ABB INDUSTRIAL DRIVES

ACS880-604 3-phase brake units as modules

Hardware manual

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Hardware manual

3AXD50000022033 Rev D
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Further information

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Introduction to the manual

Contents of this chapter

This chapter gives basic information on the manual.

Applicability

The manual is applicable to ACS880-604 3-phase brake modules intended 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.

Related documents

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

Categorization by frame size and option code

Some descriptions, instructions, technical data and dimensional drawings which concern only certain brake units are marked with the symbol of the frame size such as 4×R8i. The marking derives from the quantity and basic construction of the brake chopper modules that form the brake unit. For example, frame size 2×R8i indicates that the brake unit consists of two frame size R8i brake chopper modules connected in parallel.

The frame size is marked on the type designation labels. The frame size of each brake chopper module is also shown in the technical data.

The instructions and technical data which concern only certain optional selections are marked with option codes (such as +E210). The options included in the drive can be identified from the option codes 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/ Abbreviation	**Description**
BCON	Type of control board
BCU	Type of control unit
BDFC	Control board for direct-on-line cooling fan
BDPS	Module internal power supply board
BFPS	Control and power supply board for speed-controlled cooling fan
Brake chopper	Conducts the surplus energy from the intermediate circuit of the drive to the brake resistor when necessary. The chopper operates when the DC link voltage exceeds a certain maximum limit. The voltage rise is typically caused by deceleration (braking) of a high inertia motor.
Brake chopper module	Brake chopper enclosed in a metal frame or housing. Intended for cabinet installation.
Brake resistor	Dissipates the drive surplus braking energy conducted by the brake chopper to heat
Brake unit	Brake chopper modules and the necessary auxiliary equipment, such as control electronics, fusing and cabling
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 link	DC circuit between rectifier and inverter
DI	Digital input
Drive	Frequency converter for controlling AC motors
EMC	Electromagnetic compatibility
FDPI	Diagnostics and panel interface board
FEPL-01	Optional Ethernet POWERLINK adapter module
FIO-11	Optional analog I/O extension module
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
Intermediate circuit	DC circuit between rectifier and inverter
Inverter	Converts direct current and voltage to alternating current and voltage.

Term/ Abbreviation	Description
Inverter module	Inverter bridge, related components and drive DC link capacitors enclosed in a metal frame or enclosure. Intended for cabinet installation.
Inverter unit	Inverter module(s) under control of one control 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.
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.
Single drive	Drive for controlling one motor
Supply unit	Supply module(s) under control of one control board, and related components.
VX25	Enclosure system by Rittal (www.rittal.com)
ZMU	Type of memory unit, attached to the control unit

2

Operation principle and hardware description

Contents of this chapter

This chapter describes a typical drive system and the operation principle and construction of the brake chopper module.

Product overview

The ACS880-604 is an air-cooled brake unit as modules. The brake unit as modules range contains components for building the brake unit(s) to be used in a common DC bus system drive. The brake unit as modules includes a brake chopper module or several parallel-connected brake chopper modules. The brake chopper module is actually a three-phase inverter module (ACS880-104) that is connected and controlled in a particular way: the input of the module is connected to the DC bus – like in the inverter use – but each output phase connects to a resistor of its own.

Operating principle

The brake chopper handles the energy generated by a decelerating motor. The extra energy increases the DC link voltage. The chopper connects the brake resistors to the intermediate DC circuit whenever the voltage in the circuit exceeds the limit defined by the control program. Energy consumption by the resistor losses lowers the voltage until the resistors can be disconnected.

When to use resistor braking

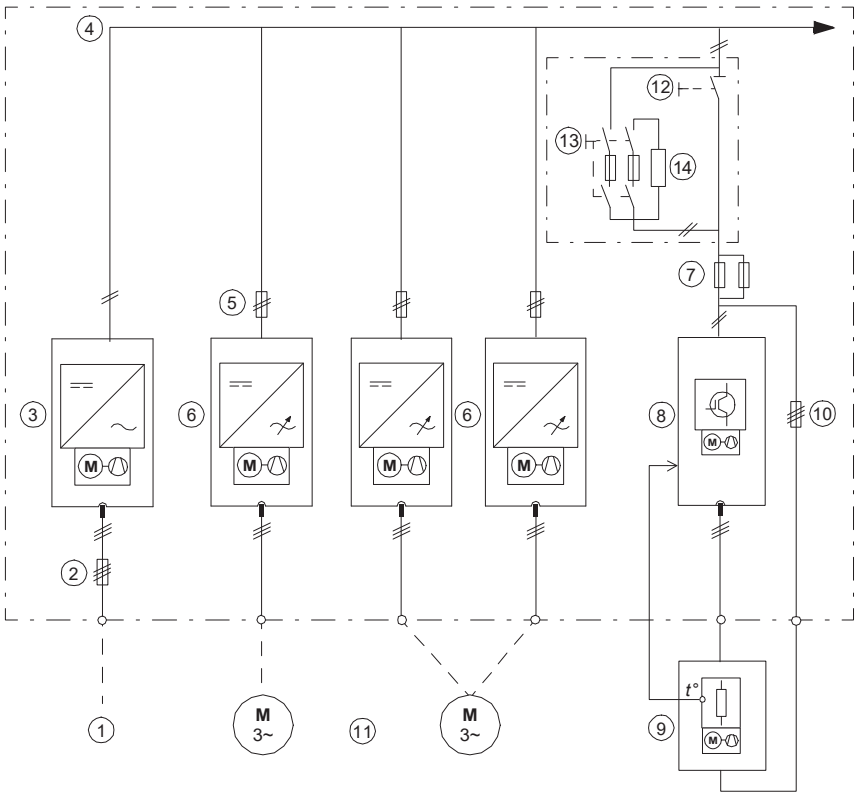
Typically, a drive system is equipped with a brake chopper if

- high capacity braking is needed and the drive cannot be equipped with a regenerative supply unit

- a backup for the regenerative supply unit is needed.

Simplified main circuit diagram of the drive system

This diagram shows a typical common DC bus drive system.



1	AC supply
2	Input (AC) fuses
3	Supply unit
4	DC bus
5	Inverter DC fuses (with or without a DC switch/disconnector)
6	Inverter units (in this example, one of the two units consists of two inverter modules connected in parallel)
7	Brake chopper fuses
8	Brake unit
9	Brake resistors
10	Brake resistor fuses
11	Motor(s)
12	DC switch/disconnector
13	Charging circuit switch with fuses
14	Charging resistors

The supply unit connects to the AC supply network. The supply unit converts the AC voltage into DC. The DC voltage is distributed through the DC bus to all inverter and brake units. The inverter unit, consisting of one or more inverter modules, converts the DC back to AC that rotates the motor. The brake unit, consisting of one or more brake chopper modules, conveys energy to brake resistors whenever needed.

Brake module hardware

General

A brake unit contains one or more 3-phase brake chopper modules connected in parallel, together with the necessary auxiliary equipment such as control electronics, fusing and cabling. All brake modules have coated circuit boards as standard.

The modules run on wheels, and can easily be removed from the cubicle for cable installation or service.

The output connection is via a quick connector at the back of the module that couples when the module is inserted into the cubicle. Each parallel-connected module is cabled separately to the brake resistors.

The internal control electronics of the module must be powered from an external auxiliary voltage. The cooling fan is automatically speed-controlled according to the loading of the brake module. The fan is supplied from the DC input. A direct-on-line fan, supplied from an external 3-phase source, is optionally available.

Internal d*u*/d*t* filtering is included as standard.

Each parallel-connected brake module is controlled by a dedicated control unit. The control unit is installed separately from the module. The control unit is connected to each brake module by a fiber optic link. The control unit can be powered from a brake module, from an external 24 V DC supply, or both for redundancy. Each control unit contains the basic I/Os and slots for optional I/O modules. Other equipment is primarily installed on separate mounting plates.

DC connection and capacitor charging

The module must be equipped with external DC fuses.

A DC switch/disconnector can be installed if quick isolation of the module from the DC bus is required.

A capacitor charging circuit must be fitted if:

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

The charging circuit design presented in this manual consists of a charging switch, resistors and a charging controller. When the module is connected to an energized DC bus, the charging switch is closed first. When the charging is finished, the main DC switch/disconnector can be closed and the charging switch opened. The module will not start if the charging switch is closed.

Common mode filtering is implemented by running the DC bus through ferrite cores at the input of the module.

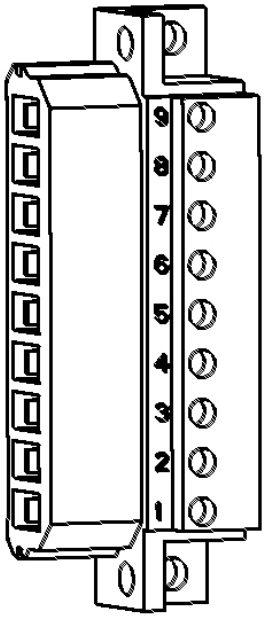
Connectors X50…X53

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.

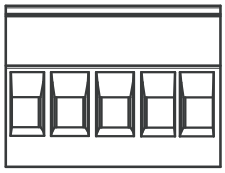
If a direct-on-line fan (option +C188) is used, the user must connect the fan supply (400 V AC 50 Hz or 60 Hz) to the module control connector [X50.1]. If an internal heating element (option +C183) is used, the user must connect the supply for the heating element to the module control connector [X50.7].

Connector X50



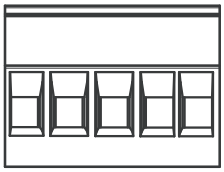
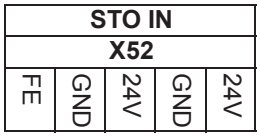
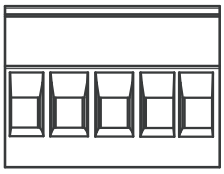
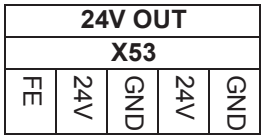
9	Not in use.	
8	N	115/230 V AC (50/60 Hz) input for optional heating element (+C183). The cabinet builder must connect this when the option is in use.
7	L	
6	Not in use.	
5	N	115/230 V AC 50 Hz input for internal power supply (BDPS) (115 V AC 60 Hz with option +G304). The cabinet builder must connect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

Connectors X51, X52, X53

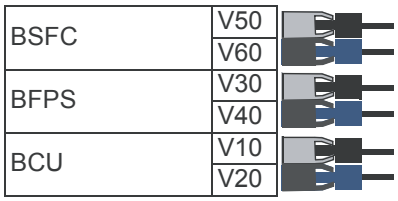


STO OUT				
X51				
FE	GND	24V	GND	24V

X51	STO OUT	Not in use.

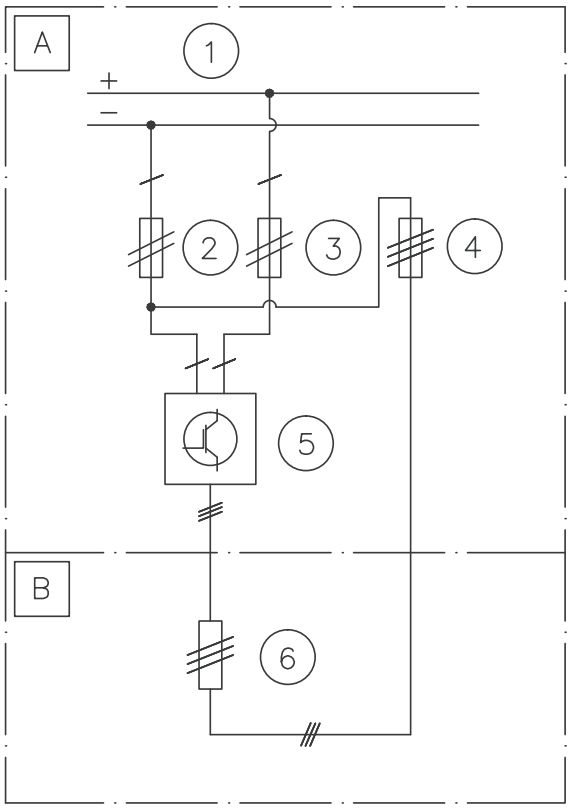
<table>
<tr><th colspan="5">Connectors X51, X52, X53</th></tr>
<tr><td rowspan="2">  </td><td rowspan="2"> 
</td><td>X52</td><td>STO IN</td><td>STO connectors of the module. Must be connected to 24 V DC for the module to start.</td></tr>
<tr><td>X53</td><td>24V OUT</td><td>24 V DC for BCU and for STO IN to enable the module operation.</td></tr>
<tr><td>  </td><td> 
</td><td colspan="3">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.</td></tr>
</table>

Fibre optic connectors

<table>
<tr><td rowspan="2"> 
</td><th>Name</th><th>Description</th></tr>
<tr><td>BSFC</td><td>Charging controller connection. Must be connected by the installer.</td></tr>
<tr><td></td><td>BFPS</td><td>Fan control connection (to fan control box). Connected at the factory.</td></tr>
<tr><td></td><td>BCU</td><td>Control unit connection. Must be connected by the installer.</td></tr>
</table>

Overview circuit diagram of the brake unit

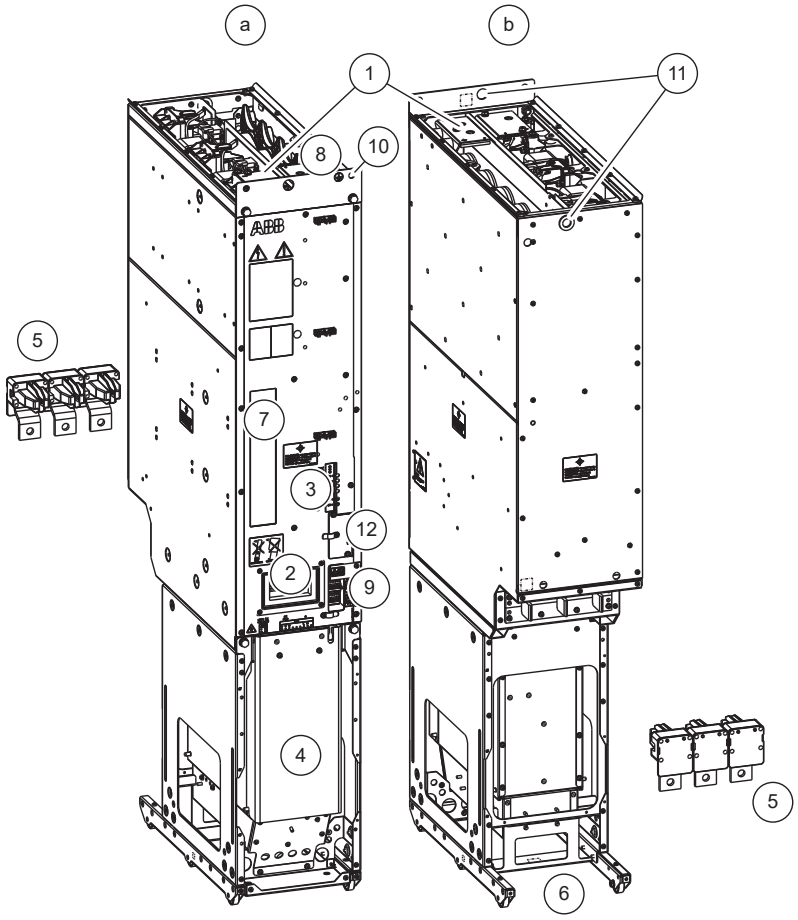
The following figure shows a simplified connection example of a brake unit.



Item	Explanation	Available through
A	Brake unit cabinet	
1	DC link	-
2	DC- fuses	ABB or third party
3	DC+ fuses	ABB or third party
4	Brake resistor fuses	ABB or third party
5	Brake chopper module R8i	ABB
B	Brake resistors cabinet	
6	Brake resistors	ABB or third party

Frame R8i layout

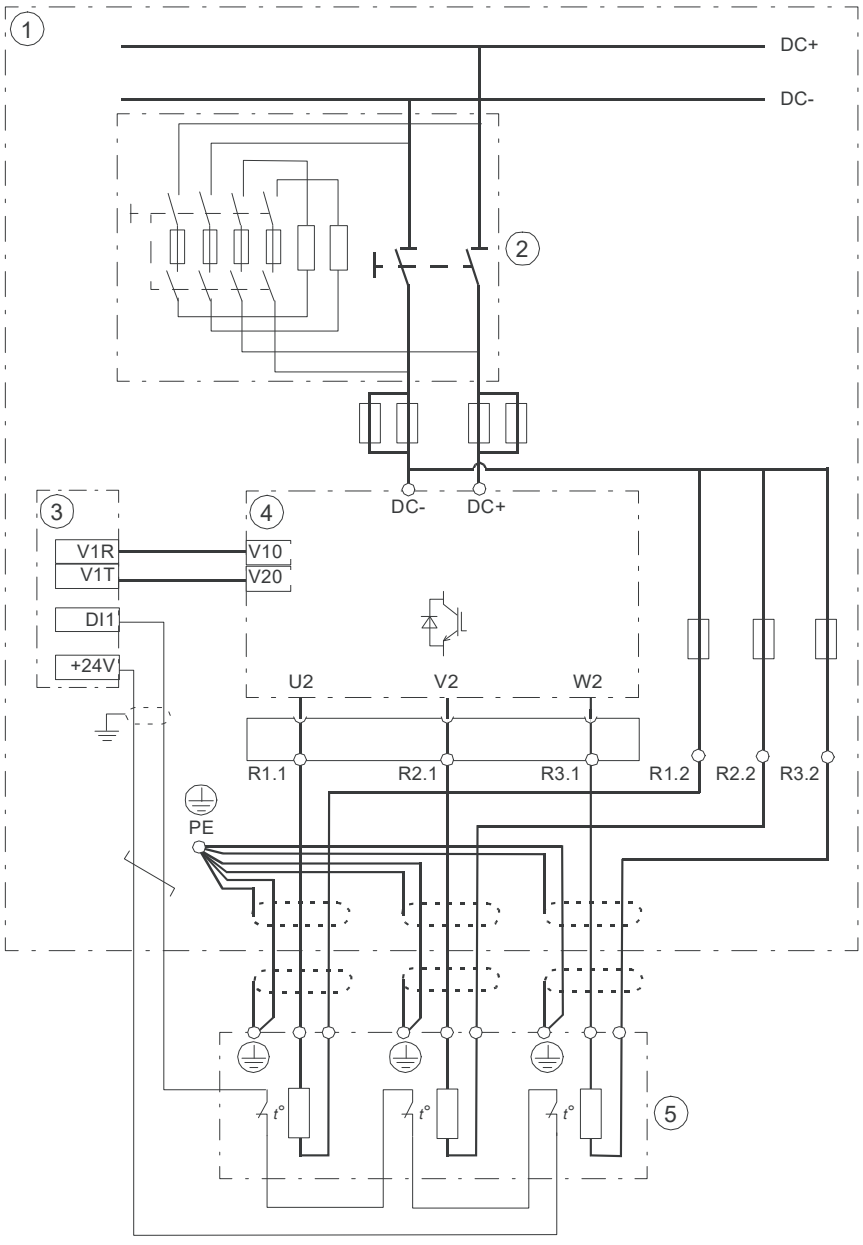
This figure shows the layout of the R8i module.



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

Overview of power and control connections

The diagram below shows the power and control connections of the brake unit consisting of one 3-phase brake module. For parallel-connected brake modules, the brake resistors are connected to each brake module also as shown below.



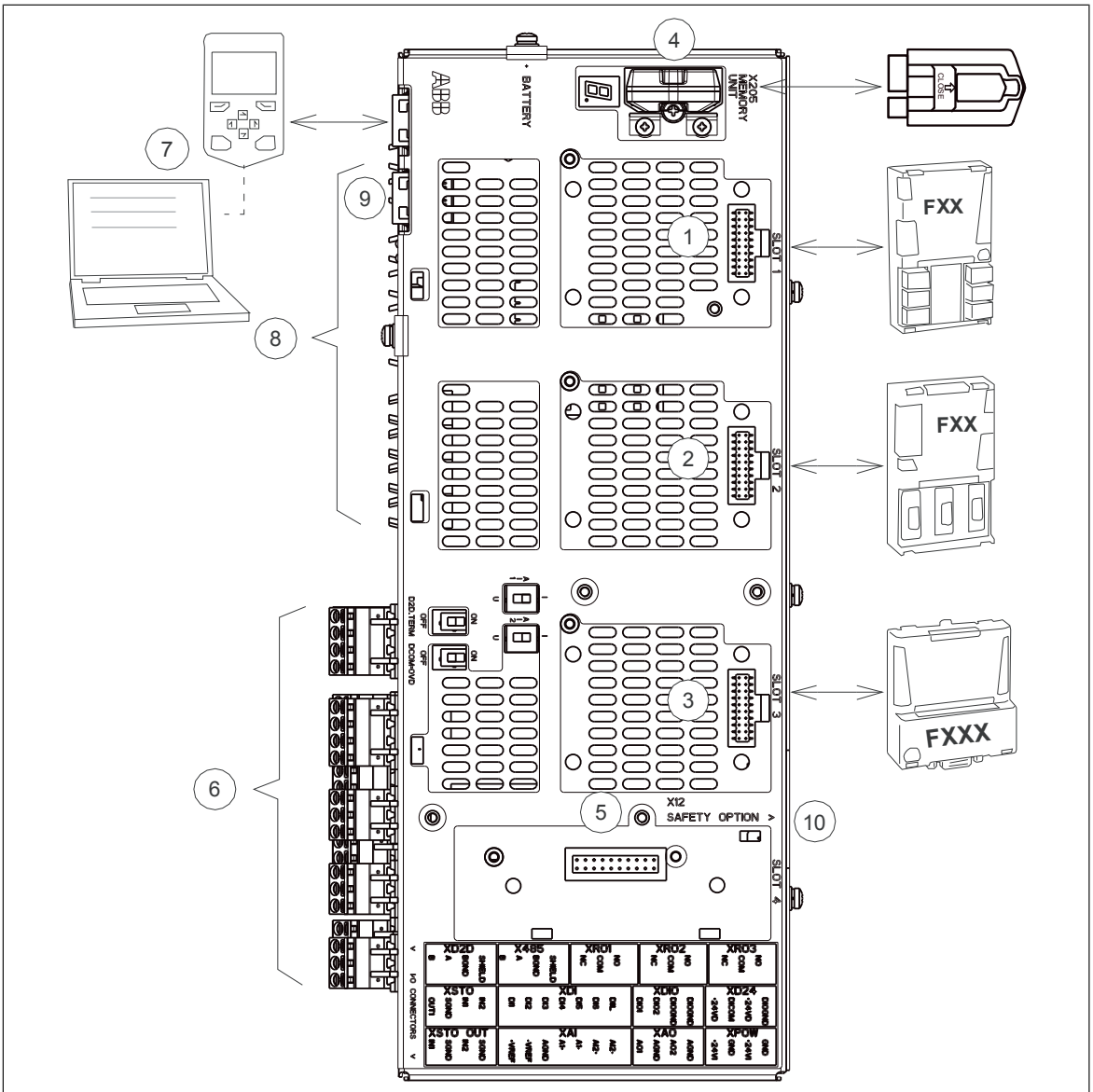
1	Brake module cubicle
2	DC switch/disconnector with charging circuit
3	Control unit
4	Brake module
5	Brake resistors

Brake unit control devices

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

Overview of the control connections of the BCU control unit

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



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

The control panel

The control panel (optional) is the user interface of the brake unit, providing the essential controls such as reset, and the parameter settings for the control program.

The control panel can be mounted on the cabinet door using a DPMP-01 mounting platform (available separately).

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

Control by PC tools

There is a USB connector on the front of the panel that can be used to connect a PC to the drive.

Fieldbus control

The unit can be controlled through a fieldbus interface if it is equipped with an optional fieldbus adapter, and when the control program has been configured for fieldbus control by parameters. For information on the parameters, see the firmware manual.

DC switch and charging switch

DC switch/disconnector

The brake unit can optionally be equipped with DC switch/disconnectors which allow the isolation of the brake chopper modules from the DC bus.

The status of the DC switch/disconnector is connected to the DIIL input on the brake control unit. By default, the run enable signal is removed when the DC switch/disconnector is open.

WARNING!
Do not open the DC switch/disconnector under load.

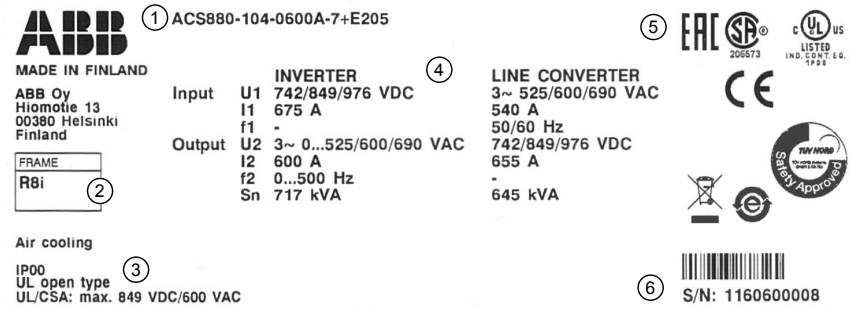
Charging switch

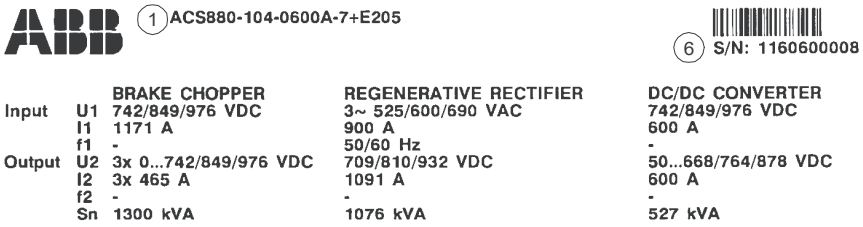
The brake chopper modules equipped with a DC switch/disconnector also have a DC link precharging circuit including an xSFC-02 charging control unit and a charging switch on the cubicle door.

Inverter module type designation label

Each module has a type designation label attached to it. The type designation stated on the label contains information on the specifications and configuration of the module. The first digits express the basic construction, for example “ACS880-104-0100A-3”. Any optional selections are given thereafter, separated by plus signs.

Examples of the label are shown below.





1	Type designation.
2	Frame size.
3	Degree of protection; additional UL/CSA specifications.
4	Ratings. The labels show ratings for inverter module (INVERTER), IGBT supply module (LINE CONVERTER), brake chopper module (BRAKE CHOPPER), regenerative rectifier module (REGENERATIVE RECTIFIER) and DC/DC converter module (DC/DC CONVERTER).
5	Valid markings.
6	Serial number. The first digit refers to the manufacturing plant. The next four digits indicate manufacturing year and week respectively (yyww). The remaining digits complete the serial number so that there are no two units with the same number.

Type designation 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.
Voltage range	
3	513…566 V DC. This is indicated in the type designation label as typical input voltage level 566 V DC.
5	513…707 V DC. This is indicated in the type designation label as typical input voltage levels 566/679/707 V DC.
7	709…976 V DC. This is indicated in the type designation label as typical input voltage levels 742/849/976 V DC (849 V DC for UL/CSA).
Option codes (plus codes)	
C183	Internal heating element
C188	Direct-on-line (DOL) cooling fan
E205	Internal d*u*/d*t* filtering. Included in the module delivery as standard.
G304	115 V auxiliary voltage supply
P904	Extended warranty 24/30
P909	Extended warranty 36/42

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.

Installation of the brake control unit (BCU)

See *BCU-02/12/22 control units hardware manual* (3AUA0000113605 [English]) for the mechanical installation of the brake control unit and chapter *Electrical installation* for the electrical installation.

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:

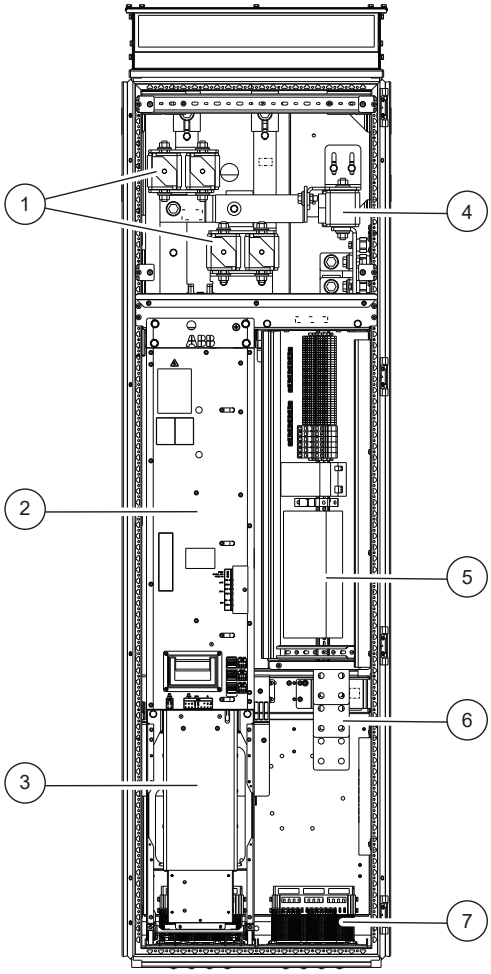
- installation stages of different equipment in the order in which the installation into the cabinet should be performed
- code of the step-by-step instructions
- equipment kit code
- kit ordering code.

