ABB INDUSTRIAL DRIVES

ACS880-1604 DC/DC-converter modules

Hardware manual

ACS880-1604 DC/DC-converter modules

Hardware manual

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Table of contents

4 Cabinet construction

5 Guidelines for planning electrical installation

6 Electrical installation

7 Control unit (UCU)

8 Control unit (BCU)

9 Installation checklist

10 Start-up

11 Maintenance

12 Ordering information

13 Technical data

14 Dimension drawings

15 Example circuit diagrams

Further information

1

Introduction to the manual

Contents of this chapter

This chapter gives basic information on the manual.

Applicability

The manual is applicable to ACS880-1604 DC/DC-converter modules for user-defined cabinet installations.

Safety instructions

Obey all safety instructions of the drive.

- Read the **complete safety instructions** before you install, commission, use or service the drive. The complete safety instructions are given in ACS880 multidrives cabinets and modules safety instructions (3AUA0000102301 [English]).
- Read the warnings of the software function before you take the function in use or change its default parameter settings. Read the warnings of the parameter before you change its default setting. Refer to the firmware manual.

Target audience

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

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

Categorization by frame size and option module

Some descriptions, instructions and technical data which concern only certain module or frame sizes are marked with the size identifier (such as "2×R8i", etc.). The marking derives from the quantity and basic construction of the converter modules that form the converter unit. For example, frame size "2×R8i" indicates that the converter unit consists of two frame size R8i converter modules connected in parallel.

The frame size is marked on the type designation labels. The frame size of each drive module is also shown in the rating tables.

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

Use of component designations

Some device names in the manual include the component designation in brackets (for example, [Q20]). This will help you to identify the components in the circuit diagrams of the drive.

Terms and abbreviations

Term	Description
BAMU	Auxiliary measurement unit
BCU	Type of control unit
BDCL	Series of L-filters, for example BDCL-14-5
BDPS	Module internal power supply board
BFPS	Control and power supply board for speed-controlled cooling fan
Control unit	The part in which the control program runs.
Cubicle	One section of a cabinet-installed drive. A cubicle is typically behind a door of its own.
DC/DC-converter	Charges or discharges an external energy storage (such as a battery or capacitor bank) from or into the DC bus
DC/DC-converter module	Converter power electronics, related components and DC capacitors enclosed in a metal frame or enclosure. Intended for cabinet installation.
DC/DC-converter unit	DC/DC-converter module(s) under control of one control unit, and related components
DDC	DC/DC-converter unit
DI	Digital input
DOL	Direct-on-line
Drive	Frequency converter for controlling AC motors
EMC	Electromagnetic compatibility
Energy storage	Device that stores electrical energy, for example, a battery or a super capacitor.
Flat-PLS	Rittal Flat-PLS, a busbar system for standard, commercially available flat busbars
Frame, frame size	Physical size of the drive or power module
IGBT	Insulated gate bipolar transistor
INU	Inverter unit
Inverter	Converts direct current and voltage to alternating current and voltage.
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.

Term	Description
Parameter	In the drive control program, user-adjustable operation instruction to the drive, or signal measured or calculated by the drive. In some (for example fieldbus) contexts, a value that can be accessed as an object. For example, variable, constant, or signal.
PLC	Programmable logic controller
Supply unit	Supply module(s) under control of one control unit, and related components.
UCU	Type of control unit.
USCA-02	Adapter for installing F-series option modules onto the UCU control unit.
VX25	Enclosure system by Rittal (http://www.rittal.com)

Related documents

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

	Manuals for ACS880 multidrives modules

2

Operation principle and hardware description

Contents of this chapter

This chapter describes the DC/DC-converter operation basics and the hardware of the converter.

Operation principle

The DC/DC-converter unit (DDC) transfers energy from a common DC bus of a drive into an external energy storage and discharges energy back to the DC bus. The energy storage can be, for example, a battery or super capacitor. The energy storage is not included in the DC/DC module product offering.

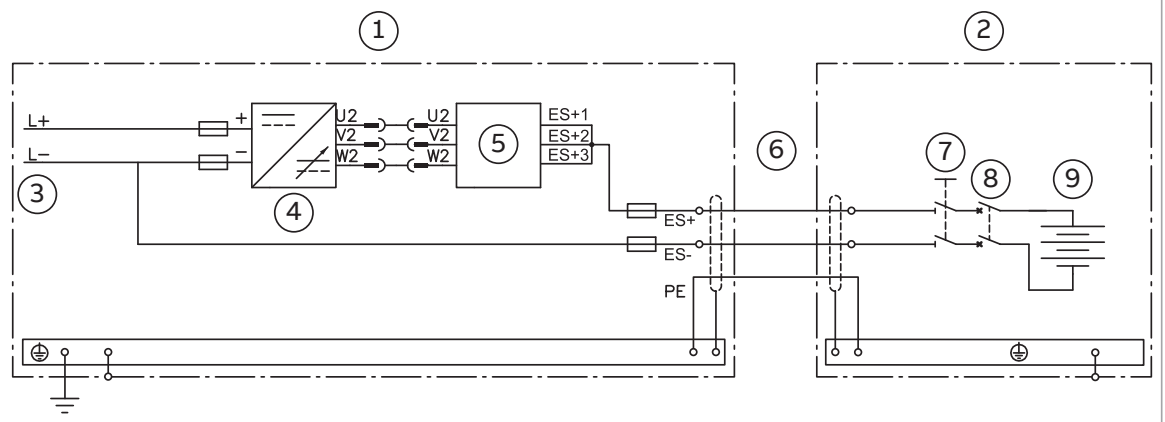
The DC/DC-converter unit has a single converter module or parallel converter modules under the command of one control unit. Parallel DC/DC-converter modules must have a common energy storage. Each parallel module must have the output cabling of its own. ABB also recommends that you use identical cablings (cable type, cross-sectional area, and length) and have identical load for each module. For other solutions, contact ABB.

Typically, the DC/DC-converter is used in marine applications for heave compensation, peak load compensation, propulsion supply in harbors, energy storing instead of an additional generator and so on. The DC/DC-converter can also be used in automotive applications such as electric car charging systems and also in several other applications where energy storing and reuse is needed.

Main circuit diagram

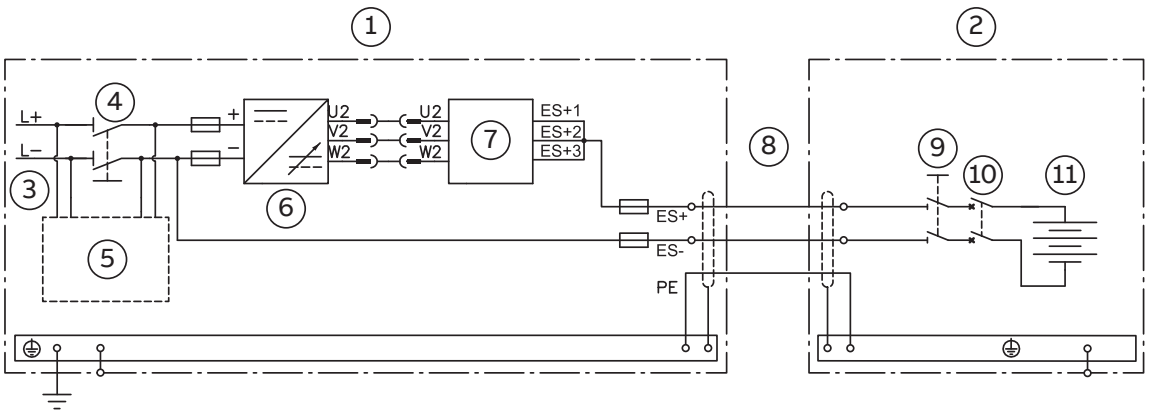
The DC/DC-converter module must be equipped with external DC fuses. You can equip the converter with a DC switch-disconnector, if quick isolation of the module from the DC bus is required.

This figure shows a simplified main circuit diagram of a DC/DC-converter without a DC switch-disconnector or charging circuit.



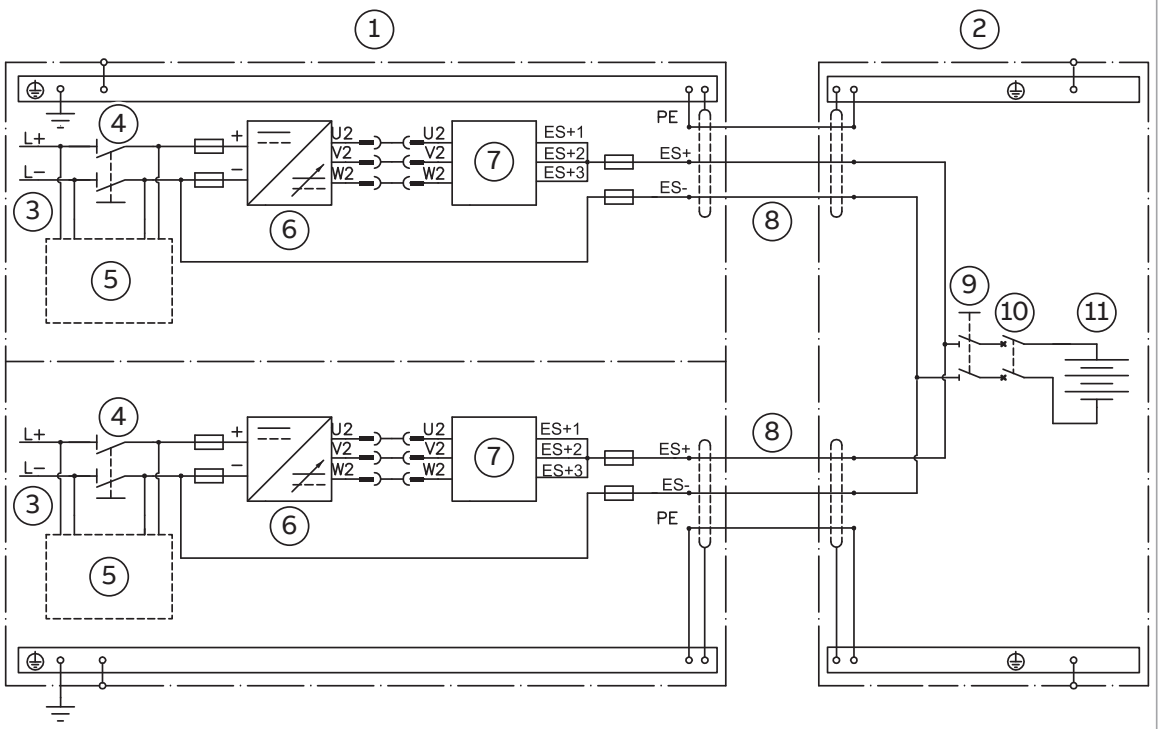
1	DC/DC-converter cubicle
2	Energy storage cabinet
3	Drive DC bus
4	DC/DC-converter module
5	Filter module
6	Cabling between DC/DC-converter unit and energy storage
7	Energy storage disconnecting device
8	Energy storage protective circuit breaker
9	Energy storage

This figure shows a simplified main circuit diagram of a DC/DC-converter with the DC switch-disconnector and charging circuit.



1	DC/DC-converter cubicle
2	Energy storage cabinet
3	Drive DC bus
4	DC switch-disconnector
5	Charging components
6	DC/DC-converter module
7	Filter module
8	Cabling between DC/DC-converter unit and energy storage
9	Energy storage disconnecting device
10	Energy storage protective circuit breaker
11	Energy storage

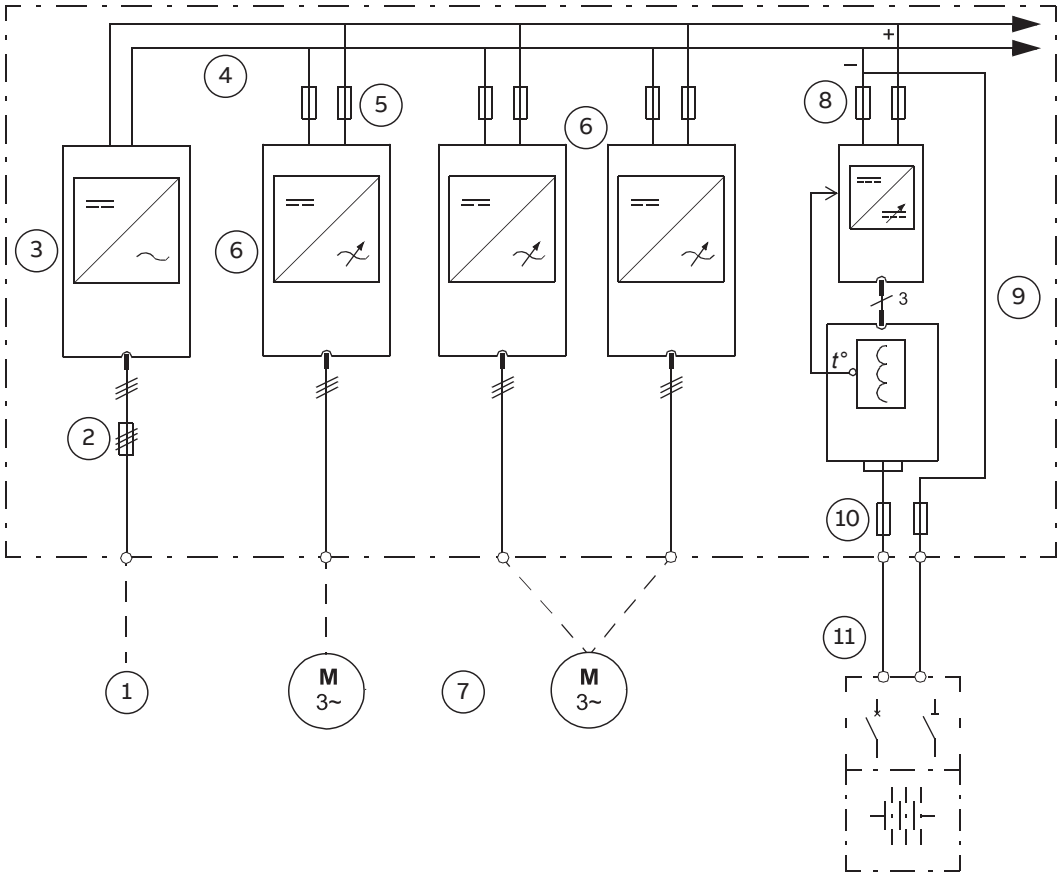
This figure shows a simplified main circuit diagram of parallel-connected DC/DC-converter modules with the DC switch-disconnector and charging circuit. Also the energy storage and related cabling and equipment are visible.



1	DC/DC-converter cubicles
2	Energy storage cabinet
3	Drive DC bus
4	DC switch-disconnector
5	Charging components
6	DC/DC-converter module
7	Filter module
8	Cabling between DC/DC-converter unit and energy storage
9	Energy storage disconnecting device
10	Energy storage protective circuit breaker
11	Energy storage

Overview diagram of a drive with a DC/DC-converter unit

This diagram shows a possible application of a converter unit in an example system. The DC/DC-converter unit includes a DC/DC-converter module and a filter module.

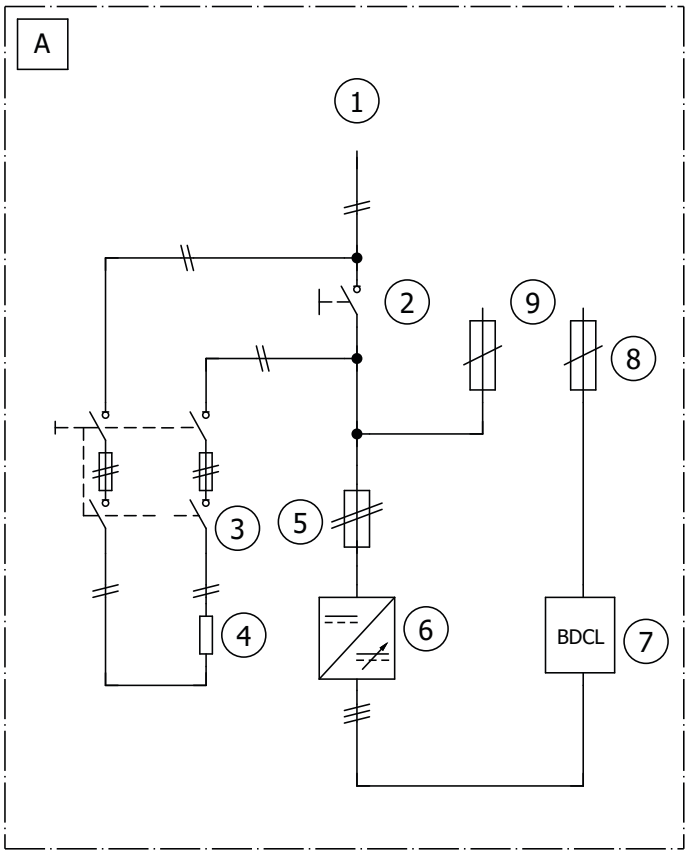


1	AC supply
2	Input (AC) fuses
3	Supply module
4	DC bus (-,+)
5	Inverter DC fuses (with or without a DC switch-disconnector)
6	Inverter modules
7	Motors
8	DC fuses (DC bus side, with or without a DC switch-disconnector)
9	DC/DC-converter unit (converter and filter module)
10	Output DC fuses
11	Customer-defined energy storage with disconnecting and protection devices

Single-line circuit diagram of the DC/DC-converter unit

This figure shows a connection example of a DC/DC-converter unit with one frame R8i module. The connection is the same in both Rittal VX25 and generic enclosures.

The table gives explanations for the numbers and letters of the diagram. It also indicates if customer can order the components from ABB or if the customer needs to acquire them separately.



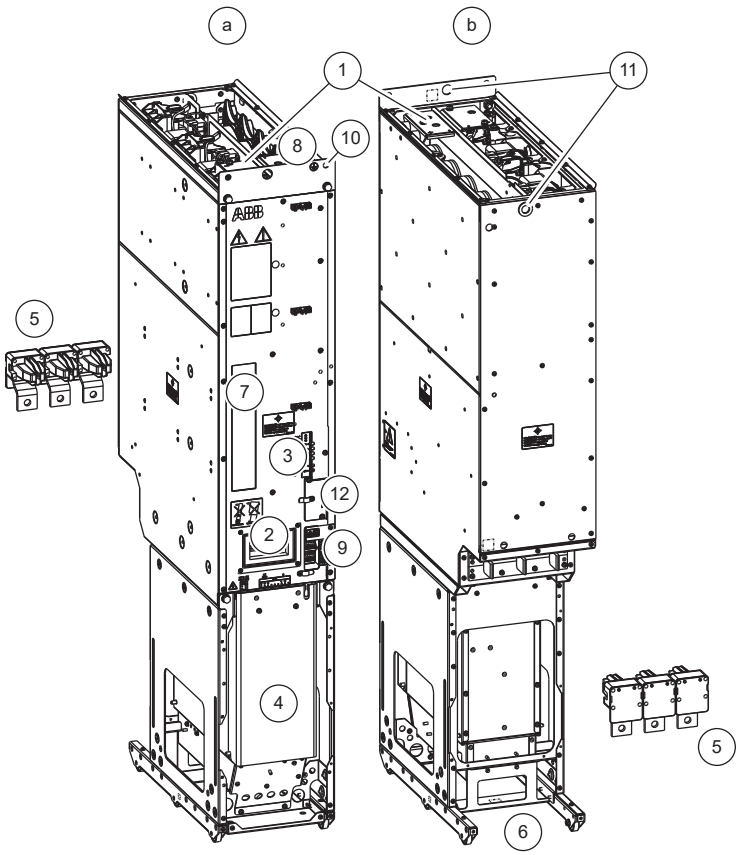
A	DC/DC-converter cubicle
1	DC bus
2	DC switch-disconnector (optional)[1)]
3	Charging switch fuse (optional)[1)]
4	Charging resistors (optional)[1)]
5	DC fuses (DC-bus side)[1)]
6	DC/DC-converter module[2)]
7	Filter module[2)]
8	Output DC fuses[1)]
9	Energy storage connection

1) Available from ABB or third party.
2) Available from ABB.

Converter module hardware

Frame R8i layout

This figure shows the layout of the R8i module.



A	R8i module, front
B	R8i module, back
1	DC busbars
2	Handle
3	LEDs and fiber optic connectors
4	Fan (standard speed-controlled fan shown; a direct-on-line fan is available as option +C188)
5	Quick connector (three phases). The counterpart is fastened to the cabinet behind the module.
6	Wheels
7	Type designation label
8	Terminal block [X50] (power supply for internal boards and module heating element, option +C183; DOL fan supply, option +C188)
9	Connectors [X51], [X52], [X53]
10	The unpainted grounding point (PE) between module frame and cabinet frame.
11	Lifting eyes
12	Circuit board compartment fan

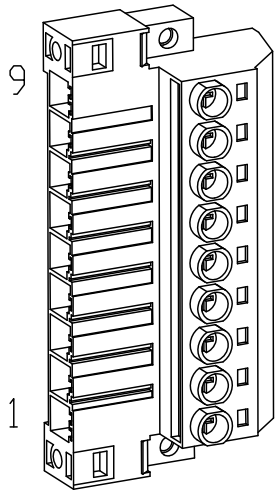
Connectors X50...X53

The cabinet builder must arrange an auxiliary voltage of 230 V AC (or 115 V AC with option +G304) to connector X50 to power the electronics of the power module. Also, the cabinet builder must arrange an auxiliary voltage of 230 V AC to connector X50 to power the main circuit interface board of the module during charging.

There is an internal power supply (BDPS) in the module that produces 24 V DC from the auxiliary voltage for the internal circuit boards. The 24 V DC voltage is available on X53, and it can be used to power the control unit. It is not permitted to use the 24 V DC output on terminal X53 for other purposes than for powering the control unit. An output power of 60 W is available from X53. If the unit consists of parallel-connected R8i modules, ABB recommends that you use an external 24 V DC supply to power the control unit.

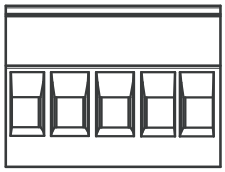
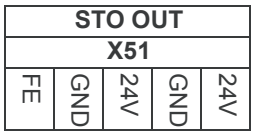
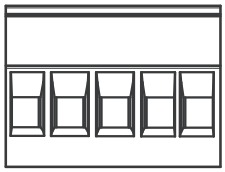
If a direct-on-line fan (option +C188) is used, the installer must connect the fan supply (400 V AC 50 Hz or 60 Hz) to the module control connector [X50.1]. If an internal heating element (option +C183) is used, the installer must connect the supply for the heating element to the module control connector [X50.7].

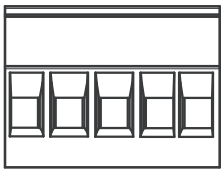
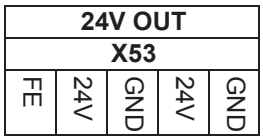
Connector X50



9	Not in use.	
8	N	115/230 V AC (50/60 Hz) input for optional heating element (+C183). The cabinet builder must connect this when the option is in use.
7	L	
6	Not in use.	
5	N	230 V AC 50/60 Hz input for internal power supply (BDPS) (115 V AC 50/60 Hz with option +G304). The cabinet builder must connect this.
4	L	
3	W	400 V AC (50/60 Hz) supply for optional DOL (direct-on-line) cooling fan (option +C188). The cabinet builder must connect this when the option is in use. **Note:** In modules without +C188, the DOL wiring is present but not in use.
2	V	
1	U	

Connectors X51, X52, X53

		X51	STO OUT	Not in use.
		X52	STO IN	STO connectors of the module. Must be connected to 24 V DC for the module to start.

Connectors X51, X52, X53				
		X53	24V OUT	24 V DC for control unit and for STO IN to enable the module operation.
		Note: The Safe torque off (STO) safety function is only implemented in inverter units. Therefore, the STO function cannot be used in supply, rectifier, DC/DC converter and brake units. In these units, de-energizing any connection of STO IN (X52) connector stops the unit. Note that this stop is not safety related and must not be used for safety function purposes.		

Frame R8i hardware

Frame R8i modules are used in single or parallel configurations. R8i modules have wheels, and can easily be removed from the cubicle for cable installation or service.

The quick connector at the back of the module couples when the module is inserted into the cubicle.

Each parallel-connected module is cabled separately, or connected by busbars to adjacent modules to reduce the number of cables.

The internal electronics of the R8i module need to be powered from an external auxiliary voltage source. The R8i speed-controlled cooling fan (delivered as standard) is supplied internally from DC.

If a direct-on-line fan (option +C188) is used, the installer must connect the fan supply (400 V AC / 50/60 Hz or 320 V AC / 60 Hz) to the terminal block [X50].

The control unit of the DC/DC converter controls the direct-on-line fan of the filter. The installer must connect the fan supply to the filter connector [X30].

DC bus connection and capacitor charging

The customer (or the system integrator) must equip the converter unit with input DC fuses and output DC fuses. The customer (or the system integrator) must also equip the energy storage with a protective device (for example, fuses) that protects the energy storage cable in a cable short-circuit or overload situation.

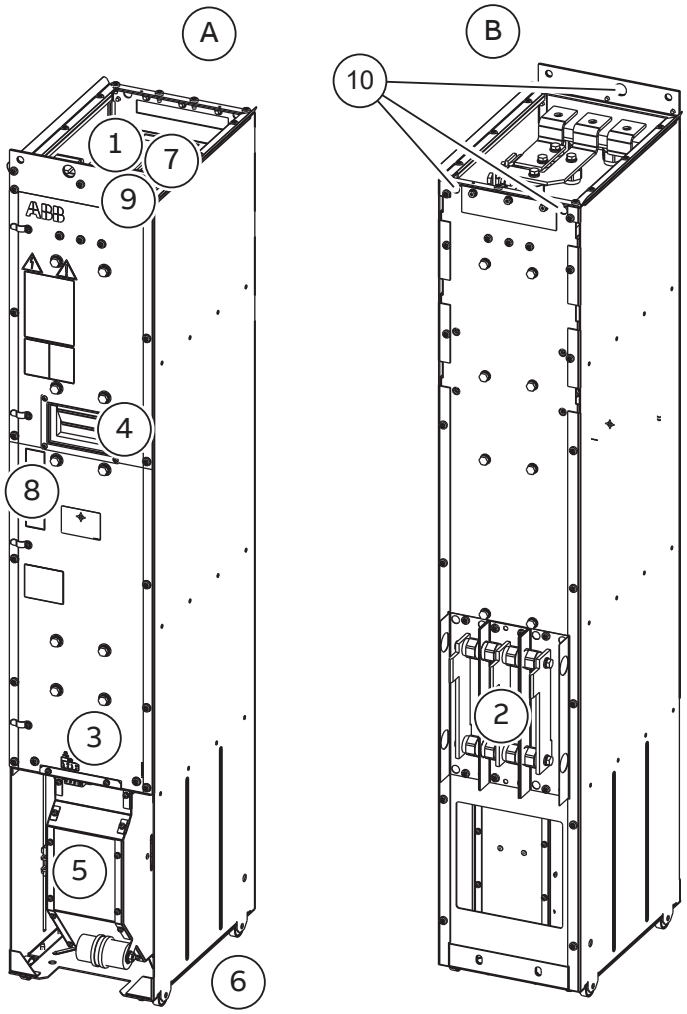
The customer (or the system integrator) can install a DC switch-disconnector if quick isolation of the module from the DC bus is required.

The customer (or the system integrator) must install a capacitor charging circuit, if:

- the converter module is connected to the DC bus through a DC switch-disconnector, or
- the converter unit is directly connected to the DC bus and the supply unit of the system does not have charging circuit capability.

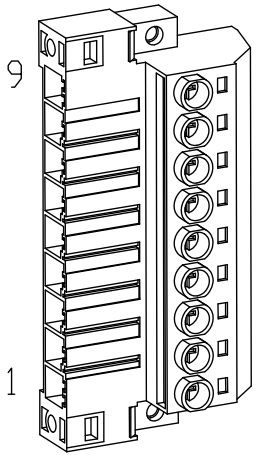
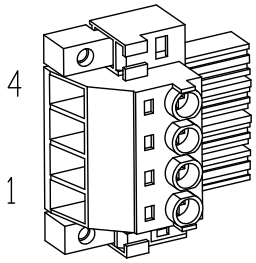
The charging circuit design presented in this manual consists of a charging switch [Q10], resistors [R10] and a charging controller [A11].

BDCL filter module



A	Filter module, front
B	Filter module, back
1	Energy storage connection
2	Converter module connection
3	Terminal block [X55] (DOL fan supply, option +C188) (ready-connected)
4	Handle
5	Fan
6	Wheels
7	Terminal block [X30] (module DOL fan supply, option +C188)
8	Type designation label of the module
9	The unpainted grounding point
10	Lifting eyes

Connectors X30 and X55

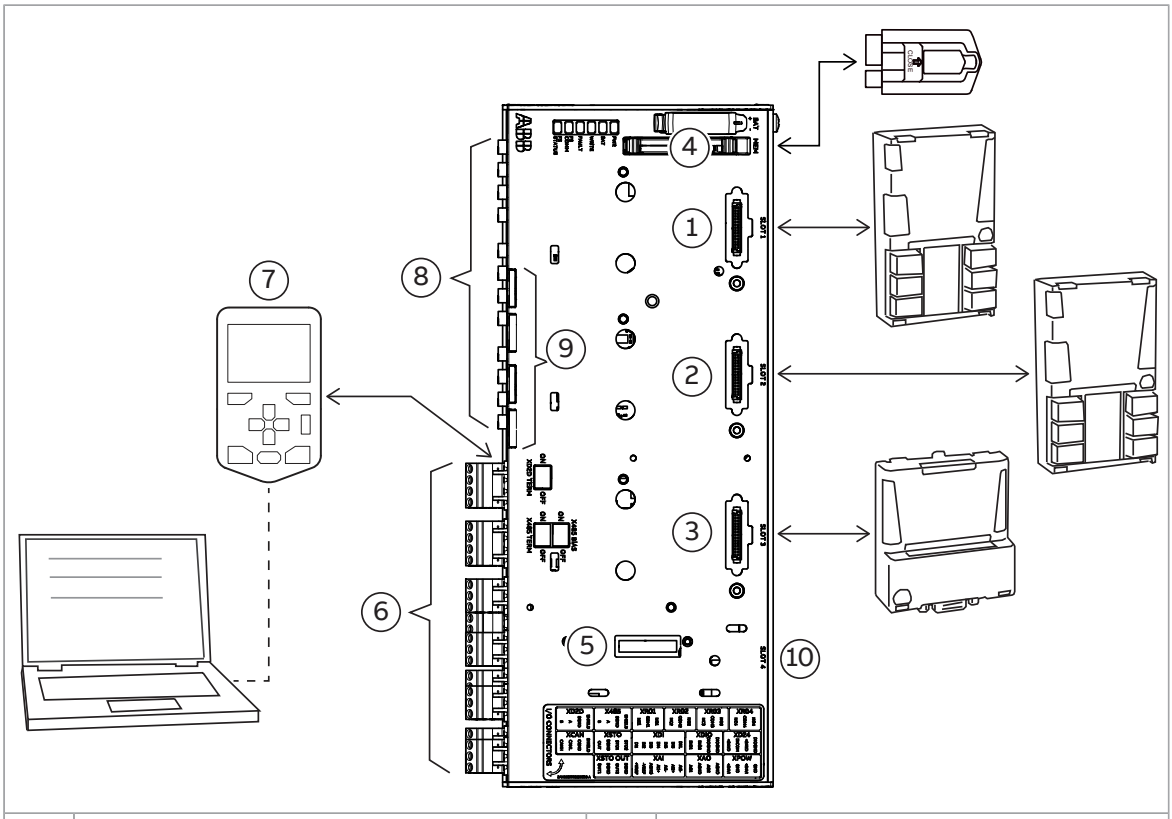
Connector X30		
	9	Not in use
	8	Not in use
	7	Not in use
	6	TP2, thermal cutoff circuit
	5	TP1, thermal cutoff circuit
	4	Not in use
	3	Not in use
	2 1	Customer connection point for the filter fan power supply. **Note:** These terminals are wired further to connector X55:1 and A55:2 internally by ABB.
Connector X55 **Note:** Connections of the connector X55 are ready-made at the factory.		
	4	Not in use
	3	Not in use
	2 1	+C188: DOL fan N +C188: DOL fan L (230 V AC or option +G304: 115 V AC) **Note:** These terminals are wired further to the filter connector X30:1 and X30:2 internally by ABB.

Control unit

DC/DC-converter units use a UCU or BCU control unit. The control unit has inputs, outputs, and slots for option modules. A fiber optic link connects the control unit to each converter module.

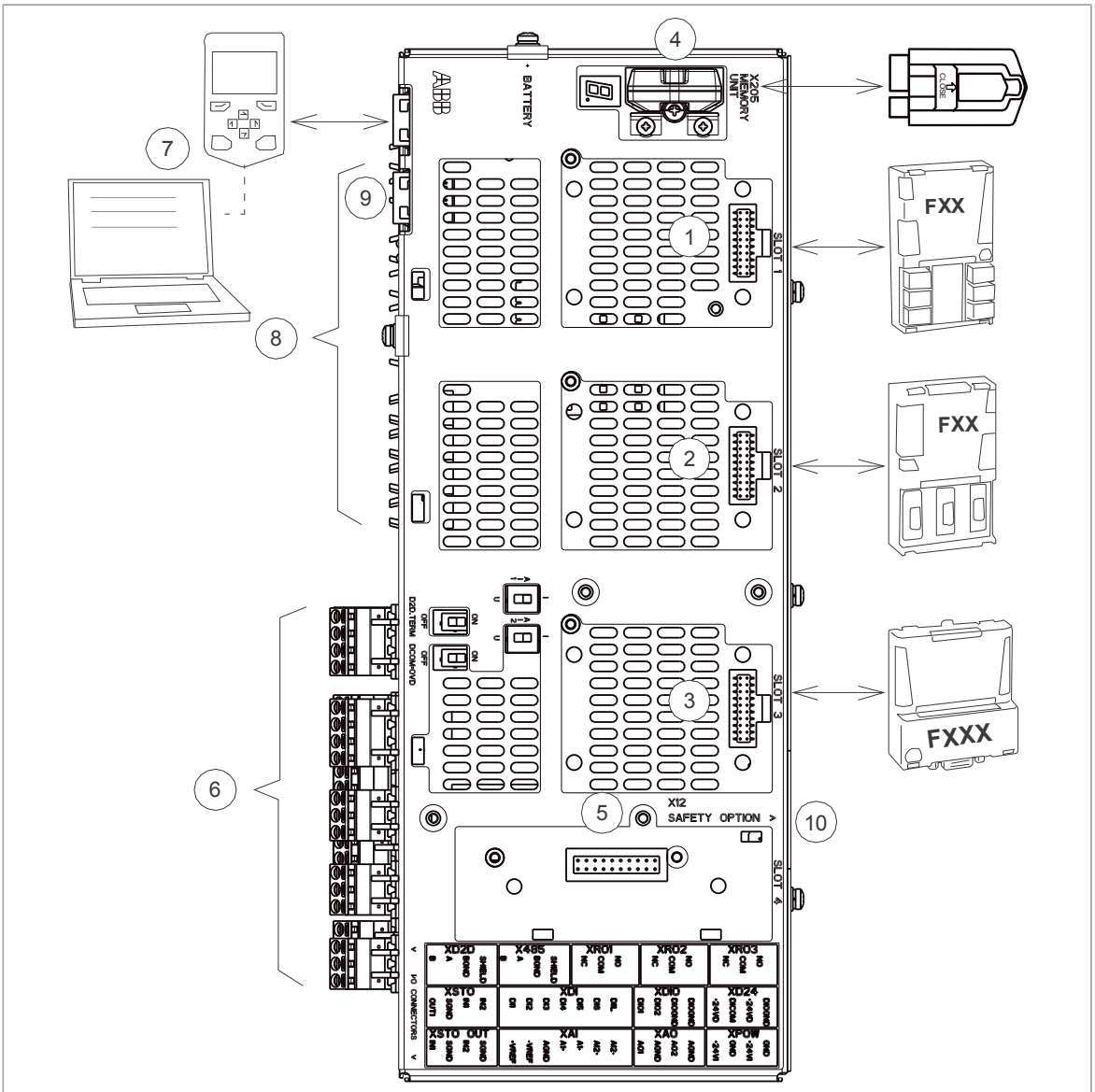
Power to the control unit can be supplied from the module (terminal block X53), from an external 24 V DC power supply, or both for redundancy.

Overview of the control connections of the UCU control unit



1 2 3	Analog and digital I/O extension modules and fieldbus communication modules can be inserted into slots 1, 2 and 3. For F-type modules with USCA-02 adapter.	7	Control panel
4	Memory unit	8	Fiber optic links to power modules (inverter, supply, brake or converter)
5	Slot 4 for RDCO module	9	Ethernet ports
6	Terminal blocks	10	Safety option interface. Reserved for future use.

Overview of the control connections of the BCU control unit



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

Converter unit control devices

DC switch-disconnector

You can equip the DC/DC converter cabinet with DC switch-disconnector [Q11]. A converter unit with a DC switch-disconnector must also have a precharge circuit including a charging switch.

The DC switch-disconnector allows the isolation of the unit from the DC bus. Before the unit is reconnected to the DC bus, you must charge the capacitors of the converter modules through a charging circuit.

WARNING!
You must also switch off the charging switch to disconnect the DC/DC converter from the DC supply. Do not operate the DC switch-disconnector under load.

Charging switch

If the converter is equipped with a DC switch-disconnector, you must equip the converter unit with a charging circuit including a charging switch [Q10]. If you have connected the switches as shown in the example circuit diagrams, close the charging switch first when the converter unit is connected to an energized DC bus. When the charging is completed, close the main DC switch-disconnector and open the charging switch. The converter unit will not start if the charging switch is closed.

WARNING!
You must also switch off the charging switch to disconnect the DC/DC converter from the DC supply.

Door lights

You can install the load disconnected indicator on the cabinet door. This indicator shows the state of the energy storage disconnecting device.

You can install also the charging OK indicator and DC/DC converter disconnected indicator, if the converter is equipped with a DC switch-disconnector.

Control unit

A control unit of type BCU or UCU controls the DC/DC converter module. For more information, refer to the ordering information and the applicable control unit chapter.

Control panel [A49]

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

With the control panel, the user can:

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

PC connection

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

Fieldbus control

You can control the converter unit through a fieldbus interface if the unit is equipped with an optional fieldbus adapter, and when you have configured the control program for the fieldbus control with parameters. For more information on parameters, see ACS880 DC/DC converter control program firmware manual (3AXD50000024671 [English]).

BAMU voltage/current measurement unit

You can equip the converter with a BAMU voltage/current measurement unit. For more information, see BAMU-12C auxiliary measurement unit hardware manual (3AXD50000117840 [English]).

CIO-01 I/O module

You can equip the converter with a CIO-01 I/O module. For more information, see CIO-01 I/O module for distributed I/O bus control user's manual (3AXD50000126880 [English]).

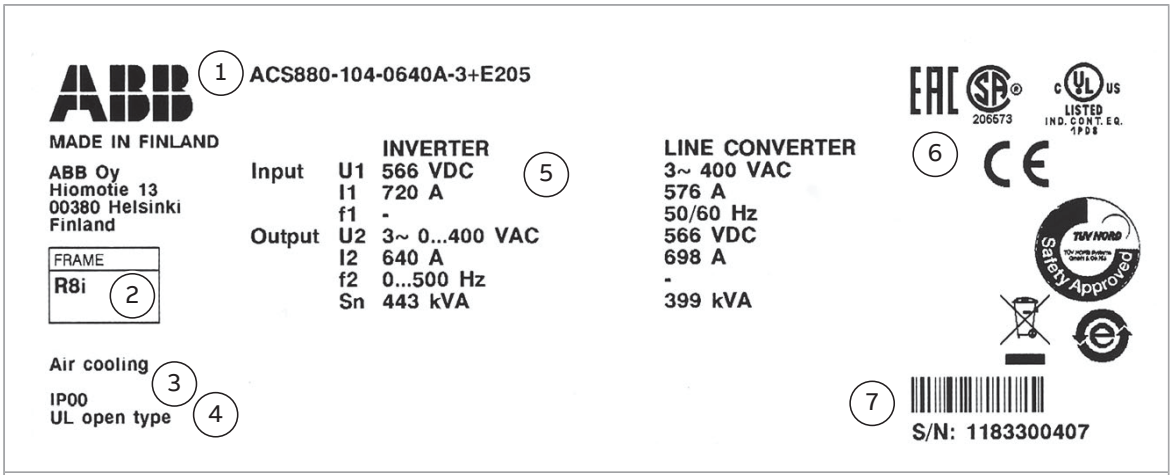
Type designation labels

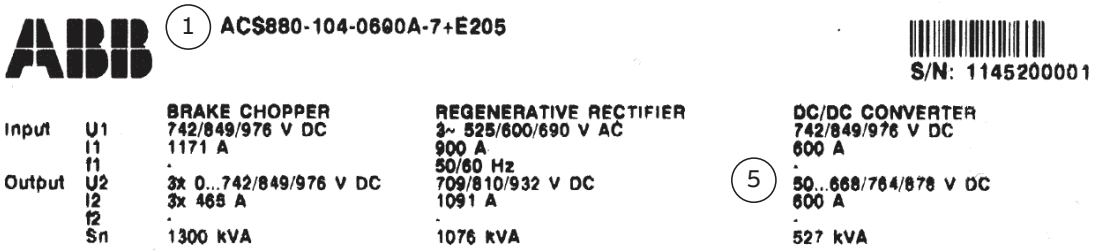
Type designation labels of the DC/DC-converter module

Each DC/DC-converter module has type designation labels attached to it. The type designation stated on the labels contains information on the specifications and configuration of the module.

Quote the complete type designation and serial number when contacting technical support on the subject of individual DC/DC-converter modules.

Example labels are shown below.





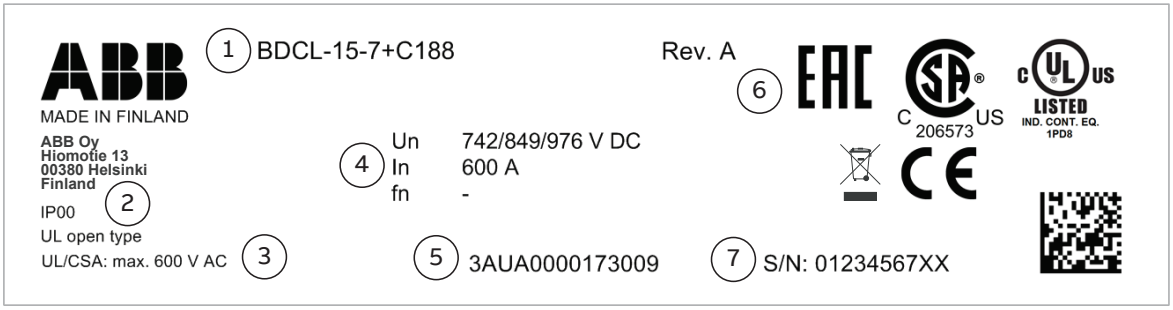
1	Type designation
2	Frame size
3	Degree of protection
4	UL/CSA data
5	Ratings
6	Valid markings. Refer to ACS880 multidrives cabinets and modules electrical planning instructions (3AUA0000102324 [English]).
7	Serial number. The first digit of the serial number refers to the manufacturing plant. The next 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 label of the BDCL filter module

Each filter module has a type designation label attached to it.

Quote the complete type designation and serial number when contacting technical support on the subject of individual filter modules.

An example label is shown below.



No.	Description
1	Type designation
2	Degree of protection
3	UL/CSA data
4	Ratings
5	Code of the filter
6	Valid markings. See ACS880 multidrives cabinets and modules electrical planning instructions (3AUA0000102324 [English]).
7	Serial number. The first digit of the serial number refers to the manufacturing plant. The next four digits refer to the unit's manufacturing year and week, respectively. The remaining digits complete the serial number so that there are no two units with the same number.

Type designation key

Type designation key of the converter module

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

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

The subcodes are described below.

Code	Description
Basic codes	
ACS880	Product series
104	Construction: Inverter, supply, converter or brake module.

Code	Description
Size	
xxxxx	Refer to the ratings table in the technical data.
Voltage range	
3	DC voltage corresponding AC input voltages 3 ~ 380…415 V. This is indicated in the type designation label as typical input voltage level 566 V DC.
5	DC voltage corresponding AC input voltages 3 ~ 380…500 V. This is indicated in the type designation label as typical input voltage level 566/679/707 V DC.
7	DC voltage corresponding AC input voltages 3 ~ 525…690 V. This is indicated in the type designation label as typical input voltage level 742/849/976 V DC (849 V DC for UL/CSA).
Option codes (plus codes)	
C129	UL Listed (evaluated to both U.S. and Canadian safety requirements)
C132	Marine type approval
C134	CSA approved
C188	Direct-on-line (DOL) cooling fan
C209	Marine product certification issued by Bureau Veritas
E205	Internal d*u*/d*t* filtering
G304	115 V auxiliary voltage supply
P904	Extended warranty (30 months from delivery or 24 months from commissioning)
P909	Extended warranty (42 months from delivery or 36 months from commissioning)
P911	Extended warranty (66 months from delivery or 60 months from commissioning)
V112	Module auxiliary and fan power supply connector change

Type designation key of the filter module

The type designation contains information on the specifications and configuration of the filter module. The digits express the module type. The optional selections are given thereafter, separated by plus signs.

Code	Description
Basic code	
BDCL-14	BDCL-14 filter
BDCL-15	BDCL-15 filter
Voltage range	
5	DC voltage corresponding AC input voltages 3 ~ 380…500 V. This is indicated in the type designation label as typical input voltage level 566 / 679 / 707 V DC.
7	DC voltage corresponding AC input voltages 3 ~ 525…690 V. This is indicated in the type designation label as typical input voltage level 742 / 849 / 976 V DC.
Option codes	
C188	Direct-on-line (DOL) cooling fan (included in the delivery as standard)
G304	115 V auxiliary voltage supply
V112	Module auxiliary and fan power supply connector version. Type of the connector is not mechanically backwards compatible with a module without option +V112.

3

Moving and unpacking the module

Contents of this chapter

This chapter gives basic information on moving, unpacking and lifting the modules.

Moving and lifting the transport package

Move the transport package by a pallet truck or lift. Lift the transport package in a horizontal position. Use soft lifting slings.

Unpacking

The module is delivered on a wooden base, boxed in corrugated cardboard. The cardboard box is tied to the base with PET bands.

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

1. Cut off the bands.
2. Lift off the cardboard box.
3. Remove any filling material.
4. Cut open the plastic wrapping of the module.
5. Lift off the module.
6. Check that there are no signs of damage.

Dispose of or recycle the packaging according to the local regulations.

Lifting the unpacked modules

Lift the unpacked module only by its lifting eyes.

Moving the unpacked modules

WARNING!
For general safety instructions for moving the module, refer to ACS880 multidrives cabinets and modules safety instructions (3AUA0000102301 [English]).

4

Cabinet construction

Contents of this chapter

This chapter gives instructions on how to install the modules and additional equipment into a cabinet.

For general instructions, see Drive modules cabinet design and construction instructions (3AUA0000107668 [English]).

Limitation of liability

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

- **North America**

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

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

Energy storage

Obey the instructions of the energy storage manufacturer.

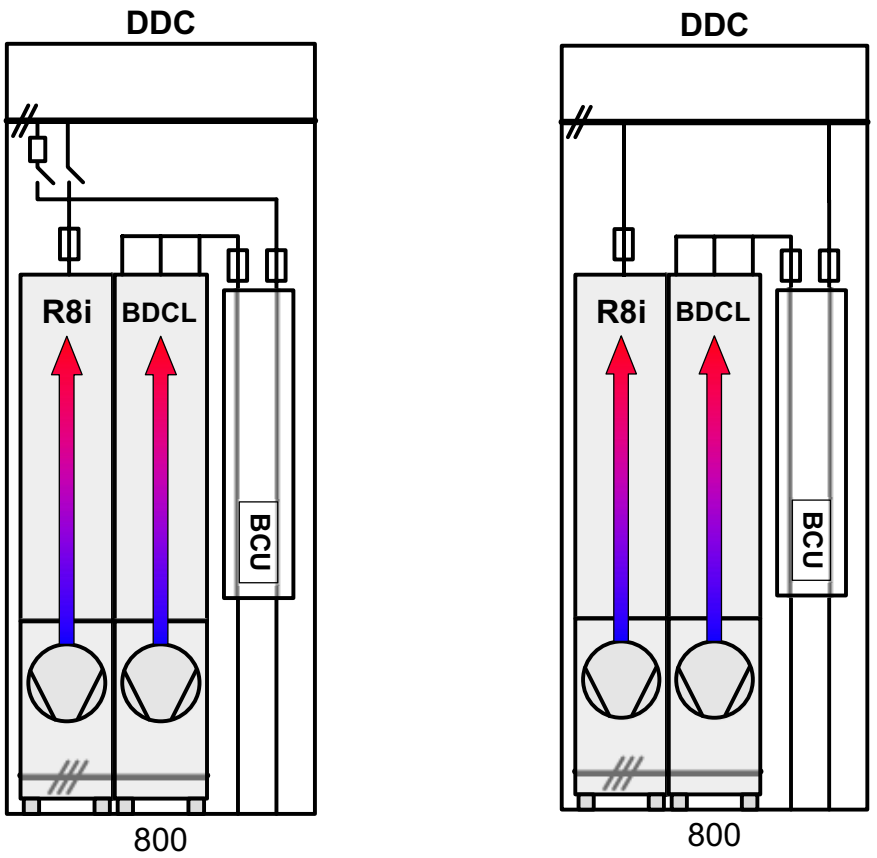
Cooling and mounting orientations

For free space requirements, cooling information and allowable mounting orientations, see the technical data.

Cabinet configuration overview

ACS880-1604 configuration in Rittal VX25 and generic enclosure

This figure shows the ACS880-1604 DC/DC-converter configuration that can be installed in the Rittal VX25 and generic enclosures. The figure shows the converter with a DC switch-disconnector solution and without the DC switch-disconnector.



BCU	BCU control unit
BDCL	BDCL filter
DDC	DC/DC-converter unit
R8i	DC/DC module (frame R8i)

Installation examples

This section contains cabinet construction example(s). Each example presents the cubicle with the power module(s) and related main circuit components. These examples do not show the installation and connections of the control unit, or other components in control circuit or auxiliary power supply circuit.

Each example includes a table that lists:

- installation stages of different equipment in the order in which the installation into the enclosure should be done
- instruction code of the step-by-step instructions
- equipment kit code
- kit ordering code.

You can find the kit-specific assembly drawings, step-by-step instructions and kit information on the Internet. Go to https://sites-apps.abb.com/sites/lvacdrivesengineeringsupport/content. If needed, contact your local ABB representative.

The example includes also cabinet assembly drawings that show each stage listed in the table. More detailed steps of each stage are described in the kit-specific assembly drawings. The tightening torques are listed in the kit-specific assembly drawings and in the technical data in the hardware manual.

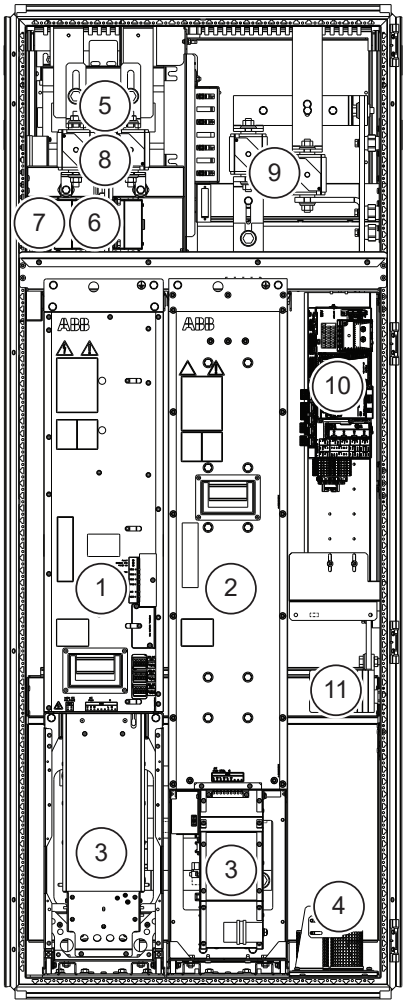
For general instructions, see Drive modules cabinet design and construction instructions (3AUA0000107668 [English]).

WARNING!
Remove the code labels attached to mechanical parts such as busbars, shrouds and sheet metal parts before installation. They may cause bad electrical connections, or, after peeling off and collecting dust in time, cause arcing or block the cooling air flow.

1×R8i DDC unit in a 800 mm wide Rittal VX25 enclosure

Layout with DC switch-disconnector and charging

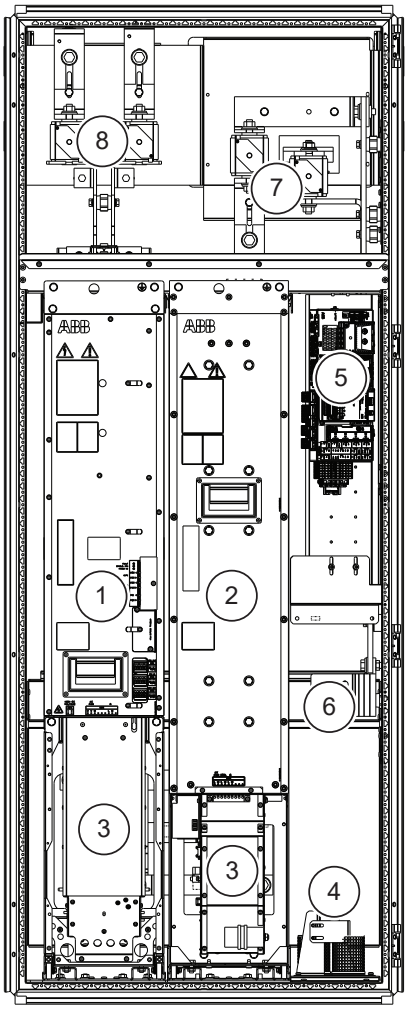
This figure shows an example of the DC/DC-converter unit in the Rittal VX25 enclosure. The unit includes an R8i DC/DC-converter module, a BDCL filter module, bottom cable entries for the energy storage connection, DC switch-disconnector and charging components.



1	R8i DC/DC-converter module
2	BDCL filter module
3	Module cooling fan
4	Cable entries for energy storage cables
5	DC switch-disconnector
6	Charging switch
7	Charging controller
8	Converter DC fuses (on the drive DC bus side)
9	Output DC fuses (for the energy storage connection)
10	Control unit
11	Energy storage connection

Layout without DC switch-disconnector and charging

This figure shows an example of the DC/DC-converter unit in the Rittal VX25 enclosure without DC switch-disconnector and charging. The unit includes an R8i DC/DC-converter module, a BDCL filter module and bottom cable entries for the energy storage connection.

