maintenance and/or operation of the pressure relief (if present). Also obey the general mechanical installation instructions.

Front		Sides		Above	
mm	**in.**	**mm**	**in.**	**mm**	**in.**
1000	39	0	0	250	9.85

Losses, cooling data and noise

ACS880-207LC-...	Coolant flow		Heat dissipation		Coolant quantity (total)	Noise[1)]
	l/min	US gal/min	into coolant (kW)	into air (kW)	l	dB(A)
U_N = 500 V						
0270A-5	36	9.5	2.9	0.07	2.9	66
0340A-5	36	9.5	3.2	0.08	2.9	66
0410A-5	36	9.5	3.6	0.09	2.9	66
U_N = 690 V						
0260A-7	36	9.5	7.6	0.2	2.9	66
0310A-7	36	9.5	9.0	0.2	2.9	66
0350A-7	36	9.5	10.6	0.3	2.9	66
0360A-7	52	13.7	8.9	0.2	8.1	66
0400A-7	52	13.7	9.8	0.3	8.1	66
0450A-7	52	13.7	11.1	0.3	8.1	66
0480A-7	52	13.7	12.0	0.3	8.1	66
0560A-7	52	13.7	14.1	0.4	8.1	66
0620A-7	52	13.7	15.7	0.4	8.1	66
0700A-7	52	13.7	18.4	0.5	8.1	66
0770A-7	52	13.7	20.9	0.5	8.1	66
0930A-7	88	23.2	21.3	0.5	11.3	68
1090A-7	88	23.2	25.3	0.6	11.3	68
1180A-7	88	23.2	28.6	0.7	11.8	68
1360A-7	88	23.2	31.0	0.8	11.8	68
1500A-7	88	23.2	35.1	0.9	11.8	68
1800A-7	144	38.0	39.3	1.0	18.7	70
2020A-7	144	38.0	45.6	1.2	18.7	70
2220A-7	144	38.0	51.7	1.3	18.7	70
2670A-7	160	42.3	58.6	1.5	23.6	71
2930A-7	160	42.3	66.2	1.7	23.6	71
3320A-7	216	57.1	73.8	1.9	30.0	72
3840A-7	280	74.0	83.8	2.1	34.1	73
4360A-7	280	74.0	100.6	2.6	37.4	73
5240A-7	312	82.4	113.9	2.9	43.3	74
5810A-7	312	82.4	130.3	3.3	46.6	74

1) Measured in a hemi-anechoic room in accordance with ISO 9614-2 standard.