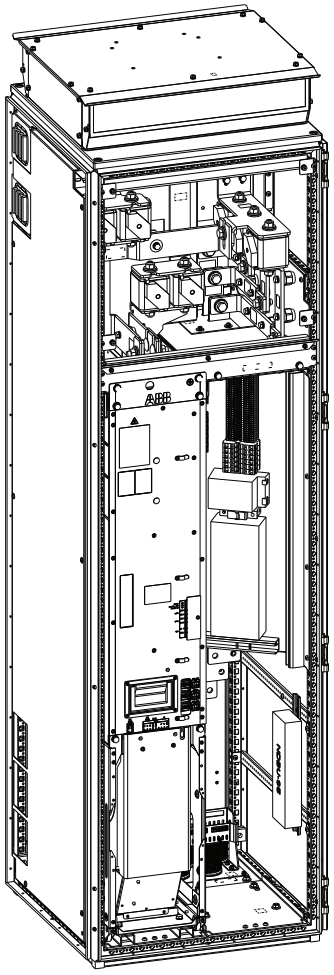
You can find the kit-specific assembly drawings, step-by-step instructions and kit information on the Internet. Go to https://sites-apps.abb.com/sites/lvacdrivesengineeringsupport/content. If needed, contact your local ABB representative.

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]).

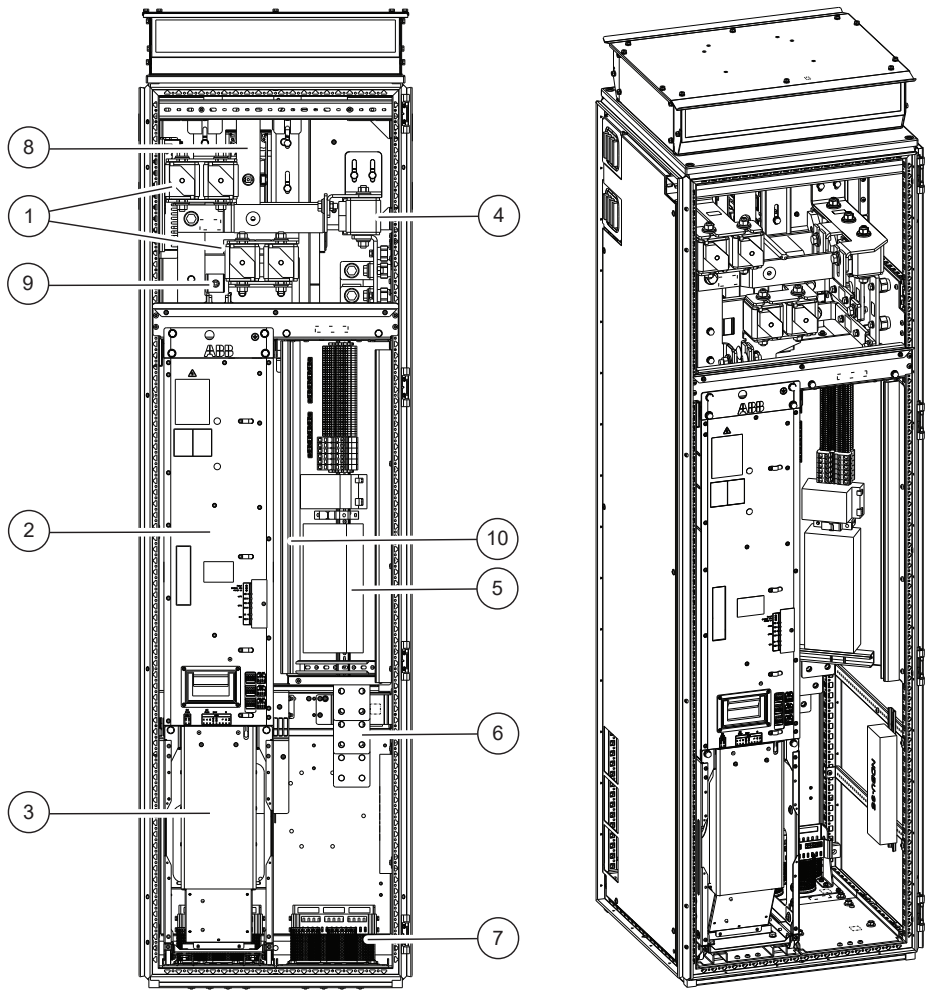
One R8i module in a 600 mm wide Rittal VX25 enclosure without DC switch/disconnector





1	DC fuses	5	BCU-02 brake control unit
2	Brake chopper module	6	Terminals for brake resistor cable connection
3	Brake chopper module cooling fan	7	Cable entries for brake resistor and control cables
4	Brake resistor fuses		

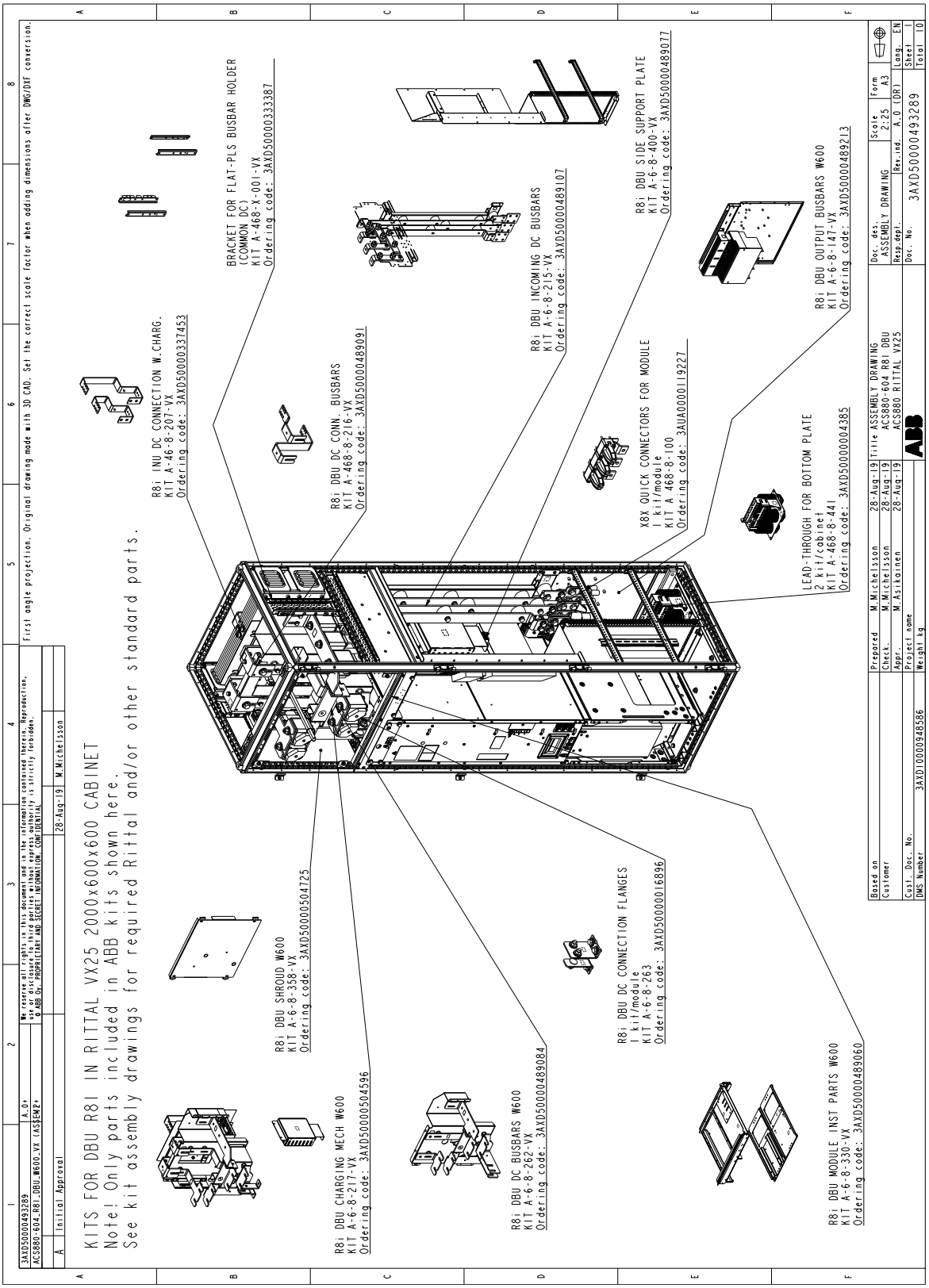
One R8i module in a 600 mm wide Rittal VX25 enclosure with DC switch/disconnector



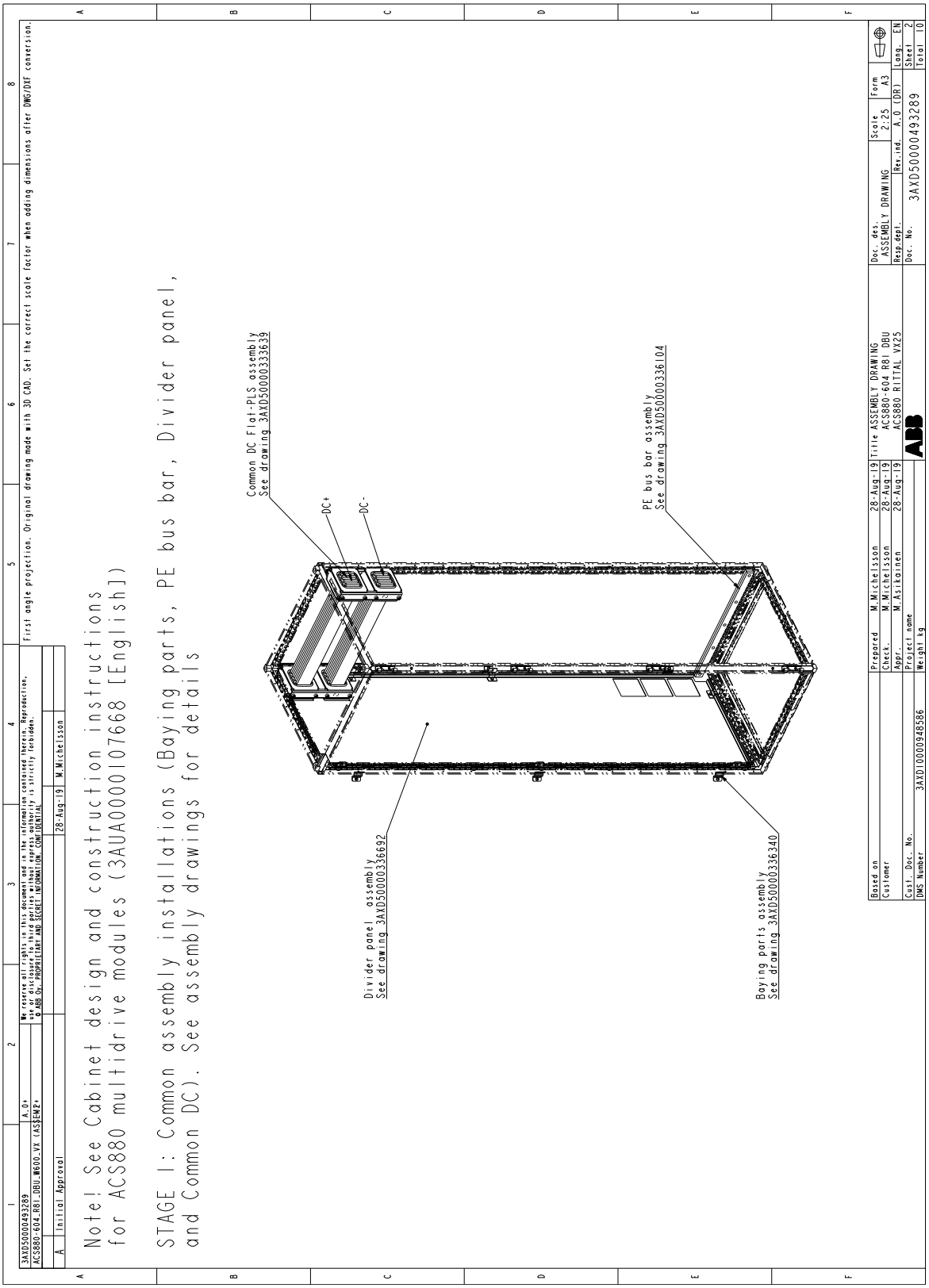
1	DC fuses	6	Cable entries for brake resistor and control cables
2	Brake chopper module	7	Terminals for brake resistor cable connection
3	Brake chopper module cooling fan	8	DC switch/disconnector behind the plate
4	Brake resistor fuses	9	Charging switch with fuses behind the plate
5	BCU-02 brake control unit	10	Charging resistors behind the plate

#	Parts to be installed	Instruction code	Kit code	Kit ordering code
1	Common parts:			
	• Baying parts	3AXD50000336340	-	-
	• PE busbar	3AXD50000336104	-	-
	• Divider panel	3AXD50000336692	-	-
	• DC busbars	3AXD50000333639	A-468-X-001-VX	3AXD50000333387
2A	DC connection 1 of 2 (busbars from DC bus to DC fuses and flanges from DC fuses to brake chopper module)			
	• Mounting plate assembly with DC busbars	3AXD50000493555	A-6-8-262-VX	3AXD50000489084
	• DC connection busbars	3AXD50000493265	A-468-8-216-VX	3AXD50000489091
	• DC connection flanges	3AXD50000016945	A-6-8-263	3AXD50000016896
2B	DC connection 1 of 2 (from DC bus to DC fuses) with DC switch and charging			
	• DC switch/charging mechanics	3AXD50000493395	A-6-8-217-VX	3AXD50000504596
	• Busbars	3AXD50000345458	A-46-8-207-VX	3AXD50000337453
3	Quick connector, outgoing resistor busbars (cable connection):			
	• Quick connector	3AUA0000118667	A-468-8-100	3AUA00000119227
	• Outgoing resistor busbars and shrouds	3AXD50000493388	A-6-8-147-VX	3AXD50000489213
4	DC connection 2 of 2 (from DC bus to output DC fuses to resistor connection terminals):			
	• Incoming resistor busbars	3AXD50000493357	A-6-8-215-VX	3AXD50000489107
5	Brake module installation and brake resistor cable entries			
	• Mounting plates	3AXD50000492145	A-6-8-330-VX	3AXD50000489060
	• Cable entry kits	3AXD50000004817	A-468-8-441	3AXD50000004385
6	Side support	3AXD50000493579	A-6-8-400-VX	3AXD50000489077
7	Shroud	3AXD50000492947	A-6-8-358-VX	3AXD50000504725
8	Brake chopper module	-	-	-

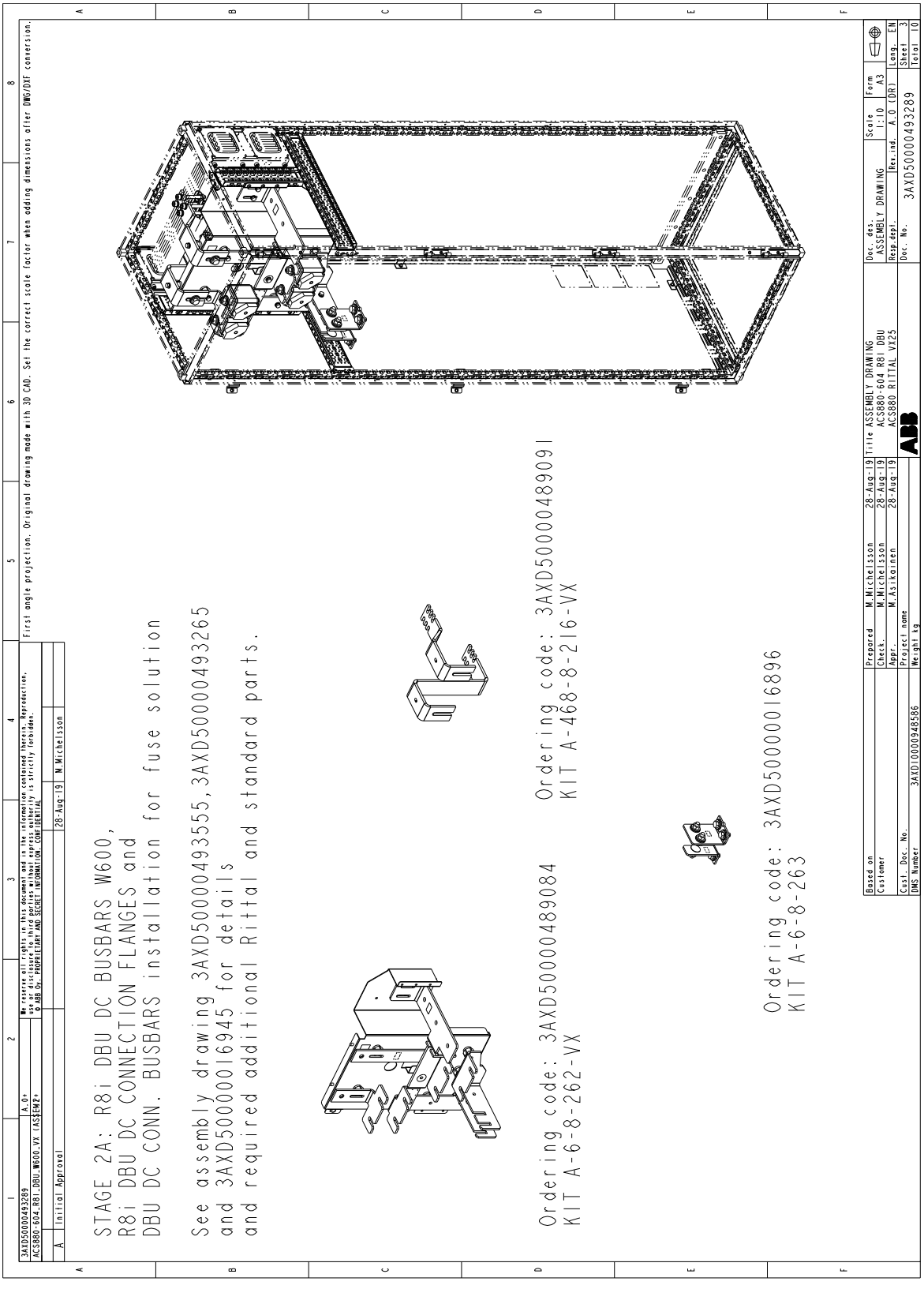
Overview of kits



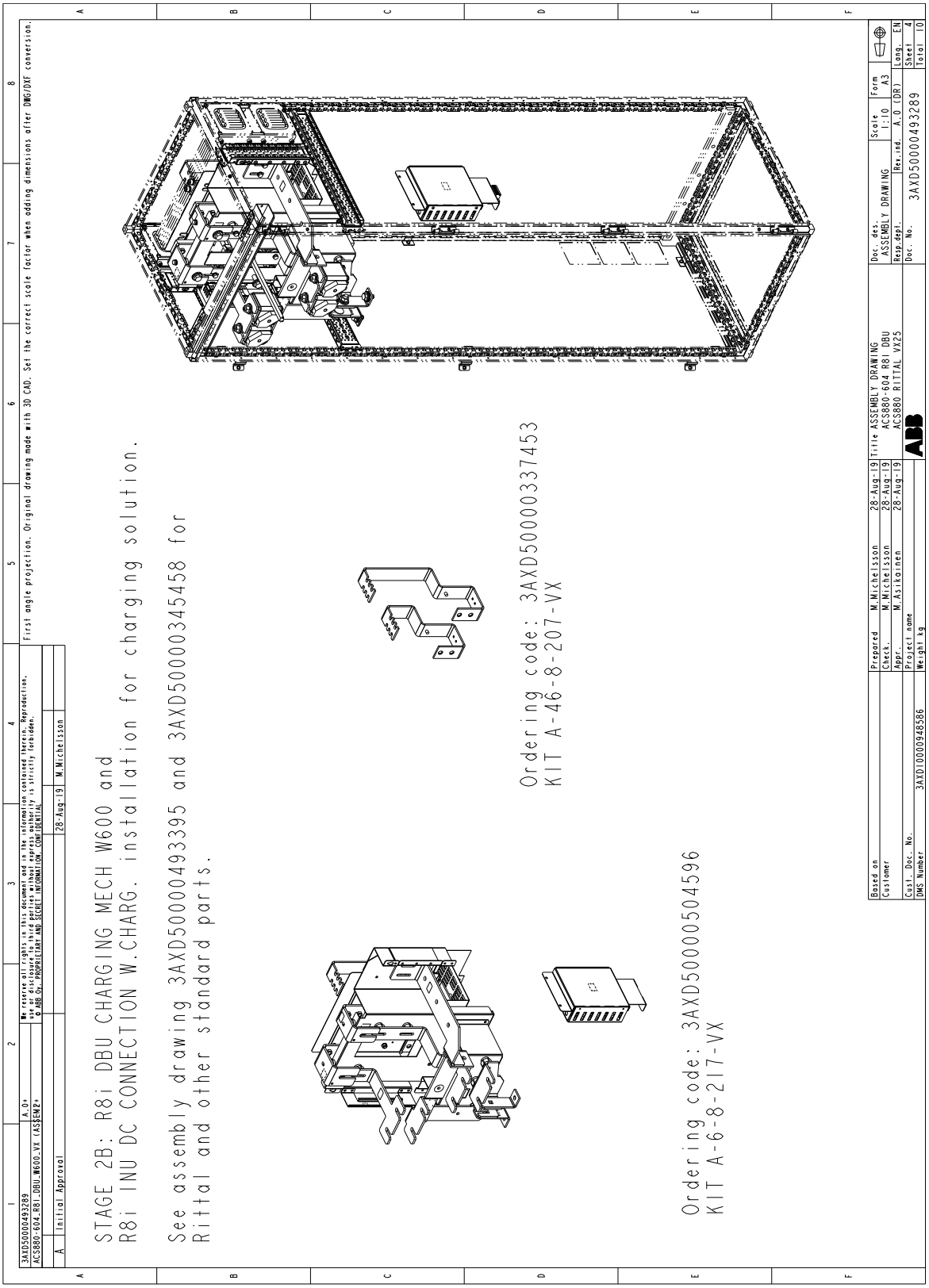
Stage 1: Installation of common parts



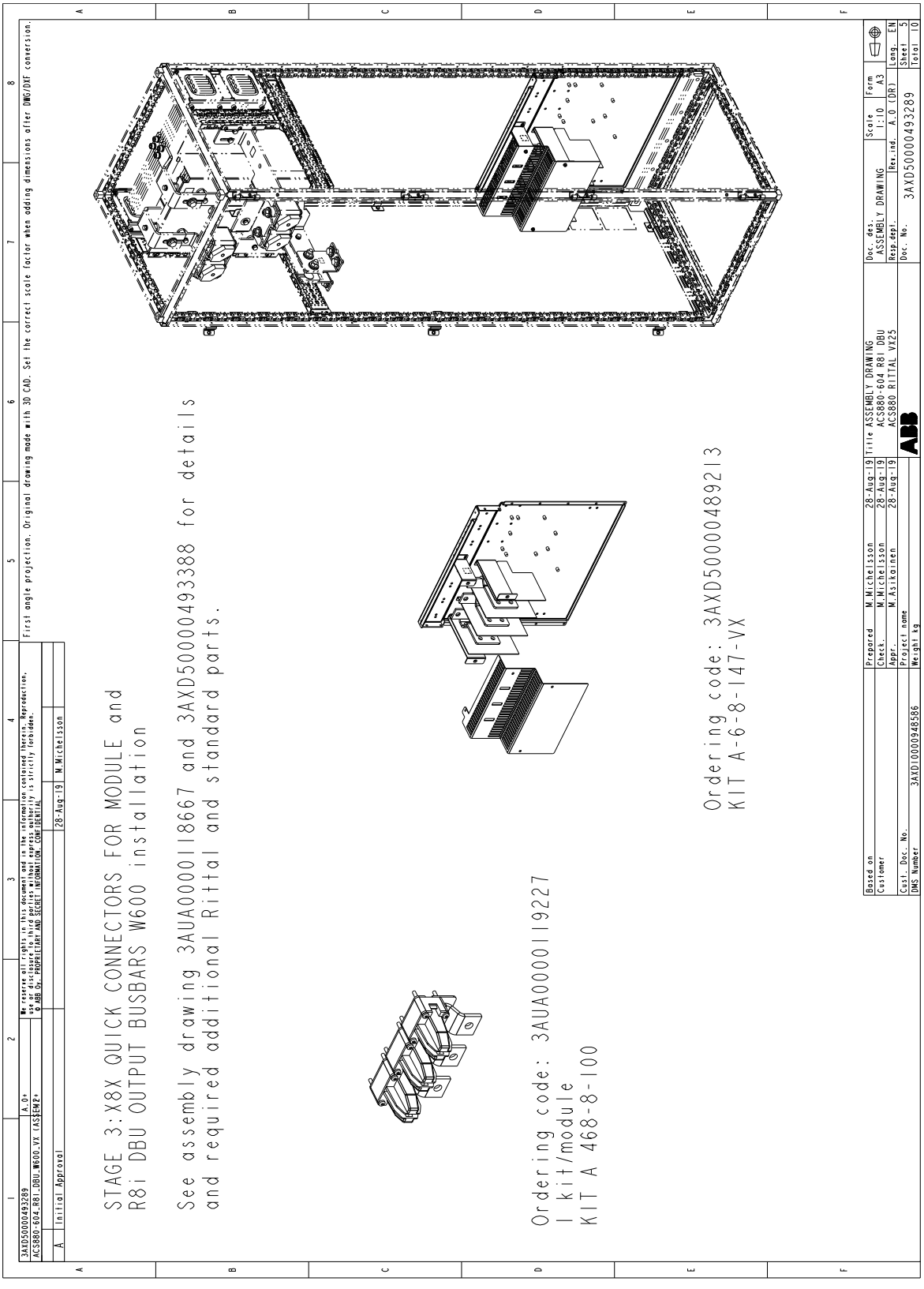
Stage 2A: Installation of DC busbars (1) (without DC switch or charging)



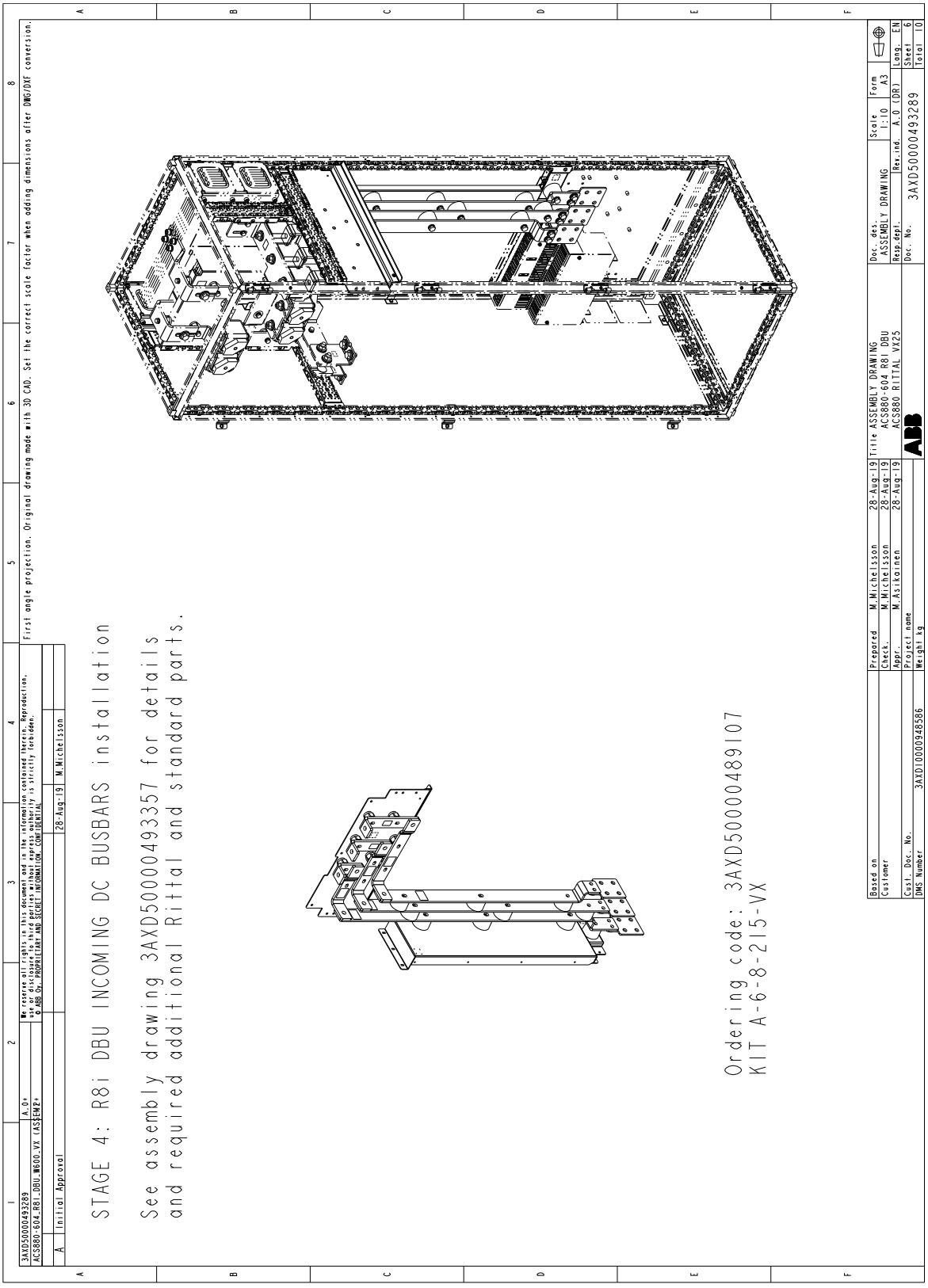
Stage 2B: Installation of DC busbars (1) (with DC switch and charging)



