

ABB INDUSTRIAL DRIVES

ACS880-1604 DC/DC converter modules

Hardware manual



ACS880-1604 DC/DC converter modules

Hardware manual

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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 delivered with the drive.

- Read the **complete safety instructions** before you install, commission, use or service the drive. The complete safety instructions are given in *ACS880 multidrive cabinets and modules safety instructions* (3AUA0000102301 [English]).
- Read the **software-function-specific warnings and notes** before changing the default settings of a function. For each function, the warnings and notes are given in the section describing the related user-adjustable parameters.
- Read the **task-specific safety instructions** before starting the task. See the section describing the task.

Target audience

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

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

The manual is written for readers worldwide. Both SI and imperial units are shown.

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

Terms and abbreviations

Term	Description
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 board	Circuit board in which the control program runs
Control unit	Control board built in a housing (often rail-mountable)
Cubicle	One section of a cabinet-installed drive. A cubicle is typically behind a door of its own.
DC/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 board, 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 board, 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, eg, variable, constant, or signal.
PLC	Programmable logic controller
Supply unit	Supply module(s) under control of one control board, and related components.
VX25	Enclosure system by Rittal (www.rittal.com)

Related documents

Manual	Code
General manuals	
<i>ACS880 multidrive cabinets and modules safety instructions</i>	3AUA0000102301
<i>ACS880 multidrive cabinets and modules electrical planning instructions</i>	3AUA0000102324
<i>Drive modules cabinet design and construction instructions</i>	3AUA0000107668
<i>BCU-02/12/22 control units hardware manual</i>	3AUA0000113605
Supply module manuals	
<i>ACS880-204 IGBT supply modules hardware manual</i>	3AUA0000131525
<i>ACS880 IGBT supply control program firmware manual</i>	3AUA0000131562
<i>ACS880-304 +A003 diode supply modules hardware manual</i>	3AUA0000102452
<i>ACS880-304...+A018 diode supply modules hardware manual</i>	3AXD50000010104
<i>ACS880 diode supply control program firmware manual</i>	3AUA0000103295
<i>ACS880-904 regenerative rectifier modules hardware manual</i>	3AXD50000020457
<i>ACS880 regenerative rectifier control program firmware manual</i>	3AXD50000020827
Inverter module manuals and guides	
<i>ACS880-104 inverter modules hardware manual</i>	3AUA0000104271
<i>ACS880 primary control program firmware manual</i>	3AUA0000085967
<i>ACS880 primary control program quick start-up guide</i>	3AUA0000098062
Brake module and DC/DC converter module manuals	
<i>ACS880-604 1-phase brake chopper modules hardware manual</i>	3AUA0000106244
<i>ACS880-604 3-phase brake modules hardware manual</i>	3AXD50000022033
<i>ACS880 (3-phase) brake control program firmware manual</i>	3AXD50000020967
<i>ACS880-1604 DC/DC converter modules hardware manual</i>	3AXD50000023642
<i>ACS880 DC/DC converter control program firmware manual</i>	3AXD50000024671
Module package hardware manuals	
<i>ACS880-04 module packages hardware manual</i>	3AUA0000138495
<i>ACS880-14 and -34 module packages hardware manual</i>	3AXD50000022021
Option manuals	
<i>ACX-AP-x assistant control panels user's manual</i>	3AUA0000085685
<i>BAMU-12C auxiliary measurement unit hardware manual</i>	3AXD50000117840
<i>Drive composer start-up and maintenance PC tool user's manual</i>	3AUA0000094606
<i>Drive application programming (IEC 61131-3) manual</i>	3AUA0000127808

Manual	Code
<i>Installation frames for ACS880 multidrive modules hardware manual</i>	3AXD50000010531
Manuals and quick guides for I/O extension modules, fieldbus adapters, safety functions modules, etc.	

See www.abb.com/drives/documents for all manuals on the Internet.

You can find all documentation related to the multidrive modules on the Internet at <https://sites-apps.abb.com/sites/lvacdrivesengineeringsupport/content>.

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 media does not belong to the DC/DC module product offering.

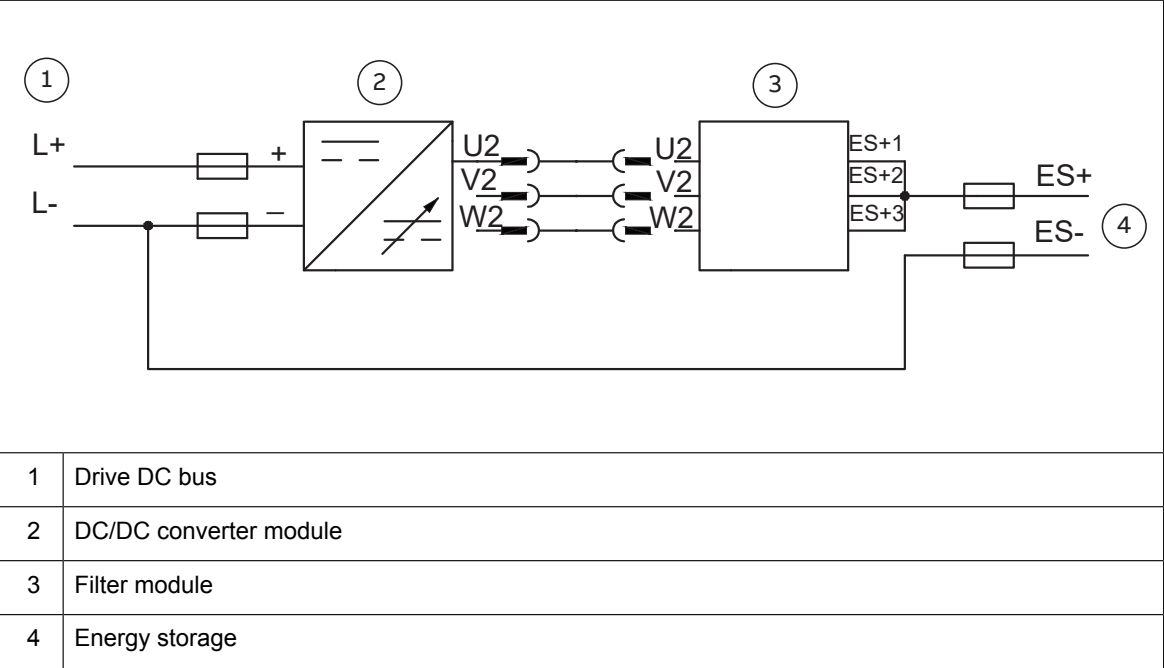
The DC/DC converter unit has a single converter module or parallel converter modules under the command of one control unit. Parallel DC/DC converter modules must have a common energy storage. Each parallel module must have the output cabling of its own. We also recommend that you use identical cablings (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.

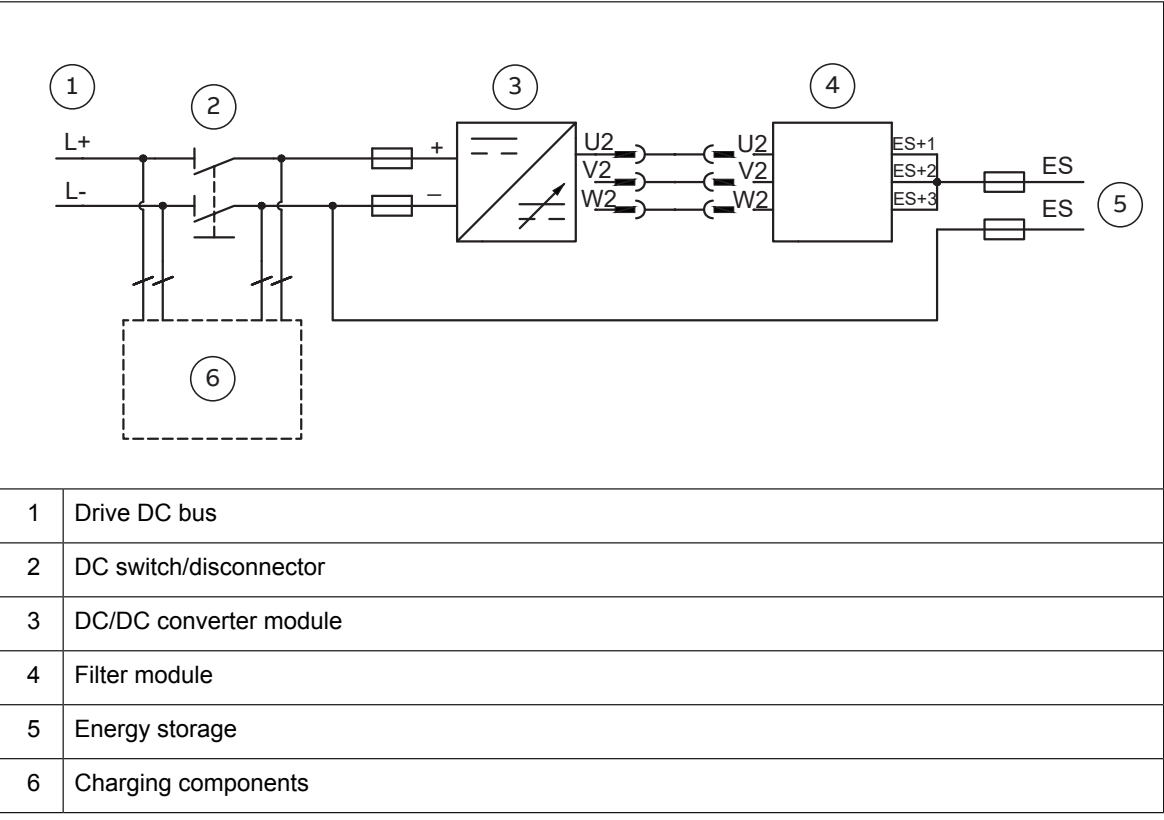
■ Main circuit diagram

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.

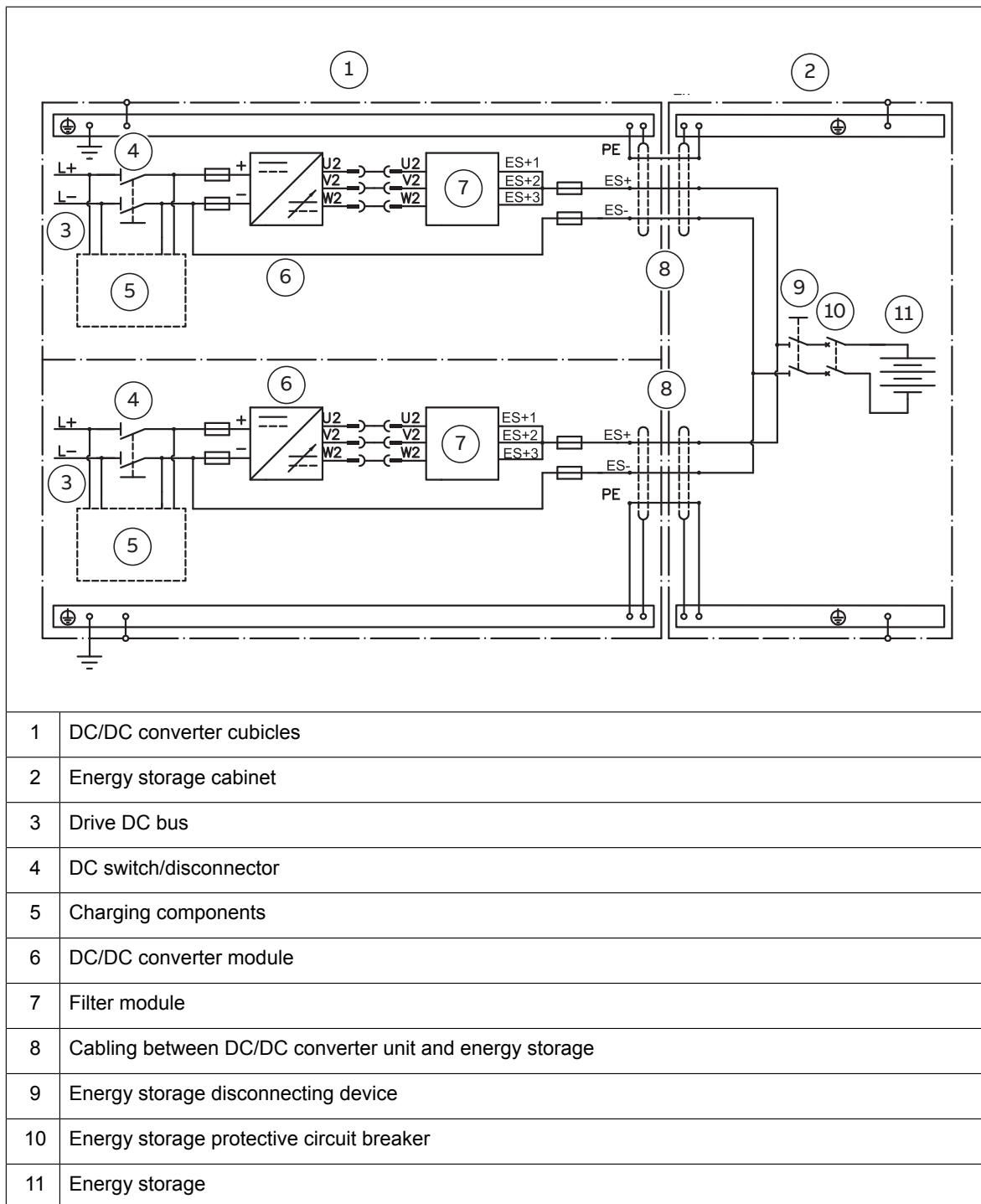
This figure shows a simplified main circuit diagram of a DC/DC converter without a DC switch/disconnector and charging circuit.



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

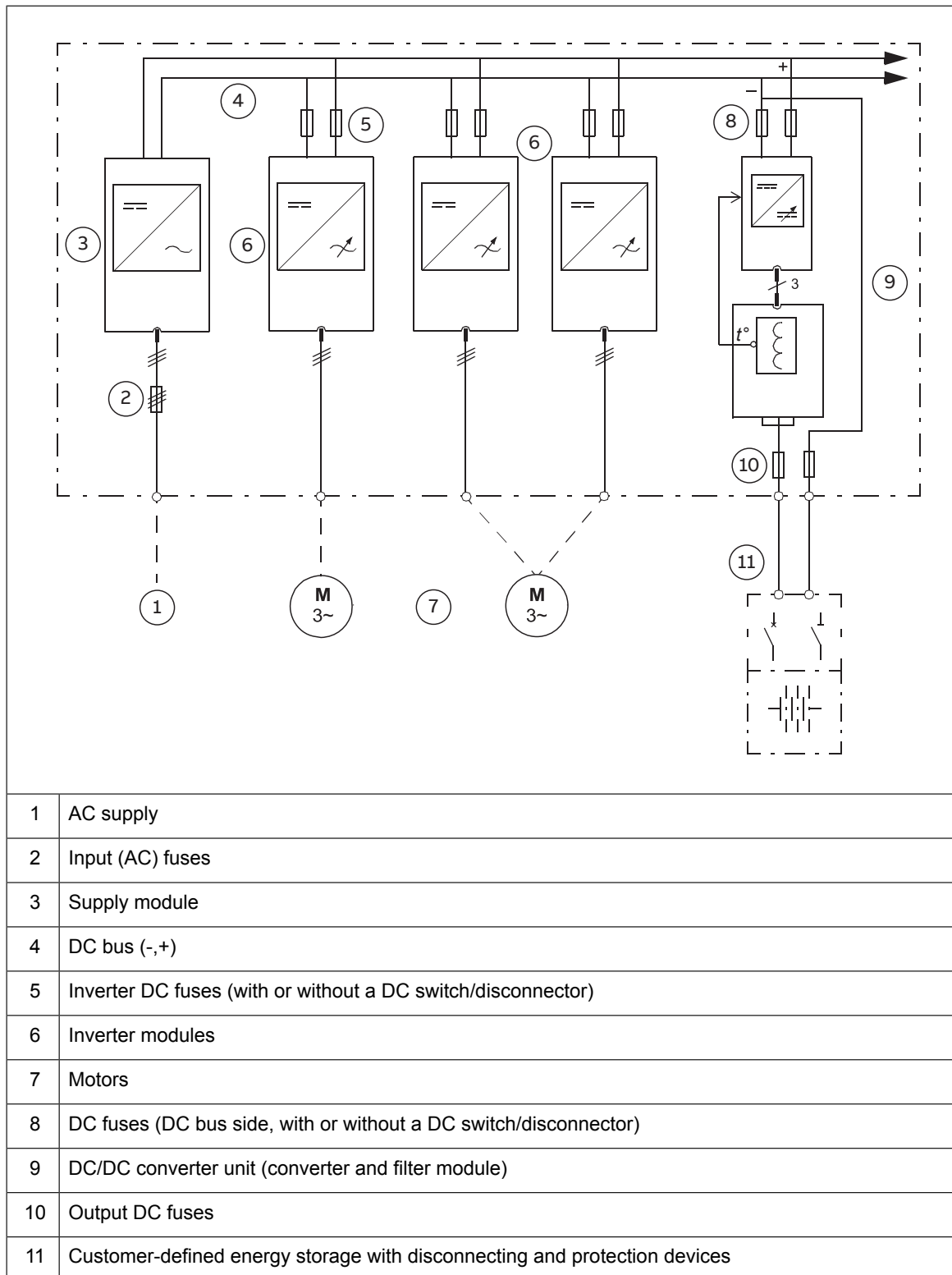


This figure shows a simplified main circuit diagram of parallel-connected DC/DC converter modules with the DC switch/disconnector and charging circuit. Also the energy storage and related cabling and equipment are visible.



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

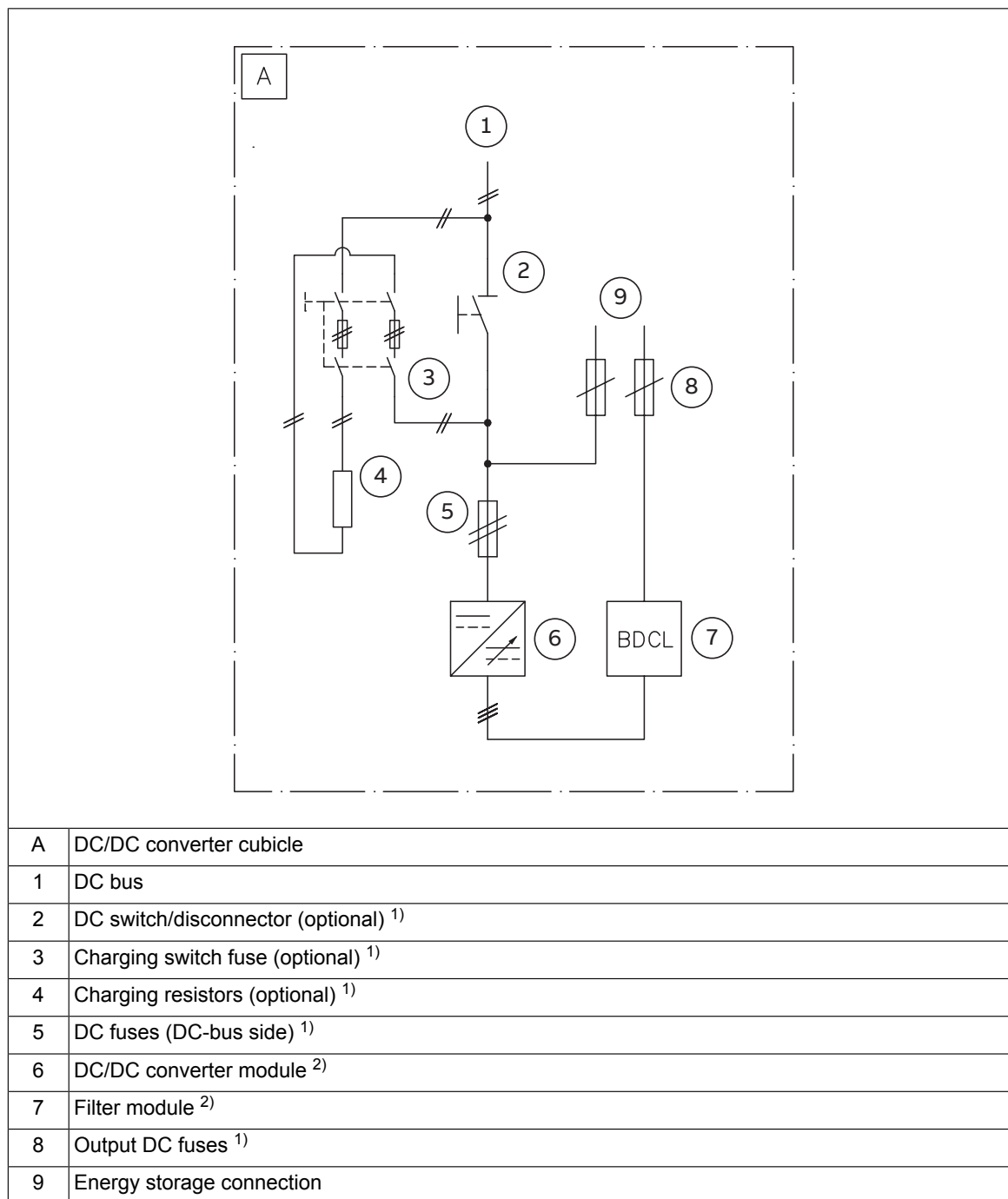
This diagram shows a possible application of a converter unit in an example system. The DC/DC converter unit includes a DC/DC converter module and a filter module.



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.



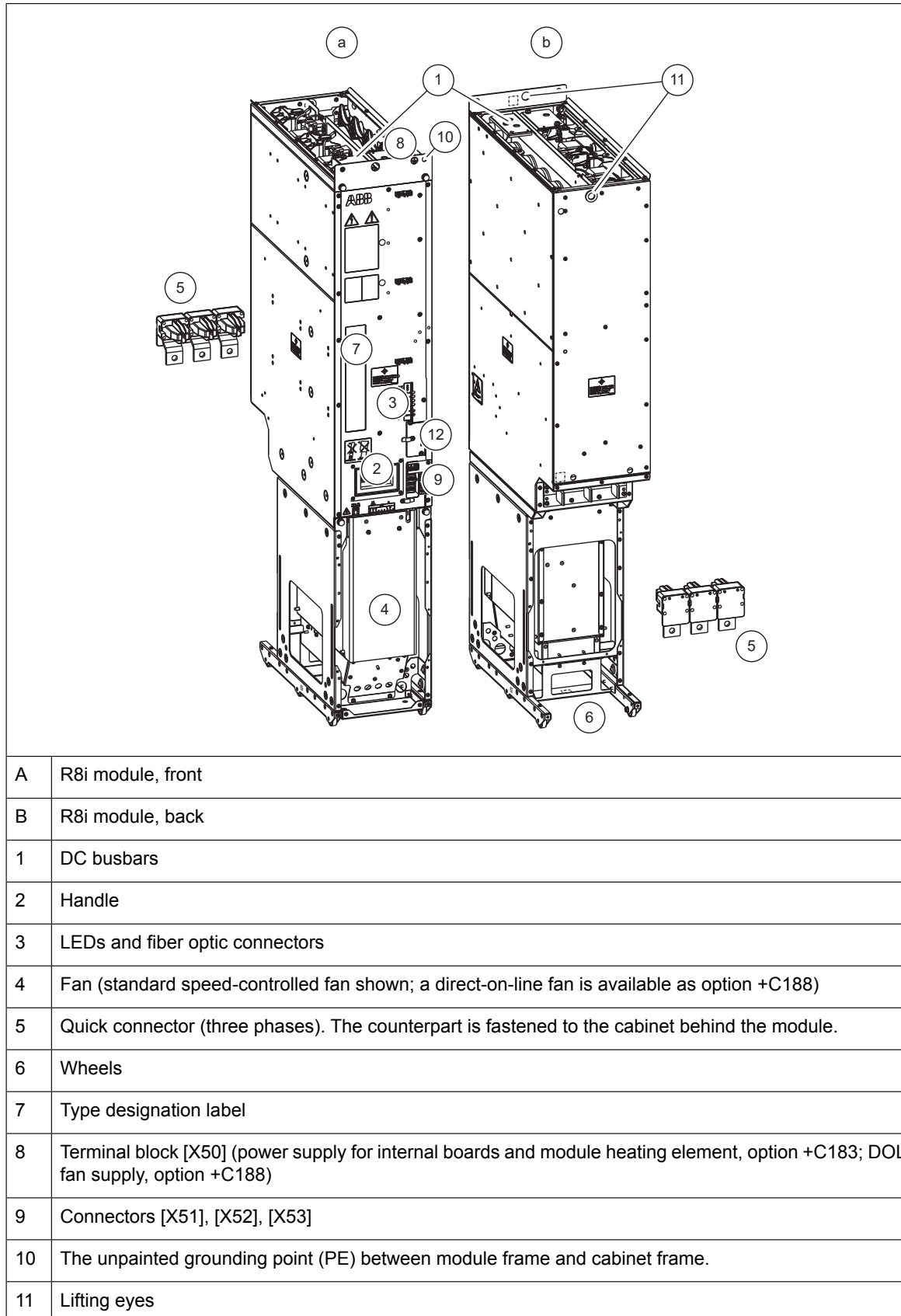
¹⁾ Available through ABB or third party

²⁾ Available through ABB

Converter module hardware

■ Frame R8i layout

This figure shows the layout of the R8i module.



■ Connectors X50...X53

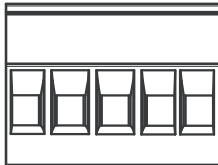
The cabinet builder must arrange an auxiliary voltage of 230 V AC (or 115 V AC with option +G304) to connector X50 to power the electronics of the power module. Also, the cabinet builder must arrange an auxiliary voltage of 230 V AC to connector X50 to power the main circuit interface board of the module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

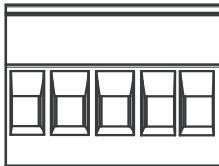
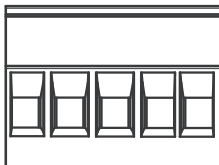
There is an internal power supply (BDPS) in the module that produces 24 V DC from the auxiliary voltage for the internal circuit boards. The 24 V DC voltage is available on X53 and it can be used to power the BCU control unit. It is not allowed to use the 24 V DC output on terminal X53 for any other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

If a direct-on-line fan (option +C188) is used, the user 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 user 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	115/230 V AC 50 Hz input for internal power supply (BDPS) (115 V AC 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-online) cooling fan (option +C188). The cabinet builder must connect this when the option is in use.
2	V	
1	U	
Note: In modules without +C188, the DOL wiring is present but not in use.		

Connectors X51, X52, X53																					
	<table><tr><th colspan="5">STO OUT</th></tr><tr><th colspan="5">X51</th></tr><tr><td>FE</td><td>GND</td><td>24V</td><td>GND</td><td>24V</td></tr></table>			STO OUT					X51					FE	GND	24V	GND	24V	X51	STO OUT	Not in use.
STO OUT																					
X51																					
FE	GND	24V	GND	24V																	

Connectors X51, X52, X53																				
	<table><tr><th colspan="5">STO IN</th></tr><tr><th colspan="5">X52</th></tr><tr><td>FE</td><td>GND</td><td>24V</td><td>GND</td><td>24V</td></tr></table>		STO IN					X52					FE	GND	24V	GND	24V	X52	STO IN	STO connectors of the module. Must be connected to 24 V DC for the module to start.
STO IN																				
X52																				
FE	GND	24V	GND	24V																
	<table><tr><th colspan="5">24V OUT</th></tr><tr><th colspan="5">X53</th></tr><tr><td>FE</td><td>24V</td><td>GND</td><td>24V</td><td>GND</td></tr></table>		24V OUT					X53					FE	24V	GND	24V	GND	X53	24V OUT	24 V DC for BCU and for STO IN to enable the module operation.
24V OUT																				
X53																				
FE	24V	GND	24V	GND																
					<p>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.</p>															

■ Frame R8i hardware

Frame R8i modules are used in single or parallel configurations. R8i modules run on 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 user 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 user must connect the fan supply to the filter connector [X30].

■ DC bus connection and capacitor charging

The cabinet installer must equip the converter unit with DC fuses on the DC bus side and with output DC fuses on the energy storage side. The user must equip also the energy storage with fuses for protecting the energy storage cable in a cable short-circuit situation.

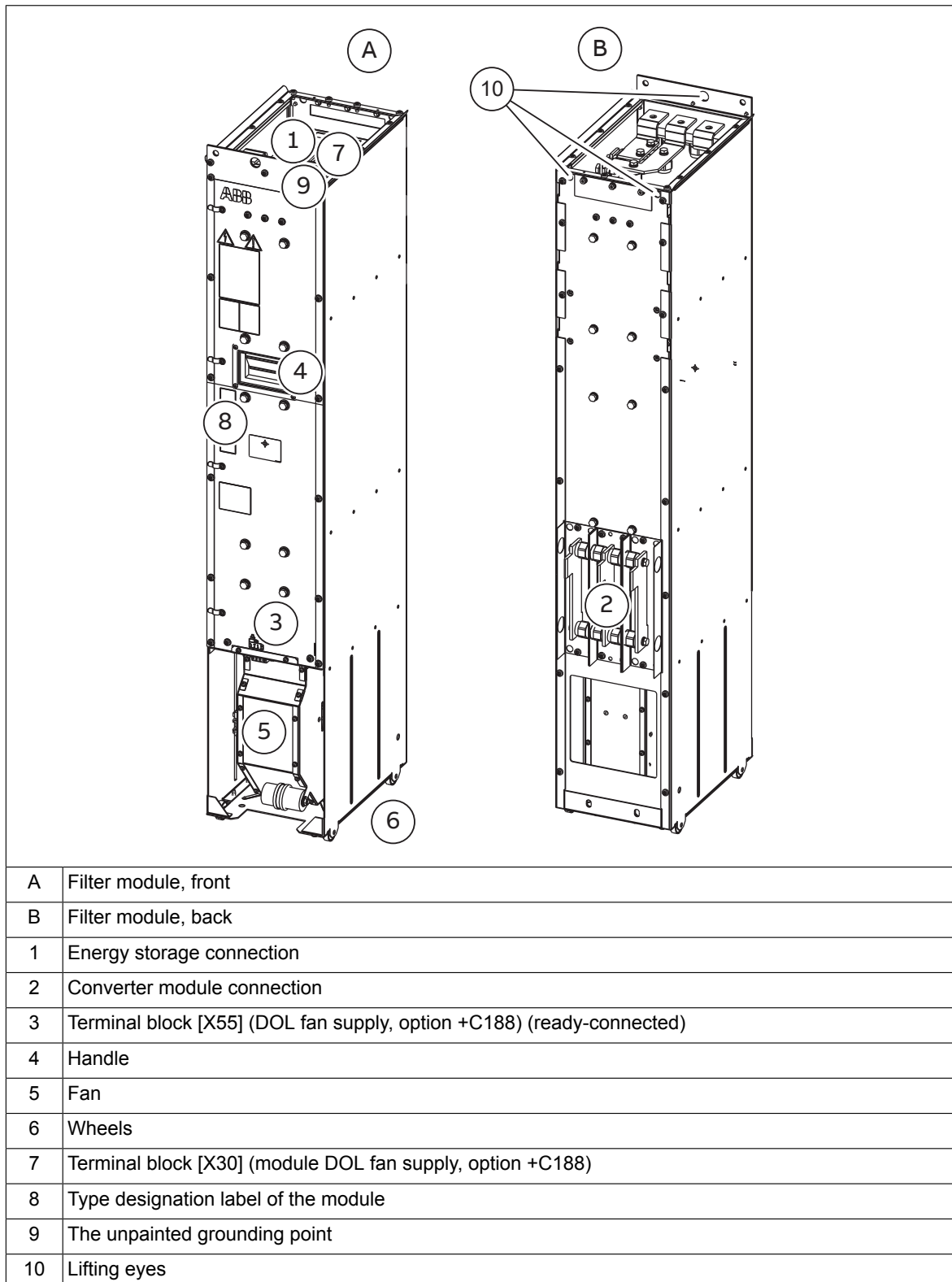
The user can install a DC switch/disconnector if quick isolation of the module from the DC bus is required.

The user must install a capacitor charging circuit if

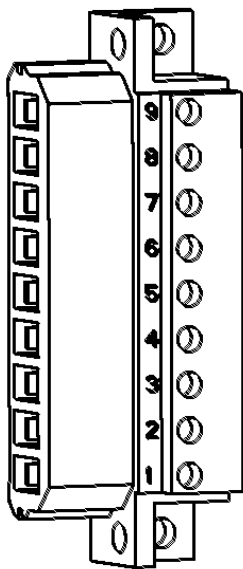
- the converter module is connected to the DC bus through a DC switch/disconnector, or
- the converter unit is directly connected to the DC bus and the supply unit of the system does not have charging circuit capability.

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

BDCL filter module



■ 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	Customer connection point for the filter fan power supply.
	1	Note: These terminals are wired further to connector X55:1 and A55:2 internally by ABB.

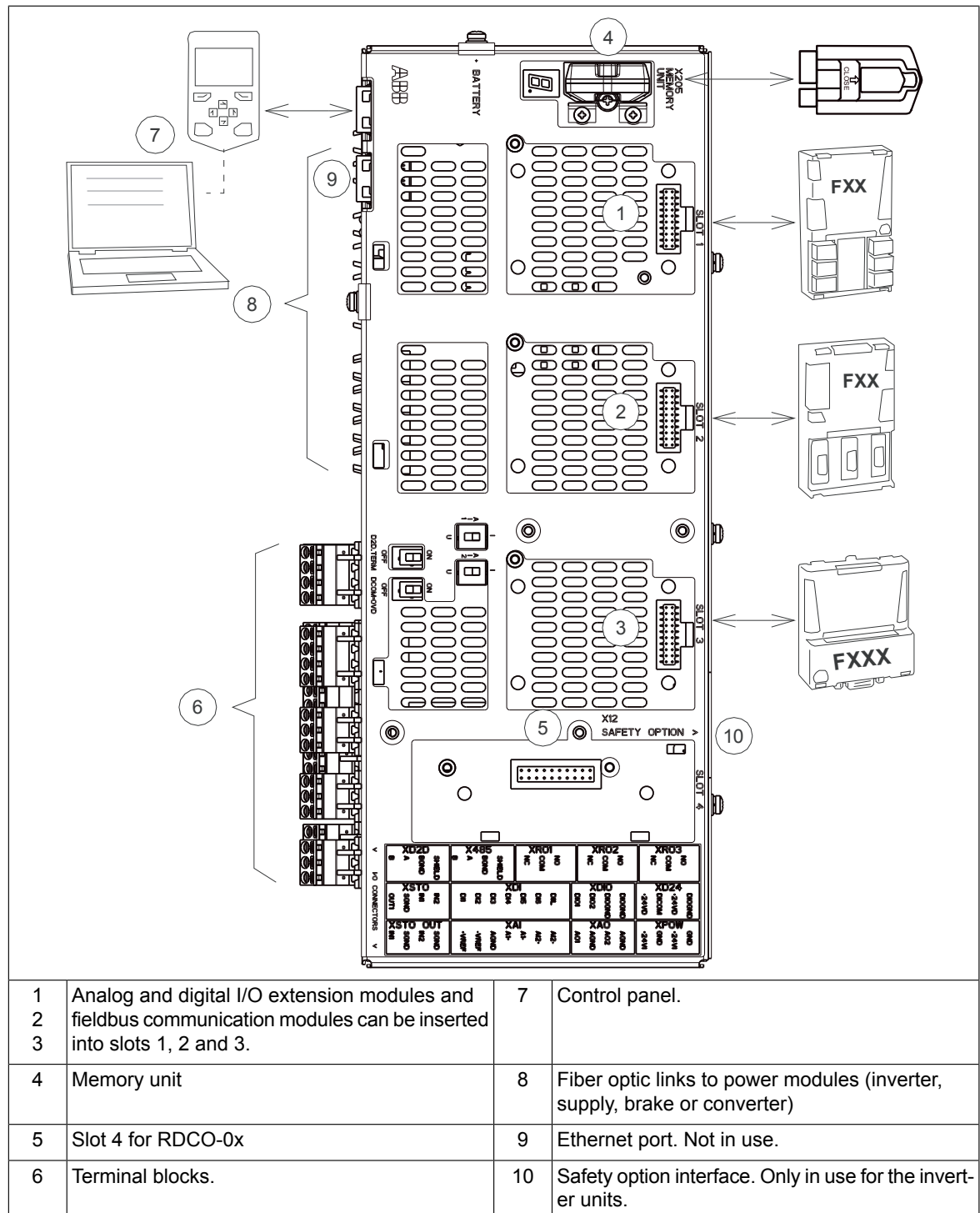
Connector X55		
Note: Connections of the connector X55 are ready-made at the factory.		
	4	Not in use
3	Not in use	
2	+C188: DOL fan N	
1	+C188: DOL fan L (230 V AC or option +G304: 115 V AC)	
		Note: These terminals are wired further to the filter connector X30:1 and X30:2 internally by ABB.

BCU control unit of frame R8i and multiples

Frame R8i (and multiples, if any) modules are controlled by a single BCU control unit installed separately from the module(s). The control unit is connected to each module by a fiber optic link. The control unit can be powered from the module (terminal block X53), from an external 24 V DC supply, or both for redundancy. The control unit contains the basic I/Os and slots for optional I/O modules. Other equipment is primarily installed on separate mounting plates.

Overview of the control connections of the BCU control unit

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



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 finished, 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 DC switch/disconnector is equipped.

■ BCU control unit

The DC/DC converter module is controlled by a BCU control unit. For more information, see [Control units of the drive](#).

■ ACX-AP-x control panel

The ACX-AP-x control panel is the user interface of the unit. With the control panel, you can:

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

To be able to start and stop the unit by the control panel, you must have the parameter-defined Run enable signal and Start enable signal on (1). The control panel must also be in local control mode.

To change between local and remote control mode, press the Loc/Rem key of the control panel. For the instructions on the use of the panel, see *ACX-AP-x Assistant control panels user's manual* (3AUA0000085685 [English]). For the parameter settings, see the firmware manual.

■ **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 unit.

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.

ABB ① ACS880-104-0640A-3+E205

MADE IN FINLAND
ABB Oy
Hiomotie 13
00380 Helsinki
Finland

FRAME
R8i ②

Air cooling ③
IP00
UL open type ④

INVERTER ⑤
Input U1 566 VDC
I1 720 A
f1 -
Output U2 3~ 0...400 VAC
I2 640 A
f2 0...500 Hz
Sn 443 kVA

LINE CONVERTER ⑥
3~ 400 VAC
576 A
50/60 Hz
566 VDC
698 A
-
399 kVA

⑦

S/N: 1183300407

ABB ① ACS880-104-0600A-7+E205

BRAKE CHOPPER
742/849/976 V DC
1171 A

REGENERATIVE RECTIFIER
3~ 525/600/690 V AC
900 A
50/60 Hz
709/810/932 V DC
1091 A

DC/DC CONVERTER ⑤
742/849/976 V DC
600 A
50...668/764/878 V DC
600 A
527 kVA

S/N: 1145200001

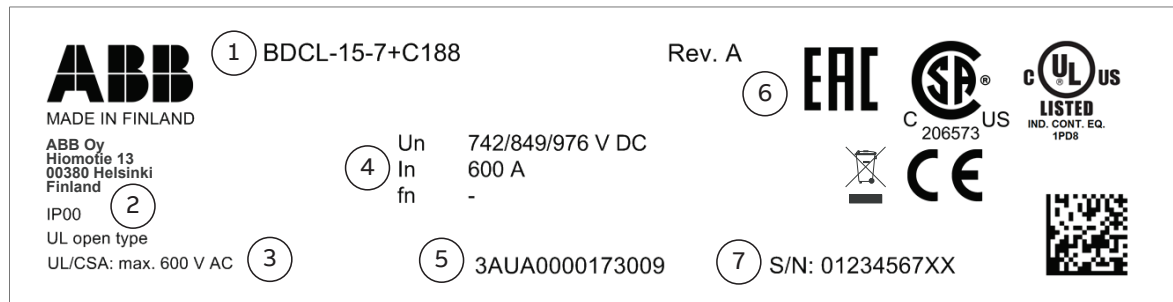
No.	Description
1	Type designation
2	Frame size
3	Degree of protection
4	UL/CSA data
5	Ratings
6	Valid markings. See <i>ACS880 multidrive cabinets and modules electrical planning instructions</i> (3AUA0000102324 [English]).
7	Serial number. The first digit of the serial number refers to the manufacturing 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 <i>ACS880 multidrive cabinets and modules electrical planning instructions</i> (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 of the 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.
Size	
xxxxx	Refer to the ratings table in the technical data.

CODE	DESCRIPTION
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.
Option codes (plus codes)	
C183	Internal heating element
C188	Direct-on-line (DOL) cooling fan
E205	Internal du/dt filtering. Standard with 690 V modules.
G304	115 V auxiliary voltage supply

■ Type designation key of the filter module

The designation code of the BDCL filter is divided in subcodes:

- The first 4 letters and two numbers give the type of the filter, for example, **BDCL-15-7**.
- 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.

CODE	DESCRIPTION
Basic codes	
BDCL-1x-	BDCL 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.
Plus codes	
C188	Direct-on-line (DOL) cooling fan (included in the delivery as standard)
G304	115 V auxiliary voltage supply

3

Moving and unpacking the module

Contents of this chapter

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



WARNING!

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

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.

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 modules

Lift the unpacked module only by its lifting eyes.

Moving the modules



WARNING!

For general safety instructions for moving the module, see *ACS880 multidrive cabinets and modules safety instructions* (3AUA0000102301 [English]).

4

Cabinet construction



Contents of this chapter

This chapter instructs in placing 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.

Energy storage

Obey the energy storage manufacturer's instructions.

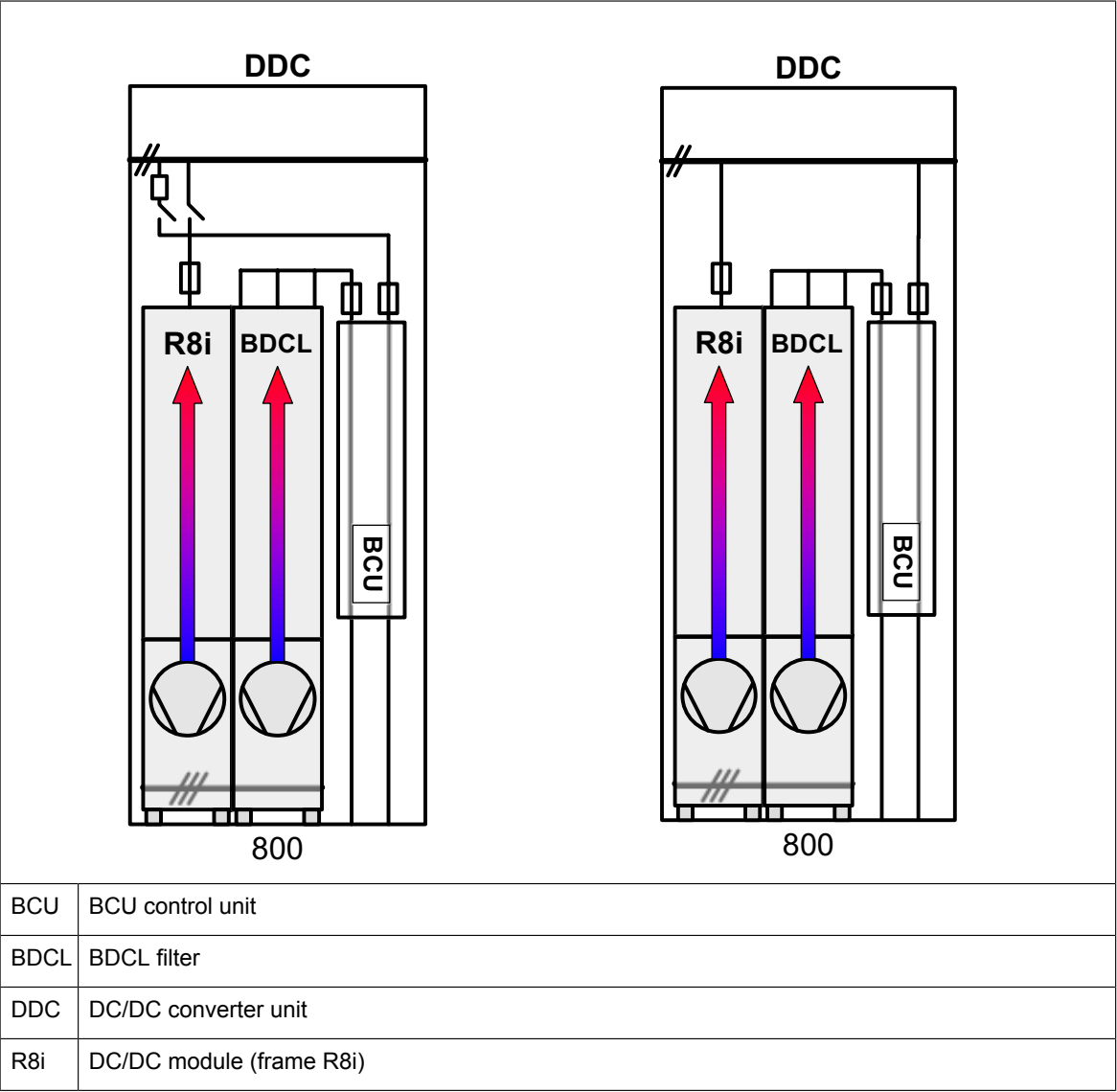
Cooling and mounting orientations

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.



Installation examples

**WARNING!**

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

This section instructs in placing the modules and additional equipment into a user-defined cabinet.

Each example includes a table that lists:

- installation stages of different equipment in the order in which the installation into the cabinet should be performed
- 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.

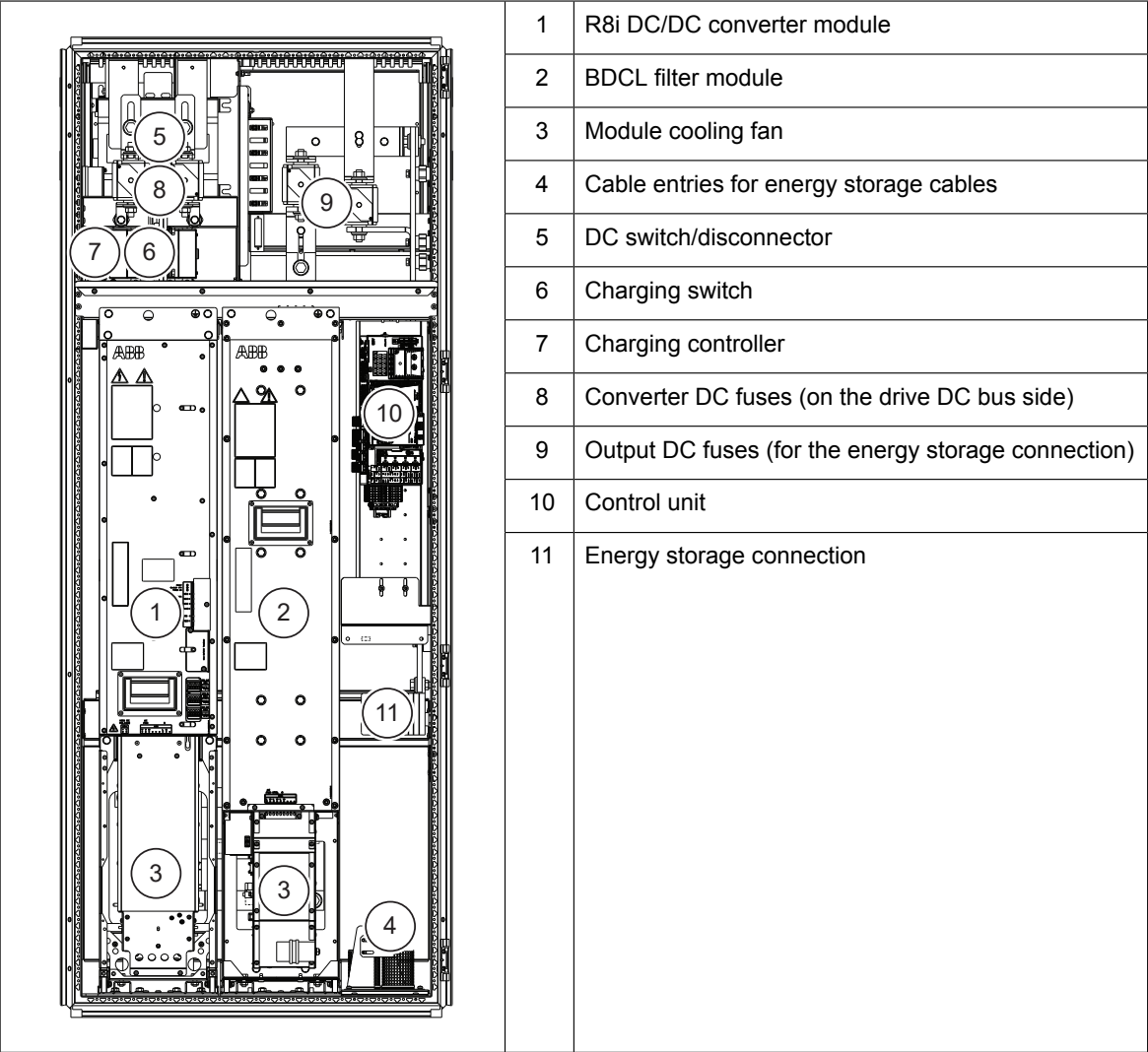
For general instructions, see *Drive modules cabinet design and construction instructions* (3AUA0000107668 [English]).