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

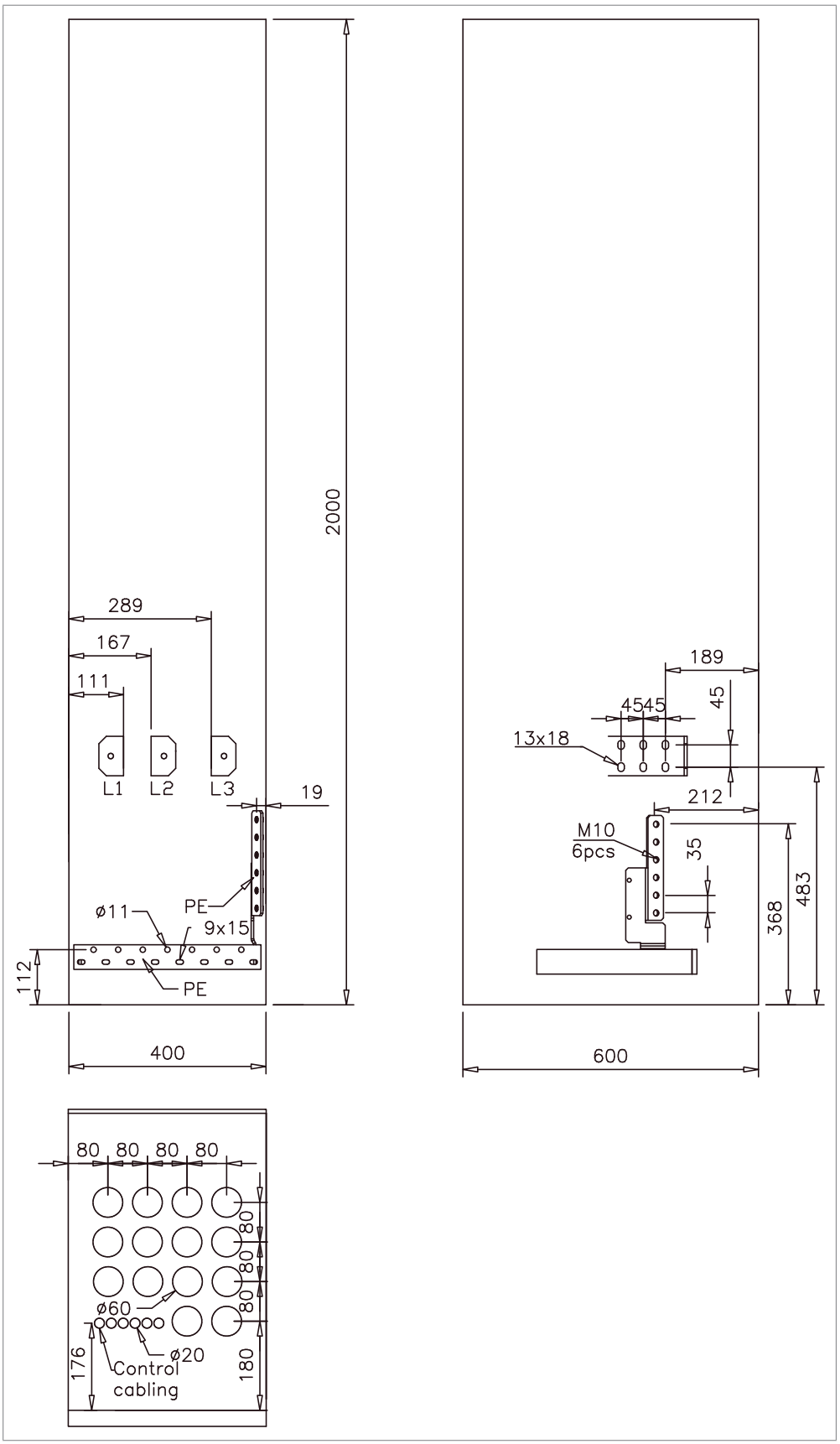
Internal cooling circuit data

See chapter Internal cooling circuit.