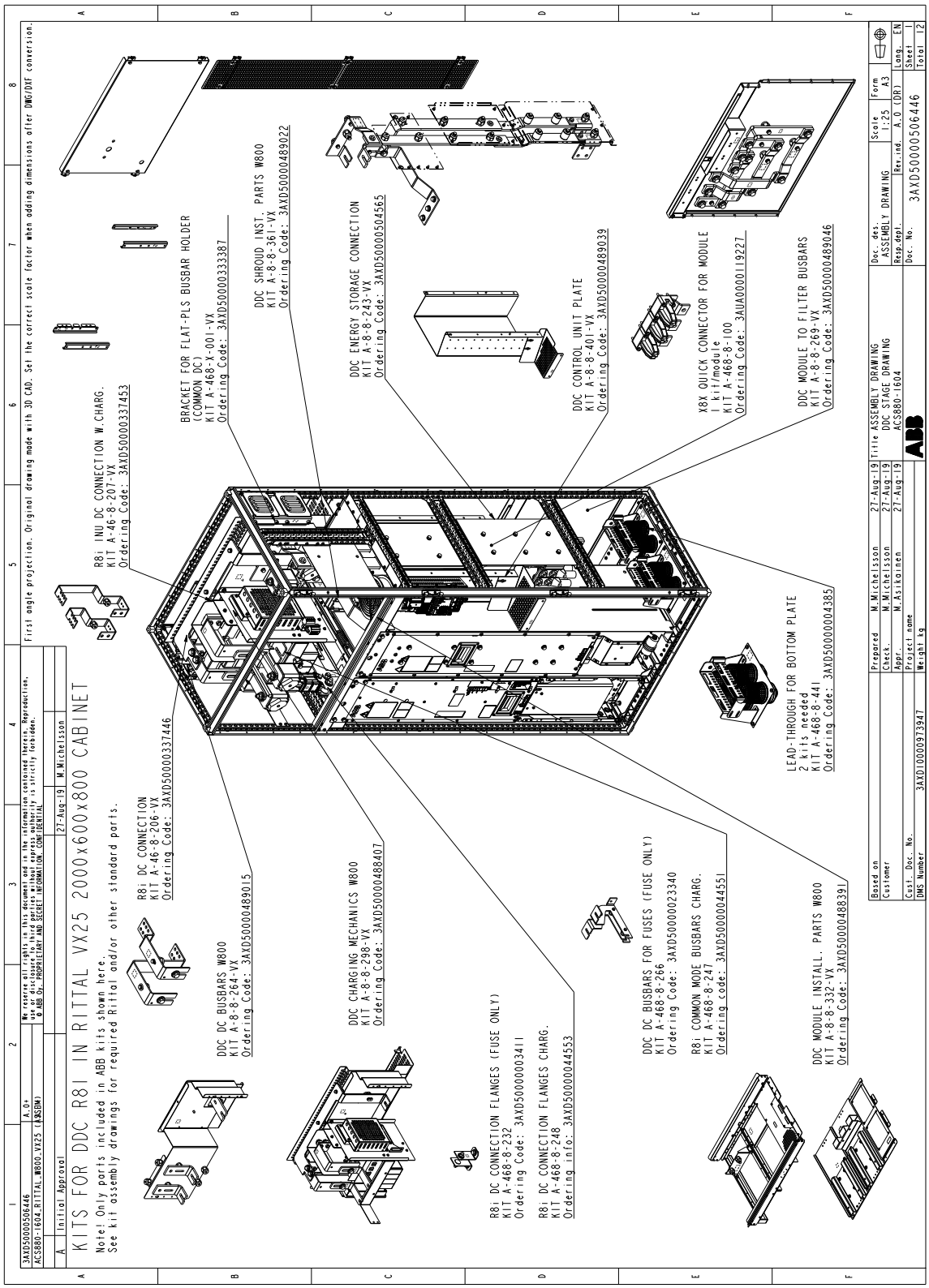


1	R8i DC/DC-converter module
2	BDCL filter module
3	Module cooling fan
4	Cable entries for energy storage cables
5	Control unit
6	Energy storage connection
7	Output DC fuses (for the energy storage connection)
8	DC fuses (DC bus side, fuses for R8i DC/DC module connection)

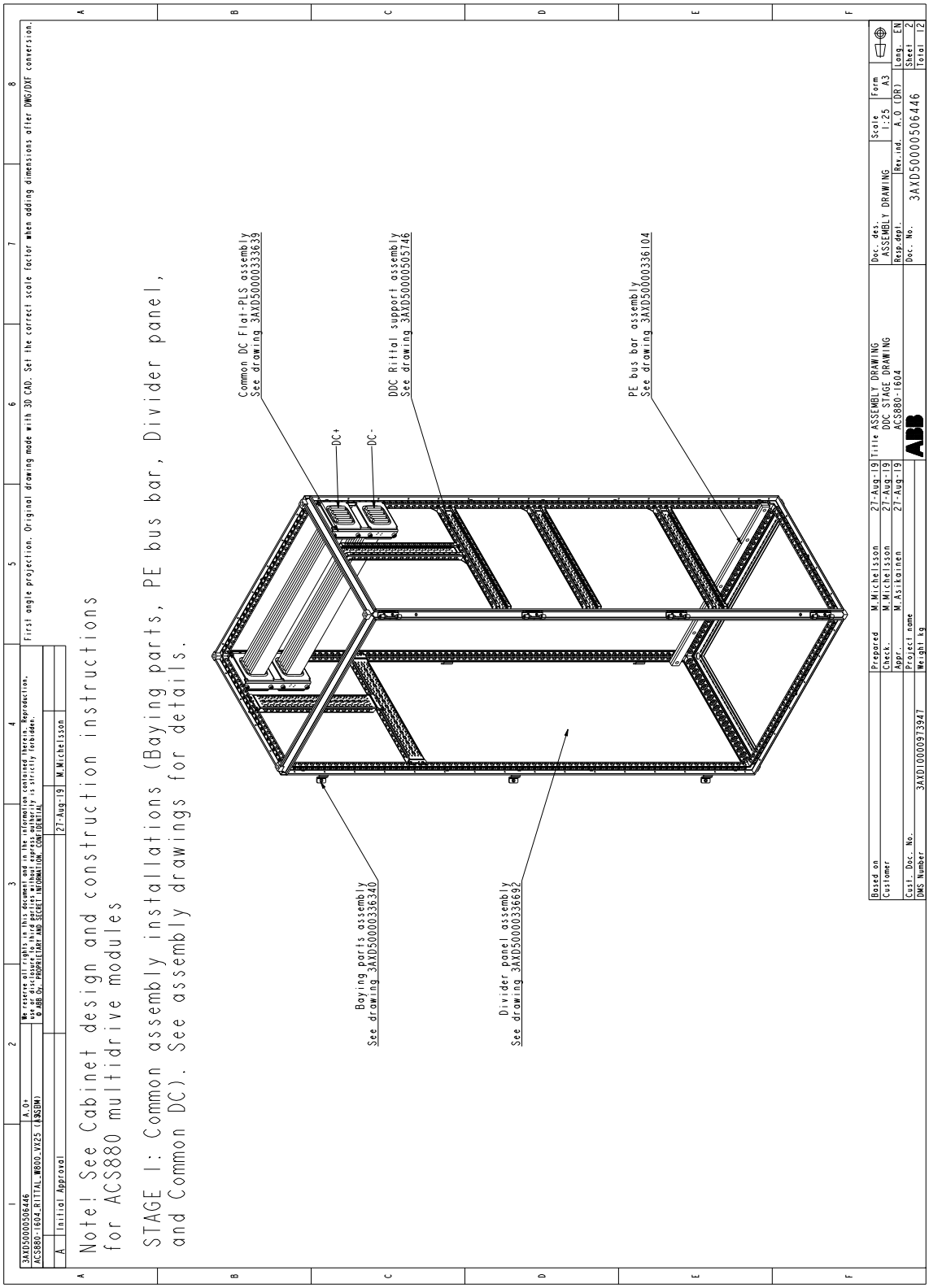
Installation stages

#	Installation stages	Instruction code	Kit code	Kit ordering code
1.	Installation of common parts:			
	Baying parts	3AXD50000336340	-	-
	PE busbar [PE]	3AXD50000336104	-	-
	Divider panel	3AXD50000336692	-	-
	Common DC Flat-PLS assembly	3AXD50000333639	A-468-X-001-VX	3AXD50000333387
	DDC Rittal support assembly	3AXD50000505746	-	-
2.	Module installation parts	3AXD50000482122	A-8-8-332-VX	3AXD50000488391
	Bottom cable entry	3AXD50000004817	A-468-8-441	3AXD50000004385
3.	Busbars for connecting DDC module and filter	3AXD50000482290	A-8-8-269-VX	3AXD50000489046
	Quick connectors	3AUA0000118667	A-468-8-100	3AUA0000119227
4A	DC connection with DC switch-disconnector and charging			
	Charging mechanics	3AXD50000482955	A-8-8-298-VX	3AXD50000488407
	Busbars	3AXD50000345458	A-46-8-207-VX	3AXD50000337453
4B	DC connection without DC switch-disconnector and charging			
	DC busbar mounting plate	3AXD50000485116	A-8-8-264-VX	3AXD50000489015
	Busbars	3AXD50000345915	A-46-8-206-VX	3AXD50000337446
5A	DC connection with DC switch-disconnector and charging			
	DC busbars	3AXD50000043411	A-468-8-247	3AXD50000044551
	L-shaped DC busbars	3AXD50000043466	A-468-8-248	3AXD50000044553
5B	DC connection without DC switch-disconnector and charging			
	DC busbars	3AXD50000023463	A-468-8-266	3AXD50000023340
	L-shaped DC busbars	3AXD50000003403	A-468-8-232	3AXD50000003411
6.	DDC and energy storage connection	3AXD50000488773	A-8-8-243-VX	3AXD50000504565
7.	Control unit mounting plate	3AXD50000505814	A-8-8-401-VX	3AXD50000489039
8.	DDC shroud installation	3AXD50000491865	A-8-8-361-VX	3AXD50000489022
9.	DDC module and filter installation	-	-	-

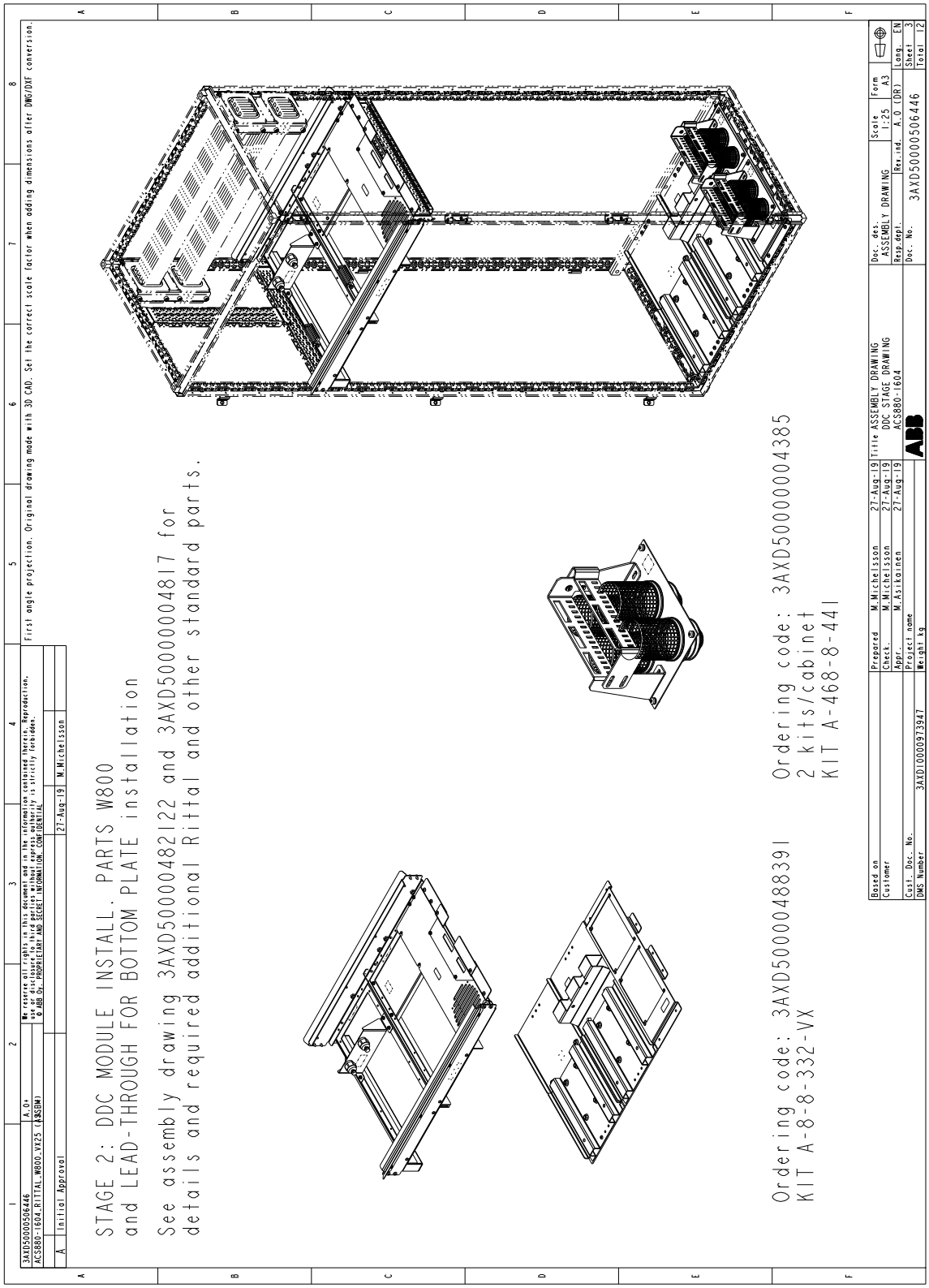
Kits for DDC R8i unit in 800 mm Rittal VX25 enclosure



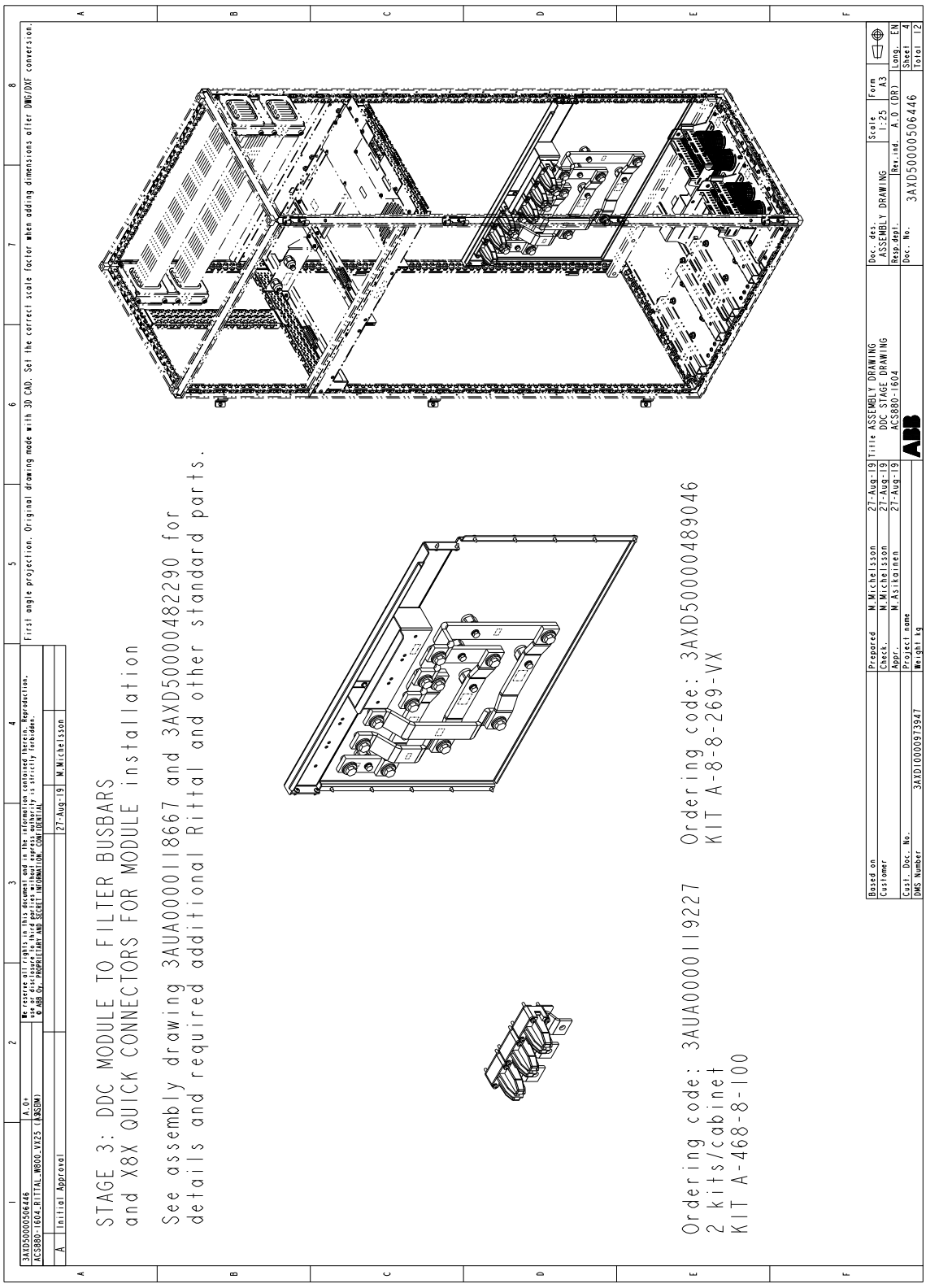
Stage 1: Installation of common parts



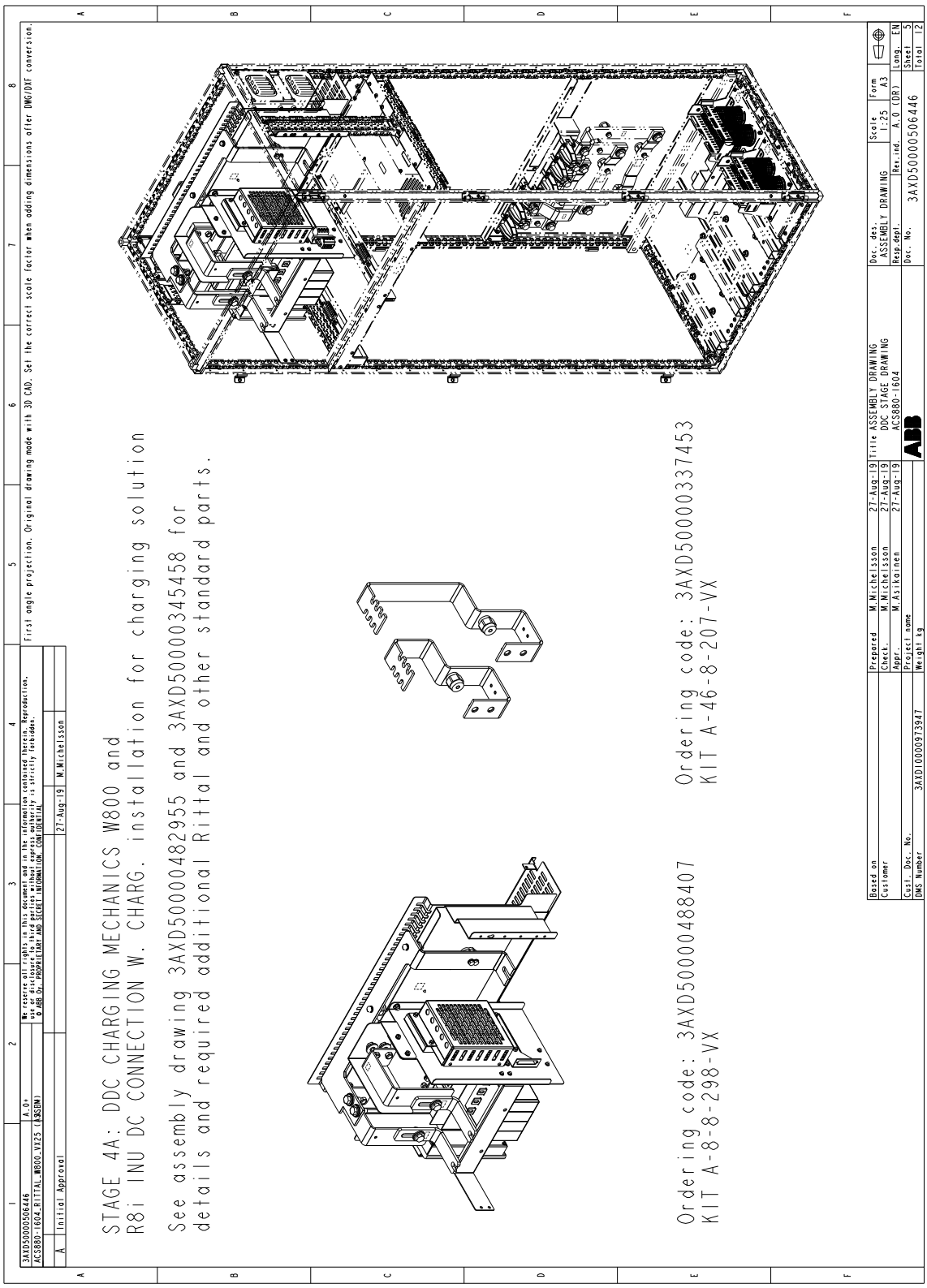
Stage 2: Module and bottom cable entry installation parts



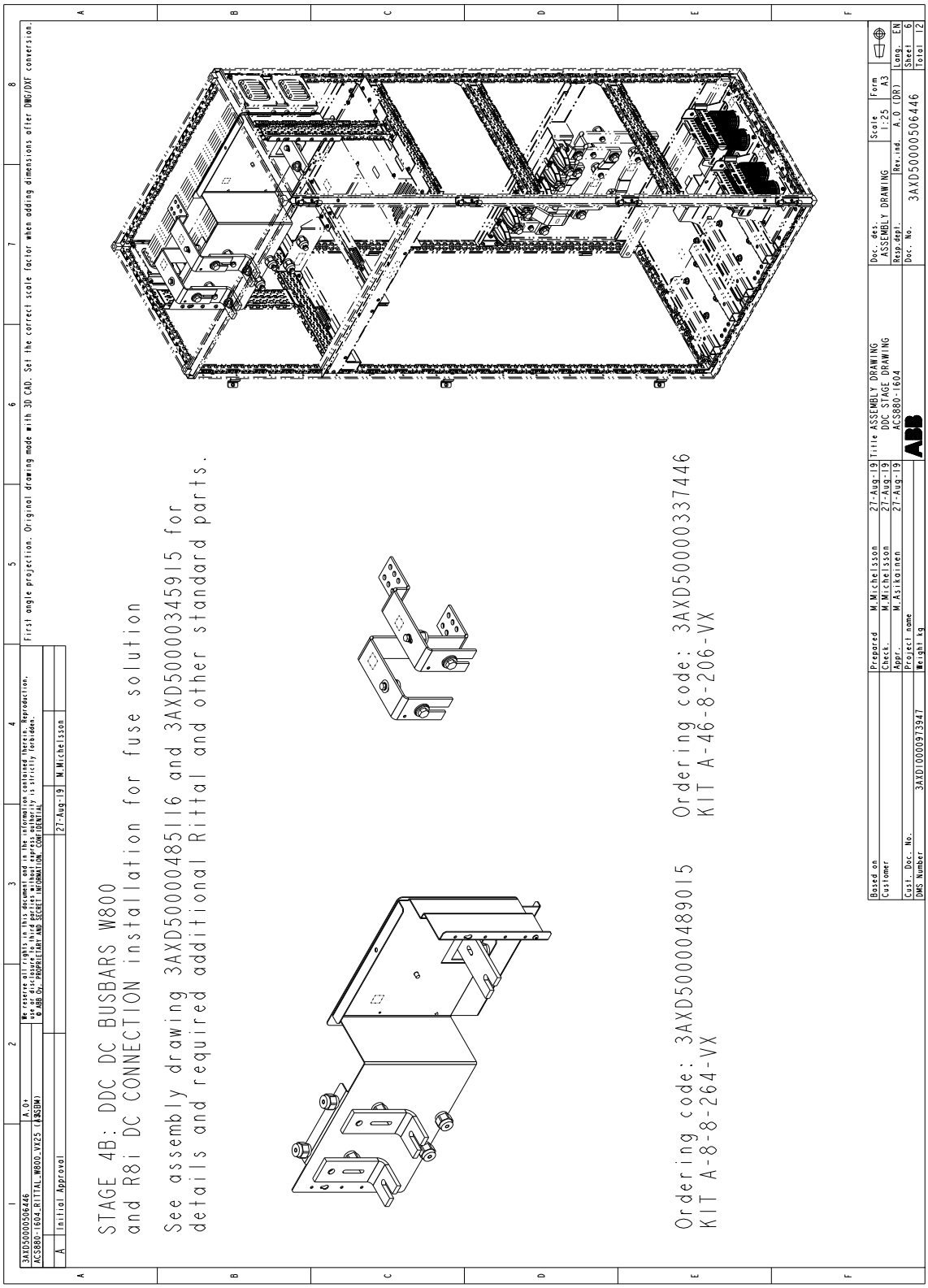
■ Stage 3: Busbars and quick connectors for connecting DDC module and filter



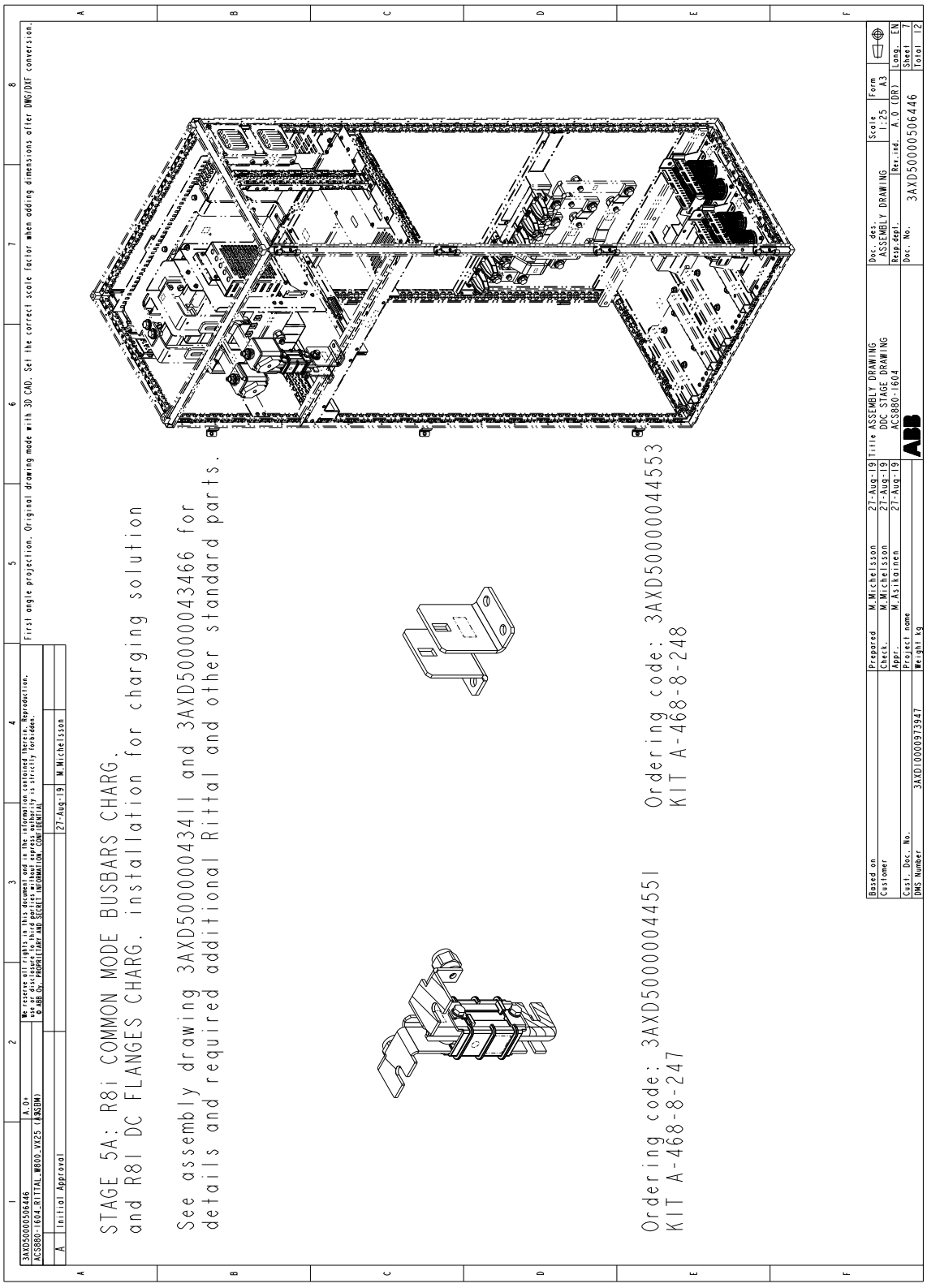
Stage 4A: DC connection with charging



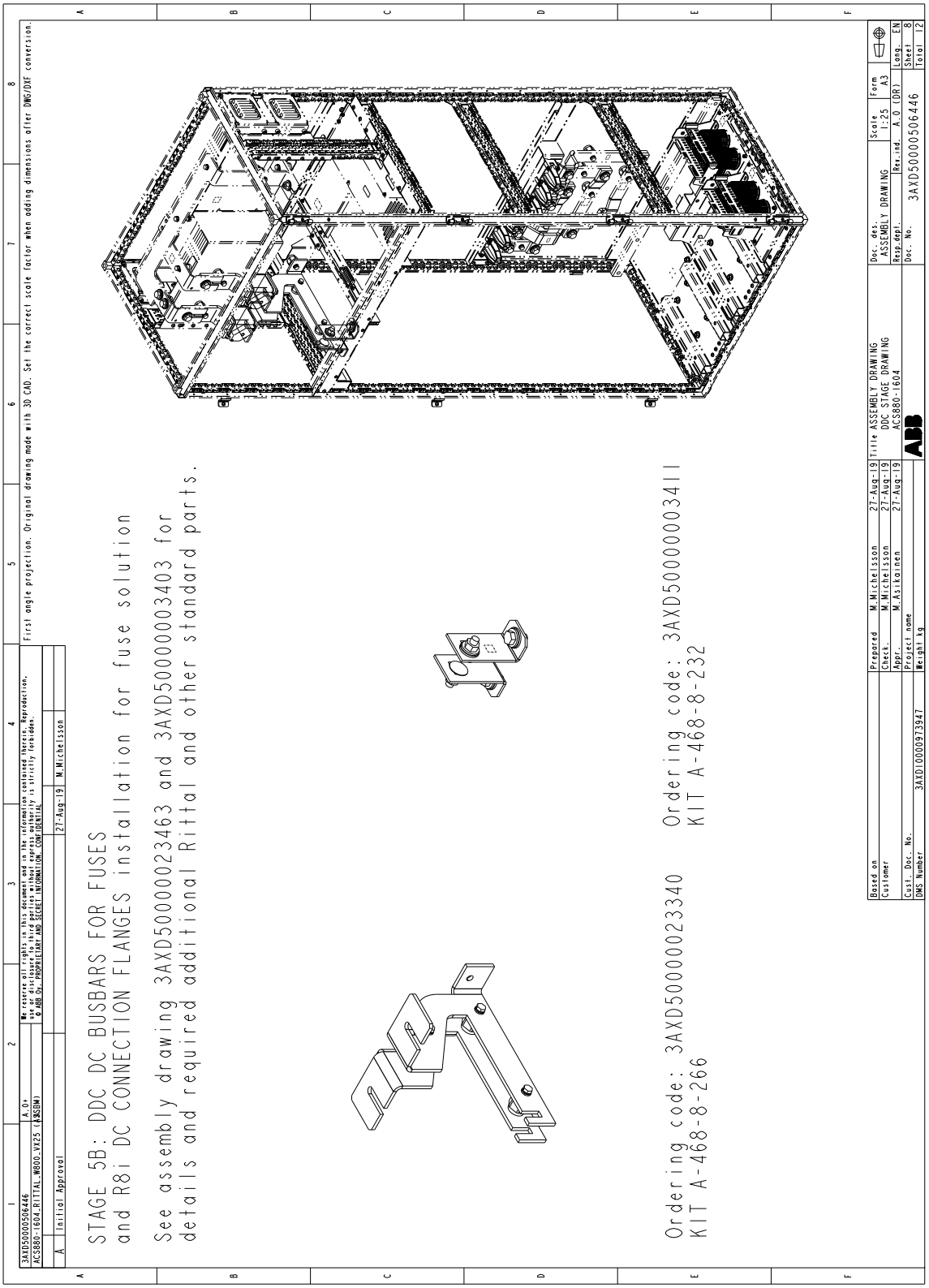
Stage 4B: DC connection without charging



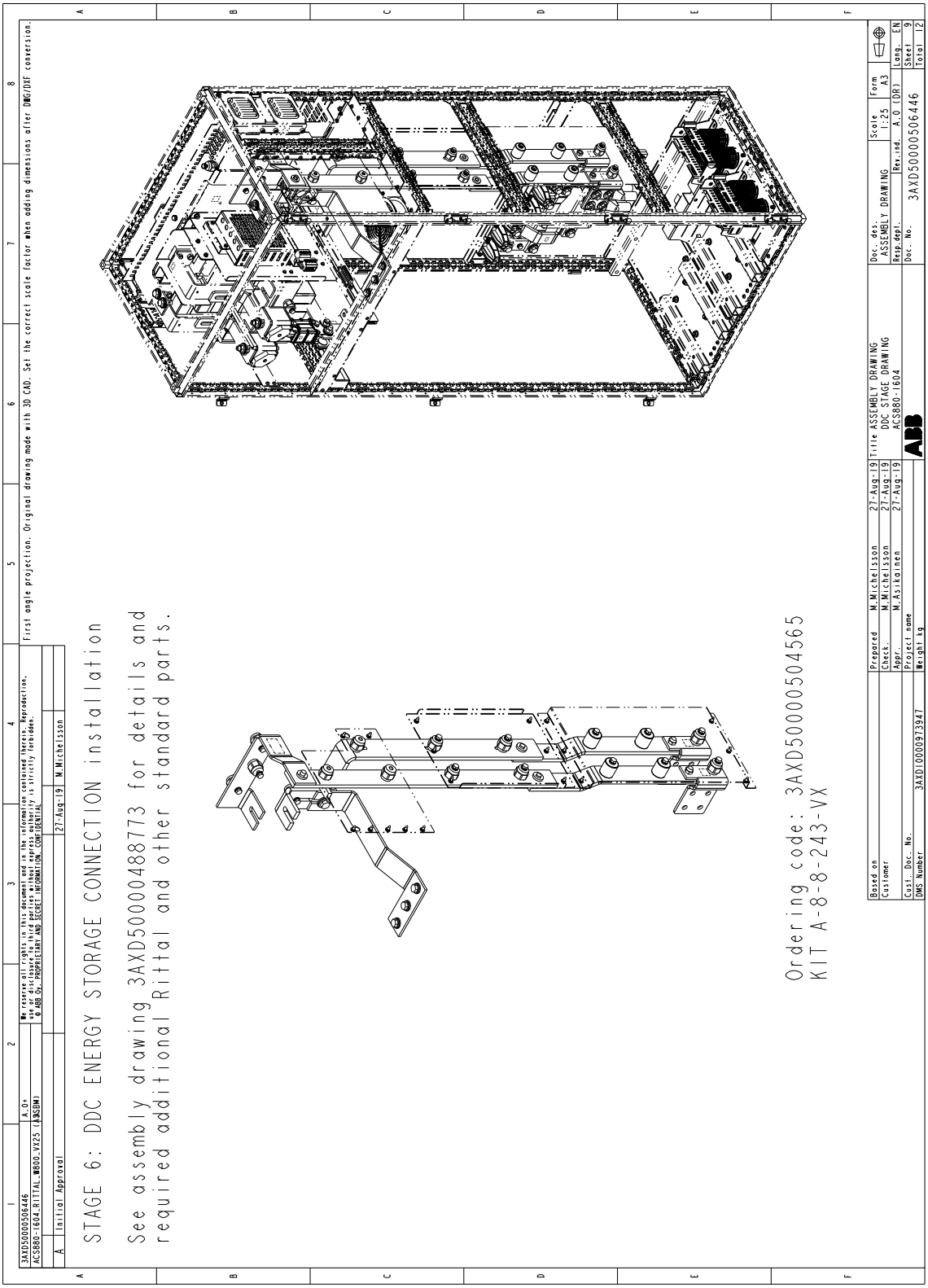
Stage 5A: DC connection with charging



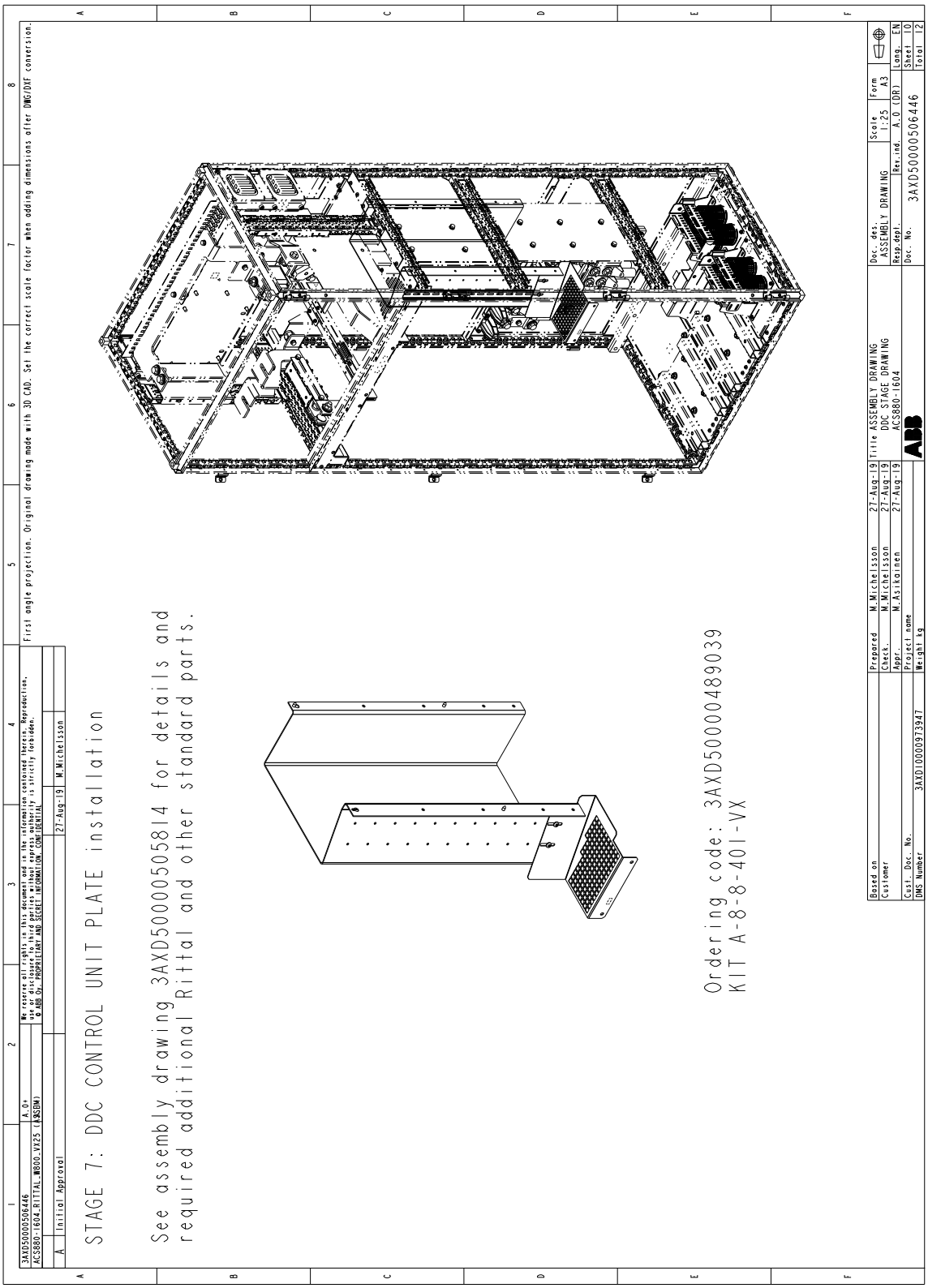
Stage 5B: DC connection without charging



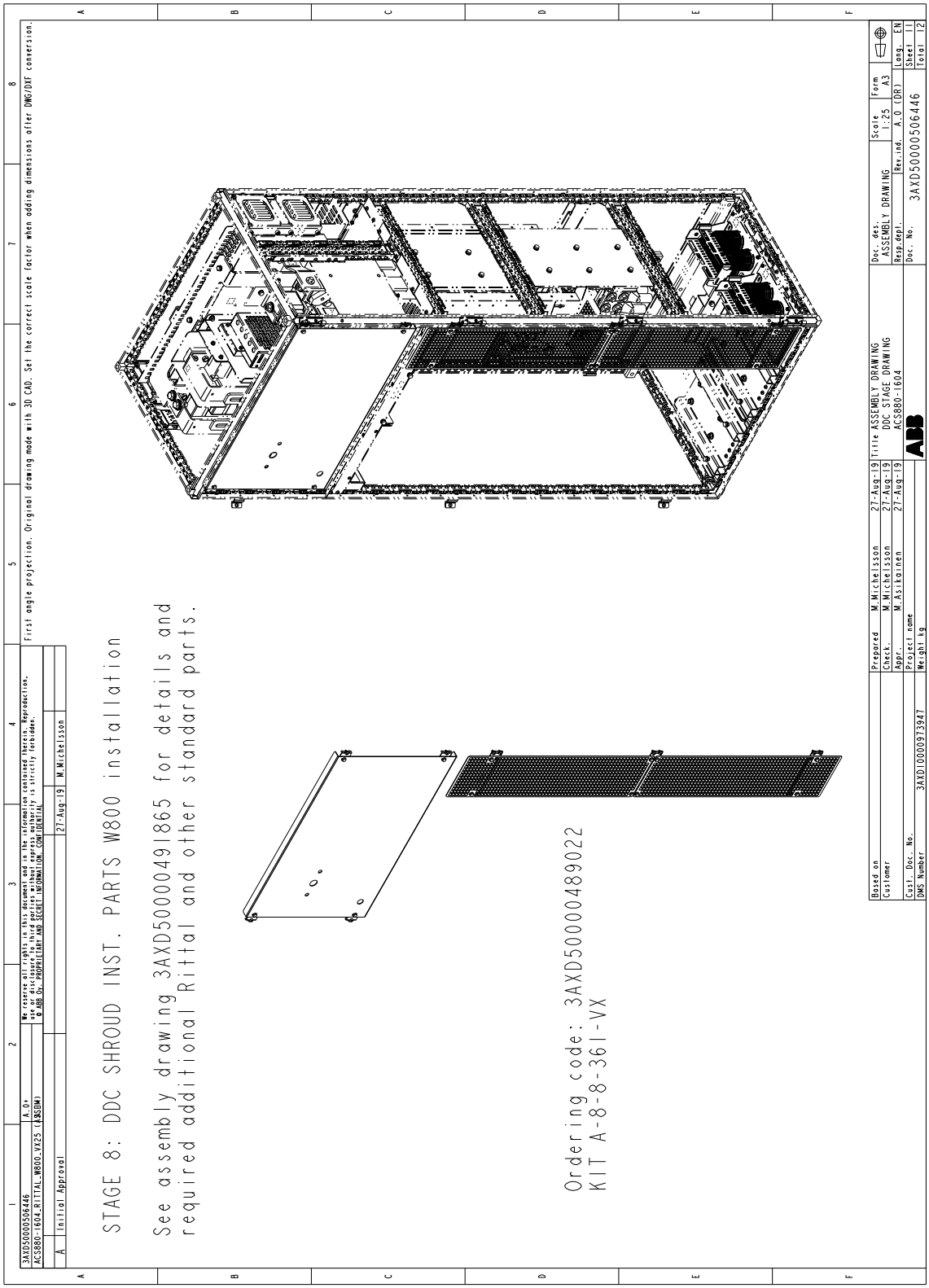
Stage 6: DDC and energy storage connection



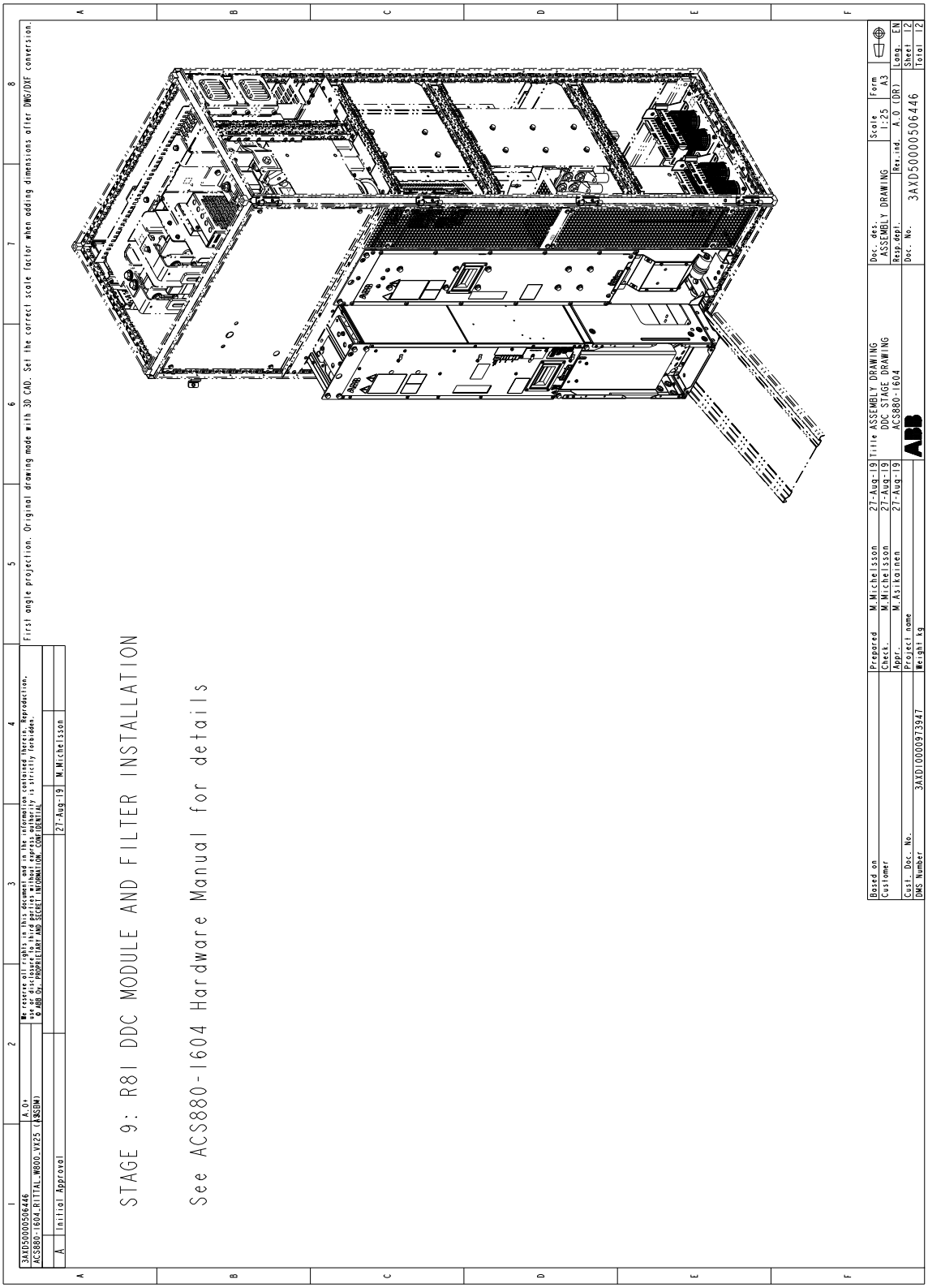
Stage 7: Control unit mounting plate



Stage 8: DDC shroud installation



Stage 9: DDC module and filter installation

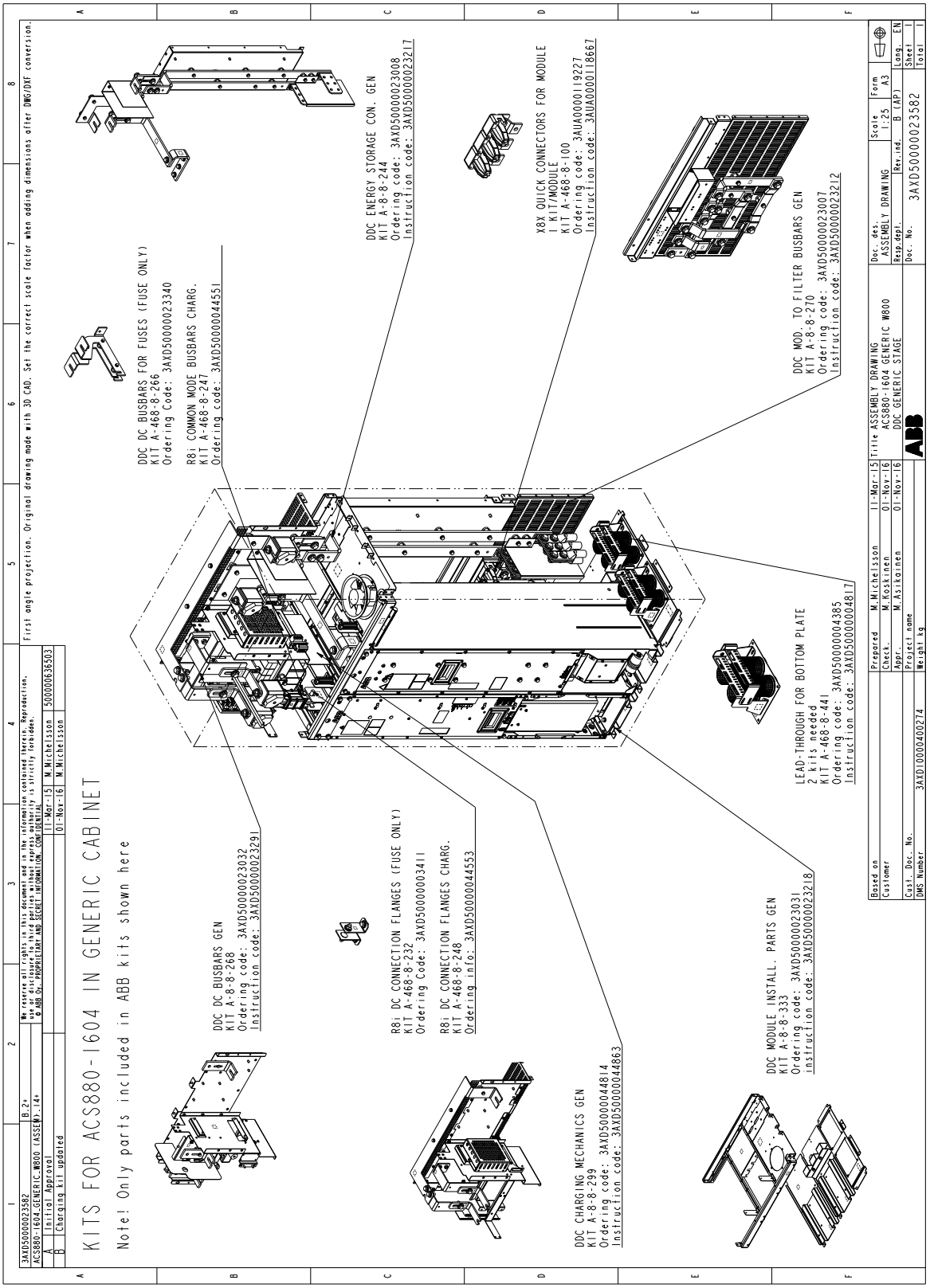


1×R8i DDC unit in a 800 mm wide generic enclosure

Parts to be installed

Parts to be installed	Instruction code	Kit code	Kit ordering code
Module installation parts Bottom cable entry	3AXD50000023218 3AXD50000004817	A-8-8-333 A-468-8-441	3AXD50000023031 3AXD50000004385
Busbars for connecting DDC module and filter, and quick connectors	3AXD50000023212 3AUA0000118667	A-8-8-270 A-468-8-100	3AXD50000023007 3AUA0000119227
DC connection with DC switch-disconnector and charging: • Charging mechanics	3AXD50000044863	A-8-8-299	3AXD50000044814
DC busbars and DC connection flanges with charging	3AXD50000043411 3AXD50000043466	A-468-8-247 A-468-8-248	3AXD50000044551 3AXD50000044553
DC busbars for fuses and DC connection flanges without charging	3AXD50000023463 3AXD50000003403	A-468-8-266 A-468-8-232	3AXD50000023340 3AXD50000003411
DDC and energy storage connection	3AXD50000023217	A-8-8-244	3AXD50000023008
DDC module and filter installation	-	-	-

Kits for DDC R8i unit in 800 mm wide generic enclosure



5

Guidelines for planning electrical installation

Contents of this chapter

This chapter contains electrical planning instructions.

Limitation of liability

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

North America

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

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

ABB is not responsible for the energy storage selection or protection of the energy storage.

Generic guidelines

Refer to ACS880 multidrives cabinets and modules electrical planning instructions (3AUA0000102324 [English]) for the generic guidelines for planning the electrical installation (selecting cables, routing cables, etc.) of multidrives cabinets and modules.

Selecting the energy storage

The energy storage is not included in the drive delivery. The customer (or the system integrator) must acquire a suitable energy storage system. The customer (or the system integrator) is also responsible for the protection of the energy storage. Additional guidelines:

- Connect parallel modules (if any) to the same energy storage.
- If the DC feeder unit has parallel strings, connect each string to a separate energy storage.
- Dimension the energy storage so that it withstands the required current cycles and the stored energy is sufficient. Take the depth of discharge into account in energy storage lifetime calculations.
- Make sure that the energy storage withstands the current ripple of the converter. See the technical data.
- The output voltage (energy storage voltage) is not allowed to exceed the drive DC bus voltage. Add sufficient voltage margin in the design to prevent this in case of voltage dips or grid faults.
- The recommended energy storage operating voltage is:
  U_{ES} = 150 V … 80% of U_{DC}
- Typical DC voltage values:
  - with diode supply units:
    $U_{DC} = 1.35 \times U_{AC}$
  - with IGBT supply units:
    $U_{DC} = 1.41 \times U_{AC}$ (can be changed with supply unit parameter group 123 DC volt ref.
  - where
    U_{DC} = Drive DC voltage (in the DC bus)
    U_{AC} = Drive input voltage (AC)
- ABB recommends to measure the energy storage voltage. If the energy storage is a super capacitor, voltage measurement is obligatory unless the capacitor withstands the maximum DC voltage of the drive or contains internal overvoltage protection.
  If the converter has the optional BAMU voltage/current measurement unit, the converter measures its output voltage (and thus also the energy storage voltage) automatically.
  If the converter does not have a BAMU, you must arrange the voltage measurement separately, and send the measured value to the converter control program, for example, through fieldbus communication or by some other means.
  For more information, see section Energy storage voltage measurement and estimation and parameter description in ACS880 DC/DC-converter control program firmware manual (3AXD50000024671 [English]).
- Equip the energy storage with a circuit breaker capable of opening the circuit if there is a failure in the energy storage or cable. See Selecting a protective device for the energy storage and Energy storage disconnecting (isolating) device.

Implementing protections for the energy storage

General principles

The requirements for the customer-defined protections at the energy storage end:

- disconnecting device between the drive and energy storage system (for example, isolation disconnector switch, withdrawable circuit breaker)
- overload and short circuit protection for the cabling (for example, circuit breaker with thermal or electromagnetic trip unit)
- overload and short circuit protection for the energy storage elements itself (for example, integrated overload protection in batteries).

Selecting a protective device for the energy storage

The customer (or the system integrator) must equip the energy storage with a protective device. The protective device is not included in the drive delivery.

The protective device must provide an overload and short-circuit protection for the energy storage. If there is no other protection device for the cables at the energy storage end, the protective device of the energy storage must also provide the overload and short-circuit protection for the cable(s).

The customer (or the system integrator) must verify the operation of the protective device by short circuit calculations taking into account the impedances of the drive, filter (if any), cabling and energy storage, and minimum and maximum state of charge of the energy storage. The customer (or the system integrator) must take into account the impact of aging to storage impedances.

Energy storage disconnecting (isolating) device

The customer (or the system integrator) must equip the energy storage with an disconnecting (isolating) device. The disconnecting device is not included in the drive delivery.

Overload protection of the system by the DC/DC-converter

There is a thermal protection function in the DC/DC-converter control program. For more information on the thermal protection function, see the firmware manual.

Protecting the energy storage cable

There must be protective devices on the two ends of the energy storage cable:

- output DC fuses in the DC/DC-converter unit (available from ABB, must be acquired and installed by the customer or system integrator)
- energy storage protective device (must be acquired and installed by the customer or system integrator).

On the converter side of the cable, the output DC fuses protect the DC/DC-converter and the cable in a short-circuit situation.

On the energy storage side of the cable, the energy storage protective device protects the energy storage and the cable in a short-circuit or overload situation.

Energy storage discharging device

When necessary, the customer (or the system integrator) must equip the energy storage with a discharging device. If the energy storage is a super capacitor, ABB recommends to install a discharging device.

Implementing earth fault protection

The customer (or the system integrator) must install an earth fault protection device and connect it to the converter unit.

The DC/DC-converter control program can be configured to trip on a fault or give a warning when external earth leakage is detected. For more information, refer to the firmware manual.

Implementing an interlocking between the disconnecting devices

The customer (or the system integrator) must implement an interlocking circuit between the DC switch-disconnector of the drive [Q11] and the energy storage disconnector (isolator). The user must not be able to close the energy storage disconnector (isolator) before closing the DC switch-disconnector of the drive [Q11].

Selecting and routing the energy storage cables

Cable selection procedure

Select each power cable as follows. Obey the local regulations.

1. Select the cable type. Obey the general guidelines and recommendations for the drive power cabling.
2. Select the cable size.
   Multidrives module: Refer to the listing of typical power cable sizes given in the technical data of the multidrives module hardware manual.
3. Make sure that the short-circuit rating of the cable is sufficient. Take into account the disconnection time of the protective device. If the rating is not sufficient, select a larger cable, increase the number of parallel cables or change the cable to a type with higher conductor temperature rating.
4. Select the cable lugs.
5. Make sure that the cable can enter the cabinet through the cable entry plate.
   Multidrives module: Refer to the dimension drawings of the customer-defined cabinet.
6. Make sure that there is sufficient space to install the cable(s) and cable lugs to the terminals.
   Multidrives module: Refer to the terminal and cable entry data of the customer-defined cabinet.

Recommended cables

The customer (or the system integrator) must acquire and connect the energy storage cables. It is possible to use shielded cables with 2, 3 or 4 conductors. ABB recommends to use shielded cables with 4 conductors.

Refer to the table below for the cables and possible configurations.

Cable type	Positive	Negative	PE (ground)
2-conductor shielded cable	1 conductor	1 conductor	Shield[1)]
3-conductor shielded cable	1 conductor	1 conductor	1 conductor + shield
4-conductor shielded cable	2 conductors	2 conductors	Shield[1)]

1) The shield must meet the requirements of IEC 61439-1. If the shield does not meet the requirements, an additional PE conductor or cable is required.

ABB does not recommend to use single core cables. If it necessary to use single core cables, obey these guidelines:

- Use shielded cables. Ground the cable shields only at one end.
- Put the cables in groups of 2 or 4.
- Attach the cables according to the requirements to withstand the apparent short circuit forces.

Typical cable sizes

See the technical data.

Minimizing electromagnetic interference

The customer (or the system integrator) must obey these rules in order to minimize the electromagnetic interference caused by rapid current changes in the energy storage cables:

- Shield the energy storage cabling completely, either by using shielded cable or a metallic enclosure. Unshielded single-core cable can only be used if it is routed inside a cabinet that efficiently suppresses radiated emissions.
- Install the cables away from other cable routes.
- Avoid long parallel runs with other cables. The minimum recommended separation distance for parallel cabling is 0.3 m (1 ft).
- Cross other cables at right angles.

Keep the cable as short as possible in order to minimize the radiated emissions and stress on converter IGBT semiconductors. The longer the cable, the higher the radiated emissions, inductive load and voltage peaks over the IGBTs of the DC/DC-converter.

Maximum cable length

Refer to the technical data.

EMC compliance of the complete installation

ABB has not verified that the EMC requirements are fulfilled with external energy storage and its cabling. The EMC compliance of the complete installation must be considered by the customer (or the system integrator).

Parallel connection

It is possible to connect multiple DC/DC-converter units in parallel. In the parallel connection, both the inputs and the outputs of the units must be connected together. The inputs are connected through the common DC bus of the drive as standard. The outputs (ES+ to ES+, ES- to ES-) must be connected together at the energy storage end by the customer (or the system integrator).

The customer (or the system integrator) must make sure that the load sharing is even between the parallel units. Depending on the case, this may require additional parameter tuning in DC/DC-converter control programs of both units:

- If the operating mode selection (parameter 197.13) is Power or Add: The load between the units is inherently shared according to the power or current references. No additional settings are required.
- If the operating mode selection (parameter 197.13) is DC voltage: Tune the load sharing using the droop control function.
- Master/follower operation of the parallel units: The control program does not support the master/follower link between several units. However, it is possible to implement the Master/follower operation with an external PLC. In that case, one DC/DC-converter unit, the master unit, operates in the DC voltage control mode and the other unit(s) in power control mode. The external PLC reads the output current reference of the master unit, and uses it as the current reference of the follower units.

The load sharing during an overvoltage or undervoltage control of the DC/DC-converter can require tuning of the DC voltage offset value between the parallel units. See the firmware manual for details.

The customer (or the system integrator) must pay special attention to the protection concept in case of parallel units. The protection must operate reliably in all possible fault cases.

6

Electrical installation

Contents of this chapter

This chapter describes the electrical installation of the modules.

The wiring diagrams in this chapter are simplified presentations. For details, see the example circuit diagrams included in the manual.

Note: The instructions do not cover all possible cabinet constructions.

For more information on electrical installation, see ACS880 multidrives cabinets and modules electrical planning instructions (3AUA0000102324 [English]).

Safety and liability

WARNING!
Only qualified electrical professionals are allowed to do the work described in this chapter. Read the **complete safety instructions** before you install, commission, use or service the drive. The complete safety instructions are given in ACS880 multidrives cabinets and modules safety instructions (3AUA0000102301 [English]).

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

Electrical safety precautions

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

This procedure gives information on how to de-energize the drive and make it safe to do work on it. The procedure does not include all possible drive configurations.

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

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

Do these steps before you begin any installation or maintenance work.

1. Prepare for the work.
   - Make sure that you have a work order.
   - Do an on-site risk assessment or job hazard analysis.
   - Make sure that you have the correct tools available.
   - Make sure that the workers are qualified.
   - Select the correct personal protective equipment (PPE).
   - Stop the drive and motor(s).
2. Clearly identify the work location and equipment.
3. Disconnect all possible voltage sources. Make sure that connection is not possible. Lock out and tag out.
   - Open the disconnecting device of the energy storage connected to the DC/DC converter unit. The disconnecting device is outside the drive cabinet. Then open the DC switch-disconnector [Q11] of the unit.
   - Open the main disconnecting device of the drive.
   - Open the charging switch if it is present.
   - Open the disconnector of the supply transformer. (The main disconnecting device in the drive cabinet does not disconnect the voltage from the AC input power busbars of the drive cabinet.)
   - Open the auxiliary voltage switch-disconnector (if it is present), and all other possible disconnecting devices that isolate the drive from dangerous voltage sources.
   - If a permanent magnet motor connects to the drive, disconnect the motor from the drive with a safety switch or by other means.
   - Open the main isolating device of the drive.
   - Disconnect all dangerous external voltages from the control circuits.
   - After you disconnect power from the drive, wait 5 minutes to let the intermediate circuit capacitors discharge before you continue.
4. Protect other energized parts in the work location against contact and take special precautions when close to bare conductors.
5. Measure that the installation is de-energized. Use a 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 electrical work. This includes, but is not limited to, electric shock and arc protection.

- Before and after you measure the installation, verify the operation of the voltage tester on a known voltage source.
- Make sure that the voltage between the drive input power terminals (L1, L2, L3) and the grounding (PE) busbar is zero.
- Make sure that the voltage between the drive output terminals (U, V, W) and the grounding (PE) busbar is zero.

  Important! Repeat the measurement with the DC voltage setting of the voltage tester. Measure between each phase and ground. There is a risk of dangerous DC voltage charging due to leakage capacitances of the motor circuit. This voltage can remain charged for a long time after the drive power-off. The measurement discharges the voltage.
- Make sure that the voltage between the drive DC busbars and the grounding (PE) busbar is zero.
- Make sure that the voltage between the energy storage terminals of the DC/DC converter unit (ES+ and ES-) and the grounding (PE) busbar is zero.

6. Install temporary grounding as required by the local regulations.
7. Ask for a permit to work from the person that is responsible for the electrical installation work.

General notes

Printed circuit boards

WARNING!
Use ESD wristband when you handle printed circuit boards. Do not touch the boards unnecessarily. The boards are sensitive to electrostatic discharge.

Handling fiber optic cables

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

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

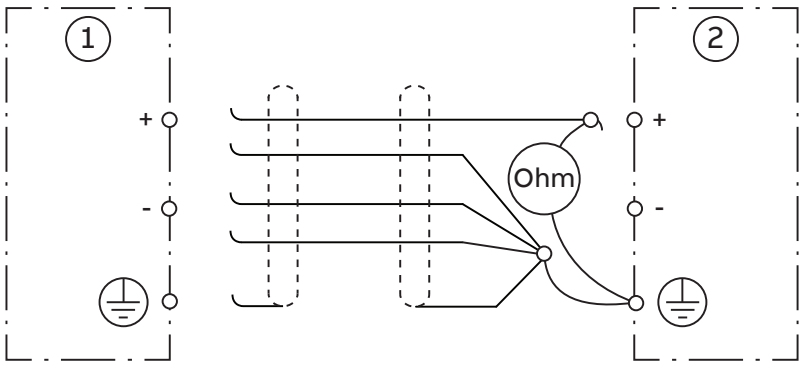
Measuring the insulation resistance of the DC cabling

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

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

Measure the insulation resistance of the DC cabling as follows:

1. Make sure that the cable is disconnected at the drive end and at the other end. All conductors and the cable shield must be disconnected.
2. At the drive end, connect all conductors and shield of the cable together and to the grounding busbar (PE).
3. Disconnect one conductor and measure the insulation resistance between the conductor and the grounding busbar (PE). Use a measuring voltage of 1 kV DC. The insulation resistance must be higher than 1 Mohm.
4. Disconnect another conductor and measure its insulation resistance. Do this for all remaining conductors (including the cable shield).



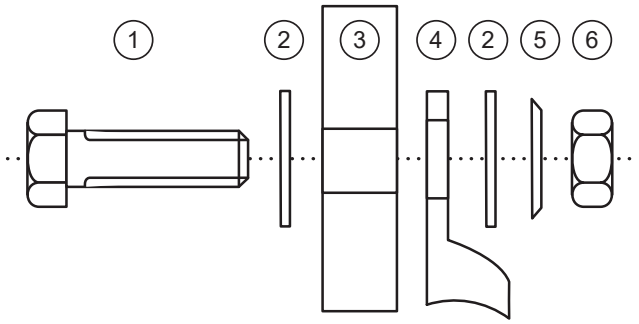
1	Energy storage
2	Converter unit

Connecting the energy storage cable and load disconnected indicator cable

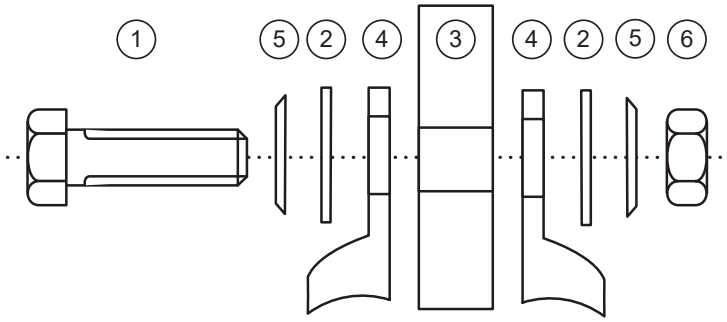
Use of fasteners in cable lug connections

Install all the fasteners in the correct order. See the figure below. Tighten the cable lug to the torque specified for the connection.