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

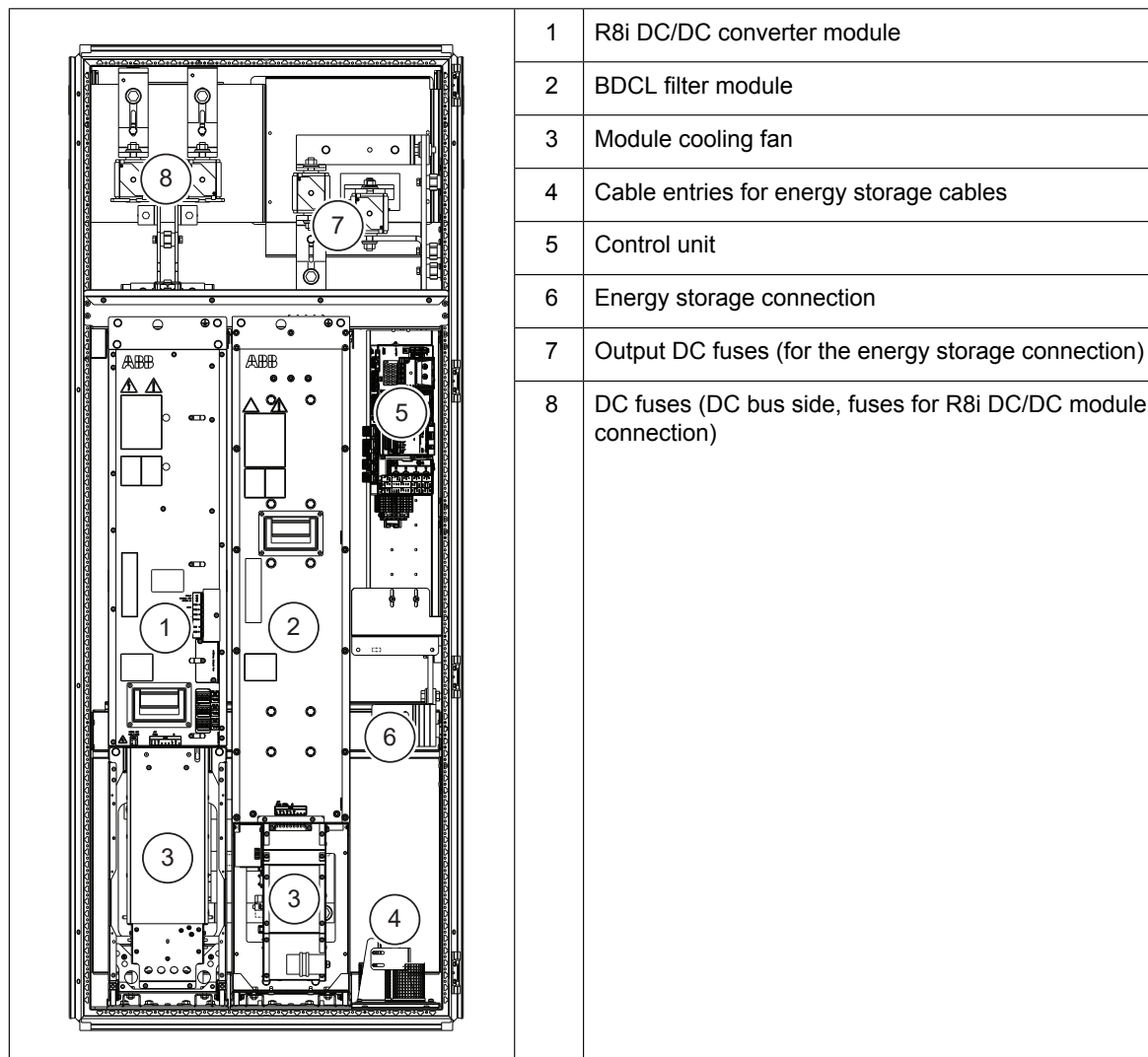
■ Layout with DC switch/disconnector and charging

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.



■ 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.

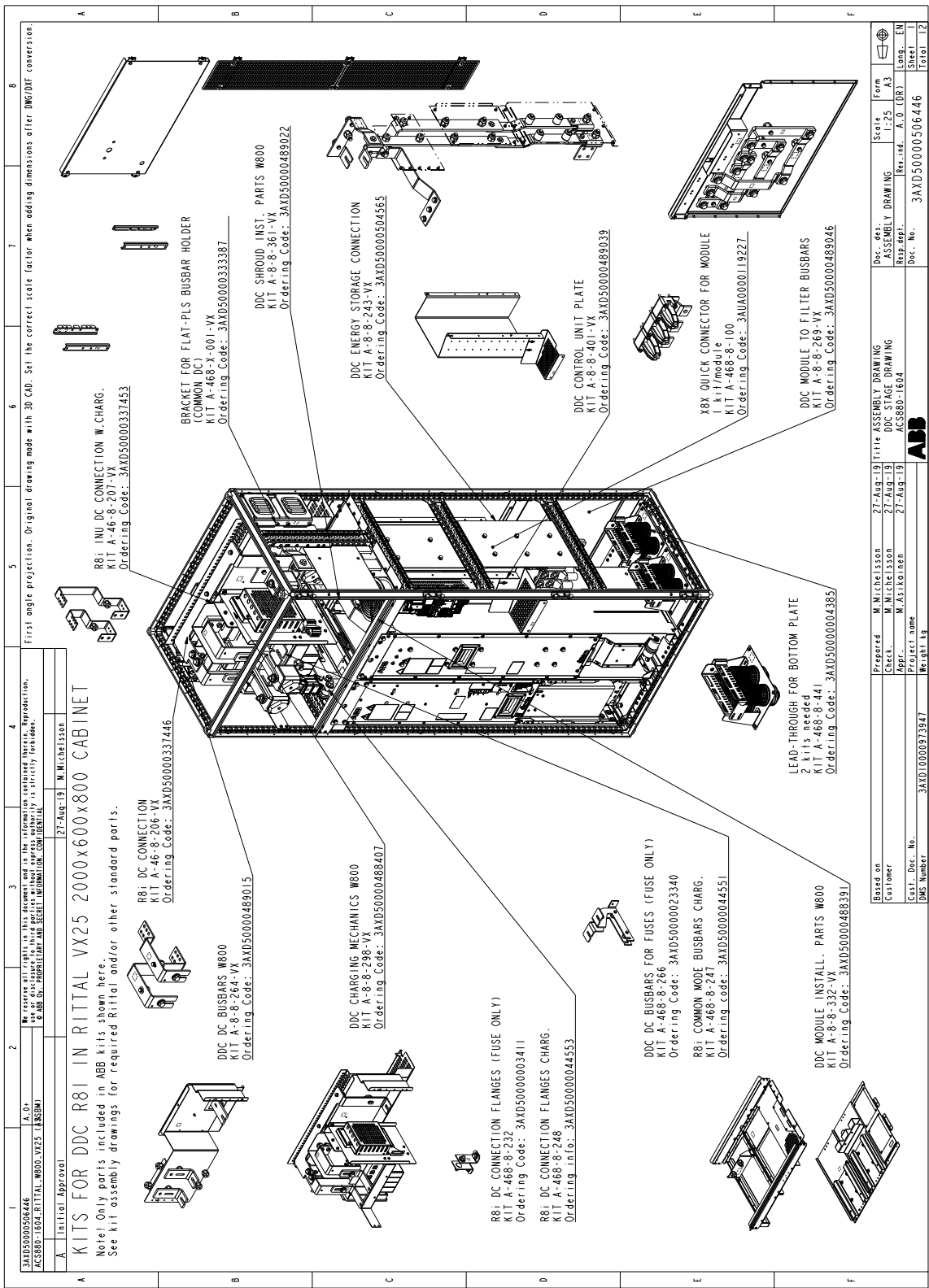


■ Installation stages

#	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 2: Module and bottom cable entry installation parts

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3AXD50000506446

A. O+
AC5880-1604, RITTAL, W800, V725 (A850M)

Initial Approval

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First angle projection. Original drawing made with 3D CAD. Set the correct scale factor when adding dimensions after DWG/DXF conversion.

3AXD50000506446

A. O+
AC5880-1604, RITTAL, W800, V725 (A850M)

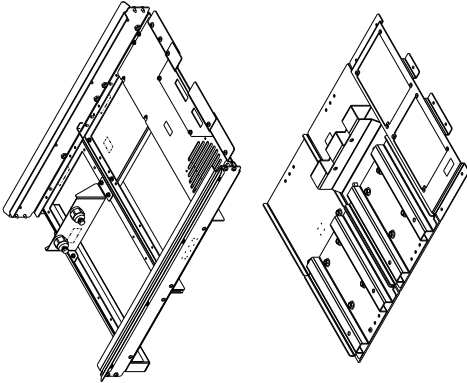
Initial Approval

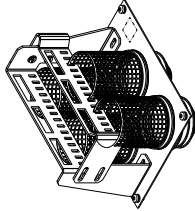
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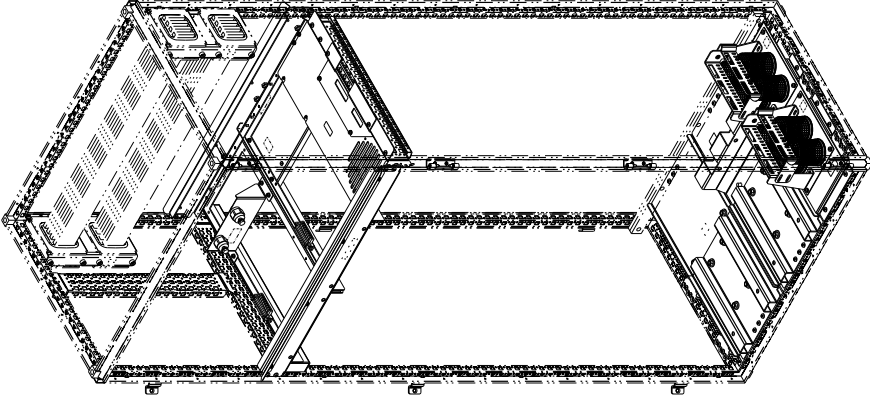
27-Aug-19 M. Michelsson

STAGE 2: DDC MODULE INSTALL. PARTS W800
and LEAD-THROUGH FOR BOTTOM PLATE installation

See assembly drawing 3AXD50000482122 and 3AXD50000004817 for
details and required additional Rittal and other standard parts.







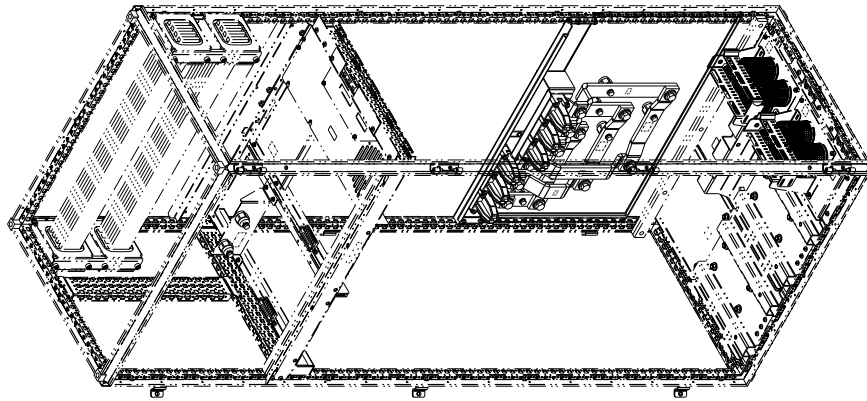
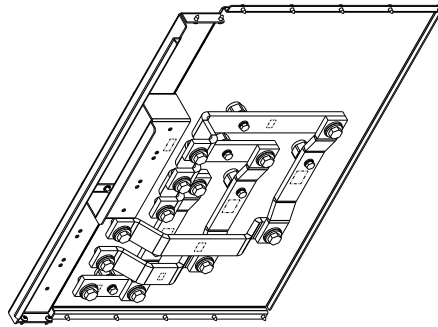
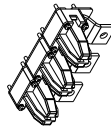
Ordering code: 3AXD50000488391
KIT A-8-8-332-VX

Ordering code: 3AXD50000004385
2 kits/cabinet
KIT A-468-8-441

Based on	Prepared	27-Aug-19	Title	ASSEMBLY DRAWING	Scale	Form
Customer	Check.	M. Michelsson	27-Aug-19	DDC STAGE DRAWING	1:25	A3
Cust. Doc. No.	Appr.	M. Asikainen	27-Aug-19	AC5880-1604	Rev. inf.	A. O. (DR)
DWG Number	Project name			Doc. No.	3AXD50000506446	Sheet 3
	Weight kg					Total 12

STAGE 3: DDC MODULE TO FILTER BUSBARS and X8X QUICK CONNECTORS FOR MODULE installation

See assembly drawing 3AUA0000118667 and 3AXD50000482290 for details and required additional Rittal and other standard parts.



Ordering code: 3AUA0000119227
2 kits/cabinet
KIT A-468-8-100

Ordering code: 3AXD50000489046
KIT A-8-8-269-VX

STAGE 3: DDC MODULE TO FILTER BUSBARS
and X8X QUICK CONNECTORS FOR MODULE installation

See assembly drawing 3AUA0000118667 and 3AXD50000482290 for
details and required additional Rittal and other standard parts.

Ordering code: 3AUA0000119227 Ordering code: 3AXD50000489046
2 kits/cabinet KIT A-8-8-269-VX
KIT A-468-8-100

Based on	Customer	Prepared	Check.	Appr.	Project name	Doc. des.	Scale	Form	EN
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						DDC STAGE DRAWING			EN
						Rev. ind.	A. O. (DR)		EN
						Rev. appl.			EN
									EN

■ Stage 4A: DC connection with charging

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A. O.

AC3880-1604-RTTAL-W800-V125 (A3S3M)

Initial Approval

27-Aug-19

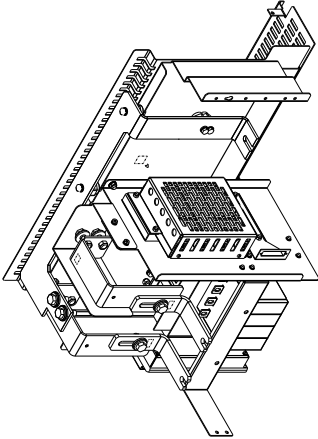
M. Michelsson

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First angle projection. Original drawing made with 3D CAD. Set the correct scale factor when adding dimensions after DWG/DXF conversion.

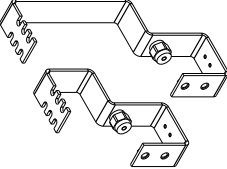
STAGE 4A: DDC CHARGING MECHANICS W800 and R8i INU DC CONNECTION W. CHARG. installation for charging solution

See assembly drawing 3AXD50000482955 and 3AXD50000345458 for details and required additional Rittal and other standard parts.



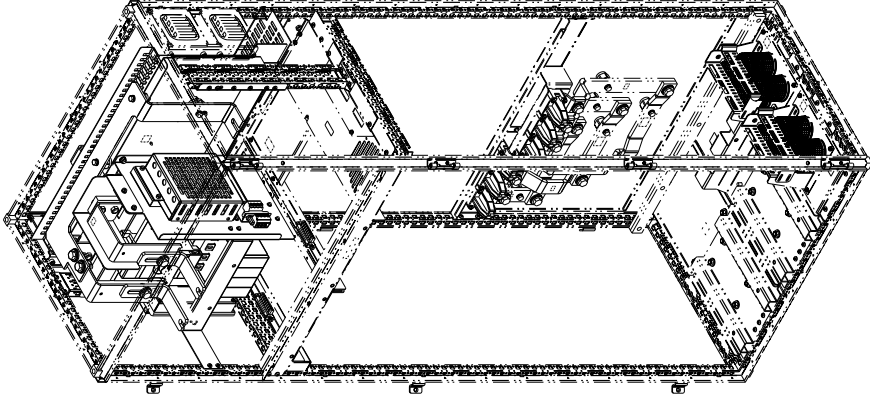
Ordering code: 3AXD50000488407

KIT A-8-8-298-VX



Ordering code: 3AXD50000337453

KIT A-46-8-207-VX



Doc. des.

ASSEMBLY DRAWING

Scale

1:25

Form

A3

Doc. No.

3AXD50000506446

Rev. no.

A. O. T001

Long.

EN

Sheet

5

Total

12

Based on

Customer

Cust. Doc. No.

DWG Number

Prepared

Check

Appr.

Project name

Weight kg

M. Michelsson

M. Michelsson

M. Asikainen

3AXD10000913947

27-Aug-19

27-Aug-19

27-Aug-19


Title

ASSEMBLY DRAWING

DDC STAGE DRAWING

AC3880-1604

ABB



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3AXD50000506446		Warranty all parts in this document are the intellectual property of Rittal GmbH & Co. KG. No part of this document may be reproduced without express written permission from Rittal GmbH & Co. KG.					
A Initial Approval		27-Aug-19 M.Michelsson					

STAGE 4B: DDC BUSBARS W800
and R8i DC CONNECTION installation for fuse solution

See assembly drawing 3AXD50000485116 and 3AXD50000345915 for details and required additional Rittal and other standard parts.

Ordering code: 3AXD50000489015
KIT A-8-8-264-VX

Ordering code: 3AXD50000337446
KIT A-46-8-206-VX

- **Stage 5A: DC connection with charging**

3AXD50000506446
ACS880-160A-RITTAL_WG02_V025 (483504)

A Initial Approval

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27-Aug-19 M.Michelsson

STAGE 5A: R8i COMMON MODE BUSBARS CHARG.
and R8I DC FLANGES CHARG. installation for charging solution.

See assembly drawing 3AXD50000043411 and 3AXD50000043466 for details and required additional Rittal and other standard parts.

Ordering code: 3AXD500000044551
KIT A-468-8-247

Ordering code: 3AXD500000044553
KIT A-468-8-248

First angle projection. Original drawing made with 3D CAD. Set the correct scale factor when adding dimensions after DWG/DXF conversion.

Based on	Prepared	M. Michelsson	27-Aug-19	Title	ASSEMBLY DRAWING	Scale	Form
Customer	Check.	M. Michelsson	27-Aug-19	DDC STAGE DRAWING	ASSEMBLY DRAWING	1:25	A3
Cust. Doc. No.	Appr.	M. Järvi	27-Aug-19	ACS880-160A	Responsible	Ther. med.	A. D (DR)
Project name							

Doc. No. 3AXD500000506446
Sheet 1 of 1



- **Stage 6: DDC and energy storage connection**

1	2	3	4	5	6	7	8
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		A-3-					
Initial Approval		M. Michelsson					

STAGE 6: DDC ENERGY STORAGE CONNECTION installation

See assembly drawing 3AXD50000488773 for details and required additional Rittal and other standard parts.

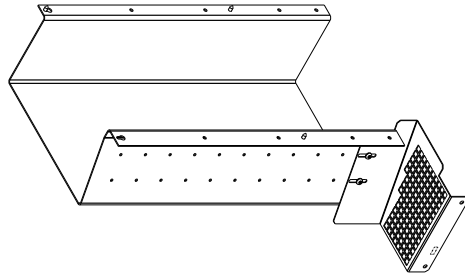
Ordering code: 3AXD50000504565
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Based on		Prepared	M. Michelsson	27-Aug-19	Title	ASSEMBLY DRAWING	Scale	A3
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		Appr.	M. Asikainen	27-Aug-19	ACS880-1604	Doc. No.	3AXD50000506446	Sheet - 9



STAGE 7: DDC CONTROL UNIT PLATE installation

See assembly drawing 3AXD50000505814 for details and required additional Rittal and other standard parts.



Ordering code: 3AXD50000489039
KIT A-8-8-401-VX

1	2	3	4	5	6	7	8
3AXD50000506446	2	3	4	5	6	7	8
AC8807-1004-RITRAL-0000-V235 (148594)	2	3	4	5	6	7	8
Initial Approval	27-Aug-19	M. Michelsson					

First angle projection. Original drawing made with 3D CAD. Set the correct scale factor when adding dimensions after DWG/DXF conversion.

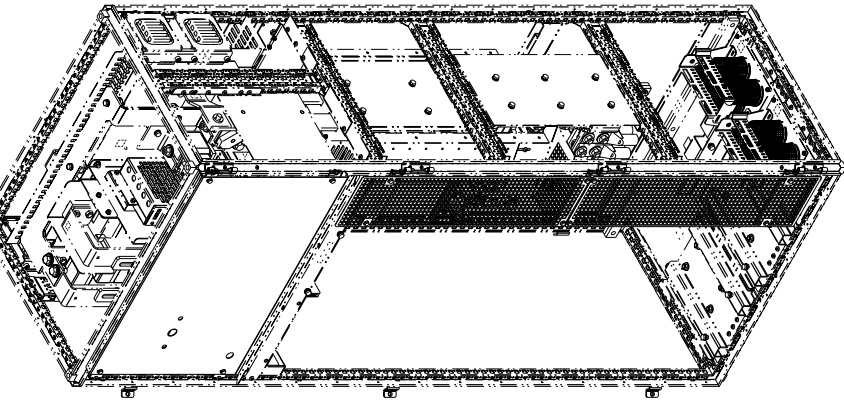
STAGE 7: DDC CONTROL UNIT PLATE installation

See assembly drawing 3AXD50000505814 for details and required additional Ritral and other standard parts.

Ordering code: 3AXD50000489039
KIT A-8-8-401-VX

Based on	Prepared	27-Aug-19	Title	ASSEMBLY DRAWING	Scale	Form
Customer	M. Michelsson	27-Aug-19	DDC STAGE DRAWING	1:25	A3	
	Check	27-Aug-19	AC8800-1604	Reg. appl.	Reg. ind.	
	Appr.	27-Aug-19				
Cust. Doc. No.	Project name					
3AXD50000506446						

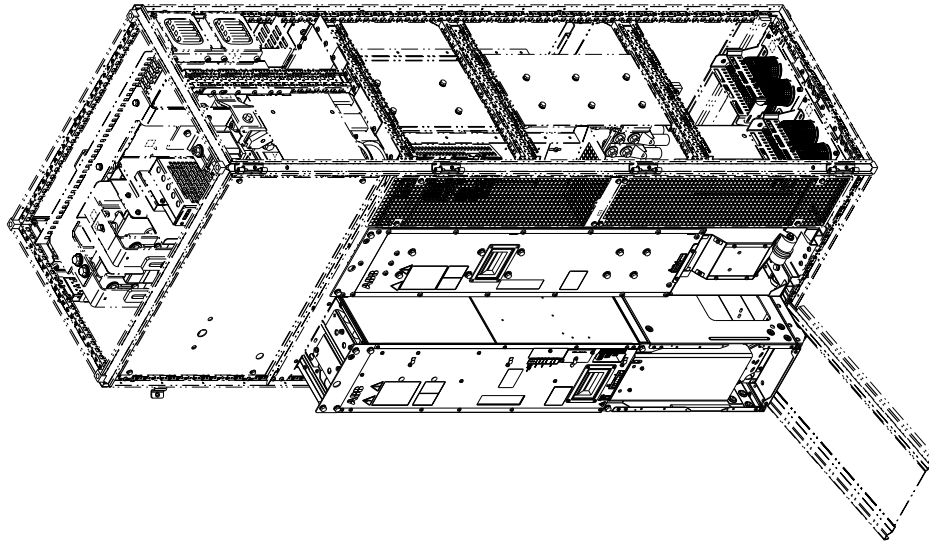
■ Stage 8: DDC shroud installation

1	2	3	4	5	6	7	8
3AXD5000506446 A.O. ACS880-180A-RITTAL-W800-VX2S (ENGLISH) M. Michelsson 27-Aug-19 M. Michelsson							
First angle projection. Original drawing made with 3D CAD. Set the correct scale factor when adding dimensions after DWG/DXF conversion.							
A	Initial Approval						
STAGE 8: DDC SHROUD INST. PARTS W800 installation							
See assembly drawing 3AXD50000491865 for details and required additional Rittal and other standard parts.							
Ordering code: 3AXD50000489022 KIT A-8-8-36I-VX							
							
Based on: Customer: Prepared by: Checked by: Approved by:							
Project name: 3AXD50000491865							
Title: DDC STAGE DRAWING ACS880-180A							
Dec. des.: ASSEMBLY DRAWING Scale: 1:25 Form: A3							
Doc. No.: 3AXD50000506446 Sheet: 1 of 1							



STAGE 9: R8I DDC MODULE AND FILTER INSTALLATION

See ACS880-1604 Hardware Manual for details

[illegible]

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	3AXD50000023218	A-8-8-333	3AXD50000023031
Bottom cable entry	3AXD50000004817	A-468-8-441	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 ACS880-1604 IN GENERIC CABINET

Note! Only parts included in ABB kits shown here

KITS FOR ACS880-1604 IN GENERIC CABINET

Note! Only parts included in ABB kits shown here

Kit Details:

- R8i DC BUSBARS FOR FUSES (FUSE ONLY)**
KIT A-468-8-266
Ordering Code: 3AXD50000023340
- R8i COMMON MODE BUSBARS CHARG.**
KIT A-468-8-247
Ordering code: 3AXD50000044551
- DDC DC BUSBARS GEN**
KIT A-8-8-268
Ordering code: 3AXD50000023032
Instruction code: 3AXD50000023291
- R8i DC CONNECTION FLANGES (FUSE ONLY)**
KIT A-468-8-232
Ordering Code: 3AXD50000003411
- R8i DC CONNECTION FLANGES CHARG.**
KIT A-468-8-248
Ordering info: 3AXD50000044553
- DDC ENERGY STORAGE CON. GEN**
KIT A-8-8-244
Ordering code: 3AXD50000023008
Instruction code: 3AXD50000023217
- X8X QUICK CONNECTORS FOR MODULE I KIT/MODULE**
KIT A-468-8-100
Ordering code: 3AUA0000119227
Instruction code: 3AUA0000118667
- DDC CHARGING MECHANICS GEN**
KIT A-8-8-299
Ordering code: 3AXD50000044814
Instruction code: 3AXD50000044863
- DDC MOD. TO FILTER BUSBARS GEN**
KIT A-8-8-270
Ordering code: 3AXD50000023007
Instruction code: 3AXD50000023212
- LEAD-THROUGH FOR BOTTOM PLATE**
2 kits needed
KIT A-468-8-441
Ordering code: 3AXD50000004385
Instruction code: 3AXD5000004817
- DDC MODULE INSTALL. PARTS GEN**
KIT A-8-8-333
Ordering code: 3AXD50000023031
Instruction code: 3AXD50000023218

3AXD50000023582	B. 2*	Reproduce all rights in this document and in the information contained therein. Reproduction, without prior written permission, is strictly prohibited. © ABB Oy. PROPRIETARY AND SECRET INFORMATION - CONFIDENTIAL	IT-Mär-15	M. Michelsson	500000636303
A	Initial Approval		01-Nov-16	M. Michelsson	
B	Charging kit updated		01-Nov-16	M. Michelsson	

Cust.	Doc. No.	Project name	Prepared	Check.	Appr.	I-Mär-15	M. Michelsson	Title	ASSEMBLY DRAWING	Scale	Form
						01-Nov-16	M. Koskinen	ACS880-1604 GENERIC W800	ASSEMBLY DRAWING	1:25	A3
						01-Nov-16	M. Asikainen	DDC GENERIC STAGE	Rev.ind B (TAP)		
									Doc. No.		
									Sheet		
									Long		
									EN		

5

Guidelines for planning electrical installation

Contents of this chapter

This chapter contains instructions on selecting, placing and protecting the DC/DC converter circuit components and cables.

Limitation of liability

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

Generic guidelines

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

Selecting the energy storage



WARNING!

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

The energy storage does not belong to the converter unit delivery. The customer (or the system integrator) must equip the DC/DC converter with a suitable energy storage system. The customer (or the system integrator) must also connect parallel modules (if any) to the same energy storage. Additional guidelines:

- 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 DC/DC converter 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:
 $U_{\text{storage}} = 150 \text{ V} \dots 80\% \text{ of } U_{\text{DC}}$
- Typical DC voltage values:
 - with diode supply units with modules (ACS880-304 +A003, ACS880-304 +A018):
 $U_{\text{DC}} = 1.35 \times U_{\text{AC}}$
 - with IGBT supply units with modules (ACS880-204):
 $U_{\text{DC}} = 1.41 \times U_{\text{AC}}$ (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)
- We recommend 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 is equipped with the optional BAMU voltage/current measurement unit, the converter measures its output voltage (and thus also the energy storage voltage) automatically. If there is no BAMU, you must arrange the voltage measurement separately, and send the measured value to the converter control program, eg, via a fieldbus communication (if in use), 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 the protective circuit breaker of the energy storage](#) and [Energy storage disconnecting device](#).

Implementing protections for the energy storage

■ General principles

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

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

■ Selecting the protective circuit breaker of the energy storage



WARNING!

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

The customer (or the system integrator) must equip the energy storage with a protective circuit breaker. The breaker must be able to switch the load current on and off. The breaker must also provide the overload and short-circuit protection for the energy storage. If there is no other protection devices for the cables at the energy storage end, the breaker must also provide the overload and short-circuit protection for the cable(s).

The energy storage protective circuit breaker does not belong to the converter unit delivery.

The customer (or the system integrator) must verify the operation of the circuit breaker by short circuit calculations taking into account impedances of the converter, filter, 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 ageing to storage impedances.

■ Energy storage disconnecting device

The customer (or the system integrator) must equip the energy storage also with an energy storage disconnecting device. The disconnecting device does not belong to the converter unit 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

ABB equips the DC/DC converter unit with fuses as standard. The fuses protect the DC/DC converter and cables in a cable short-circuit situation.

The customer (or the system integrator) must equip the energy storage with overload and short circuit protection for the cable.

■ 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, we recommend to have it.

■ 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 DC/DC converter unit and the energy storage disconnector. The user must not be able to close the energy storage disconnector before closing the DC switch/disconnector [Q11] of the DC/DC converter.

Selecting and routing the energy storage cables

■ Recommended cables

The customer (or the system integrator) must acquire and connect the energy storage cables. It is possible to use either 3-conductor shielded cable(s) or 4-conductor shielded cables:

- If you use a 4-conductor shielded cable, use 2 conductors for plus and 2 conductors for minus and the shield for PE.
- If you use a 3-conductor shielded cable, use 1 conductor for plus, 1 conductor for minus and 1 conductor and the shield for PE.

■ 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 parallel cabling separation distance should be 0.3 meters.
- 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

The maximum cable length of the energy storage cable(s) is 100 m (328 ft).

■ EMC compliance of the complete installation

Note: 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 multidrive 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 (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 (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 multidrive cabinets and modules electrical planning instructions* (3AUA0000102324 [English]).

Safety and liability

**WARNING!**

Only qualified electricians 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 multidrive cabinets and modules safety instructions* (3AUA0000102301 [English]).

Note: 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 personnel who do work on the drive, motor cable or motor.

**WARNING!**

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

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

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

1. Clearly identify the work location and equipment.
2. Disconnect all possible voltage sources. Make sure that re-connection is not possible. Lock out and tag out.
 - Open the main disconnecting device of the drive.
 - Open the charging switch if present.
 - Open the disconnecter of the supply transformer. (The main disconnecting device in the drive cabinet does not disconnect the voltage from the AC input power busbars of the drive cabinet.)
 - If the drive is equipped with a DC/DC converter unit (optional): Open the DC switch/disconnector ([Q11], option +F286) of the DC/DC converter. Open the disconnecting device of the energy storage connected to the DC/DC converter unit (outside the drive cabinet).
 - Open the auxiliary voltage switch-disconnector (if present), and all other possible disconnecting devices that isolate the drive from dangerous voltage sources.
 - If you have a permanent magnet motor connected to the drive, disconnect the motor from the drive with a safety switch or by other means.
 - Disconnect any dangerous external voltages from the control circuits.
 - After you disconnect power from the drive, always wait 5 minutes to let the intermediate circuit capacitors discharge before you continue.
3. Protect any other energized parts in the work location against contact.
4. Take special precautions when close to bare conductors.
5. Measure that the installation is de-energized. If the measurement requires removal or disassembly of shrouding or other cabinet structures, obey the local laws and regulations applicable to live working (including – but not limited to – electric shock and arc protection).
 - Use a multimeter with an impedance greater than 1 Mohm.
 - Make sure that the voltage between the drive input power terminals (L1, L2, L3) and the grounding (PE) busbar is close to 0 V.
 - Make sure that the voltage between the drive DC busbars (+ and -) and the grounding (PE) busbar is close to 0 V.
 - Make sure that the voltage between the drive output terminals (T1/U, T2/V, T3/W) and the grounding (PE) busbar is close to 0 V.
6. Install temporary grounding as required by the local regulations.
7. Ask the person in control of the electrical installation work for a permit to work.

General notes

■ Printed circuit boards

**WARNING!**

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

■ Optical components

**WARNING!**

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

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



Checking the insulation of the energy storage cable



WARNING!

Obey the safety instructions given in *ACS880 multidrive 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!

Open the DC switch/disconnector [Q11] of each DC/DC converter.



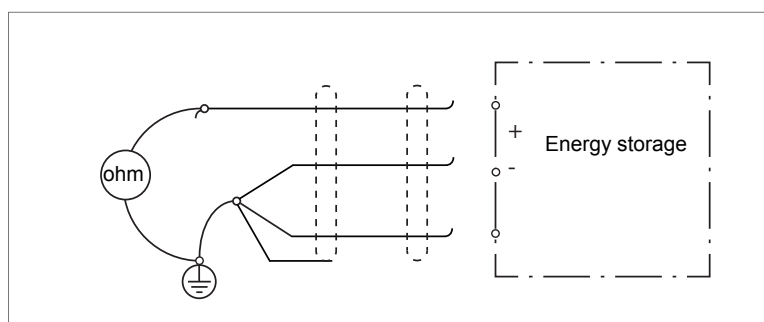
WARNING!

Do not do any voltage withstand or insulation resistance tests on any part of the drive as testing can damage the drive. Every drive has been tested for insulation between the main circuit and the chassis at the factory. Also, there are voltage-limiting circuits inside the drive which cut down the testing voltage automatically.

Check the insulation resistance of the energy storage as instructed by its manufacturer.

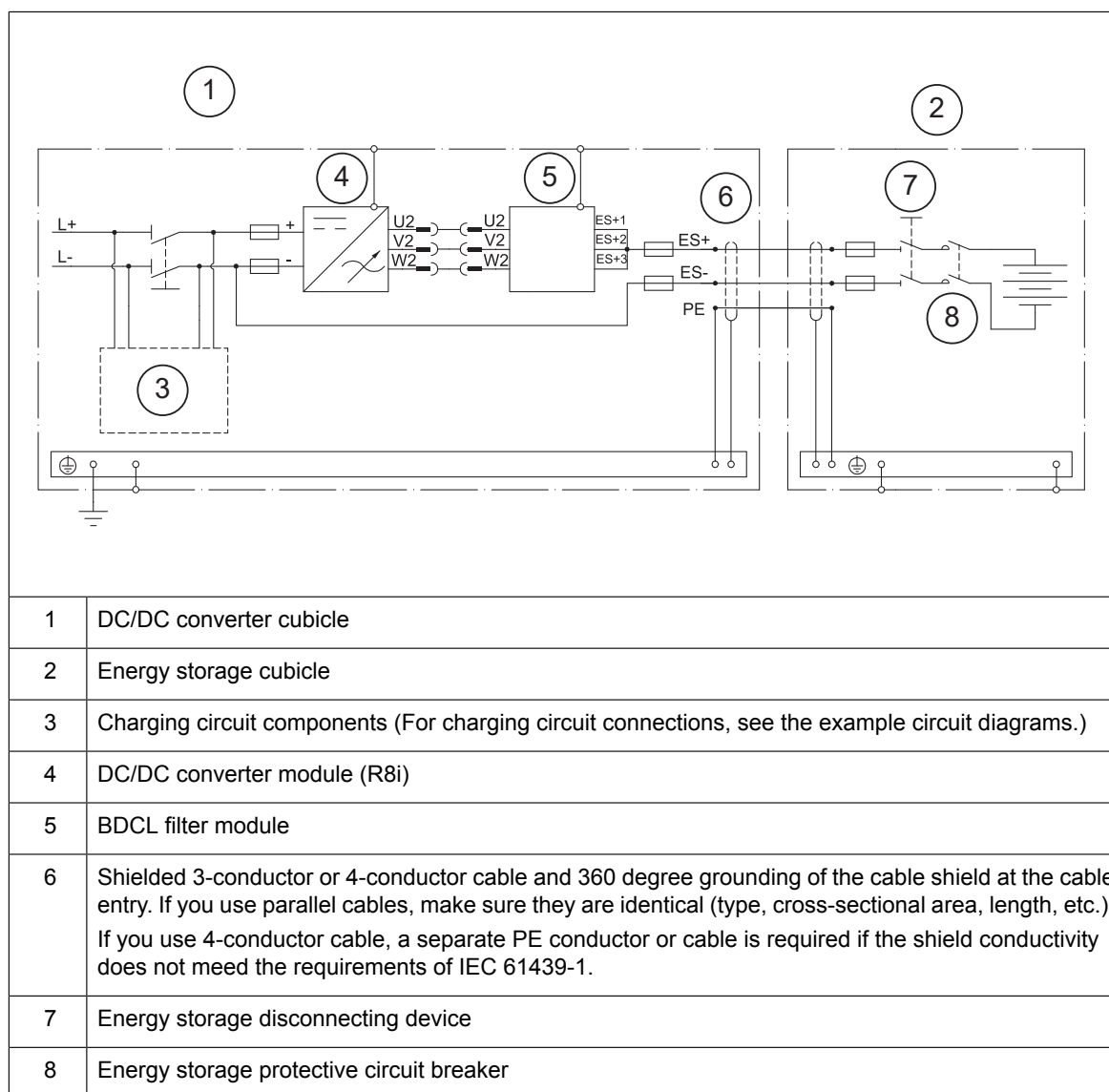
Check the energy storage cable as follows:

1. Make sure that the cable is disconnected from the DC/DC converter and energy storage: all conductors and the shield.
2. At the converter unit end, connect all conductors and shield of the cable together and to the grounding terminal (PE).
3. Disconnect one conductor and measure the insulation resistance between the conductor and the PE by using a measuring voltage of 1 kV DC. The insulation resistance must be higher than 1 Mohm.
4. Reconnect the conductor, disconnect another conductor and measure its insulation resistance. Repeat this for all remaining conductors (including the cable shield).



Connecting the power cables

■ Connection diagram (frame 1×R8i)



Notes:

Connection of the DC/DC converter unit with parallel power modules: Each module must have the output cabling of its own. The cablings must also be identical (cable type, cross-sectional area, and length).

For the cable selection instructions, see [Selecting and routing the energy storage cables \(page 58\)](#).

For tightening torques, see the technical data.

For connecting parallel-connected DC/DC converter modules, see the hardware description.

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



WARNING!

Obey the safety instructions given in *ACS880 multidrive 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 attaching 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 converter and filter modules, and other components of the DC/DC converter unit has been installed in a cabinet, in other words, the mechanical installation of the unit has been done.

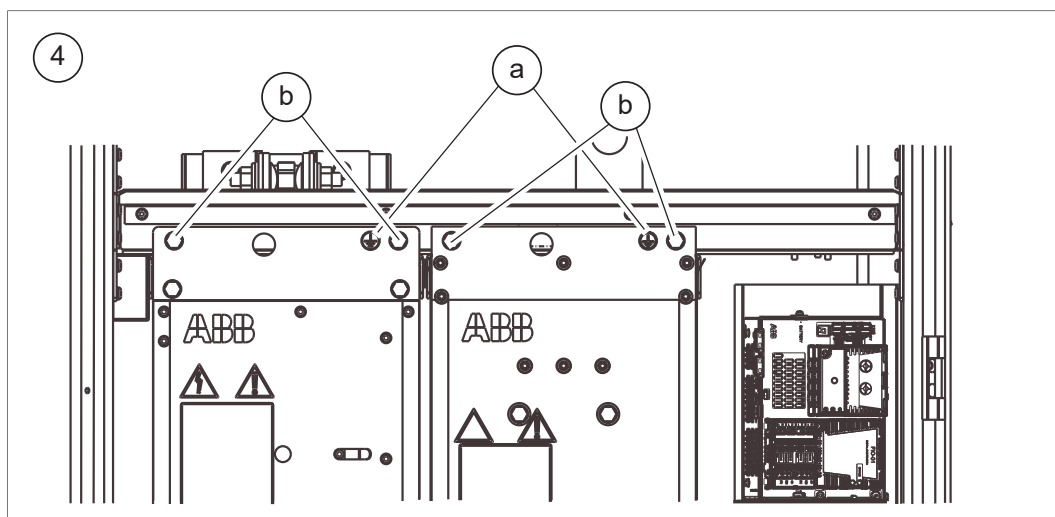
1. Stop the drive and do the steps in section [Electrical safety precautions \(page 61\)](#) before you start the work.
2. Open the door of the DC/DC converter cubicle and remove the shrouding (if any).
3. Make the connections in between the main circuit components inside the cabinet if not done yet. Do the connections according to the final circuit diagrams for the drive. If the connections are ready, check them against the final circuit diagrams. Do not use the example circuit diagrams in this manual as the sole source of information when doing or checking the connections.

For the tightening torques, see the technical data.

4. Ground the modules by the top edge of the front plate. The grounding point is marked on the module (a). Connect the front plate to the frame support bracket (b) with screws. The frame support bracket should have a galvanic connection to the PE busbar through the cabinet frame.

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 merely through the mounting screws and the cabinet chassis is not always good enough. 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). See *ACS880 multidrive cabinets and modules electrical planning instructions* (3AUA0000102324 [English]).



5. Refit any shrouding removed earlier and close the cubicle doors.

■ Connection procedure of the energy storage cables

Make sure that the converter and filter modules, and other components of the DC/DC converter unit has been installed in a cabinet, in other words, the mechanical installation has been done.

Make also sure that the electrical connections between the components of the DC/DC converter unit has been done.



WARNING!

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

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



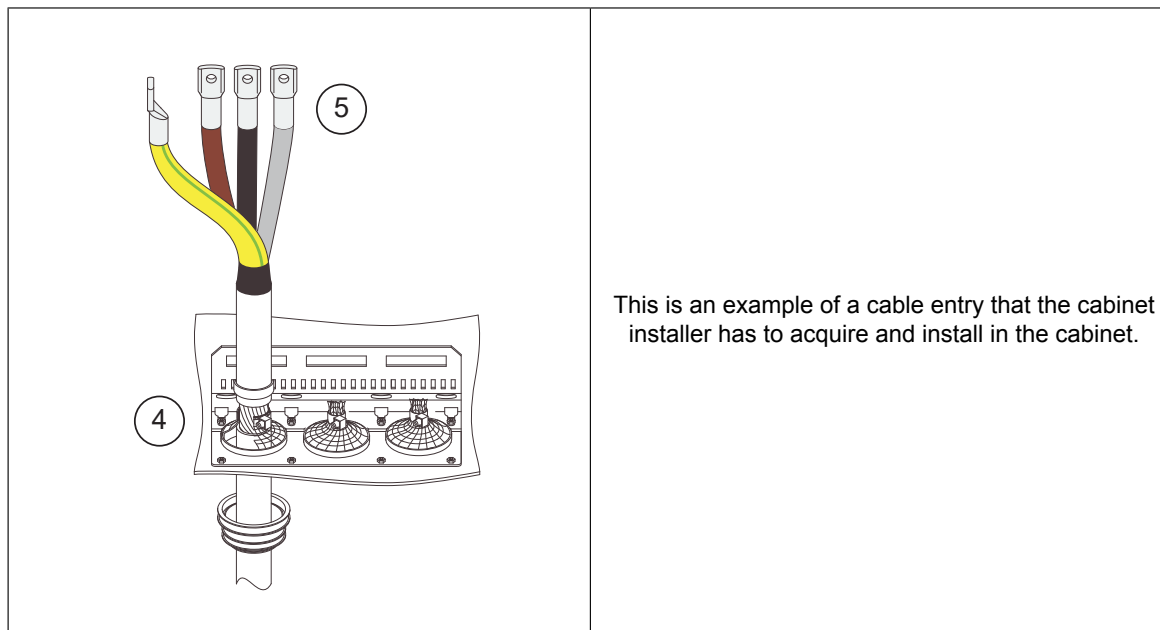
WARNING!

Apply grease to stripped aluminum conductors before attaching them to non-coated aluminum cable lugs. Obey the grease manufacturer's instructions.

Aluminum-aluminum contact can cause oxidation in the contact surfaces.

1. Stop the drive and do the steps in section [Electrical safety precautions \(page 61\)](#) 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.
4. Ground the cable shield 360 degrees 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 appropriate terminals. See the delivery-specific connection diagram of the cabinet-installed unit. For the tightening torques, see the technical data.
7. Twist the cable shields into bundles and connect them to the protective grounding busbar (PE) of the cabinet.
8. Refit any 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.



Connecting the BDCL filter

Make sure that the converter and filter modules, and other components of the DC/DC converter unit has been installed in a cabinet, in other words, the mechanical installation of the unit has been done.

Make sure that the filter module is properly 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 or maintenance work.

1. Stop the drive and do the steps in section [Electrical safety precautions \(page 61\)](#) before you start the work.
2. Do the filter module power connections. See [Connection diagram \(frame 1×R8i\) \(page 65\)](#). Connect the filter terminals ES+1, ES+2 and ES+3 together, for example, using an appropriate kit. See the ordering information.
3. Connect the thermistor input [XD1] of the converter control unit to the filter thermistors [X30:5, X30:6].



WARNING!

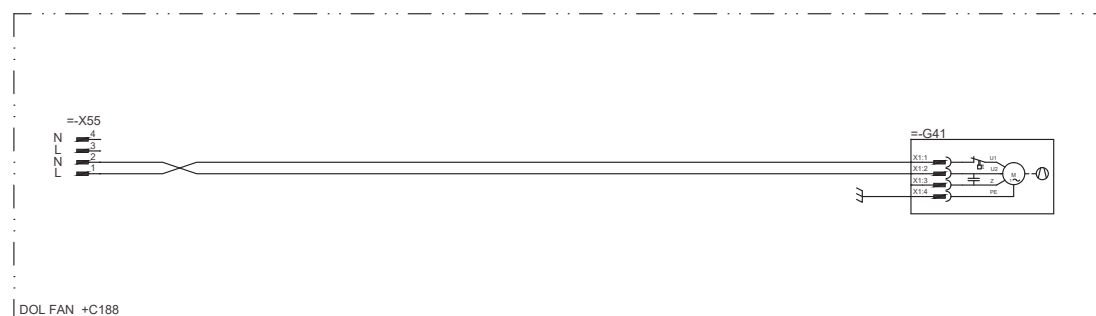
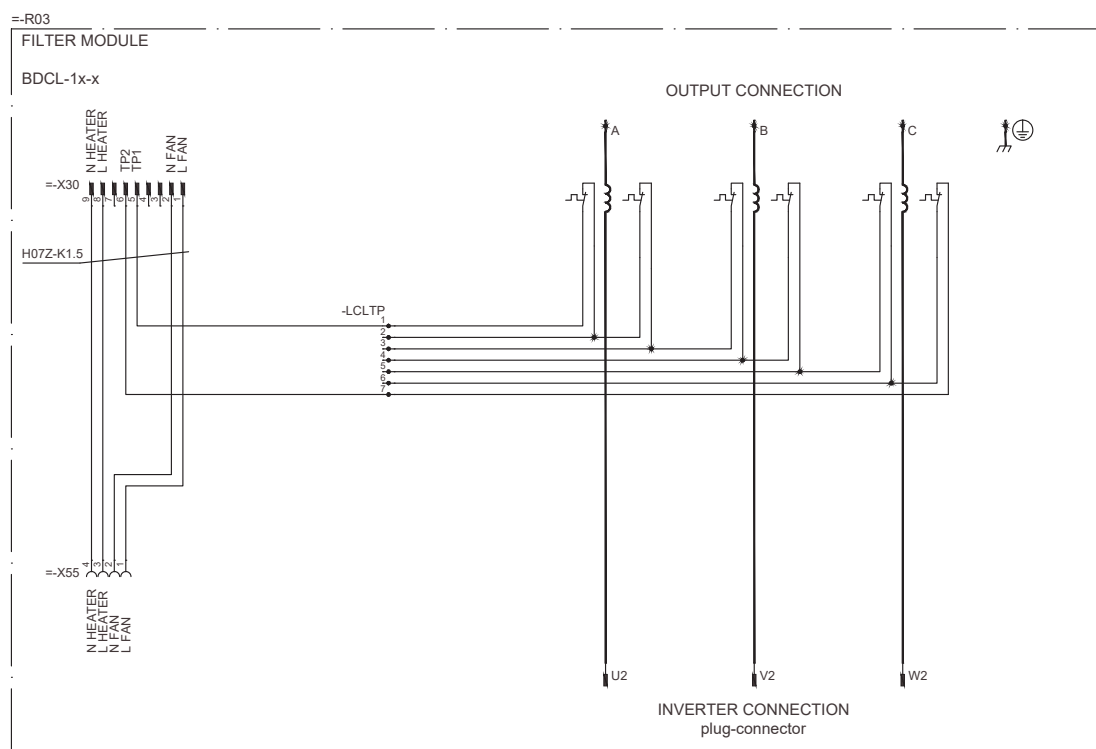
Do not disable the module temperature monitoring function.



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 components and wirings needed.

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

■ R8i DC/DC converter module

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 DC/DC converter module. R8i modules contain a power supply (BDPS) that produces 24 V DC from the auxiliary voltage for the internal circuit boards. The 24 V DC voltage provided by the BDPS is available on X53, and can be used to power one BCU control unit. It is not allowed to use the 24 V DC output on terminal X53 for any other purpose than for powering the BCU 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 the connectors, see the hardware description.