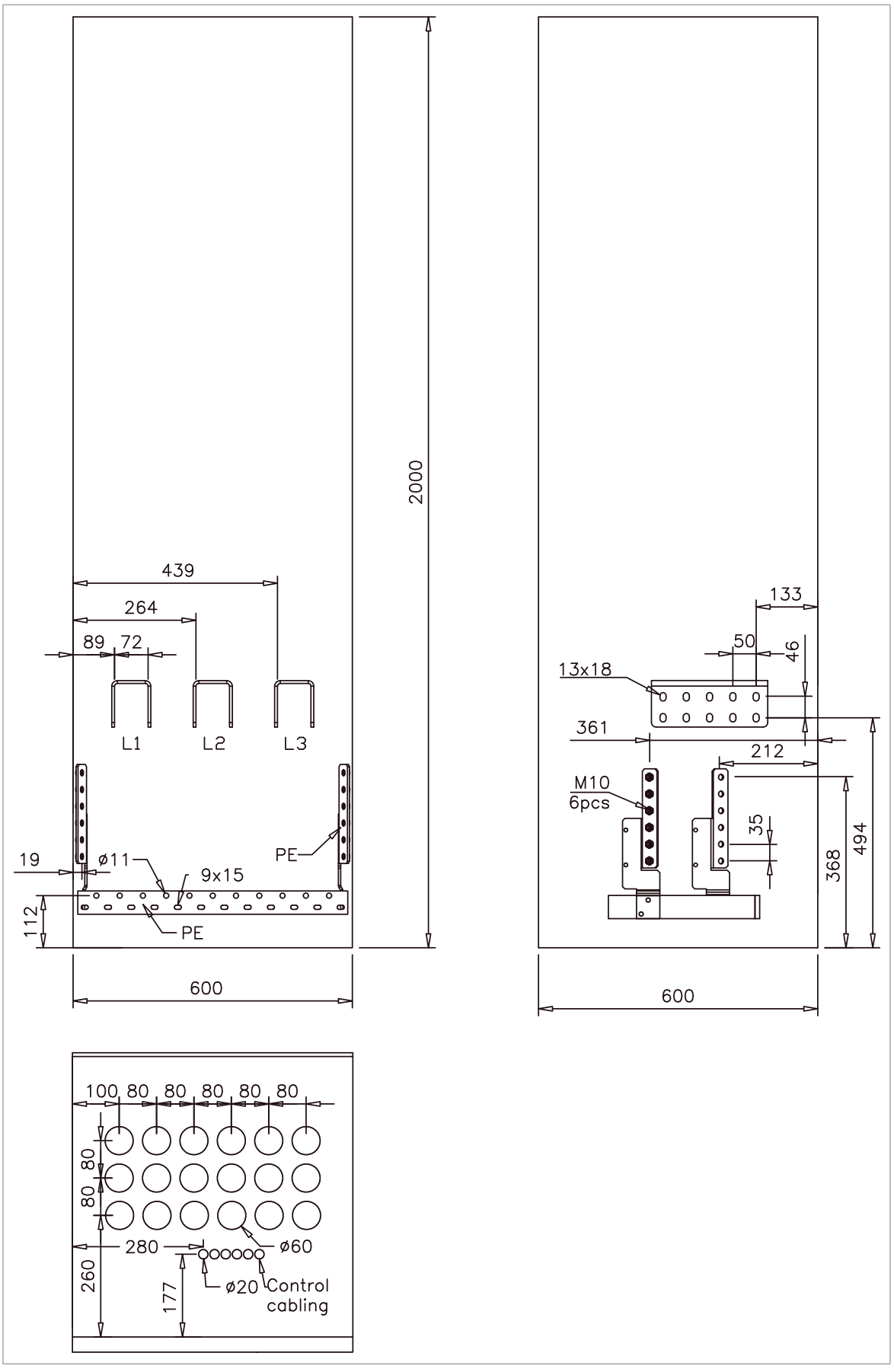
Terminal and lead-through data for the input power cable

These drawings (from front, side and above) show the terminal and cable entry dimensions for incoming and input cubicles. The dimensions are given in millimeters. Tightening torque for the cable lug connection depends on the bolt size and type. Refer to section Tightening torques (page 160).