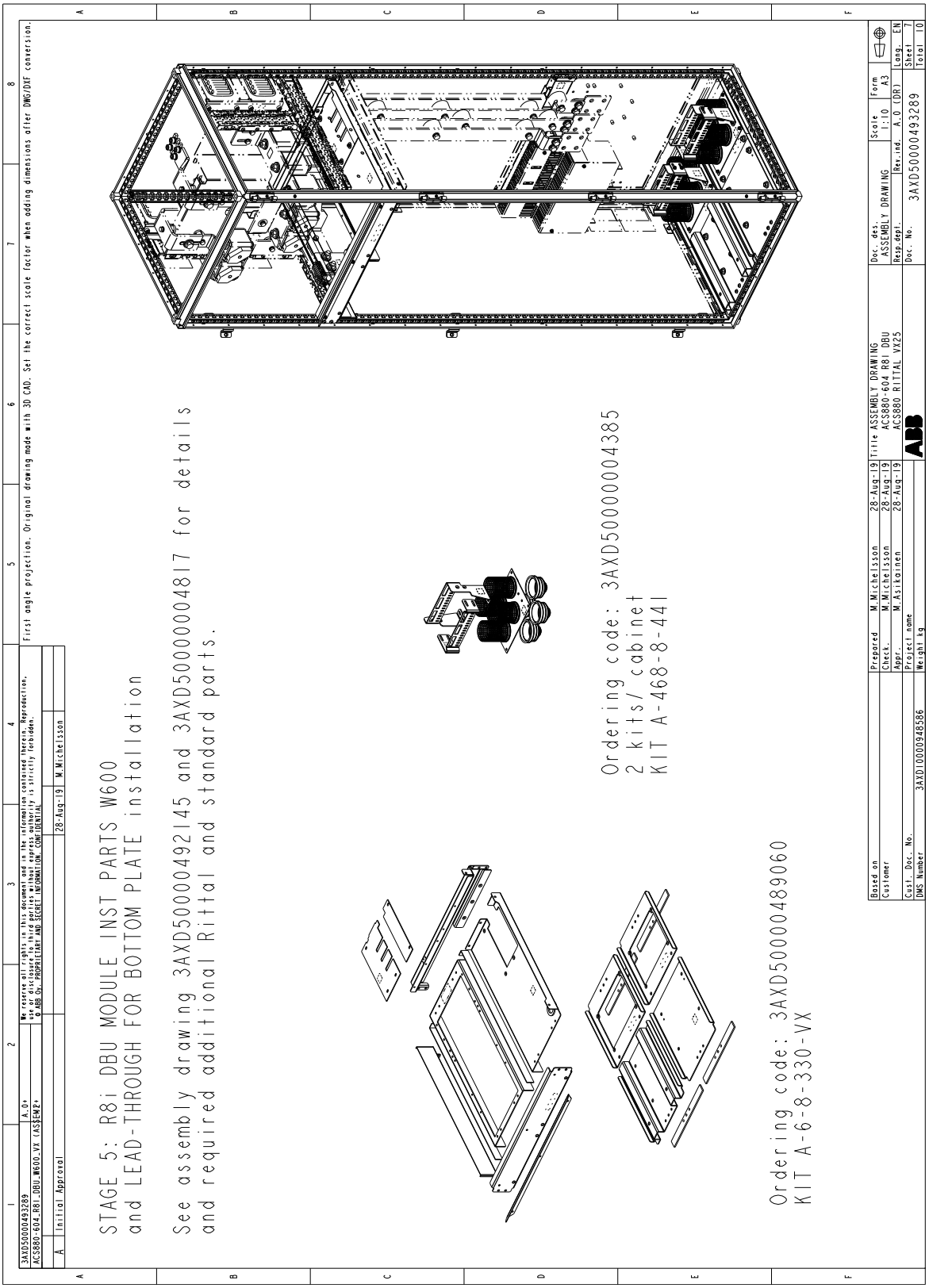
Stage 3: Installation of quick connector and outgoing resistor busbars (cable connection)



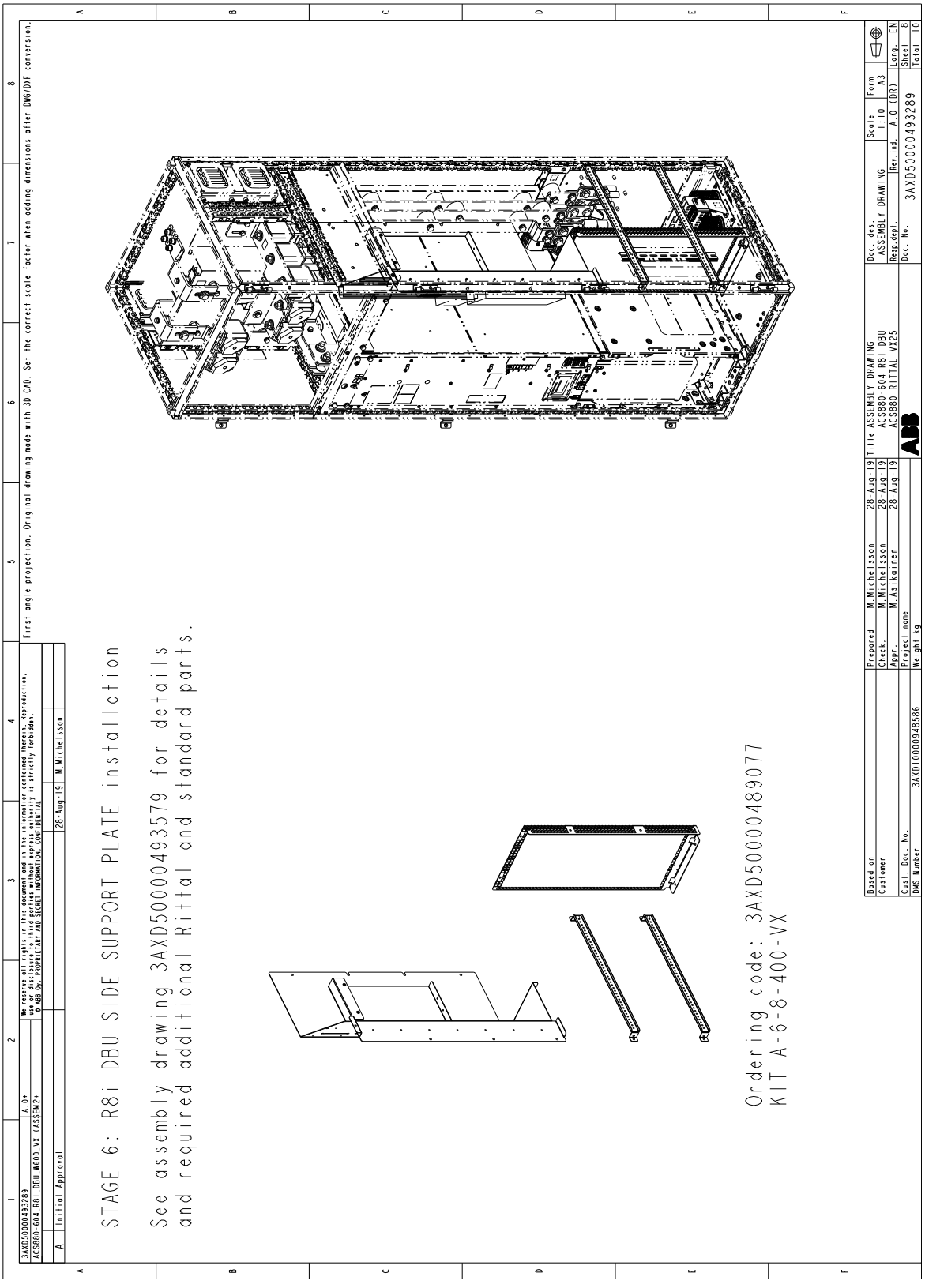
Stage 4: Installation of incoming resistor busbars (cable connection)



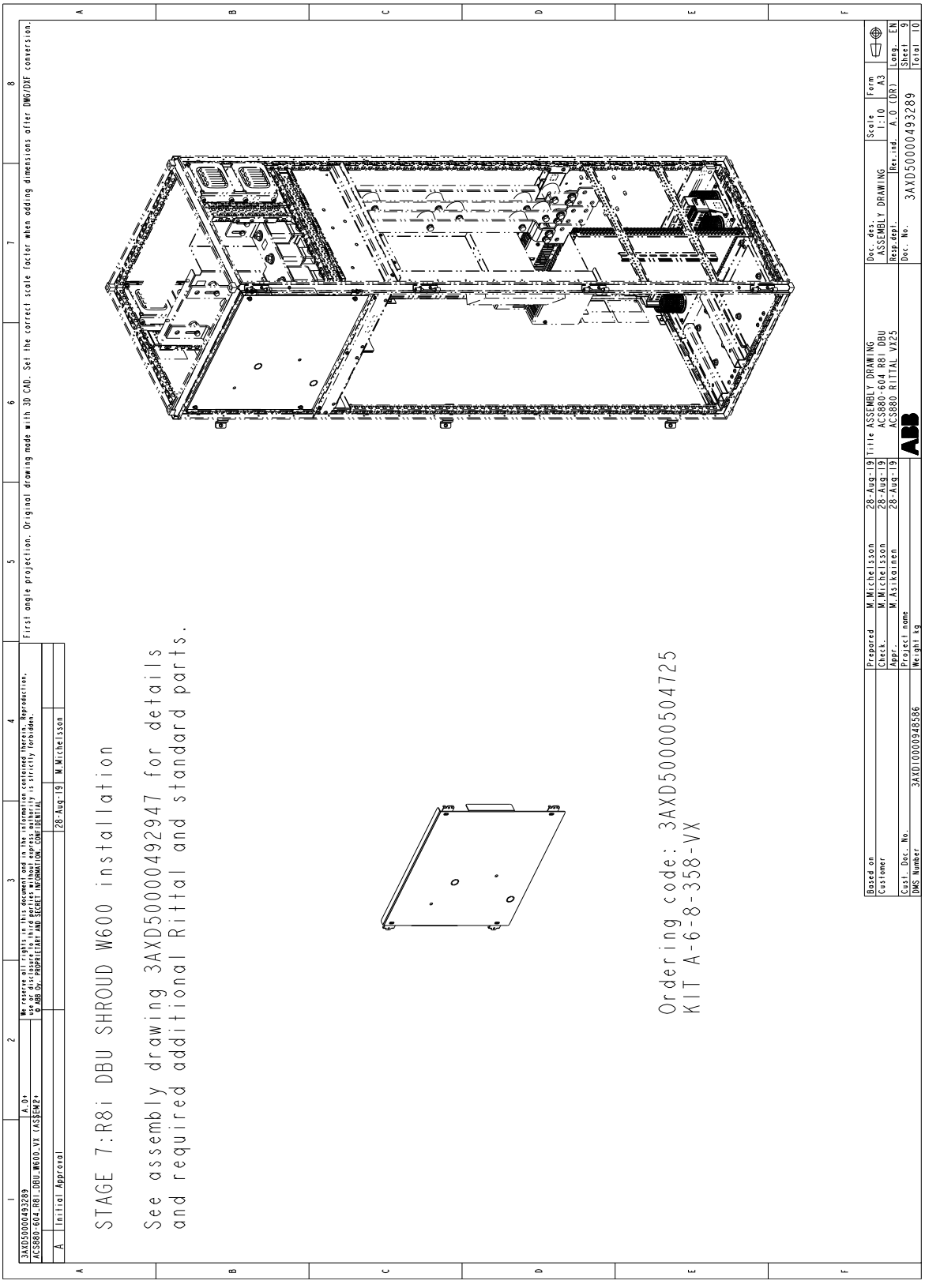
Stage 5: Installation of mounting plates and cable entries



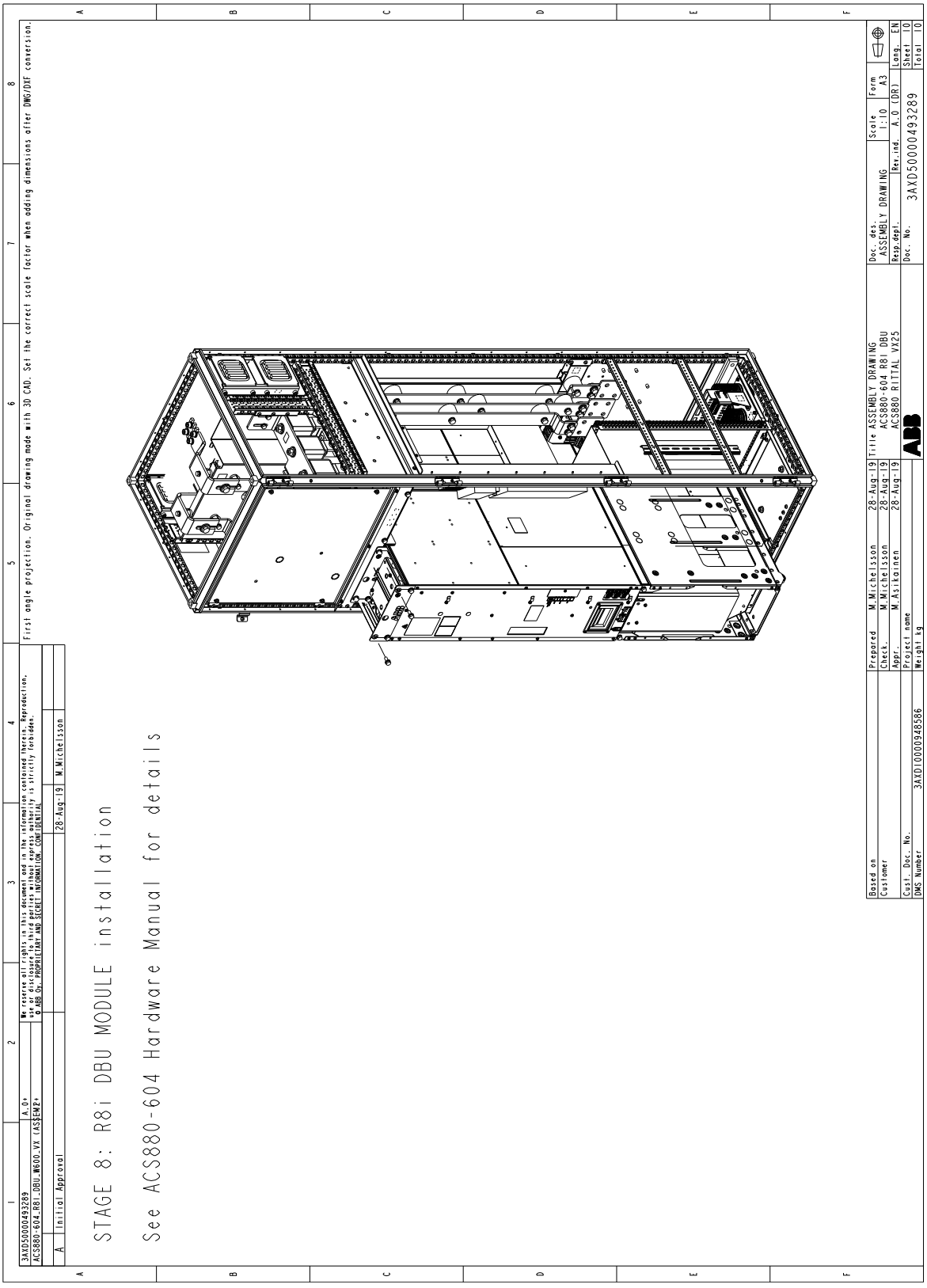
Stage 6: Installation of support plate



Stage 7: Installation of shrouding



Stage 8: Installation of brake chopper module



5

Guidelines for planning the electrical installation

Contents of this chapter

This chapter contains instructions on selecting, placing and protecting the brake circuit components and cables.

Limitation of liability

The installation must always be designed and made according to applicable local laws and regulations. ABB does not assume any liability whatsoever for any installation 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.).

Selecting the brake resistors

WARNING!
ABB is not responsible for user resistor selection or protection of the resistor.

Select the resistor according to the resistor specification given in the technical data. In addition, consider the following:

- Each chopper must feed a resistor or resistor assembly of its own.

- The resistance (*R*) of the brake resistor assembly must be equal to or above the value specified. Never use resistance values below the specified value.
- The resistor must withstand the specified brake cycles.
- The ventilation of the space/room in which the resistors are located must meet the air flow amounts specified.
- The resistor assembly must be equipped with a thermal switch.

WARNING!
IEC 60664 and IEC 61800-5-1 require double or reinforced insulation between resistor live parts and the sensor. If the resistor assembly does not fulfill the requirement, the I/O terminals on the control unit must be protected against contact and must not be connected to other equipment, or the temperature sensor must be isolated from the I/O terminals, for example, with a suitable relay.

Selecting and routing the brake resistor cables

Typical resistor cable sizes

See the technical data.

Minimizing electromagnetic interference

Obey these rules in order to minimize the electromagnetic interference caused by rapid current changes in the resistor cables:

- Shield the braking power line 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 is 0.3 meters (1 ft).
- Cross the other cables at right angles.
- Keep the cable as short as possible in order to minimize the radiated emissions and stress on chopper IGBTs. The longer the cable, the higher the radiated emissions, inductive load and voltage peaks over the IGBT semiconductors of the brake chopper.

Maximum cable length

See the technical data.

EMC compliance of the complete installation

Note: ABB has not verified that the EMC requirements are fulfilled with external user-defined brake resistors and cabling. The EMC compliance of the complete installation must be considered by the customer.

Placing the brake resistors

Install the resistors outside the drive in a place where they will cool.

Arrange the cooling of the resistor in a way that:

- no danger of overheating is caused to the resistor or nearby materials

- the temperature of the room the resistor is located in does not exceed the allowed maximum.

Supply the resistor with cooling air or coolant according to the resistor manufacturer's instructions.

WARNING!
The materials near the brake resistor must be non-flammable. The surface temperature of the resistor is high. Air flowing from the resistor is of hundreds of degrees Celsius. If the exhaust vents are connected to a ventilation system, make sure that the material withstands high temperatures. Protect the resistor against contact.

Selecting the resistor thermal switch circuit cable

Make sure that the cable in the resistor thermal switch circuit meets the following requirements:

- shielded cable
- rated operating voltage between a core and ground > 750 (U_0)
- insulation test voltage > 2.5 kV
- jacket material for at least 90 °C (194 °F). Take into account further requirements due to resistor construction and temperature.

Protecting the system against thermal overload

The brake control program includes a resistor and resistor cable thermal protection function, which can be tuned by the user. The brake chopper protects itself and the resistor cables against thermal overload. Make sure that the resistor assembly is equipped with a thermal switch, which is connected to chopper control unit input.

For more information on the thermal protection function, see the appropriate firmware manual.

Operation principle

If the resistor overheats, the thermal switch opens and interrupts the chopper control unit input signal and the chopper stops operating. In addition, the control unit relay output either opens the drive main contactor/breaker or gives a fault indication to the overriding control system, which takes care of the protection.

Protecting the system against short-circuits

Equip the brake unit with brake chopper fuses and brake resistor fuses.

The fuses protect the brake chopper, the brake resistors and the brake circuit cables in a short-circuit situation.

6

Electrical installation

Contents of this chapter

This chapter contains instructions on wiring the brake units.

Electrical safety precautions

These electrical safety precautions are for all 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 disconnector of the supply transformer. (The main disconnecting device in the drive cabinet does not disconnect the voltage from the AC input power busbars of the drive cabinet.)
   - 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

Static electricity

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.

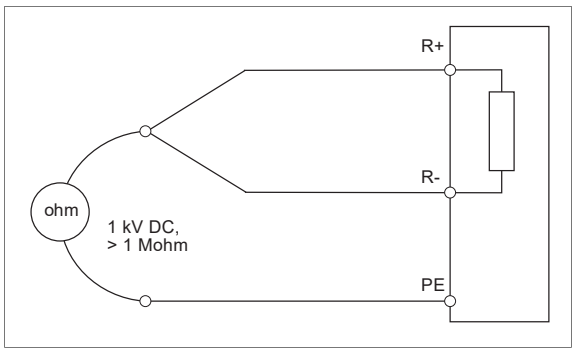
- Handle the fiber optic cables with care.
- When you unplug the fiber optic cables, always hold the connector, not the cable itself.
- Do not touch the ends of the fibers with bare hands as the ends are extremely sensitive to dirt.
- Do not bend the fiber optic cables too tightly. The minimum allowed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

Measuring the insulation of brake resistor and resistor cable

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

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

1. Stop the drive and do the steps in section *Electrical safety precautions (page 50)* before you start the work.
2. Make sure that the resistor cable is connected to the resistor and disconnected from the drive output terminals.
3. At the drive end, connect the R+ and R- conductors of the resistor cable together. Measure the insulation resistance between the conductors and the PE conductor with a measuring voltage of 1000 V DC. The insulation resistance must be higher than 1 Mohm.

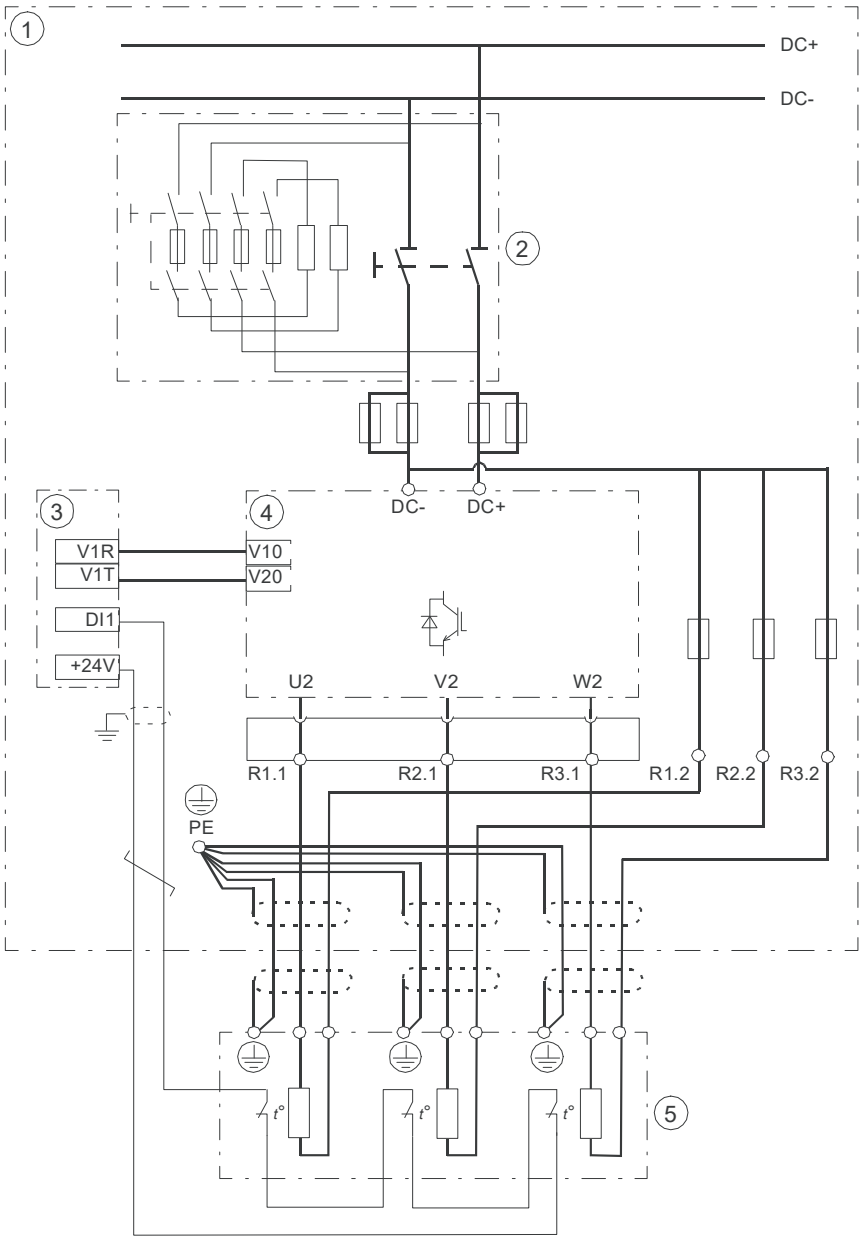


Connecting the brake resistor cables and thermal switch

Connection diagram

This diagram shows the brake resistor cable connections and an example connection of the thermal switches.

The diagram also shows the internal connections of the brake chopper module cubicle to be done by the system integrator.



1	Brake chopper cubicle
2	DC switch/disconnector including charging circuit
3	Control unit
4	Brake chopper module
5	Brake resistors

Connection procedure of the brake chopper cubicle

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

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

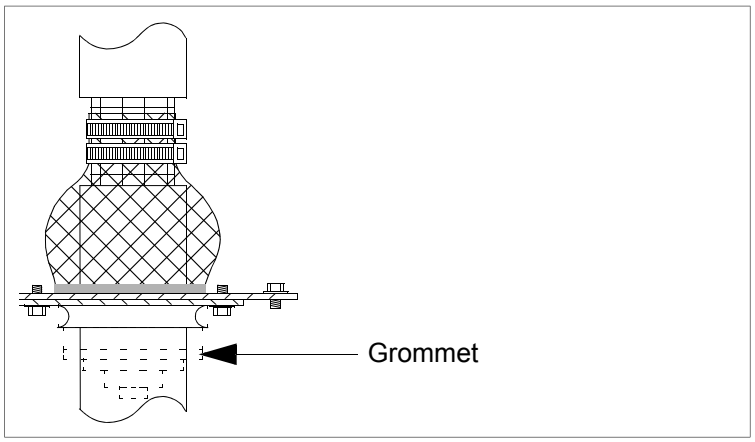
1. Stop the drive and do the steps in section *Electrical safety precautions (page 50)* before you start the work.
2. Make the internal connections of the brake chopper cubicle. See the diagram above.

Connection procedure of the resistor cables

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

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

1. Stop the drive and do the steps in section *Electrical safety precautions (page 50)* before you start the work.
2. Open the door of the brake unit cubicle and remove the shrouding.
3. Lead the cables into the cubicle. Make the 360° earthing arrangement at the cable entry as shown. Install the rubber grommet (if present) below the cable entry for proper sealing.



4. Cut the cables to suitable length. Strip the cables and conductors.
5. Twist the cable shields into bundles and connect the bundles to the PE busbar in the cubicle.
6. Connect the resistor cables. Note the connection of the third conductor and the cable shield. See also the circuit diagrams delivered with the unit. See the technical data for tightening torques.

Connection procedure of the thermal switch cable

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

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

1. Stop the drive and do the steps in section *Electrical safety precautions (page 50)* before you start the work.
2. Run the sensor cable inside the brake unit cubicle.
3. ABB recommends that you ground the cable shield 360° at the cable entry.
4. Run the cable to its connection point using existing trunking wherever possible. Protect the cables against any sharp edges or hot surfaces.
5. Connect the conductors to the appropriate terminals.
6. Twist the cable shield into a bundle, crimp a ring terminal onto it and connect it to the nearest chassis grounding point. At the other end of the cable, leave the shields unconnected or ground them via a capacitor (eg. 3.3 nF / 630 V).