■ BDCL filter module

A direct-on-line fan (option +C188) is used in the BDCL filter module as standard. See [Connecting the BDCL filter \(page 68\)](#).

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

See [Control units of the drive](#).

■ 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 following procedure instructs how to connect the control cables of a DC/DC converter unit. In the example, the power cables are routed to the cabinet through the bottom.



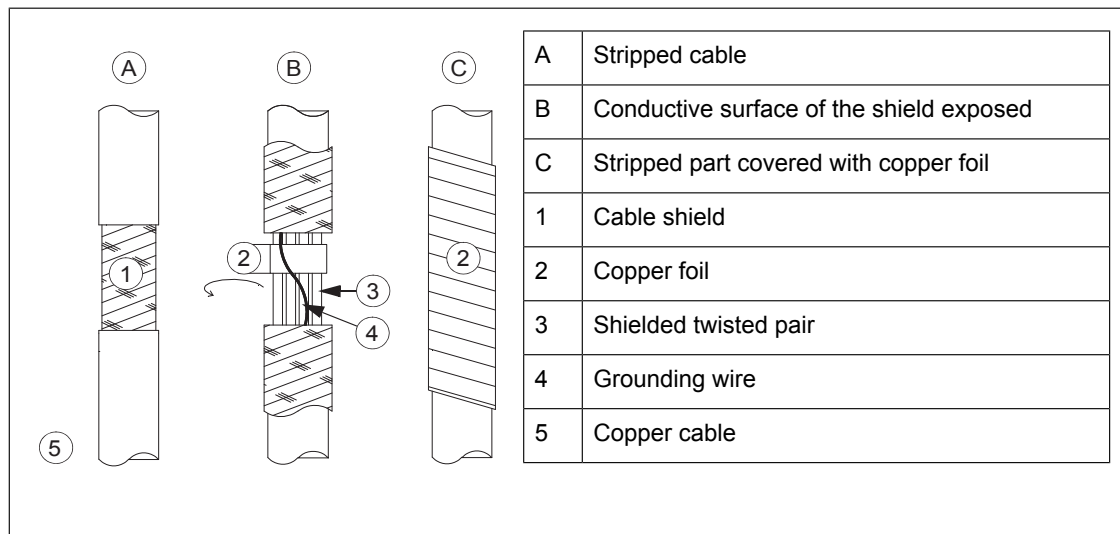
WARNING!

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

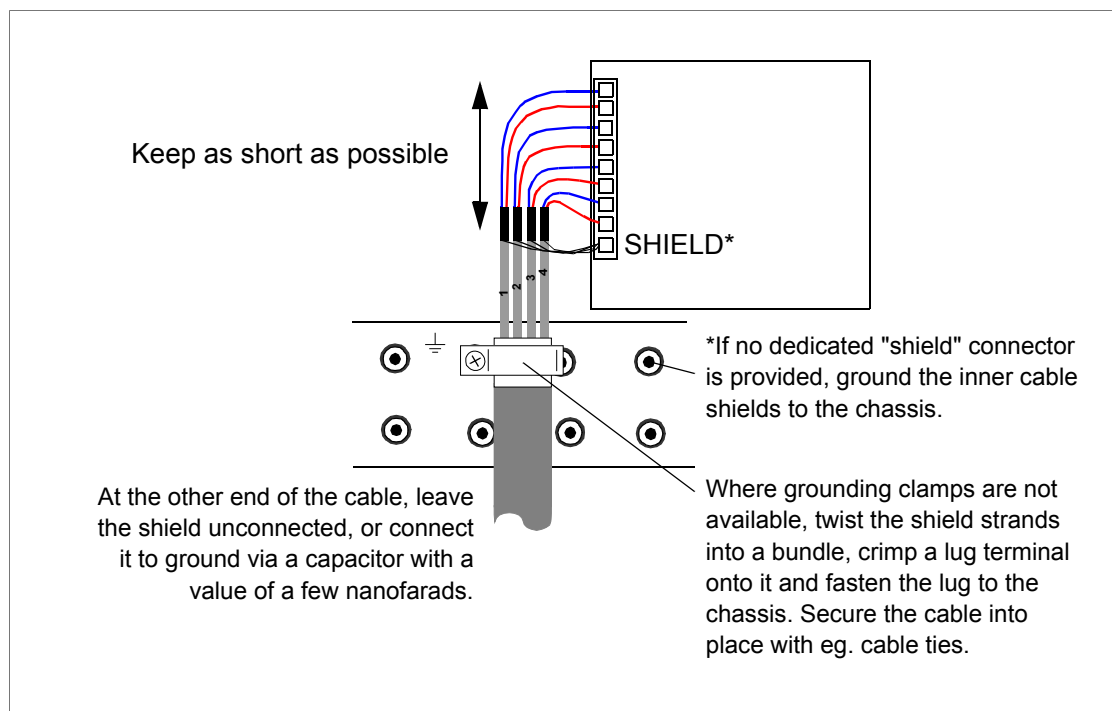
If you are not a qualified electrical professional, do not do installation or maintenance work.

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).



4. Run the cables to the appropriate terminals. Wherever possible:
 - Use the existing cable trunking in the cabinet.
 - Use sleeving wherever the cables are laid against sharp edges.
 - Tie the cables to provide strain relief.
5. Cut the cables to suitable 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 appropriate terminals.

8. Fasten 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 optional modules



WARNING!

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

Note: Pay attention to the free space required by the cabling or terminals coming to the optional modules.

1. Repeat the steps described in section [Electrical safety precautions \(page 61\)](#).
2. Ensure by measuring that the I/O terminals of the control unit (especially the relay output terminals) are safe.
3. Insert the module into a free option module slot on the control unit.
4. Fasten the module. For instructions, see the documentation of the optional module.
5. Connect the necessary wiring to the module following the instructions given in the documentation of the module.
6. Tighten the grounding screw 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.

Connecting a PC

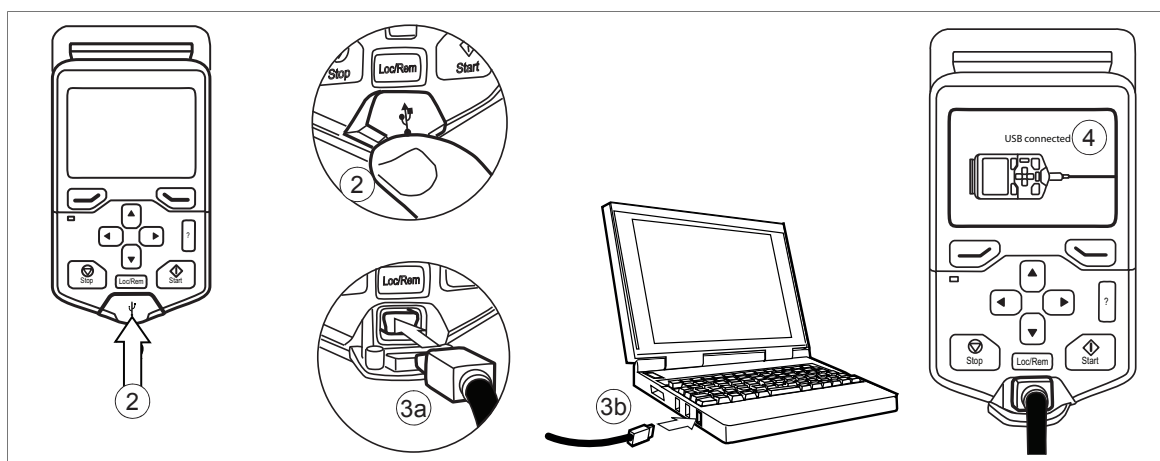


WARNING!

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

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

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



7

Installation checklist of the drive

Contents of this chapter

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

Checklist

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



WARNING!

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

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



WARNING!

Stop the drive and do the steps in section [Electrical safety precautions \(page 61\)](#) before you start the work.

Make sure that ...	<input checked="" type="checkbox"/>
The ambient operating conditions meet the drive ambient conditions specification, and enclosure rating (IP code or UL enclosure type).	<input type="checkbox"/>
The supply voltage matches the nominal input voltage of the drive. See the type designation label.	<input type="checkbox"/>
The drive cabinet is attached to the floor, and if necessary due to vibration etc, also by its top to the wall or roof.	<input type="checkbox"/>
The cooling air flows freely in and out of the drive. Air recirculation inside the cabinet is not be possible (air baffle plates are on place, or there is another air guiding solution).	<input type="checkbox"/>

76 Installation checklist of the drive

Make sure that ...	<input checked="" type="checkbox"/>
<u>If the drive is connected to a network other than a symmetrically grounded TN-S system:</u> You have done all the required modifications (for example, you may need to disconnect the EMC filter or ground-to-phase varistor). See the electrical installation instructions in the supply unit manual.	<input type="checkbox"/>
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 (unpainted) and the connections are tight, or separate grounding conductors have been installed.	<input type="checkbox"/>
The main circuit connections inside the drive cabinet correspond to the circuit diagrams.	<input type="checkbox"/>
The control unit has been connected. See the circuit diagrams.	<input type="checkbox"/>
Appropriate AC fuses and main disconnect are installed.	<input type="checkbox"/>
There is an adequately sized protective earth (ground) conductor(s) between the drive and the switchboard, the conductor is connected to correct terminal, and the terminal is tightened to the correct torque. Proper grounding has also been measured according to the regulations.	<input type="checkbox"/>
There is an adequately sized protective earth (ground) conductor between the energy storage and the DC/DC converter, the conductor has been connected to appropriate terminal, and the terminal has been tightened to the proper torque. Proper grounding has also been measured according to the regulations.	<input type="checkbox"/>
The energy storage cable has been connected to the correct terminals of the DC/DC converter and energy storage, and the terminals have been tightened to the proper torque.	<input type="checkbox"/>
The energy storage has been equipped with fuses for protecting energy storage cable in a cable short-circuit situation.	<input type="checkbox"/>
The energy storage has been equipped with a disconnecting device.	<input type="checkbox"/>
The input power cable is connected to the correct terminals, the phase order is correct, and the terminals are tightened to the correct torque.	<input type="checkbox"/>
There is an adequately sized protective earth (ground) conductor between the motor and the drive, and the conductor is connected to the correct terminal, and the terminal is tightened to the correct torque. Proper grounding has also been measured according to the regulations.	<input type="checkbox"/>
The motor cable is connected to the correct terminals, the phase order is correct, and the terminals are tightened to the correct torque.	<input type="checkbox"/>
The motor cable is routed away from other cables.	<input type="checkbox"/>
No power factor compensation capacitors are connected to the motor cable.	<input type="checkbox"/>
Proper grounding has also been measured according to the regulations.	<input type="checkbox"/>
The control cables are connected to the correct terminals, and the terminals are tightened to the correct torque.	<input type="checkbox"/>
<u>If a drive bypass connection will be used:</u> The direct-on-line contactor of the motor and the drive output contactor are either mechanically and/or electrically interlocked, that is, they cannot be closed at the same time. A thermal overload device must be used for protection when bypassing the drive. Refer to local codes and regulations.	<input type="checkbox"/>
There are no tools, foreign objects or dust from drilling inside the drive.	<input type="checkbox"/>
The area in front of the drive is clean: the drive cooling fan cannot draw any dust or dirt inside.	<input type="checkbox"/>
Cover(s) of the motor connection box are in place. Cabinet shrouds are in place and doors are closed.	<input type="checkbox"/>
<u>If the drive is stored for longer than one year:</u> The electrolytic DC capacitors in the DC link of the drive are reformed. Refer to <i>Converter module capacitor reforming instructions</i> (3BFE64059629 [English]).	<input type="checkbox"/>
The motor and the driven equipment are ready for power-up.	<input type="checkbox"/>

8

Start-up

Contents of this chapter

This chapter describes the start-up procedure of the converter unit. The information is valid for the example DC/DC converter units presented in the example circuit diagrams.


The underlined tasks are needed for certain cases only. The default device designations (if any) are given in square brackets, for example, DC switch/disconnector [Q11]. The same device designations are also used in the example circuit diagrams, typically. They refer to the circuit diagram of the example installation by ABB.




**WARNING!**

Only qualified by ABB electricians/engineers are allowed to do the work described in this chapter. In addition, the electrician/engineer must know the energy storage system he is about to take into use, and the DC/DC converter control program and operation principle. Obey all the safety instructions in *ACS880 multidrive cabinets and modules safety instructions* (3AUA0000102301 [English]) and *Electrical safety precautions* (page 61). If you ignore the safety instructions, injury or death, or damage to the equipment can occur.


Before you start, connect a control panel to the DC/DC converter unit. We recommend that you also have a PC with a drive commissioning tool (Drive composer) connected.

Start-up procedure

Tasks	<input checked="" type="checkbox"/>
Safety	
 <p>WARNING! Obey the safety instructions during the start-up procedure. See <i>ACS880 multidrive cabinets and modules safety instructions</i> (3AUA0000102301 [English]). If you ignore the safety instructions, injury or death, or damage to the equipment can occur.</p> <p>If you are not a qualified electrical professional, do not do installation or maintenance work.</p>	<input type="checkbox"/>
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 61) .	<input type="checkbox"/>
Make sure that the disconnecter of the supply transformer is locked to the off (0) position, that means no voltage is, or cannot be connected to drive inadvertently.	<input type="checkbox"/>
Make sure that all external auxiliary circuits are switched off and disconnected. See the start-up instructions in the supply unit hardware manual.	<input type="checkbox"/>
Make sure that the supply unit is switched off, and the drive system has been isolated from the supply network.	<input type="checkbox"/>
<u>DC/DC converter with the DC switch/disconnector [Q11]:</u> Make sure that the DC switch/disconnector [Q11] and the DC/DC converter charging switch [Q10] are open and locked.	<input type="checkbox"/>
Make sure that the energy storage disconnecting device is open and locked to open position (customer or system integrator-installed device).	<input type="checkbox"/>
Make sure that the mechanical and electrical installation of the converter unit has been inspected and is OK. See the installation checklist.	<input type="checkbox"/>
<p>Make sure that the drive is ready for the converter unit power up:</p> <ul style="list-style-type: none"> • 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 appropriate supply unit manual. • The inverter units have been started up according to the instructions given in the hardware manual and appropriate firmware manual. <p>For the supply and inverter unit hardware manuals, see Related documents (page 15).</p> <p>Note: If the drive has been stored over one year: Reform the electrolytic DC capacitors in the DC bus of the drive. See the separate reforming instructions (available in the Internet or from your local ABB representative).</p>	<input type="checkbox"/>
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.	<input type="checkbox"/>
Close the cabinet doors.	<input type="checkbox"/>
Connecting voltage to the drive and converter control unit	
Connect main AC voltage to the input terminals of the drive supply unit. (Close the main breaker of the supply transformer.)	<input type="checkbox"/>



Tasks	<input checked="" type="checkbox"/>
<p> WARNING! When connecting voltage to the supply unit, the DC busbars will become live, as will all the converters connected to the DC bus.</p> <p> WARNING! <u>Converter units with a DC switch/disconnector:</u> Some types of the converter module may be energized through a charging circuit even when the DC switch/disconnector is open or the DC fuses are removed.</p> <p><u>Converter units without a DC switch/disconnector:</u> If the converter unit only has DC fuses without a switch fuse, all the converter units with the DC fuses in place will be energized when the main breaker/contacter closes. To prevent this, remove the fuses from the converter units which are to remain unenergized before connecting voltage. When the main breaker/contacter of the supply unit is closed (DC busbars are live), never remove or insert the DC fuses of a converter unit.</p> <p><u>If the drive is equipped with a main switch/disconnector:</u> Close the main disconnecting device of the drive system.</p>	<input type="checkbox"/>
<p>Close the auxiliary voltage switch [Q21] of the drive supply unit. The converter control unit will be powered.</p> <p>Do not close the main circuit breaker [Q1] or the main contactor [Q2] of the drive supply unit yet! You must not power up the drive DC bus yet.</p>	<input type="checkbox"/>
Setting the parameters	
<p>Set the DC/DC converter parameters. See chapter Start-up in the <i>DC/DC converter control program firmware manual</i> (3AXD50000024671 [English]).</p> <p>If you need information on the use of the control panel, see <i>ACX-AP-x assistant control panels user's manual</i> (3AUA0000085685 [English]). See also <i>Drive composer start-up and maintenance PC tool user's manual</i> (3AUA0000094606 [English]).</p>	<input type="checkbox"/>
Charging the DC/DC converter and connecting voltage to the converter	
<p> WARNING! Make sure that the energy storage disconnecting device is still open. Always keep the energy storage disconnected from DC/DC converter until the DC/DC converter is charged.</p>	<input type="checkbox"/>
<p>Power up and charge the DC/DC converter:</p> <p><u>DC/DC converter with the DC switch/disconnector [Q11]:</u></p> <ol style="list-style-type: none"> 1. Start the supply unit and close the main contactor [Q2] or the main circuit breaker [Q1] of the drive supply unit. 2. Close the DC/DC converter charging switch [Q10]. 3. Close the DC switch/disconnector [Q11]. 4. Open the DC/DC converter charging switch [Q10]. <p>Note: The charging switch must be open before you can start the DC/DC converter.</p> <p><u>DC/DC converter without DC switch/disconnector:</u></p> <ol style="list-style-type: none"> 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. 	<input type="checkbox"/>
Connecting the energy storage to the DC/DC converter	
<p>Set parameter <i>120.12 Run enable 1</i> to <i>Off</i>. This makes sure that the DC/DC converter does not start automatically or unexpectedly after you connect the energy storage.</p>	<input type="checkbox"/>
<p>Switch the control panel to local control mode.</p>	<input type="checkbox"/>
<p>Make sure that the energy storage voltage is below the drive DC link voltage.</p>	<input type="checkbox"/>



Tasks	<input checked="" type="checkbox"/>
 WARNING! Do not close the energy storage disconnecting device if the DC/DC converter is not connected or not ready to use.	<input type="checkbox"/>
Close the energy storage disconnecting device (customer or system integrator-installed device).	
Close the energy storage protective circuit breaker (customer or system integrator-installed device).	<input type="checkbox"/>
Testing the DC/DC converter operation	
Set parameter <i>120.12 Run enable 1</i> to On.	<input type="checkbox"/>
Set parameter <i>122.01 User Power ref</i> to 0 A.	<input type="checkbox"/>
Set current limits to low values, for example, <ul style="list-style-type: none"> • <i>130.119 Minimum current</i> to -50 A. • <i>130.120 Maximum current</i> to 50 A. 	<input type="checkbox"/>
Press the control panel Start key to start the converter. After start, increase slowly the value of parameter <i>122.01 User Power ref</i> .	<input type="checkbox"/>
Check the following signals: <ul style="list-style-type: none"> • <i>102.01 DC voltage</i> • <i>102.02 ES voltage used</i> • <i>102.08 Total current</i> • <i>102.11 Modulation index %</i> • <i>130.101 DDC limit word 1</i>. 	
Make sure that the DC/DC converter module and filter module cooling fan rotates freely in the right direction. A paper sheet set on the intake (door) gratings stays. The fans run noiselessly.	<input type="checkbox"/>
Press the control panel Stop key to stop the converter.	<input type="checkbox"/>




Disconnecting the DC/DC converter with DC switch/disconnector

Tasks	<input checked="" type="checkbox"/>
Safety	
  WARNING! Obey the safety instructions during the start-up procedure. See <i>ACS880 multidrive cabinets and modules safety instructions</i> (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.	<input type="checkbox"/>
Stopping the DC/DC converter	
Press the control panel Stop key. Change the control panel to local mode (loc/rem key). To prevent accidental restart, set parameter <i>120.19 Enable start signal</i> to value <i>Off</i> .	<input type="checkbox"/>
Disconnecting the energy storage	
Open the energy storage protective circuit breaker.	<input type="checkbox"/>
Open the energy storage disconnecting device. Lock out and tag out.	<input type="checkbox"/>
Disconnecting the DC/DC converter	

Tasks	<input checked="" type="checkbox"/>
Open the DC switch/disconnector [Q11]. Lock out and tag out.	<input type="checkbox"/>
Working inside the DC/DC converter cubicle	
If you need to work inside the DC/DC converter cubicle, you must switch off and disconnect the whole multidrive system from any (AC, DC, main or auxiliary) power sources. Before you start the work, repeat also the necessary safety precautions. See Electrical safety precautions (page 61) .	<input type="checkbox"/>

Reconnecting the DC/DC converter with DC switch/disconnector

Tasks	<input checked="" type="checkbox"/>
Safety	
 <p>WARNING! Obey the safety instructions during the start-up procedure. See <i>ACS880 multidrive cabinets and modules safety instructions</i> (3AUA0000102301 [English]). If you ignore the safety instructions, injury or death, or damage to the equipment can occur.</p> <p>If you are not a qualified electrical professional, do not do installation or maintenance work.</p>	<input type="checkbox"/>
Reconnecting the DC/DC converter	
<p>After you have finished the work inside the converter cubicle, reinstall any shrouds, and close the door. Reconnect the DC/DC converter and energy storage. See:</p> <ul style="list-style-type: none"> • Connecting voltage to the drive and converter control unit (page 78) • Charging the DC/DC converter and connecting voltage to the converter (page 79) and • Connecting the energy storage to the DC/DC converter (page 79). 	<input type="checkbox"/>
Starting the DC/DC converter	
<p>Change the control panel to local mode (loc/rem key). Set parameter <i>120.19 Enable start signal</i> to value <i>On</i>. Press the control panel Start key.</p> <p>If you need information on the use of the control panel, see <i>ACX-AP-x assistant control panels user's manual</i> (3AUA0000085685 [English]). See also <i>Drive composer start-up and maintenance PC tool user's manual</i> (3AUA0000094606 [English]).</p>	<input type="checkbox"/>



9

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

Component	Years from start-up												
	1	2	3	4	5	6	7	8	9	10	11	12	...
Cooling fans													
Main cooling fan (speed-controlled)									R				
Main cooling fan (direct-on-line, 50 Hz)									R				
Main cooling fan (direct-on-line, 60 Hz)									R				
BDCL filter cooling fan (DOL, 50 Hz)									R				
BDCL filter cooling fan (DOL, 60 Hz)						R						R	
Internal cooling fan for circuit boards									R				
Cabinet cooling fan, internal (50 Hz)									R				
Cabinet cooling fan, internal (60 Hz)						R						R	
Cabinet cooling fan, IP54 (50 Hz)									R				
Cabinet cooling fan, IP54 (60 Hz)						R						R	
Batteries													
Control panel battery									R				
Control unit battery						R						R	
Connections and environment													
Cabinet door filters (IP54)	R	R	R	R	R	R	R	R	R	R	R	R	R
Quality of supply voltage	P	P	P	P	P	P	P	P	P	P	P	P	P
Spare parts													
Spare parts	I	I	I	I	I	I	I	I	I	I	I	I	I
Reforming of DC circuit capacitors, spare modules and spare capacitors	P	P	P	P	P	P	P	P	P	P	P	P	P
Other useful tasks													
IP42 air inlet and outlet meshes	I	I	I	I	I	I	I	I	I	I	I	I	I
Checking tightness of cable and bus bar terminals. Tightening if needed.	I	I	I	I	I	I	I	I	I	I	I	I	I
Checking ambient conditions (dustiness, moisture, temperature)	I	I	I	I	I	I	I	I	I	I	I	I	I
Cleaning heatsinks of DC/DC converter module	I	I	I	I	I	I	I	I	I	I	I	I	I

Symbols

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

Maintenance and component replacement intervals are based on the assumption that the equipment is operated within the specified ratings and ambient conditions. ABB recommends annual drive inspections to ensure the highest reliability and optimum performance.

Note: Long term operation near the specified maximum ratings or ambient conditions may require shorter maintenance intervals for certain components. Consult your local ABB Service representative for additional maintenance recommendations.

Maintenance timers and counters

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

Cabinet

■ Cleaning the interior of the cabinet



WARNING!

Obey the safety instructions given in *ACS880 multidrive 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!

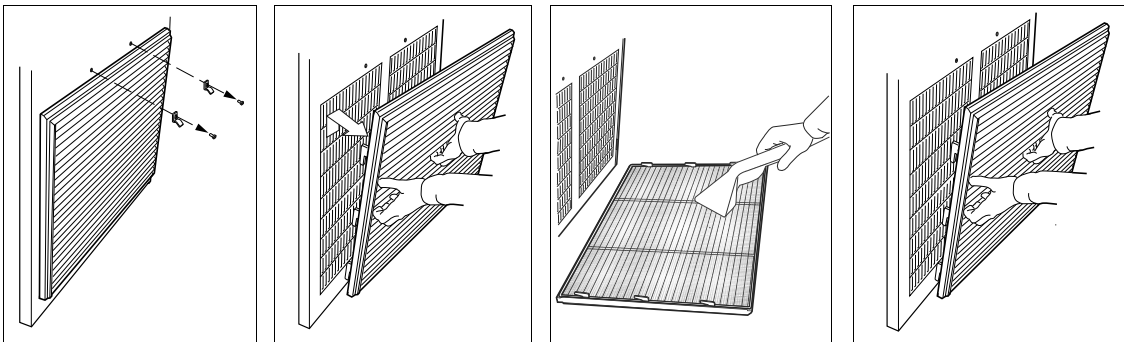
Use a vacuum cleaner with antistatic hose and nozzle, and wear a grounding wristband. Using a normal vacuum cleaner creates static discharges which can damage circuit boards.

1. Stop the drive and do the steps in section [Electrical safety precautions \(page 61\)](#) 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)

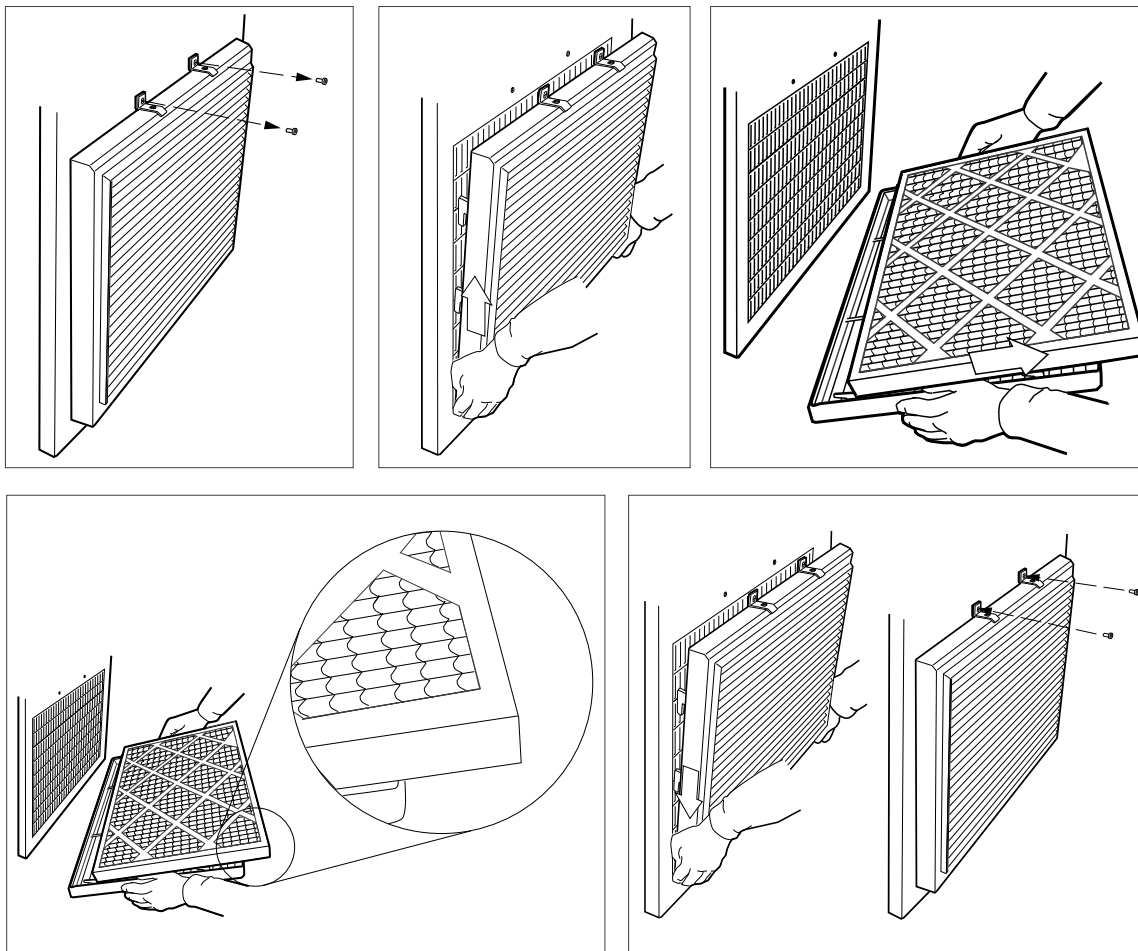
Check the dustiness of the air inlet meshes. If the dust cannot be removed by vacuum cleaning from outside through the grating holes with a small nozzle, proceed as follows:

1. Stop the drive and do the steps in section [Electrical safety precautions \(page 61\)](#) 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 \(page 61\)](#) 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.

Power connections

■ Retightening the power connections



WARNING!

Obey the safety instructions given in *ACS880 multidrive 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. Repeat the steps described in section [Electrical safety precautions \(page 61\)](#).
2. Check the tightness of the cable connections. Use the tightening torques given in the technical data.

Fans

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

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

■ Replacing the cabinet cooling fan

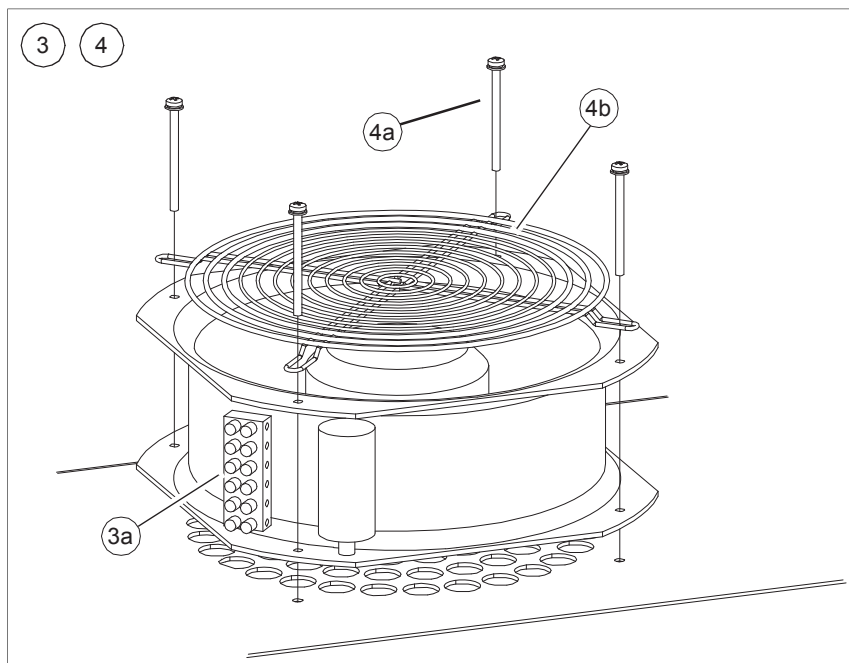


WARNING!

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

1. Stop the drive and do the steps in section [Electrical safety precautions \(page 61\)](#) 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. Check that the arrow indicating the air flow direction points upwards.



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

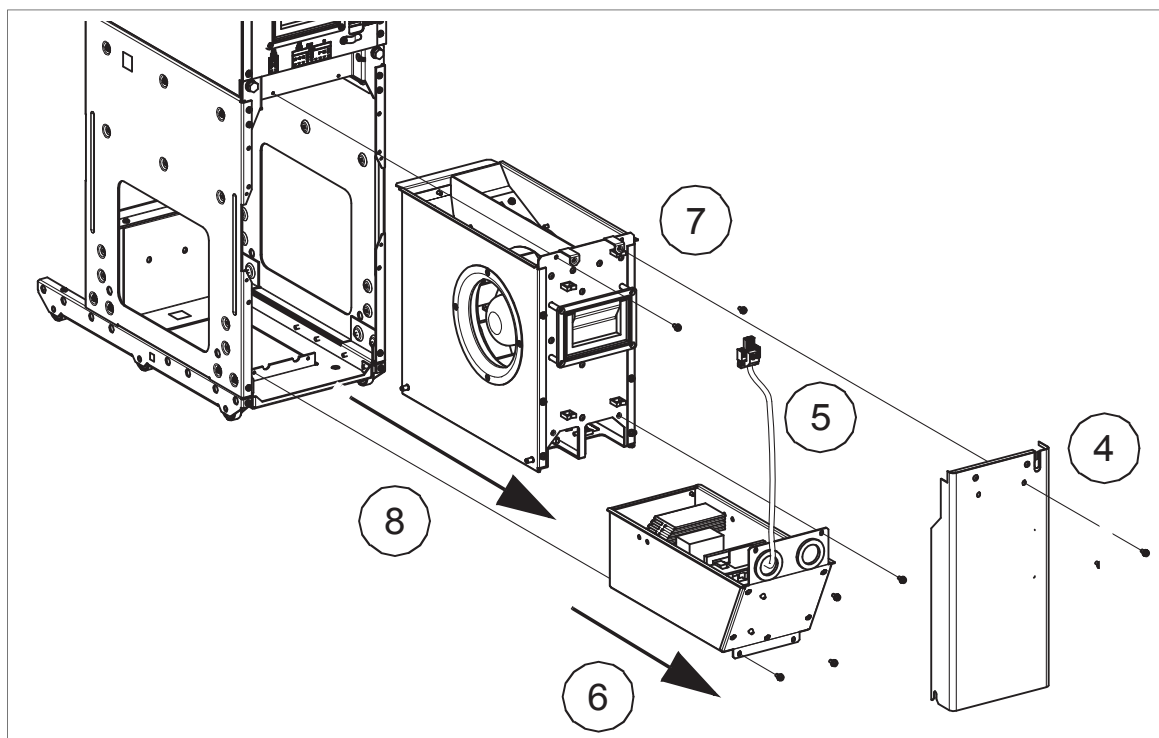
If you are not a qualified electrical professional, do not do installation or maintenance work.



WARNING!

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

1. Stop the drive and do the steps in section [Electrical safety precautions \(page 61\)](#) 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!**

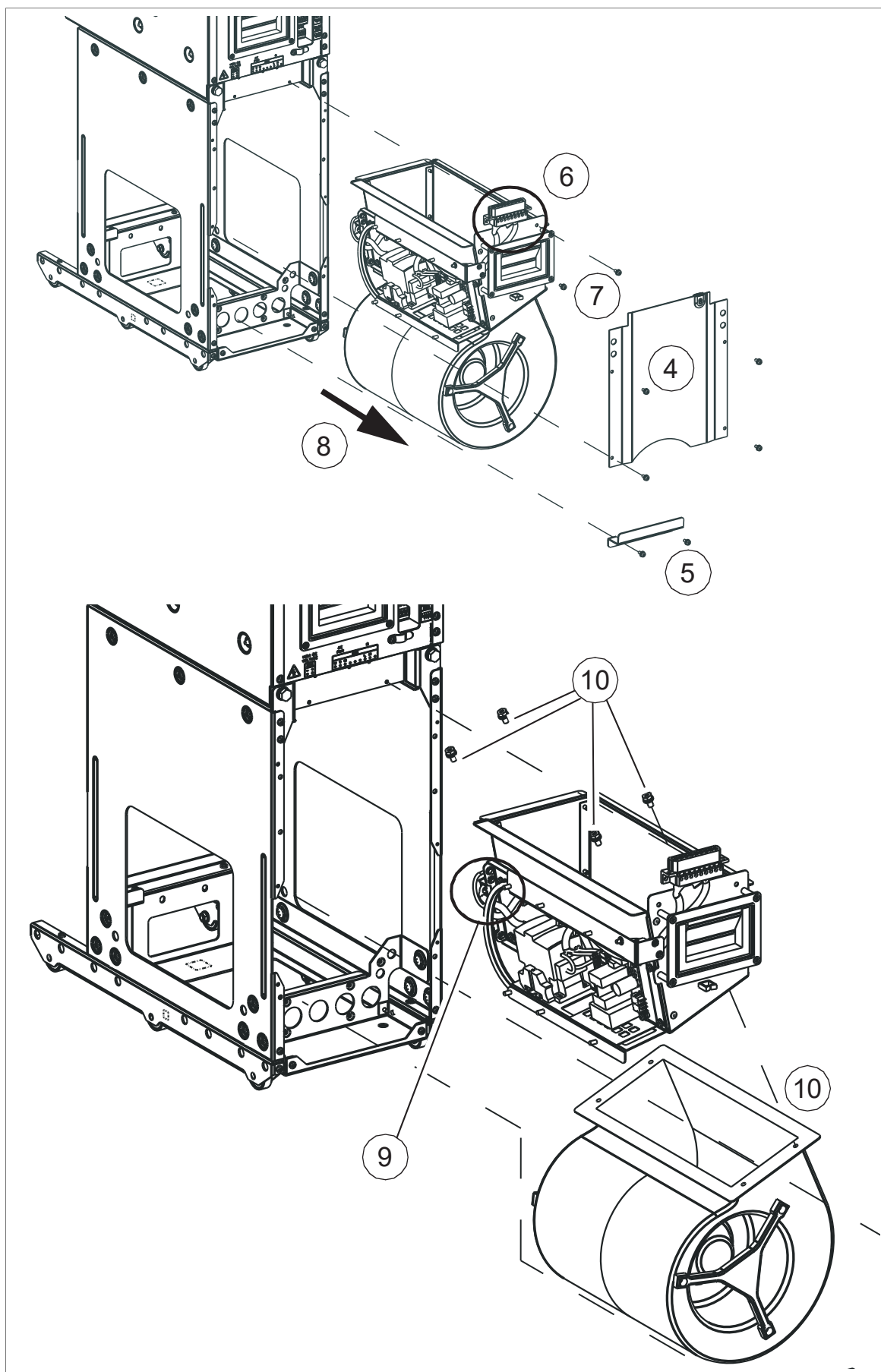
Obey the safety instructions given in *ACS880 multidrive cabinets and modules safety instructions* (3AUA0000102301 [English]). If you ignore the safety instructions, injury or death, or damage to the equipment can occur.

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 do the steps in section [Electrical safety precautions \(page 61\)](#) 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.

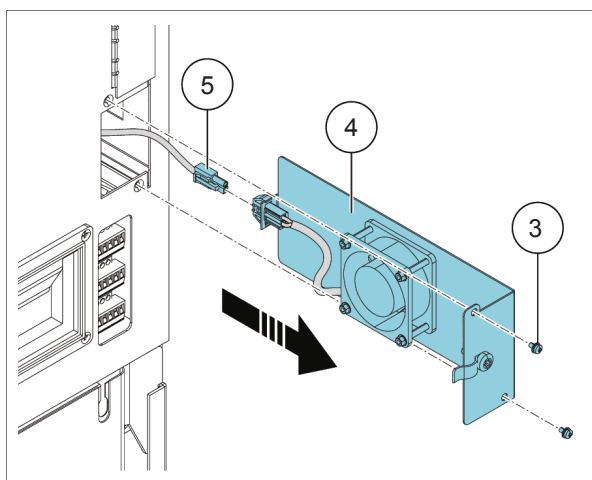


WARNING!

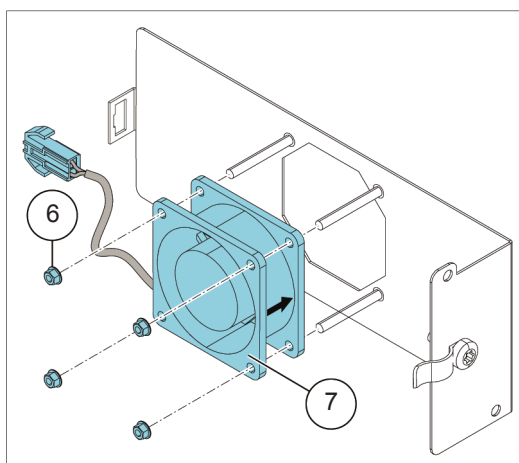
Obey the safety instructions given in *ACS880 multidrive cabinets and modules safety instructions* (3AUA0000102301 [English]). If you ignore the safety instructions, injury or death, or damage to the equipment can occur.

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

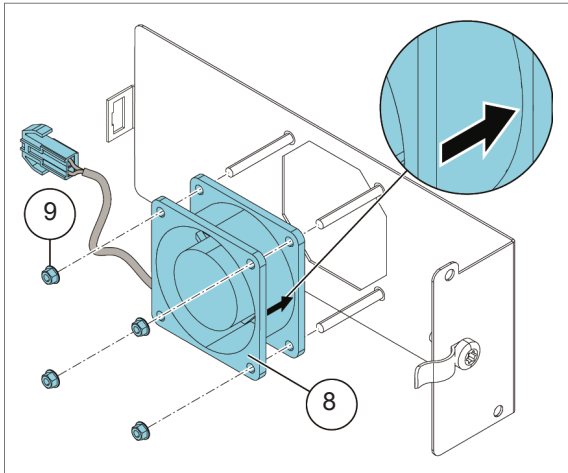
1. Stop the drive and do the steps in section [Electrical safety precautions \(page 61\)](#) before you start the work.
2. Open the door of the module cubicle.
3. Remove the two M4×12 (T20) screws which lock the fan holder.
4. Pull the fan holder out of the module.
5. Disconnect the fan cable.



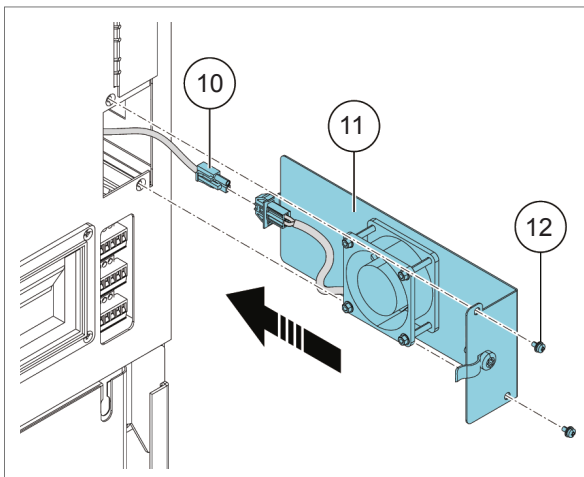
6. Remove the four M3 (5.5 mm) nuts which hold the fan.
7. Remove the fan from the fan holder.



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!**

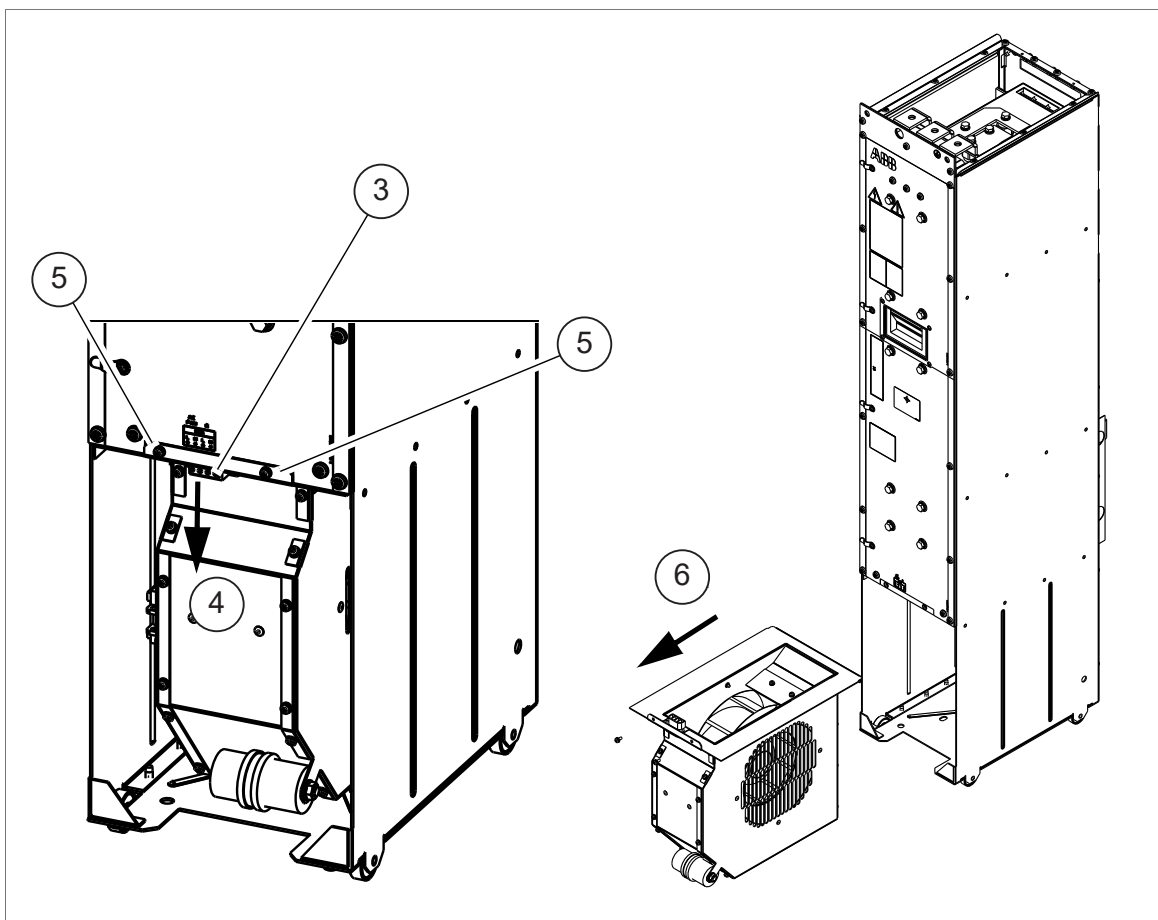
Obey the safety instructions given in *ACS880 multidrive cabinets and modules safety instructions* (3AUA0000102301 [English]). If you ignore the safety instructions, injury or death, or damage to the equipment can occur.

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 do the steps in [Electrical safety precautions](#).
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 multidrive 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. Disconnect the drive from the AC power line and DC/DC converter from the energy storage and obey the instructions in section [Electrical safety precautions](#). See [Disconnecting the DC/DC converter with DC switch/disconnector](#).
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 multidrive 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. Disconnect the drive from the AC power line and DC/DC converter from the energy storage and obey the instructions in section [Electrical safety precautions](#).
 2. Follow 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!**

Obey the safety instructions given in *ACS880 multidrive 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 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 \(page 61\)](#) before you start the work.
 2. Remove the drive module from the cabinet.
 3. Remove the module cooling fan(s). See the separate instructions.
 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. If there is a risk of dust entering adjoining equipment, do the cleaning in another room.
 5. Reinstall the cooling fan.
-

■ Replacing the R8i DC/DC converter module

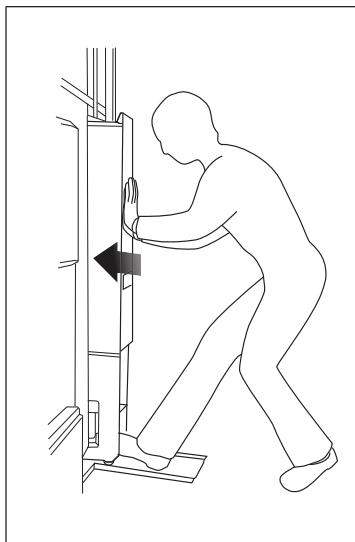
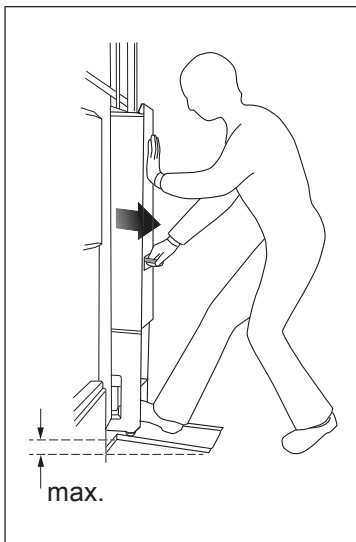


WARNING!

Obey the safety instructions given in *ACS880 multidrive 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 with plinth heights which exceeds the maximum allowed 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.