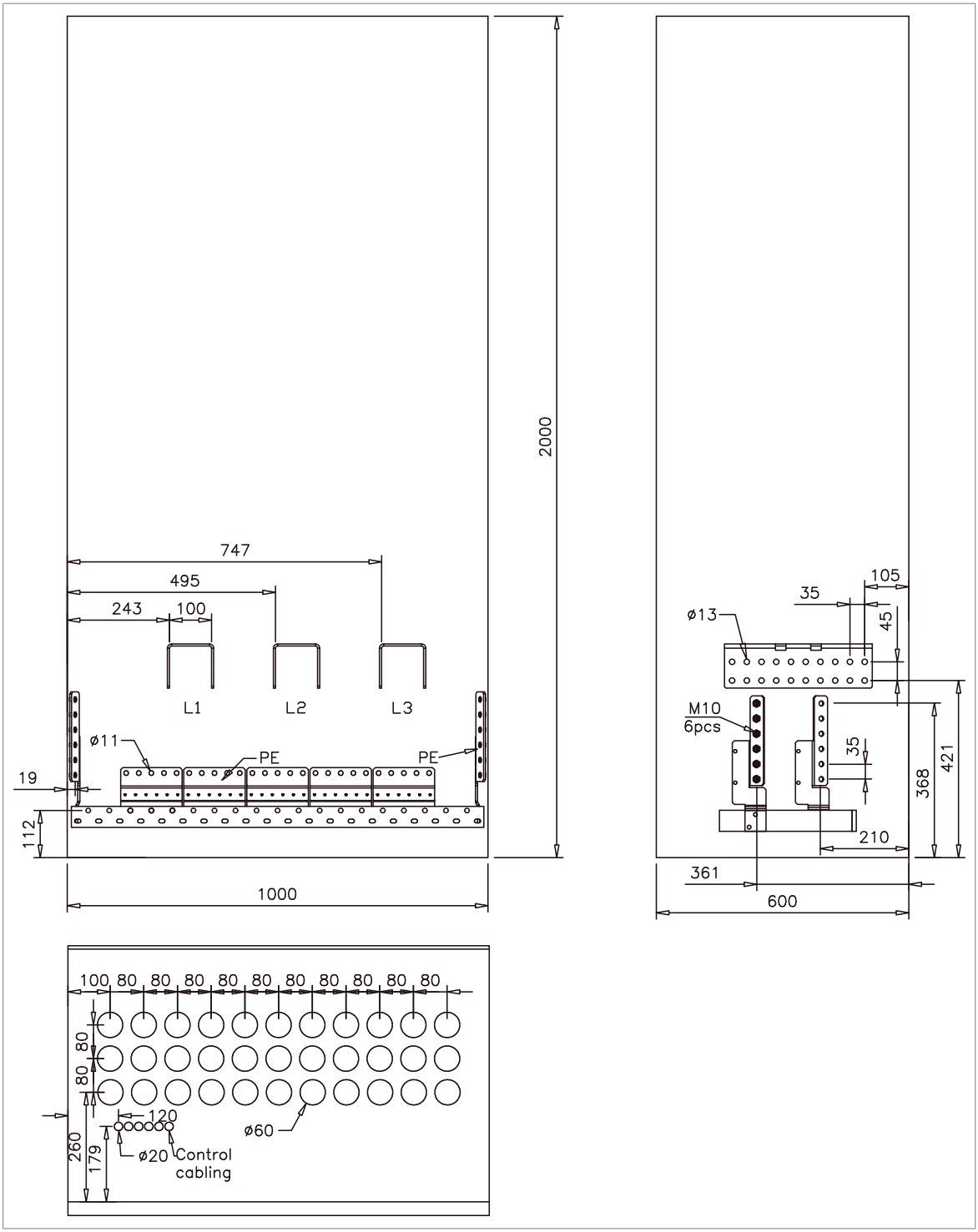
400 mm wide input cubicle



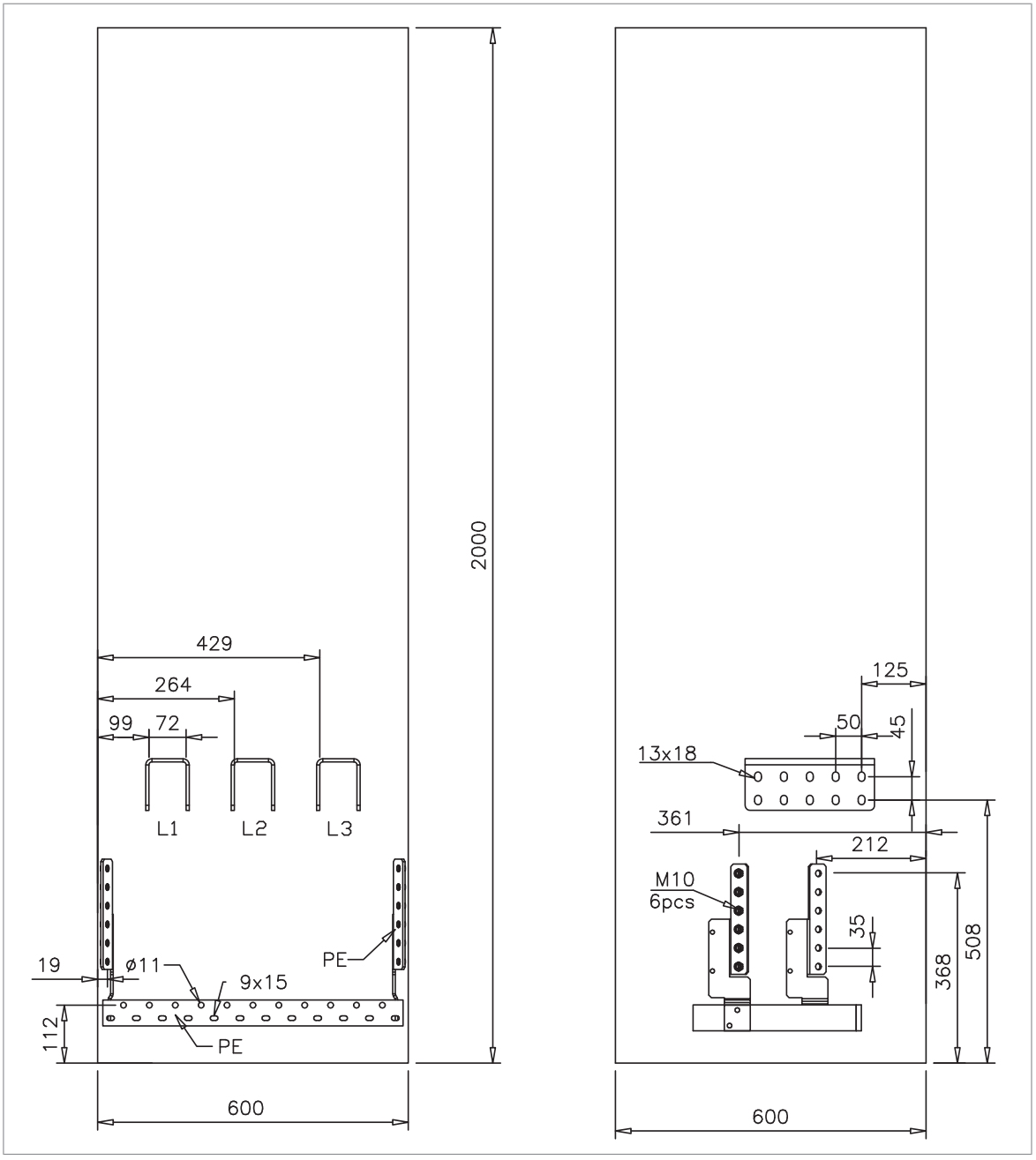
600 mm wide incoming cubicle or input cubicle



1000 mm wide input cubicle



100 kA input cubicle (option +F274)



Tightening torques

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

Electrical connections

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

Mechanical connections

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

Insulation supports

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

Cable lugs

Size	Max. torque	Strength class
M8	15 N·m (11 lbf·ft)	8.8 (A2-70 or A4-70)
M10	32 N·m (23.5 lbf·ft)	8.8
M12	50 N·m (37 lbf·ft)	8.8

Terminal data for the control cables

See chapter The control unit.

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

Electrical power network specification

<table>
<tr><td>Voltage (U_1)</td><td>690 V units:
IEC:
525…690 V AC 3-phase ± 10%
In corner-grounded TN systems: 525…600 V AC
UL/CSA:
525…600 V AC
This is indicated in the type designation label as typical input voltage levels (3~ 525/600/690 V AC).</td></tr>
<tr><td>Network type</td><td>TN (grounded) and IT (ungrounded) systems</td></tr>
<tr><td>Frequency</td><td>50/60 Hz, variation ± 5% of nominal frequency</td></tr>
<tr><td>Imbalance</td><td>Max. ± 3% of nominal phase-to-phase input voltage</td></tr>
<tr><td>Short-circuit withstand strength (IEC/EN 61439-1)</td><td>Supply units with ABB-defined main breaker and fuses:
Frame R7i module(s): Rated conditional short-circuit current of LCL+ISU (I_{cc}) is 50 kA with module's AC fuses given in this manual.
Frame R8i module(s): Rated conditional short-circuit current of LCL+ISU (I_{cc}) is 65 kA with module's AC fuses given in this manual.
All other configurations:
Rated peak withstand current (I_{pk}): 105 kA
Rated short-time withstand current (I_{cw}): 50 kA/1 s</td></tr>
<tr><td>Short-circuit withstand strength for supply unit with 100 kA input unit (option +F274) (IEC/EN 61439-1)</td><td>Rated peak withstand current (Ipk): 220 kA
Rated short-time withstand current (Icw): 100 kA/1 s