Connecting the fiber optic cables

Connect the fiber optic cables to the brake modules.

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 50)*.
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).

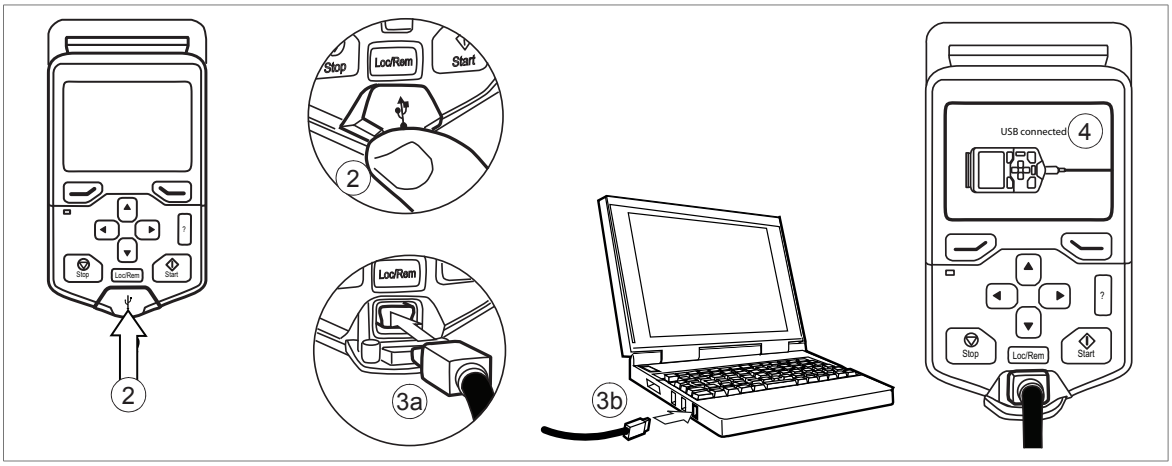
   Note: The screw tightens the connections and grounds the module. It is essential for fulfilling the EMC requirements and for proper operation of the module.

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

Control unit

Contents of this chapter

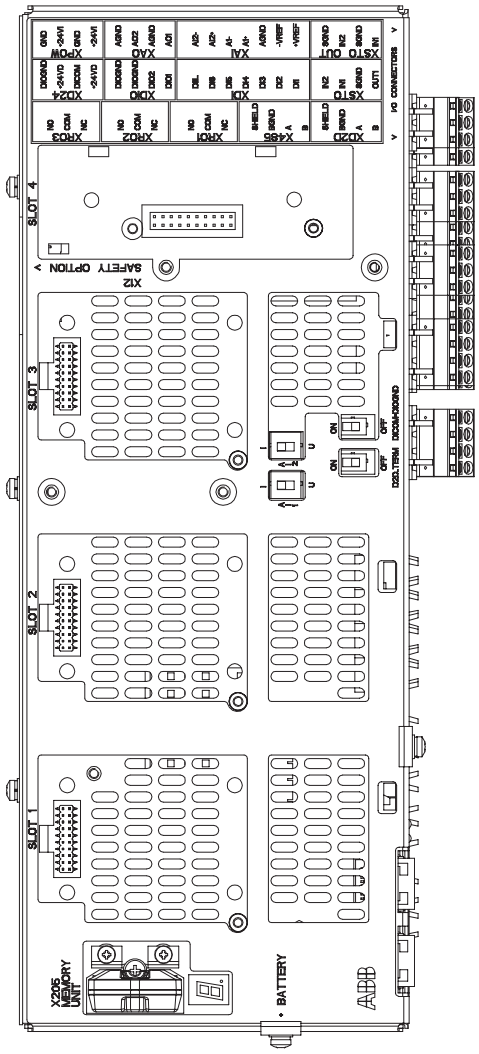
This chapter

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

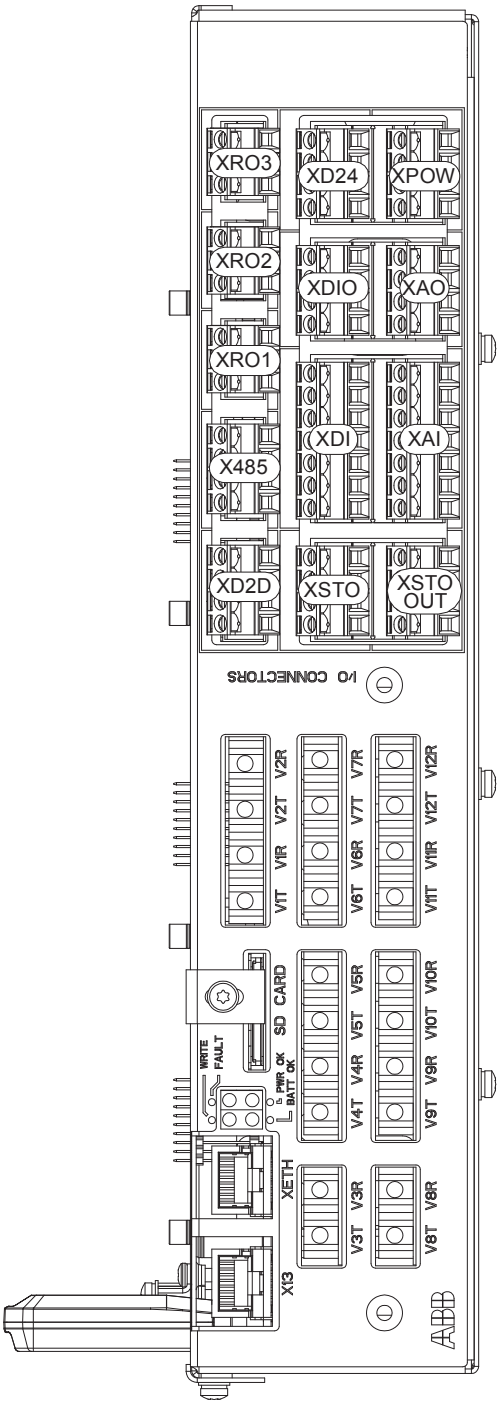
General

Each brake module is controlled by a dedicated BCU control unit. The control unit 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 brake module by fiber optic cables.

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	
o	(“U” is indicated briefly before “o”.) Control program running
U	Control program startup in progress
L	(Flashing) Firmware cannot be started. Memory unit missing or corrupted
1	Firmware download from PC to control unit in progress
2	At power-up, the display may show short indications of eg. “1”, “2”, “b” or “U”. These are normal indications immediately after power-up. If the display ends up showing any other value than those described, it indicates a hardware failure.



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

Default I/O diagram of the brake control unit

The diagram below shows the default I/O connections on the brake control unit, and describes the use of the signals/connections.See also example circuit diagrams.

The wire size accepted by all screw terminals (for both stranded and solid wire) is 0.5 … 2.5 mm^2 (24…12 AWG). The torque is 0.5 N·m (5 lbf·in).

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: **Running** 1) (energized = running) 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: **Running** 1) (energized = running) 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 brake 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	Not in use by default
4	DI4	Not in use by default
5	DI5	Not in use by default
6	DI6	Reset 1) (0⟶1 = fault reset)
7	DIIL	Not in use by default
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(4)…20 mA, R_{in} = 100 ohm 3)
6	AI2+	Not in use by default.
7	AI2-	0(2)…10 V, R_{in} > 200 kohm 2)
XAO		**Analog outputs**
1	AO1	**Zero** 1) 0…20 mA, R_L < 500 ohm
2	AGND	
3	AO2	**Zero** 1) 0…20 mA, R_L < 500 ohm
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**
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 ohm] or voltage [0(2)…10 V, R_{in} > 200 kohm] input selected by switch AI1. Change of setting requires reboot of control unit.

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

[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.

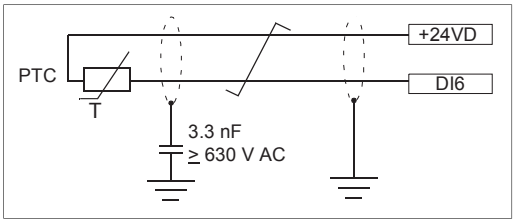
[6] This input only acts as a true Safe torque off input in inverter control units. In other applications (such as a supply or brake unit), de-energizing the IN1 and/or IN2 terminal will stop the unit but not constitute a true safety function.

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.

DI6 as a PTC sensor input

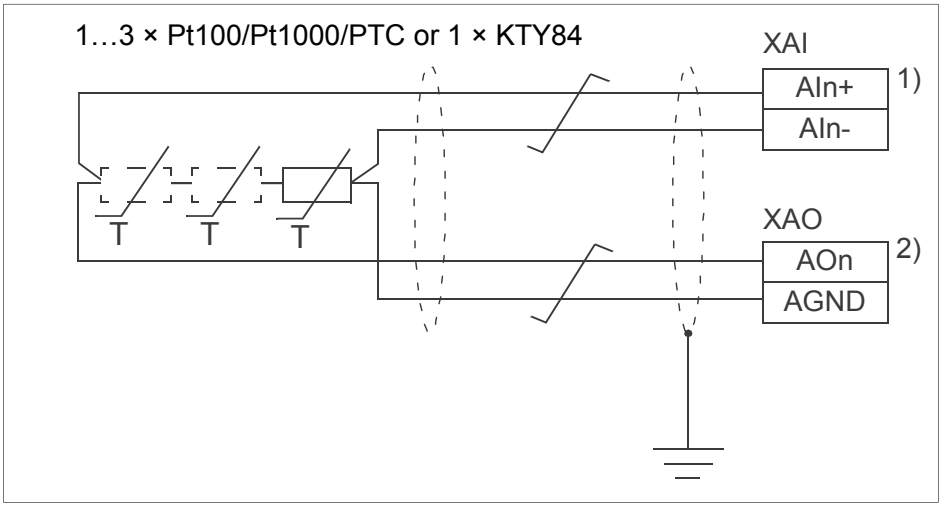
A PTC sensor can be connected to this input for motor temperature measurement as follows. The sensor can alternatively be connected to FEN-xx encoder interface module. At the sensor end of the cable, leave the shields unconnected or ground them indirectly via a high-frequency capacitor with a few nanofarads, for example 3.3 nF / 630 V. The shield can also be grounded directly at both ends if they are in the same ground line with no significant voltage drop between the end points. See the firmware manual of the inverter unit for parameter settings.



WARNING!
As the inputs pictured above are not insulated according to IEC 60664, the connection of the motor temperature sensor requires double or reinforced insulation between motor live parts and the sensor. If the assembly does not fulfill the requirement, the I/O board terminals must be protected against contact and must not be connected to other equipment or the temperature sensor must be isolated from the I/O terminals.

AI1 or AI2 as a Pt100, Pt1000, PTC or KTY84 sensor input

Three Pt100/Pt1000 sensors or one KTY84 sensor for motor temperature measurement can be connected between an analog input and output as shown below. (Alternatively, you can connect the KTY to an FIO-11 or FAIO-01 analog I/O extension module or FEN-xx encoder interface module.) At the sensor end of the cable, leave the shields unconnected or ground them indirectly via a high-frequency capacitor with a few nanofarads, for example 3.3 nF / 630 V. The shield can also be grounded directly at both ends if they are in the same ground line with no significant voltage drop between the end points.



[1] Set the input type to voltage with the appropriate switch or jumper on the inverter control unit. Make the corresponding setting in the inverter unit control program in parameter group **12 Standard AI**.

[2] Select the excitation mode in parameter group **13 Standard AO** of inverter unit control program.

WARNING!
As the inputs pictured above are not insulated according to IEC/EN 60664, the connection of the motor temperature sensor requires double or reinforced insulation between motor live parts and the sensor. If the assembly does not fulfill the requirement, the I/O board terminals must be protected against contact and must not be connected to other equipment or the temperature sensor must be isolated from the I/O terminals.

DIIL input

The DIIL input is used for the connection of safety circuits. The input is parametrized to stop the unit when the input signal is lost.

Note: This input is NOT SIL or PI certified.

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.

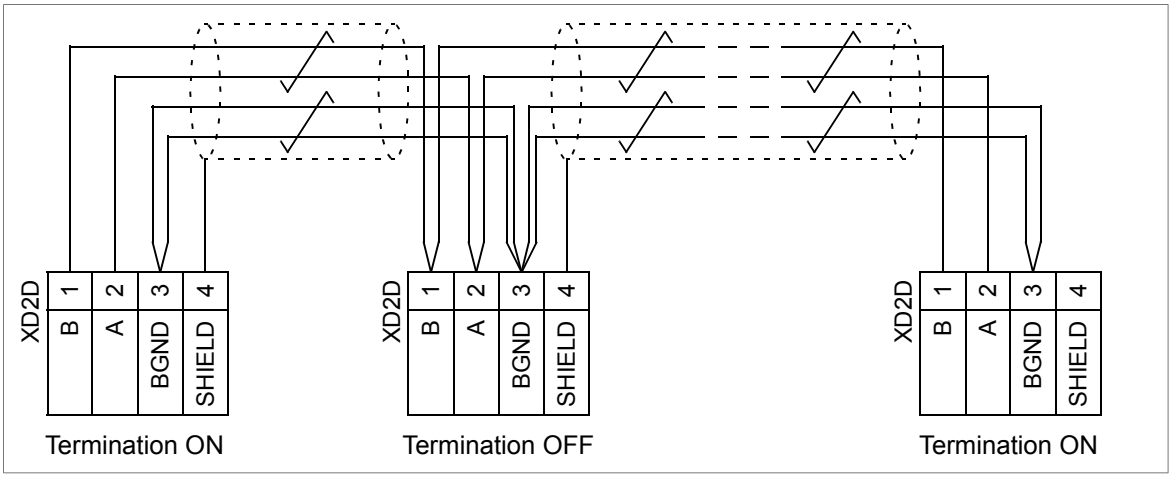
See the firmware manual of the drive for the related parameter settings.

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.

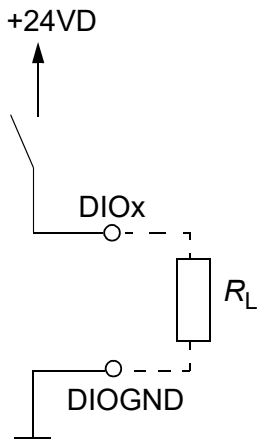
FSO-xx safety functions module connection (X12)

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

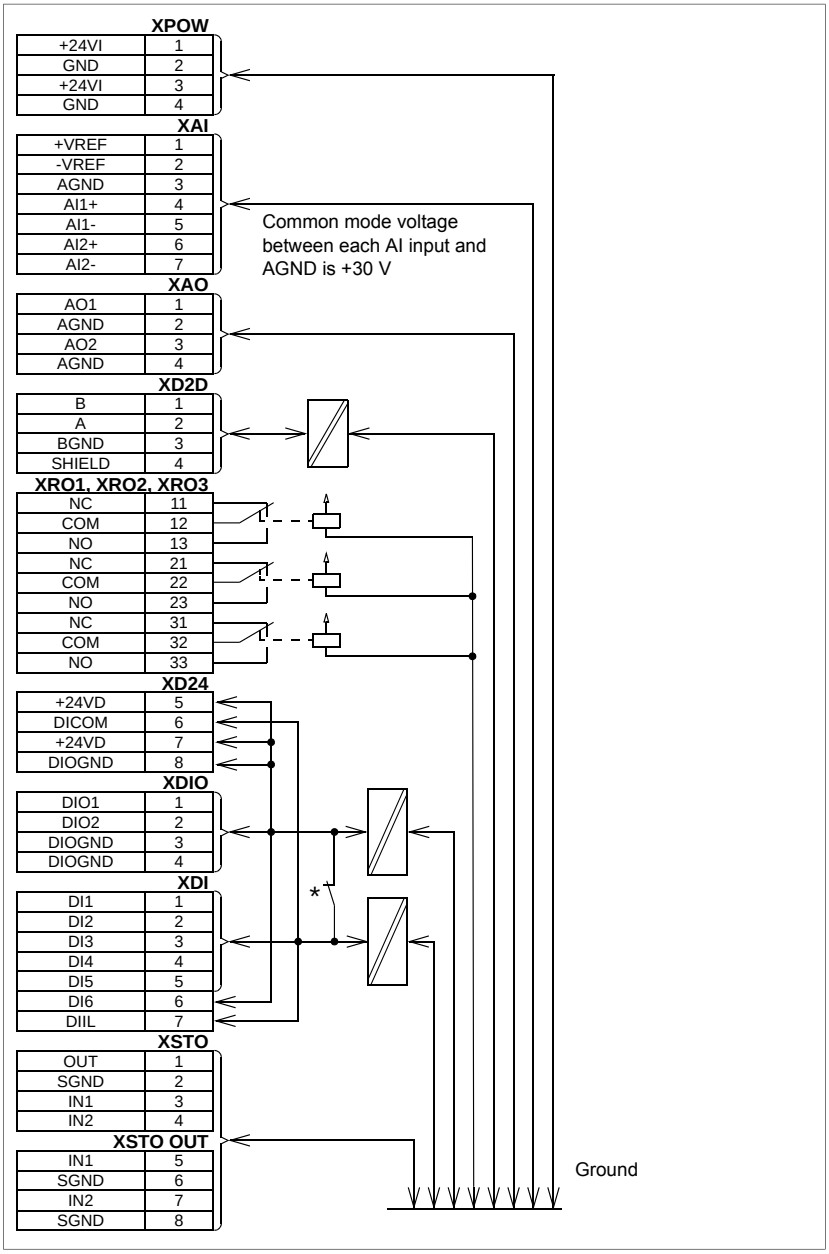
The BCU-x2 has an on-board data logger that collects real-time data from the power modules to help fault tracing and analysis. The data is stored onto the SDHC memory card inserted into the SD CARD slot and can be analyzed by ABB service personnel.

Connector data

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

Analog inputs AI1 and AI2 (XAI:4 … XAI:7). Current/voltage input mode selection by switches	Connector pitch 5 mm, wire size 2.5 mm^2 Current input: –20…20 mA, R_{in} = 100 ohm Voltage input: –10…10 V, R_{in} > 200 kohm Differential inputs, common mode range ±30 V Sampling interval per channel: 0.25 ms Hardware filtering: 0.25 ms, adjustable digital filtering up to 8 ms Resolution: 11 bit + sign bit Inaccuracy: 1% of full scale range
Analog outputs AO1 and AO2 (XAO)	Connector pitch 5 mm, wire size 2.5 mm^2 0…20 mA, R_{load} < 500 ohm Frequency range: 0…500 Hz Resolution: 11 bit + sign bit Inaccuracy: 2% of full scale range
XD2D connector	Connector pitch 5 mm, wire size 2.5 mm^2 Physical layer: RS-485 Transmission rate: 8 Mbit/s Cable type: Shielded twisted-pair cable with a twisted pair for data and a wire or another pair for signal ground (nominal impedance 100 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.

8

Installation checklist

Contents of this chapter

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

Checklist

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

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

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

WARNING!
Stop the drive and do the steps in section *Electrical safety precautions (page 50)* before you start the work.

Make sure that …	☑
The ambient operating conditions meet the drive ambient conditions specification, and enclosure rating (IP code or UL enclosure type).	☐
The supply voltage matches the nominal input voltage of the drive. See the type designation label.	☐
The drive cabinet is attached to the floor, and if necessary due to vibration etc, also by its top to the wall or roof.	☐
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).	☐

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

9

Start-up

Contents of this chapter

This chapter contains the start-up procedure of the brake unit. The symbols in brackets, for example [Q1], refer to the item designations used in the circuit diagrams.

These instructions do not cover all start-up tasks of all possible variants of the brake unit. Always refer to the unit-specific circuit diagrams when proceeding with the start-up.

Start-up procedure

Tasks	☑
Safety	
WARNING! Obey the safety instructions during the start-up procedure. See *Safety instructions for ACS880 multidrive cabinets and modules* (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.	
Note: Some brake resistors are coated with oil film for protection. The protective oil will burn off when the brake resistor is used for the first time. Make sure that there is proper ventilation.	☐
Installation checklist	
Make sure that the installation has been inspected. See the installation checklist.	☐
Make sure that the insulation of the resistor circuit has been measured and is OK.	☐
Supply and inverter units	
Make sure that the supply unit of the drive system has been installed and started up according to the instructions in its hardware manual.	☐

Tasks	☑
Make sure that the inverter units of the drive system have been installed and started up according to the instructions in their hardware manual.	☐
Make sure that the supply unit is stopped, and the drive system has been isolated from the supply network.	☐
Powering up the DC bus	
Make sure that all cabinet doors are closed.	☐
Close the disconnector of the supply transformer.	☐
Close the drive auxiliary voltage switch (if present) to power up the control units.	☐
Start the supply unit. See the procedure in the supply unit hardware manual. When started, the supply unit charges the capacitors of all inverters and brake units connected to the DC bus.	☐
Brake units with DC switch/disconnector: Connecting the brake unit to the DC bus	
To charge the brake unit capacitors, close the charging switch [Q10.1].	☐
When the green light [P11.1] on the cabinet door illuminates, close the DC switch/disconnector [Q11.1] of the brake unit.	☐
Open the charging switch [Q10.1]. **Note:** The brake unit can start only after the charging switch is open.	☐
Setting up the brake unit parameters	
Check the brake control program parameter settings. See *ACS880 brake control program firmware manual* (3AXD50000020967 [English]).	☐
Operational tests	
Test the operation of the braking. See *ACS880 brake control program firmware manual* (3AXD50000020967 [English]).	☐

10

Fault tracing

Contents of this chapter

This chapter describes the fault tracing of the brake unit.

Fault indications

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

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

Depending on the application, the relay output either opens the drive main contactor/breaker or gives a fault indication to the overriding control system. See the circuit diagrams delivered with the unit.

Fault indication/Fault	Cause	What to do
Fault indication relay output switches off the main power or gives a fault indication to an overriding control system.	Chopper or resistor overheated.	Let equipment cool.
	Digital input for the temperature fault is at value 0 = overtemperature, although there is no overtemperature.	Check temperature sensor connections both at the brake control unit end, and at the temperature sensor end. Check sensor. Replace faulty sensor.
	Short circuit in resistor or power cables.	Check power cables and resistor.
	Chopper control board failure. Chopper damaged; it is not able to disconnect resistor from intermediate circuit.	Contact local ABB representative.
Chopper does not function.	Chopper voltage setting too high. Inverter overvoltage control is on.	Check voltage setting. Check parameters of all inverters.

Fault indication/Fault	Cause	What to do
Chopper starts to function at too low a DC voltage.	Chopper voltage setting too low.	Check voltage setting.
Inverter trips on fault 3210 DC link overvoltage.	Chopper voltage setting too high.	Check voltage setting. Check parameters of all inverters.
Brake resistor or chopper overheats.	The maximum brake cycle exceeded or resistor cooling insufficient.	Check duty cycle and resistor cooling.

LEDs

Control panel and panel platform/holder LEDs

The 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.

Control unit LEDs

This table shows the LEDs visible on the BCU control unit.

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

R8i module LEDs

Frame R8i modules have three LEDs. For their indications, see the following table.

Location	LED	Indication
R8i module	FAULT (continuous red)	There is an active fault in the module.
	ENABLE / STO (continuous green)	The module is ready for use.
	ENABLE / STO (continuous yellow)	XSTO connectors are de-energized.
	POWER OK (continuous green)	Supply voltage of the internal circuit boards is OK (> 21 V).

Warning and fault messages

See the firmware manual for the descriptions, causes and remedies of the control program warning and fault messages.

7-segment display of the brake control unit

See the control unit description.

11

Maintenance

Contents of this chapter

This chapter refers to the maintenance instructions of the brake unit.

Maintenance intervals

See *ACS880-104 inverter modules hardware manual* (3AUA0000104271 [English]).

Maintenance instructions

See *ACS880-104 inverter modules hardware manual* (3AUA0000104271 [English]).

12

Ordering information

Contents of this chapter

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

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

Brake modules

The frame size of the brake modules is R8i. The delivery of a brake module includes these items:

Brake module type	Frame size	Contents
U_N = 400 V (Range 380 … 415 V):		• brake module(s) (frame R8i) with speed-controlled cooling fan(s) • internal d*u*/d*t* filter (option +E205, included in the module delivery as standard)
ACS880-604-0500-3	R8i	
ACS880-604-0750-3	R8i	
ACS880-604-1000-3	2×R8i	
ACS880-604-1510-3	2×R8i	
ACS880-604-2260-3	3×R8i	
ACS880-604-3010-3	4×R8i	
ACS880-604-3770-3	5×R8i	
U_N = 500 V (Range 380 … 500 V):		
ACS880-604-0630-5	R8i	
ACS880-604-0940-5	R8i	
ACS880-604-1260-5	2×R8i	
ACS880-604-1880-5	2×R8i	
ACS880-604-2830-5	3×R8i	
ACS880-604-3770-5	4×R8i	
ACS880-604-4710-5	5×R8i	
U_N = 690 V (Range 525… 690 V):		
ACS880-604-0870-7	R8i	
ACS880-604-1300-7	R8i	
ACS880-604-1730-7	2×R8i	
ACS880-604-2600-7	2×R8i	
ACS880-604-3900-7	3×R8i	
ACS880-604-5200-7	4×R8i	
ACS880-604-6500-7	5×R8i	

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

- BCU control unit kits, 1 kit/1 brake module
- Fiber optic cables
- 1 × Control circuit plug connector (3AUA0000059813)
- 1 × Control circuit plug connector (3AXD50000012975)
- Quick connectors, 1 kit/1 brake module (3AUA0000119227).

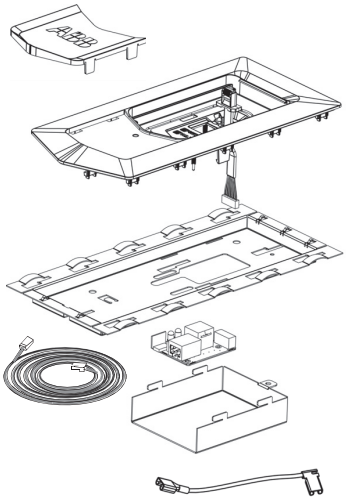
The other parts listed

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

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	

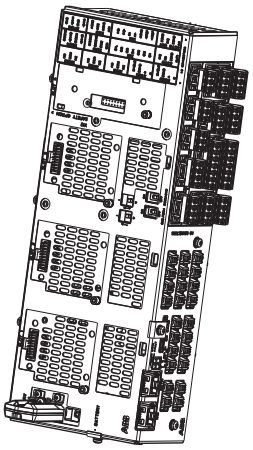
The door mounting kit contains:

- 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

Control unit

You must equip each parallel-connected brake chopper module with a dedicated control unit (and memory unit).

Brake module type	Frame size	Control unit	Qty	Ordering code	Illustration
U_N = 400 V (Range 380 … 415 V):					
ACS880-604-0500-3	R8i	Control unit BCU-02 kit	1	3AXD50000020676	
ACS880-604-0750-3					
ACS880-604-1000-3	2×R8i		2		
ACS880-604-1510-3					
ACS880-604-2260-3	3×R8i		3		
ACS880-604-3010-3	4×R8i		4		
ACS880-604-3770-3	5×R8i		5		
U_N = 500 V (Range 380 … 500 V):					
ACS880-604-0630-5	R8i	Control unit BCU-02 kit	1	3AXD50000020676	
ACS880-604-0940-5					
ACS880-604-1260-5	2×R8i		2		
ACS880-604-1880-5					
ACS880-604-2830-5	3×R8i		3		
ACS880-604-3770-5	4×R8i		4		
ACS880-604-4710-5	5×R8i		5		
U_N = 690 V (Range 525… 690 V):					
ACS880-604-0870-7	R8i	Control unit BCU-02 kit	1	3AXD50000020676	
ACS880-604-1300-7					
ACS880-604-1730-7	2×R8i		2		
ACS880-604-2600-7					
ACS880-604-3900-7	3×R8i		3		
ACS880-604-5200-7	4×R8i		4		
ACS880-604-6500-7	5×R8i		5		

The BCU-02 control unit kit contains:

- BCU-02 control unit
- memory unit with brake control program.

You must connect the control unit to each brake chopper module with a pair of fiber optic cables. You can order them from ABB.

You can supply 24 V DC for the control unit from the brake 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 plug connector X53 for the connection to the brake module.

Fiber optic cables

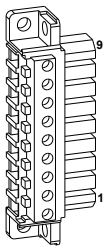
The following kits, each consisting of a pair of plastic fiber optic cables, are available from ABB:

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 for X51, X52 and X53 are included in the module kit.