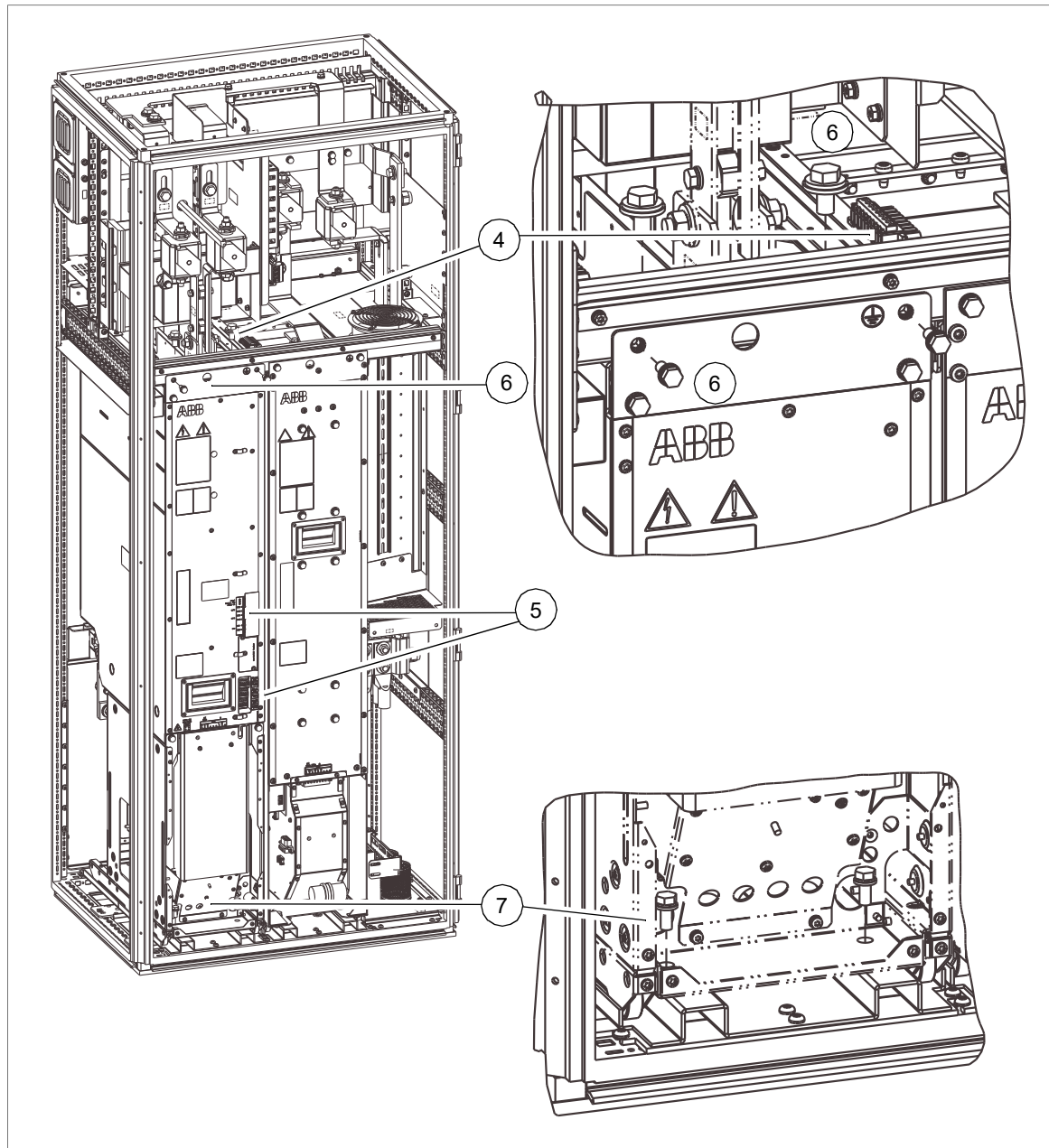


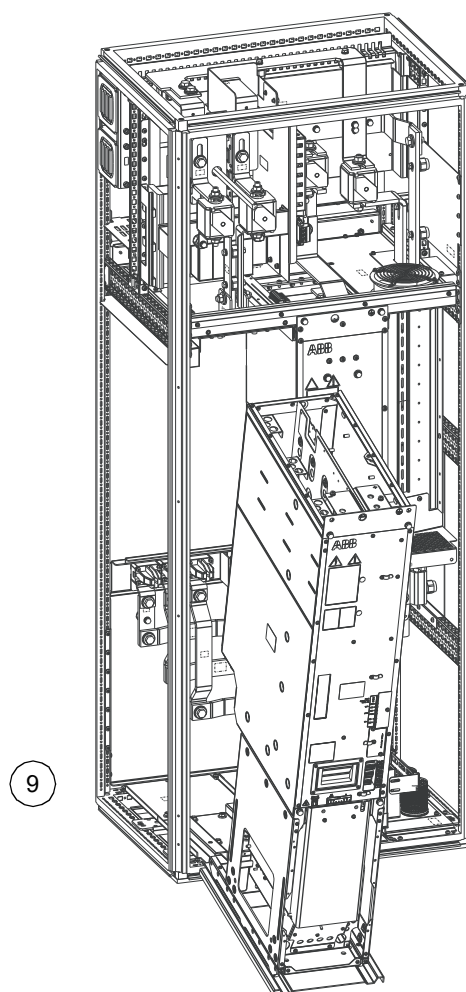
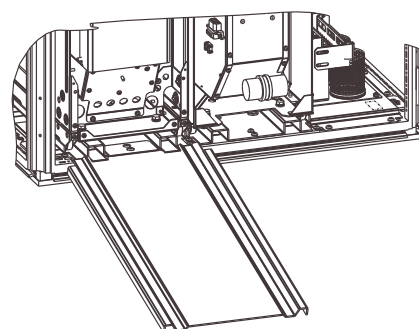
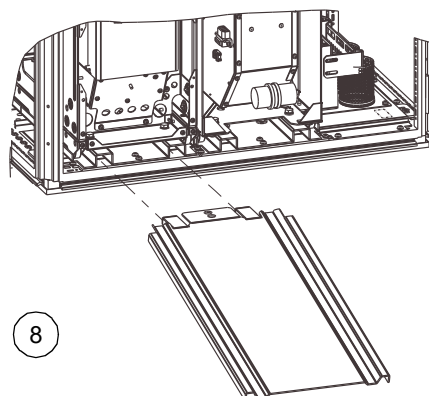
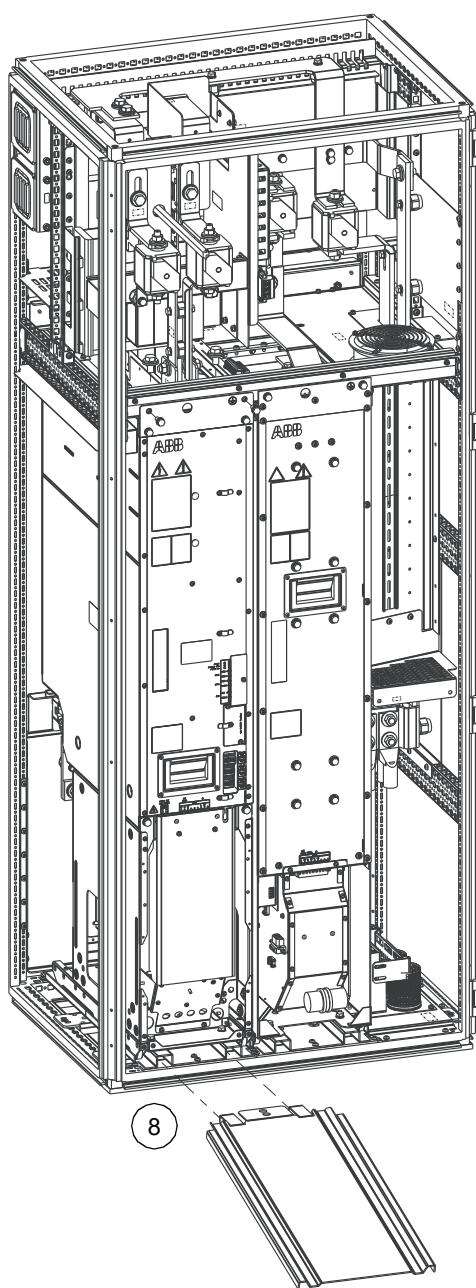
- Be careful when handling a tall module. The module overturns easily because it is heavy and has a high center of gravity. Whenever possible, secure the module with chains. Do not leave an unsupported module unattended especially on a sloping floor.



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

1. Disconnect the drive from the AC power line and DC/DC converter from the energy storage and obey the instructions in section [Electrical safety precautions \(page 61\)](#). See [Disconnecting the DC/DC converter with DC switch/disconnector \(page 80\)](#).
 2. Open the cubicle door.
 3. Remove the shrouds (if any).
 4. Unplug the terminal block [X50] cable (if any) on top of the module.
 5. Unplug 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 any other 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.
-





BDCL filter module

■ Replacing the BDCL filter

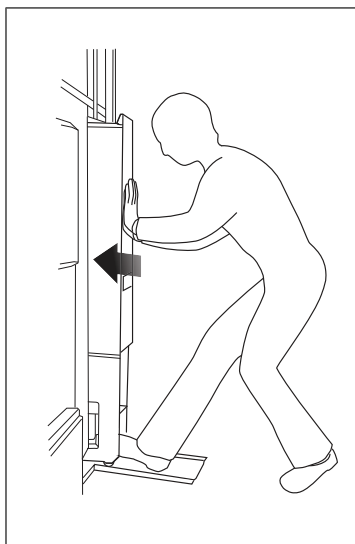
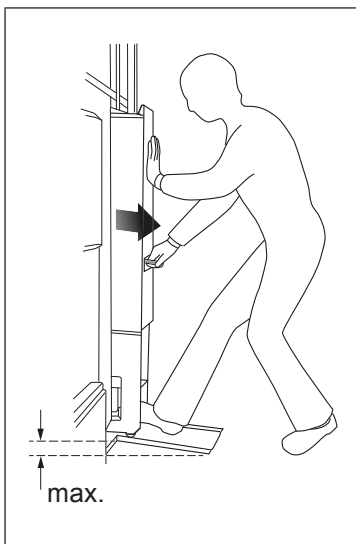


WARNING!

Obey the safety instructions given in *ACS880 multidrive 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.

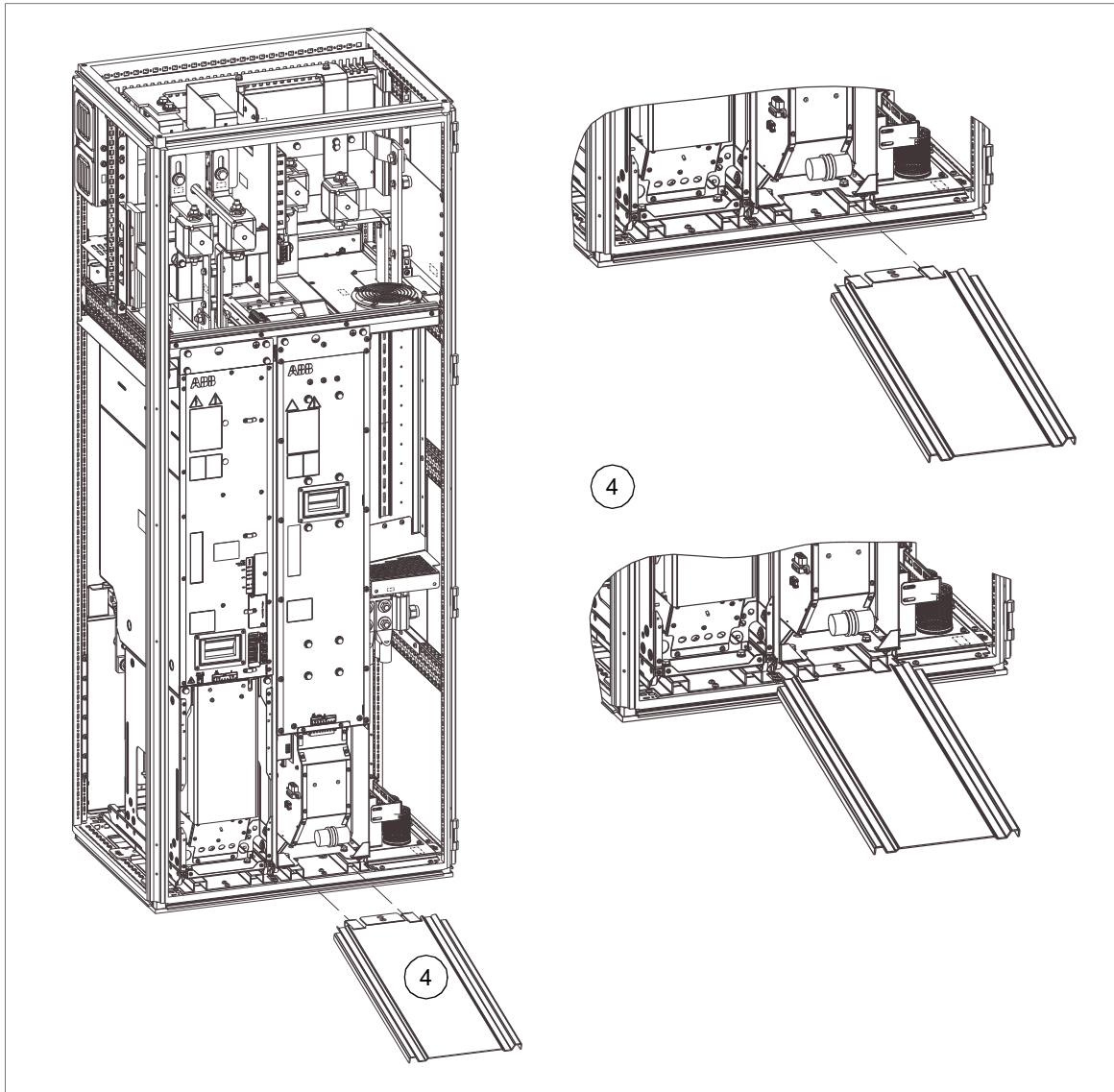
- Do not use the module extraction/installation ramp with plinth heights which exceeds the maximum allowed height.
- Secure the module extraction/installation ramp carefully.
- Push the module into the cabinet and pull it from the cabinet carefully preferably with help from another person. Keep a constant 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.

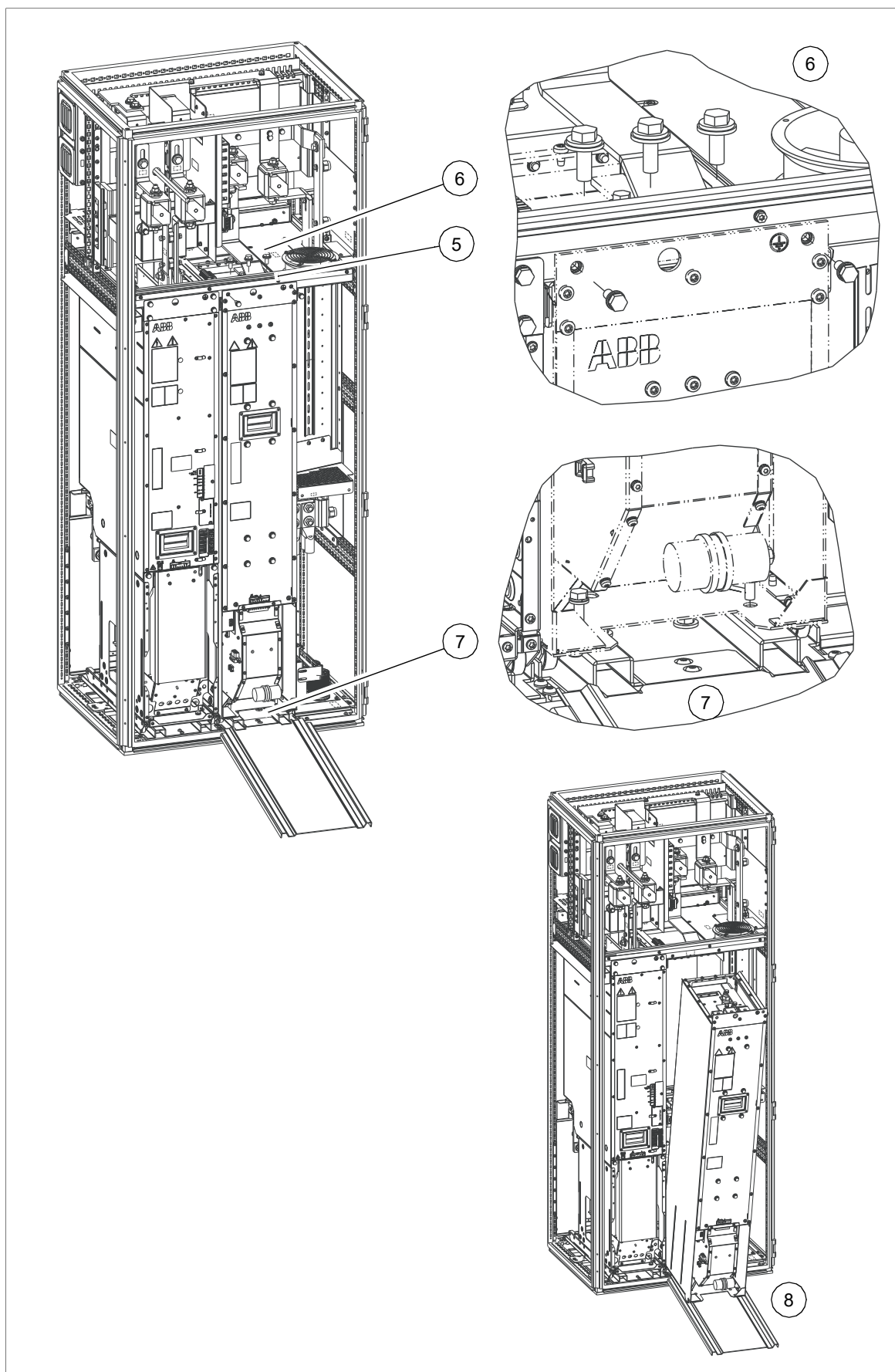


- Be careful when handling a tall module. The module overturns easily because it is heavy and has a high center of gravity. Whenever possible, secure the module with chains. Do not leave an unsupported module unattended especially on a sloping floor.



- Wear protective gloves and long sleeves! Some parts have sharp edges.
 - 1. Disconnect the drive from the AC power line and DC/DC converter from the energy storage and obey the instructions in section [Electrical safety precautions \(page 61\)](#). See [Disconnecting the DC/DC converter with DC switch/disconnector \(page 80\)](#).
 - 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. Unplug the 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 any other 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.
-





Capacitors

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

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

■ Reforming the capacitors

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

Control panel

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

■ Cleaning the control panel

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

■ Replacing the control panel battery

For instructions on how to replace the control panel battery, see the separate *ACx-AP-x assistant control panels user's manual* document (3AUA0000085685 [English]).

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 (2, 7 and 12 respectively) but are otherwise identical. The three BCU types are interchangeable as long as the number of connections is sufficient. For example, the BCU-22 can be used as a direct replacement for both BCU-02 and BCU-12.

■ Replacing the memory unit

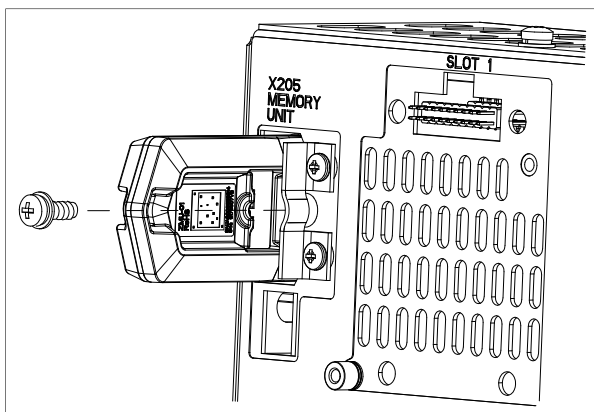
After replacing a control unit, you can retain the existing parameter settings by transferring the memory unit from the defective control unit to the new control unit.



WARNING!

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

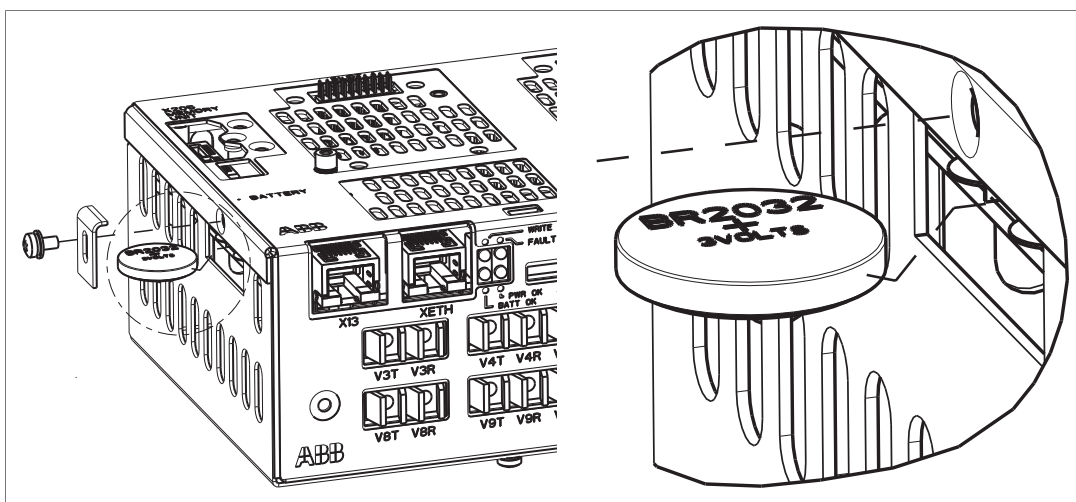
1. Stop the drive and do the steps in section *Electrical safety precautions (page 61)* before you start the work.
 2. Make sure that the control unit is not powered.
 3. Undo the fastening screw and pull the memory unit out.
 4. Install a memory unit in reverse order.
-



■ Replacing the BCU control unit battery

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

1. Stop the drive and do the steps in section [Electrical safety precautions \(page 61\)](#) before you start the work.
2. Undo the fastening screw and remove the battery
3. Replace the battery with a new BR2032 battery.
4. Dispose of the old battery according to local disposal rules or applicable laws.
5. Set the real-time clock.



■ LEDs and other status indicators

This section instructs how to interpret the status indications of the ACS880-1604 DC/DC converter.

Warnings and faults reported by the control program are displayed on the control panel or in the Drive composer PC tool. For further information, see the firmware manual delivered with the module.

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

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

The DC/DC converter module (frame R8i) has three LEDs. For their indications, see the following table.

Location	LED	Indication
DC/DC converter module	FAULT (continuous red)	There is an active fault in the DC/DC converter module.
	ENABLE / STO (continuous green)	The DC/DC converter module is ready for use.
	ENABLE / STO (continuous yellow)	XSTO connectors are de-energized.
	POWER OK (continuous green)	Supply voltage on the board is OK (> 21 V).

The cabinet has from one to three door lamps. For their indications, see the following table.

Location	LED	Indication
Cabinet door lamps	Charging OK indicator (green)	The DC bus of the converter modules is charged. The unit is ready for connection to the common DC bus.
	DC/DC converter disconnected (white)	The DC/DC converter unit is disconnected from the main DC bus. Note: Auxiliary voltages are to be disconnected separately.
	Load disconnected indicator (white)	The disconnecter of the energy storage is switched off.

10

Ordering information

Contents of this chapter

This chapter lists the types and ordering codes of the ACS880-1604 DC/DC converter unit components. The data is valid for ACS880-1604 DC/DC converter modules and related accessories.

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 needed, 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 DC/DC converter unit ratings, see the technical data.

DC/DC converter unit		Modules used		
Type	Frame size	Qty	Ordering code (for options, see below)	Contents
$U_N = 400\text{ V}$				• DC/DC converter module(s) (frame R8i) with speed-controlled cooling fan(s)
ACS880-1604-0600A-3	R8i	1	ACS880-104-0640A-3+E205	
ACS880-1604-0900A-3	R8i	1	ACS880-104-0900A-3+E205	
ACS880-1604-1200A-3	2×R8i	2	ACS880-104-0640A-3+E205	
ACS880-1604-1800A-3	2×R8i	2	ACS880-104-0900A-3+E205	
$U_N = 500\text{ V}$				
ACS880-1604-0600A-5	R8i	1	ACS880-104-0590A-5+E205	
ACS880-1604-0900A-5	R8i	1	ACS880-104-0810A-5+E205	
ACS880-1604-1200A-5	2×R8i	2	ACS880-104-0590A-5+E205	
ACS880-1604-1800A-5	2×R8i	2	ACS880-104-0810A-5+E205	
$U_N = 690\text{ V}$				
ACS880-1604-0400A-7	R8i	1	ACS880-104-0410A-7+E205	
ACS880-1604-0600A-7	R8i	1	ACS880-104-0600A-7+E205	
ACS880-1604-0800A-7	2×R8i	2	ACS880-104-0410A-7+E205	
ACS880-1604-1200A-7	2×R8i	2	ACS880-104-0600A-7+E205	

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 +E205: Internal du/dt filters (When the module is used as a DC/DC converter, it must always be ordered with +E205.) +G304: 115 V auxiliary voltage supply

Note: The energy storage does not belong to the ACS880 module product offering. The customer must equip the DC/DC converter with a suitable energy storage system. For more information, see [Selecting the energy storage \(page 56\)](#).

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

- BDCL filter module(s) with direct-on-line cooling fan(s) (+C188). One filter module is needed for each R8i converter module. See [BDCL filters \(page 112\)](#) and Type equivalence table on the technical data.
- BCU control unit kit. For the contents of the kit, see [Control unit \(page 115\)](#).
- [Fiber optic cables \(page 115\)](#).
- 1 × Control circuit plug connector (3AUA0000059813). See [Control circuit plug connectors \(page 116\)](#).
- Quick connectors, 1 kit/1 converter or filter module (3AUA0000119227). For the contents of the kit, see [Electrical installation accessories \(page 120\)](#).

The other parts listed

- may be required by the application, or
- make the installation or use of the module easier.

BDCL filters

■ BDCL filters (+C188)

The BDCL filters must be ordered separately.

DC/DC converter unit type ACS880-1604...	Frame size	L-filter			Contents
		Type	Qty	Ordering code	
$U_N = 400\text{ V}$					• +C188: Direct-on-line (DOL) cooling fan with 230 V supply
0600A-3	R8i	ACS880-BDCL-14-5+C188	1	3AUA0000173022	
0900A-3	R8i	ACS880-BDCL-15-5+C188	1	3AUA0000173021	
1200A-3	2×R8i	ACS880-BDCL-14-5+C188	2	3AUA0000173022	
1800A-3	2×R8i	ACS880-BDCL-15-5+C188	2	3AUA0000173021	
$U_N = 500\text{ V}$					
0600A-5	R8i	ACS880-BDCL-14-5+C188	1	3AUA0000173022	
0900A-5	R8i	ACS880-BDCL-15-5+C188	1	3AUA0000173021	
1200A-5	2×R8i	ACS880-BDCL-14-5+C188	2	3AUA0000173022	
1800A-5	2×R8i	ACS880-BDCL-15-5+C188	2	3AUA0000173021	
$U_N = 690\text{ V}$					
0400A-7	R8i	ACS880-BDCL-14-7+C188	1	3AUA0000173010	
0600A-7	R8i	ACS880-BDCL-15-7+C188	1	3AUA0000173009	
0800A-7	2×R8i	ACS880-BDCL-14-7+C188	2	3AUA0000173010	
1200A-7	2×R8i	ACS880-BDCL-15-7+C188	2	3AUA0000173009	


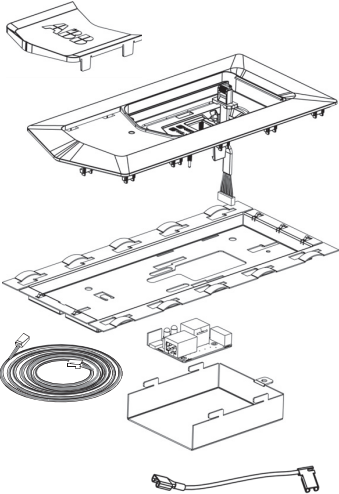
■ **BDCL filters (+C188+G304)**

DC/DC converter unit type ACS880-1604-...	Frame size	L-filter			Contents
		Type	Qty	Ordering code	
$U_N = 400\text{ V}$					• +C188 : Direct-on-line (DOL) cooling fan • +G304 : Cooling fan with 115 V AC 1-phase supply
0600A-3	R8i	ACS880-BDCL-14-5+C188+G304	1	3AUA0000180031	
0900A-3	R8i	ACS880-BDCL-15-5+C188+G304	1	3AUA0000180030	
1200A-3	2×R8i	ACS880-BDCL-14-5+C188+G304	2	3AUA0000180031	
1800A-3	2×R8i	ACS880-BDCL-15-5+C188+G304	2	3AUA0000180030	
$U_N = 500\text{ V}$					
0600A-5	R8i	ACS880-BDCL-14-5+C188+G304	1	3AUA0000180031	
0900A-5	R8i	ACS880-BDCL-15-5+C188+G304	1	3AUA0000180030	
1200A-5	2×R8i	ACS880-BDCL-14-5+C188+G304	2	3AUA0000180031	
1800A-5	2×R8i	ACS880-BDCL-15-5+C188+G304	2	3AUA0000180030	
$U_N = 690\text{ V}$					
0400A-7	R8i	ACS880-BDCL-14-7+C188+G304	1	3AUA0000180029	
0600A-7	R8i	ACS880-BDCL-15-7+C188+G304	1	3AUA0000180028	
0800A-7	2×R8i	ACS880-BDCL-14-7+C188+G304	2	3AUA0000180029	
1200A-7	2×R8i	ACS880-BDCL-15-7+C188+G304	2	3AUA0000180028	

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 *ACX-AP-x 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	

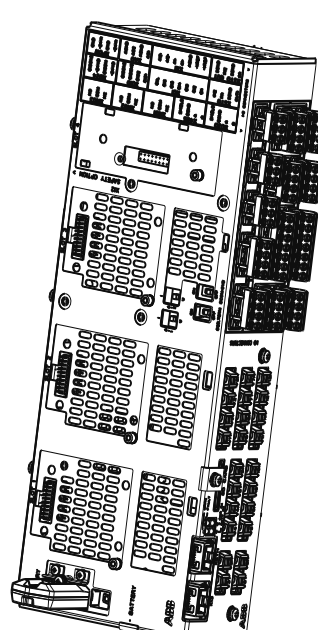
The door mounting kit contains:

- front cover
- flat cable (between DDPI-01 board and the panel)
- DDPI-01 board, cover and M4×8 combi screw for the cover
- EMC shield
- control panel mounting platform
- grounding wire
- Ethernet cable (3 m).
- *DPMP-01 mounting platform for ACS-AP control panel installation guide* [3AUA0000100140 (English)].

Control electronics

Cabling of the electronics outside the module must be done by the customer. The current consumption of the main components in the auxiliary circuit is shown in the technical data.

■ Control unit

DC/DC convert- er module ACS880- 1604-...	Frame size	Control unit	Qty	Ordering code	Illustration	
$U_N = 400\text{ V}$						
0600A-3	R8i	Control unit BCU-02 kit for R8i DDC	1	3AXD50000022059		
0900A-3	R8i					
1200A-3	2×R8i	Control unit BCU-12 kit * for R8i DDC		3AXD50000022060		
1800A-3	2×R8i					
$U_N = 500\text{ V}$						
0600A-5	R8i	Control unit BCU-02 kit for R8i DDC	1	3AXD50000022059		
0900A-5	R8i					
1200A-5	2×R8i	Control unit BCU-12 kit * for R8i DDC		3AXD50000022060		
1800A-5	2×R8i					
$U_N = 690\text{ V}$						
0400A-7	R8i	Control unit BCU-02 kit for R8i DDC	1	3AXD50000022059		
0600A-7	R8i					
0800A-7	2×R8i	Control unit BCU-12 kit * for R8i DDC		3AXD50000022060		
1200A-7	2×R8i					

* Frame sizes 2×R8i can also use BCU-02 if the BAMU voltage/current measurement unit is not in use.

The BCU control unit kit contains:

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

You must connect the control unit to each DC/DC converter module with a pair of fiber optic cables. You can order them from ABB. See section [Fiber optic cables \(page 115\)](#).

You can supply 24 V DC for the control unit from the DC/DC converter module.

(Alternatively, you can take the power supply from another suitable power source.) You must acquire the cables separately. Use a suitable standard installation cable. Use appropriate [X53] plug connector for the connection to the DC/DC converter module. See sections [Connectors X50...X53](#) and [Control circuit plug connectors \(page 116\)](#).

■ Fiber optic cables

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

The following kits, each consisting of a pair of plastic fiber optic cables, are available from ABB:

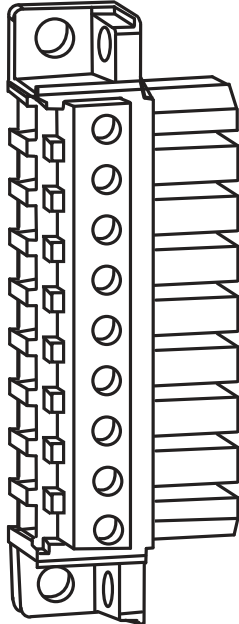
Length	Kit type designation	Ordering code
2 m	NLWC-02	58988821
3 m	NLWC-03	58948233
5 m	NLWC-05	58948250
7 m	NLWC-07	58948268
10 m	NLWC-10	58948276

■ Control circuit plug connectors

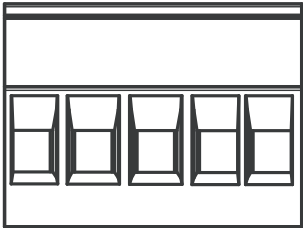
The control circuit plug for connector X50 is not included in the module kit and you must order it separately.

Note: Plug connectors X51, X52 and X53 are included in the module kit.

For more information on the connectors, see the hardware description.

Connector	Data	Qty	Ordering code	Illustration
X50 for R8i X30 for BDCL module	STV S 9 SB 500 V, 32 A, 9-pole 6 KV/3 (female) 4 mm ²	1 per module	3AUA0000059813	

Plug connectors for X51, X52 and X53 are included in the module kit. Plug connectors can be ordered separately as spare parts.

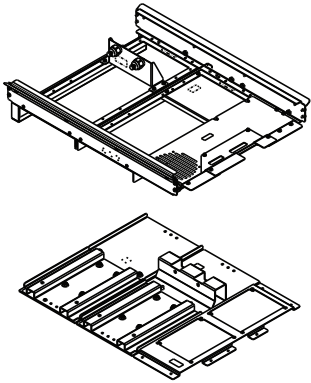
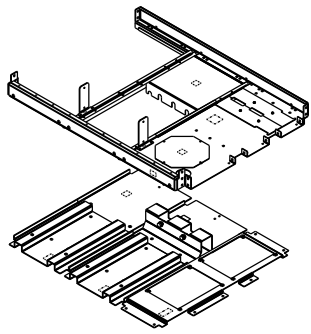
Connector	Data	Qty	Ordering code	Illustration
X51-X53	1 × MSTB 2,5/5-ST- 5,08 BK 2 × MSTB 2,5/5-ST- 5,08 YE 2.50 mm ² , 12 A, 320 V	1 per module	3AXD50000003541	

Mechanical installation accessories and tools

■ Module installation parts

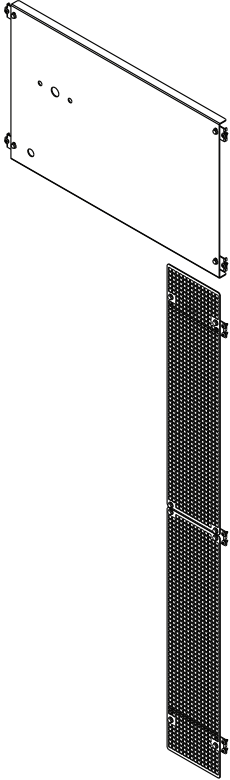
Module installation parts include, for example, top and bottom supports for the DC/DC converter and BDCL filter modules.

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 cu-bicle	3AXD50000488391	A-8-8-332-VX	 <p>Instruction code: 3AXD50000482122</p>
Generic	1 per cu-bicle	3AXD50000023031	A-8-8-333	 <p>Instruction code: 3AXD50000023218</p>

■ Shrouds

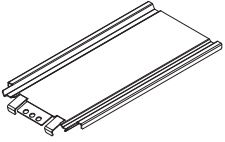
Shrouds are used for IP20 touch protection with the cabinet doors open.

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

■ Ramp

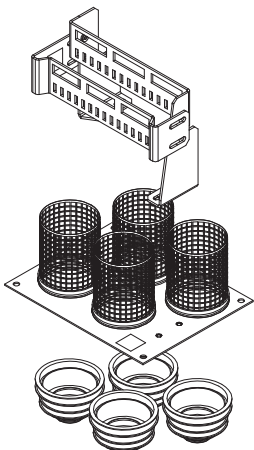
The ramp can be used when installing or removing an R8i module.

Note: Do not use the ramp with plinth heights over 100 mm. 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	

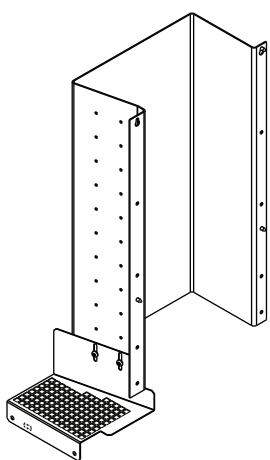
■ Bottom cable entry

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	 <p>Instruction code: 3AXD50000004817</p>

■ Control unit mounting plate

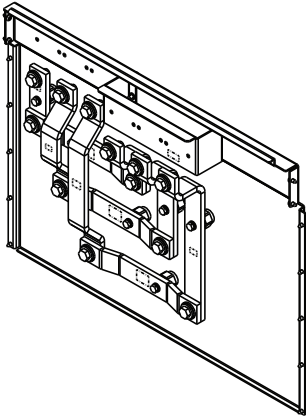
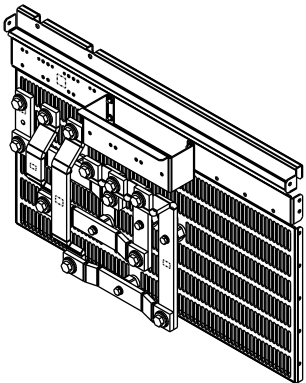
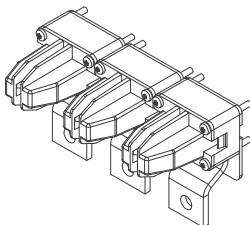
The control unit mounting plate kit includes a mounting plate to which the control unit can be attached with a DIN rail. It also includes a small shroud that can be used as an alternative upper side shroud with the shroud kit.

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

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	 <p>Instruction code: 3AXD50000482290</p>
Generic	1 per cubicle	3AXD50000023007	A-8-8-270	 <p>Instruction code: 3AXD50000023212</p>
Rittal VX25 and generic	1 per module (1 for DDC and 1 for filter module)	3AUA0000119227	A-468-8-100	 <p>Instruction code: 3AUA0000118667</p>

■ Common DC Flat-PLS assembly

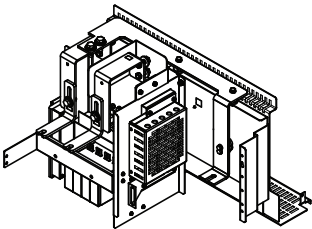
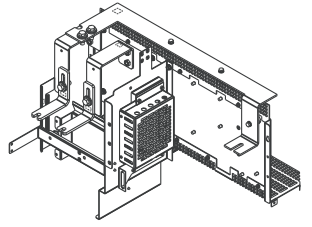
The brackets in this kit act as a mounting base for the busbar supports of the Rittal Flat-PLS DC bus and ensure its correct placement and alignment inside the cabinet line-up.

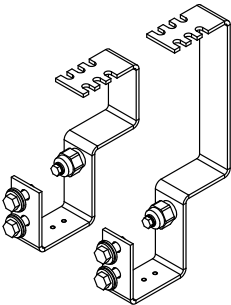
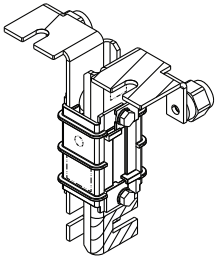
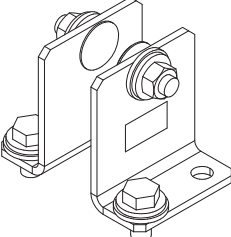
Note: Note: The designs presented in this manual for Rittal VX25 enclosures employ the Rittal Flat-PLS busbar system. Make sure that the current carrying capability of the busbars is not exceeded at any point of the drive system.

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

■ 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.

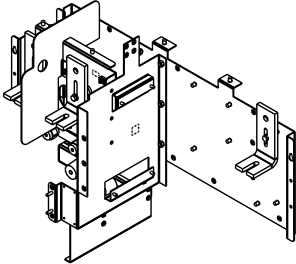
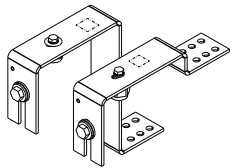
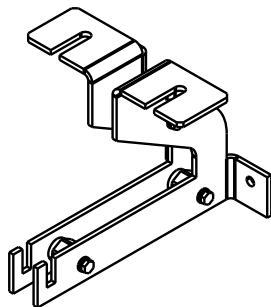
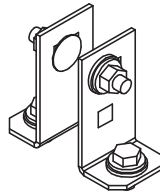
Enclosure	Qty	Ordering code	Kit code	Illustration
Rittal VX25 with DC switch/disconnector and charging	1	3AXD50000488407	A-8-8-298-VX	 <p>Instruction code: 3AXD50000482955</p>
Generic with DC switch/disconnector and charging	1	3AXD50000044814	A-8-8-299	 <p>Instruction code: 3AXD50000044863</p>

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

■ DC connection without DC switch/disconnector and charging

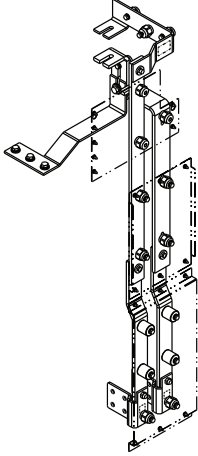
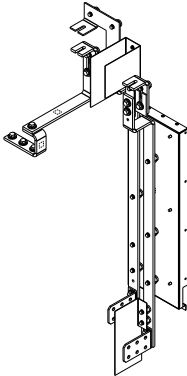
These parts provide the mounting base for the DC fuses and connect the converter module to the DC bus.

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

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

■ 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 = 50 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 = 50 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		
$U_N = 400\text{ V}$					
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	
$U_N = 50\text{ V}$					
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	
$U_N = 690\text{ V}$					
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 = 50 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 = 50 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
$U_N = 400\text{ V}$				
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	
$U_N = 50\text{ V}$				

ACS880-1604-...	Frame size	Kit	Qty	Ordering code
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 disconnecter (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
$U_N = 400\text{ V}$				
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	
$U_N = 50\text{ V}$				
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	
$U_N = 690\text{ V}$				
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 disconnecter (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**

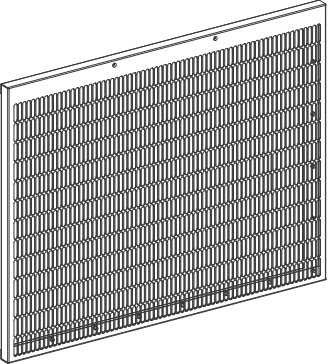
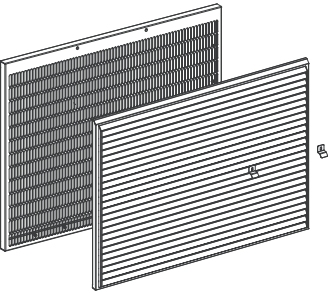
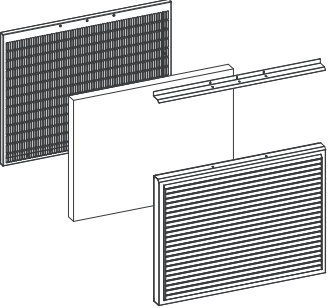
IEC / UL

ACS880-1604-...	Frame size	Kit	Qty	Ordering code
$U_N = 400\text{ V}$				
0600A-3	R8i	ZRF 30X165S24R	4	10037531
0900A-3	R8i		4	
1200A-3	2×R8i		8	
1800A-3	2×R8i		8	
$U_N = 50\text{ V}$				

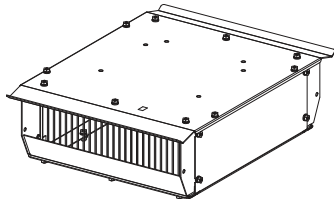
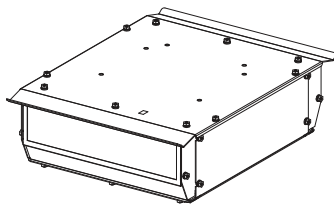
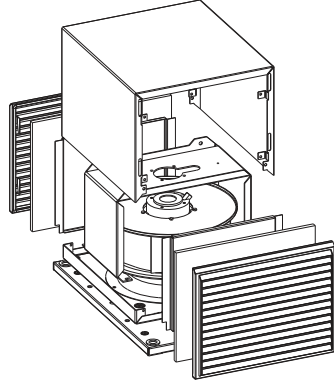
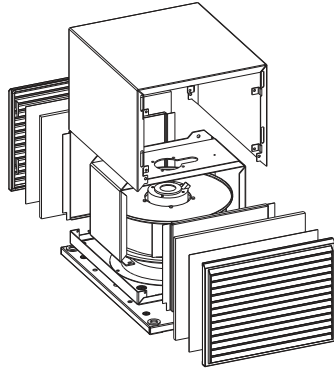
ACS880-1604-...	Frame size	Kit	Qty	Ordering code
0600A-5	R8i	ZRF 30X165S24R	4	10037531
0900A-5	R8i		4	
1200A-5	2×R8i		8	
1800A-5	2×R8i		8	
U _N = 690 V				
0400A-7	R8i	ZRF 30X165 SIK.	4	10028531
0600A-7	R8i		4	
0800A-7	2×R8i		8	
1200A-7	2×R8i		8	

Cabinet ventilation kits

■ Air inlet kits 800 mm cabinet

Used with ...	Qty	Ordering code	Kit code	Illustration
IP20	1	3AUA0000117005	A-8-X-023	 <p>Instruction code: 3AUA0000116887</p>
IP42	1	3AUA0000117009	A-8-X-026	 <p>Instruction code: 3AUA0000116875</p>
IP54	1	3AXD50000009186	A-8-X-029	 <p>Instruction code: 3AXD50000010001</p>

■ Air outlet kits 800 mm cabinet

Used with ...	Qty	Ordering code	Kit code	Illustration
IP20 (IEC)	2	3AUA0000125203	A-4-X-042	 <p>Instruction code: 3AUA0000116887</p>
IP42 (IEC)	2	3AUA0000114968	A-4-X-040	 <p>Instruction code: 3AUA0000116875</p>
IP54 (IEC)	2	3AXD50000009187	A-4-X-064	 <p>Instruction code: 3AXD50000010001</p> <p>Note: Fan to be ordered separately</p>
IP54 (UL)	2	3AXD50000010362	A-4-X-067	 <p>Instruction code: 3AXD50000010284</p> <p>Note: Fan to be ordered separately</p>

■ 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	RB4C-355/170	2	3AXD50000006934
	Capacitor	MSB MKP 6/603/E1679	2	3AXD50000006959
	Connector	SPB2,5/7 (2.5 mm ² , 12AWG)	2	3AXD50000000723
	Connector	SC 2,5-RZ/7 (2.5 mm ² , 12AWG)	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	RB4C-355/170	2	64750062
	Capacitor	MSB MKP 6/603/E1679	2	68713188
	Connector	SPB2,5/7 (2.5 mm ² , 12AWG)	2	3AXD50000000723
	Connector	SC 2,5-RZ/7 (2.5 mm ² , 12AWG)	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	W2E 143-AA09-01, 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	W2E 143-AA15-01, 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

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

Note: You must have BCU-12 control unit to have enough fiber optic connections if you use BAMU for 2×R8i frames.

Type	Data	Qty	Ordering code
BAMU-12C	BAMU voltage/current measurement board	1	3AXD50000045879
NLWC-03	2 × 3 m single core fiber optic cables with connectors	2	58948233
Mersen PS272PREMCPS	Fuse holder (disconnecter), 1000 V AC, 1250 V DC, 250 A, cartridge fuse, 27 × 60 mm	1	3AXD50000012958
Mersen PS 27, A 220087	Terminal cover	2	3AUA0000185146
Mersen 1021 CP URB	Fuse, 27×60/32, 32 A, 1000 V, 27×60 mm, AR, (IEC/UL)	2	3AUA0000089196

11

Technical data

Contents of this chapter

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

Ratings

Module type ACS880- 1604-...	Frame	No-overload use							
		I_1 input	I_2 output	P_{contmax}	P_{contmax}	I_{max} output	S_N	I_{p2p}	f_{swout}
		A (DC)	A (DC)	kW	hp	A (DC)	kVA	A	Hz
$U_N = 400 \text{ V}$									
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
$U_N = 500 \text{ V}$									
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
$U_N = 690 \text{ V}$									
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

Module type ACS880- 1604-...	Frame	High-overload use		Heavy-duty use	
		$I_{\text{short time}}$	$P_{\text{short time}}$	I_{Hd}	P_{Hd}
		A	W	A	kW
$U_{\text{N}} = 400 \text{ V}$					
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
$U_{\text{N}} = 500 \text{ V}$					
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
$U_{\text{N}} = 690 \text{ V}$					
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

Definitions

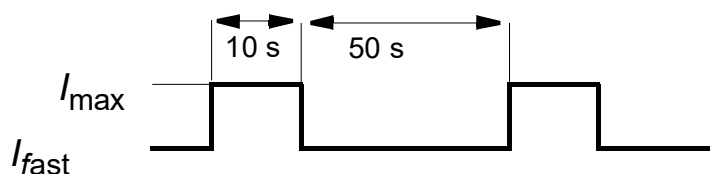
U_N Supply voltage range. For U_1 , see [Input power \(DC bus\) connection \(page 142\)](#). For U_2 , see [Output power \(energy storage\) connection \(page 143\)](#).