Note: Options +F259 and +F274 are mutually exclusive for some drive types. Consult ABB for availability.</td></tr>
<tr><td>Short-circuit current protection (UL 508A, CSA C22.2 No. 14-13)</td><td>The drive is suitable for use on a circuit capable of delivering not more than 100,000 rms symmetrical amperes at 600 V maximum when the input cable is protected with class T fuses.</td></tr>
<tr><td>Fundamental power factor (cos phi$_1$)</td><td>0.99</td></tr>
<tr><td>Harmonic distortion</td><td>Harmonics are below the limits defined in IEEE519.
<table>
<tr><th>R_{sc}</th><th>THD Voltage [%]</th><th>THD Current [%]</th></tr>
<tr><td>20</td><td>3</td><td>2.5 [1)]</td></tr>
<tr><td>100</td><td>0.8</td><td>2.5 (4.0 with types -0390A…-0520A-7) [1)]</td></tr>
</table>
$$THD = \sqrt{\sum_{2}^{50}\left(\frac{I_n}{I_N}\right)^2}$$
1) Other loads may influence the THD value.
THD = Total Harmonic Distortion (THD). The voltage THD depends on the short-circuit ratio (R_{sc}). The spectrum of the distortion also contains interharmonics.
$R_{sc} = I_{sc}/I_N$
I_{sc} = short-circuit current at point of common coupling (PCC)
I_N = supply unit nominal current
I_n = nth harmonic current component</td></tr>
</table>

Note: When the supply unit includes an earthing switch (option +F259), the short-circuit withstand current is 50 kA.

Control unit connection data

See chapter The control unit.

Efficiency

Efficiency	98.2…98.8% at nominal power level depending on drive type. The efficiency is not calculated according to the ecodesign standard IEC 61800-9-2.

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).

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 "-3" 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). For UL and CSA compliant installations, the maximum surrounding air temperature is 40 °C (104 °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	IEC/EN 60721-3-3:2002 10…57 Hz: max. 0.075 mm amplitude 57…150 Hz: 1 *g* Units with marine construction (option +C121): Max. 1 mm (0.04 in) (5 … 13.2 Hz), max. 0.7 *g* (13.2 … 100 Hz) sinusoidal	IEC/EN 60721-3-1:1997 10…57 Hz: max. 0.075 mm amplitude 57…150 Hz: 1 *g*	IEC/EN 60721-3-2:1997 2…9 Hz: max. 3.5 mm amplitude 9…200 Hz: 10 m/s^2 (32.8 ft/s^2)
Shock IEC 60068-2-27:2008, EN 60068-2-27:2009	Not allowed	With packing max. 100 m/s^2 (328 ft/s^2) 11 ms	With packing max. 100 m/s^2 (328 ft/s^2) 11 ms

Materials

Cabinet

Enclosure	Zinc coated steel sheet
Finish	Polyester thermosetting powder coating on visible surfaces, color RAL Classic 7035 and RAL Classic 9017
Busbars for user power connections	Tin-plated copper
Fire safety of materials (IEC 60332-1)	Insulating materials and non-metallic items: mostly self-extinctive

Package

Standard package (Container package) Vertical	**Materials:** Wood, PE (VCI film), VCI emitter, clay desiccant, PET strap, metal fixing clamps and screws, packing tape. **Transport method:** Road and air transport and sea transport in container. **Storage conditions (IEC 60721-3-1):** 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) Vertical	**Materials:** Wood, plywood, PE (VCI film), VCI emitter, clay desiccant, metal fixing clamps and screws, packing tape. **Transport method:** Road and air transport and sea transport in container or deck. **Storage conditions (IEC 60721-3-1):** 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.