Cable lug on one side of the busbar



Cable lugs on both sides of the busbar

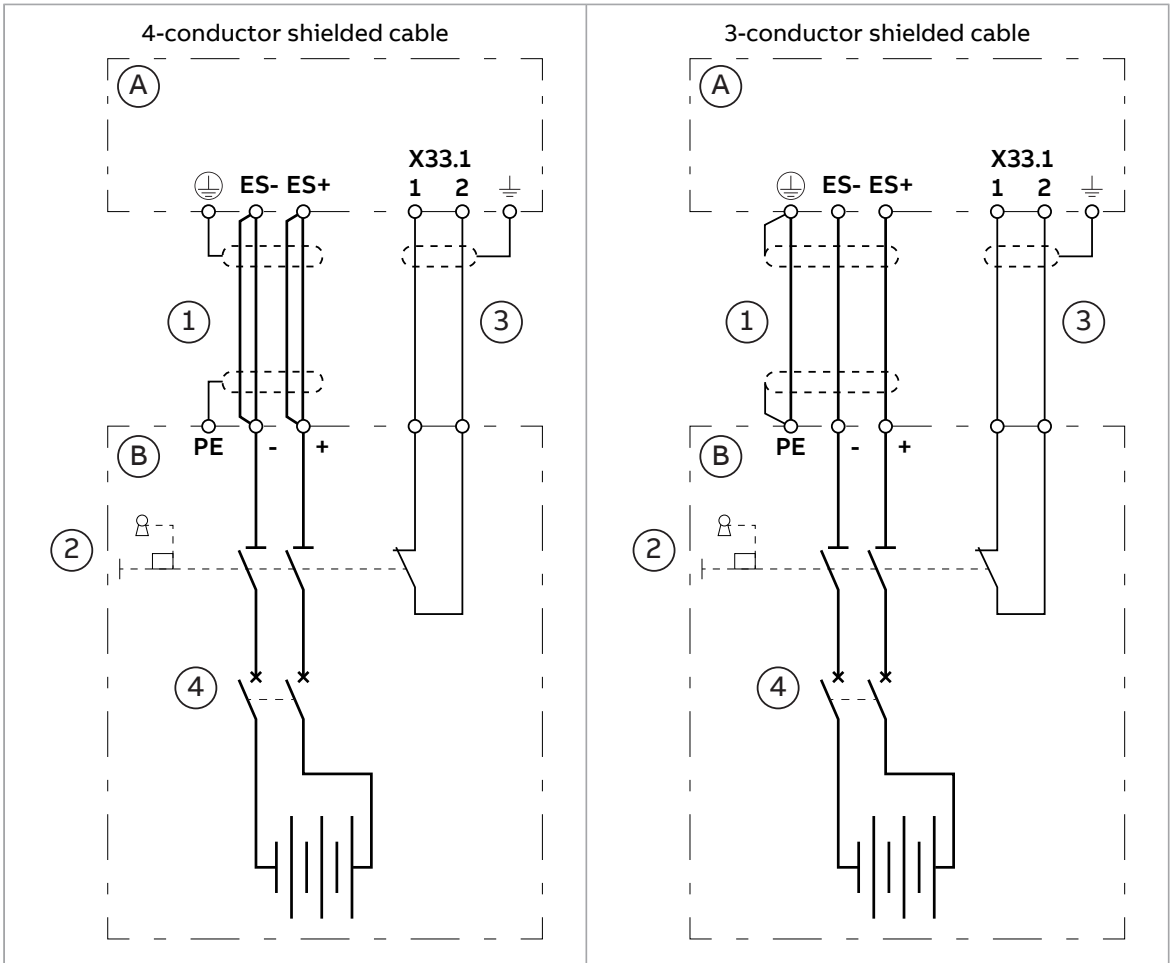


1	Bolt	4	Cable lug
2	Plain washer	5	Spring washer
3	Busbar	6	Nut

Connection diagram

If the converter unit has parallel modules, each module must have its own output cables. The cables must also be identical (cable type, cross-sectional area, and length must be the same).

This diagram shows the connections between the DC/DC-converter unit and an energy storage.



A	DC/DC-converter unit
B	Energy storage
1	Shielded 3-conductor or 4-conductor cable and 360° grounding of the cable shield at the cable entry. If you use parallel cables, make sure they are identical (type, cross-sectional area, length are the same). If you use a 4-conductor cable, a separate PE conductor or cable is required if the shield conductivity does not meet the requirements of IEC 61439-1.
2	Disconnecting device
3	Connection to load disconnected indicator [P13.x] on the cabinet door
4	Protective circuit breaker

Connection procedure for power connections inside the DC/DC-converter cubicle

WARNING!
Obey the safety instructions given in ACS880 multidrives cabinets and modules safety instructions (3AUA0000102301 [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!
Apply grease to stripped aluminum conductors before you attach them to non-coated aluminum cable lugs. Obey the grease manufacturer's instructions. Aluminum-aluminum contact can cause oxidation in the contact surfaces.

Make sure that the mechanical installation of the unit is completed (the converter and filter modules, and other components are installed into a cabinet).

Do the power connections inside the converter cubicle as follows:

1. Do the steps in section Electrical safety precautions (page 64) before you start the work.
2. Open the door of the DC/DC-converter cubicle and remove the shrouding (if any).
3. Make the connections between the main circuit components inside the cabinet. Refer to the final circuit diagrams for the drive. When the connections are completed, examine them against the final circuit diagrams. Do not use the example circuit diagrams in this manual as the only source of information when you make or examine the connections. For the tightening torques, see the technical data.
4. Ground the converter module(s) through the module mounting screws. The grounding point is marked on the module.

   Note: If the cabinet frame is painted (for example, Rittal VX25 enclosures), it is important to make sure that a good galvanic connection to ground (PE busbar) is achieved. You can, for example, remove the paint from the connection points and use star washers.

   Note: The connection to ground only through the mounting screws and the cabinet chassis is not always sufficient. To ensure the continuity of the protective bonding circuit, you can connect the modules to the cabinet PE busbar with a copper busbar or cable. The inductance and impedance of the PE conductor must be rated according to permissible touch voltage appearing under fault conditions (so that the fault point voltage will not rise excessively when a ground fault occurs). Refer to ACS880 multidrives cabinets and modules electrical planning instructions (3AUA0000102324 [English]).
5. Install the shrouding removed earlier and close the cubicle doors.

Connection procedure of the energy storage cables

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

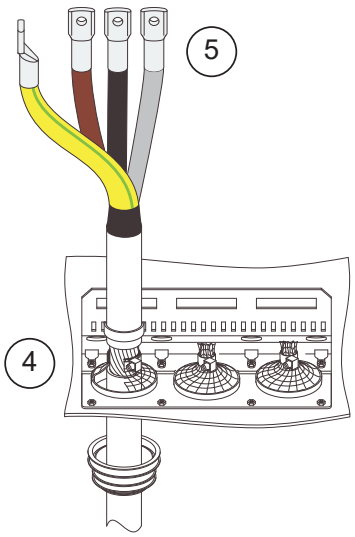
WARNING!
Apply grease to stripped aluminum conductors before you attach them to non-coated aluminum cable lugs. Obey the grease manufacturer's instructions. Aluminum-aluminum contact can cause oxidation in the contact surfaces.

This procedure is applicable to an example cabinet design. The final custom designs of the cabinet can be different.

Before you start, make sure that:

- the mechanical installation is completed (the converter and filter modules, and other components of the DC/DC-converter unit are installed into a cabinet), and
- the electrical connections between the components of the DC/DC-converter unit are completed.

1. Stop the drive and do the steps in section Electrical safety precautions (page 64) before you start the work.
2. Open the door of the DC/DC-converter cubicle and remove the shrouding (if any).
3. Lead the cables into the cubicle through the cable entry plate.
4. Ground the cable shield 360° at the cable entry. See the instructions by the cabinet installer. An example grounding arrangement is shown below.
5. Cut the cables to suitable length. Strip the cables and conductors, and install the cable lugs at the end of the conductors.
6. Connect the conductors to the applicable terminals. Refer to the delivery-specific connection diagram of the cabinet-installed unit. For the tightening torques, refer to the technical data.
7. Twist the cable shields into bundles and connect them to the protective grounding busbar (PE) of the cabinet.
8. Install the shrouding removed earlier and close the cubicle doors.
9. At the energy storage, connect the cables according to the instructions of the energy storage manufacturer.

	This is an example cable entry. The actual design may vary. Refer to the instructions by the cabinet installer.

Connection procedure of the load disconnected indicator cable

WARNING!
Obey the safety instructions given in ACS880 multidrives cabinets and modules safety instructions (3AUA0000102301 [English]). If you ignore the safety instructions, injury or death, or damage to the equipment can occur.

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

1. Stop the drive and do the steps in section Electrical safety precautions (page 64) before you start the work.
2. Open the door of the DC/DC-converter cubicle and remove the shrouding.
3. Run the load disconnected indicator cable inside the cubicle and connect to the applicable terminal. Obey the general control cable connection instructions. Refer to section Connecting the control cables (page 74).

Connecting the BDCL filter

Make sure that the mechanical installation of the unit is completed (the converter and filter modules, and other components are installed into a cabinet).

Make sure that the filter module is correctly grounded.

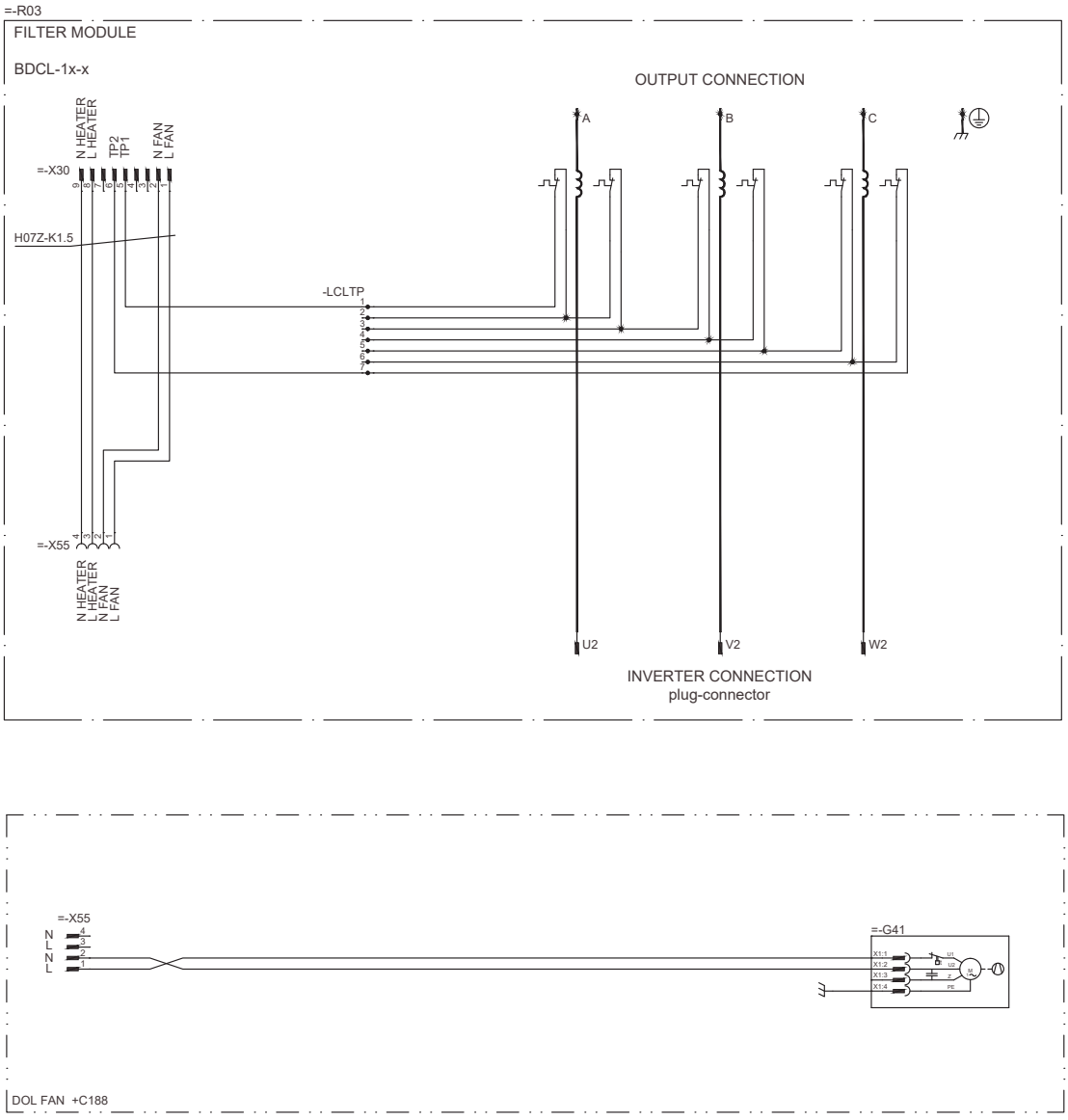
WARNING!
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do installation, commissioning or maintenance work.

1. Do the steps in section Electrical safety precautions (page 64) before you start the work.
2. Make the filter module power connections. Connect the filter terminals ES+1, ES+2 and ES+3 together, for example, with a kit. Refer to sections Main circuit diagram (page 17) and Connection diagram (page 68). For available kits, refer to the ordering information.
3. Connect the thermistor input [XD1] of the converter control unit to the filter thermistor terminals:
   - Frame R7i: terminals [X6:1, X6:11]
   - Frame R8i: terminals [X30:5, X30:6].

WARNING!
Do not disable the module temperature monitoring function.

WARNING!
Use the BDCL filter only with an ACS880-1604 DC/DC converter module

Internal circuit diagram for the BDCL filter



Installing the charging circuit

The cabinet builder must install and connect the charging circuit. For connections, see the example circuit diagrams. Consult ABB for more information on the necessary components and wiring.

Activate and tune the charging function in the control program. For information on tuning the parameters, see ACS880 DC/DC converter control program firmware manual (3AXD50000024671 [English]).

Connecting the external power supply cable for the auxiliary circuit

DC/DC converter module

The cabinet builder can arrange an auxiliary voltage of 230 V AC (or 115 V AC with option +G304) to connector X50 to supply power to the electronics of the DC/DC converter module. DC/DC converter modules have a power supply board that produces 24 V DC from the auxiliary voltage for the internal circuit boards. The 24 V DC voltage supplied by the power supply is available on connector X53, and can be used to power one control unit. It is not permitted to use the 24 V DC output on connector X53 for other purposes than for supplying power to the control unit.

If a direct-on-line fan (option +C188) is used, connect the fan supply (400 V AC / 50 Hz / 60 Hz) to the module control connector [X50:1-3].

If an internal heater (option +C183) is used, connect the supply for the heating resistor to the DC/DC converter module control connector [X50:7-8].

For information on the connectors, refer to section Connectors X50…X53 (page 24).

BDCL filter module

A direct-on-line fan (option +C188) is used in the BDCL filter module as standard. See Connecting the BDCL filter (page 72).

For the filter connectors, see the hardware description. For the details about supply voltage levels and auxiliary circuit current consumption, see the technical data.

Connecting the control cables

Default I/O connection diagram

Refer to chapter Control unit (BCU) or Control unit (UCU).

Connection procedure

Note: The instructions below are based on an example cabinet construction. They are not applicable to all possible solutions but only clarify the principles.

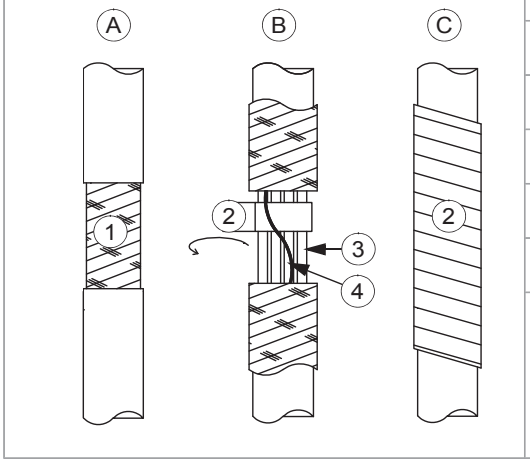
The procedure tells how to connect the control cables of a DC/DC converter unit. In this example, the power cables are routed to the cabinet through the bottom.

WARNING!
Obey the safety instructions given in ACS880 multidrives cabinets and modules safety instructions (3AUA0000102301 [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.

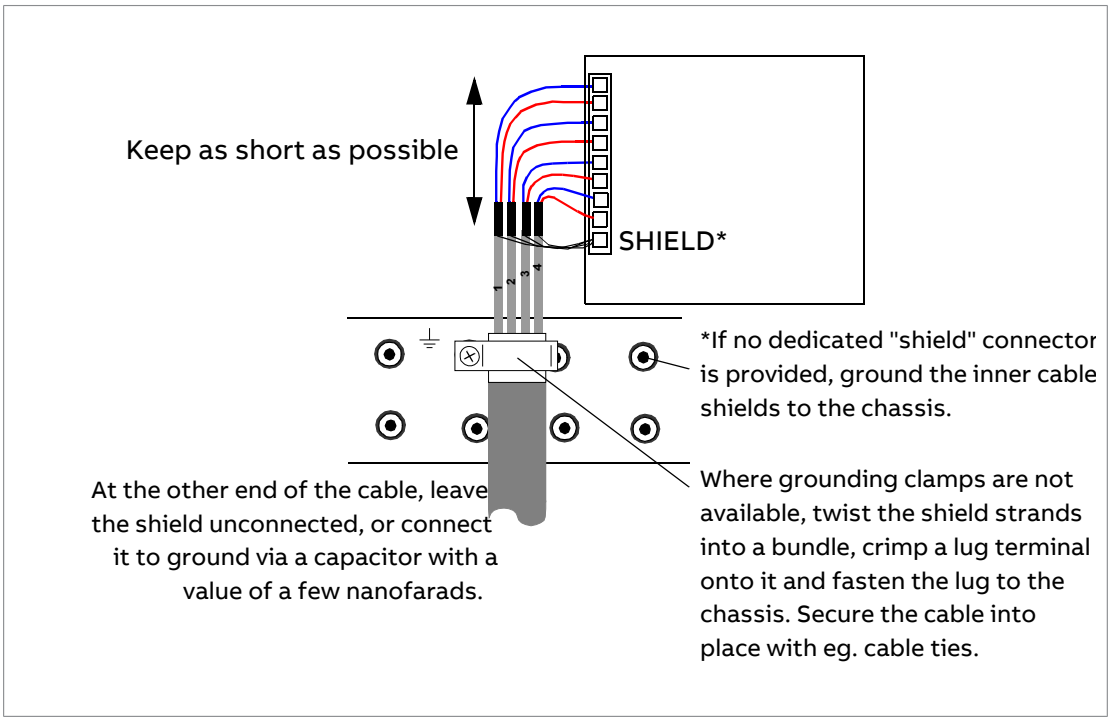
1. Open the cubicle door.
2. Remove the shrouds (if any) from the cubicle.
3. Run the cables into the cabinet. If possible, arrange for a 360° grounding of the cable shield at the cable entry through.

If the outer surface of the shield is non-conductive, turn the shield inside out as shown below and wrap copper foil around the cable to keep the shielding continuous. Do not cut the grounding wire (if present).



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

4. Run the cables to the applicable terminals. When possible:
   - Use the existing cable trunking in the cabinet.
   - Use sleeving if the cables are laid against sharp edges.
   - Tie the cables to provide strain relief.
5. Cut the cables to the correct length.
6. Strip the cable ends and conductors. When connecting to the drive I/O, also remove the shield along with the outer sheathing, and use electrical tape or shrink tubing to contain the strands. Elsewhere, twist outer shield strands into a bundle, crimp a lug onto it and connect it to the nearest chassis grounding point.

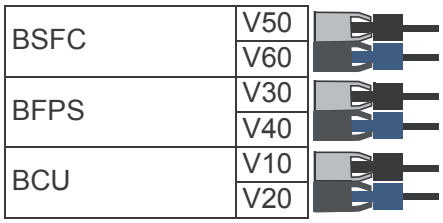


7. Connect the conductors to applicable terminals.

8. Install the shrouds (if any).
9. Close the doors.

Fiber optic connectors of the DC/DC converter module

The figure shows the fiber optic connections of the DC/DC converter module.



Name	Description
BSFC	Charging controller connection (see the hardware description). Must be connected by the installer.
BFPS	Fan control connection (to fan control box) Connected at the factory.
BCU	Control unit connection Must be connected by the installer.

Installing option modules

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

WARNING!
Use ESD wristband when you handle printed circuit boards. Do not touch the boards unnecessarily. The boards are sensitive to electrostatic discharge.

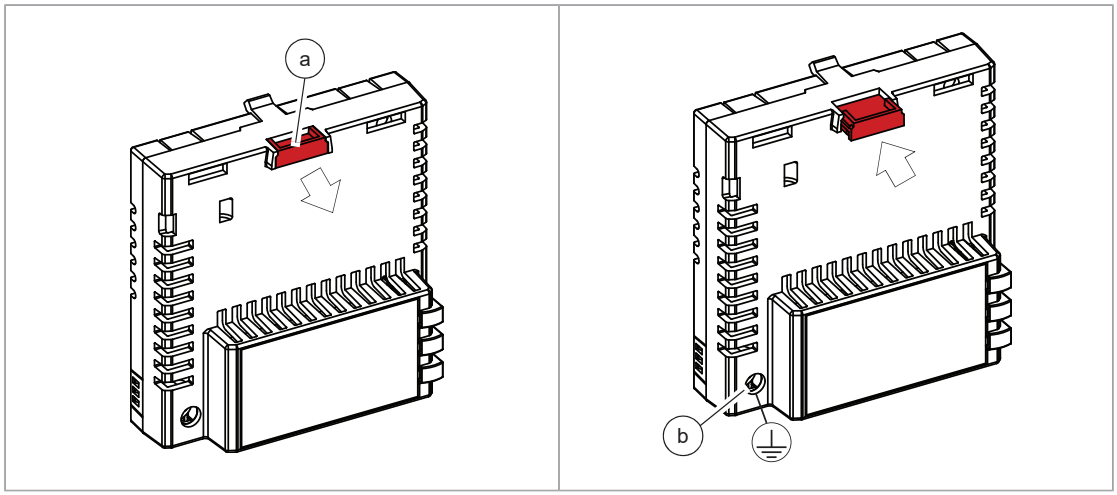
Pay attention to the free space required by the cabling or terminals coming to the option modules.

1. Stop the drive and do the steps in section Electrical safety precautions (page 64) before you start the work.
2. Pull out the lock (a) with a screw driver.

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

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

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



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

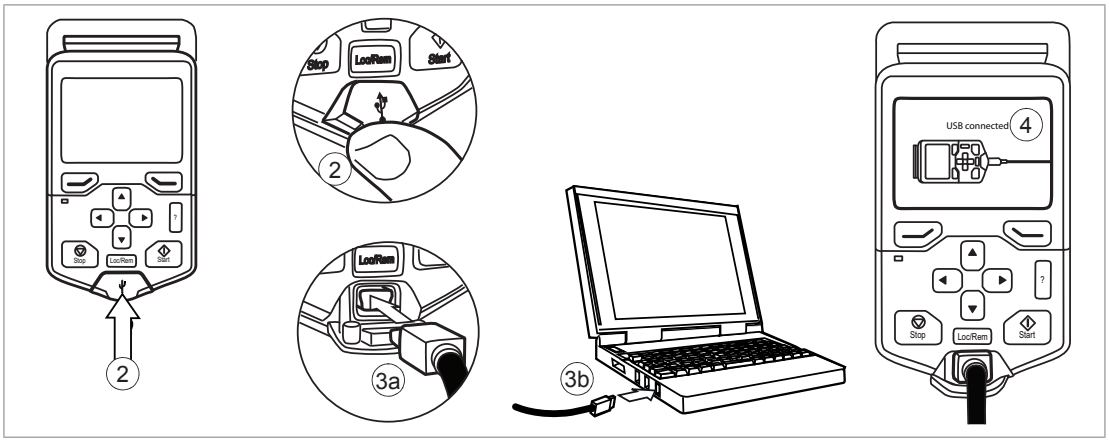
If you must remove the option module after it is installed into the drive, use a suitable tool (for example, small pliers) to carefully pull out the lock.

Connecting a PC

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

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

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



7

Control unit (UCU)

Contents of this chapter

This chapter:

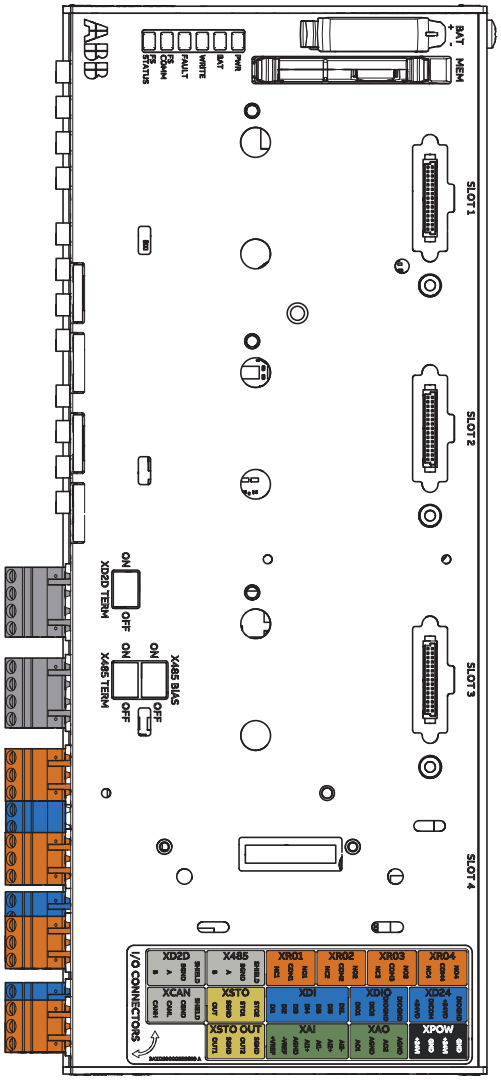
- gives information on the connections of the control unit, and
- contains the specifications of the inputs and outputs of the control unit.

General

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

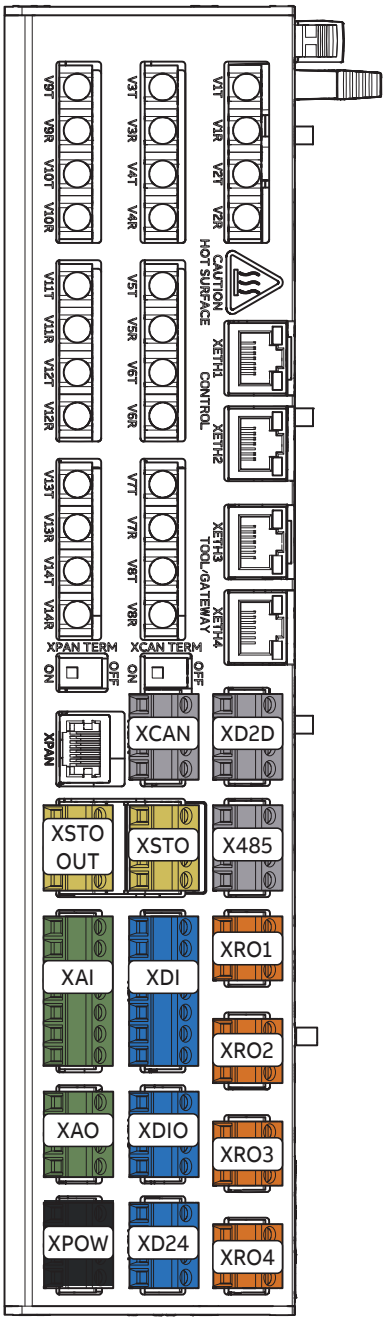
Layout

The figures below show an example UCU-24 control unit.

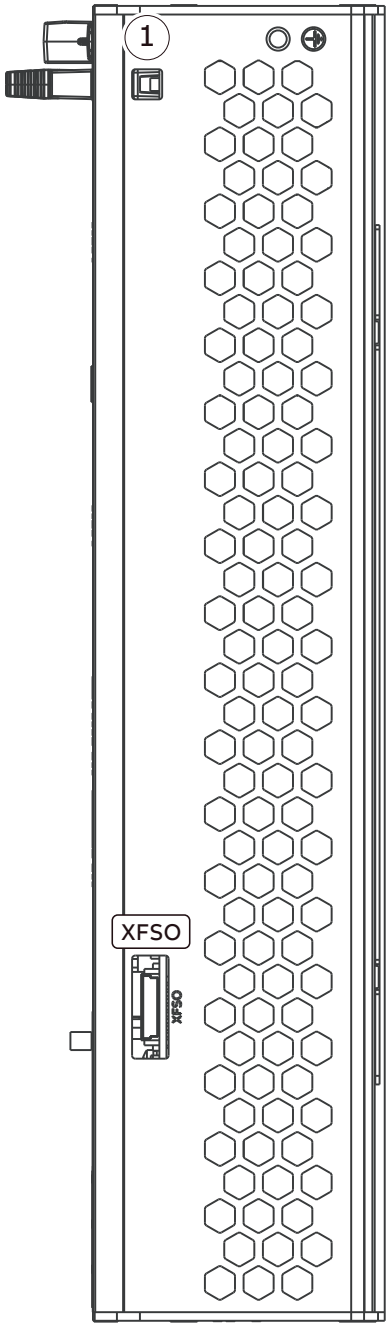


	Description
I/O	I/O terminals
SLOT 1	I/O extension, encoder interface or fieldbus adapter module connection. For F-type modules with USCA-02 adapter.
SLOT 2	
SLOT 3	
SLOT 4	RDCO-0x DDCS communication option module connection
MEM	UMU-01 memory unit connection. Data logger microSDHC memory card for inverter module communication is inside the memory unit.
BAT	Holder for real-time clock battery (BR2032)
XD2D TERM	Termination switches for drive-to-drive link (XD2D)
X485 TERM	RS-485 link termination switch
X485 BIAS	RS-485 link bias switch.
DICOM= DIOGND	Ground selection. Determines whether DICOM is separated from DIOGND (ie. the common reference for the digital inputs floats). Refer to the ground isolation diagram.

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



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



	Description
XFSO	Not in use
1	Humidity and temperature measurements

Default I/O diagram of the converter control unit

The table below shows the default I/O connections of the UCU control unit of the converter.

Terminal			Description	
XD2D			Drive-to-drive link	
1	1	B	Not supported in DC/DC converter units	
2	2	A		
3	3	BGND		
4	4	SHIELD		
	XD2D TERM		Drive-to-drive link termination switch	
X485			RS485 connection	
5	5	B	Not in use by default	
6	6	A		
7	7	BGND		
8	8	SHIELD		
	X485 BIAS		X485 bias selection switch	
	X485 TERM		X485 termination switch	
XCAN			CAN bus	
9	9	CANH	Not supported	
10	10	CANL		
11	11	CGND		
12	12	SHIELD	Control cable shield	
	XCAN TERM		CANopen termination switch	
XRO1			Relay output 1	
11	11	NC1	Norm. closed	XRO1: Not in use 250 V AC / 30 V DC, 2 A
12	12	COM1	Common	
13	13	NO1	Norm. open	
XRO2			Relay output 2	
21	21	NC2	Norm. closed	XRO2: Fault (-1)[1] (Energized = no fault) 250 V AC / 30 V DC, 2 A
22	22	COM2	Common	
23	23	NO2	Norm. open	
XRO3			Relay output 3	
31	31	NC3	Norm. closed	XRO3: Fan control (DC/DC converter in operation, fan control on) 250 V AC / 30 V DC, 2 A
32	32	COM3	Common	
33	33	NO3	Norm. open	

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

Terminal			Description
XAI			Analog inputs, reference voltage output
1 2 3 4 5 6 7	1	+VREF	10 V DC, R_L 1…10 kohm
	2	-VREF	-10 V DC, R_L 1…10 kohm
	3	AGND	Ground
	4	AI1+	Not in use by default. 0(2)…10 V, R_{in} > 200 kohm [3]
	5	AI1-	
	6	AI2+	Not in use by default. 0(4)…20 mA, R_{in} = 100 ohm [4]
	7	AI2-	
XAO			Analog outputs
1 2 3 4	1	AO1	Zero (no signal indicated)[1] 0…20 mA, R_L < 500 ohm (not in use by default)
	2	AGND	
	3	AO2	Zero (no signal indicated)[1] 0…20 mA, R_L < 500 ohm (not in use by default)
	4	AGND	
XPOW			External power input
1 2 3 4	1	+24VI	19…32 V DC, 1.5 … 2.9 A (depends on the load and supply voltage) External power input. Two supplies can be connected to the control unit for redundancy.
	2	GND	
	3	+24VI	
	4	GND	
XFSO			Safety functions module connection. Not supported in DC/DC converter units.
XETH1			Ethernet ports for fieldbus. Support depends on the firmware. Refer to the firmware manual.
XETH2			
XETH3			Ethernet ports for tool communication. Support depends on the firmware. Refer to the firmware manual.
XETH4			
XPAN			Control panel connection
	XPAN TERM		Control panel connection termination switch. Used for panel bus configuration.
MEM			Memory unit connection

1) Default use of the signal in the control program. The use can be changed by a parameter. See also the delivery-specific circuit diagrams.
2) Total load capacity of these outputs is 4.8 W (200 mA at 24 V) minus the power taken by DIO1 and DIO2.
3) Current [0(4)…20 mA, R_{in} = 100 ohm] or voltage [0(2)…10 V, R_{in} > 200 kohm]. Change of setting requires reboot of control unit.
4) Current [0(4)…20 mA, R_{in} = 100 ohm] or voltage [0(2)…10 V, R_{in} > 200 kohm]. Change of setting requires reboot of control unit.

Additional information on the connections

Power supply for the control unit (XPOW)

Connect a power supply to the control unit through terminal block XPOW.

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

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

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

Digital interlock (DIIL)

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

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

Control panel connection (XPAN)

The XPAN connector can be used to connect an assistant control panel or FDPI-02 diagnostics and panel interface unit to the control unit. With FDPI-02, it is possible to connect one control panel to two or more control units in a chain topology, also known as a panel bus. For more information, refer to FDPI-02 diagnostics and panel interface user's manual (3AUA0000113618 [English]).

The XPAN TERM switch sets the termination for the panel bus. Must be set to ON if there is no panel bus, or if the control unit is the last one in a panel bus. On intermediate units in a panel bus, set termination to OFF (1).

Safe torque off (XSTO, XSTO OUT)

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

MicroSDHC memory card slot

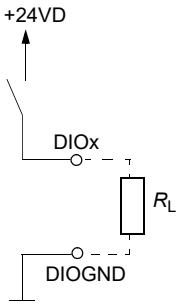
The control unit has an on-board data logger that collects real-time data from the power modules to help fault tracing and analysis. The data is stored onto the microSDHC memory card inserted into the UMU-01 memory unit and can be analyzed by ABB service personnel.

Connector data

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

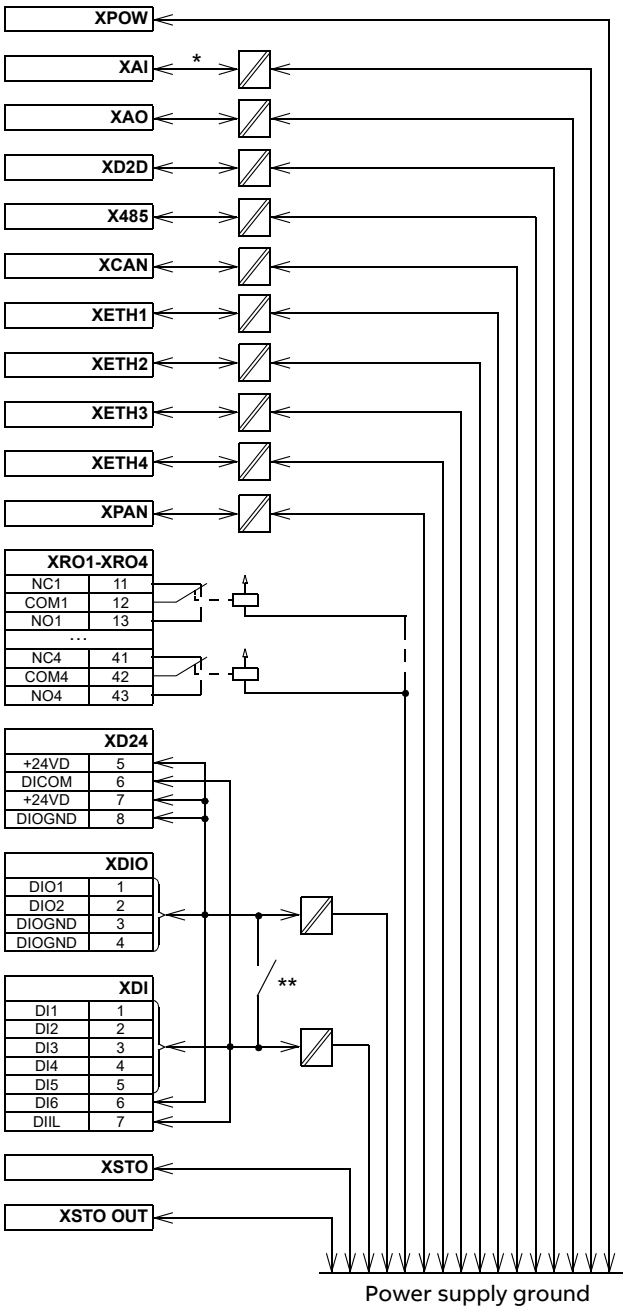
Maximum tightening torque of the screw terminals is 0.45 N·m (4 lbf·in).

Power supply (XPOW)	19…32 V DC, 1.5 … 2.9 A (depends on the load and supply voltage) External power input. Two supplies can be connected to the control unit for redundancy.
Relay outputs XRO1…XRO4	250 V AC / 30 V DC, 2 A Protected by varistors

+24 V output (XD24:2 and XD24:4)	Total load capacity of these outputs is 4.8 W (200 mA / 24 V) minus the power taken by DIO1 and DIO2.
Digital inputs DI1…DI6 (XDI:1…XDI:6)	24 V logic levels: “0” < 5 V, “1” > 15 V R_{in}: 2.0 kohm Input type: NPN/PNP (DI1…DI5), PNP (DI6) Hardware filtering: 0.04 ms, digital filtering up to 8 ms I_{max}: 15 mA (DI1…DI5), 5 mA (DI6)
Start interlock input DIIL (XDI:7)	24 V logic levels: "0" < 5 V, "1" > 15 V R_{in}: 2.0 kohm Input type: NPN/PNP Hardware filtering: 0.04 ms, digital filtering up to 8 ms
Digital inputs/outputs DIO1 and DIO2 (XDIO:1 and XDIO:2) Input/output mode selection by parameters. DIO1 can be configured as a frequency input (0…100 kHz with hardware filtering of 4 microseconds) for 24 V level square wave signal (sinusoidal or other wave form cannot be used). In some control programs, DIO2 can be configured as a 24 V level square wave frequency output. Refer to the firmware manual, parameter group 11.	As inputs: 24 V logic levels: "0" < 5 V, "1" > 15 V. R_{in}: 2.0 kohm. Filtering: 1 ms. As outputs: Total output current from +24VD is limited to 200 mA 
Reference voltage for analog inputs +VREF and -VREF (XAI:1 and XAI:2)	10 V ±1% and -10 V ±1%, R_{load} 1…10 kohm Maximum output current: 10 mA
Analog inputs AI1 and AI2 (XAI:4 … XAI:7). Current/voltage input mode selection by parameters 12.15 AI1 unit selection and 12.25 AI2 unit selection	Current input: -20…20 mA, R_{in} = 100 ohm Voltage input: -10…10 V, R_{in} > 200 kohm Differential inputs, common mode range ±30 V Sampling interval per channel: 0.25 ms Hardware filtering: 0.25 ms Resolution: 11 bit + sign bit Inaccuracy: 1% of full scale range
Analog outputs AO1 and AO2 (XAO)	0…20 mA, R_{load} < 500 ohm Frequency range: 0…500 Hz Resolution: 11 bit + sign bit Inaccuracy: 2% of full scale range
XD2D connector	Physical layer: RS-485 Transmission rate: 8 Mbit/s Cable type: Shielded twisted-pair cable with a twisted pair for data and a wire or another pair for signal ground (nominal impedance 100 … 165 ohm, for example Belden 9842) Maximum length of link: 50 m (164 ft) Termination by switch
RS-485 connection (X485)	Physical layer: RS-485 Cable type: Shielded twisted-pair cable with a twisted pair for data and a wire or another pair for signal ground (nominal impedance 100 … 165 ohm, for example Belden 9842) Maximum length of link: 50 m (164 ft) Termination and bias by switch (X485 TERM and X485 BIAS)

CAN connection (XCAN)	Termination by switch (XCAN TERM) This connection is not supported by the ACS880 control programs.
Safe torque off connection (XSTO)	Input voltage range: -3…30 V DC Logic levels: "0" < 5 V, "1" > 17 V. **Note:** Both circuits must be closed to enable start and operation (STO1 and STO2 must be connected to OUT). This applies to all control units (including drive, inverter, supply, brake, DC/DC converter etc. control units), but SIL/PL classified Safe torque off functionality is only achieved through the XSTO connector of the drive/inverter control unit. Current consumption (continuous) per STO channel: 10 mA. The number of parallel inverter modules does not have an effect on the current consumption. EMC (immunity) according to IEC 61326-3-1 and IEC 61800-5-2
Safe torque off output (XSTO OUT)	To STO connector of inverter module.
Control panel connection (XPAN)	Connector: RJ-45 Cable length < 50 m (164 ft) Termination by switch (XPAN TERM)
Fieldbus Ethernet connection with internal switch (XETH1 and XETH2)	Connector: RJ-45 Cable type: minimum requirement CAT5e
microSDHC memory card slot (microSDHC CARD)	Memory card type: microSDHC (minimum of class 4 speed grade) Supported memory size: 4 GB…32 GB
Battery	Real-time clock battery type: BR2032
The terminals of the control unit fulfill the Protective Extra Low Voltage (PELV) requirements. The PELV requirements of a relay output are not fulfilled if a voltage higher than 48 V is connected to the relay output.	

Ground isolation diagram



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

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

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

Other information

Refer to UCU-22, UCU-23 and UCU-24 control units hardware manual (3AXD50000817726 [English]).

8

Control unit (BCU)

Contents of this chapter

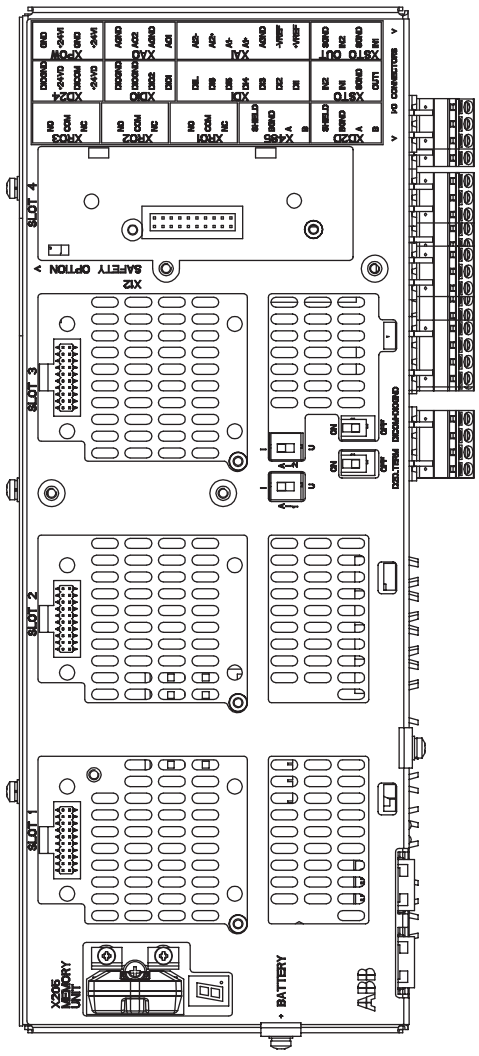
This chapter:

- gives information on the connections of the control unit, and
- contains the specifications of the inputs and outputs of the control unit.

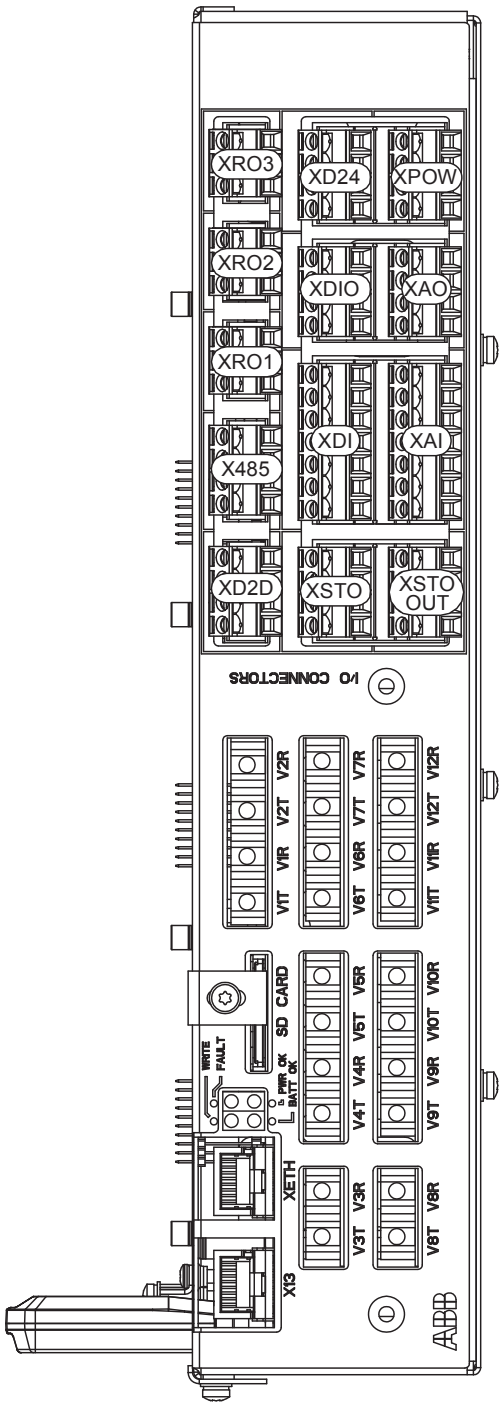
General

The BCU control units are used for controlling power modules (drive, inverter, supply, converter, etc) via fiber optic links. BCU-02 has two, BCU-12 has seven, and BCU-22 has 12 power module connections. The BCU control units have integrated branching unit functionality for collecting and storing real-time data from the power modules to help fault tracing and analysis. The data is stored on a memory card which can be analyzed by ABB service personnel.

Layout



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



	Description
XAI	Analog inputs
XAO	Analog outputs
XDI	Digital inputs, Digital input interlock (DIIL)
XDIO	Digital input/outputs
XD2D	Drive-to-drive link
XD24	+24 V output (for digital inputs)
XETH	Ethernet port – Not in use
XPOW	External power input
XRO1	Relay output RO1
XRO2	Relay output RO2
XRO3	Relay output RO3
XSTO	Safe torque off connection (input signals)
XSTO OUT	Safe torque off connection (to inverter modules)
X12	(On the opposite side) Connection for FSO safety functions module (optional)
X13	Control panel, PC connection through the control panel
X485	Not in use by default
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 and BCU-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 is sufficient
WRITE	Writing to memory card in progress. Do not remove the memory card.

Default I/O diagram of the converter control unit

The table below shows the default I/O connections of the BCU control unit of the converter.

Terminal			Description	
XD2D			Drive-to-drive link	
1	1	B	Not supported in DC/DC converter units	
2	2	A		
3	3	BGND		
4	4	Shield		
ON OFF	D2D.TERM		Drive-to-drive link termination switch	
X485			RS485 connection	
5	5	B	Not in use by default	
6	6	A		
7	7	BGND		
8	8	Shield		
XRO1, XRO2, XRO3			Relay outputs	
11	11	NC	Norm. closed	XRO1: Not in use 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) [1] (Energized = no fault) 250 V AC / 30 V DC, 2 A
22	22	COM	Common	
23	23	NO	Norm. open	
31	31	NC	Norm. closed	XRO3: Fan control (DC/DC converter running, fan control on) 250 V AC / 30 V DC, 2 A
32	32	COM	Common	
33	33	NO	Norm. open	
XSTO			Safe torque off input connection	
1	1	OUT	XSTO: IN1 and IN2 are connected to OUT at the factory. To enable start and operation, IN1 and IN2 must be connected to OUT.	
2	2	SGND		
3	3	IN1		
4	4	IN2		
XSTO OUT			Safe torque off output connection (to inverter modules)	
5	5	IN1	XSTO OUT: Not in use	
6	6	SGND		
7	7	IN2		
8	8	SGND		

Terminal			Description
XDI			Digital inputs
1	1	DI1	Temp fault[1] (0 = overtemperature)
2	2	DI2	Not in use by default
3	3	DI3	Not in use by default
4	4	DI4	Not in use by default
5	5	DI5	Not in use by default
6	6	DI6	Not in use by default
7	7	DIIL	Not in use by default. DIIL is connected to XD24:5 at the factory.
XDIO			Digital input/outputs
1	1	DIO1	Not in use by default
2	2	DIO2	Not in use by default
3	3	DIOGND	Digital input/output ground
4	4	DIOGND	Digital input/output ground
XD24			Auxiliary voltage output
5	5	+24VD	+24 V DC 200 mA[2]
6	6	DICOM	Digital input ground
7	7	+24VD	+24 V DC 200 mA[2]
8	8	DIOGND	Digital input/output ground
ON OFF	DICOM=DIOGND		Ground selection switch. Determines whether DICOM is separated from DIOGND (ie, common reference for digital inputs floats). ON: DICOM connected to DIOGND. OFF: DICOM and DIOGND separate.
XAI			Analog inputs, reference voltage output
1	1	+VREF	10 V DC, R_L 1…10 kohm
2	2	-VREF	-10 V DC, R_L 1…10 kohm
3	3	AGND	Ground
4	4	AI1+	Not in use by default. 0(2)…10 V, R_{in} > 200 kohm[3]
5	5	AI1-	
6	6	AI2+	Not in use by default. 0(4)…20 mA, R_{in} = 100 ohm[4]
7	7	AI2-	
– U	AI1		AI1 current/voltage selection switch
– U	AI2		AI2 current/voltage selection switch
XAO			Analog outputs
1	1	AO1	Zero[1] 0…20 mA, R_L < 500 ohm (not in use by default)
2	2	AGND	
3	3	AO2	Zero[1] 0…20 mA, R_L < 500 ohm (not in use by default)
4	4	AGND	
XPOW			External power input
1	1	+24VI	24 V DC (±10%), 2 A External power input. Two supplies can be connected to the control unit for redundancy.
2	2	GND	
3	3	+24VI	
4	4	GND	

Terminal	Description
X12	Safety functions module connection. Not supported in DC/DC converter units.
X13	Control panel connection
X205	Memory unit connection

1) Default use of the signal in the control program. The use can be changed by a parameter. See also the delivery-specific circuit diagrams.
2) Total load capacity of these outputs is 4.8 W (200 mA at 24 V) minus the power taken by DIO1 and DIO2.
3) 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.
4) 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.

Additional information on the connections

Power supply for the control unit (XPOW)

Connect a power supply to the control unit through terminal block XPOW.

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

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

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

Digital interlock (DIIL)

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

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

Safe torque off (XSTO, XSTO OUT)

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

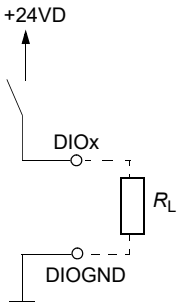
SDHC memory card slot

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

Connector data

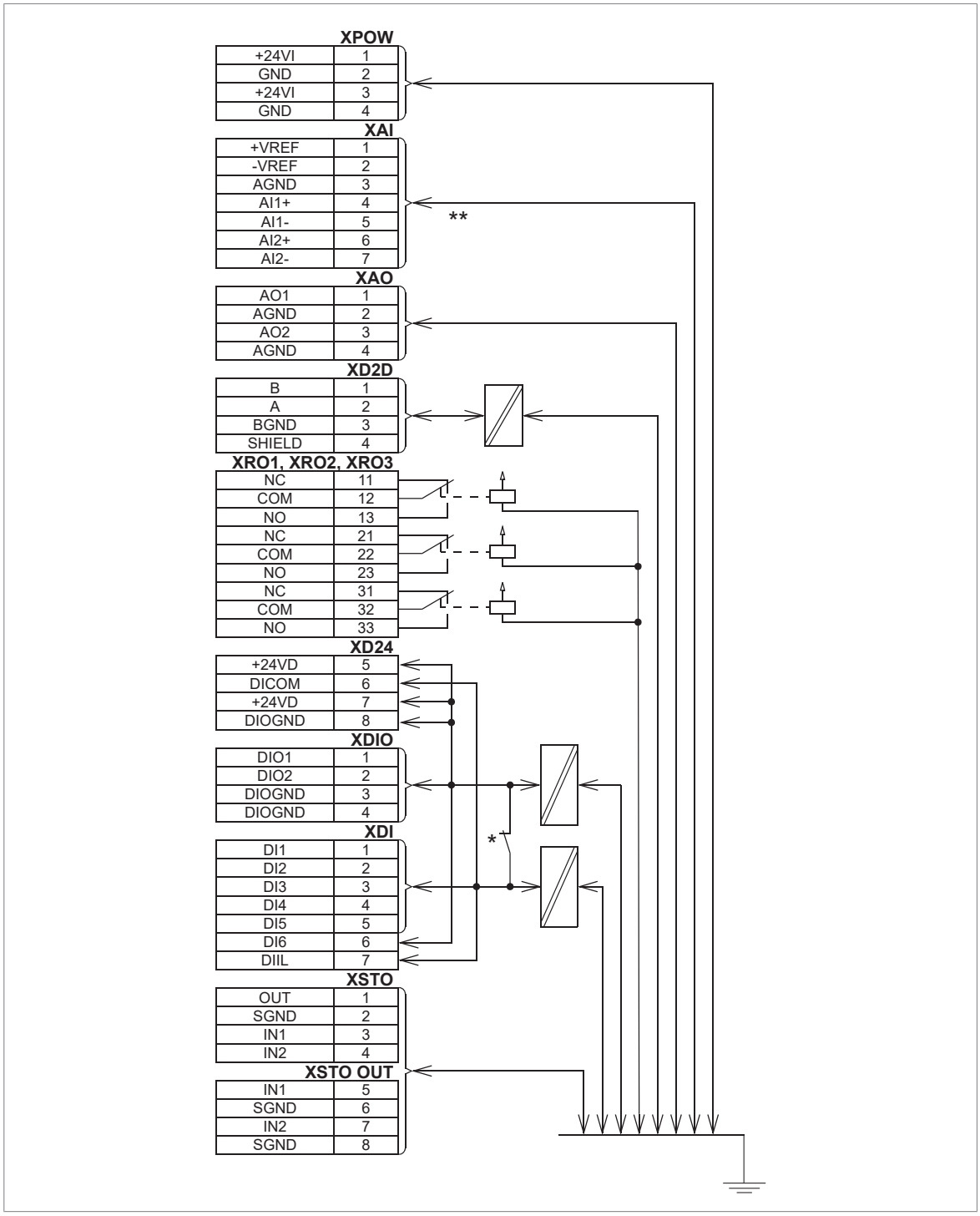
The wire size accepted by all screw terminals (for both stranded and solid wire) is 0.5 … 2.5 mm^2 (22…12 AWG). Connector pitch is 5 mm.

The maximum tightening torque for screw terminals is 0.45 N·m (4 lbf·in).

Power supply (XPOW)	24 V DC (±10%), 2 A External power input. Two supplies can be connected to the BCU control unit for redundancy.
Relay outputs RO1…RO3 (XRO1…XRO3)	250 V AC / 30 V DC, 2 A Protected by varistors
+24 V output (XD24:5 and XD24:7)	Total load capacity of these outputs is 4.8 W (200 mA / 24 V) minus the power taken by DIO1 and DIO2.
Digital inputs DI1…DI6 (XDI:1…XDI:6)	24 V logic levels: “0” < 5 V, “1” > 15 V R_{in}: 2.0 kohm (DI1…DI5) Input type: NPN/PNP (DI1…DI5), PNP (DI6) Hardware filtering: 0.04 ms, digital filtering up to 8 ms I_{max}: 15 mA (DI1…DI5), 5 mA (DI6)
Start interlock input DIIL (XDI:7)	24 V logic levels: "0" < 5 V, "1" > 15 V R_{in}: 2.0 kohm Input type: NPN/PNP Hardware filtering: 0.04 ms, digital filtering up to 8 ms
Digital inputs/outputs DIO1 and DIO2 (XDIO:1 and XDIO:2) Input/output mode selection by parameters. DIO1 can be configured as a frequency input (0…16 kHz with hardware filtering of 4 microseconds) for 24 V level square wave signal (sinusoidal or other wave form cannot be used). In some control programs, DIO2 can be configured as a 24 V level square wave frequency output. Refer to the firmware manual, parameter group 11.	As inputs: 24 V logic levels: "0" < 5 V, "1" > 15 V. R_{in}: 2.0 kohm. Filtering: 1 ms. As outputs: Total output current from +24VD is limited to 200 mA 
Reference voltage for analog inputs +VREF and -VREF (XAI:1 and XAI:2)	10 V ±1% and -10 V ±1%, R_{load} 1…10 kohm Maximum output current: 10 mA
Analog inputs AI1 and AI2 (XAI:4 … XAI:7). Current/voltage input mode selection by switches	Current input: -20…20 mA, R_{in} = 100 ohm Voltage input: -10…10 V, R_{in} > 200 kohm Differential inputs, common mode range ±30 V Sampling interval per channel: 0.25 ms Hardware filtering: 0.25 ms Resolution: 11 bit + sign bit Inaccuracy: 1% of full scale range
Analog outputs AO1 and AO2 (XAO)	0…20 mA, R_{load} < 500 ohm Frequency range: 0…500 Hz Resolution: 11 bit + sign bit Inaccuracy: 2% of full scale range

XD2D connector	Physical layer: RS-485 Transmission rate: 8 Mbit/s Cable type: Shielded twisted-pair cable with a twisted pair for data and a wire or another pair for signal ground (nominal impedance 100 … 165 ohm, for example Belden 9842) Maximum length of link: 50 m (164 ft) Termination by switch
RS-485 connection (X485)	Physical layer: RS-485 Cable type: Shielded twisted-pair cable with a twisted pair for data and a wire or another pair for signal ground (nominal impedance 100 … 165 ohm, for example Belden 9842) Maximum length of link: 50 m (164 ft)
Safe torque off connection (XSTO)	Input voltage range: -3…30 V DC Logic levels: "0" < 5 V, "1" > 17 V. **Note:** Both circuits must be closed to enable start and operation (IN1 and IN2 must be connected to OUT). This applies to all control units (including drive, inverter, supply, brake, DC/DC converter etc. control units), but SIL/PL classified Safe torque off functionality is only achieved through the XSTO connector of the drive/inverter control unit. Current consumption: 66 mA (continuous) per STO channel per drive/inverter module EMC (immunity) according to IEC 61326-3-1 and IEC 61800-5-2
Safe torque off output (XSTO OUT)	To STO connector of inverter module.
Control panel connection (X13)	Connector: RJ-45 Cable length < 100 m (328 ft)
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
Battery	Real-time clock battery type: BR2032
The terminals of the control unit fulfill the Protective Extra Low Voltage (PELV) requirements. The PELV requirements of a relay output are not fulfilled if a voltage higher than 48 V is connected to the relay output.	

BCU ground isolation diagram



*Ground selector (DICOM=DIOGND) settings

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

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

Other information

Refer to BCU-02, BCU-12 and BCU-22 control units hardware manual (3AUA0000113605 [English]).

9

Installation checklist

Contents of this chapter

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

Checklist

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

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

WARNING!
Do the steps in section Electrical safety precautions (page 64) before you start the work.

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

Make sure that ...	☑
The cooling air can flow freely in and out of the drive. Air recirculation inside the cabinet is not possible (air baffle plates are installed, or there is another air guiding solution).	☐
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.	☐
The enclosures of the equipment in the cabinet have proper galvanic connection to the cabinet protective earth (ground) busbar; The connection surfaces at the fastening points are bare (un-painted) and the connections are tight, or separate grounding conductors have been installed.	☐
The main circuit connections inside the drive cabinet correspond to the circuit diagrams.	☐
The control unit has been connected. See the circuit diagrams.	☐
Appropriate AC fuses and main disconnecting device 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. Grounding has also been measured according to the regulations.	☐
There is an adequately sized protective earth (ground) conductor between the energy storage and the DC/DC-converter, the conductor is connected to the correct terminal, and the terminal is tightened to the correct torque. Proper grounding has also been measured according to the regulations.	☐
The energy storage cable is connected to the correct terminals of the DC/DC-converter and energy storage, and the terminals are tightened to the correct torque.	☐
The energy storage is equipped with fuses for protecting the energy storage cable in a cable short-circuit situation.	☐
The energy storage is equipped with a disconnecting device.	☐
The input power cable is connected to the correct terminals, the phase order is correct, and the terminals are tightened to the correct torque.	☐
There is an adequately sized protective earth (ground) conductor between the motor and the drive. The conductor is connected to the correct terminal, and the terminal is tightened to the correct torque. Grounding has also been measured according to the regulations.	☐
The motor cable is connected to the correct terminals, the phase order is correct, and the terminals are tightened to the correct torque.	☐
The motor cable is routed away from other cables.	☐
No power factor compensation capacitors are connected to the motor cable.	☐
If an external brake resistor is connected to the drive: There is an adequately sized protective earth (ground) conductor between the brake resistor and the drive, and the conductor is connected to the correct terminal, and the terminals are tightened to the correct torque. Grounding has also been measured according to the regulations.	☐
If an external brake resistor is connected to the drive: The brake resistor cable is connected to the correct terminals, and the terminals are tightened to the correct torque.	☐
If an external brake resistor is connected to the drive: The brake resistor cable is routed away from other cables.	☐
The control cables are connected to the correct terminals, and the terminals are tightened to the correct torque.	☐
If a drive bypass connection will be used: The direct-on-line contactor of the motor and the drive output contactor are either mechanically and/or electrically interlocked, that is, they cannot be closed at the same time. A thermal overload device must be used for protection when bypassing the drive. Refer to local codes and regulations.	☐
There are no tools, foreign objects or dust from drilling inside the drive.	☐
The area in front of the drive is clean: the drive cooling fan cannot draw any dust or dirt inside.	☐
The terminal box cover of the motor is in place. Cabinet shrouds are in place and doors are closed.	☐

Make sure that ...	☑
The motor and the driven equipment are ready for power-up.	☐

10

Start-up

Contents of this chapter

This chapter describes the start-up procedure of the converter unit. The information is applicable to the example DC/DC-converter units shown in the example circuit diagrams. The persons who do the start-up procedure must know the energy storage system, the DC/DC-converter control program and the operation principle of the DC/DC-converter.

The default device designations are given in square brackets, for example, [Q11]. The same device designations are also used in the example circuit diagrams. They refer to the circuit diagram of the example installation by ABB.

Before you start, connect a control panel to the DC/DC-converter unit. ABB recommends that you also have a PC with a drive commissioning tool (Drive Composer) connected. For information on the use of the control panel, refer to ACS-AP-I, -S, -W and ACH-AP-H, -W Assistant control panels user's manual (3AUA0000085685 [English]). For information on the use of the Drive Composer PC tool, refer to Drive Composer start-up and maintenance PC tool user's manual (3AUA0000094606 [English]).