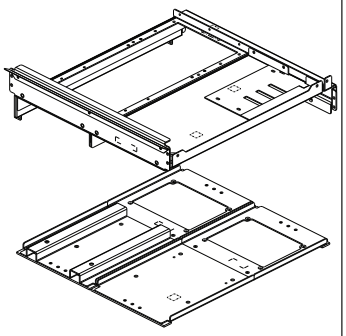
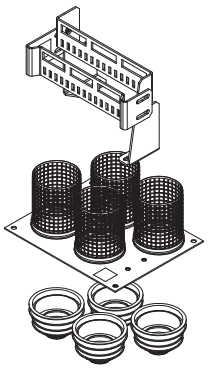
Connector	Data	Qty	Ordering code	Illustration
X50 for R8i	STV S 9 SB 500 V, 32 A, 9-pole 6 KV/3 (female) 4 mm^2, 1	1 per module	3AUA0000059813	

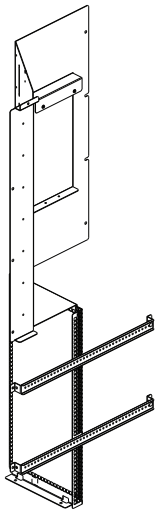
Mechanical installation accessories

Module installation parts

Module installation parts include, for example, side and bottom supports and cable entries for bottom plate for the modules.

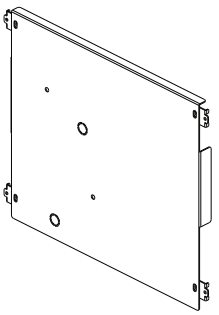
Note: The designs presented in this manual for Rittal VX25 enclosures employ the Rittal Flat-PLS busbar system. Make sure that the current carrying capability of the busbars is not exceeded at any point of the drive system.

Frame size	Enclosure	Qty	Ordering code	Kit code	Illustration
R8i	600 mm	1	3AXD50000489060	A-6-8-330-VX	 Instruction code: 3AXD50000492145
R8i	600 mm	2	3AXD50000004385	A-468-8-441	 Instruction code: 3AXD50000004817

Frame size	Enclosure	Qty	Ordering code	Kit code	Illustration
R8i	600 mm	1	3AXD50000489077	A-6-8-400-VX	 Instruction code: 3AXD50000493579

Shrouds

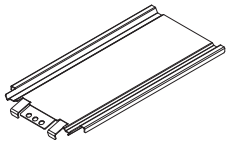
Shrouds are used for IP20 touch protection with the cabinet doors open.

Frame size	Enclosure	Qty	Ordering code	Kit code	Illustration
R8i	600 mm	1	3AXD50000504725	A-6-8-358-VX	 Instruction code: 3AXD50000492947

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).

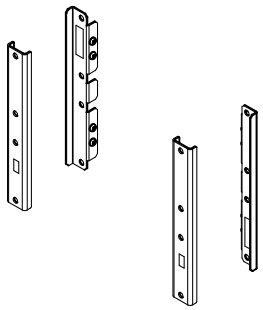
Used with …	Qty	Ordering code	Kit code	Illustration
All VX25 enclosures	1	3AXD50000438037	A-468-8-304-VX	

DC-side components

Common DC Flat-PLS assembly

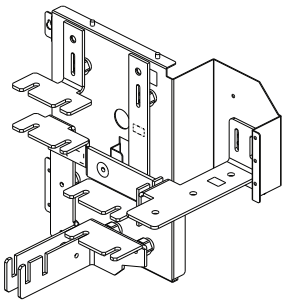
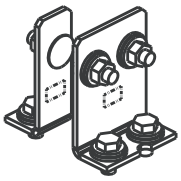
The brackets in this kit act as a mounting base for the busbar supports of the Rittal Flat-PLS DC bus and ensure its correct placement and alignment inside the cabinet line-up.

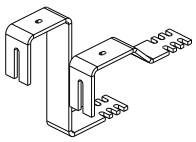
Note: The designs presented in this manual for Rittal VX25 enclosures employ the Rittal Flat-PLS busbar system. Make sure that the current carrying capability of the busbars is not exceeded at any point of the drive system.

Used with …	Qty	Ordering code	Kit code	Illustration
400/600/800 mm VX25 enclosure	1 kit per cubicle	3AXD50000333387	A-468-X-001-VX	 Instruction code: 3AXD50000333639

DC connection flanges and busbars

These DC busbars provide connection from the common DC bus to the module DC input.

Frame size	Enclosure	Qty	Ordering code	Kit code	Illustration
R8i	600 mm	1	3AXD50000489084	A-6-8-262-VX	 Instruction code: 3AXD50000493555
R8i	600 mm	1	3AXD50000016896	A-6-8-263	 Instruction code: 3AXD50000016945

Frame size	Enclosure	Qty	Ordering code	Kit code	Illustration
R8i	600 mm	1	3AXD50000489091	A-468-8-216-VX	 Instruction code: 3AXD50000493265

DC fuses

DC fuses protect the module and drive DC bus against short circuits. Fuse kits are available for modules of frame size R8i.

The fuses listed below are size 3.

Brake unit type	Fuse (IEC and UL)			
	Type	Qty	Data	Ordering code
U_N = 400 V				
ACS880-604-0500-3	170M6410	2×2	630 A; 690 V	68335418
ACS880-604-0750-3	170M6414	2×2	1000 A; 690 V	68333296
ACS880-604-1000-3	170M6410	2×4	630 A; 690 V	68335418
ACS880-604-1510-3	170M6414	2×4	1000 A; 690 V	68333296
ACS880-604-2260-3	170M6414	2×6	1000 A; 690 V	68333296
ACS880-604-3010-3	170M6414	2×8	1000 A; 690 V	68333296
ACS880-604-3770-3	170M6414	2×10	1000 A; 690 V	68333296
U_N = 500 V				
ACS880-604-0630-5	170M6410	2×2	630 A; 690 V	68335418
ACS880-604-0940-5	170M6414	2×2	1000 A; 690 V	68333296
ACS880-604-1260-5	170M6410	2×4	630 A; 690 V	68335418
ACS880-604-1880-5	170M6414	2×4	1000 A; 690 V	68333296
ACS880-604-2830-5	170M6414	2×6	1000 A; 690 V	68333296
ACS880-604-3770-5	170M6414	2×8	1000 A; 690 V	68333296
ACS880-604-4710-5	170M6414	2×10	1000 A; 690 V	68333296
U_N = 690 V				
ACS880-604-0870-7	170M6544	2×2	630 A; 1250 V	63903167
ACS880-604-1300-7	170M6548	2×2	1000 A; 1100 V	63916749
ACS880-604-1730-7	170M6544	2×4	630 A; 1250 V	63903167
ACS880-604-2600-7	170M6548	2×4	1000 A; 1100 V	63916749
ACS880-604-3900-7	170M6548	2×6	1000 A; 1100 V	63916749
ACS880-604-5200-7	170M6548	2×8	1000 A; 1100 V	63916749
ACS880-604-6500-7	170M6548	2×10	1000 A; 1100 V	63916749

DC switch/disconnector kits

IEC– 230 V 60 Hz						
Brake unit type ACS880-604-…			**Frame**	**Qty**	**Ordering code**	**Switch type**
0500-3	0630-5	0870-7	R8i	1	3AXD50000009534	OT1600E11
0750-3	0940-5	1300-7	R8i	1		
1000-3	1260-5	1730-7	2×R8i	2		
1510-3	1880-5	2600-7	2×R8i	2		
2260-3	2830-5	3900-7	3×R8i	3		
3010-3	3770-5	5200-7	4×R8i	4		
3770-3	4710-5	6500-7	5×R8i	5		

IEC – 240 V 60 Hz						
Brake unit type ACS880-604-…			**Frame**	**Qty**	**Ordering code**	**Switch type**
0500-3	0630-5	0870-7	R8i	1	3AXD50000026854	OT1600E11
0750-3	0940-5	1300-7	R8i	1		
1000-3	1260-5	1730-7	2×R8i	2		
1510-3	1880-5	2600-7	2×R8i	2		
2260-3	2830-5	3900-7	3×R8i	3		
3010-3	3770-5	5200-7	4×R8i	4		
3770-3	4710-5	6500-7	5×R8i	5		

UL/CSA – 110 V 60 Hz						
Brake unit type ACS880-604-…			**Frame**	**Qty**	**Ordering code**	**Switch type**
0500-3	0630-5	0870-7	R8i	1	3AXD50000009540	OT1200U11
0750-3	0940-5	1300-7	R8i	1		
1000-3	1260-5	1730-7	2×R8i	2		
1510-3	1880-5	2600-7	2×R8i	2		
2260-3	2830-5	3900-7	3×R8i	3		
3010-3	3770-5	5200-7	4×R8i	4		
3770-3	4710-5	6500-7	5×R8i	5		

Kit contents:

- DC switch/disconnector(s)
- Shaft (12 × 395 mm)
- OHB150J12P handle with off/on indication
- Interlock kit OTZT4A with PDAL2 coil
- One normally-open (OA1G10) and one normally-closed (OA3G01) auxiliary contact block.

Charging kits

The charging kit contains the main parts of the charging circuit, such as the charging switch (with shaft, handle, terminal shrouds and a set of auxiliary contacts), fuses, connectors and the charging controller. Note that the charging resistors or fiber optic cables are not included in the kit and must be ordered separately.

IEC					
Brake unit type ACS880-604-…			**Frame**	**Qty**	**Ordering code**
0500-3	0630-5	0870-7	R8i	1	3AXD50000009537
0750-3	0940-5	1300-7	R8i	1	
1000-3	1260-5	1730-7	2×R8i	2	
1510-3	1880-5	2600-7	2×R8i	2	
2260-3	2830-5	3900-7	3×R8i	3	
3010-3	3770-5	5200-7	4×R8i	4	
3770-3	4710-5	6500-7	5×R8i	5	

UL					
Brake unit type ACS880-604-…			**Frame**	**Qty**	**Ordering code**
0500-3	0630-5	0870-7	R8i	1	3AXD50000009538
0750-3	0940-5	1300-7	R8i	1	
1000-3	1260-5	1730-7	2×R8i	2	
1510-3	1880-5	2600-7	2×R8i	2	
2260-3	2830-5	3900-7	3×R8i	3	
3010-3	3770-5	5200-7	4×R8i	4	
3770-3	4710-5	6500-7	5×R8i	5	

Kit contents:

Ordering code	Contents
3AXD50000009537	Switch fuse (OS160GD04F) with terminal shrouds (OSS160GT1S/4); shaft (6 × 290 mm); handle (OHB65J6); normally-closed auxiliary contacts (OA3G01, 2 pcs); 170M2676 fuses; charging controller
3AXD50000009538	Switch fuse (OS100GJ04FP) with terminal shrouds (OSS160GT1S/4); shaft (6 × 161 mm); handle (OHB65J6); normally-closed auxiliary contacts (OA3G01, 2 pcs); FWJ30A fuses and fuse holder modification parts; charging controller

- Charging resistors are not included and must be ordered separately. See below.
- The charging controller connects to each inverter module by a pair of fiber optic cables. The cables are not included and must be ordered separately.

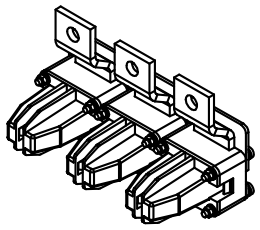
Charging resistors

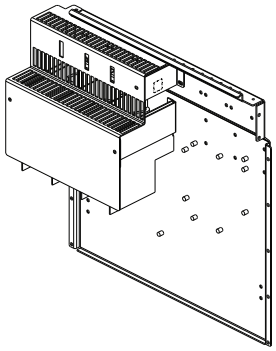
IEC/UL						
Brake unit type ACS880-604-…			**Frame**	**Qty**	**Ordering code**	**Data**
0500-3	0630-5		R8i	4	10037531	ZRF 30X165S24R
0750-3	0940-5		R8i	4		
1000-3	1260-5		2×R8i	8		
1510-3	1880-5		2×R8i	8		
2260-3	2830-5		3×R8i	12		
3010-3	3770-5		4×R8i	16		
3770-3	4710-5		5×R8i	20		
		0870-7	R8i	4	10028531	ZRF 30X165 SIK.
		1300-7	R8i	4		
		1730-7	2×R8i	8		
		2600-7	2×R8i	8		
		3900-7	3×R8i	12		
		5200-7	4×R8i	16		
		6500-7	5×R8i	20		

Resistor-side components

Quick connector and outgoing resistor busbars

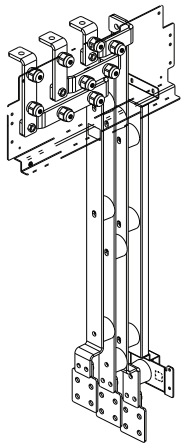
This quick connector and the busbars are used for the output of the module.

Frame size	Enclosure	Qty	Ordering code	Kit code	Illustration
R8i	600 mm	1	3AUA0000119227	A-468-8-100	 Instruction code: 3AUA0000118667

Frame size	Enclosure	Qty	Ordering code	Kit code	Illustration
R8i	600 mm	1	3AXD50000489213	A-6-8-147-VX	 Instruction code: 3AXD50000493388

Incoming resistor busbars

These busbars are used for connecting the returning resistor cables to the DC input of the module.

Frame size	Enclosure	Qty	Ordering code	Kit code	Illustration
R8i	600 mm	1	3AXD50000489107	A-6-8-215-VX	 Instruction code: 3AXD50000493357

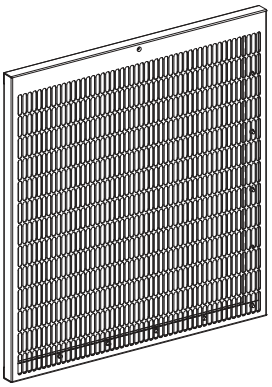
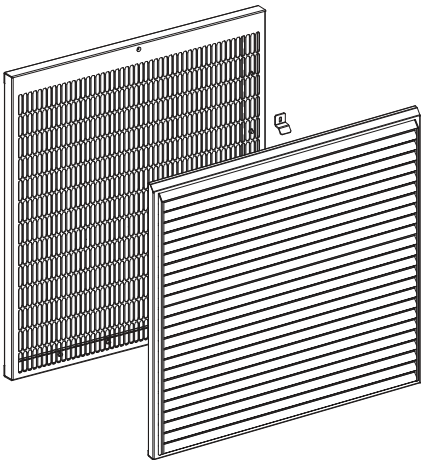
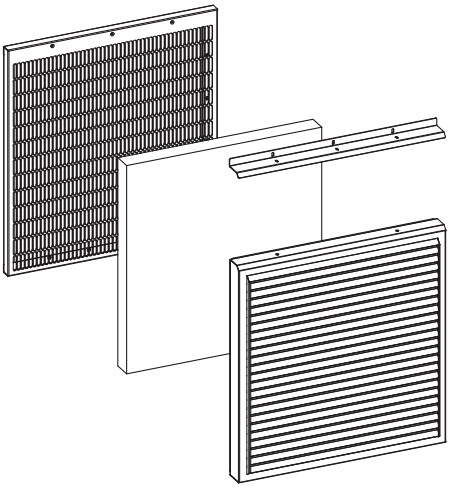
Resistor fuses

The resistor fuses protect the resistor cables against short-circuits.

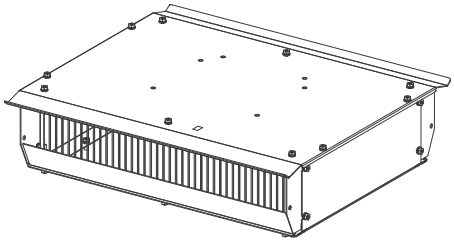
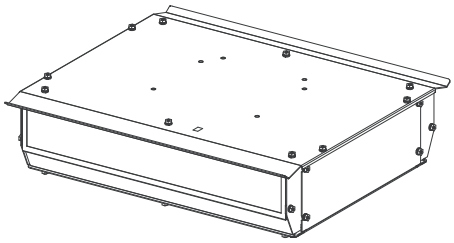
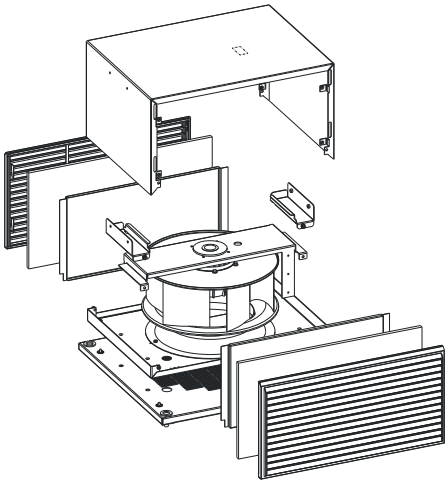
Brake unit type	Fuse (IEC and UL)			
	Type	Qty	Data	Ordering code
U_N = 400 V				
ACS880-604-0500-3	170M6408	3	500 A; 690 V	3AUA0000136232
ACS880-604-0750-3	170M6412	3	800 A; 690 V	68731640
ACS880-604-1000-3	170M6408	6	500 A; 690 V	3AUA0000136232
ACS880-604-1510-3	170M6412	6	800 A; 690 V	68731640
ACS880-604-2260-3	170M6412	9	800 A; 690 V	68731640
ACS880-604-3010-3	170M6412	12	800 A; 690 V	68731640
ACS880-604-3770-3	170M6412	15	800 A; 690 V	68731640
U_N = 500 V				
ACS880-604-0630-5	170M6408	3	500 A; 690 V	3AUA0000136232
ACS880-604-0940-5	170M6412	3	800 A; 690 V	68731640
ACS880-604-1260-5	170M6408	6	500 A; 690 V	3AUA0000136232
ACS880-604-1880-5	170M6412	6	800 A; 690 V	68731640
ACS880-604-2830-5	170M6412	9	800 A; 690 V	68731640
ACS880-604-3770-5	170M6412	12	800 A; 690 V	68731640
ACS880-604-4710-5	170M6412	15	800 A; 690 V	68731640
U_N = 690 V				
ACS880-604-0870-7	170M6542	3	500 A; 1250 V	3AXD50000021111
ACS880-604-1300-7	170M6546	3	800 A; 1250 V	63919128
ACS880-604-1730-7	170M6542	6	500 A; 1250 V	3AXD50000021111
ACS880-604-2600-7	170M6546	6	800 A; 1250 V	63919128
ACS880-604-3900-7	170M6546	9	800 A; 1250 V	63919128
ACS880-604-5200-7	170M6546	12	800 A; 1250 V	63919128
ACS880-604-6500-7	170M6546	15	800 A; 1250 V	63919128

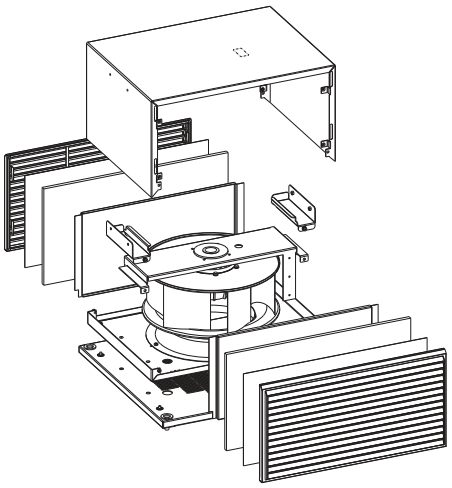
Cabinet ventilation

Air inlet kits

Enclosure / Degree of protection	Qty	Ordering code	Kit code	Illustration
600 mm / IP20	1	3AUA0000117003	A-6-X-022	 Instruction code: 3AUA0000116880
600 mm / IP42	1	3AUA0000117008	A-6-X-025	 Instruction code: 3AUA0000116874
600 mm / IP54	1	3AXD50000009185	A-6-X-028	 Instruction code: 3AXD50000009990

Air outlet kits

Enclosure / Degree of protection	Qty	Ordering code	Kit code	Illustration
600 mm / IP20	1	3AUA0000125204	A-6-X-043	 Instruction code: 3AXD50000001981
600 mm / IP42	1	3AUA0000114789	A-6-X-041	 Instruction code: 3AUA0000115166
600 mm / IP54 / IEC	1	3AXD50000009189	A-6-X-065	 Instruction code: 3AXD50000010004 **Note:** Fan to be ordered separately

Enclosure / Degree of protection	Qty	Ordering code	Kit code	Illustration
600 mm / IP54 / UL	1	3AXD50000010327	A-6-X-066	 Instruction code: 3AXD50000010004 **Note:** Fan to be ordered separately

Cooling fans

One cooling fan is to be installed inside the air outlet compartment to ensure sufficient cooling of the cabinet.

Enclosure width / Degree of protection	Component		Qty	Ordering code
	Name	Data		
IEC				
600 mm / IP54	Fan	CRBB/4-400/188	1	3AXD50000006111
	Capacitor	MSB MKP 12/603/E1679	1	3AXD50000006885
	Connector	SPB2,5/7 (2.5 mm^2, 12AWG)	1	3AXD50000000723
	Connector	SC 2,5-RZ/7 (2.5 mm^2, 12AWG)	1	3AXD50000000724
UL				
600 mm / IP54	Fan	CRBB/4-400/188	1	3AXD50000006111
	Capacitor	MSB MKP 12/603/E1679	1	3AXD50000006885
	Connector	SPB2,5/7 (2.5 mm2, 12AWG)	1	3AXD50000000723

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Technical data

Contents of this chapter

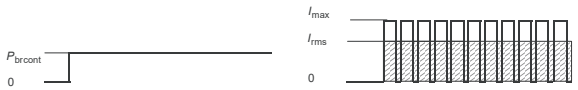
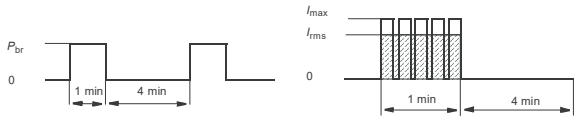
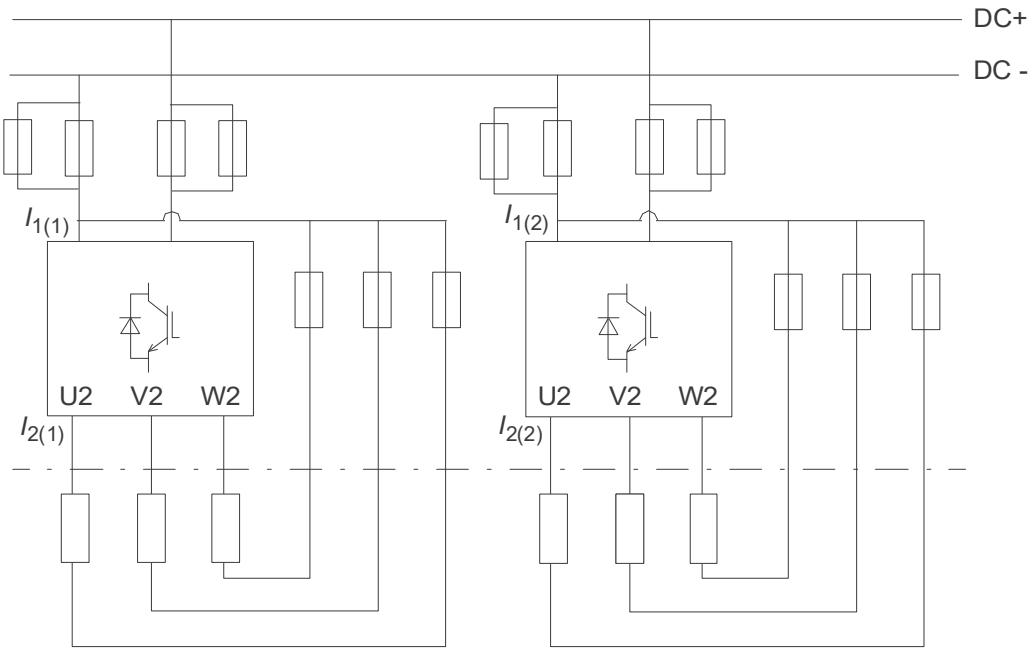
This chapter contains the technical data for the brake units.

Ratings

ACS880-604-…	Frame size	Resistor values		Ratings with R_{min}						
				No overload use			Cyclic load (1 min / 5 min)			
		R_{min}	R_{max}	I_1	I_2	$P_{contmax}$ (S_n)	I_{max}	I_{dc}	I_{rms}	P_{br}
		Ohm	Ohm	A DC	A DC	kW (kVA)	A DC	A DC	A DC	kW
U_N = 400 V										
0500-3	R8i	1.7	2.1	781	310	500	370	999	351	640
0750-3	R8i	1.2	1.4	1171	465	750	555	1499	527	960
1000-3	2×R8i	1.7	2.1	1562	621	1000	740	1998	702	1290
1510-3	2×R8i	1.2	1.4	2342	931	1510	1110	2997	1053	1930
2260-3	3×R8i	1.2	1.4	3514	1396	2260	1665	4496	1580	2890
3010-3	4×R8i	1.2	1.4	4685	1862	3010	2220	5994	2106	3860
3770-3	5×R8i	1.2	1.4	5856	2327	3770	2775	7493	2633	4820
U_N = 500 V										
0630-5	R8i	2.2	2.6	781	310	630	370	999	351	800
0940-5	R8i	1.4	1.7	1171	465	940	555	1499	527	1210
1260-5	2×R8i	2.2	2.6	1562	621	1260	740	1998	702	1610
1880-5	2×R8i	1.4	1.7	2342	931	1880	1110	2997	1053	2410
2830-5	3×R8i	1.4	1.7	3514	1396	2830	1665	4496	1580	3620
3770-5	4×R8i	1.4	1.7	4685	1862	3770	2220	5994	2106	4820
4710-5	5×R8i	1.4	1.7	5856	2327	4710	2775	7493	2633	6030
U_N = 690 V										
0870-7	R8i	3.0	3.6	781	310	870	370	999	351	1110
1300-7	R8i	2.0	2.4	1171	465	1300	555	1499	527	1660
1730-7	2×R8i	3.0	3.6	1562	621	1730	740	1998	702	2220
2600-7	2×R8i	2.0	2.4	2342	931	2600	1110	2997	1053	3330
3900-7	3×R8i	2.0	2.4	3514	1396	3900	1665	4496	1580	4990
5200-7	4×R8i	2.0	2.4	4685	1862	5200	2220	5994	2106	6650
6500-7	5×R8i	2.0	2.4	5856	2327	6500	2775	7493	2633	8320

ACS880-604-…	Frame size	Resistor values		Ratings with R_{max}						
				No overload use			Cyclic load (1 min / 5 min)			
		R_{min}	R_{max}	I_1	I_2	$P_{contmax}$ (S_n)	I_{max}	I_{dc}	I_{rms}	P_{br}
		Ohm	Ohm	A DC	A DC	kW (kVA)	A DC	A DC	A DC	kW
U_N = 400 V										
0500-3	R8i	1.7	2.1	781	282	500	312	827	291	530
0750-3	R8i	1.2	1.4	1171	424	750	468	1241	436	800
1000-3	2×R8i	1.7	2.1	1562	565	1000	625	1655	581	1060
1510-3	2×R8i	1.2	1.4	2342	847	1510	937	2482	872	1600
2260-3	3×R8i	1.2	1.4	3514	1271	2260	1405	3723	1308	2400
3010-3	4×R8i	1.2	1.4	4685	1694	3010	1874	4964	1744	3190
3770-3	5×R8i	1.2	1.4	5856	2118	3770	2342	6205	2180	3990
U_N = 500 V										
0630-5	R8i	2.2	2.6	781	284	630	312	835	293	670
0940-5	R8i	1.4	1.7	1171	430	940	468	1277	449	1030
1260-5	2×R8i	2.2	2.6	1562	568	1260	625	1671	587	1340
1880-5	2×R8i	1.4	1.7	2342	860	1880	937	2555	898	2060
2830-5	3×R8i	1.4	1.7	3514	1289	2830	1405	3832	1347	3080
3770-5	4×R8i	1.4	1.7	4685	1719	3770	1874	5110	1795	4110
4710-5	5×R8i	1.4	1.7	5856	2149	4710	2342	6387	2244	5140
U_N = 690 V										
0870-7	R8i	3.0	3.6	781	283	870	312	833	293	920
1300-7	R8i	2.0	2.4	1171	425	1300	468	1249	439	1390
1730-7	2×R8i	3.0	3.6	1562	567	1730	625	1665	585	1850
2600-7	2×R8i	2.0	2.4	2342	850	2600	937	2498	878	2770
3900-7	3×R8i	2.0	2.4	3514	1275	3900	1405	3746	1316	4160
5200-7	4×R8i	2.0	2.4	4685	1700	5200	1874	4995	1755	5540
6500-7	5×R8i	2.0	2.4	5856	2125	6500	2342	6244	2194	6930

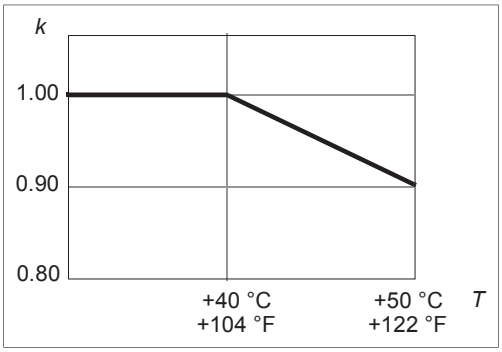
Definitions

U_N	Nominal voltage.
R_{min}	Minimum allowed resistance value of the brake resistor per one phase of the brake module.
R_{max}	Maximum resistance value of the brake resistor per one phase of the brake module.
Note:	Connect one resistor per brake chopper module phase. For example, a brake unit of frame size 2×R8i includes two brake chopper modules -> 2 × 3 resistors are needed.
No-overload use	
I_1	Input current. Input current with R_{min} is given in the type designation label.
I_2	Output current. This is indicated in the type designation label as 3x the value with R_{min} given in this table.
$P_{cont.max}$	Maximum continuous braking power per brake unit. 
S_n	Apparent power.
Cyclic load (1 min / 5 min)	
I_{max}	Peak brake current (DC) per brake chopper module phase.
I_{dc}	Input current.
I_{rms}	Total rms DC current per brake unit phase during a period of 1 minute with braking power P_{br}.
P_{br}	Short term braking power per brake unit allowed for one minute every 5 minutes. 
Example: Brake unit with two parallel brake chopper modules	
 $I_1 = I_{1(1)} + I_{1(2)}$ $I_2 = I_{2(1)} + I_{2(2)}$	

Derating

Temperature derating

In the temperature range +40…50 °C (+104…122 °F), the rated output current is derated by 1% 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 2000 m (3300 to 6561 ft) above sea level, the continuous output currents given above must be derated 1% for every 100 m (328 ft). For a more accurate derating, use the DriveSize PC tool.

