ABB INDUSTRIAL DRIVES

ACS880-307LC diode supply units

Hardware manual

ACS880-307LC diode supply units

Hardware manual

3AXD50000579662 Rev B
EN
Original instructions
EFFECTIVE: 2021-07-09

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Further information

1

Introduction to the manual

Contents of this chapter

This chapter contains general information on the manual.

Applicability

The manual is applicable to the cabinet-installed ACS880-307LC…+A018 diode supply units that form a part of an ACS880 multidrive system.

Safety instructions

Obey all safety instructions delivered with the drive.

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

Target audience

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

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

Categorization by frame size and option code

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

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

Use of component designations

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

Terms and abbreviations

Term	Description
ACU	Auxiliary control unit. Contains control electronics, auxiliary voltage circuitry, etc.
BCU	Type of control unit
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.
D8T	Frame size designation of the diode supply module
DC link	DC circuit between rectifier and inverter
DI	Digital input
Diode supply module	Diode rectifier and related components enclosed in a metal frame or enclosure. Intended for cabinet installation.
Diode supply unit	Diode supply modules under control of one control board, and related components.
Drive	Frequency converter for controlling AC motors
DSU	Diode supply unit
Frame, frame size	Physical size of the drive or power module
ICU	Incoming unit
Intermediate circuit	DC circuit between rectifier and inverter
INU	Inverter unit
Inverter module	Inverter bridge, related components and drive DC link capacitors enclosed in a metal frame or enclosure. Intended for cabinet installation.
Inverter unit	Inverter module(s) under control of one control unit, and related components. One inverter unit typically controls one motor.
Multidrive	Drive for controlling several motors which are typically coupled to the same machinery. Includes one supply unit, and one or several inverter units.
Parameter	In the drive control program, user-adjustable operation instruction to the drive, or signal measured or calculated by the drive. In some (for example fieldbus) contexts, a value that can be accessed as an object, eg, variable, constant, or signal.
Rectifier	Converts alternating current and voltage to direct current and voltage
Single drive	Drive for controlling one motor

Related documents

Manual	Code
General manuals	
ACS880 liquid-cooled multidrive cabinets and modules safety instructions	3AXD50000048633
ACS880 liquid-cooled multidrive cabinets and modules electrical planning instructions	3AXD50000048634
ACS880 liquid-cooled multidrive cabinets mechanical installation instructions	3AXD50000048635
CIO-01 I/O module for distributed I/O bus control user's manual	3AXD50000126880
Supply unit manuals	
ACS880-207LC IGBT supply units hardware manual	3AXD50000174782
ACS880 IGBT supply control program firmware manual	3AUA0000131562
ACS880-307LC…+A018 diode supply units hardware manual	3AXD50000579662
ACS880 diode supply control program firmware manual	3AUA0000103295
Inverter unit manuals	
ACS880-107LC inverter units hardware manual	3AXD50000196111
ACS880 primary control program firmware manual	3AUA0000085967
ACS880 primary control program quick start-up guide	3AUA0000098062
Manuals for application programs (Crane, Winder, etc.)	
Brake unit and DC/DC converter unit manuals	
ACS880-607LC 1-phase brake units hardware manual	3AXD50000481491
ACS880-607LC 3-phase dynamic brake units hardware manual	3AXD50000581627
ACS880 (3-phase) brake control program firmware manual	3AXD50000020967
ACS880-1607LC DC/DC converter units hardware manual	3AXD50000431342
ACS880 DC/DC converter control program firmware manual	3AXD50000024671
ACS880-7107LC DC feeder unit hardware manual	3AXD50000752423
Option manuals	
ACS880-1007LC liquid cooling unit user's manual	3AXD50000129607
ACS880 +C132 marine type-approved cabinet-built drives supplement	3AXD50000039629
ACS-AP-x assistant control panels user’s manual	3AUA0000085685
Drive composer start-up and maintenance PC tool user’s manual	3AUA0000094606
Converter module lifting device for drive cabinets hardware manual	3AXD50000210268
Manuals for I/O extension modules, fieldbus adapters, safety options etc.	

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

2

Operation principle and hardware description

Contents of this chapter

This chapter contains a description of the diode supply unit. The information is valid for the ACS880-307LC…+A018 diode supply units.

Operation principle

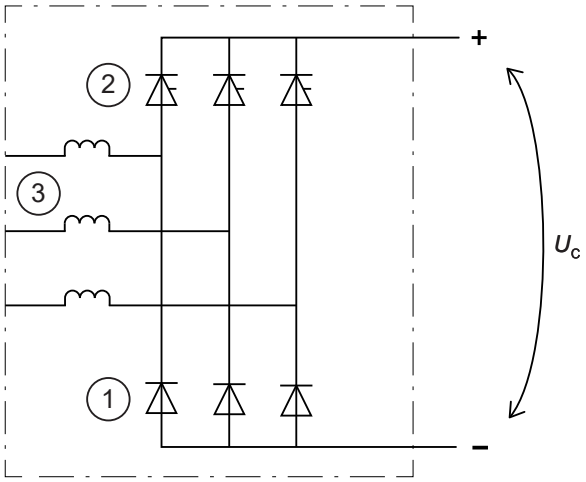
The core of the diode supply unit is a diode-thyristor bridge. It rectifies three-phase AC current to direct current for the intermediate DC link of the drive. The intermediate DC link supplies the inverters that run the motors. There can be one inverter unit only (single drives) or several inverter units (multidrives) connected to the intermediate circuit. The DSU modules have inbuilt AC chokes. The AC chokes smoothen the current waveform in the power supply network and voltage in the DC link of the drive.

The main difference between the ordinary diode-diode bridge and the controlled diode-thyristor bridge is the controllability. You cannot control the operation of the diodes but you can control the thyristors. By controlling the thyristors, you can limit the AC current of the drive at the power up without additional charging circuit in the supply unit or in inverter units.

There are two control modes for the upper leg thyristor firing: the charging mode and the normal mode:

- The charging mode is in operation a short period after the power switch on: the supply control program controls the thyristor firing angle gradually towards zero while the intermediate circuit capacitors located in the inverter module(s) get charged.
- In the normal mode, the thyristor firing angle is 0 degrees: The thyristors operate as diodes.

Overview diagram of the rectifier bridge



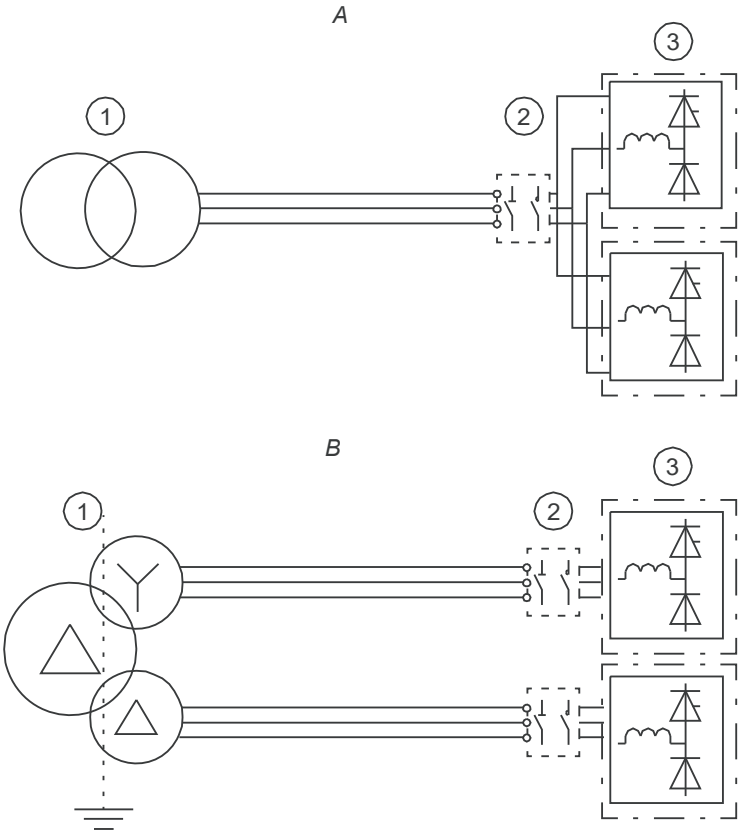
1	Diodes. The diodes connect the AC terminals in cyclic sequence to the lower DC busbar (-).
2	Thyristors. The thyristors connect the AC line terminals in cyclic sequence to the upper DC busbar (+).
3	AC chokes

6- and 12-pulse supply connections

The figure below illustrates the difference between 6-pulse and 12-pulse AC supply connections. The 6-pulse connection is standard. If the drive has an even number of supply modules, you can order it as a 12-pulse version (option +A004).

The 12-pulse supply connection eliminates the fifth and seventh harmonics, which substantially reduces the harmonic distortion of the line current and the conducted emissions.

The 12-pulse connection requires a three-winding transformer, or two separate transformers. There must be phase shift of 30-degrees between the two 6-pulse supply lines, which are connected to different supply modules through electrically separate switching equipment.

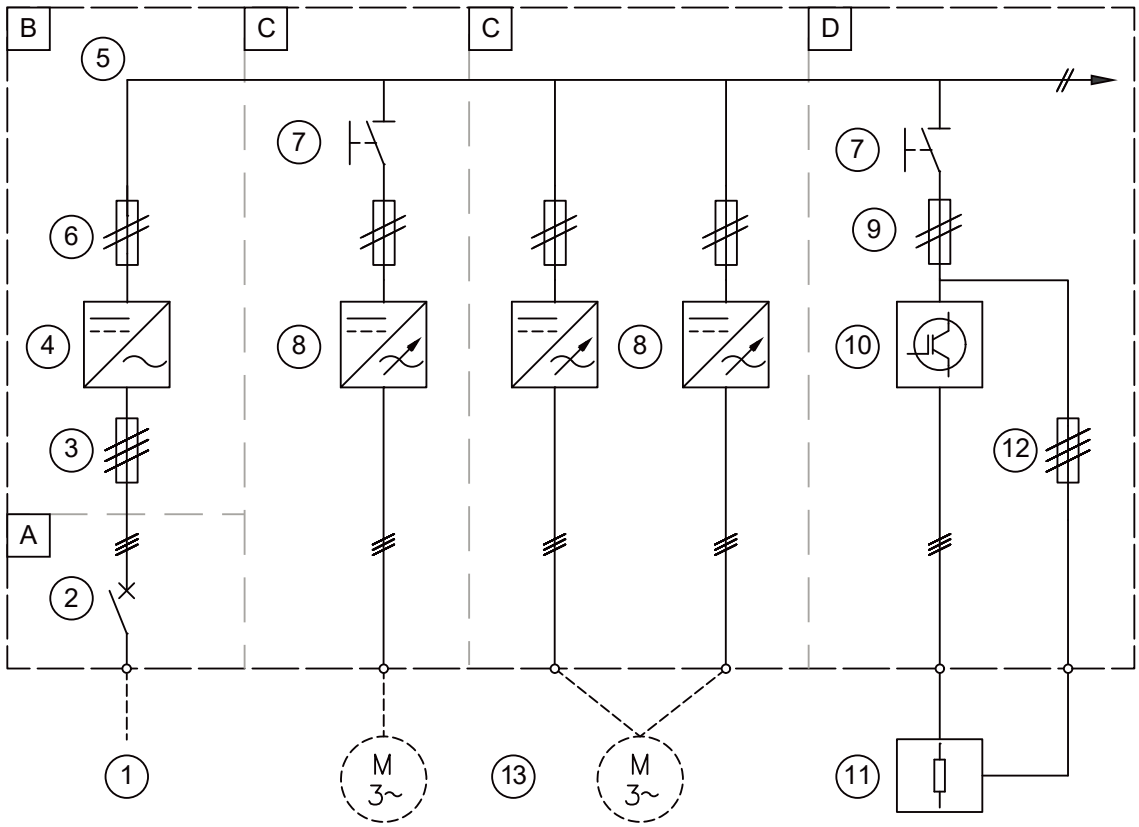


A	6-pulse connection
B	12-pulse connection
1	Supply transformer
2	Switching equipment
3	Diode supply modules

Overview diagram of the drive system

This diagram shows an example of a multidrive. The supply unit connects the drive to the AC supply network. It converts the AC voltage into DC. The DC voltage is distributed through the DC bus to all inverter units and optional brake units. The inverter unit converts the DC

back to AC that rotates the motor. The brake unit (optional) conveys energy to brake resistors whenever needed.

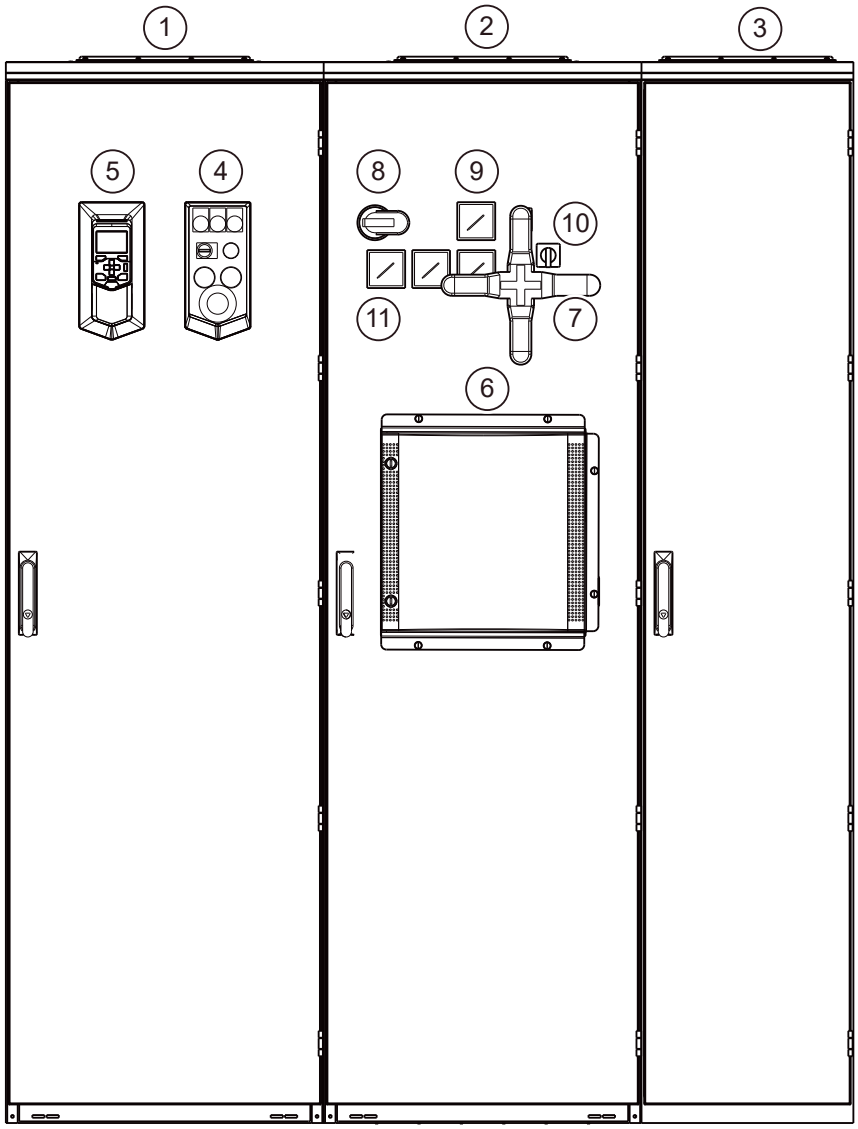


A	Incoming unit
B	Supply unit
C	Inverter unit
D	Brake unit
1	AC supply
2	Main breaker, or main contactor and main switch-disconnector
3	Input (AC) fuses
4	Supply module
5	DC bus
6	Supply and inverter module DC fuses
7	DC switch/disconnector (optional)
8	Inverter modules
9	Brake chopper fuses
10	3-phase brake chopper module (optional)
11	Brake resistors (optional or acquired by user)
12	Fuses for the brake resistors
13	Motor(s) (acquired by user)

Layout drawings

Overview layout drawing of the supply unit

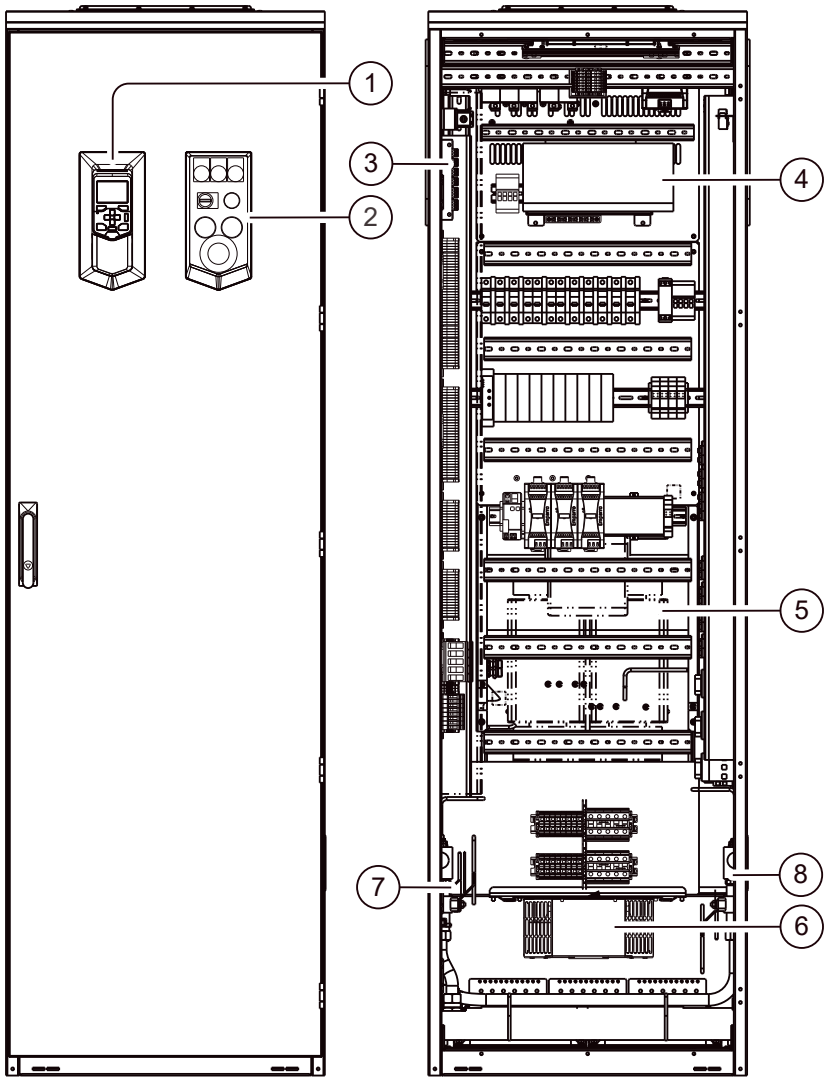
This drawing shows an example of a diode supply unit.



1	Auxiliary control cubicle
2	Incoming cubicle
3	Supply module cubicle
4…11	Control devices. See section *Supply unit control devices*.

Auxiliary control cubicle layout

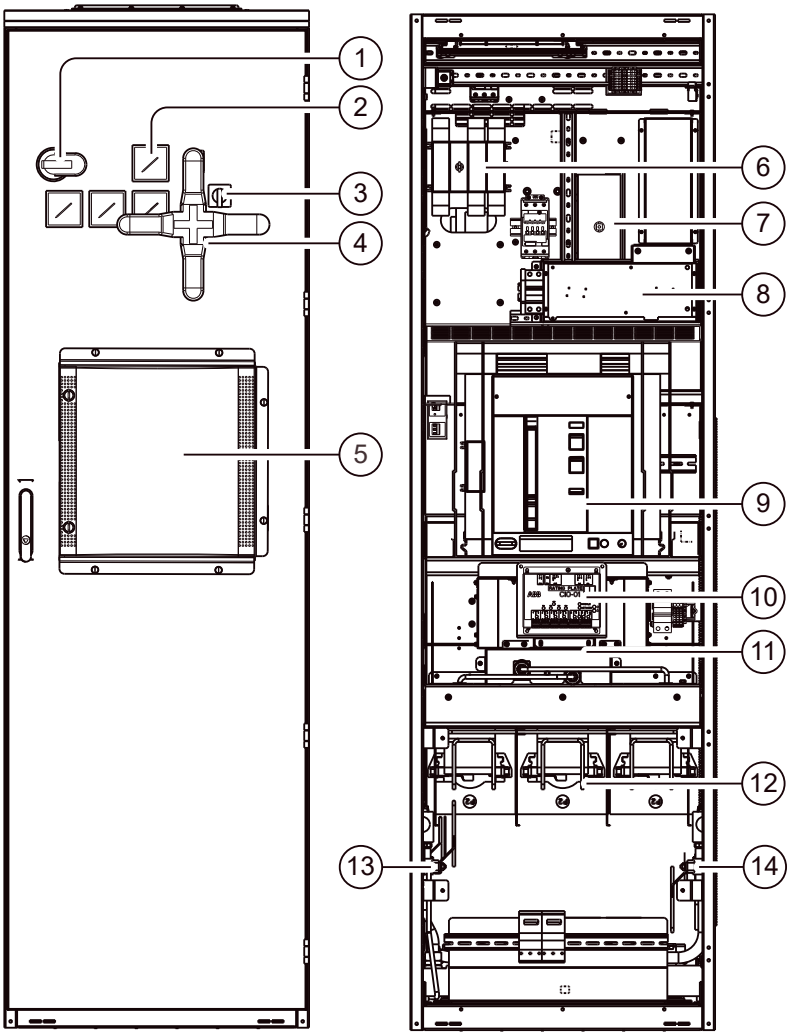
The cubicle has a bottom control cable entry. The top cable entry (option +H351) increases the cubicle height.



1	Control panel [A59] (option +J400, or +J425)
2	Operating switch [S21], emergency stop button [S61], etc.
3	CIO-01 I/O module for cooling fan monitoring [A115.99]
4	BCU control unit [A51]
5	Auxiliary voltage transformers behind the assembly plates ([T21] option +G344, [T115] option +G451, in some deliveries also [T125])
6	Cooling fan and heat exchanger [G115.99]
7	Inlet manifold with stop and drain valves
8	Outlet manifold with stop and drain valves

Incoming cubicle layout - bottom cable entry

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

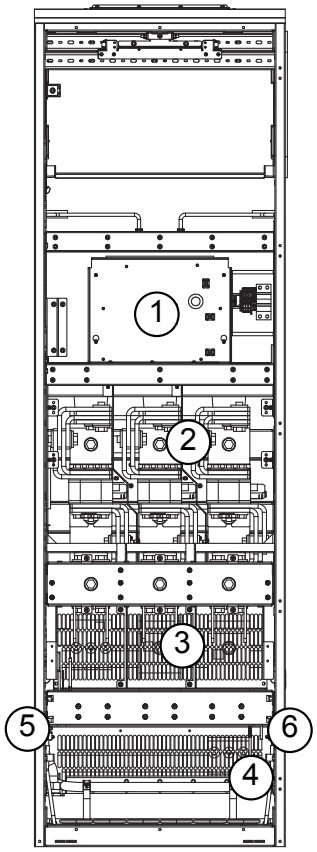


1…4	See *Supply unit control devices (page 26)*.
5, 9	Main supply breaker [Q1.x] (option +F255)
1, 6	Auxiliary voltage supply breaker (switch fuse) [Q21]
4, 7	Grounding switch [Q9.x] (option +F259)
8	Not in use.
10	CIO-01 I/O module for cooling fan control [A115.x]
11	Cooling fan and heat exchanger [G115.x]
12	Input power cable terminals L1, L2, L3
13	Inlet manifold with stop and drain valves
14	Outlet manifold with stop and drain valves

100 kA input cubicle (option +F274)

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 beside the standard 65 kA incoming cubicle or input cubicle at the factory. The input power cables enter the 100 kA input cubicle. All other customer cables enter the auxiliary control cubicle or other supply unit cubicles. The factory installs no optional door devices (such as meters, etc.) on the door of the 100 kA cubicle. No UL version (option +C129) is available.

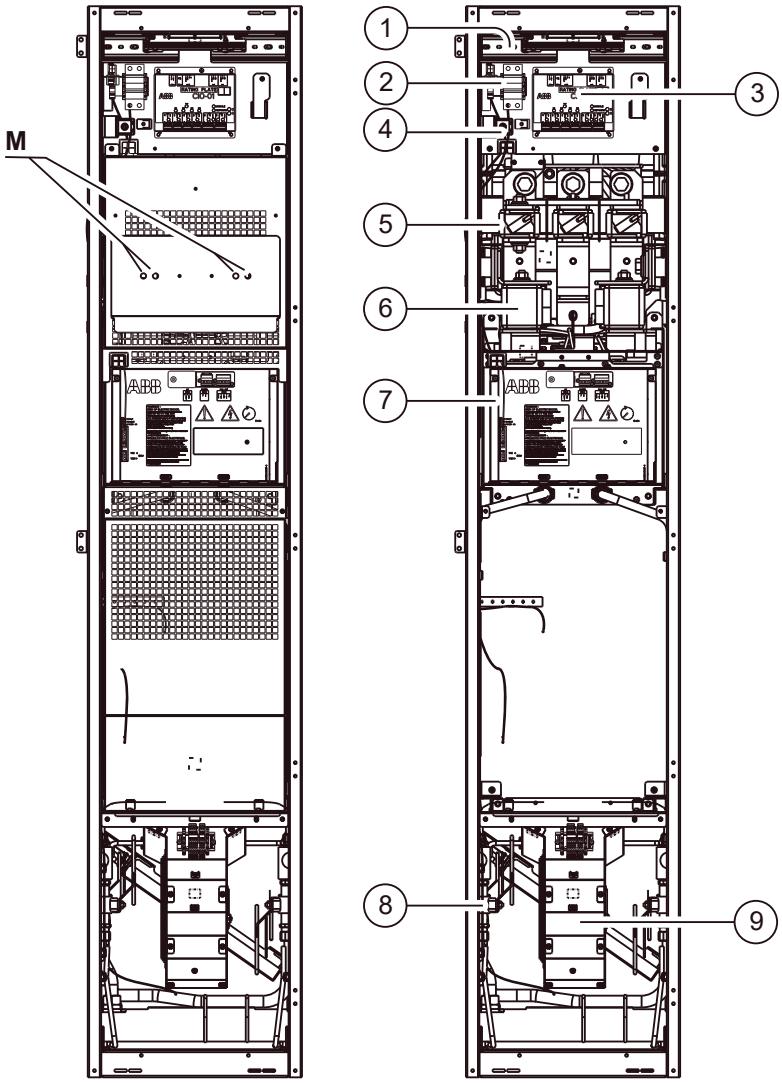
The layout drawing presents the bottom power cable entry version.