Start-up procedure

Tasks	☑
Safety	
WARNING! Obey the safety instructions during the start-up procedure. See ACS880 multidrives cabinets and modules safety instructions (3AUA0000102301 [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.	☐
Checks/Settings with no voltage connected	
Make sure that it is safe to start the work. Do the steps in section Electrical safety precautions (page 64).	☐
Make sure that the disconnector of the supply transformer is locked into the open position and that voltage cannot be connected to the drive accidentally.	☐
Make sure that all external auxiliary circuits are de-energized and disconnected. See the start-up instructions in the supply unit hardware manual.	☐
Make sure that the supply unit is de-energized, and the drive system is isolated from the supply network.	☐
DC/DC-converter with the DC switch-disconnector [Q11]: Make sure that the DC switch-disconnector [Q11] and the DC/DC-converter charging switch [Q10] are open and locked.	☐
Make sure that the energy storage disconnecting device (customer or system integrator-installed device) is locked into the open position.	☐
Make sure that the mechanical and electrical installation of the converter unit is completed and inspected. Refer to the installation checklist.	☐
Make sure that the drive is ready for the converter unit power up: • The supply and inverter units have been installed according to the instructions given in their hardware manuals. • The supply unit has been started up according to the instructions given in the applicable supply unit manual. • The inverter units have been started up according to the instructions given in the hardware manual and applicable firmware manual.	☐
If the converter unit was stored for more than one year: Reform the electrolytic DC capacitors in the DC bus of the drive. Refer to Capacitor reforming instructions (3BFE64059629 [English]).	☐
Close the auxiliary voltage circuit breakers of the converter unit [F21.1, F26.1]. Close also other circuit breakers in between the converter control unit [A41] and the auxiliary voltage switch [Q21] of the drive supply unit.	☐
Close the cabinet doors.	☐
Connecting voltage to the drive and converter control unit	
Connect main AC voltage to the input terminals of the drive supply unit: Close the disconnector of the supply transformer.	☐

Tasks	☑
WARNING! When you connect voltage to the supply unit, the DC busbars and the converters connected to the DC bus will become energized. **WARNING!** Converter units with a DC switch-disconnector: Some types of converter modules can be energized through a charging circuit even if the DC switch-disconnector is open or the DC fuses are removed. Converter units without a DC switch-disconnector: If the converter unit only has DC fuses without a switch fuse, all the converter units with the DC fuses in position will be energized when the main breaker/contactor closes. To prevent this, remove the fuses from the converter units which are to remain de-energized before you connect the voltage. **Do not install or remove DC fuses when the main breaker/contactor of the supply unit is closed (DC busbars are energized).** If the drive is equipped with a main switch-disconnector: Close the main disconnecting device of the drive system.	☐
Close the auxiliary voltage switch [Q21] of the drive supply unit. The converter control unit will be powered. **Do not** close the main circuit breaker [Q1] or the main contactor [Q2] of the drive supply unit! You must not energize the drive DC bus at this time.	☐
Setting the parameters	
Set the DC/DC-converter parameters. Refer to chapter **Start-up** in DC/DC-converter control program firmware manual (3AXD50000024671 [English]).	☐
Charging the DC/DC-converter and connecting voltage to the converter	
Make sure that the energy storage disconnecting device is open. **WARNING!** Always keep the energy storage disconnected from DC/DC-converter until the DC/DC-converter is charged.	☐
Start the supply unit and close the main contactor [Q2] or the main circuit breaker [Q1] of the drive supply unit.	☐
Power up and charge the DC/DC-converter: DC/DC-converter with the DC switch-disconnector [Q11]: 1. Close the DC/DC-converter charging switch [Q10]. 2. Close the DC switch-disconnector [Q11]. 3. Open the DC/DC-converter charging switch [Q10]. **Note:** The charging switch must be open before you can start the DC/DC-converter. DC/DC-converter without DC switch-disconnector: 1. Start the supply unit and close the main contactor [Q2] or the main breaker [Q1] of the drive supply unit. The DC/DC-converter is energized and gets charged.	☐
Connecting the energy storage to the DC/DC-converter	
Set parameter 120.12 Run enable 1 to Off. This makes sure that the DC/DC-converter does not start automatically or unexpectedly after you connect the energy storage.	☐
Set the control panel to local control mode with the **Loc/Rem** key.	☐
Make sure that the energy storage voltage is less than the drive DC link voltage.	☐
WARNING! Do not close the energy storage disconnecting device if the DC/DC-converter is not connected or not ready to use. Close the energy storage disconnecting device.	☐
Close the energy storage protective circuit breaker (customer or system integrator-installed device).	☐

Tasks	☑
Testing the DC/DC-converter operation	
Set parameter 120.12 Run enable 1 to On.	☐
Set parameter 122.01 User Power ref to 0 A.	☐
Set current limits to low values, for example, • 130.119 Minimum current to -50 A. • 130.120 Maximum current to 50 A.	☐
Push the **Start** key on the control panel to start the converter. After start, increase slowly the value of parameter 122.01 User Power ref.	☐
Check the following signals: • 102.01 DC voltage • 102.02 ES voltage used • 102.08 Total current • 102.11 Modulation index % • 130.101 DDC limit word 1.	☐
Make sure that the DC/DC-converter module and filter module cooling fan turns freely in the correct direction. A paper sheet set on the intake (door) gratings stays. The fans operate without unusual noises.	☐
Press the **Stop** key on the control panel to stop the converter.	☐

11

Maintenance

Contents of this chapter

This chapter instructs how to maintain the DC/DC-converter modules and how to interpret their fault indications. The information is valid for ACS880-1604 DC/DC-converter modules and example cabinet installations of the modules.

Note: The instructions do not cover all possible cabinet constructions.

WARNING!
Obey the safety instructions given in ACS880 multidrives cabinets and modules safety instructions (3AUA0000102301 [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 show the maintenance tasks that can be done by the end user. For the ABB Service offering, contact your local ABB Service representative (new.abb.com/contact-centers).

Description of symbols

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

Recommended maintenance intervals after start-up

Recommended annual actions by the user	
Connections and environment	
Cabinet door filters IP54	R
Quality of supply voltage	P
Spare parts	
Spare parts	I
DC circuit capacitors reforming, spare modules and spare capacitors	P
Inspections by user	
IP22 and IP42 air inlet and outlet meshes	I
Tightness of terminals	I
Dustiness, corrosion and temperature	I
Heatsink cleaning	I
Other	
ABB-SACE Air circuit breaker maintenance	I
ABB Contactors maintenance	I

Item	Years from start-up						
	3	6	9	12	15	18	21
Main cooling fan							
R8i direct online 50/60 Hz			R			R	
R8i speed controlled			R			R	
Internal cooling fan for circuit boards							
R8i			R			R	
Cabinet cooling fan							
Internal LONG-LIFE 50 Hz			R			R	
Internal LONG-LIFE 60 Hz		R		R		R	
Door LONG-LIFE 50 Hz			R			R	
Door LONG-LIFE 60 Hz		R		R		R	
IP54 50 Hz			R			R	
IP54 60 Hz		R		R		R	
Aging							
Control unit battery		R		R		R	
Control panel battery			R			R	

Note:

- The maintenance and component replacement intervals are based on the assumption that the equipment operates 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. Contact your local ABB Service representative for additional maintenance recommendations.

Maintenance timers and counters

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

Disconnecting the DC/DC-converter

Disconnecting the DC/DC-converter from the energy storage

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

This procedure tells you how to disconnect the DC/DC-converter from the energy storage.

1. Set the control panel to local mode with the **Loc/Rem** key.
2. Push the **Stop** key on the control panel.
3. Set parameter 120.19 Enable start signal to value Off. This prevents an accidental start of the unit.
4. Open the energy storage protective circuit breaker.
5. Open the energy storage disconnecting device. Lock out and tag out.
6. If it is necessary to disconnect the DC/DC-converter from the drive system, and the converter has a DC switch-disconnector [Q11], continue with step 2 of the procedure in section Disconnecting the DC/DC-converter from the drive system with the DC switch-disconnector (page 111).

Disconnecting the DC/DC-converter from the drive system with the DC switch-disconnector

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

This procedure tells you how to disconnect the DC/DC-converter from the energy storage and the drive system with the optional DC switch-disconnector .

1. Do the steps in section Disconnecting the DC/DC-converter from the energy storage (page 111).
2. Drives with DC switch-disconnector [Q11]: Open the DC switch-disconnector [Q11]. Lock out and tag out.
3. If it is necessary to do work inside the DC/DC-converter unit, stop the drive system and isolate it from the main and auxiliary power supplies. Do the steps in section Electrical safety precautions (page 64).

Connecting the DC/DC-converter

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

This procedure tells you how to connect the DC/DC-converter to the energy storage and the drive system.

1. Make sure that the work is completed and there are no tools inside the drive.
2. Close the cabinet doors.
3. Connect the DC/DC-converter and energy storage. Refer to these instructions in chapter Start-up:
   - Connecting voltage to the drive and converter control unit (page 106)
   - Charging the DC/DC-converter and connecting voltage to the converter (page 107)
   - Connecting the energy storage to the DC/DC-converter (page 107).
4. Set the control panel to local mode with the **Loc/Rem** key.
5. Set parameter 120.19 Enable start signal to value On.
6. Push the **Start** key on the control panel.

Cabinet

Cleaning the interior of the cabinet

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

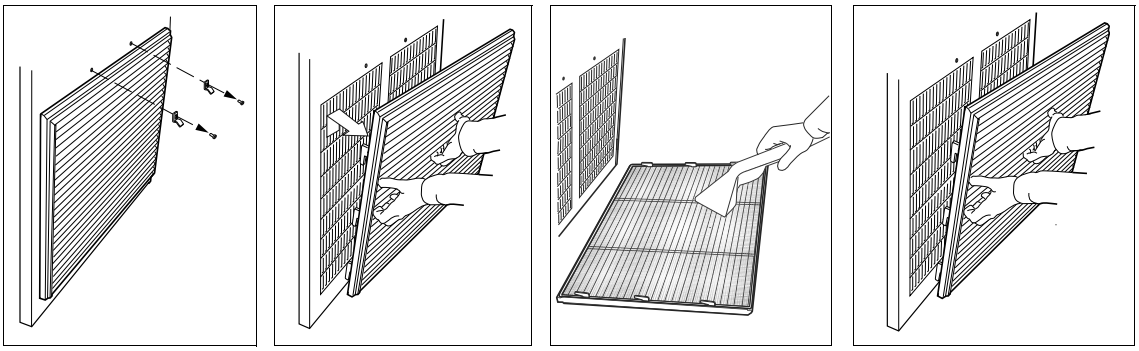
WARNING!
Use a vacuum cleaner with antistatic hose and nozzle, and wear a grounding wristband. Using a normal vacuum cleaner creates static discharges which can damage circuit boards.

1. Stop the drive and do the steps in section Electrical safety precautions (page 64) before you start the work.
2. Open the cabinet door.
3. Clean the interior of the cabinet. Use a vacuum cleaner and a soft brush.
4. Clean the air inlets of the fans and air outlets of the modules (top).
5. Clean the air inlet gratings (if any) on the door.
6. Close the door.

Cleaning the door air inlets (IP22 and IP42)

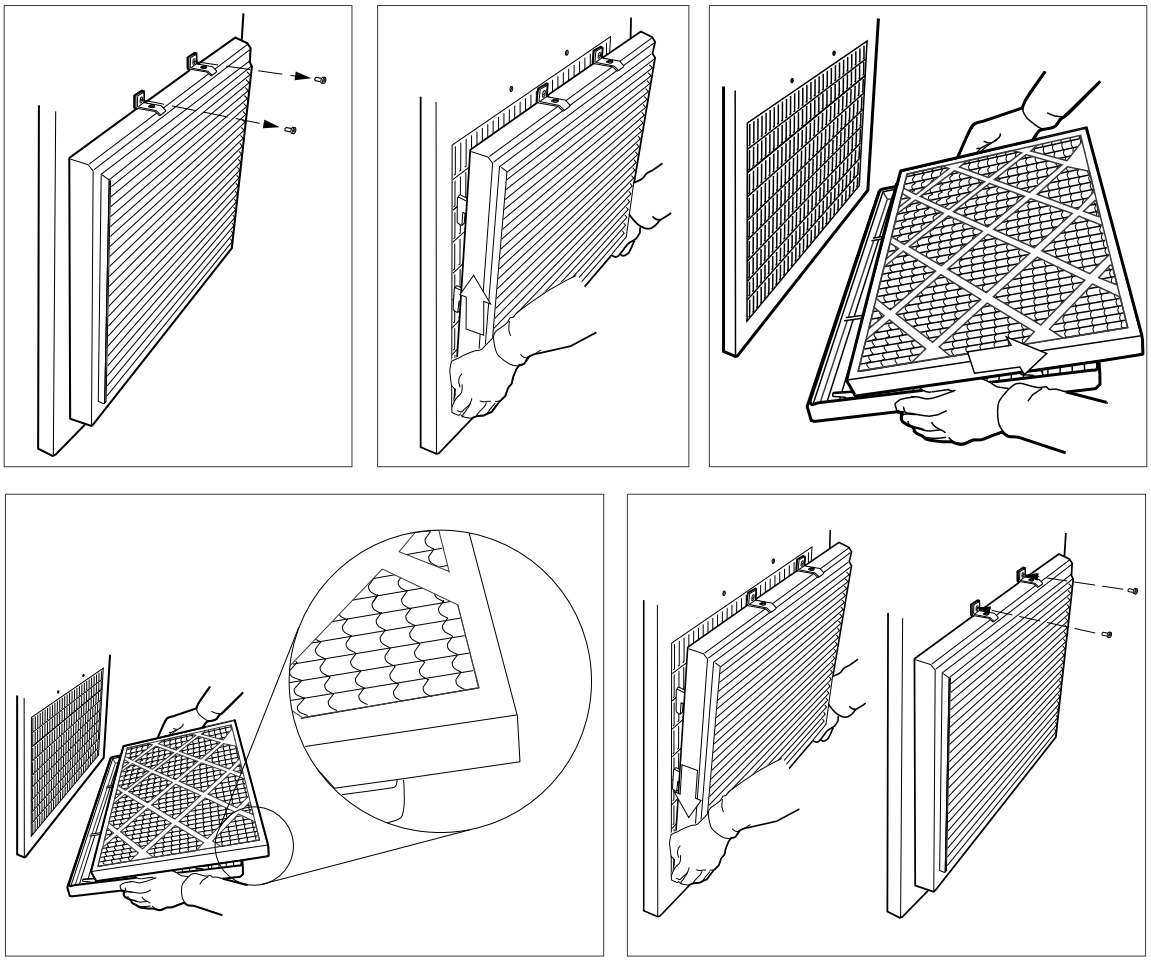
Check the dustiness of the air inlet meshes. If the dust cannot be removed by vacuum cleaning from outside through the grating holes with a small nozzle, proceed as follows:

1. Stop the drive and do the steps in section Electrical safety precautions (page 64) before you start the work.
2. Remove the fasteners at the top of the grating.
3. Lift the grating and pull it away from the door.
4. Vacuum clean or wash the grating on both sides.
5. Reinstall the grating in reverse order.



Replacing the inlet door filters (IP54)

1. Stop the drive and do the steps in section Electrical safety precautions (page 64) before you start the work.
2. Remove the fasteners at the top of the grating.
3. Lift the grating and pull it away from the door.
4. Remove the air filter mat.
5. Place the new filter mat in the grating the metal wire side facing the door.
6. Reinstall the grating in reverse order.



Cleaning the roof outlet filters (IP54)

The outlet filters on the roof of IP54 units can be accessed by pulling the gratings upwards.

Fans

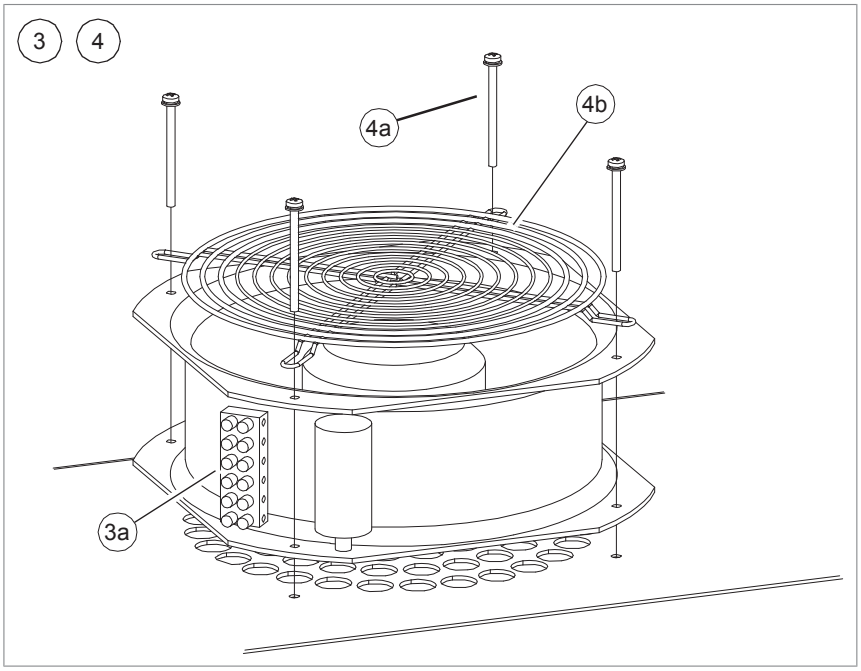
The lifespan of the cooling fans of the drive depends on running time, ambient temperature and dust concentration. See the firmware manual for the actual signal which indicates the running time of the cooling fan. Reset the running time signal after fan replacement.

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

Replacing the cabinet cooling fan

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

1. Stop the drive and do the steps in section Electrical safety precautions (page 64) before you start the work.
2. Remove the shrouding (if any) in front of the fan.
3. Disconnect the fan wiring (a).
4. Remove the fastening screws (a) and finger guard (b) of the fan.
5. Install the new fan in reverse order. Make sure that the arrow indicating the air flow direction points up.



Replacing the speed-controlled cooling fan of the DC/DC-converter module

The module is equipped with a fan unit that contains two cooling fans.

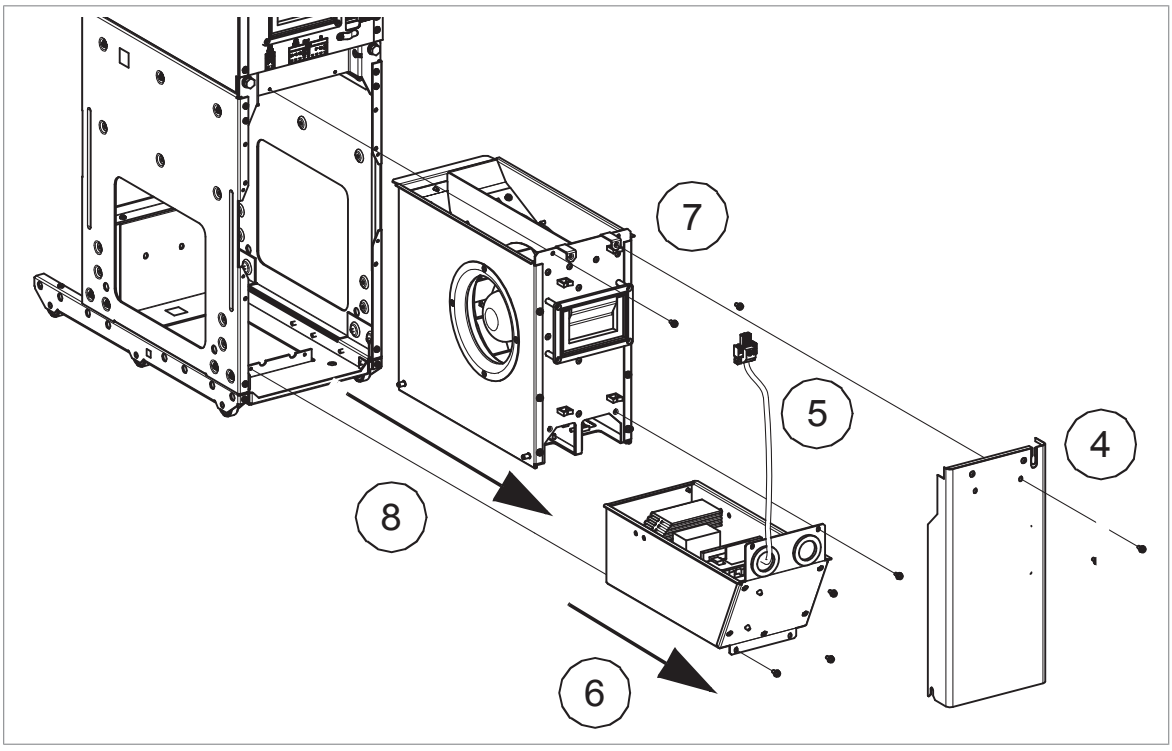
WARNING!
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do installation, commissioning or maintenance work.

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

Before you start replacing the fan kit of the converter module, make sure that the connector at the end of the fan kit cable is compatible with the counterpart in the

module. Black connector is compatible only with the black counterpart, and gray connector only with the gray counterpart. If the connectors are not compatible, replace the connector at the end of the fan kit cable. Use the connector in the old fan kit, or order a suitable connector from ABB.

1. Stop the drive and do the steps in section Electrical safety precautions (page 64) before you start the work.
2. Open the cubicle door.
3. Remove the shroud in front of the fan (if any).
4. Remove the screws holding the front cover plate. Lift the cover plate somewhat to release it.
5. Disconnect the fan wiring.
6. Remove the unit below the fan.
7. Remove the screws of the fan unit.
8. Pull out the fan unit.
9. Install a new fan in reverse order.



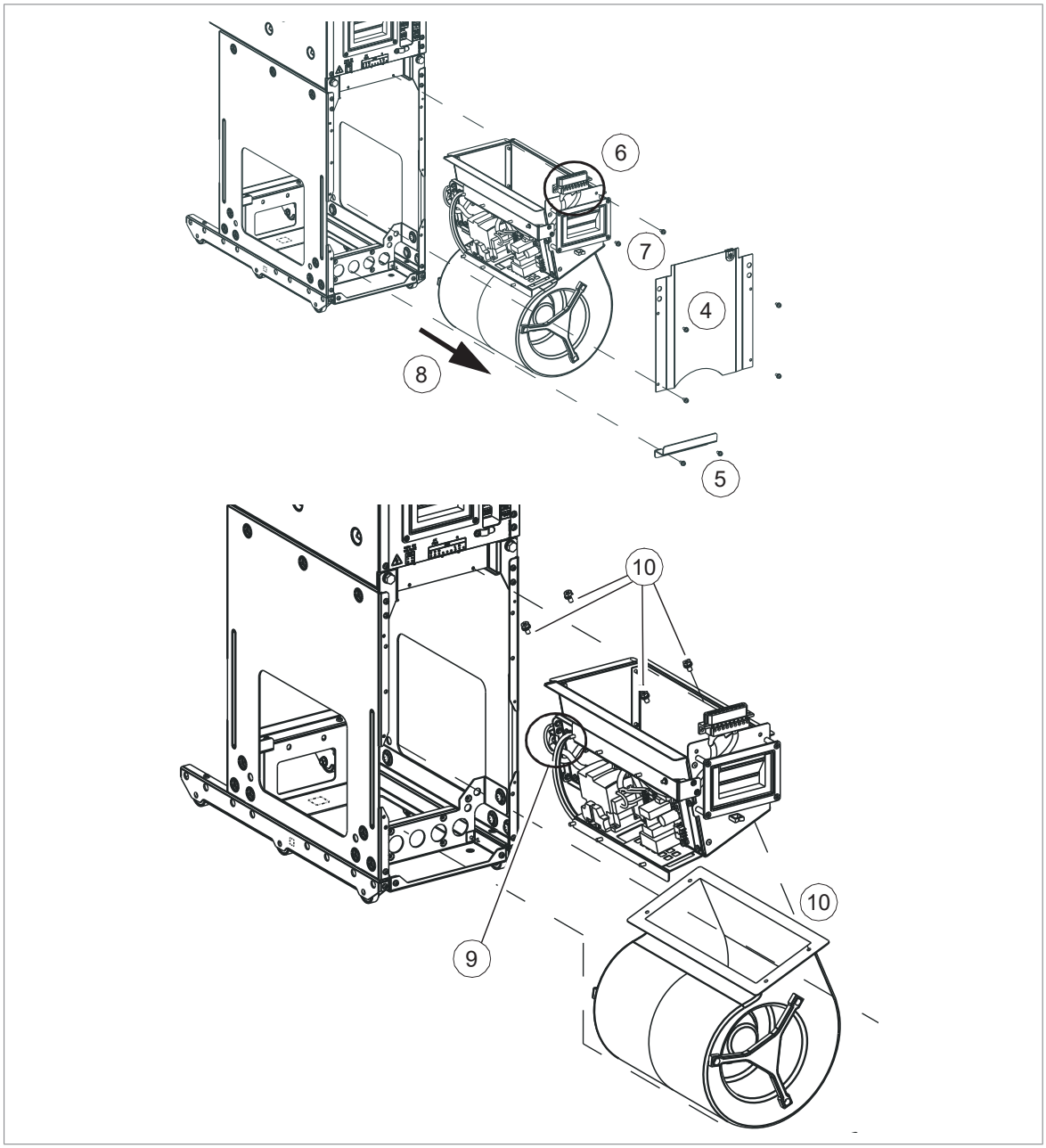
Replacing the direct-on-line fan (option +C188) of the DC/DC-converter module

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, commissioning or maintenance work.

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

Before you start replacing the fan kit of the converter module, make sure that the connector at the end of the fan kit cable is compatible with the counterpart in the module. Black connector is compatible only with the black counterpart, and gray connector only with the gray counterpart. If the connectors are not compatible, replace the connector at the end of the fan kit cable. Use the connector in the old fan kit, or order a suitable connector from ABB. Refer to Connector replacement guide for ACS880-x04 R8i/D8T, BLCL-2X, BL-2X and BLHF DOL fan (3AXD50001059903 [English]).

1. Stop the drive and do the steps in section Electrical safety precautions (page 64) before you start the work.
2. Open the door.
3. Remove the shroud in front of the fan (if any).
4. Remove the screws holding the front cover plate. Lift the cover plate somewhat to release it.
5. Remove the bracket.
6. Disconnect the wiring of the fan unit.
7. Remove the screws of the fan unit.
8. Pull out the fan unit.
9. Disconnect the fan wire from the fan unit.
10. Remove the screws of the fan.
11. Install a new fan in reverse order.



Replacing the circuit board compartment fan

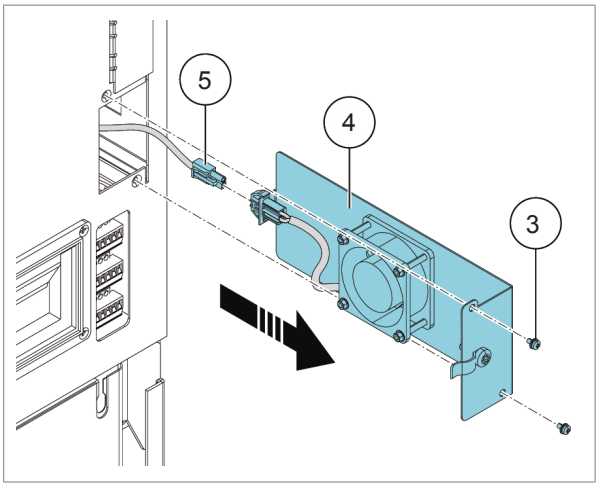
Frame R8i modules are equipped with a fan blowing air through the circuit board compartment.

The fan is accessible from the front of the module.

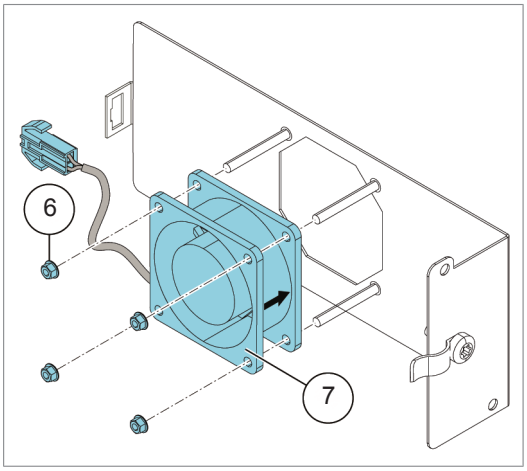
WARNING!
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do installation, commissioning or maintenance work.

1. Stop the drive and do the steps in section Electrical safety precautions (page 64) before you start the work.
2. Open the door of the module cubicle.
3. Remove the two M4×12 (T20) screws which lock the fan holder.

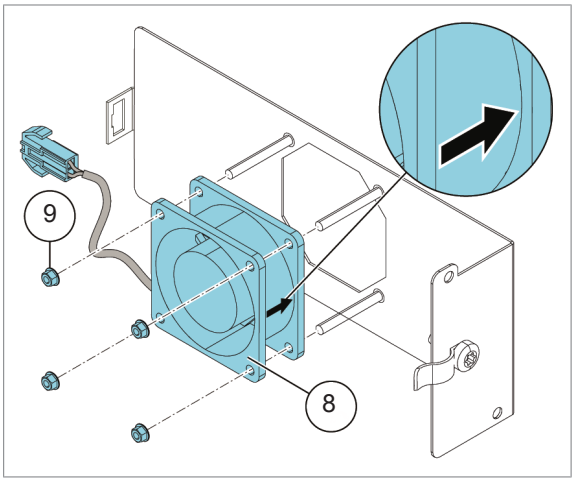
4. Pull the fan holder out of the module.
5. Disconnect the fan cable.



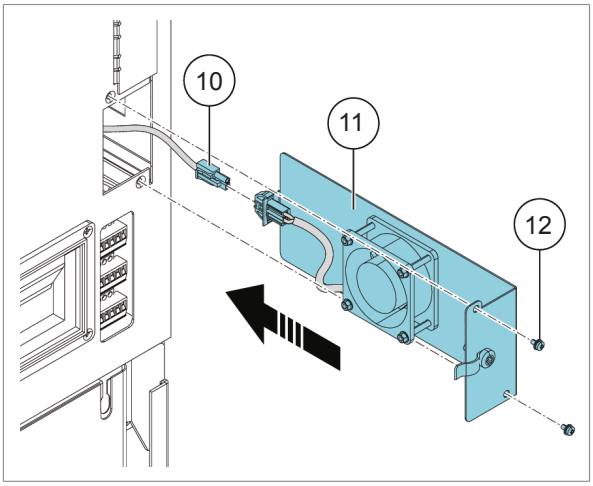
6. Remove the four M3 (5.5 mm) nuts which hold the fan.
7. Remove the fan from the fan holder.



8. Put the fan onto the threaded studs on the fan holder with the airflow direction arrow pointing towards the fan holder.
9. Install and tighten the four nuts removed earlier.



10. Connect the fan cable.
11. Align and push the fan holder into the module.
12. Install and tighten the two M4×12 (T20) screws.



Replacing the fan of the BDCL filter

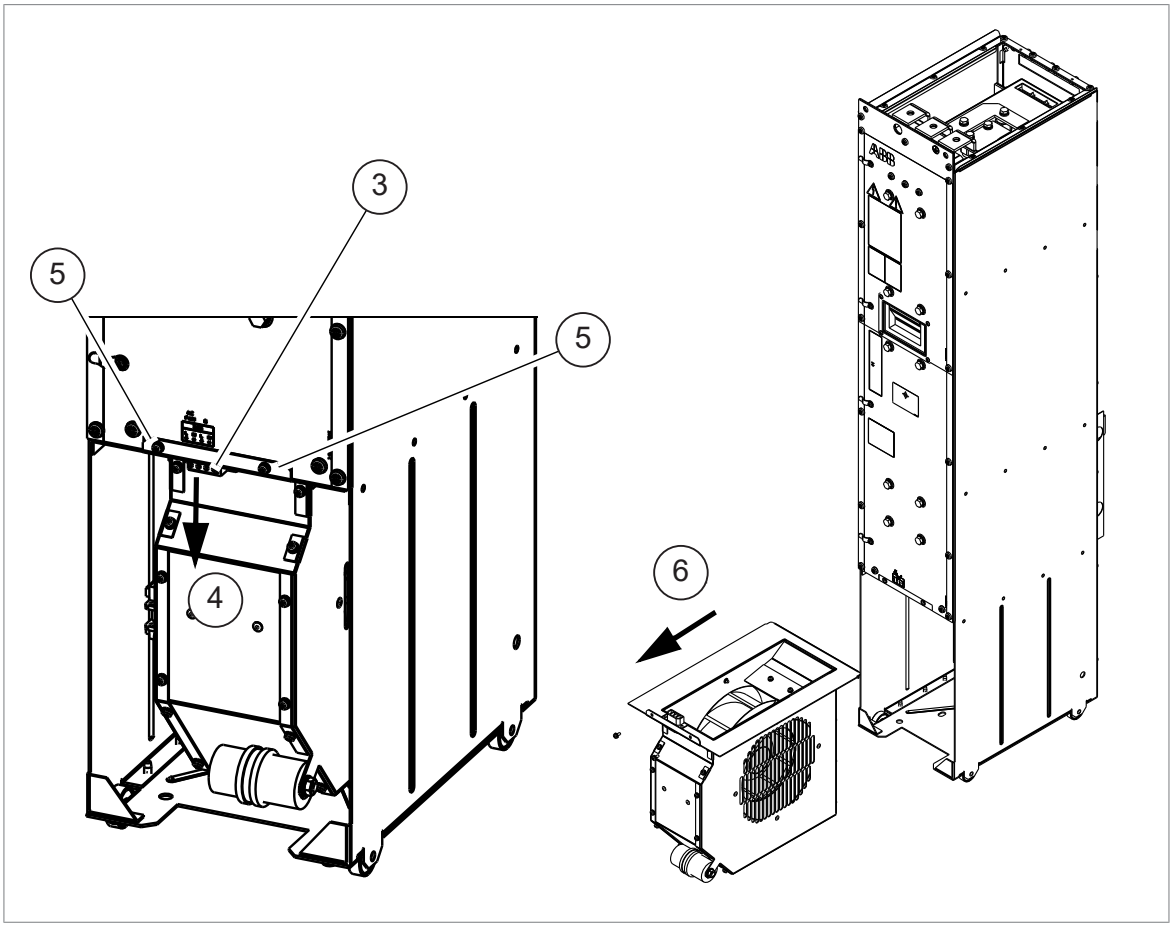
WARNING!
Obey the safety instructions given in ACS880 multidrives cabinets and modules safety instructions (3AUA0000102301 [English]). If you ignore the safety instructions, injury or death, or damage to the equipment can occur.

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.

Before you replace the fan kit of the filter module, make sure that the connector at the end of the fan kit cable is compatible with the counterpart in the module. Black connector is compatible only with the black counterpart, and gray connector only with the gray counterpart. Refer to Connector replacement guide, fan kit cable for BDCL-1… BLCL-0…, or ACS880-304 D7T with +C188 (3AXD50001065126 [English]).

1. Stop the drive and do the steps in section Electrical safety precautions (page 64) before you start the work.
2. Open the door.
3. Remove the two locking screws of fan supply plug connector.
4. Pull the plug connector downwards to unplug the fan wiring.
5. Remove the two locking screws in front of the fan unit.
6. Pull the fan unit out.
7. Install a new fan in reverse order.



Replacing the roof fan for IP54 cabinet

Cabinets with ABB air outlet kits

WARNING!
Obey the safety instructions given in ACS880 multidrives cabinets and modules safety instructions (3AUA0000102301 [English]). If you ignore the safety instructions, injury or death, or damage to the equipment can occur.

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

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

1. Stop the drive and disconnect the DC/DC-converter unit from the energy storage. Refer to section Disconnecting the DC/DC-converter from the energy storage (page 111). Then disconnect the drive from the input power supply and do the steps in section Electrical safety precautions (page 64)
2. The instruction mentioned for each air outlet kit in the ordering information contains an exploded view of the outlet. Remove all gratings and filters, and finally remove the plate on top of the outlet. Unscrew all necessary screws securing the fan and remove it.
3. Install new fan in reverse order.

Cabinets with other fan types

WARNING!
Obey the safety instructions given in ACS880 multidrives cabinets and modules safety instructions (3AUA0000102301 [English]). If you ignore the safety instructions, injury or death, or damage to the equipment can occur.

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

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

1. Stop the drive and disconnect the DC/DC-converter unit from the energy storage. Refer to section Disconnecting the DC/DC-converter from the energy storage (page 111). Then disconnect the drive from the input power supply and do the steps in section Electrical safety precautions (page 64)
2. Obey the instructions of the manufacturer of the air outlet or enclosure system.

DC/DC-converter module

Cleaning the module

The drive module heatsink fins pick up dust from the cooling air. The drive runs into overtemperature warnings and faults if the heatsink is not clean. When necessary, clean the heatsink as follows.

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

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

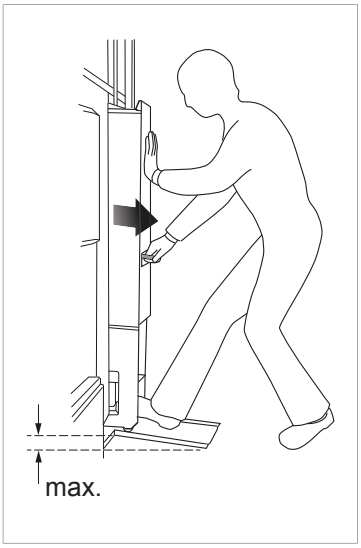
1. Stop the drive and do the steps in section Electrical safety precautions (page 64) before you start the work.
2. Remove the module cooling fan(s). See the separate instructions.
3. Protect the adjacent equipment from dust.
4. Blow dry, clean and oil-free compressed air from bottom to top and simultaneously use a vacuum cleaner at the air outlet to trap the dust.
5. Reinstall the cooling fan.

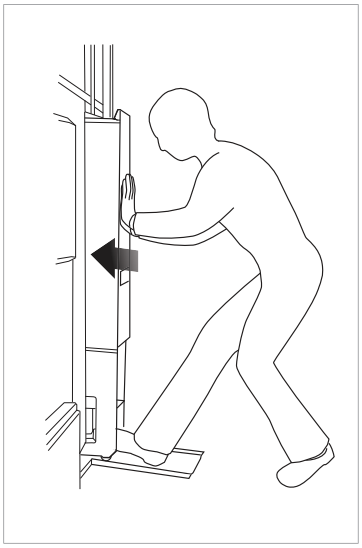
Replacing the R8i DC/DC-converter module

WARNING!
Obey the safety instructions given in ACS880 multidrives cabinets and modules safety instructions (3AUA0000102301 [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.

- Do not use the module extraction/installation ramp when the height of the drive cabinet plinth is more than the maximum permitted height.
- Secure the module extraction/installation ramp carefully.
- Push the module into the cabinet and pull it from the cabinet carefully preferably with help from another person. Keep a constant pressure with one foot on the base of the module to prevent the module from falling on its back. Keep your fingers away from the edges of the front flange of the module.





- Do not move the module on its wheels for long distances. It can cause damage to the wheels. Also, there is a risk of the module falling over.
- Be careful when handling a tall module. The module overturns easily because it is heavy and has a high center of gravity. Whenever possible, secure the module with chains. Do not leave an unsupported module unattended especially on a sloping floor.

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

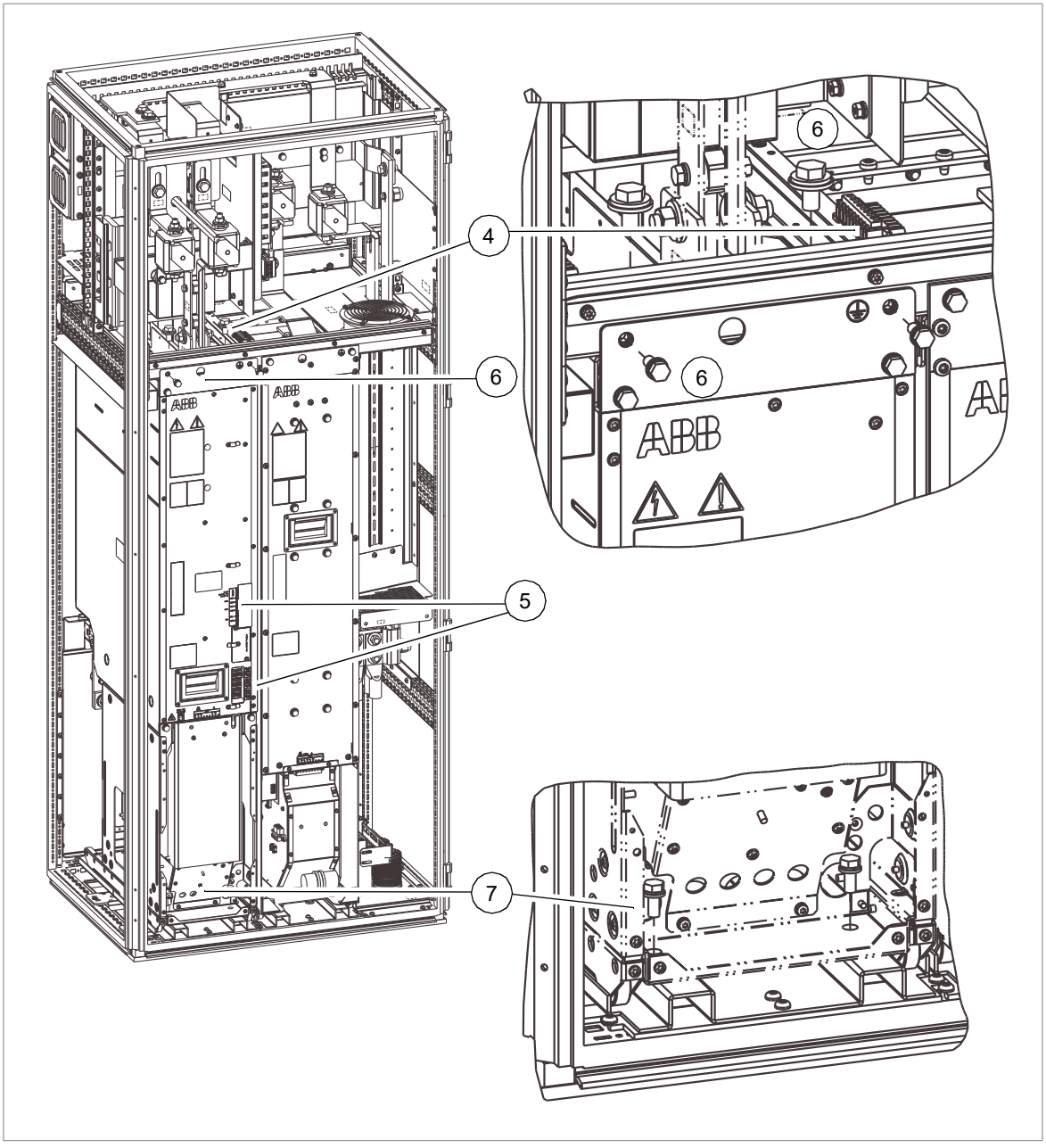
Note: There is a module lifter available from ABB Service. See Lifter for air-cooled drive modules user's guide (3AXD50000332588 [English]).

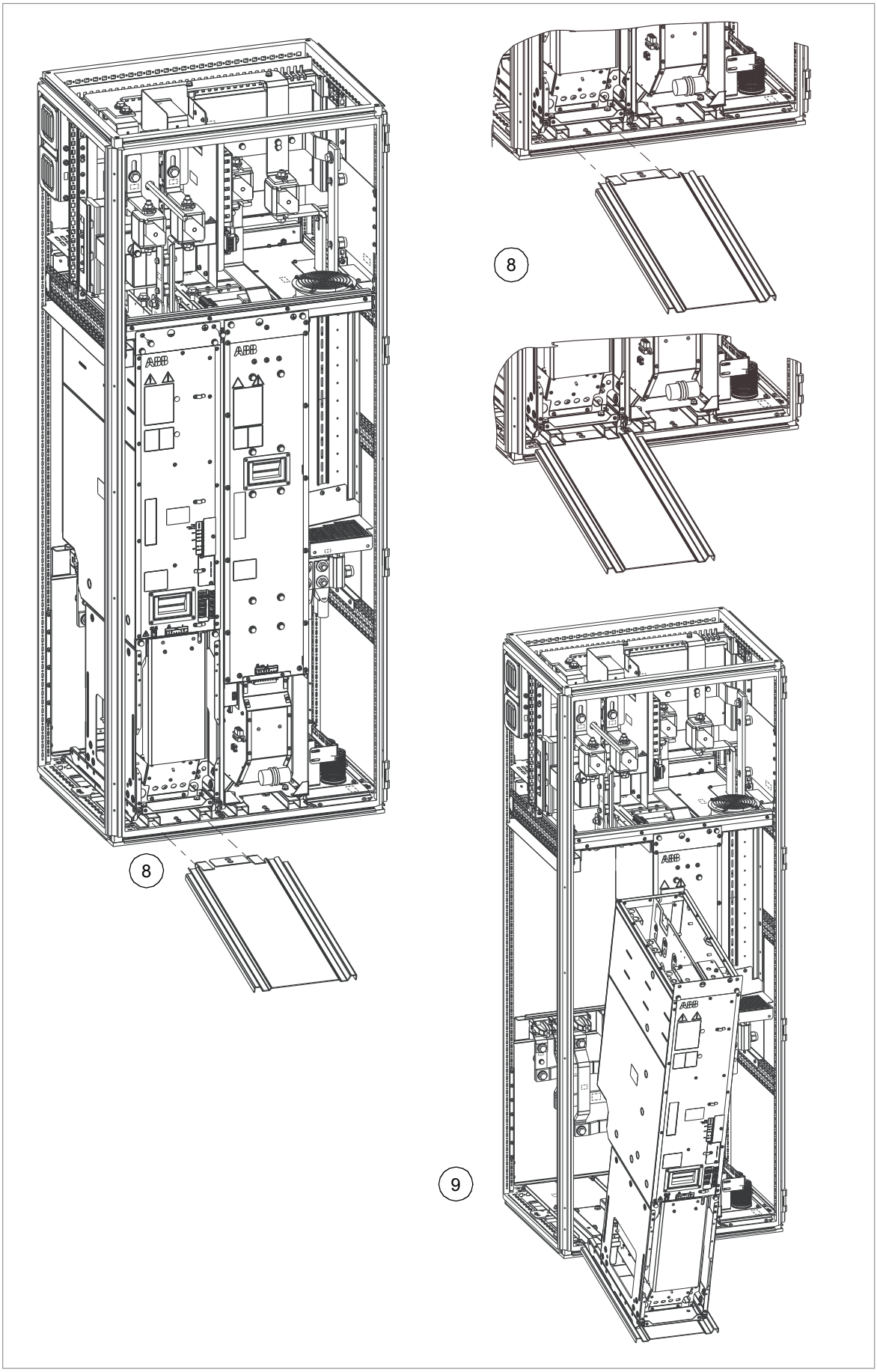
Before you replace a converter module with a new one, make sure that the connector of the auxiliary power supply cable in the cabinet is compatible with the counterpart in the module (X50). Black connector is compatible only with the black counterpart, and gray connector only with the gray counterpart. If the connectors are not compatible, replace the connector in the new module. Use the connector from the old module, or order suitable connector from ABB. Refer to Connector replacement guide, auxiliary power supply for ACS880-104 R8i, ACS880-304 D8T and D7T (3AXD50001060015 [English]) or Connector replacement guide, auxiliary power supply for ACS880-104 R8i with +C183, ACS880-304 D8T with +C183 (3AXD50001060022 [English]).

Replace the converter module as follows:

1. Stop the drive and disconnect the DC/DC-converter unit from the energy storage. Refer to section Disconnecting the DC/DC-converter from the energy storage (page 111). Then disconnect the drive from the input power supply and do the steps in section Electrical safety precautions (page 64)
2. Open the cubicle door.
3. Remove the shrouds (if any).
4. Disconnect the terminal block [X50] cable (if any) on top of the module.
5. Disconnect the optic cables and connector [X53].
6. Remove the two fastening screws in front of the module. Remove the two M12 fastening bolts in the module DC connection, loosen the carriage screws on the DC flanges and lift the flanges up.
7. Remove the two fastening screws in the lower part of the module.
8. Use a module pull out ramp or other lifting device to remove the module from the cabinet. If the ramp is used, install it by placing the hooks of the ramp between the bottom plate and Rittal frame.
9. Pull the module carefully out of the cabinet along the ramp, or use another lifting device to remove the module.
10. Replace the module:

- Push the module back in and fasten. Be careful not to break the fastening screws: tighten the fastening screws of the module to 22 N·m (16.2 lbf·ft) and fastening bolts of the DC output busbars to 70 N·m (51.6 lbf·ft).
- Connect the module signal wire set to the module terminal block [X50].
- Reconnect the fiber optic cables and connector [X53].
- Remove the module pull-out ramp, attach the shrouds (if any) and close the cabinet doors.

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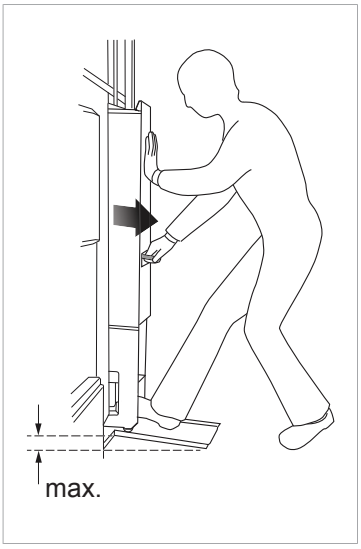
BDCL filter module

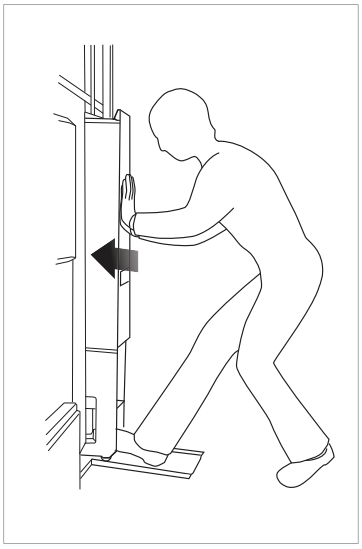
Replacing the BDCL filter

WARNING!
Obey the safety instructions given in ACS880 multidrives cabinets and modules safety instructions (3AUA0000102301 [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.

- Do not use the module extraction/installation ramp when the height of the drive cabinet plinth is more than the maximum permitted height.
- Secure the module extraction/installation ramp carefully.
- Push the module into the cabinet and pull it from the cabinet carefully preferably with help from another person. Keep a constant pressure with one foot on the base of the module to prevent the module from falling on its back. Keep your fingers away from the edges of the front flange of the module.





- Do not move the module on its wheels for long distances. It can cause damage to the wheels. Also, there is a risk of the module falling over.
- Be careful when handling a tall module. The module overturns easily because it is heavy and has a high center of gravity. Whenever possible, secure the module with chains. Do not leave an unsupported module unattended especially on a sloping floor.

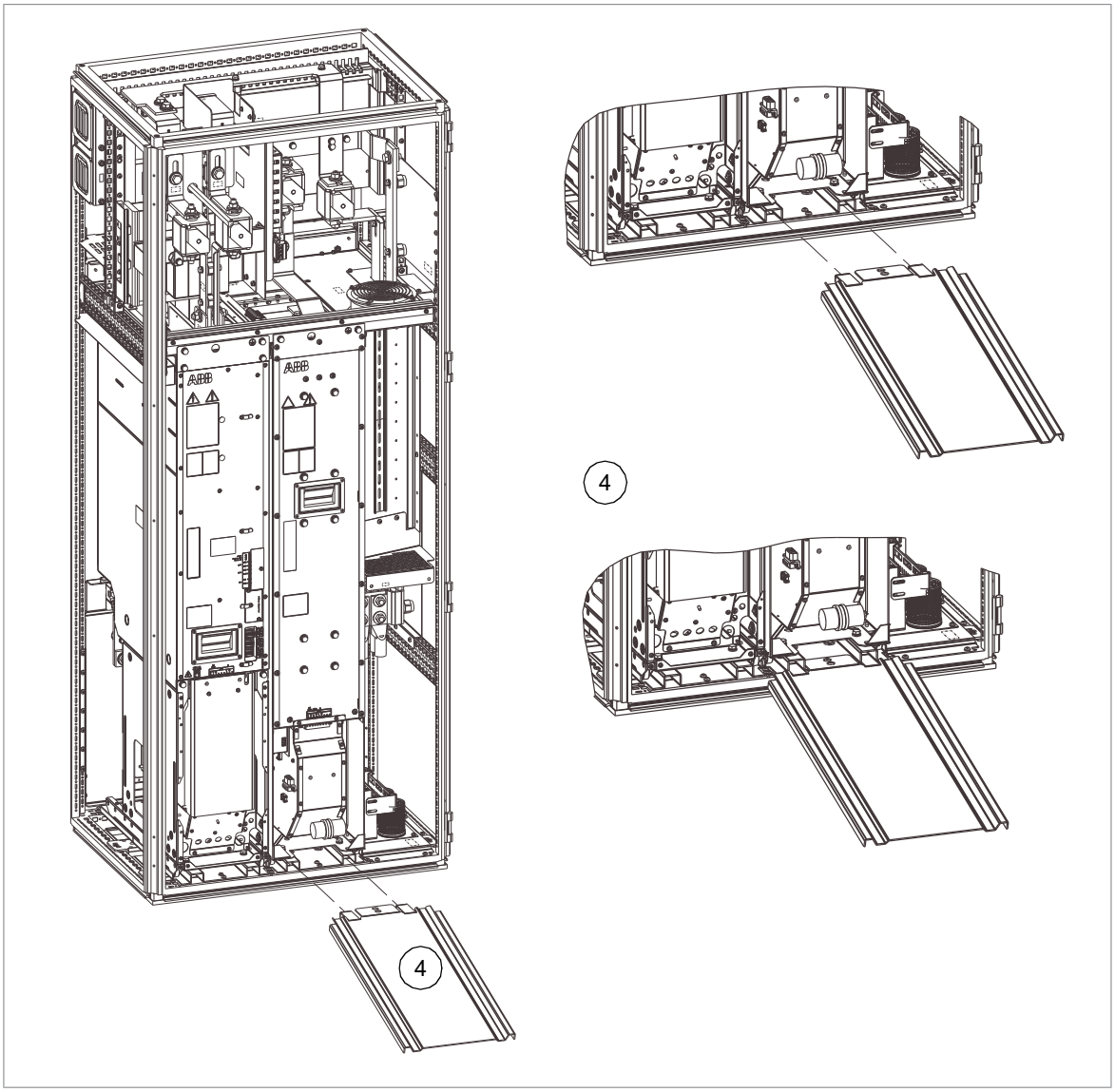
- Wear protective gloves and long sleeves! Some parts have sharp edges.

Note: There is a module lifter available from ABB Service. See Lifter for air-cooled drive modules user's guide (3AXD50000332588 [English]).

Before you replace a filter module with a new one, make sure that the connector of the auxiliary power supply cable in the cabinet is compatible with the counterpart in the new module. Black connector is compatible only with the black counterpart, and gray connector only with the gray counterpart. If the connectors are not compatible, replace the connector in the new module. Use the connector from the old module, or order suitable connector from ABB. Refer to Auxiliary power supply for BLCL-1..., BLCL-0..., BL-1..., or BDCL-1... Connector replacement guide (3AXD50001065171 [English])

Replace the filter module as follows:

1. Stop the drive and disconnect the DC/DC-converter unit from the energy storage. Refer to section Disconnecting the DC/DC-converter from the energy storage (page 111). Then disconnect the drive from the input power supply and do the steps in section Electrical safety precautions (page 64)
2. Open the cubicle door.
3. Remove the shrouds (if any).
4. If you use a module pull out ramp to remove the module from the cabinet, install it by placing the hooks of the ramp between the bottom plate and Rittal frame.
5. Disconnect the auxiliary power supply cable from terminal block [X30] on top of the filter module.
6. Remove the two fastening screws in front of the filter module. Unscrew and remove the bolts on the DC connection.
7. Remove the four fastening screws in the lower part of the filter module.
8. Pull the module carefully out of the cabinet along the ramp, or use another lifting device to remove the module.
9. Replace the module:
   - Push the module back in and fasten. Be careful not to break the fastening screws: tighten the fastening screws of the module to 22 N·m (16.2 lbf·ft) and fastening bolts to 70 N·m (51.6 lbf·ft).
   - Connect the module signal wire set to the module terminal block [X30].
   - Remove the module pull-out ramp, attach the shrouds (if any) and close the cabinet doors.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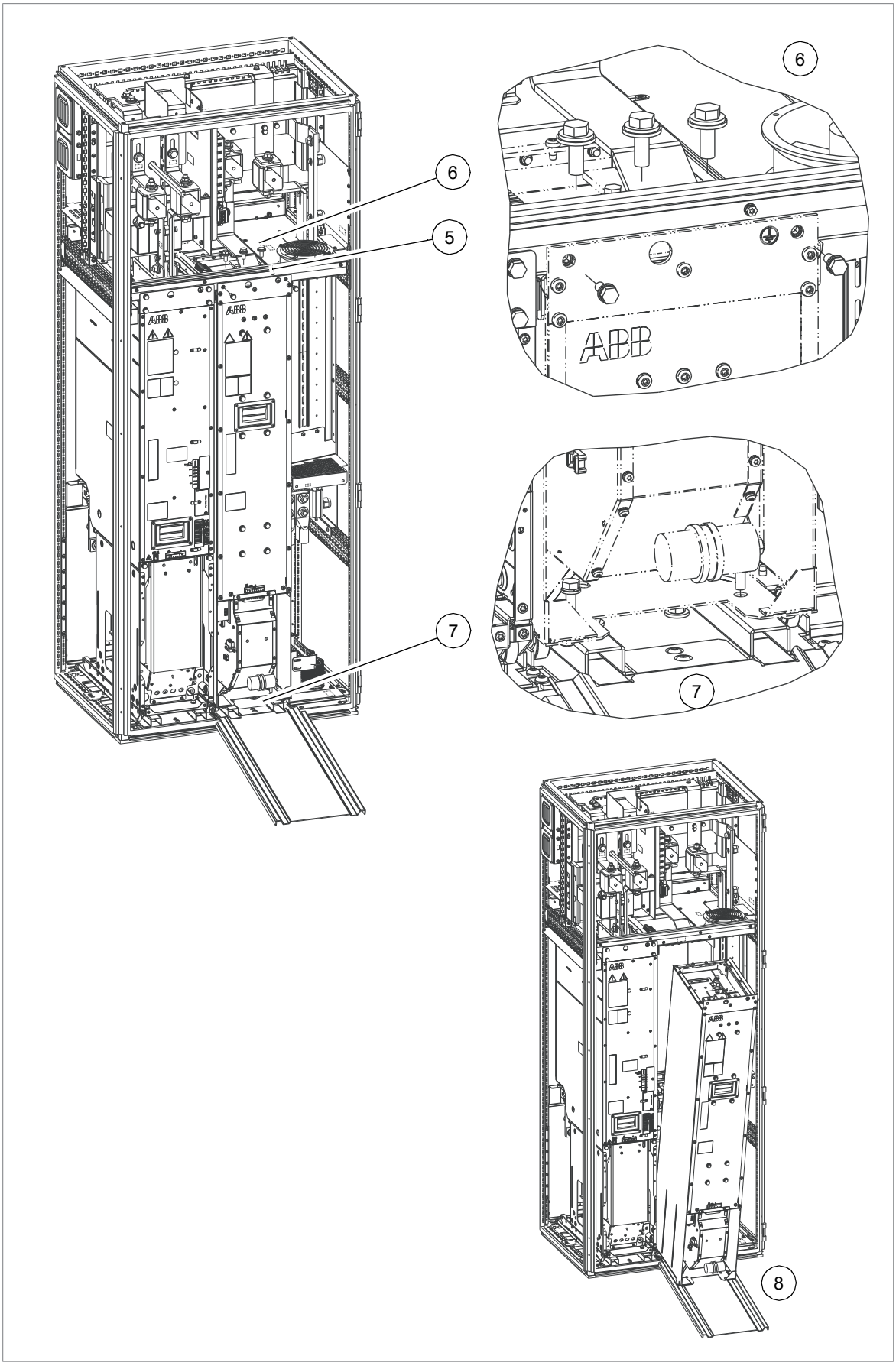
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Capacitors

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

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

Reforming the capacitors

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

Control panel

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

UCU control unit

UCU control unit types

There are three variants of the UCU control unit used in ACS880: UCU-22, UCU-23 and UCU-24. These have a different number of converter module connections but are otherwise identical. The UCU types are interchangeable if the number of connections is sufficient and the control program is the same. For example, UCU-24 can be used as a direct replacement for both UCU-22 and UCU-23.

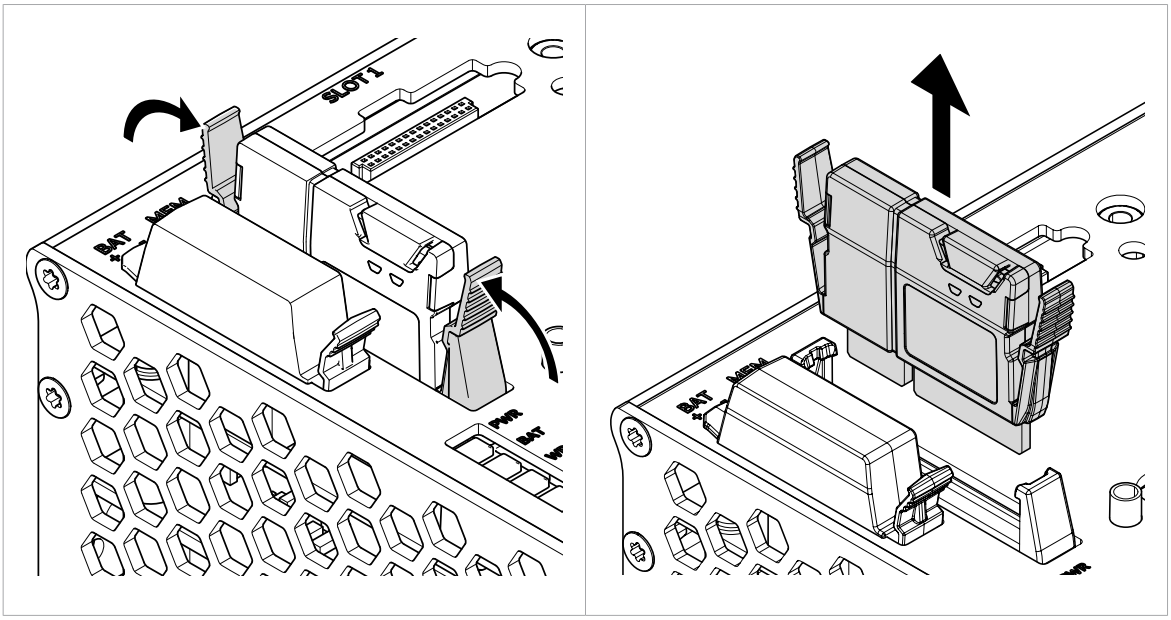
Replacing the memory unit (UCU)

If you replace the control unit, move the memory unit from the old control unit to the new control unit to keep the existing parameter settings.