Nominal ratings

I_1 DC input current
 I_2 Continuous output current (RMS)
 P_{contmax} Maximum continuous active power
 S_N Nominal apparent power
 $I_{\text{max output}}$ Maximum output current
 I_{p2p} Peak-to-peak value of output current ripple measured after the filter
 f_{SWout} Switching frequency at output terminals (energy storage connection) measured after the filter

High-overload use

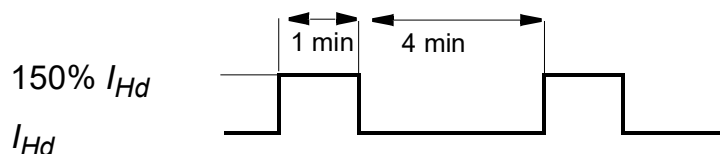
$I_{\text{short time}}$ Continuous current allowing I_{max} for 10 s / 60 s at 40 °C (104 °F)



$P_{\text{short time}}$ Continuous power allowing I_{max} for 10 s / 60 s at 40 °C (104 °F)

Heavy-duty use

I_{Hd} Continuous current allowing 150% I_{Hd} for 1 min / 5 min at 40 °C (104 °F)



P_{Hd} Continuous power allowing 150% I_{Hd} for 1 min / 5 min at 40 °C (104 °F)

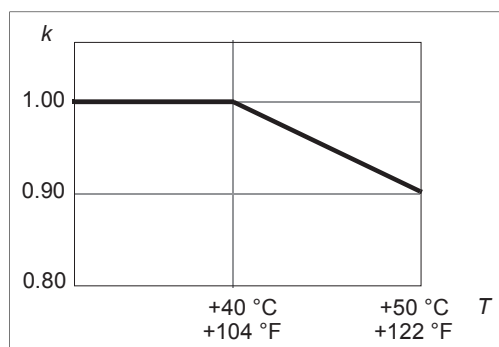
Note: The ratings apply at an ambient temperature of 40 °C (104 °F).

The ratings apply to units without option +C132 (marine type approval). For ratings of units with option +C132, see *ACS880 +C132 marine type-approved drive modules and module packages supplement* (3AXD50000037752 [English]).

Derating

Ambient temperature derating

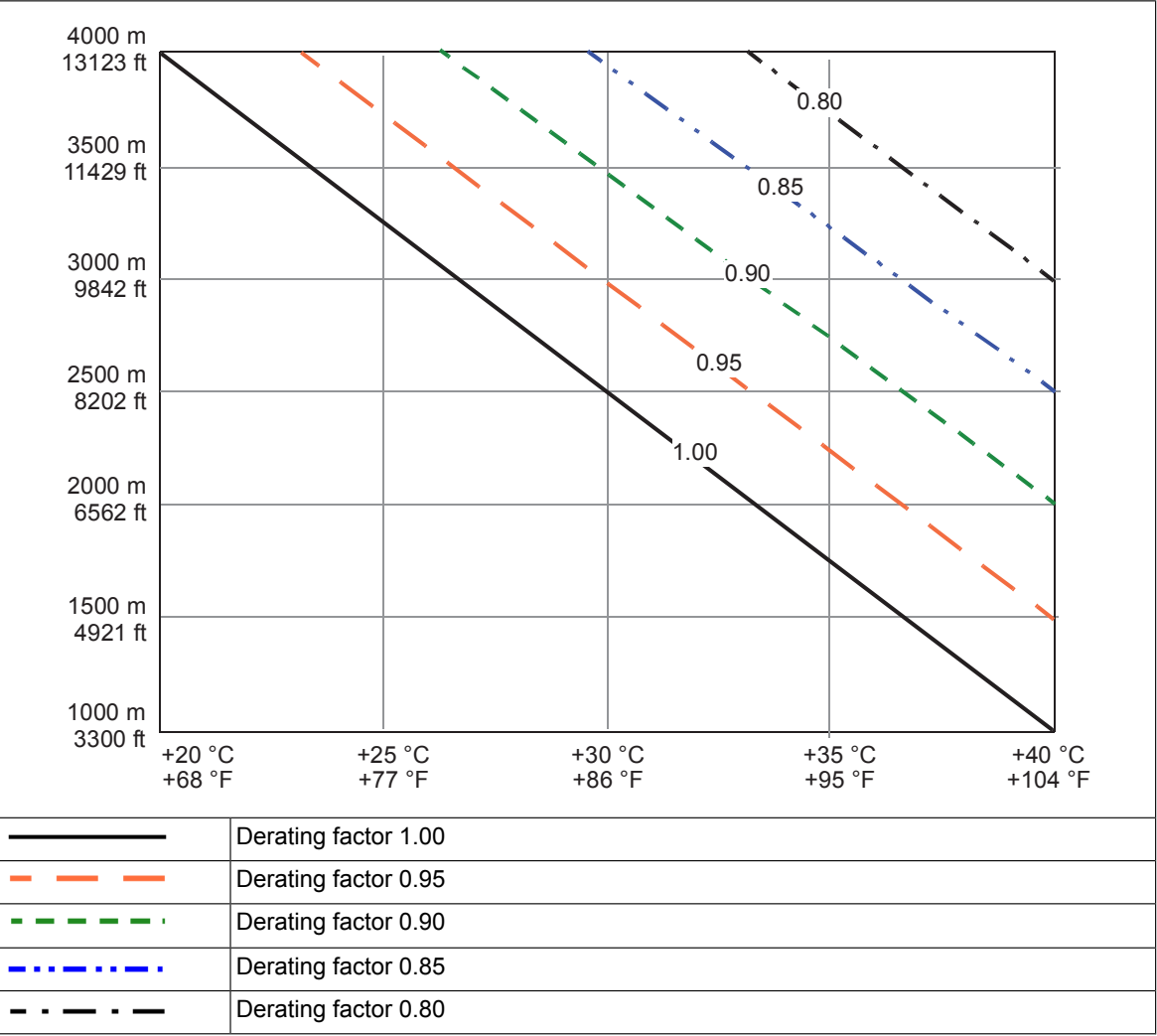
In the temperature range +40...50 °C (+104...122 °F), the rated output current is derated by 1 percentage point for every added 1 °C (1.8 °F). The output current can be calculated by multiplying the current given in the rating table by the derating factor (k):



Altitude derating

At altitudes from 1000 to 4000 m (3281 to 13123 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.

If ambient temperature is below +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.



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

Type equivalence table

Cabinet-installed unit type ACS880-1607... ¹⁾	DC/DC converter module type ACS880-1604... ²⁾	Basic module type ACS880-104... ³⁾	Frame	BDCL filters	
				Type	Qty
U _N = 400 V					
0600A-3	0600A-3	0640A-3	R8i	BDCL-14-5	1
0900A-3	0900A-3	0900A-3	R8i	BDCL-15-5	1
1200A-3	1200A-3	0640A-3	2×R8i	BDCL-14-5	2
1800A-3	1800A-3	0900A-3	2×R8i	BDCL-15-5	2
U _N = 500 V					
0600A-5	0600A-5	0590A-5	R8i	BDCL-14-5	1
0900A-5	0900A-5	0810A-5	R8i	BDCL-15-5	1
1200A-5	1200A-5	0590A-5	2×R8i	BDCL-14-5	2
1800A-5	1800A-5	0810A-5	2×R8i	BDCL-15-5	2
U _N = 690 V					
0400A-7	0400A-7	0410A-7	R8i	BDCL-14-7	1
0600A-7	0600A-7	0600A-7	R8i	BDCL-15-7	1
0800A-7	0800A-7	0410A-7	2×R8i	BDCL-14-7	2
1200A-7	1200A-7	0600A-7	2×R8i	BDCL-15-7	2

¹⁾ Cabinet-installed units available from ABB

²⁾ DC/DC converter unit types available from ABB as modules

³⁾ R8i converter modules used. The quantity of the modules is shown in the Frame column.

⁴⁾ BDCL filter quantity and type. See also BDCL filters in the ordering information.

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	Nominal inductance / phase	Saturated inductance / phase	Saturated current / phase	DC resistance / phase
BDCL-14-5/-7	540 μH	140 μH	850 A	7 m Ω
BDCL-15-5/-7	360 μH	120 μH	1200 A	7 m Ω

Charging component ratings

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

Dimensions and weights

■ R8i DC/DC converter module

The dimensions of a DC/DC converter module are:

- height 1397.0 mm (55.0 in)
- width 240.0 mm (9.45 in)
- depth 583.0 mm (22.95 in)
- weight 125 kg (275.6 lb).

For more information, see the dimension drawings.

For the number of R8i modules in a given DC/DC converter unit, see [Type equivalence table \(page 139\)](#).

■ BDCL filter module

The dimensions of a BDCL module are:

- height 1397.0 mm (55.0 in)
- width 240.0 mm (9.45 in)
- depth 444.0 mm (17.47 in)
- weight BDCL-14-5/-7 195.0 kg (429.9 lb) and BDCL-15-5/-7 225 kg (496.0 lb).

For more information, see the dimension drawings.

One filter module is needed for each converter module.

Free space requirements

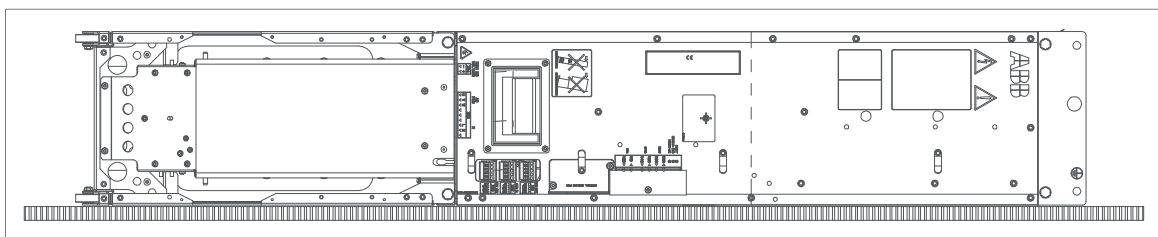
Free space requirements for the DC/DC converter modules are:

- 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).

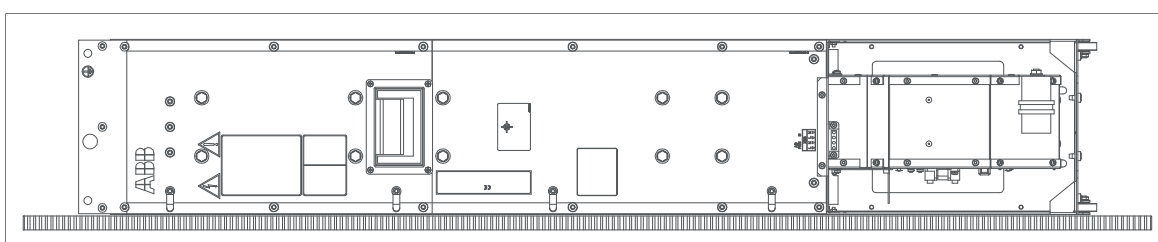
For more information on cooling the cabinet, see *Drive modules cabinet design and construction instructions* (3AUA0000107668 [English]).

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-1x-x filter, the allowable mounting orientations are upright position and on the left-hand side (viewed from the front).



Losses, cooling data and noise

Module type ACS880- 1604-...	Frame	P_{loss}	Air flow		Noise	Efficiency
		kW	m ³ /h	ft ³ /min	dB	%
$U_N = 400 \text{ V}$						
0640A-3	R8i	5.2	2200	1295	74	98.3
0900A-3	R8i	8.0	2200	1295	74	98.3
0640A-3	2×R8i	10.5	4400	2590	76	98.3
0900A-3	2×R8i	16.5	4400	2590	76	98.2
$U_N = 500 \text{ V}$						
0590A-5	R8i	6.0	2200	1295	74	98.5
0810A-5	R8i	9.1	2200	1295	74	98.4
0590A-5	2×R8i	12.1	4400	2590	76	98.4
0810A-5	2×R8i	18.8	4400	2590	76	98.4
$U_N = 690 \text{ V}$						
0410A-7	R8i	6.4	2200	1295	74	98.2
0600A-7	R8i	10.6	2200	1295	74	98.0
0410A-7	2×R8i	12.8	4400	2590	76	98.2
0600A-7	2×R8i	21.5	4400	2590	76	98.0

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

■ Mechanical connections

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

■ Insulation supports

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

■ Cable lugs

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

Input power (DC bus) connection

Voltage (U_1)	<p>ACS880-104-xxxx-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.</p> <p>ACS880-104-xxxx-5 = DC voltage corresponding AC input voltages 3 ~ 380...500 V. This is indicated in the type designation label as typical input voltage levels 566 / 679 / 707 V DC.</p> <p>ACS880-104-xxxx-7 = DC voltage corresponding AC input voltages 3 ~ 525...690 V. This is indicated in the type designation label as typical input voltage levels 742 / 849 / 976 V DC (849 V DC for UL/CSA).</p>
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Input terminals	R8i module: M12, maximum intrusion into module 20 mm (0.8"). BDCL filter: M10, maximum intrusion into module 20 mm (0.8").
------------------------	---

Output power (energy storage) connection

Voltage (U_2)	ACS880-104-xxxx-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. Recommended output voltage 150 V...80% of U_{DC} . ACS880-104-xxxx-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. Recommended output voltage 150 V...80% of U_{DC} . ACS880-104-xxxx-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. Recommended output voltage 150 V...80% of U_{DC} .
Current	See section Ratings (page 135) .
Output terminals	R8i module: Busbars to quick connector: M12. Torque: 50 N·m (37 lbf·ft). Busbars to support insulators: M8. Torque: 9 N·m (6.5 lbf·ft). Cables to busbars: M12. Torque: 70 N·m (52 lbf·ft). Busbar to BDCL filter: M10. Torque: 42 N·m (31 lbf·ft).
Maximum energy storage cable length	100 m (328 ft)

Control accuracy – Current and voltage control performance data

Current control dynamic response	Step response time < 10 ms for a reference step 0% to 50% of the drive nominal current
Current control accuracy (static)	Current error < 1% of the drive nominal current rating For the DC current ripple, see Ratings (page 135) .
ES 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.

Control unit connection data

See [Control units of the drive](#).

Optical components

The specifications of the optic cable are as follows:

- Storage temperature: -55 ... +85 °C (-67 ... +185 °F)

- Installation temperature: -20 ... +70 °C (-4 ... +158 °F)
- Maximum short-term tensile force: 50 N (11.2 lbf)
- Minimum short-term bend radius: 25 mm (1.0 in)
- Minimum long-term bend radius: 35 mm (1.4 in)
- Maximum long-term tensile load: 1 N (3.6 ozf)
- Flexing: Max. 1000 cycles

ABB drive products in general utilize 5 and 10 MBd (megabaud) optical components from Avago Technologies' Versatile Link range. Note that the optical component type is not directly related to the actual communication speed.

Note: The optical components (transmitter and receiver) on a fiber optic link must be of the same type.

Plastic optical fiber (POF) cables can be used with both 5 MBd and 10 MBd optical components. 10 MBd components also enable the use of Hard Clad Silica (HCS®) cables, which allow longer connection distances thanks to their lower attenuation. HCS® cables cannot be used with 5 MBd optical components.

The maximum lengths of fiber optic links for POF and HCS® cables are 20 and 200 meters (65.6 ft and 656 ft) respectively.

Protection classes

Degrees of protection (IEC/EN 60529)	IP00
Enclosure types (UL508C)	UL open type
Overvoltage category (IEC/EN 60664-1)	III
Protective class (IEC/EN 61800-5-1)	I

Ambient conditions

The unit is to be used in a heated indoor controlled environment.

	Operation	Storage	Transportation
Altitude above sea level	0...1000 m (0...3300 ft) without derating, 1000...4000 m (3300...13123 ft) with derating.	-	-
Air temperature	0...+40 °C (+32...+104 °F), no condensation allowed	-40...+70 °C (-40...+158 °F)	-40...+70 °C (-40...+158 °F)
	+40...+50 °C (+104...+122 °F) derating 1% / 1 °C (1.8 °F)		
Relative humidity	Maximum 95%, no condensation allowed	Maximum 95%, no condensation allowed	Maximum 95%, no condensation allowed
Contamination	IEC/EN 60721-3-3:2002: Classification of environmental conditions - Part 3-3: Classification of groups of environmental parameters and their severities Stationary use of weather protected locations	IEC 60721-3-1	IEC 60721-3-2
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 allowed.	-	-
Vibration IEC/EN 61800-5-1 IEC 60068-2-6:2007, EN 60068-2-6:2008 Environmental testing - Part 2: Tests – Test Fc: Vibration (sinusoidal)	IEC/EN 60721-3-3:2002 10 ... 57 Hz: max. 0.075 mm amplitude 57 ... 150 Hz: 1 g Tested in ABB multidrive cabinet (ACS880-x07) according to: Max 1 mm (0.04 in.) (5 ... 13.2 Hz), max. 0.7 g (13.2 ... 100 Hz) sinusoidal	IEC/EN 60721-3-1:1997 10 ... 57 Hz: max. 0.075 mm amplitude 57 ... 150 Hz: 1 g	IEC/EN 60721-3-2:1997 2 ... 9 Hz: max. 3.5 mm amplitude 9 ... 200 Hz: 10 m/s ² (32.8 ft/s ²)
Shock IEC 60068-2-27:2008 IEC 60068-2-27:2009 Environmental testing - Part 2-27: Tests – Test Ea and guidance: Shock	Not allowed	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 housing	<ul style="list-style-type: none"> • Zinc coated steel sheet • Front plate covered with Lexan 8B35 polycarbonate film, color PMS 1C Cool Gray and PMS Process Black (frames R6i...R8i)
Fire safety of materials (IEC 60332-1)	Insulating materials and non-metallic items: mostly self-extinctive
Package	<ul style="list-style-type: none"> • Plywood base, corrugated cardboard, PET straps. • Product wrapping: polyethylene sheet or VCI protection bag
Disposal	<p>The main parts of the drive can be recycled to preserve natural resources and energy. Product parts and materials should be dismantled and separated. Generally all metals, such as steel, aluminum, copper and its alloys, and precious metals can be recycled as material. Plastics, rubber, cardboard and other packaging material can be used in energy recovery. Printed circuit boards and large electrolytic capacitors need selective treatment according to IEC 62635 guidelines. To aid recycling, plastic parts are marked with an appropriate identification code. Contact your local ABB distributor for further information on environmental aspects and recycling instructions for professional recyclers. End of life treatment must follow international and local regulations.</p>

Auxiliary current consumption

Device	U_N	f	I_{cont}	I_{start}	P_{cont}
	V	Hz	A	A	W
R8i module internal electronics • Option +G304 (115 V auxiliary voltage supply)	230 V AC (+15%/-20%)	50/60	0.45	-	105
	115 V AC (+15%-20%)	50/60	0.90	-	105
Control unit BCU-x2	24 V DC $\pm 10\%$	-	2.0	-	48
R8i module option +C188 (DOL fan)	400 V AC	50	1.50	3.00	-
	400 V AC	60	1.90	3.80	-
	320 V AC	60	1.50	4.40	-
BDCL filter option +C188 (DOL fan as standard with 230 V supply) • Options +C188+G304 (DOL fan with 115 V AC supply)	230 V AC	50	0.60	1.20	-
	230 V AC	60	0.88	1.76	-
	115 V AC	60	1.80	3.60	-
R8i module heating element (option +C183)	230 V AC	50/60	-	-	40
	115 V AC	60	-	-	40
Charging controller	230 V AC (+10%/-15%)	50/60	0.04	-	-
	115 V AC (+10%/-15%)	50/60	0.08	-	-
PDAL2 switch/disconnector interlock 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
BAMU voltage/current measurement board	24 V DC	-	0.15	-	-

■ Cooling fans

Device	Type	U_N	f	I_{cont}
		V AC	Hz	A
IP54 roof fan	RB4C-355/170	230	50	1.10
			60	1.45
	RH35M-4EK.4F.1R	115	50	3.1
			60	3.9
Internal cabinet fan	W2E 143-AA09-01, axial	230	50	0.10
			60	0.14
	W2E 143-AA15-01, axial	115	50	0.21
			60	0.23

Applicable standards

See *ACS880 multidrive cabinets and modules electrical planning instructions* (3AUA0000102324 [English]).

Markings

See *ACS880 multidrive 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.

■ Cybersecurity disclaimer

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

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Control units of the drive

Contents of this chapter

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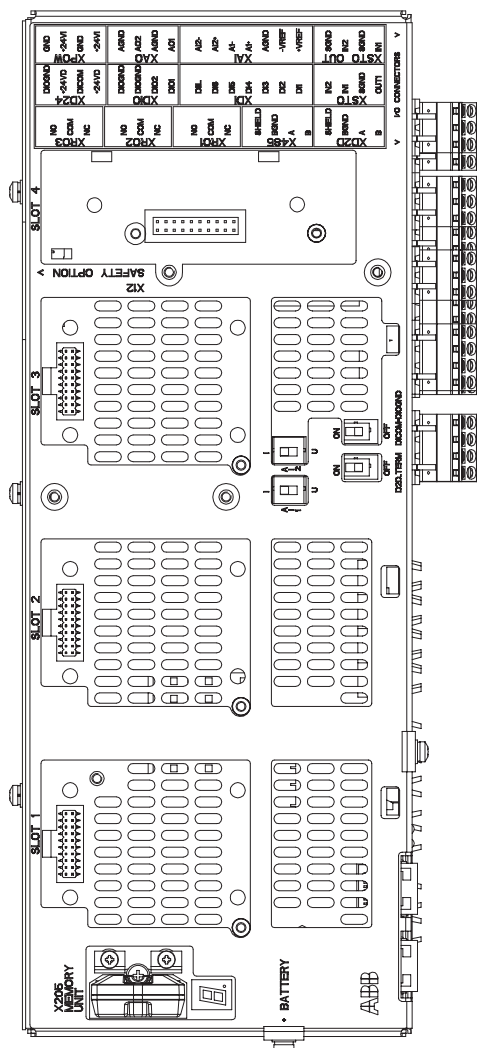
- describes the connections of the control unit
- contains the specifications of the inputs and outputs of the control unit.

General

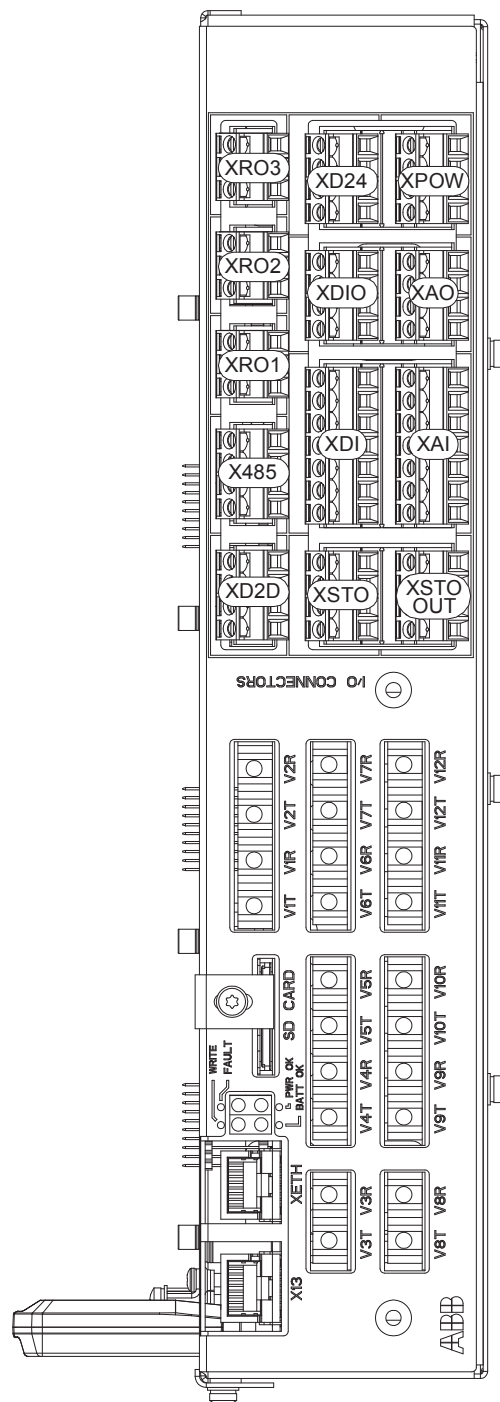
The converter unit is controlled by a BCU-x2 control unit. The BCU-x2 consists of a BCON-12 control board (and a BIOC-01 I/O connector board and power supply board) built in a metal housing. The control unit is connected to the rectifier module(s) by fiber optic cables.

In this manual, the name “BCU-x2” represents the control unit types BCU-02, BCU-12 and BCU-22. These have a different number of power module connections (2, 7 and 12 respectively) but are otherwise similar.

BCU-x2 control unit layout and connections



	Description
I/O	I/O terminals (see following diagram)
SLOT 1	I/O extension, encoder interface or fieldbus adapter module connection. (This is the sole location for an FDPI-02 diagnostics and panel interface.)
SLOT 2	I/O extension, encoder interface or fieldbus adapter module connection
SLOT 3	I/O extension, encoder interface, fieldbus adapter or FSO-xx safety functions module connection
SLOT 4	RDCO-0x DDCS communication option module connection
X205	Memory unit connection
BATTERY	Holder for real-time clock battery (BR2032)
AI1	Mode selector for analog input AI1 (I = current, U = voltage)
AI2	Mode selector for analog input AI2 (I = current, U = voltage)
D2D TERM	Termination switch for drive-to-drive link (D2D)
DICOM=DIOGND	Ground selection. Determines whether DICOM is separated from DIOGND (ie. the common reference for the digital inputs floats). See the ground isolation diagram.
7-segment display Multicharacter indications are displayed as repeated sequences of characters	
	("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-xx safety functions module (optional)
X13	Control panel / PC connection
X485	Not in use
V1T/V1R, V2T/V2R	Fiber optic connection to modules 1 and 2 (VxT = transmitter, VxR = receiver)
V3T/V3R ... V7T/V7R	Fiber optic connection to modules 3...7 (BCU-12/22 only) (VxT = transmitter, VxR = receiver)
V8T/V8R ... V12T/V12R	Fiber optic connection to modules 8...12 (BCU-22 only) (VxT = transmitter, VxR = receiver)
SD CARD	Data logger memory card for inverter module communication
BATT OK	Real-time clock battery voltage is higher than 2.8 V. If the LED is off when the control unit is powered, replace the battery.
FAULT	The control program has generated a fault. See the firmware manual of the supply/inverter unit.
PWR OK	Internal voltage supply is OK
WRITE	Writing to memory card in progress. Do not remove the memory card.

Default I/O diagram of the converter control unit

The diagram below shows the default I/O connections on the converter control unit, and describes the use of the signals/connections.

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

XD2D		Drive-to-drive link
1	B	Drive-to-drive link (not in use by default)
2	A	
3	BGND	
4	Shield	
X485		RS485 connection
5	B	Not in use (not in use by default)
6	A	
7	BGND	
8	Shield	
XRO1...XRO3		Relay outputs
11	NC	XRO1: Not in use 250 V AC / 30 V DC / 2 A
12	COM	
13	NO	
21	NC	XRO2: Fault(-1) ¹⁾ (Energized = no fault) 250 V AC / 30 V DC / 2 A
22	COM	
23	NO	
31	NC	XRO3: Fan control (DC/DC converter running, fan control on) 250 V AC / 30 V DC / 2 A
32	COM	
33	NO	
XSTO		XSTO connector
1	OUT	XSTO connector. Both circuits (power module, control unit) must be closed for the unit to start. (IN1 and IN2 must be connected to OUT.) ⁶⁾
2	SGND	
3	IN1	
4	IN2	
5	IN1	Not in use
6	SGND	
7	IN2	
8	SGND	
XDI		Digital inputs
1	DI1	Temp fault ¹⁾ (0 = overtemperature)
2	DI2	Not in use by default.
3	DI3	
4	DI4	
5	DI5	
6	DI6	
7	DIIL	
XDIO		Digital input/outputs
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	+24VD	+24 V DC 200 mA ⁴⁾
6	DICOM	Digital input ground
7	+24VD	+24 V DC 200 mA ⁴⁾
8	DIOGND	Digital input/output ground
DICOM=DIOGND		Ground selection switch ⁵⁾
XAI		Analog inputs, reference voltage output
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.
5	AI1-	0(2)...10 V, R_{in} > 200 kohm ²⁾
6	AI2+	Not in use by default.
7	AI2-	0(4)...20 mA, R_{in} = 100 ohm ³⁾
XAO		Analog outputs
1	AO1	Zero ¹⁾ 0...20 mA, R_L < 500 ohm (not in use by default)
2	AGND	
3	AO2	Zero ¹⁾ 0...20 mA, R_L < 500 ohm (not in use by default)
4	AGND	
XPOW		External power input
1	+24VI	24 V DC, 2.05 A
2	GND	
3	+24VI	
4	GND	
X12		Safety functions module connection (not in use in DDC)
X13		Control panel connection
X205		Memory unit connection

Notes:

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

External power supply for the control unit (XPOW)

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

The XD2D connector

The XD2D connector provides an RS-485 connection that can be used for

- basic master/follower communication with one master drive and multiple followers,
- fieldbus control through the embedded fieldbus interface (EFB), or
- drive-to-drive (D2D) communication implemented by application programming (not supported by the DC/DC converter control program).

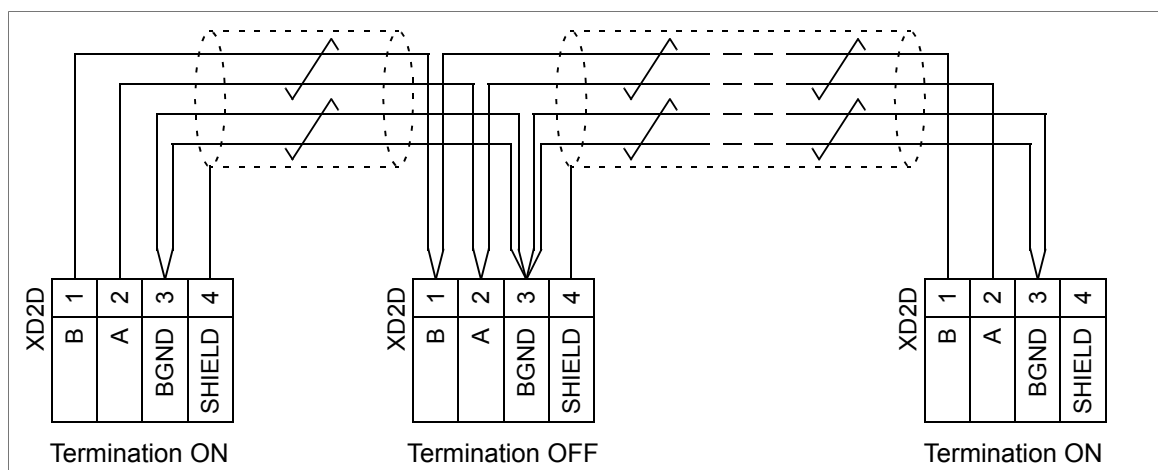
See the firmware manual of the drive for the related parameter settings.

Enable bus termination on the units at the ends of the drive-to-drive link. Disable bus termination on the intermediate units.

Use shielded twisted-pair cable with a twisted pair for data and a wire or another pair for signal ground (nominal impedance 100 to 165 ohm, for example Belden 9842) for the wiring. For best immunity, ABB recommends high quality cable. Keep the cable as short as possible. Avoid unnecessary loops and parallel runs near power cables such as motor cables.

The following diagram shows the wiring between control units.

BCU-x2



Safe torque off (XSTO, XSTO OUT)

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

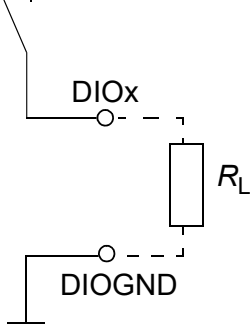
FSO-xx safety functions module connection (X12)

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

SDHC memory card slot

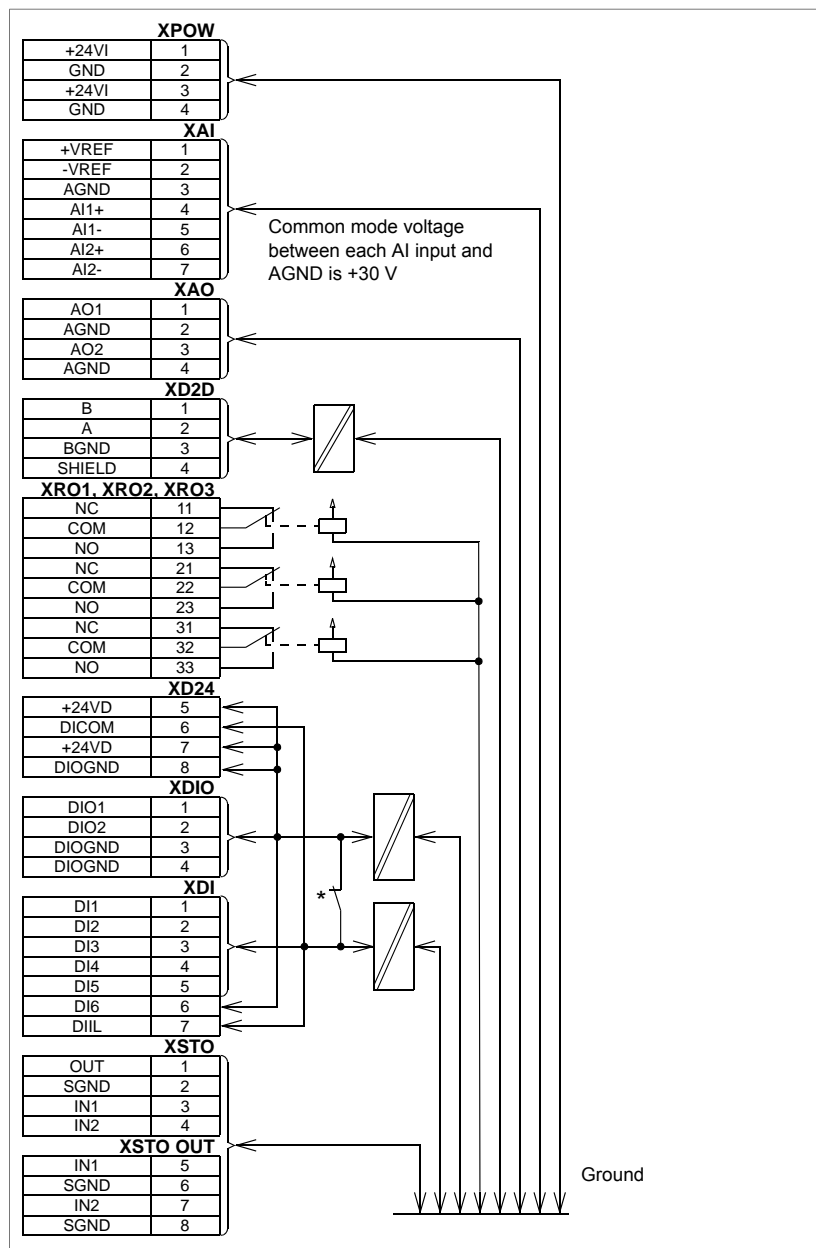
The BCU-x2 has an on-board data logger that collects real-time data from the power modules to help fault tracing and analysis. The data is stored onto the SDHC memory card inserted into the SD CARD slot and can be analyzed by ABB service personnel.

Connector data

Power supply (XPOW)	<p>Connector pitch 5 mm, wire size 2.5 mm²</p> <p>24 V ($\pm 10\%$) DC, 2 A</p> <p>External power input.</p> <p>Two supplies can be connected for redundancy.</p>
Relay outputs RO1...RO3 (XRO1...XRO3)	<p>Connector pitch 5 mm, wire size 2.5 mm²</p> <p>250 V AC / 30 V DC, 2 A</p> <p>Protected by varistors</p>
+24 V output (XD24:2 and XD24:4)	<p>Connector pitch 5 mm, wire size 2.5 mm²</p> <p>Total load capacity of these outputs is 4.8 W (200 mA / 24 V) minus the power taken by DIO1 and DIO2.</p>
Digital inputs DI1...DI6 (XDI:1...XDI:6)	<p>Connector pitch 5 mm, wire size 2.5 mm²</p> <p>24 V logic levels: "0" < 5 V, "1" > 15 V</p> <p>R_{in}: 2.0 kohm</p> <p>Input type: NPN/PNP (DI1...DI5), NPN (DI6)</p> <p>Hardware filtering: 0.04 ms, digital filtering up to 8 ms</p> <p>DI6 (XDI:6) can alternatively be used as an input for a PTC sensor. "0" > 4 kohm, "1" < 1.5 kohm.</p> <p>I_{max}: 15 mA (DI1...DI5), 5 mA (DI6)</p>
Start interlock input DIIL (XDI:7)	<p>Connector pitch 5 mm, wire size 2.5 mm²</p> <p>24 V logic levels: "0" < 5 V, "1" > 15 V</p> <p>R_{in}: 2.0 kohm</p> <p>Input type: NPN/PNP</p> <p>Hardware filtering: 0.04 ms, digital filtering up to 8 ms</p>
<p>Digital inputs/outputs DIO1 and DIO2 (XDIO:1 and XDIO:2)</p> <p>Input/output mode selection by parameters.</p> <p>DIO1 can be configured as a frequency input (0...16 kHz with hardware filtering of 4 microseconds) for 24 V level square wave signal (sinusoidal or other wave form cannot be used). DIO2 can be configured as a 24 V level square wave frequency output. See the firmware manual of the supply/inverter unit, parameter group 111/11.</p>	<p>Connector pitch 5 mm, wire size 2.5 mm²</p> <p><u>As inputs</u>: 24 V logic levels: "0" < 5 V, "1" > 15 V. R_{in}: 2.0 kohm. Filtering: 1 ms.</p> <p><u>As outputs</u>: Total output current from +24VD is limited to 200 mA</p> <p>+24VD</p>  <p>DIOx</p> <p>R_L</p> <p>DIOGND</p>
Reference voltage for analog inputs +VREF and -VREF (XAI:1 and XAI:2)	<p>Connector pitch 5 mm, wire size 2.5 mm²</p> <p>10 V $\pm 1\%$ and -10 V $\pm 1\%$, R_{load} 1...10 kohm</p> <p>Maximum output current: 10 mA</p>

Analog inputs AI1 and AI2 (XAI:4 ... XAI:7). Current/voltage input mode selection by switches	Connector pitch 5 mm, wire size 2.5 mm ² Current input: -20...20 mA, $R_{in} = 100 \text{ ohm}$ Voltage input: -10...10 V, $R_{in} > 200 \text{ kohm}$ Differential inputs, common mode range $\pm 30 \text{ V}$ Sampling interval per channel: 0.25 ms Hardware filtering: 0.25 ms, adjustable digital filtering up to 8 ms Resolution: 11 bit + sign bit Inaccuracy: 1% of full scale range
Analog outputs AO1 and AO2 (XAO)	Connector pitch 5 mm, wire size 2.5 mm ² 0...20 mA, $R_{load} < 500 \text{ ohm}$ Frequency range: 0...500 Hz Resolution: 11 bit + sign bit Inaccuracy: 2% of full scale range
XD2D connector	Connector pitch 5 mm, wire size 2.5 mm ² Physical layer: RS-485 Transmission rate: 8 Mbit/s Cable type: Shielded twisted-pair cable with a twisted pair for data and a wire or another pair for signal ground (nominal impedance 100 to 165 ohm, for example Belden 9842) Maximum length of link: 50 m (164 ft) Termination by switch
RS-485 connection (X485)	Connector pitch 5 mm, wire size 2.5 mm ² Physical layer: RS-485
Safe torque off connection (XSTO)	Connector pitch 5 mm, wire size 2.5 mm ² Input voltage range: -3...30 V DC Logic levels: "0" < 5 V, "1" > 17 V. Note: For the unit to start, both connections must be "1". This applies to all control units (including drive, inverter, supply, brake, DC/DC converter etc. control units), but true Safe torque off functionality is only achieved through the XSTO connector of the drive/inverter control unit. EMC (immunity) according to IEC 61326-3-1
Safe torque off output (XSTO OUT)	Connector pitch 5 mm, wire size 2.5 mm ² To STO connector of inverter module.
Control panel connection (X13)	Connector: RJ-45 Cable length < 3 m
Ethernet connection (XETH)	Connector: RJ-45 This connection is not supported by the firmware.
SDHC memory card slot (SD CARD)	Memory card type: SDHC Maximum memory size: 4 GB
The terminals of the control unit fulfill the Protective Extra Low Voltage (PELV) requirements. The PELV requirements of a relay output are not fulfilled if a voltage higher than 48 V is connected to the relay output.	

■ BCU-x2 ground isolation diagram



*Ground selector (DICOM=DIOGND) settings

DICOM=DIOGND: ON

All digital inputs share a common ground (DICOM connected to DIOGND). This is the default setting.

DICOM=DIOGND: OFF

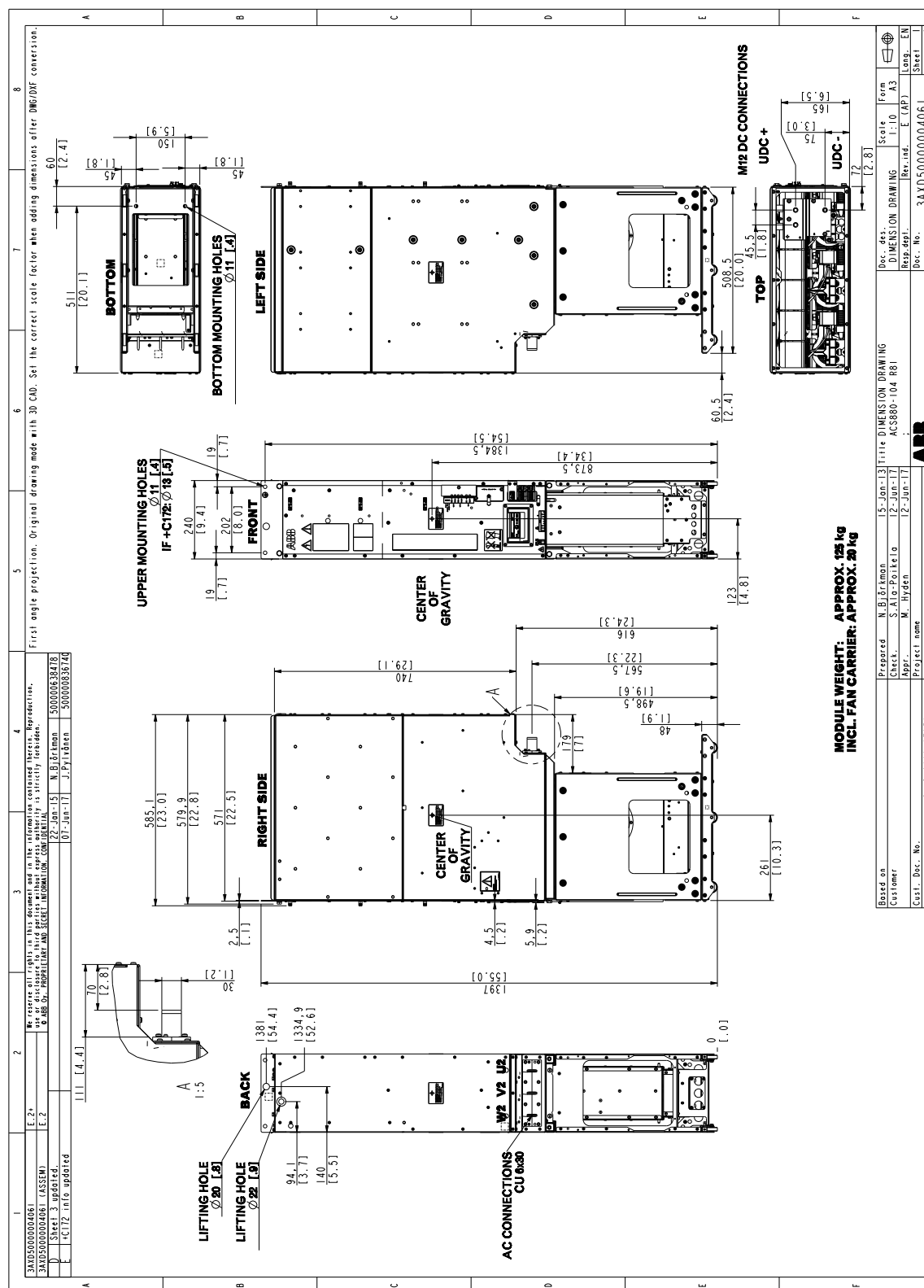
Ground of digital inputs DI1...DI5 and DIIL (DICOM) is isolated from DIO signal ground (DIOGND). Isolation voltage 50 V.

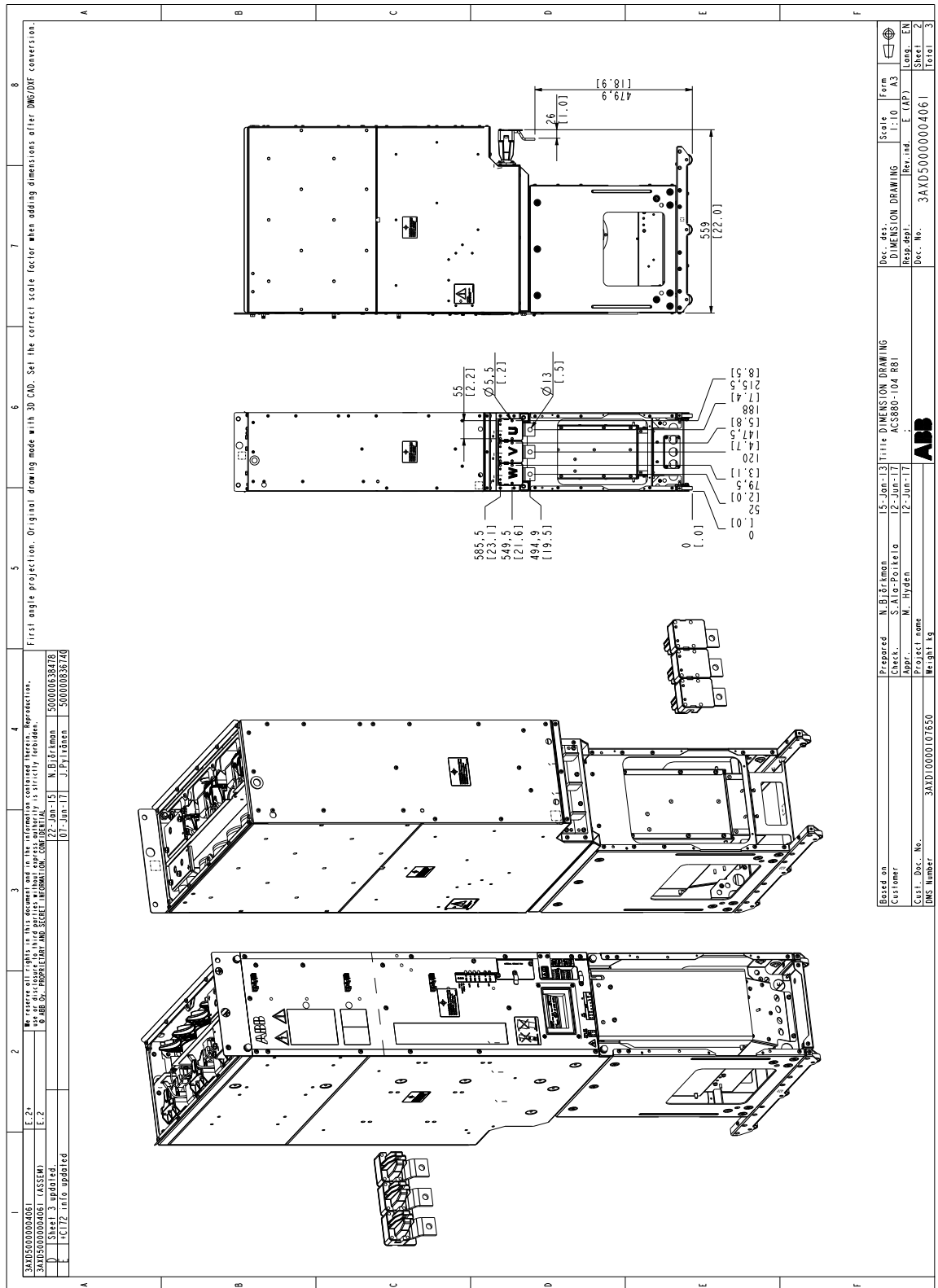
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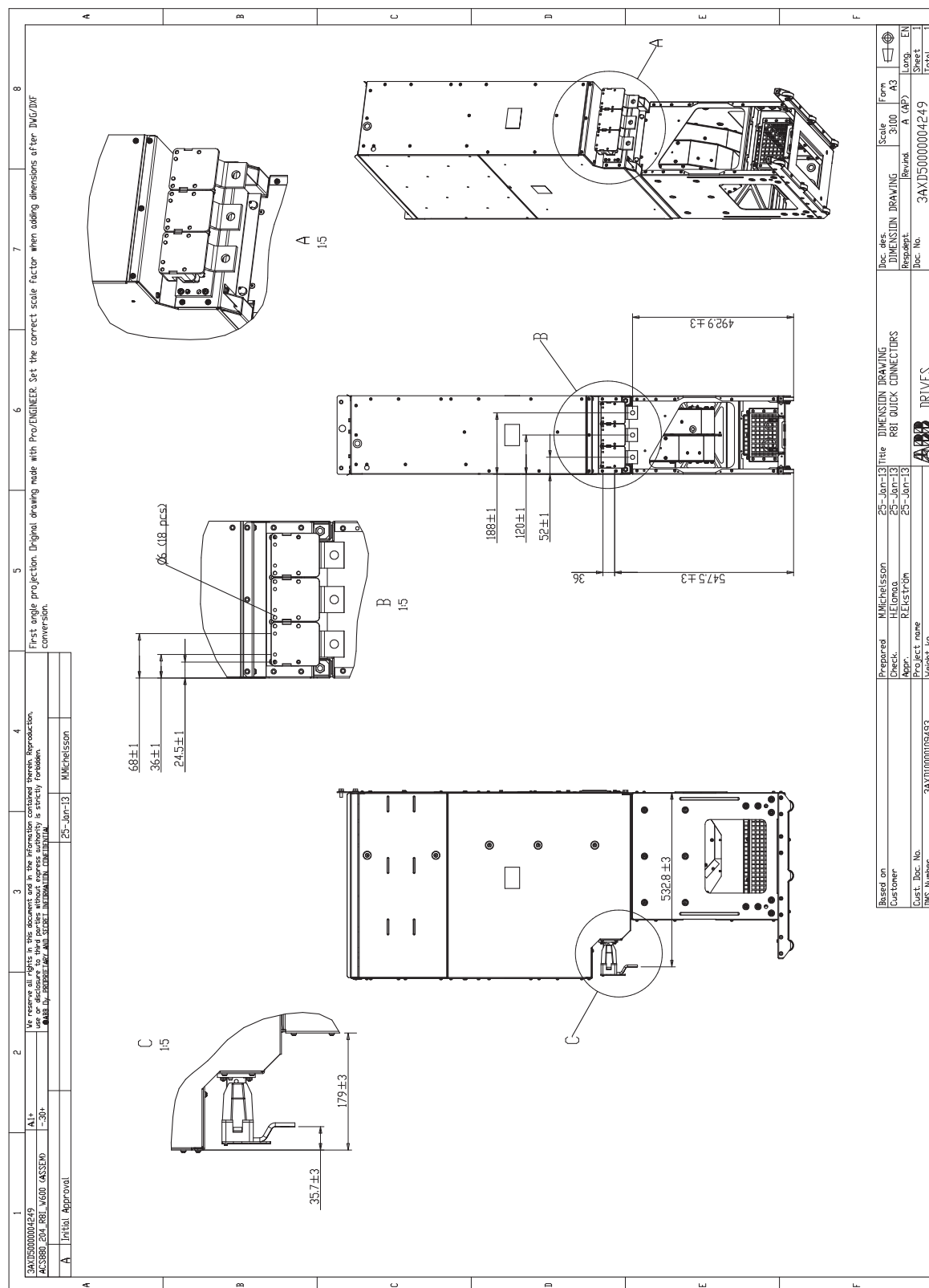
Dimension drawings

Contents of this chapter

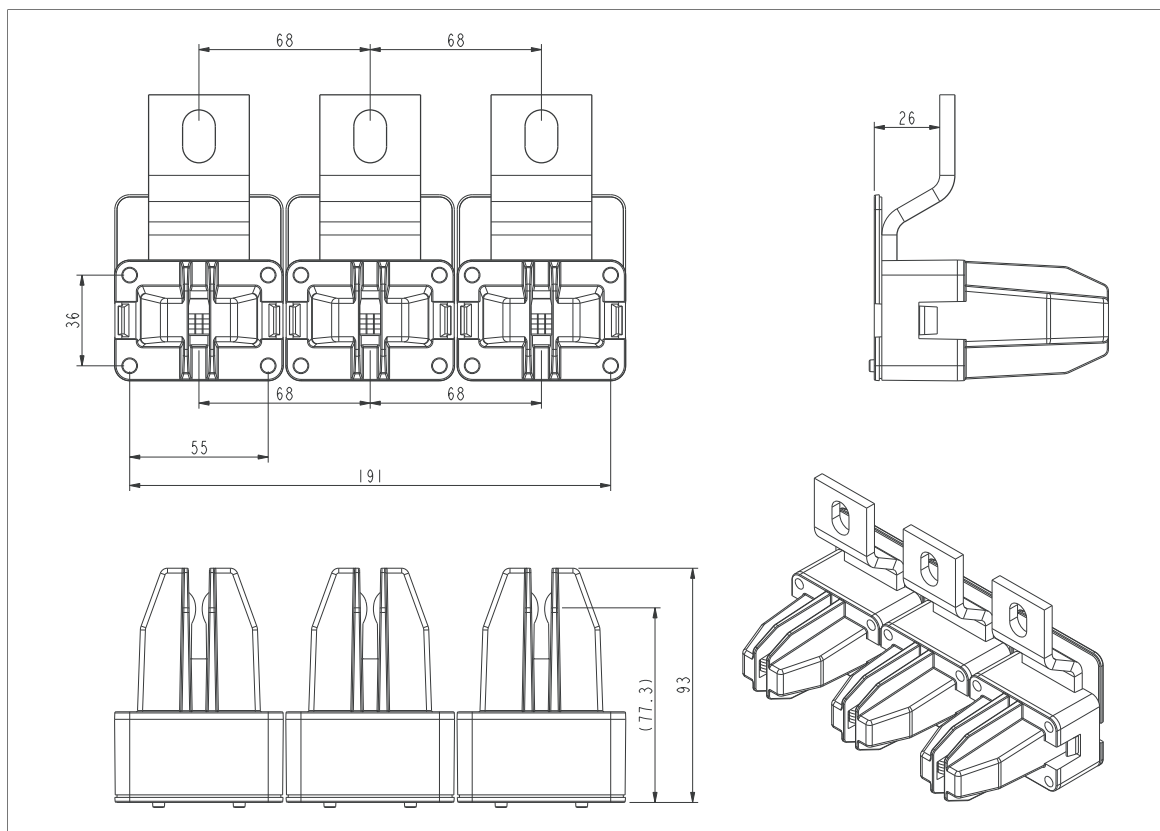
This chapter shows the dimensions of the ACS880-1604 DC/DC converter modules and accessories.