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

Supply module cubicle layout – frame 1×D8T

Supply module cubicle layout – frame 1×D8T, electrical components



M	DC voltage measuring/testing points
1	Cabinet light ([H310.10 1)], option +G301)
2	Cabinet fan miniature circuit breaker [F115.10 1)]
3	CIO-01 I/O module for distributed I/O bus control [A115.10 1)]
4	Cabinet light switch ([S130.10 1)], option +G301)
5	Module 1 AC fuses [F3.11… 1)]
6	Module 1 DC fuses [F2.11… 1)]
7	Supply module [T01.1]
8	Cabinet heater ([E95.10 1)], option +G300)
9	Cabinet fan [G115.10 1)]

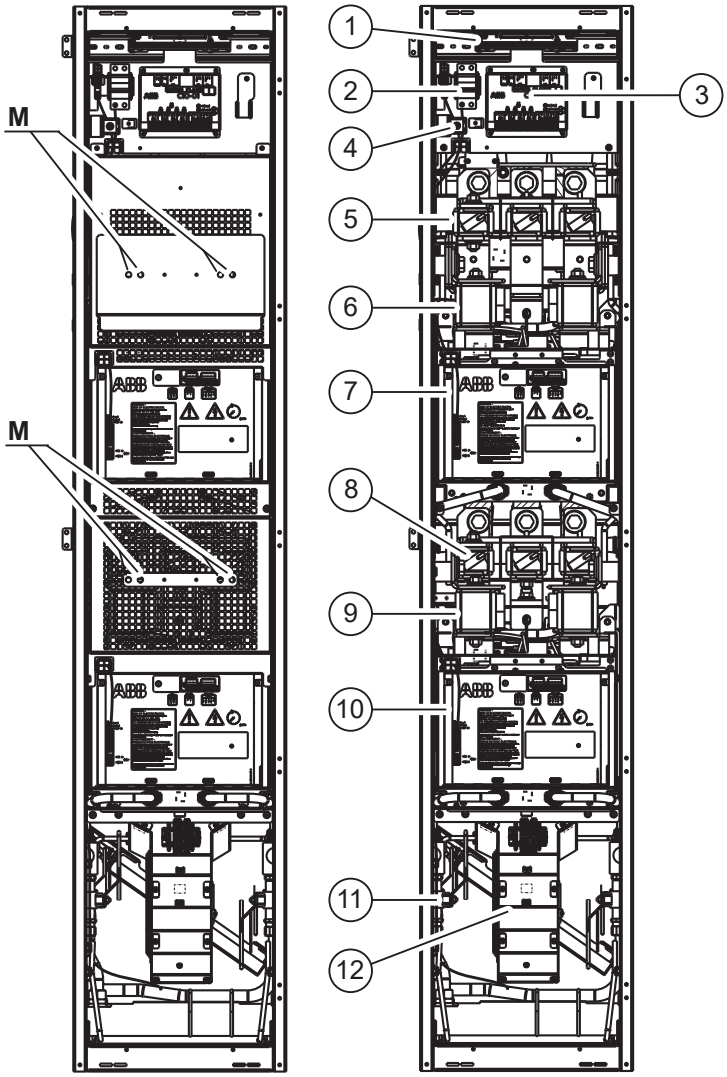
1) Latter number is for the first supply module cubicle. The number increases in other cubicles (if any).

Supply module cubicle layout – frame 1×D8T, cooling circuit

See *Supply module cubicle layout – frame 2×D8T, cooling circuit (page 23)*.

Supply module cubicle layout – frame 2×D8T

Supply module cubicle layout – frame 2×D8T, electrical components

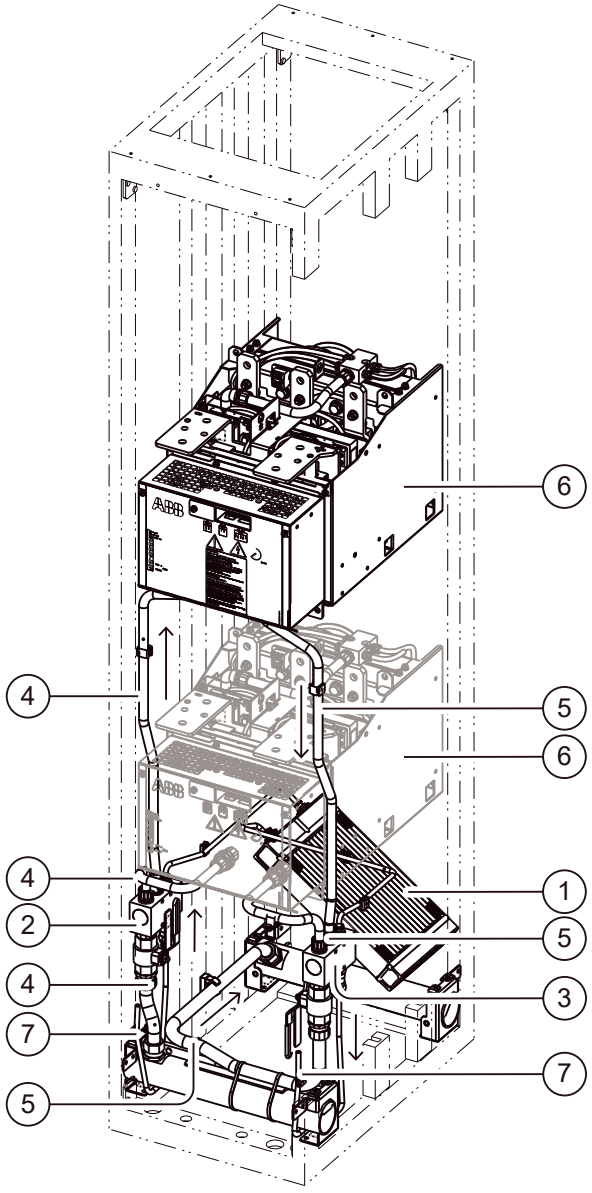


M	DC voltage measuring/testing points
1	Cabinet light ([H310.10 1)], option +G301)
2	Cabinet fan miniature circuit breaker [F115.10 1)]
3	CIO-01 I/O module for distributed I/O bus control [A115.10 1)]
4	Cabinet light switch ([S130.10 1)], option +G301)
5	Module 1 AC fuses [F3.1… 1)]
6	Module 1 DC fuses [F2.11… 1)]
7	Supply module 1 [T01.1]
8	Module 2 AC fuses [F3.4 or F3.7… 1)]
9	Module 2 DC fuses [F2.21… 1)]
10	Supply module [T01.2]

11	Cabinet heater ([E95.10[1)]], option +G300)
12	Cabinet fan [G115.10[1)]]

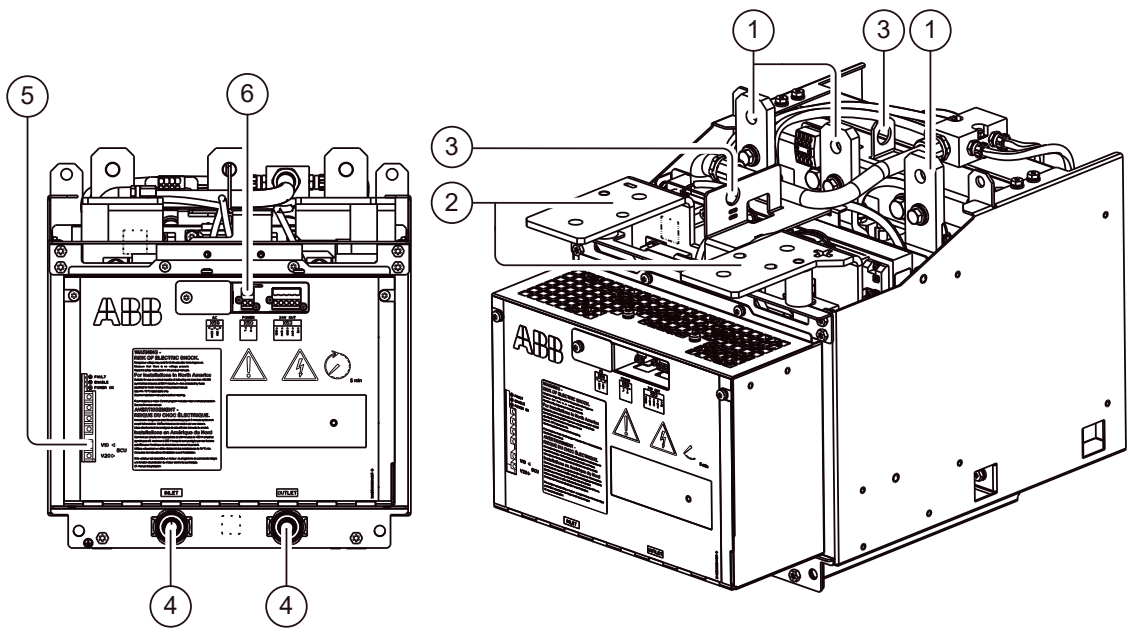
1) Latter number is for the first supply module cubicle. The number increases in other module cubicles (if any).

Supply module cubicle layout – frame 2×D8T, cooling circuit



1	Heat exchanger
2	Inlet manifold with stop and drain valves
3	Outlet manifold with stop and drain valves
4	Inlet pipes (cold coolant) from main pipe to modules and heat exchanger
5	Output pipes (warm coolant) to main pipe from modules and heat exchanger
6	Supply modules [T01.x]
7	Draining pipes (inlet draining pipe, and outlet draining pipe)

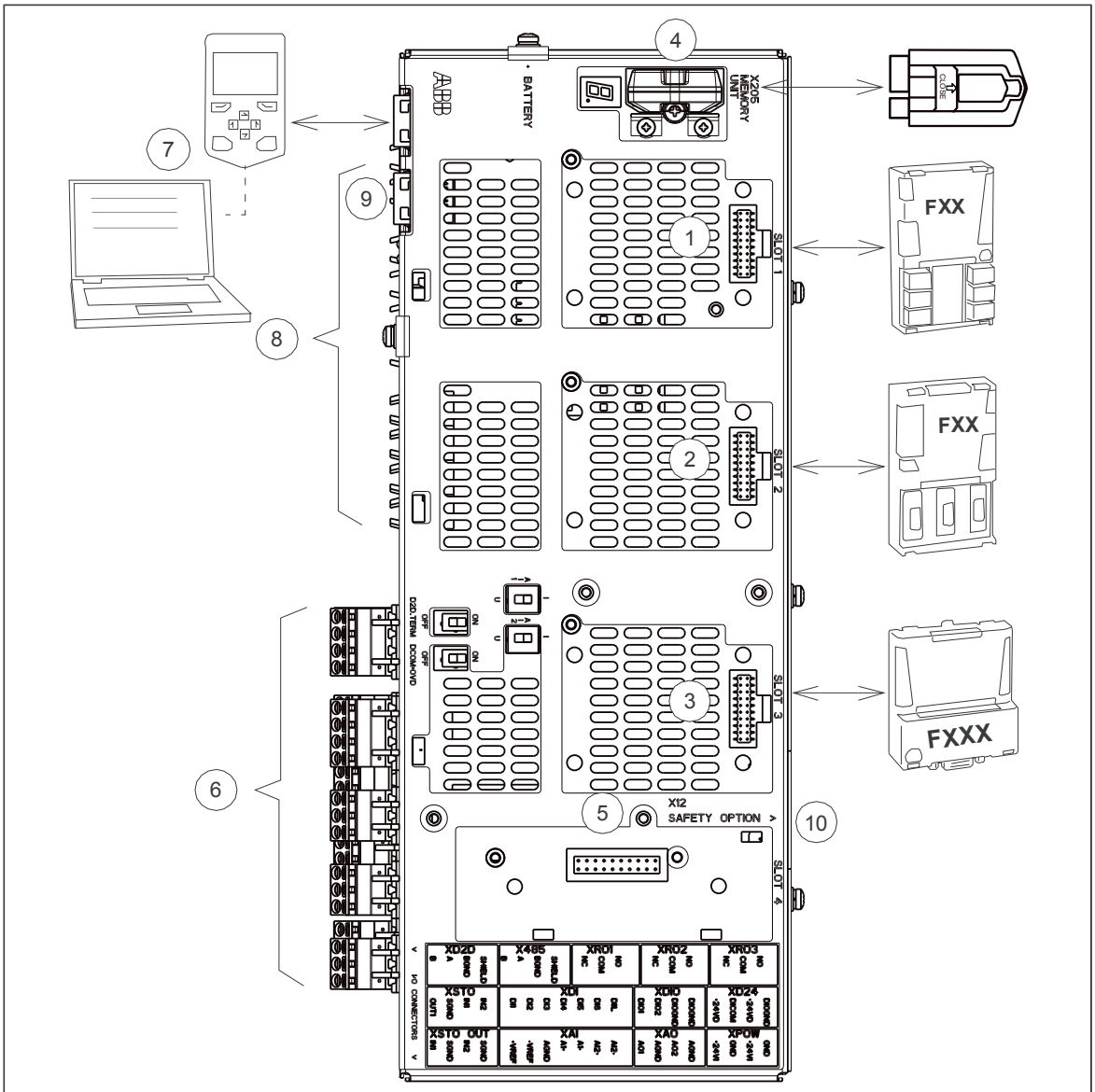
Supply module layout - frame D8T



1	AC input busbars
2	DC output busbars
3	Lifting eyes
4	Coolant in and out connectors
5	Fiber optic connectors
6	230/115 V supply connection

Overview of the control connections of the BCU control unit

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

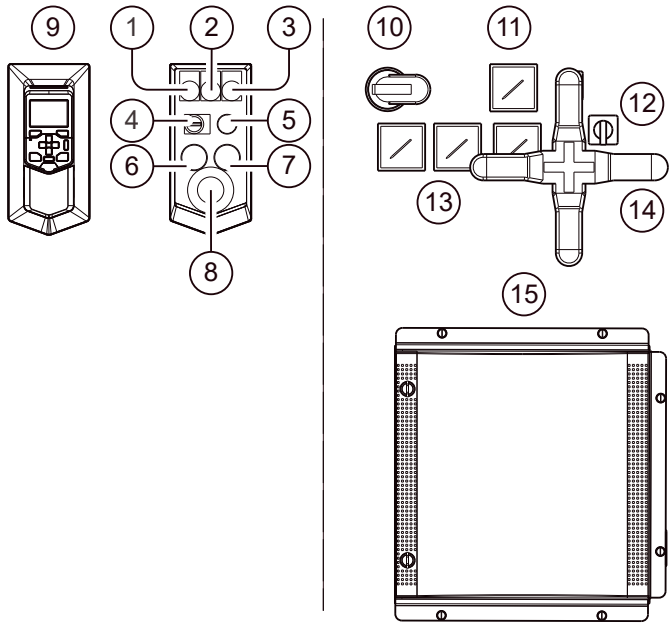


1 2 3	Analog and digital I/O extension modules and fieldbus communication modules can be inserted into slots 1, 2 and 3.	7	Control panel.
4	Memory unit	8	Fiber optic links to power modules (inverter, supply, brake or converter)
5	Slot 4 for RDCO-0x	9	Ethernet port. Not in use.
6	Terminal blocks.	10	Safety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

Supply unit control devices

Overview of door switches and lights

This figure shows and example of the door control devices. The devices and their exact locations varies depending on the options selected. The purpose of the devices is explained in the following sections.



1…3	Not in use in multidrives
4	Operating switch [S21]. OFF: Opens main breaker (Q1.x), disables supply unit. ON (ENABLE/RUN): Enables supply unit, closes main breaker (Q1.x).
5	Emergency stop reset button and indication lamp [S62] (option +G331)
6	Ground (earth) fault indicator light and reset button [S90] (option +Q954)
7	Reserved for application-engineered equipment
8	Emergency stop button [S61] (option +G331)
9	Control panel [A59] (option +J400, or +J412)
10	Auxiliary voltage supply breaker (switch fuse) [Q21]
11	Voltage meter [P5.x] (option +G334)
12	Selector switch for phase voltage meter [S5.x] (option +G334)
13	Phase current meter(s) [P2.x] (option +G335)
14	Grounding switch [Q9.x] (option +F259)
15	Main supply breaker [Q1.x] (option +F255)

Main disconnecting device [Q1.x]

The supply unit is equipped with a main breaker ([Q1], option +F255) as standard. With this device, you can isolate the main circuit of the drive from the power line. The main breaker is withdrawable: to disconnect the drive, crank the breaker out with a separate loose handle (included in the delivery). For the 12-pulse supply unit and power ratings higher than 3000 A there are two main disconnecting devices ([Q1.1] and [Q1.2]).

WARNING!
The main disconnecting device does not isolate the input power terminals, AC voltage meters ([P5.x], option +G334) or the auxiliary circuit from the power line. To isolate auxiliary voltage, use the auxiliary voltage switch [Q21]. To isolate the input power terminals and AC voltage meters, open the main breaker of the supply transformer and lock it to the open position.

If the drive is equipped with a main breaker and has a charging circuit: The main circuit breaker does not isolate the charging circuit. Use the charging switch [Q3].

Auxiliary voltage switch [Q21]

The supply unit is equipped with an auxiliary voltage switch [Q21] as standard. Using the switch, you can disconnect the auxiliary circuit from the power line. The switch has an operating handle on the cabinet door.

Grounding switch [Q9.x]

The supply unit can be equipped with an optional grounding switch ([Q9.x], option +F259). Using the switch, you can temporarily ground the main AC busbars of the supply unit during the maintenance work. The switch has an operating handle on the cabinet door.

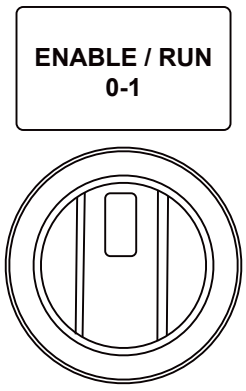
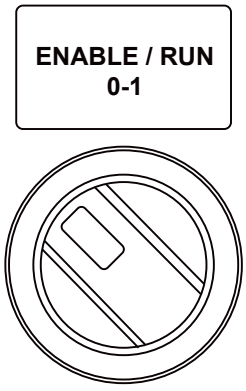
WARNING!
The grounding switch does not ground the input power terminals of the drive or the auxiliary (control) voltage circuits.

Operating switch [S21]

The operating switch [S21] is a standard device.

By default, the operating switch controls the unit as follows:

- The ENABLE/RUN position energizes digital input DI2 of the control unit: Control program receives Run/Enable command and controls the supply unit power up via the control unit I/O interface. The supply unit first charges the drive DC link and then starts normal operation. The main breaker [Q1] closes.
- The OFF position de-energizes digital input DI2 of the control unit: Control program does not receive Run/Enable command and it opens the main breaker [Q1]. Supply module stops rectifying.

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

Emergency stop button [S61]

The emergency stop button [S61] is an optional device (option +G331). Pressing the button activates an emergency stop function of the supply unit. The button locks to open position automatically. You must release the button before you can return to the normal operation. Before the restart, you also need to reset the emergency stop circuit with a separate reset button [S62].

E-stop reset button [S62] and indication lamp [P62]

The emergency stop reset button [S62] is automatically installed on the door when the supply unit is equipped with an emergency stop function (for example, options +Q951, +Q952, etc). The button is illuminated, ie it includes an indication lamp [P62]. You can reset the emergency stop circuit with the button.

Note: The emergency stop options are described in separate option manuals.

Other optional door controls

- A voltage meter is an optional device ([P5.x], option +G334). There is a meter on the door and a switch [S5.x] with which you can select which phase voltage value to display.
- An AC phase current meter is an optional device ([P2.x], option +G335). It is also possible to have three meters on the door - one for each phase currents (option +3G335).
- Tripping button for the supply breaker ([S22], option +Q959) is a push button on the cabinet door for the user-defined use, for example, for tripping the breaker of the supply transformer of the drive. The button is wired to a terminal block at the factory. The user connects the external circuit to be controlled on site.
- An electrical on/off push button ([S23], option +G332) on the cabinet door for tripping the supply unit. The button is connected in series with the operating switch. The button trips the Run enable signal and further the main contactor/breaker of the drive.

Control panel

The control panel is the user interface of the unit. For the cabinet-installed drives, the panel is optional (option +J400 or +J425). With the control panel, you 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 and external control.

To be able to start and stop the unit by the control panel, you must have the Run enable signal and Start enable signal on (1) on the control board. Normally this means, that you must have the operating switch on the cabinet door in ENABLE/RUN position. The control panel must also be in local control mode. You can select the mode with the Loc/Rem key on the panel.

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

PC connection

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

Fieldbus control

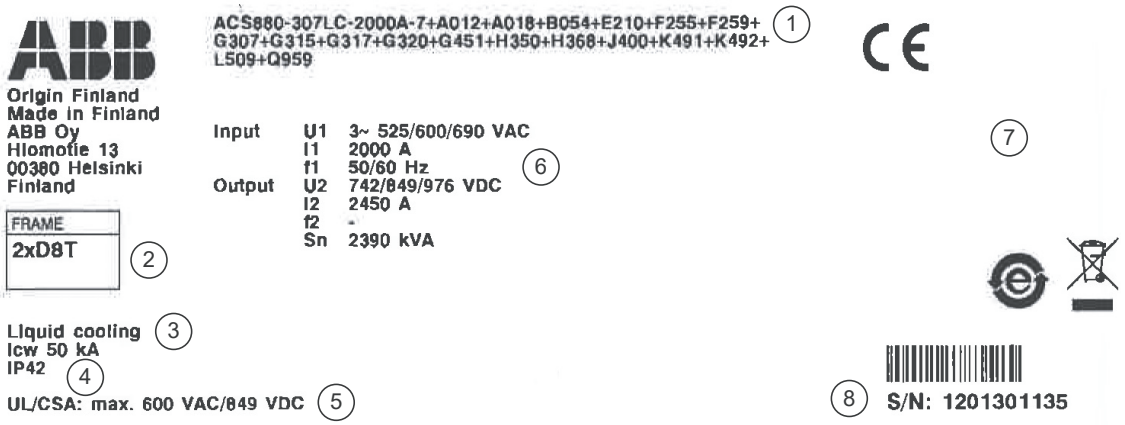
You can control the unit through a fieldbus interface if the unit is equipped with an optional fieldbus adapter (for example, option +K454), and when you have configured the control program for the fieldbus control with the parameters. For information on the parameters, see the firmware manual.

Note: To be able to switch the main breaker [Q1] and the supply unit on and off (Run enable signal) through the fieldbus, the Run enable command at digital input DI2 must be on (1). That is the case when the operating switch [S21] is switched to the ENABLE/RUN position.

Type designation labels

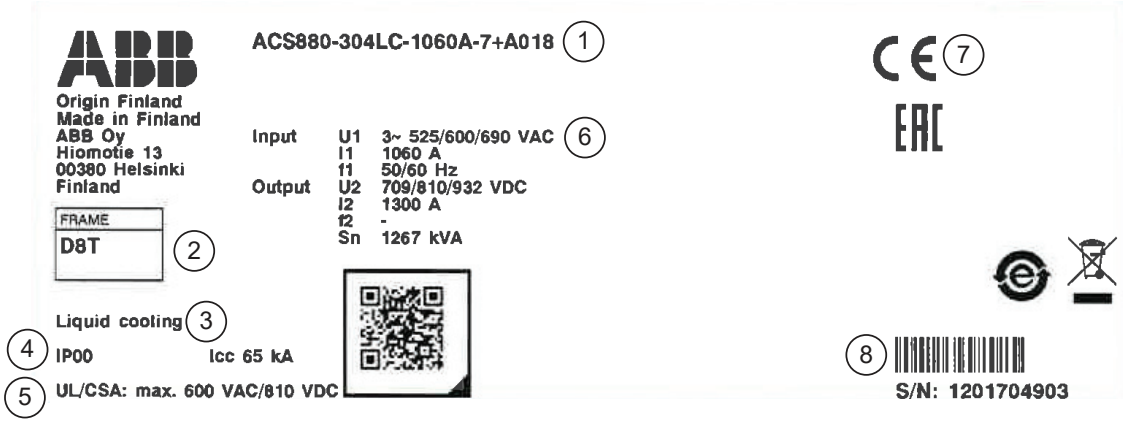
Each diode supply module and unit has a type designation label. The type designation stated on the label contains information on the specifications and configuration of the unit.

Supply unit



1	Type designation
2	Frame size
3	Cooling method
4	Degree of protection
5	UL/CSA data
6	Ratings
7	Valid markings. See *Electrical planning instructions for ACS880 liquid-cooled multidrive cabinets and modules* (3AXD50000048634 [English]).
8	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.