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

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

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



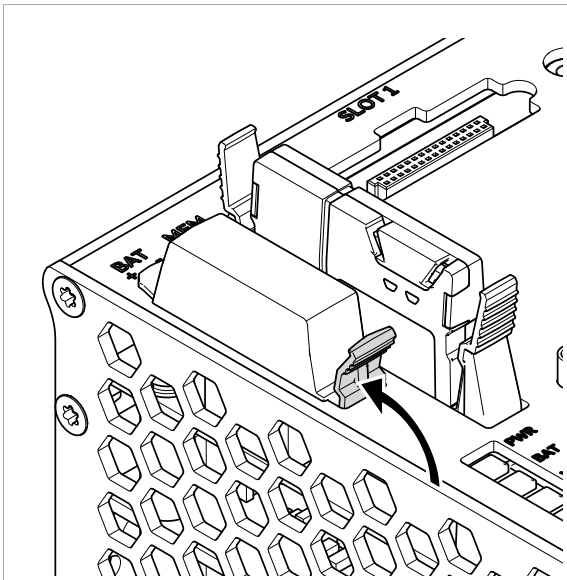
Replacing the real-time clock battery (UCU)

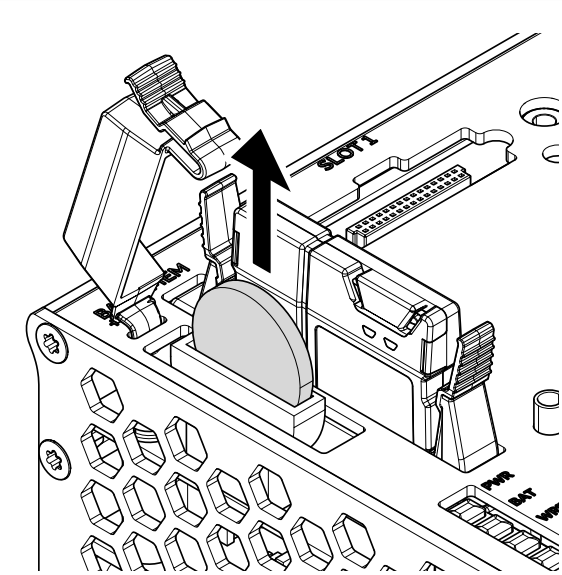
WARNING!
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do installation, commissioning or maintenance work.

Replace the real-time clock battery if the BAT LED is off when the control unit is powered.

1. Stop the drive and do the steps in section Electrical safety precautions (page 64) before you start the work.
2. Open the battery cover.
3. Replace the battery with a new BR2032 battery.

   Note: The real-time clock stays set for 2 minutes without battery.
4. Close the battery cover.
5. If necessary, set the real-time clock.
6. Dispose of the old battery according to local disposal rules or applicable laws.



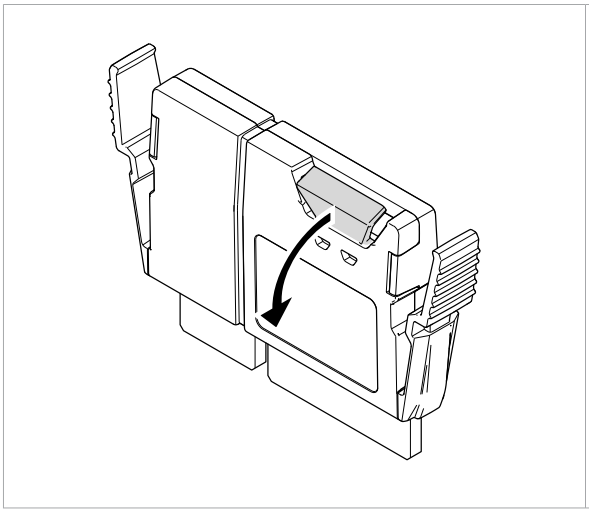


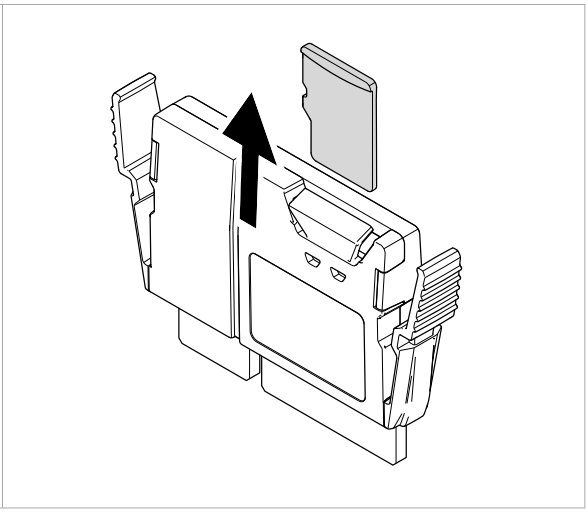
Replacing the microSDHC memory card (UCU)

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

For the replacement card type, refer to the technical data.

1. Stop the drive and do the steps in section Electrical safety precautions in the hardware manual before you start work.
2. Remove the UMU-01 memory unit from the control unit.
3. Open the memory card cover in the memory unit.
4. Push the card to remove it.
5. Install a new card in reverse order.





BCU control unit

BCU control unit types

There are three variants of the BCU control unit used in ACS880: BCU-02, BCU-12 and BCU-22. These have a different number of converter module connections but are otherwise identical. The BCU types are interchangeable if the number of connections is sufficient and the control program is the same. For example, BCU-22 can be used as a direct replacement for both BCU-02 and BCU-12.

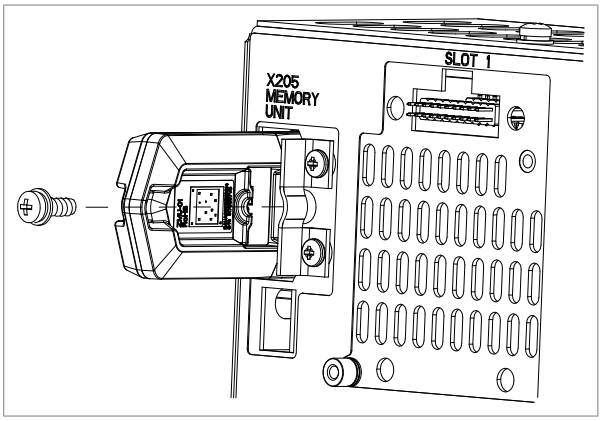
Replacing the memory unit (BCU)

If you replace the control unit, move the memory unit from the old control unit to the new control unit to keep the existing parameter settings.

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

WARNING!
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 64) 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.

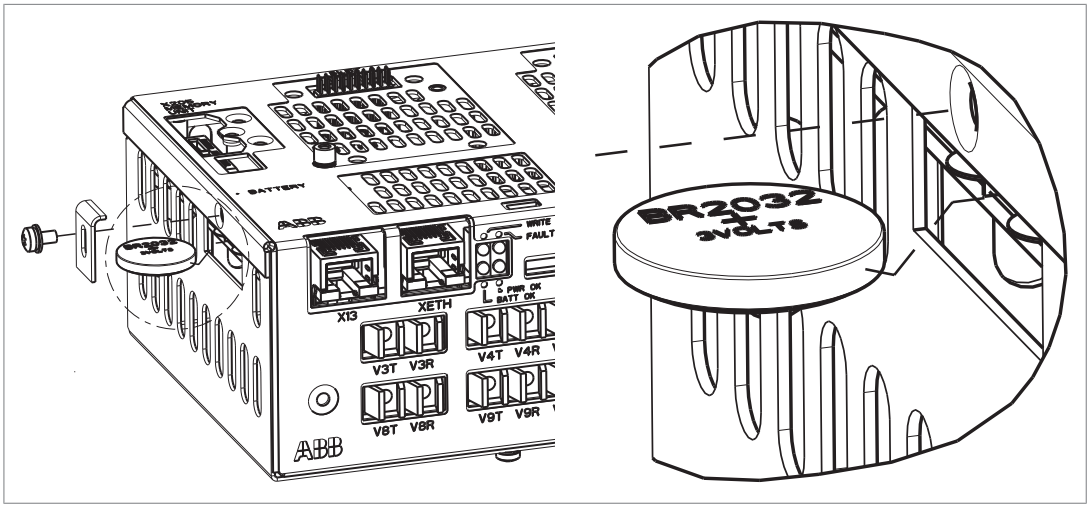


Replacing the battery (BCU)

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

Replace the real-time clock battery if the BATT OK LED is off when the control unit is powered.

1. Stop the drive and do the steps in section Electrical safety precautions (page 64) before you start the work.
2. Remove the fastening screw.
3. Replace the battery with a new BR2032 battery.
4. If necessary, set the real-time clock.
5. Discard the old battery according to local disposal rules or applicable laws.



LEDs and other status indicators

This section gives information on how to read the status indications of the DC/DC-converter.

The control panel on the cabinet door shows the warnings and faults given by the control program. You can also use the Drive Composer PC tool to view the warnings and faults. For more information, refer to the firmware manual and the Drive Composer PC tool 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.
	Flashing green	There is an active warning in the unit.
	Continuous red	There is an active fault in the unit.
	Flashing red	There is a fault that requires the stopping and restarting of the drive/converter/inverter.
	Flashing blue (ACS-AP-W only)	The Bluetooth interface is enabled, in discoverable mode, and ready for pairing.
	Flickering blue (ACS-AP-W only)	Data is being transferred through the Bluetooth interface of the control panel.
Control panel mounting platform or holder (with the control panel removed)	Red	There is an active fault in the unit.
	Green	Power supply for the control unit is OK.

R8i module LEDs

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

12

Ordering information

Contents of this chapter

This chapter lists the types and ordering codes of the unit components.

You can find the kit-specific assembly drawings, step-by-step instructions and detailed kit information on the Internet. Go to https://sites-apps.abb.com/sites/lvacdrivesengineeringsupport/content. If necessary, contact your local ABB representative.

Note:

- This chapter only lists the installation accessories available from ABB. All other parts must be sourced from a third party (such as Rittal) by the system integrator. For a listing, refer to the kit-specific installation instructions available at https://sites-apps.abb.com/sites/lvacdrivesengineeringsupport/content. For access, contact your local ABB representative.
- Parts that are labeled suitable for generic enclosures are not designed for any specific enclosure system. These parts are intended as a basis for further engineering, and may require additional parts to be fully usable.
  Installation accessories designed for generic enclosures are in fact designed for an inside width of 50 mm less than the nominal width of the enclosure. For example, a mechanical kit intended for 800 mm wide generic enclosure is designed for an inside width of 750 mm, and will not fit a 800 mm wide Rittal VX25 enclosure.

Kit code key

The kit codes shown in this chapter break down as follows.

The format of the kit code is x-w-s-yyy(-VX), for example, L-6-8-401 where:

- x = cooling method

    - A = air-cooled (some of these kits are also used with liquid-cooled drives)
    - L = liquid-cooled
- w = cabinet width
    - 4 = 400 mm
    - 6 = 600 mm
    - 8 = 800 mm
- s = module frame size / sizes
    - 1 = R1i
    - 2 = R2i
    - 3 = R3i
    - 4 = R4i
    - 5 = R5i
    - 6 = R6i/D6D
    - 7 = R7i/D7D/D7T
    - 8 = R8i/D8D/D8T
    - X = any, or not defined.
- yyy = consecutive numbering
    - 001…099 = Kits related to cabinets, for example, adapter plates

001…019	Common AC- and DC-related kits
020…049	Cabinet mechanics kits
050…059	Swing frame kits

    - 100…199 = Kits related to AC connection, for example, busbars

100…129	Kits with connection to AC
130…149	Kits with connection to module
150…199	Other kits related to AC connection

    - 200…299 = Kits related to DC connection, for example, busbars

200…229	Kits with connection to common DC
230…249	Kits with connection to module
250…299	Other kits related to DC connection

- 300…399 = Kits related to module installation, for example, mechanical supports

300…330	Module supporting kits, basic mechanical support
350…379	Shroud kits

- 400…499 = Other kits

400…419	Fan kits
420…439	Air guides
440…459	Cooling circuit kits

- VX = Kit specifically designed for the Rittal VX25 enclosure system. Many kits without this designation are also used with the VX25 system.

DC/DC-converter modules

DC/DC-converter units consisting of frame R8i modules are to be ordered as separate modules. For converter unit ratings, see the technical data.

DC/DC-converter unit		Modules used	
Type	**Frame size**	**Qty**	**Ordering code (for options, see below)**
U_n = 400 V			
ACS880-1604-0600A-3	R8i	1	ACS880-104-0640A-3+E205+V112
ACS880-1604-0900A-3	R8i	1	ACS880-104-0900A-3+E205+V112
ACS880-1604-1200A-3	2×R8i	2	ACS880-104-0640A-3+E205+V112
ACS880-1604-1800A-3	2×R8i	2	ACS880-104-0900A-3+E205+V112
U_n = 500 V			
ACS880-1604-0600A-5	R8i	1	ACS880-104-0590A-5+E205+V112
ACS880-1604-0900A-5	R8i	1	ACS880-104-0810A-5+E205+V112
ACS880-1604-1200A-5	2×R8i	2	ACS880-104-0590A-5+E205+V112
ACS880-1604-1800A-5	2×R8i	2	ACS880-104-0810A-5+E205+V112
U_n = 690 V			
ACS880-1604-0400A-7	R8i	1	ACS880-104-0410A-7+E205+V112
ACS880-1604-0600A-7	R8i	1	ACS880-104-0600A-7+E205+V112
ACS880-1604-0800A-7	2×R8i	2	ACS880-104-0410A-7+E205+V112
ACS880-1604-1200A-7	2×R8i	2	ACS880-104-0600A-7+E205+V112

Ordering code format	Option codes
[Module type] + code [+code]… **For example, ACS880-104-0640A-3 +E205**	**+C132:** Marine type-approved DC/DC-converter module **+C183:** Internal heating element **+C188:** Direct-on-line (DOL) cooling fan[1)] **+C209:** Marine product certification issued by Bureau Veritas **+E205:** Internal d*u*/d*t* filtering (When the module is used as a DC/DC-converter, it must always be ordered with +E205.) **+G304:** 115 V auxiliary voltage supply **+V112:** Updated module connectors

1) Without option +C188, the module has a speed-controlled cooling fan.

Note: The energy storage is not included in the ACS880 module product offering. The customer must equip the DC/DC-converter with an applicable energy storage system. For more information, see Selecting the energy storage (page 58).

Note: These components are always required to construct a working unit and must be ordered separately:

- DC/DC-converter module(s)
- BDCL filter module(s). One filter module is necessary for each DC/DC-converter module.
- Control unit kit
- Fiber optic cables
- Control circuit plug connector (3AXD50000960248)
- Frame R8i: Module quick connectors (3AUA0000119227), one kit for each converter or filter module.

Other parts given in this chapter can be required by the application or make the installation of the module easier.

BDCL filters

The BDCL filters must be ordered separately.

BDCL filters (+C188)

DC/DC-converter unit type ACS880-1604…	Frame size	L-filter		
		Type	Qty	Ordering code
U_n = 400 V				
0600A-3	R8i	BDCL-14-5+C188+V112	1	3AXD50000987115
0900A-3	R8i	BDCL-15-5+C188+V112	1	3AXD50000987108
1200A-3	2×R8i	BDCL-14-5+C188+V112	2	3AXD50000987115
1800A-3	2×R8i	BDCL-15-5+C188+V112	2	3AXD50000987108
U_n = 500 V				
0600A-5	R8i	BDCL-14-5+C188+V112	1	3AXD50000987115

DC/DC-converter unit type ACS880-1604...	Frame size	L-filter		
		Type	Qty	Ordering code
0900A-5	R8i	BDCL-15-5+C188+V112	1	3AXD50000987108
1200A-5	2×R8i	BDCL-14-5+C188+V112	2	3AXD50000987115
1800A-5	2×R8i	BDCL-15-5+C188+V112	2	3AXD50000987108
U_n = 690 V				
0400A-7	R8i	BDCL-14-7+C188+V112	1	3AXD50000987092
0600A-7	R8i	BDCL-15-7+C188+V112	1	3AXD50000987085
0800A-7	2×R8i	BDCL-14-7+C188+V112	2	3AXD50000987092
1200A-7	2×R8i	BDCL-15-7+C188+V112	2	3AXD50000987085

Option code	Description
+C188	Direct-on-line (DOL) cooling fan
+V112	Updated module connectors

BDCL filters (+C188+G304)

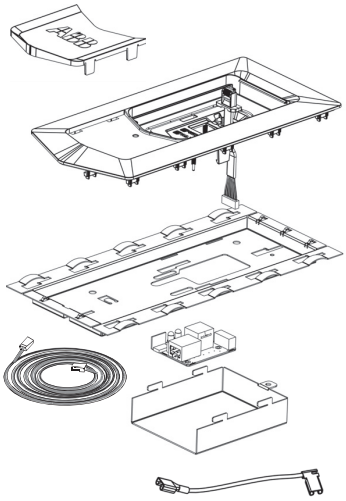
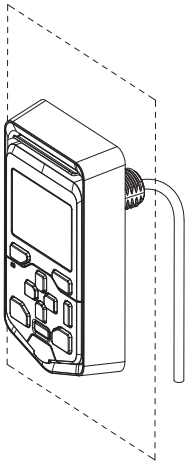
DC/DC-converter unit type ACS880-1604-...	Frame size	L-filter		
		Type	Qty	Ordering code
U_n = 400 V				
0600A-3	R8i	BDCL-14-5+C188+G304+V112	1	3AXD50000987153
0900A-3	R8i	BDCL-15-5+C188+G304+V112	1	3AXD50000987146
1200A-3	2×R8i	BDCL-14-5+C188+G304+V112	2	3AXD50000987153
1800A-3	2×R8i	BDCL-15-5+C188+G304+V112	2	3AXD50000987146
U_n = 500 V				
0600A-5	R8i	BDCL-14-5+C188+G304+V112	1	3AXD50000987153
0900A-5	R8i	BDCL-15-5+C188+G304+V112	1	3AXD50000987146
1200A-5	2×R8i	BDCL-14-5+C188+G304+V112	2	3AXD50000987153
1800A-5	2×R8i	BDCL-15-5+C188+G304+V112	2	3AXD50000987146
U_n = 690 V				
0400A-7	R8i	BDCL-14-7+C188+G304+V112	1	3AXD50000987139
0600A-7	R8i	BDCL-15-7+C188+G304+V112	1	3AXD50000987122
0800A-7	2×R8i	BDCL-14-7+C188+G304+V112	2	3AXD50000987139
1200A-7	2×R8i	BDCL-15-7+C188+G304+V112	2	3AXD50000987122

Option code	Description
+C188	Direct-on-line (DOL) cooling fan
+G304	Cooling fan with 115 V AC 1-phase supply
+V112	Updated module connectors

Control panel

The control panel is not included with the module but must be ordered separately. One control panel is required for the commissioning of an ACS880 drive system, even if the Drive Composer PC tool is used.

The control panel can be flush mounted on the cabinet door with the help of a door mounting kit. For more information on the control panel, see ACS-AP-I, -S, -W and ACH-AP-H, -W Assistant control panels user's manual (3AUA0000085685 [English]).

Type	Description	Ordering code	Illustration
ACS-AP-W	Control panel with Bluetooth	3AXD50000025965	
DPMP-01	Door mounting kit (IP55)	3AUA0000108878	
DPMP-02	Door mounting kit (IP65)	3AXD50000009374	

For more information on the door mounting kits, such as the contents of the kit, see the installation manuals:

- DPMP-01 mounting platform for control panels installation guide (3AUA0000100140 [English])
- DPMP-02/03 mounting platform for control panels installations guide (3AUA0000136205 [English]).

Control electronics

The customer must do the installation and wiring of the electronics outside of the module. The current consumption of the main components in the auxiliary circuit is shown in the technical data.

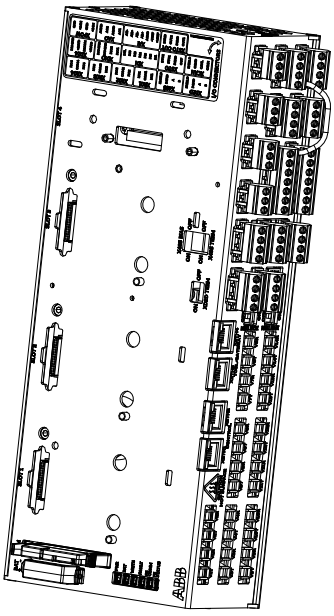
A control unit controls the DC/DC-converter module(s). You must acquire the control unit and connect it to each DC/DC-converter module with a pair of fiber optic cables. You can supply power (24 V DC) to the control unit from the DC/DC-converter module, or from an applicable power supply.

You must also acquire the cables. Use a suitable standard installation cable. Use the applicable plug connector [X53] for the connection to the DC/DC-converter module. Refer to section Control circuit plug connectors (page 144).

Control unit (UCU)

The UCU control unit kit contains:

- UCU-22 or UCU-23 control unit
- memory unit with DC/DC-converter control program.

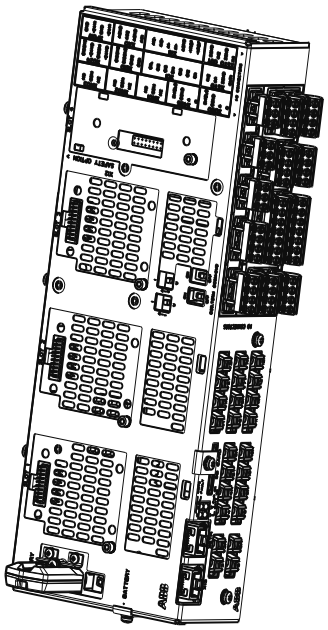
Converter module frame size	Control unit type	Qty	Ordering code (for options, see below)	Illustration
R8i	UCU-22	1	ACS880UCU-1604-22-0	
2×R8i	UCU-23*	1	ACS880UCU-1604-23-0	

*UCU-22 can be used as an alternative to UCU-23, if the BAMU voltage/current measurement unit is not used.

Control unit (BCU)

The BCU control unit kit contains:

- BCU-02 or BCU-12 control unit
- memory unit with DC/DC-converter control program.

Converter module frame size	Control unit type	Qty	Ordering code	Illustration
R8i	BCU-02	1	3AXD50000022059	
2×R8i	BCU-12*	1	3AXD50000022060	

*BCU-02 can be used as an alternative to BCU-12, if the BAMU voltage/current measurement unit is not used.

Fiber optic cables

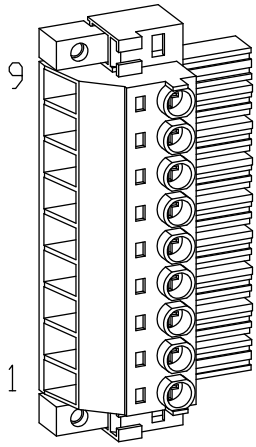
The fiber optic cables are needed between the control unit and the DC/DC-converter R8i module. You need one kit for each module. Select a kit with the correct length.

The following kits, each contain a pair of plastic fibre optic cables. They are needed in communication between the control unit and the power (inverter/supply/brake/converter) module.

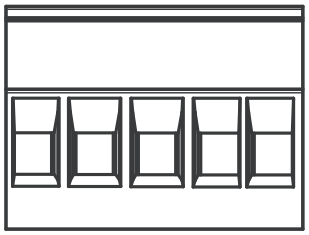
Length	Kit type designation	Ordering code
2 m (6.6 ft)	NLWC-02	58988821
3 m (9.8 ft)	NLWC-03	58948233
5 m (16.4 ft)	NLWC-05	58948250
7 m (23 ft)	NLWC-07	58948268
10 m (32.8 ft)	NLWC-10	58948276

Control circuit plug connectors

The control circuit plug for connector X50 is not included in the module kit and you must order it separately.

Connector	Data	Qty	Ordering code	Illustration
X50 for R8i modules with +V112 X30 for BDCL filter module with +V112	BVZ 7.62HP/09/180FC SN BK BX LRP 9-pole (female) 10 mm², 1000 V, 57 A (UL/CSA: 600 V, 40.5 A)	1 per module	3AXD50000960248	

Plug connectors for X51, X52 and X53 are included in the module kit. You can order these plug connectors as spare parts.

Connector	Data	Qty	Ordering code	Illustration
X51…X53	1 × MSTB 2,5/5-ST-5,08 BK 2× MSTB 2,5/5-ST-5,08 YE 2.50 mm², 12 A, 320 V	1 per module	3AXD50000003541	

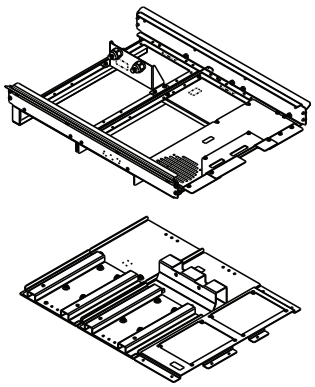
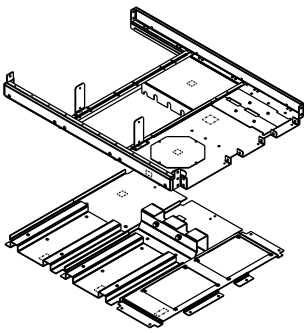
For more information on the connectors, refer to section Connectors X50…X53 (page 24).

Mechanical installation accessories and tools

Module installation parts

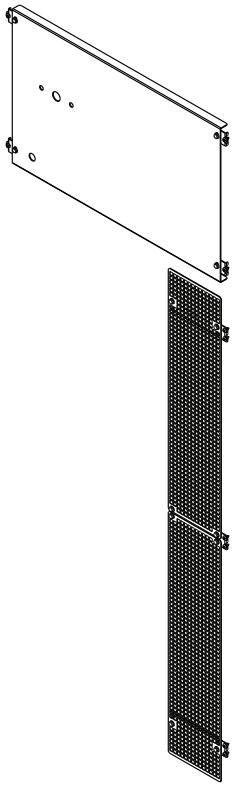
Module installation parts include, for example, top and bottom supports for the DC/DC-converter and BDCL filter modules.

Note: The designs presented in this manual for Rittal VX25 enclosures employ the Rittal Flat-PLS busbar system. Make sure that the current carrying capability of the busbars is not exceeded at any point of the drive system.

Enclosure	Qty	Ordering code	Kit code	Illustration
800 mm Rittal VX25	1 per cubicle	3AXD50000488391	A-8-8-332-VX	 Instruction code: 3AXD50000482122
Generic	1 per cubicle	3AXD50000023031	A-8-8-333	 Instruction code: 3AXD50000023218

Shrouds

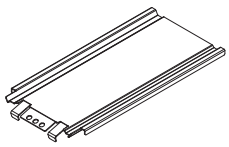
Shrouds are used for IP20 touch protection with the cabinet doors open.

Enclosure	Qty	Ordering code	Kit code	Illustration
Rittal VX25	1 per cubicle	3AXD50000489022	A-8-8-361-VX	 Instruction code: 3AXD50000491865

Insertion/Extraction ramp

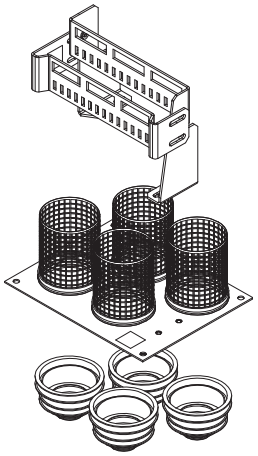
The ramp can be used when inserting or extracting wheeled modules.

Do not use the ramp with plinth heights over 100 mm (3.93 in). The ramp is designed for a plinth height of 100 mm (the standard plinth height of Rittal VX25 enclosures).

Used with ...	Qty	Ordering code	Kit code	Illustration
All VX25 enclosures	1	3AXD50000438037	A-468-8-304-VX	

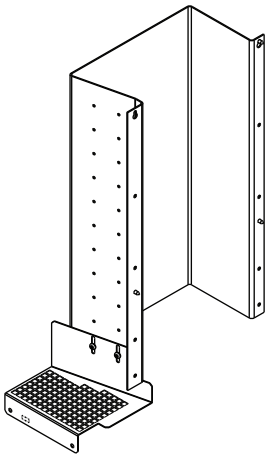
Bottom cable entry

Cable entry kit, to be installed on the bottom plate of the enclosure, contains four cable entries for energy storage cables with grommets, wire meshing for 360° grounding, and a strain relief bracket.

Enclosure	Qty	Ordering code	Kit code	Illustration
Rittal VX25 and generic	2 kits per cubicle	3AXD50000004385	A-468-8-441	 Instruction code: 3AXD50000004817

Control unit mounting plate

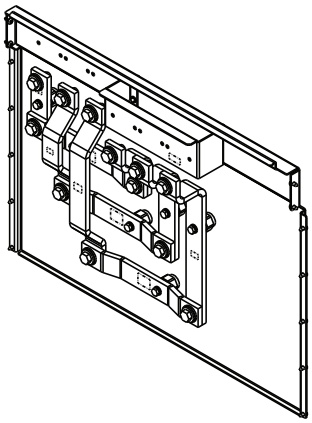
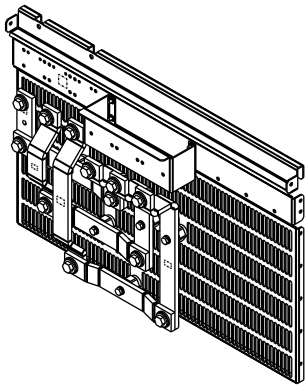
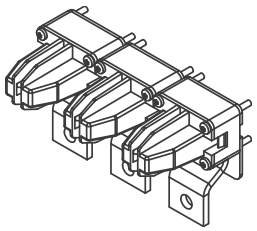
The control unit mounting plate kit includes a mounting plate to which the control unit can be attached with a DIN rail. It also includes a small shroud that can be used as an alternative upper side shroud with the shroud kit.

Enclosure	Qty	Ordering code	Kit code	Illustration
Rittal VX25 and generic	2 kits per cubicle	3AXD50000489039	A-8-8-401-VX	 Instruction code: 3AXD50000505814

Electrical installation accessories

Busbars and quick connectors for connecting DDC module and filter

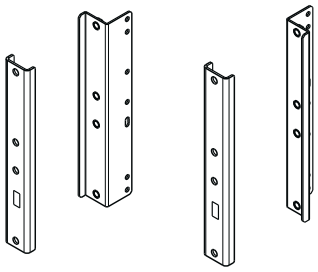
Busbars provide connection from the DC/DC-converter module to the BDCL filter.

Enclosure	Qty	Ordering code	Kit code	Illustration
Rittal VX25	1 per cubicle	3AXD50000489046	A-8-8-269-VX	 Instruction code: 3AXD50000482290
Generic	1 per cubicle	3AXD50000023007	A-8-8-270	 Instruction code: 3AXD50000023212
Rittal VX25 and generic	1 per module (1 for DDC and 1 for filter module)	3AUA0000119227	A-468-8-100	 Instruction code: 3AUA0000118667

Common DC Flat-PLS assembly

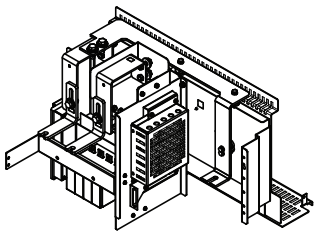
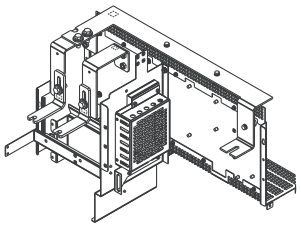
The brackets in this kit act as a mounting base for the busbar supports of the Rittal Flat-PLS DC bus and ensure its correct placement and alignment inside the cabinet line-up.

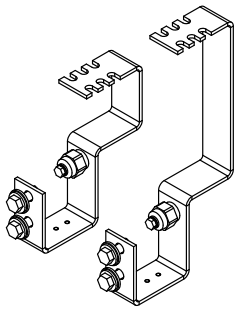
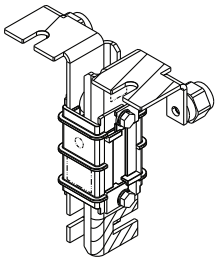
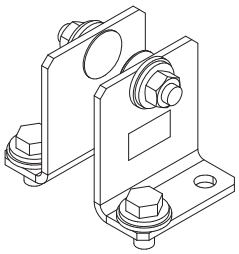
Note: Note: The designs presented in this manual for Rittal VX25 enclosures employ the Rittal Flat-PLS busbar system. Make sure that the current carrying capability of the busbars is not exceeded at any point of the drive system.

Enclosure	Qty	Ordering code	Kit code	Illustration
Rittal VX25	1 per cubicle	3AXD50000333387	A-468-X-001-VX	 Instruction code: 3AXD50000333639

DC connection with DC switch-disconnector and charging

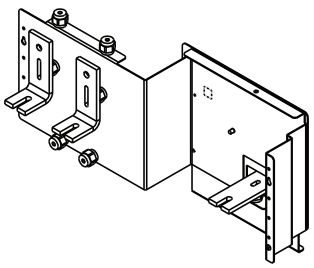
These parts provide the mounting base for the charging components and connect the converter module to the DC bus.

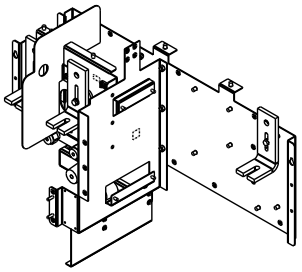
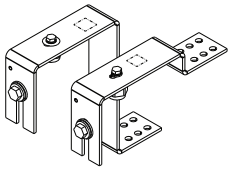
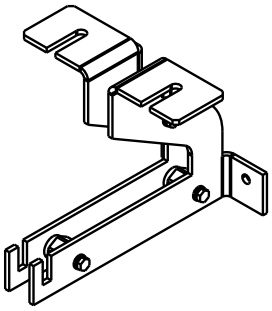
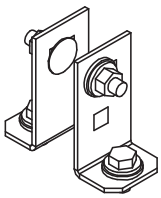
Enclosure	Qty	Ordering code	Kit code	Illustration
Rittal VX25 with DC switch-disconnector and charging	1	3AXD50000488407	A-8-8-298-VX	 Instruction code: 3AXD50000482955
Generic with DC switch-disconnector and charging	1	3AXD50000044814	A-8-8-299	 Instruction code: 3AXD50000044863

Enclosure	Qty	Ordering code	Kit code	Illustration
Rittal VX25 with DC switch-disconnector and charging	1 kit	3AXD50000345458	A-46-8-207-VX	 Instruction code: 3AXD50000337453
Rittal VX25 with DC switch-disconnector and charging	1 kit per R8i module	3AXD50000044551	A-468-8-247	 Instruction code: 3AXD50000043411
Rittal VX25 with DC switch-disconnector and charging	1 kit per R8i module	3AXD50000044553	A-468-8-248	 Instruction code: 3AXD50000043466

DC connection without DC switch-disconnector and charging

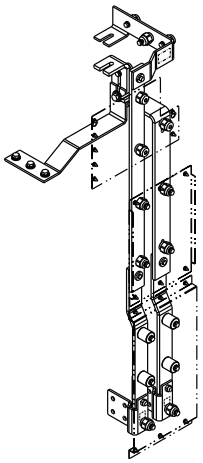
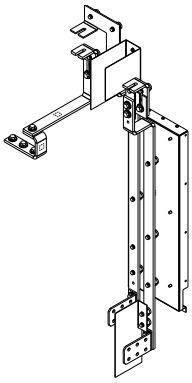
These parts provide the mounting base for the DC fuses and connect the converter module to the DC bus.

Enclosure	Qty	Ordering code	Kit code	Illustration
Rittal VX25 without DC switch-disconnector and charging	1	3AXD50000489015	A-8-8-264-VX	 Instruction code: 3AXD50000485116

Enclosure	Qty	Ordering code	Kit code	Illustration
Generic without DC switch-disconnector and charging	1	3AXD50000023032	A-8-8-268	 Instruction code: 3AXD50000023291
Rittal VX25 without DC switch-disconnector and charging	1	3AXD50000337446	A-46-8-206-VX	 Instruction code: 3AXD50000345915
Rittal VX25 and generic without DC switch-disconnector and charging	1 kit per R8i module	3AXD50000023340	A-468-8-266	 Instruction code: 3AXD50000023463
Rittal VX25 and generic without DC switch-disconnector and charging	1 kit per R8i module	3AXD50000003411	A-468-8-232	 Instruction code: 3AXD50000003403

Energy storage connection

These parts provide the DDC and energy storage connection.

Enclosure	Qty	Ordering code	Kit code	Illustration
Rittal VX25	1 kit per cubicle	3AXD50000504565	A-8-8-243-VX	 Instruction code: 3AXD50000488773
Generic	1 kit per cubicle	3AXD50000023008	A-8-8-244	 Instruction code: 3AXD50000023217

DC fuses (DC bus side)

DC fuses on the DC bus side protect the module and drive DC bus against short circuits.

ACS880-1604-...	Frame size	Fuse (IEC and UL)				Qty
		Type	Data	Ordering code	Size	
U_n = 400 V						
0600A-3	R8i	Bussmann 170M6415	1100 A, 690 V	68731658	3	2
0900A-3	R8i	Bussmann 170M6419	1600 A, 690 V	68393108	3*	2
1200A-3	2×R8i	Bussmann 170M6415	1100 A, 690 V	68731658	3	4
1800A-3	2×R8i	Bussmann 170M6419	1600 A, 690 V	68393108	3*	4
U_n = 500 V						
0600A-5	R8i	Bussmann 170M6415	1100 A, 690 V	68731658	3	2
0900A-5	R8i	Bussmann 170M6419	1600 A, 690 V	68393108	3*	2
1200A-5	2×R8i	Bussmann 170M6415	1100 A, 690 V	68731658	3	4
1800A-5	2×R8i	Bussmann 170M6419	1600 A, 690 V	68393108	3*	4
U_n = 690 V						
0400A-7	R8i	Bussmann 170M6545	700 A, 1250 V	68735980	3	2
0600A-7	R8i	Bussmann 170M6549	1100 A, 1000 V	68736021	3	2
0800A-7	2×R8i	Bussmann 170M6545	700 A, 1250 V	68735980	3	4
1200A-7	2×R8i	Bussmann 170M6549	1100 A, 1000 V	68736021	3	4

Output DC fuses (energy storage side)

DC fuses on the energy storage side protect the module against short circuits from the energy storage.

ACS880-1604-...	Frame size	Fuses (IEC and UL)				Qty
		Type	Data	Ordering code	Size	
U_n = 400 V						
0600A-3	R8i	Bussmann 170M6415	1100 A, 690 V	68731658	3	2
0900A-3	R8i	Bussmann 170M6419	1600 A, 690 V	68393108	3*	2
1200A-3	2×R8i	Bussmann 170M6415	1100 A, 690 V	68731658	3	4
1800A-3	2×R8i	Bussmann 170M6419	1600 A, 690 V	68393108	3*	4
U_n = 500 V						
0600A-5	R8i	Bussmann 170M6415	1100 A, 690 V	68731658	3	2
0900A-5	R8i	Bussmann 170M6419	1600 A, 690 V	68393108	3*	2
1200A-5	2×R8i	Bussmann 170M6415	1100 A, 690 V	68731658	3	4
1800A-5	2×R8i	Bussmann 170M6419	1600 A, 690 V	68393108	3*	4
U_n = 690 V						
0400A-7	R8i	Bussmann 170M6545	700 A, 1250 V	68735980	3	2
0600A-7	R8i	Bussmann 170M6549	1100 A, 1000 V	68736021	3	2
0800A-7	2×R8i	Bussmann 170M6545	700 A, 1250 V	68735980	3	4
1200A-7	2×R8i	Bussmann 170M6549	1100 A, 1000 V	68736021	3	4

DC switch-disconnector kits

You can equip the DC/DC-converter with DC switch-disconnector if quick isolation of the module from the DC bus is required.

DC switch-disconnectors (IEC, 230 V, 50 Hz)

ACS880-1604-...	Frame size	DC switch-disconnector		Qty	Ordering code
		Type	Data		
U_n = 400 V					
0600A-3	R8i	SWITCH KIT OT-TYPE IEC 1600 E11	1600 A; 1000 V; ICW = 50 kA, 1 s, ICM = 110 kA	1	3AXD50000009534
0900A-3	R8i			1	
1200A-3	2×R8i			2	
1800A-3	2×R8i			2	
U_n = 500 V					
0600A-5	R8i	SWITCH KIT OT-TYPE IEC 1600 E11	1600 A; 1000 V; ICW = 50 kA, 1 s, ICM = 110 kA	1	3AXD50000009534
0900A-5	R8i			1	
1200A-5	2×R8i			2	
1800A-5	2×R8i			2	
U_n = 690 V					
0400A-7	R8i	SWITCH KIT OT-TYPE IEC 1600 E11	1600 A; 1000 V; ICW = 50 kA, 1 s, ICM = 110 kA	1	3AXD50000009534
0600A-7	R8i			1	
0800A-7	2×R8i			2	
1200A-7	2×R8i			2	

DC switch-disconnectors (IEC, 240 V, 60 Hz)

ACS880-1604-...	Frame size	DC switch-disconnector		Qty	Ordering code
		Type	Data		
U_n = 400 V					
0600A-3	R8i	SWITCH KIT OT-TYPE IEC 1600 E11 60 Hz	1600 A; 1000 V; ICW = 50 kA, 1 s, ICM = 110 kA	1	3AXD50000026854
0900A-3	R8i			1	
1200A-3	2×R8i			2	
1800A-3	2×R8i			2	
U_n = 500 V					
0600A-5	R8i	SWITCH KIT OT-TYPE IEC 1600 E11 60 Hz	1600 A; 1000 V; ICW = 50 kA, 1 s, ICM = 110 kA	1	3AXD50000026854
0900A-5	R8i			1	
1200A-5	2×R8i			2	
1800A-5	2×R8i			2	
U_n = 690 V					
0400A-7	R8i	SWITCH KIT OT-TYPE IEC 1600 E11 60 Hz	1600 A; 1000 V; ICW = 50 kA, 1 s, ICM = 110 kA	1	3AXD50000026854
0600A-7	R8i			1	
0800A-7	2×R8i			2	
1200A-7	2×R8i			2	

DC switch-disconnectors (UL/CSA, 110 V, 60 Hz)

ACS880-1604-...	Frame size	DC switch-disconnector		Qty	Ordering code
		Type	Data		
U_n = 400 V					
0600A-3	R8i	SWITCH KIT OT1200U11 UL	1200 A; 600 V; ICW = 50 kA, 1 s, ICM = 110 kA	1	3AXD50000009540
0900A-3	R8i			1	
1200A-3	2×R8i			2	
1800A-3	2×R8i			2	
U_n = 500 V					
0600A-5	R8i	SWITCH KIT OT1200U11 UL	1200 A; 600 V; ICW = 50 kA, 1 s, ICM = 110 kA	1	3AXD50000009540
0900A-5	R8i			1	
1200A-5	2×R8i			2	
1800A-5	2×R8i			2	
U_n = 690 V					
0400A-7	R8i	SWITCH KIT OT1200U11 UL	1200 A; 600 V; ICW = 50 kA, 1 s, ICM = 110 kA	1	3AXD50000009540
0600A-7	R8i			1	
0800A-7	2×R8i			2	
1200A-7	2×R8i			2	

The DC switch-disconnector kit contains:

- DC switch disconnector unit
- shaft (12 × 395 mm)
- alignment ring for shaft OHZX10
- handle OHB150J12P with on/off indication
- 2 × normally-open auxiliary contact OA1G10
- 2 × normally-closed auxiliary contact OA3G01
- mechanical interlock kit OTZT4A
- coil PDAL2
- instruction (3AXD50000330713).

Charging kits

IEC

ACS880-1604-...	Frame size	Kit	Qty	Ordering code
U_n = 400 V				
0600A-3	R8i	UNIT CHARGING KIT 1-2XR8I IEC	1	3AXD50000009538
0900A-3	R8i		1	
1200A-3	2×R8i		2	
1800A-3	2×R8i		2	

ACS880-1604-...	Frame size	Kit	Qty	Ordering code
U_n = 500 V				
0600A-5	R8i	UNIT CHARGING KIT 1-2XR8I IEC	1	3AXD50000009538
0900A-5	R8i		1	
1200A-5	2×R8i		2	
1800A-5	2×R8i		2	
U_n = 690 V				
0400A-7	R8i	UNIT CHARGING KIT 1-2XR8I IEC	1	3AXD50000009538
0600A-7	R8i		1	
0800A-7	2×R8i		2	
1200A-7	2×R8i		2	

The charging kit contains:

- charging switch (switch fuse type) OS160GD04F, 160 A, 690 V, 50 kA, 4 poles
- shaft (6 × 290 mm)
- alignment ring for shaft
- handle OHB65J6
- normally-closed auxiliary contact OA3G01 (2 pcs)
- terminal covers for the switch disconnector (2 pcs)
- charging controller BSFC-02
- charging fuses 170M2676 (4 pcs), 35 A, 1000 V, DIN00

UL

ACS880-1604-...	Frame size	Kit	Qty	Ordering code
U_n = 400 V				
0600A-3	R8i	UNIT CHARGING KIT 1-2XR8I UL	1	3AXD50000009538
0900A-3	R8i		1	
1200A-3	2×R8i		2	
1800A-3	2×R8i		2	
U_n = 500 V				
0600A-5	R8i	UNIT CHARGING KIT 1-2XR8I UL	1	3AXD50000009538
0900A-5	R8i		1	
1200A-5	2×R8i		2	
1800A-5	2×R8i		2	
U_n = 690 V				
0400A-7	R8i	UNIT CHARGING KIT 1-2XR8I UL	1	3AXD50000009538
0600A-7	R8i		1	
0800A-7	2×R8i		2	
1200A-7	2×R8i		2	

The charging kit contains:

- charging switch (switch fuse type) OS100GJ04FP, 100 A, 600 V, 50 kA
- shaft (6 × 161 mm)
- alignment ring for shaft
- handle OHB65J6
- terminal covers for the switch disconnector (2 pcs)
- charging controller BSFC-02
- charging fuses FWJ-30A (4 pcs), 30 A, 1000 V, size 14 × 67 mm, and fuse holder modification parts
- normally-closed auxiliary contact OA3G01 (2 pcs)
- fuse clips (8 pcs)

Charging resistors

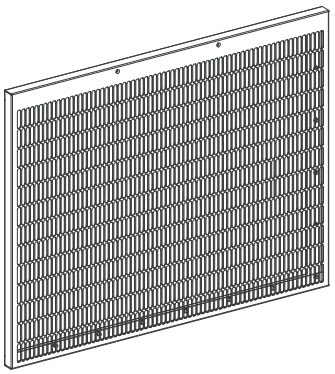
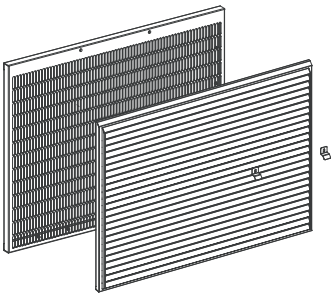
IEC / UL

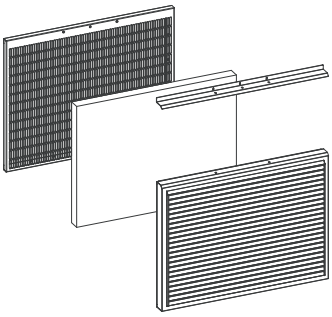
ACS880-1604-...	Frame size	Kit	Rating	Qty	Ordering code
U_n = 400 V					
0600A-3	R8i	ZRF 30/165 S 24 R	24 ohm	4	10037531
0900A-3	R8i			4	
1200A-3	2×R8i			8	
1800A-3	2×R8i			8	

ACS880-1604-...	Frame size	Kit	Rating	Qty	Ordering code
U_n = 500 V					
0600A-5	R8i	ZRF 30/165 S 24 R	24 ohm	4	10037531
0900A-5	R8i			4	
1200A-5	2×R8i			8	
1800A-5	2×R8i			8	
U_n = 690 V					
0400A-7	R8i	ZRF 30/165 S 33 R	33 ohm	4	10028531
0600A-7	R8i			4	
0800A-7	2×R8i			8	
1200A-7	2×R8i			8	

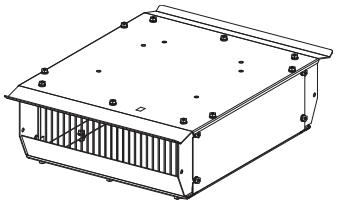
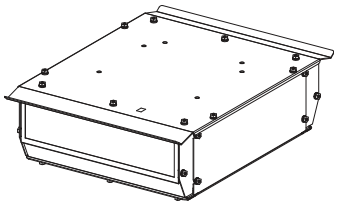
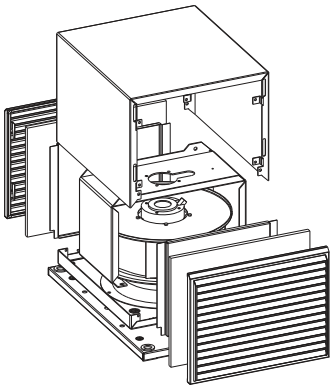
Cabinet ventilation kits

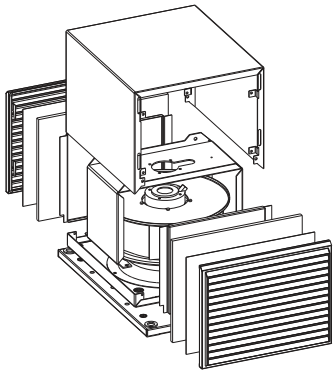
Air inlet kits 800 mm cabinet

Used with ...	Qty	Ordering code	Kit code	Illustration
IP20	1	3AUA0000117005	A-8-X-023	 Instruction code: 3AUA0000116887
IP42	1	3AUA0000117009	A-8-X-026	 Instruction code: 3AUA0000116875

Used with …	Qty	Ordering code	Kit code	Illustration
IP54	1	3AXD50000009186	A-8-X-029	 Instruction code: 3AXD50000010001

Air outlet kits 800 mm cabinet

Used with …	Qty	Ordering code	Kit code	Illustration
IP20	2	3AUA0000125203	A-4-X-042	 Instruction code: 3AXD50000001983
IP42	2	3AUA0000114968	A-4-X-040	 Instruction code: 3AUA0000116875
IP54 (230 V)	2	3AXD50000009187	A-4-X-064	 Instruction code: 3AXD50000010284 **Note:** Fan to be ordered separately

Used with ...	Qty	Ordering code	Kit code	Illustration
IP54 (115 V)	2	3AXD50000010362	A-4-X-067	 Instruction code: 3AXD50000010284 **Note:** Fan to be ordered separately

Cooling fans

Roof fans

One or two cooling fans are to be installed inside the air outlet compartment to ensure sufficient cooling of the cabinet.

IEC/UL				
Enclosure / Degree of protection (Auxiliary voltage)	**Component**		**Qty**	**Ordering code**
	Name	**Data**		
800 mm / IP54 (230 V, 50/60 Hz)	Fan	1.1 A; 230 V; 240 W; 50 Hz 1.45 A; 230 V; 350 W; 60 Hz	2	3AXD50000006934
	Capacitor	6 µF, 600 V	2	3AXD50000006959
	Connector	PLUG; 12 AWG; 2.50 mm^2	2	3AXD50000000723
	Connector	SOCKET; 12 AWG; 2.50 mm^2	2	3AXD50000000724

UL/CSA				
Enclosure / Degree of protection (Auxiliary voltage)	**Component**		**Qty**	**Ordering code**
	Name	**Data**		
800 mm / IP54 (115 V, 50/60 Hz)	Fan	1.1 A; 230 V; 240 W; 50 Hz 1.45 A; 230 V; 350 W; 60 Hz	2	64750062
	Capacitor	6 µF, 600 V	2	68713188
	Connector	PLUG; 12 AWG; 2.50 mm^2	2	3AXD50000000723
	Connector	SOCKET; 12 AWG; 2.50 mm^2	2	3AXD50000000724

Internal cabinet fan

The cabinet fan is always needed for cooling of the cabinet components (one set/cabinet).

IEC/UL			
Name	**Data**	**Qty**	**Ordering code**
Fan, axial	230 V, 50/60 Hz 20 W, 0.1 A	1	10005019
Grille, steel	150.5*162*6 7114 LHR FINGER GUARD	1	64082981

UL/CSA			
Name	**Data**	**Qty**	**Ordering code**
Fan, axial	115 V, 50/60 Hz 24/26 W	1	59023373
Grille, steel	150.5*162*6 7114 LHR FINGER GUARD	1	64082981

Miscellaneous

BAMU voltage/current measurement unit

The BAMU voltage/current measurement unit is not included in the module delivery, but can be ordered separately. If you use a BAMU unit to measure the energy storage voltage, the converter measures its output voltage (and thus also the energy storage voltage) automatically. In this case, you do not need an additional voltage measurement for the converter.

To use the BAMU voltage/current measurement unit, the control unit must have a sufficient number of fiber optic connections. If the converter unit has two converter modules and a BAMU unit, you must use a BCU-12 or UCU-23 control unit.

Type	Qty	Ordering code	Kit contents
BAMU-12 kit for DDC	1	3AXD50000360741	• BAMU-12 unit (3AXD50000045879) • Fuse holder PS272PREMCPS (3AXD50000012958) • 2× fuse 1021 CP URB 27X60/32 (3AUA0000089196) • 4× plastic shroud for fuse (3AXD50000014357) • Fiber optic cable kit NLWC-03 (2 × 3 m fiber optic cables with connectors) (58948233) • Kit instruction (3AXD50000360758)

13

Technical data

Contents of this chapter

This chapter contains technical data for ACS880-1604 DC/DC-converter modules.

Ratings

ACS880-1604-...	Frame	No-overload use							
		I_1 (input)	I_2 (output)	$P_{contmax}$	$P_{contmax}$	$I_{max\ output}$	S_N	I_{p2p}	f_{SW} out
		A (DC)	A (DC)	kW	hp	A (DC)	kVA	A	Hz
U_n = 400 V									
0600A-3	R8i	600	600	305	410	900	305	22	12000
0900A-3	R8i	900	900	458	614	1350	458	33	12000
1200A-3	2×R8i	1200	1200	611	819	1800	611	11	24000
1800A-3	2×R8i	1800	1800	916	1229	2700	916	16	24000
U_n = 500 V									
0600A-5	R8i	600	600	382	512	900	382	27	12000
0900A-5	R8i	900	900	573	768	1350	573	41	12000
1200A-5	2×R8i	1200	1200	764	1024	1800	764	14	24000
1800A-5	2×R8i	1800	1800	1146	1536	2700	1146	20	24000
U_n = 690 V									
0400A-7	R8i	400	400	351	471	600	351	38	12000
0600A-7	R8i	600	600	527	707	900	527	56	12000
0800A-7	2×R8i	800	800	703	942	1200	703	19	24000
1200A-7	2×R8i	1200	1200	1054	1413	1800	1054	28	24000

ACS880-1604-...	Frame	Short time overload use		Heavy overload use	
		$I_{short\ time}$	$P_{short\ time}$	I_{Hd}	P_{Hd}
		A	kW	A	kW
U_n = 400 V					
0600A-3	R8i	450	229	510	260
0900A-3	R8i	675	343	765	389
1200A-3	2×R8i	899	458	1020	519
1800A-3	2×R8i	1349	687	1529	779
U_n = 500 V					
0600A-5	R8i	450	286	510	324
0900A-5	R8i	675	429	765	487
1200A-5	2×R8i	899	572	1020	649
1800A-5	2×R8i	1349	859	1529	973
U_n = 690 V					
0400A-7	R8i	300	263	340	298
0600A-7	R8i	450	395	510	448
0800A-7	2×R8i	600	527	680	597
1200A-7	2×R8i	899	790	1020	895

U_n Nominal supply voltage of the drive

I_1 Maximum continuous DC input current from DC bus

I_2 Maximum continuous output current to/from energy storage

$P_{contmax}$ Maximum continuous output power to/from energy storage

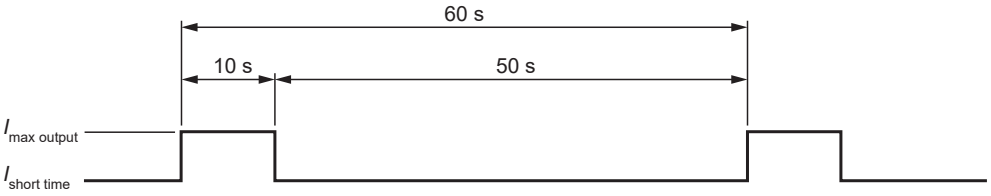
$I_{max\ output}$ Maximum output current to/from energy storage. Available for 10 seconds at start, otherwise as long as permitted by drive temperature.

S_n Nominal apparent power

I_{p2p} Peak-to-peak value of output current ripple measured after the filter

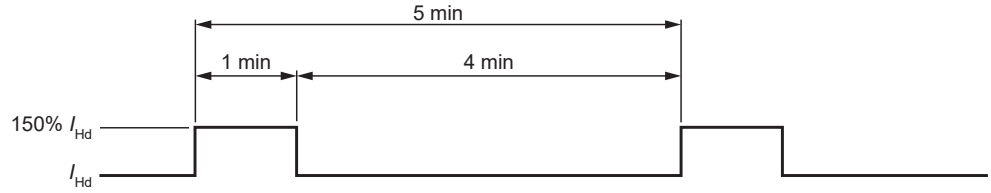
$f_{sw\ out}$ Switching frequency at output terminals (energy storage connection) measured after the filter

$I_{short\ time}$ Continuous output current allowing 10 s of $I_{max\ output}$ every 60 s



$P_{short\ time}$ Continuous output power allowing 10 s of $I_{max\ output}$ every 60 s

I_{Hd} Continuous output current allowing 150% I_{Hd} for 1 min every 5 min

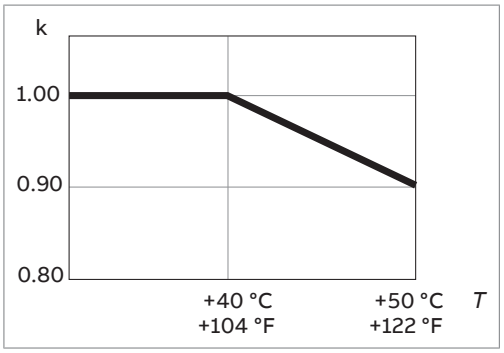


P_{Hd} Continuous output power allowing 150% I_{Hd} for 1 min every 5 min

Derating

Surrounding air temperature derating

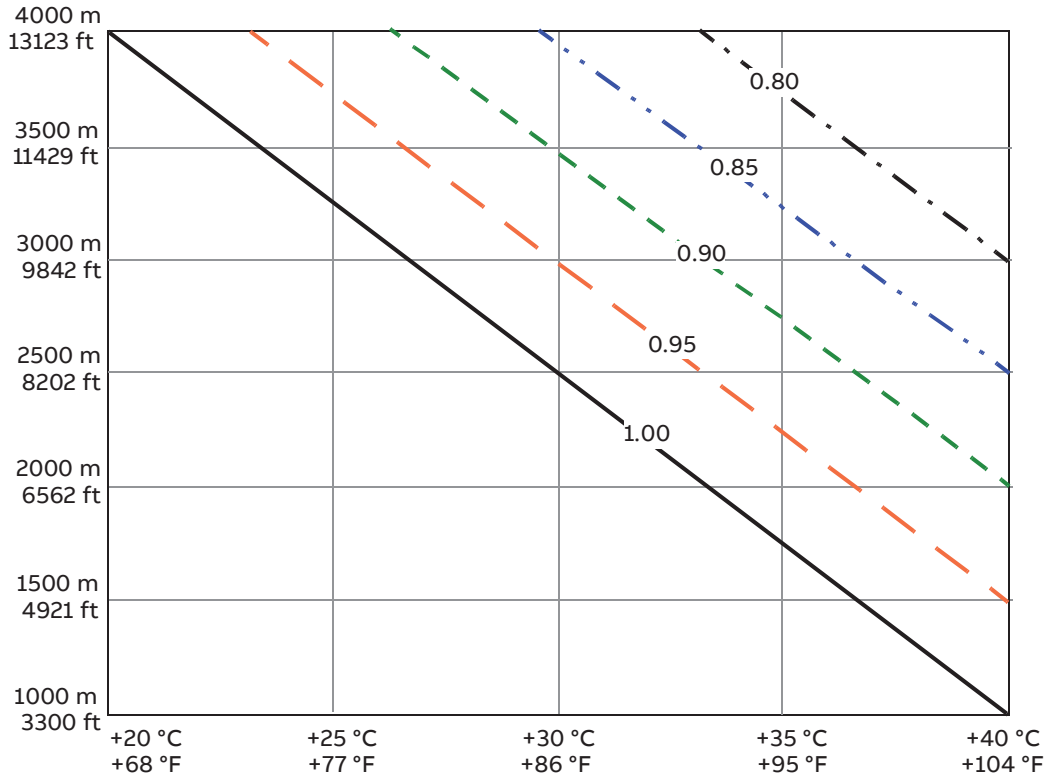
In the temperature range +40…50 °C (+104…122 °F), the rated output current is derated by 1 percentage point for every added 1 °C (1.8 °F). The output current can be calculated by multiplying the current given in the rating table by the derating factor *(k)*:



Altitude derating

At altitudes more than 1000 m (3281 ft) above sea level, the output current derating is 1 percentage point for every added 100 m (328 ft). For example, the derating factor for 1500 m (4921 ft) is 0.95. The maximum permitted installation altitude is given in the technical data.

If the surrounding air temperature is less than +40 °C (104 °F), the derating can be reduced by 1.5 percentage points for every 1 °C (1.8 °F) reduction in temperature. A few altitude derating curves are shown below.