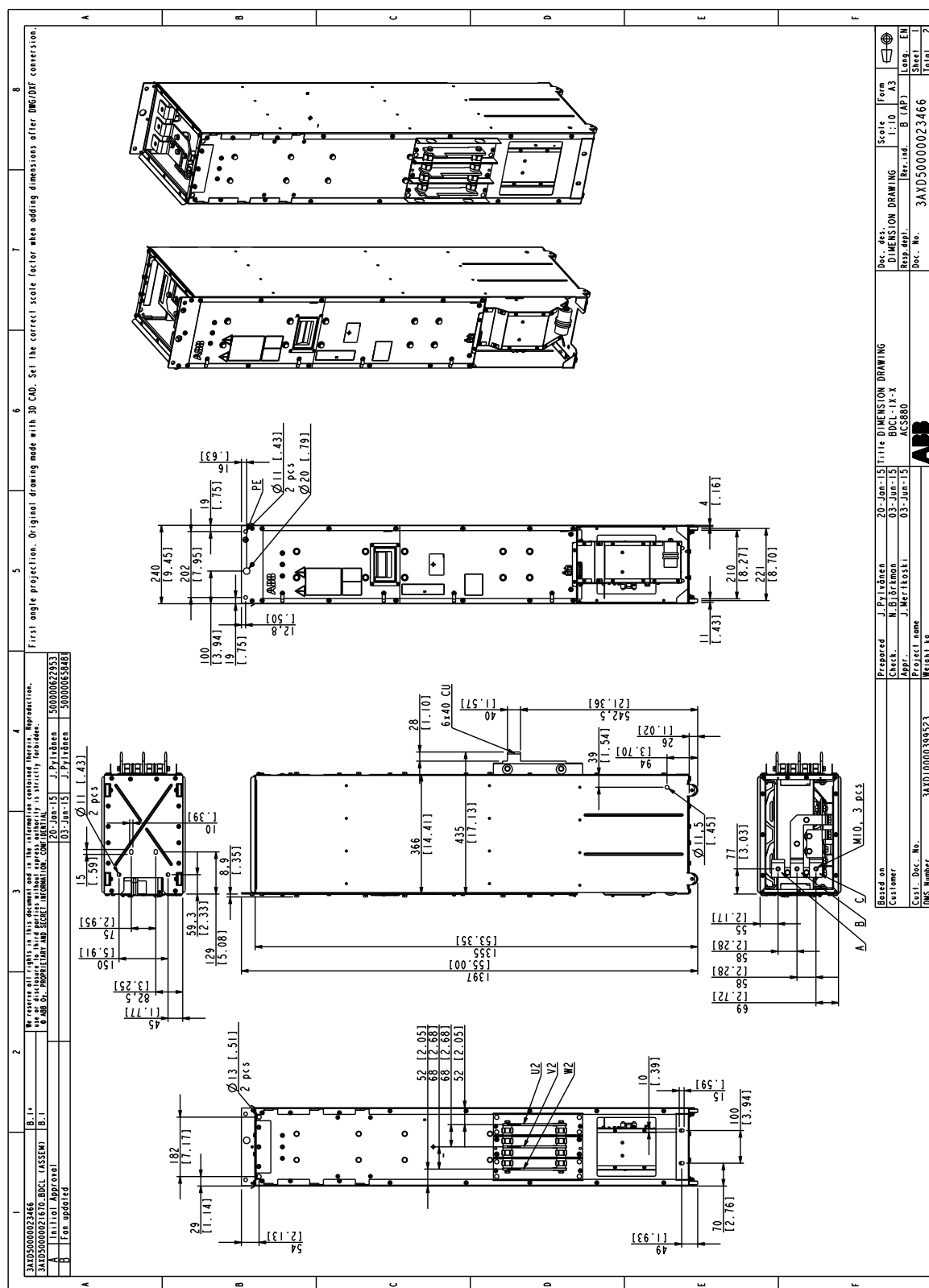


Quick connectors

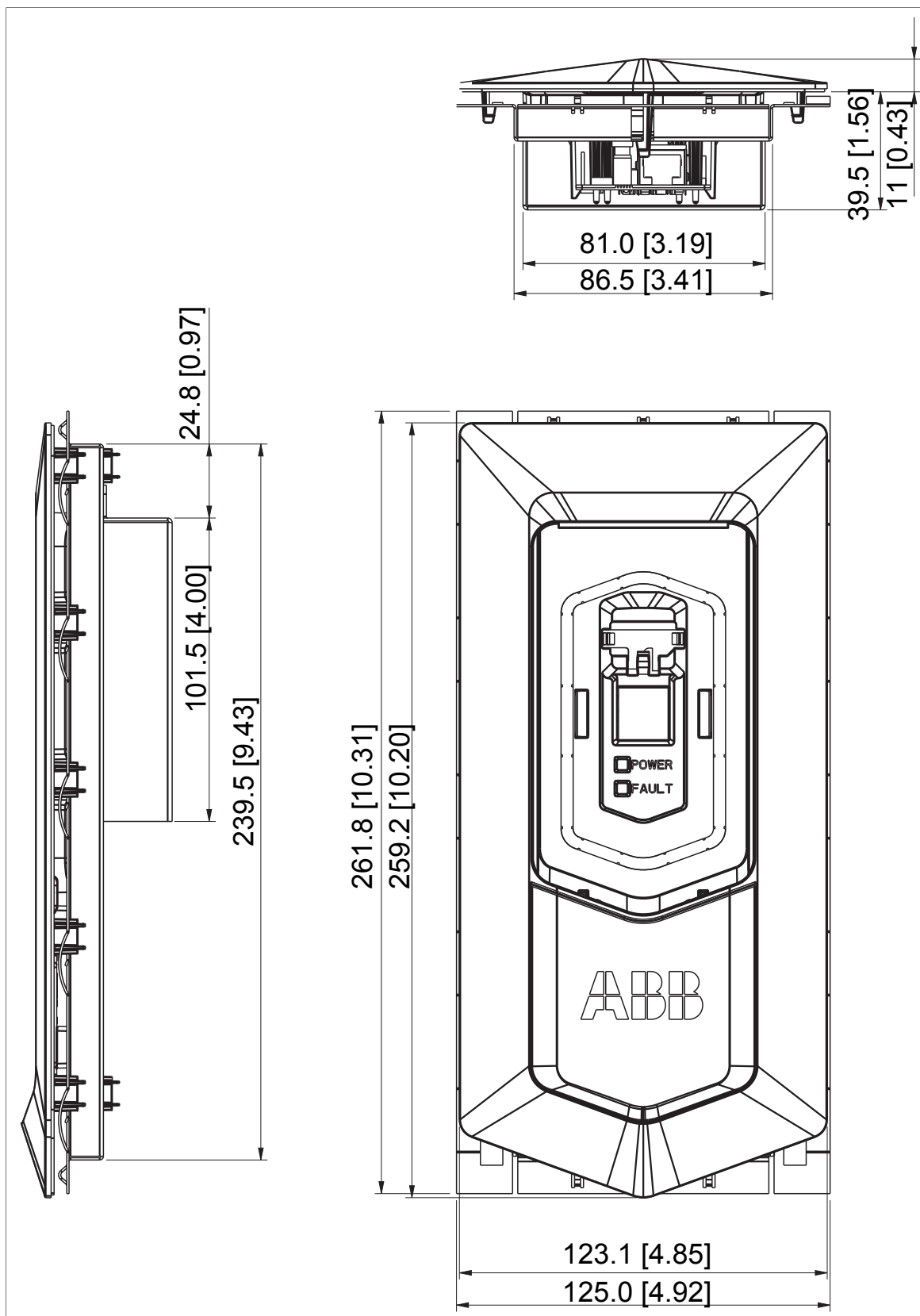


Dimensions in mm

1 mm = 0.0394 in



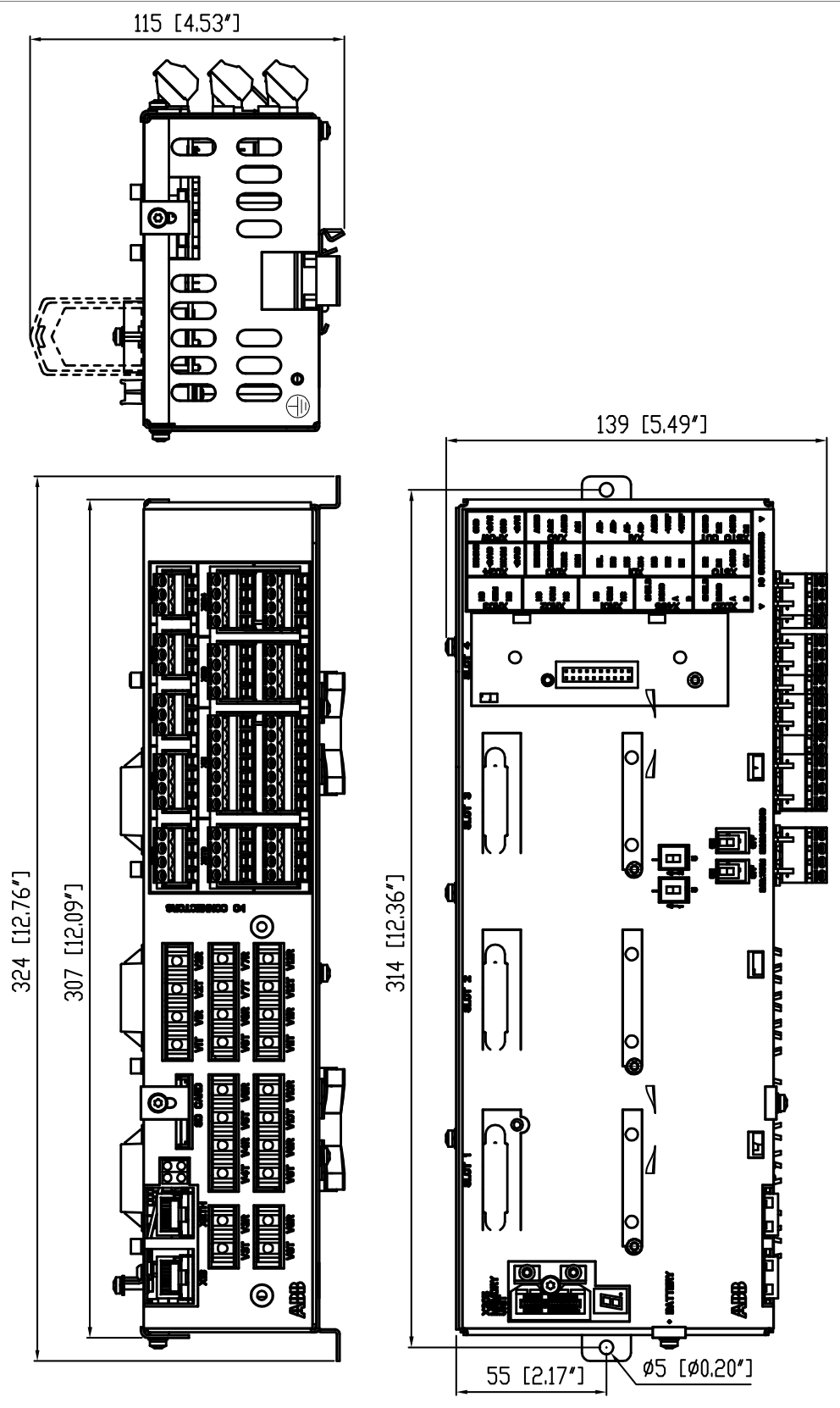
DPMP-01 door mounting kit



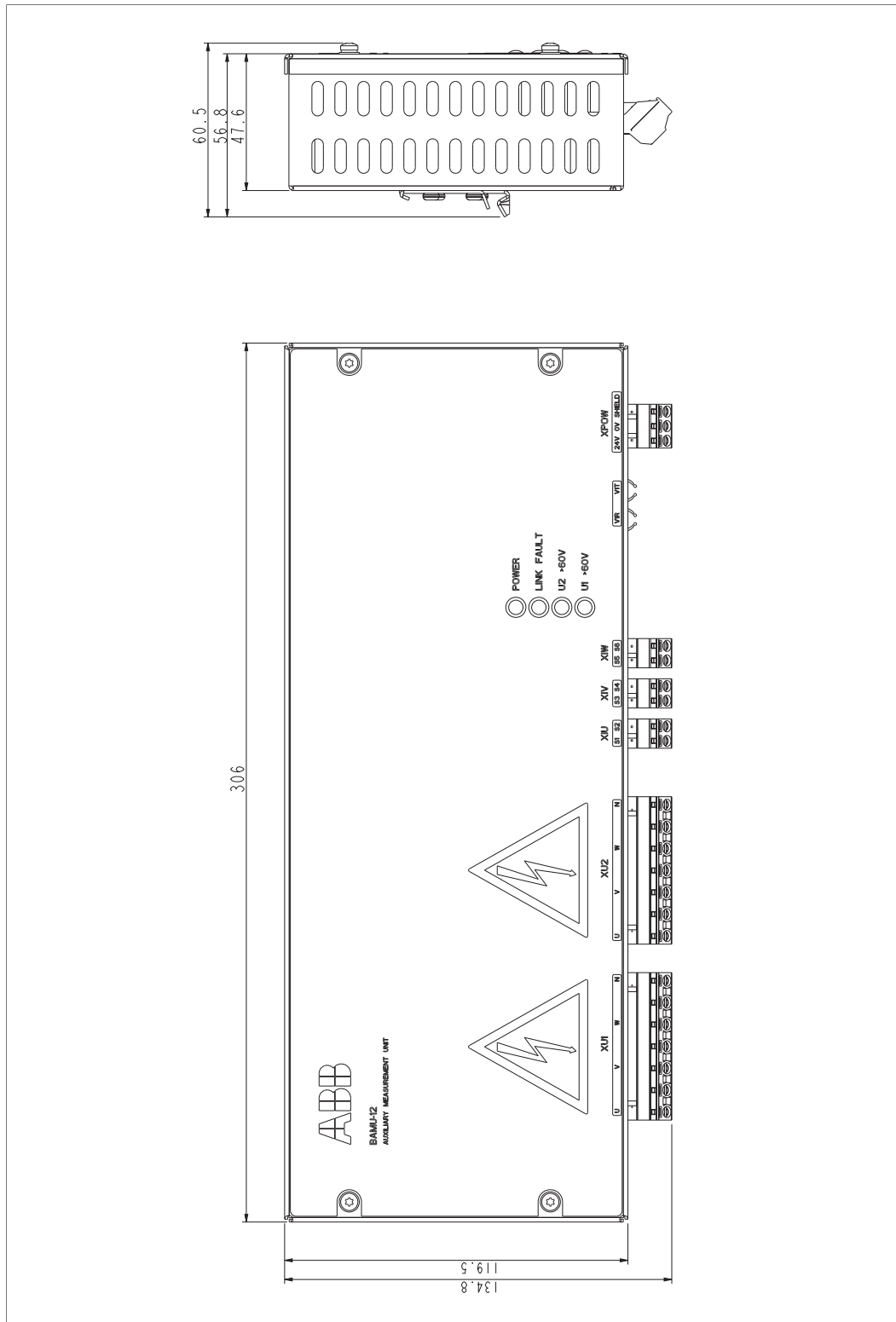
Cutting in the cabinet door: 109 mm × 223 mm (4.29 in. × 8.78 in.)

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

BCU control unit



BAMU voltage/current measurement unit

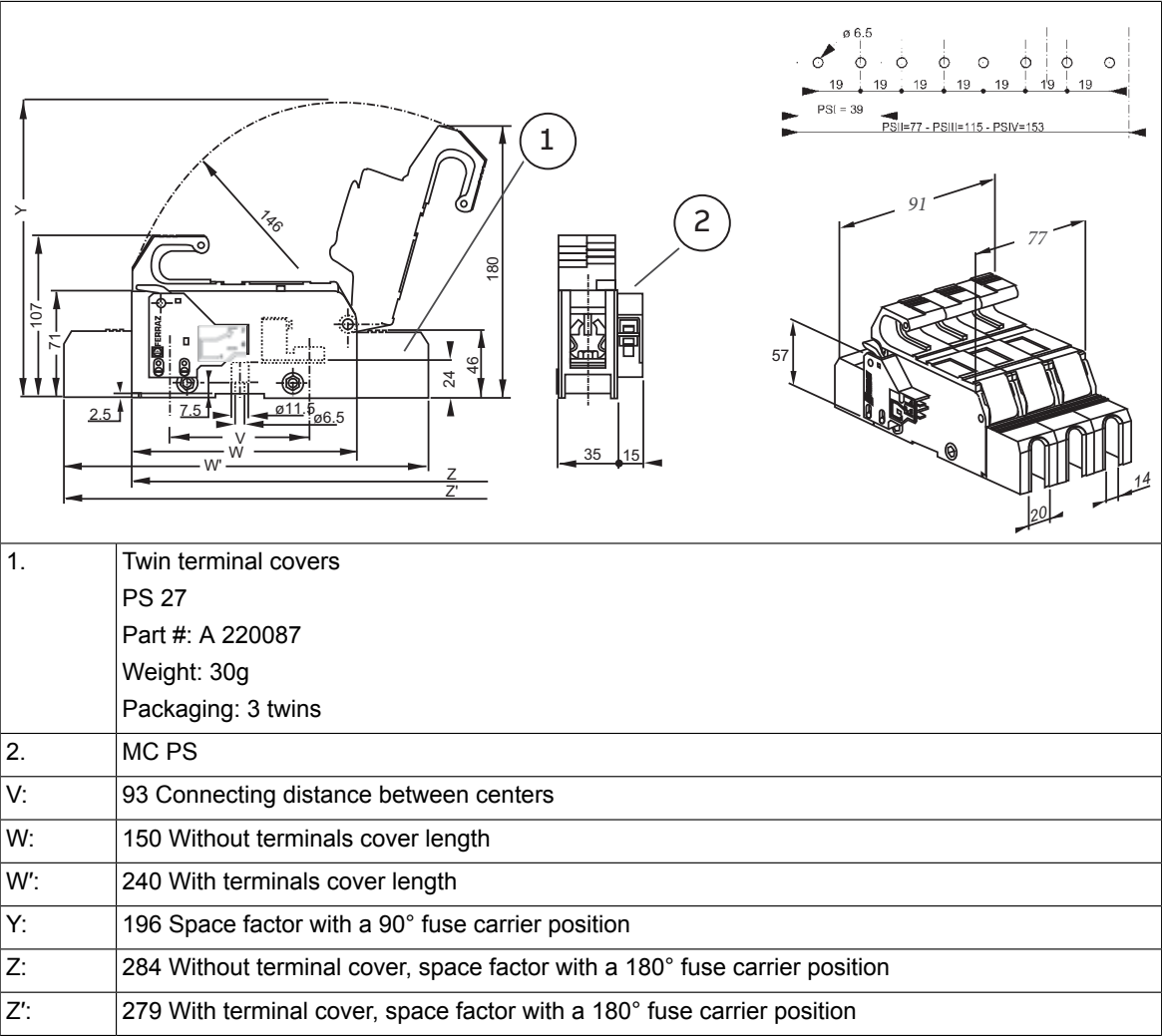


Dimensions in mm

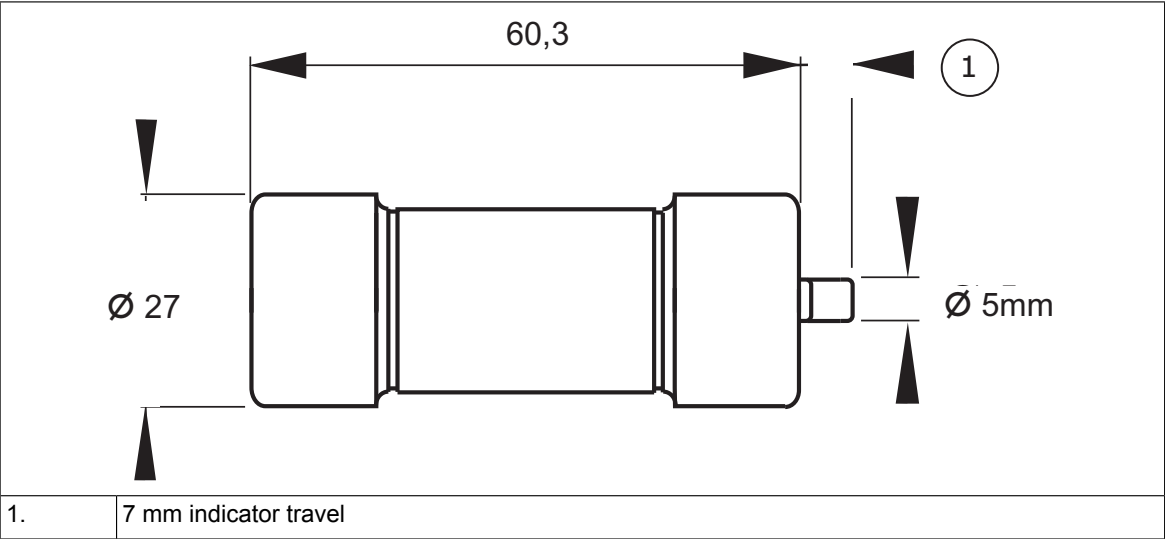
1 mm = 0.0394 in

BAMU fuse holders and fuses

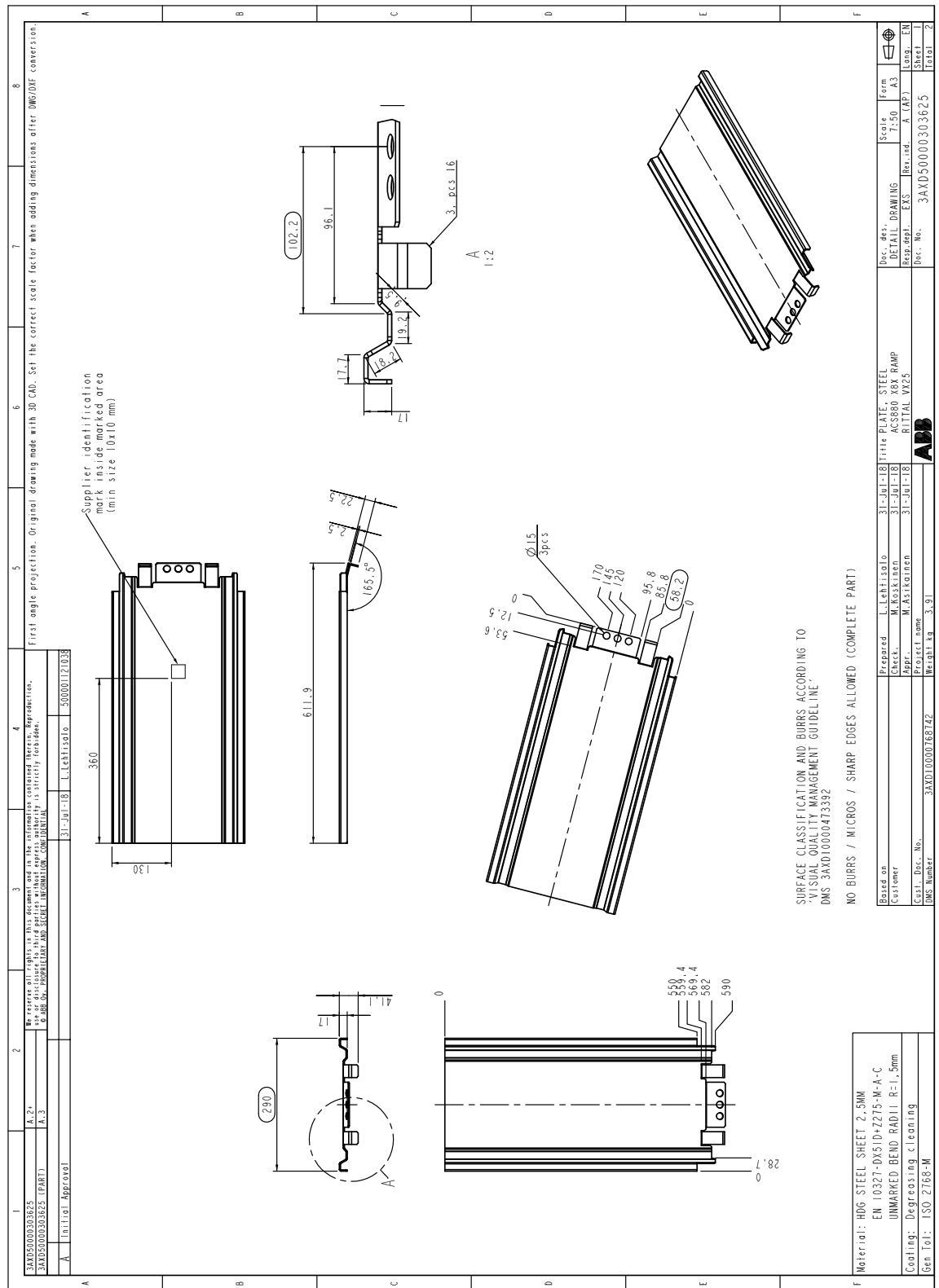
■ PS272PREMCPS fuse disconnecter and PS27 terminal cover

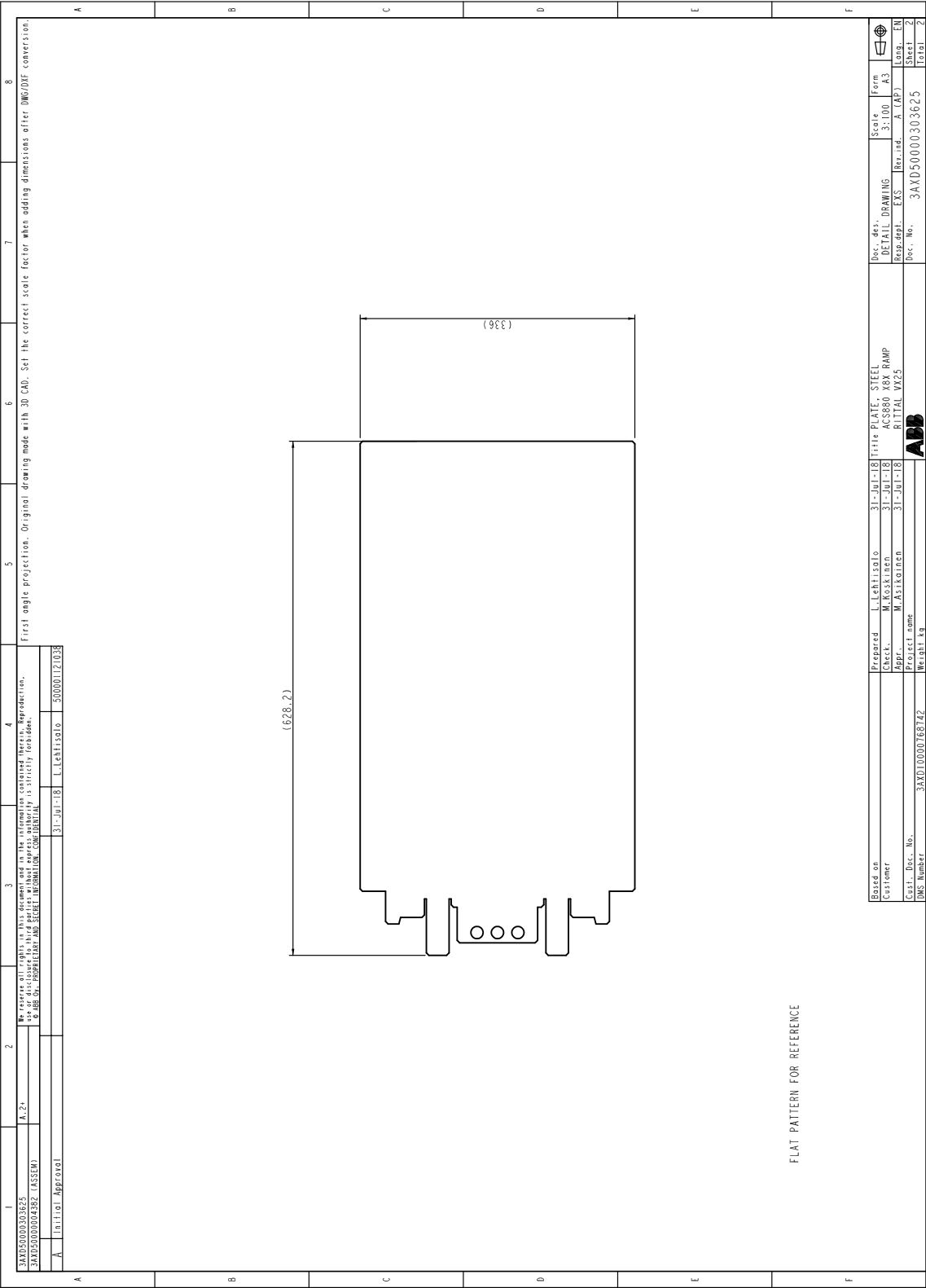


■ Fuse, 27 × 60 mm



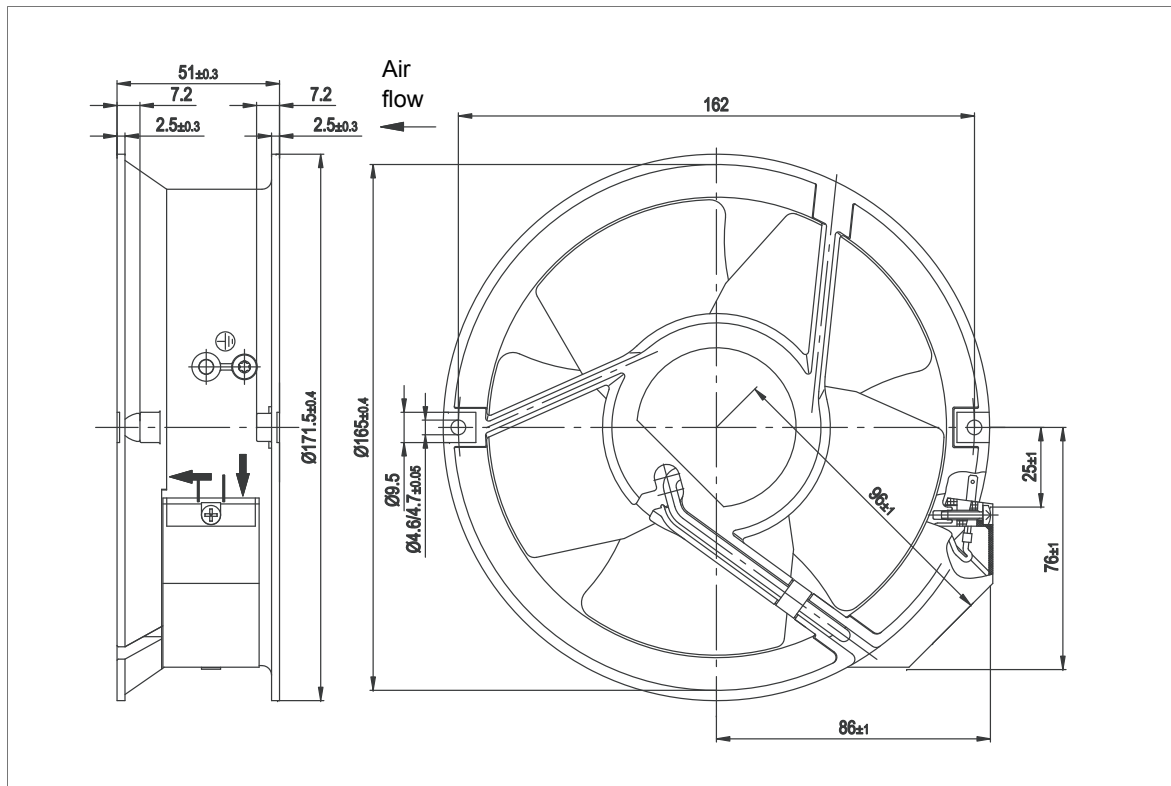
Ramp





Internal cabinet fan

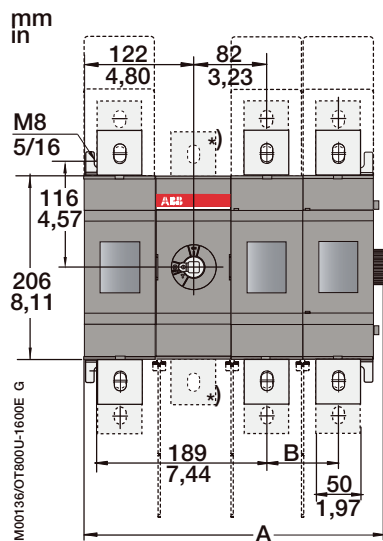
■ W2E 143-AA09-01, W2E 143-AA15-01



Switchgear and charging components

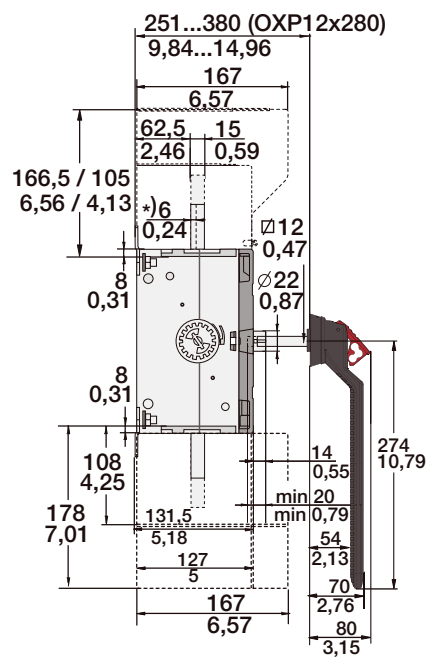
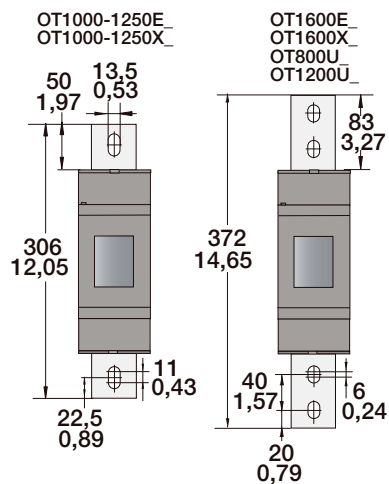
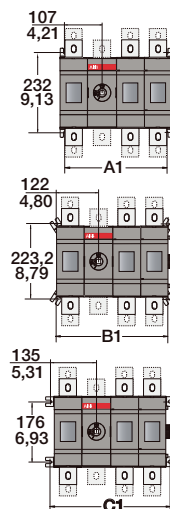
■ DC switch/disconnectors

OT1600E11 (IEC), OT1200U11 (UL)



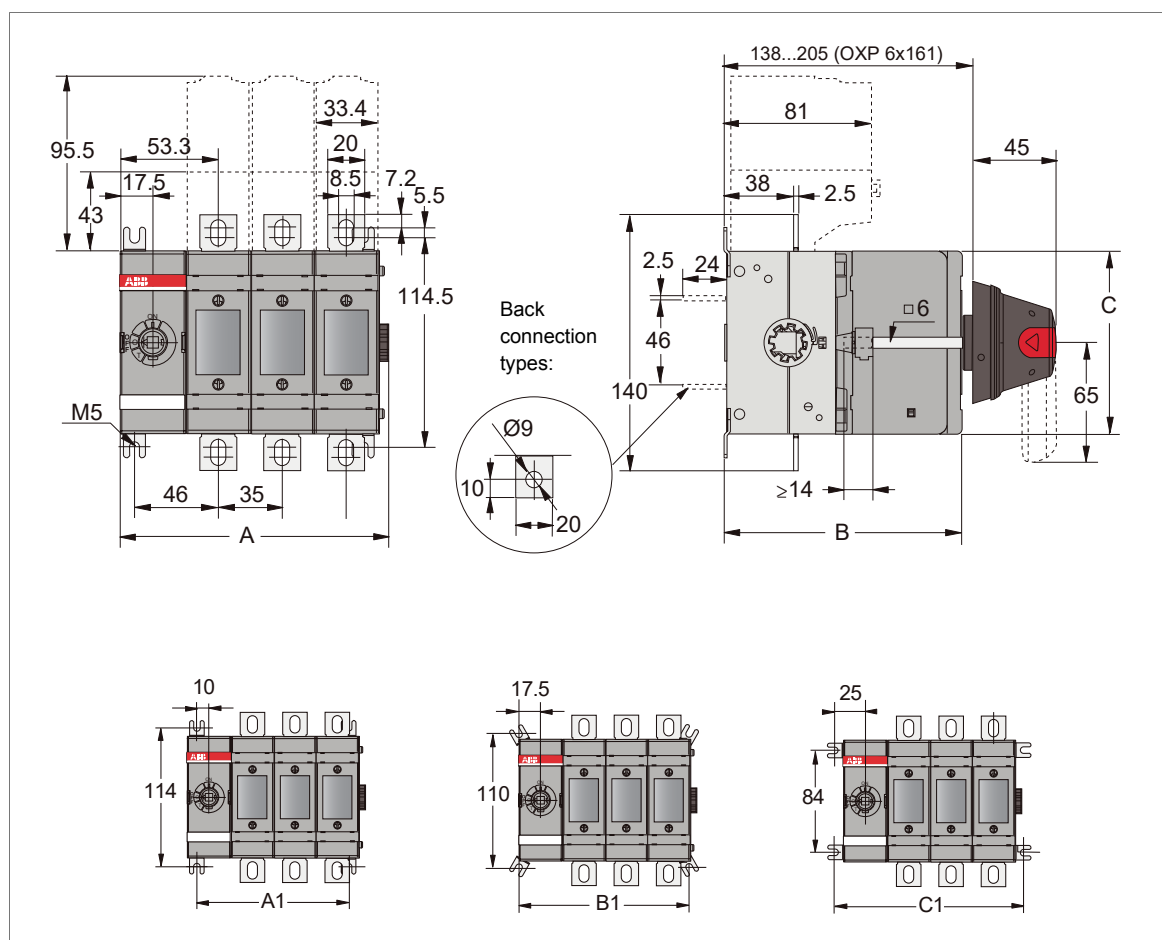
*) N3 types

	_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)

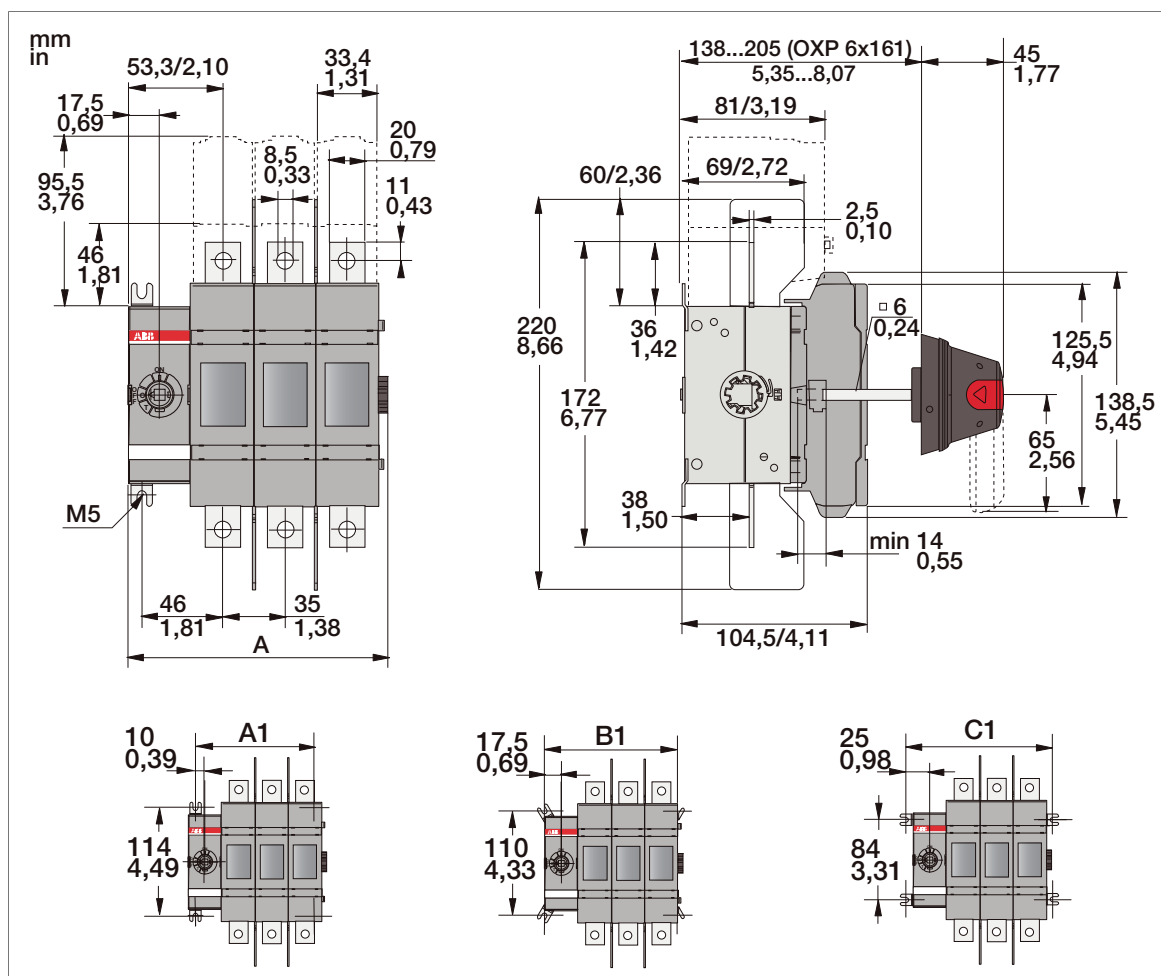


■ Charging switches

OS160GD04F (IEC)

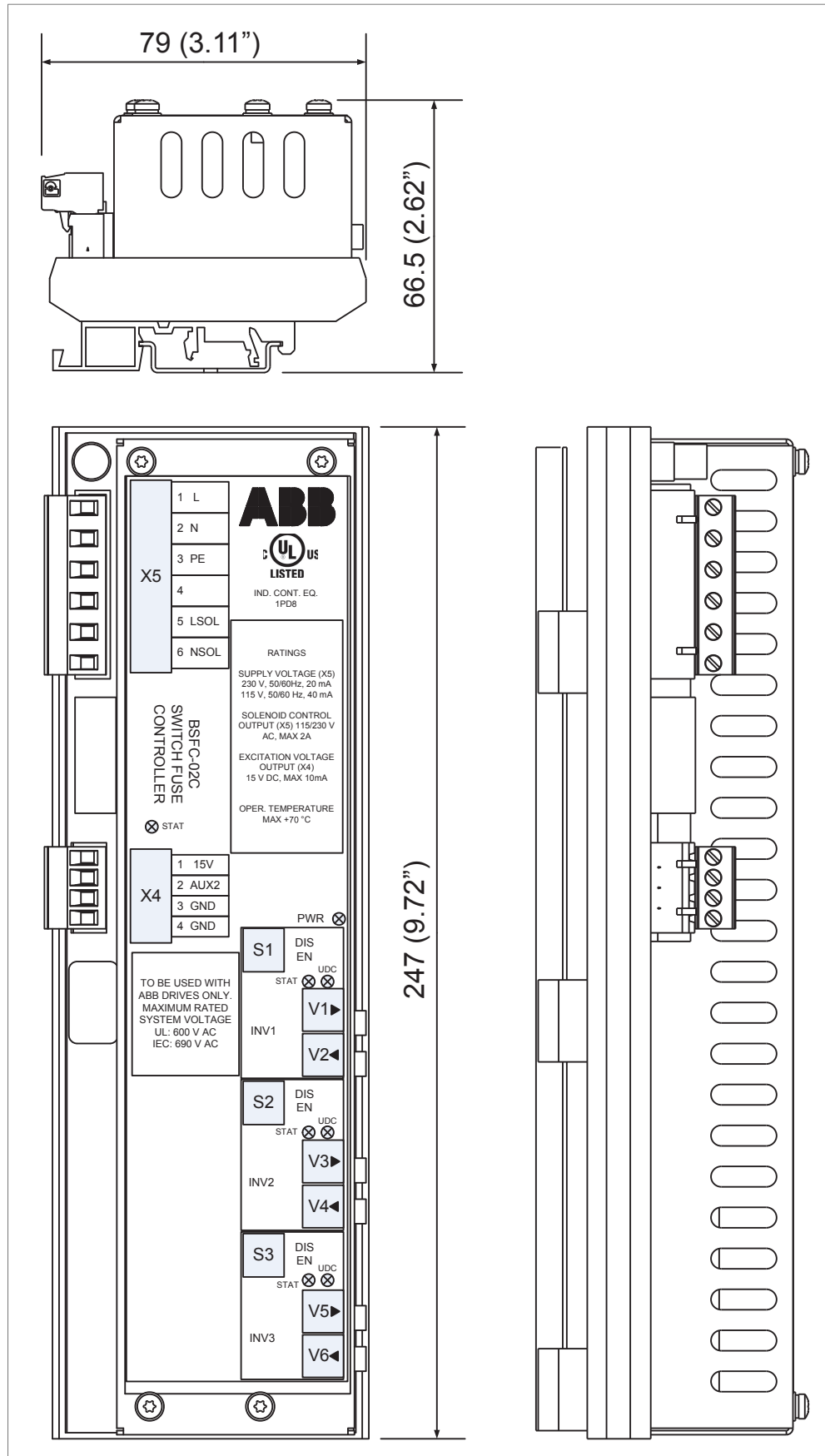


A	181.5 mm
B	130 mm
C	100 mm
A1	160 mm
B1	175 mm
C1	190 mm

OS100GJ04FP (UL/CSA)