Disposal

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

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

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

To aid recycling, most plastic parts are marked with an appropriate identification code. In addition, components containing substances of very high concern (SVHCs) are listed in European Chemicals Agency's 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 further information, contact your local ABB distributor or consult European Chemicals Agency's SCIP database to find out which SVHCs are used in the drive, and to find out where those components are located.

Contact your local ABB distributor for further information on environmental aspects. End of life treatment must follow 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

Refer to ACS880 liquid-cooled multidrives cabinets and modules electrical planning (3AXD50000048634 [English]).

Markings

Refer to ACS880 liquid-cooled multidrives 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 Customer's sole responsibility to provide and continuously ensure a secure connection between the product and Customer network or any other network (as the case may be). Customer shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc.) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information.

ABB and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

9

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.

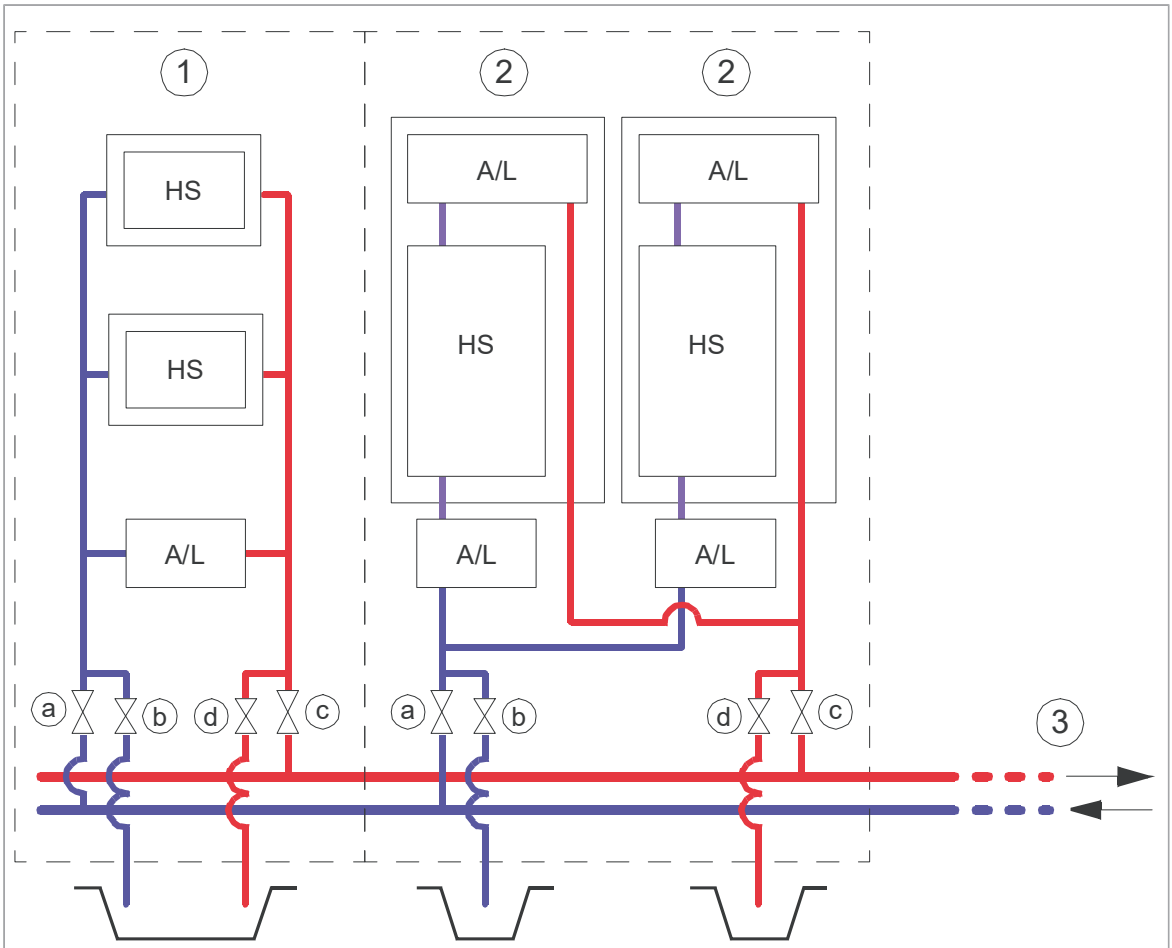
Internal cooling system

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 172).