Supply module



1	Type designation
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6	Ratings
7	Valid markings. See *Electrical planning instructions for ACS880 liquid-cooled multidrive cabinets and modules* (3AXD50000048634 [English]).
8	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 keys

Type designation key of the supply unit

The type designation describes the composition of the unit in short. The type designation is visible on the label (sticker) which is attached to the cabinet. The complete designation code is divided in subcodes:

- The first 1…18 digits form the basic code. It describes the basic construction of the unit. The fields in the basic code are separated by hyphens.
- The option codes follow the basic code. Each option code starts with an identifying letter (common for the whole product series), followed by descriptive digits. The option codes are separated by plus signs.

Basic code

Code	Description
ACS880	Product series
307LC	Default configuration: liquid-cooled cabinet-installed diode supply unit, IP42 (UL Type 1), supply frequency 50 Hz, control (auxiliary) voltage 230 V AC, half-controlled diode thyristor bridge, IEC industrial cabinet construction, main switch type: air circuit breaker, degree of protection IP42 (UL type 1), EMC filter (category 3, 2nd Environment), EN/IEC approved components, speed-controlled module cooling fans, DC busbar material copper, cable supply conductors, standard wiring material, power and control cabling through the bottom of the cabinet, ACS-AP-W assistant control panel, ACS880 diode supply control program, coated circuit boards, lead-through-type cable entries, multilingual door device label sticker, complete documentation in English in a USB memory stick.
Size	
xxxxx	Refer to the rating table in the technical data.
Voltage range	
7	525…690 V. This is indicated in the type designation label as typical input voltage levels 3~525/600/690 V AC.

Option codes

Code	Description
A004	12-pulse supply connection
A012	50 Hz supply frequency
A013	60 Hz supply frequency
A018	Half-controlled diode-thyristor bridge
B054	IP42 (UL Type 1 Filtered)
B055	IP54 (UL Type 12)
C121	Marine construction
C129	UL Listed (evaluated to both U.S. and Canadian safety requirements)
C132	Marine type approval. Refer to *ACS880 +C132 marine type-approved cabinet-built drives supplement* (3AXD50000039629 [English]).
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)

Code	Description
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)
E210	EMC/RFI filter for 2nd environment TN (grounded) or IT (ungrounded) system, category C3
F255	Main circuit breaker
F259	Grounding (earthing) switch
F274	100 kA short-circuit rating (100 kA input cubicle)
G300	Cabinet and module heating elements (external supply)
G301	Cabinet lighting
G304	Control (auxiliary) voltage 115 V AC
G307	Terminals for connecting external control voltage (230 V AC or 115 V AC, eg. UPS)
G315	Tin-plated copper DC busbars
G316	Cable supply conductors
G317	Supply connection by busbars
G320	Control (auxiliary) voltage 230 V AC
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 / ACB)
G333	kW-meter on door
G334	V-meter with selector switch
G335	A-meter in one phase
G336	Arc monitoring
G337	Arc monitoring with current monitoring unit
G338	Additional wire markings
G339	
G340	
G341	
G342	
G343	Corrosion indicator
G344	Auxiliary voltage transformer
G426	Arc monitoring extension unit
H350	Bottom power cable entry
H351	Top power cable entry
H358	Cable gland plates (3 mm steel, undrilled)
H364	Cable gland plates (3 mm aluminum, undrilled)
H365	Cable gland plates (6 mm brass, undrilled)
H367	Control cable entry through floor of cabinet
H368	Control cabling through roof of cabinet
J410	Control panel mounting platform
K450	Panel bus (control of several units from one control panel)
K451	FDNA-01 DeviceNet™ adapter module

Code	Description
K454	FPBA-01 PROFIBUS DP adapter module
K457	FCAN-01 CANopen adapter module
K458	FSCA-01 RS-485 (Modbus/RTU) adapter module
K462	FCNA-01 ControlNet™ adapter module
K469	FECA-01 EtherCat adapter module
K470	FEPL-02 EtherPOWERLINK adapter module
K475	FENA-21 Ethernet adapter module for EtherNet/IP™, Modbus TCP and PROFINET IO protocols, 2-port
K480	Ethernet switch for PC tool or control network (for max. 6 inverter units)
K483	Ethernet switch with optical link for PC tool or control network (for max. 6 inverter units)
K490	FEIP-21 Ethernet adapter module for EtherNet/IP™
K491	FMBT-21 Ethernet adapter module for Modbus TCP
K492	FPNO-21 Ethernet adapter module for PROFINET IO
L500	FIO-11 analog I/O extension module
L501	FIO-01 digital I/O extension module
L503	FDCO-01 optical DDCS communication adapter module
L508	FDCO-02 optical DDCS communication adapter module
L509	RDCO-04 optical DDCS communication for BCU-xx (4xTransmitter/Receiver)
L525	FAIO-01 analog I/O extension module
L526	FDIO-01 digital I/O extension module
N8010	IEC 61131-3 application programmability
P913	Special color (RAL Classic)
P966	Special color (other than RAL Classic)
Q951	Emergency stop (category 0) with safety relays, by opening the main breaker/contactor
Q952	Emergency stop (category 1) with safety relays, by opening the main breaker/contactor
Q954	Earth fault monitoring for IT (ungrounded) systems
Q959	Supply transformer breaker disconnect push button (red, wired to terminals) on the door
Q963	Emergency stop (category 0) with safety relays, by activating the Safe torque off function
Q964	Emergency stop (category 1) with safety relays, by activating the Safe torque off function
Q979	Emergency stop (configurable for category 0 or 1) with FSO-xx safety functions module, by activating the Safe torque off function
Q984	Emergency stop button monitoring
R700	Documentation/manuals in English

Type designation key of the diode supply module

The type designation describes the composition of the module in short. The complete designation code is divided in subcodes:

- The first 1…18 digits form the basic code. It describes the basic construction of the unit. The fields in the basic code are separated by hyphens.
- The option codes follow the basic code. Each option code starts with an identifying letter (common for the whole product series), followed by descriptive digits. The option codes are separated by plus signs.

Code	Description
Basic codes	
ACS880	Product series
304LC	Construction: Liquid cooled diode supply module, IP00 (UL Open Type), AC-choke, circuit boards with coating, CE approval
Size	
0780A	Refer to the technical data.
Voltage range	
7	525…690 V. This is indicated in the type designation label as typical input voltage levels 3~525/600/690 V AC.
Plus codes	
A018	Half-controlled diode-thyristor bridge (as standard)
C132	Marine type approval
C209	Marine product certification (only with +C132)
P904	Extended warranty 24/30
P909	Extended warranty 36/42
P911	Extended warranty 60/66

3

Electrical installation

Contents of this chapter

This chapter instructs how to check the insulation of the assembly and how to install the input power cables and control cables. The information is valid for ACS880-307LC…+A018 diode supply units.

For more information on cable selection, protections, etc., see *ACS880 multidrive cabinets and modules electrical planning instructions* (3AUA0000102324 [English]).

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

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

Electrical safety precautions

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

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

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

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

1. Clearly identify the work location and equipment.
2. Disconnect all possible voltage sources. Make sure that re-connection is not possible. Lock out and tag out.
   - Open the main disconnecting device of the drive.
   - Open the charging switch if present.
   - Open the 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.
   - If the drive is equipped with a DC/DC converter unit (optional) or a DC feeder unit (optional): Open the DC switch-disconnector ([Q11], option +F286 or +F290) of the unit. Open the disconnecting device of the energy storage connected to the unit (outside the drive cabinet).
   - Open the auxiliary voltage switch-disconnector (if present), and all other possible disconnecting devices that isolate the drive from dangerous voltage sources.
   - In the liquid cooling unit (if present), open the switch-disconnector of the cooling pumps.
   - If you have a permanent magnet motor connected to the drive, disconnect the motor from the drive with a safety switch or by other means.
   - Disconnect all dangerous external voltages from the control circuits.
   - After you disconnect power from the drive, always wait 5 minutes to let the intermediate circuit capacitors discharge before you continue.
3. Protect any other energized parts in the work location against contact.
4. Take special precautions when close to bare conductors.

5. Measure that the installation is de-energized. 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 measuring the installation, verify the operation of the voltage tester on a known voltage source.
   - Make sure that the voltage between the drive input power terminals (L1, L2, L3) and the grounding (PE) busbar is zero.
   - Make sure that the voltage between the drive output terminals (T1/U, T2/V, T3/W) and the grounding (PE) busbar is zero.
     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 even long time after the drive power off. The measurement discharges the voltage.
   - Make sure that the voltage between the drive DC terminals (UDC+ and UDC-) and the grounding (PE) terminal is zero. In cabinet-built drives, measure between the drive DC busbars (+ and -) and the grounding (PE) busbar.

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

6. If the drive is not equipped with a grounding switch, 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.

General notes

Static electricity

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

Optical components

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

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

Measuring the insulation

Measuring the insulation resistance of the drive

WARNING!
Do not do any voltage withstand or insulation resistance tests on any part of the drive as testing can damage the drive. Every drive has been 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.

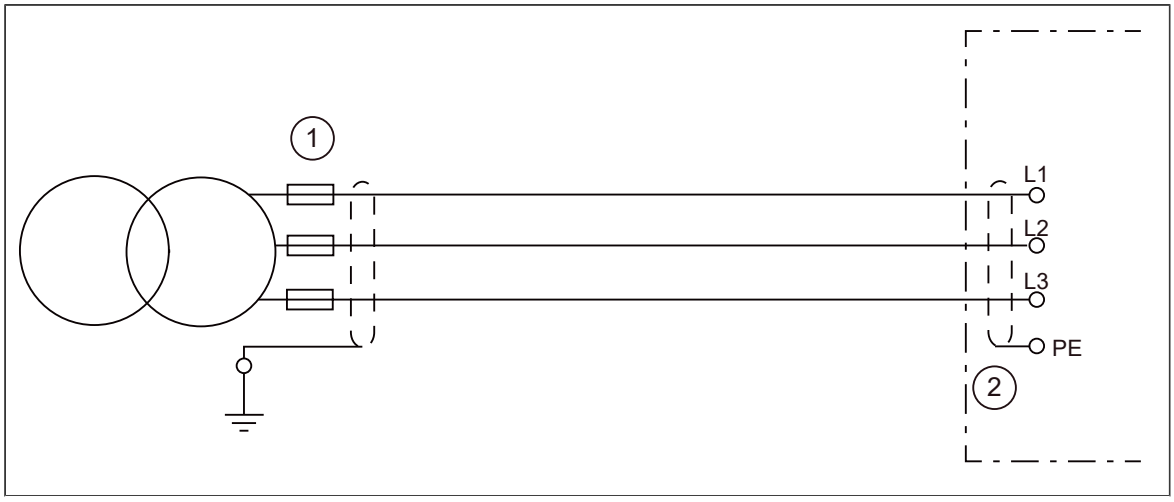
Measuring the insulation resistance of the input power cable

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

Connecting the input power cables - cable entry in standard incoming cubicle

Connection diagram – 6-pulse supply unit

This is a connection diagram for the 6-pulse supply unit. See also the delivery specific circuit diagrams.



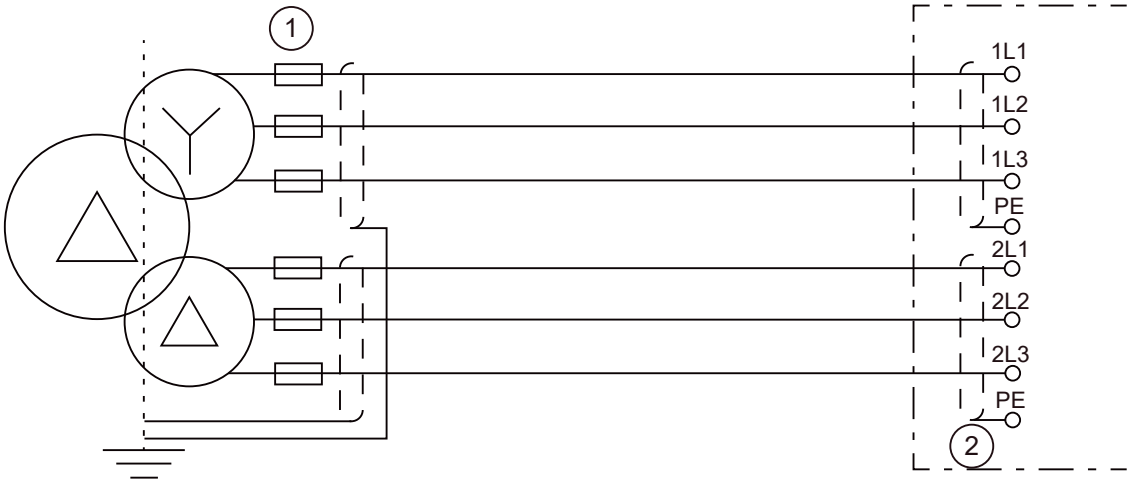
1	Fuses or other protection means for short-circuit protection of the cable.
2	Grounding of the cable shield at the cable entry (360-degree grounding).

Additional information:

- See the technical data for the dimensions of the cable entries, and the dimensions and tightening torques of the terminals.
- Use a separate PE conductor in addition if the conductivity of the shields does not meet the requirement for the PE conductor.
- See *ACS880 multidrive cabinets and modules electrical planning instructions* [3AUA0000102324 (English)] for the cable selection instructions.

Connection diagram – 12-pulse supply unit (option +A004)

This is a connection diagram for the 12-pulse supply unit (option +A004). See also the delivery specific circuit diagrams.



1	Fuses or other protection means for short-circuit protection of the cable.
2	Grounding of the cable shield at the cable entry (360-degree grounding).

Additional information:

- See the technical data for the dimensions of the cable entries, and the dimensions and tightening torques of the terminals.
- If the conductivity of the shields does not meet the requirement for the PE conductor, use a separate PE conductor in addition.
- See *ACS880 multidrive cabinets and modules electrical planning instructions* (3AUA0000102324 [English]) for the cable selection instructions.

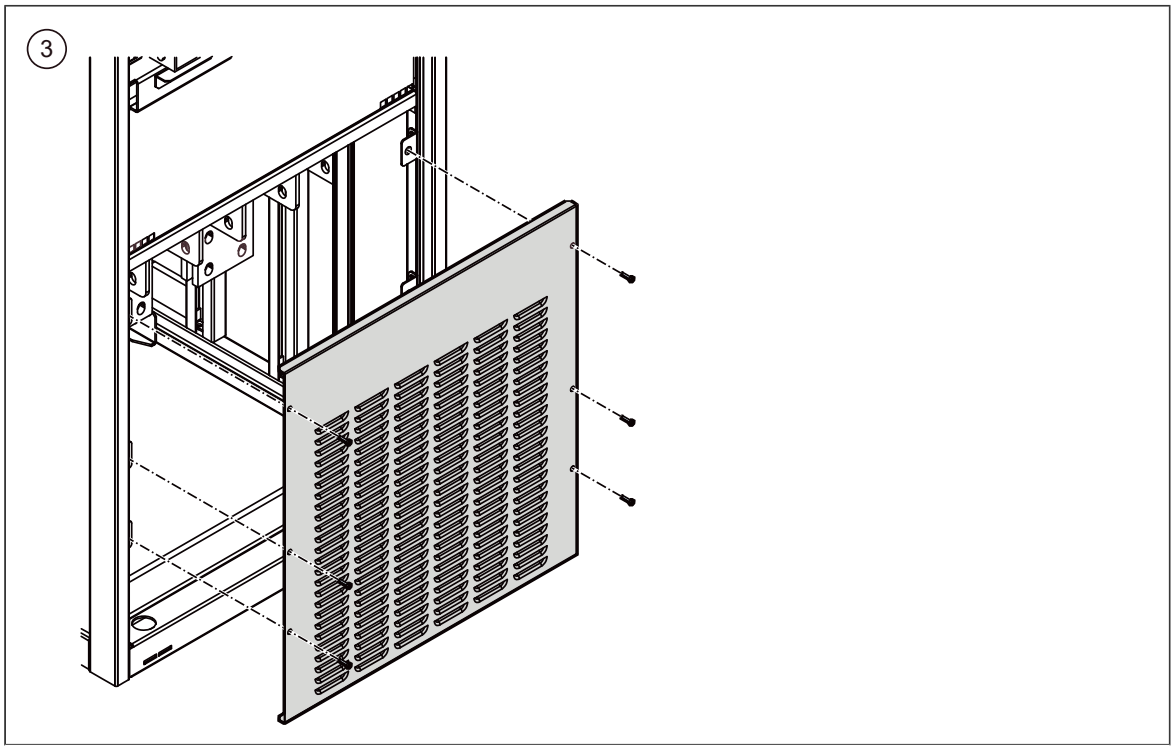
Connection procedure – bottom cable entry (option +G350)

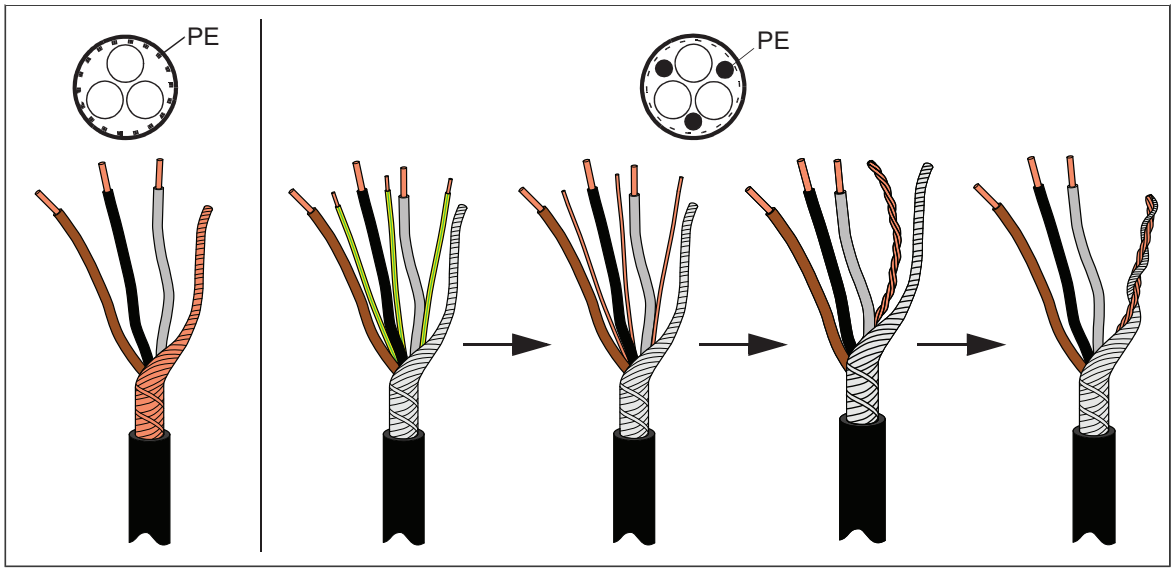
See the technical data for the dimensions of the cable entries, and the dimensions and tightening torques of the terminals.

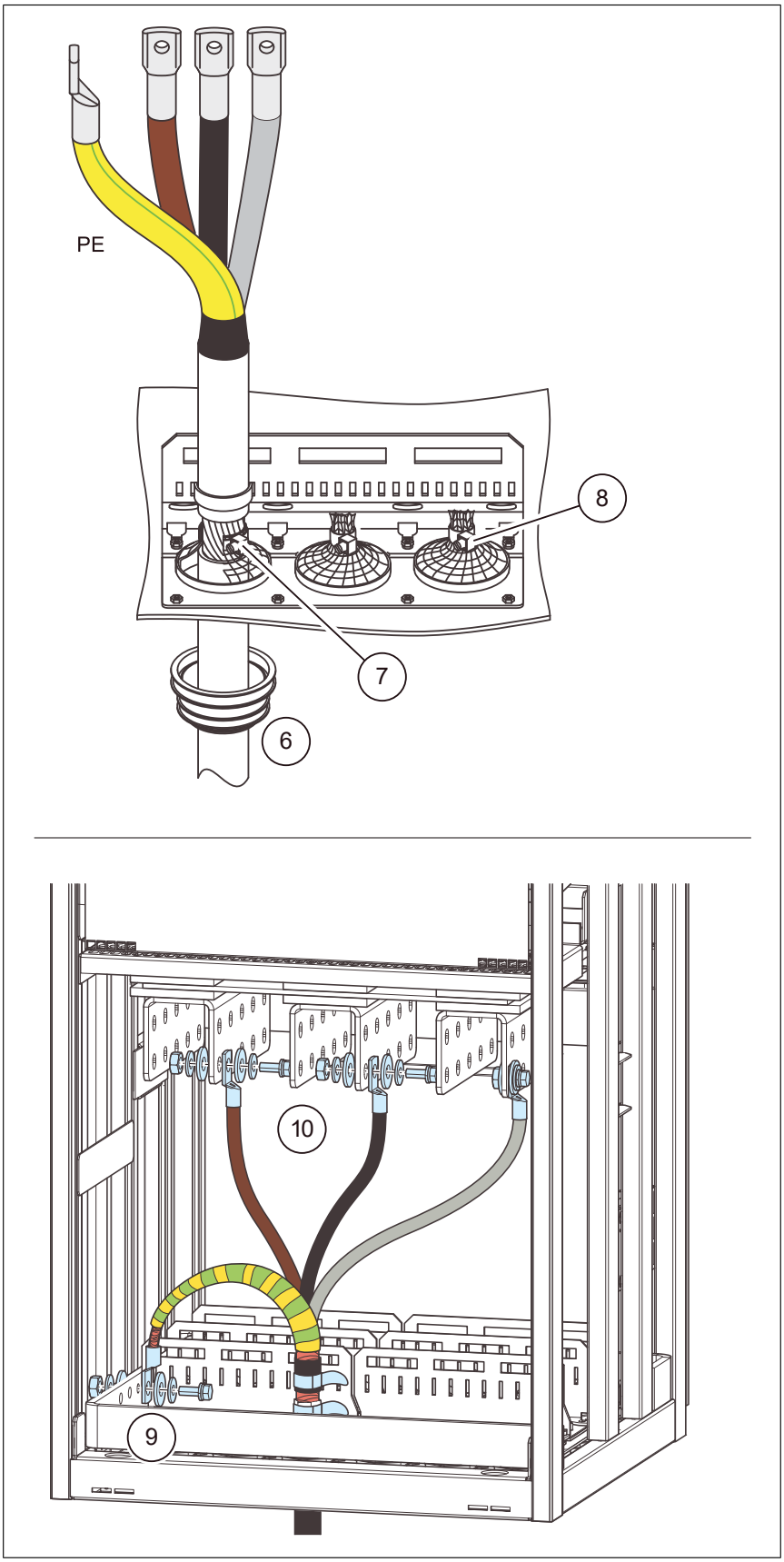
WARNING!
Apply grease to stripped aluminum conductors before attaching them to non-coated aluminum cable lugs. Obey the grease manufacturer's instructions. Aluminum-aluminum contact can cause oxidation in the contact surfaces.

1. Disconnect the drive from the AC power line and make sure it is safe to start the work. See section *Electrical safety precautions (page 36)*.
2. Open the door of the incoming cubicle.
3. Remove the shrouding covering the input terminals.

4. Peel off 3 to 5 cm of the outer insulation of the cables above the lead-through plate for 360° high-frequency grounding.
5. Prepare the ends of the cables.
6. Remove the rubber grommet from the cable entry plate for the cable to be connected. Cut adequate hole into the rubber grommet. Slide the grommet onto the cable. Slide the cable through the cable entry and attach the grommets to the holes.
7. Fasten the conductive sleeve of the cable entry to the cable shield with cable ties.
8. Tie up the unused conductive sleeves with cable ties.
9. Connect the twisted shield of the cable to the PE busbar of the cabinet. Tighten the screw to the torque given in the technical data.
10. Connect the phase conductors of the input cable to the L1, L2 and L3 terminals. Tighten the screws to the torque given in the technical data.
11. Reinstall the shrouding removed earlier.
12. Close the door.