Input and output voltages

Typical input and output voltages are listed below.

U_N (V AC)	Input voltage U_1 (DC)	Output voltage U_2 (0…U_1 3-phase symmetrical), ie, resistor (AC) connection
400	513…566 V DC. This is indicated in the type designation label as typical input voltage level 566 V DC.	3 × 0…566 V DC This is indicated in the type designation label as typical output voltage level 566 V DC.
500	513…707 V DC. This is indicated in the type designation label as typical input voltage levels 566 / 679 / 707 V DC.	3 × 0…707 V DC This is indicated in the type designation label as typical output voltage levels 566 / 679 / 707 V DC.
690	709…976 V DC (UL, CSA: 848 V DC). This is indicated in the type designation label as typical input voltage levels 742 / 849 / 976 (849 UL, CSA) V DC.	3 × 0…976 V DC (UL, CSA: 848 V DC) This is indicated in the type designation label as typical output voltage levels 742 / 849 / 976 (849 UL, CSA) V DC.

Modules used

ACS880-604-...	Module type	Qty × frame size
U_N = 400 V		
0500-3	ACS880-104-0640A-3	R8i
0750-3	ACS880-104-0900A-3	R8i
1000-3	ACS880-104-0640A-3	2×R8i
1510-3	ACS880-104-0900A-3	2×R8i
2260-3	ACS880-104-0900A-3	3×R8i
3010-3	ACS880-104-0900A-3	4×R8i
3770-3	ACS880-104-0900A-3	5×R8i
U_N = 500 V		
0630-5	ACS880-104-0590A-5	R8i
0940-5	ACS880-104-0810A-5	R8i
1260-5	ACS880-104-0590A-5	2×R8i
1880-5	ACS880-104-0810A-5	2×R8i
2830-5	ACS880-104-0810A-5	3×R8i
3770-5	ACS880-104-0810A-5	4×R8i
4710-5	ACS880-104-0810A-5	5×R8i
U_N = 690 V		
0870-7	ACS880-104-0410A-7	R8i
1300-7	ACS880-104-0600A-7	R8i
1730-7	ACS880-104-0410A-7	2×R8i
2600-7	ACS880-104-0600A-7	2×R8i
3900-7	ACS880-104-0600A-7	3×R8i
5200-7	ACS880-104-0600A-7	4×R8i
6500-7	ACS880-104-0600A-7	5×R8i
* Type of brake module(s) to be installed into a user-defined cabinet.		

Typical power cable sizes

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

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

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

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

Typical resistor cable sizes

This table gives copper cable types. Cable sizing is based on max. 9 cables laid on a cable ladder side by side, three ladder type trays one on top of the other, ambient temperature 30 °C, PVC insulation, surface temperature 70 °C and 90 °C (EN 60204-1 and IEC 60364-5-2/2001). For other conditions, size the cables according to local safety regulations, appropriate input voltage and the load current of the drive. $I_{rms\ dim}$ is the dimensioning current.

ACS880-604-...	Frame size	$I_{rms\ dim}$	Cable data	
			Cable, T=70 °C	Cable, T=90 °C
		A	mm^2	mm^2
U_N = 400 V				
0500-3	R8i	372	3×(2×(3×120+70))	3×(3×240+120)
0750-3	R8i	559	3×(2×(3×240+120))	3×(2×(3×150+70))
1000-3	2×R8i	745	2×(3×(2×(3×120+70)))	2×(3×(3×240+120))
1510-3	2×R8i	1117	2×(3×(2×(3×240+120)))	2×(3×(2×(3×150+70)))
2260-3	3×R8i	1676	3×(3×(2×(3×240+120)))	3×(3×(2×(3×150+70)))
3010-3	4×R8i	2234	4×(3×(2×(3×240+120)))	4×(3×(2×(3×150+70)))
3770-3	5×R8i	2793	5×(3×(2×(3×240+120)))	5×(3×(2×(3×150+70)))
U_N = 500 V				
0630-5	R8i	372	3×(2×(3×120+70))	3×(3×240+120)
0940-5	R8i	559	3×(2×(3×240+120))	3×(2×(3×150+70))
1260-5	2×R8i	745	2×(3×(2×(3×120+70)))	2×(3×(3×240+120))
1880-5	2×R8i	1117	2×(3×(2×(3×240+120)))	2×(3×(2×(3×150+70)))
2830-5	3×R8i	1676	3×(3×(2×(3×240+120)))	3×(3×(2×(3×150+70)))
3770-5	4×R8i	2234	4×(3×(2×(3×240+120)))	4×(3×(2×(3×150+70)))
4710-5	5×R8i	2793	5×(3×(2×(3×240+120)))	5×(3×(2×(3×150+70)))
U_N = 690 V				
0870-7	R8i	372	3×(2×(3×120+70))	3×(3×240+120)
1300-7	R8i	559	3×(2×(3×240+120))	3×(2×(3×150+70))
1730-7	2×R8i	745	2×(3×(2×(3×120+70)))	2×(3×(3×240+120))
2600-7	2×R8i	1117	2×(3×(2×(3×240+120)))	2×(3×(2×(3×150+70)))
3900-7	3×R8i	1676	3×(3×(2×(3×240+120)))	3×(3×(2×(3×150+70)))
5200-7	4×R8i	2234	4×(3×(2×(3×240+120)))	4×(3×(2×(3×150+70)))
6500-7	5×R8i	2793	5×(3×(2×(3×240+120)))	5×(3×(2×(3×150+70)))

Maximum cable length

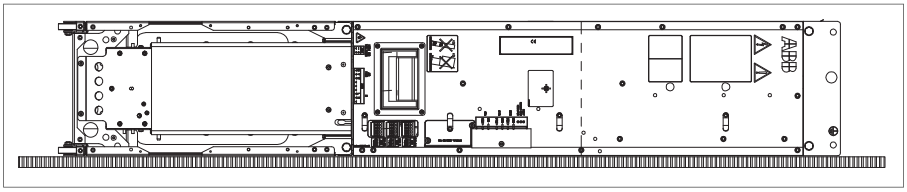
The maximum cable length of the resistor cable(s) is 300 m (984 ft). Keep the cable as short as possible in order to minimize the EMC emissions and stress on chopper IGBTs. The longer the cable the higher the EMC emissions. The longer the cable the higher the inductive load and voltage peaks over the IGBT semiconductors of the brake chopper.

Fuses

ACS880-604-…	DC fuses (IEC and UL)			Brake resistor fuses (IEC and UL)		
	Type	Data	Qty	Type	Data	Qty
U_N = 400 V						
0500-3	170M6410	630 A; 690 V	2	170M6408	500 A; 690 V	3
0750-3	170M6414	1000 A; 690 V	2	170M6412	800 A; 690 V	3
1000-3	170M6410	630 A; 690 V	4	170M6408	500 A; 690 V	6
1510-3	170M6414	1000 A; 690 V	4	170M6412	800 A; 690 V	6
2260-3	170M6414	1000 A; 690 V	6	170M6412	800 A; 690 V	9
3010-3	170M6414	1000 A; 690 V	8	170M6412	800 A; 690 V	12
3770-3	170M6414	1000 A; 690 V	10	170M6412	800 A; 690 V	15
U_N = 500 V						
0630-5	170M6410	630 A; 690 V	2	170M6408	500 A; 690 V	3
0940-5	170M6414	1000 A; 690 V	2	170M6412	800 A; 690 V	3
1260-5	170M6410	630 A; 690 V	4	170M6408	500 A; 690 V	6
1880-5	170M6414	1000 A; 690 V	4	170M6412	800 A; 690 V	6
2830-5	170M6414	1000 A; 690 V	6	170M6412	800 A; 690 V	9
3770-5	170M6414	1000 A; 690 V	8	170M6412	800 A; 690 V	12
4710-5	170M6414	1000 A; 690 V	10	170M6412	800 A; 690 V	15
U_N = 690 V						
0870-7	170M6544	630 A; 1250 V	2	170M6542	500 A; 1250 V	3
1300-7	170M6548	1000 A; 1100 V	2	170M6546	800 A; 1250 V	3
1730-7	170M6544	630 A; 1250 V	4	170M6542	500 A; 1250 V	6
2600-7	170M6548	1000 A; 1100 V	4	170M6546	800 A; 1250 V	6
3900-7	170M6548	1000 A; 1100 V	6	170M6546	800 A; 1250 V	9
5200-7	170M6548	1000 A; 1100 V	8	170M6546	800 A; 1250 V	12
6500-7	170M6548	1000 A; 1100 V	10	170M6546	800 A; 1250 V	15

Allowable mounting orientations

The modules must be mounted upright or on right-hand side (viewed from the front).



Dimensions and weights

Frame	Height		Width		Depth		Weight	
	mm	in	mm	in	mm	in	kg	lb
R8i	1397	55	240	9.4	583	23	125	275

Free space requirements

Frame	Above		Below		Front		Left / Right	
	mm	in	mm	in	mm	in	mm	in
R8i	200	7.9	-	-	10	0.4	10	0.4

Definitions

Above	Free space to enable cooling air flow
Front	Free space for cabling
Left	Free space for smooth installation
Right	Free space for smooth installation

Losses, cooling data and noise

ACS880-604-...	Noise level	Losses	Cooling air flow	
	dB (A)	kW	m^3/h	ft^3/min
U_N = 400 V				
0500-3	72	3.1	1300	765
0750-3	72	4.8	1300	765
1000-3	74	6.3	2600	1530
1510-3	74	9.7	2600	1530
2260-3	76	14.5	3900	2295
3010-3	76	19.3	5200	3060
3770-3	77	24.1	6500	3825
U_N = 500 V				
0630-5	72	3.3	1300	765
0940-5	72	5.0	1300	765
1260-5	74	6.6	2600	1530
1880-5	74	10.0	2600	1530
2830-5	76	15.0	3900	2295
3770-5	76	20.0	5200	3060
4710-5	77	25.1	6500	3825
U_N = 690 V				
0870-7	72	4.2	1300	765
1300-7	72	6.3	1300	765
1730-7	74	8.4	2600	1530
2600-7	74	12.6	2600	1530
3900-7	76	18.9	3900	2295
5200-7	76	25.2	5200	3060
6500-7	77	31.5	6500	3825

Input power (DC) connection

Voltage (U_1)	ACS880-104-xxxx-3 modules: 513…566 V DC. This is indicated in the type designation label as typical input voltage level 566 V DC.
	ACS880-104-xxxx-5 modules: 513…707 V DC. This is indicated in the type designation label as typical input voltage levels 566 / 679 / 707 V DC.
	ACS880-104-xxxx-7 modules: 709…976 V DC. This is indicated in the type designation label as typical input voltage levels 742 / 849 / 976 (849 UL, CSA) V DC.
Input terminals	M12, maximum intrusion into module 20 mm (0.8”).

Resistor connection

Voltage (U_2)	0…U_1 3-phase symmetrical.
	For ACS880-104-xxxx-3 modules: This is indicated in the type designation label as typical output voltage level 3x 0…566 VDC.
	For ACS880-104-xxxx-5 modules: This is indicated in the type designation label as typical output voltage levels 3x 0…566 / 679 / 707 VDC.
	For ACS880-104-xxxx-7 modules: This is indicated in the type designation label as typical output voltage levels 3x 0…742 / 849 / 976 (849 UL, CSA) VDC.
Maximum resistor cable length	300 m (984 ft)
Terminals (outgoing)	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)
Terminals (incoming)	Cables to busbars: M12. Torque: 70 N·m (52 lbf·ft)

Efficiency

Efficiency	Approximately 98% at nominal power level

Degree of protection

Degree of protection	IP00

Ambient conditions

The unit is to be used in a heated indoor controlled environment.			
	Operation installed for stationary use	**Storage** in protective package	**Transportation** in protective package
Altitude above sea level	0…4000 m (13123 ft)* Output derated above 1000 m (3281 ft). See section Altitude derating. *Neutral-grounded TN and TT network systems, non-corner-grounded IT network systems. Corner-grounded TN, TT and IT network systems up to 600 V.	-	-

Air temperature	0 … +45 °C (+32 … +113 °F), no condensation allowed. Output derated in the range +45 … +55 °C (+113 … +131 °F).	-40 … +70 °C (-40 … +158 °F)	-40 … +70 °C (-40 … +158 °F)
Relative humidity	Maximum 95%, no condensation allowed	Maximum 95%, no condensation allowed	Maximum 95%, no condensation allowed
	No condensation allowed. Maximum allowed relative humidity is 60% in the presence of corrosive gases.		
Contamination	IEC/EN 60721-3-3:2002: Classification of environmental conditions - Part 3-3: Classification of groups of environmental parameters and their severities - Stationary use of weather protected locations	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 61800-5-1 IEC 60068-2-6:2007, EN 60068-2-6:2008 Environmental testing Part 2: Tests -Test Fc: Vibration (sinusoidal) 10 … 57 Hz, max. 0.075 mm amplitude 57 … 150 Hz 1 *g* Tested in a typical cabinet assembly according to: Max. 1 mm (0.04 in.) (peak value, 5 … 13.2 Hz), max. 0.7 *g* (13.2 … 100 Hz) sinusoidal	IEC/EN 60721-3-1:1997	IEC/EN 60721-3-1:1997
Shock IEC 60068-2-27:2008, EN 60068-2-27:2009 Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock	Not allowed	With packing max. 100 m/s^2 (330 ft./s^2) 11 ms	With packing max. 100 m/s^2 (330 ft./s^2) 11 ms

Materials

Module housing	• 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	• Plywood base, corrugated cardboard, PET straps. • Product wrapping: polyethylene sheet or VCI protection bag
Disposal	The main parts of the drive can be recycled to preserve natural resources and energy. Product parts and materials should be dismantled and separated. Generally all metals, such as steel, aluminum, copper and its alloys, and precious metals can be recycled as material. Plastics, rubber, cardboard and other packaging material can be used in energy recovery. Printed circuit boards and large electrolytic capacitors need selective treatment according to IEC 62635 guidelines. To aid recycling, plastic parts are marked with an appropriate identification code. Contact your local ABB distributor for further information on environmental aspects and recycling instructions for professional recyclers. End of life treatment must follow international and local regulations.

Standards

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

Markings

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

Auxiliary circuit current consumption

Device	U_n	f	I_{cont}	I_{start}	P_{cont}
	V	Hz	A	A	W
Internal electronics of the brake module	115 V AC	50/60	0.90	-	105
	230 V AC	50/60	0.45	-	105
Control unit BCU-02	24 V DC	-	2.00	-	48
Direct-on-line fan of the brake module (option +C188)	400 V AC	50	1.50	3.00	-
	400 V AC	60	1.90	3.80	-
Heating element of the brake module (option +C183)	115 V AC	60	-	-	40
	230 V AC	50	-	-	40

Cabinet fan	Type	U_n	f	I_{cont}	I_{start}
		V AC	Hz	A	A
IP54 roof fan	CRBB/4-315/112D ML	230	50	1.10	TBA
			60	1.45	
	CRBB/4-400/188	230	50	2.30	TBA
			60	3.00	

f	Supply frequency
I_{cont}	Calculated continuous load current
I_{start}	Calculated load current at start
P_{cont}	Continuous input power
U_N	Nominal voltage

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

Size	Max. torque	Note
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

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.

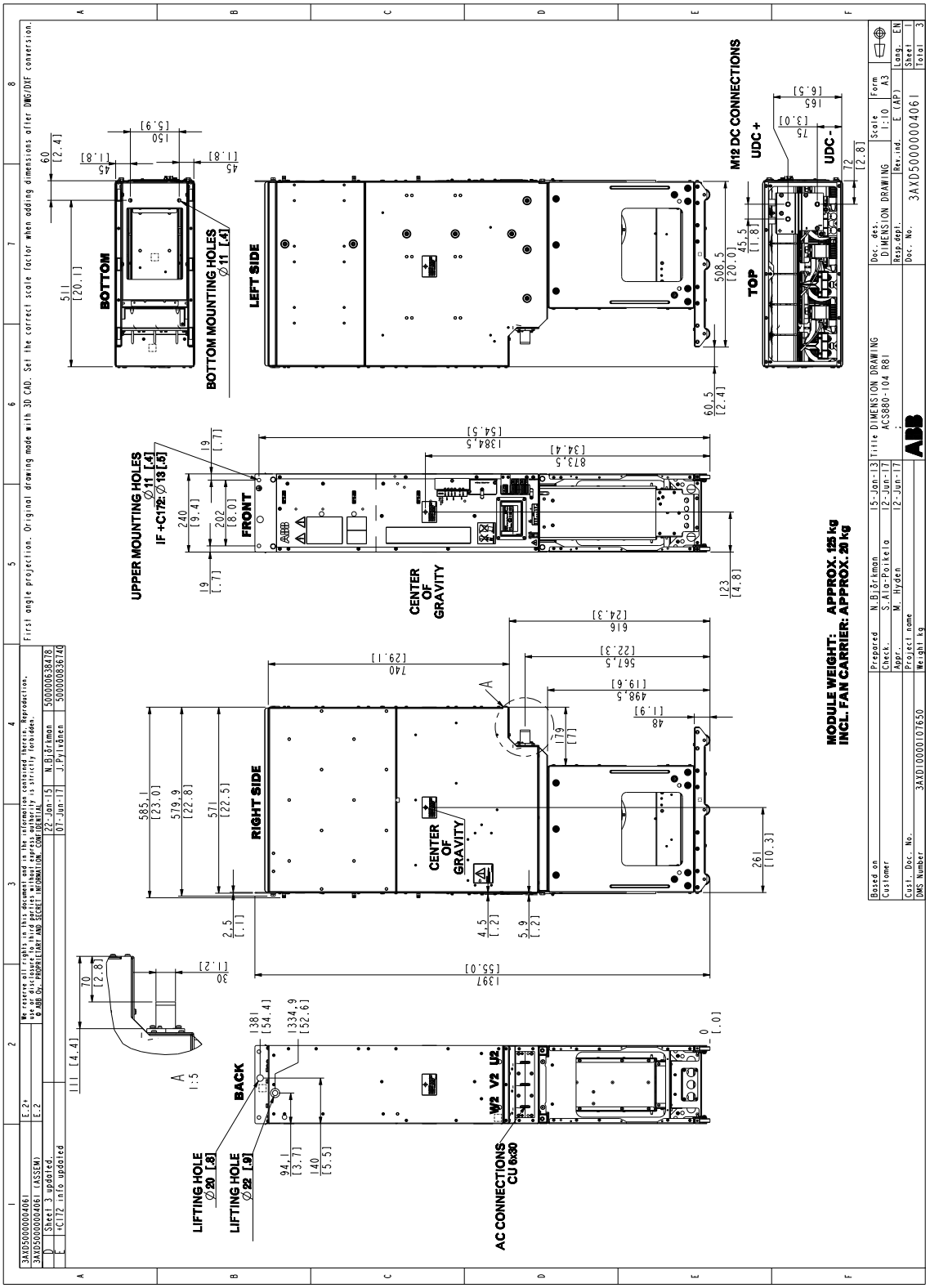
14

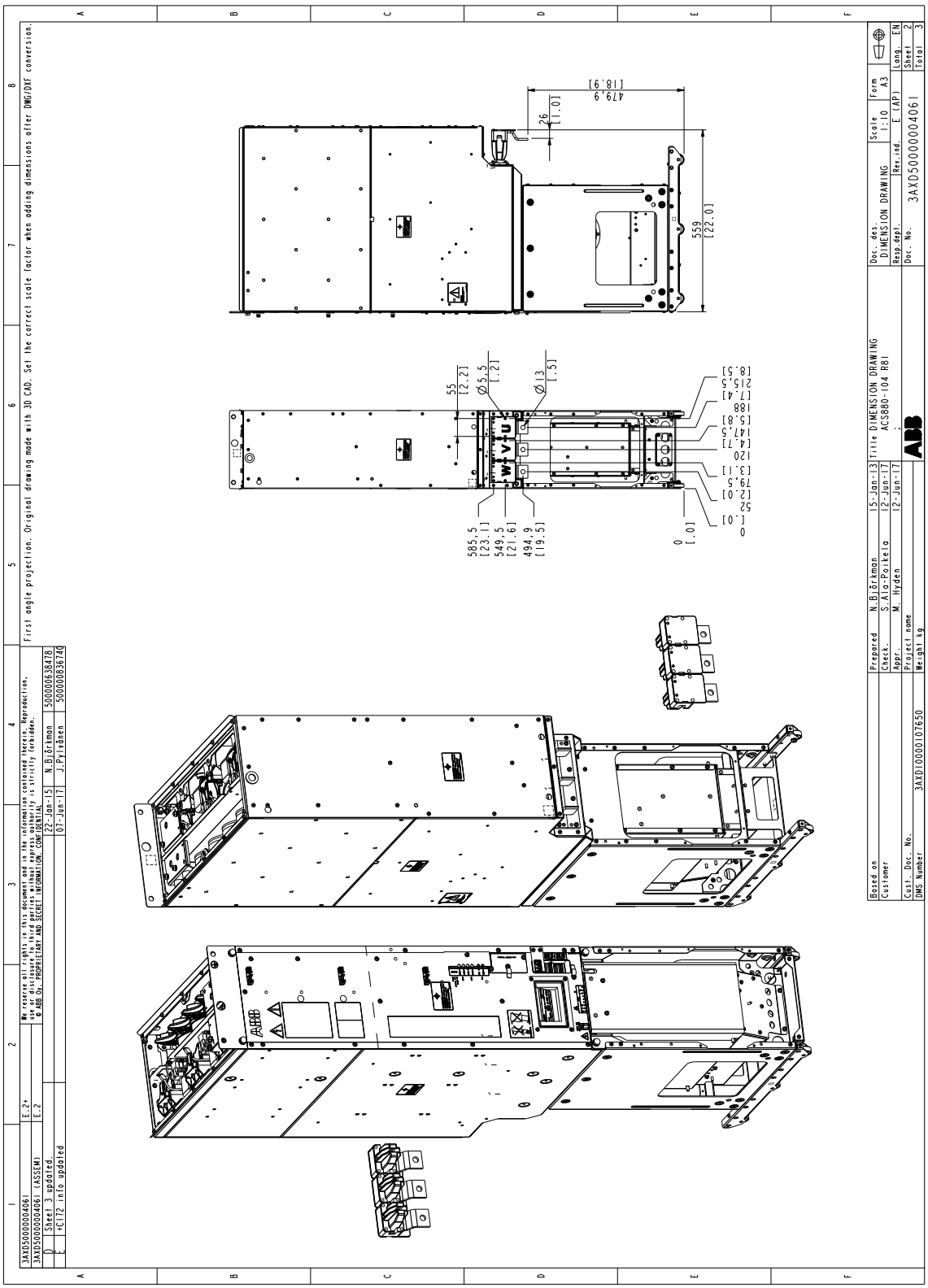
Dimension drawings

Contents of this chapter

This chapter contains dimension drawings of the brake module as well as auxiliary components. Dimensional drawings of most installation accessories are available from ABB on request.