Connection to a cooling unit

Connection to an ACS880-1007LC cooling unit

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

Connection to a custom cooling unit

General requirements

Equip the system with an expansion vessel to damp pressure rise due to volume changes when the temperature varies. Equip the system with a pump that provides a nominal flow and pressure. Keep the pressure within the limits specified in Technical data (page 172). 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 174).

Coolant temperature control

The temperature of the coolant in the internal cooling circuit must be kept within the limits specified in Technical data (page 172). Note that the minimum temperature is dependent on ambient temperature and relative humidity.

Filling up and bleeding the internal cooling circuit

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

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

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

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

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 172).
   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.

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

1. Attach hoses to each drain valve in the cubicle to be drained. Lead the hoses into a suitable container. Make sure the ends of the hoses are not immersed in coolant at any point so that air can displace the coolant in the system.
2. Open the drain valves. Wait until all coolant has drained.

   Note: Draining coolant into the sewer system is not allowed.
3. If required, dry the piping with compressed oil-free air of less than 6 bar.
4. If the drive is to be stored in temperatures below 0 °C (32 °F),
   - dry the cooling circuit with air,
   - fill the cooling circuit with coolant specified under Coolant specification (page 172).
   - drain the cooling circuit again.

Maintenance intervals

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

Technical data

Coolant specification

Coolant type

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

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.

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

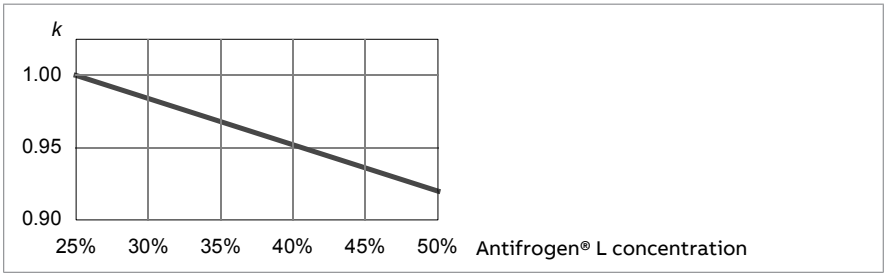
Temperature limits

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 174).

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.



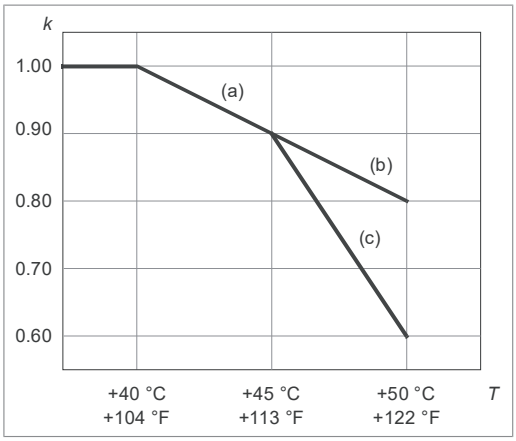
Incoming coolant temperature:

- 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.



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

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

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

Design pressure (PS): 600 kPa

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

Maximum pressure difference: 160 kPa

Coolant flow rate limits

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

Cooling circuit materials

Materials used in the internal cooling circuit are listed below.

- stainless steel AISI 316L (UNS 31603)
- heavy gauge aluminum
- plastic materials such as PA, PEX and PTFE

  Note: PVC hoses are not suitable for use with antifreeze.
- rubber gasketing NBR (nitrile rubber).

WARNING!
If 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.

Further information

Product and service inquiries

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

Product training

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

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