	Derating factor 1.00
	Derating factor 0.95
	Derating factor 0.90
	Derating factor 0.85
	Derating factor 0.80

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

Type equivalence table

Converter module type	Basic module type			BDCL filter	
ACS880-1604-...	**ACS880-104-...**	**Frame size**	**Qty**	**Type**	**Qty**
U_n = 400 V					
0600A-3	0640A-3	R8i	1	BDCL-14-5	1
0900A-3	0900A-3	R8i	1	BDCL-15-5	1
1200A-3	0640A-3	R8i	2	BDCL-14-5	2
1800A-3	0900A-3	R8i	2	BDCL-15-5	2
U_n = 500 V					
0600A-5	0590A-5	R8i	1	BDCL-14-5	1
0900A-5	0810A-5	R8i	1	BDCL-15-5	1
1200A-5	0590A-5	R8i	2	BDCL-14-5	2
1800A-5	0810A-5	R8i	2	BDCL-15-5	2
U_n = 690 V					
0400A-7	0410A-7	R8i	1	BDCL-14-7	1

Converter module type	Basic module type			BDCL filter	
ACS880-1604-...	ACS880-104-...	Frame size	Qty	Type	Qty
0600A-7	0600A-7	R8i	1	BDCL-15-7	1
0800A-7	0410A-7	R8i	2	BDCL-14-7	2
1200A-7	0600A-7	R8i	2	BDCL-15-7	2

Fuses

The fuses are given in the ordering information.

Note: The recommended fuses are for branch circuit protection per NEC as required for the UL approval.

Fuses on BFPS board

The fuse type is Mersen (Ferraz Shawmut) A070GRB05T13 (5 A 690 V AC).

Fuses and fuse bases for BAMU unit

The fuses and fuse bases for BAMU unit are given in the ordering information.

Filter module data

Filter module type	Nominal inductance / phase	DC resistance / phase
	µH	mohm
BDCL-14	540	7
BDCL-15	360	7

Charging component ratings

For the ratings of charging fuses, resistors and switches, refer to the ordering information.

Dimensions and weights

R8i DC/DC-converter module

The dimensions of a DC/DC-converter module are:

- height 1397 mm (55.0 in)
- width 240 mm (9.45 in)
- depth 583 mm (22.95 in)
- weight 125 kg (275.6 lb).

For more information, refer to the dimension drawings.

BDCL filter module

The dimensions of a BDCL module are:

- height 1397 mm (55.0 in)
- width 240 mm (9.45 in)
- depth 444 mm (17.47 in)
- weight BDCL-14-5/-7 186 kg (410 lb) and BDCL-15-5/-7 195 kg (430 lb).

For more information, refer to the dimension drawings.

One filter module is necessary for each converter module.

Free space requirements

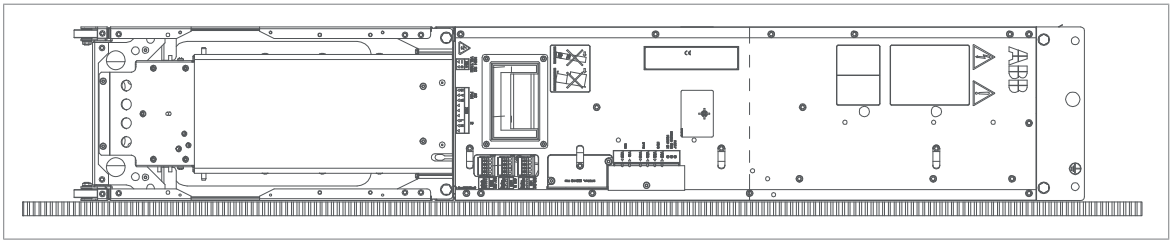
Free space requirements for the DC/DC-converter modules are:

- above the module to enable cooling air flow 200.0 mm (7.9 in)
- in front of the module free space for cabling 10.0 mm (0.4 in)
- left and right of the module free space for smooth installation 10.0 mm (0.4 in).

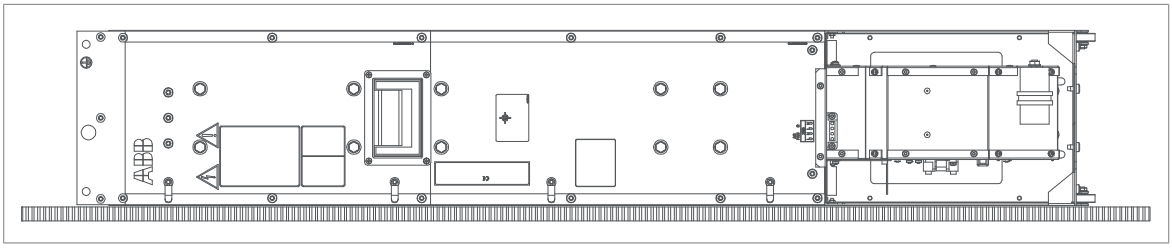
For more information on cooling the cabinet, refer to Drive modules cabinet design and construction instructions (3AUA0000107668 [English]).

Allowable mounting orientations

For frame R8i, the allowable mounting orientations are upright position and on the right-hand side (viewed from the front).



For the BDCL filter, the allowable mounting orientations are upright position and on the left-hand side (viewed from the front).



Losses, cooling data and noise

Type ACS880-1604-...	Frame	P_{loss}	Air flow		Noise	Efficiency[1)]
		kW	m³/h	ft³/min	dB	%
U_n = 400 V						
0600A-3	R8i	5.2	2200	1295	74	98.3
0900A-3	R8i	8.0	2200	1295	74	98.3
1200A-3	2×R8i	10.5	4400	2590	76	98.3

Type ACS880-1604-...	Frame	P_{loss}	Air flow		Noise	Efficiency[1)]
		kW	m³/h	ft³/min	dB	%
1800A-3	2×R8i	16.5	4400	2590	76	98.2
U_n = 500 V						
0600A-5	R8i	6.0	2200	1295	74	98.5
0900A-5	R8i	9.1	2200	1295	74	98.4
1200A-5	2×R8i	12.1	4400	2590	76	98.4
1800A-5	2×R8i	18.8	4400	2590	76	98.4
U_n = 690 V						
0400A-7	R8i	6.4	2200	1295	74	98.2
0600A-7	R8i	10.6	2200	1295	74	98.0
0800A-7	2×R8i	12.8	4400	2590	76	98.2
1200A-7	2×R8i	21.5	4400	2590	76	98.0

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

Definitions

P_{loss}	Heat dissipation. Maximum total losses of the DC/DC-converter and BDCL filter with full output power.
Noise	Noise (DC/DC-converter and BDCL filter)

Tightening torques

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

Electrical connections

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

Mechanical connections

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

Insulation supports

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

Cable lugs

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

Input power (DC bus) connection

Voltage (U_1)	ACS880-1604-xxxxx-3 = 566 V DC. This is indicated in the type designation label as typical input voltage levels 566 V DC. ACS880-1604-xxxxx-5 = 566…707 V DC. This is indicated in the type designation label as typical input voltage levels 566 / 679 / 707 V DC. ACS880-1604-xxxxx-7 = 742…976 V DC. This is indicated in the type designation label as typical input voltage levels 742 / 849 / 976 V DC (849 V DC for UL/CSA).
Input terminals, converter module	Frame R7i: Quick connector. Frame R8i: M12. Torque: 70 N·m (52 lbf·ft). Maximum intrusion into module 20 mm (0.8 in).
Input terminals, filter module	BDCL-14 and BDCL-15: M10. Torque: 42 N·m (31 lbf·ft). Maximum intrusion into module 20 mm (0.8 in).

Output power (energy storage) connection

Voltage (U_2)	ACS880-1604-xxxxx-3 = Maximum output voltage 50 V…95% of U_{DC} (Drive DC voltage in the DC bus). This is indicated in the type designation label as typical output voltage range 50…509 V DC. ACS880-1604-xxxxx-5 = Maximum output voltage 50 V…95% of U_{DC} (Drive DC voltage in the DC bus). This is indicated in the type designation label as typical output voltage range 50…509 / 611 / 636 V DC. ACS880-1604-xxxxx-7 = Maximum output voltage 50 V…95% of U_{DC} (Drive DC voltage in the DC bus). This is indicated in the type designation label as typical output voltage range 50…668 / 764 / 878 V DC (764 V DC for UL/CSA). Recommended output voltage 150 V…80% of U_{DC}.
Current	See the ratings data.
Output terminals, converter module	Quick connector.
Maximum energy storage cable length	100 m (328 ft)

Typical power cable sizes

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

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

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

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

Control accuracy – Current and voltage control performance data

Current control dynamic response	Step response time < 10 ms for a reference step 0…50% of the drive nominal current
Current control accuracy (static)	Current error < 1% of the drive nominal current rating For the DC current ripple, refer to the ratings data.
Energy storage voltage control accuracy (static)	Voltage error < 1% of the drive nominal voltage (converter with the optional BAMU voltage/current measurement unit) **Note:** If the converter does not include the BAMU voltage/current measurement unit, the voltage measurement accuracy depends on the customer's measurement device.

Protection classes

Degrees of protection (IEC/EN 60529)	IP00
Enclosure types (UL 50/50E)	UL Open Type
Overvoltage category (IEC/EN 60664-1)	III
Protective class (IEC/EN 61800-5-1)	I

Energy efficiency data (ecodesign)

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

Ambient conditions

This section gives the environmental requirements for the converter module.

The converter module must be used in a heated indoor controlled environment.

	Operation installed for stationary use	**Storage** in protective package	**Transportation** in protective package
Altitude above sea level	0…1000 m (0…3281 ft) without derating, 1000…4000 m (3281…13123 ft) with derating.	-	-
Air temperature	0…40 °C (32…104 °F) without derating. Output derated in the range 40…50 °C (104…122 °F). No condensation permitted.	-40…+70 °C (-40…+158 °F)	-40…+70 °C (-40…+158 °F)
Relative humidity	Maximum 95%, no condensation permitted.	Maximum 95%, no condensation permitted.	Maximum 95%, no condensation permitted.

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 at weatherprotected locations	IEC 60721-3-1:1997: Classification of environmental conditions - Part 3 Classification of groups of environmental parameters and their severities - Section 1: Storage	IEC 60721-3-2:1997: Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 2: Transportation
Chemical gases	Class 3C2	Class 1C2	Class 2C2
Solid particles	Class 3S1	Class 1S3 (packing must support this, otherwise 1S2)	Class 2S2
	No conductive dust permitted.	-	-
Vibration IEC 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* Tested in a typical cabinet assembly according to: Max. 1 mm (0.04 in.) (peak value, 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 permitted	With packing max. 100 m/s^2 (330 ft./s^2) 11 ms	With packing max. 100 m/s^2 (330 ft./s^2) 11 ms

Materials

Module

Refer to Recycling instructions and environmental information for ACS880 cabinet-installed drives and multidrive modules (3AXD50000153909 [English]).

Package materials for module products

This is a complete list of the package materials. The materials vary depending on the frame size (packages do not contain all materials listed below).

- Cardboard (heavy duty quality with wet strength glue in large modules)
- Molded pulp
- Plywood
- Wood
- PP (strapping)
- EPP (foam)
- PE (plastic bag and/or VCI film)
- Metal (fixing clamps, screws).

Disposal

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

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

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

To aid recycling, most plastic parts are marked with an appropriate identification code. In addition, components containing substances of very high concern (SVHCs) are listed in European Chemicals Agency's SCIP database. SCIP is the database for information on Substances of Concern In articles as such or in complex objects (Products) established under the Waste Framework Directive (2008/98/EC). For further information, contact your local ABB distributor or consult European Chemicals Agency's SCIP database to find out which SVHCs are used in the drive, and to find out where those components are located.

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

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

Auxiliary current consumption

Device	U_n	f	I_{cont}	I_{start}	P_{cont}
	V	Hz	A	A	W
UCU-22 control unit[1)]	24 V DC (+30%/-20%)	-	0.5	-	12
UCU-23 control unit[1)]	24 V DC (+30%/-20%)	-	0.6	-	14.3
UCU-24 control unit[1)]	24 V DC (+30%/-20%)	-	0.7	-	16.6
BCU control unit	24 V DC ±10%	-	2.0	-	48
BAMU-12C auxiliary measurement unit	24 V DC ±10%	-	0.15	-	-
BSFC-02C charging controller	230 V AC (+10%/-15%)	50/60	0.04	-	-
	115 V AC (+10%/-15%)	50/60	0.08	-	-
DOL fan for R8i module (option +C188)	400 V AC	50	1.50	3.00	-
	400 V AC	60	1.90	3.80	-
	320 V AC	60	1.50	4.40	-
DOL fan for BDCL filter (option +C188)	230 V AC	50	1.40	-	-
	230 V AC	60	1.40	-	-
DOL fan for BDCL filter (option +C188+G304)	115 V AC	60	2.40	-	-
Heating element for R8i module (option +C183)	230 V AC	50/60	-	-	40
	115 V AC	60	-	-	40
PDAL2 switch/disconnector inter-lock coil	230 V AC (+10%/-30%)	50	-	-	6.5
	240 V AC (+10%/-30%)	60	-	-	6.5
	110 V AC (+10%/-30%)	60	-	-	6.5

Device	U_n	f	I_{cont}	I_{start}	P_{cont}
	V	Hz	A	A	W
R8i module internal electronics	230 V AC (+15%/-20%)	50/60	0.45	-	105
R8i module internal electronics, with option +G304	115 V AC (+15%/-20%)	50/60	0.90	-	105

1) Continuous load with no options installed on the control unit. For the maximum load, refer to the control unit data.

Cooling fans

Device	U_N	f	I_{cont}
	V AC	Hz	A
IP54 roof fan	230	50	1.10
		60	1.45
	115	50	3.1
		60	3.9
Internal cabinet fan	230	50	0.10
		60	0.14
	115	50	0.21
		60	0.23

Definitions

f	Supply frequency
I_{cont}	Continuous current consumption
I_{start}	Calculated load current at start
P_{cont}	Continuous input power
U_n	Voltage

Applicable standards

Refer to ACS880 multidrives cabinets and modules electrical planning instructions (3AUA0000102324 [English]).

Markings

Refer to ACS880 multidrives cabinets and modules electrical planning instructions (3AUA0000102324 [English]).

Disclaimers

Generic disclaimer

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

Cyber security disclaimer

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

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

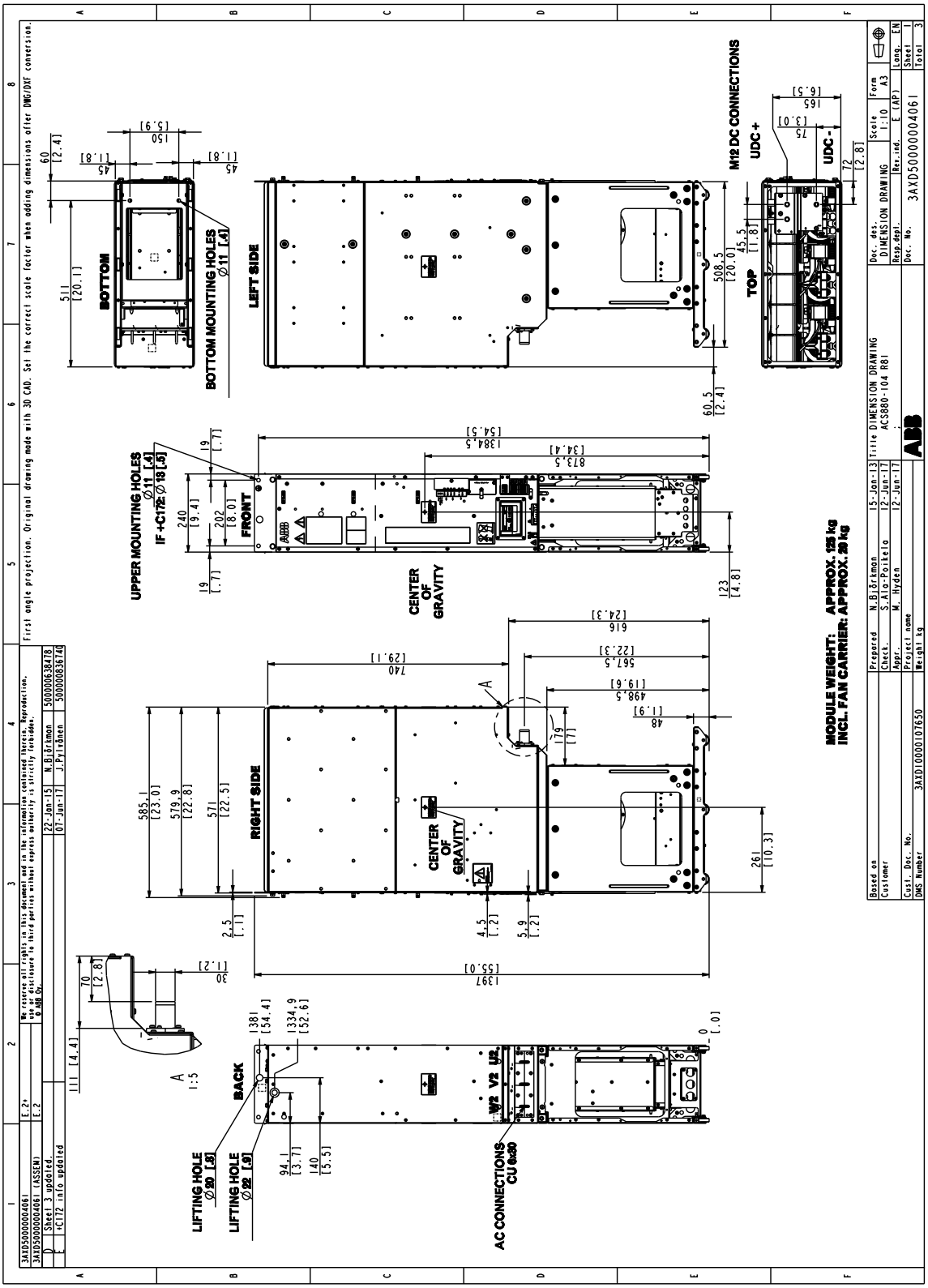
14

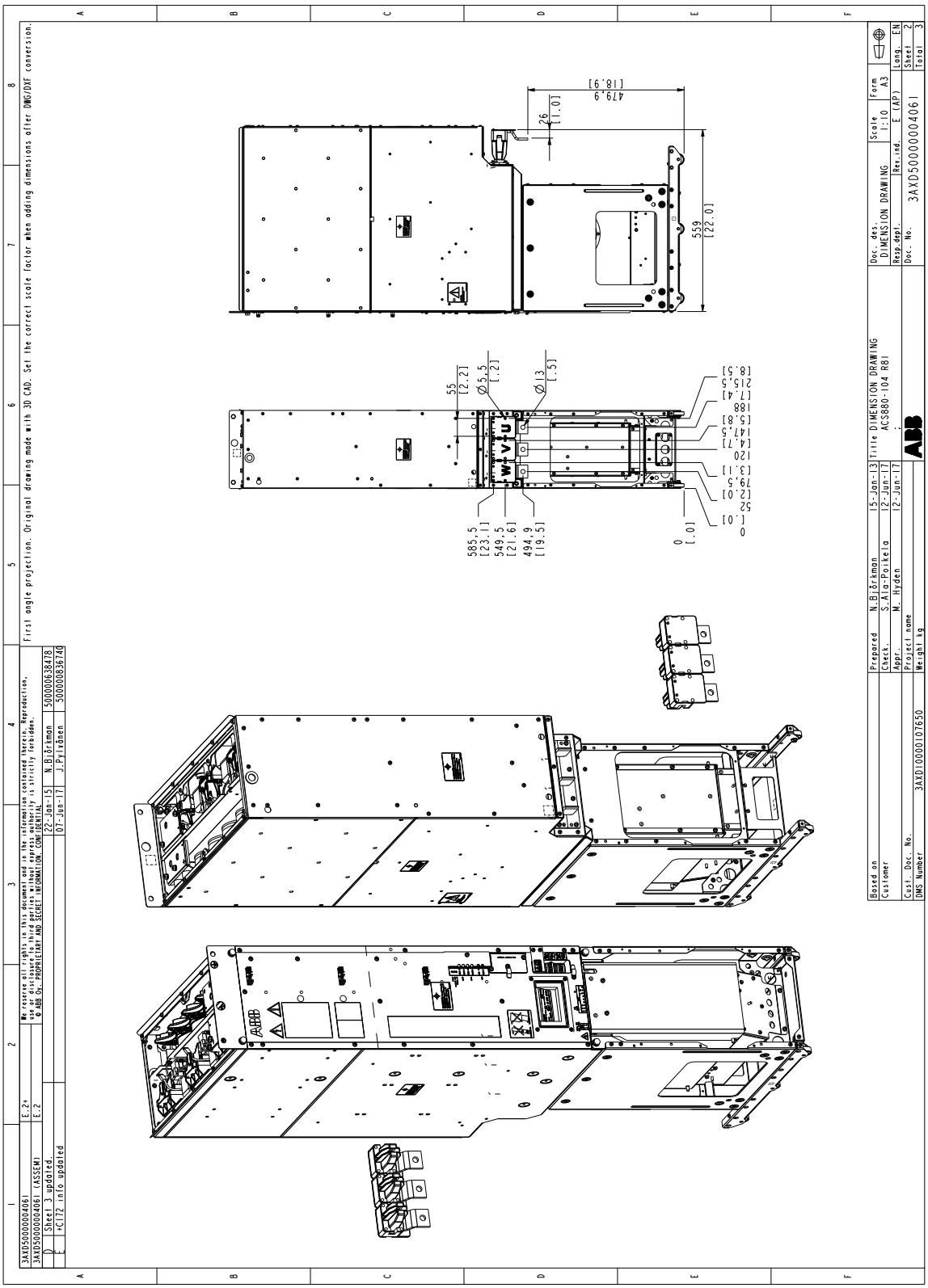
Dimension drawings

Contents of this chapter

This chapter shows the dimensions of the ACS880-1604 DC/DC-converter modules and accessories.

R8i DC/DC-converter module

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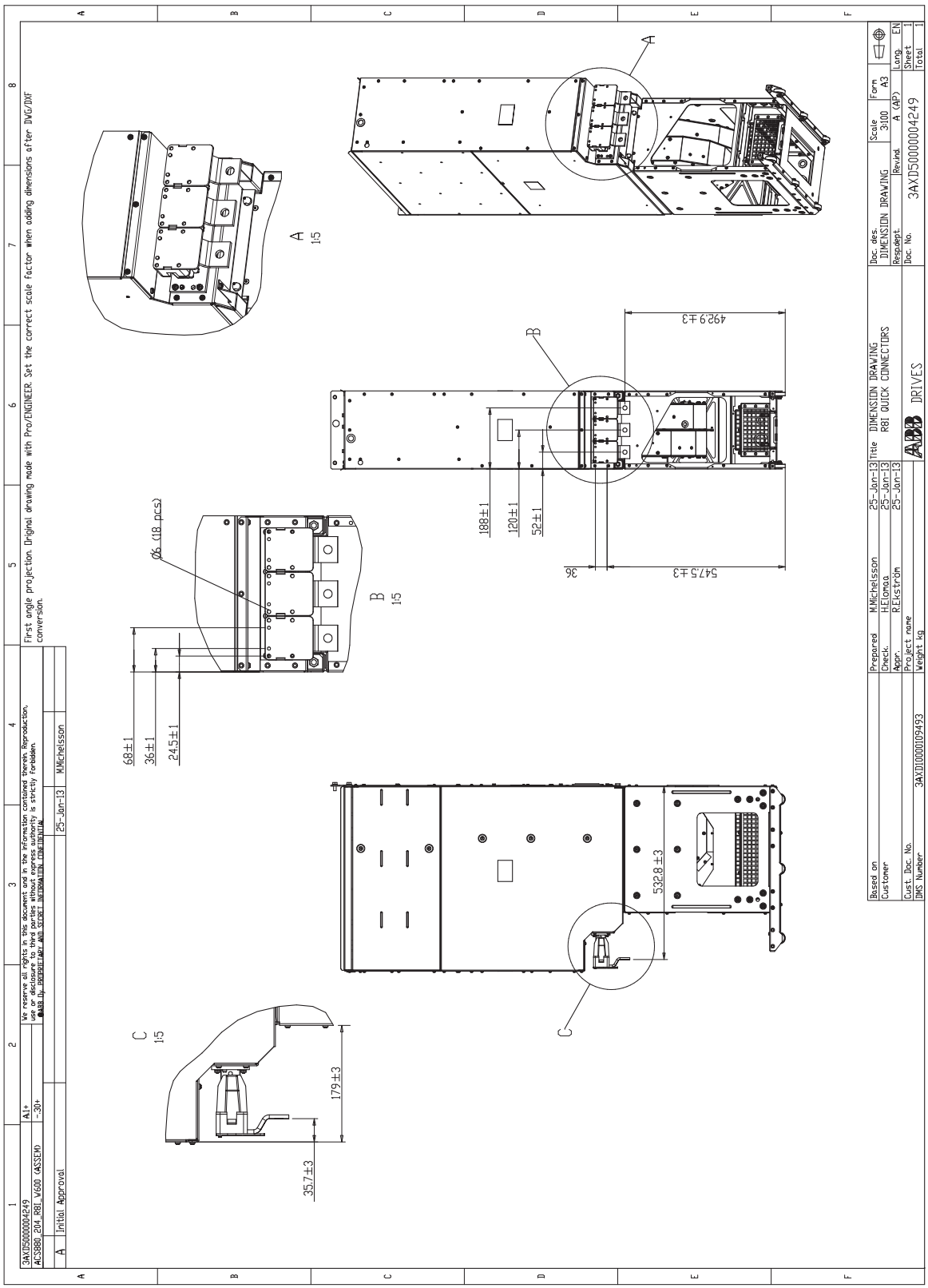
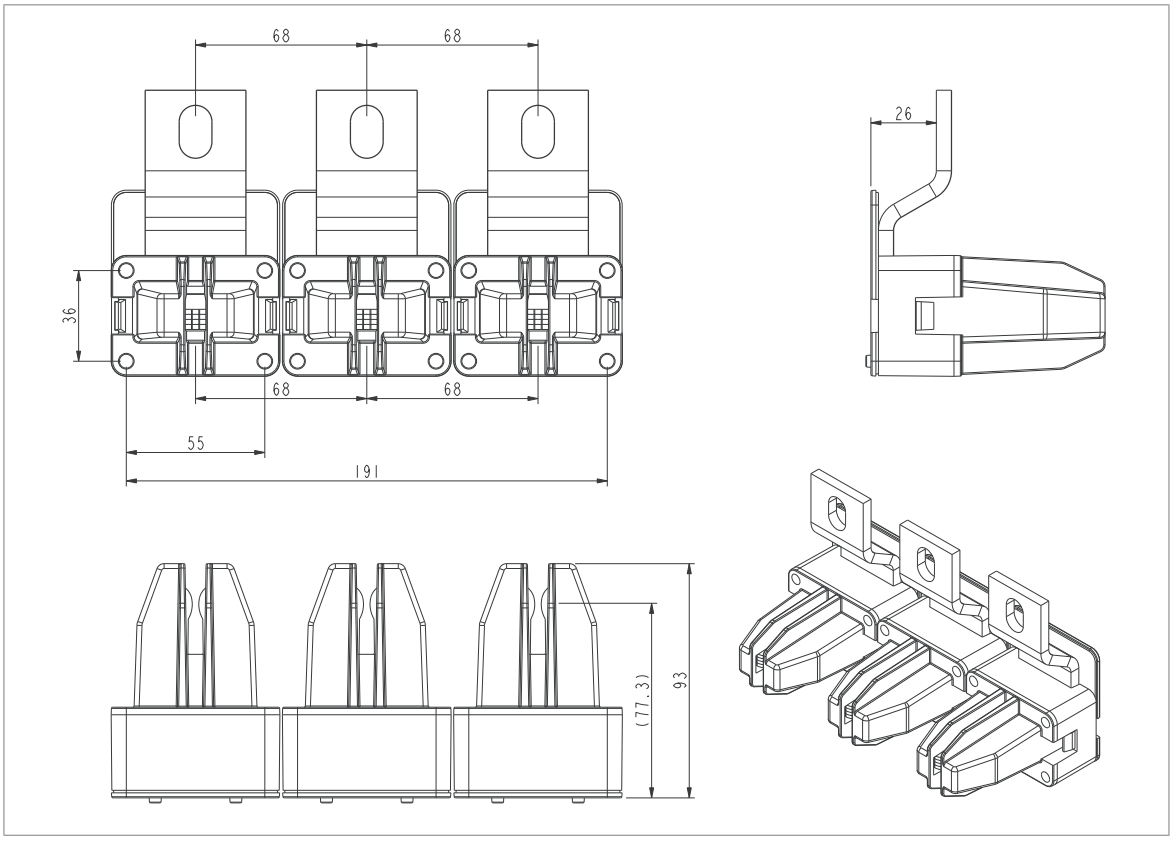
Title DIMENSION DRAWING
ACS880-104 R81
Doc. No. 3AXD50000004061
Scale 1:10
Form A3
Lang. EN
Sheet 2
Total 3
Prepared N.Björkman 15-Jan-13
Check. S.Ala-Poikela 12-Jun-17
Appr. M. Hyden 12-Jun-17
Project name
Weight kg
3AXD10000107650
3AXD50000004061 E.2+ +C172 info updated
3AXD50000004061 (ASSEM) E.2 Sheet 3 updated
22-Jun-15 N.Björkman 5000006384 78
07-Jun-17 J.Pylvänen 5000008367 40

Quick connectors of the DC/DC-converter module



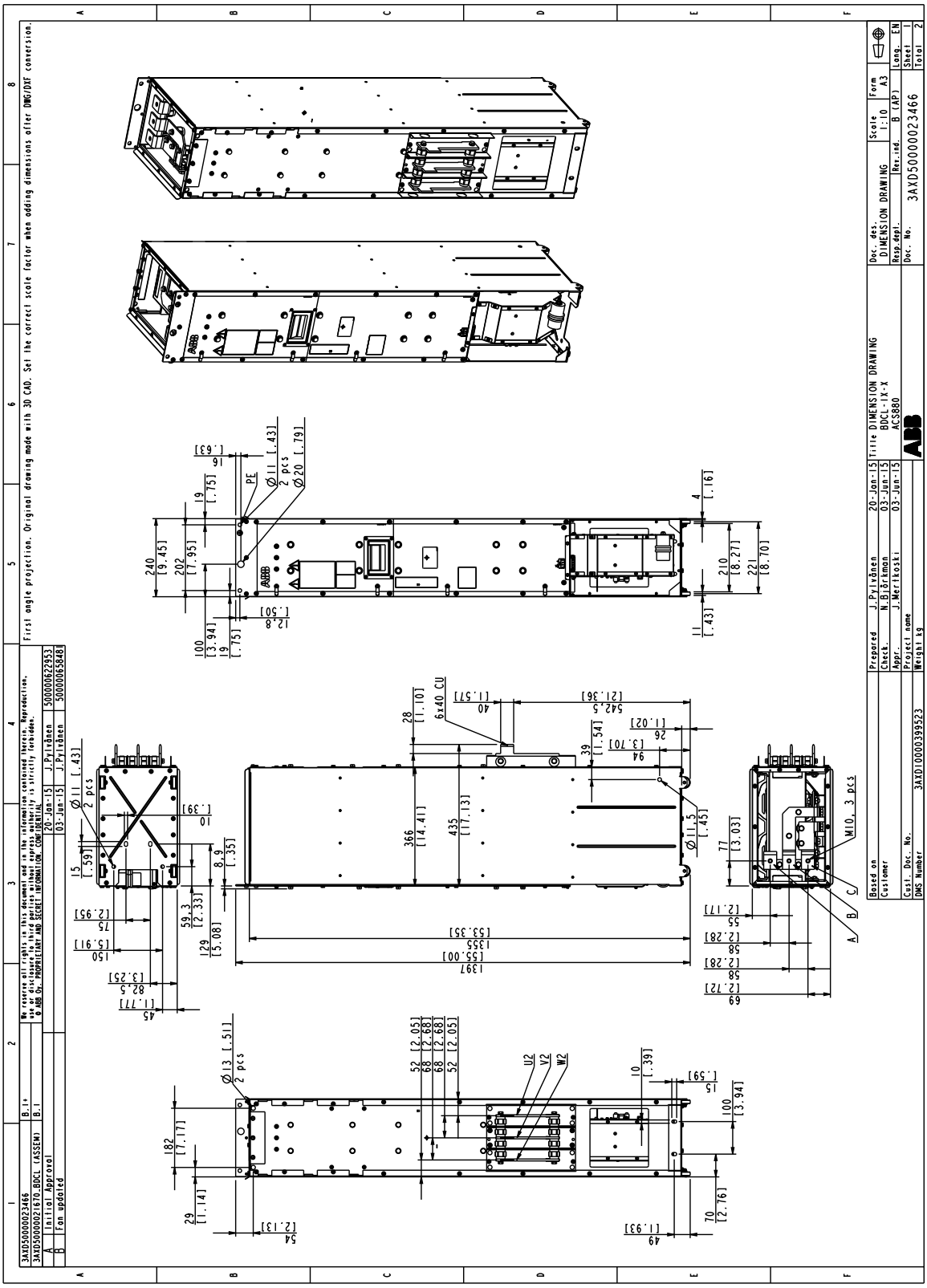
Quick connectors



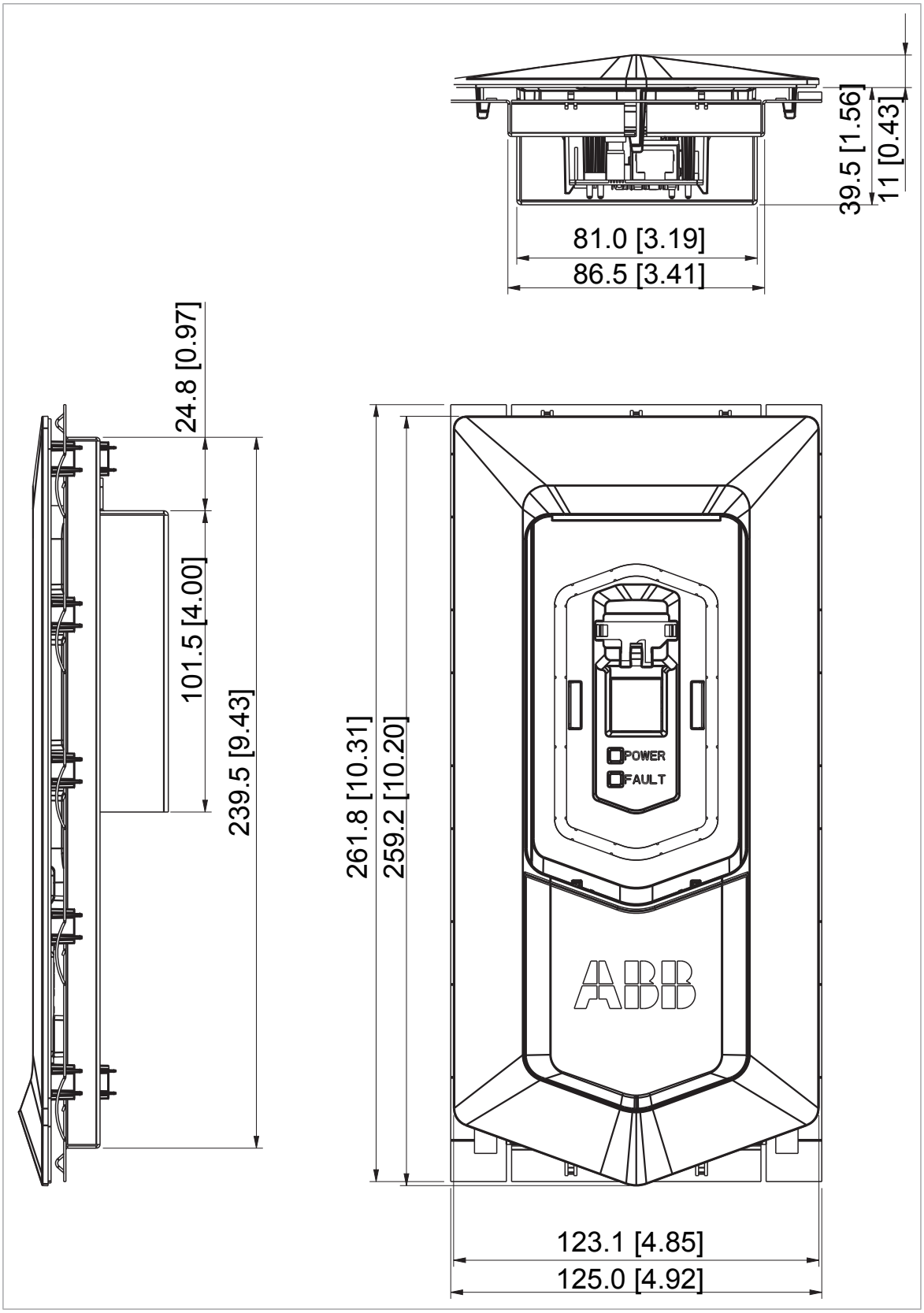
Dimensions in mm

1 mm = 0.0394 in

BDCL filter module



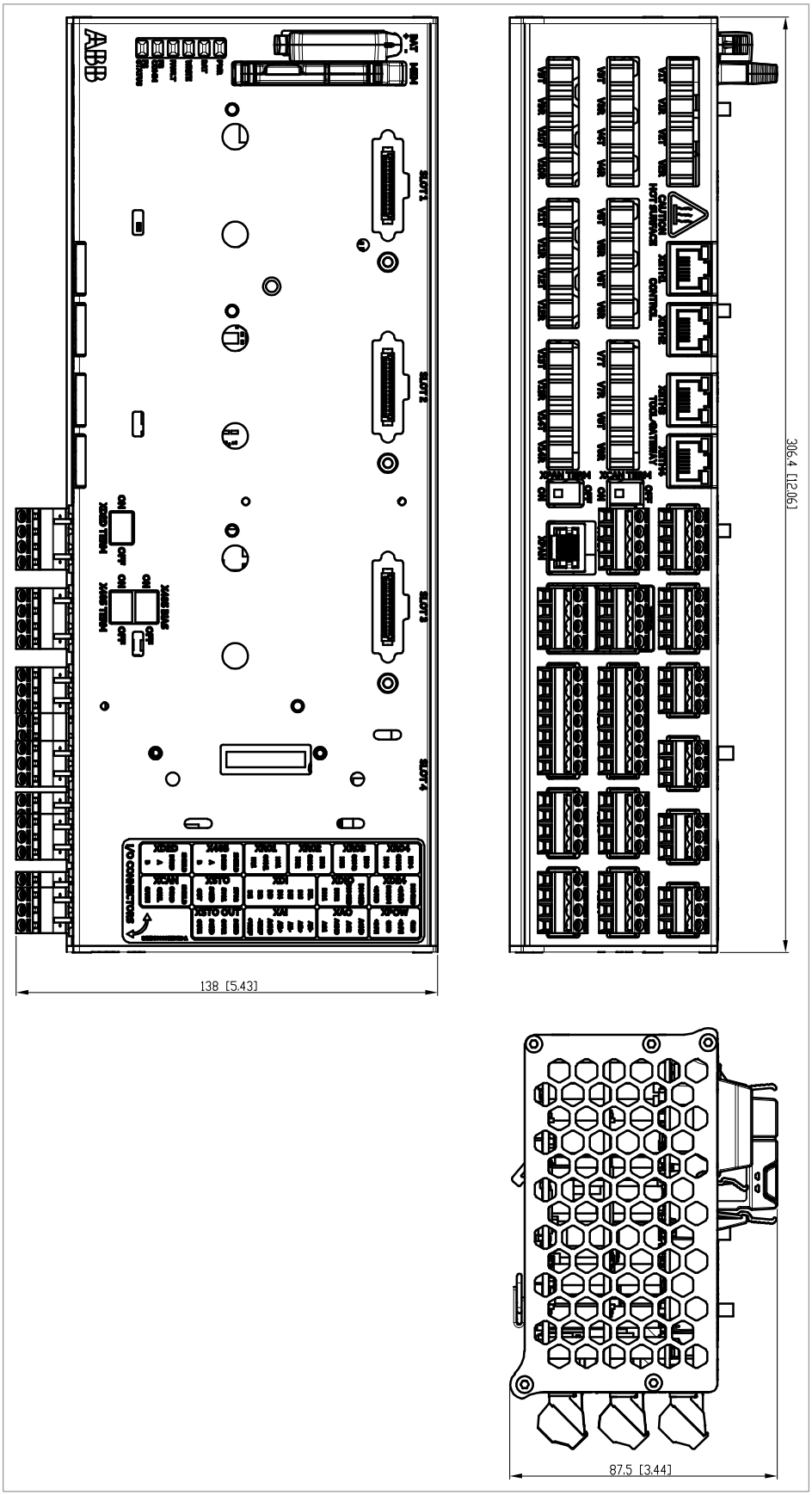
DPMP-01 door mounting kit



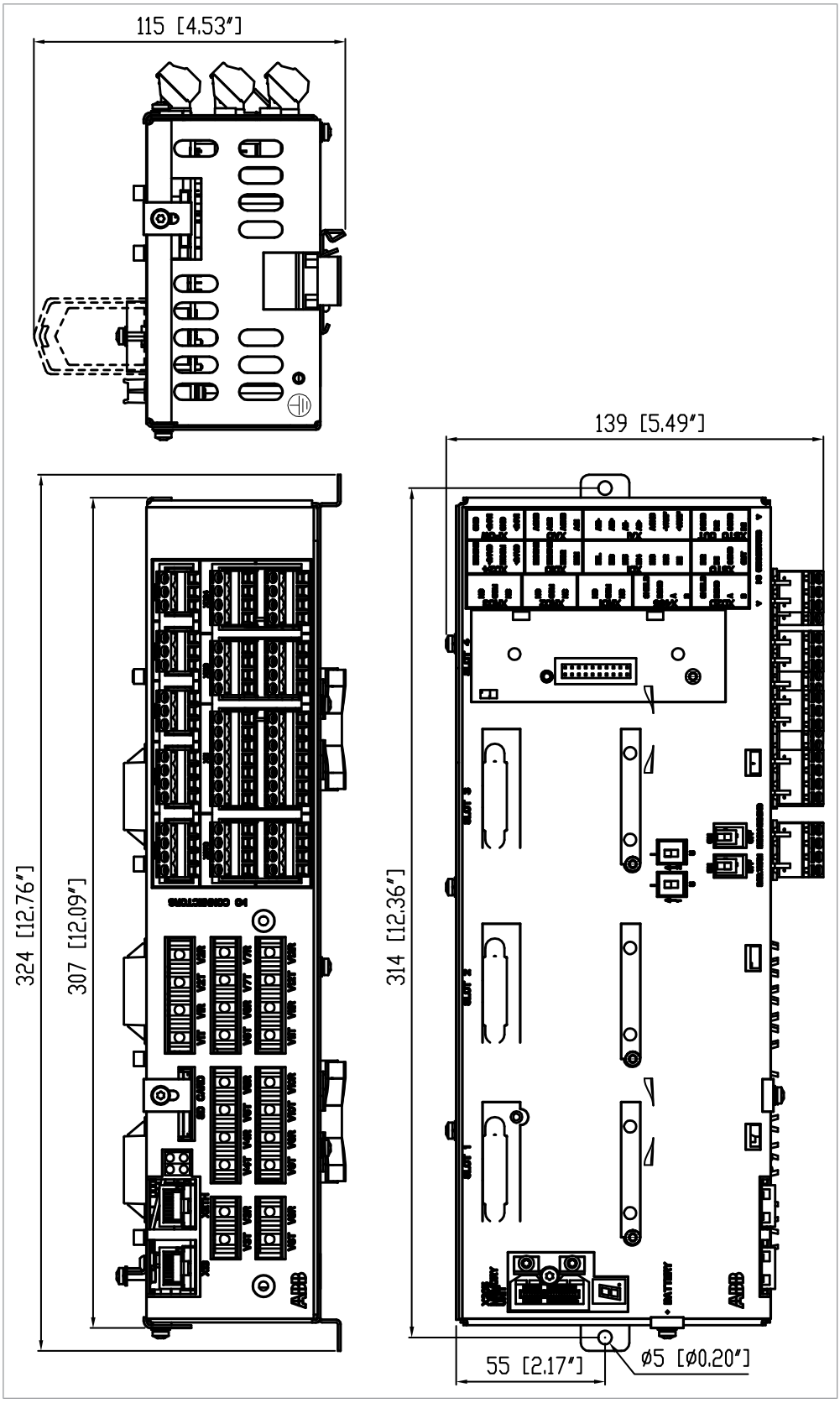
Cutting in the cabinet door: 109 mm × 223 mm (4.29 in. × 8.78 in.)

Plate thickness: 1.5 … 2.5 mm (0.059 … 0.098 in.)

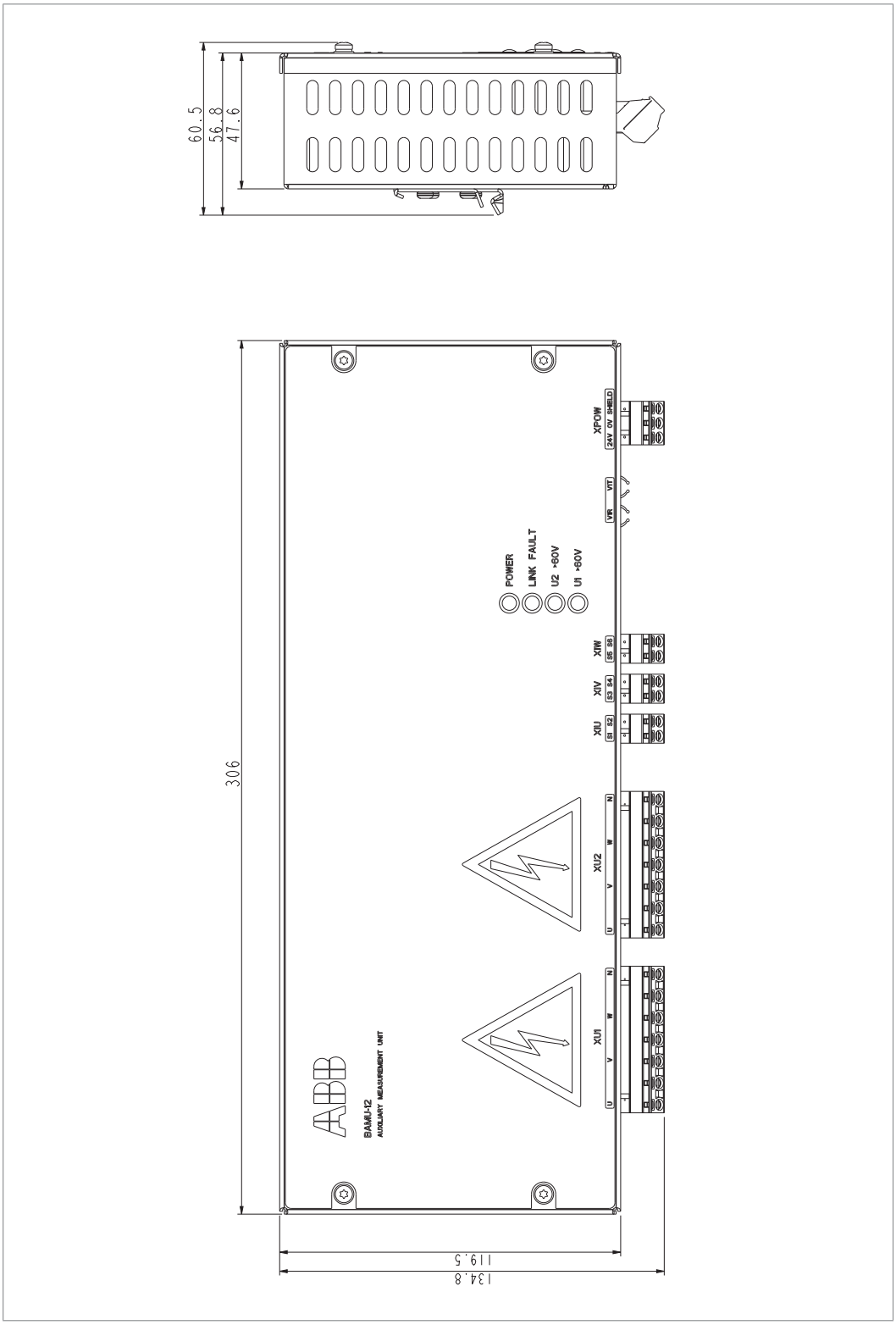
UCU control unit



BCU control unit



BAMU voltage/current measurement unit

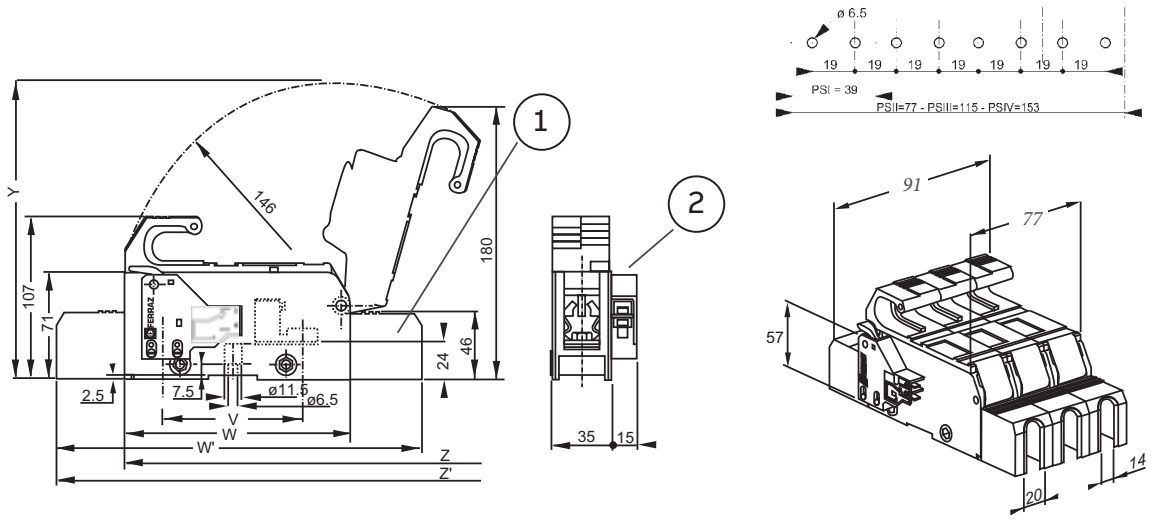


Dimensions in mm

1 mm = 0.0394 in

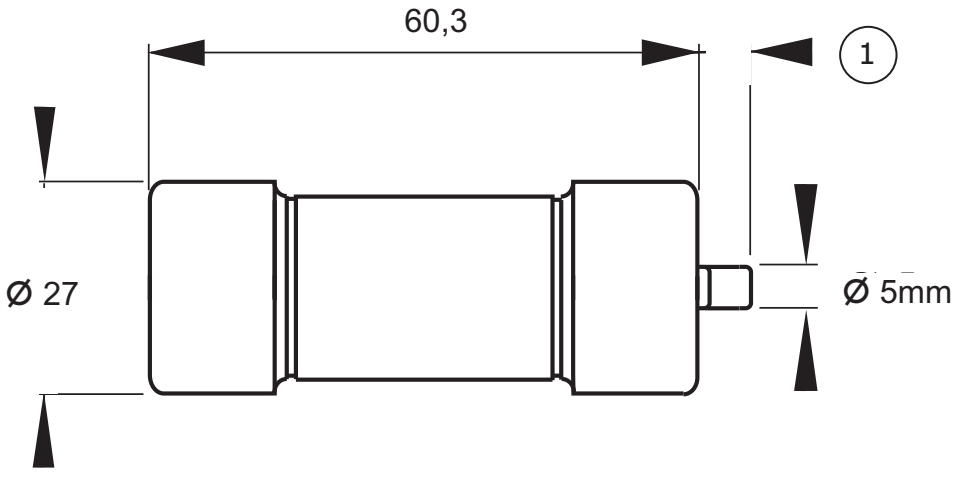
BAMU fuse holders and fuses

PS272PREMCPS fuse disconnector and PS27 terminal cover



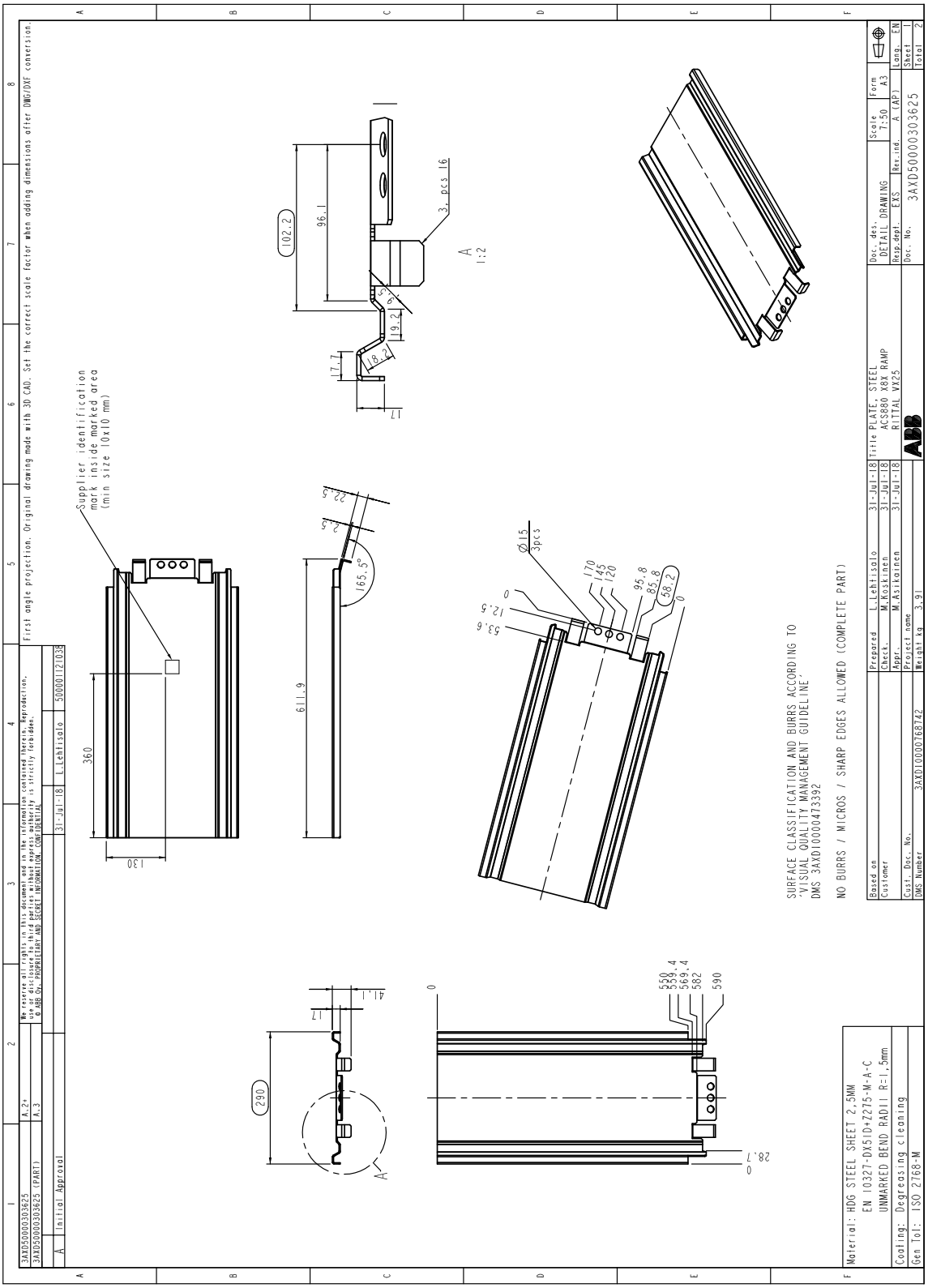
1.	Twin terminal covers PS 27 Part #: A 220087 Weight: 30g Packaging: 3 twins
2.	MC PS
V:	93 Connecting distance between centers
W:	150 Without terminals cover length
W’:	240 With terminals cover length
Y:	196 Space factor with a 90° fuse carrier position
Z:	284 Without terminal cover, space factor with a 180° fuse carrier position
Z’:	279 With terminal cover, space factor with a 180° fuse carrier position

Fuse, 27 × 60 mm



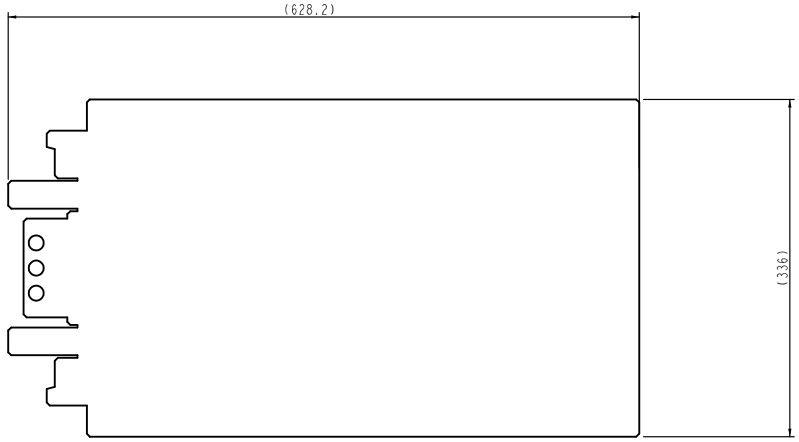
1.	7 mm indicator travel

Ramp


Supplier identification
mark inside marked area
(min size 10x10 mm)
360
130
611.9
165.5°
22.5
12.5
Ø15
3pcs
170
145
120
95.8
85.8
38.2
53.6
12.5
102.2
96.1
3x pcs 16
19.2
18.2
17.7
17
A
1:2
290
41.1
17
550
559.4
569.4
582
590
28.7
SURFACE CLASSIFICATION AND BURRS ACCORDING TO
"VISUAL QUALITY MANAGEMENT GUIDELINE"
DMS 3AXD10000473392
NO BURRS / MICROS / SHARP EDGES ALLOWED (COMPLETE PART)
Material: HDG STEEL SHEET 2.5MM
EN 10327-DX51D+Z275-M-A-C
UNMARKED BEND RADII R=1,5mm
Cooling: Degreasing cleaning
Gen Tol: ISO 2768-M
Based on
Customer
Cust. Doc. No.
DMS Number
3AXD10000768742
Prepared L.Lehtisalo 31-Jul-18
Check. M.Koskinen 31-Jul-18
Appr. M.Asikainen 31-Jul-18
Project name
Weight kg 3.91
Title PLATE, STEEL
ACS880 X8X RAMP
RITTAL VX25
Doc. des. DETAIL DRAWING
Resp.dept. EKS
Doc. No. 3AXD50000303625
Scale 7:50
Form A3
Rev.ind. A (AP)
Lang. EN
Sheet 1
Total 2
3AXD50000303625 A.2+
3AXD50000303625 (PART) A.3
A Initial Approval 31-Jul-18 L.Lehtisalo 5000011203B
First angle projection. Original drawing made with 3D CAD. Set the correct scale factor when adding dimensions after DWG/DXF conversion.