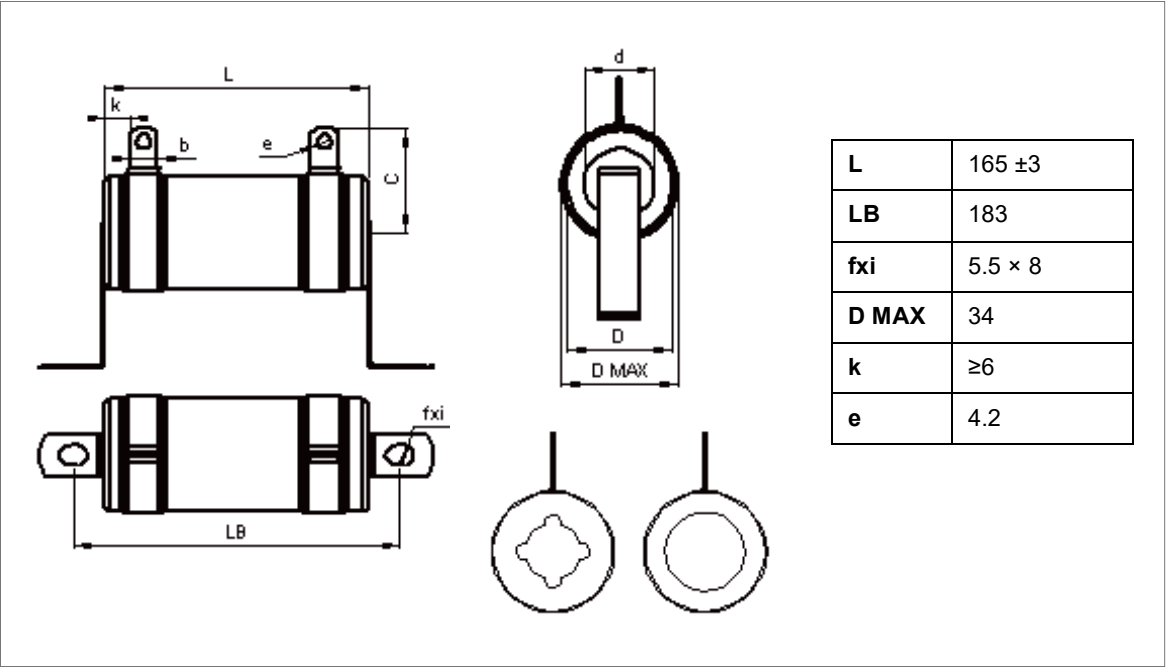
[mm/in]	J01	J02	J03	J04
A	76.5/3.01	111.5/4.39	146.5/5.77	181.5/7.15
A1	55/2.17	90/3.54	125/4.92	160/6.30
B1	70/2.76	105/4.13	140/5.51	175/6.89
C1	85/3.35	120/4.72	155/6.10	190/7.84

■ Charging controller



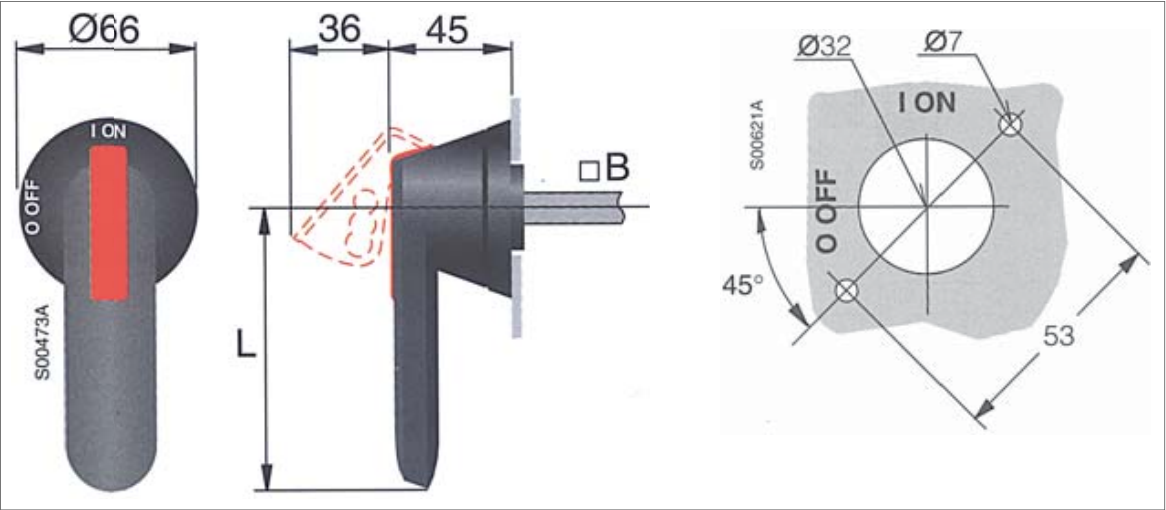
■ Resistors

ZRF 30X165



■ Handles

OHB65J6

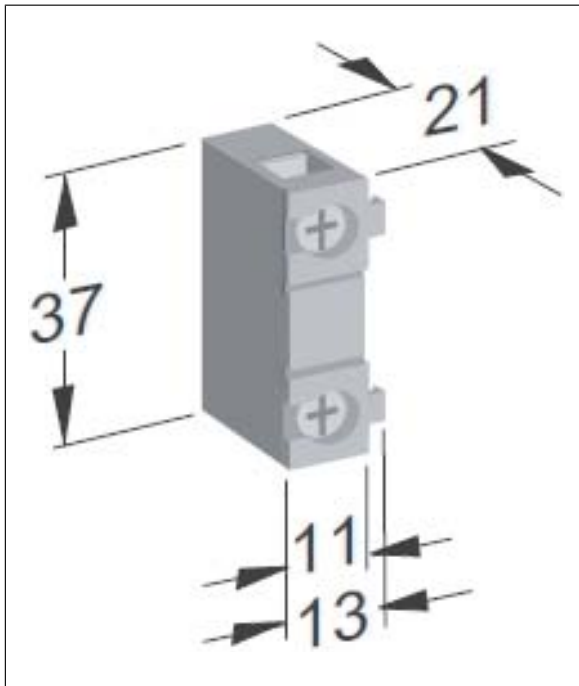


Handle type	L (mm)	B (mm)	Notes
OHB65J6	65	6 × 6	Used with switch-disconnector units

Dimensions in mm
1 mm = 0.0394 in

■ Contacts

Auxiliary contact OA3G01, OA1G10

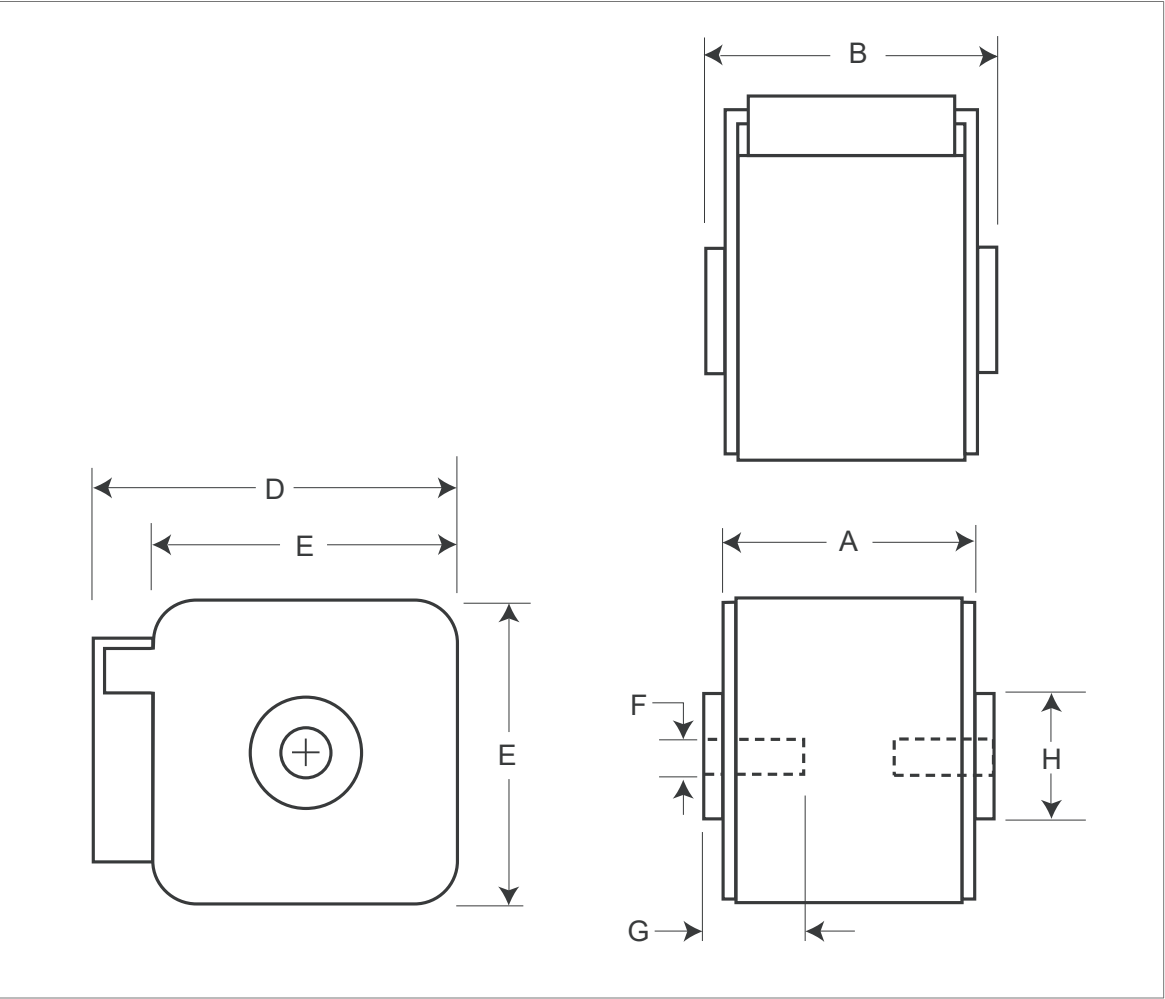


2×0.75...2.5 mm² (2×18...14 AWG)

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

14. Example circuit diagrams

Contents of this chapter

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

The purpose of these diagrams is to help in:

- understanding the internal connections and operation of the cabinet-installed DC/DC converter unit, and
- learning how to wire a DC/DC converter modules when installed in a user-defined cabinet.

Component designations used in the diagrams

■ DC/DC converter 1×R8i and 2×R8i without DC switch/disconnector

The circuit diagrams include:

Designation	Component
A41	BCU control unit
A48	DPMP-01 door mounting kit for control panel, including DDPI board
A49	ACS-AP-x control panel
A232	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)
F90.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 1×R8i and 2×R8i with DC switch/disconnector

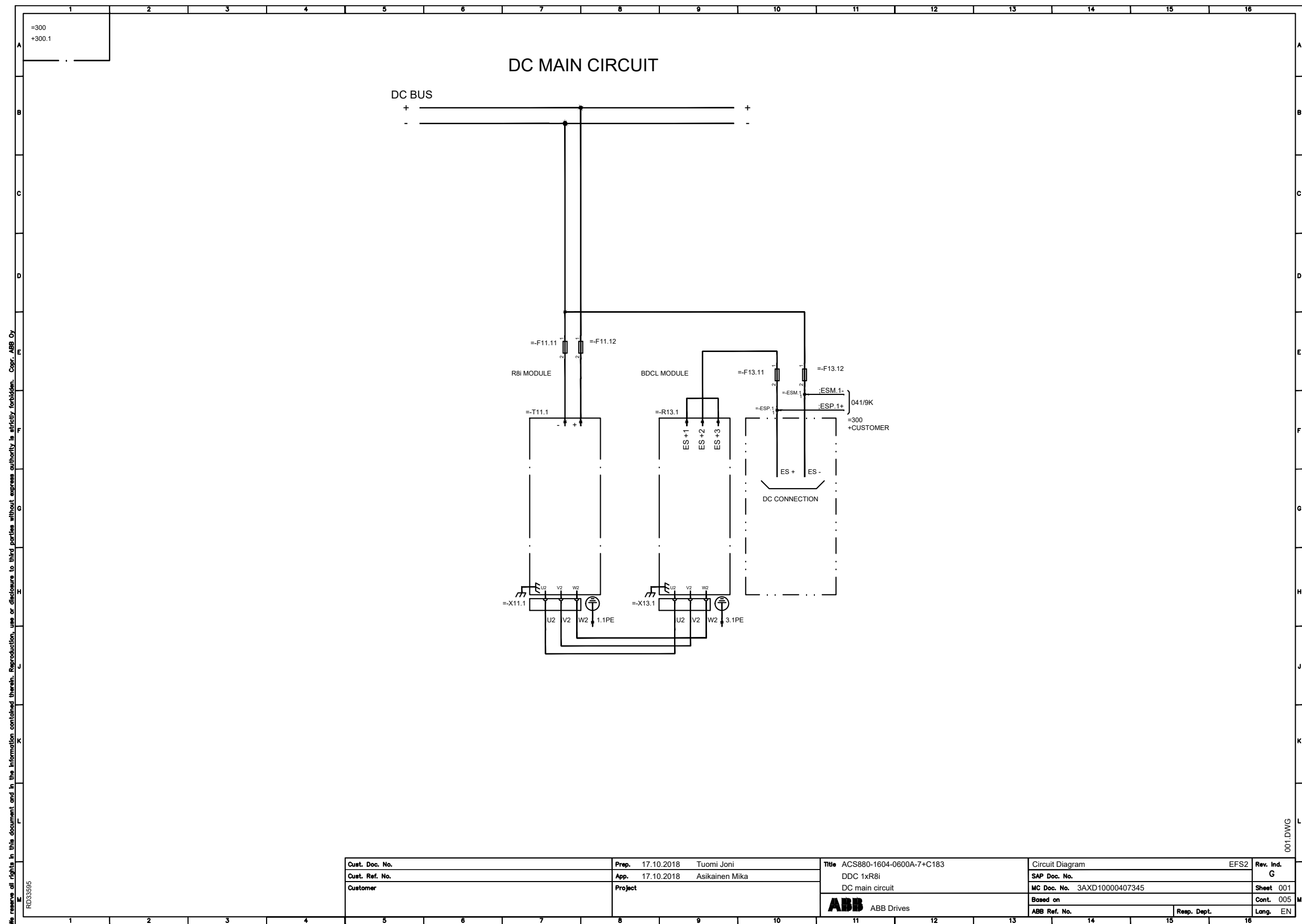
The diagrams include:

Designation	Component
A11.x	Charging controller
A41	BCU control unit
A48	DPMP-01 door mounting kit for control panel, including DDPI board
A49	ACS-AP-x control panel
A232	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)
F90.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

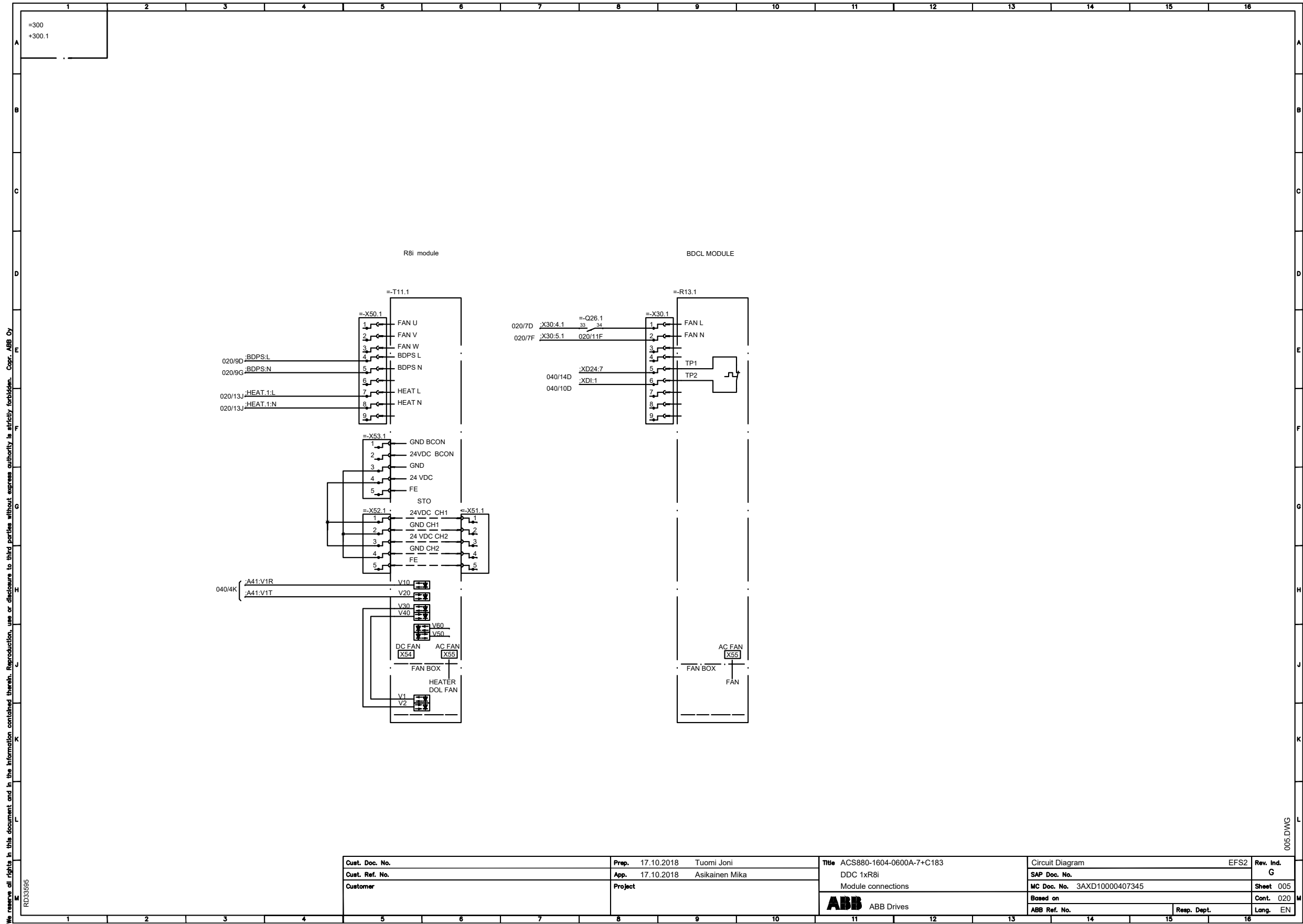
The circuit diagrams also include DOL fan supply (+C188), an example of auxiliary voltage distribution and external supply for heating element (option +C183).

DDC 1xR8i without DC switch/disconnector

■ DC main circuit (sheet 001)



Module connections (sheet 005)



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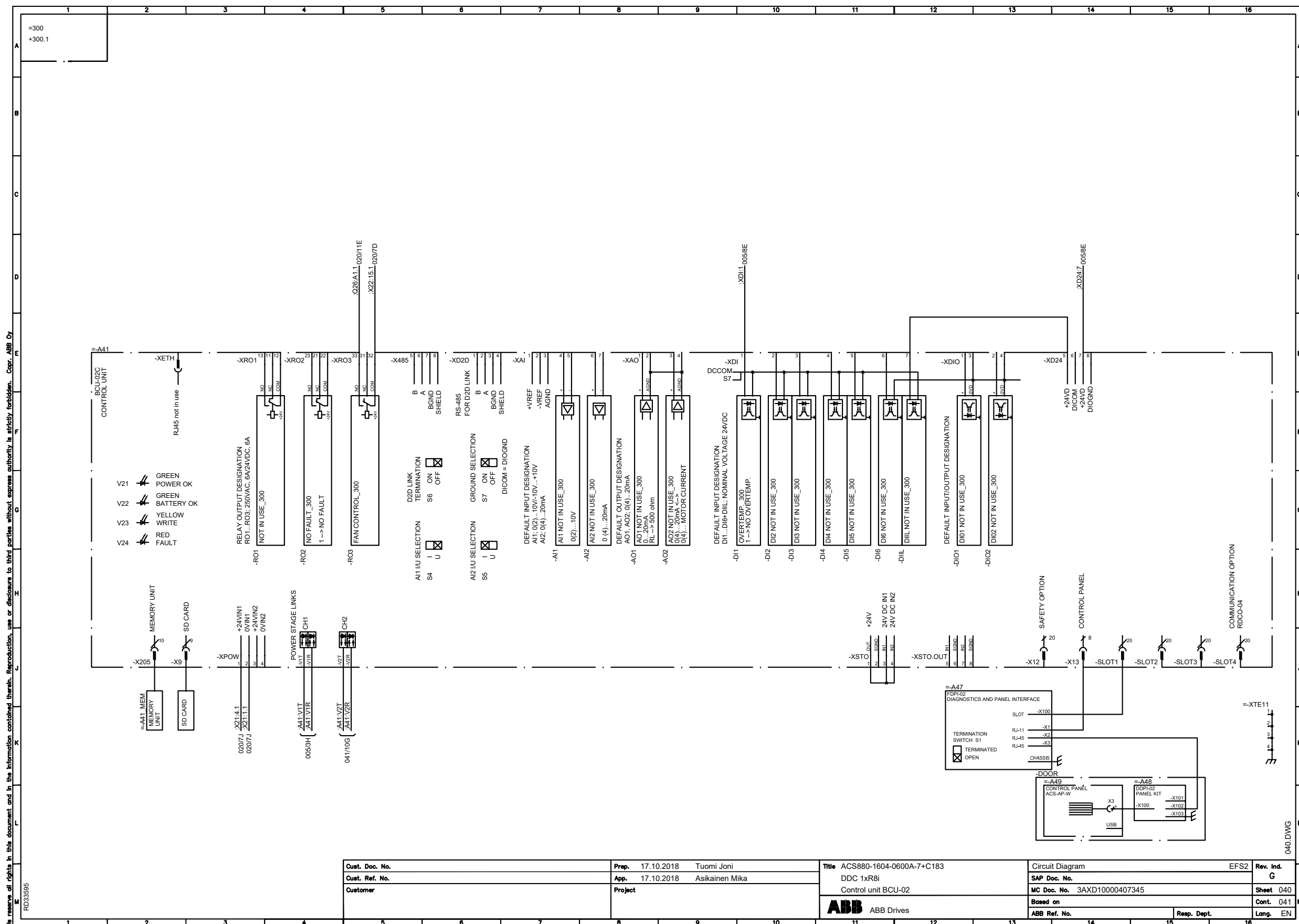
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Cust. Ref. No.	App. 17.10.2018 Asikainen Mika	DDC 1xR8i	SAP Doc. No.		G
Customer	Project	Module connections	MC Doc. No. 3AXD10000407345		Sheet 005
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			ABB Ref. No.	Resp. Dept.	Lang. EN

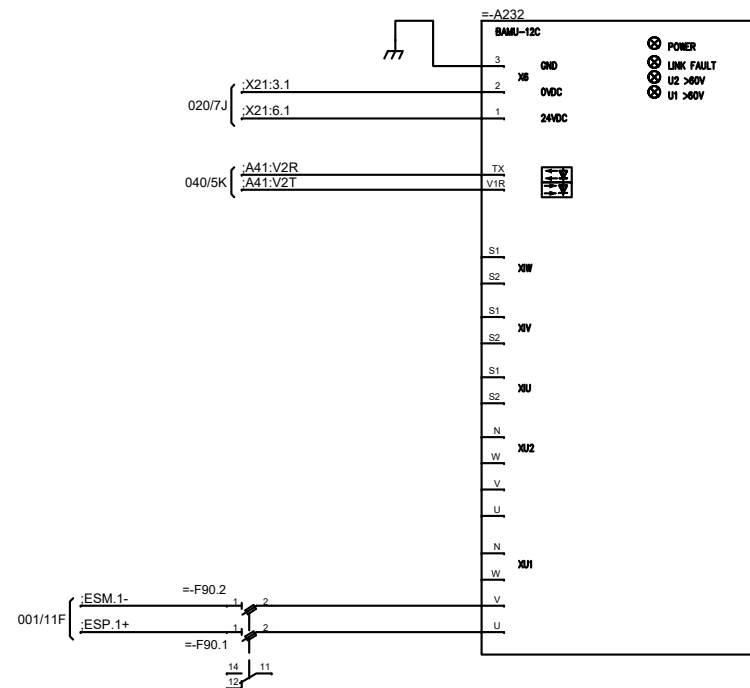
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Control unit (sheet 040)



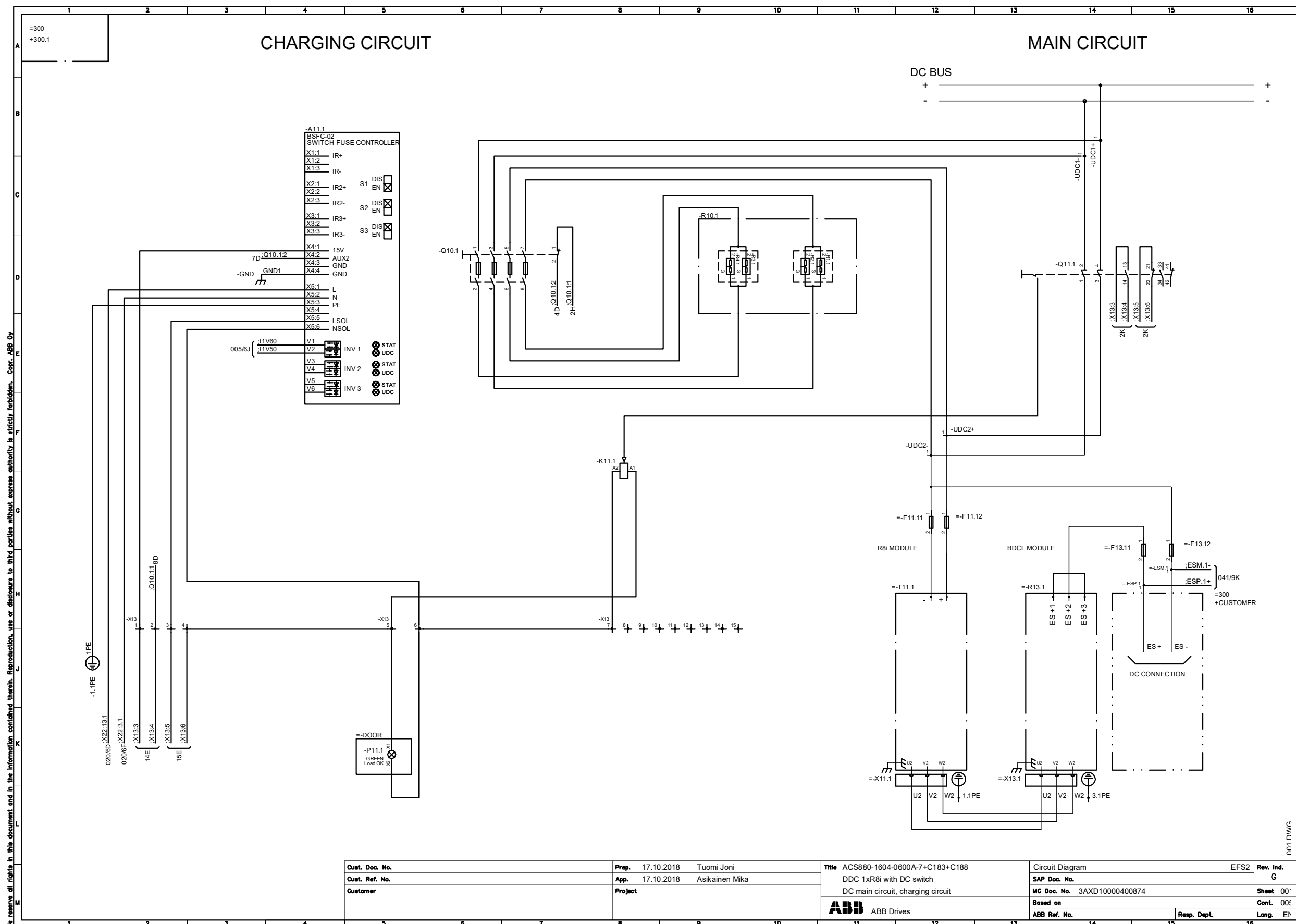
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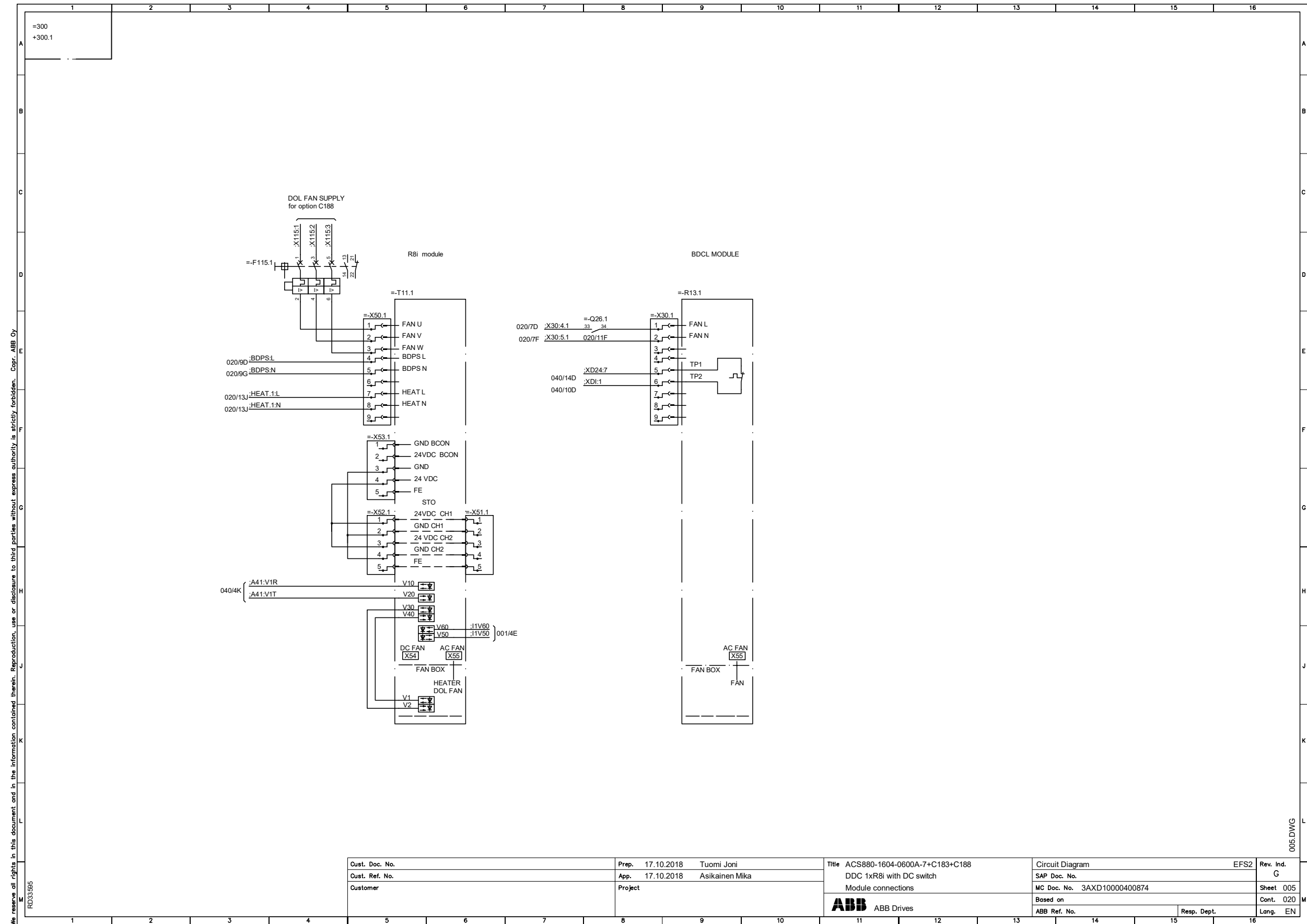
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Cust. Ref. No.	App. 17.10.2018 Asikainen Mika		SAP Doc. No.		
Customer	Project		MC Doc. No. 3AXD10000407345		Sheet 041
			Based on		Cont. -
			ABB Ref. No.	Resp. Dept.	Lang. EN

DDC 1×R8i with DC switch/disconnector

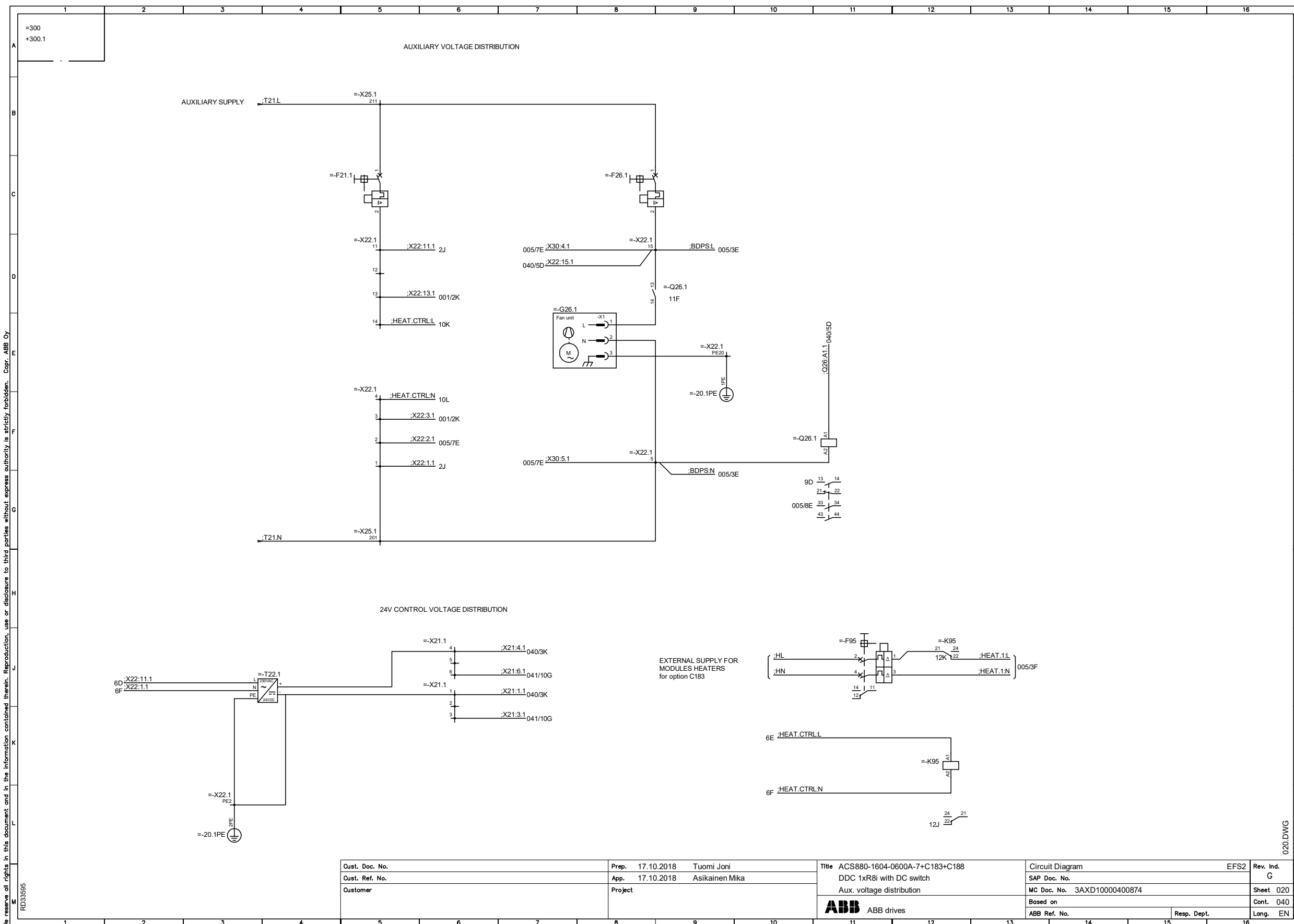
- **DC main circuit, charging circuit (sheet 001)**



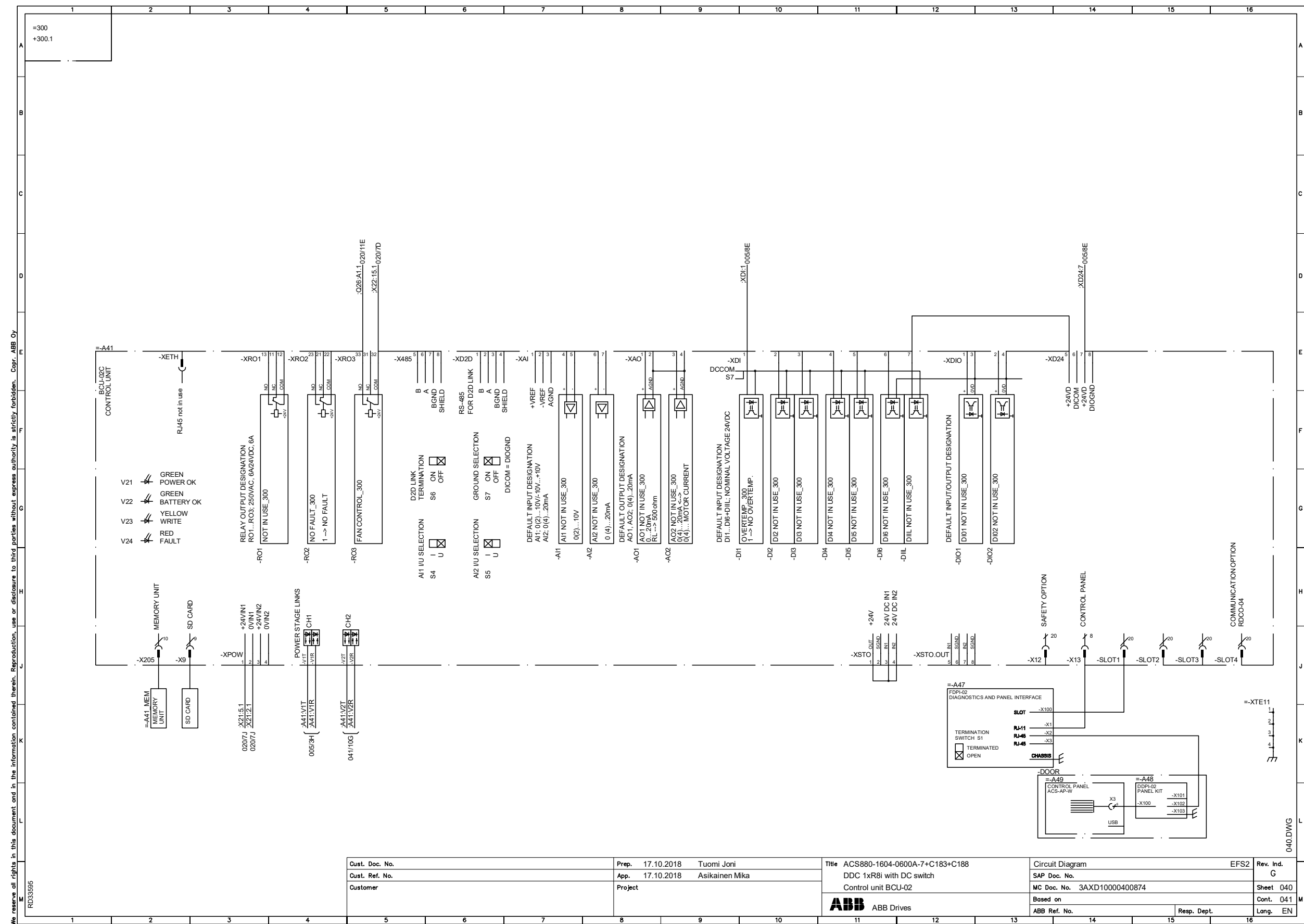
■ Module connections (sheet 005)



■ Auxiliary voltage distribution (sheet 020)

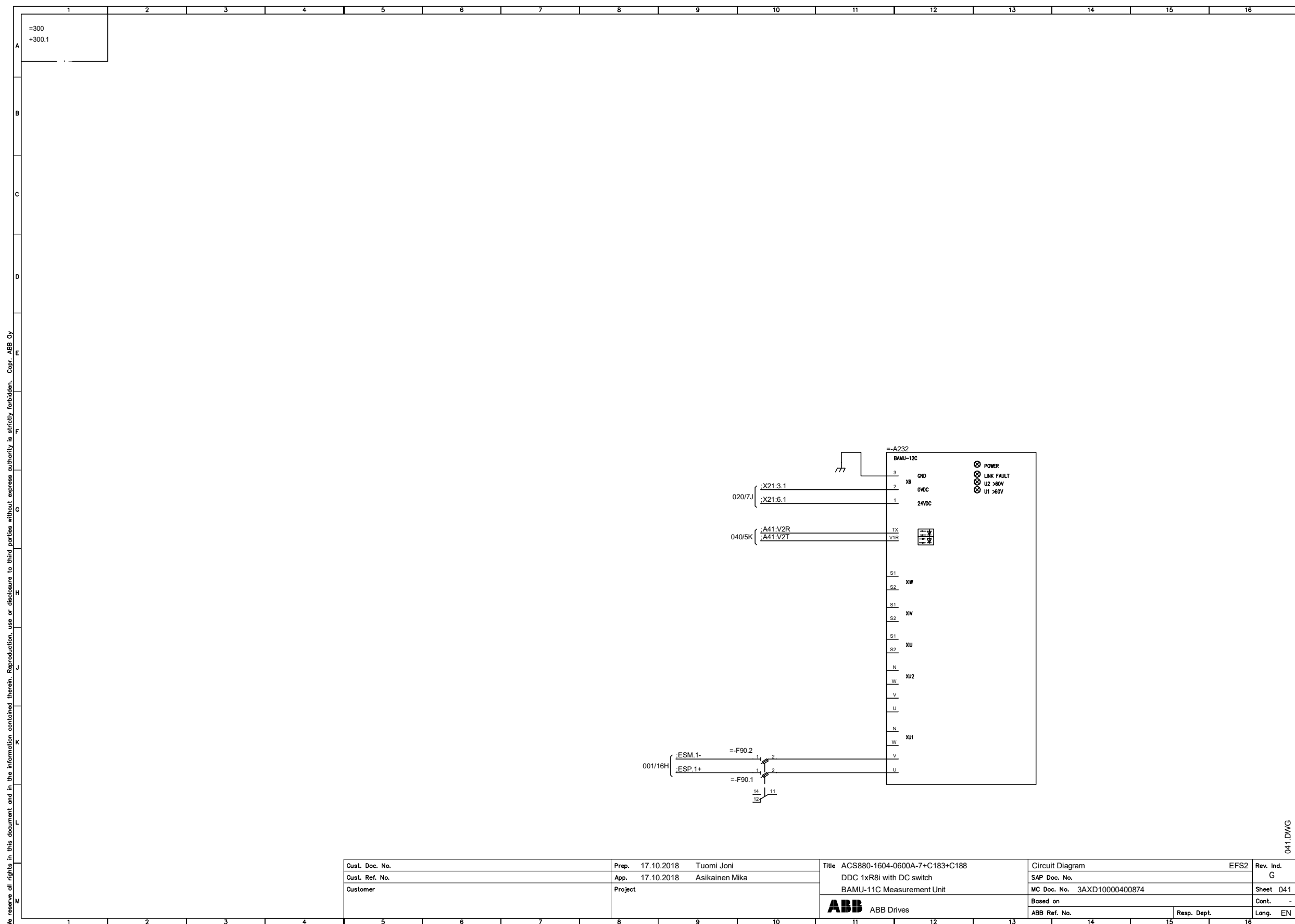


■ Control unit (sheet 040)



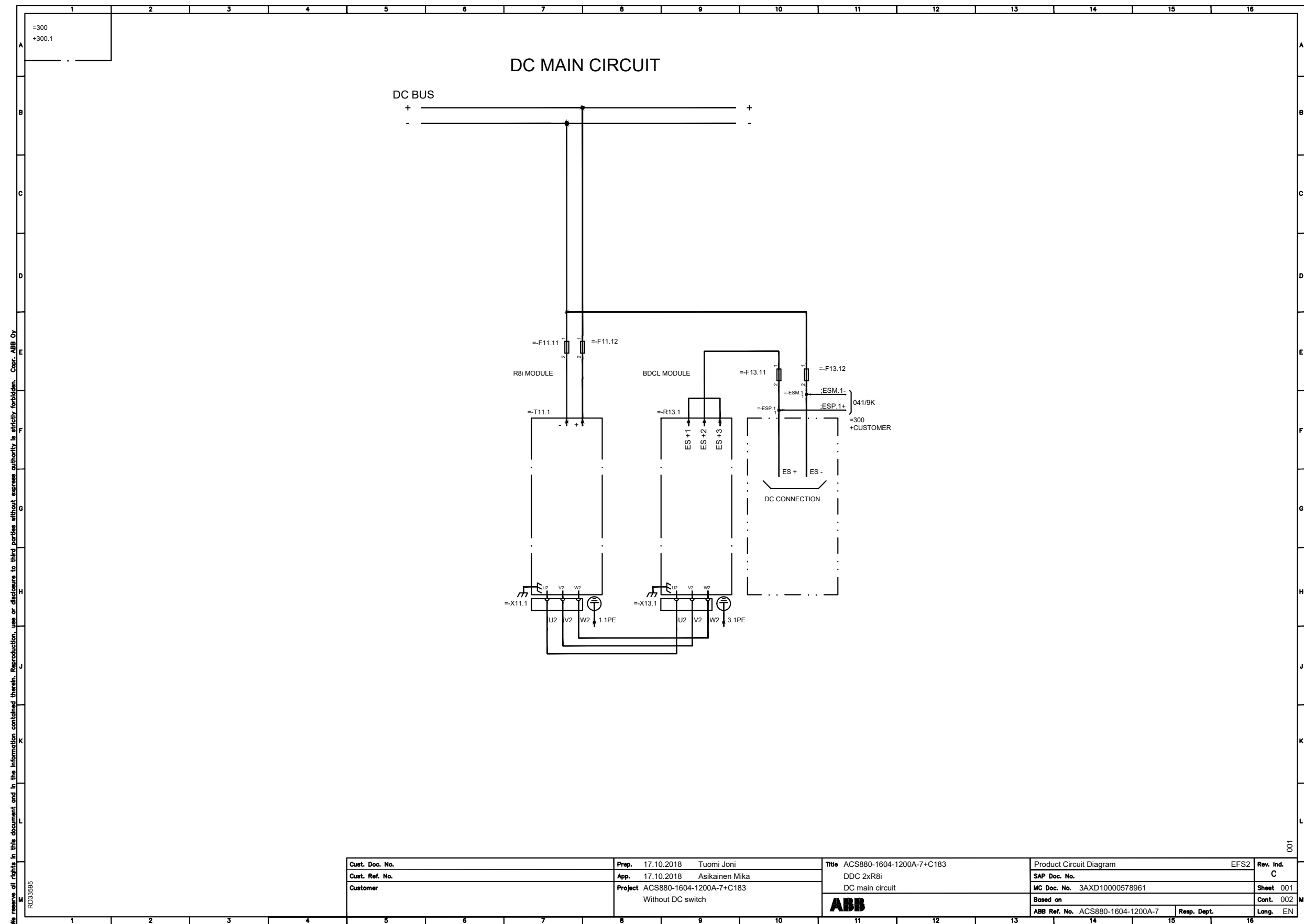
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Cust. Ref. No.	App. 17.10.2018	Asikainen Mika	DDC 1xR8i with DC switch	SAP Doc. No.		G
Customer	Project		Control unit BCU-02	MC Doc. No.	3AXD10000400874	Sheet 040
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				ABB Ref. No.	Resp. Dept.	Lang. EN