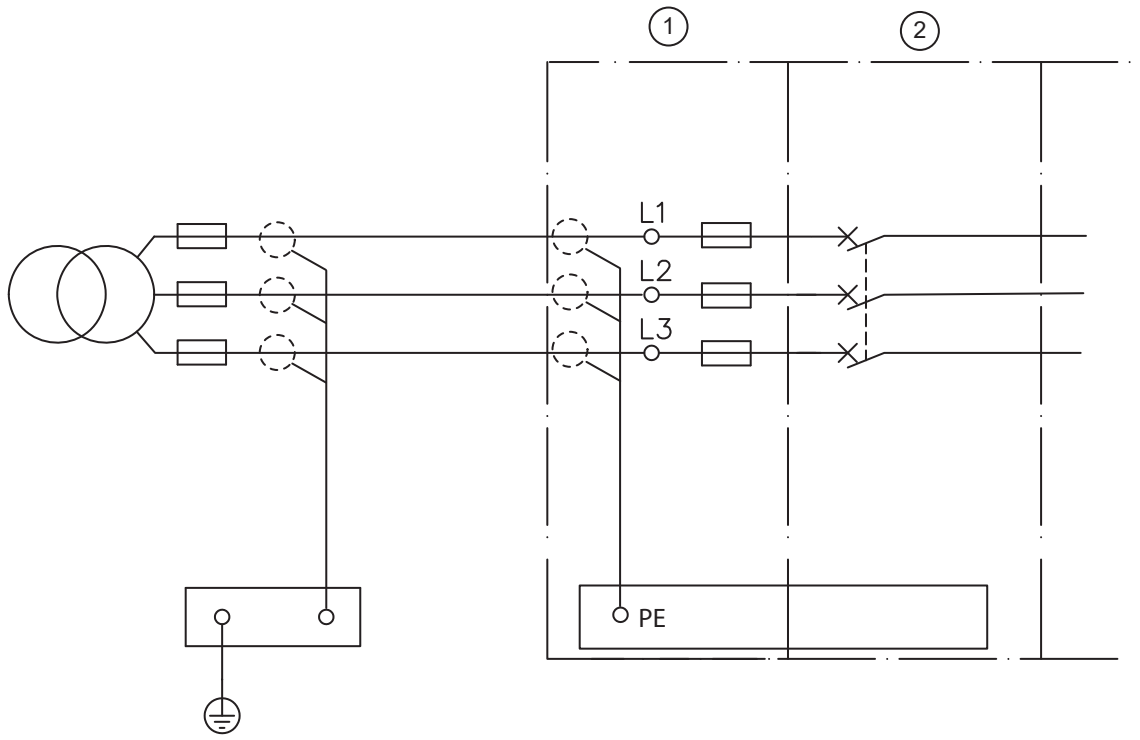



PE
PE


PE
8
7
6
10
9

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

Connection diagram



1	100 kA input cubicle
2	Incoming cubicle

Note:

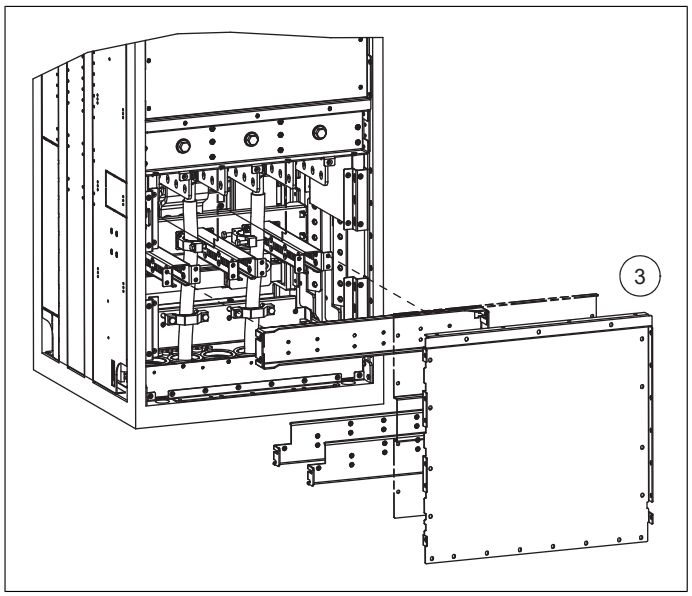
This diagram shows the installation with shielded single core cables. The shields are grounded at bothn ends and they operate as the PE conductors of the drive. Make sure that the shields meet the conductivity requirement for the drive protective earth conductor. If that is not the case, install a separate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

Connection procedure

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

1. Do the steps in section *Electrical safety precautions (page 36)* before you start the work.
2. Open the door of the 100 kA input cubicle.

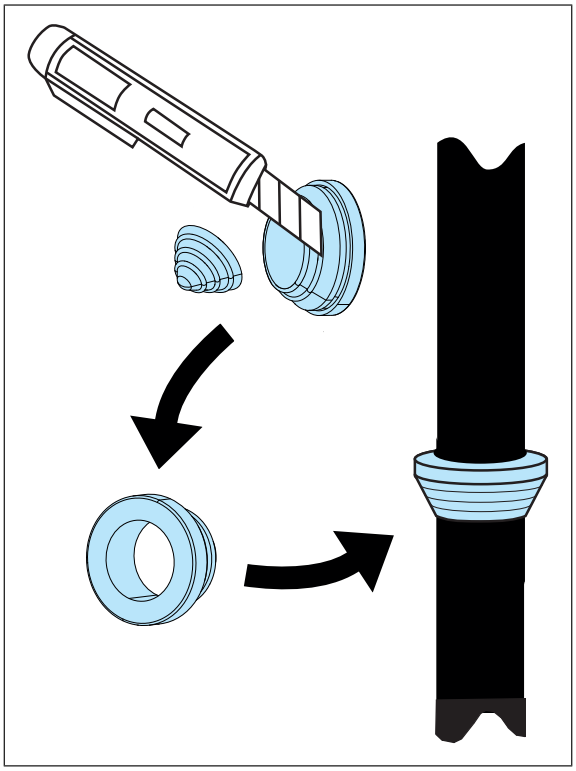
3. Remove the shrouding and assembly plates covering the input terminals.



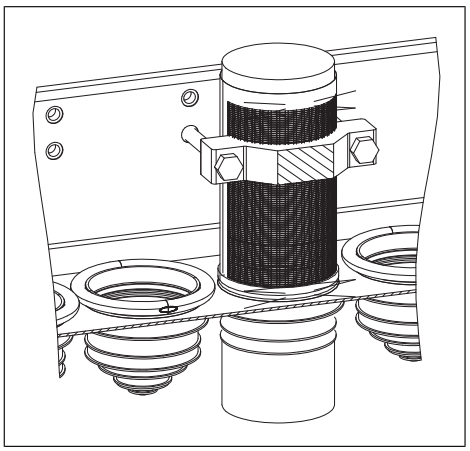
4. Remove the beams in front of the input terminals.
5. Peel off 3…5 cm (1.2 … 2 in) of the outer insulation of the cables above the lead-through plate for 360° high-frequency grounding.
6. Prepare the ends of the cables.

WARNING!
Apply grease to stripped aluminum conductors before attaching them to non-coated aluminum cable lugs. Obey the grease manufacturer's instructions. Aluminum-aluminum contact can cause oxidation in the contact surfaces.

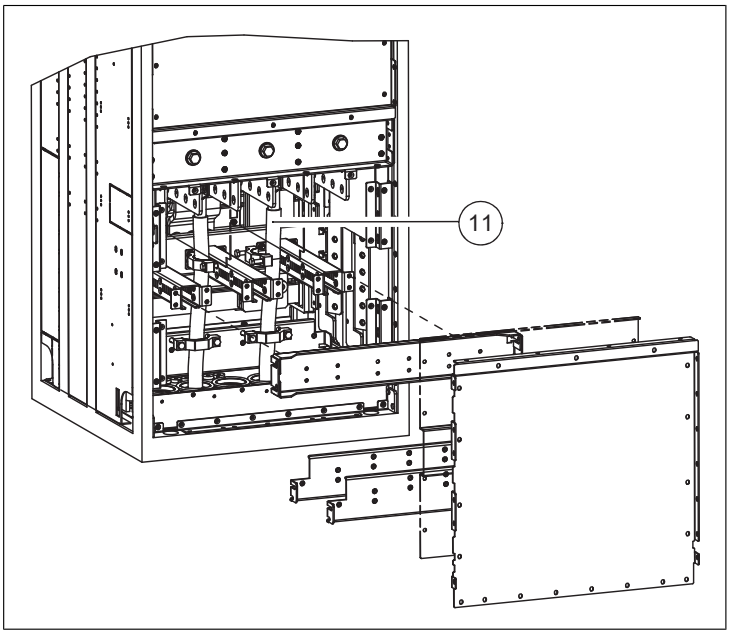
7. Remove rubber grommets from the cable entries for the cables to be connected. Cut adequate holes into the rubber grommets. Slide the grommets onto the cables. Starting from back, slide the cables into the cubicle through the conductive sleeves and attach the grommets to the holes.



8. Attach the conductive sleeves to the bare cable shields with cable ties. Tie up the unused conductive sleeves with cable ties.



9. Seal the gap between the cable and mineral wool sheet (if used) with sealing compound (eg. CSD-F, ABB brand name DXXT-11, code 35080082).
10. Connect the twisted shields of the cables to the PE busbar of the cabinet. Tighten the screws to the torque given under *Tightening torques (page 109)*.
11. Connect the phase conductors of the input cable to the L1, L2 and L3 terminals. Tighten the screws to the torque given under *Tightening torques (page 109)*.
12. Reinstall the shrouding and assembly plates removed earlier.
13. Close the cubicle door.



Connecting the external power supply cable for the auxiliary circuit (option +G307)

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

For the connection diagram, see the delivery-specific circuit diagrams. For the auxiliary circuit current consumption, see the delivery-specific technical documentation.

Wiring the functional safety options

The wiring instructions for the functional safety options such as +Q951, +Q952, etc are in separate option manuals.

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

Control cable connection procedure

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

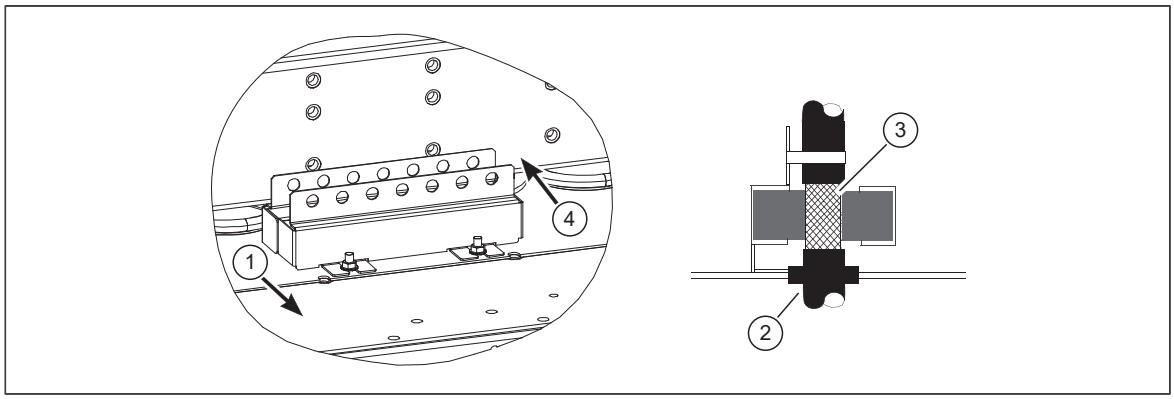
If you are not a qualified electrical professional, do not do installation or maintenance work.

1. Stop the drive (if running) and do the steps in section *Electrical safety precautions (page 36)* before you start the work.
2. Run the control cables into the cabinet as described in section *Grounding the outer shields of the control cables at the cabinet entry* below.
3. Route the control cables as described in section *Routing the control cables inside the cabinet*.
4. Connect the control cables as described in section *Connecting control cabling*.

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

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

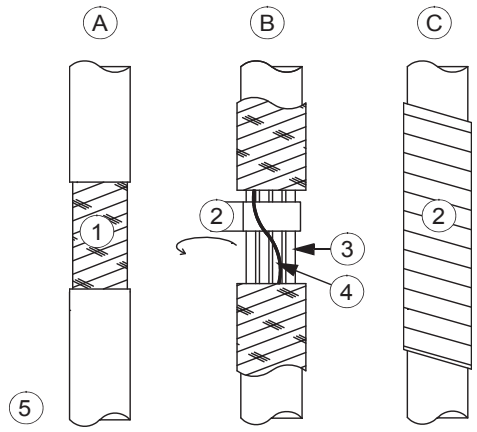
1. Loosen the tightening screws of the EMI conductive cushions and pull the cushions apart.
2. Cut adequate holes to the rubber grommets in the entry plate and put the cables through the grommets and the cushions.
3. Strip off the cable plastic sheath above the entry plate just enough to ensure proper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



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

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

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



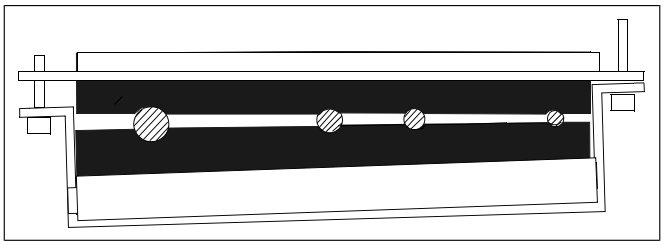
A	Stripped cable
B	Conductive surface of the shield exposed
C	Stripped part covered with copper foil
1	Cable shield
2	Copper foil
3	Shielded twisted pair
4	Grounding wire

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

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

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

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



6. If more than one cable go through a grommet, seal the grommet by applying Loctite 5221 (or equivalent adhesive sealant) inside the grommet.

Routing the control cables inside the cabinet

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

Connecting control cabling

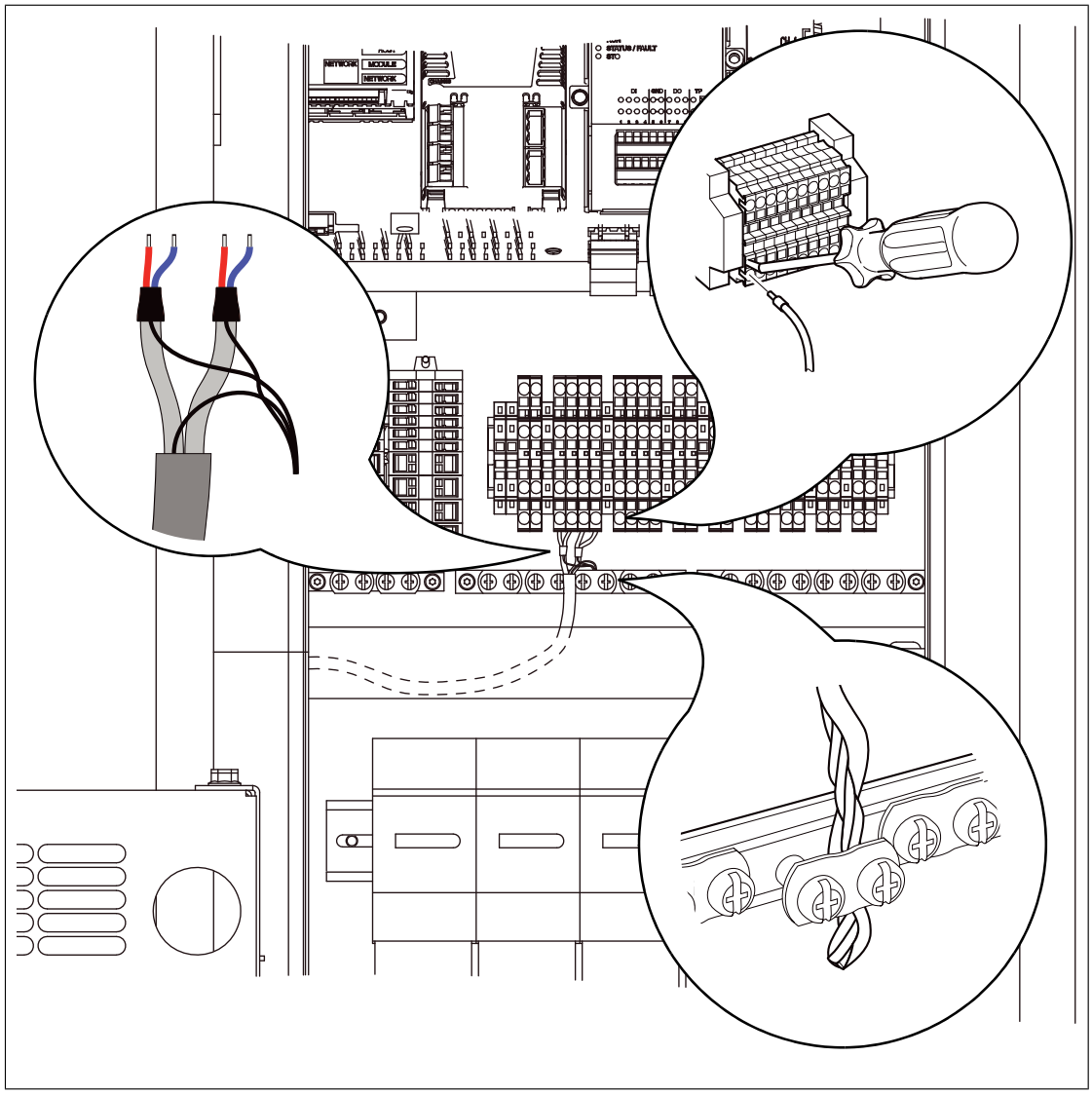
Connect the conductors to the appropriate terminals. Refer to the wiring diagrams delivered with the drive.

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

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

Notes:

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



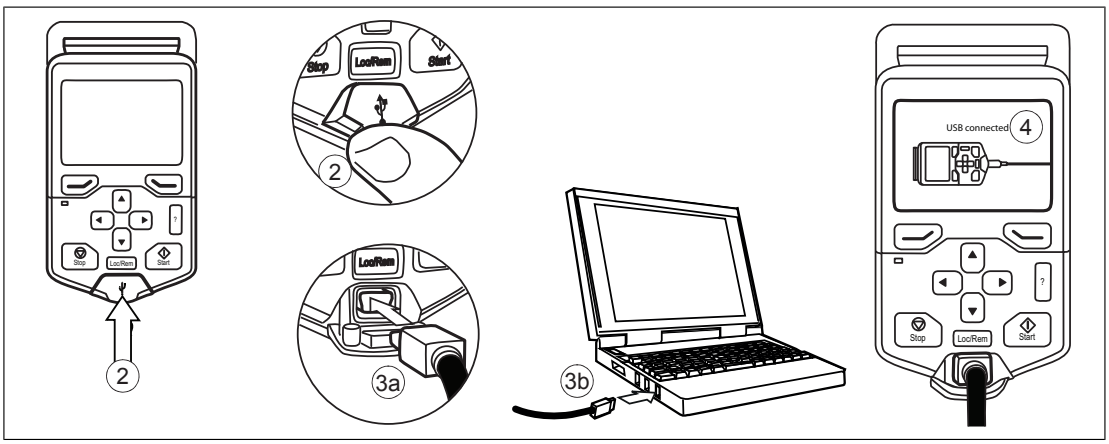
At the other end of the cable, leave the shields unconnected or ground them indirectly via a high-frequency capacitor with a few nanofarads, eg. 3.3 nF / 630 V. The shield can also be grounded directly at both ends if they are in the same ground line with no significant voltage drop between the end points.

Connecting a PC

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

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

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



4

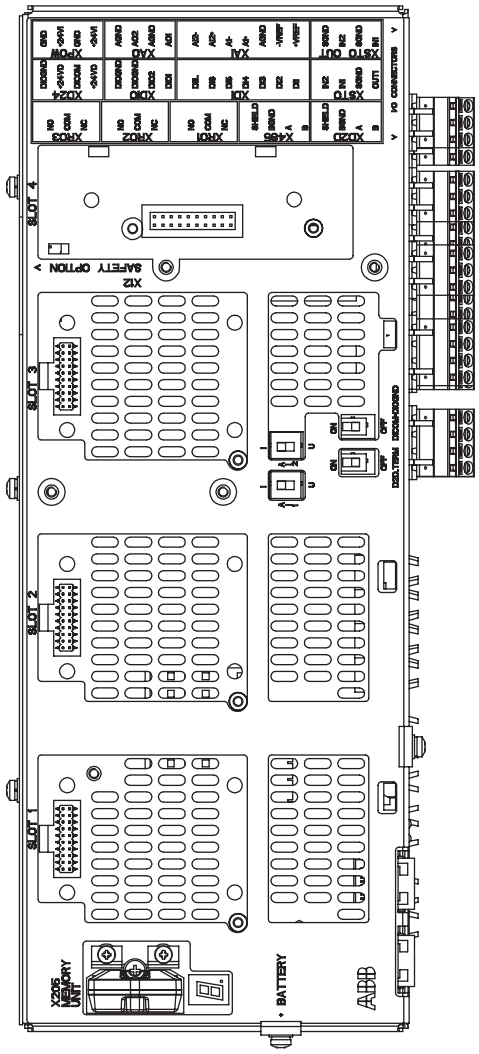
The control unit

Contents of this chapter

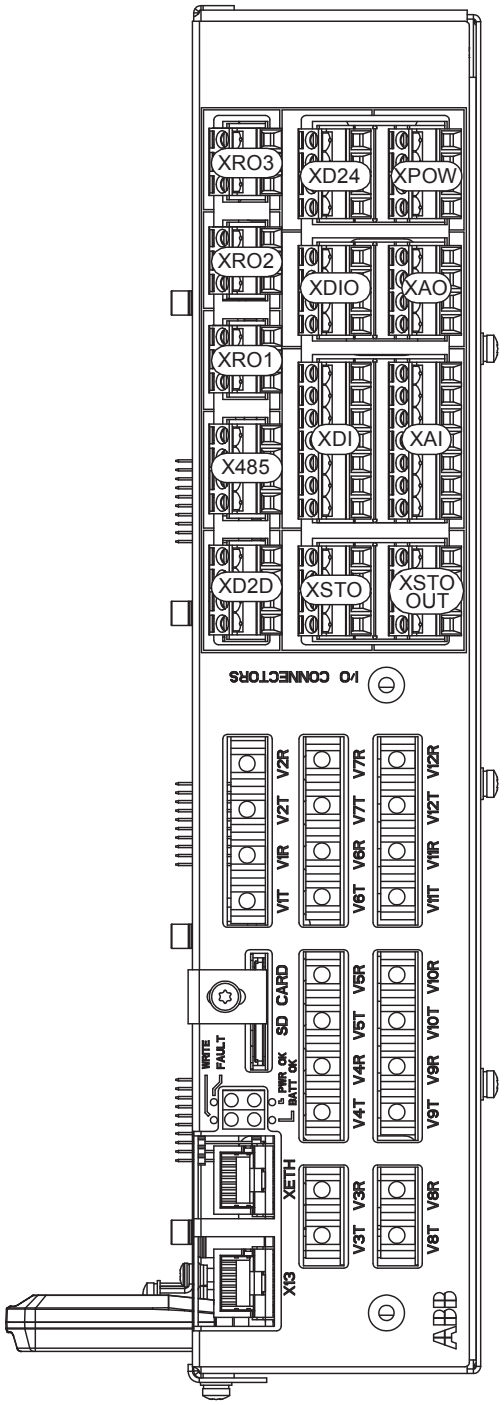
This chapter

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

BCU-x2 layout



	Description
I/O	I/O terminals (see following diagram)
SLOT 1	I/O extension, encoder interface or fieldbus adapter module connection. (This is the sole location for an FDPI-02 diagnostics and panel interface.)
SLOT 2	I/O extension, encoder interface or fieldbus adapter module connection
SLOT 3	I/O extension, encoder interface, fieldbus adapter or FSO-xx safety functions module connection
SLOT 4	RDCO-0x DDCS communication option module connection
X205	Memory unit connection
BATTERY	Holder for real-time clock battery (BR2032)
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	
0	(“U” is indicated briefly before “o”.) Control program running
U	Control program startup in progress
F	(Flashing) Firmware cannot be started. Memory unit missing or corrupted
1	Firmware download from PC to control unit in progress
2	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-xx 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.

Default I/O diagram of the supply control unit

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 mm^2 (24…12 AWG). The torque is 0.5 N·m (5 lbf·in).

Terminal			Description	
XD2D			Drive-to-drive link	
1	1	B	Not in use by default	
2	2	A		
3	3	BGND		
4	4	Shield		
ON OFF	D2D.TERM		Drive-to-drive link termination switch [1]	
X485			RS485 connection	
5	5	B	Cooling fan monitoring (CIO module)	
6	6	A		
7	7	BGND		
8	8	Shield		
XRO1, XRO2, XRO3			Relay outputs	
11	11	NC	Norm. closed	XRO1: **Running** [2] (Energized = running) 250 V AC / 30 V DC, 2 A
12	12	COM	Common	
13	13	NO	Norm. open	
21	21	NC	Norm. closed	XRO2: **Fault (-1)** [2] (Energized = no fault) 250 V AC / 30 V DC, 2 A **Note:** If drive is equipped with a liquid cooling unit, the relay output controls the cooling unit start signal. Then the selection **Fault(-1)** may also be changed to **Started** by bit 12 of parameter 195.12. See *ACS880 diode supply control program firmware manual* (3AUA0000103295 [English]).
22	22	COM	Common	
23	23	NO	Norm. open	
31	31	NC	Norm. closed	XRO3: **MCB ctrl** [3] (Energized = closes main contactor/breaker) 250 V AC / 30 V DC, 2 A
32	32	COM	Common	
33	33	NO	Norm. open	
XSTO, XSTO OUT			Safe torque off [4]	
1	1	OUT	XSTO: Factory connection. Both circuits must be closed for the drive to start (IN1 and IN2 must be connected to OUT).	
2	2	SGND		
3	3	IN1		
4	4	IN2		
5	5	IN1	XSTO OUT: Not in use.	
6	6	SGND		
7	7	IN2		
8	8	SGND		
XDI			Digital inputs	

Terminal			Description
1 2 3 4 5 6 7	1	DI1	**Temp fault**[2] (0 = overtemperature)
	2	DI2	**Run enable**[2] (1 = run enable)
	3	DI3	**MCB feedback**[3] (0 = main contactor/breaker open)
	4	DI4	**Auxiliary circuit breaker fault**[2]
	5	DI5	Not in use by default. Can be used for eg. earth fault monitoring.
	6	DI6	**Reset**[2] (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-	
– U	AI1		AI1 current/voltage selection switch
– U	AI2		AI2 current/voltage selection switch
XAO			Analog outputs
1 2 3 4	1	AO1	**Zero** (no signal indicated)[2] 0…20 mA, R_L < 500 ohm
	2	AGND	
	3	AO2	**Zero** (not signal indicated)[2] 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			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) Default use of the signal in the control program. The use can be changed by a parameter. See also the delivery-specific circuit diagrams.
3) 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 true 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.