Frame R8i


BOTTOM
BOTTOM MOUNTING HOLES Ø11 [.4]
LEFT SIDE
M12 DC CONNECTIONS
UDC +
UDC -
TOP
UPPER MOUNTING HOLES Ø11 [.4] IF +C172: Ø13 [.5]
FRONT
CENTER OF GRAVITY
RIGHT SIDE
CENTER OF GRAVITY
MODULE WEIGHT: APPROX. 125 kg
INCL. FAN CARRIER: APPROX. 29 kg
BACK
LIFTING HOLE Ø20 [.8]
LIFTING HOLE Ø22 [.9]
AC CONNECTIONS CU 6x30
W2 V2 U2
ABB


479,9
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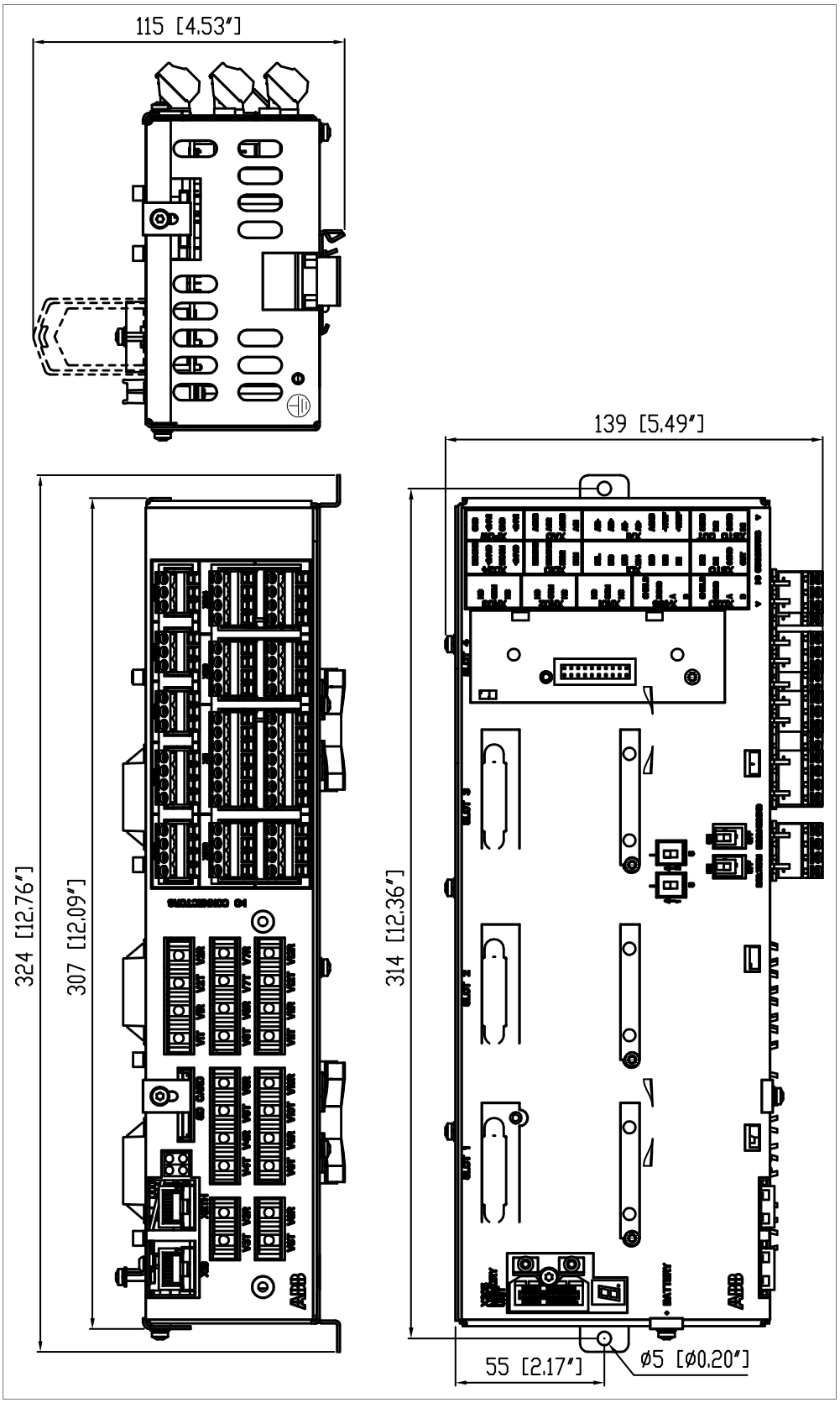
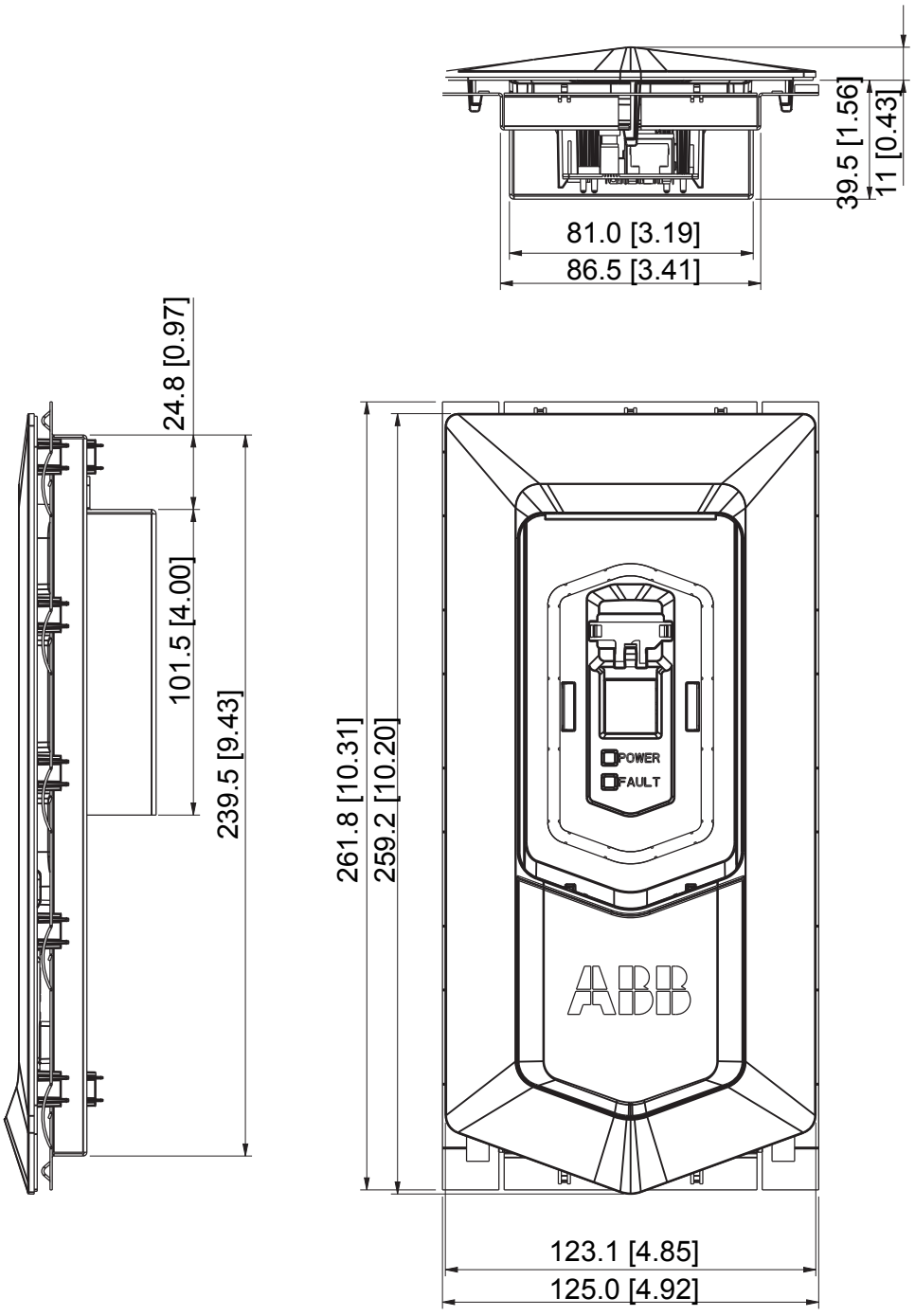
26
[1.0]
559
[22.01]
55
[2.2]
Ø5,5
[.2]
Ø13
[.5]
585,5
[23.1]
549,5
[21.6]
494,9
[19.5]
0
[.01]
52
[2.0]
79,5
[3.1]
120
[4.7]
147,5
[5.8]
188
[7.4]
215,5
[8.5]
ABB
Drive DIMENSION DRAWING
ACS880-104 R8i
3AXD50000004061
3AXD10000107650
Scale 1:10
Form A3
Lang. EN
Sheet 2
Total 3

Control electronics

BCU control unit



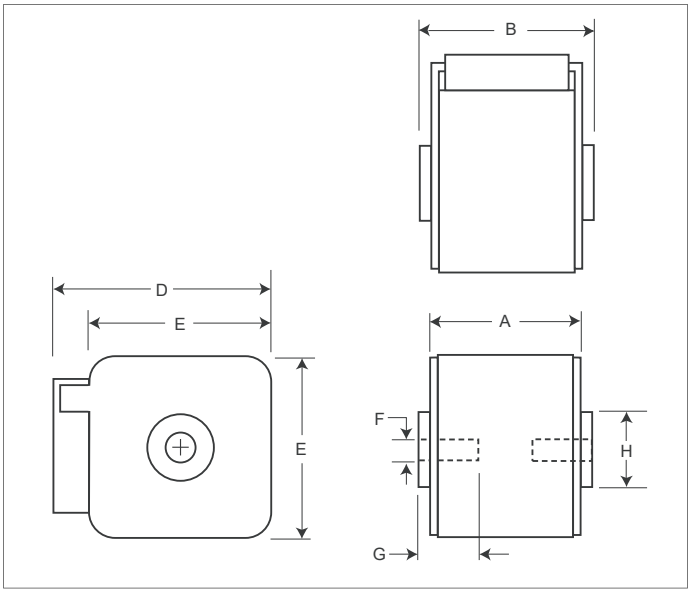
DPMP-01 door mounting kit



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

Plate thickness: 1.5…2.5 mm (0.06…0.10 in.)

DC fuse blocks (Bussmann)



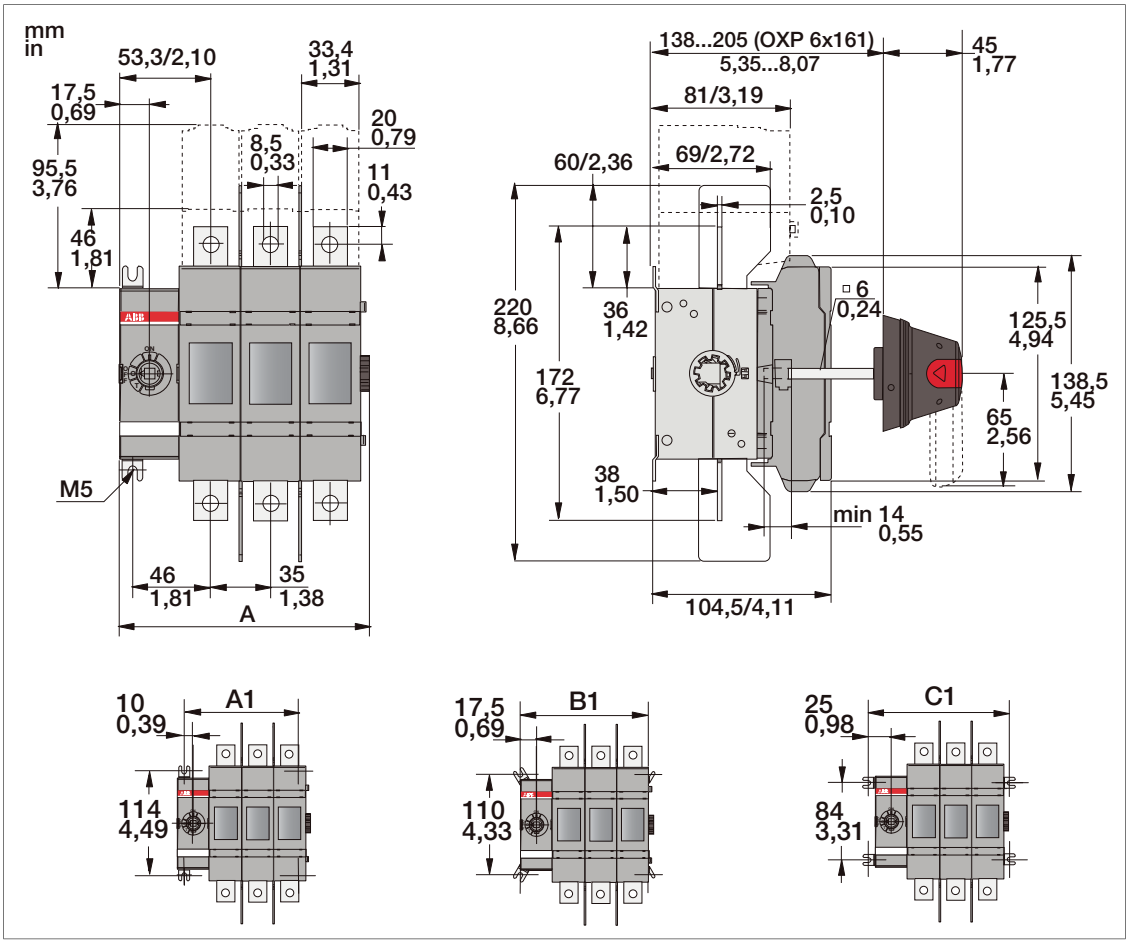
690 V fuses (as used with 400 and 500 V units)							
Size	**A** mm (inch)	**B** mm (inch)	**D** mm (inch)	**E** mm (inch)	**F**	**G** mm (inch)	**H** mm (inch)
3	51 (2.01)	53 (2.09)	92 (3.62)	76 (2.99)	M12	10 (0.39)	30 (1.18)

1000…1250 V fuses (as used with 690 V units)							
Size	**A** mm (inch)	**B** mm (inch)	**D** mm (inch)	**E** mm (inch)	**F**	**G** mm (inch)	**H** mm (inch)
3	81 (3.19)	83 (3.27)	92 (3.62)	76 (2.99)	M12	10 (0.39)	30 (1.18)

Switchgear and charging components

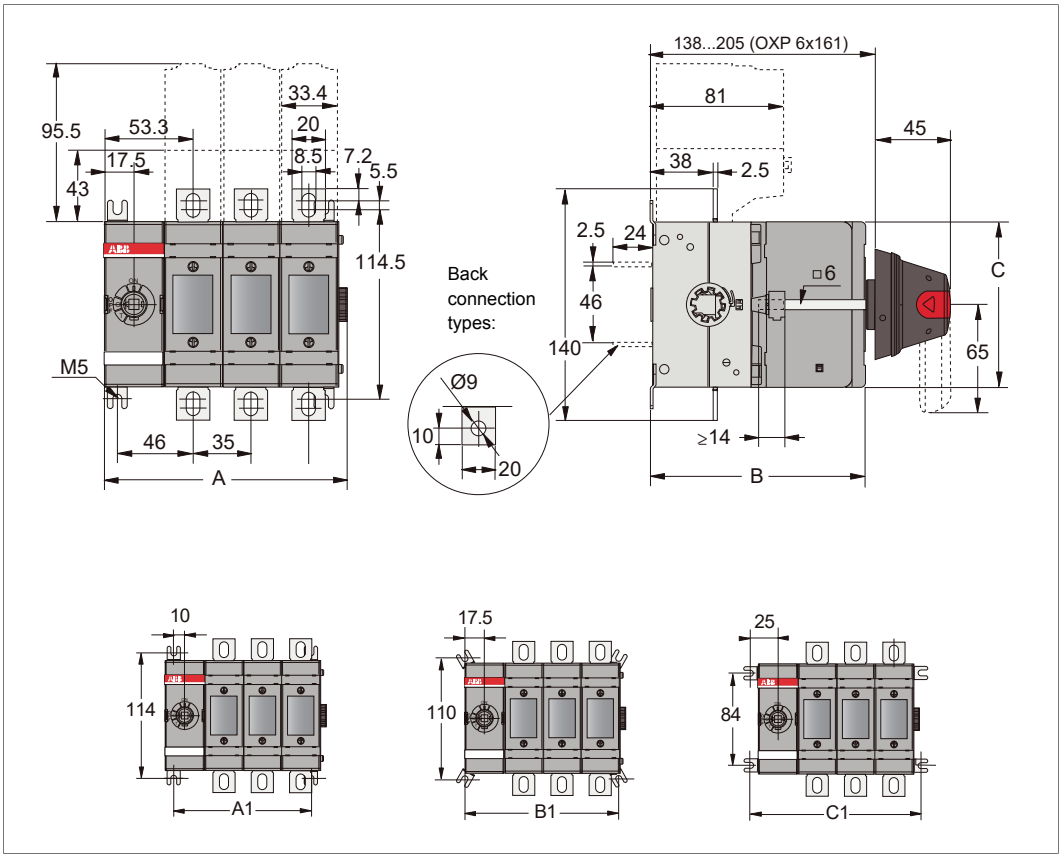
Switch fuses

OS100GJ04FP



	mm (in)
A	181.5 (7.15)
A1	160 (6.30)
B1	175 (6.89)
C1	190 (7.48)

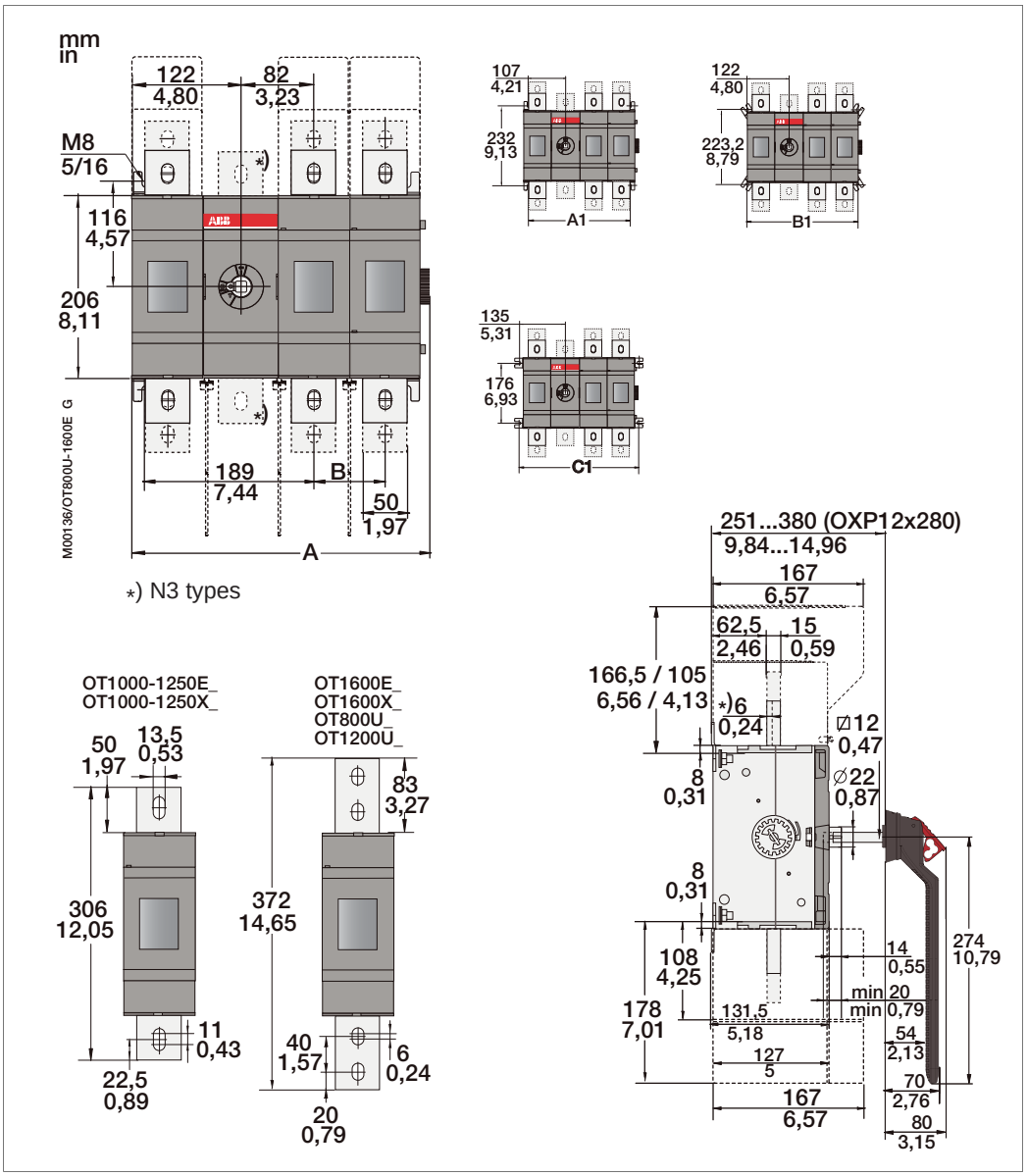
OS160GD04F



	mm (in)
A	181.5 (7.15)
B	130 (5.12)
C	100 (3.94)
A1	160 (6.30)
B1	175 (6.89)
C1	190 (7.48)

Switch/disconnectors

OT1200U11 and OT1600E11

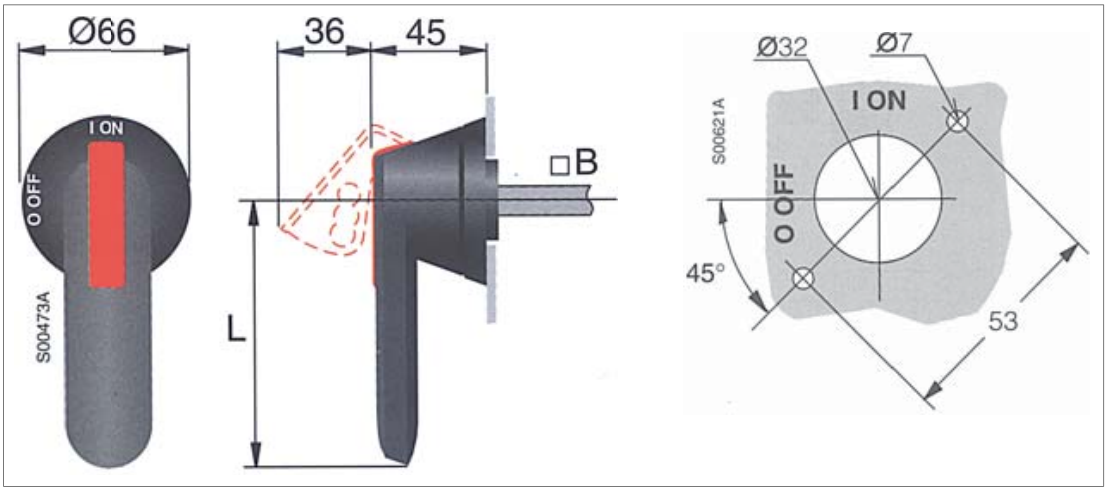


	mm (in)
A	254.50 (10.02)
B	-
A1	214 (8.43)
B1	244 (9.61)
C1	270 (10.63)

Switch handles

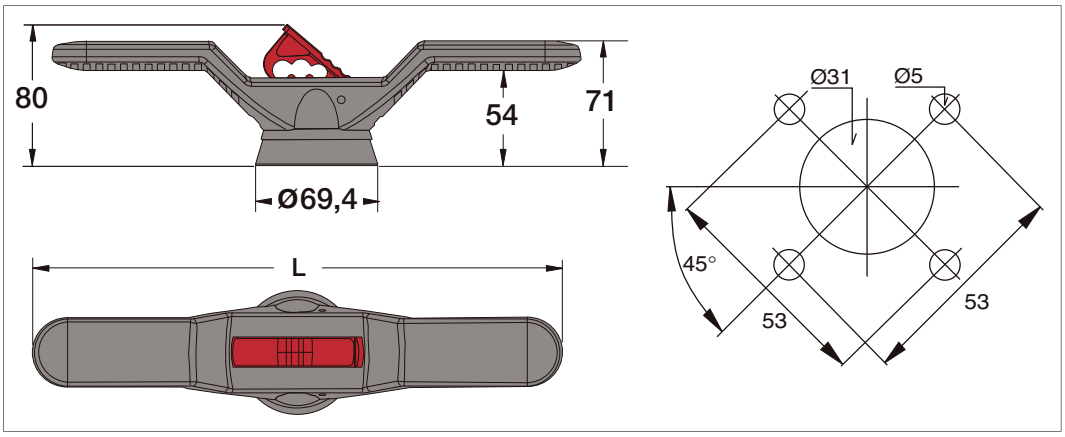
Note: The drawings are not to scale.

OHB65J6



Handle type	L mm (inch)	B mm (inch)	Notes
OHB65J6	65 (2.56)	6 × 6 (0.24 × 0.24)	Used with OS_, OT200_

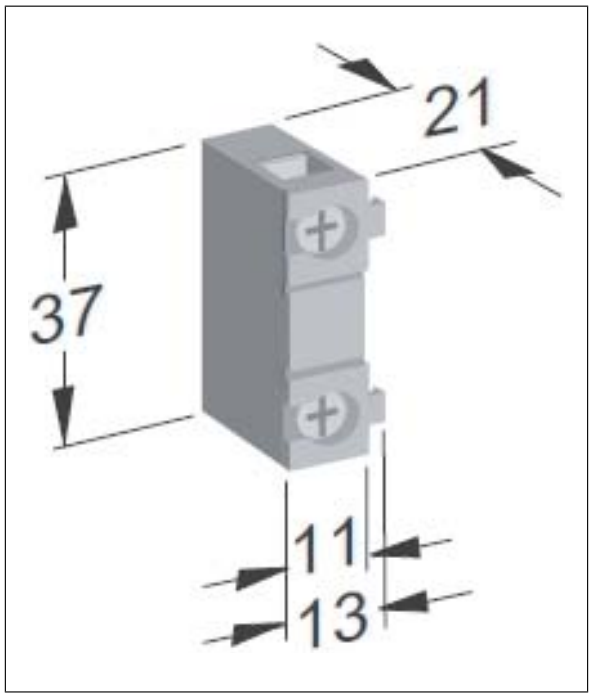
OHB150J12P



Handle type	L mm (inch)	Shaft mm (inch)	Notes
OHB150J12P	300 (11.81)	12 × 12 (0.47 × 0.47)	Used with OT1200U11 and OT1600E11

Auxiliary contact blocks

OA1G10 and OA3G01

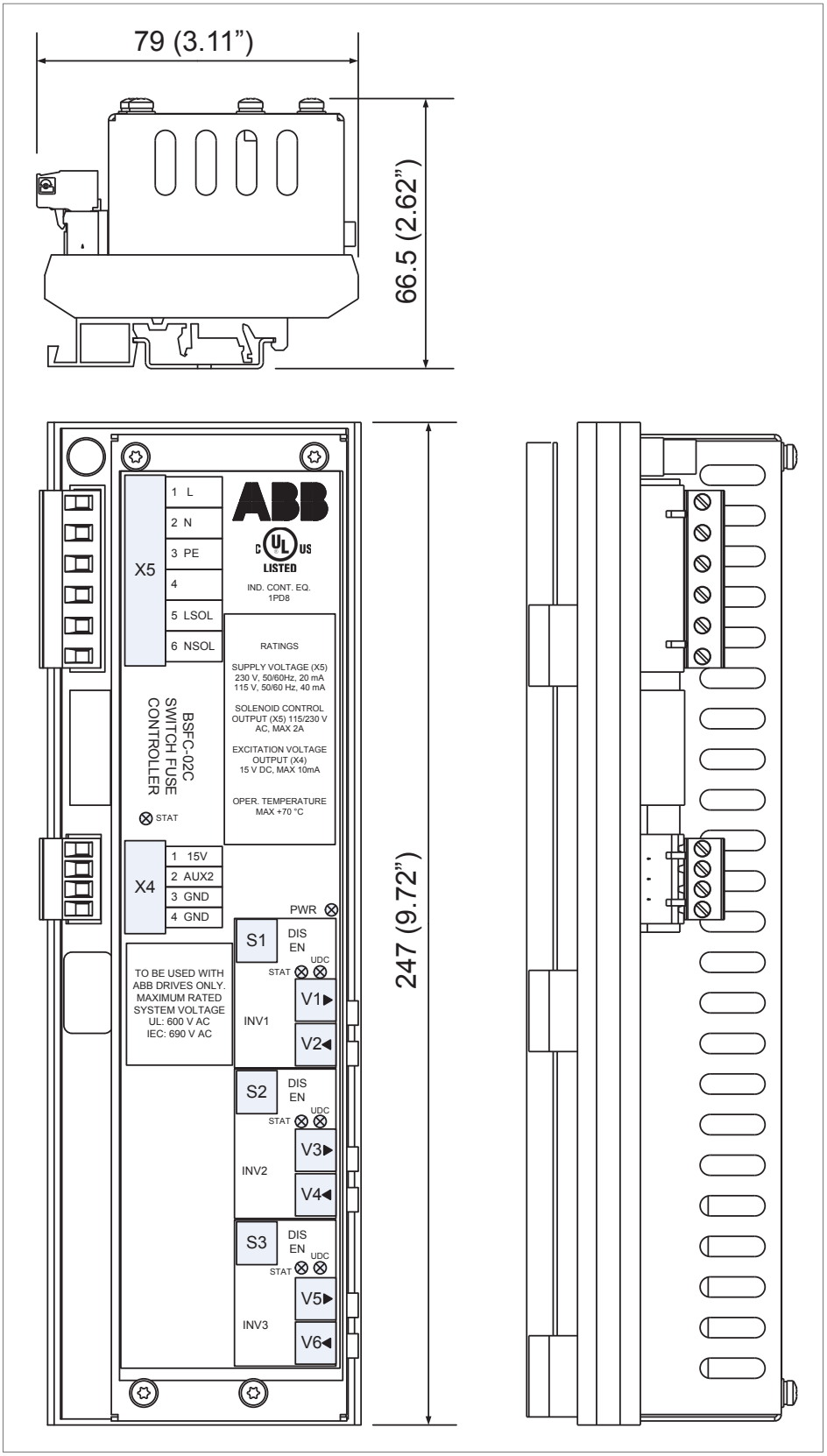


2×0.75…2.5 mm^2 (2×18…14 AWG)