1	2	3	4	5	6	7	8

3AXD50000303625 3AXD50000004382 (ASSEM)	A.2+	We reserve all rights in this document and in the information contained therein. Reproduction, use or disclosure to third parties without express authority is strictly forbidden. © ABB Oy. PROPRIETARY AND SECRET INFORMATION. CONFIDENTIAL		First angle projection. Original drawing made with 3D CAD. Set the correct scale factor when adding dimensions after DWG/DXF conversion.	
A	Initial Approval		31-Jul-18	L.Lehtisalo	500001121038

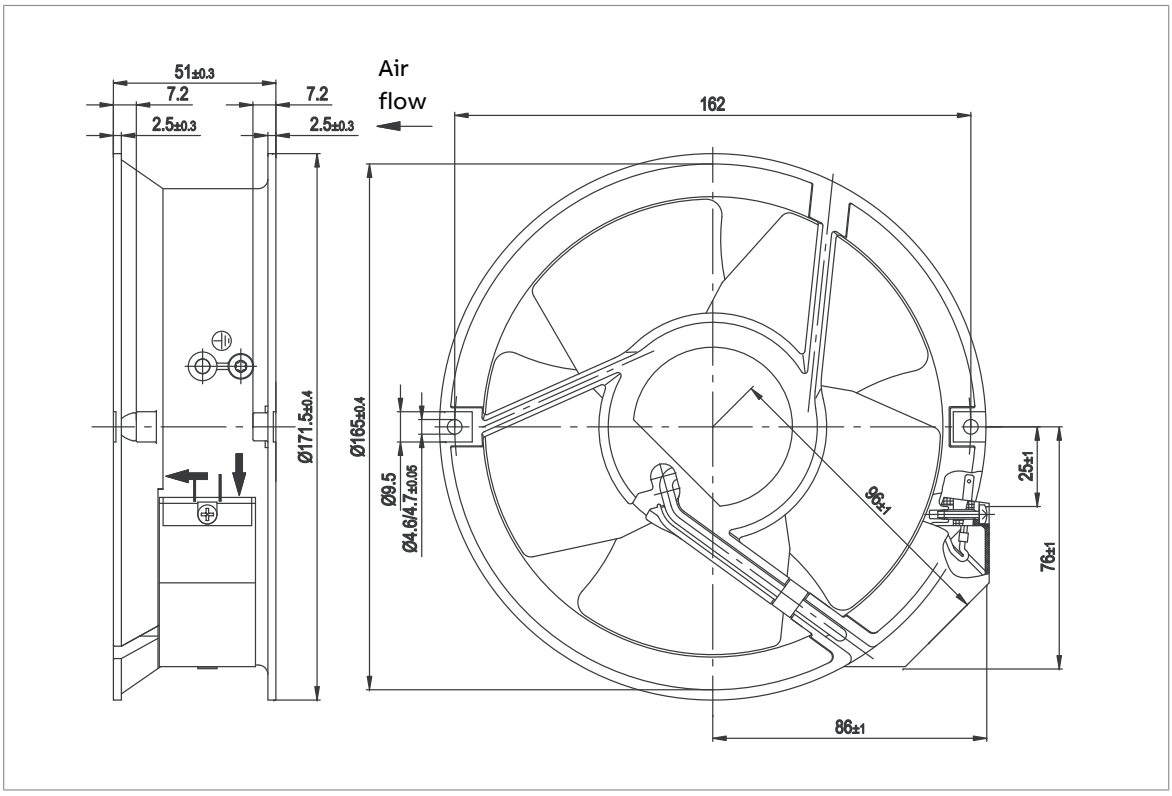


FLAT PATTERN FOR REFERENCE

Based on	Prepared L.Lehtisalo 31-Jul-18	Title PLATE, STEEL	Doc. des. DETAIL DRAWING	Scale 3:100	Form A3		
Customer	Check. M.Koskinen 31-Jul-18	ACS880 X8X RAMP					
	Appr. M.Asikainen 31-Jul-18	RITTAL VX25	Resp.dept. EXS	Rev.ind. A (AP)		Lang. EN	
Cust. Doc. No.	Project name	ABB	Doc. No. 3AXD50000303625			Sheet 2	
DMS Number 3AXD10000768742	Weight kg					Total 2	

Internal cabinet fan

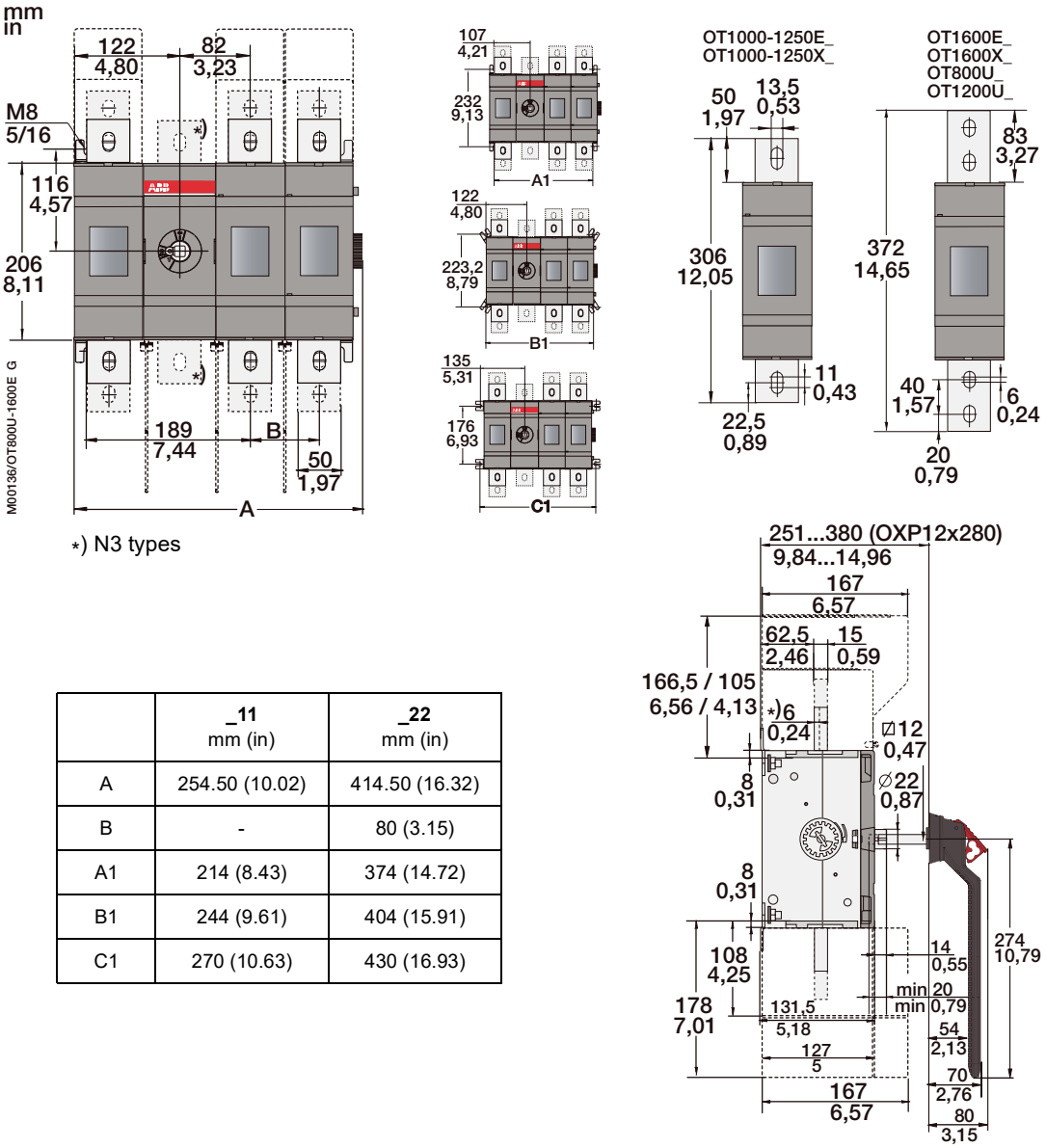
W2E 143-AA09-01, W2E 143-AA15-01



Switchgear and charging components

DC switch-disconnectors

OT1600E11 (IEC), OT1200U11 (UL)

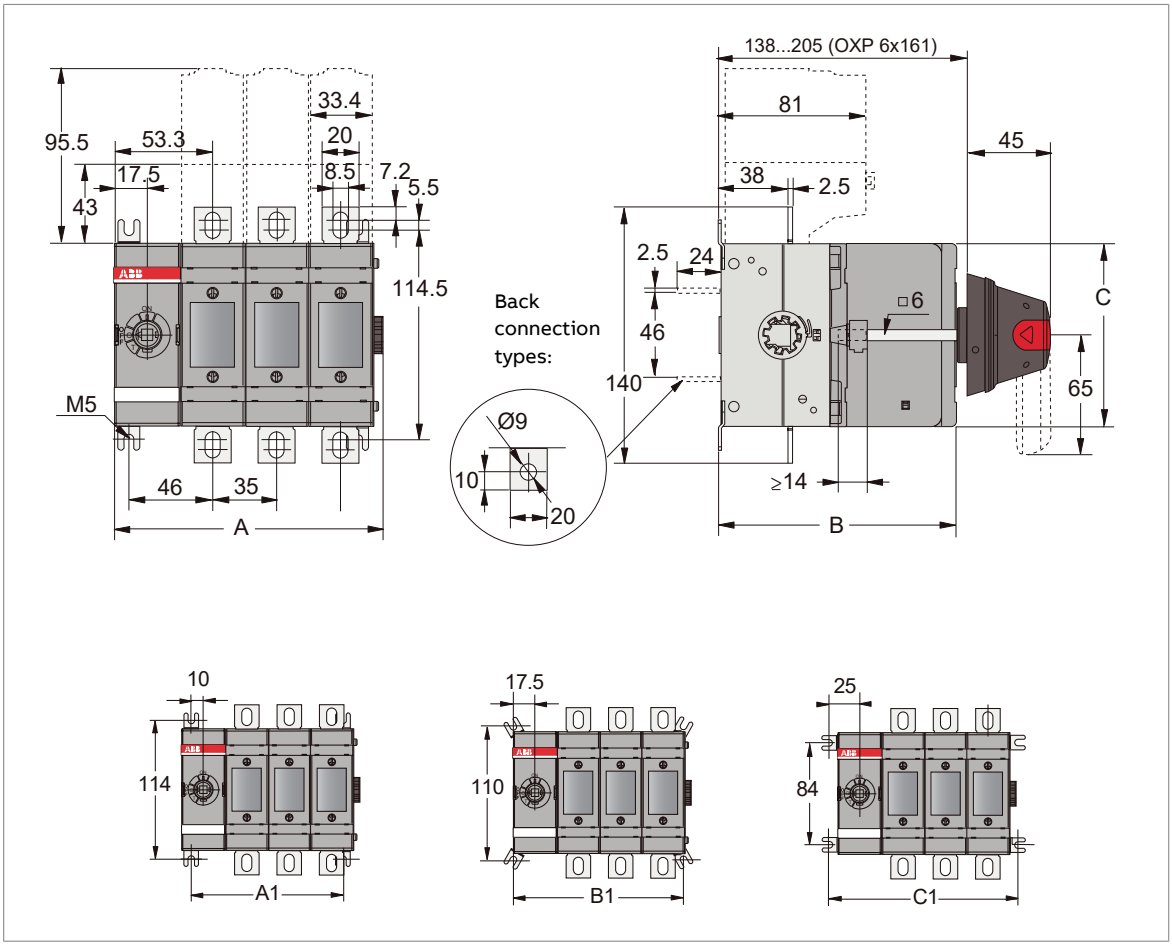


*) N3 types

	_11 mm (in)	_22 mm (in)
A	254.50 (10.02)	414.50 (16.32)
B	-	80 (3.15)
A1	214 (8.43)	374 (14.72)
B1	244 (9.61)	404 (15.91)
C1	270 (10.63)	430 (16.93)

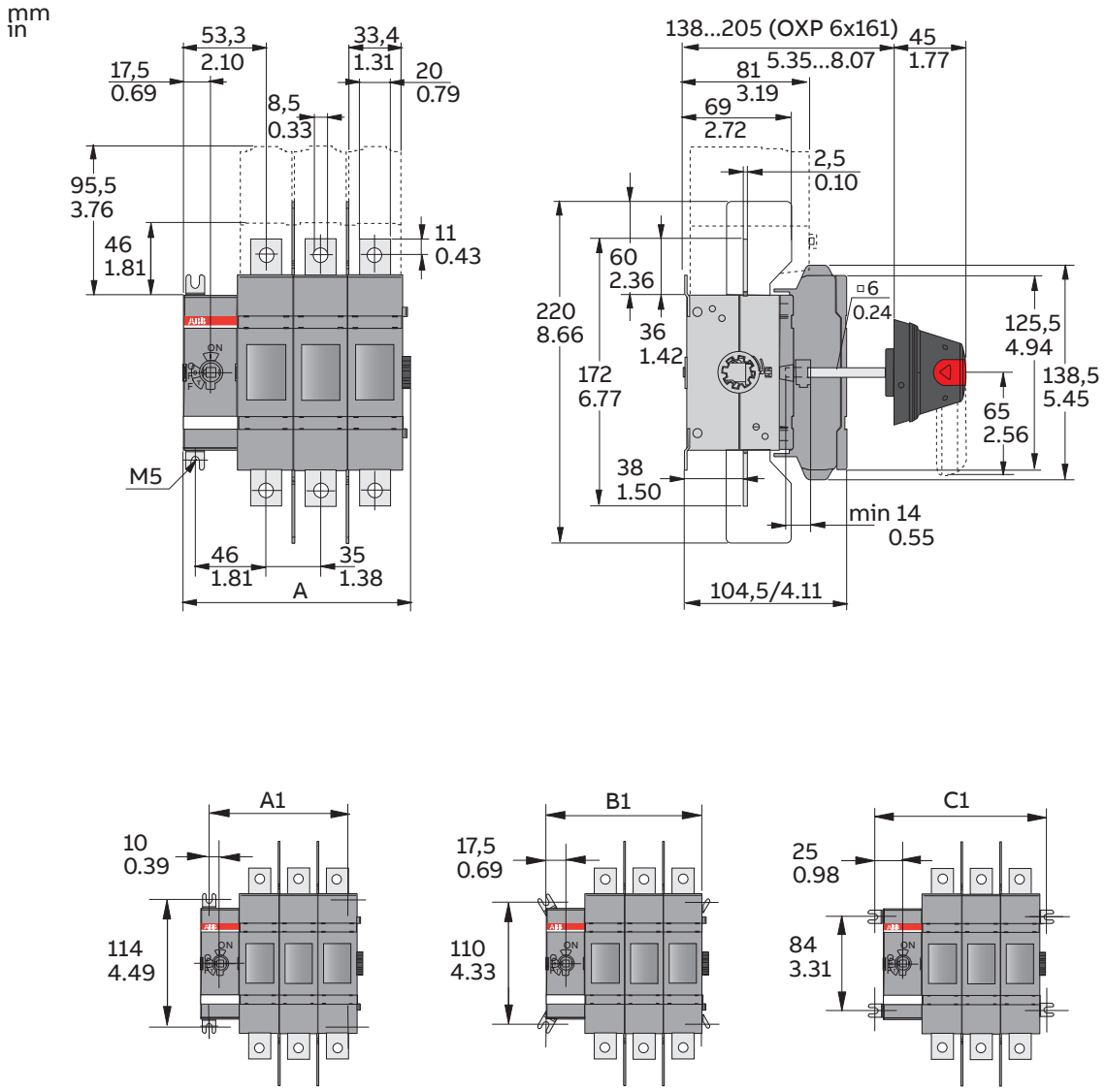
Charging switches

OS160GD04F (IEC)



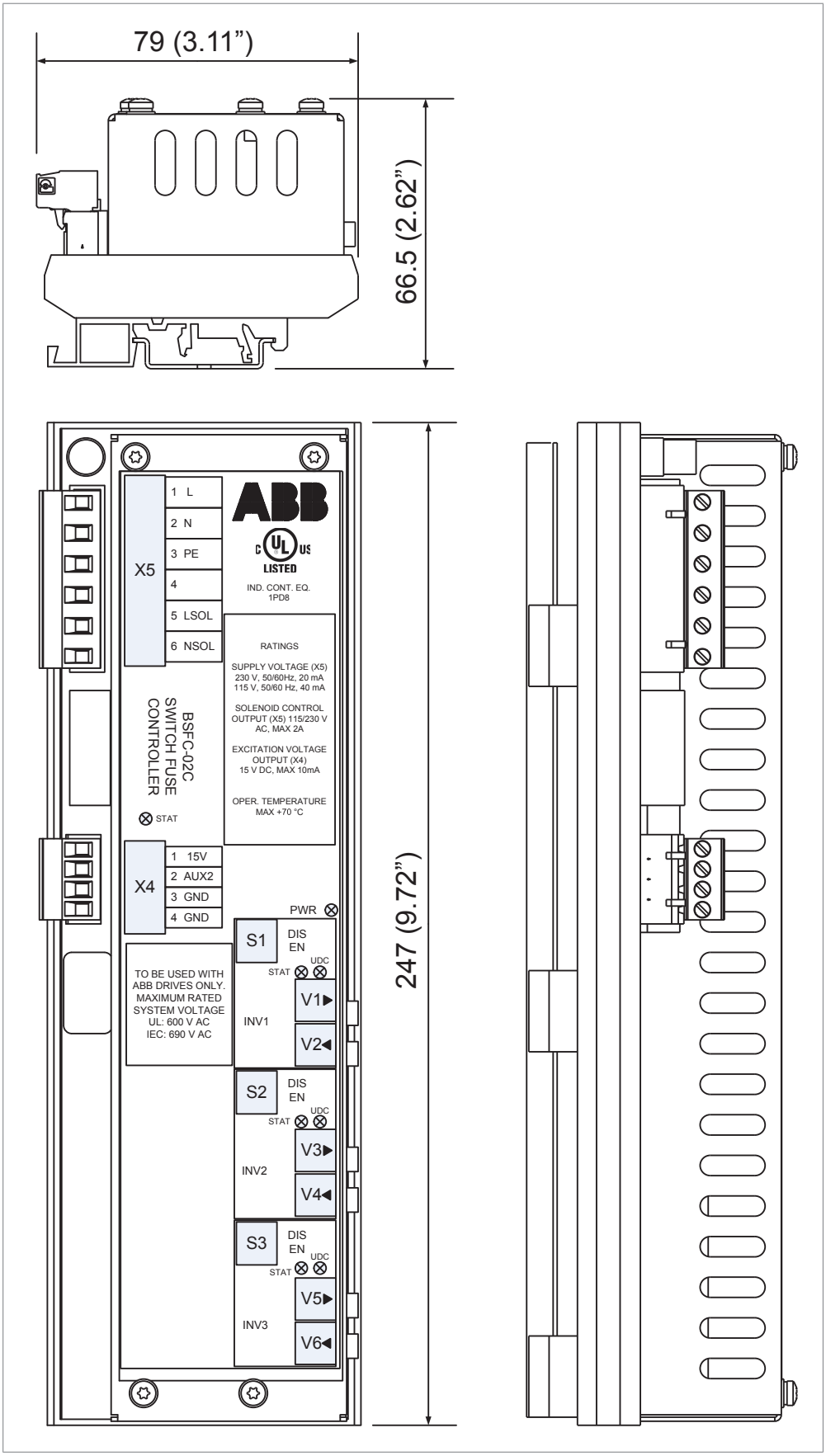
A	181.5 mm
B	130 mm
C	100 mm
A1	160 mm
B1	175 mm
C1	190 mm

OS100GJ04FP (UL/CSA)

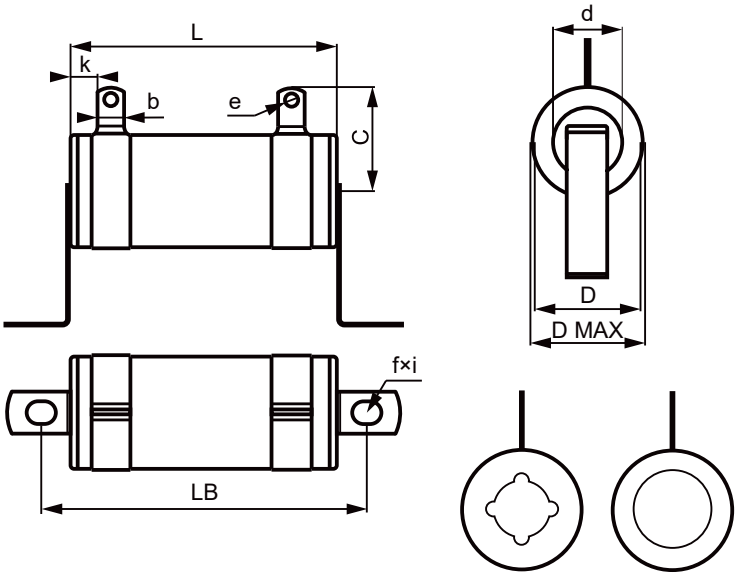


[mm/in]	J01	J02	J03	J04
A	76.5/3.01	111.5/4.39	146.5/5.77	181.5/7.15
A1	55/2.17	90/3.54	125/4.92	160/6.30
B1	70/2.76	105/4.13	140/5.51	175/6.89
C1	85/3.35	120/4.72	155/6.10	190/7.84

Charging controller



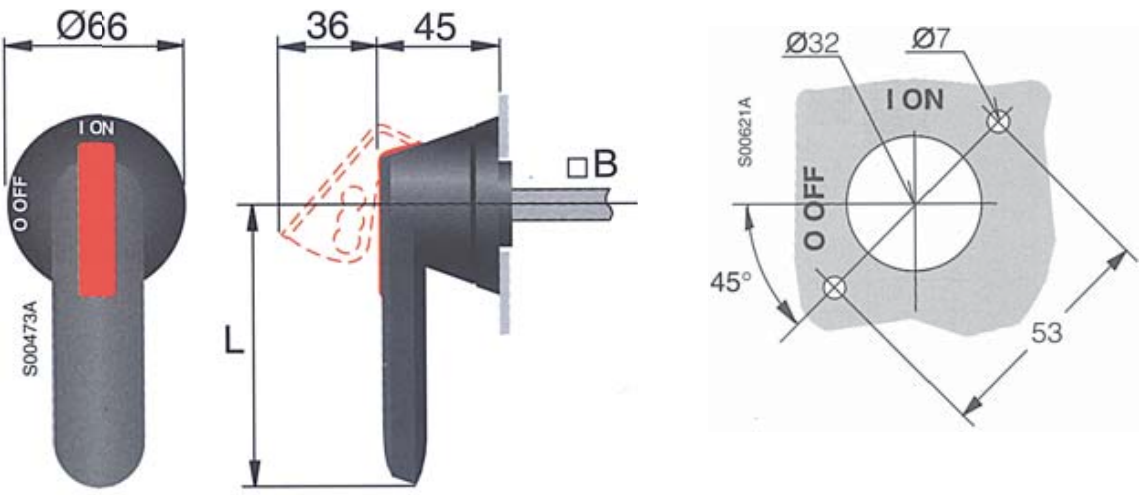
Charging resistor



L	165 ±3
LB	183
f×i	5.5 × 8
D MAX	34
k	≥6
e	4.2

Handles

OHB65J6



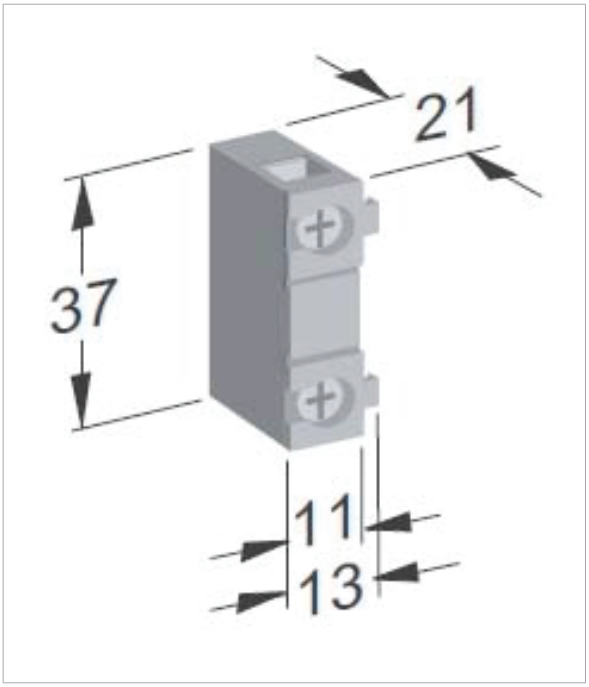
Handle type	L (mm)	B (mm)	Notes
OHB65J6	65	6 × 6	Used with switch-disconnector units

Dimensions in mm

1 mm = 0.0394 in

Contacts

Auxiliary contact OA3G01, OA1G10

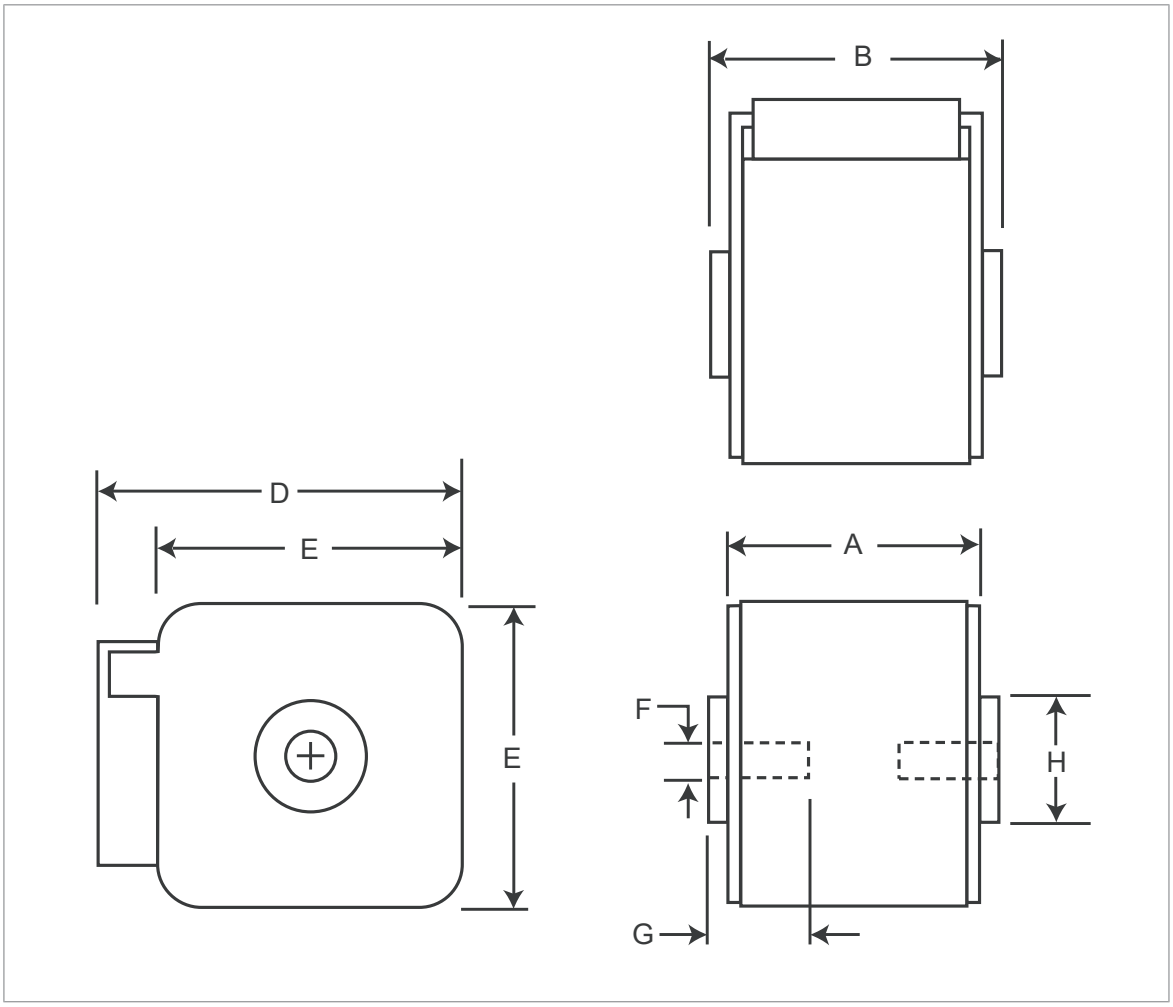


2×0.75…2.5 mm² (2×18…14 AWG)

0.8 N·m (7 lbf·in)

Pozidriv M3.5 Form 2

DC fuses



690 V fuses (as used with 400 and 500 V units)							
Size	**A** (mm)	**B** (mm)	**D** (mm)	**E** (mm)	**F**	**G** (mm)	**H** (mm)
3	51	53	92	76	M12	10	30
3*	51	65	92	76	M12	10	30

1000 ... 1250 V fuses (as used with 690 V units)							
Size	**A** (mm)	**B** (mm)	**D** (mm)	**E** (mm)	**F**	**G** (mm)	**H** (mm)
3	81	83	92	76	M12	10	30

15

Example circuit diagrams

Contents of this chapter

This chapter contains example circuit diagrams of a DC/DC-converter module.

Note: The diagrams do not necessarily match the installation-specific circuit diagrams of a tailor-made cabinet-installed unit.

The example circuit diagrams help you to:

- understand the internal connections and operation of the cabinet-installed DC/DC-converter unit, and
- learn how to connect DC/DC-converter modules when installed in a customer-defined cabinet.

Contents of the example circuit diagrams

DC/DC-converter unit, 1×R8i with DC switch-disconnector

The diagrams include:

Designation	Component
A11.x	Charging controller
A41	UCU control unit
A48	DPMP-01 door mounting kit for control panel
A49	ACS-AP-W control panel
A7	BAMU Voltage/current measurement unit
ES+, ES-	Energy storage connection
F11.xx	DC fuses (on the drive DC bus side)
F13.xx	Output DC fuses (on the energy storage side)
F7.x	BAMU fuses
Q10.x	Charging switch
Q11.x	DC switch-disconnector (optional)
R10.x	Charging resistors
R13.x	BDCL filter module
T11.x	DC/DC-converter module (R8i)
T22.x	24 V DC power supply
X30.x, X55	Connectors. For the description, see the hardware description.
X50.x, X53.x	Connectors. For the description, see the hardware description.
+, -	DC bus

The circuit diagrams also include DOL fan supply (+C188), an example of auxiliary voltage distribution and external supply for heating element (option +C183).

DC/DC-converter unit, 2×R8i without DC switch-disconnector

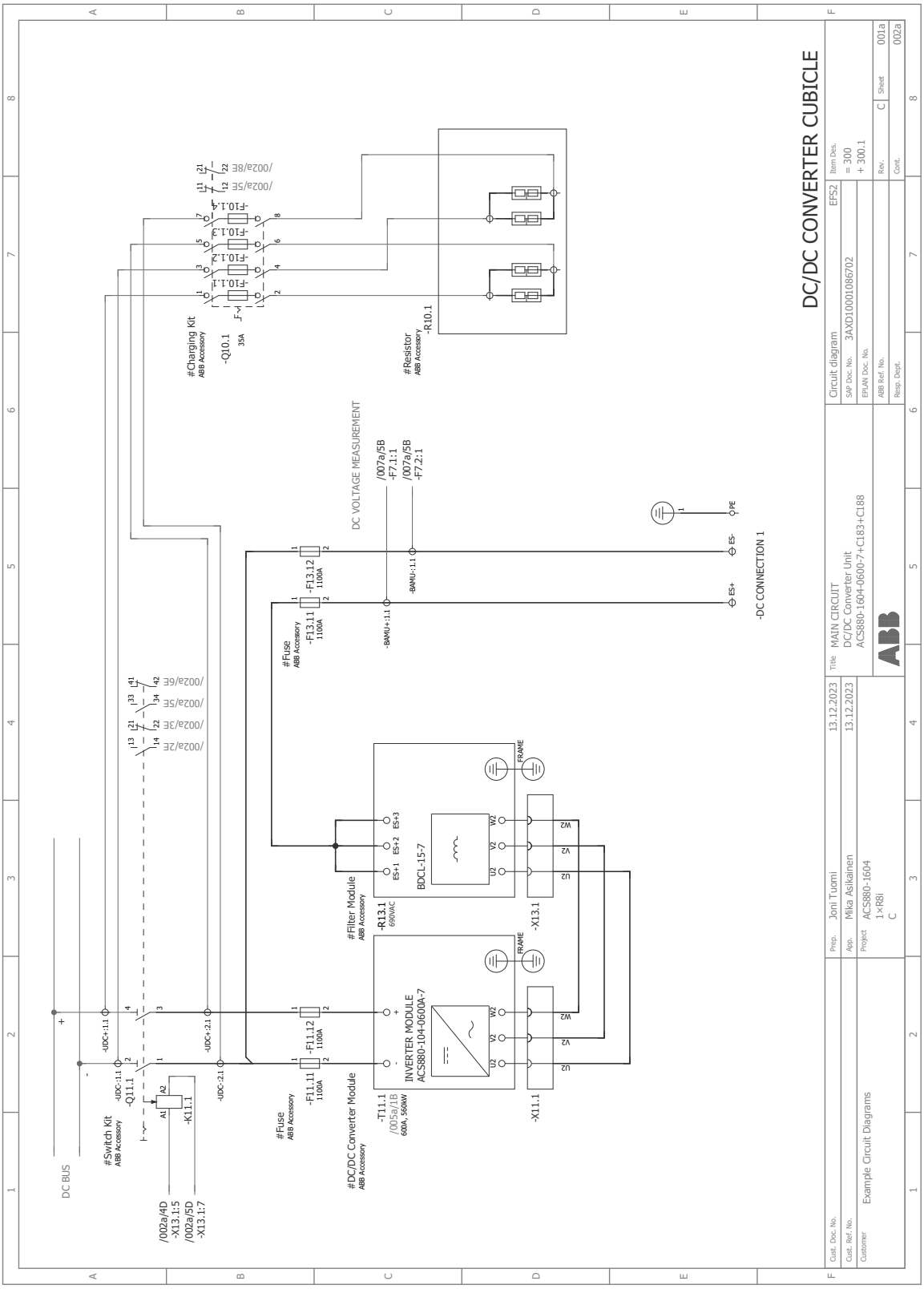
The circuit diagrams include:

Designation	Component
A41	UCU control unit
A48	DPMP-01 door mounting kit for control panel, including DDPI board
A49	ACS-AP-W control panel
A7	BAMU Voltage/current measurement unit
ES+, ES-	Energy storage connection
ES+1, ES+2, ES+3	Filter output terminals
F11.xx	DC fuses (on the drive DC bus side)
F13.xx	Output DC fuses (on the energy storage side)
F7.x	BAMU fuses
R13.x	BDCL filter module
T11.x	DC/DC-converter module (R8i)
T22.x	24 V DC power supply
X30.x, X55	Connectors. For the description, see the hardware description.
X50.x, X53.x	Connectors. For the description, see the hardware description.
+, -	DC bus

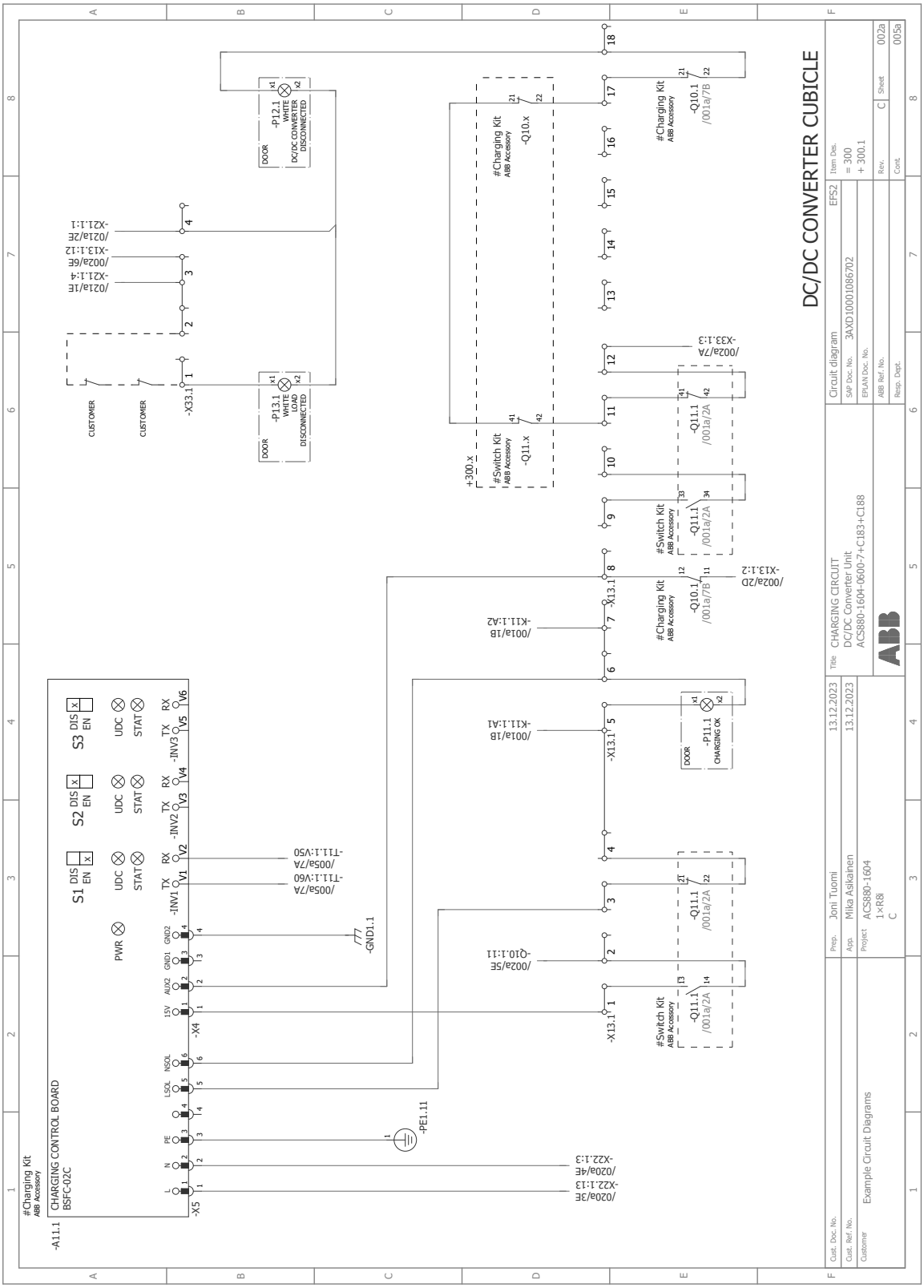
The circuit diagrams also include an example of auxiliary voltage distribution and external supply for heating element (option +C183).

DC/DC-converter unit, 1×R8i with DC switch-disconnector

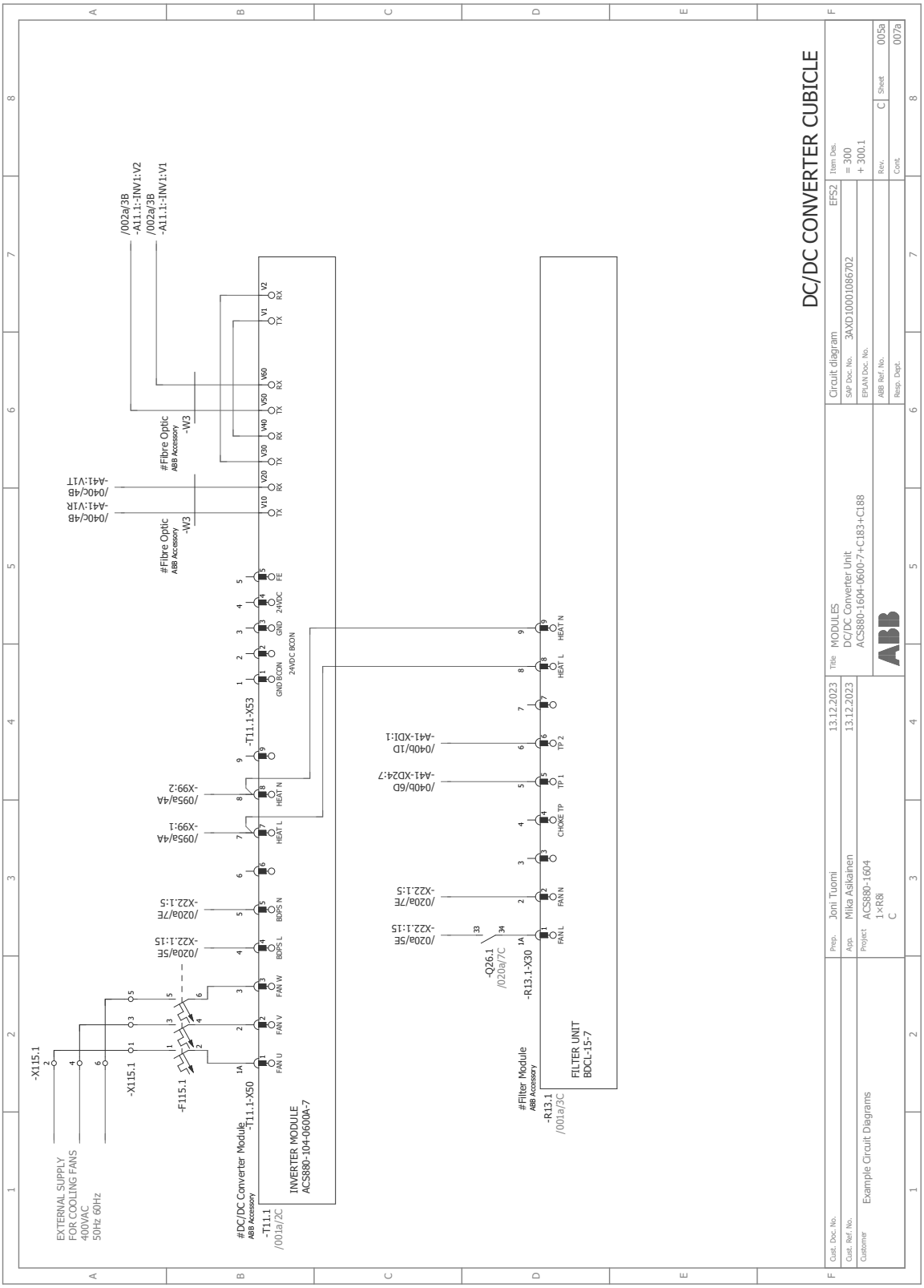
Sheet 001a (Main circuit)



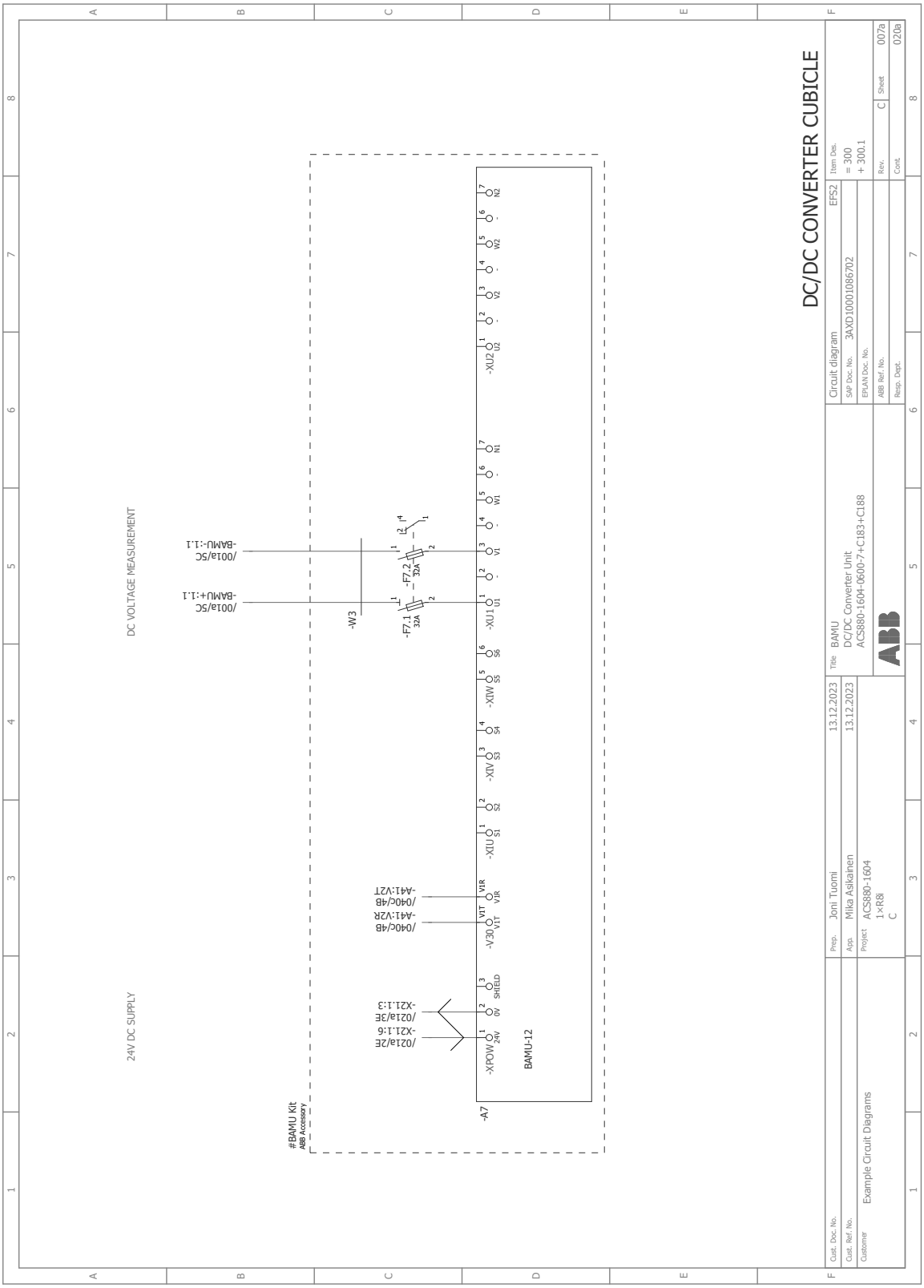
Sheet 002a (Charging circuit)



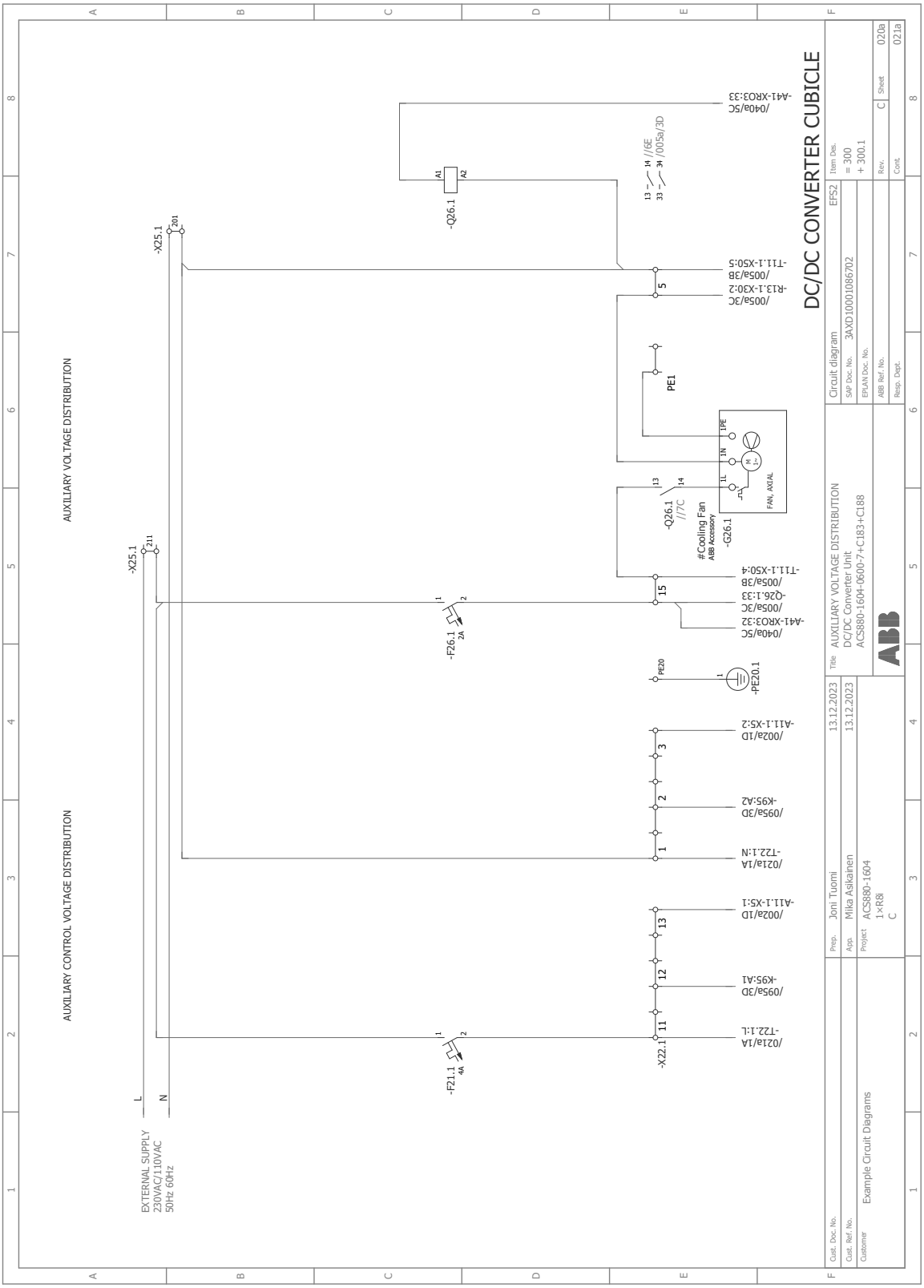
Sheet 005a (Module connections)



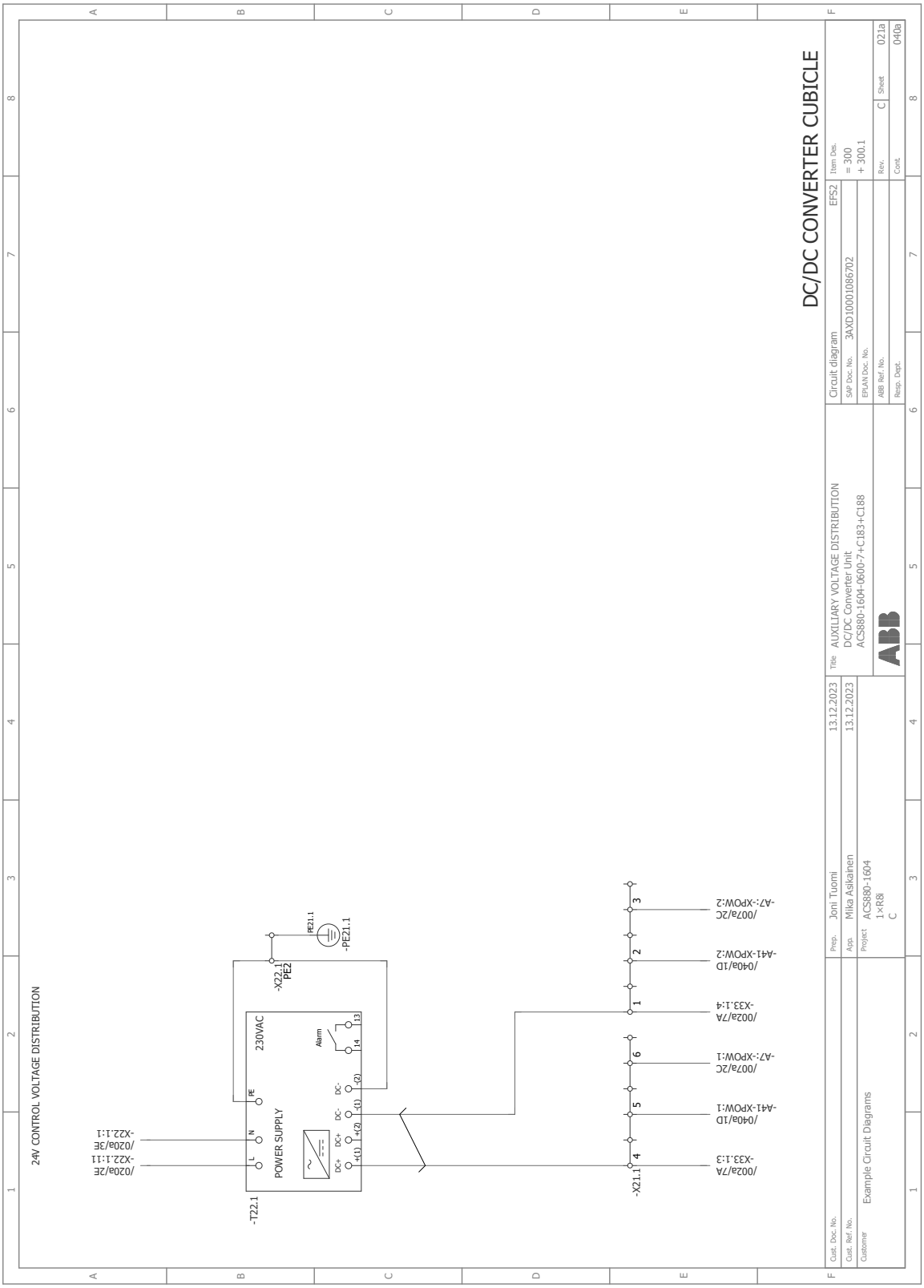
Sheet 007a (BAMU voltage measurement)



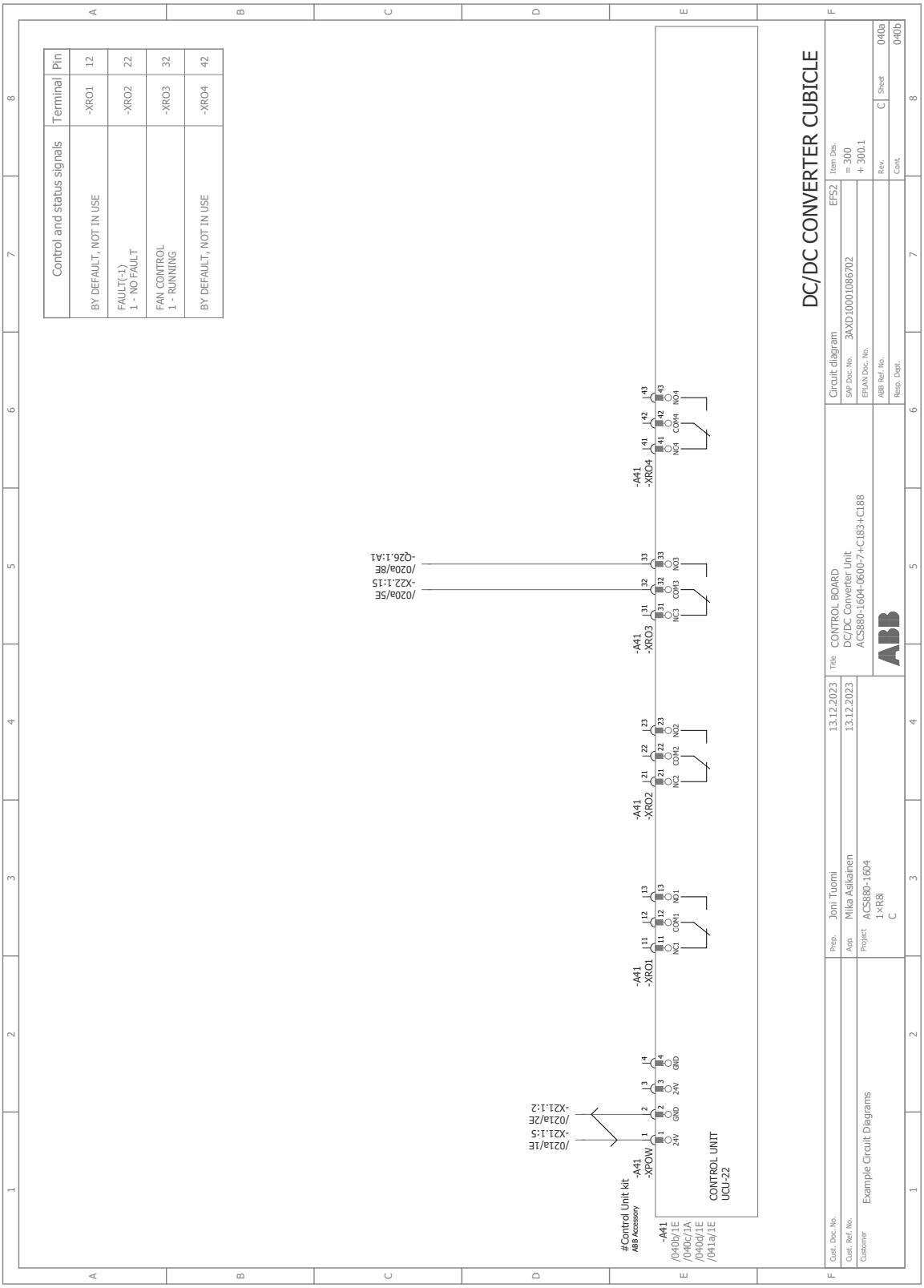
Sheet 020a (Auxiliary voltage distribution)



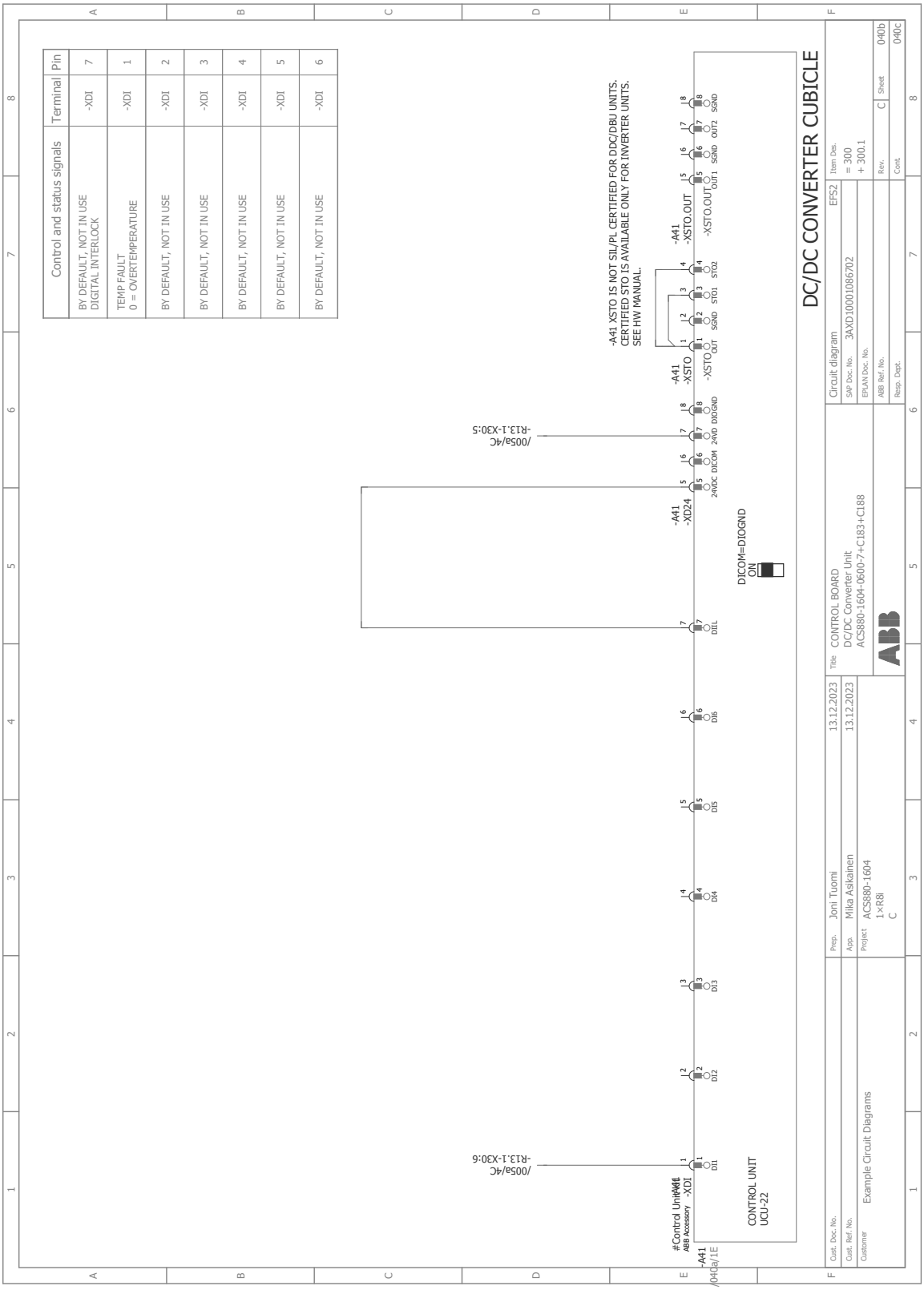
Sheet 021a (Auxiliary voltage distribution)



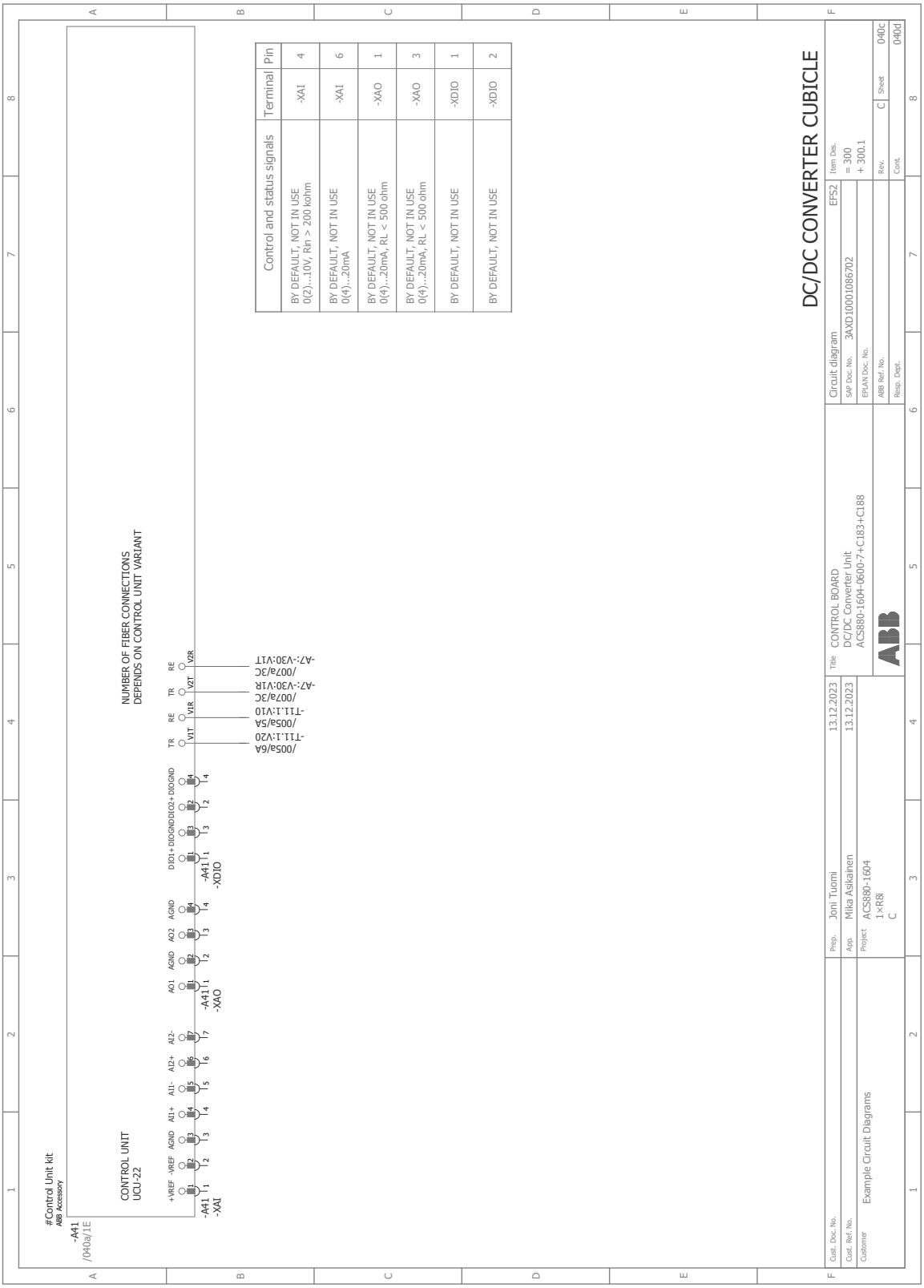
Sheet 040a (Control unit)