External power supply for the control unit (XPOW)

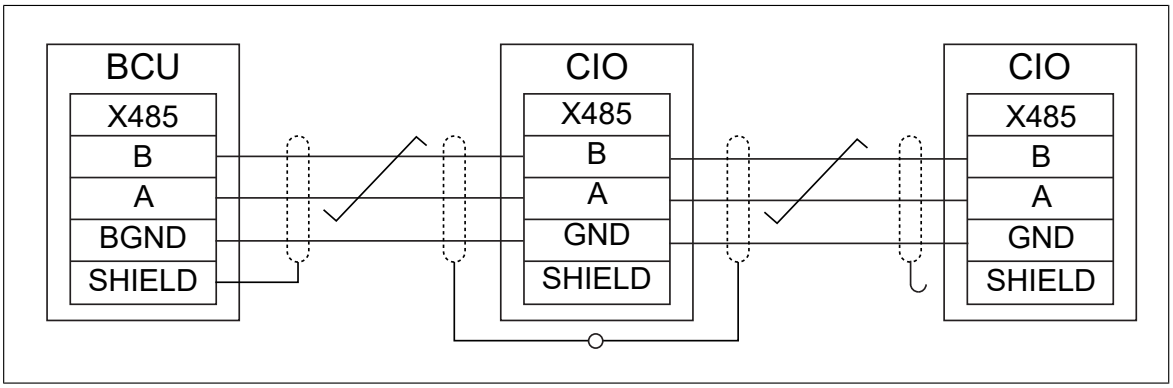
The control unit is powered from a 24 V DC, 2 A supply through terminal block XPOW. With a type BCU control unit, a second supply can be connected to the same terminal block for redundancy.

Using an external supply is recommended if

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

The X485 connector

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



Safe torque off (XSTO, XSTO OUT)

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

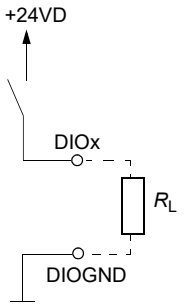
FSO-xx safety functions module connection (X12)

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

SDHC memory card slot

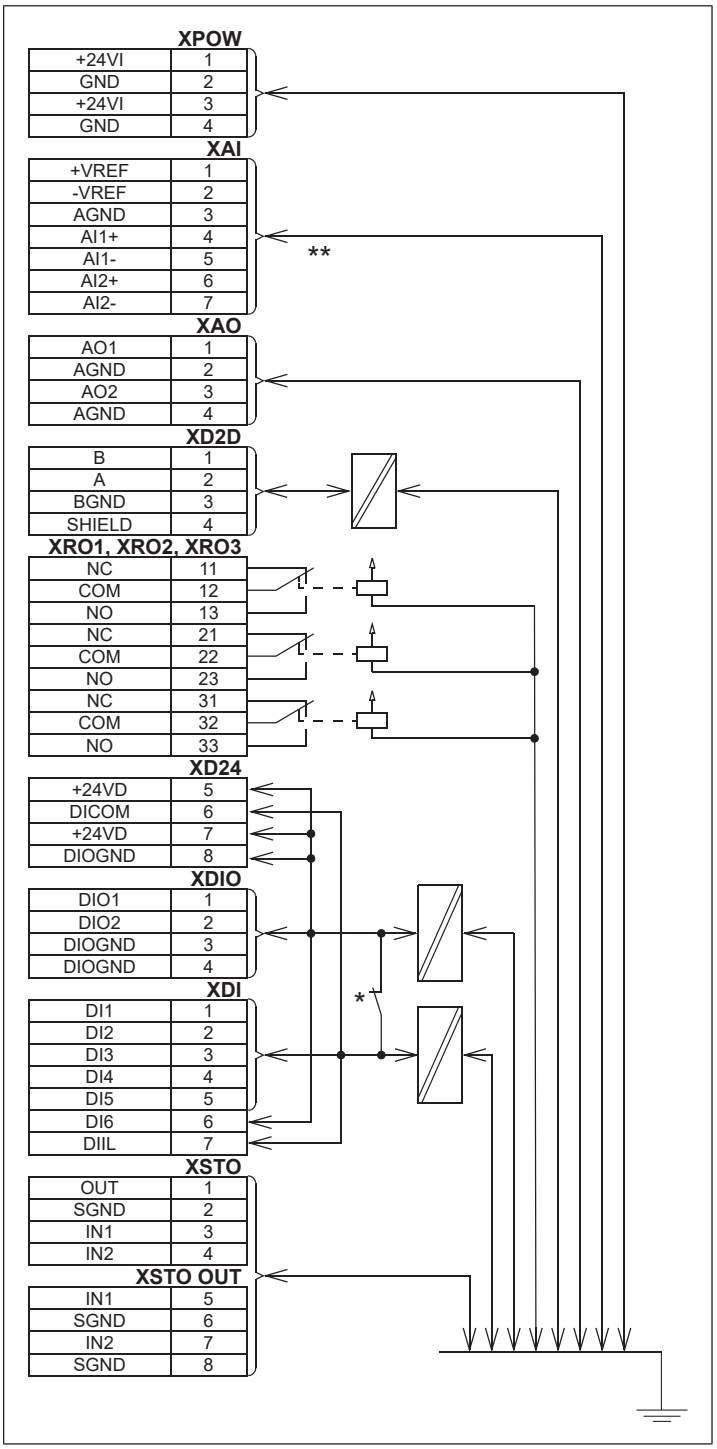
The BCU-x2 has an on-board data logger that collects real-time data from the power modules to help fault tracing and analysis. The data is stored onto the SDHC memory card inserted into the SD CARD slot and can be analyzed by ABB service personnel.

Connector data

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

Analog outputs AO1 and AO2 (XAO)	Connector pitch 5 mm, wire size 2.5 mm^2 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 2.5 mm^2 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 2.5 mm^2 Physical layer: RS-485
Safe torque off connection (XSTO)	Connector pitch 5 mm, wire size 2.5 mm^2 Input voltage range: -3…30 V DC Logic levels: "0" < 5 V, "1" > 17 V. **Note:** For the unit to start, both connections must be “1”. This applies to all control units (including drive, inverter, supply, brake, DC/DC converter etc. control units), but true Safe torque off functionality is only achieved through the XSTO connector of the drive/inverter control unit. EMC (immunity) according to IEC 61326-3-1
Safe torque off output (XSTO OUT)	Connector pitch 5 mm, wire size 2.5 mm^2 To STO connector of inverter module.
Control panel connection (X13)	Connector: RJ-45 Cable length < 3 m
Ethernet connection (XETH)	Connector: RJ-45 This connection is not supported by the firmware.
SDHC memory card slot (SD CARD)	Memory card type: SDHC Maximum memory size: 4 GB
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-x2 ground isolation diagram



*Ground selector (DICOM=DIOGND) settings

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

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

5

Installation checklist

Contents of this chapter

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

Checklist

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

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

WARNING!
Stop the drive and do the steps in section *Electrical safety precautions (page 36)* before you start the work.

Make sure that …	☑
The ambient operating conditions meet the drive ambient conditions specification, and enclosure rating (IP code or UL enclosure type).	☐
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.	☐
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.	☐

Make sure that …	☑
Appropriate DC fuses are installed.	☐
There is an adequately sized protective earth (ground) conductor(s) between the drive and the switchboard, the conductor is connected to correct terminal, and the terminal is tightened to the correct torque. Proper grounding has also been measured according to the regulations.	☐
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 has been connected to appropriate terminal, and the terminal has been tightened to the proper torque. Proper grounding has also been measured according to the regulations.	☐
If the drive is equipped with a DC/DC converter unit: The energy storage cable has been connected to the correct terminals of the DC/DC converter and energy storage, and the terminals have been tightened to the proper torque.	☐
If the drive is equipped with a DC/DC converter unit: The energy storage has been equipped with fuses for protecting energy storage cable in a cable short-circuit situation.	☐
If the drive is equipped with a DC/DC converter unit: The energy storage has been 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, and the conductor is connected to the correct terminal, and the terminal is tightened to the correct torque. Proper grounding has also been measured according to the regulations.	☐
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. Proper 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.	☐
Cover(s) of the motor connection box are 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: Refer to the cooling unit documentation for specific tasks.	☐

6

Start-up

Contents of this chapter

This chapter contains start-up instructions of the diode supply unit.

The underlined tasks are necessary only for certain cases. The symbols in brackets, for example [Q1], refer to the item designations used in the circuit diagrams. If a task is valid only for a certain option device or feature, the option code is given in brackets, for example, (option +F259).

Note: The instructions do not cover all possible supply unit configurations. Always refer to the delivery-specific circuit diagrams when proceeding with the start-up. This default start-up procedure is valid for a supply unit equipped with a main breaker ([Q1], option +F255) and an external auxiliary voltage supply (option +G307).

Note: For the functional safety options, the start-up instructions are given in separate option manuals. Reserve the necessary option manuals at hand before the supply unit start-up. Obey their start-up instructions.

WARNING!
Obey the safety instructions during the start-up procedure. See *ACS880 liquid-cooled multidrive cabinets and modules safety instructions* (3AXD50000048633 [English]). If you ignore the safety instructions, injury or death, or damage to the equipment can occur.

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

Start-up procedure

Basic checks with no voltage connected

Action	☑
Disconnect the drive from the AC power line and make sure it is safe to start the work. See section *Electrical safety precautions (page 36)*.	☐
Set the current trip limits of the main breaker. The trip limits have been preset to generic values by the breaker manufacturer. The generic limits do not correspond the protection requirements of the application. **General rule** Make sure that the selectivity condition is fulfilled, that is the breaker trips at the lower current than the protection device of the supplying network, and that the limit is high enough to cause unnecessary trips during the intermediate DC circuit load peak at start. **Long term current limit** Rule of thumb: Set to the rated AC current of the drive. **Peak current limit** Rule of thumb: Set to a value 3…4 times the rated AC current of the drive.	☐
Make sure that the mechanical and electrical installation of the drive is completed. See *Installation checklist (page 63)*.	☐
Check the settings of breakers/switches in the auxiliary circuits.	☐
Make sure that the voltage settings of the auxiliary voltage transformers (option +G344) are according to the actual power line voltage. See the delivery-specific circuit diagrams. Transformer [T21] is selected by option +G344; [T101] and [T111] are present if required by the options specified by the customer.	☐

Starting and checking the cooling system

Action	☑
Fill up and bleed the internal cooling circuit. Start the cooling unit up. See *Internal cooling circuit (page 89)*.	☐
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.	☐
Install all shrouds (if removed) and close the cabinet doors.	☐

Connecting voltage to input terminals and auxiliary

Action	☑
Remove the temporary grounding system (if installed).	☐
Drive with voltage meters (option +G334): Close the circuit breaker for the voltage meters [F5].	☐
Close the circuit breakers supplying the auxiliary circuits [F20, F22.x].	☐
Drive with an external control voltage supply (option +G307): Close the circuit breaker of the external control voltage supply.	☐

Action	☑
Make sure that it is safe to connect voltage: •nobody is working on the unit or circuits that are wired from outside into the cabinets •covers of the motor terminal boxes are on •cabinet doors are closed •the disconnecting device [Q1] is open.	☐
Drive with the earthing/grounding switch [Q9] (option +F259): Open the earthing/grounding switch.	☐
Close the auxiliary voltage switch [Q21].	☐

Setting the supply unit parameters

Action	☑
If the supply unit includes one supply module: •Check the correct voltage ranges by parameter *195.01 Supply voltage*. •Reboot the control unit by parameter *196.08 Control board boot*. If the supply unit includes more than one supply module: Make sure that the value of parameter *195.31 Parallel connection rating id* corresponds to the actual number of parallel-connected diode supply modules: •Select the correct voltage range with parameter *195.30 Parallel type filter*. •Select the correct supply unit type with parameter *195.31 Parallel connection rating id*. •Reboot the control unit by parameter *196.08 Control board boot*. •Check the correct voltage range, parameter *195.01 Supply voltage*. •Reboot the control unit by parameter *196.08 Control board boot*. If you need more information on the use of the control panel, see *ACX-AP-x assistant control panels user's manual* (3AUA0000085685 [English]).	☐

Powering up the drive

Action	☑
Close the disconnecting device of the supply unit. Drive with main breaker [Q1] (option +F255): Unlock the withdrawn breaker, and crank it in. **WARNING!** Never use the start button of the air circuit breaker to close it. Start button bypasses normal start-up procedure and may damage the module.	☐
Make sure that the control panel [A59] is in the remote mode (Loc/Rem key of the panel).	☐
Switch the Run enable and Start signals at digital input DI2 on (1) to start the operation of the supply unit. Turn the operating switch [S21] on the cabinet door to ENABLE/RUN (1) position. Run enable starts the supply unit power up sequence. After the program has stepped through it (approximately 3 seconds), the drive DC link is charged, the main breaker is closed and the supply unit is in operation and ready to the supply inverters.	☐
Turn the operating switch [S21] to *on* (1) position to activate the Run enable signal and to close the main breaker [Q1].	☐

Safety function validation

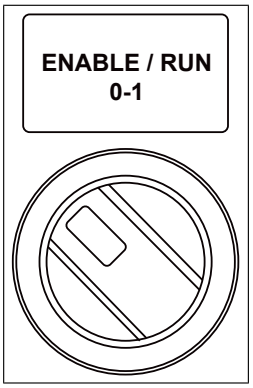
Action	☑
Validate the operation of safety functions (for example, emergency stop). **WARNING!** The safety functions are not safe before they are validated according to the instructions. See the function-specific manual for the validation tasks. Safety functions are optional. See the function-specific manual for the validation tasks.	☐

On-load checks

Action	☑
Make sure that the cooling operates properly (no overtemperature related warnings or faults).	☐

Switching the supply unit off

1. Stop the motors connected to inverter units. See the inverter unit hardware and firmware manuals.
2. Turn the operating switch [S21] to the OFF (0) position to deactivate the Run enable signal and to switch off the main disconnecting device (main breaker [Q1]).



Disconnecting and temporary grounding the drive

See *Electrical safety precautions (page 36)*.

7

Maintenance

Contents of this chapter

This chapter instructs how to maintain the diode supply unit and how to interpret its fault indications. The information is valid for ACS880-307LC…+A018 diode supply units.

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

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

Maintenance intervals

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

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

Component	Years from start-up												
	1	2	3	4	5	6	7	8	9	10	11	12	…
Coolant													
Coolant draining and refill						R						R	
Checking coolant quantity		P		P		P		P		P		P	
Checking coolant antifreeze concentration	P	P	P	P	P	P	P	P	P	P	P	P	P
External circuit of main heat exchanger (temperature, flow, pressure)		I		I		I		I		I		I	
Cabinet fans and fan control board													
Cooling fans 230 V AC 50/60 Hz									R				
Cooling fans 115 V AC 50/60 Hz						R			R			R	
CIO-module for fan control (230 V AC)									R				
CIO-module for fan control (115 V AC) [1]						I/R						R	
Batteries													
Control panel battery									R				
Control unit battery						R						R	
Control unit													
BCU Control unit												R	
Connections and environment													
Quality of supply voltage	P	P	P	P	P	P	P	P	P	P	P	P	P
Inspections													
Tightness of terminals	I	I	I	I	I	I	I	I	I	I	I	I	I
Ambient conditions (dustiness, moisture, corrosion, temperature)	I	I	I	I	I	I	I	I	I	I	I	I	I
Cooling liquid pipe connections	I	I	I	I	I	I	I	I	I	I	I	I	I
Spare parts													
Spare part stock	I	I	I	I	I	I	I	I	I	I	I	I	I
Other													
ABB-SACE Air 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 L

[1] Replace CIO-module or reset fan counters, see *CIO-01 I/O module for distributed I/O bus control user's manual* (3AXD500000126880 [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.

Internal liquid-cooling system

For instructions on coolant replacement and checking the liquid-cooling system, see chapter *Internal cooling circuit*.

Cabinet

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 or maintenance work.

1. Stop the drive and do the steps in section *Electrical safety precautions (page 36)* 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.

Power connections

Retightening the power connections

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

1. Stop the drive and do the steps in section *Electrical safety precautions (page 36)* before you start the work.
2. Examine the tightness of the cable connections. Use the tightening torques given in the technical data.

Fans

The lifespan of the cooling fans of the drive depends on the 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.

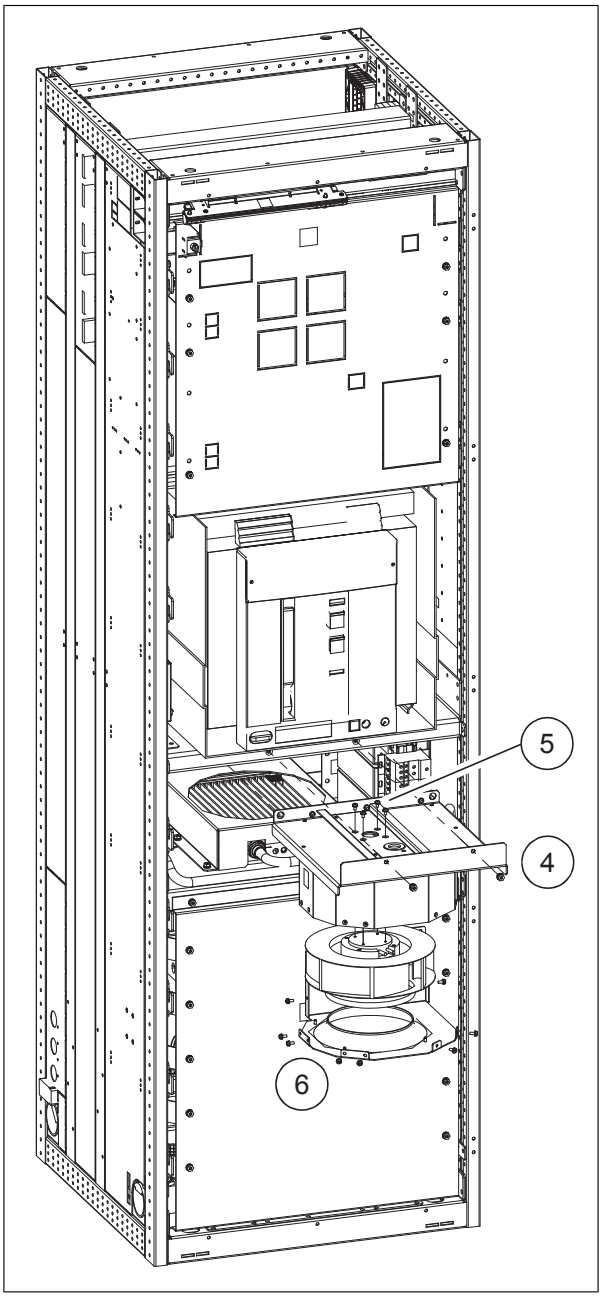
Replacement fans are available from ABB. Do not use other than ABB specified spare parts.

Replacing the fan in the 600 mm wide incoming cubicle

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

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

1. Repeat the steps described in section *Electrical safety precautions (page 36)* 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.

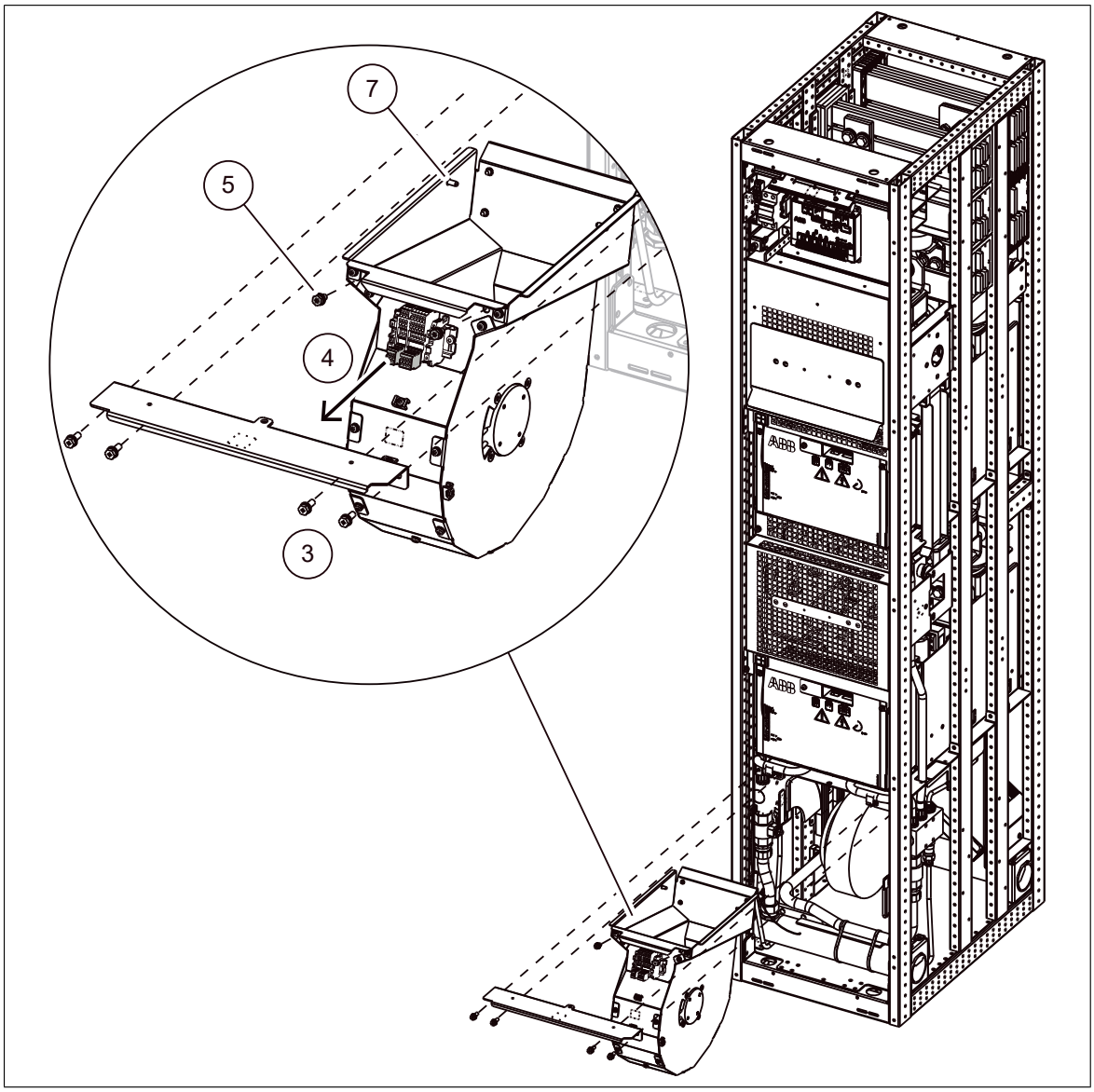


Replacing the cooling fan of a D8T supply module

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

1. Repeat the steps described in section *Electrical safety precautions (page 36)*.
2. Remove any shrouding in front of the cooling fan.
3. Remove the support bracket of the fan.
4. Disconnect the fan wiring.
5. Undo the two retaining screws.

6. Pull the fan outwards to separate it from the heat exchanger housing.
7. Install new fan in reverse order. Align the guide pins at the rear of the fan cowling with the slots in the bottom guide, then reinstall the retaining screws.



Fan replacement of the 100 kA input unit

Fuses

The necessary tools:

- A ratchet wrench (13 mm, 17 mm, 19 mm)
- A torque wrench with changeable heads:
  - Open-ended insert tools for M10 and M12
  - Ratchet insert tools
- An extension bar 500 mm
- Sockets (13 mm, 17 mm, 19 mm, 24 mm)
- 1/4 Hex 300 mm magnetic screwdriver extension bits holder bar

- Torx T25, T27
- Socket bit 13 mm (with a magnet recommended)

Checking and replacing the AC fuses - standard incoming cubicle

This procedure is valid for the IEC design of the supply unit. The UL design (option +C129) with the UL recognized fuses is similar except for one difference: Two parallel fuses form a single fuse block. It is not possible to dismantle this block.

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

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

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

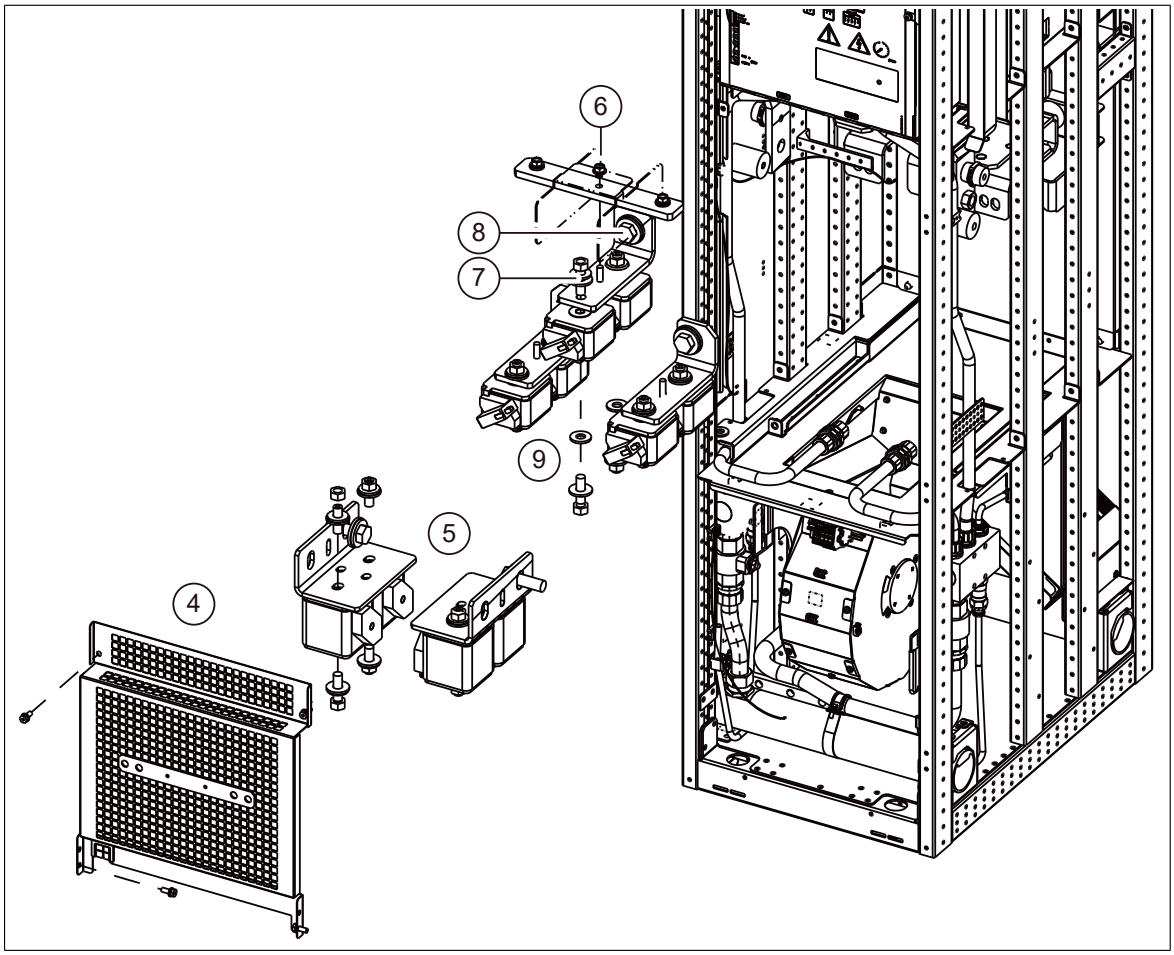
WARNING! Be very careful when you loosen or remove screws and bolts inside the cabinet. Do not drop screws, washers or nuts inside the cabinet or module. It can cause severe damage at the power up: short circuit or arc blast.