0.8 N·m (7 lbf·in)

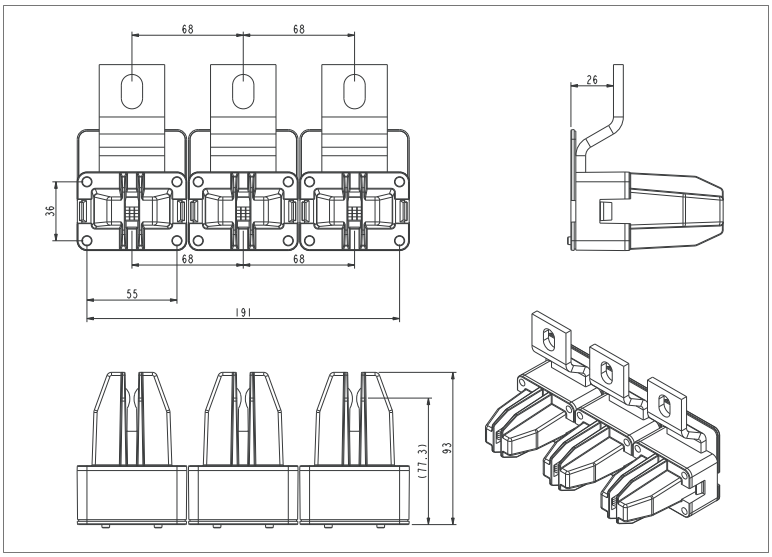
Pozidriv M3.5 Form 2

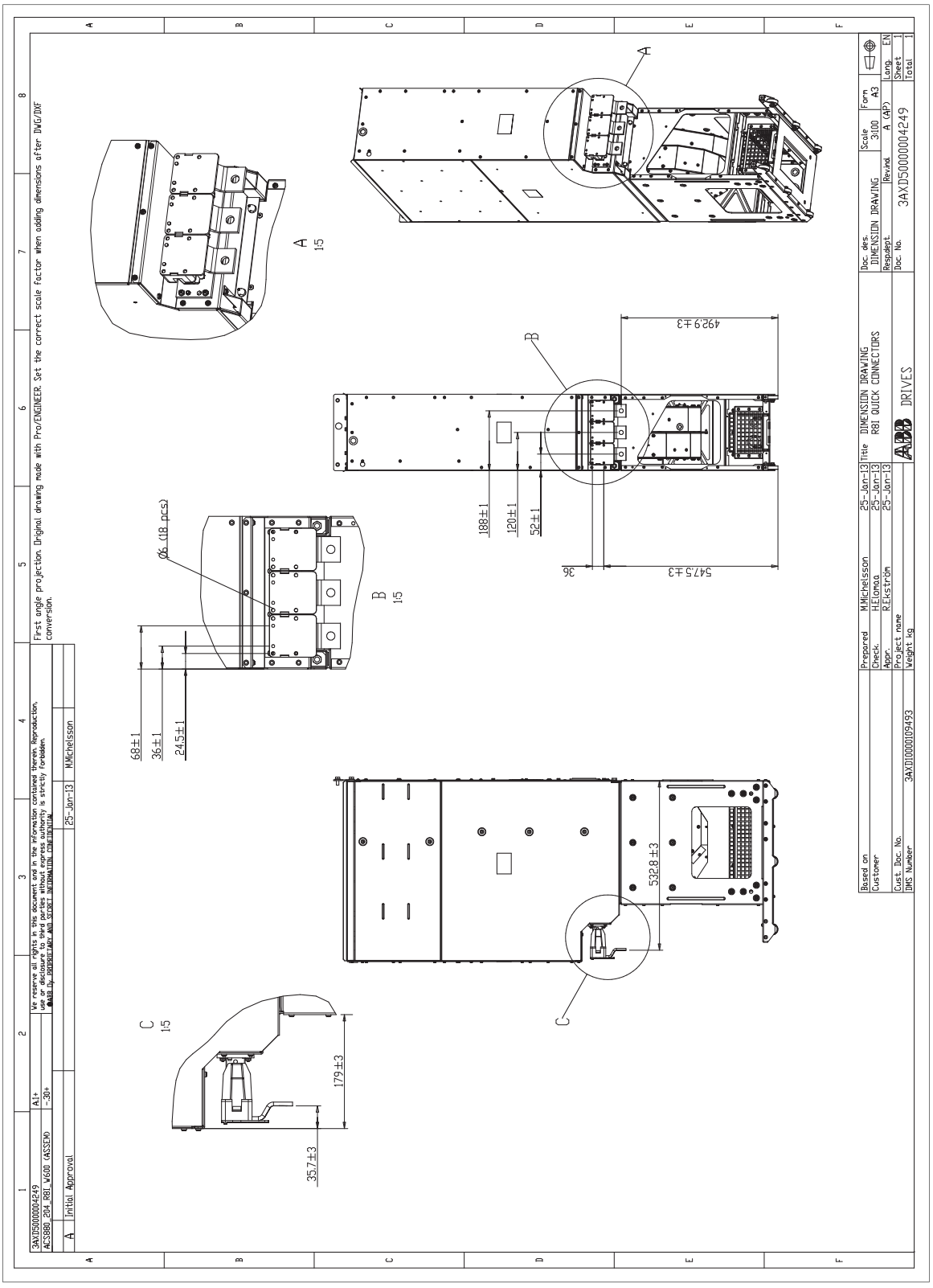
Charging controller



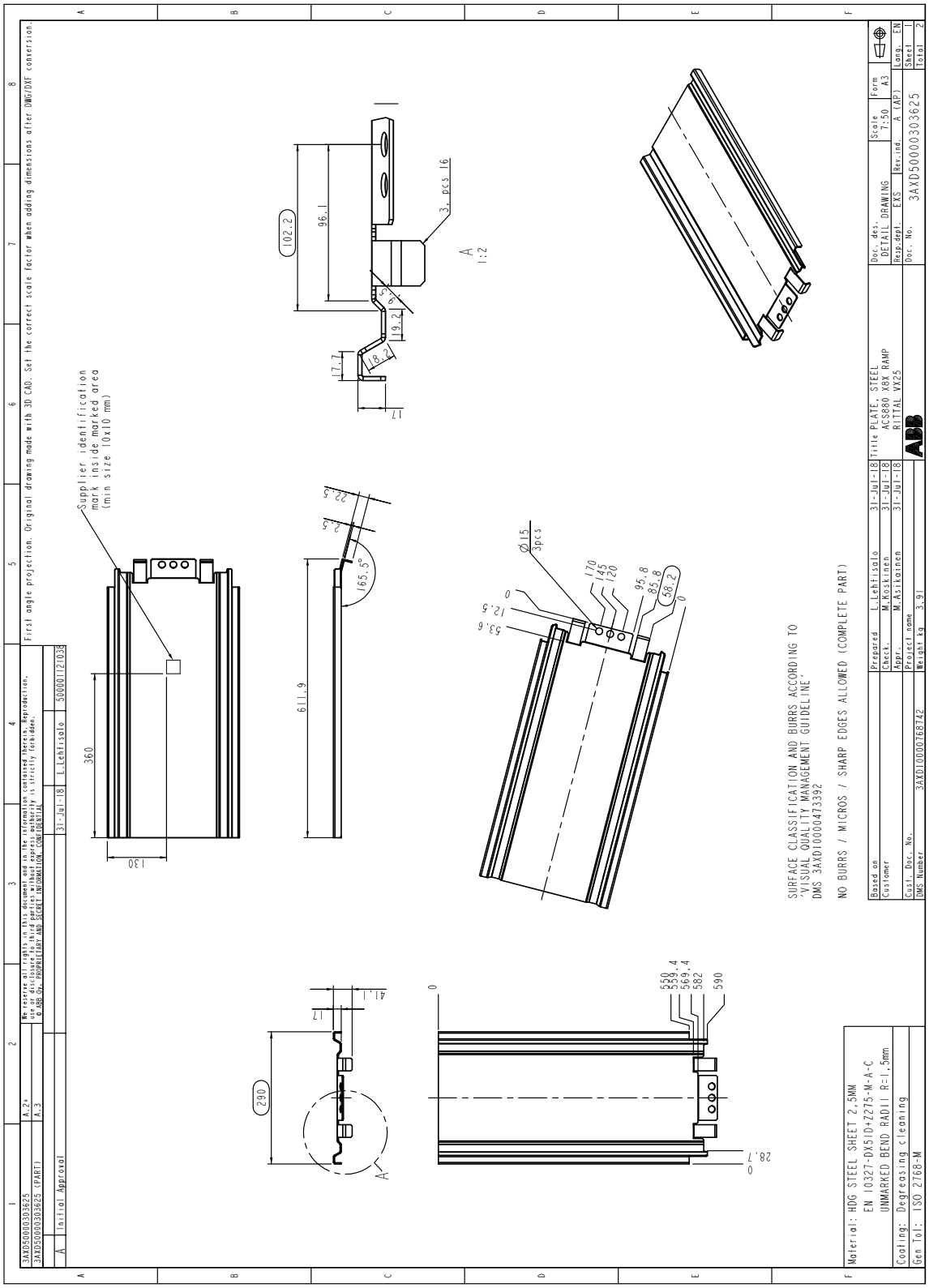
Miscellaneous components

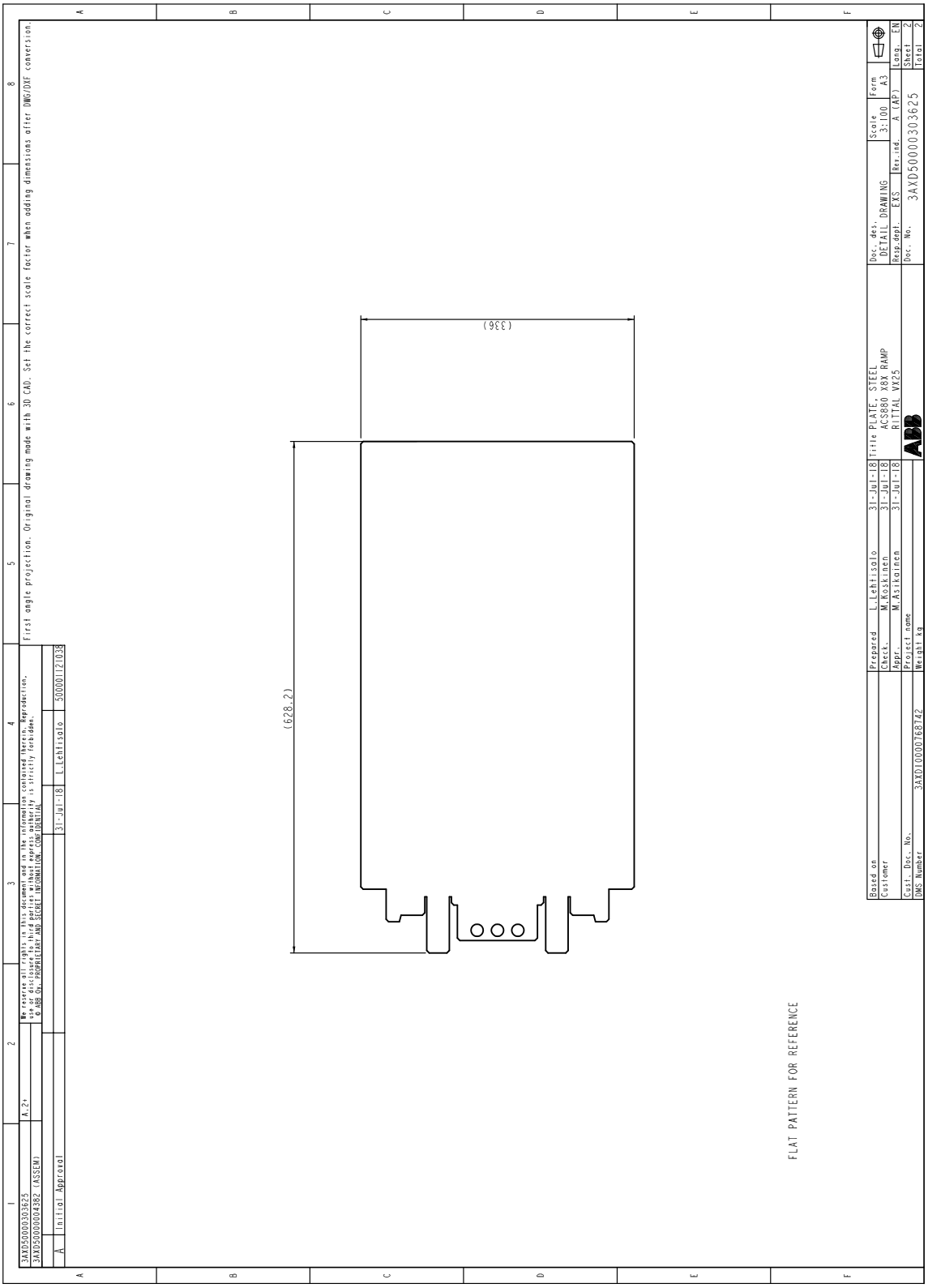
Quick connector for frame R8i




A
15
B
15
C
15
Ø6 (18 pcs)
68±1
36±1
24.5±1
188±1
120±1
52±1
36
547.5±3
492.9±3
532.8±3
179±3
35.7±3
DIMENSION DRAWING
R8I QUICK CONNECTORS
3AXD50000004249
ABB DRIVES

Insertion/extraction ramp for frame R8i modules




(628.2)
(336)
FLAT PATTERN FOR REFERENCE
3AXD50000303625
3AXD50000004382 (ASSEM)
A Initial Approval
A.2+
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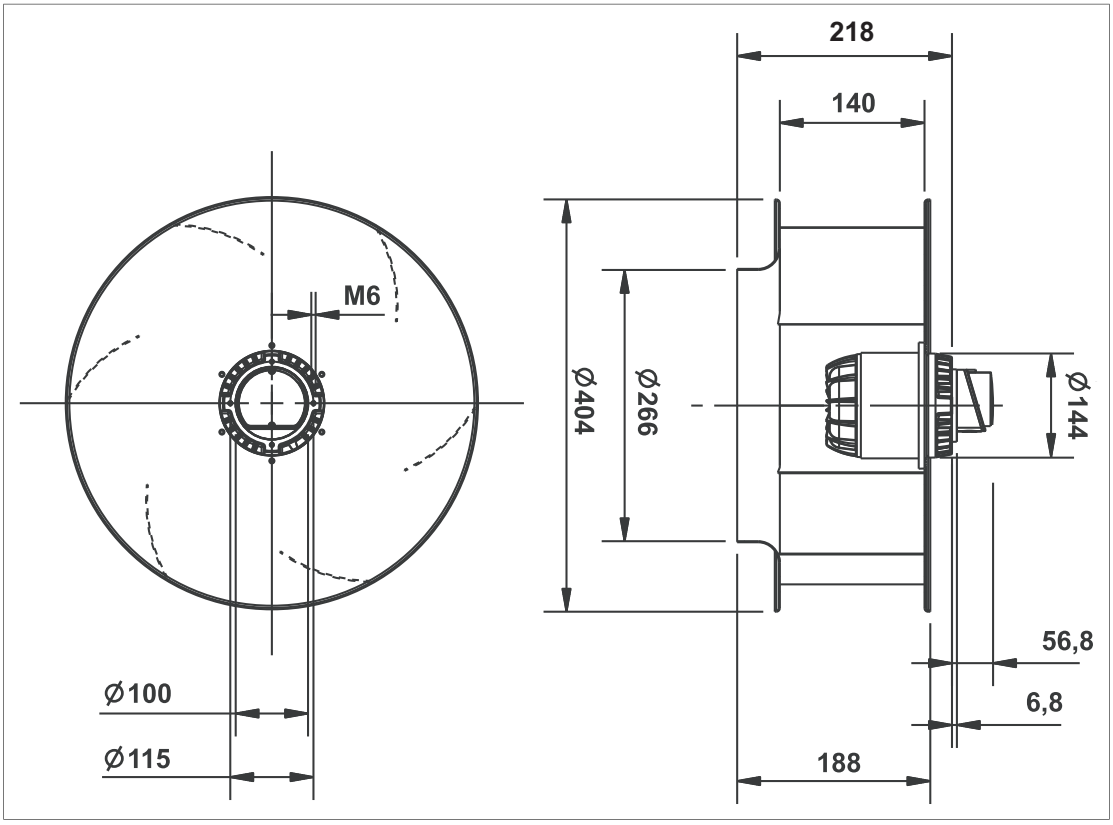
First angle projection. Original drawing made with 3D CAD. Set the correct scale factor when adding dimensions after DWG/DXF conversion.
31-Jul-18 L.Lehtisalo 5000012038
Based on
Customer
Cust. Doc. No.
DMS Number 3AXD10000768742
Prepared L.Lehtisalo 31-Jul-18
Check. M.Koskinen 31-Jul-18
Appr. M.Asikainen 31-Jul-18
Project name
Weight kg
Title PLATE, STEEL
ACS880 X8X RAMP
RITTAL VX25
Doc. des. DETAIL DRAWING
Resp.dept. EXS
Doc. No. 3AXD50000303625
Scale 3:100
Form A3
Res.ind. A (AP)
Lang. EN
Sheet 2
Total 2

CRBB/4-400/188 cooling fan



15. Example circuit diagrams

Contents of this chapter

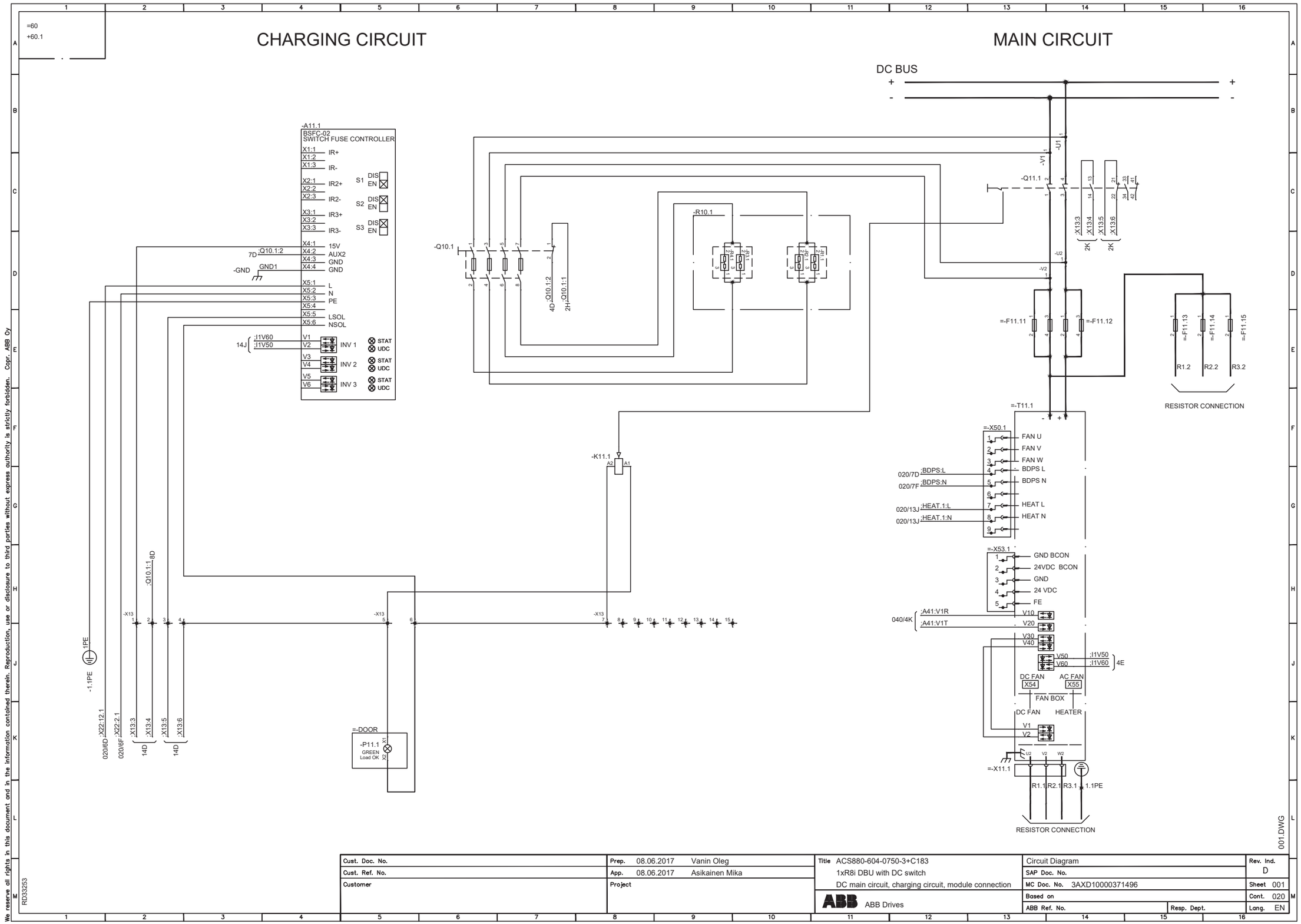
This chapter contains connection diagram examples for frame 1×R8i brake units.

Note: The Safe torque off (STO) function is not in use, and has been bridged at the factory as shown in the diagrams.

Component designations used in the diagrams

Designation	Component
A41	BCU control unit
A48	FDPI board, included in a DPMP-01 panel mounting platform kit (to be ordered separately)
A49	ACS-AP-W control panel
F11.xx	DC fuses
T11.x	Brake module
T22	External 24 V DC power supply

Frame 1×R8i with DC switch/disconnector – Sheet 001 (Main circuit)



Cust. Doc. No.	Prep. 08.06.2017 Vanin Oleg	Title ACS880-604-0750-3+C183	Circuit Diagram	Rev. Ind. D
Cust. Ref. No.	App. 08.06.2017 Asikainen Mika	1xR8i DBU with DC switch	SAP Doc. No.	
Customer	Project	DC main circuit, charging circuit, module connection	MC Doc. No. 3AXD10000371496	Sheet 001
		ABB Drives	Based on	Cont. 020
			ABB Ref. No. / Resp. Dept.	Lang. EN

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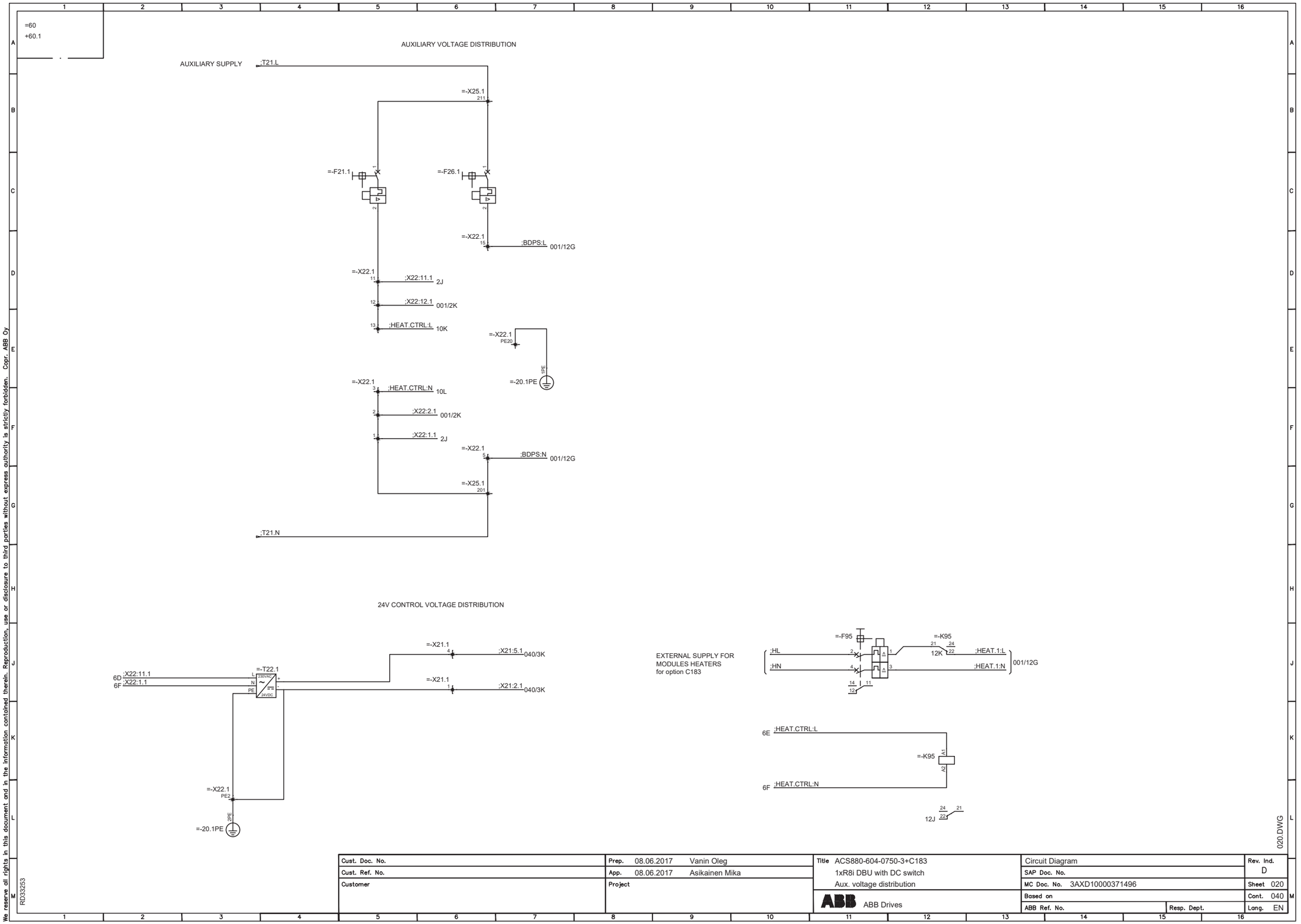
Frame 1×R8i with DC switch/disconnector – Sheet 020 (Auxiliary voltage distribution)



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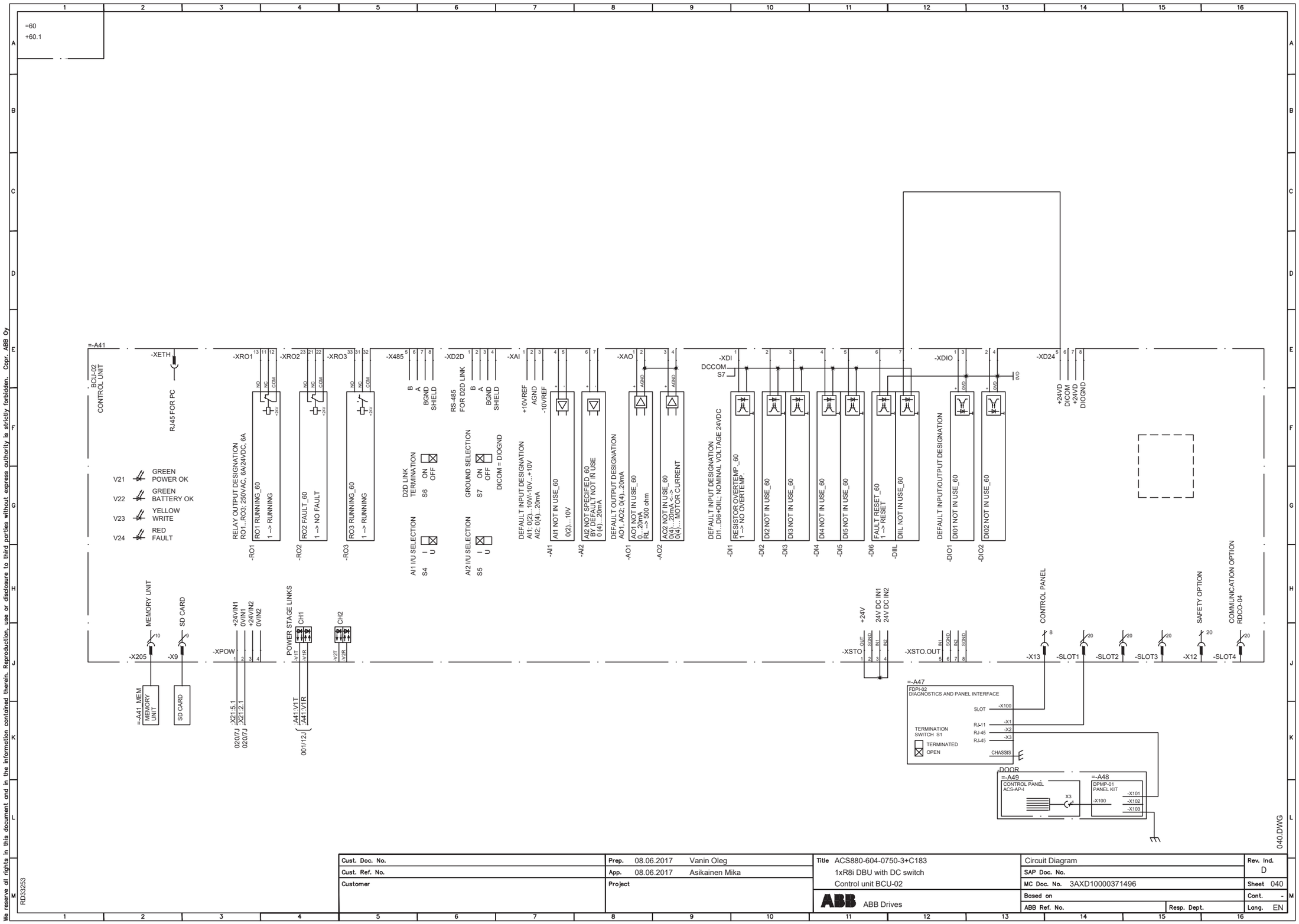
Cust. Doc. No.	Prep. 08.06.2017 Vanin Oleg	Title ACS880-604-0750-3+C183 1xR8i DBU with DC switch Aux. voltage distribution	Circuit Diagram
Cust. Ref. No.	App. 08.06.2017 Asikainen Mika		SAP Doc. No.
Customer	Project	ABB Drives	MC Doc. No. 3AXD10000371496
			Based on
			ABB Ref. No. / Resp. Dept.
			Rev. Ind. D
			Sheet 020
			Cont. 040
			Lang. EN

Frame 1×R8i with DC switch/disconnector – Sheet 040 (Control unit)



Cust. Doc. No.	Prep. 08.06.2017 Vanin Oleg	Title ACS880-604-0750-3+C183 1xR8i DBU with DC switch Control unit BCU-02	Circuit Diagram / Rev. Ind. D
Cust. Ref. No.	App. 08.06.2017 Asikainen Mika		SAP Doc. No.
Customer	Project	ABB Drives	MC Doc. No. 3AXD10000371496 / Sheet 040
			Based on / Cont. -
			ABB Ref. No. / Resp. Dept. / Lang. EN

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Further information

Product and service inquiries

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

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