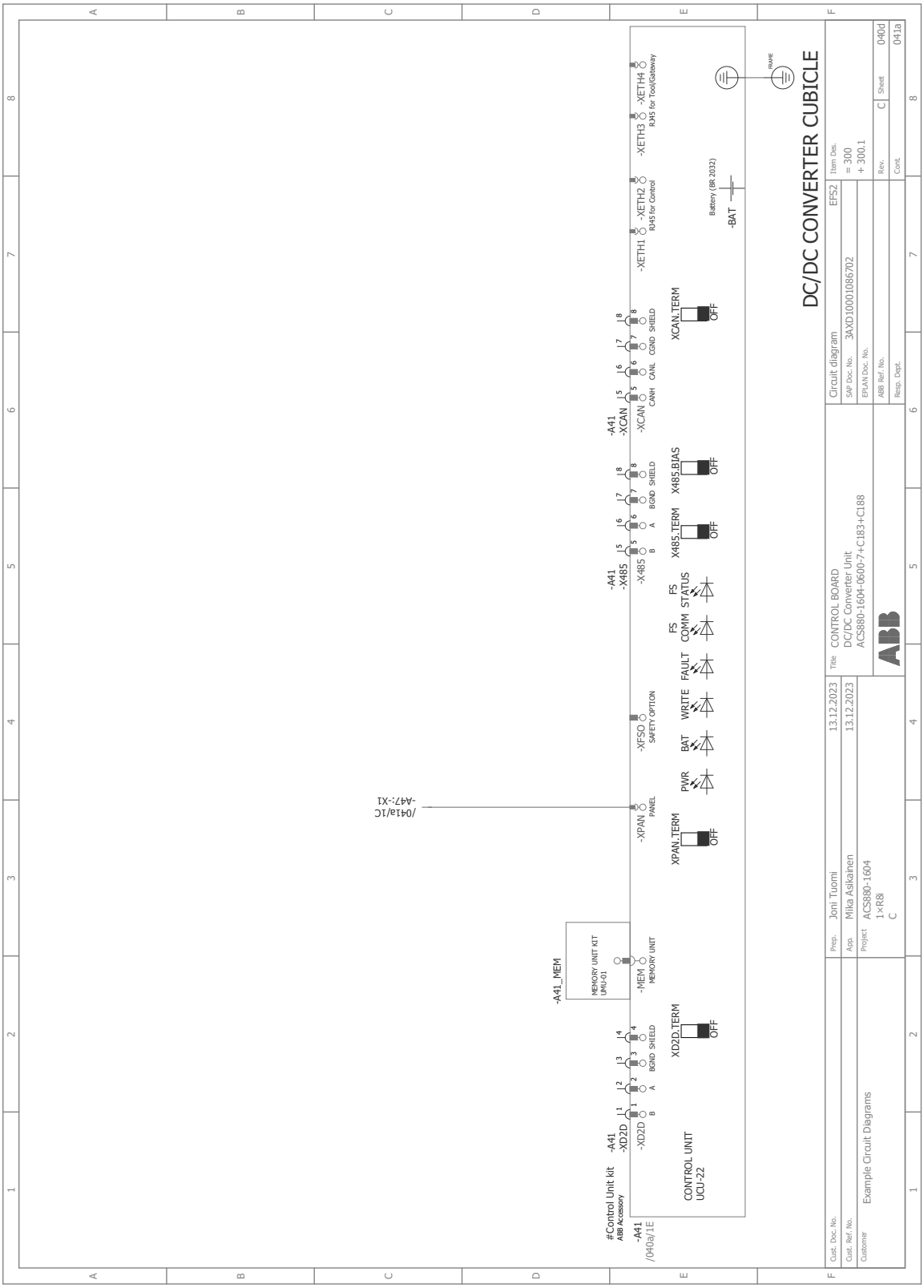
Sheet 040b (Control unit)



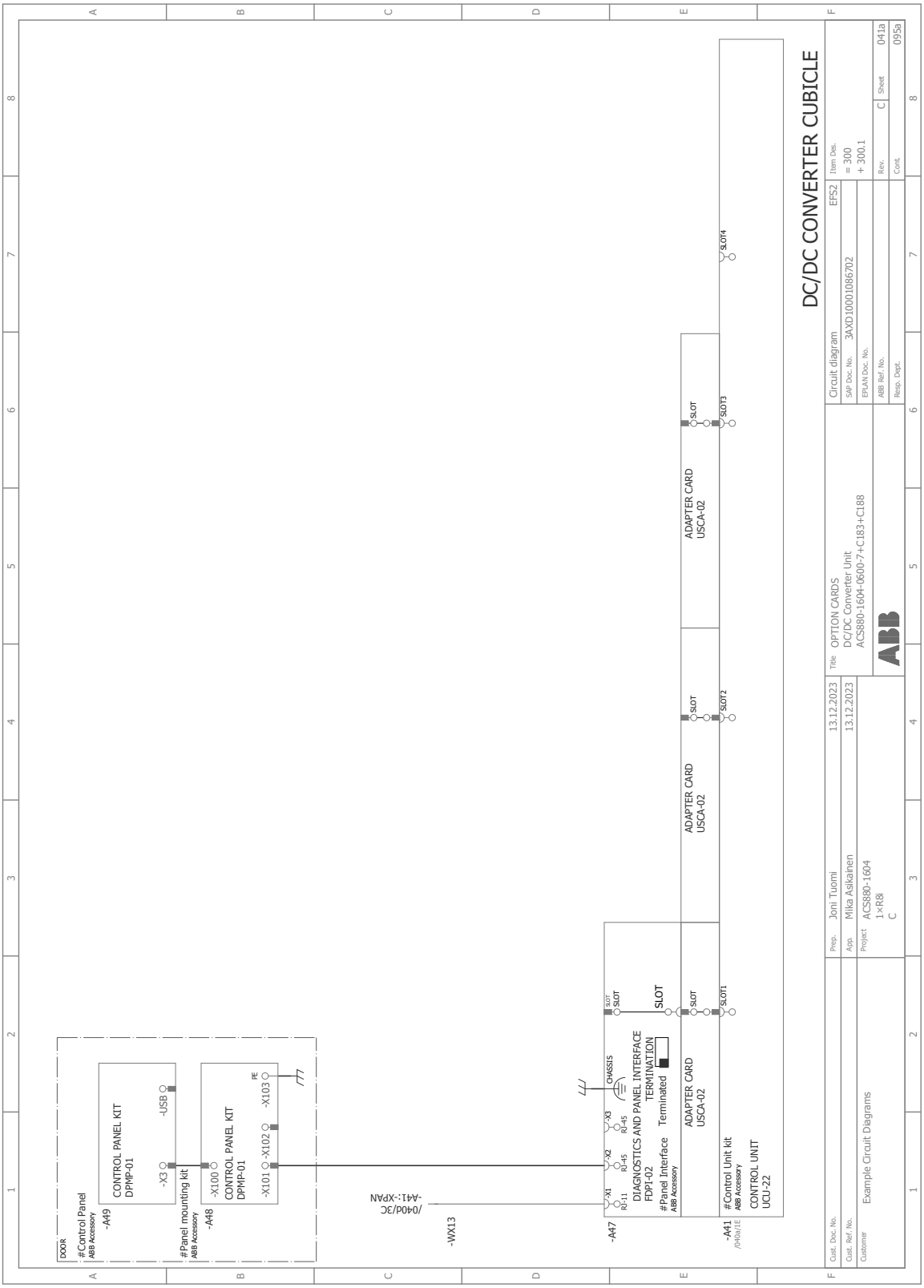
Sheet 040c (Control unit)



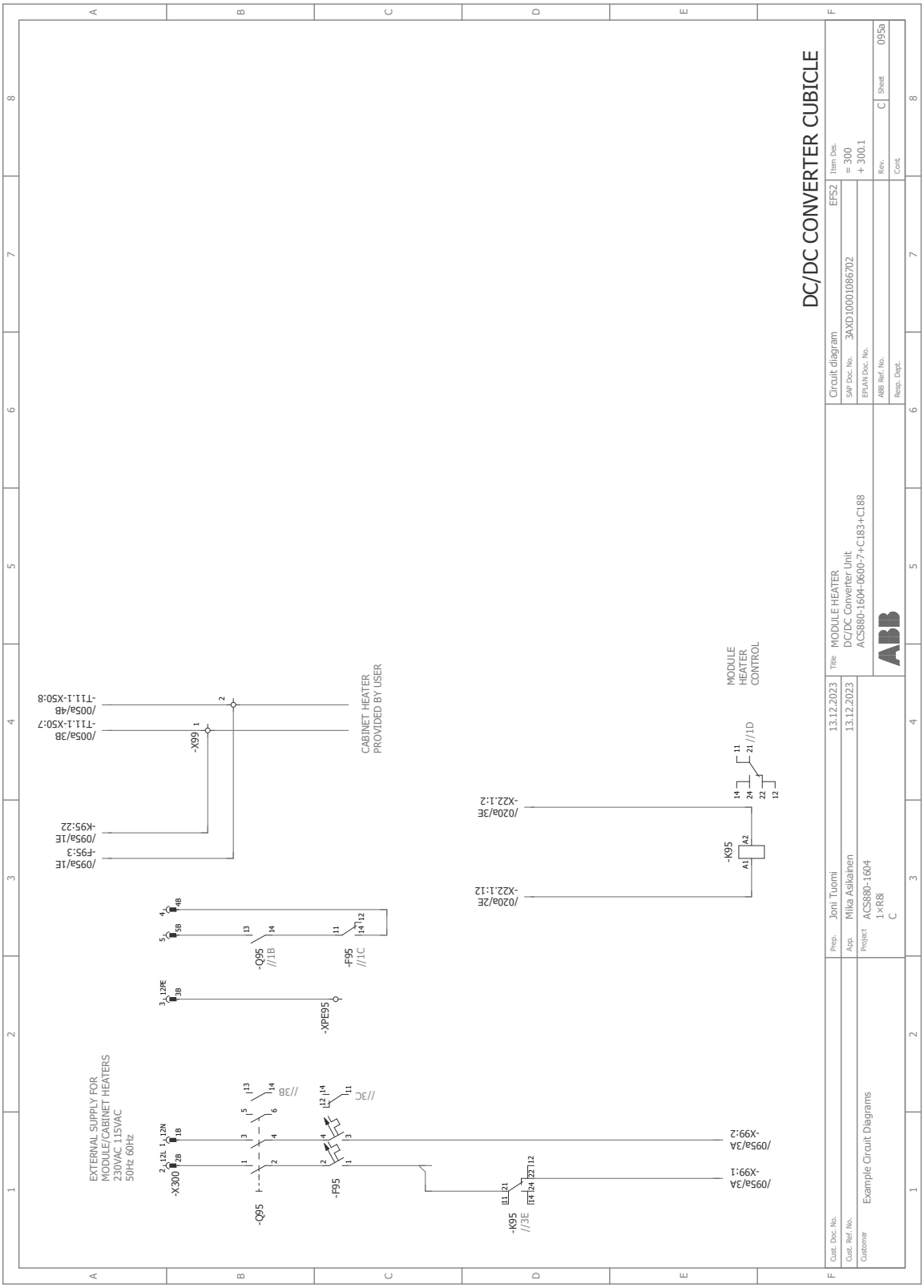
Sheet 040d (Control unit)



Sheet 041a (Option cards)

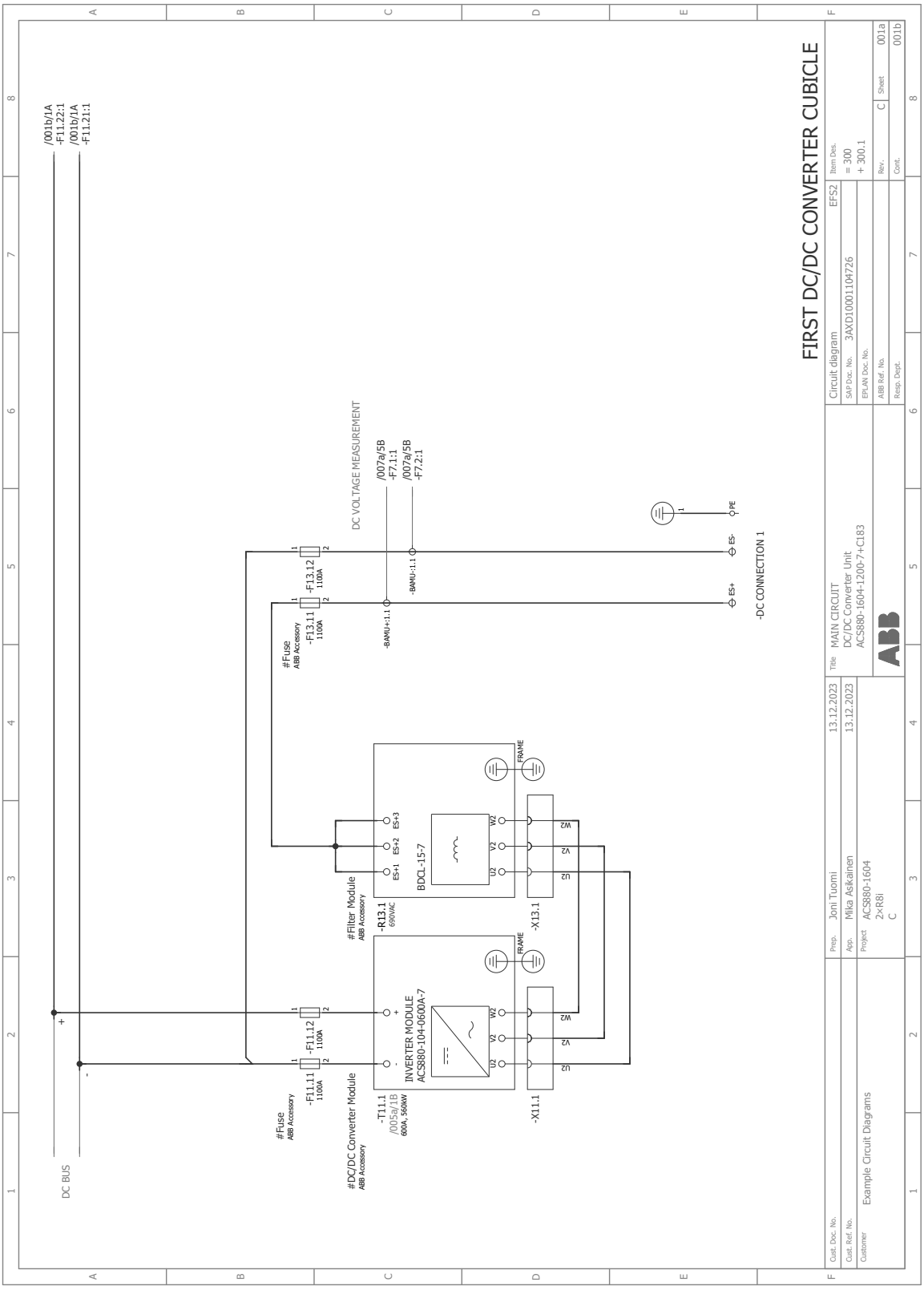


Sheet 095a (Module heater)

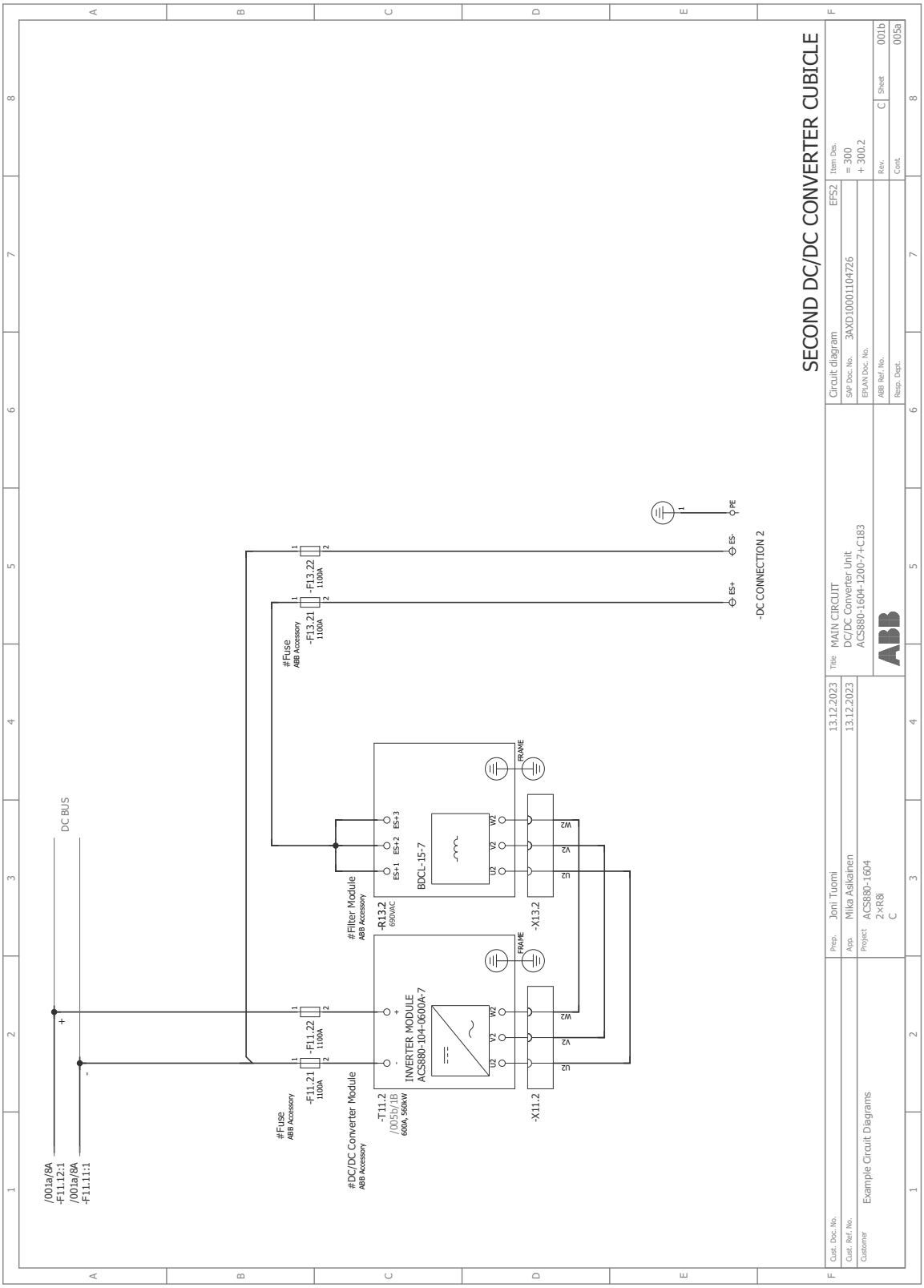


DC/DC-converter unit, 2×R8i without DC switch-disconnector

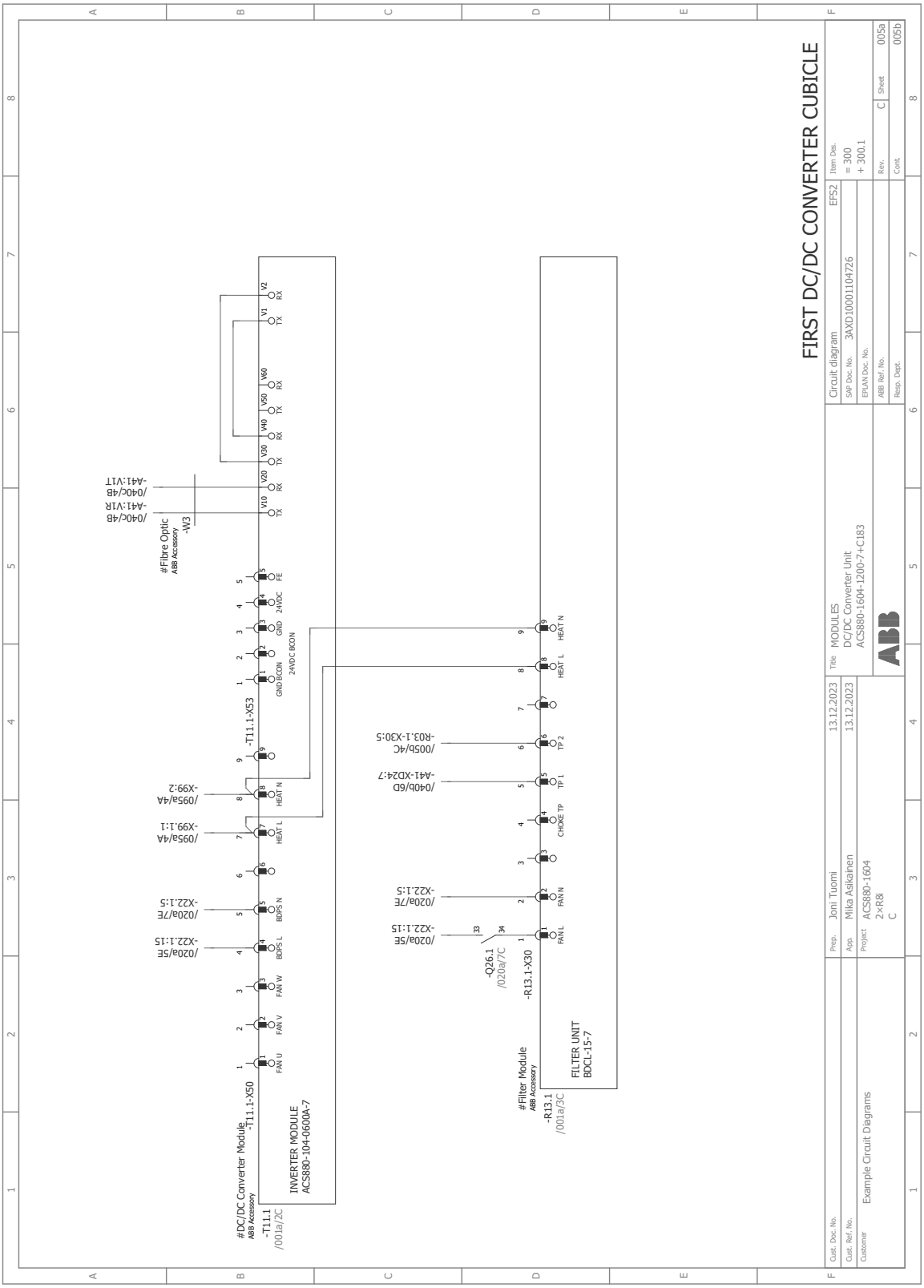
Sheet 001a (Main circuit)



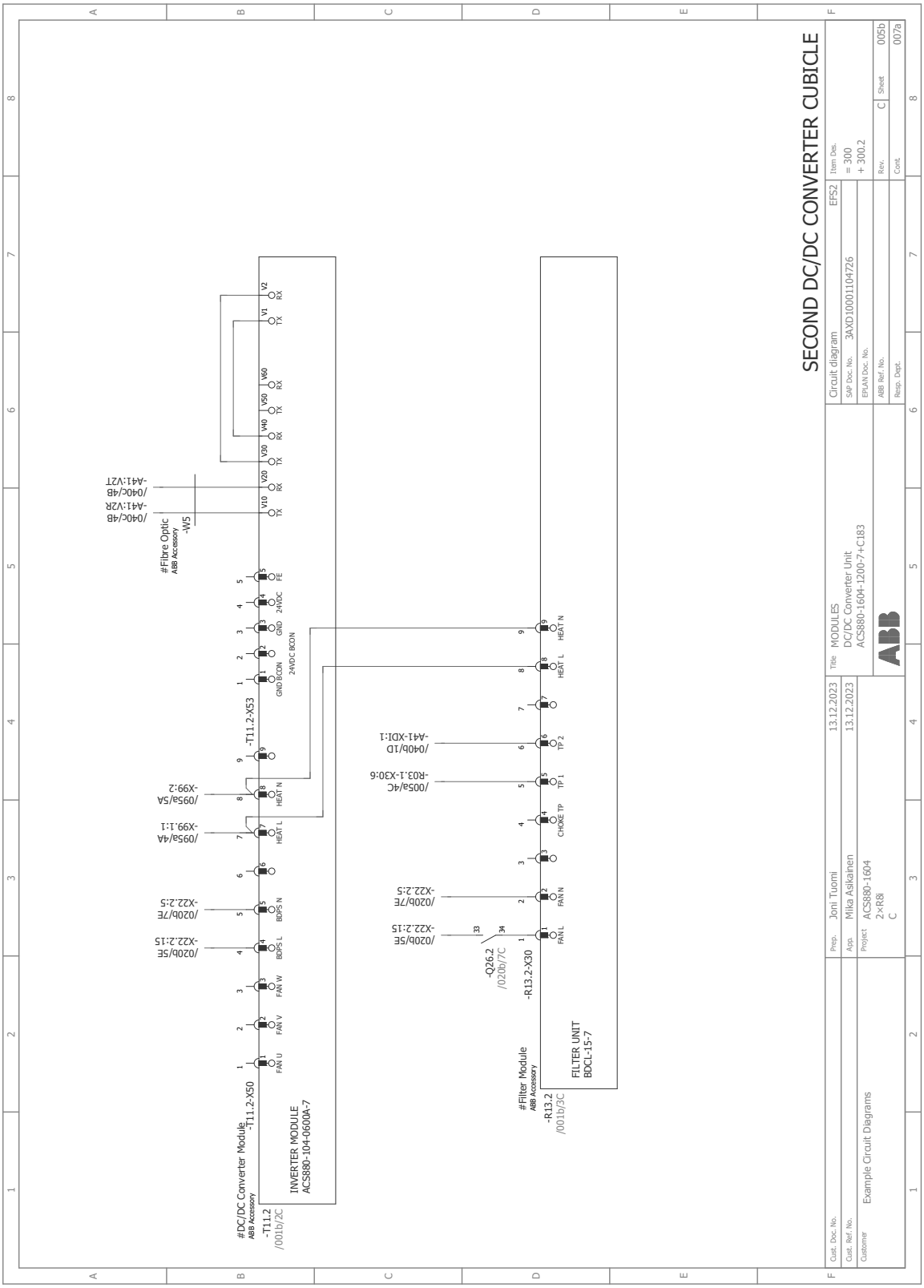
Sheet 001b (Main circuit)



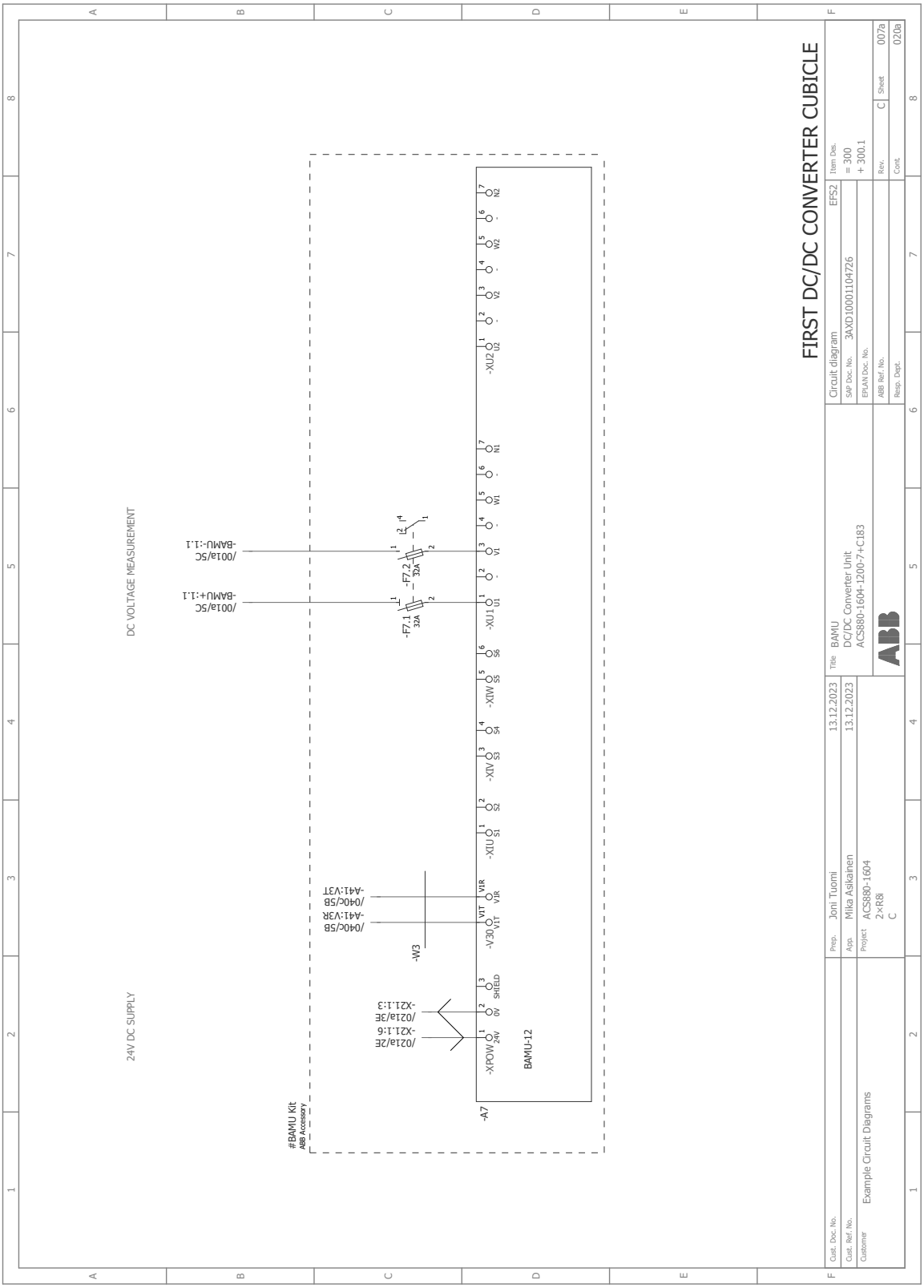
Sheet 005a (Module connections)



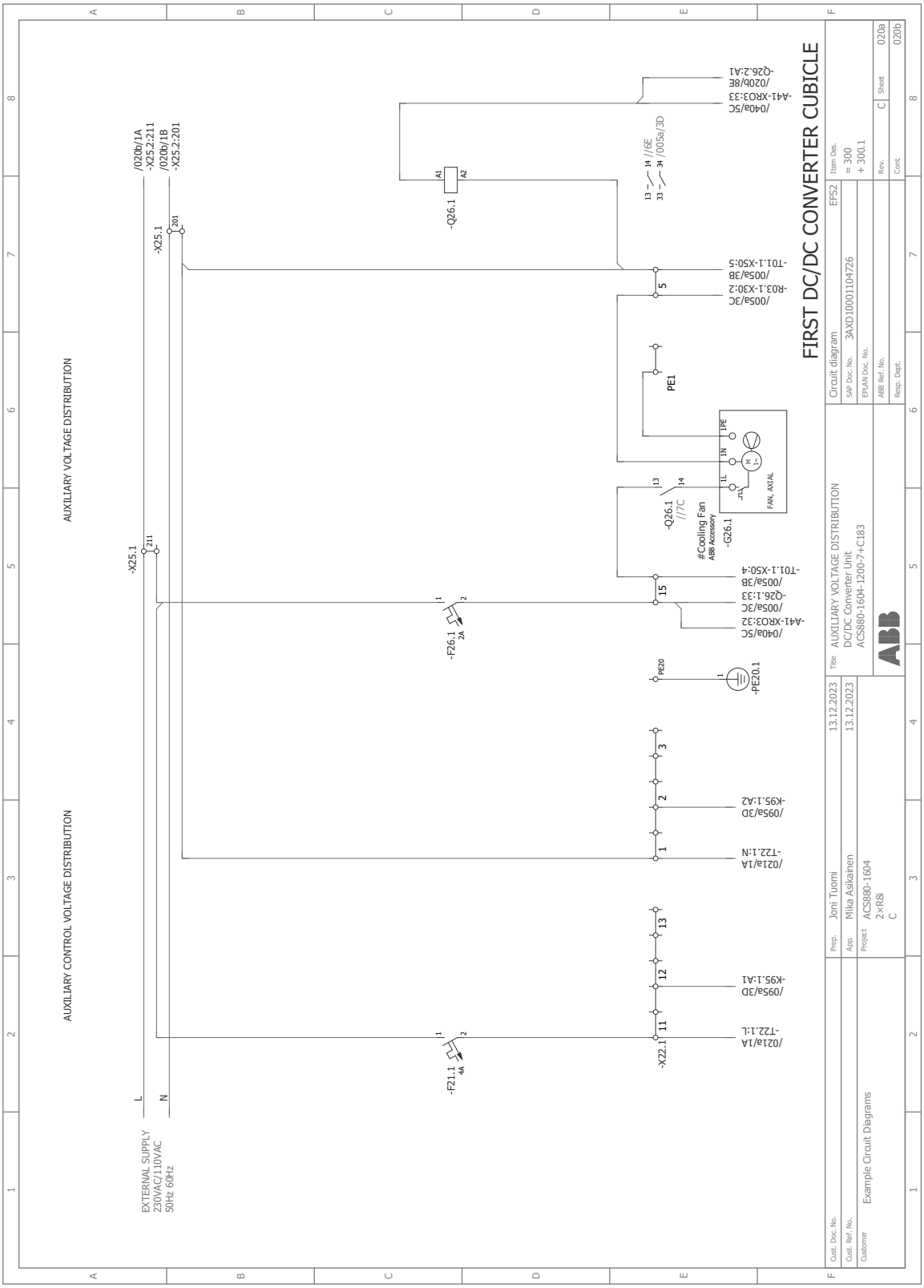
Sheet 005b (Module connections)



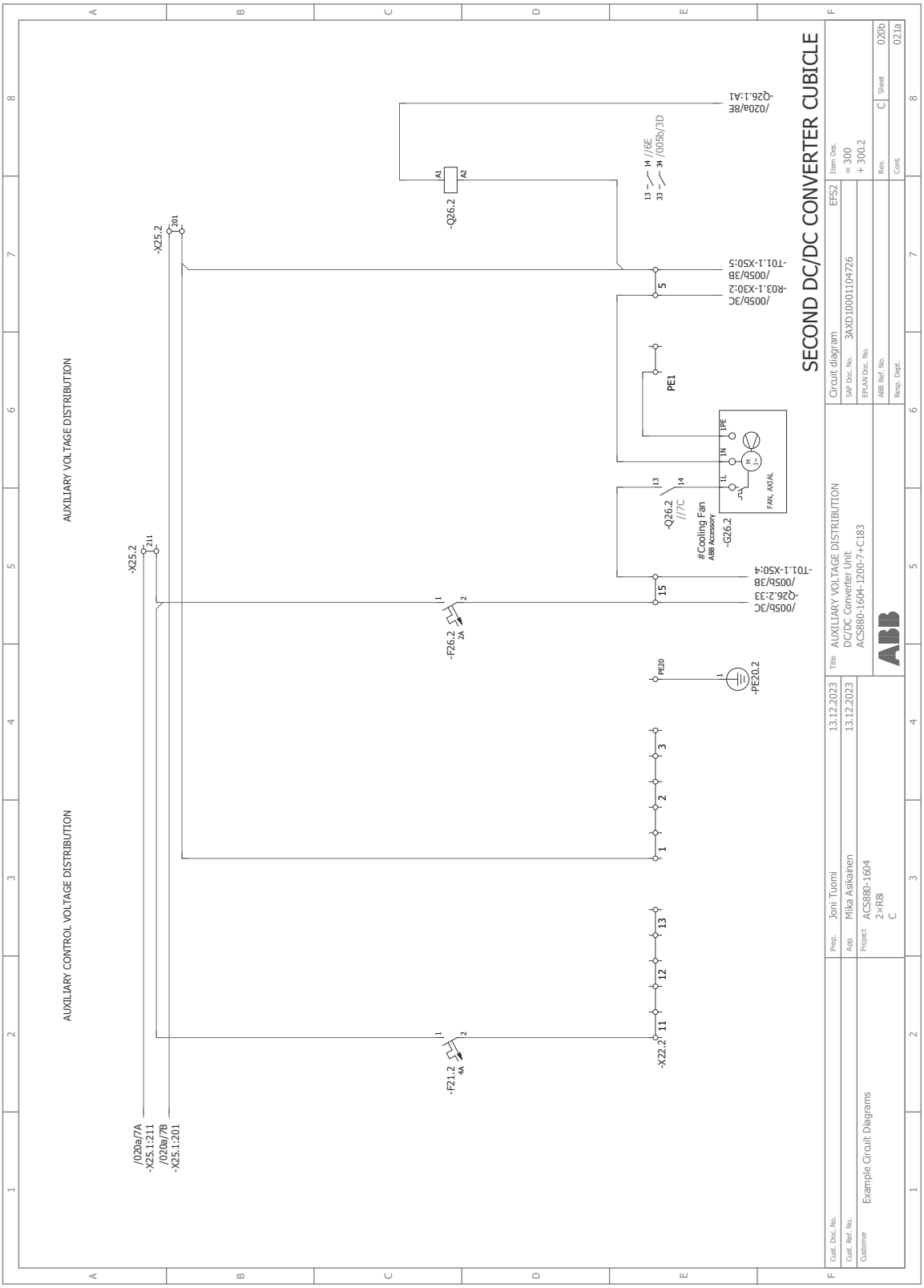
Sheet 007a (BAMU voltage measurement)



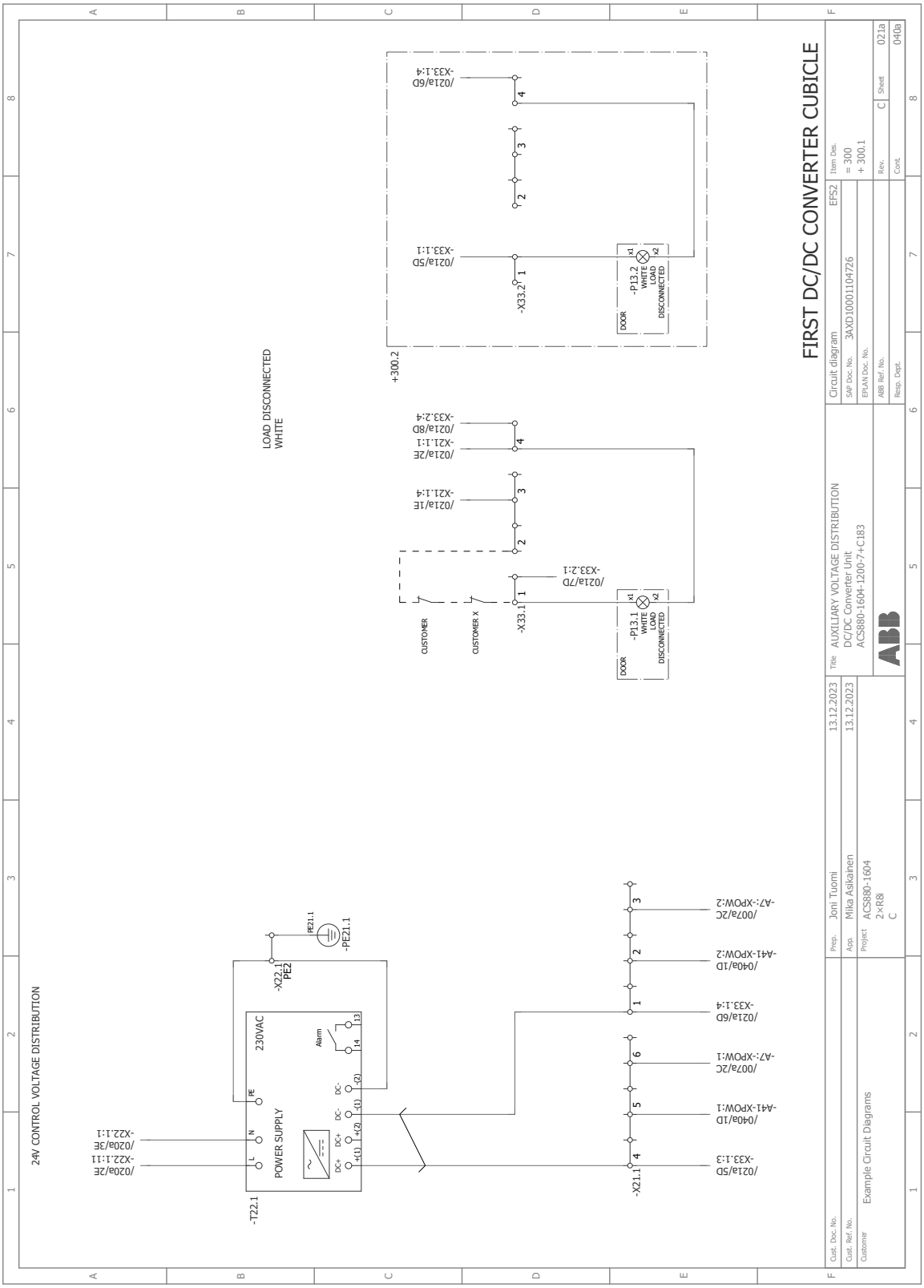
Sheet 020a (Auxiliary voltage distribution)



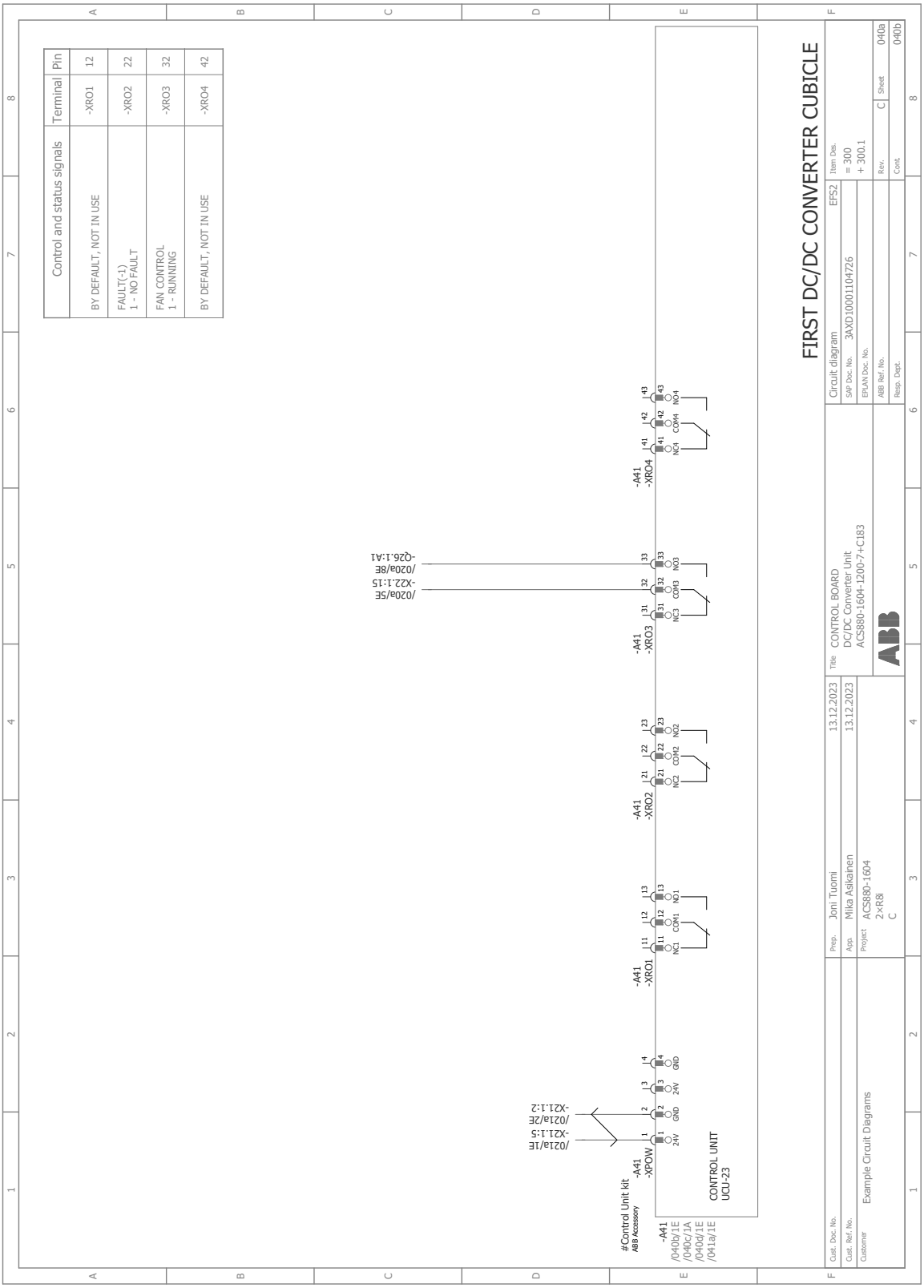
Sheet 020b (Auxiliary voltage distribution)



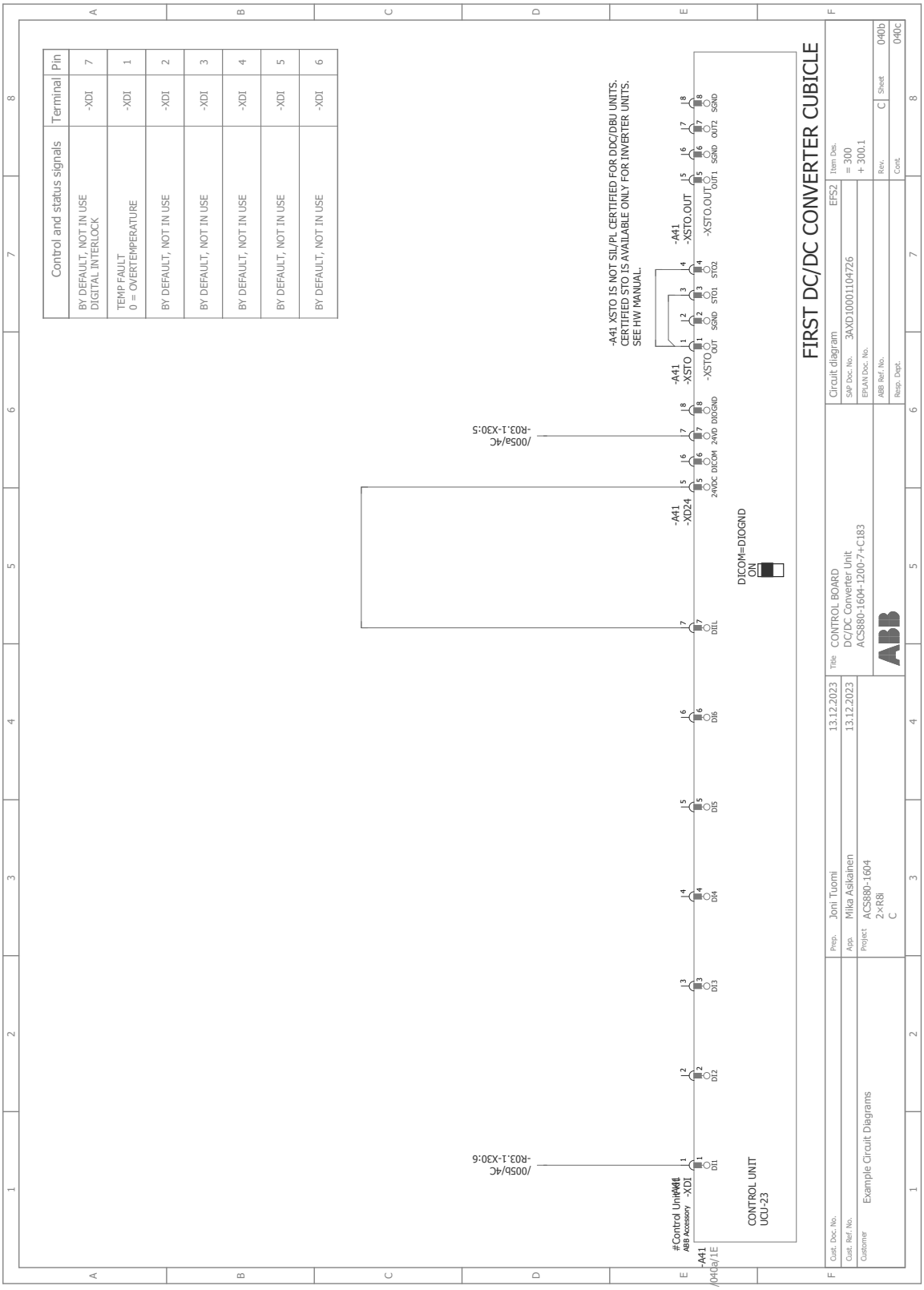
Sheet 021a (Auxiliary voltage distribution)



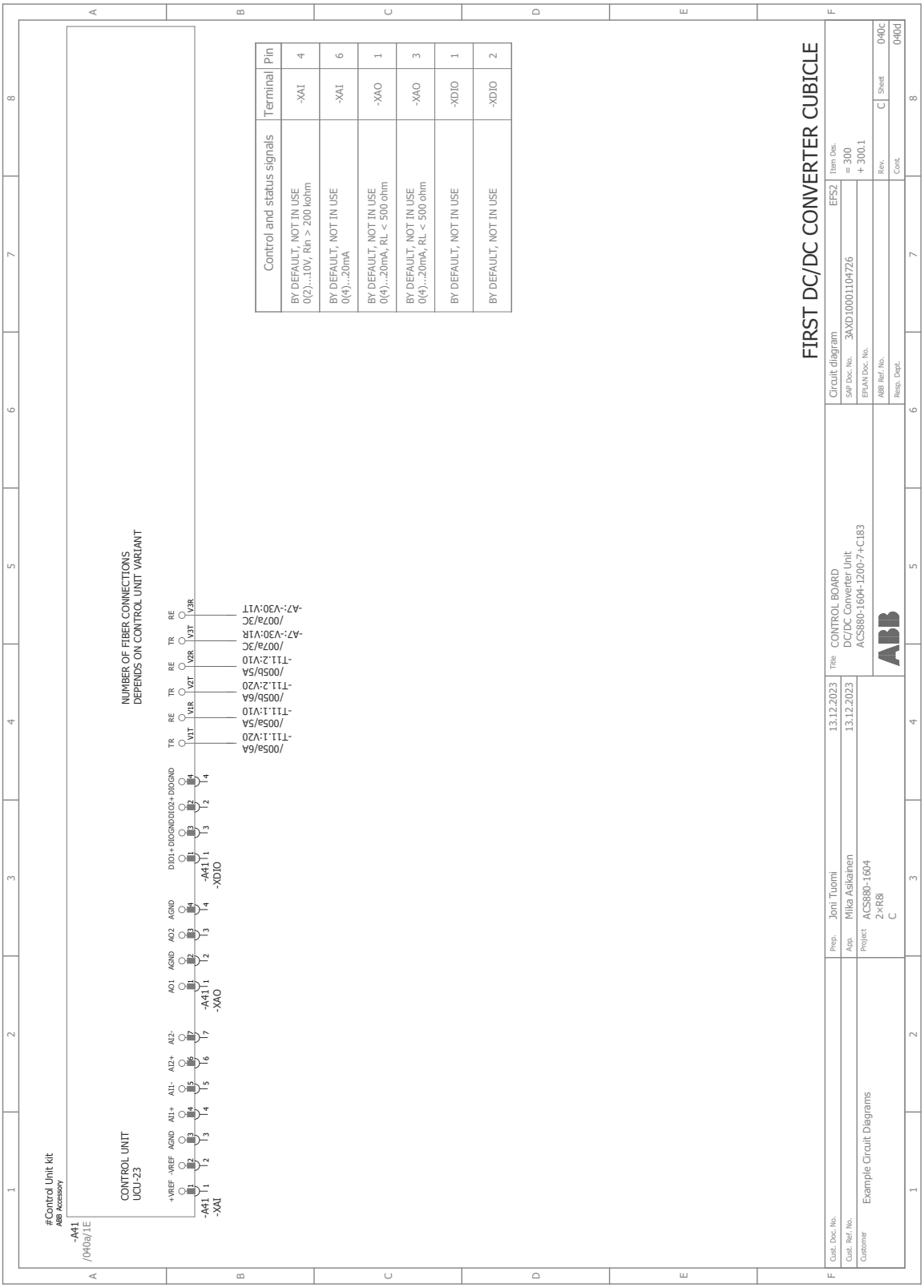
Sheet 040a (Control unit)



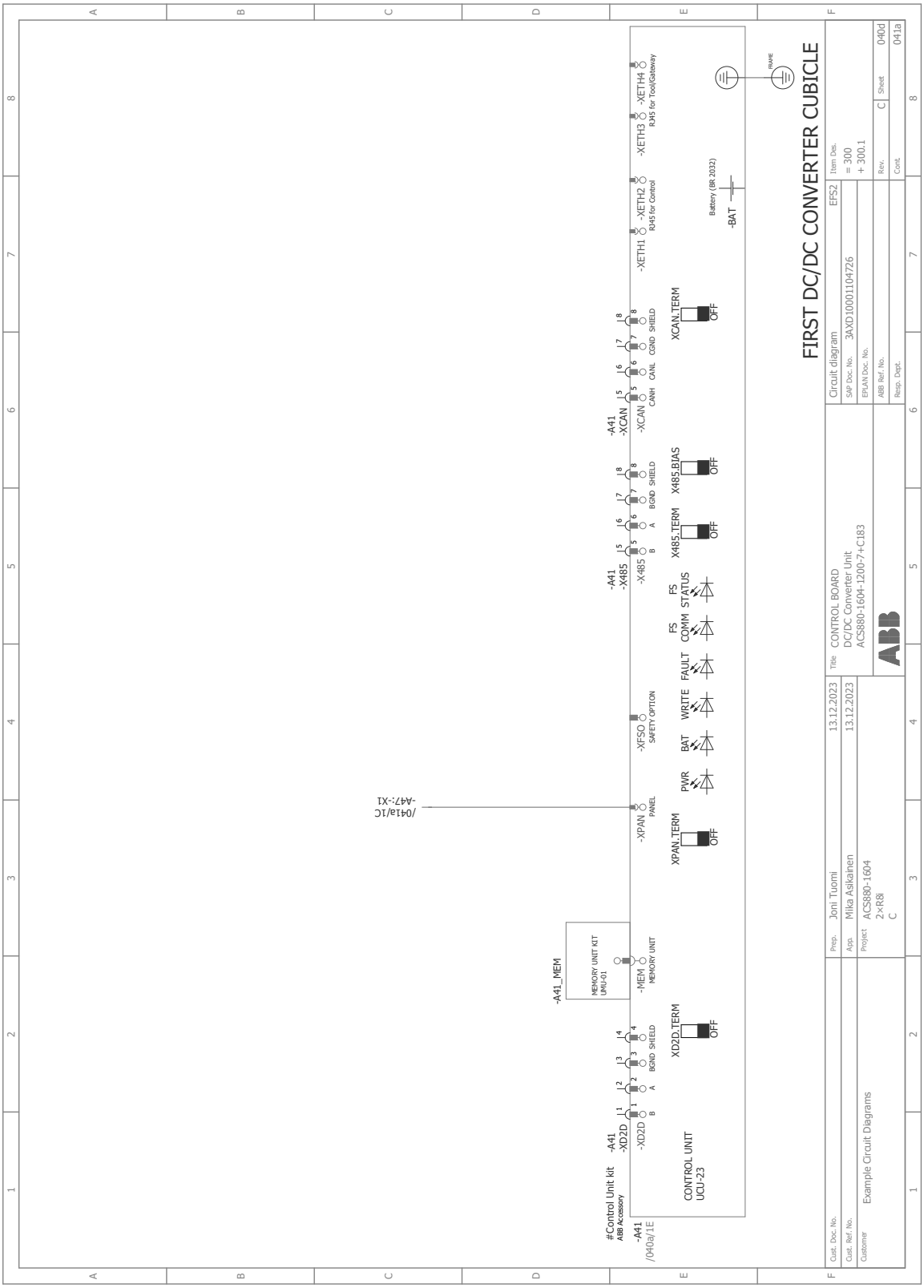
Sheet 040b (Control unit)



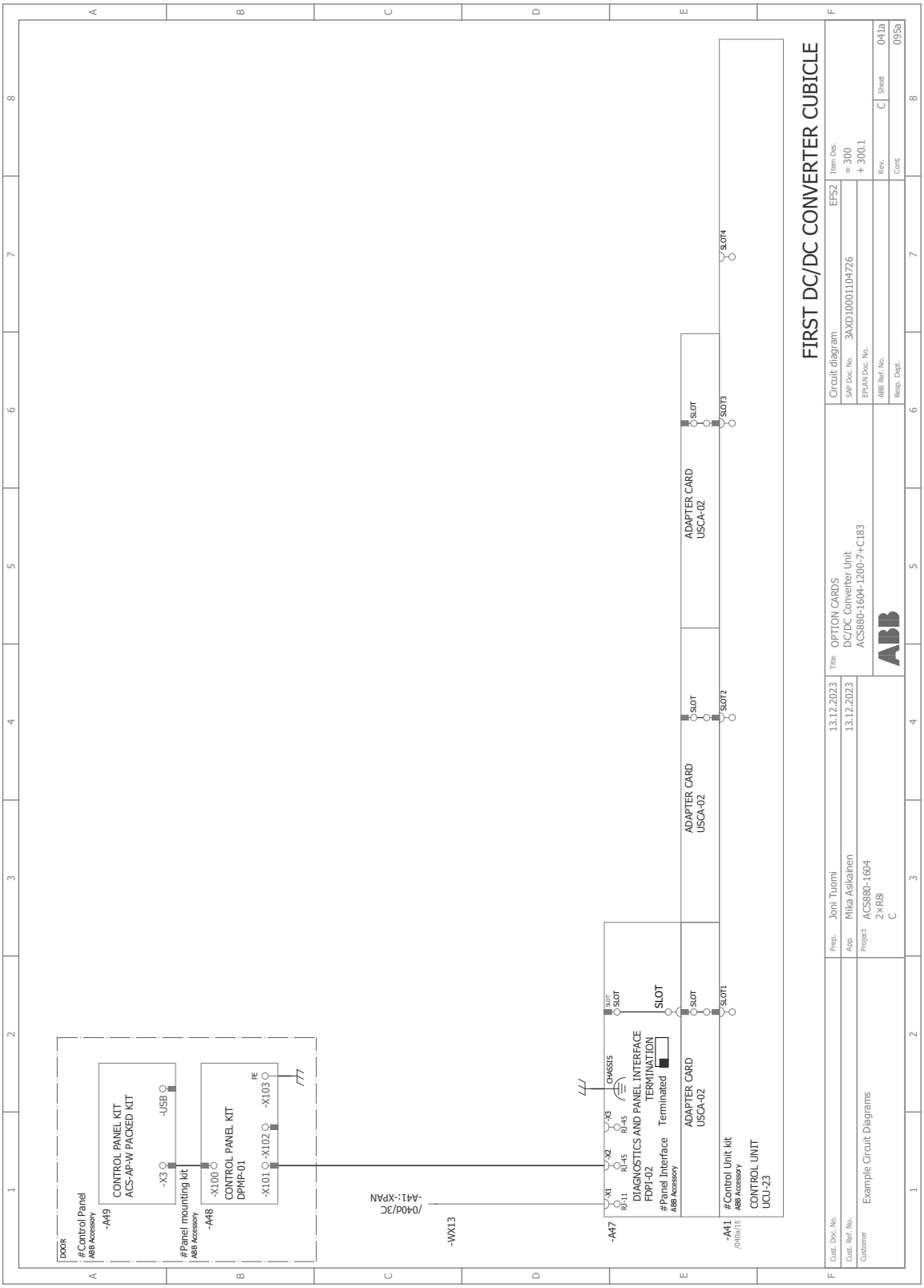
Sheet 040c (Control unit)



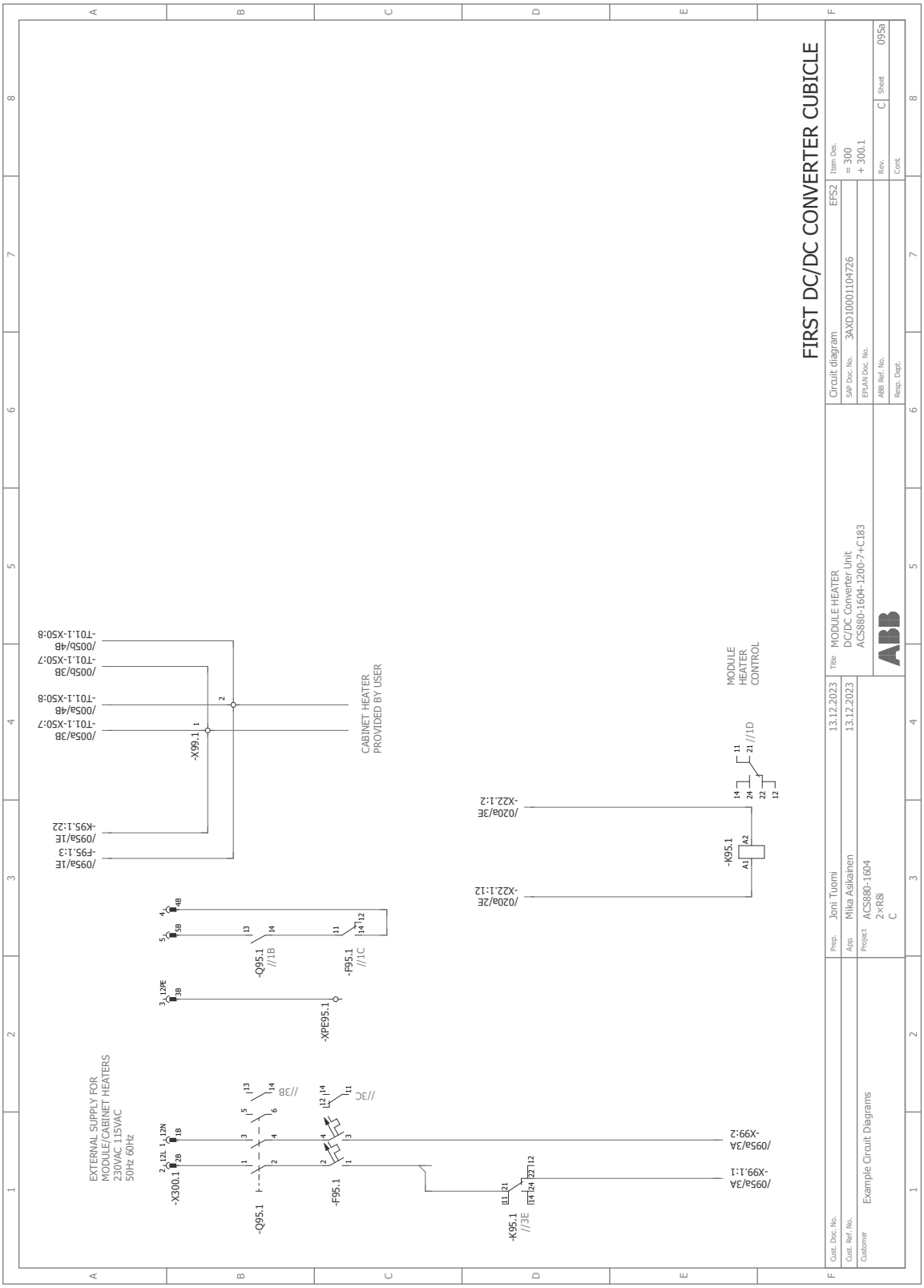
Sheet 040d (Control unit)



Sheet 041a (Option cards)



Sheet 095a (Module heater)



Further information

Product and service inquiries

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

Product training

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

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