1. Stop the motors connected to the drive.
2. Repeat the steps described in section *Electrical safety precautions (page 36)*.
3. Open the cubicle door.
4. Remove any shrouding in front of the fuses.
5. A supply unit with two supply module 2×D8T on top of each other: To remove the lower module AC fuses, remove the DC fuse assemblies in front of the AC fuses first. This is not necessary for the upper module:
   - Remove the screws, nuts and washers (8 pcs) from the top and bottom of the DC fuses. Write down the correct order of the washers.
   - Remove the screws and nuts from the L-shaped busbars.
   - Remove the DC fuses and the L-shaped busbars.
6. Remove the horizontal support (3 nuts).
7. Remove the screws, nuts and washers (1 per fuse) from the L-shaped busbars above the fuses.

   Note: In the UL design (option +C129), two parallel fuses form a single fuse block.
8. Remove the screws that attach the L-shaped busbars above the fuses to the module AC busbars. There is one screw and busbar for each AC phase (3 pcs). Remove the L-shaped busbars.
9. Remove the screws, nuts and washers (1 pcs per fuse) from the L-shaped busbars below the fuses. Remove the old fuses.

   Note: In the UL design (option +C129), two parallel fuses form a single fuse block.

10. Attach the new fuses and busbars in reverse order. Insert the new fuses into their slots in the cubicle. Pre-tighten the nuts first by hand.
11. Tighten the nuts to torque as follows:
    - IEC design of the supply unit: Bussmann fuses: 50 N·m (37 lbf·ft), Mersen (Ferraz-Shawmut): 46 N·m (34 lbf·ft). Fuses by other manufacturer: Refer to the fuse manufacturer's instructions.
    - UL design of the supply unit (option +129) with the UL recognized fuses: 40 N·m (30 lbf·ft).
12. Attach the shroud and close the door.

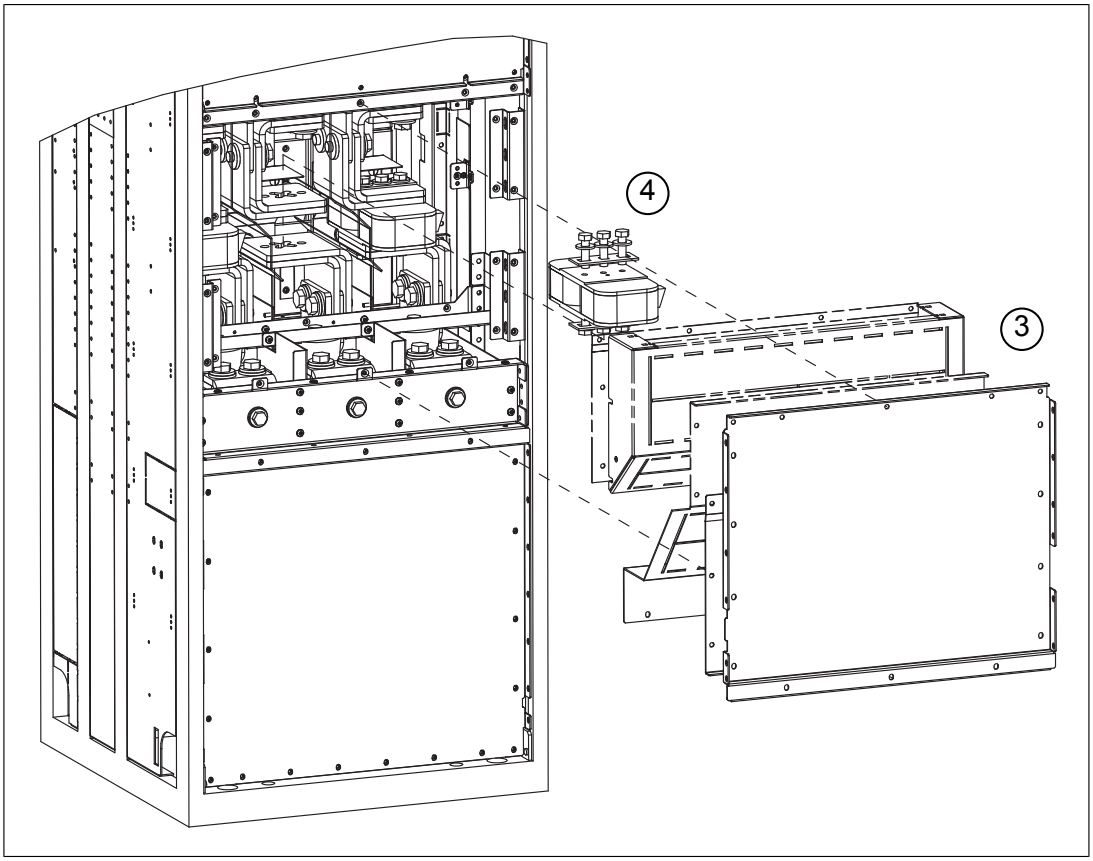


Replacing AC fuses - 100 kA input cubicle (option +F274)

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

1. Repeat the steps described in section *Electrical safety precautions (page 36)* 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. Check 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 unscrew 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 Bussmann fuses, and 46 N·m (34 lbf·ft) for Mersen (Ferraz-Shawmut) fuses.
5. Attach the shrouding and close the door.



Checking and replacing the DC fuses

This procedure is valid for the IEC design with the IEC fuses. The UL design with the UL recognized fuses is similar except for one difference: Two parallel fuses form a single fuse block. It is not possible to dismantle this block.

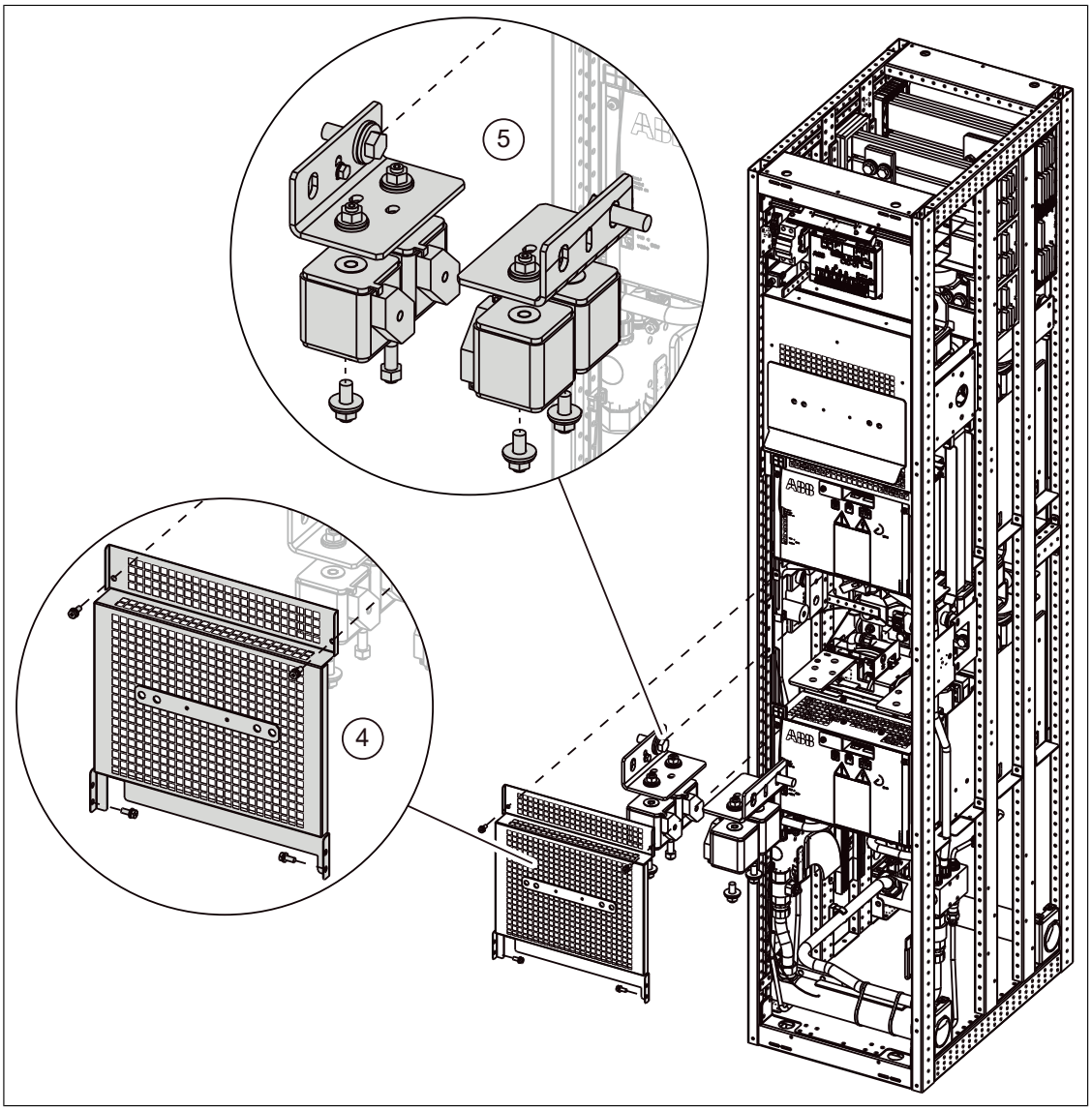
WARNING!
Obey the safety instructions given in *ACS880 liquid-cooled multidrive cabinets and modules safety instructions* (3AXD50000048633 [English]). If you ignore the safety instructions, injury or death, or damage to the equipment can occur.

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

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

WARNING! Be very careful when you remove screws and bolts inside the cabinet. Do not drop screws, washers or nuts inside the cabinet or module. It can cause severe damage at the power up: short circuit or arc blast.

1. Stop the motors connected to the drive.
2. Repeat the steps described in section *Electrical safety precautions (page 36)*.
   Note: You can test the DC voltage without removing the shroud.
3. Open the cubicle door.
4. Remove any shrouding in front of the DC fuses.
5. IEC version of the supply unit: Remove the screws, nuts and washers from the old fuses. Write down the correct order of the washers. Pull the fuses out. If necessary, loosen the bolts of the L-shape busbars somewhat.
   UL approved version of the supply unit: The design differs somewhat from the image below. Remove the screws, nuts and washers from the L-shaped busbars. Write down the correct order of the washers. Pull out the busbars with the fuses.
6. Install the new fuses in reverse order. Make sure that the washers are in the correct 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:
   - 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.
   - UL: 40 N·m (30 lbf·ft)
9. Attach the shrouding and close the door.



Supply module

Replacing the D8T supply module

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

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

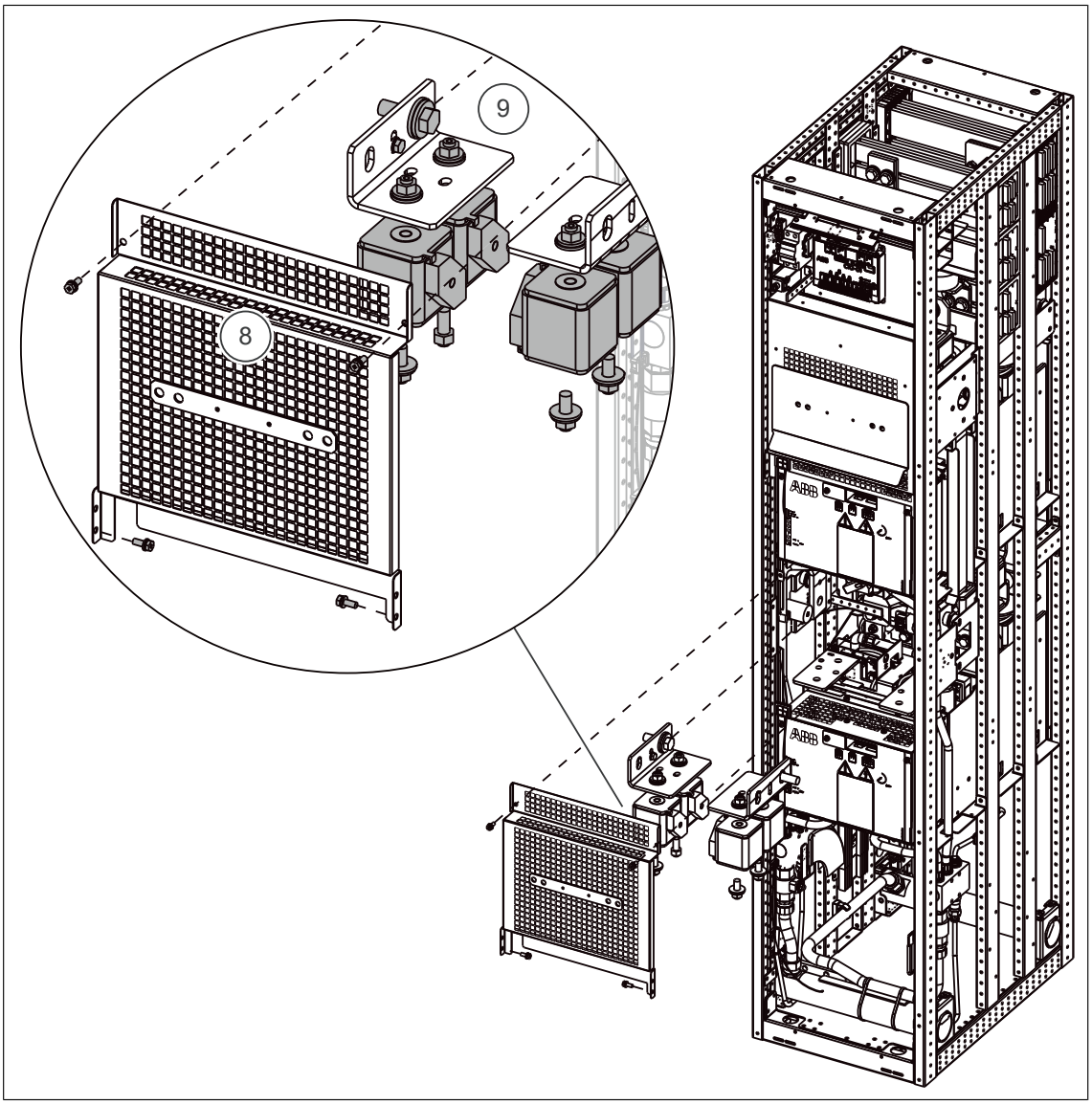
Keep the module in its package until you install it. After unpacking, protect the module from dust, debris and moisture.

Lift/lower a heavy module with a lifting device. Use the designated lifting points. See the dimension drawings. There is a lifting device available from ABB (order code 3AXD50000047447).

Make sure that the drive cabinet is attached to the floor to prevent it from toppling over. The cabinet has a high center of gravity. When you pull out heavy components or power modules, there is a risk of overturning.

1. Stop the motors connected to the drive.
2. Repeat the steps described in section *Electrical safety precautions (page 36)*.
3. Open the cubicle door.
4. Close the inlet and outlet valve.
5. Lead the drain hoses into a suitable container. If necessary, extend the hoses. Open the inlet and outlet drain valves. This will drain all modules in the cubicle.
6. After the cubicle has drained, disconnect the piping from the module.
7. 2×D8T module: If lower module needs to be replaced, remove the cooling fan (see the fan replacement instructions).
8. Remove any shrouding above the module.
9. Remove the DC fuses above the module. See section *Checking and replacing the DC fuses (page 77)*.
10. Disconnect the plug connector and fiber optic connectors in front of the module.
11. Remove the L-shaped busbars (3 pcs above the module).
12. Remove the module fastening screws (4 pcs).
13. Install the module lifting device to the cabinet. See *Converter module lifting device for drive cabinets hardware manual* (3AXD50000210268 [English]).
14. Attach one lifting hook to the front lifting eye of the module and pull the module out 10 centimeters. Keep the lifting chain tight.

15. Attach the second lifting hook to the rear lifting eye, and pull the module completely out of the cabinet. Keep the weight constantly on the lifting device.
16. Lower the module on a pallet. Keep the lifting chain attached to the module and attach the module safely to the pallet.
17. Remove the lifting chains from the old module and move the pallet out of the way.
18. Install the new module:
    a. Attach the lifting hooks to the module, lift the module and place it on the module guide plate. Keep the weight on the lifting device.
    b. Push the module into cabinet.
    c. Fasten the module fastening screws.
    d. Remove the lifting chains.
    e. Reinstall the DC busbars and fuses above the module.
    f. Connect the plug connector and fiber optic connectors.
    g. Reconnect the coolant pipes to the module.
    h. Fill up the cooling system.
    i. Reinstall all shrouds removed earlier.
    j. Remove the lifting device.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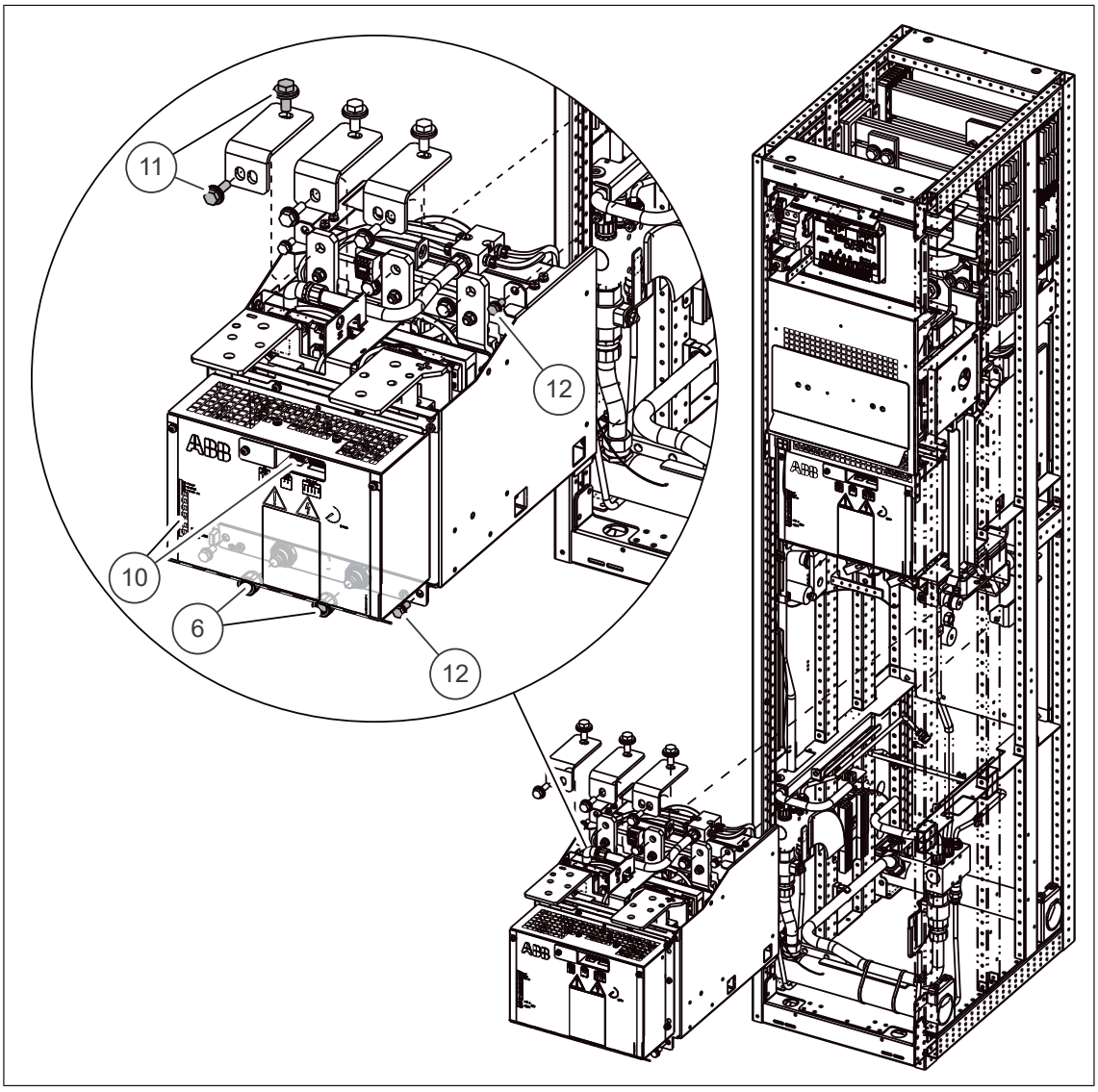
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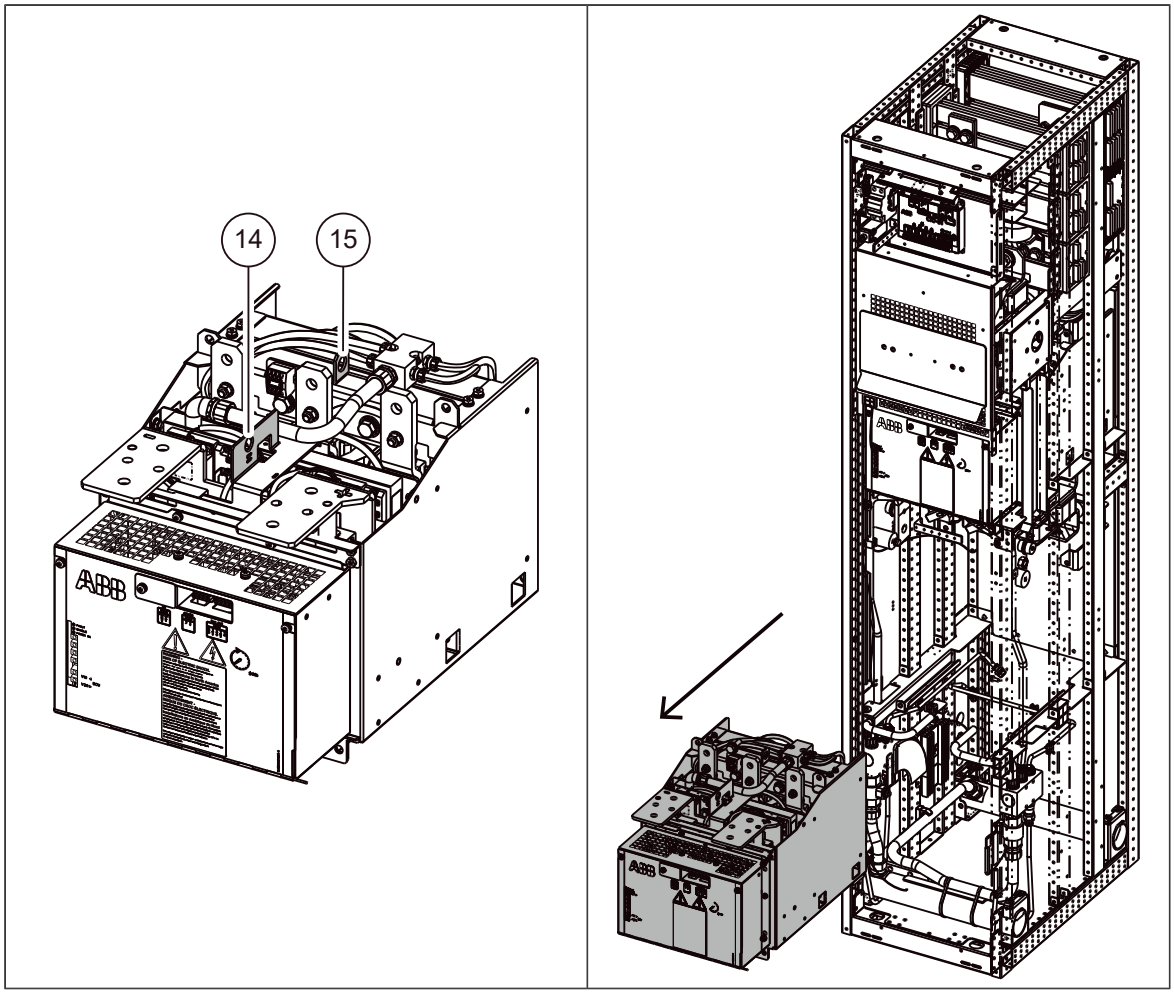


Control panel

For detailed information on the control panel, see *ACx-AP-x assistant control panels user's manual* (3AUA0000085685 [English]).

Cleaning the control panel

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

Replacing the battery

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

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

Note: Contact ABB for ZCU-12 (Supply control unit) battery replacement.