- **BAMU measurement unit (sheet 041)**



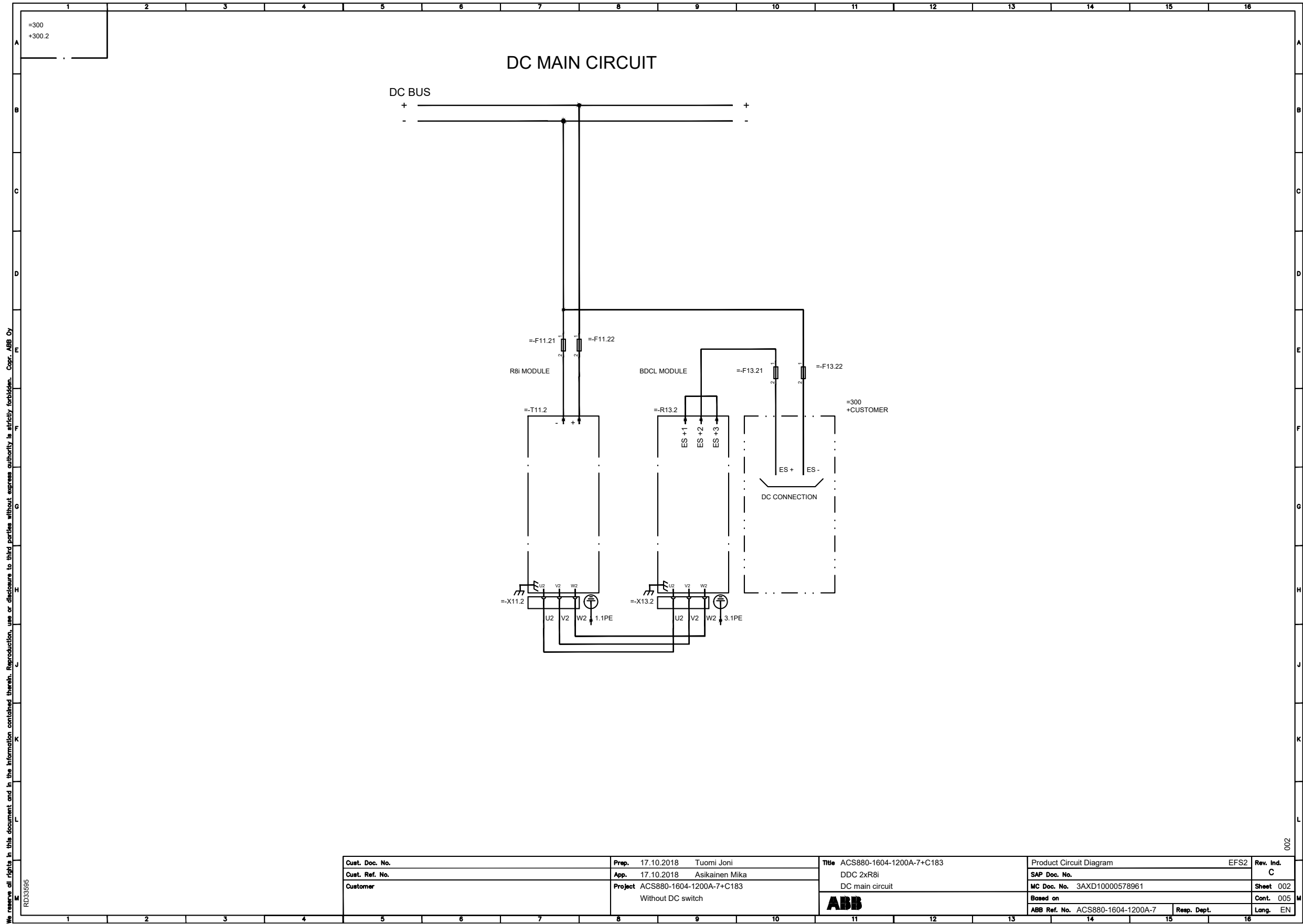
DDC 2×R8i without DC switch/disconnector

■ DC main circuit (sheet 001)

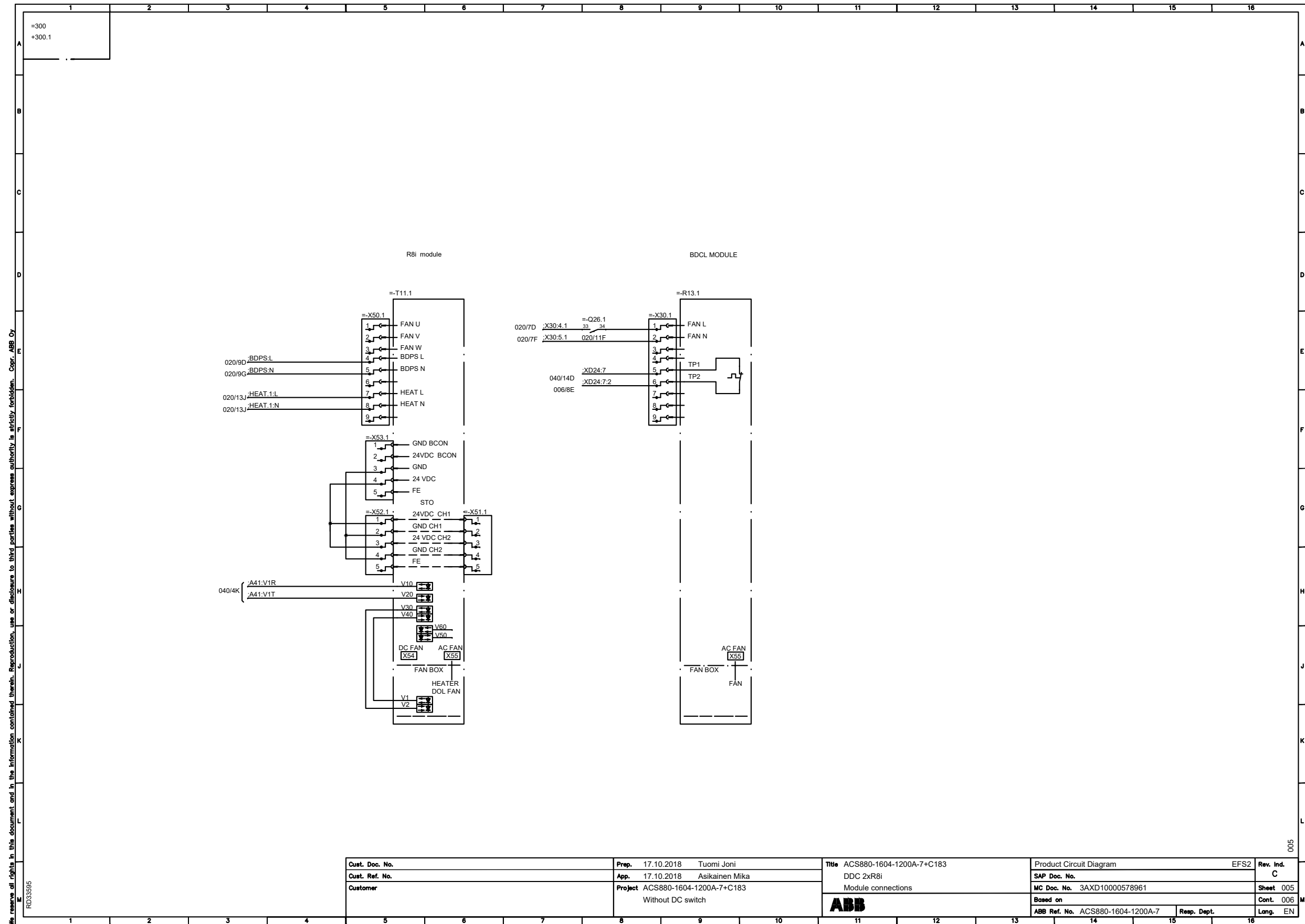


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Cust. Ref. No.	App. 17.10.2018 Asikainen Mika	DDC 2xR8i	SAP Doc. No.		C
Customer	Project ACS880-1604-1200A-7+C183	DC main circuit	MC Doc. No. 3AXD10000578961		Sheet 001
	Without DC switch		Based on		Cont. 002
			ABB Ref. No. ACS880-1604-1200A-7	Resp. Dept.	Lang. EN

■ DC main circuit (sheet 002)



■ Module connections (sheet 005)



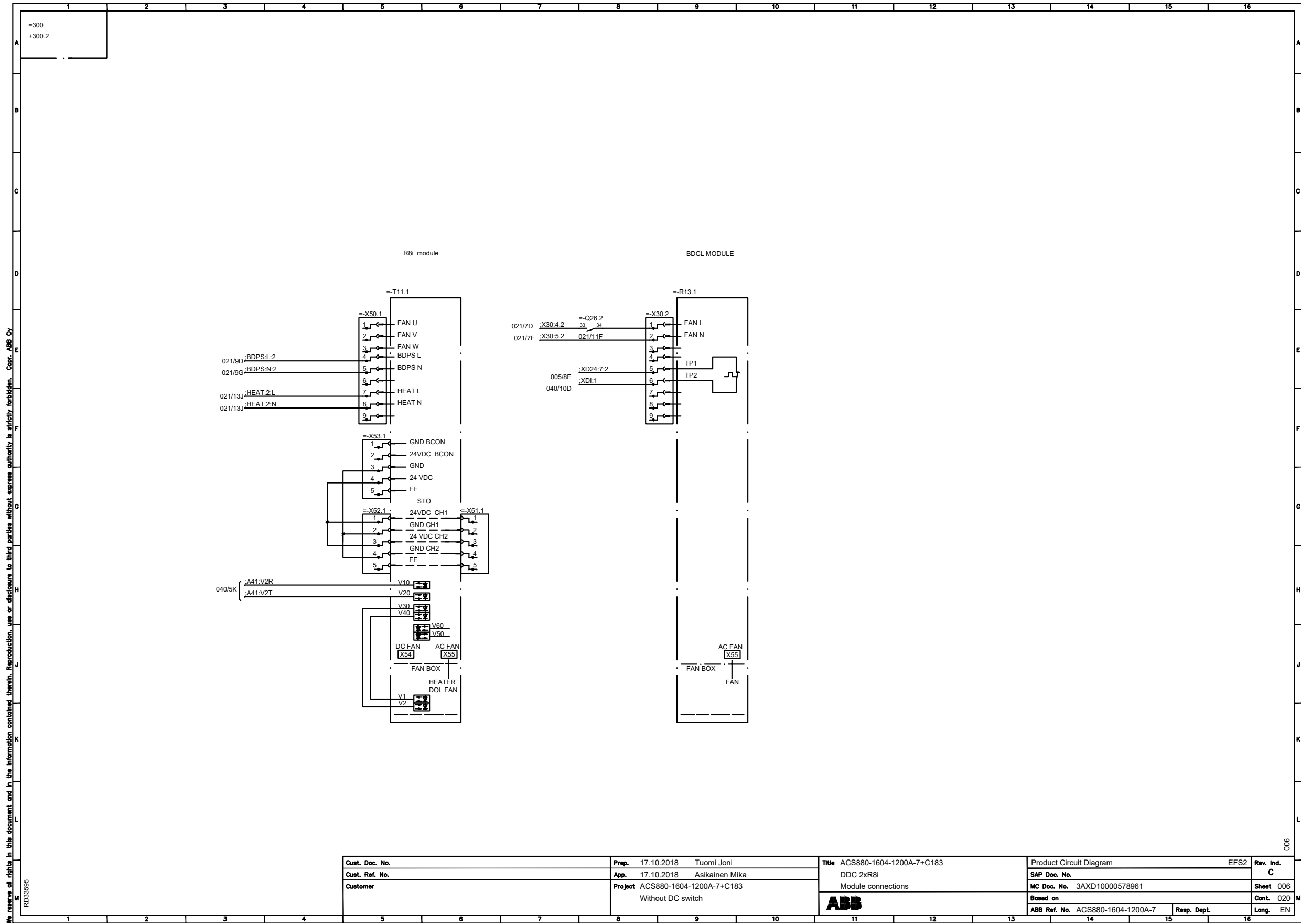
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005

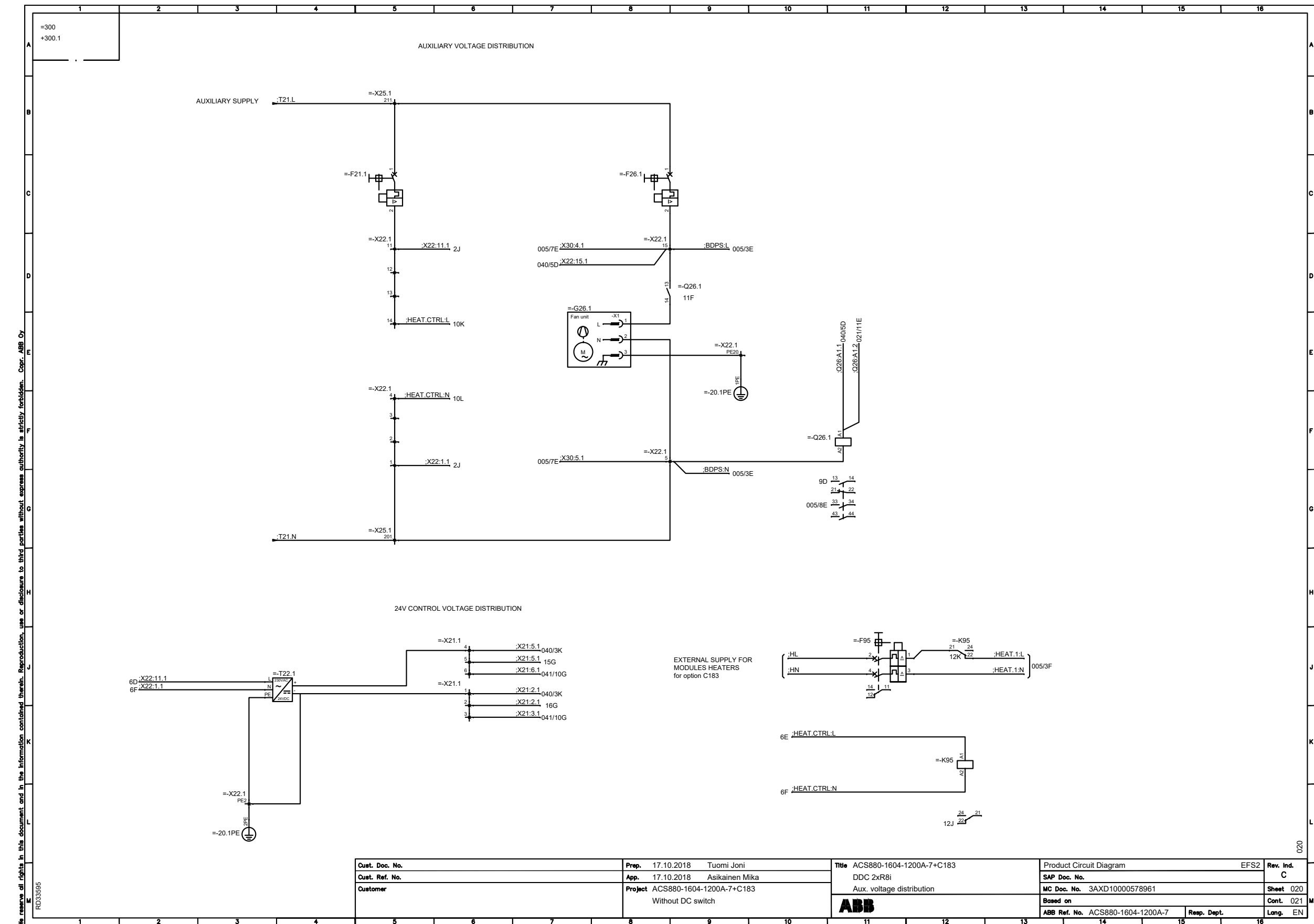
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Cust. Ref. No.	App. 17.10.2018 Asikainen Mika	DDC 2xR8i	SAP Doc. No.		C
Customer	Project ACS880-1604-1200A-7+C183	Module connections	MC Doc. No.	3AXD10000578961	Sheet 005
	Without DC switch	ABB	Based on		Cont. 006
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			Resp. Dept.		

Module connections (sheet 006)

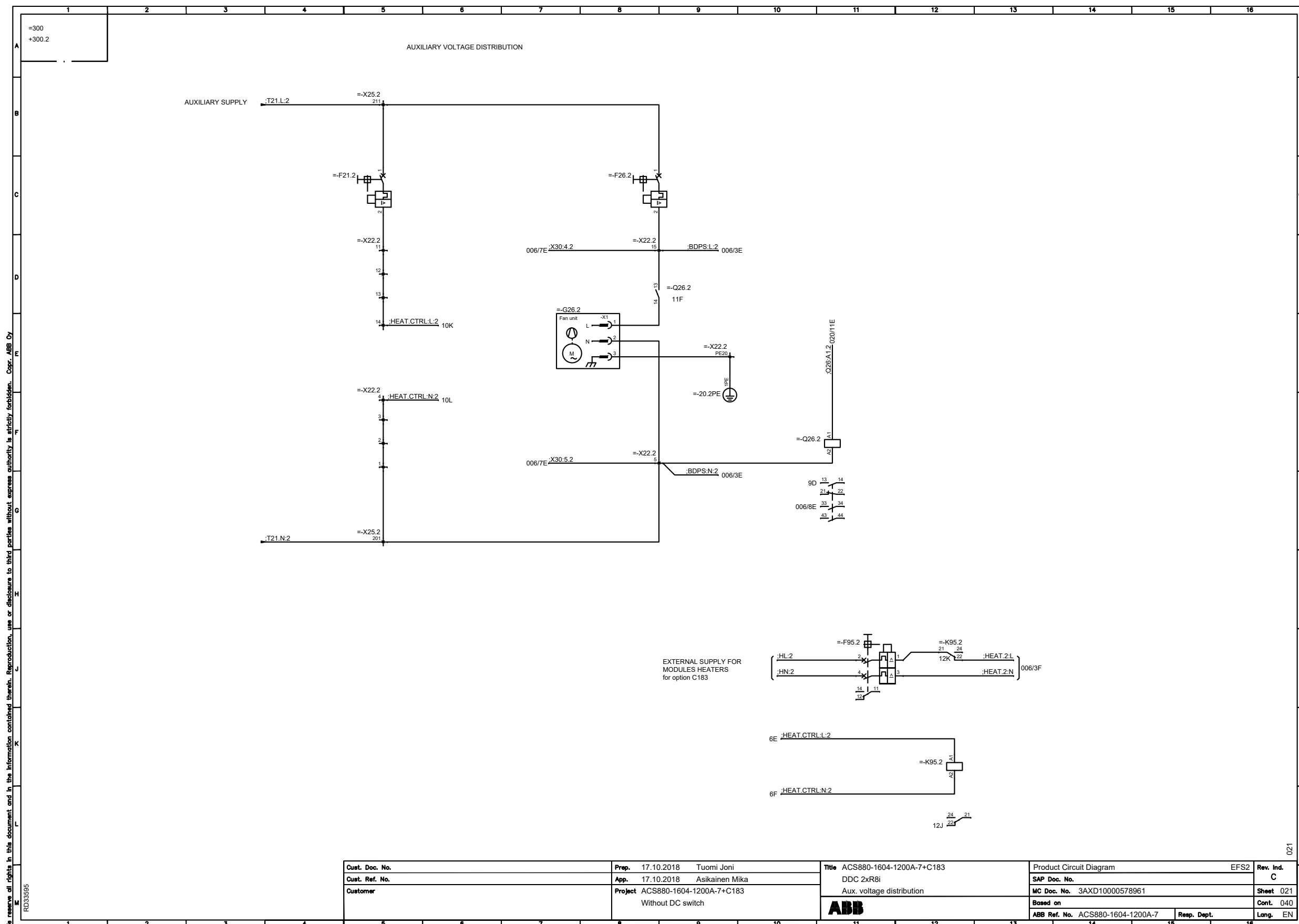


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Cust. Doc. No.	Prep. 17.10.2018 Tuomi Joni	Title ACS880-1604-1200A-7+C183	Product Circuit Diagram EFS2	Rev. Ind. C
Cust. Ref. No.	App. 17.10.2018 Asikainen Mika	DDC 2xR8i	SAP Doc. No.	Sheet 006
Customer	Project ACS880-1604-1200A-7+C183 Without DC switch	Module connections	MC Doc. No. 3AXD10000578961	Cont. 020
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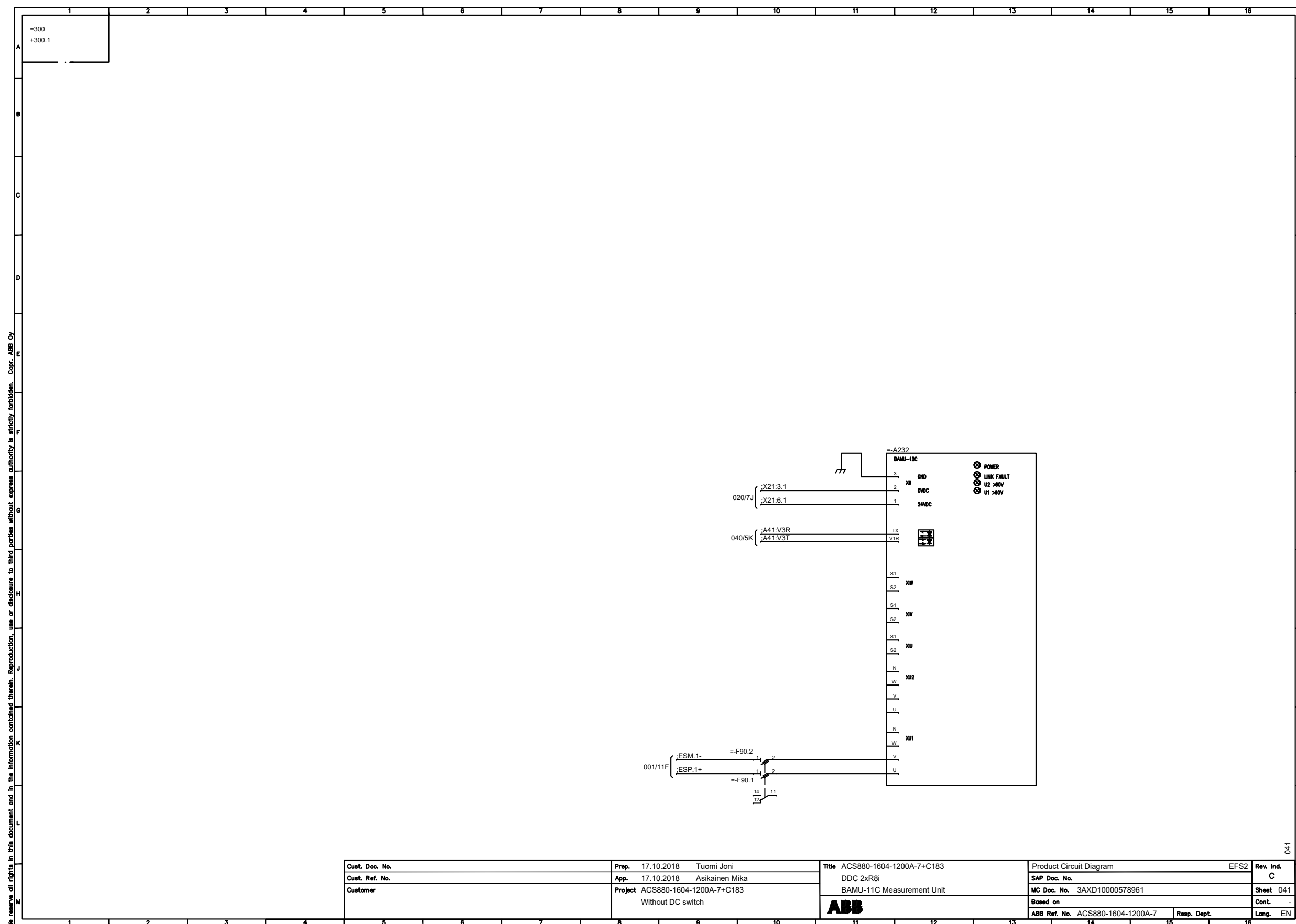


■ Auxiliary voltage distribution (sheet 021)



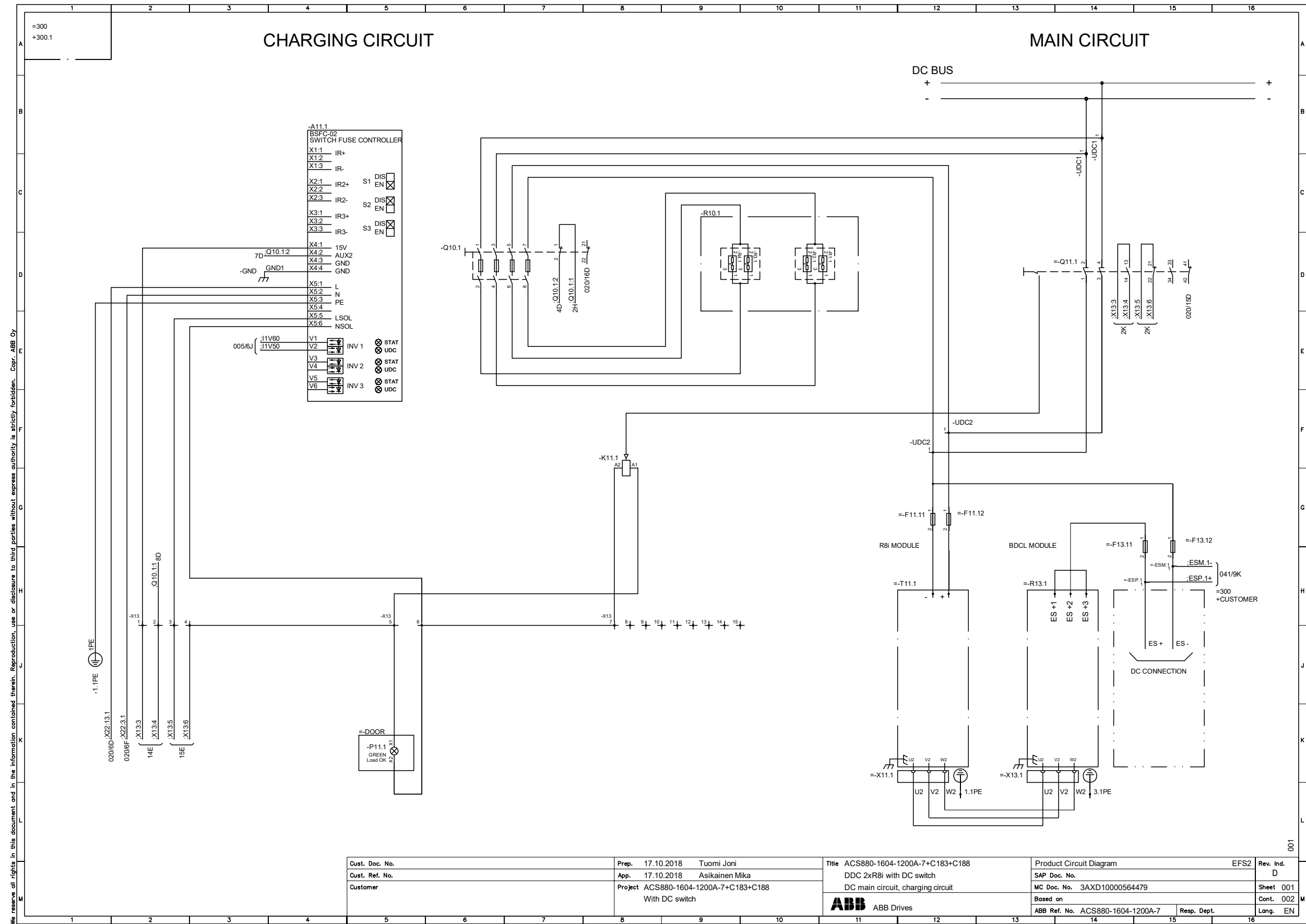


- **BAMU measurement unit (sheet 041)**



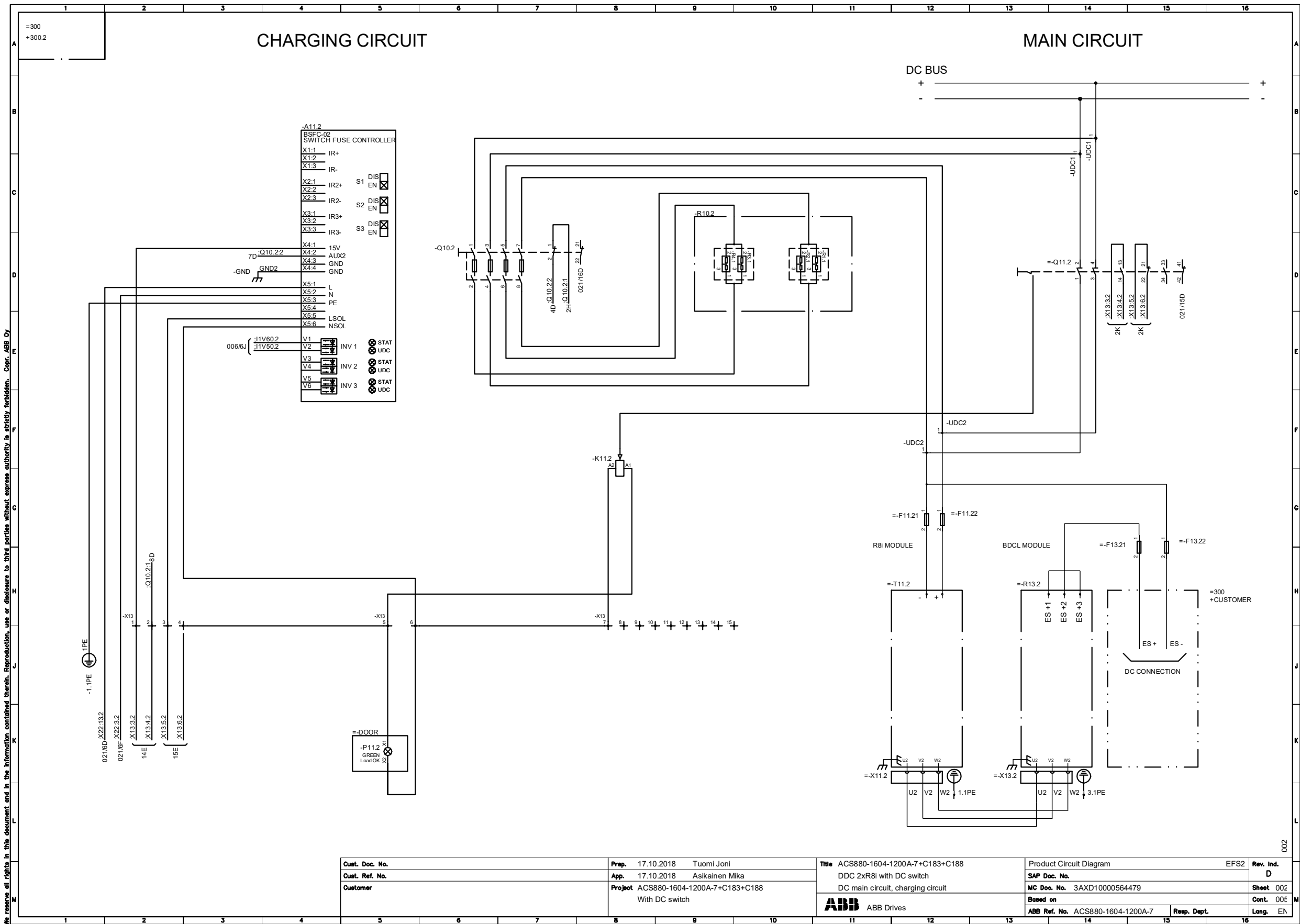
DDC 2xR8i with DC switch/disconnector

■ DC main circuit, charging circuit (sheet 001)



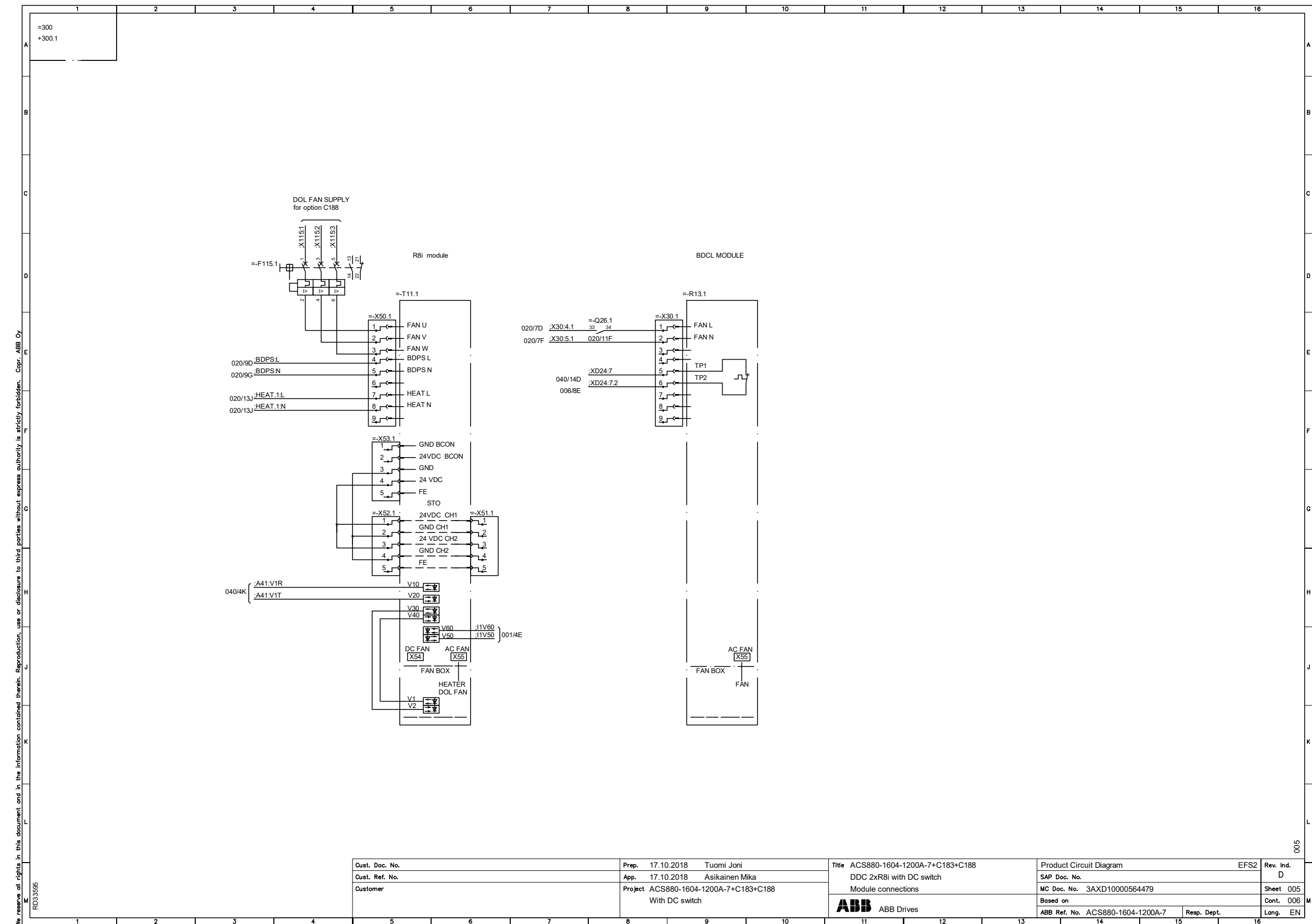
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Customer	Project ACS880-1604-1200A-7+C183+C188	DC main circuit, charging circuit	MC Doc. No. 3AXD10000564479		Sheet 001
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■ DC main circuit, charging circuit (sheet 002)

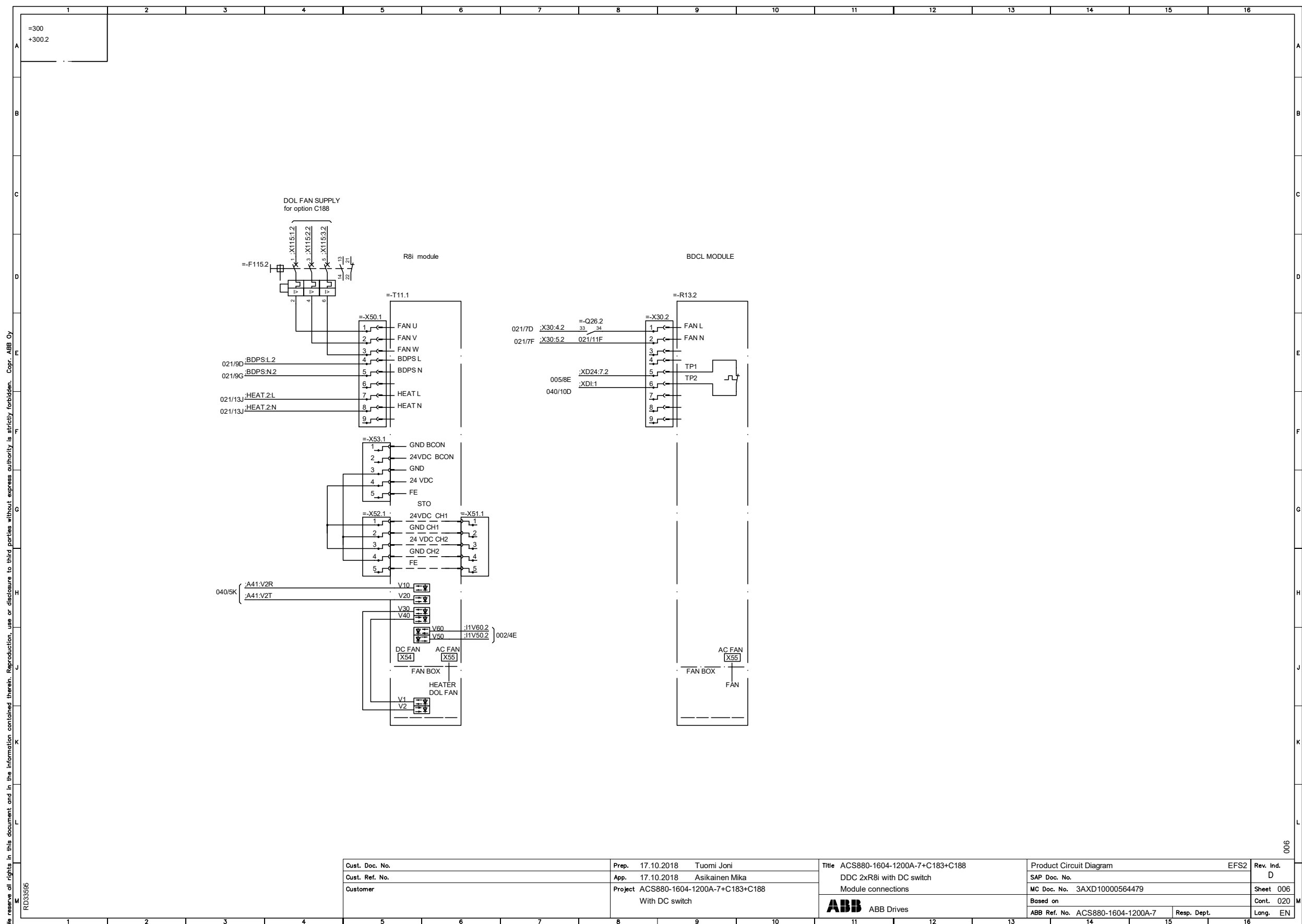


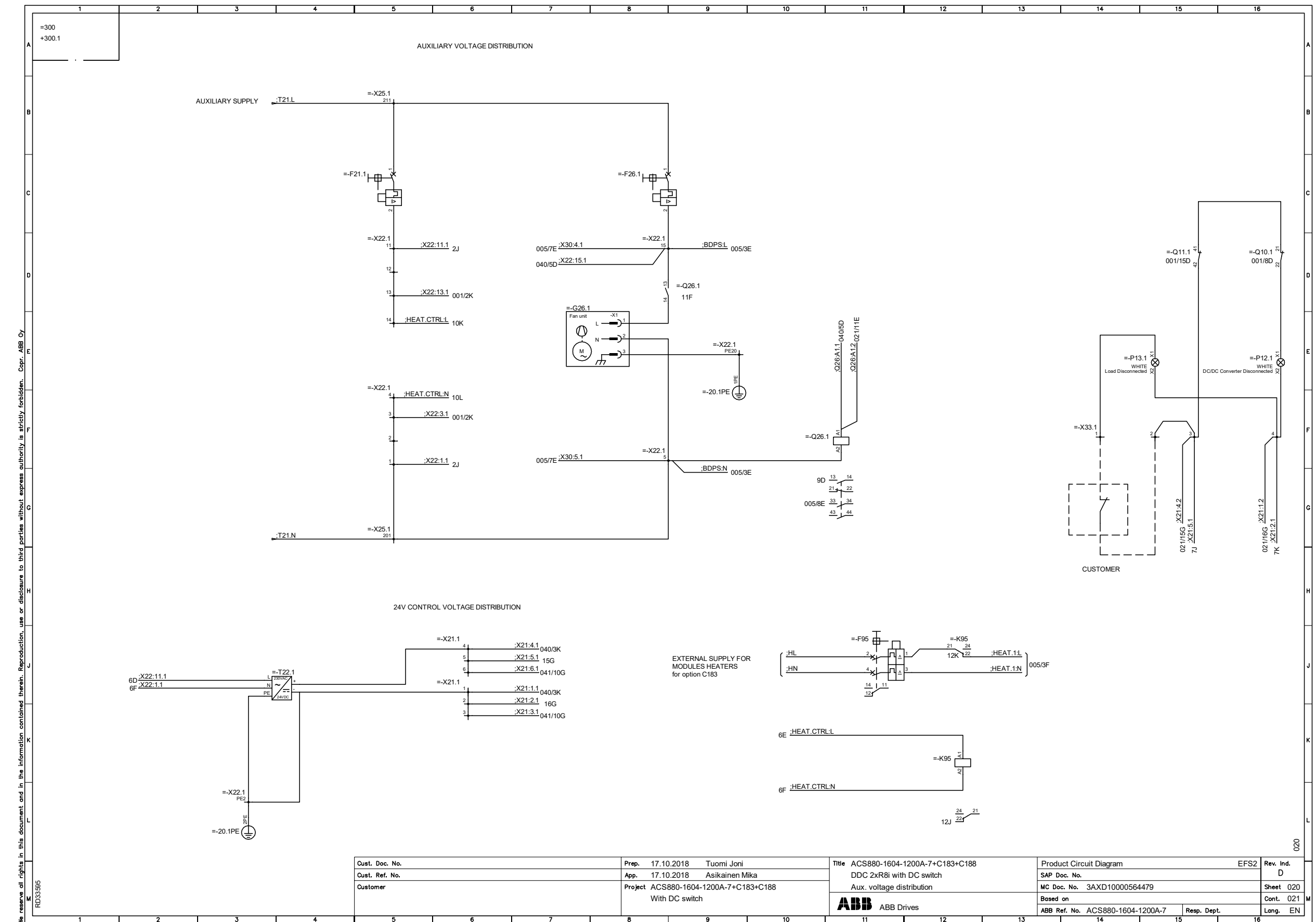
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Cust. Ref. No.	App. 17.10.2018 Asikainen Mika	DDC 2xR8i with DC switch	SAP Doc. No.		D
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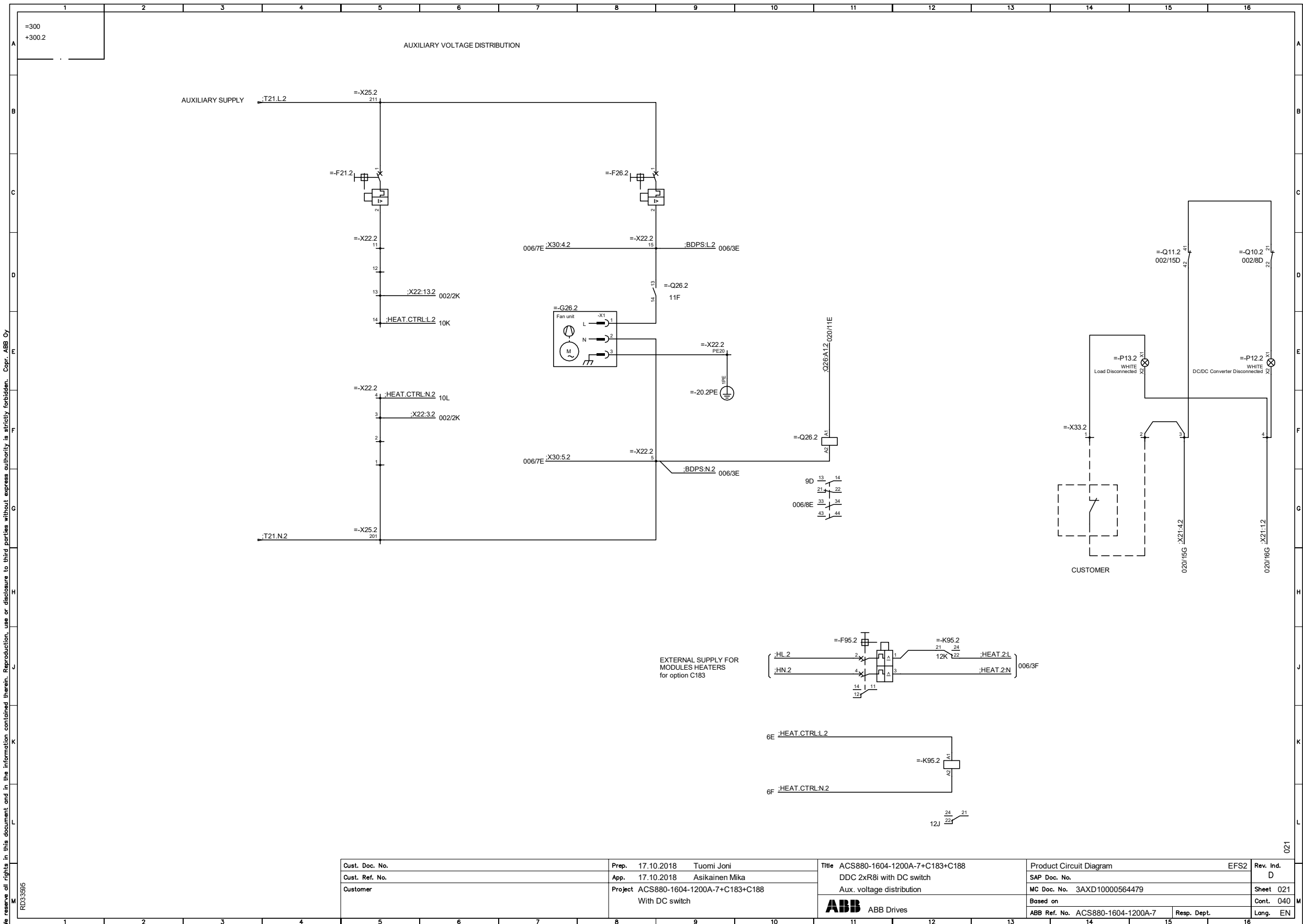


■ Module connections (sheet 006)





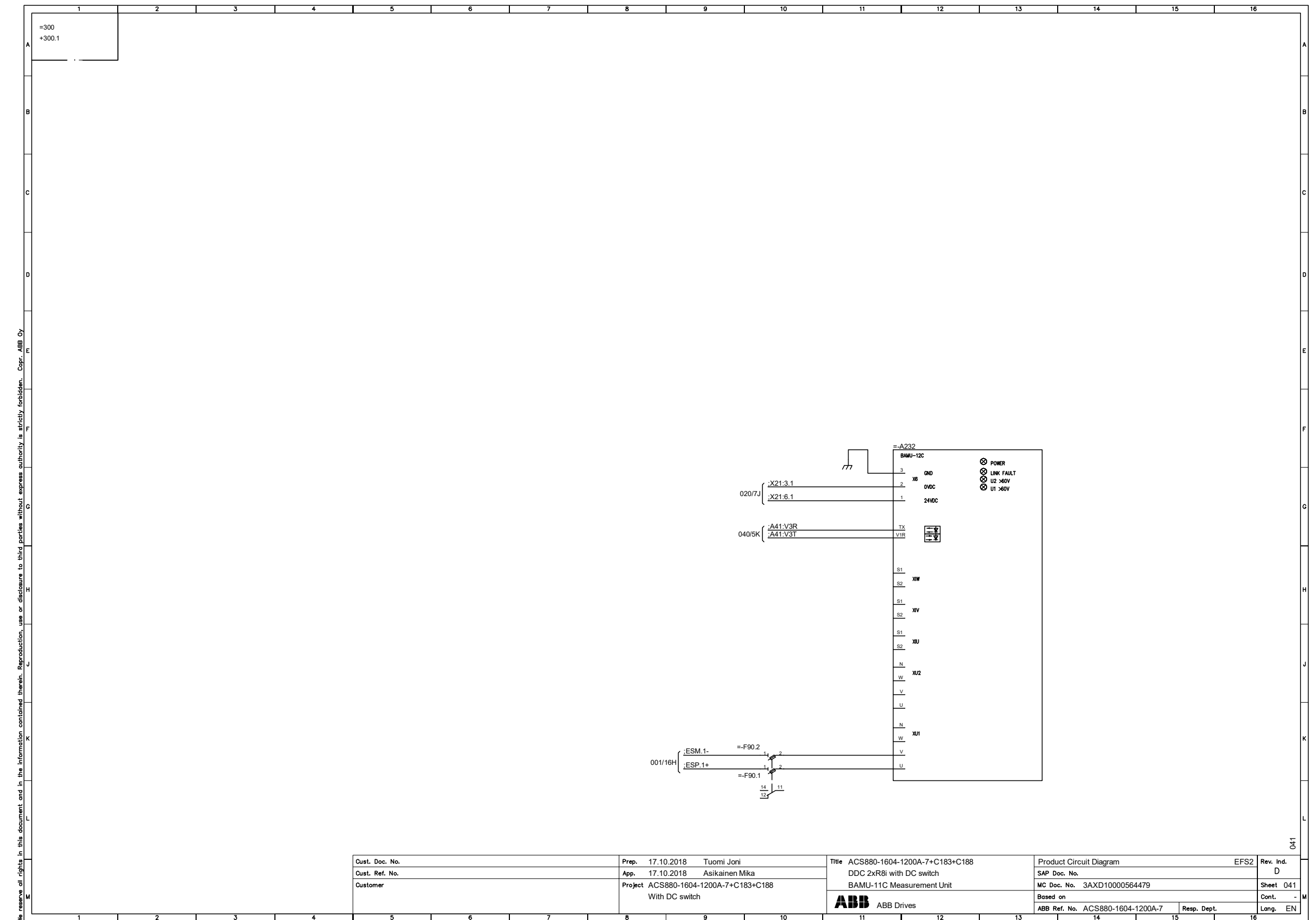
■ Auxiliary voltage distribution (sheet 021)



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- **BAMU measurement unit (sheet 041)**



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