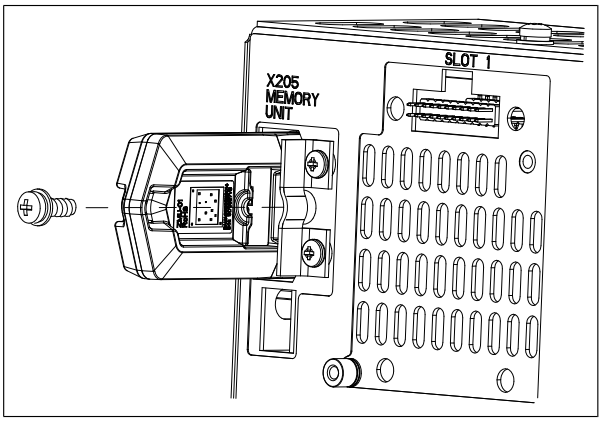
Control unit

Replacing the memory unit

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

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

1. Stop the drive and do the steps in section *Electrical safety precautions (page 36)* 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.

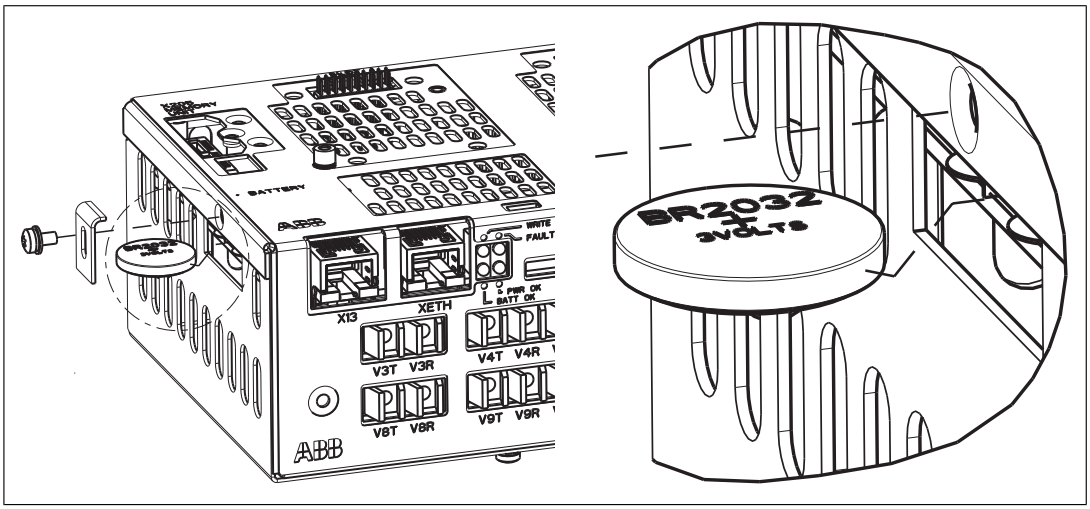


Replacing the BCU control unit battery

Replace the real-time clock battery if the BATT OK LED is not illuminated when the control unit is powered.

1. Stop the drive and do the steps in section *Electrical safety precautions (page 36)* before you start the work.
2. Undo the fastening screw and remove the battery.
3. Replace the battery with a new BR2032 battery.

4. Dispose of the old battery according to local disposal rules or applicable laws.
5. Set the real-time clock.



LEDs and other status indicators

This section instructs how to interpret the status indications of the diode supply unit.

Warnings and faults reported by the control program are displayed on the control panel on the cabinet door. For further information, see the firmware manual.

Control panel and panel platform/holder LEDs

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

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

Control unit LEDs

LED	Color	Indication
BATT OK	Green	Battery voltage of the real-time clock is OK (higher than 2.8 V). When the LED is not lit, •battery voltage is below 2.8 V, •the battery is missing, or •the control unit is not powered.
PWR OK	Green	Internal voltage OK
FAULT	Red	The control program indicates that the equipment is faulty. See the appropriate firmware manual.
WRITE	Yellow	Writing to SD card in progress.

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

Internal cooling circuit

Contents of this chapter

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

Applicability

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

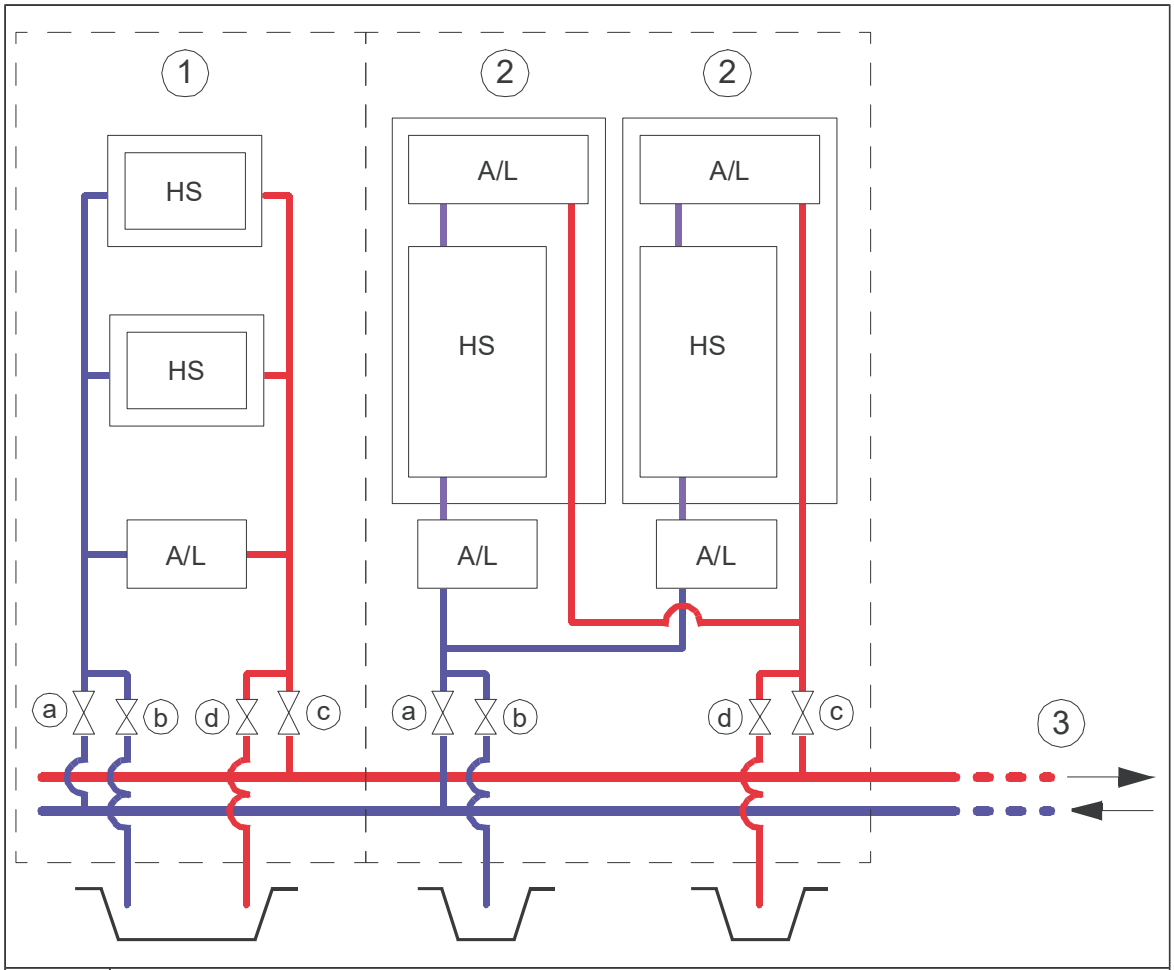
Internal cooling system

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

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

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

The following diagram shows the coolant pipe connections in a drive system consisting of a supply unit and an inverter unit. 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 94)*.

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 94)*. 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 96)*.

Coolant temperature control

The temperature of the coolant in the internal cooling circuit must be kept within the limits specified in *Technical data (page 94)*. Note that the minimum temperature is dependent on ambient temperature and relative humidity.

Filling up and bleeding the internal cooling circuit

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

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

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

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

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

Drive line-ups with a custom cooling unit

Note:

- In filling up the system, the drain valves in the line-up are used only to vent the air from the circuit so that it can be displaced by the coolant. The actual bleeding of the circuit must be done via an external bleed valve installed at the highest point of the cooling circuit. The most practical location for the valve is usually near or at the cooling unit.
- Observe the instructions given by the manufacturer of the cooling unit. Pay special attention to filling up and bleeding the pumps properly as they may be damaged if operated when dry.
- Draining coolant into the sewer system is not allowed.

1. Open the bleed valve at the cooling unit.
2. Open the inlet valve and the outlet-side drain valve of one cubicle. Keep the outlet valve and the inlet-side drain valve closed.
3. Attach a hose to the outlet-side drain valve and lead it into a suitable container.
4. Fill the circuit with coolant. For coolant specification, see *Coolant specification (page 94)*.
   Note: To minimize foaming, do not exceed the filling flow rate of 5 l/min (1.3 US gallon/min).
5. As the piping and modules in the cubicle fills up, coolant starts to flow from the hose. Let some coolant flow out, then close the drain valve.
6. Close the inlet valve.
7. Repeat steps 2 to 6 for all cubicles in the line-up.
8. Open the inlet and outlet valves in all cubicles. Let any air remaining in the system out through the bleed valve at the cooling unit.
9. Close the bleed valve at the cooling unit.
10. Continue to fill in coolant until a base pressure of 100…150 kPa is achieved.

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

Draining the internal cooling circuit

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

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

1. Attach hoses to each drain valve in the cubicle to be drained. Lead the hoses into a suitable container. Make sure the ends of the hoses are not immersed in coolant at any point so that air can displace the coolant in the system.
2. Open the drain valves. Wait until all coolant has drained.
   Note: Draining coolant into the sewer system is not allowed.
3. If required, dry the piping with compressed oil-free air of less than 6 bar.
4. If the drive is to be stored in temperatures below 0 °C (32 °F),
   - dry the cooling circuit with air,
   - fill the cooling circuit with coolant specified under *Coolant specification (page 94)*.
   - drain the cooling circuit again.

Maintenance intervals

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

Technical data

Coolant specification

Coolant type

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

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

Antifrogen® L 25% mixture is usable in storage temperatures down to -16 °C (3.2 °F).
Antifrogen® L 50% mixture is usable in storage temperatures down to -40 °C (-40 °F).

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

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

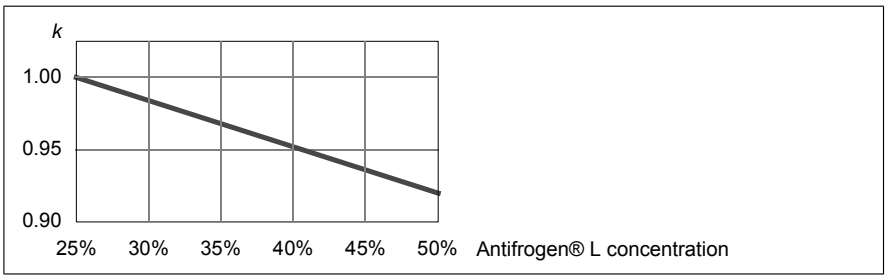
Temperature limits

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

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

The higher the concentration of heat transfer fluid, the higher the viscosity of the coolant. This results in a higher pressure loss in the system. See *Pressure limits (page 96)*.

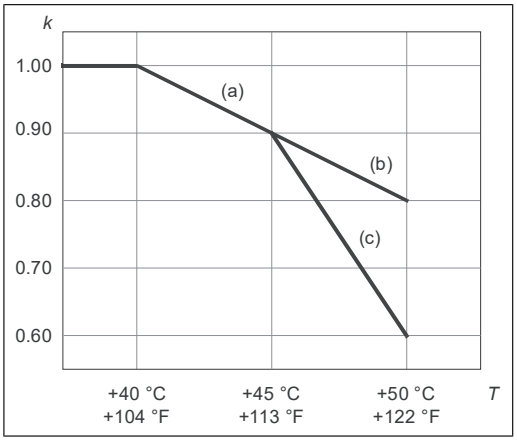
The nominal current ratings of drive system modules apply to an Antifrogen® L / water solution of 25/75% (volume). With the Antifrogen® L concentration between 25% and 50%, the drive output current must be derated by 1/3 percentage point per 1 p.p. increase in Antifrogen® L concentration. The drawing 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 allowed. The minimum coolant temperature to avoid condensation (at an atmospheric pressure of 1 bar) is shown below as a function of relative humidity (RH) and ambient temperature (T_{air}).

T_{air} (°C)	Min. $T_{coolant}$ (°C)				
	RH = 95%	RH = 80%	RH = 65%	RH = 50%	RH = 40%
5	4.3	1.9	-0.9	-4.5	-7.4
10	9.2	6.7	3.7	-0.1	-3.0
15	14.2	11.5	8.4	4.6	1.5
20	19.2	16.5	13.2	9.4	6.0
25	24.1	21.4	17.9	13.8	10.5
30	29.1	26.2	22.7	18.4	15.0
35	34.1	31.1	27.4	23.0	19.4
40	39.0	35.9	32.2	27.6	23.8
45	44.0	40.8	36.8	32.1	28.2
50	49.0	45.6	41.6	36.7	32.8
55	53.9	50.4	46.3	42.2	37.1

	= Not allowed as standard but the coolant temperature must be 0 °C (32 °F) or above.
Example:	At an air temperature of 45 °C and relative humidity of 65% the coolant temperature may not be below +36.8 °C

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

Pressure limits

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

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

Design pressure (PS): 600 kPa

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

Maximum pressure difference: 160 kPa

Coolant flow rate limits

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

Cooling circuit materials

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

- stainless steel AISI 316L (UNS 31603)
- heavy gauge aluminum

- plastic materials such as PA, PEX and PTFE

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

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

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

9

Technical data

Contents of this chapter

This chapter contains the technical data.

The information is valid for ACS880-307LC…+A018 diode supply units.

Ratings

ACS880-307LC-…	No overload use						Light overload use		Heavy-duty use	
	I_1	I_2	I_{max_1}	S_N	I_{max_2}	P_N	I_{Ld}	P_{Ld}	I_{Hd}	P_{Hd}
	A (AC)	A (DC)	A (DC)	kVA	A (AC)	kW (DC)	A (DC)	kW (DC)	A (DC)	kW (DC)
U_N = 690 V										
6-pulse										
0490A-7+A018	490	600	900	585	735	559	576	537	449	418
0780A-7+A018	780	955	1430	932	1170	890	917	854	714	666
1060A-7+A018	1060	1300	1950	1267	1590	1211	1248	1163	972	906
1470A-7+A018	1470	1800	2700	1757	2205	1677	1728	1610	1346	1255
2000A-7+A018	2000	2450	3675	2390	3000	2283	2352	2192	1833	1708
3000A-7+A018	3000	3670	5505	3585	4500	3420	3523	3283	2745	2558
4000A-7+A018	4000	4900	7350	4780	6000	4566	4704	4383	3665	3415
5000A-7+A018	5000	6120	9180	5979	7500	5703	5875	5475	4578	4266
6000A-7+A018	6000	7350	11025	7171	9000	6849	7056	6575	5498	5123
12-pulse										
0920A-7 +A004+A018	920	1130	1695	1100	1380	1053	1085	1011	845	788

ACS880-307LC-…	No overload use						Light overload use		Heavy-duty use	
	I_1	I_2	I_{max_1}	S_N	I_{max_2}	P_N	I_{Ld}	P_{Ld}	I_{Hd}	P_{Hd}
	A (AC)	A (DC)	A (DC)	kVA	A (AC)	kW (DC)	A (DC)	kW (DC)	A (DC)	kW (DC)
1470A-7 +A004+A018	1470	1800	2700	1757	2205	1677	1728	1610	1346	1255
2000A-7 +A004+A018	2000	2450	3675	2390	3000	2283	2352	2192	1833	1708
2940A-7 +A004+A018	2940	3600	5400	3514	4410	3355	3456	3220	2693	2509
4000A-7 +A004+A018	4000	4900	7350	4780	6000	4566	4704	4383	3665	3415
6000A-7 +A004+A018	6000	7350	11025	7171	9000	6849	7056	6575	5498	5123

Definitions

Nominal ratings

U_N Nominal input voltage. For U_1, see *Electrical power network specification (page 113)*. For U_2, see DC connection data.

I_1 Continuous rms input (AC) current. No overload capability at the coolant temperature of 40 °C (104 °F) and air temperature of 45 °C (113 °F).

I_2 Continuous rms output (DC) current. No overload capability at the coolant temperature of 40 °C (104 °F) and air temperature of 45 °C (113 °F).

I_{max_1} Maximum output (DC) current. Available for 10 s at start, otherwise as long as allowed by module temperature.

S_N Nominal apparent (AC) power

I_{max_2} Maximum input (AC) current

P_N Nominal output (DC) power

Light-overload use (50% overload capability) ratings

I_{Ld} Continuous current. 50% overload is allowed for one minute every 5 minutes.

P_{Ld} Output power in light-overload use

Heavy-duty use (50% overload capability) ratings

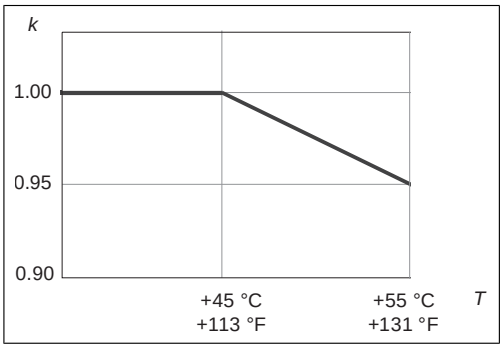
I_{Hd} Continuous current. 50% overload is allowed for one minute every 5 minutes.

P_{Hd} Output power in heavy-duty use

Derating

Surrounding air temperature derating

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



Coolant temperature derating

See section *Temperature limits (page 94)*.

Antifreeze content derating

See section *Temperature limits (page 94)*.

Altitude derating

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

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

Type equivalence table

Supply unit type	Basic module type	Frame
6-pulse		
ACS880-307LC-0490A-7+A018	ACS880-304LC-0490A-7+A018	D8T
ACS880-307LC-0780A-7+A018	ACS880-304LC-0780A-7+A018	D8T
ACS880-307LC-1060A-7+A018	ACS880-304LC-1060A-7+A018	D8T
ACS880-307LC-1470A-7+A018	ACS880-304LC-0780A-7+A018	2×D8T
ACS880-307LC-2000A-7+A018	ACS880-304LC-1060A-7+A018	2×D8T
ACS880-307LC-3000A-7+A018	ACS880-304LC-1060A-7+A018	3×D8T
ACS880-307LC-4000A-7+A018	ACS880-304LC-1060A-7+A018	4×D8T
ACS880-307LC-5000A-7+A018	ACS880-304LC-1060A-7+A018	5×D8T
ACS880-307LC-6000A-7+A018	ACS880-304LC-1060A-7+A018	6×D8T
12-pulse		
ACS880-307LC-0920A-7+A004+A018	ACS880-304LC-0490A-7+A018	2×D8T
ACS880-307LC-1470A-7+A004+A018	ACS880-304LC-0780A-7+A018	2×D8T
ACS880-307LC-2000A-7+A004+A018	ACS880-304LC-1060A-7+A018	2×D8T
ACS880-307LC-2940A-7+A004+A018	ACS880-304LC-0780A-7+A018	4×D8T
ACS880-307LC-4000A-7+A004+A018	ACS880-304LC-1060A-7+A018	4×D8T
ACS880-307LC-6000A-7+A004+A018	ACS880-304LC-1060A-7+A018	6×D8T

Fuses

Main circuit AC fuses - standard incoming cubicle

IEC				
ACS880-307LC-…	**Type**	**Qty**	**I_N** **A**	**Size**
U_N = 690 V				
6-pulse				
0490A-7+A018	170M6413	3	900	size 3
0780A-7+A018	170M6416	3	1250	size 3
1060A-7+A018	170M6413	6	2 × 900	2 × size 3
1470A-7+A018	170M6416	6	1250	size 3
2000A-7+A018	170M6413	12	2 × 900	2 × size 3
3000A-7+A018	170M6413	18	2 × 900	2 × size 3
4000A-7+A018	170M6413	24	2 × 900	2 × size 3
5000A-7+A018	170M6413	30	2 × 900	2 × size 3
6000A-7+A018	170M6413	36	2 × 900	2 × size 3
12-pulse				
0920A-7+A004+A018	170M6413	6	900	size 3
1470A-7+A004+A018	170M6416	6	1250	size 3
2000A-7+A004+A018	170M6413	12	2 × 900	2 × size 3
2940A-7+A004+A018	170M6416	12	1250	size 3
4000A-7+A004+A018	170M6413	24	2 × 900	2 × size 3
6000A-7+A004+A018	170M6413	36	2 × 900	2 × size 3

UL				
ACS880-307LC-…	**Type**	**Qty**	**I_N** **A**	**Size**
U_N = 690 V				
6-pulse				
0490A-7+A018+C129	170M6413	3	900	size 3
0780A-7+A018+C129	170M6416	3	1250	size 3
1060A-7+A018+C129	170M6904	3	1800	size 23
1470A-7+A018+C129	170M6416	6	1250	size 3
2000A-7+A018+C129	170M6904	6	1800	size 23
3000A-7+A018+C129	170M6904	9	1800	size 23
4000A-7+A018+C129	170M6904	12	1800	size 23
5000A-7+A018+C129	170M6904	15	1800	size 23
6000A-7+A018+C129	170M6904	18	1800	size 23
12-pulse				
0920A-7+A004+A018+C129	170M6413	6	900	size 3
1470A-7+A004+A018+C129	170M6416	6	1250	size 3

UL				
ACS880-307LC-…	Type	Qty	I_N	Size
			A	
2000A-7+A004+A018+C129	170M6904	6	1800	size 23
2940A-7+A004+A018+C129	170M6416	12	1250	size 3
4000A-7+A004+A018+C129	170M6904	12	1800	size 23
6000A-7+A004+A018+C129	170M6904	18	1800	size 23

Main circuit AC fuses – 100 kA input unit (+F274)

ACS880-307LC-…	Type	Qty	I_N
			A
U_N = 690 V			
6-pulse			
0490A-7+A018+F274	170M7059	3	1250
0780A-7+A018+F274	170M7059	3	1250
1060A-7+A018+F274	170M7062	3	2000
1470A-7+A018+F274	170M7063	3	2500
2000A-7+A018+F274	170M7085	3	3500
3000A-7+A018+F274	170M7064	3	5000
4000A-7+A018+F274	170M7085	6	2 × 3500
5000A-7+A018+F274	170M7162	6	2 × 4000
6000A-7+A018+F274	170M7164	6	2 × 5000
12-pulse			
0920A-7+A004+A018+F274	170M7059	6	2 x 1250
1470A-7+A004+A018+F274	170M7059	6	2 x 1250
2000A-7+A004+A018+F274	170M7061	6	2 × 1600
2940A-7+A004+A018+F274	170M7063	6	2 x 2500
4000A-7+A004+A018+F274	170M7085	6	2 × 3500
6000A-7+A004+A018+F274	170M7164	6	2 × 5000

Main circuit DC fuses

IEC				
ACS880-307LC-…	Type	Qty	I_N	Size
			A	
U_N = 690 V				
6-pulse				
0490A-7+A018	170M6549	2	1100	size 3
0780A-7+A018	170M6546	4	2 × 800	2 × size 3
1060A-7+A018	170M6549	4	2 × 1100	2 × size 3
1470A-7+A018	170M6546	8	2 × 800	2 × size 3
2000A-7+A018	170M6549	8	2 × 1100	2 × size 3
3000A-7+A018	170M6549	12	2 × 1100	2 × size 3

IEC				
ACS880-307LC-…	**Type**	**Qty**	**I_N** **A**	**Size**
4000A-7+A018	170M6549	16	2 × 1100	2 × size 3
5000A-7+A018	170M6549	20	2 × 1100	2 × size 3
6000A-7+A018	170M6549	24	2 × 1100	2 × size 3
12-pulse				
0920A-7+A004+A018	170M6549	4	1100	size 3
1470A-7+A004+A018	170M6546	8	2 × 800	2 × size 3
2000A-7+A004+A018	170M6549	8	2 × 1100	2 × size 3
2940A-7+A004+A018	170M6546	16	2 × 800	2 × size 3
4000A-7+A004+A018	170M6549	16	2 × 1100	2 × size 3
6000A-7+A004+A018	170M6549	24	2 × 1100	2 × size 3

UL				
ACS880-307LC-…	**Type**	**Qty**	**I_N** **A**	**Size**
U_N = 690 V				
6-pulse				
0490A-7+A018+C129	170M6549	2	1100	size 3
0780A-7+A018+C129	170M6792	2	1600	size 23
1060A-7+A018+C129	170M6827	2	2100	size 23
1470A-7+A018+C129	170M6792	4	1600	size 23
2000A-7+A018+C129	170M6827	4	2100	size 23
3000A-7+A018+C129	170M6827	6	2100	size 23
4000A-7+A018+C129	170M6827	8	2100	size 23
5000A-7+A018+C129	170M6827	10	2100	size 23
6000A-7+A018+C129	170M6827	12	2100	size 23
12-pulse				
0920A-7+A004+A018+C129	170M6789	4	1100	size 3
1470A-7+A004+A018+C129	170M6792	4	1600	size 23
2000A-7+A004+A018+C129	170M6827	4	2100	size 23
2940A-7+A004+A018+C129	170M6792	8	1600	size 23
4000A-7+A004+A018+C129	170M6827	8	2100	size 23
6000A-7+A004+A018+C129	170M6827	12	2100	size 23

Dimensions and weights

Note: The following dimensions and weights are applicable to diode supply module cubicle only. Incoming and auxiliary control cubicles not included.

ACS880-307LC-…	Basic module type ACS880-304LC-…	Frame	Height [1]	Width [2] [3]	Depth	Weight
			mm	mm	mm	kg
6-pulse						
0490A-7+A018	0490A-7+A018	D8T	2002	400	644	300
0780A-7+A018	0780A-7+A018	D8T	2002	400	644	300
1060A-7+A018	1060A-7+A018	D8T	2002	400	644	300
1470A-7+A018	0780A-7+A018	2xD8T	2002	400	644	450
2000A-7+A018	1060A-7+A018	2xD8T	2002	400	644	450
3000A-7+A018	1060A-7+A018	3xD8T	2002	800	644	750
4000A-7+A018	1060A-7+A018	4xD8T	2002	800	644	900
5000A-7+A018	1060A-7+A018	5xD8T	2002	1200	644	1200
6000A-7+A018	1060A-7+A018	6xD8T	2002	1200	644	1350
12-pulse						
0920A-7+A004+A018	0490A-7+A018	2xD8T	2002	400	644	450
1470A-7+A004+A018	0780A-7+A018	2xD8T	2002	400	644	450
2000A-7+A004+A018	1060A-7+A018	2xD8T	2002	400	644	450
2940A-7+A004+A018	0780A-7+A018	4xD8T	2002	800	644	900
4000A-7+A004+A018	1060A-7+A018	4xD8T	2002	800	644	900
6000A-7+A004+A018	1060A-7+A018	6xD8T	2002	1200	644	1350

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

2) These are the widths of the IEC supply unit variants. Large UL variants (option +C129) are wider because of different main breaker selections and incoming cubicle widths. Consult ABB for more information.

3) Additional width with 100 kA input cubicle (option +F274) is 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.
1500	59	0	0	250	9.85

Cooling data and noise

ACS880-307LC-…	Coolant volume		Coolant flow rate		Pressure loss	Noise level	Power loss			
	Modules	Modules + cabinet	Modules	Modules + cabinet		Average	Total	Coolant	Air	ACU + ICU [1]
	l	l	l/min	l/min	kPa	dB (A)	kW	kW	kW	kW
6-pulse										
0490A-7+A018	0.6	3.5	14	20	120	65	4.8	4.7	0.1	1.8
0780A-7+A018	0.6	3.5	14	20	120	65	6.6	6.4	0.2	2.0
1060A-7+A018	0.6	3.5	14	20	120	65	8.9	8.7	0.2.	2.7
1470A-7+A018	1.2	4.2	28	34	120	65	12.1	11.8	0.3	3.4
2000A-7+A018	1.2	4.2	28	34	120	65	15.4	15.0	0.4	3.7
3000A-7+A018	1.8	7.7	42	54	120	67	23.0	22.5	0.6	5.5
4000A-7+A018	2.4	8.4	56	68	120	67	29.8	29.1	0.7	6.4
5000A-7+A018	3.0	11.9	70	88	120	68	38.4	37.5	1.0	9.2
6000A-7+A018	3.6	12.6	84	102	120	68	45.3	44.2	1.1	10.2
12-pulse										
0920A-7+A004+A018	1.2	4.2	28	34	120	67	8.3	8.1	0.2	2.7
1470A-7+A004+A018	1.2	4.2	28	34	120	67	12.1	11.8	0.3	3.4
2000A-7+A004+A018	1.2	4.2	28	34	120	67	15.4	15.0	0.4	3.7
2940A-7+A004+A018	2.4	8.4	56	68	120	68	23.5	22.9	0.6	5.5
4000A-7+A004+A018	2.4	8.4	56	68	120	68	29.8	29.1	0.7	6.4
6000A-7+A004+A018	3.6	12.6	84	102	120	68	45.3	44.2	1.1	10.2

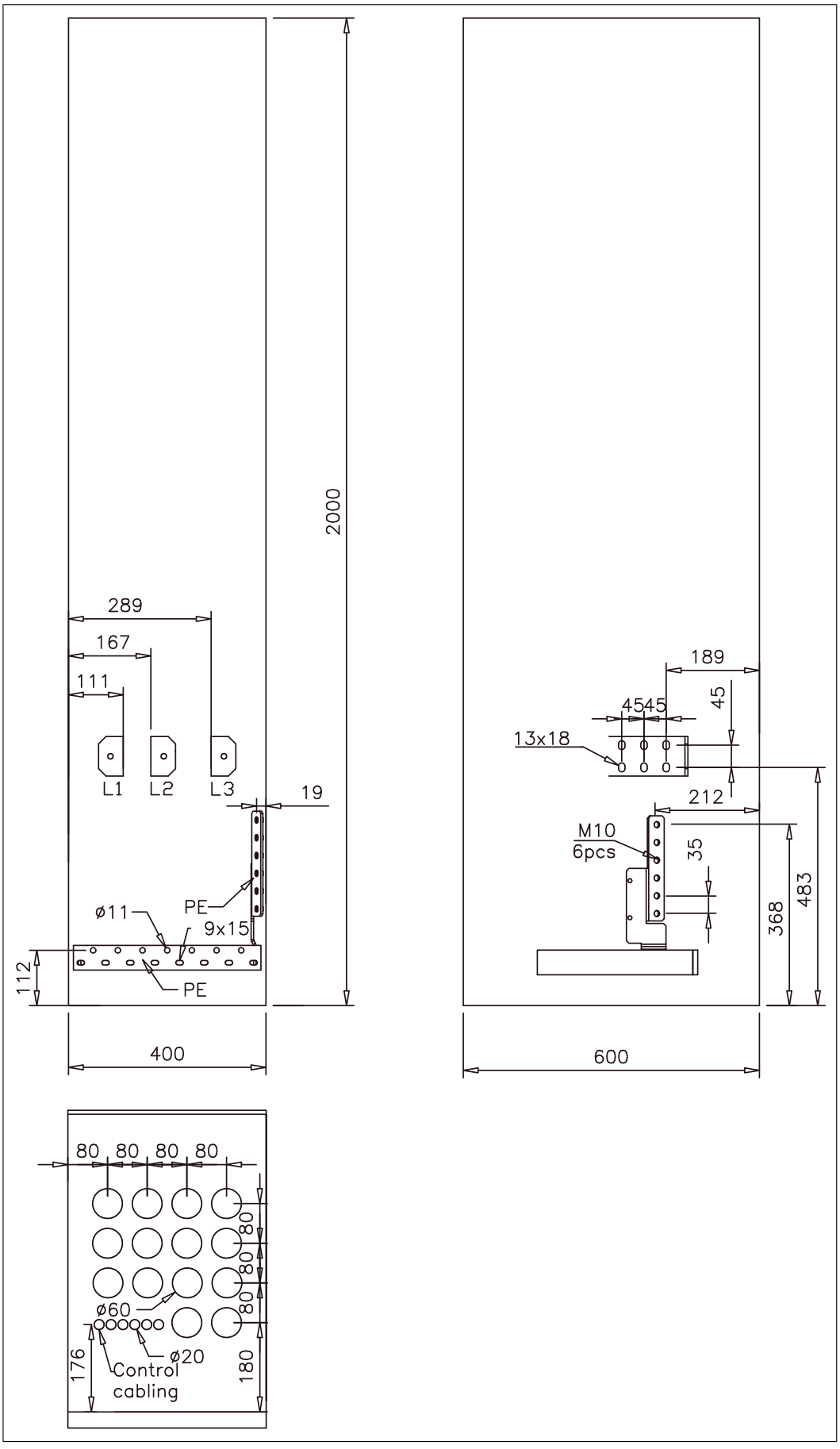
[1] Losses for the auxiliary control cubicle and the incoming cubicle. Other power loss values are for the supply module cubicle. The losses are dissipated either into the coolant or into air.

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

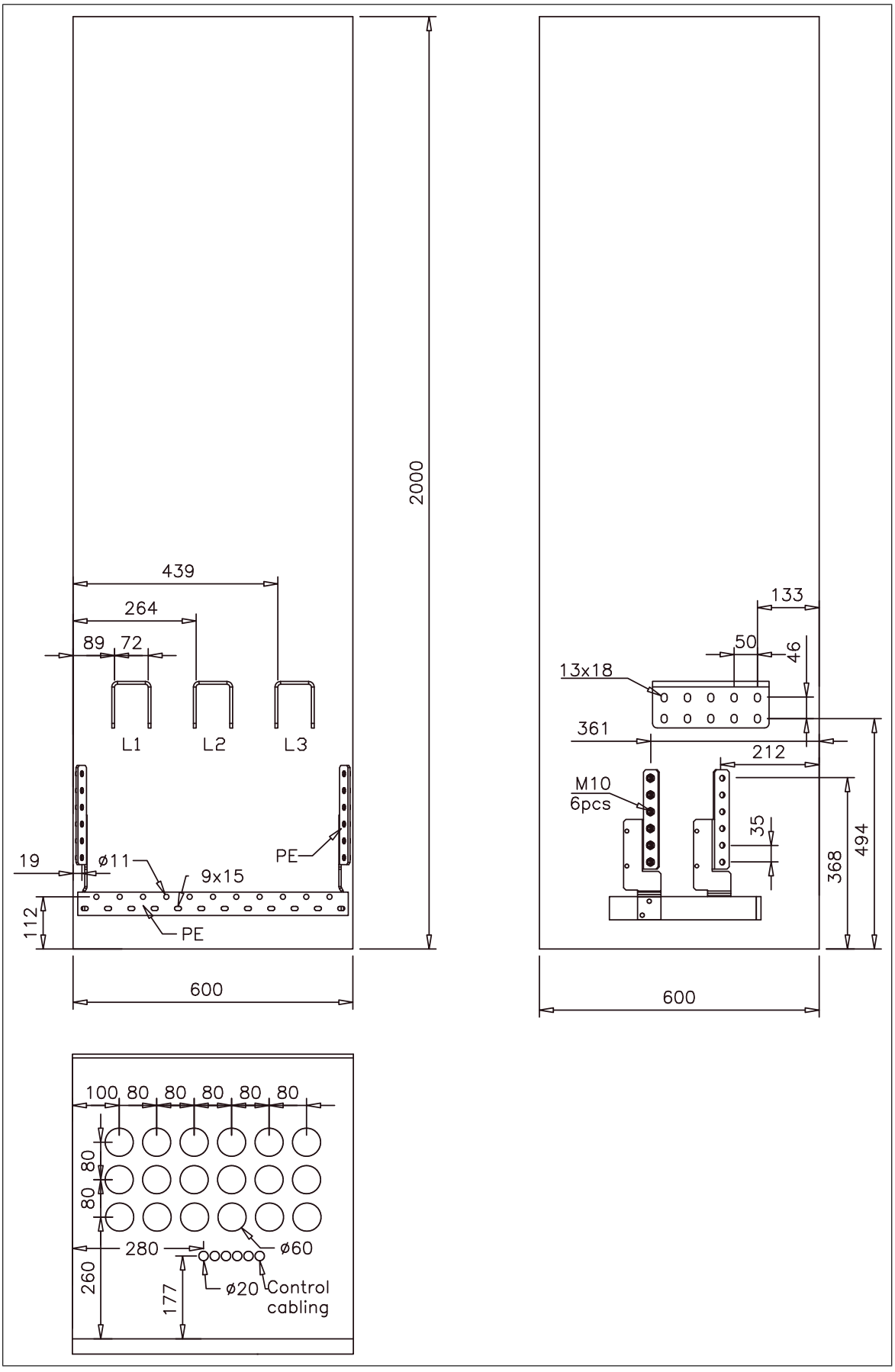
Terminal and cable entry data for the input power cable

These drawings (from front, side and above) show the terminal and cable entry dimensions for incoming cubicles. The dimensions are given in millimeters. Tightening torque for the cable lug connection depends on the bolt size and type. See section *Tightening torques (page 109)*.

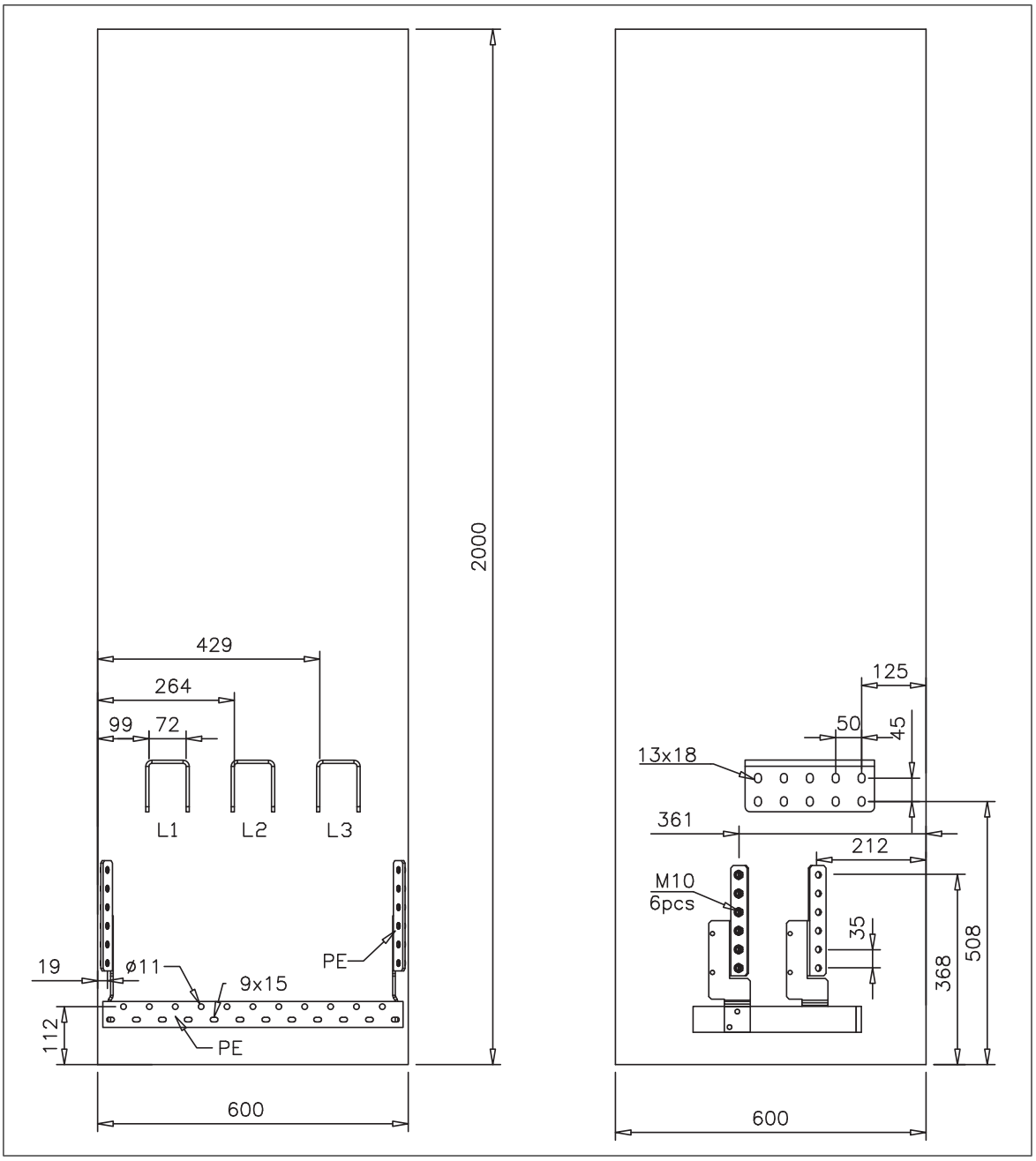
400 mm wide input cubicle



600 mm wide incoming cubicle or 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

Size	Torque	Strength class
M10	42 N·m (31 lbf·ft)	8.8
M12	70 N·m (52 lbf·ft)	8.8
M16	120 N·m (90 lbf·ft)	8.8

Mechanical connections

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

Insulation supports

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

Cable lugs

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

Typical power cable sizes

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

The cable sizing is based on max. 9 cables laid on the cable trays side by side, three ladder type trays one on top of the other, ambient temperature 30 °C (EN 60204-1 and IEC 60364-5-52).

Aluminum cable		**PVC insulation Conductor temperature 70 °C**		**XLPE insulation Conductor temperature 90 °C**	
Size	⌀ **[mm]**	I_{Lmax} **[A]**	**Time const. [s]**	I_{Lmax} **[A]**	**Time const. [s]**
3 × 35 + 10 Cu	26	67	736	84	669
3 × 50 + 15 Cu	29	82	959	102	874
3 × 70 + 21 Cu	32	105	1182	131	1079
3 × 95 + 29 Cu	38	128	1492	159	1376
3 × 120 + 41 Cu	41	148	1776	184	1637
3 × 150 + 41 Cu	44	171	2042	213	1881
3 × 185 + 57 Cu	49	196	2422	243	2237
3 × 240 + 72 Cu	54	231	2967	286	2740
3 × 300 + 88 Cu	58	267	3478	330	3229
2 × (3 × 70 + 21 Cu)	2 × 32	210	1182	262	1079
2 × (3 × 95 + 29 Cu)	2 × 38	256	1492	318	1376
2 × (3 × 120 + 41 Cu)	2 × 41	297	1776	368	1637
2 × (3 × 150 + 41 Cu)	2 × 44	343	2042	425	1881
2 × (3 × 185 + 57 Cu)	2 × 49	392	2422	486	2237
2 × (3 × 240 + 72 Cu)	2 × 54	462	2967	572	2740
2 × (3 × 300 + 88 Cu)	2 × 58	533	3478	659	3229
3 × (3 × 150 + 41 Cu)	3 × 44	514	2042	638	1881
3 × (3 × 185 + 57 Cu)	3 × 49	588	2422	728	2237
3 × (3 × 240 + 72 Cu)	3 × 54	693	2967	859	2740
3 × (3 × 300 + 88 Cu)	3 × 58	800	3478	989	3229
4 × (3 × 185 + 57 Cu)	4 × 49	784	2422	971	2237
4 × (3 × 240 + 72 Cu)	4 × 54	924	2967	1145	2740
4 × (3 × 300 + 88 Cu)	4 × 58	1067	3478	1319	3229
5 × (3 × 185 + 57 Cu)	5 × 49	980	2422	1214	2237
5 × (3 × 240 + 72 Cu)	5 × 54	1155	2967	1431	2740
5 × (3 × 300 + 88 Cu)	5 × 58	1333	3478	1648	3229
6 × (3 × 240 + 72 Cu)	6 × 54	1386	2967	1718	2740
6 × (3 × 300 + 88 Cu)	6 × 58	1600	3478	1978	3229
7 × (3 × 240 + 72 Cu)	7 × 54	1617	2967	2004	2740
7 × (3 × 300 + 88 Cu)	7 × 58	1867	3478	2308	3229
8 × (3 × 240 + 72 Cu)	8 × 54	1848	2967	2290	2740
8 × (3 × 300 + 88 Cu)	8 × 58	2133	3478	2637	3229
9 × (3 × 240 + 72 Cu)	9 × 54	2079	2967	2577	2740
9 × (3 × 300 + 88 Cu)	9 × 58	2400	3478	2967	3229
10 × (3 × 240 + 72 Cu)	10 × 54	2310	2967	2867	2740
10 × (3 × 300 + 88 Cu)	10 × 58	2667	3478	3297	3229

Copper cable		PVC insulation Conductor temperature 70 °C		XLPE insulation Conductor temperature 90 °C	
Size	**⌀ [mm]**	**I_{Lmax} [A]**	**Time const. [s]**	**I_{Lmax} [A]**	**Time const. [s]**
3 × 1.5 + 1.5	13	13	85	16	67
3 × 2.5 + 2.5	14	18	121	23	88
(3 × 4 + 4)	16	24	175	30	133
3 × 6 + 6	18	30	251	38	186
3 × 10 + 10	21	42	359	53	268
3 × 16 + 16	23	56	514	70	391
3 × 25 + 16	24	71	791	89	598
3 × 35 + 16	26	88	1000	110	760
3 × 50 + 25	29	107	1308	134	990
3 × 70 + 35	32	137	1613	171	1230
3 × 95 + 50	38	167	2046	209	1551
3 × 120 + 70	41	193	2441	241	1859
3 × 150 + 70	44	223	2820	279	2139
3 × 185 + 95	50	255	3329	319	2525
3 × 240 + 120	55	301	4073	376	3099
3 × 300 + 150	58	348	4779	435	3636
2 × (3 × 70 + 35)	2 × 32	274	1613	342	1230
2 × (3 × 95 + 50)	2 × 38	334	2046	418	1551
2 × (3 × 120 + 70)	2 × 41	386	2441	482	1859
2 × (3 × 150 + 70)	2 × 44	446	2820	558	2139
2 × (3 × 185 + 95)	2 × 50	510	3329	638	2525
2 × (3 × 240 + 120)	2 × 55	602	4073	752	3099
2 × (3 × 300 + 150)	2 × 58	696	4779	869	3636
3 × (3 × 120 + 70)	3 × 41	579	2441	723	1859
3 × (3 × 150 + 70)	3 × 44	669	2820	837	2139
3 × (3 × 185 + 95)	3 × 50	765	3329	957	2525
3 × (3 × 240 + 120)	3 × 55	903	4073	1128	3099
3 × (3 × 300 + 150)	3 × 58	1044	4779	1304	3636
4 × (3 × 150 + 70)	4 × 44	892	2820	1116	2139
4 × (3 × 185 + 95)	4 × 50	1020	3329	1276	2525
4 × (3 × 240 + 120)	4 × 55	1204	4073	1504	3099
4 × (3 × 300 + 150)	4 × 58	1391	4779	1304	3636
5 × (3 × 185 + 95)	5 × 50	1275	3329	1595	2525
5 × (3 × 240 + 120)	5 × 55	1505	4073	1880	3099
5 × (3 × 300 + 150)	5 × 58	1739	4779	2173	3636
6 × (3 × 185 + 95)	6 × 50	1530	3329	1914	2525
6 × (3 × 240 + 120)	6 × 55	1806	4073	2256	3099
6 × (3 × 300 + 150)	6 × 58	2087	4779	2608	3636
7 × (3 × 240 + 120)	7 × 55	2107	4073	2632	3099
7 × (3 × 300 + 150)	7 × 58	2435	4779	3043	3636
8 × (3 × 240 + 120)	8 × 55	2408	4073	3008	3099
8 × (3 × 300 + 150)	8 × 58	2783	4779	3477	3636

Electrical power network specification

Voltage (U_1)	690 V units: 525…690 V AC 3-phase ± 10% (525…600 V AC ± 10% in UL/CSA installations, or corner-grounded TN systems). This is indicated in the type designation label as typical input voltage levels (3~ 525/600/690 V AC).
Network type	TN (grounded) and IT (ungrounded) systems
Frequency	50/60 Hz, variation ± 5% of nominal frequency
Imbalance	Max. ± 3% of nominal phase-to-phase input voltage
Short-circuit withstand strength, standard IEC supply unit variant (IEC/EN 61439-1)	With main circuit breaker (option +F255) and without grounding/earthing switch (without option +F259): Rated peak withstand current (I_{pk}): 143 kA Rated short-time withstand current (I_{cw}): 65 kA/1 s All other configurations (exception for the 100 kA input cubicle see the next rows): Rated peak withstand current (I_{pk}): 105 kA Rated short-time withstand current (I_{cw}): 50 kA/1 s
Short-circuit withstand strength for supply unit with 100 kA input unit (option +F274) (IEC/EN 61439-1)	Rated peak withstand current (Ipk): 220 kA Rated short-time withstand current (Icw): 100 kA/1 s
Short-circuit current protection (UL 508A, CSA C22.2 No. 14-13)	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.
Transformer specification for 12-pulse supply (IEC 60076-1:2011)	Connection: Dy 11 d0 or Dyn 11 d0 Phase shift between secondaries: 30° electrical Voltage difference between secondaries: < 0.5% Short-circuit impedance of secondaries: > 5% Short-circuit impedance difference between secondaries: ≤ 10% of the percentage impedance To avoid a potentially destructive DC voltage level in an earth fault situation, grounding of the secondaries is not allowed. Static shielding is recommended.

Control unit (board) connection data

See *Connector data (page 60)*.

Auxiliary circuit current consumption

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

Efficiency

Efficiency	98.2…98.8% at nominal power level depending on drive type

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

Energy efficiency (ecodesign)

Energy efficiency data is not provided for the drive/unit. The multidrives 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.
Overvoltage category (IEC/EN 60664-1)	III, except for auxiliary power connections (fan, control, heating, lighting, cooling unit pump etc) which are category II.
Protective class (IEC/EN 61800-5-1)	I

Ambient conditions

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

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

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

Materials

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

Color

RAL 7035 and RAL 9017.

Package

Standard package (Container package) Vertical	**Materials:** Wood, PE (VCI film), VCI emitter, clay desiccant, PE sheet, PET strap, metal fixing clamps and screw, packing tape. **Transport method:** Road and air transport and sea transport in container. **Storage conditions (IEC 60721-3-1):** Up to 24 months (1K20) in enclosed conditions, up to 3 months in sheltered conditions (1K23, 1K24).
Seaworthy package (option +P912) Vertical	**Materials:** Wood, plywood, PE (VCI film), VCI emitter, clay desiccant, PE sheet, metal fixing clamps and screw, packing tape. **Transport method:** Road and air transport and sea transport in container or deck. **Storage conditions (IEC 60721-3-1):** Up to 24 months (1K20) in enclosed conditions, up to 12 months in sheltered conditions (1K23, 1K24) and up to 3 months in open-air conditions (1K25–1K27).

Disposal

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

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

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

Applicable standards

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

Markings

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

Disclaimers

Generic disclaimer

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

Cybersecurity disclaimer

This product can be connected to and to communicate information and data via a network interface. The HTTP protocol, which is used between the commissioning tool (Drive Composer) and the product, is an unsecured protocol. For independent and continuous operation of product such connection via network to commissioning tool is not necessary. However 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, prevention of physical access, 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.

Notwithstanding any other provision to the contrary and regardless whether the contract is terminated or not, ABB and its affiliates are under no circumstances liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

Further information

Product and service inquiries

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

Product training

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

Providing feedback on ABB manuals

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

Document library on the Internet

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

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3AXD50000579662B

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